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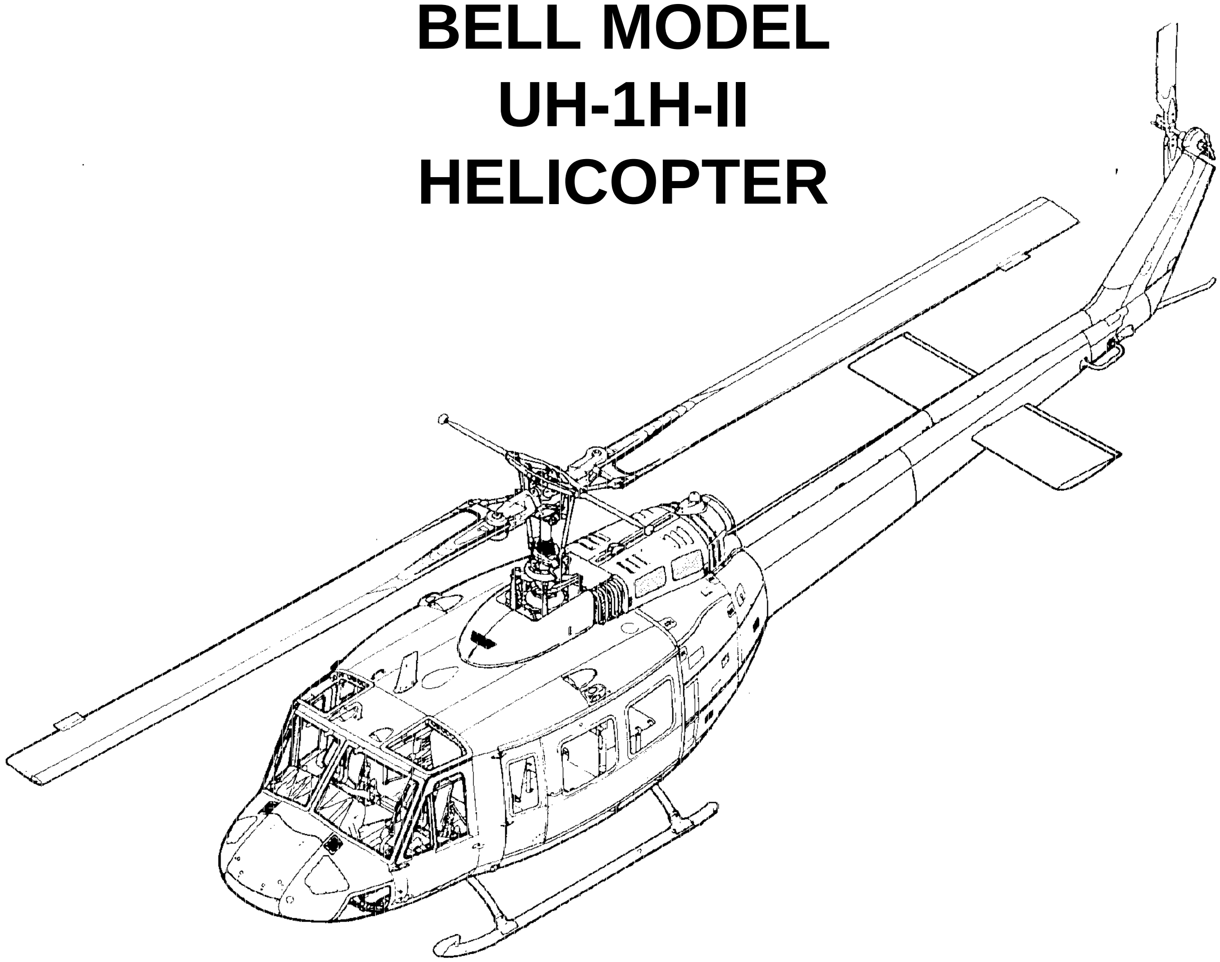
TECHNICAL MANUAL

AVIATION UNIT & INTERMEDIATE MAINTENANCE MANUAL AIRFRAME BELL MODEL UH-1H-II HELICOPTER



Bell Helicopter
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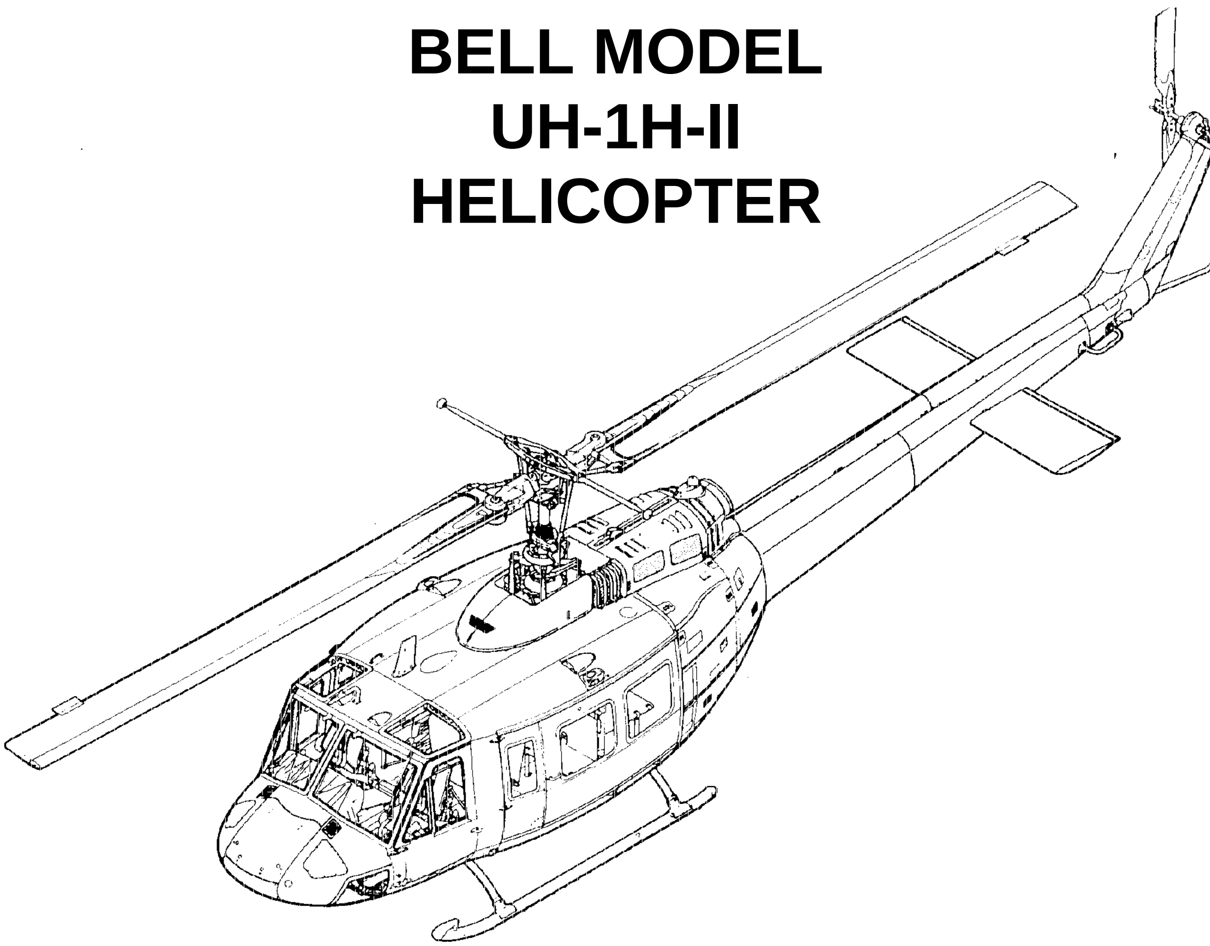

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12 JANUARY 1998
REVISION 6 — 30 JUNE 2002

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LIST OF EFFECTIVE PAGES

Insert latest revision pages as indicated: dispose of superseded pages.

On a revised page the portion of the text and illustration affected by the latest technical revision is indicated by a black vertical line. Revised pages without a black vertical line are a result of text shift from page to page or nontechnical corrections.

Original	0	22 Dec 1994
Revision	1	02 Jun 1997
Reissue	0	12 Jan 1998
Revision	1	16 July 2001
Revision	2	24 Jun 1999
Revision	3	14 Aug 2000
Revision	4	16 Jul 2001
Revision	5	22 Oct 2001
Revision	6	30 Jun 2002

Page No.	Revision No.
Cover	0
Title	6
P/N	0
A - B	6
i	6
ii	5
iii	0
iv - ix	6
x	4
xi	0
xii	4
1-1	0
1-2	5
1-3 - 1-13	0
1-14	6
1-15 - 1-16	0
1-17	2
1-18 - 1-29	0
1-30	6
1-31 - 1-40	0
1-41	6
1-42 - 1-43	0
1-44 - 1-60	4
1-61 - 1-62	6
1-62A/1-62B	6
1-63 - 1-96	4
1-97	2
1-98 - 1-100	6
1-101/1-102	5
2-1 - 2-124	0
3-1	6
3-2	0
3-2A - 3-2B	6
3-3 - 3-16	0
3-17/3-18	0
4-1 - 4-2	0
4-2A/4-2B	2
4-3	2
4-4 - 4-7	0
4-8	2
4-9 - 4-25	0
4-26	2
4-27 - 4-37	0
4-38	2
4-39 - 4-49	0
4-50	6
4-51 - 4-61	0
4-62	6
4-63 - 4-72	0
4-73	2
4-74 - 4-102	0
4-103/4-104	0
5-1	6
5-2	0
5-3	2
5-4	0
5-5	2
5-6	6
5-7 - 5-14	0
5-15	6
5-16 - 5-32	0
5-33	4
5-34 - 5-41	0
5-42	6
5-43 - 5-52	0
5-53	6
5-54 - 5-55	0
5-56	2
5-57 - 5-61	0
5-62	2
5-63	4
5-64	0
5-65	4
5-66 - 5-89	0
5-90	6
5-91 - 5-99	0
5-100 - 5-101	6
5-102	0
5-103	2
5-104 - 5-106	0
5-107	2
5-108	6
5-109 - 5-110	0
5-111 - 5-112	2
5-113 - 5-114	6
5-115 - 5-116	0
5-117	6
5-118 - 5-119	0
5-120	6
5-121	2
5-122	6
5-123 - 5-124	0
5-125	6
5-126 - 5-129	0
5-130 - 5-131	6
5-132	0
5-133	2
5-134	0
5-135/5-136	2
5-137/5-138 DELETED	2
6-1	6
6-2 - 6-89	0
6-90 - 6-90B	5
6-90C/6-90D	5
6-91 - 6-106	0
6-107	4
6-108	0
6-109	6
6-110 - 6-112	0
6-113	3
6-114 - 6-118	0
6-119	4
6-120	3
6-121 - 6-128	0
6-129 - 6-137	5
6-138 - 6-164	0
7-1 - 7-29	0
7-30	6
7-31	0
7-32	6
7-33	0
7-34	6
7-35 - 7-55	0
7-56	2
7-57 - 7-77	0
7-78 - 7-84	5
8-1 - 8-10	0
8-11	2
8-12 - 8-13	6
8-14	4
8-15 - 8-40	0
9-1 - 9-24	0
9-25	6
9-26 - 9-44	0
9-45 - 9-46	6
9-47 - 9-72	0
9-73/9-74	0
10-1 - 10-46	0
11-1 - 11-5	0
11-6	4
11-7	6
11-8 - 11-14	0
11-15 - 11-16	4
11-17 - 11-19	0
11-20 - 11-22	6
11-23 - 11-27	0
11-28	4
11-29	6
11-30	0
11-31	4
11-32 - 11-37	0
11-38	4
11-39 - 11-58	0

LIST OF EFFECTIVE PAGES (Cont.)

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LOGISTICS

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Have you found something wrong with this manual — an error, an inconsistency, unclear instructions, etc? Although we strive for accuracy and clarity, we may make errors on occasion. If we do and you discover it, we would appreciate your telling us about it so that we can change whatever is incorrect or unclear. Please be as specific as possible.

Your complaint or suggestion will be acknowledged and we will tell you what we intend to do.

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All Alert Service Bulletins and Technical Bulletins issued prior to and including the bulletins listed below have been incorporated in this manual, as applicable. Subsequent bulletins will be incorporated in future revisions/reissues.

ALERT SERVICE BULLETINS

ASB NUMBER	SUBJECT	DATE REISSUE

TECHNICAL BULLETINS

TB NUMBER	SUBJECT	DATE REISSUE

WARRANTY

WARRANTY AND REMEDY: Seller warrants each new helicopter part or helicopter part reconditioned by seller to be free from defect in material and workmanship under normal use and service. Seller's sole obligation under this warranty is limited to replacement or repair of parts which are determined to Seller's reasonable satisfaction to have been defective within 1,000 hours of operation or one (1) year after installation, whichever occurs first and reimbursement of reasonable freight charges. After 200 hours of use, there will be a prorated charge to the Purchaser for replacement parts (prorating the hours of total use against the then applicable part life or 2,000 hours, whichever is the lesser). Defective parts must be reported in writing to the Seller's Warranty Administration within 90 days of being found defective. Warranty adjustment is contingent upon the Purchaser complying with the Seller's Warranty Administration disposition instructions for defective parts. Failure to comply with all of the terms of this paragraph may, at Seller's sole option, void this warranty.

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This warranty is the only warranty made by Seller. The Purchaser's sole remedy for a breach of this warranty or any defect in a part is the repair or replacement of helicopter parts and reimbursement of reasonable freight charges as provided herein. Seller excludes liability, whether as a result of a breach of contract or warranty, negligence or strict product liability, for incidental or consequential damages, including without limitation, damage to the helicopter or other property, costs and expenses resulting from required changes or modifications to helicopter components and assemblies, changes in retirement lives and overhaul periods, local customs fees and taxes, and costs or expenses for commercial losses or lost profits due to loss of use or grounding of helicopters or otherwise.

Seller makes no warranty and disclaims all liability in contract or in tort (delict), including, without limitation, negligence and strict tort (delictual) liability, with respect to work performed by third parties at Purchaser's request and with respect to engines, engine accessories, batteries, radios, and avionics, except Sellers assigns each manufacturer's warranty to Purchaser to the extent such manufacturer's warranty exists and is assignable.

This warranty shall not apply to any helicopter part which has been repaired or altered outside Seller's factory in any way so as, in Seller's judgment, to affect its stability, safety or reliability, or which has been subject to misuse, negligence or accident, or which has been installed in any aircraft which has been destroyed unless that helicopter has been rebuilt by Bell. A list of destroyed aircraft is obtainable from Bell Product Support. Repairs and alterations which use or incorporate parts and components other than genuine Bell parts or parts approved by Bell for direct acquisition from sources other than Bell itself are not warranted by Bell, and this warranty shall be void to the extent that such repairs and alterations, in Seller's sole judgment, affect the stability, safety or reliability of the helicopter or any part thereof, or damage genuine Bell or Bell-approved parts. No person, corporation, or organization, including Bell Customer Service Facilities, is authorized by Seller to assume for it any other liability in connection with the sale of its helicopters and parts.

January 1, 1996

Bell Helicopter
A Textron Company

WARNING

Personnel performing operations, procedures, and practices which are included or implied in this technical manual shall observe the following instructions. Disregard of these warnings and precautionary information can cause serious injury, death, or an aborted mission.

TOXIC POISONS

Battery electrolyte is a strong alkaline solution and is harmful to the hands and clothing. Wear protective clothing that is used exclusively for servicing nickel-cadmium batteries. Use a 3 percent solution of boric acid to neutralize any spilled electrolyte. Flush areas thoroughly with water.

Turbine fuels and lubricating oils contain additives which are poisonous and readily absorbed through the skin. Do not allow them to remain on skin longer than necessary.

NOISE

Sound pressure levels in this helicopter during some operating conditions exceed the Surgeon General hearing conservation criteria, as defined in TB MED 251. Hearing protection devices, such as aviator helmet or ear plugs are required to be worn by all personnel in and around the helicopter during its operation.

GROUND OPERATION

Engine will be started and operated only by authorized personnel. References AR95-1.

FIRE EXTINGUISHER

Exposure to high concentrations of monobromotrifluoremethane (CF3BR) extinguishing agent or decomposition products should be avoided. The liquid should not be allowed to come into contact with the skin, as it may cause frost bite or low temperature burns.

FUELING AND DEFUELING

When refueling helicopter, the refueling vehicle or forward air refueling unit must be parked a minimum of 20 feet from the helicopter. Before starting the fueling operation, always insert fueling nozzle grounding chain of fuel truck ground wire into GROUND HERE receptacle located on the right side of the helicopter aft of the cabin area.

When defueling, turn off all electrical switches and disconnect external power from the helicopter. The helicopter must be electrically grounded prior to defueling.

RADIOACTIVE MATERIALS

Self-luminous dials and ignition units may contain radioactive materials. If such an instrument or unit is broken or becomes unsealed, avoid personal contact. Use forceps or gloves made of rubber of polyethylene to pick up contaminated material. Place materials and gloves in a plastic bag. Seal bag and dispose of it as radioactive waste in accordance with AR755-15 and TM 3-261 (Refer to TB 55-1500-314-25). Repair procedures shall conform to requirements in AR700-52.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont)

TABLE OF CONTENTS (Cont)

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF ILLUSTRATIONS (Cont)

LIST OF TABLES

LIST OF TABLES (Cont)

CHAPTER 1

AIRCRAFT GENERAL

SECTION I — SERVICING

1-1. SERVICING.

1-2. Description — Servicing. Instructions and information for complete servicing of the helicopter are provided in the following paragraphs. Figure 1-1 shows the location of servicing points, as well as other pertinent data. Table 1-1 contains, in tabular form, all materials and quantities required.

1-3. Fuel Systems — Servicing. All five interconnected cells of the main fuel system are serviced through a single filler located on the right side of the helicopter. A grounding jack is provided near the filler. Sump drains are located in the bottom of the right and left fuel cells beneath the cabin floor. A system defuel valve is accessible through the left side of the bottom skin just behind the aft cabin bulkhead. See figure 1-1.

Standard fuels, alternate fuels and emergency fuels are listed in the Operator's Flight Manual.

WARNING

Fueling and defueling helicopters requires extreme caution on the part of all personnel. The fuels used are extremely flammable and easily ignited. Fuel vapors can be ignited by static or friction sparks, hot exhaust pipes, lighted cigarette, electrical devices and similar ignition sources.

a. Only qualified personnel actually engaged in the fueling operation should be allowed in the area, and they shall not carry matches, lighters, or other sparking or flame producing devices on their person.

b. When high winds are considered hazardous or when electrical storms are within a three mile radius of fueling or defueling operations, fueling or defueling should be suspended.

c. Fuel transfer personnel shall not wear static producing clothing such as nylon, rayon, or wool. Before starting actual fuel operations, all persons working at the helicopter should dissipate static potential by gripping the static ground line with a bare hand. Shoes with taps or protruding nails should not be worn.

d. The helicopter should not be serviced near drainage ditches or low places where combustible vapors could accumulate.

e. Under no circumstances should a helicopter be fueled or defueled in a hangar. During fueling or defueling, the helicopter shall be positioned at least 50 feet away from any building or smoking area.

f. The helicopter shall be positioned at least 500 feet from any radar system.

g. No other aircraft shall be allowed to operate under its own power within 100 feet of the refueling area during fueling or defueling.

h. The service unit should be positioned as far away from the helicopter as the hose will permit, and in a position so that it may be driven or towed away from the area in the event of an emergency.

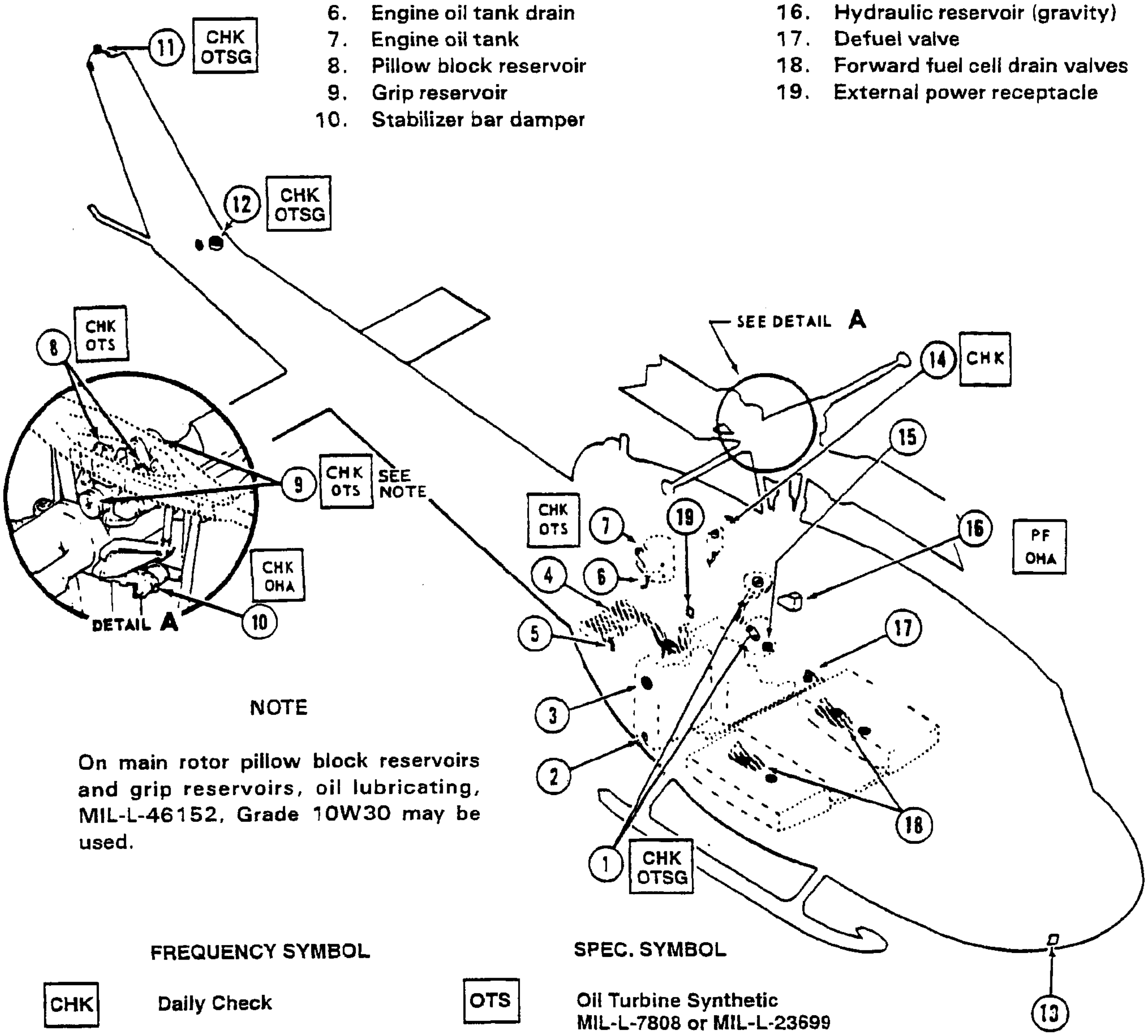
i. Clear paths shall be maintained around the helicopter being serviced, at all times, to permit rapid evacuation of vehicles and personnel.

j. One fully charged, 50-pound CO2 fire extinguisher, equipped with an extension assembly, shall be in the immediate area. Access to fire extinguishers on vehicle shall not be obstructed.

k. A minimum of 20 feet shall be maintained from other aircraft by servicing units during fueling defueling units. All venting doors on servicing unit shall be open.

l. The service unit shall be grounded by unreeling the ground cable and attaching its ground-rod clip to the nearest approved ground rod.

1. Transmission filler and sight gage
2. Ground receptacle
3. Fuel tank filler
4. Transmission oil cooler drain
5. Engine oil cooler drain
6. Engine oil tank drain
7. Engine oil tank
8. Pillow block reservoir
9. Grip reservoir
10. Stabilizer bar damper
11. Tail rotor gearbox
12. Intermediate gearbox
13. External power receptacle
14. Fuel filter drain
15. Transmission sump drain
16. Hydraulic reservoir (gravity)
17. Defuel valve
18. Forward fuel cell drain valves
19. External power receptacle



NOTE

On main rotor pillow block reservoirs and grip reservoirs, oil lubricating, MIL-L-46152, Grade 10W30 may be used.

FREQUENCY SYMBOL

CHK	Daily Check
PF	Preflight Check
OTSG	Oil Turbine Synthetic (Gearbox) DOD-L-85734 (AS) BP Turbine OIL ETO25 AEROSHELL 555 ROYCO 555

SPEC. SYMBOL

OTS	Oil Turbine Synthetic MIL-L-7808 or MIL-L-23699
OHA	Oil Hydraulic Aircraft

UH-1H-II-M-01-1

Figure 1-1. Servicing points

Table 1-1. Servicing Capacities and Materials

TANK OR SYSTEM	CAPACITY	NOMENCLATURE	MATERIAL SPECIFICATION
Main Tanks (5)	209 or 220 Gallons*	Turbine Fuel	Refer to Flight Manual
Auxiliary Fuel Tanks (2) (Optional)	150 Gallons	Turbine Fuel	Refer to Flight Manual
Engine Assembly	3.25 Gallons	Lubricating Oil (Synthetic Base)	Refer to Flight Manual
Transmission, Filter and Cooler	2.75 Gallons	Lubricating Oil (Synthetic Base)	Refer to Flight Manual
Tail Rotor (Intermediate) Gearbox	0.375 Pints	Lubricating Oil (Synthetic Base)	Refer to Flight Manual
Tail Rotor Gearbox	0.50 Pints	Lubricating Oil (Synthetic Base)	Refer to Flight Manual
Pillow Blocks	0.12 Quart per Block	Lubricating Oil (Synthetic Base)	Refer to Flight Manual
Main Rotor Grips (each)	1.0 Quart	Lubricating Oil (Synthetic Base)	Refer to Flight Manual
Hydraulic System	10.0 Pints	Hydraulic Fluid (Petroleum Base)	Refer to Flight Manual
Reservoir	5.3 Pints	Hydraulic Fluid (Petroleum Base)	Refer to Flight Manual

*Fuel capacity of helicopters with crashworthy fuel system incorporated is approximately 209 gallons. Fuel capacity of unmodified helicopters (with rigid fuel cells) in 220 gallons.

CAUTION

1. Before removing filler cap to service engine and engine gearbox, ensure cap area is clean. Keep contaminants out of oil system.

2. Stained or discolored sight gage glass may give falst indication of oil quantity. When checking oil level, shake helicopter and observe sight gage for oil movement. If gage is determined to be stained or discolored, removal and cleaning or replacement will be required.

3. When engine fuel types are changed, refer to Engine Manual.

m. After grounding the service unit, ground the helicopter to either the rod that grounds the service unit or another approved ground rod.

n. The service unit hose nozzle shall then be grounded to the helicopter before removing the dust cap from the nozzle or the cap off the fill port. If the helicopter has a receiver for the grounding plug, use the plug; if not, clip the alligator clip to a bare metal part of the helicopter.

o. All helicopter electrical power shall be OFF.

NOTE

If power is required, turn battery and required system switches ON prior to start of refueling operation. No further switching shall be done until fueling is complete except as required by an emergency.

WARNING

When aircraft fuels come in contact with the skin, a solvent action occurs, which removes natural fats and oil that may expose the skin to infectious dermatosis. Extensive vapor inhalation may cause serious illness while accidental swallowing of the fuels will result in internal injury and possibly death. Personnel who are subjected to splashed and sprayed fuel should remove their clothing as soon as possible and wash down/shower with large amounts of water. Contaminated clothing should not be removed around potential ignition sources.

1-4. Refueling.

a. Comply with requirements of paragraph 1-3.

WARNING

Overfilling fuel cells can cause injury to personnel through fuel coming in contact with the skin or vapors entering the respiratory system. Further, fuel spillage presents an extreme fire hazard.

WARNING

No one should be aboard the helicopter during refueling.

b. Check interior of helicopter.

c. Check all helicopter electrical power — OFF.

NOTE

If power is required, turn battery and required switches ON prior to refueling operation. No further switching shall be done until fueling is complete except as required by an emergency condition.

d. Check vent lines for obstructions.

e. Move servicing unit into position.

f. Park servicing unit and set brake.

g. Check fuel in servicing unit to ensure it is the right type.

h. Position fire extinguishers.

i. Ground the servicing unit to approved ground-rod.

j. Ground the helicopter to approved ground-rod.

k. Attach transfer hose nozzle grounding wire to helicopter.

l. Remove filler cap.

m. Service fuel tanks slowly.

WARNING

Do not leave the nozzle unattended at any time during the refueling operation.

n. Replace filler cap and nozzle dust cap.

o. Remove nozzle ground wire.

p. Remove helicopter ground.

q. Remove service unit ground.

r. In the event of a fire emergency, the following should be accomplished expeditiously as possible:

(1) Stop fuel flow.

(2) Separate helicopter and service unit.

(3) Sound alarm.

(4) Attempt rescue and contain fire.

1-5. Defueling.

CAUTION

If the helicopter is being defueled because it has crashed, made a forced landing, or the quality of its fuel is questionable, the fuel drained from it should be stored, sampled and tested before it is used, downgraded, or disposed of as the tests indicate appropriate.

a. Comply with requirements of paragraph 1-3.

WARNING

Fuel spills/splashes can cause injury to personnel through fuel coming in contact with the skin or vapors entering the respiratory system. Further, fuel spillage presents an extreme fire hazard.

WARNING

Defueling is more dangerous than fueling because the procedure is more difficult and the draining provisions are sometimes less convenient. All safety precautions shall be observed.

b. Notify fire department of defueling operation location, anticipated start time and estimated time to completion.

WARNING

No one should be aboard the helicopter during defueling.

c. Check interior of helicopter.

d. Check all helicopter electrical power — OFF.

NOTE

If power is required, turn battery and required switches ON prior to defueling operation. No further switching shall be done until defueling is complete except as required by an emergency condition.

e. Check vent lines for obstructions.

f. Move servicing unit into position.

g. Park servicing unit and set brake.

h. Position fire extinguishers.

i. Ground servicing unit to approved ground-rod.

j. Ground the helicopter to approved ground-rod.

k. Attach defueling tube/hose ground wire to the helicopter.

NOTE

Defuel helicopters with crashworthy fuel system at gravity defuel valves located on sumps adjacent to drain valves (18, figure 1-1). The defuel valve is activated by using a fitting such as: AN815-12 union, AN832-12 union, AN919-12 reducer, and MS33656E12 end fitting after removing protection cover.

l. Remove filler cap.

m. Insert defueling tube/hose into helicopter fuel cell.

n. Start pumping fuel from helicopter.

o. As the fuel flow stops, shut down pump.

p. Remove defueling tube/hose from helicopter.

q. Replace filler cap.

r. Remove defueling tube/hose ground wire and reel tube/hose up.

s. Remove helicopter ground.

t. Remove service unit ground.

CAUTION

Do not return the drained fuel to a storage area unless it is passed through a filter/ separator after it is drained from the helicopter.

u. In the event of a fire emergency, the following should be accomplished as expeditiously as possible.

(1) Stop fuel flow.

(2) Separate helicopter and service unit.

(3) Sound alarm.

(4) Attempt rescue and contain fire.

v. Purge fuel system. (Refer to paragraph 1-6.)

1-6. PURGING FUEL SYSTEM.

a. Prepare helicopter for defueling in accordance with paragraph 1-3.

b. Defuel helicopter in accordance with paragraph 1-5.

CAUTION

Use filtered compressed air only or as outlined in step 4.

c. Air purge fuel cell as follows:

(1) Open all sump drains and drain lines.

(2) Insert air hose in cell filler inlet under cap and seal with masking tape (C-426).

(3) Blow filtered air through cell at 60 to 100 psi for a period of 8 hours.

(4) Remove air line from cell inlet. Wait 1 hour.

WARNING

Explosimeter reading must be less than 20 percent. If reading is more than 20 percent, repeat steps (1) through (3) until reading is less than 20 percent.

(5) Check interior with explosimeter (combustible gas indicator calibrated for fuel vapors) for level of vapors.

d. Purge cells using CO2 or inert gas as follows:

WARNING

Remove the fiber horn when using a fire extinguisher bottle as a source of CO2 for purging fuel cells. Gas moving through the horn can generate static electrical charges. Ground the nozzle to the aircraft. Ground the CO2 bottle to the aircraft. Discharge the CO2 into the fuel cell slowly at a rate of one pound per minute. Rapid passage of gas through a hose can generate static electrical charges. Rapid discharge of the gas allows rapid expansion of the gas, lowering the temperature with possible damage to the cell as a result. Nitrogen (gas) (C-315) or other inert gas may be used with the same precautionary measures outlined above.

(1) Open all sump drains and drain lines.

(2) Insert inert nitrogen gas hose in cell filler inlet under cap and seal with masking tape (C-426).

(3) Blow inert nitrogen (gas) (C-315) through cells for a period of 8 hours.

(4) Remove air line from cell inlet. Wait 1 hour.

WARNING

Explosimeter reading must be less than 20 percent. If reading is more than 20 percent, repeat steps (2) through (4) until reading is less than 20 percent.

(5) Check interior with explosimeter (combustible gas indicator calibrated for fuel vapors) for level of fuel vapors.

e. Fog interior of fuel cell with lubricating oil (C-009). Close drains and replace filler caps. Do not close vents.

1-7. Auxiliary Fuel System. Auxiliary fuel cells, when installed, are at rear of cabin and are accessible through cargo doors. Observe same precautions as for servicing main fuel system. Refer to paragraph 1-3 and table 1-1.

a. Refueling. Fill auxiliary fuel cells through filler cap at top front as installed.

b. Draining — Auxiliary fuel. Auxiliary fuel drain valves are located at cabin floor level, outboard of fuel cells. Drain lines discharge under cabin floor and inboard of valves.

1-8. Engine Oil System. The supply tank for the engine oil system is located on the right side and forward of the forward engine firewall. The oil level in the tank can be checked by viewing the sight gage indicators on the tank. The sight gage indicators are accessible through inspection door. For access to the filler cap and filler cap dipstick, the lower engine cowl must be removed. Service the tank with an authorized type of synthetic base lubricating oil. (Refer to Flight Manual for approved list.)

NOTE

Numbers 1 through 4 appearing on dipstick indicate level of oil in engine oil tank.

CAUTION

Stained or discolored sight gage glasses may give false indication of oil/fluid quantity. If false indication is suspected, shake helicopter by means of the tail skid and observe sight gage for oil/fluid movement. Replace sight glass if condition warrants.

NOTE

It is recommended that anytime the system is serviced, either for an oil change or routine quantity servicing, the oil container be agitated prior to opening. If oil pressure fluctuation is accompanied by foaming, drain and service with agitated oil. When using quart cans, open the end which has been on the bottom during storage.

a. Prior to changing type of oil, new decals and/or servicing instructions must be installed at the proper locations on the helicopter.

NOTE

An appropriate entry must be made in the aircraft and engine logbooks. The entry must show the type and brand name of the oil, to prevent inadvertent mixing of lubricating oils. Refer to Engine Manufacturers Manual for additional information, and oil change intervals for the engine.

b. If oil brand change is made after extended time on one oil, it is recommended that the system be flushed and a filter inspection be accomplished after 5 and 15 hours of operation on new oil for accumulation of deposits on filter.

c. To change oil type, perform the following steps:

(1) Drain lubricating oil from system. Inspect and clean filter and strainers as required.

(2) Fill oil system with specification of lubricating oil to be used.

(3) Operate system for a period of 30 minutes to 1 hour to heat oil to operating temperature. Shut down engine.

(4) Inspect and clean system oil filters and strainers. If heavy contamination of filters and strainers is noted, proceed with steps (5) through (8). If little or no contamination of filters and strainers is noted, release helicopter for service and proceed with steps (7) and (8).

(5) Drain lubricating oil from oil system and discard oil.

(6) Refill oil system with specification of lubricating oil to be used and release helicopter for service.

(7) Inspection and cleaning of oil system filters and strainers is required after 5 and 15 hours of composite operating time.

(8) After 15 hours, inspect oil system filters and strainers and revert to normal inspection interval.

(9) Consult maintenance instructions for further details of engine oil system (Chapter 4).

1-9. Transmission Oil System. The transmission sump case serves as the reservoir for this system. The filler is located on the upper right side of the transmission and is accessible when the forward pylon fairing is opened. Oil level sight gages may be viewed through the right side of the pylon support structure in the cabin with the aid of a light controlled by a push-button switch. A sump drain valve is located directly beneath the sump. An external filter, in the return line from the oil cooler, is located inside the pylon structure at the right side and has a red indicator which will be visible when the filter is in impending bypass condition. Drain valves in the oil cooler lines are accessible through the bottom fuselage skin below oil cooler. Refer to Chapter 6 for further details of transmission oil system.

1-10. Main and Tail Rotor System.

a. Transparent plastic sight gages are on the grip and pillow block reservoirs for checking oil level. Oil level shall be maintained at the one-half indication. See table 1-1 for main rotor grip and pillow block reservoir oil requirements.

b. Oil level in the intermediate and tail rotor gearboxes may be checked on the sight gages and replenished, as required.

c. Check timing and service stabilizer bar dampers as necessary. Refer to Chapter 5.

1-11. Hydraulic Reservoir. Check sight gage of hydraulic reservoir (16, figure 1-1) through viewing hole provided on right side of transmission fairing. If fluid level shows in sight gage, reservoir servicing is required. Open transmission fairing for access. Remove cap and fill reservoir to overflow with hydraulic fluid (C-002). Reinstall filler cap. Close transmission fairing.

WARNING

Avoid contamination, do not use previously opened cans of hydraulic fluid. A new, sealed can of fluid will be opened and used.

HYDRAULIC FLUID CAPACITY	U.S. PINTS
System	10.0
Reservoir	5.3
Reservoir Refill	2.5

a. Drain hydraulic reservoir by removing plug from port marked DRAIN on lower aft side of reservoir.

1-12. Ground Handling Gear Pump. Hold pump in an upright position, with oil hole and handle socket at top. Fill with hydraulic fluid (C-002) until hydraulic fluid comes out filler hole. Check pump for leaks and proper operation.

1-13. Ground Handling Gear Tires. Each ground handling assembly has two 7.00-6, 6-ply rating, Type III aircraft tires. The tires are to be inflated to 50 psig air pressure.

1-14. Battery.

A nickel cadmium battery is located in the helicopter nose compartment and aft battery compartment. Refer to Chapter 9.

1-15. Engine Fire Extinguisher Bottles.

Check gages of engine compartment fire extinguisher bottles through inspection doors in sides of engine cowling. If gage is below the acceptable limit replace with a serviceable unit.

1-16. Portable Fire Extinguishers. Check gages of portable fire extinguishers in cabin. The fire extinguisher is located on the floor to the right of the pilot seat. The fire extinguisher may also be located between seats aft of console.

1-17. CLEANING.

1-18. Description — Cleaning. Cleaning the helicopter before preparing it for storage, is important because residues from exhaust gases, dirt, and contamination of any kind will accelerate corrosion, whether coated with preservative compound or not. The helicopter must be grounded prior to any cleaning, maintenance, disassembly, or preservation.

NOTE

Additional cleaning procedures are covered in this manual under individual components.

1-19. Interior — Cleaning. Clean the interior of the helicopter to prevent debris from falling into the operating mechanism. If the upholstery needs cleaning, use mild soap and water. To remove grease or oil spots use solvent (C-304). Wipe dry with a clean cloth. Finally, thoroughly clean the aircraft with a vacuum cleaner.

WARNING

Although solvent (C-304) is very safe and is nonflammable, it still should be used with adequate ventilation and prolonged breathing of the vapors should be avoided. The solvent shall not be used near open flames or heat as the products of decomposition are toxic and very irritating. Contact with the skin should be avoided; rubber gloves shall be worn.

1-20. Exterior — Cleaning. Clean the exterior structure by applying a mixture of one part cleaning compound (C-318) and three to seven parts water. Use stronger mixtures for exhaust outlet areas and other very dirty surfaces. Wash a small area at a time making sure to rinse thoroughly with water under pressure. If allowed to dry or if not completely rinsed off, the compound could harm painted finishes.

CAUTION

Cleaning solution inadvertently splashed on plexiglass should be rinsed off with clear water before it becomes dry.

CAUTION

To preclude damage to bonded panels, solvents and water are to be applied at the minimum pressure required to maintain a constant flow suitable for washing or rinsing. Steam cleaning is not to be utilized.

1-21. Plexiglass — Cleaning. Clean all plexiglass surfaces as follows:

a. Clean all transparent plastics with large quantities of mild soap and water.

b. Gently free all caked mud or dirt with the pads of the fingers. Do not use sponges or coarse cloths. Rinse the area continuously while removing the mud.

CAUTION

Do not use aliphatic naphtha TT-N-95 Type II (C-305).

CAUTION

Do not use compounds containing any abrasive material or solutions containing chlorinated carbons. Avoid excessive scrubbing of plastic panels during washing operation.

c. Allow surface to drip dry.

d. Minor scratches may be reduced or removed by application of a suitable plastic cleaner.

e. A light coat of high quality wax may be applied to reduce scratching.

1-22. Rotor Blades — Cleaning. Wash rotor blades with detergent (C-355) and water.

1-23. Treatment of Aluminum and Magnesium Alloy Corrosion. Aluminum and Magnesium alloy corrosion will be treated in accordance with CSSD-PSE-87-001 and TM 55-1500-204-25/1. Apply the protective paint finish to the affected area immediately after drying of chemical treatment in accordance with TB 746-93-2.

1-24. Snow and Ice Removal. Refer to TM 55-1500-204-25/1.

1-25. CONSUMABLE MAINTENANCE SUPPLIES AND MATERIALS.

1-26. Description — Consumable Maintenance Supplies and Materials. Consumable maintenance supplies and materials are listed in BHT-ALL-SPM Standard Practices Manual.

1-27. SPECIAL TOOLS AND TEST EQUIPMENT.

1-28. Description — Special Tools and Test Equipment. Special tools and test equipment are listed in table 1-2. Each tool or piece of test equipment has an item number assigned for ease of location and reference. When an item is referenced in the manual you may locate the item through its T designator and item number. T designators are used only with special tools and test equipment. The special tools and test equipment table is found only within this chapter; therefore, the table number will not be referenced within the text. A complete listing of all special tools and test equipment authorized for use to perform maintenance on aircraft/accessories are contained in the aircraft parts manual.

USABILITY CODES

R — Removal	A — Assembly
D — Disassembly	IN — Installation
I — Inspection	AD — Adjustment
RP — Repair/Replace	SP — Storage/Preservation
T — Testing	

Table 1-2. Special Tools and Test Equipment

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T 1	AA4920-85-03	Kit, Rotor Balance Positioning	AD	
T 2	AN8515	Wrench, Spanner	D/A	
T 3	AN/PSM-6A	Multimeter	T	
T 4	BH120-1032	Tool, Torque Nut		
T 5	BL-6529	Wrench, Spline		
T 6	JS953	Kit, Hydraulic	RP	3-4, 3-5

Table 1-2. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T 7	JTB Model 33FS	Meter, Frequency	T	
T 8	LTCT400	Trailer, Engine	R/IN	
T 9	LTCT434	Stand, Engine	R/IN	
T10	LTCT773	Sling, Engine Lift	R/IN/RP	4-40
T11	PD1201	Wrench, Power	R/IN	5-7
T12	PD2659	Socket, Mast Nut	R/IN	5-7
T13	PD2660	Adapter, Reaction Torque	R/IN	5-7
T14	S22	Assembly, Bushing	A	
T15	S135	Packing, Seating Tool	A	
T16	SWE100	Wrench, Power	A	
T17	SWE124330	Plate, Anchor	A	
T18	SWE13851	Stand, Engine and Transmission	R/IN/RP	4-4, 4-41
T19	SWE13852-1210	Arm, Engine	R/IN/RP	4-41
T20	SWE13852-1510	Base, Engine Adapter (SWE13851)	R/IN/RP	4-41
T21	SWE13852-40	Adapter	R/IN/A	
T22	SWE13852-500	Adapter	R	
T23	SWE13855	Stand, Transmission	R/IN/A	
T24	T100220	Slings, Lifting	R/IN	
T25	T100615-13LW	Fixture Lockwire	IN	
T26	T100615-15	Tool, Seal Installation	A	
T27	T100619-2	Adapter, Torque	R/D/A	

Table 1-2. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T28	T100929	Jackscrews	A/R	
T29	T101303	Socket	A	
T30	T101304	Adapter	A	
T31	T101306	Wrench, Splined	D/A	
T32	T101307	Wrench, Outer Coupling	D/A	
T33	T101308	Jack Screws	D/A/R	
T34	T101330	Fixture, Cyclic Stick		
T35	T101336	Wrench	D/A	
T36	T101338	Jackscrews	D	
T37	T101356	Bench, Buildup	AD/D/A/R/IN	
T38	T101365	Fixture, Quill	R/D/A	
T39	T101369	Assembly, Support	D/A	
T40	T101382	Assembly, Ram	D/A	
T41	T101392	Wrench	D/A	
T42	T101400	Assembly, Support	AD	
T43	T101401	Assembly, Scope	AD	
T44	T101402	Links, Grip Positioning	AD/R/IN/A	
T45	T101406	Puller, Bearing	D	
T46	T101407	Tool, Seal Bearing	D	
T47	T101412	Tool, Grip Spacing	D/A	
T48	T101414	Wrench	R/IN	
T49	T101416	Hoist, Maintenance	R/N	

Table 1-2. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T50	T101419	Tool Set, Alignment Engine to Transmission Driveshaft	AD	
T51	T101420	Fixture, Holding	D/A	
T52	T101421	Plate, Adapter Buildup Bench	AD/R/D/A/IN	
T53	T101424	Bar, Bearing Removal	D/A	
T54	T101440	Jack, Transmission Leveling	AD	
T55	T101446	Plate Assembly	D/A	
T56	T101447	Holding Fixture	D/A	
T57	T101449	Wrench, Retaining Nut, Quill	D/A	
T58	T101452	Hoist, Maintenance	AD/R/IN/A	1-8, 1-9, 4-4
T59	T101455	Fixture, Holding	D/A	4-4
T60	T101456	Wrench	A	
T61	T101457	Tool, Grip Spacing	A	
T62	T101488	Wrench	A/R/D	
T63	T101493	Wrench	D/A	
T64	T101559	Gage, Grip Spacing	AD	
T65	T101586	Pusher Set	A	
T66	T101600	Wrench, Retaining Nut	D/A	
T67	T107640	Trailer, Engine	R	
T68	T101865	Stops, Flap	AD	
T69	T41000870-1	Adapter, Torque	A	
T70	XW20509	Wrench		

Table 1-2. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T73	204-040-001-3, 3G1F-1-10	Holding Tool	D/A	
T74	204-040-300-1, 3G1F-1-10	Backlash Tool	D/A	
T75	204-076-202-100B	Wrench, Spanner	I	
T76	2201	Spacer	AD	
T77	2215	Wheel, Hand	AD	
T78	2259	Arbor, Balancing	AD	5-23
T79	2337	Fixture	AD	5-23
T80	2467	Sleeve	AD	5-23
T81	2486	Gage, Strut Positioning	AD	5-23
T82	2586	Plate, Special Tool	AD	
T83	2588	Adapter	AD	5-23
T84	27872-2 and -11	Reamer	A	
T85	387011	(Simmonds) Bridge Automatic Capacitance	T	
T86	387991-003	Field Calibration	T	
T87	4920-EG-008	Stand, Engine	R/IN/RP	
T88	49208975623	Stand, Engine	R/IN	
T89	67SPL1275-0114	Tool	D/A	
T90	7A050	Kit, Balancing	AD	5-22, 5-23
T91	7FA18005-50	Wrench		

Table 1-2. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T92	7HEL053	Kit, Balancing	AD	
T93	7HEL054	Kit, Main Rotor Balance	AD	
T94	7HEL061	Kit, Balancing	AD	5-23
T95	7HEL065	Kit	AD	
T96	T101458	Balancing Set	AD	
T97	T101458-3	Socket	AD	
T98	T101458-5	Plug	AD	
T99	T101458-7	Spacer	AD	
T100	T101559-3	Plug, Main Rotor Hub Grip Spacing	AD	
T101	T101597	Tab Bender	AD	
T102	T101598	Gage	AD	
T103	412-204-033-101	Hanger Simulator (2 required)	AD	
T104	T103226-101	Tail Rotor Gearbox Simulator	AD	
T105	412-240-034-101	Hanger Simulator	AD	
T106	T103224-101	Intermediate Gearbox Simulator	AD	
T107	T103225-119	Tailboom Bulkhead Alignment Plate Assembly	AD	
T108	T103225-108 and -109	Spacer	AD	
T109	T101564	Holding Fixture	AD	
T110	412-240-035-101	Hanger Simulator	AD	
T111	T41000310-1	Torque Fixture	D/A	
T112	2288	Tube Assembly (Marvel Balancing Tools)	AD	
T113	2291	Stand, Table	AD	
T114	2293	Balancing Arbor	AD	
T115	2589	Yoke	AD	
T116	2769	Tube Assembly (Marvel Balancing Tools)	AD	
T117	3350	Stand, Table	AD	

Table 1-2. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
T118	7HEL087	Kit, Tail Rotor Balancing	AD	
T119	D3659-30	Drain Line	R, S/P	
T120	T101264-103	Tail Rotor Gearbox Pusher	R	
T121	T101560	Holding Fixture	D/A	
T122	T101350	Backlash Clamp	A, AD	
T123	T101872	Backlash Arm	A, AD	
T124	T103206	Tool, Tail Rotor Rigging	AD	
—	204-040-001-019 GIF-1 △1	Input Bevel Pinion Backlash Tool		
—	205-040-001-017 PAT-1	Input Bevel Gear Holding Tool		
—	212-040-001-003 PAT-1 △2	Dial Indicator Holding Tool		
—	205-040-200-001 PAT-003	Offset Generator Drive Pinion Backlash Tool		
—	212-040-001-003 GIF-ID4 △3	Sump Pinion Holding Tool		
—	212-040-001-003 GIF-ID3	Tail Rotor Drive Output Quill Backlash Tool		
—	212-040-001-003 GIF-ID2	Sump Accessory Drive Pinion Backlash Tool		

NOTES

△1 Alternate Tool — 212-040-001-003 GIF-ID6

△2 Alternate Tool — 204-040-009-013 PAT-1

△3 Maintenance of Drive and Sump Assembly

1-29. SUPPORT EQUIPMENT.

1-30. Description — Support Equipment. Support equipment will include all equipment authorized for use in support of this helicopter. Equipment is listed in table 1-3 and may be located by item number.

Table 1-3. Support Equipment

ITEM NO.	PART NUMBER	NOMENCLATURE
S1	AA1730-1301-7	Driving Rod Assembly Aircraft Mooring
S2	AA1730-1301-9	Eye Assembly Aircraft Mooring
S3	AA1730-1301-10	Anchor Guy, Aircraft Mooring
S4	AA1730-1301-38	Rod, Aircraft Mooring
S5	BU953B	Pump, Hydraulic Jack
S6	SW1961-2	Tiedown Assembly, Rotor
S7	SW4737-1	Tiedown Assembly, Rotor Blade
S8	T101448	Hoist Assembly, Maintenance
	T101452	Hoist Assembly, Maintenance
S9	T101460	Hoist Assembly, Maintenance
S10	1106149	Stand, Rotor
S11	1106181	Stand, Generator
S12	204-050-200-5	Gear Assembly Ground Handling
S13	204-070-464-1	Cover Assembly, Engine Exhaust
S14	204-070-478-1	Cover Pylon Assembly
S15	204-706-058-001	Adapter Kit, Wheel Loading
S16	205-070-675-007	Cover Assembly
S17	205-070-675-011	Cover, Turbine Air Inlet
S18	Deleted	
S19	Deleted	
S20	T101626	Sling Assembly
S21	T102012	Tailboom Support Assembly
S22	988S	Jack, Hydraulic Tripod

1-31. LUBRICATION INSTRUCTIONS.

1-32. Description — Lubrication Instructions. This chapter covers the lubrication requirements as shown on Lubrication Chart in this section. See figure 1-2. This chart consists of a main drawing which is a perspective diagram of the helicopter, with enlarged or detailed views where required to show items clearly. The chart shows all parts requiring periodic lubrication. The Lubrication Chart uses symbols and abbreviations to indicate the required lubricant and method of application for each part.

1-33. Lubrication.

a. After each day of operation in rain showers or snow or after washing helicopter, all exposed control bearings shall be purge lubricated to remove trapped moisture and ensure that a lubrication film is applied to susceptible surfaces.

b. Parking helicopters outside in a heavy dew environment requires that all exposed control bearings be purge lubricated every seven days to ensure that no voids exist that could trap moisture.

c. If helicopter is stored for periods in excess of 45 days without operation of service, purge lubricate all bearings.

1-34. Lubrication Symbols.

The Lubrication Chart (figure 1-2) uses symbols and abbreviations to indicate the required lubricant, method of application, and time interval for lubrication of each part listed. A key on the chart indicates the meanings of symbols and abbreviations.

1-35. 204-040-755-005 Lubrication Restrictions.

NOTE

Do not exceed lubrication intervals specified on lubrication chart.

a. The 204-040-755-005 lubricant (C-015) has 4 year shelf life from packing date on container.

b. The calendar life (months) that is listed for a lubricated component shall be adhered to whether the component is installed on a helicopter or is placed on a shelf as a spare. The calendar time or hours of operating item, whichever comes first, shall not be exceeded.

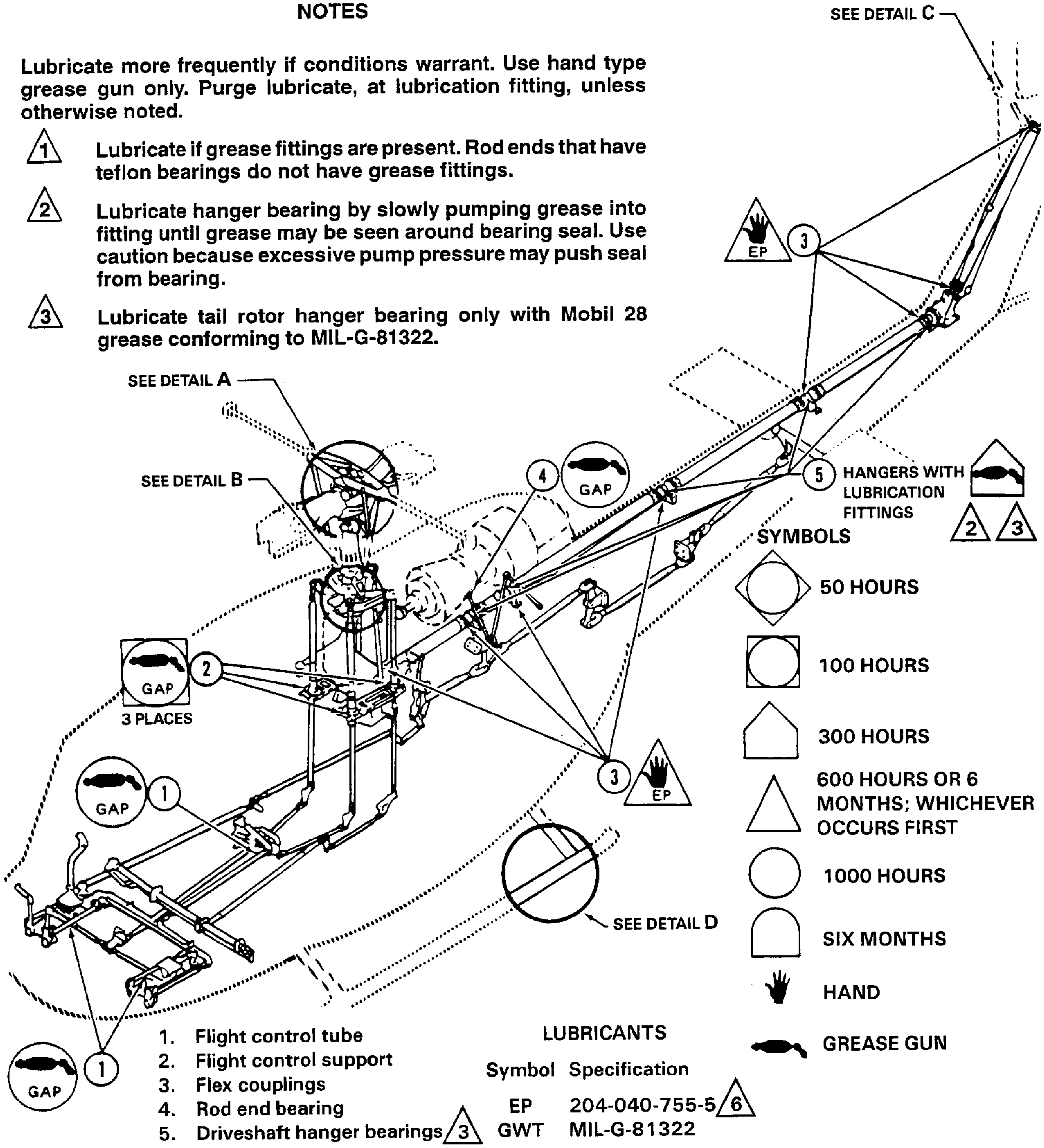
1-36. Flex Coupling Lubrication Log.

The flex coupling lubrication log, table 1-4 shall be filled out any time a component that uses 204-040-755-005 lubricant (C-015) is installed on the helicopter. This log shall be filled out listing the date the 204-040-755-005 lubricant was applied in the component. This grease carries operational hour and calendar requirements in this chapter. Lubricant shall be replaced at the requirement that occurs first (hours/months).

NOTES

Lubricate more frequently if conditions warrant. Use hand type grease gun only. Purge lubricate, at lubrication fitting, unless otherwise noted.

1. Lubricate if grease fittings are present. Rod ends that have teflon bearings do not have grease fittings.
2. Lubricate hanger bearing by slowly pumping grease into fitting until grease may be seen around bearing seal. Use caution because excessive pump pressure may push seal from bearing.
3. Lubricate tail rotor hanger bearing only with Mobil 28 grease conforming to MIL-G-81322.



1. Flight control tube
2. Flight control support
3. Flex couplings
4. Rod end bearing
5. Driveshaft hanger bearings 3

LUBRICANTS

Symbol	Specification
EP	204-040-755-5 6
GWT	MIL-G-81322

UH-1H-II-M-01-2-1

Figure 1-2. Lubrication chart (Sheet 1 of 3)

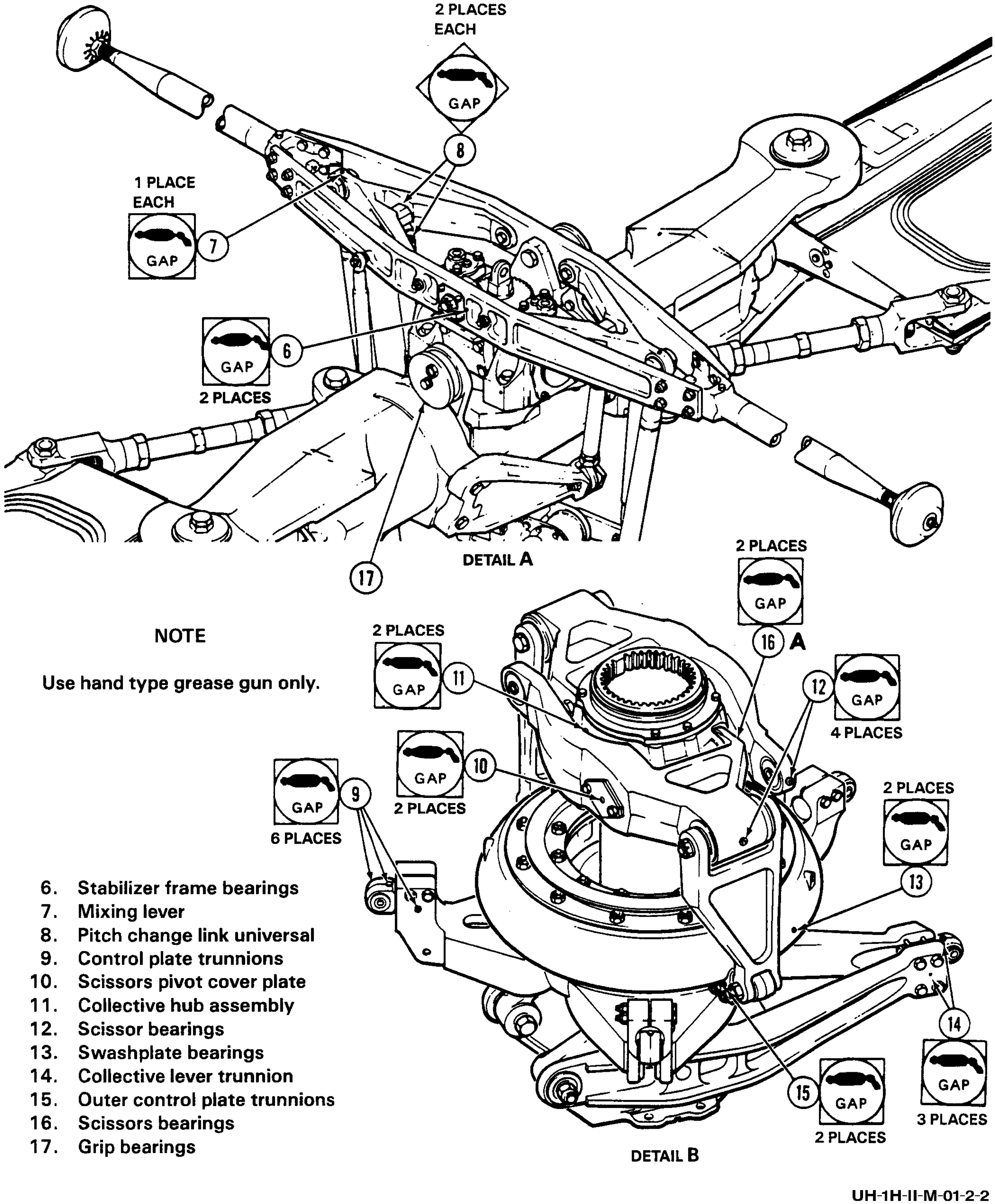


Figure 1-2. Lubrication chart (Sheet 2 of 3)

NOTES

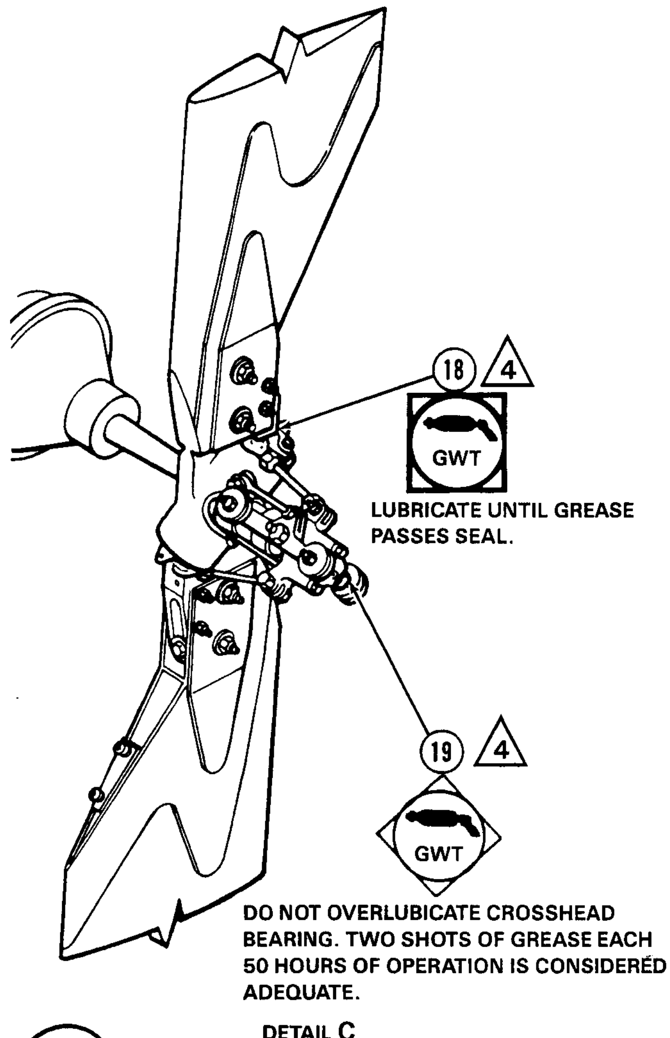
4 Use hand type grease gun only.

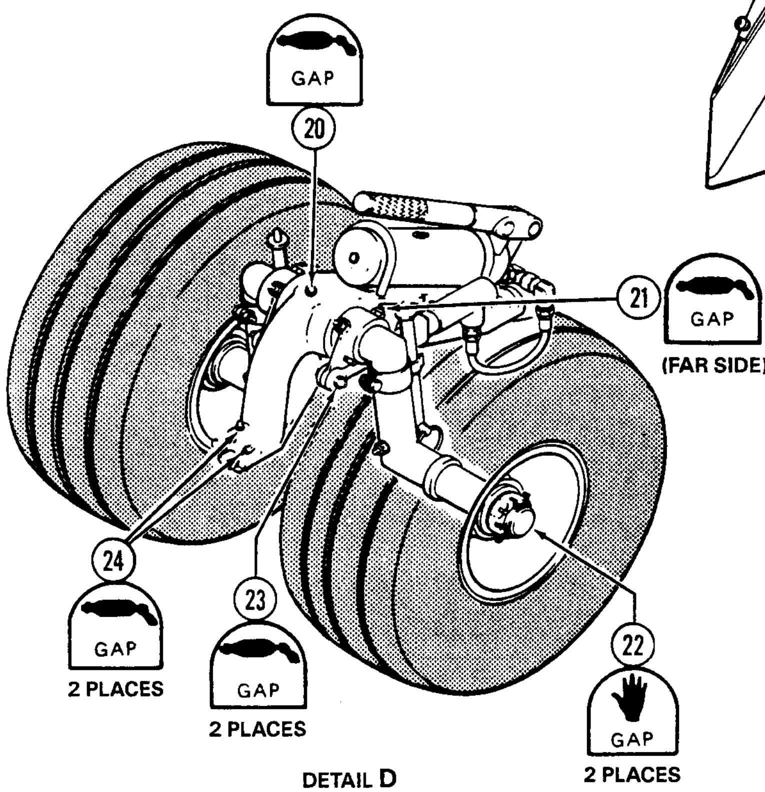
5 If conditions warrant, purge lubricate tail rotor hub and blade grip bearings every 25 hours as follows:

1. Disconnect pitch link at one blade grip and purge bearing with grease. Rotate grip several times in both directions. Repeat purging procedure. Wipe off excess grease and reconnect pitch link.

2. Disconnect pitch link on opposite blade grip and purge bearing in accordance with step 1 procedure. Reconnect pitch link.

6 204-040-755-5 grease has a storage shelf life of 4 years.





18. Trunnion bearing
19. Crosshead bearing
20. Axle pivot point
21. Actuating cylinder trunnions
22. Wheel bearing
23. Pin assembly
24. Securing pin

UH-1H-II-M-01-2-3

Figure 1-2. Lubrication chart (Sheet 3 of 3)

Table 1-4. Flex Couplings Lubrication Log

PART NUMBER	NOMENCLATURE	DATE LUBRICATED	AIRFRAME HOURS	DATE LUBRICATED	AIRFRAME HOURS
	Transmission Tail Rotor Drive				
	Output Coupling				
	Tail Rotor Driveshaft Hangers (8)				
	Intermediate Gearbox Input Quill				
	Intermediate Gearbox Output Quill				
	Tail Rotor Gearbox Input Quill				

SECTION II — HANDLING, JACKING, MOORING, HOISTING, AND SLING LOADING

1-37. GROUND HANDLING.

1-38. Description — Ground Handling. The following paragraphs contain information necessary for towing, jacking and leveling, parking, mooring, hoisting, sling loading, application of external power, and attachment of all weather covers. Refer to Chapter 2 for helicopter dimensions and clearances.

1-39. TOWING.

1-40. Description — Towing. The helicopter can be moved by two methods, forward and aft towing. The equipment required for each method is covered in the following paragraphs.

1-41. Forward Towing. The helicopter can be equipped for towing by attaching two ground handling gear assemblies (3 or 4, figure 1-3) to the landing gear skid tubes. A standard tow bar (1) may be attached to the tow rings (2) provided on the forward end of each landing gear skid tubes.

CAUTION

Towing the helicopter on ground or unprepared surfaces; or across hanger door tracks, etc., at gross weights in excess of 9500 pounds will cause permanent set in aft cross tube.

a. Tie down main rotor blades.

b. Attach tow bar to skid gear tow rings and to tractor pintle hook. Install safety pin through pintle hook. If helicopter is moved by hand, do not push on any part of airframe that could result in damage to helicopter, i.e., loop antenna, elevator, etc.

c. Install ground handling wheels as follows:

(1) Position ground handling wheels over landing gear skid tube and align with eyebolts.

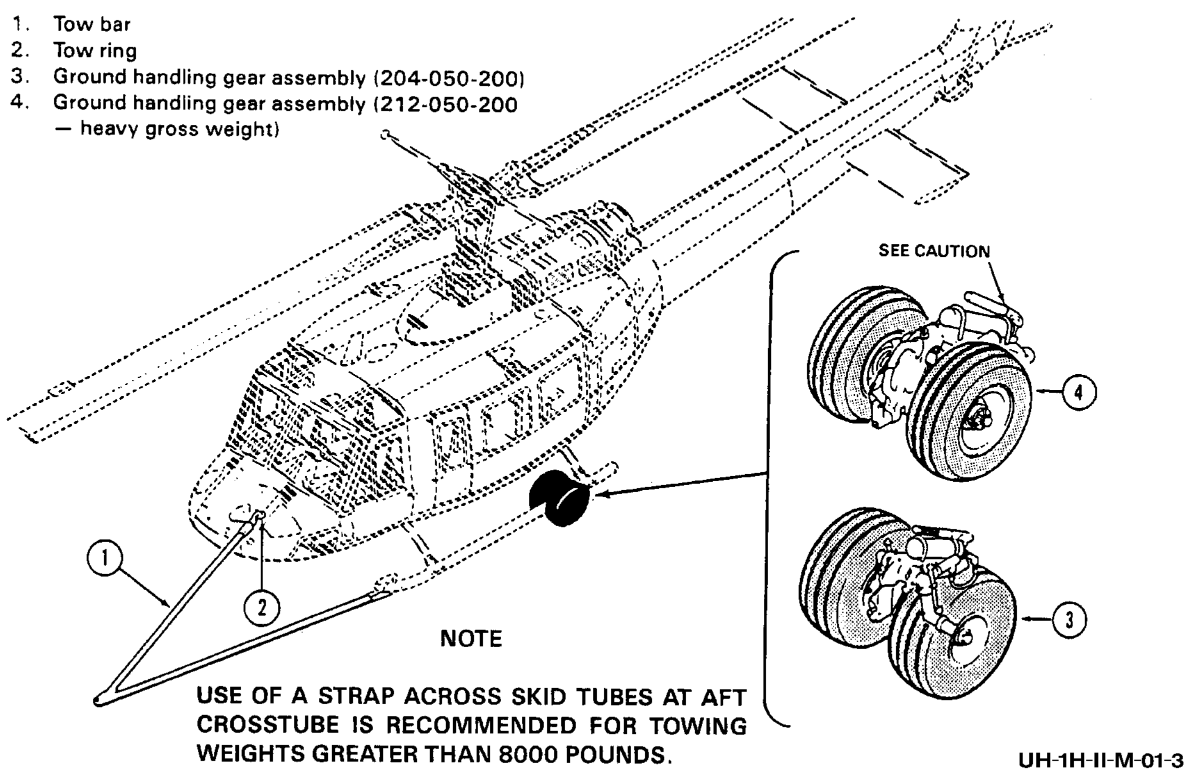


Figure 1-3. Towing

NOTE

The ground handling wheels can be installed with both fixed pins forward or both pins aft or one fixed pin forward and one fixed pin aft. Cabin loading will dictate direction so that ground handling wheels when lowered are on or near CG of helicopter.

(2) Station a man at tail skid to maintain helicopter in level position during jacking and towing operations.

(3) If installed, insert pin of lanyard in hole in release pin and spring-loaded pin.

(4) Extend wheels individually, to raise skid gear clear of ground.

d. Disconnect ground wire.

CAUTION

Do not leave helicopter unattended with ground handling wheels in extended position.

e. Clear departure area of auxiliary support equipment, such as; work stands, power units, etc.

f. Tow or push slowly, balancing helicopter with tail skid.

g. Remove ground handling wheels as follows:

(1) Retract wheels individually to lower helicopter to skid by turning T-handle of pump valve.

(2) If installed, remove pin of lanyard from release pin.

(3) Push release pin to disengage spring-loaded pin from eyebolt.

(4) Pull fixed pin from eyebolt, remove ground handling wheels from skid gear.

h. Install ground wire to receptacle.

1-42. Aft — Towing. The aft towing of the helicopter will require a special tool which can be fabricated in the maintenance shop with instructions in figure 1-4. Use the following procedure for aft towing.

a. Tie down main rotor blades.

b. Inspect tow cable, cable clamps and tail skid clamps for condition and security.

c. Clear departure area of auxiliary support equipment such as work stands and power units.

d. Install ground handling gear.

e. Fully extend ground handling gear to raise landing gear skids clear of ground.

f. Disconnect ground wire.

g. Position tow tractor at helicopter tail skid.

h. Place tail skid in recess of towing bracket. Place ends of cable assemblies over aft cross tubes.

i. Using the hand winch on the tow assembly, take up slack in tow cables. Secure clamps on tail skid.

j. Tow helicopter slowly.

CAUTION

Do not make any sudden stops, turns, or tow down grades exceeding two degrees.

k. Disconnect tow vehicle from tail skid. Retract ground handling gear and allow helicopter to rest on landing gear skids.

l. Disconnect towing cables from aft landing gear cross tubes.

m. Attach ground wire to receptacle.

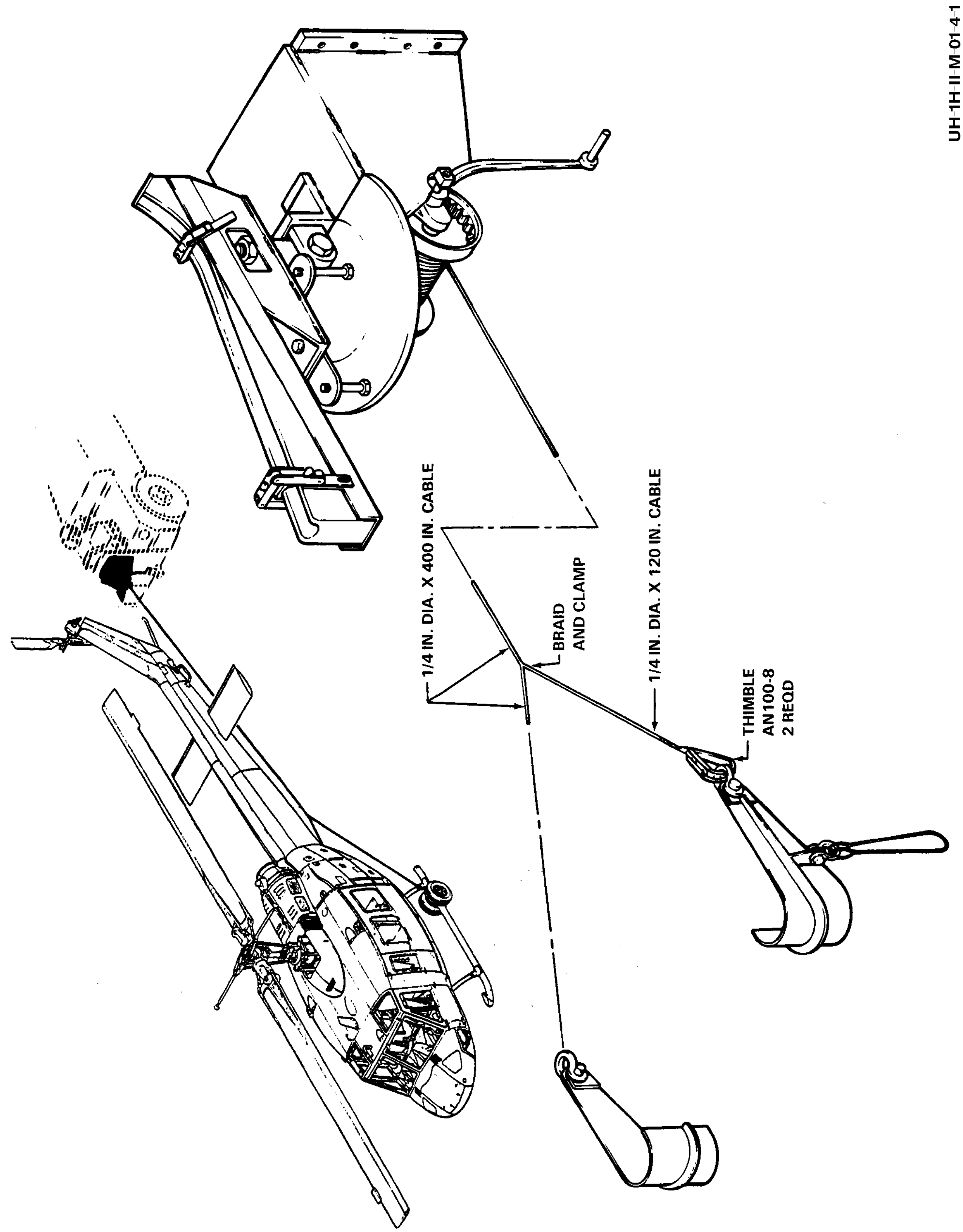


Figure 1-4. Towing provisions (aft-towing) (Sheet 1 of 5)

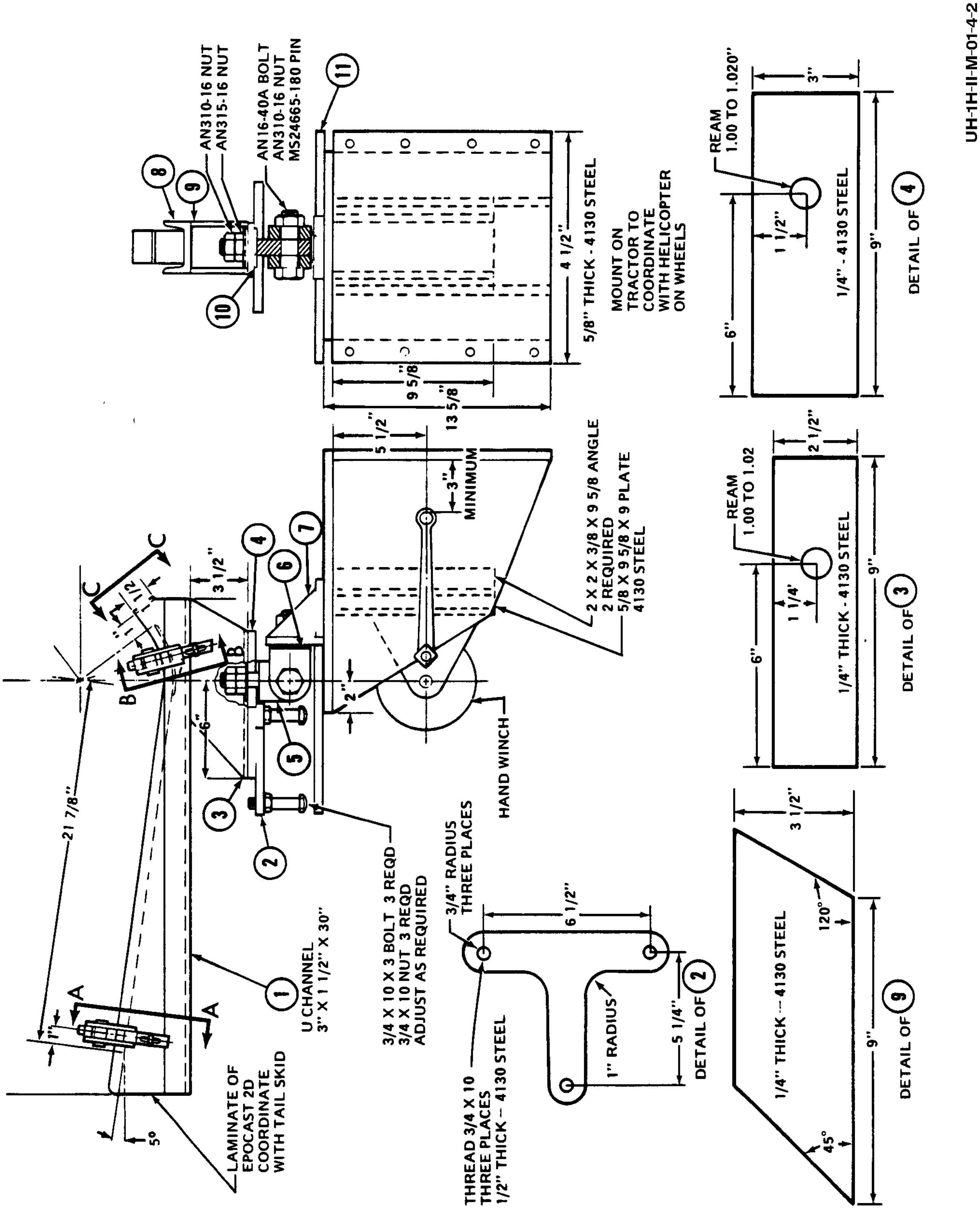


Figure 1-4. Towing provisions (aft-towing) (Sheet 2 of 5)

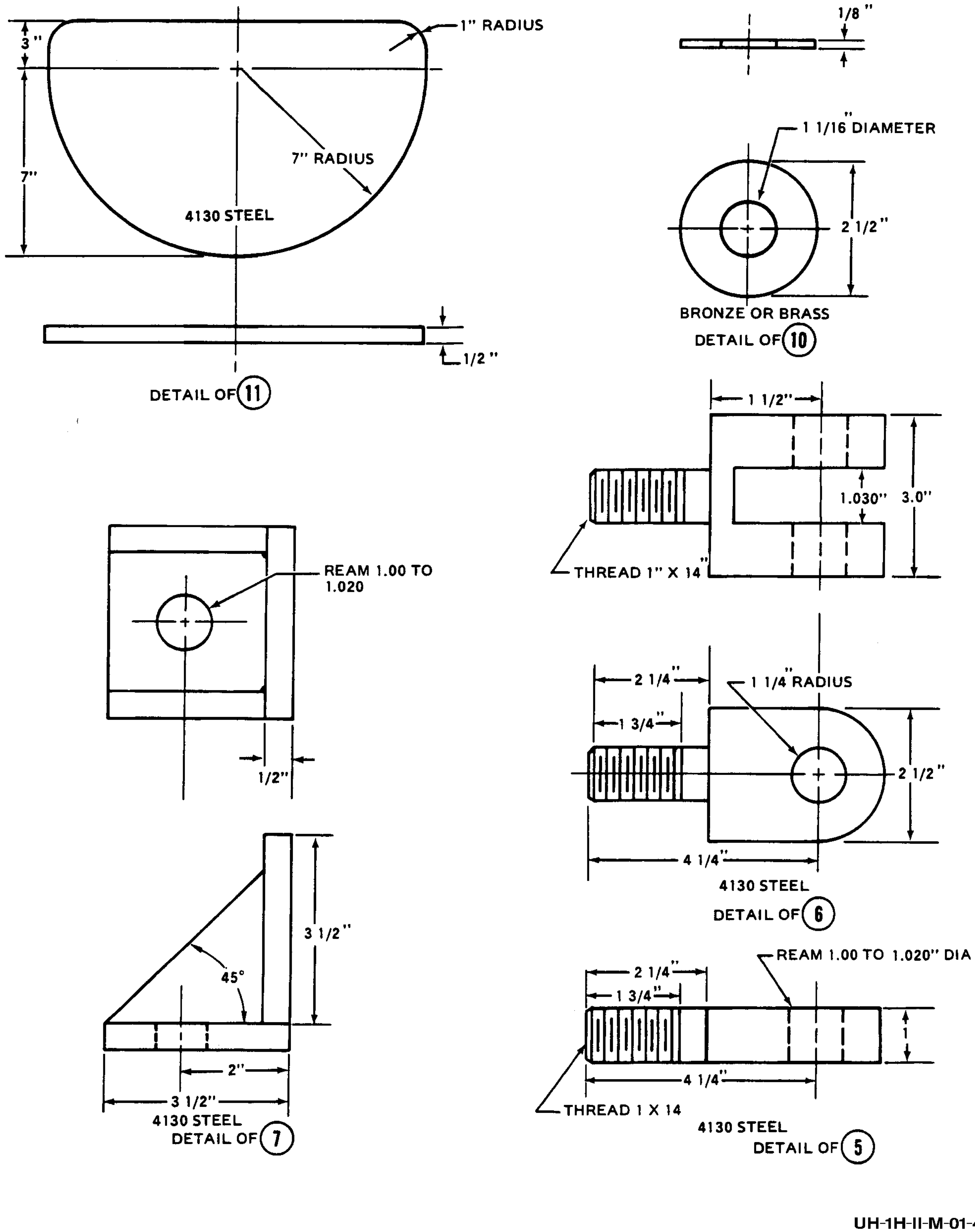


Figure 1-4. Towing provisions (aft-towing) (Sheet 3 of 5)

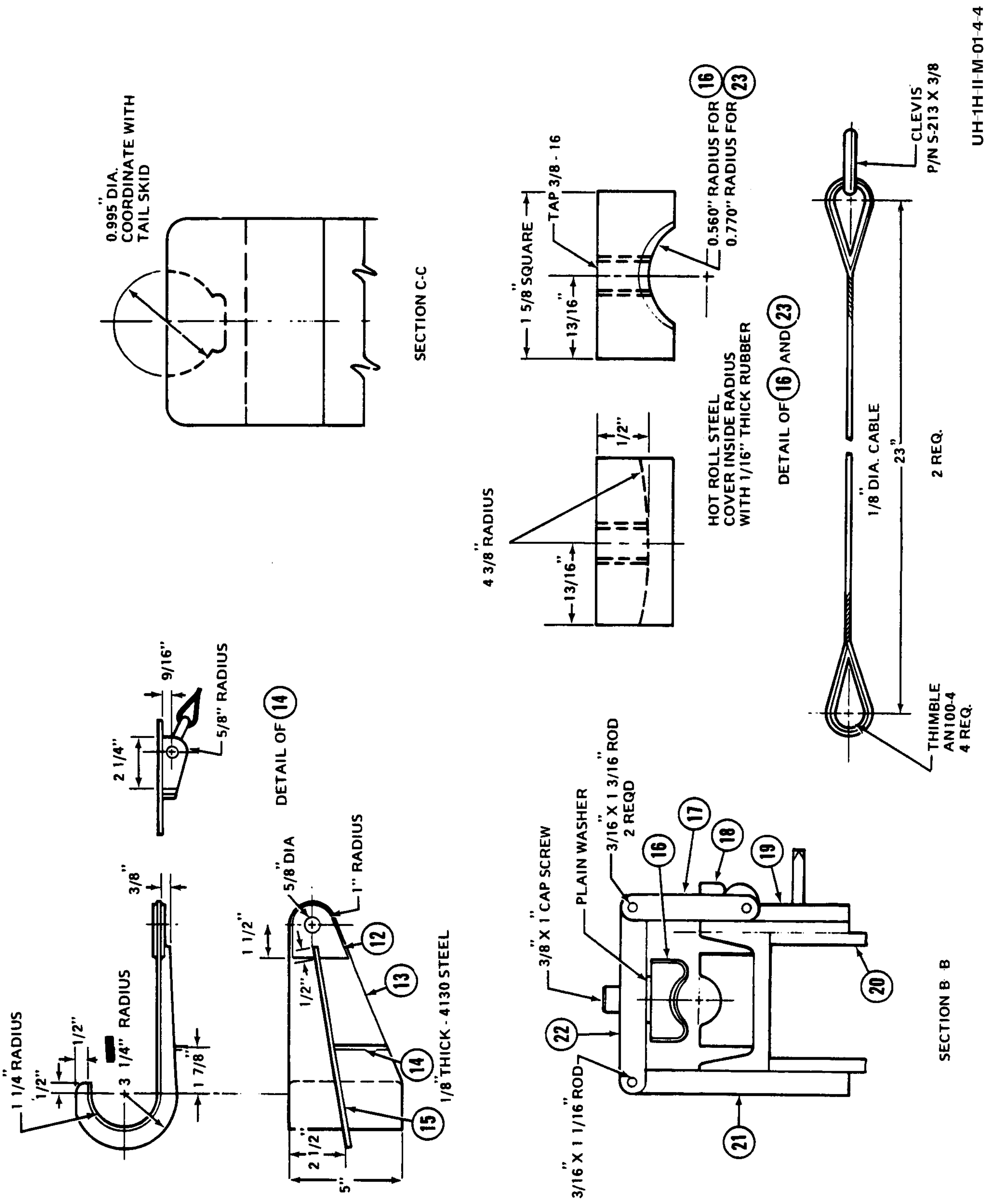


Figure 1-4. Towing provisions (aft-towing) (Sheet 4 of 5)

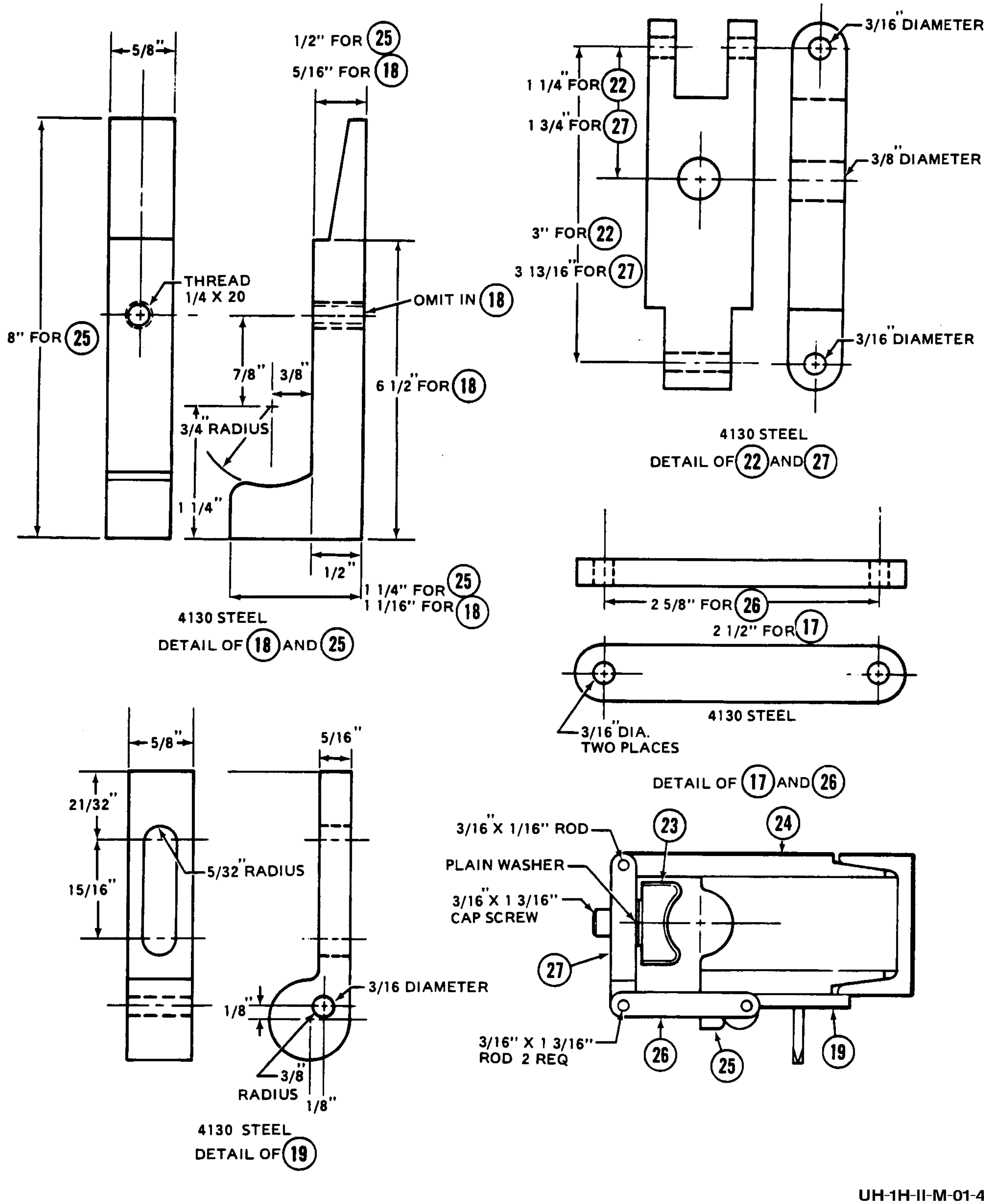


Figure 1-4. Towing provisions (aft-towing) (Sheet 5 of 5)

1-43. JACKING.

1-44. Description — Jacking. Four 3-ton hydraulic jacks (Regent Model No. 988S) are required for jacking the helicopter. Two forward and two aft jack fittings are provided on lower fuselage. See figure 1-5.

NOTE

Equivalent substitutes may be used for required jacks.

1-45. Jacking Procedures. Raise and lower the helicopter by accomplishing the following:

WARNING

Personnel shall not crawl into or onto helicopter while it is being raised or supported on jacks. Area shall be roped off. Warning signs shall be prominently displayed "WARNING: THIS HELICOPTER IS ON JACKS."

CAUTION

In unsheltered area, do not raise helicopter on jacks if wind velocity is above 20 MPH. Point nose of helicopter into wind before raising.

a. Raise the helicopter as follows:

(1) Provide hard level surface for jacks.

(2) Tie down main rotor blade.

(3) Place four hydraulic tripod jacks or equivalent in position under forward and aft jack fittings (1 and 2, figure 1-5).

(4) Close each jack valve and slowly operate each jack handle at same rate. Take care to keep helicopter level while raising to desired height.

(5) Place suitable blocks and support under tail skid as shown in figure 1-5.

b. Lower the helicopter as follows:

(1) Remove blocks and support under tail skid.

(2) Open valves on all four jacks slowly at same time, keeping helicopter level.

(3) Remove four jacks from under helicopter.

1-46. PARKING.

Parking, as used in this manual, is defined as condition in which helicopter will be secured while on the ground (figure 1-6). Direction of heading and location of helicopter is normally determined by ease of maintenance and servicing, to allow removal of any one helicopter from parking area, and to permit ready access of mobile fire fighting equipment within area. Maximum velocity of surface winds which can be withstood by helicopter when parked in following manner depends on gross weight of helicopter.

1-47. Parking — Normal Conditions.

NOTE

This procedure to be used when wind does not exceed 20 knots. (Refer to figure 1-6.)

a. Park helicopter on a level surface, whenever possible, so that load will be balanced.

b. Retract or remove ground handling wheels to allow helicopter to rest on skid-type landing gear.

c. Align main rotor blades fore and aft, and tail rotor blades parallel to vertical fin.

d. Engage the hook of the main rotor tiedown strap (1) in the hole of the fitting on the end of the rotor blade above the tailboom. (If necessary, the weighted end of the tiedown strap can be tossed over the blade to bring it down to reach.) Secure rotor by firmly cross-tying strap of tiedown around the tailboom.

e. Attach tail rotor tiedown strap (2) to the tail rotor and secure to tiedown cleat (8) provided on the side of the vertical fin.

f. Tighten friction locks on flight controls. Check that all switches are in the OFF position and external power is disconnected. Close all doors, windows, and access covers.

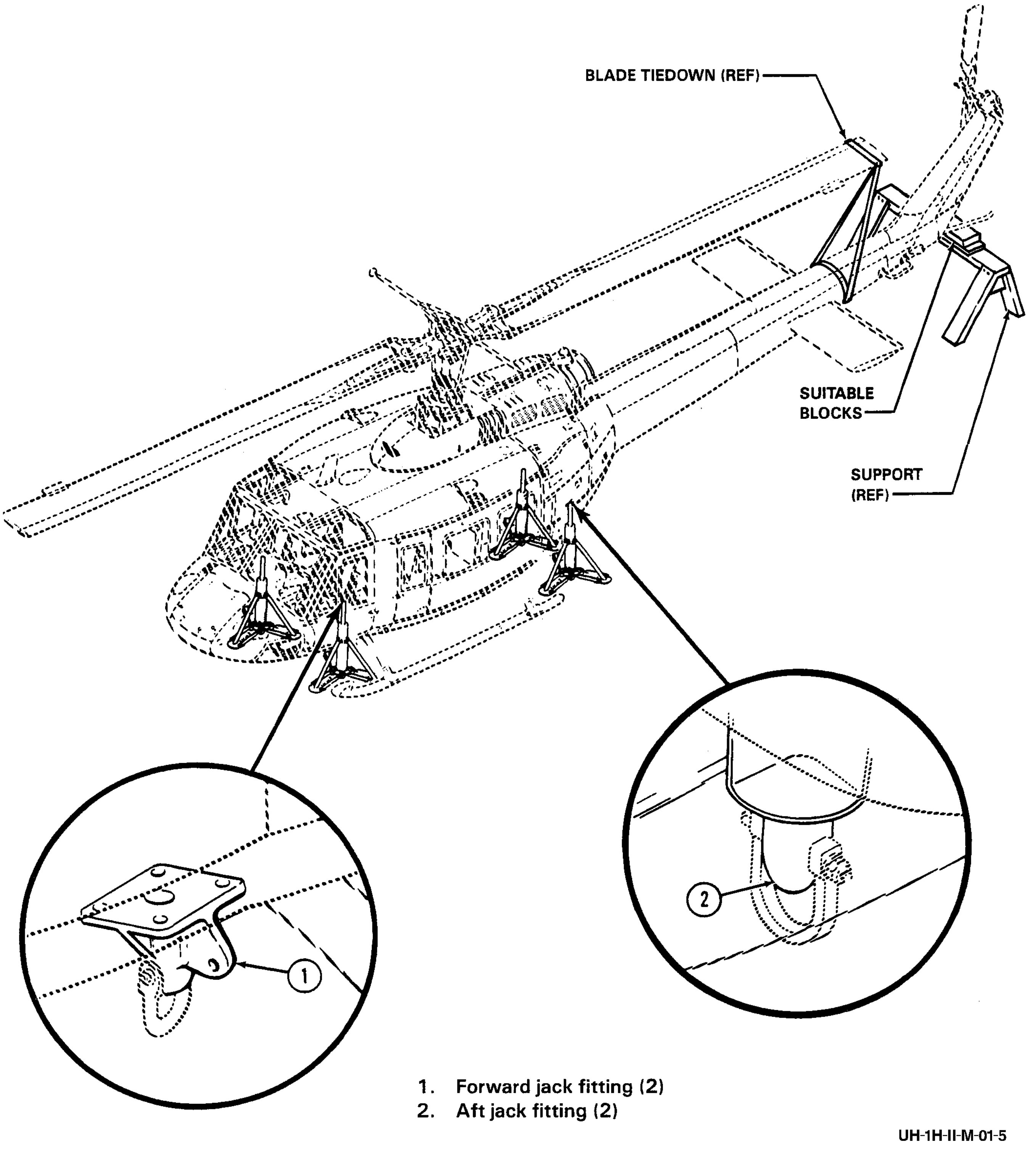
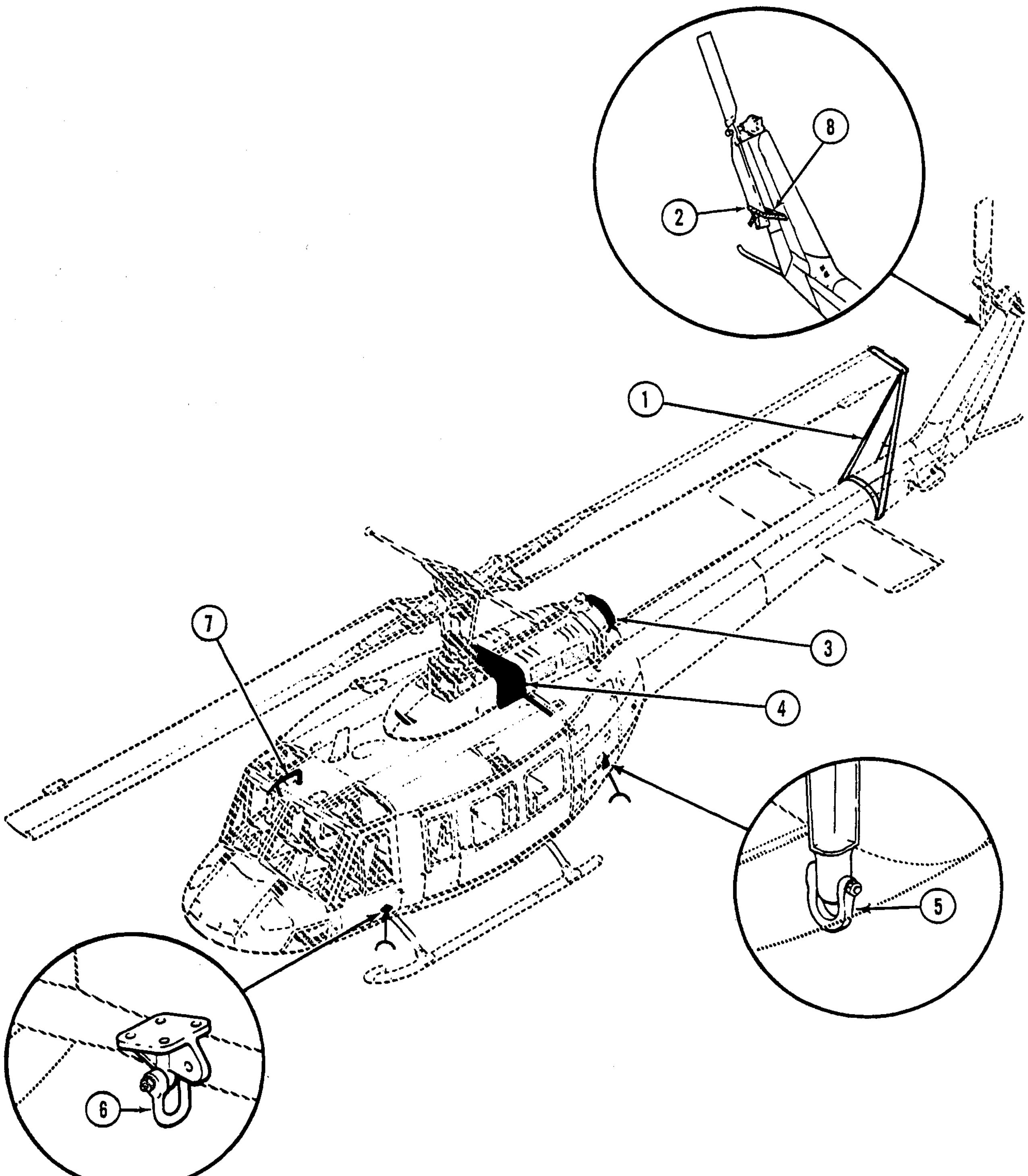


Figure 1-5. Jacking helicopter



1. Main rotor tiedown strap
2. Tail rotor tiedown strap
3. Exhaust cover
4. Intake cover
5. Aft mooring fitting (2)
6. Forward mooring strap
7. Pitot tube cover
8. Tiedown cleat

UH-1H-II-M-01-6

Figure 1-6. Parking and mooring

1-48. Parking — Turbulent Conditions.

NOTE

This procedure to be used when winds are 20 to 45 knots or a gust spread of 15 knots exists or is forecasted.

a. Park helicopter on a level surface, whenever possible, so that load will be balanced. Head helicopter into the wind.

b. Retract the ground handling wheels, and allow the helicopter to rest on the skid-type landing gear.

c. Secure main rotor with tiedown straps (1, figure 1-6).

d. Secure tail rotor to vertical fin with tiedown straps (2).

e. Install intake cover (4) and exhaust cover (3).

1-49. MOORING.

1-50. Description — Mooring. Mooring is the process of securing the parked helicopter to avoid damage by high winds or turbulent weather. Mooring fittings are provided on jack pad fittings.

CAUTION

The helicopter shall be moored if wind is expected to exceed 45 knots. If possible, the helicopter should be evacuated to a safe area when wind condition above 75 knots is expected.

If the helicopter must be parked in the open during a period when high wind has been forecast, moor the helicopter in the following manner.

a. If a paved ramp with suitably spaced tiedown rings is available, park the helicopter on skid landing gear headed in the direction from which highest forecast winds are expected. Secure helicopter to ramp tiedowns. Use cable, rope, or manufactured tiedowns at helicopter mooring fittings. A clevis used at each of the four mooring fittings (5 and 6, figure 1-6) will permit use of a large diameter rope.

b. If suitably spaced ramp tiedowns are not available, park the helicopter on an unpaved parking area headed in the direction from which the highest forecast winds are expected and retract ground handling wheels. Use mooring anchor to moor helicopter as described in step a.

c. Secure main and tail rotor with tiedown straps (1 and 2). If storage space and time is available, remove and store main rotor blades. Secure main rotor hub to the mast to prevent movement on the flapping axis.

d. Install pitot tube cover (7), exhaust cover (3), and intake cover (4).

e. Tighten friction on cyclic and collective controls.

f. Close all windows, doors, and access panels.

g. Fill fuel tank to capacity with the prescribed fuel.

h. Secure all ground handling equipment and other objects which might be blown by high winds.

NOTE

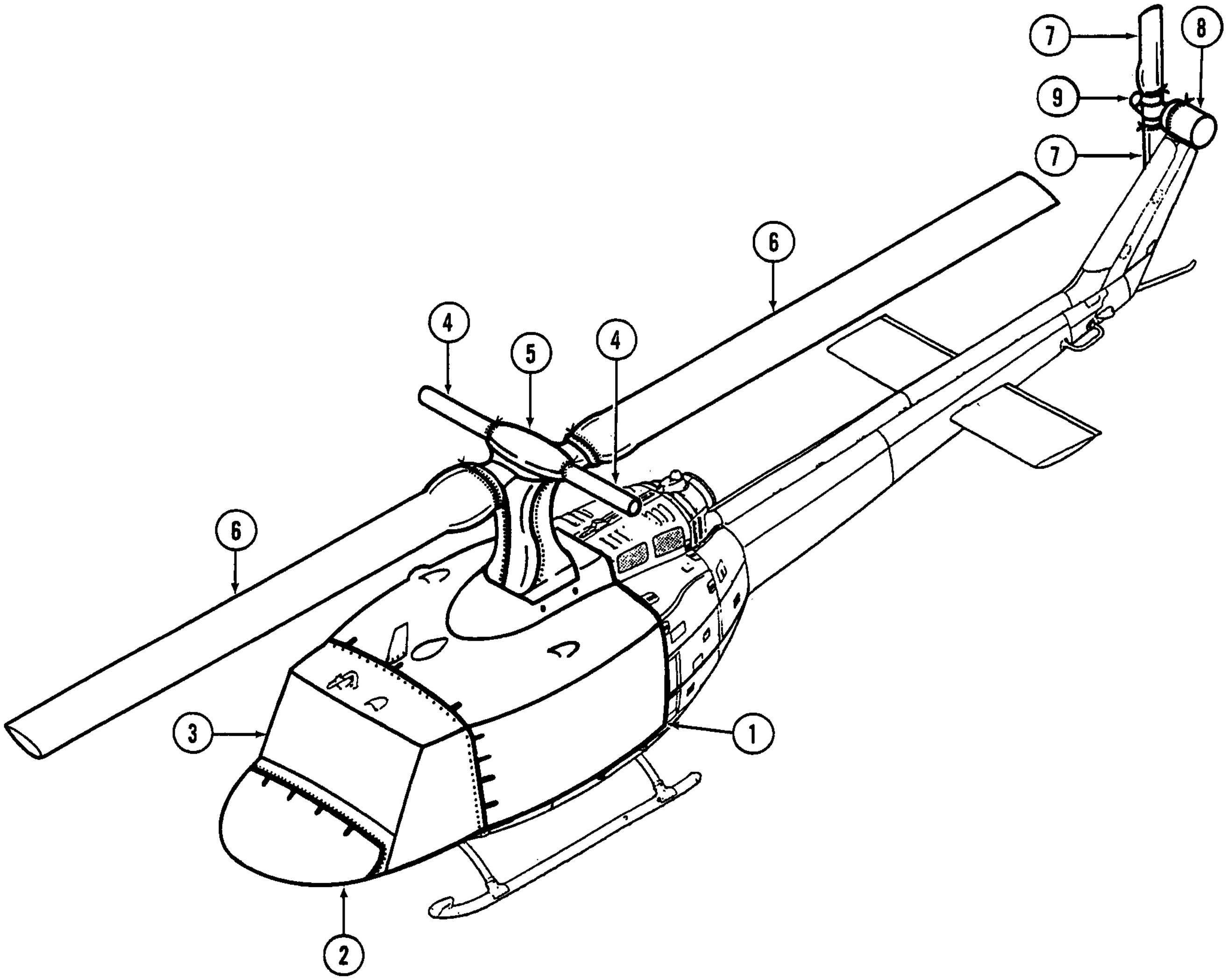
After winds subside, inspect the helicopter carefully for damage which may have been inflicted by flying objects.

1-51. AIRCRAFT COVERS.

1-52. Description — Aircraft Covers. A set of twelve all-weather covers is provided for the protection of cabin area and major components. Covers are fastened by cord and snap fasteners and are to be installed in sequence as illustrated (figure 1-7).

1-53. HOISTING.

1-54. Description — Hoisting. The helicopter may be lifted by jacking or by attaching a hoist to a clevis installed on main rotor mast nut or pylon lift link. Tailboom may be removed or installed by attaching a sling at tailboom center of gravity or using tailboom support.



1. Main cabin cover
2. Nose cover
3. Forward cabin cover
4. Stabilizer bar cover
5. Pylon cover
6. Main rotor blade cover
7. Tail rotor blade cover
8. 90° gearbox cover
9. Tee head cover

UH-1H-II-M-01-7

Figure 1-7. Aircraft all weather covers

1-55. Aircraft Hoisting. Hoist the helicopter as follows:

WARNING

Personnel shall not crawl into or onto helicopter while it is being lifted.

NOTE

A 204-011-178 or equivalent hoisting clevis and 6-ton capacity hoist is required for hoisting helicopter.

a. Attach a 204-011-178 hoisting clevis (2, figure 1-8) to eye on main rotor mast nut (3). Connect a suitable hoist (1) and take up the slack.

b. Station a person at tail skid to steady helicopter while being lifted. If lifting beyond arm reach from ground, use a guide rope to steady helicopter.

c. Lift slowly and carefully, using constant force on hoist.

d. If transmission has been removed, attach hoist (1) to pylon lift link (4) using same procedure as for lifting complete helicopter.

WARNING

The P/N 204-011-178 hoisting clevis is not intended for use when sling loading the helicopter, i.e.; transporting helicopter by air using a sling or cable. In this situation, main rotor, main rotor mast assembly, and associated controls shall be removed and a P/N 204-040-929 lift and cover plate installed in the transmission. This lift and cover plate is designed to carry weight of an empty, defueled helicopter.

1-56. Component Hoisting. To hoist engine, main rotor, or mast and transmission assemblies from the helicopter, use maintenance hoist (T49). For hoisting or handling tailboom as a separate component use straps or slings at both ends of boom. Use tail skid for steadying boom.

The tailboom, as a separate component, may be lifted using sling assembly and 1-ton capacity hoist or by using a tailboom support. Lift tailboom using hoist as follows:

a. Attach sling assembly (3, figure 1-9) to suitable hoist (1) and clevis (2).

CAUTION

Do not position strap in area of baggage compartment door. Suitable straps must be positioned at bulkheads to prevent damage to tailboom skin.

b. Position straps around tailboom at bulkheads forward of vertical fin and aft of baggage door. Position sling assembly (3) to maintain balance.

c. Support weight of tailboom with straps. Take up slack and disconnect tailboom from the helicopter.

CAUTION

Take care so that tailboom does not rotate in straps.

d. Hoist tailboom slowly with steady force.

1-57. Engine Hoisting. Hoist engine, main rotor, or mast and transmission assembly as follows:

CAUTION

Particular attention should be paid to the maintenance hoist to ascertain that it is assembled correctly. Correct assembly should have the hinge halves of the mating casting and hinge bolt on outboard side of closed curve of upper tube, and the latch bolt and knob on inboard side (figure 1-11, detail A). Hoist must be centered over component being hoisted.

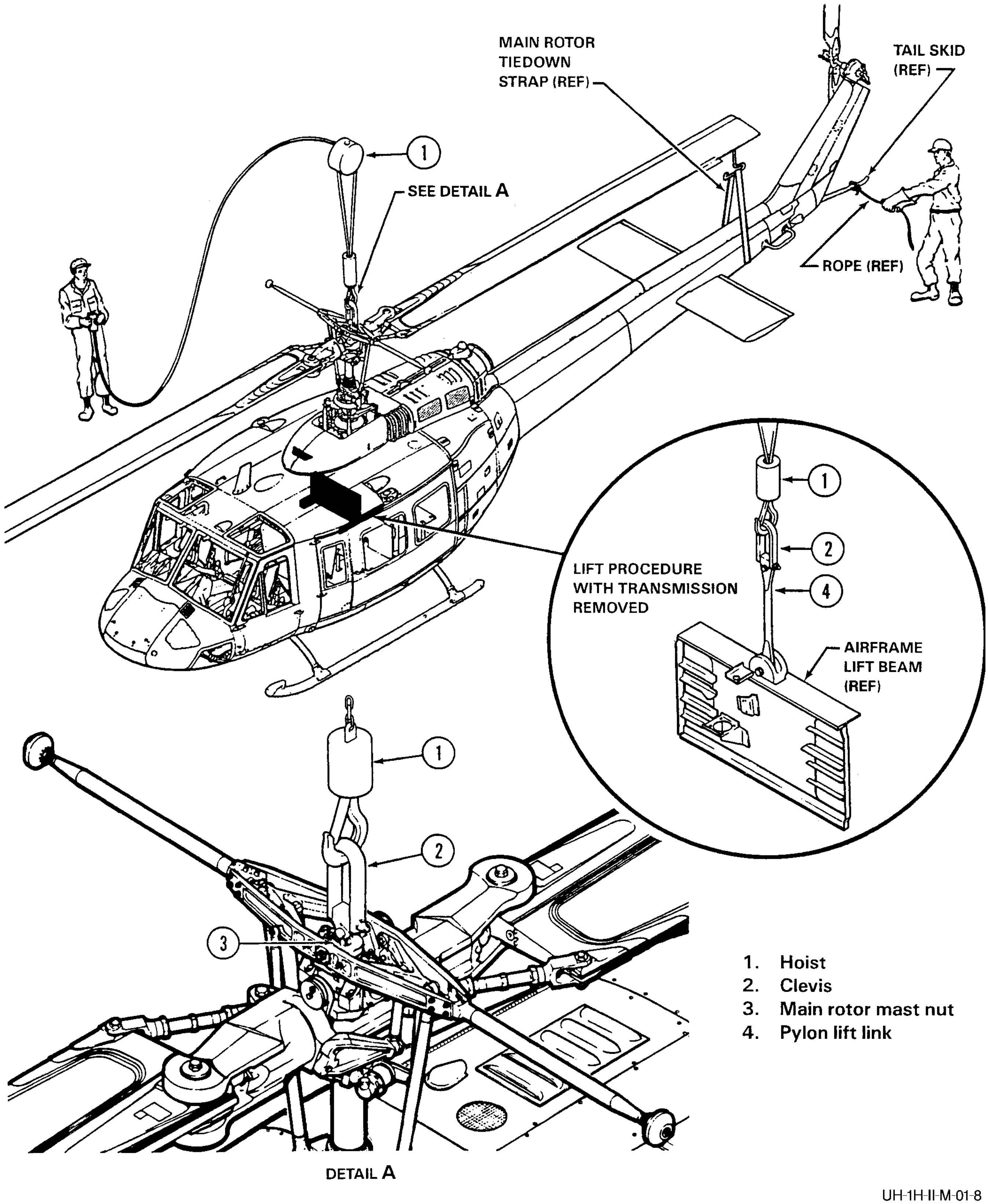
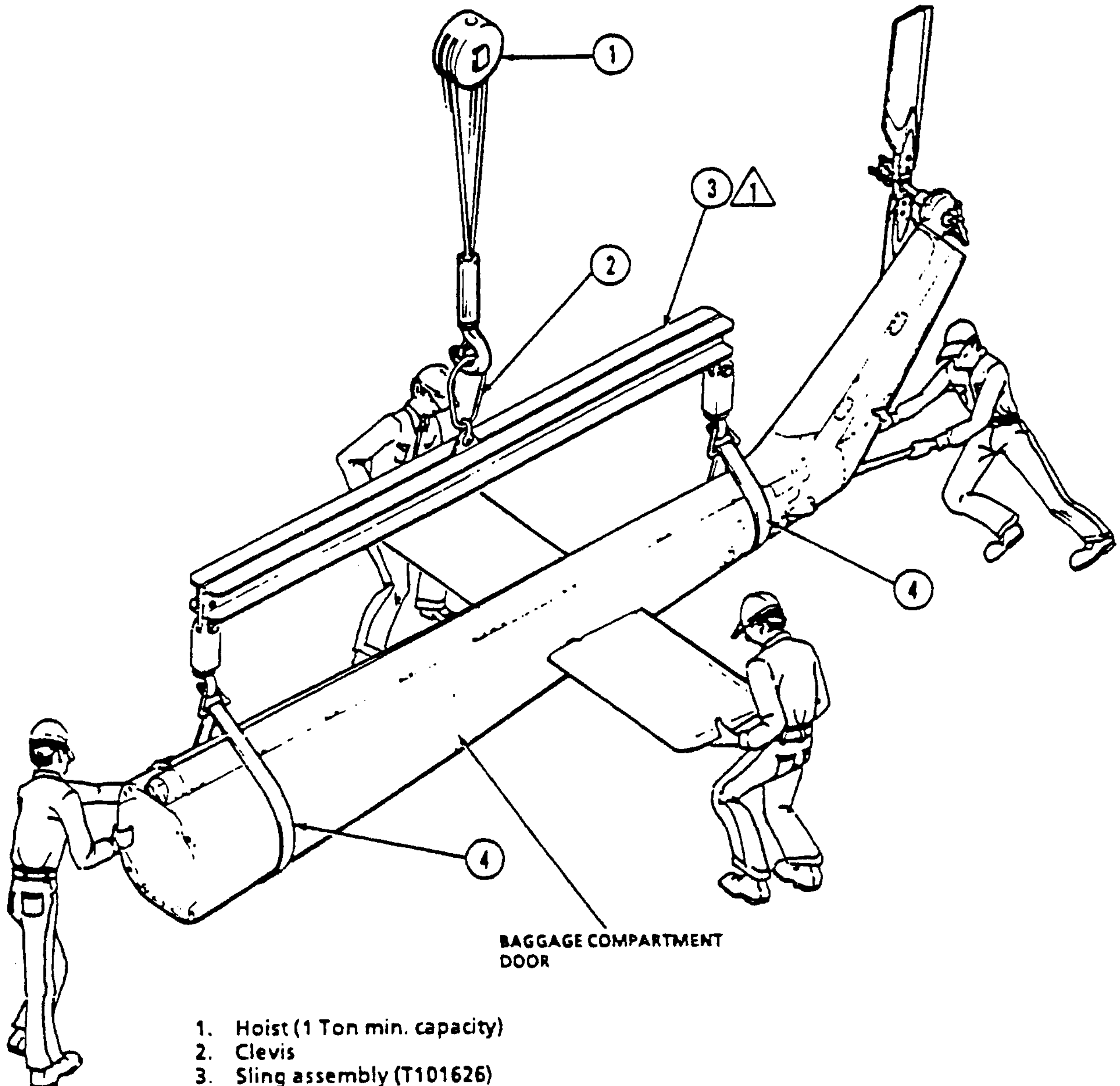


Figure 1-8. Lifting complete helicopter



1. Hoist (1 Ton min. capacity)
2. Clevis
3. Sling assembly (T101626)
4. Strap

NOTE: 1 Position sling assembly on tailboom to maintain balance.

CAUTION: Ensure straps (4) are positioned at bulkheads.

Do not position straps (4) in area of baggage compartment door.

UH-1H-II-M-01-9

Figure 1-9. Lifting tailboom by hoist

NOTE

The maintenance hoist (T49) is provided to be mounted on airframe for field use to lift engine, main rotor, or mast and transmission assemblies. Maximum operating load of this hoist is 800 pounds. Hoist consists of a support tube equipped with a hand-operated winch, cable, and hook (figure 1-10 and 1-11). Support tube has a hinged joint to fold for storage, a 48-inch section which can be removed to reduce height when required, and a selection of attachment holes for upper pulley to allow centering over unit being removed or installed. Mounting allows hoist to be rotated, with load, to reach over engine and pylon area or outboard from left side of helicopter.

a. Remove cover at rear left side on cabin roof. Remove soundproofing blanket section in cabin and plug bottom in floor directly below.

b. Lift hoist to position and insert lower support tube down through roof and engage pin at lower end in support fitting in cabin floor. In this procedure hoist tube can be partially folded at hinge joint and a man on ground or roof walkway can handle upper support tube in such manner as to assist a man on engine service deck or roof who is lowering hoist into place.

c. Raise upper end of hoist to normal position and secure latchbolt on hinge joint.

d. Turn hoist to center its hook over component to be lifted. If necessary, change position of upper pulley to another attachment hole of support tube.

1-58. SLING LOADING.

1-59. Description — Sling Loading. Retrieval of an inoperative helicopter is accomplished by use of cables, slings, and hoisting equipment. Refer to TM55-450 for helicopter sling loading.

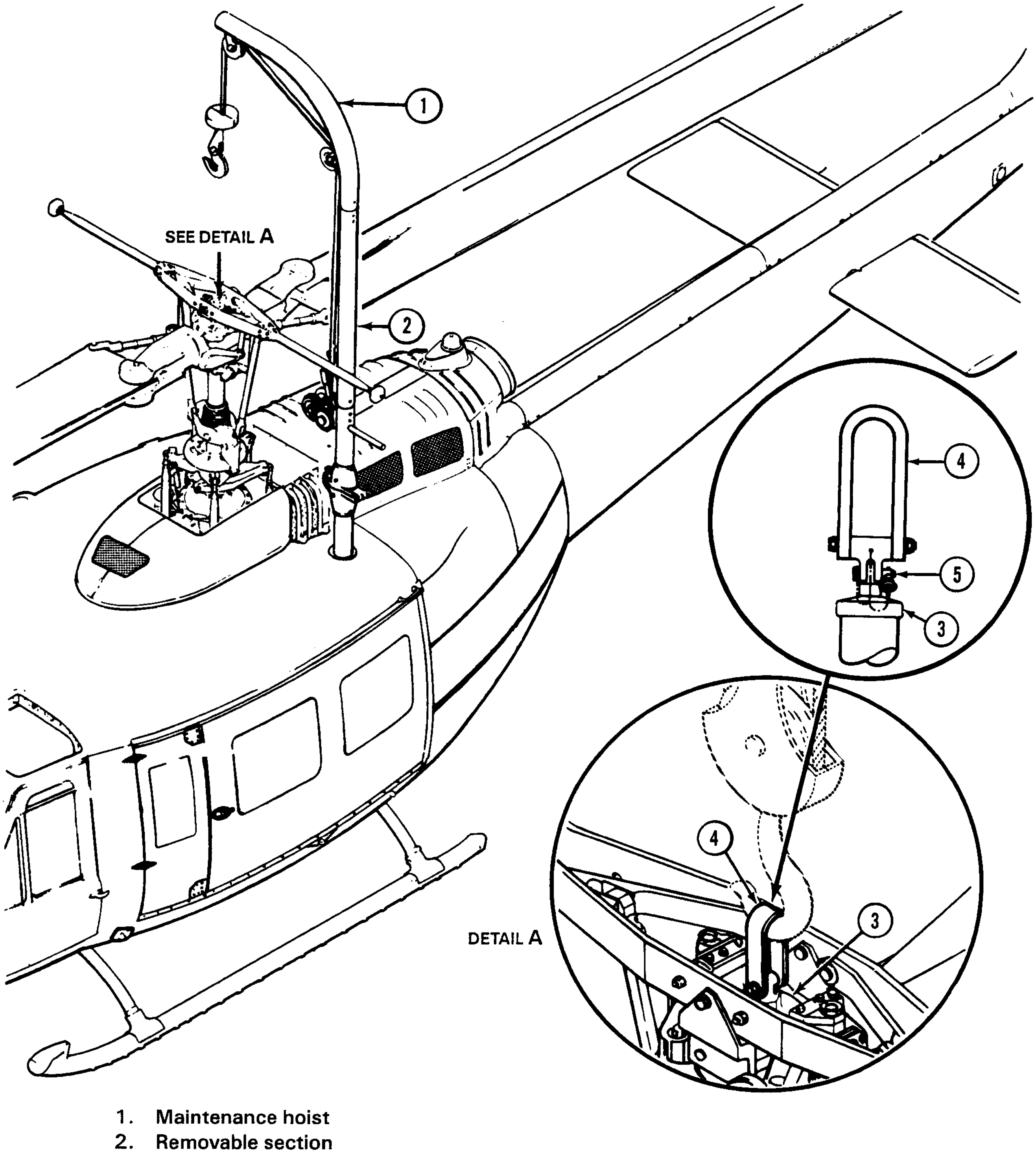
WARNING

The P/N 204-011-178 hoisting clevis is not intended for use when sling loading the helicopter, i.e.; transporting helicopter by air using a sling or cable. In this situation, main rotor, main rotor mast assembly, and associated controls shall be removed and a P/N 204-040-929-029 lift and cover plate installed in the transmission. This lift and cover plate is designed to carry weight of an empty, defueled helicopter.

1-60. APPLICATION OF EXTERNAL POWER.

1-61. Description — Application of External Power. External power receptacle (19, figure 1-1) for 28 Vdc is in lower left side of fuselage, below electrical equipment compartments. Access is through a small door, which is equipped with a limit switch to light EXTERNAL POWER caution panel when door is open and power connected. When applying power from external sources, battery switch shall be OFF.

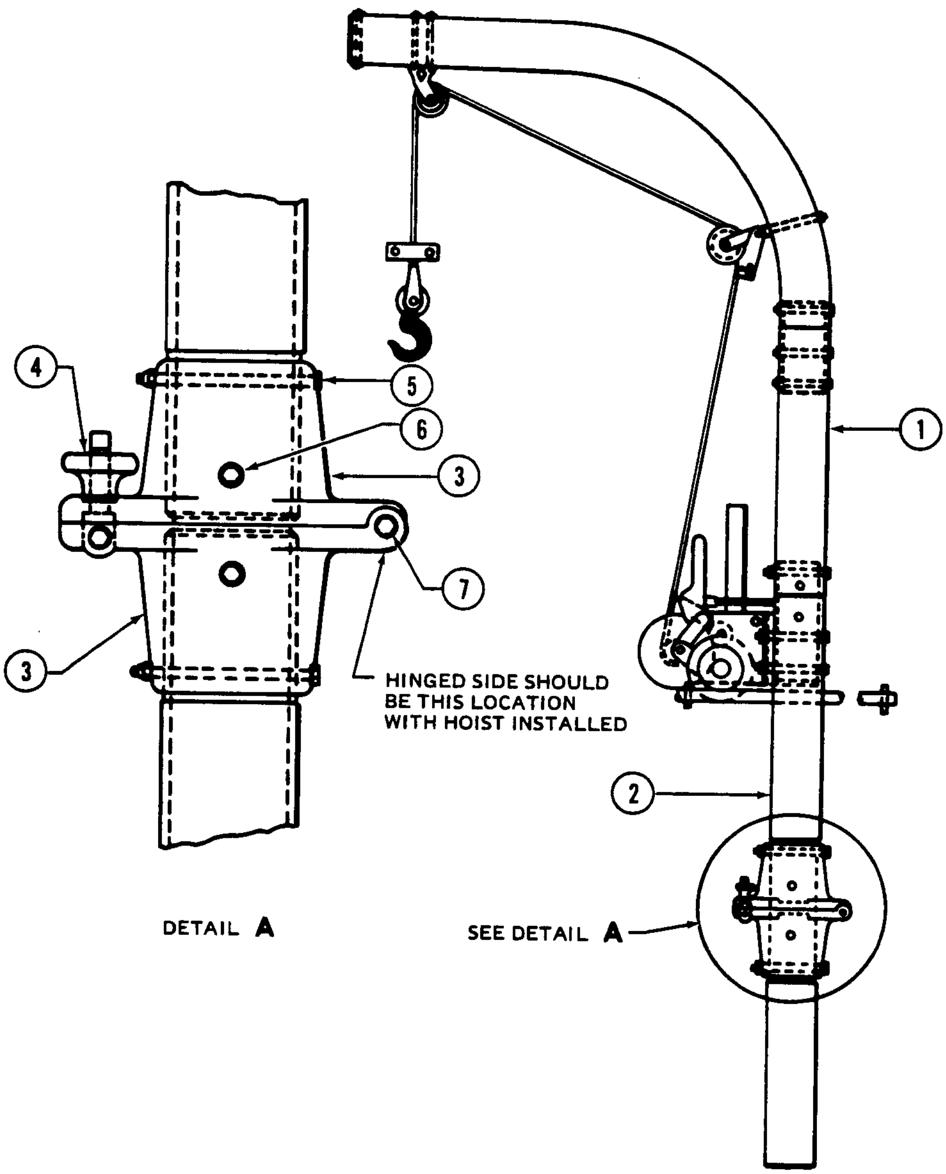
1-62. Electrical Power Application. Open access door over external power receptacle (19, figure 1-1) and plug in external power source.



1. Maintenance hoist
2. Removable section
3. Mast nut
4. Clevis (204-011-178-1)
5. Pin

UH-1H-II-M-01-10

Figure 1-10. Hoisting diagram



1. Upper tube assembly
2. Lower tube assembly
3. Clamshell
4. Latch bolt knob
5. AN5-52A bolt
6. AN5-55A bolt
7. AN6-60A bolt

UH-1H-II-M-01-11

Figure 1-11. T101452 maintenance hoist assembly

SECTION III — INSPECTION REQUIREMENTS

1-63. GENERAL INFORMATION.

a. This section contains complete requirements for special, conditional, and scheduled inspections, overhaul and retirement schedule, and standards of serviceability applicable to the aircraft. The inspections prescribed in this chapter shall be accomplished at specified periods by aviation unit maintenance activities with the assistance of intermediate maintenance activities when required.

b. These inspection requirements constitute an approved inspection program designed and recommended by Bell Helicopter Textron for the UH-1H-II. They can be utilized by registered owners or operators, who desire to develop a progressive inspection system, as part of the complete maintenance program for their helicopters. A written request for approval to use the progressive inspection system must be submitted to the Governing Civil Aviation Authority having jurisdiction over the area in which owner or operator is located.

NOTE

Neither the assignment of a time period for overhaul of a component nor failure to assign a time period for overhaul of a component constitutes a warranty of any kind. The only warranty applicable to the helicopter and any component is that warranty included in the Purchase Agreement for the helicopter of the component.

c. Time between overhauls and inspection periods is based upon experience, testing, and engineering judgment, and is subject to change at the sole discretion of Bell Helicopter Textron or an appropriate government agency.

d. The inspection intervals designated herein are the maximum allowable and should not be exceeded. When unusual local conditions, such as environmental conditions, utilization, etc., dictate, it is the prerogative and responsibility of the operator to increase the scope and frequency of the inspections as necessary to ensure safe operation.

e. Annual and Hourly Inspections shall be a visual and a thorough searching inspection to determine the airworthiness of the helicopter and components. The inspection must be conducted by qualified personnel and in accordance with quality standard aircraft practices and appropriate maintenance manual. Comply with all applicable and required Alert Service Bulletins and Airworthiness Directives (A.D.).

f. Prior to inspection, remove or open as necessary cowling, fairing, inspection doors and panels.

NOTE

Lubrication and service requirements are in addition to those stated herein. Refer to lubrication chart and servicing diagram in this chapter. Detailed inspection requirements for auxiliary kits installed will be found in the appropriate Service Instruction (S.I.).

1-64. STANDARDS OF SERVICEABILITY.

Standards of serviceability to be utilized in day-to-day inspection and maintenance of the aircraft such as fits, tolerances, wear limits, and specifications can be found in the aircraft maintenance manuals. Standards of serviceability for transfer of aircraft are contained in TM55-1500-326-24.

1-65. SPECIAL INSPECTION.

1-66. Description — Special Inspection. Special inspections are required for certain systems or components at other than normal time intervals.

1-67. CONDITIONAL INSPECTION.

1-68. Description Conditional Inspection. Conditional inspection are required for certain systems, and/or components after unusual events such as hard landings or sudden stoppage of rotor, etc.

NOTE

Refer to engine manufacturers requirements for Conditional Inspections that apply only to the engine.

1-69. SCHEDULED INSPECTION.

1-70. Scheduled Inspection. Scheduled inspections are required for certain systems or components at specified time intervals.

1-71. Overhaul and Retirement Schedule. Overhaul components in accordance with overhaul schedule. Refer to section IV. Overhaul procedures for Powertrain components will be in accordance with BHT-212-CR Overhaul procedures for engine and/or optional equipment will be in accordance with equipment manufacturers overhaul manuals.

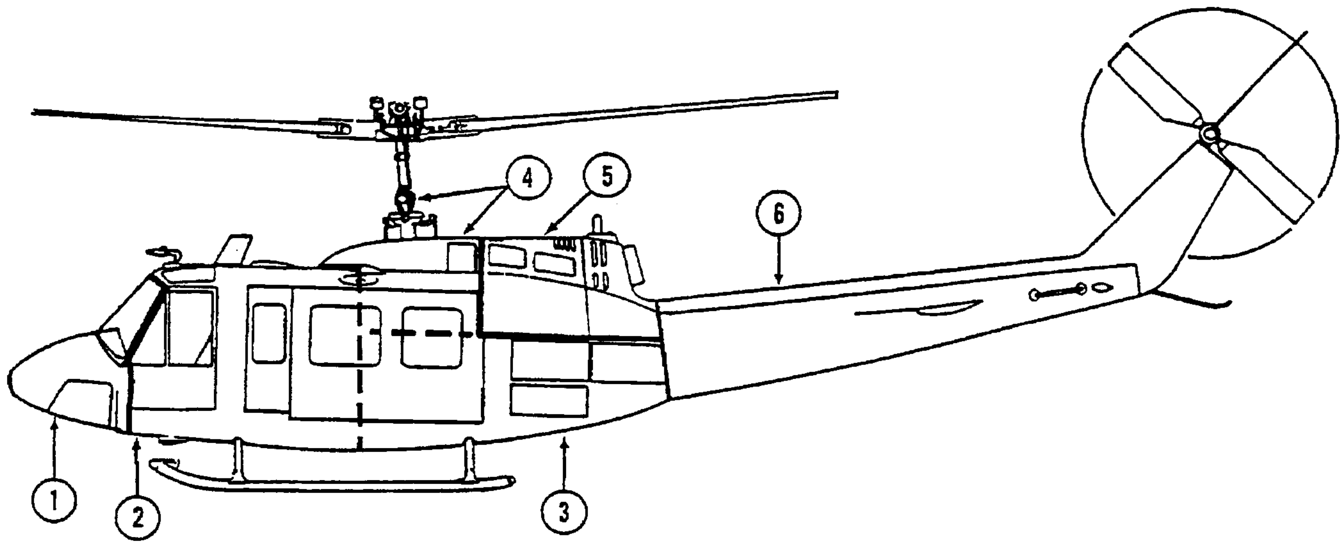
1-72. Definition and General Information. This section supplements the scheduled inspections as outlined in the Preventive Maintenance Service checklist (BHT PUB 92-004-PMS). This section also includes inspection of items which are required to be inspected at intervals not compatible with airframe operating time or airframe inspection intervals. Areas of inspection are shown on figure 1-12. Refer to TM 38-750 for applicable forms, records, and worksheets required for these inspection intervals. Typical inspection items are:

a. An inspection which is contingent upon specific conditions or incidentals, that arise, and only because of these conditions or incidents, immediate inspection is required to ensure safe flight. Typical of these conditions are hard landings, overspeed, and sudden stoppage.

b. Inspection of components or airframe on a calendar basis: first aid kits, weight and balance check, aircraft inventory, etc.

c. Refer to TM 38-750 for applicable forms, records, and worksheets.

1-73. Requirements. The requirements of this section shall include items which qualify under the criteria in paragraph 1-72. The requirements shall be grouped under area headings only and shall be inserted in a columnar listing on the inspection checksheet format, in such a manner as to permit local reproduction of entire section.



AREA No. 1	**Nose Area**	**All surfaces, components, and equipment in nose compartment and on exterior ahead of crew doors.**
AREA No. 2	**Cabin and Landing Gear**	**All surfaces, components, and equipment inside cabin, and on cabin exterior between forward sides of crew doors and aft cabin walls and pylon island structure. Includes complete landing gear, but does not include forward fuel cell sumps on cabin underside.**
AREA NO. 3	**Center Fuselage Area**	**All surfaces, components, and equipment in fuselage below engine deck level, between cabin area and tail boom attachment bulkhead. Includes fuel cells (also forward cells under cabin floor), compartment in pylon island below main transmission, and compartments accessible through side doors on fuselage.**
AREA NO. 4	**Pylon Area**	**All surfaces, componenets, and equipment of the main rotor pylon group, from top of mast to bottom of transmission. Includes main rotor, mast and rotating controls, transmission with accessories and mounts, and main (input) driveshaft.**
AREA NO. 5	**Engine Area**	**All surfaces, components, and equipment associated with engine installation, located above engine work deck and within engine cowling, tailpipe fairing, and intake fairing.**
AREA NO. 6	**Tailboom Area**	**All surfaces, components, and equipment located in or on the tailboom and vertical fin structure. Includes tail rotor,. synchronized elevatoı, and control linkages; also the complete drive train of shaft and gearboxes between main transmission and tail rotor.**

UH-1H-II-M-1-12

Figure 1-12. Area inspection diagram

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 1	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**		**STATUS**	**RECORDED ON WORKSHEET**
All Areas	**EVERY 25 HOURS OF OPERATION**				
	1. Log Book.				
	a. Review for recorded discrepancies.				
All	b. Correct discrepancies that have a direct adverse effect on operating safety or function of item that is undetectable by flight crew that could adversely affect operating safety.				
	2. Assure that all applicable and required Special Inspections have been complied with.				
	3. Lubricate and service helicopter in accordance with Chapter 1, Section I.				
1	4. Forward fuselage area.				
	— Inspect				
	a. Pitot tubes and static ports for obstruction and damage.				
	b. Battery, external connections, and tubes for condition and security.				
	c. Avionics and electrical equipment for condition and security.				
	d. Nose door for condition, security, and proper latching.				
	e. Windshield wipe blades for serviceability and security.				
	f. Chin bubbles and windshields for cracks, crazing, and cleanliness.				
2	5. Fuselage - cabin				
	— Inspect				
	a. Crew doors for proper operation; emergency release handles and pins for condition, security, and corrosion.				
	b. Instruments and panel for condition and security.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 2	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
3	**EVERY 25 HOURS OF OPERATION (Cont)**				
	c. Center console and equipment for condition and security.				
	d. Crew seat belts and shoulder harness for condition, proper operation and security.				
	e. Cabin doors for proper operation and escape windows for condition and security.				
	f. Passenger seats and seat belts for condition, operation and security.				
	g. Cabin floor for condition and damage.				
	h. Cabin sound proofing for condition and security.				
	i. Cabin fire extinguisher for condition, proper charge and security.				
3	j. That transmission external oil filter bypass indicator button is not extended.				
	k. Hydraulic system; hydraulic servoactuators for security of attachment and evidence of leaks.				
2	l. Underside of fuselage for obvious damage and evidence of fuel, oil, and hydraulic leaks.				
3	m. Fuel samples for contamination.				
4	n. Transmission (lower case) for mechanical and corrosion damage.				
	o. Transmission, oil hoses, tubes, and electrical harness for condition, leakage, chafing, and security.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 3	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY		ITEM	STATUS	RECORDED ON WORKSHEET
	EVERY 25 HOURS OF OPERATION (Cont)				
2		p. Landing gear crosstubes and skid tubes for condition and security and lower surface of crosstubes for nicks and corrosion.			
3		6. Fuselage aft of cabin.			
		— Inspect			
		a. Fuel filler cap for proper operation and security.			
		b. Engine oil tank for leaks and oil gage for contamination and discoloration.			
		c. Heater compartment door and equipment for condition leakage and security.			
		d. Oil cooler blower and tail rotor actuator and equipment for condition, leakage, and security.			
		e. Engine cowling and fairings for condition, missing fasteners and proper operation of latches.			
		f. Engine air induction cowl, particle separator, plenum and inlet for condition, cleanliness, loose or missing fasteners, and security of hardware.			
		g. Engine mounts for mechanical damage and security.			
		h. Engine fuel and oil hoses and tubes, and electrical harnesses for chafing, clamping, leakage, and security.			
		k. Engine airframe oil filter for condition, leakage, and security.			
		l. Engine accessories and connections for damage and security.			

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 4	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 25 HOURS OF OPERATION (Cont)				
	m. Visually, engine compressor housing for cracks, scratches, corrosion, and security.				
	n. Engine combustion chamber housing, exhaust diffuser, support cone, fireshield, and tailpipe for cracks, dents, and burned or buckled areas.				
	o. Second stage turbine blades; inspect through exhaust diffuser for cracks, burns, dents or missing blades.				
	p. Electrical cable assembly, ignition coil and lead, exhaust thermocouple assembly for chafing, cracks, and security.				
	q. Main and starting fuel manifolds for leaks, and security.				
	r. Flow divider assembly for leaks, damage, and security.				
	s. Fuel control and power lever for freedom of movement through full range to each stop.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 5	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 25 HOURS OF OPERATION (Cont)				
1 & 3	t. Electrical and electronic compartments for condition and security of installed equipment.				
	u. External power receptacle pins for arcing, and door for condition, and security.				
3	v. Tail rotor driveshaft couplings at transmission and first driveshaft hanger for security and grease leakage. Check TEMP-PLATES (two places each coupling) for evidence of elevated temperatures indicated by dot changing color to black.				
	CAUTION				
	Refer to Chapter 6, table 6-6 to determine serviceability. TEMP-PLATES must not show evidence of overtemperature, deterioration, debonding, or discoloration of the epoxy coating that prevents interpretation of the indicating dots. If only one TEMP-PLATE on a coupling is missing, and no dot on the other TEMP-PLATE is discolored or shows mechanical damage or degradation of the overcoating, the aircraft may be returned to service. The discrepant TEMP-PLATE should be replaced as soon as is practical.				
	7. Cabin roof area.				
	— Inspect				
	a. Cabin roof, cowlings, fairings, and pylon structure for condition and damage.				
	b. Hydraulic reservoir, hydraulic pump and hoses and tubes for condition and leakage and proper fluid level.				
	c. Transmission (upper case) for oil leakage and corrosion and mechanical damage and accessories and quills for condition and security.				
	d. Transmission oil hoses, tubes and electrical harness for condition, leakage, chafing and security.				

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 6	NO. OF PAGES
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET

EVERY 25 HOURS OF OPERATION (Cont)

e. Rotor brake quill (if installed) for seal leakage and disc for condition and security.

f. Transmission tail rotor drive quill coupling seals and surrounding area for evidence of grease leakage. Overheat indicators for color and condition. A change in color indicates possible overheating and/or component degradation. Cause of color change shall be determined and corrected prior to next flight.

g. Transmission to engine driveshaft for visual damage and security of clamps and bolts.

h. Swashplate and support assembly for corrosion and mechanical damage, and security. Pay particular attention to gimbal ring bearings, trunnion bearings and attaching hardware for excessive looseness and security.

WARNING

Do not attempt to turn bolts or nuts. Bolt rotation will fail Loctite in joint and permit bolt wear.

(1) Grasp swashplate rotating ring 204-011-403 and attempt to move it in a horizontal plane on an axis in line with gimbal ring attach points to support assembly 204-011-404. Maximum allowable, axial looseness across the gimbal ring bearings and attaching bolts, is 0.010 inch.

(2) Repeat step (1) and apply force on an axis 90 degrees to check in step (1) attempting to detect looseness in line with gimbal ring attach points to inner ring 204-011-402. Maximum allowable axial looseness across the gimbal ring bearings and attaching bolts is 0.010 inch.

(3) Check trunnions in rotating ring for axial looseness.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 7	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 25 HOURS OF OPERATION (Cont)				
	i. Scissors and sleeve and collective lever assemblies for corrosion and mechanical damage and security.				
	j. Mast assembly for corrosion and mechanical damage and condition of static stop contact surface and seal for excessive leakage.				
	k. Main rotor pitch links, damper tubes and connecting links for corrosion and mechanical damage. Rod end bearings and universal bearings for looseness.				
	l. Stabilizer bar assembly for corrosion and mechanical damage and scissors bearings for looseness.				
	m. Stabilizer bar dampers for condition, proper fluid level, timing, and security.				
	n. Main rotor hub assembly (grips, drag braces, blade bolts, and static stops) for corrosion and mechanical damage. Hub assembly for proper lubricant quantity.				
	o. Main rotor yoke for evidence of cracks or corrosion in area of pillow block bushing bores and spindle radii and in shields; pillow blocks and attaching hardware for proper sealing.				
	p. Wash main rotor blades upper and lower surfaces with a mild soap detergent. Thoroughly rinse with water and dry with clean cloth. Inspect both surfaces and blade tip for damage, cracks and visible indications of voids, bond separation and corrosion. Inspect leading edge scarf joints for erosion and corrosion.				
6	9. Tailboom				
	— Inspect				
	a. Tailboom and vertical exterior skin for evidence of damage, cracks, loose or missing rivets, and corrosion and for security of elevators and tail skid.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 8	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

EVERY 25 HOURS OF OPERATION (Cont)

b. Vertical fin forward spar and vertical fin driveshaft cover attachment channel for cracks in the area directly below the 90 degree gearbox attachment fitting.

c. Baggage compartment for condition; door for security and proper latching.

d. Visually inspect, tailboom attach bolts for security, and fittings for cracks.

e. Elevators for condition and security.

NOTE

The following steps require a visual check of the tail rotor drive couplings TEMP-PLATES for evidence of elevated temperatures indicated by dot changing color to black.

CAUTION

Refer to Chapter 6, table 6-6 to determine serviceability. TEMP-PLATES must not show evidence of over-temperature, deterioration, debonding, or discoloration of the epoxy coating that prevents interpretation of the indicating dots. If only one TEMP-PLATE on a coupling is missing, and no dot on the other TEMP-PLATE is discolored or shows mechanical damage or degradation of the overcoating, the aircraft may be returned to service. The discrepant TEMP-PLATE should be replaced as soon as is practical.

f. Tail rotor driveshaft and tail rotor driveshaft hanger assemblies for security and obvious damage; driveshaft hangers and surrounding areas for evidence of grease leakage, and driveshaft hangers visual overheat indicators for discoloration and overheat condition; tail rotor driveshafts for corrosion and missing balance weights. Hanger coupling TEMP-PLATES for evidence of elevated temperatures indicated by dot changing color to black.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 9	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 25 HOURS OF OPERATION (Cont)				
	g. Intermediate gearbox for security and obvious damage, and oil leaks. Check input and output quill couplings and surrounding area for grease leakage and TEMP-PLATES for evidence of elevated temperatures indicated by dot changing color to black.				
	h. Tail rotor gearbox for security and obvious damage, and oil leaks. Check input quill coupling and surrounding area for grease leakage and TEMP-PLATES for evidence of elevated temperatures indicated by dot changing color to black.				
	i. Driveshaft and intermediate gearbox covers for condition and security.				
	j. Tail rotor blades for cleanliness, tip erosion, damage, and security.				
	k. Tail rotor hub assembly for security and general condition. Inspect flapping bearings and pitch change bearings for excessive looseness and for freedom through full range of movement with antitorque pedals, full right and then full left.				
	l. Tail rotor pitch change links, crosshead, counterweight arms and links for security and general condition. Inspect pitch change link bearings and counterweight link bearings for excessive looseness and for freedom through full range of movement with antitorque pedals full right and then full left. Ensure that pitch change links do not bind when tail rotor blade is moved to both full flapping positions.				
	m. Tail skid and fairing for deformation and security of attachment.				
	EVERY 75 HOURS OF OPERATION				
All	1. Perform complete 25 hour inspection.				
1	2. Check battery electrolyte level and service battery in accordance with the battery manufacturers recommendation.				
	EVERY 150 HOURS OF OPERATION				
All	1. Perform complete 25 hour inspection.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 10	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**		**STATUS**	**RECORDED ON WORKSHEET**
	EVERY 150 HOURS OF OPERATION (Cont)				
4	2. Remove main transmission oil sump full flow debris monitor and transmission chip detectors, inspect and clean. If metallic particles are found, investigate to determine cause and correct.				
6	3. Inspect attachment lugs at each end of elevator horn for cracks and security of attachment. Inspect elevator horn to elevator spar joint for excessive play and attaching bolts and surrounding joint for cracks and security of attachment.				
	4. Remove, inspect, and clean intermediate gearbox chip detector. If metallic particles are found, investigate to determine cause and correct. Functionally test chip detector by grounding center connector to case of chip detector and verify caution light illuminates.				
	5. Remove, inspect and clean tail rotor gearbox chip detector. If metallic particles are found investigate to determine cause and correct. Functionally test chip detector by grounding center connector to case of chip detector and verify caution light illuminates.				
5	6. Every third 150 hour inspection interval, drain oil from engine (refer to Lycoming Engine Manual), engine or tank and engine oil cooler. Remove engine airframe oil filter element and inspect for contamination and metallic particles. If discrepancy is evident, investigate to determine cause and correct. Install new element and packings.				
	7. Service engine with approved oil.				
	EVERY 300 HOURS OF OPERATION				
All	1. Perform complete 25 hour inspection.				
	— Inspect				
	a. Fuselage cabin area by removing sound proofing and inspect structure for corrosion, cracks, loose rivets, and missing fasteners.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 11	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 300 HOURS OF OPERATION (Cont) 2. Transmission oil system. a. Drain oil from transmission and oil cooler. b. Remove transmission external oil filter element and inspect for contamination and metallic particles. If discrepancy is evident, investigate to determine cause and correct. c. Remove transmission sump screen and inspect for contamination and metallic particles. If discrepancy is evident, investigate to determine cause and correct. d. Thoroughly clean and reinstall new packings, and sump screen. Install new external transmission filter element and new packings. e. Remove full flow debris monitor and chip detector from sump case. (1) Remove cup and screen tube from debris monitor. Visually inspect screen tube for contamination and non–metallic debris. Inspect external surface of monitor and chip detector for magnetic chips and particles. If contamination, chips or particles are found, investigate to determine cause and correct. (2) Thoroughly clean screen tube and monitor with solvent. Clean exterior surfaces of magnetics with clean cloth. Install screen tube with new packing in debris monitor; torque 22 to 30 inch–pounds. (3) Connect electrical harness to debris monitor and short across magnetics (2 places). Verify chip detector caution light illuminates on each magnetic. (4) Install debris monitor in sump case with a new packing. f. Service transmission with approved oil.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 12	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

EVERY 300 HOURS OF OPERATION (Cont)

4. Inspect all fuel, hydraulic, and oil tubes and hoses, and electrical harnesses in cargo hook compartment for condition, chafing, leakage and security.

5. Inspect lift link and attachment points for condition and security, bearing for looseness.

6. Inspect cyclic and collective hydraulic actuator assemblies as follows;

— Inspect

a. Universal bearings for looseness.

b. Input lever bushings and bolts for wear and looseness.

c. Lift dust boot and inspect for corrosion in the actuator mounting bracket cavity and on the upper cylinder housing. Ensure drain hole in bracket is unobstructed. Inspect dust boot for condition and security.

d. Tighten nuts attaching actuators to upper supports.

e. Fasteners attaching actuator lower supports to structure for looseness.

f. Actuator lower bearings for looseness.

g. Actuators for damage and leakage. Clean exposed area of pistons with hydraulic fluid and clean cloth.

h. Actuator extension tubes for condition and security.

7. Cargo hook compartment (hell hole).

— Inspect

a. Control tubes, bellcranks, support and structure and attaching hardware for condition, corrosion, damage, and wear.

b. All attaching hardware for security.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 13	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 300 HOURS OF OPERATION (Cont)				
2	8. Landing gear.				
	— Inspect				
	a. Skid shoes and wear strips for excessive wear, cracks, damage, corrosion and security of attachment.				
	b. Crosstubes for damage, corrosion and security.				
4	9. Remove, clean and inspect hydraulic filter element.				
3	10. Fuselage aft of cabin.				
	— Inspect				
	a. Cabin/tailboom bulkheads and fittings for cracks, loose rivets, and loss of bolt torque.				
	b. Engine firewalls and fireshields for cracks, distortion, missing rivets and fasteners, and broken spot welds. Check seals for deterioration.				
	c. Engine N1 and N2 control linkage for looseness, lost motion and security.				
	d. Engine starter–generator brushes and splines for wear.				
	e. Engine mount rod–end bearings for wear.				
2	11. Cabin roof.				
	— Inspect				
	a. Cabin roof cowlings and fairings for cracks, distortion, missing rivets, and fasteners, and bond voids. Check seals for deterioration.				
	b. Upper pylon structure panels, skin and fittings for corrosion, cracks, and loose or missing hardware.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 14	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 300 HOURS OF OPERATION (Cont)				
4	c. Pylon friction dampers and fifth mount for condition and security. Move pylon fore and aft, using main rotor mast as lever and check dampers for freedom.				
	d. If installed, rotor brake disc and pucks for wear and serviceability.				
6	e. Synchronized elevator control tubes and bellcranks for condition, corrosion, damage and wear.				
6	12. Tailboom				
	— Inspect				
	a. Tailboom and vertical fin interior structure for corrosion, cracks, and damage. Pay particular attention to joints, splices, longerons, bulkheads, attach fittings, and attachment hardware.				
	b. Elevator and tail rotor control tubes, bellcranks, supports and attaching hardware for corrosion and damage. Bearings for looseness and control tubes for wear at fairleads.				
	c. Wiring harness for condition, chafing, and security.				
	d. Tail rotor controls at vertical fin and rotating pitch controls for corrosion, wear, and damage.				
	e. Dynamically balance tail rotor.				
	f. Drain oil from intermediate and tail rotor gearboxes.				
	g. Service gearboxes with approved oil.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 15	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 24 MONTHS OF OPERATION				
2	1. Emergency equipment.				
	— Inspect				
	a. Emergency and safety equipment (first aid kits, life rafts, jackets, survival equipment, etc.) for condition and completeness.				
	b. Replace all over age items.				
	2. Calibrate and inspect magnetic compass.				
	3. Fuselage and tailboom.				
2 & 6	Remove all interior and exterior fuselage and tailboom access panels, removable floor panels, cowlings and fairings.				
	— Inspect				
	a. Remove panels, cowlings and fairings for condition, damage, and loss of protective finish.				
	b. Openings to fuselage and tailboom structure for corrosion, damage, and loss of protective finish and sealant. Pay particular attention to edges of joints and seams and around fastener leads.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 16	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**		**STATUS**	**RECORDED ON WORKSHEET**
	EVERY 24 MONTHS OF OPERATION (Cont)				
	c. Drain holes for cleanliness and obstructions.				
2, 3 & 4	4. Flight and engine controls.				
	— Inspect				
	a. Flight and engine control systems bellcranks, mounts, jackshaft, and control tubes for chafing, corrosion, damage, leakage, and security of attachment.				
	b. Flight and engine control systems for smooth movement, throughout their full travel ranges.				
	5. Fuel system.				
	— Inspect				
	a. Fuel cell hoses, tubes and attachments for chafing, corrosion, damage, leakage, and security of attachment.				
	b. Calibrate fuel system.				
All	6. General.				
	— Inspect				
	a. Wire bundles, bundle supports, and connectors for chafing, corrosion, damage, and security.				
	b. Heating ducts and controls for damage and proper operation.				
	c. Test pitot static system.				
	d. Collective stick minimum friction and inspect shoes and liners for condition.				
	7. Perform operational check of the battery temperature sensor caution light system.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 17	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
4	**EVERY 24 MONTHS OF OPERATION (Cont)** 8. Perform operational check of crew door emergency release mechanism. 9. Perform fire detector system test. 10. Flight controls. Disconnect bottom of each drive link from swashplate trunnions and scissors lever control tubes. Remove drive plate from collective hub. **— Inspect** a. Collective sleeve hub bearing set for roughness and ease of rotation. b. Swashplate duplex thrust bearings for roughness and ease of rotation. c. Purge lubricate bearings and check seals for condition. d. Install drive plate, drive links, and control tubes. 11. Remove main driveshaft and inspect internal fail–safe diameters for evidence of contact. If contact is noticed, driveshaft shall be replaced. a. Visually inspect driveshaft for obvious mechanical damage, flex plate looseness, corrosion, and/or fretting at flex plate bolted joints. b. Remove the lockwire from bolt 204-040-813-101, which secures adapter 204-040-812-003 to the engine. c. Using pencil or ink, mark a reference line across the bolt head to the adapter. d. Apply 360 inch-pounds torque to the bolt. If the reference line indicates no movement of the bolt head, inspection is complete. Install lockwire.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 18	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	EVERY 24 MONTHS OF OPERATION (Cont)				
		e. If the reference line indicates movement of the bolt, remove adapter from engine.			
		f. Inspect adapter pilot shoulder for wear where it contacts the engine output gear and end face of adapter for evidence of contact with anti-rotation tangs of output gearshaft plug. Replace adapter if wear on pilot shoulder exceeds 0.010 inch.			
2		12. Weight check cabin and cockpit fire extinguishers.			
4		13. Install 0-300 PSI pressure gauge at rotor brake quick-disconnect fitting. Actuate rotor brake handle and check for 250 plus or minus 10 psi hydraulic pressure at the rotor brake assembly quick-disconnect fitting. An average of three actuations should be used (if installed).			
6		14. Elevators.			
	Remove both elevators.				
		— Inspect			
		a. Condition of ears of elevator horn by dye penetrant method. Replace horn if any crack is evident.			
		b. For general condition, cracks and corrosion. Repair inboard rib if any cracks exist. The inboard rib must be replaced if any crack extends into the rib flange.			
2		15. Check magnetic compass for discoloration of liquid and proper calibration; recompensate if necessary.			
		16. Check first aid kit for inspection.			
		17. Check remote compasses for calibration.			
		18. Inspect and test pitot static system.			
		19. Inspect and test altimeter.			
		20. Inspect and test airspeed indicator.			

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 19	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**		**STATUS**	**RECORDED ON WORKSHEET**
6	**AFTER 5 TO 10 HOURS OF FLIGHT FOLLOWING EACH INITIAL INSTALLATION**				
	1. Retorque tail rotor hub retaining nut.				
	2. Retorque tail rotor gearbox (90 degrees) retaining nuts 200 to 235 inch-pounds. Use a 0.005 inch or less feeler gage to check that no gap exists between the gearbox input quill and gearbox case shim.				
	3. Retorque intermediate gearbox retaining bolts 50 to 70 inch-pounds.				
4	**AFTER 15 TO 30 HOURS OF FLIGHT FOLLOWING EACH INITIAL INSTALLATION OF MAIN ROTOR HUB OR MAIN ROTOR BLADES**				
	1. Retorque main rotor pillow block bolt nuts (64 to 79 foot pounds), and reseal area around nuts and bolts.				
	2. Inspect pillow block bushing flange and outside area of bushing holes for evidence of cracks/corrosion.				
	3. Retorque main rotor blade retention nuts (260 to 300 foot pounds).				
	EVERY 6 MONTHS OR 600 HOURS OF OPERATION				
4	1. Remove, inspect and repack the following driveshaft flexible couplings.				
	a. Transmission tail rotor output quill coupling.				
6	b. Tail rotor driveshaft flexible couplings.				
	c. Intermediate gearbox input and output quill couplings.				
	d. Tail rotor gearbox input quill couplings.				
	EVERY 24 MONTHS AFTER INSTALLATION OF FLIGHT CONTROL SYSTEM, INSPECT SYSTEM BOLTS				
	Remove, clean and visually inspect the flight control system bolts as listed.				
	ITEM		**PART NUMBER**		
	Fixed swashplate to R/H and L/H cyclic boost tubes (2)		20-057-5-24D		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
6	**EVERY 24 MONTHS AFTER INSTALLATION OF FLIGHT CONTROL SYSTEM, INSPECT SYSTEM BOLTS (Cont)**				

ITEM	PART NUMBER
Collective lever to collective boost tube (1)	20-057-5-24D 204-011-463-001 204-011-463-003
Swashplate gimbal rings bolts (4)	20-057-5-30D
Collective lever to swashplate support (2)	20-057-5-30D
Boost tube to universal (2)	20-057-5-24D
Universal to hydraulic cylinder (2)	20-057-5-24D
Mixing lever to scissors tube (2)	20-057-5-27D
Scissors tube to scissors (2)	20-057-5-27D
Pitch link to universal (2)	20-057-6-27D
Drive link to rotating swashplate (2)	20-057-5-30D
Pitch horn to pitch link (2)	20-057-6-31D
Universal to mixing lever (2)	20-057-6-34D
Mixing lever pivot bolts (4)	20-057-6S23D or 20-057-6S24D
Scissors to drive link (2)	20-057-8S69D
Stabilizer bar pivot bolts (2)	20-057-10S27D or 20-057-10S29D
Hydraulic cylin+der to lower support (2)	212-001-304-003 or 212-001-323-001
Scissors pivot bolt (2)	212-040-411-005

1. Clean bolts with solvent (C-305 or C-316).
2. Visually inspect all bolts listed. Replace any bolts with discrepancies.

AIRCRAFT INSPECTION CHECKSHEET		TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 20	NO. OF PAGES
AIRCRAFT AND SERIAL NO.		INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**	**STATUS**	**RECORDED ON WORKSHEET**

6

EVERY 24 MONTHS AFTER INSTALLATION OF FLIGHT CONTROL SYSTEM, INSPECT SYSTEM BOLTS (Cont)

2. Inspect bolts for thread damage, shank wear and corrosion. Replace any bolt that has damaged threads, detectable shank wear or exhibits corrosion pitting.
3. Apply corrosion preventive compound (C-104) to the bolt shanks only and install in accordance with Chapter 11.
4. After bolts have been installed, nuts torqued and safetied, coat the bolt heads and nuts with hard film corrosion preventive compound (C-101).

NOTE

Operations in extreme environmental conditions which erode the corrosion preventive compound (C-101) may warrant periodic touchup of control bolts external surfaces. Prior to touchup, visually check exposed surfaces of hardware for evidence of corrosion and fretting. Remove, clean, and inspect bolts as conditions warrant.

100 HOURS OF OPERATION AFTER EACH INITIAL INSTALLATION OF TAILBOOM

Torque tailboom attachment bolts.

1. Upper left: 1300 to 1600 inch-pounds.
2. Upper right: 1000 to 1200 inch-pounds.
3. Both lower: 400 to 430 inch-pounds.

2

AFTER RESCUE HOIST CABLE MAINTENANCE

A 300 pound load should be raised and lowered by the hoist a minimum of five up and down cycles. Length of cycle is a minimum of 5 feet. Cable will then be inspected for condition and fraying.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 21	NO. OF PAGES
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
2	**FIRST FLIGHT EACH DAY AND/OR EACH USAGE**			
		Inspect rescue hoist (if installed). 1. Inspect rescue hoist hook for damage. Give special attention to hook keeper. 2. Straighten bent clips. 3. Bend weak springs as necessary to restore tension. 4. Replace AN526C532-12 screws and MS21045C06 nuts that are damaged. 5. Use safety strap with forest penetrator whenever possible.		
	25 HOUR INSPECTION			
ALL		Examine inspection window(s) and/or sight glass(es) for cracking, crazing, and discoloration. If any one of these conditions is present, the part must be removed and replaced prior to returning helicopter to service.		
4		**MAIN ROTOR HUB GRIP (204-011-121-009)** 1. Prepare both main rotor grip tangs for inspection by cleaning exposed surfaces with alcohol (C-326) and wipe dry. 2. Inspect grip surfaces for hairline cracks on upper and lower surfaces. Pay particular attention to the lower tangs lower surface from the blade bolt bushing flange to the trailing and leading edge of the tang. (Figure 1-13).		
6		**TAIL ROTOR HANGER BEARINGS (204-040-623-003)** 1. Inspect bearings next four inspections for dust shield movement indicated by displacement of the witness marks (both sides of the bearing). 2. Bearings which do not display grease shield movement after the fourth 25 hour inspection may remain in service with no further inspection required.		
4	**1200 HOUR INSPECTION**			
		MAIN ROTOR HUB GRIP (204-011-121-009) 1. Prepare both main rotor grip tangs for inspection by cleaning exposed surfaces with alcohol and wipe dry. 2. Inspect grip surfaces for hairline cracks on upper and lower surfaces. Pay particular attention to the lower tangs lower surface from the blade bolt bushing flange to the trailing and leading edge of the tang. Crack indications require the grip to be removed from service for further evaluation. (Figure 1-13).		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 22	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**		**STATUS**	**RECORDED ON WORKSHEET**
4	**1200 HOUR INSPECTION (Cont)** 3. Check gap (360 degrees) between flange of blade bolt bushing and surface of grip tang. Maximum gap of 0.0025 inches (0.0635 mm) permitted. Note gaps greater than the maximum permitted requires bushing to be replaced. 4. Fit a blade bolt through both bushings simultaneously; bolt should be able to be turned with fingers. If this cannot be accomplished, refer to BHT-212-CR&O-1 for further inspection requirements. 5. Inspect buffer pads on tang inner surfaces for delamination. Any delamination will require buffer pad replacement. (Figure 1-13). **TRANSMISSION INPUT QUILL CLUTCH** 1. Inspect transmission input quill clutch in accordance with paragraph 6-77. c.				
4	**3100 HOUR INSPECTION** **MAIN ROTOR MAST (204-011-450-105)** 1. Inspect inner and outer diameters of mast for corrosion and mechanical damage. (Refer to BHT-212-CR&O-1 Manual.)				
4	**3100 HOUR INSPECTION** 1. Disassemble transmission sufficiently to remove the main input driven gear quill P/N 204-040-263. Refer to BHT-212-CR&O-1 Manual. 2. Inspect transmission assembly. Refer to Chapter 6. a. Using torque wrench, check each of the 32 bevel gear retaining bolts P/N 214-040-117-005 for minimum torque of 300 inch-pounds.				

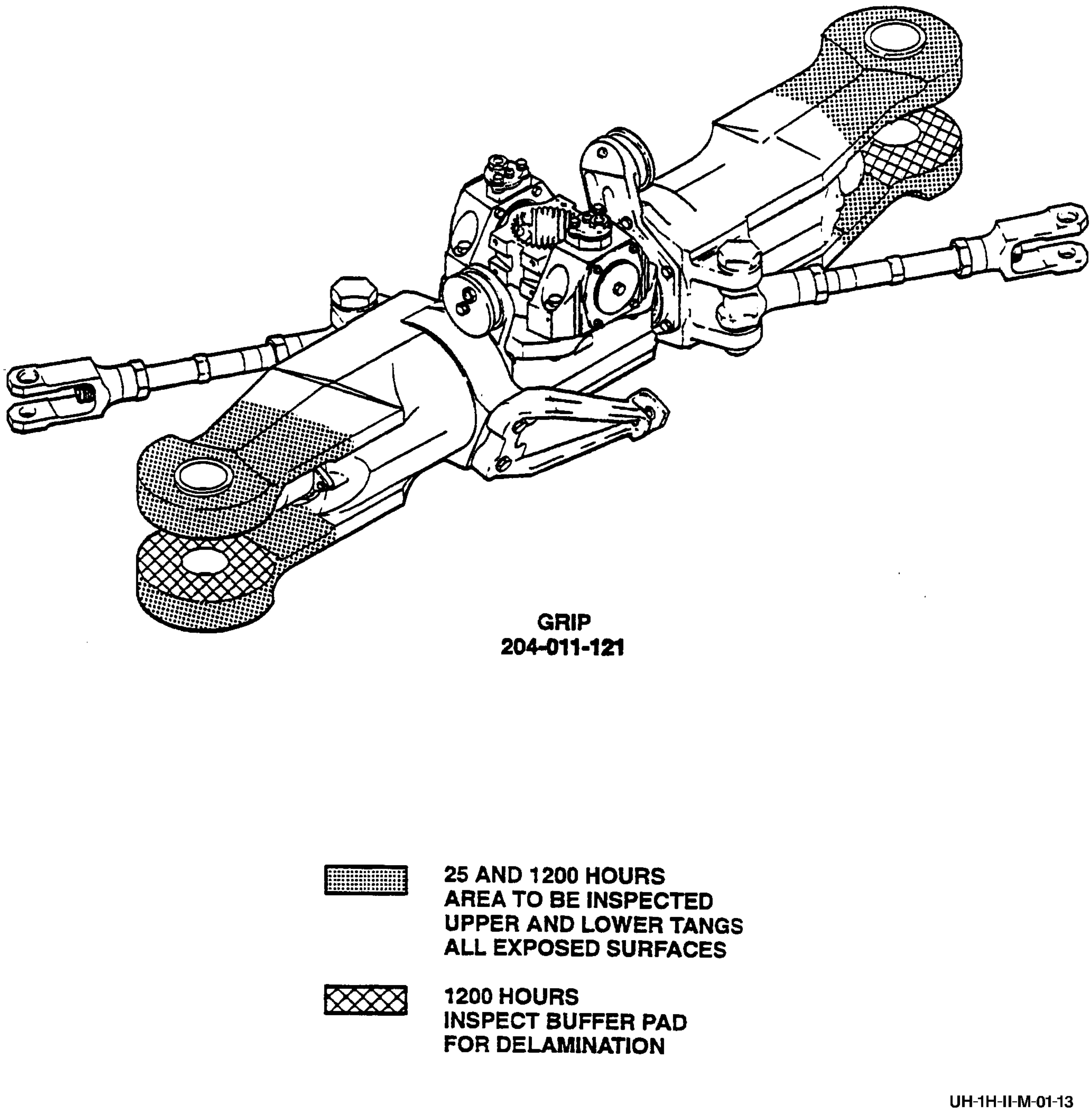


Figure 1-13. Inspection of main rotor hub grips tangs

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 23	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

3100 HOUR INSPECTION (Cont)

NOTE

Torque check is accomplished with increasing torque, not break away or loosening torque.

b. If torque value of any one retaining bolt is less than 300 inch–pounds, remove bevel gear and inspect mating surfaces of gear P/N 204-040-701-101 and shaft P/N 204-040-324-005 for fretting damage.

c. The maximum acceptable depth of pitting is 0.0005 inch. Depth may be measured by using a dial indicator with a needle pointed probe. Pitting of measurable depth is acceptable only in the area on the gear or shaft surface outside of the diameter of the bolt holes, and is not acceptable within 0.100 inch of the edge of a bolt hole. Damage in excess of these limits is cause for rejection of part.

3. Inspect upper flange surface and pilot diameter of the ring gear P/N 205-040-231, and mating surfaces of top case P/N 212-040-059 for fretting and wear. Limits in BHT-212-CR&O-1 Manual apply.

4. Inspect lower flange surface and pilot diameter of ring gear P/N 205-040-231, and mating surfaces of bevel gear support case P/N 204-040-386 for fretting and wear. Limits in BHT-212-CR&O-1 Manual apply.

5. Visually check the vibro-etched index marks on input pinion P/N 204-040-700 and inner race of the P/N 214-040-118 bearing set for alignment. Inspection may be accomplished with input quill installed by viewing pinion shaft and bearing inner race between pinion teeth and main case.

NOTE

If index marks indicate rotational movement between the pinion and inner race of the bearing set, remove quill and bearing set and inspect pinion bearing journal for signs of fretting and bearing inner race spinning. Visually inspect oil holes in input quill sleeve to ensure that they are free of any foreign material. Inspect detail parts to determine cause for bearing inner race rotation and replace parts as required.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 24	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	3100 HOUR INSPECTION (Cont) 6. Inspect sun gears and planetary pinions for general condition and wear pattern. (Refer to BHT-212-CR&O-1 Manual.) 7. Reassemble transmission. (Refer to BHT-212-CR&O-1 Manual.) **HARD LANDING**				
All Areas	Hard landing is defined as any accident or incident in which ground impact of the helicopter causes severe pitching of main rotor, allowing hard contact of hub with mast, or results in yielding or cracking the mounting lug of the transmission support case or noticeable yielding or cracking of fuselage pylon support structure or landing gear. This definition is confined only to those accidents not involving sudden stoppage of main rotor or tail rotor. **NOTE** Components removed from a helicopter for evaluation following a sudden stoppage shall be evaluated as an interrelated group. Removal records accompanying each component shall cross-reference part and serial numbers of other drive system components removed for evaluation. 1. If a hard landing is suspected, the following steps a. through g. shall be complied with. a. Inspect main and tail rotor blades for evidence of strike damage. If such evidence is found on either rotor, perform sudden stoppage power on or off. b. Visually inspect underside of fuselage and tailboom for evidence of ground contact. c. Perform landing gear deflection check. Refer to Chapter 3. (1) If cross tubes have yielded, remove landing gear and inspect support and structure to which they are attached for signs of yielding or other damage. (2) If supports and attaching structure are not damaged, replace damaged landing gear components. d. Inspect mast for evidence of hard rotor hub contact, sufficient to yield or deform mast. e. Inspect area around lower supports of pylon dampers for loose rivets or other damage.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 25	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

HARD LANDING (Cont)

f. If no damage other than yielded landing gear cross tubes has been found at this point it can reasonably be decided that a true hard landing did not occur. Complete a daily inspection and return helicopter to flight status provided no further evidence of damage is found.

g. If damage is more extensive than landing gear crosstube yielding, a hard landing has occurred; comply with requirements of steps 2., 3., and 4.

2. If a hard landing has occurred, the following steps shall be complied with:

a. Remove and perform an overhaul evaluation inspection of following components.

(1) Mast Assembly.

NOTE

If there is any yielding or deformation in area contacted by main rotor hub, or any other obvious damage, the mast is unserviceable and nonreparable.

(2) Transmission.

(3) Main Input Driveshaft.

b. Perform a thorough visual inspection of following components, which may be kept in service if no discrepancy or obvious damage is found. Replace any damaged component.

(1) Main Rotor Blades

(2) Main Rotor Hub

(3) Tail Rotor Blades

(4) Tail Rotor Hub

(5) 42° Gearbox

(6) 90° Gearbox

(7) Tail Rotor Driveshafts

(8) Tail Rotor Driveshafts Hangers

(9) Swashplate and Support Assembly

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 26	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

HARD LANDING (Cont)

(10) Scissors and Sleeve Assembly

(11) Stabilizer Bar Assembly.

c. Check all cowling and doors for proper fit and alignment. Remove cowling and inspect all attachment fittings.

NOTE

If significant damage has been found in any area of the airframe, inspection shall be expanded in those areas until it extends beyond the zone of damage.

d. Make a complete inspection, using a ten-power magnifying glass, of pylon support structure for loose or sheared rivets, cracked brackets, buckled or cracked support angles and webs. Pay particular attention to pylon mounts attaching points and damper support attaching points.

e. Make a complete inspection of lift link, lift link attachment fittings and lift beam for cracks and other evidence of damage. Remove lift ink and replace with like serviceable item, if damaged.

f. Remove both pylon dampers, disassemble and check for internal yielding. Reassemble and reinstall if no evidence of damage. Replace with like serviceable item if any damage is found.

g. Install serviceable mast, transmission assembly and main driveshaft assembly. Reinstall removed pylon control components.

h. Check all engine mount fittings and bolts for damage and looseness.

i. Inspect engine firewalls for evidence of warping, crushing or other damage.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 27	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	**REQUIREMENT EVERY**	**ITEM**		**STATUS**	**RECORDED ON WORKSHEET**

HARD LANDING (Cont)

j. Make a complete inspection of area where tailboom is attached to forward fuselage section. This includes both sets of attachment fittings and the longerons, beam caps, skins, webs, bulkhead flanges and other structural members. Check torque on attachment bolts to determine if yielding has occurred..

k. Completely inspect flight control system from pilot controls to rotor head for bent or damaged tubes, bellcranks, bellcrank supports and for damaged control system bearings. Particular attention should be given to pylon controls, lower cylinder attachment support fitting and adjacent airframe structure.

l. Pressure hydraulic system and check for leaks, interference, binding and for satisfactory operation.

m. Inspect fuel, oil and pneumatic system for damage. Make engine ground run and visually check fuel, oil, and pneumatic lines for leaks.

3. Inspect power plant in accordance with Lycoming Engine Manual T53-L-703.

4. If no significant damage has been found, no further inspection is necessary.

SUDDEN STOPPAGE (POWER ON OR POWER OFF)

All Areas

Sudden stoppage is defined as any rapid deceleration of the drive system whether caused by seizure within the helicopter transmission or by contact of the main or tail rotor blades with the ground, water, snow, dense vegetation or other object of sufficient mass to cause rapid deceleration. Main or tail rotor blade damage, when caused by striking some object of sufficient mass which requires blade replacement, is considered sudden stoppage. When sudden stoppage occurs, inspect helicopter and replace components as follows:

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 28	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	SUDDEN STOPPAGE (POWER ON OR POWER OFF) (Cont) NOTE Components removed from a helicopter for evaluation following a sudden stoppage shall be evaluated as an interrelated group. Removal records accompanying each component shall cross-reference part and serial numbers of other drive system components removed for evaluation. 1. Perform a sudden stoppage inspection as follows: NOTE If sudden stoppage inspection is the result of a tail rotor strike. Comply with steps 1. g. thru 1. m. a. Main rotor blades. (1) Visually inspect both main rotor blades for evidence of damage. Check closely for wrinkled skin. (2) If any blade is damaged sufficiently to require blade replacement, return both blades to an authorized overhaul facility. Make an entry in component record to show that reason for removal was Sudden Stoppage. (3) If no evidence of damage is found on either blade, both blades may be retained in service. b. Main rotor hub. (1) If main rotor blades were not damaged, the main rotor hub may be retained in service. (2) If any main rotor blade is damaged sufficiently to require blade replacement, perform an overhaul evaluation inspection on main rotor hub assembly in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage. (3) If any main rotor blade is damaged beyond repair, scrap grip 204-011-121 and perform an overhaul evaluation inspection on main rotor hub. Make an entry in component record to show reason for removal was Sudden Stoppage.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 29	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

SUDDEN STOPPAGE (POWER ON OR POWER OFF) (Cont)

c. Pylon control components.

(1) If one or more of the following discrepancies in step a. through e. are found, the swashplate assembly, stabilizer bar assembly, and scissors and sleeve assembly shall be removed and an overhaul evaluation shall be performed in accordance with BHT-212-CR&O-1.

(a) Severe main rotor blade damage.

(b) Pitch horn failure.

(c) Yielded stabilizer bar tube.

(d) Control tube buckled or broken.

(e) Transmission main support case mounting leg broken.

(2) If no condition exists as listed in preceding step c. (1) above, perform a close visual inspection. If no evidence of damage is found, the swashplate assembly, stabilizer assembly, and scissors and sleeve assembly may be retained in service.

d. Replace all bolts in rotating controls. Discard removed bolts.

e. Remove and inspect main driveshaft visually. If evidence of yielding or deformation is noted, scrap the driveshaft assembly. If no visual evidence of damage is detected, perform an inspection in accordance with chapter 6. Make an entry in component record to show that reason for removal was Sudden Stoppage.

f. Transmission and Mast Assembly.

(1) If mast has evidence of torsional yielding, the mast and transmission shall be considered unserviceable and scrapped. Refer to BHT-212-CR&O-1.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 30	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

SUDDEN STOPPAGE (POWER ON OR POWER OFF) (Cont)

(2) If mast does not have torsional yielding and transmission has no obvious damage that would render it nonreparable; then transmission and mast shall have an overhaul evaluation performed in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage.

g. Tail rotor driveshaft hangers.

(1) If a tail rotor driveshaft has been damaged by main rotor strike or other circumstances, the hangers to which the damaged shaft was attached shall be considered unserviceable and nonreparable. If a tail rotor driveshaft fails as a result of torsional load then all hangers and shafts shall be considered unserviceable and nonreparable.

(2) If inspection reveals no condition as listed in step (1) and there is no obvious damage which would render hanger assemblies unserviceable, then hanger assemblies shall have an overhaul evaluation performed in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage.

h. Tail rotor driveshaft.

(1) Remove tail rotor driveshafts and inspect for following conditions. If one or more conditions listed in steps (a) through (e) are noted then all driveshafts and bearing hangers shall be considered unserviceable and nonreparable.

(a) Curvic faces distorted

(b) Evidence of overload

(c) Cracks

(d) Loose or sheared rivets

(e) Scratches in excess of limits.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 31	NO. OF PAGES
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
All Areas	**SUDDEN STOPPAGE (POWER ON OR POWER OFF) (Cont)**			

(2) If inspection reveals no condition as listed in steps (a) through (e) exists, then perform an inspection in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage.

i. Tail rotor hub and blade assembly.

(1) If sudden stoppage originated at tail rotor blades, the tail rotor hub and blade assembly shall be considered unserviceable and nonreparable.

(2) If sudden stop originated at main rotor on transmission, the tail rotor hub and blade assembly may remain in service provided there is no visible external damage. If visible damage is noted on tail rotor hub and blade assembly, remove tail rotor hub and blade assembly and perform overhaul evaluation inspection in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage.

(3) If sudden stoppage originated at tail rotor driveshaft, intermediate gearbox, or tail rotor gearbox, remove tail rotor hub and blade assembly and perform overhaul evaluation inspection in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage.

j. Tail rotor gearbox.

(1) Remove tail rotor gearbox. Check for cracks, sheared or bent attaching studs, and evidence of case distortion. If any of the above is noted, then the gearbox is unserviceable and nonreparable.

(2) If inspection reveals no condition as listed in step (1) above, then perform an overhaul evaluation in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Sudden Stoppage.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 32	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
All Areas	**SUDDEN STOPPAGE (POWER ON OR POWER OFF) (Cont)** k. Intermediate gearbox. (1) Remove intermediate gearbox. Check for cracks, case distortion, or broken lugs. If any of the above is noted, then the gearbox is unserviceable and nonreparable. (2) Remove input and output quills. (3) If inspection reveals no condition as listed in step (1), perform an overhaul evaluation in accordance with BHT-212-CR&O-1. Make an entry in component record to show reason for removal was Sudden Stoppage. **NOTE** If no evidence of damage was found in steps 1. g. thru 1. k, then omit steps. 1. 1. (1) thru 1. 1. (3). l. Transmission sump case. (1) If damage was found on bearing hangers, tail rotor driveshaft, intermediate gearbox or tail rotor gearbox, then remove tail rotor drive output quill from transmission sump case assembly. (2) Inspect output quill pinion for unusual load patterns on both sides of teeth. If no damage is found, reinstall quill, and transmission can be retained in service. (3) If tail rotor quill reveals discrepancies, remove transmission and perform an overhaul evaluation. Make an entry in component record to show reason for removal was Sudden Stoppage. 2. Inspect power plant in accordance with Lycoming Engine Manual T53-L-703.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 33	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
4 & 6	**OVERSPEED INCIDENT** Overspeed is defined as any incident in which 110 percent main rotor rpm is exceeded and/or engine overspeed limits are exceeded. (Refer to Lycoming Engine Manual T53-L-703.) **NOTE** Components removed from a helicopter for evaluation following an overspeed shall be evaluated as an interrelated group. Removal records accompanying each component shall cross-reference part and serial numbers of other drive system components removed for evaluation. 1. Perform overspeed inspection as follows: a. For engine overspeed and inspection requirements, refer to Lycoming Engine Manual T53-L-703. b. Main rotor hub assembly. (1) Remove main rotor hub. Remove main rotor blades. (Refer to Chapter 5.) (2) Perform an overhaul conditional evaluation inspection in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Overspeed. (3) Inspect main rotor blades retention bolts and drag brace bolts in accordance with BHT-212-CR&O-1. c. Main rotor blades. (1) Inspect main rotor skin for wrinkles and deformation. (2) Remove each rotor blade tip cap and inspect inertia weight for looseness. Install tip cap. (Refer to BHT-212-CR&O-1.) (3) If no discrepancies are found in inspections outlined in steps (1) and (2), the main rotor can be retained in service.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 34	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	OVERSPEED INCIDENT (Cont) (4) If discrepancies are found in step 1. c. (1) and 1. c. (2) return both blades to an authorized blade repair station. Make an entry in component record to show that reason for removal was Overspeed. Indicate percent and duration if known. d. Tail rotor hub and blades. (1) Remove tail rotor hub and blade assembly. (2) Remove tail rotor blades. (3) Replace tail rotor blade retention bolts. e. Tail rotor blades. (1) Perform a Conditional Inspection of tail rotor blades in accordance with BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was overspeed. f. The main driveshaft 204-040-433-101 does not require replacing, but will require inspecting. Refer to Chapter 6. g. Perform an inspection of the following components. If no visual damage is found the components may be retained in service. (1) Main transmission. (2) Intermediate gearbox. Check gearbox for security and retorque retaining bolts. (3) Tail rotor gearbox. Check gearbox for security and retorque retaining nuts. (4) Main rotor mast (5) Main input driveshaft (6) Tail rotor driveshafts				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 35	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
All Areas	**OVERSPEED INCIDENT (Cont)** (7) Tail rotor driveshaft hangers (8) Stabilizer bar (9) Swashplate (10) Scissors and sleeve (11) Tail rotor hub. h. Install a serviceable main rotor hub and blade assembly. Install serviceable tail rotor blades. Balance and install tail rotor hub and blade assembly. Refer to Chapter 6. **OVERTORQUE INCIDENT** Overtorque is defined as any incident in which torsional loads are introduced into the helicopter dynamic system in excess of established limits. **NOTE** Components removed from a helicopter for evaluation following an overtorque shall be evaluated as an interrelated group. Remove records accompanying each component shall cross–reference part and serial numbers of other drive system components removed for evaluation. 1. For engine overtorque inspection limits, refer to Lycoming Engine Manual. 2. When overtorque has not exceeded 104 percent, perform thorough visual inspection of the following components. If inspection does not reveal any discrepancies or obvious damage to components, they may be retained in service. a. Tail rotor blades b. Main rotor hub				

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<tr><td colspan="3">AIRCRAFT INSPECTION CHECKSHEET</td><td>TYPE OF INSP (DAILY, INTERMEDIATE, ETC.)
SCHEDULED</td><td>PAGE NO.

36</td><td>NO. OF PAGES</td></tr>
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<tr><td>All Areas</td><td colspan="3">

OVERTORQUE INCIDENT (Cont)

c. Tail rotor hub

d. Intermediate gearbox. Check gearbox for security and retorque retaining bolts.

e. Tail rotor gearbox. Check gearbox for security and retorque retaining nuts.

f. Tail rotor driveshafts

g. Tail rotor driveshaft hangers

h. Stabilizer bar assembly

i. Swashplate

j. Scissors and sleeve assembly

k. Main driveshaft

l. Mast

m. Transmission.

3. When overtorque exceeds 104% but does not exceed 112%:

a. Perform thorough visual inspection of components listed in previous step 2.

b. Inspect main transmission chip detector(s).

c. Inspect main transmission internal filter and pump inlet screen.

(1) If metal particles indicating internal failure are found, remove the transmission for overhaul evaluation. Make entry in component record that reason for removal was overtorque. Remove all transmissions system oil line and oil cooler. Replace external oil filter element. Flush and reinstall lines. Install new oil cooler. Tag old cooler METAL PARTICLE CONTAMINATED, and scrap the contaminated oil cooler. Bell Helicopter does not approve of repair of contaminated oil coolers.

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AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 37	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
All Areas	**OVERTORQUE INCIDENT (Cont)** (2) If chip detector(s) internal filter and pump inlet screen appear normal, and there is no evidence of internal failure, operate the transmission for five hours, then check chip detector(s), internal filter, and pump inlet screen. If chip detector(s), filter, and screen inspection do not reveal metal particles, the transmission is satisfactory for service. If metal particles are found or if there is any evidence of internal failure, remove the transmission for overhaul evaluation. Clean oil lines, replace oil cooler, replace external oil filter element and make record entries as prescribed in preceding step (1). d. Remove fifth mount bolts, remove fifth mount. Perform a thorough inspection of bolts and fifth mount support. Check for bent bolts and bent fifth mount support. Check for bolt hole alignment between transmission and fifth mount support. 4. When overtorque has exceeded 112 percent. a. Return the following components to an overhaul facility for overhaul evaluation. **NOTE** Component removal record of dynamic components shall reflect overtorque as reason for removal. (1) Transmission (2) Main Driveshaft (3) Main Rotor Hub (4) Mast. (5) Perform thorough visual inspection of other components outlined in previous step 2. b. Remove fifth mount bolts, remove fifth mount. Perform a thorough inspection of bolts and fifth mount support. Check for bent bolts and bent fifth mount support. Check for bolt hole alignment between transmission and fifth mount support.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 38	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
5 & 6	**COMPRESSOR STALL OR SURGE** Engine compressor stall or surge is characterized by a sharp rumble or a series of loud sharp reports, severe engine vibration and a rapid rise in engine gas temperature depending on severity of surge. When a surge has been reported, progressively perform steps 1., 2., and 3., as dictated by discrepant conditions. **NOTE** Discuss circumstances of reported compressor stall with pilot. Determine N1 speed at which reported stall occurred. Check helicopter and engine logs for any pertinent history. Components removed from a helicopter for evaluation following a compressor stall or surge shall be evaluated as an interrelated group. Removal records accompanying each component shall cross-reference part and serial numbers of other drive system components removed for evaluation. 1. Power Plant. a. Examine inlet and particle separator for blockage. b. Inspect engine compressor region for salt, dust, oil, or other contaminants. If contaminants are found, clean and perform a power assurance check in accordance with Lycoming Engine Manual T53-L-703. c. If steps 1. a. and 1. b. do not reveal cause for surge, perform engine compressor surge (stall) inspection in accordance with Lycoming Engine Manual T53-L-703. 2. Power Train. a. If compressor stall occurs below 85 percent N1 speed, comply with step b. b. Remove magnetic chip detectors from transmission, intermediate gearbox, and tail rotor gearbox; inspect for metal particles. Functionally test chip detector by grounding center connector to case of chip detector and visually inspect warning light for illumination.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 39	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

COMPRESSOR STALL OR SURGE (Cont)

c. If no evidence of damage is found on tailboom pylon and no indication of metal particles are found on chip detectors, clean chip detectors and reinstall. Return helicopters flight status and repeat chip detector inspection in 5 to 10 hours. If positive indication of damage is found on tailboom pylon or metal chips are found on chip detectors, on initial or 5 to 10 hour inspection, comply with steps 2. e. thru 2. i.

d. If compressor stall occurs at 85 percent N1 or above, comply with the following steps e. thru i.

e. Remove tail rotor driveshaft and inspect in accordance with Chapter 6.

f. Remove the input and output drive quill from intermediate gearbox and inspect the gear teeth on pinion and gear for damage with a 10 power glass. If no evidence of scoring or scuffing is found and there is no mechanical damage that would render the gearbox unserviceable, reassemble and return helicopter to service. If gear teeth are scuffed or scored or gearbox has sustained other damage, gearbox must be replaced with a like, serviceable item and the following steps 2. g. and 2. h. accomplished. Refer to Chapter 6 for removal and installation procedures. Refer to BHT-212-CR&O-1 for disassembly, inspection, repair, and assembly procedures.

g. Remove tail rotor gearbox from helicopter and remove input quill. Inspect the gear teeth on the pinion and gear for damage with a 10 power glass. If no evidence of scoring or scuffing is found and there is no other damage that would render the gearbox unserviceable, it may be reassembled and reinstalled for continued use. If gear teeth are scored or scuffed or there is other damage that would render the gearbox unserviceable, it must be replaced with a like serviceable item. Refer to Chapter 6 removal and installation procedures. Refer to BHT-212-CR&O-1 for disassembly, inspection, repair, and assembly procedures.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 40	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

COMPRESSOR STALL OR SURGE (Cont)

h. Remove the tail rotor drive quill from the transmission and inspect the gear teeth for damage with a 10 power glass. If there is no indication of scoring or scuffing and there is no other damage that would render the transmission unserviceable, it is suitable for continued use. If gear teeth are scored or scuffed or there is other damage and that would render the transmission unserviceable. It must be replaced with a like, serviceable item, and comply with step j. Refer to Chapter 6 for removal and installation procedures. Refer to BHT-212-CR&O-1 for disassembly, inspection, repair, and assembly procedures.

i. Install serviceable tail rotor driveshaft if transmission is not to be replaced.

j. If transmission is replaced, the following components must also be replaced in accordance with steps 2. j. (1) thru 2. j. (3) and procedures outlined in steps 2. j. (4) through 2. j. (8) performed.

(1) Tail rotor bearing hanger assemblies.

(2) Tail rotor driveshafts.

(3) Tail rotor hub and blade assembly. Perform an overhaul evaluation in accordance BHT-212-CR&O-1. Make an entry in component record to show that reason for removal was Compressor Stall.

(4) Remove inboard and outboard drag brace bolts. Check bolts for deformation and perform magnetic particle inspection. If satisfactory, return to service.

(5) Visually inspect stabilizer bar outer tubes for bending. (Allowable deflection is 0.150 inch in each tube.)

(6) Remove main rotor pillow blocks from main rotor yoke and check for deformation of bushings and bushing holes in pillow blocks and yoke. (Refer to BHT-212-CR&O-1.)

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 41	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

COMPRESSOR STALL OR SURGE (Cont)

(7) Perform close visual inspection of all other main rotor components.

(8) If any discrepancies are noted as a result of inspection in steps (4), (5), (6), and (7), remove and replace main rotor hub and blade assembly, stabilizer bar assembly, and mast assembly. Removed assemblies shall have a conditional inspection performed in accordance with BHT-212-CR&O-1. Make an entry on component records to show that reason for removal was compressor stall.

3. Airframe.

a. Check tailboom fin for evidence of damaged skin panels and/or structure and rivets for looseness and/or sheared heads. If inspection shows no indications of damage, return helicopter to flight status. If positive evidence of damage is found, comply with steps 3. b. thru 3. e.

b. Remove skin from tailboom fin adjacent to tail rotor gearbox mounting. Inspect all support structures in this area and repair as required. Install new skin.

c. Make close visual inspection of complete tailboom structure for distortion buckles, skin cracks, and sheared or loose rivets, paying particular attention to tailboom attachment points at fuselage station 241.43 to 243.90 and adjacent fuselage to tailboom structure and intermediate gearbox support structure.

d. Make close visual inspection of main pylon support and engine mount attachment structure for distortion, buckles, cracks, sheared or loose rivets, etc.

e. If discrepancies found during inspection in steps b., c., and d. cannot be repaired by standard procedures, replace discrepant assembly.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 42	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
All Areas	**AFTER HELICOPTER IS FLOWN IN A LOOSE GRASS ENVIRONMENT** Inspect FOD screen and sand and dust separator. (Refer to Lycoming Engine Manual T53-L-703.) **NOTE** If FOD screen and sand and dust separator are installed, remove upper halves to accomplish this inspection. If blockage is evident, the lower half of the separator must be removed to ensure complete removal of grass or foreign material.				
5	**AFTER ENGINE OVER–TEMPERATURE** Perform an engine overtemperature inspection. (Refer to Lycoming Engine Manual T53-L-703.) **NOTE** If engine cannot be operated without exceeding Turbine Gas Temperature (TGT) limits as specified in Lycoming Engine Manual T53-L-703, this is indication of engine malfunction or instrument error. Refer to troubleshooting (Lycoming Engine Manual T53-L-703) to determine cause and corrective action.				
5	**ENGINE POST-INSTALLATION** **NOTE** This inspection shall be accomplished each time an engine is removed and reinstalled or replaced. 1. Perform functional test engine gas temperature system, test temperature to be 600°C, system tolerance plus or minus 5°C. (Refer to Lycoming Engine Manual T53-L-703.) 2. Check all linkage (N1 and N2) for proper adjustment, alignment, and damage.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 43	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	ENGINE POST–INSTALLATION (Cont) 3. Check fuel control stops. 4. Check calibration of power settings on fuel control with corresponding settings on collective twist grip control. 5. Twist grip for flight idle detent. 6. Energize the fuel boost pump and check for leaks at all connections, particularly fuel control. 7. Twist grip for flight idle detent. 8. Check engine mounts for cracks and security. 9. Perform a complete Daily Inspection on engine. 10. Operate engine for minimum 2 minutes at flight idle and then shut down. 11. Inspect engine for leaks and security of mounting of hoses and accessories. 12. Start engine and run at flight idle for 2 minutes. Accelerate gradually until highest power is obtained and temperatures have stabilized, without gaining flight attitude. 13. Decelerate engine to flight idle and run for 2 minutes. Shut down engine. 14. Inspect engine for the following: (Refer to Lycoming Engine T53-L-703 Manual.) a. Leaks and security of mounting provisions, hoses, and accessories.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 44	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

ENGINE POST–INSTALLATION (Cont)

NOTE

Steps 14. b. thru 17. do not apply when engine is removed and reinstalled.

b. Accumulation of metal chips or other foreign material in oil filter or in the chip detector.

15. If there is no accumulation of metal chips, lint, or other foreign material, continue with engine ground operation checks.

16. If there is a slight accumulation of metal chips, lint, or foreign material, clean and reinstall the chip detector and oil filters. Restart engine and perform a second ground run for several minutes at highest power obtainable, without gaining flight attitude. If further accumulation is found, proceed to step 17.

17. If there is an excessive accumulation of metal chips, lint, or other foreign material, the source of contamination must be determined. If the source of contamination is within the engine, another engine must be installed and the preparation and ground runup procedures repeated.

5 **ENGINE DROPPED DURING HANDLING**

(Refer to Lycoming Engine Manual.)

1 **OVERFLOW OF BATTERY AND/OR BATTERY SUMP JAR (IF SUMP JAR IS INSTALLED)**

1. Inspect sheet metal surfaces and overlaps, both internal and external, for damage.
2. Inspect rivets, bolts, screws, and other hardware in area, internally and externally, for damage.
3. Inspect hidden areas in vicinity of battery and sump jar for damage.
4. Inspect all metal parts through contaminated area for damage.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 45	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
All Areas	**LIGHTNING STRIKES** When the helicopter is suspected of receiving a lightning strike, the following precautions shall be followed: **NOTE** In all instances below, if significant damage has been found in any area, inspection shall be expanded in those areas until it extends beyond the zone of damage. Any damage found anywhere on the helicopter shall be recorded in detail and copies of these records shall be provided along with any component returned for overhaul to assist the overhauling facility in evaluating the component. **NOTE** Components removed from a helicopter for evaluation following a lightning strike shall be evaluated as an interrelated group. Removal records accompanying each component shall cross-reference part and serial numbers of other drive system components removed for evaluation. 1. Visually inspect all external surfaces of the helicopter with particular attention to main rotor blades and hub, the transmission and mast assembly, tail rotor blades and hub, tail rotor gearbox, and vertical fin. Check electrical instruments and systems. Verify magnetic compass accuracy. 2. If visual indications of damage are present, proceed as follows: a. Remove main rotor blades and visually inspect. If blades show any of the following indications, scrap blades. (1) Inspect blades for signs of burns. Burn marks can be very minute. (2) Inspect blades for debond in all bonded areas. b. Remove main rotor hub for overhaul. State lightning strike reason for removal. Inspect main rotor hub and rotating controls for indication of arcing or burning. c. Remove main driveshaft for inspection. (1) Inspect flex plates for evidence of arcing at each bolt joint.				

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 46	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

LIGHTNING STRIKES (Cont)

(2) Inspect for arcing on driveshaft curvic couplings. Engine and transmission adapters and coupling clamp set.

(3) Any evidence of arc burning or pitting is cause for rejection.

d. Remove the tail rotor output coupling for inspection.

(1) Disassemble to the same extent required for coupling. Repack and clean couplings per Chapter 6.

(2) Visually inspect couplings for any evidence of arc burning or pitting. Pay special attention to the tips, roots, and profiles of the male and female coupling teeth. Any evidence of arc burning or pitting is cause for rejection.

e. If the main rotor blades, main rotor hub, main driveshafts, or tail rotor output coupling exhibit evidence of damage which can be attributed to a lightning strike, remove the transmission and mast assembly for overhaul. State lightning strike as reason for removal. If no evidence of damage is noted on the above mentioned components, partially remove and inspect main transmission as follows:

(1) Remove and inspect all transmission chip detectors. Functionally test chip detector by grounding center connector to case of chip detector and visually inspect warning light for illumination.

(2) If any evidence of arc burning or pitting is noted, or excessive debris is found on the chip detectors, remove transmission and mast assembly for overhaul. State lightning strike as reason for removal.

(3) If no evidence of arc burning or pitting is noted, ground run helicopter light on skids for 1 hour. Reinspect chip detectors and remove full flow debris monitor.

(4) Remove cup and screen tube from debris monitor and inspect. Repeat these inspections after accumulating 5 flight hours and prior to 10 flight hours.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 47	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

LIGHTNING STRIKES (Cont)

f. Inspect tail rotor blades and hub. Scrap blades if indications of burns or debonding are present. Remove tail rotor hub for overhaul, state lightning strike as reason for removal.

g. Remove and inspect tail rotor gearbox chip detector.

h. If the tail rotor blades, tail rotor hub, or tail rotor output coupling exhibit evidence of damage which can be attributed to a lightning strike, or excessive debris is found on the chip detectors, remove the tail rotor gearbox and tail rotor driveshaft hangers for overhaul. State lightning strike as reason for removal. Additionally, the tail rotor driveshaft tubes, flexible couplings and attaching hardware shall be visually inspected for evidence of arc burns or pitting. Any evidence of arc burning or pitting is cause for rejection.

i. If no evidence of arc burning or pitting is noted, ground run helicopter light on skids for 1 hour. Reinspect chip detector. Repeat this inspection after accumulating 5 flight hours and prior to 10 flight hours.

3. If no visual indications of damage are present, proceed as follows:

a. Remove and inspect all transmission chip detectors and full flow debris monitor.

(1) If excessive debris is found on the chip detectors, remove the transmission and mast assembly for overhaul.

(2) If little or no debris is found, ground run helicopter light on skids for 1 hour. Reinspect chip detectors and remove and inspect full flow debris monitor.

(3) Repeat these inspections after accumulating 5 flight hours but prior to 10 flight hours.

b. Remove main rotor hub grips in accordance with BHT-212-CR&O-1.

(1) Visually inspect bearings for signs of electrical arcing, burning, or delamination.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 48	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

LIGHTNING STRIKES (Cont)

(2) Visually inspect pitch change links at the drive assembly connections for arcing burns.

(3) If indications of arcing or burning are present, overhaul main rotor hub and drive assembly in accordance with BHT-212-CR&O-1. Replace the affected pitch change link including the attaching hardware.

(4) If no indications are found, reassemble main rotor hub in accordance with BHT-212-CR&O-1.

4. Prior to first flight after a suspected or confirmed lightning strike, verify proper function of all drive system component chip detectors as follows:

a. Remove electrical connector from chip detector.

b. Remove chip detector and reinstall connector.

c. With helicopter electrical power on, bridge the chip detector gap with a clean screwdriver or other clean conductive object.

d. Verify proper indication on the Chip Indicator Panel and Caution Panel. Verify illumination of the Master Caution Light.

e. Make repairs as required.

5. When it has been established that lightning has struck the helicopter, the inspections of the electrical and instrument systems which follow are mandatory to ensure safety of flight:

a. Inspect all electrical wiring, bundles, and connectors for burning, or electrical arcing. Unplug all connectors and inspect pins and housing for electrical arcing or burning. Inspect the interior of all circuit breaker panels for burning or electrical arcing. Replace any wires, connectors, or circuit breakers found to be damaged.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 49	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

LIGHTNING STRIKES (Cont)

b. Inspect main rotor blade and control links, transmission system, drive shafts, gearboxes, and tailboom structure for magnetization. Using a magnetometer with a range no larger than ±5 gauss, place arrow or red dot (depending on magnetometer model) within 0.5 inch of item being checked and point it directly at item. If any items or their components have a reading greater than one gauss, those items shall be degaussed.

NOTE

Do not test chip detectors for magnetization. If transmission or gearbox magnetic readings are greater than one gauss near the chip detector, then remove chip detector from housing and repeat test.

c. Remove and bench test the voltage regulator(s). Operationally check the DC generator, starter-generator, and the inverter(s) for proper operation. Visually inspect the generator, starter-generator, and the inverter(s) for burns or electrical arcing. If damaged, remove for internal inspection and bench test.

d. Perform operational check of bussing system as dictated in the maintenance manual.

e. Inspect transmission and tail rotor gearbox chip detectors for proper operation. Functionally test chip detector by grounding. Center connector to case of chip detector and visually inspect light for illumination. Remove chip detectors found inoperative.

f. Perform operational check of the interior and exterior lighting system. Replace lamps, bulbs, and lighting assemblies as required.

g. Perform operational check on all instruments. Remove and repair/replace the instruments and sensor found to be defective.

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 50	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET
	LIGHTNING STRIKES (Cont) h. Perform operational check on all the caution messages for proper operation. Refer to the maintenance manual for the procedure on each individual segment. 6. When it has been established that lightning has struck the helicopter, the inspections of the helicopter structure which follow are mandatory to ensure safety of flight: **NOTE** Arcing damage on metal components of the airframe structure, when cleaned out to twice its visible depth, shall be treated as mechanical damage, and damage limits in the maintenance manual will establish reparability and/or scrap of components. Any other structural damage — tears, voids, rupture, etc., directly or indirectly related to lightning strike shall be treated as mechanical damage, also. a. Check sandwich panels in suspect areas for voids or debond. If damage is apparent, proceed with normal maintenance procedures. b. Check fixed controls and support system components for possible arcing damage. Bearings in rod ends, bellcranks, and supports should be most susceptible to arcing damage; check bearings for smooth rotation. Visibly inspect attaching hardware of support for signs of lightning damage — damaged finish and/or burns. If damage is evident, remove supports and inspect mounting holes and the mating surfaces for arcing damage. Arcing damages shall be blended out to twice its visible depth, and the repaired damages shall not exceed the mechanical damage limits. c. When it is apparent that lightning has been grounded through the skid landing gear, remove entire landing gear assembly and inspect crosstubes and airframe support fittings for possible arcing damage; specifically, inspect attaching holes and mating surfaces of the crosstubes directly beneath the landing gear bearing/retaining supports. Clean out arcing damage to twice its visible depth. The damage after cleanup shall not exceed the allowable mechanical damage limits.				

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 51	NO. OF PAGES
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
	LIGHTNING STRIKES (Cont)			
		d. Any airframe metal parts that are not specifically identified above but are suspect shall be noted in the maintenance log and shall be reinspected prior to next 100 hours of flight.		
4	**TRANSMISSION OIL OVER TEMP**			
		1. Troubleshoot transmission oil system to determine cause.		
		2. Replace transmission, mast, oil cooler and external oil filter if cause is due to transmission internal failure.		
		3. If cause is due to oil system external to transmission and oil temperature did not exceed 130°C for 15 minutes, drain and refill transmission oil system.		
		4. If temperature exceeded above limits, replace transmission and mast. If abnormal contamination is present, also replace oil cooler and external oil filter.		
4	**COMPLETE LOSS OF TRANSMISSION OIL**			
		1. Troubleshoot transmission oil system to determine cause.		
		2. Replace transmission and mast, if engine power was applied after complete loss of oil. Also replace oil cooler and external oil filter if abnormal contamination is present.		
1	**HELICOPTER WASHING**			
		Check pitot static system for moisture (drain plug removed).		
All Areas	**EXPOSURE TO SALT WATER OR SALT WATER SPRAY**			
		1. Wash entire helicopter with fresh water, particularly inside of engine compartment doors.		
		2. Wash all compartments which were exposed to salt water.		
		3. Make a detail check of all surfaces for corrosion.		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (DAILY, INTERMEDIATE, ETC.) SCHEDULED	PAGE NO. 52	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	
AREA NO.	REQUIREMENT EVERY	ITEM		STATUS	RECORDED ON WORKSHEET

EXPOSURE TO SALT WATER OR SALT WATER SPRAY (Cont)

4. Apply corrosion preventive compound to exposed nonpainted, anodized or cadmium plated assemblies.
5. Clean engine compressor in accordance with Lycoming Engine Manual.

4

6. Helicopters which are being operated under high humidity (80 percent) or salt laden atmospheric (50 percent humidity) environmental conditions will require the following minimum daily blade wash.
   a. Daily using a mild soap detergent wash blades thoroughly.
   b. Rinse with clear water and dry.

NOTE

All aircraft down for maintenance or nonflyable storage are not subject to blade wash and inspection.

5

HELICOPTER OPERATION IN RAIN, ICE OR HEAVY SNOW

1. Open engine inlet area and remove upper air filter assembly. Inspect and clean particle separator.
2. Purge lubricate all components which have grease fittings.

SECTION IV — COMPONENT RETIREMENT AND OVERHAUL SCHEDULE

1-74. INTRODUCTION.

This section lists units of operating equipment that are to be overhauled or retired at the period specified. Removal of equipment may be accomplished at the inspection nearest the time when overhaul is due unless otherwise specified.

1-75. RETIREMENT SCHEDULE.

1-76. Description — Retirement Schedule. The operating time or calendar interval specified for removal, condemnation, and disposal of parts shall be in accordance with table 1-5.

1-77. OVERHAUL SCHEDULE.

This component overhaul schedule summarizes, in tabular form the overhaul interval of the helicopter components. Refer to table 1-6.

Refer to Lycoming T53-L-703 Engine Service Bulletins for revisions to power plant and component overhaul intervals.

CAUTION

COMPONENT OVERHAUL SCHEDULE FOR KIT COMPONENT AND/OR PARTS ARE NOT COVERED IN THIS COMPONENT OVERHAUL SCHEDULE. REFER TO APPLICABLE SERVICE INSTRUCTIONS FOR COMPONENT OVERHAUL SCHEDULE.

NOTE

Neither the assignment of a time period for overhaul of a component nor failure to assign a time period for overhaul of a component constitutes a warranty of any kind. The only warranty applicable to the helicopter and any component is that warranty included in the Purchase Agreement for the helicopter or the component.

Time between overhauls and inspection periods is based upon experience, testing and engineering judgment, and is subject to change at the sole discretion of Bell Helicopter Textron or an appropriate government agency.

Table 1-5. Retirement Schedule

AREA	RETIREMENT LIFE (HOURS OR RETIREMENT INDEX NUMBER (RIN) WHERE SPECIFIED) △2	ITEM AND PART NUMBER △1	
MAIN ROTOR HUB AND BLADE ASSEMBLY			
4	4000	Main rotor blade	212-015-501-115
	10,000	Main rotor yoke	212-011-102-105
	15,000 △5	Main rotor trunnion	204-011-105-001
	3000	Pitch horn	204-011-120-005
	3600	Outboard strap fitting	204-012-103-005
	2400	Strap pin	204-012-104-005

Table 1-5. Retirement Schedule (Cont)

AREA	RETIREMENT LIFE (HOURS OR RETIREMENT INDEX NUMBER (RIN) WHERE SPECIFIED) △2	ITEM AND PART NUMBER △1	
	2400	Inboard strap fitting	212-010-103-101
	1200 or 2 years whichever occurs first	Tension–torsion strap	204-012-122-005 204-310-101-101
	15,000 △5	Main rotor mast	204-011-450-105
	3600	Pillow block bushing	204-011-135-105
	Conditional △3	Pillow block assembly	204-011-108-113
MAIN ROTOR CONTROLS			
	9000	Pitch link	204-011-127-003
	10,000	Stabilizer bar centerframe	204-011-307-105
	9000	Mixing lever	212-010-302-105
	9000	Swashplate gimbal ring	204-010-404-001
	9000	Swashplate outer ring	204-011-403-001
	600	Swashplate support	204-011-404-127
	9000	Scissors hub	204-011-405-013
	9000	Swashplate drive link	204-011-407-001
	9000	Collective sleeve	204-011-408-105/-107
	9000	Scissors tube	212-010-404-005
	9000	Collective lever	212-010-403-107
FIXED CONTROLS			
	6400	Tube assembly	204-076-267-001 204-076-267-003 204-076-267-005

Table 1-5. Retirement Schedule (Cont)

AREA	RETIREMENT LIFE (HOURS OR RETIREMENT INDEX NUMBER (RIN) WHERE SPECIFIED) 2	ITEM AND PART NUMBER 1	
		TAIL ROTOR	
	5000	Yoke	212-011-702-001
	2500	Blade	212-010-750-109, -111
	5000	Main driveshaft	204-040-433-101
		CONTROL SYSTEM BOLTS (KIT P/N 212-704-092-001) 4	
	1000	Fixed swashplate to R/H and L/H cyclic boost tubes (2)	20-057-5-24D
	1000	Collective lever to collective boost tube (1)	20-057-5-24D 204-011-463-001 204-011-463-003
	1000	Swashplate gimbal rings bolts (4)	20-057-5-30D
	1000	Collective lever to swashplate support (2)	20-057-5-30D
	1000	Boost tube to universal (2)	20-057-5-24D
	1000	Universal to hydraulic cylinder (2)	20-057-5-24D
	1000	Mixing lever to scrissors tube (2)	20-057-5-27D
	1000	Scissors tube to scissors (2)	20-057-5-27D
	1000	Pitch link to universal (2)	20-057-6-27D
	1000	Drive link to rotating swashplate (2)	20-057-5-30D
	1000	Pitch horn to pitch link (2)	20-057-6-31D
	1000	Universal to mixing lever (2)	20-057-6-34D

Table 1-5. Retirement Schedule (Cont)

AREA	RETIREMENT LIFE (HOURS OR RETIREMENT INDEX NUMBER (RIN) WHERE SPECIFIED) 2	ITEM AND PART NUMBER 1	
CONTROL SYSTEM BOLTS (KIT P/N 212–704–092–001) (Cont)			
	1000	Mixing lever pivot bolts (4)	20-057-6S23D or 20-057-6S24D
	1000	Scissors to drive link (2)	20-057-8S69D
	1000	Stabilizer bar pivot bolts (2)	20-057-10S27D or 20-057-10S29D
	2500	Hydraulic cylinder to lower support (2)	212-001-304-003 or 212-001-323-001
	1000	Scissors pivot bolt (2)	212-040-411-005
LANDING GEAR			
	12,000 Events	AFT high crosstube	205-050-403
	24,000 Events	AFT high crosstube	212-050-224-101

NOTES

1. Airworthiness life for part numbers listed applies to all successive dash numbers for the component unless otherwise specified.

2. Calendar life begins the day a component is entered into service.

3. An on-condition retirement is assigned to the 204-011-108-113 pillow block subject to passing a dye penetrant inspection every 2400 hours.

4. Visually inspect flight control bolts every 24 months.

5. Retire when the part has 15000 flight hours or when the accumulated RIN = 300000 (RIN) life. For manual tracking, increase the RIN count by 6 for each takeoff/lift recorded. If logging, increase the RIN count by 12 for each takeoff/lift.

Each component with a retirement life sensitive to "Torque Events" will be assigned a maximum Retirement Index Number (RIN). This RIN corresponds to the maximum allowed fatigue damage resulting from lifts and takeoffs. A new component will begin a RIN of zero and will increase as lifts and takeoffs are performed. Record the number of lifts and takeoffs and increase the accumulated RIN accordingly. When the maximum RIN is reached, remove the component from service.

NOTES

Certain components may be assigned a life in hours in addition to the RIN.

Table 1-6. Overhaul Schedule

OVERHAUL INTERVAL (HOURS)	ITEM	PART NUMBER
	MAIN AND TAIL ROTOR	
2400	Main rotor hub assembly	204-012-101-101
2500	Tail rotor hub assembly	212-011-701-003
Conditional	Stabilizer bar assembly	212-010-300-105
Conditional	Swashplate and support assembly	204-011-400-129
Conditional	Scissors and sleeve assembly	204-011-401-021
	POWER TRAIN	
6000 ⚠2 ⚠4	Transmission	205-540-009-103 212-040-007-103
5000	Intermediate gearbox assembly	212-040-003-023
5000	Tail rotor gearbox assembly	212-040-004-009
5000 ⚠2	Mast assembly	204-040-366-021
3000	T/R driveshaft hanger	212-040-600
2000	Offset generator drive quill	205-040-200-001
2400	Rotor brake quill (If installed)	412-040-123-101
	MISCELLANEOUS	
1000	Oil cooler turbine fan	204-062-540-001
⚠3	Engine	T53-L-703

NOTES

⚠1 Overhaul interval for part numbers listed applies to all successive dash numbers for the component unless otherwise specified.

⚠2 Special inspection at 3100 hours. Quills (except rotor brake quill) and offset generator drive quill have the same overhaul interval as the transmission.

⚠3 Overhaul interval and inspection requirements per TB 55-2840-229-23-1 and manufacturers Operation and Maintenance Manuals.

⚠4 Special input quill clutch inspection required at 1200 hours.

CHAPTER 2

AIRFRAME

SECTION I — FUSELAGE

2-1. FUSELAGE.

2-2. Description — Fuselage. The fuselage assembly consists of two main sections: forward section and aft section (tailboom). The forward section includes the cabin area, power plant, main rotor and landing gear. The aft section includes the tailboom, elevator, driveshafts, gearboxes, and tail rotor. (Figure 2-1.)

2-3. FUSELAGE STRUCTURE.

2-4. General Information. Paragraphs 2-5 through 2-18 provide general information necessary for repair of fuselage structure.

2-5. Type of Construction. The forward section is constructed of two main beams with transverse bulkheads, which make up the primary structure. The primary structure provides support for the cabin section, fuel cells, transmission, landing gear, engine, and tailboom. The forward section employs aluminum alloy and fiberglass skins, aluminum alloy honeycomb panels, and titanium work decks and firewalls. The aft section (tailboom) is a semimonocoque structure, employing aluminum and magnesium alloy skins, longerons, bulkheads, and stringers. The vertical fin consists of aluminum alloy forward and aft spars, aluminum alloy trailing edge extrusion, and aluminum alloy ribs and skins.

2-6. Investigating Damage.

a. Remove grease, dirt, and paint in area of damage so that the extent of damage can be determined.

b. Inspect structure for dents, scratches, abrasions, punctures, cracks, distortion and corrosion. Deep scratches, nicks, and abrasions shall be treated as a crack.

c. Inspect all riveted and bolted joints in vicinity of damaged area for sheared, loose, or missing rivets and bolts. Inspect for elongated rivet and bolt holes. If there is any doubt whether a rivet or bolt has failed, remove the fastener for inspection.

d. Inspect all adjacent structure for secondary damage that may have resulted from a shock load transmitted from the primary damage.

2-7. Classification of Damage and Types of Repair. After the extent of damage has been determined, the damage should be classified as negligible, repairable, or damage necessitating replacement of parts. Definitions of damage classification and types of repairs are as follows:

a. Negligible damage is that damage which may be allowed to exist as is, or corrected by some simple procedure without placing restrictions on flight.

b. Repairable damage is damage exceeding negligible damage limits, but not so severe as to warrant replacement.

c. Damage necessitating replacement of parts is damage which cannot be repaired by an practical means, or that damage which exceeds the limits specified as repairable.

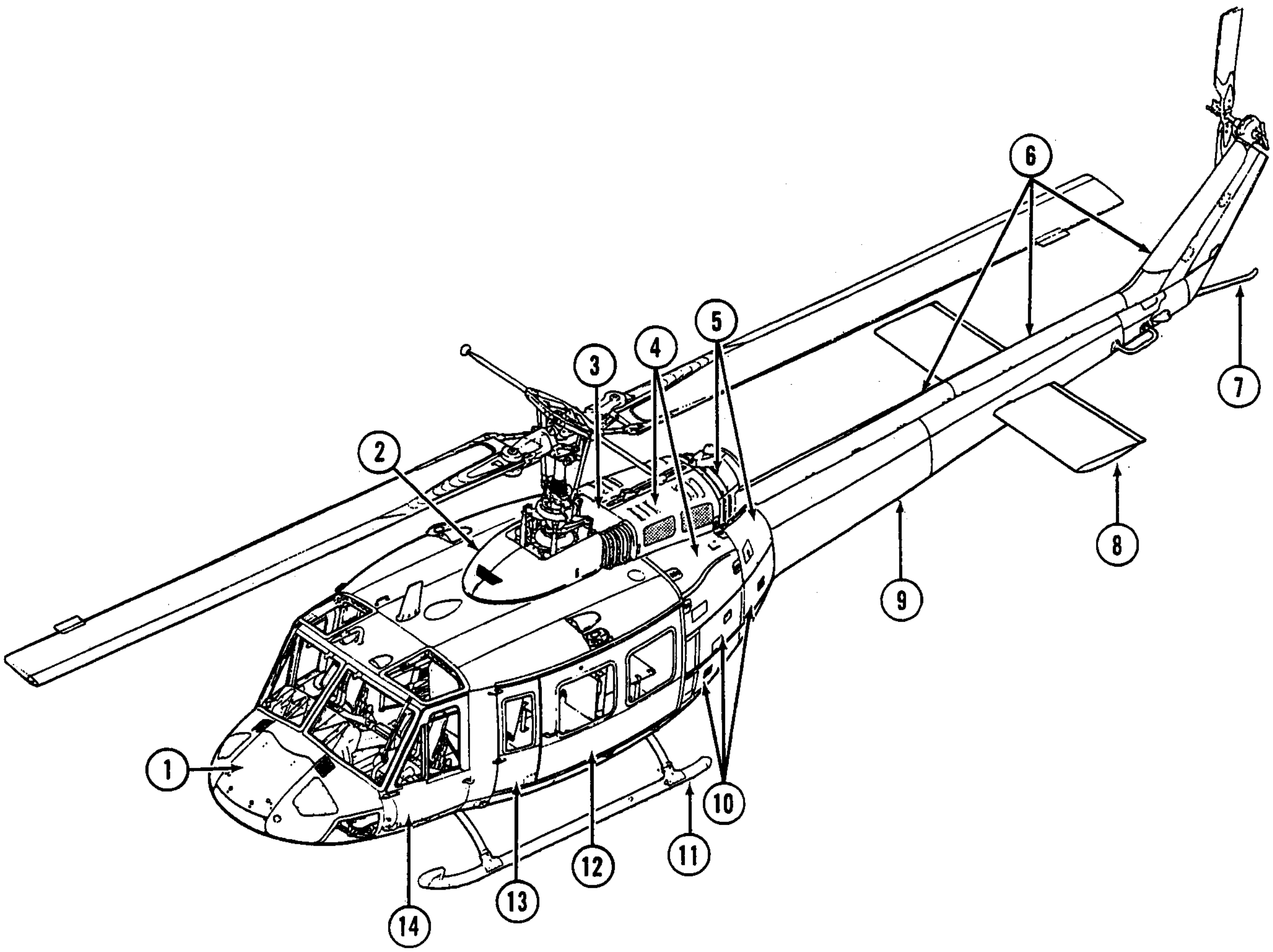
d. Riveted repairs. The finished aluminum alloy parts and magnesium alloy sheets used in the helicopter are heat treated. Only rivets and/or bolted repairs shall be permitted. For instructions on the use and installation of rivets, refer to TM 55-1500-204-25/1.

e. Welded repairs. For weld repair information to components, such as spot welds, refer to TM 55-1500-204-25/1. For welded repair procedures for the tailpipe, refer to Chapter 4.

2-8. Support of Structure During Repair.

a. Support helicopter as follows:

(1) Support helicopter on landing gear.



1. Nose compartment doors
2. Transmission fairing
3. Engine intake fairing
4. Engine cowling
5. Tailpipe fairing
6. Driveshaft covers
7. Tail skid
8. Synchronized elevator
9. Tailboom
10. Fuselage compartment doors
11. Landing gear
12. Sliding cargo door
13. Hinged panel door
14. Crew door

UH-1H-II-M-02-1

Figure 2-1. Helicopter assembly

(2) If landing gear removal is required, accomplish the following steps:

(a) Fabricate wooden, padded supports, contoured to fore and aft and transverse main structural members.

(b) Lift helicopter and remove landing gear. (Refer to Chapter 1 for hoisting instructions.)

(c) Position supports under structure and lower helicopter.

(d) Support tailboom on (T102012) tailboom support assembly (S21) as shown in figure 2-3.

2-9. Location of Leveling Points. (Refer to Chapter 1 for leveling instructions.)

2-10. Principal Dimensions. See figure 2-4 for principal dimensions.

2-11. Reference Lines. See figure 2-2 for major reference lines. Definitions of reference lines follows:

a. Fuselage Station Lines. Fuselage station (FS) lines are vertical reference lines against the helicopter which are used to locate major assemblies and parts of the structure. FS numbers indicate the distance in inches from a line of origin, located approximately 20.00 inches aft of the most forward nose contour and designated as Station 0.

b. Boom Station Lines. Boom station (BS) lines are reference lines perpendicular to the centerline of the tailboom. The most forward boom station is 17.42.

c. Water Lines. Water lines (WL) are horizontal reference lines (viewed from the side or front of helicopter) used to locate major assemblies and parts of the structure by a number indicating the distance in inches from a line or origin located below the lower skin contour and designated as Water Line 0.

d. Buttock Lines. Buttock lines (BL) are vertical reference lines as viewed from front of helicopter used to locate major assemblies and parts of the structure by a number indicating the distance in inches on each side of the helicopter centerline, which is designated by Buttock Line 0.

2-12. Skin Identification. Refer to figure 2-5 and 2-6 for skin identification.

2-13. Corrosion. Corrosion is a natural phenomenon which destroys unprotected metals by chemical or electrochemical action. Therefore, the control of corrosion is of primary importance in maintaining the structural integrity of metal parts. Proper corrosion control will eliminate or reduce the need for extensive repair or replacement of components. Corrosion forms and causes are listed in table 2-1.

2-14. Corrosion Control. A reliable corrosion control program must take into consideration factors such as geographical location and specific operational environments, i.e. marine atmospheres, industrial air pollution, agricultural sprays, corrosive soils, abrasive dust, and extreme temperatures. The problem of corrosion is complex and subtle changes in the environment can drastically change the corrosion resistance of a metal and/ or breakdown resistance of the protective finish system. Therefore, corrosion control must be handled on a day-to-day basis. A specific program must be established which will assure that all areas of the helicopter are checked on a periodic schedule. In addition, particular emphasis should be placed on those areas which are known to receive more frequent damage to protective coatings.

An effective corrosion control program must include:

a. Frequent and proper cleaning.

b. Early detection and repair of damaged protective coatings.

c. Removal of corrosion damage and reapplication of protective finishes.

d. Replacement of components which are damaged beyond allowable limits.

2-15. Types of Corrosion. There are many different types of corrosive attack and these will vary with the metal concerned, corrosive media, location and time of exposure. Uniform corrosion generally occurs on unprotected areas and is most often the result of direct chemical attack. It is seldom found on Bell Helicopters unless large areas of the protective finish have been removed or severely damage. Localized corrosion is isolated to well defined areas and it is normally electrochemical in nature. Selective attack is a form of localized corrosion which occurs in a specific phase or constituent of an alloy. This form of attack usually starts as a pit and progresses along susceptible areas such as grain boundaries. In many

Table 2-1. Forms and Causes of Corrosion

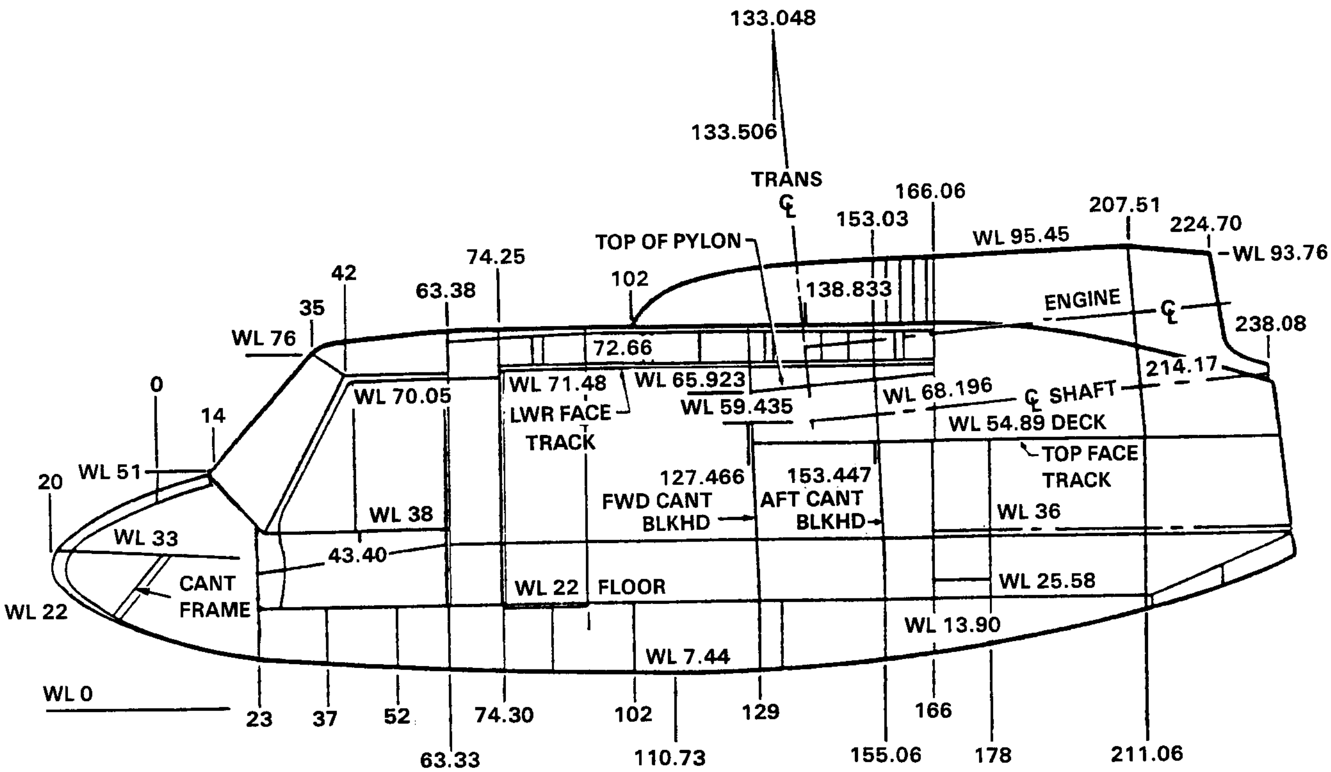
FORM	DESCRIPTION	CAUSE
Chafing	A rubbing action between two parts.	Improper clearance between parts and improper lubrication.
Brinelling	Raised areas indicating separation of metal. Normally found on plated or finished parts and precedes flaking and peeling.	Improper assembly or disassembly technique, such as using force to install a roller or ball bearing in the race; also caused by heat and wear.
Fretting Corrosion	Discoloration where surfaces are pressed or bolted together under pressure. Color or residue on steel parts is usually reddish brown and black on aluminum or magnesium parts.	Incomplete adhesion of metal or excessive loads.
Scuffing	Surface damage of pieces of a plated or finished surface.	Rubbing off of fine particles of metal by slight movement.
Galling	Transfer of metal form one surface to another.	Rubbing off of particles of two surfaces under high pressure.
Abrasion	Roughened area can vary from light to heavy.	Presence of fine particles of foreign material between moving surfaces.

cases, the type of attack will indicate a possible cause and the degree of damage to be expected. Brief descriptions of several types of corrosion are included in this manual. It is necessary that operator personnel become familiar with these and other types of attack. This will allow maintenance personnel to identify and classify the corrosion problems more easily and to initiate the proper corrective action.

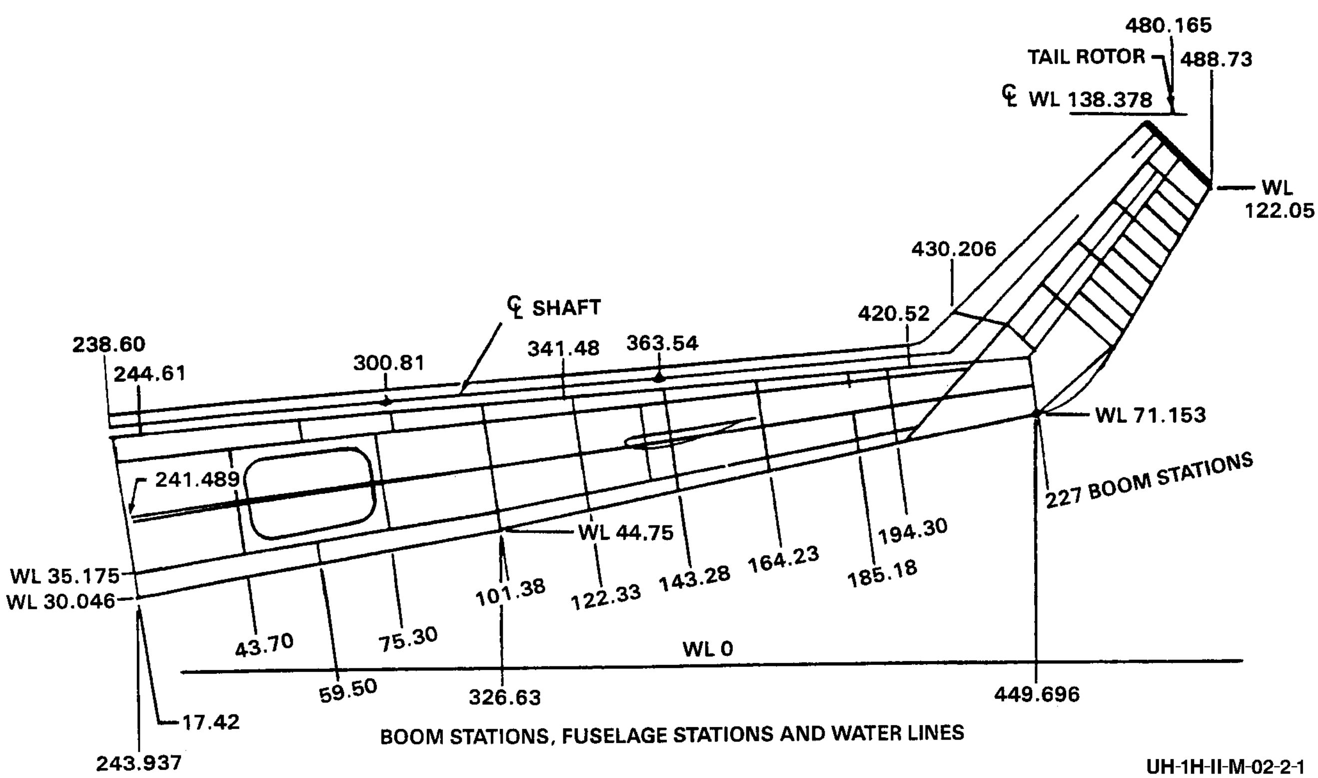
a. Pitting. Pits are usually located in a random pattern over a localized area. The pits may penetrate deeply into structural members and cause damage completely out of proportion to the apparent size of the pit. Pitting can be caused by direct chemical attack on surfaces where the protective finish as been removed or penetrated or it may propagate by the action of galvanic cells or concentration cells. Pitting may be found on surfaces of aluminum, magnesium, steel or stainless steel. Refer to figure 2-7.

b. Galvanic Cells. Galvanic cells are usually caused by dissimilar metals, but it is also possible for a galvanic cell to originate from localized differences on the surface of one piece of metal. The areas around fastener heads are prime locations for galvanic corrosion. Lap joints and other faying surfaces where different metals are jointed are also problem areas. All metals are susceptible to galvanic corrosion. (Refer to figure 2-8.)

c. Concentration Cells. When an electrolyte such as water is allowed to stagnate in contact with a metal surface, it can form either an oxygen or metal ion concentration cell. In some cases, both types will develop simultaneously. These cells can also form under foreign material and debris on a surface. Concentration cells can be especially damaging because the sites are hidden. There are two types of



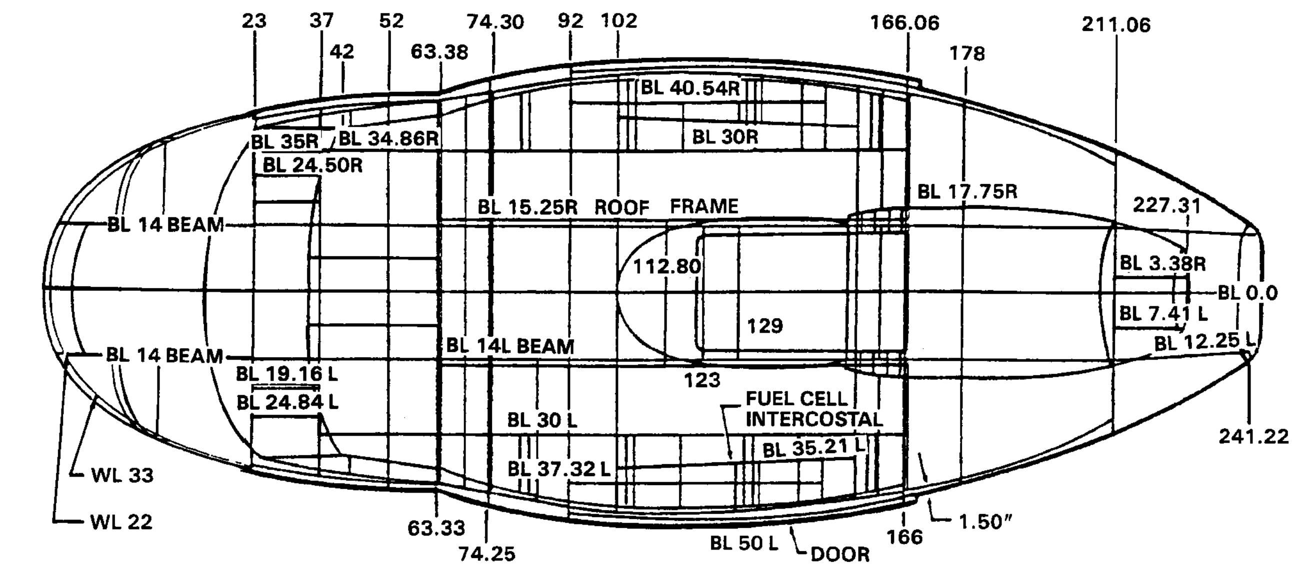
FUSELAGE STATIONS AND WATER LINES



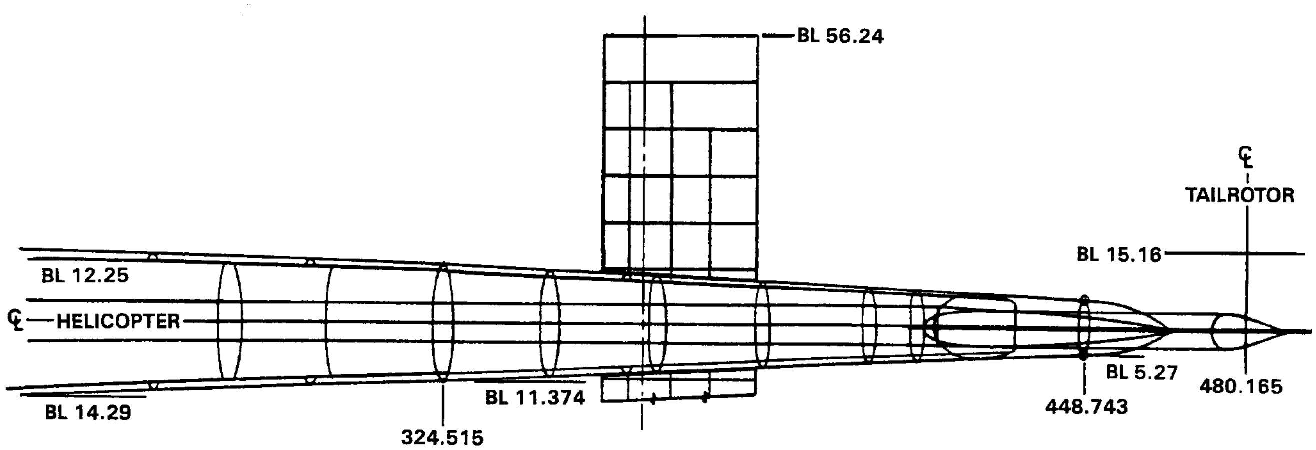
BOOM STATIONS, FUSELAGE STATIONS AND WATER LINES

UH-1H-II-M-02-2-1

Figure 2-2. Fuselage structure (Sheet 1 of 2)



FUSELAGE STATIONS AND BUTT LINES



FUSELAGE STATIONS AND BUTT LINES

UH-1H-II-M-02-2-2

Figure 2-2. Fuselage structure (Sheet 2 of 2)

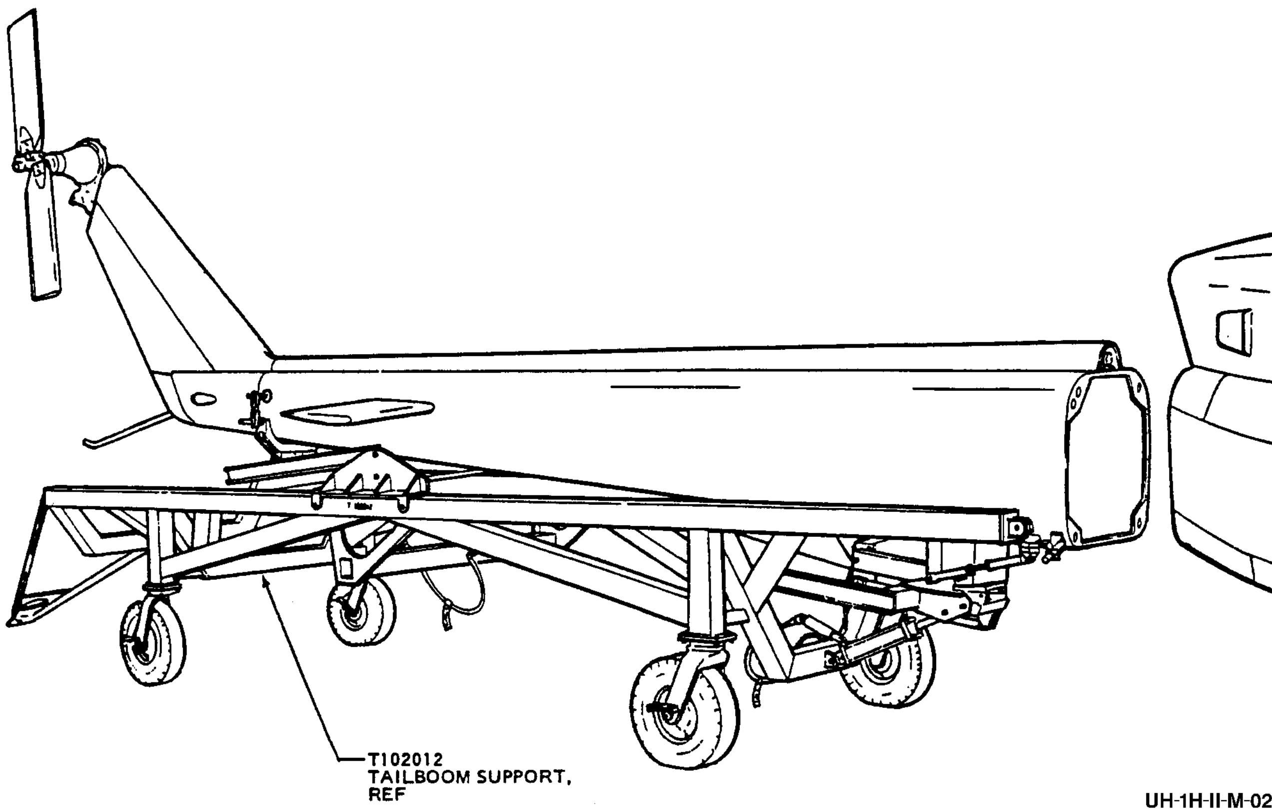


Figure 2-3. Tailboom support assembly (T102012)

concentration corrosion: crevice and deposit. (Refer to figure 2-9).

(1) Crevice corrosion.

(a) This type of corrosion is aptly named because it usually starts between two pieces of material that are in contact. It may occur between similar metals, dissimilar metals, or between a metal and a nonmetal. The crevice allows the electrolyte to accumulate and stagnate, thus creating a concentration cell.

(2) Deposit corrosion.

(a) Deposits of foreign material on a surface can create a “crevice” which will hold electrolyte and form a concentration cell. Corrosion products which are allowed to remain on a surface may also create a concentration cell which will accelerate the rate of attack.

2-16. Selective Attack. This form of attack usually starts at a point and progresses along susceptible areas such as grain boundaries or boundaries between phases.

a. Intergranular Attack. This is the primary form of selective attack. Intergranular corrosion is an insidious form of attack in that the degree of damage is usually much greater than surface appearance indicates. (Refer to figure 2-10).

b. Filiform Attack. This type of attack usually shows up as “worm-like” corrosion under paint films. rivet heads and edges of sheet metal parts are good starting points for this type of attack. It appears on the underside of the helicopter more often than at other locations. (Refer to figure 2-11.)

2-17. Corrosion and Mechanical Factors. Corrosion is often aggravated by mechanical factors. Examples of this type of problem are stress-corrosion cracking, corrosion fatigue and fretting. Parts which are subjected to sustained stress and a corrosive environment may develop stress corrosion. In a like manner, those parts which are subjected to cyclic loading in a corrosive environment may develop corrosion fatigue.

a. Fretting is a special case; it is characterized as surface damage resulting from slight relative motion

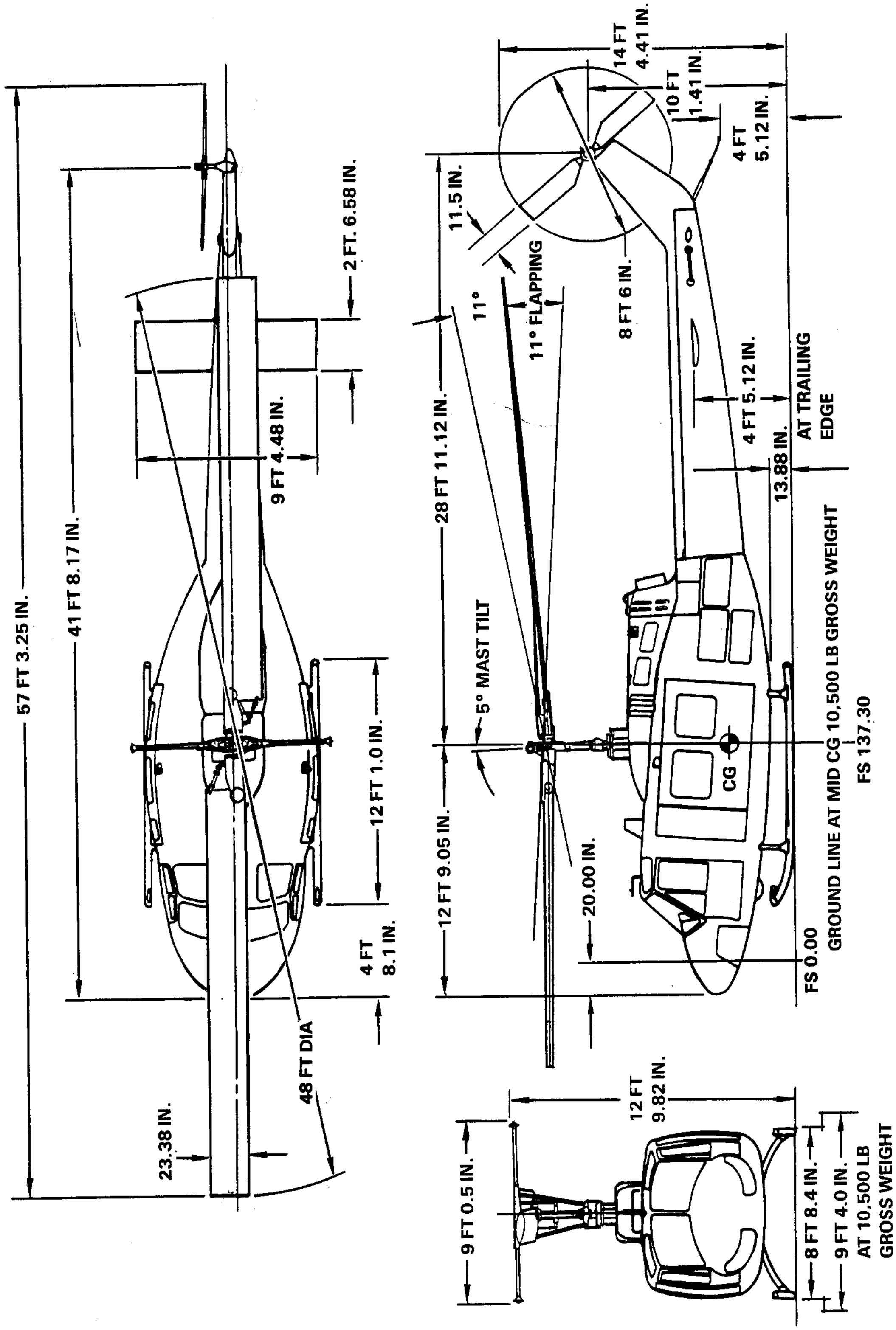


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Figure 2-4. Helicopter dimensions

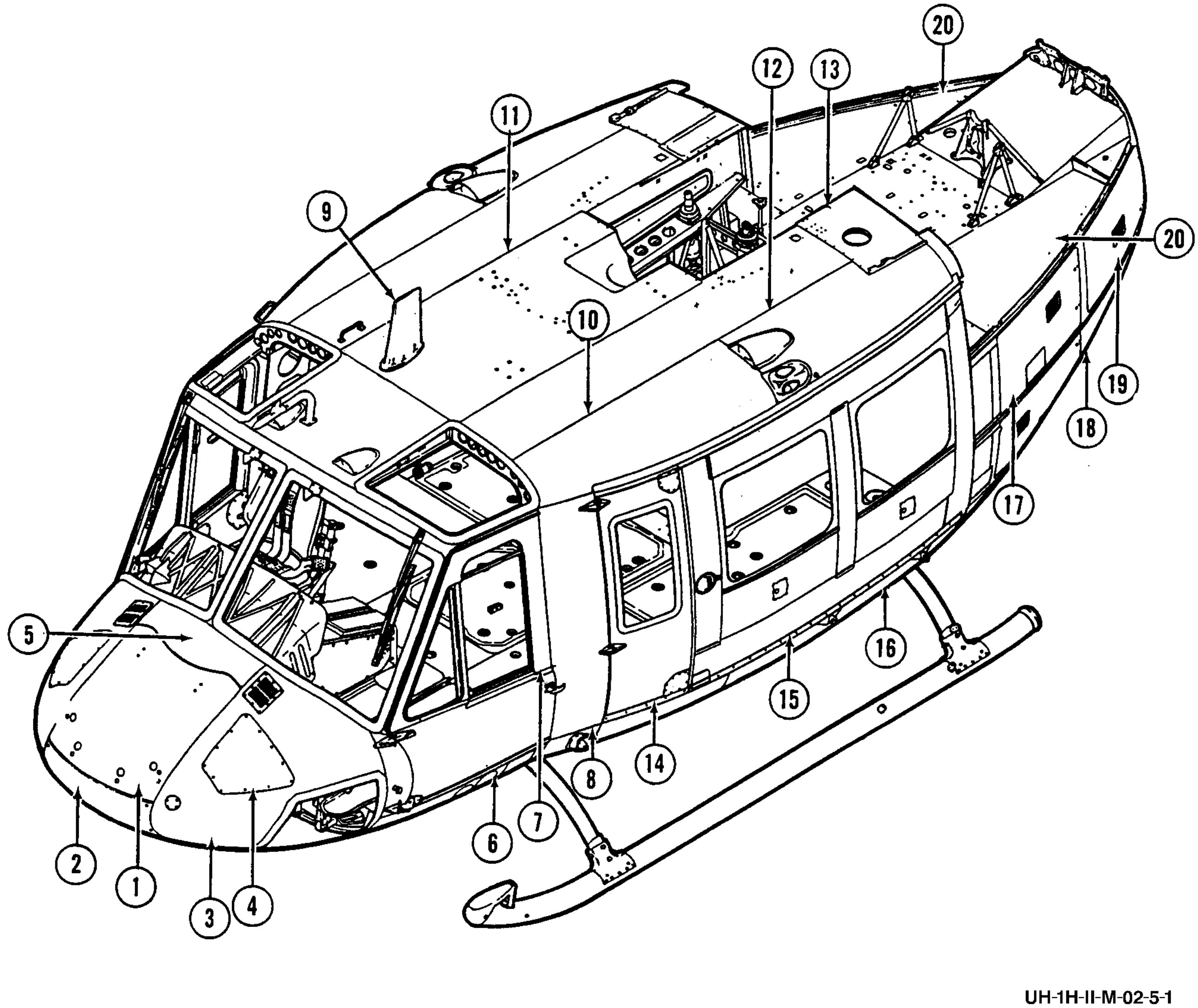


Figure 2-5. Forward fuselage skin (Sheet 1 of 5)

Item	Name	Material	Specification	Condition	Thickness
1	Nose door upper	Glass Fabric	BHT 299-947-076 Type A and Type C	—	—
	Nose door upper	Al Honeycomb	BHT 299-947-059 Type II	—	0.250
2	Nose, lwr fwd door	Al Aly	QQ-A-250/5	T42	0.071
	Door window	Glass Fabric	BHT 299-947-076 Type C	—	—
3	Side, fwd LH	Al Aly	QQ-A-250/5	T42	0.032
	Side, fwd RH	Al Aly	QQ-A-250/5	T42	0.032
4	Access panel LH	Al Aly	QQ-A-250/5	T3	0.063
	Access panel RH	Al Aly	QQ-Q-250/5	T3	0.063
5	Center, upper	Al Aly	QQ-A-250/5	T42	0.032
6	Door, lwr LH	Al Aly	QQ-A-250/5	T4	0.025
	Door, lwr, RH	Al Aly	QQ-A-250/5	T4	0.025
7	Door, upper LH	Al Aly	QQ-A-250/5	T4	0.025
	Door, upper RH	Al Aly	QQ-A-250/5	T4	0.025
8	Post, LH	Al Aly	QQ-A-250/5	T3	0.020
	Post, outer RH	Al Aly	QQ-A-250/5	T4	0.012
	Post, center RH	Al Honeycomb	MIL-C-7438	—	0.250
	Post, inner RH	Al Aly	QQ-A-250/5	T3	0.008
9	Roof, center fwd	Al Aly	QQ-A-250/5	T4	0.020
10	Roof, side LH	Al Aly	QQ-A-250/5	T4	0.020
	Roof, side RH	Al ALy	QQ-A-250/5	T4	0.020
11	Roof, cntr outer	Al Aly	QQ-A-250/5	T3	0.012
	Roof, cntr cntr	Al Honeycomb	MIL-C-7438	—	0.750
	Roof, cntr inner	Al Aly	QQ-A-250/5	T3	0.008
12	Roof, side aft LH	Al Aly	QQ-A-250/5	T4	0.020
	Roof, side aft RH	Al Aly	QQ-A-250/5	T4	0.020
13	Roof, cntr outer LH	Al Aly	QQ-A-250/5	T3	0.012
	Roof, cntr cntr LH	Al Honeycomb	MIL-C-7438	—	0.500
	Roof, cntr inner LH	Al Aly	QQ-A-250/5	T3	0.008
	Roof, cntr outer RH	Al Aly	QQ-A-250/5	T3	0.012
	Roof, cntr cntr RH	Al Honeycomb	MIL-C-7438	—	0.500
	Roof, cntr inner RH	Al Aly	QQ-A-250/5	T3	0.012
14	Post, outer LH	Al Aly	QQ-A-250/5	T3	0.020
	Post, cntr LH	Al Honeycomb	MIL-C-7438	—	0.375
	Post, inner LH	Fiberglass	Type "E"	—	—
	Post, pan LH	Al Aly	QQ-A-250/5	T4	0.025
	Post, outer RH	Al Aly	QQ-A-250/5	T3	0.020
	Post, cntr RH	Al Honeycomb	MIL-C-7438	—	0.375
	Post, inner RH	Figerglass	Type "E"	—	—
	Post, pan RH	Al Aly	QQ-A-250/5	T4	0.025
15	Door, outbd LH	Al Aly	QQ-A-250/5	T4	0.020
	Door, outbd RH	Al Aly	QQ-A-250/5	T4	0.020
	Door, outbd LH	Al Aly	QQ-A-250/5	T4	0.020
	Door, outbd RH	Al Aly	QQ-A-250/5	T4	0.020
	Door, inbd LH	Al Aly	QQ-A-250/5	T3	0.012
	Door, inbd RH	Al Aly	QQ-A-250/5	T3	0.012
	Door, inbd LH	Al Aly	QQ-A-250/5	T3	0.020
	Door, inbd RH	Al Aly	QQ-A-250/5	T3	0.020
	Door, inbd LH	Al Aly	QQ-A-250/5	T3	0.020
	Door, inbd RH	Al Aly	QQ-A-250/5	T3	0.020
	Door, inbd LH	Al Aly	QQ-A-250/5	T4	0.020
	Door, inbd RH	Al Aly	QQ-A-250/5	T4	0.020
	Door, inbd LH	Al Aly	QQ-A-250/5	T4	0.020
	Door, inbd RH	Al Aly	QQ-A-250/5	T4	0.020
16	Fuselage LH	Al Aly	QQ-A-250/5	T4	0.025
	Fuselage LH	Al Aly	QQ-A-250/5	T6	0.025
	Fuselage LH	Al Aly	QQ-A-250/5	T6	0.025
	*Fuselage LH	Al Aly	QQ-A-250/5	T6	0.032

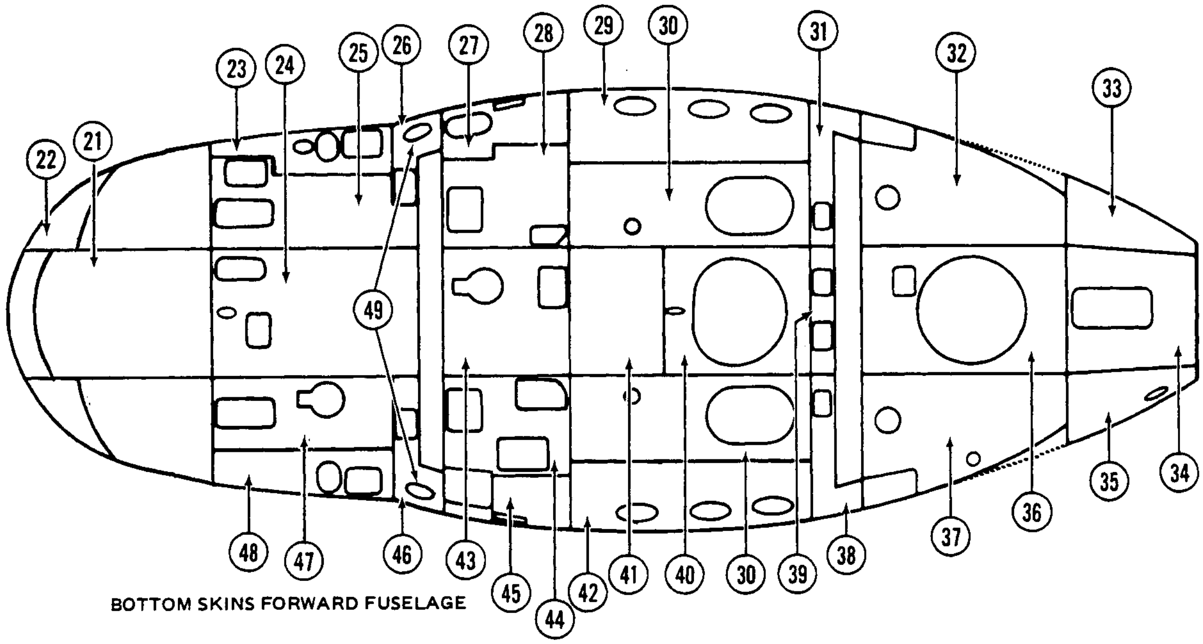
UH-1H-II-M-02-5-2

Figure 2-5. Forward fuselage skin (Sheet 2 of 5)

Item	Name	Material	Specification	Condition	Thickness
	*Fuselage LH	Al Aly	QQ-A-250/5	T6	0.032
	Fuselage LH	Al Aly	QQ-A-250/5	T6	0.032
	Fuselage LH	Al Aly	QQ-A-250/5	T4	0.025
	Fuselage LH	Al Aly	QQ-A-250/5	T6	0.025
	Fuselage RH	Al Aly	QQ-A-250/5	T4	0.025
	Fuselage RH	Al Aly	QQ-A-250/5	T6	0.025
	Fuselage RH	Al Aly	QQ-A-250/5	T6	0.025
	*Fuselage RH	Al Aly	QQ-A-250/5	T6	0.032
	Fuselage RH	Al Aly	QQ-A-250/5	T6	0.032
	*Fuselage RH	Al Aly	QQ-A-250/5	T6	0.032
	Fuselage RH	Al Aly	QQ-A-250/5	T6	0.032
	Fuselage RH	Al Aly	QQ-A-250/5	T4	0.025
	Fuselage RH	Al Aly	QQ-A-250/5	T6	0.025
	**Fuselage RH	Al Aly	QQ-A-250/5	T6	0.032
	**Fuselage RH	Al Aly	QQ-A-250/5	T6	0.032
	Fuselage, cntr	Al Aly	QQ-A-250/5	T3	0.032
	Fuselage, cntr	Al Aly	QQ-A-250/5	T3	0.032
	Fuselage, cntr	Al Aly	QQ-A-250/5	T3	0.032
	Fuselage, cntr	Al Aly	QQ-A-250/5	T4	0.025
	Fuselage, cntr	Al Aly	QQ-A-250/5	T4	0.025
17	Door, outer LH	Fiberglass	Type "E"	—	—
	Door, cntr LH	Al Honeycomb	MIL-C-7438	—	0.500
	Door, cntr LH	Al Honeycomb	MIL-C-7438	—	0.250
	Door, inner LH	Fiberglass	Type "E"	—	—
	Door, outer RH	Fiberglass	Type "E"	—	—
	Door, cntr RH	Al Honeycomb	MIL-C-7438	—	0.500
	Door, cntr RH	Al Honeycomb	MIL-C-7438	—	0.250
	Door, inner RH	Fiberglass	Type "E"	—	—
18	Door, outer LH	Fiberglass	Type "E"	—	—
	Door, cntr LH	Al Honeycomb	MIL-C-7438	—	0.500
	Door, cntr LH	Al Honeycomb	MIL-C-7438	—	0.250
	Door, inner LH	Fiberglass	Type "E"	—	—
	Door, outer RH	Fiberglass	Type "E"	—	—
	Door, center RH	Al Honeycomb	MIL-C-7438	—	0.500
	Door, center RH	Al Honeycomb	MIL-C-7438	—	0.250
	Door, inner RH	Fiberglass	Type "E"	—	—
19	Door, outer LH	Fiberglass	Type "E"	—	—
	Door, center LH	Al Honeycomb	MIL-C-7438	—	0.500
	Door, inner LH	Fiberglass	Type "E"	—	—
	Door, outer RH	Fiberglass	Type "E"	—	—
	Door, center RH	Al Honeycomb	MIL-C-7438	—	0.500
	Door, inner RH	Fiberglass	Type "E"	—	—
20	Service deck outer skin	Titanium	MIL-7-9046	—	
	Service deck core	Al Honeycomb	MIL-C-7438		
	Service deck inner skin	Fiberglass	BHT 299-947-059 Type II		

UH-1H-II-M-02-5-3

Figure 2-5. Forward fuselage skin (Sheet 3 of 5)

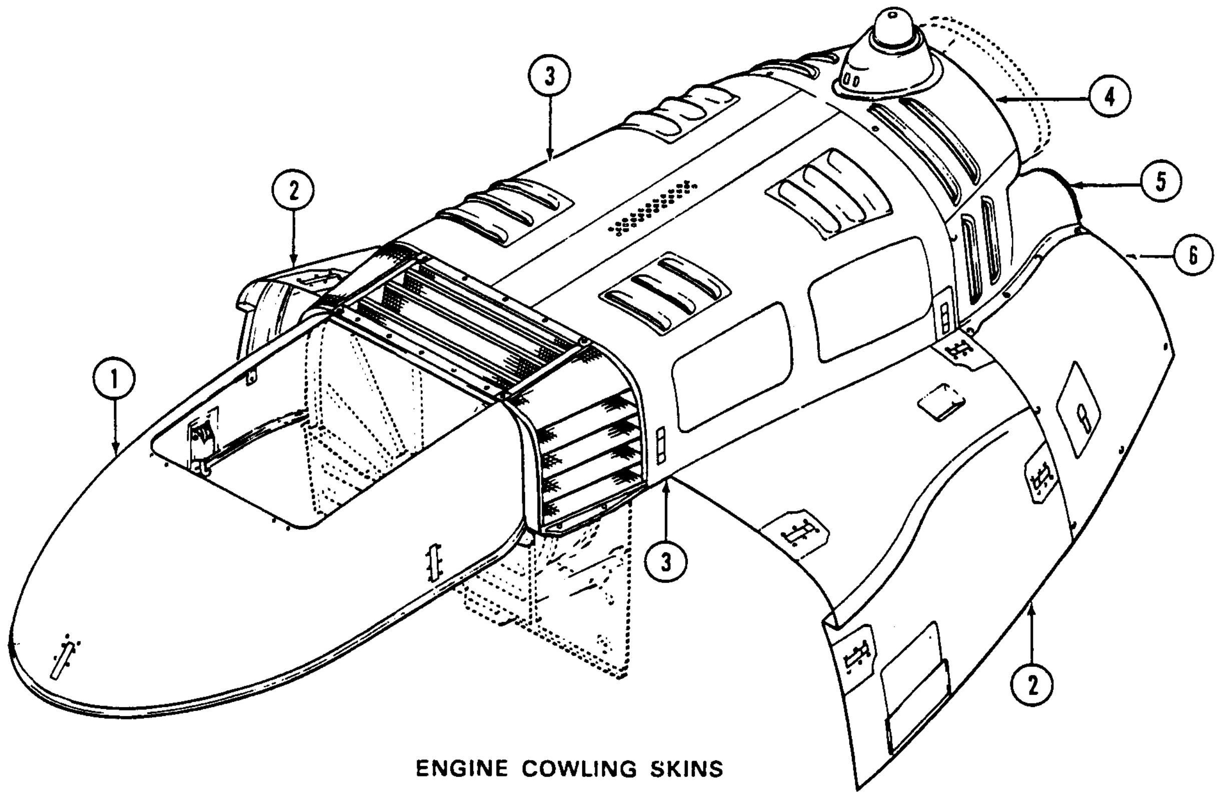


BOTTOM SKINS FORWARD FUSELAGE

Item	Name	Material	Specification	Condition	Thickness
21	Door	Al Aly Honeycomb		T42	
22	Skin	Al Aly	QQ-A-250/5	T42	0.032
23	Skin	Al Aly	QQ-A-250/13	T6	0.025
24	Skin	Al Aly	QQ-A-250/5	T3	0.032
25	Skin	Al Aly	QQ-A-250/13	T6	0.032
26	Skin	Al Aly	QQ-A-250/5	T42	0.025
27	Skin	Al Aly	QQ-A-250/5	T42	0.025
28	Skin	Al Aly	QQ-A-250/13	T6	0.032
29	Skin	Al Aly	QQ-A-250/13	T6	0.032
30	Panel	Al Aly Honeycomb	MIL-C-7438		
		Outer Skin	QQ-A-250/13	T6	0.012
		Inner Skin	BHT 299-947-057		
			Type C Glass Fabric		
31	Skin	Al Aly	QQ-A-250/13	T6	0.032
32	Skin	Al Aly	QQ-A-250/13	T6	0.025
33	Skin	Al Aly	QQ-A-250/13	T6	0.025
34	Skin	Al Aly	QQ-A-250/5	T42	0.025
35	Skin	Al Aly	QQ-A-250/13	T6	0.025
36	Skin	Al Aly	QQ-A-250/5	T42	0.025
37	Skin	Al Aly	QQ-A-250/13	T6	0.025
38	Skin	Al Aly	QQ-A-250/13	T6	0.032
39	Skin	Al Aly	QQ-A-250/5	T3	0.032
40	Panel	Al Aly Honeycomb	BHT 299-947-059		
			Type II		
		Upper Skin Al Aly	QQ-A-250/13	T6	0.012
		Lower Skin Al Aly	QQ-A-250/13	T6	0.012
41	Panel	Fiberglass/Honeycomb Core			
42	Skin	Al Aly	QQ-A-250/13	T6	0.032
43	Skin	Al Aly	QQ-A-250/5	T3	0.032
44	Skin	Al Aly	QQ-A-250/13	T6	0.032
45	Skin	Al Aly	QQ-A-250/5	T42	0.025
46	Skin	Al Aly	QQ-A-250/5	T42	0.025
47	Skin	Al Aly	QQ-A-250/13	T6	0.032
48	Skin	Al Aly	QQ-A-250/13	T6	0.025
49	Fairing	Al Aly	QQ-A-250/8	—	0.040

UH-1H-II-M-02-5-4

Figure 2-5. Forward fuselage skin (Sheet 4 of 5)

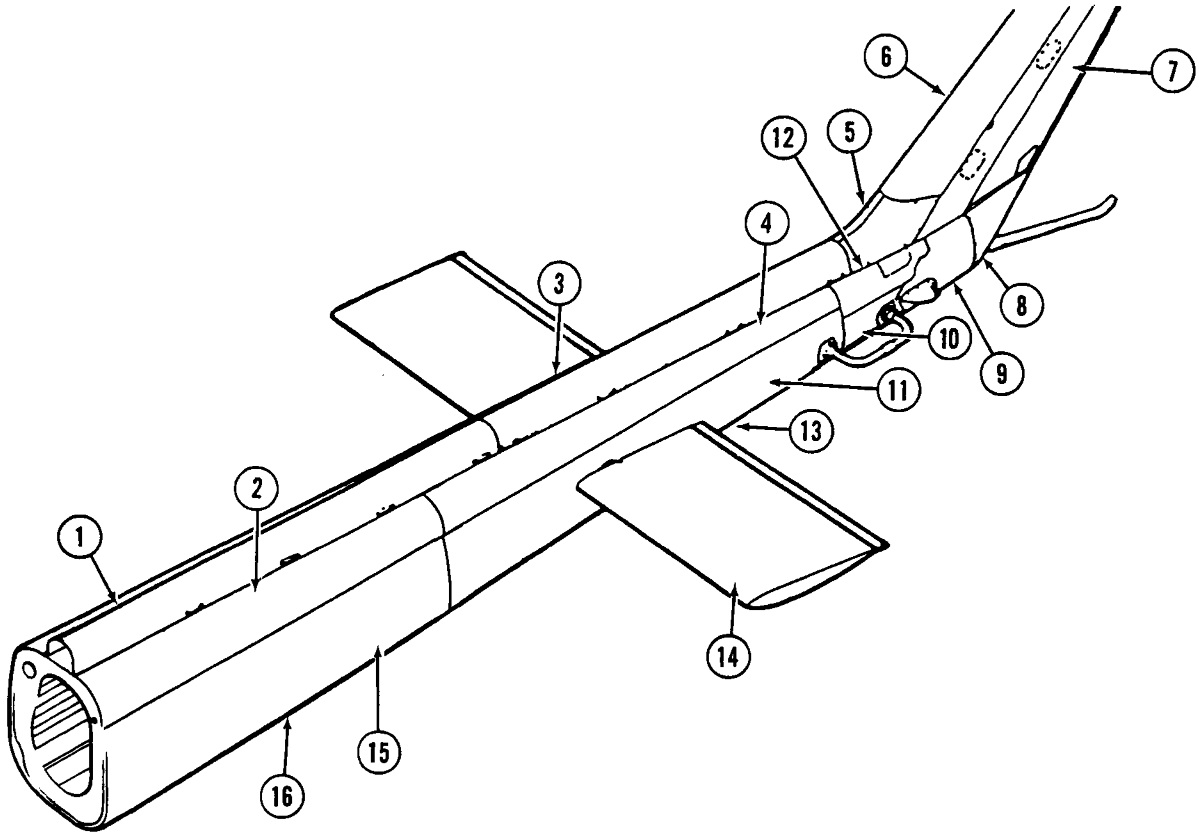


ENGINE COWLING SKINS

ITEM	DESCRIPTION	MATERIAL	SPECIFICATION	THICKNESS	HEAT TREAT CONDITION
1	Fairing				
	Outer Skin	Glass Fabric	BHT299-947-037, Type E		
	Core	Al Aly Honeycomb		0.500	
	Inner Skin	Glass Fabric	BHT299-947-037, Type E		
2	Lower Cowl				
	Inner Skin	Al Aly	QQ-A-362	0.025	T4
	Outer Skin	Al Aly	QQ-A-362	0.020	T4
3	Upper Cowl:				
	Louvers	Glass Fabric	BHT299-947-012, Type VIII		
	Bulkheads	Al Aly	QQ-A-250/5	0.025	T42
	Skins:				
	Upper Inner	Al Aly	QQ-A-250/5	0.025	T42
	Lower Inner	Al Aly	QQ-A-250/5	0.025	T42
	Outer	Al Aly	QQ-A-250/5	0.020	T42
	Perforated Inner	Al Aly	QQ-A-250/8	0.032	H34
	Tailpipe Fairing				
4	Upper Fairing	Skin	QQ-A-250/5	0.025	T42
5	Upper Fairing	Skin	QQ-A-250/8	0.025	5052-0
6	Lower Fairing	Skin	QQ-A-250/5	0.020	T4

UH-1H-II-M-02-5-5

Figure 2-5. Forward fuselage skin (Sheet 5 of 5)



Item	Name	Material	Specification	Condition	Length	Width	Thickness
1	Fwd Shaft Door	Al Aly	QQ-A-318	H34	103.7	15.0	0.040
2	Top Forward	Al Aly	QQ-A-250/5	T3	84.5	33.7	0.032
3	Aft Shaft Door	Al Aly	QQ-A-318	H34	79.7	15.0	0.040
4	Top Center	Al Aly	QQ-A-250/5	T3	93.4	27.0	0.032
5	Fin Cover, Left	Al Aly	QQ-A-250/5	T0	36.0	32.0	0.040
	Fin Cover, Right	Al Aly	QQ-A-250/5	T0	34.0	38.0	0.040
6	Vert Fin LE Door	Al Aly	QQ-A-250/13	T6	62.0	26.0	0.012
7	Fin Aft LH	Al Aly	QQ-A-250/5	T3	67.0	14.5	0.025
	Fin Aft RH	Al Aly	QQ-A-25/5	T3	67.0	14.5	0.032
8	Lower Fin Fairing	Fiberglass	BHT 299-947-018		80.0	40.0	0.010
9	Lower Fin	Al Aly	QQ-A-250/5	T3	57.0	36.0	0.032
10	Bottom Aft	Al Aly	QQ-A-250/5	T3	34.0	20.0	0.040
11	Side Center Aft LH & RH	Al Aly	QQ-A-250/5	T3	93.4	25.3	0.032
12	Upper Aft	Al Aly	QQ-A-250/5	T3	25.0	24.0	0.040
13	Bottom Center	Al Aly	QQ-A-250/5	T3	93.4	23.0	0.032
14	Elevator LH & RH	Al Aly	QQ-A-362	T3	65.0	48.0	0.025
15	Side Fwd LH	Al Aly	QQ-A-250/5	T3	84.5	30.0	0.032
	Side Fwd RH	Al Aly	QQ-A-250/5	T3	84.5	30.0	0.032
16	Bottom Forward	Al Aly	QQ-A-250/5	T3	84.5	32.6	0.032

UH-1H-II-M-02-6

Figure 2-6. Tailboom skin

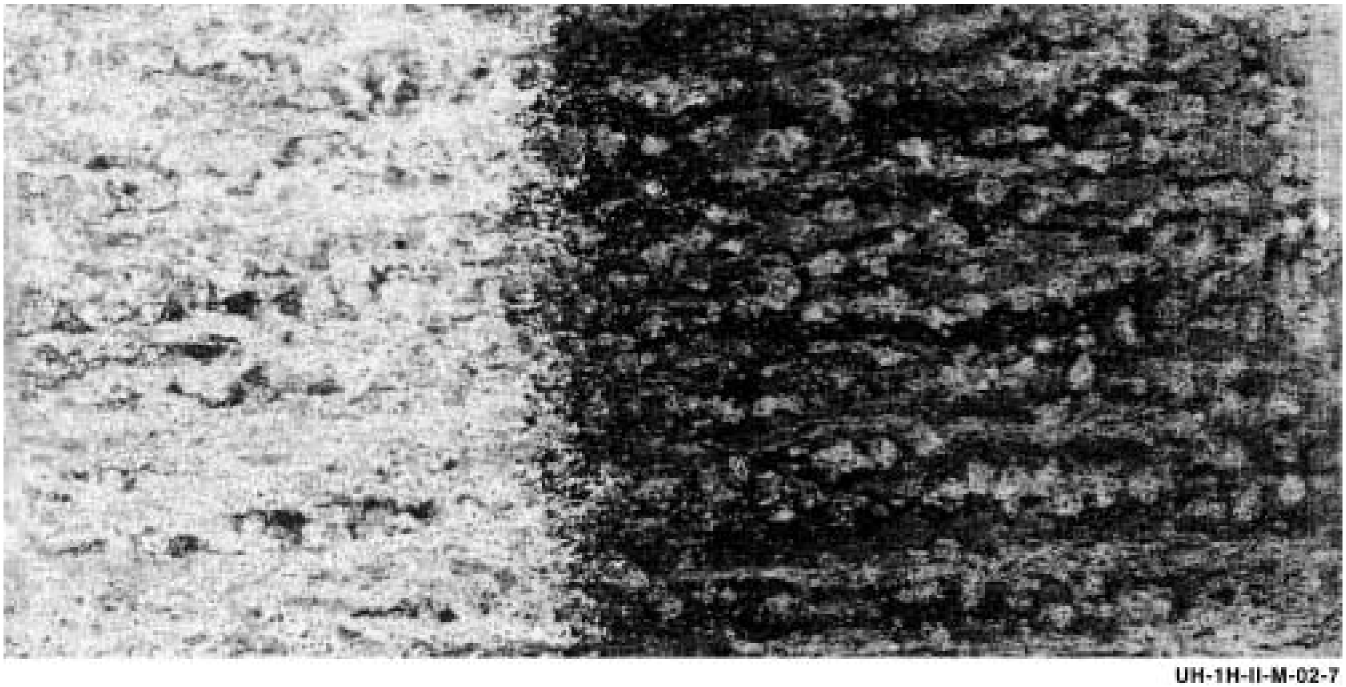


Figure 2-7. Pitting attack on aluminum

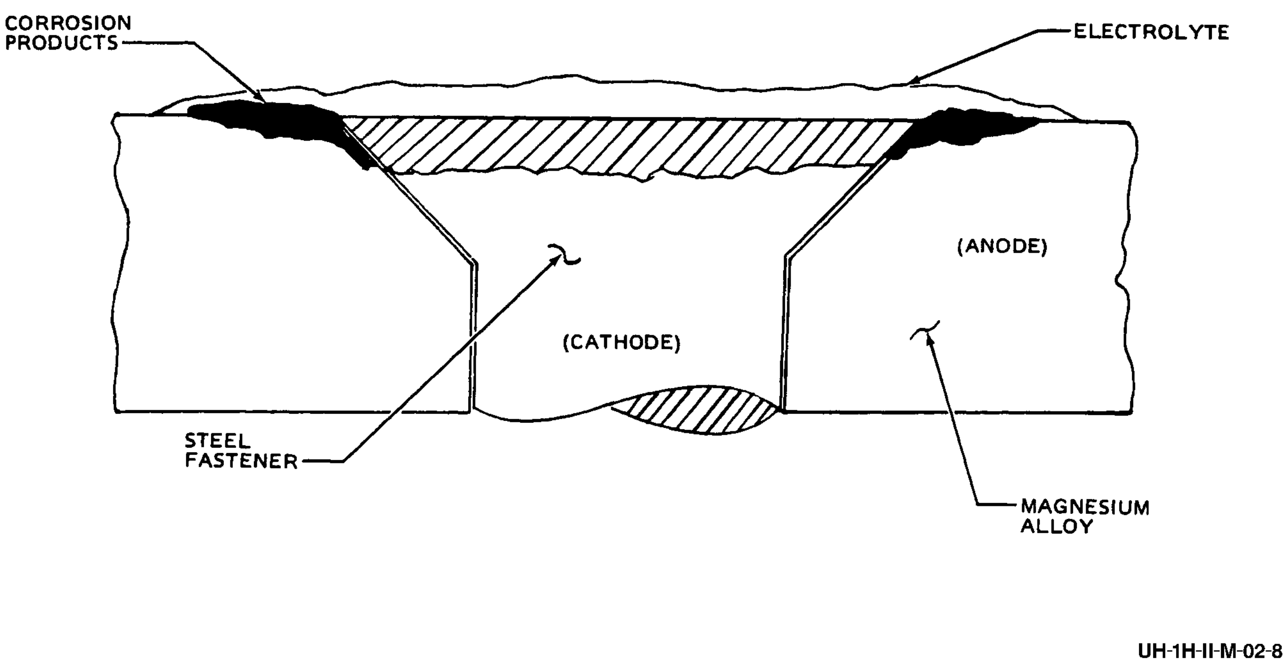


Figure 2-8. Typical galvanic cell

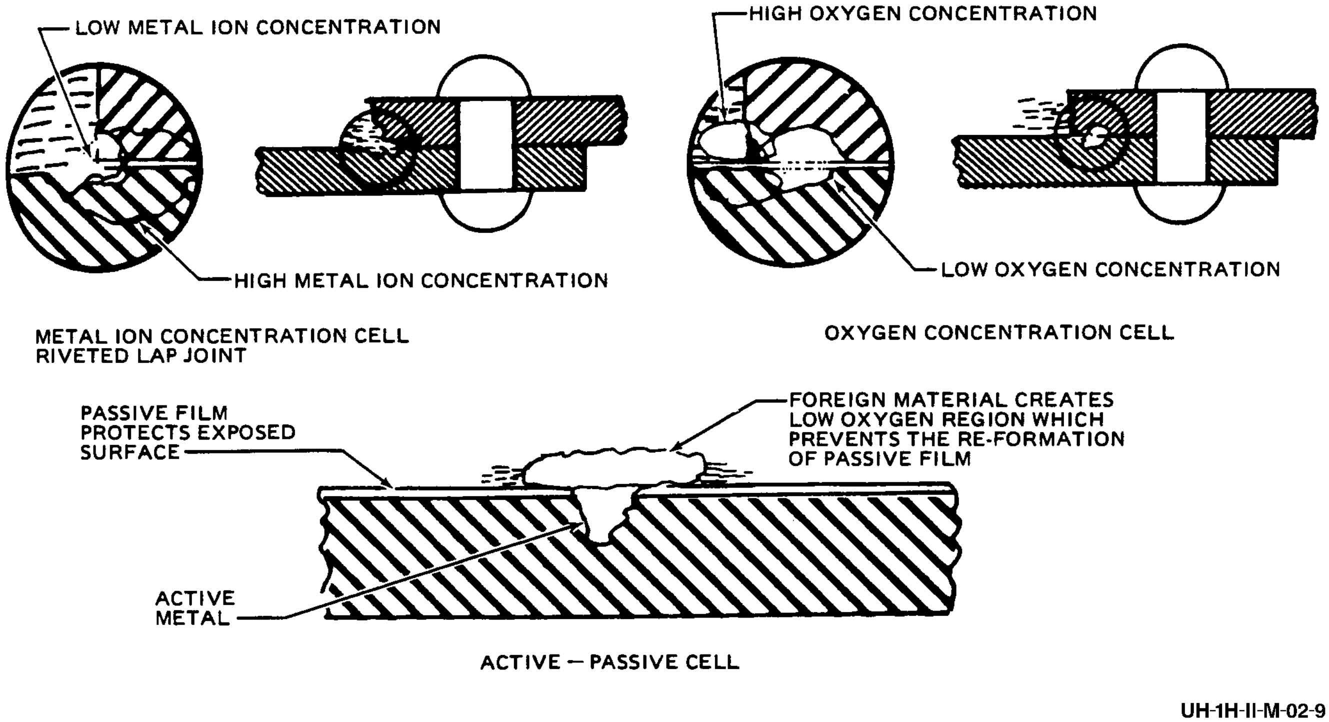


Figure 2-9. Types of concentration cell

between surfaces in intimate contact in a corrosive environment.

b. Stress Corrosion. This form occurs in a part along the lines of cold working, if the part has been stressed too high without proper heat treatment.

c. Hydroscopic Material Corrosion. This form of corrosion is caused by such materials as sponge rubber, felt, cork, etc., absorbing water and holding it in contact with the part.

2-18. Grouping of Metals and Alloys.

Group I ..... Magnesium and its alloys: aluminum alloys 5052, 5056, 5356, 6061, and 6063

Group II .... Cadmium, zinc, and aluminum and their alloys (including the aluminum alloys in Group I).

Group III .. Iron, lead, and tin and their alloys (except stainless steel).

Group IV ... Copper, chromium, nickel, silver, gold, platinum, titanium, cobalt, and rhodium and their alloys; stainless steel and graphite.

a. Metals classified in the same group are considered similar to each other.

b. Metals classified in different groups are considered dissimilar to each other.

2-19. Cleaning. Cleanliness is of primary importance in the prevention of corrosion. Contaminating material such as chemicals, soils, salt deposits, debris, grease, fluids, etc., in contact with a painted or metal surface provide active areas for deterioration and corrosive attack. The extent of the damage depends on the nature of the contaminant, the surface concerned, and the time they remain in contact. Therefore, the more frequently a surface is cleaned, the less likelihood that corrosive attack will be started.

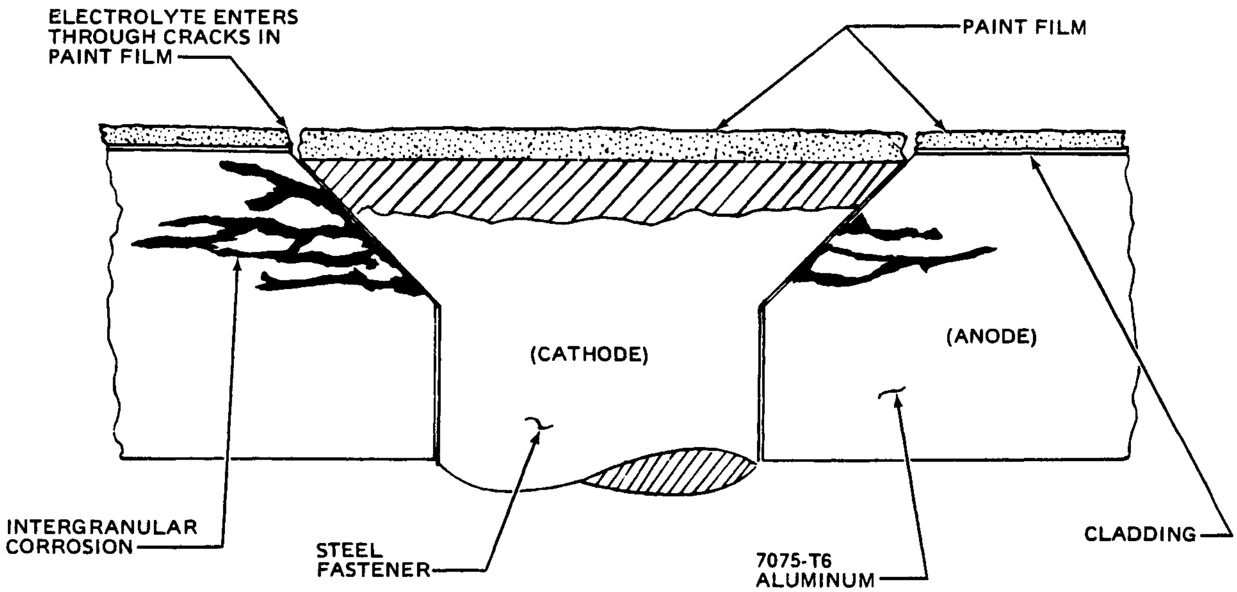


Figure 2-10. Typical intergranular corrosion site

Figure 2-11. Filiform corrosion on clad aluminum skin

2-20. Paint Removal. Paint must be removed in an area large enough to expose all corroded metal and to allow for effective blending and fairing of the surface. Parts which have been removed from the aircraft may be stripped in their entirety.

2-21. Hand Sanding. The paint finish may be removed by sanding unless prohibited by the applicable chapter of the manual for the part concerned. Use 320 or 400 grit abrasive paper or equivalent.

WARNING

MEK is extremely flammable and highly volatile. Keep away from heat and open flame. Avoid prolonged breathing of vapor and use with adequate ventilation. Avoid prolonged or repeated contact with skin.

2-22. Solvents. Methyl-ethyl-ketone (table 1-1, C-309) may be used to strip lacquer top coats. This procedure is required for rotor blades. Refer to applicable helicopter manual. Adjacent painted surfaces and plastic parts must be protected from the solvent.

2-23. Chemical Strippers. Chemical strippers (table 1-1) may be used unless prohibited by the applicable helicopter manual. When chemical strippers are used, faying surfaces, joints, seams, and adjacent areas must be masked to prevent stripper from contacting plastic parts or becoming entrapped in seams.

CAUTION

Chemical strippers must not be allowed to contact adhesive bonded joints. Acid type chemical strippers must not be used on high strength steel parts.

2-24. Corrosion Removal. Corrosion products and damaged metal must be removed by the mildest method available to prevent additional damage to the part. Chemical treatments and mechanical methods may be used alone or in combination. The method used will depend on the alloy concerned, the depth of the corrosion damage, and the function of the surface. Refer to table 2-2 for information on cleaning and treatment of corroded parts.

2-25. Chemical Treatment. Chemical treatment may be used alone to remove light corrosion products on some surfaces. It should also be used in conjunction with mechanical methods to ensure that all corrosion products have been removed.

a. Aluminum, steel and stainless steel should be treated with alcoholic phosphoric cleaner (C-344).

Solution concentration — 1 part W.O. No. 1 to 3 parts water by volume.

Solution temperature — ambient.

Treatment time — 5 to 30 minutes — agitate or brush periodically.

b. Magnesium must be treated with a solution of chromic acid (C-116) in water.

Solution concentration — 1 pound of chromic acid in each gallon of water.

Solution temperature — ambient temperature to 160°F.

Treatment time — as necessary to remove corrosion products.

CAUTION

The above chemical solutions are not considered to be prepaint treatments unless specifically required by the applicable aircraft manual.

2-26. Mechanical Methods. Mechanical methods may be used alone to remove corrosion products and deteriorated metal when specifically required by the applicable helicopter manual for the part concerned. However, in other cases it is desirable to follow the mechanical method with a chemical treatment which will aid in determining if all corrosion products have been removed. The following methods are listed in increasing order of potential damage to a part:

a. Hand Sanding. Abrasive pad (C-407).

b. Hand Sanding. Abrasive cloth or paper (C-406) and aluminum oxide cloth.

c. Honing. Fine India stone (C-464).

d. Glass Bead (C-470) Cleaning.

e. Wire Brush.

Table 2-2. Cleaning and Treating Corroded Parts

METAL	CONDITION	CLEANING	TREATMENT
Aluminum Alclad Surfaces.	Mild or heavy pitting, staining and superficial etching.	Apply cleaning compound (C-318), and rinse with water. Do not use abrasives.	Apply paint as required. On internal surfaces, use epoxy primer, (C-202). Unfinished external surfaces should be finished with aluminum pigmented lacquer.
	Mild surface pitting, staining and superficial etching.	Apply cleaning compound, (C-318) and heavy duty brightener.	Apply paint as required. On internal surfaces, use epoxy primer (C-202). Unfinished external surfaces should be finished with aluminum pigmented lacquer.
	Heavy surface pitting.	Hand rub with aluminum wool (C-422) and solvent (C-304); apply cleaning compound (C-318), and rinse with fresh water.	
Aluminum	Intergranular corrosion.	Remove corroded area. Burnish part to remove sharp edges.	Treat with a five percent solution of potassium dichromate and allow to dry. Brush off excess crystals. Apply epoxy primer (C-202).
Magnesium	Surface pitting, large nonremovable parts.	Remove corrosion with a stiff bristle brush.	Apply corrosion preventive compound, (C-110) for one minute. Rinse with fresh water.
Steel	Lightly rusted parts. No pitting.	Clean parts with cleaning compound, (C-318), and rinse with fresh water. Use steel wool (C-411) to remove compound, if necessary.	Apply epoxy primer, (C-202) on previously cadmium plated parts.
	Badly rusted.	Not applicable.	Replace parts.

f. Mechanical Scrapers.

g. Dry Blasting Abrasive. (C-474)

NOTE

Combinations of the above methods (i.e. scraper followed by hand sand and polish) should be used to provide a final finish which is as smooth as the original part and to blend the damaged area smoothly into adjacent areas to minimize surface irregularities.

CAUTION

Motor driven grinders and sanders shall not be used because of possible local overheating of the base metal.

2-27. Evaluation of the Surface. Corroded parts must be evaluated before and after rework to determine the depth of the damage, size and location of the affected area and the number of damaged areas.

CAUTION

The limits established by the applicable helicopter manual for the part or surface concerned must not be exceeded.

2-28. Refinishing. Surfaces which have had corrosion removed are very susceptible to further corrosion if not properly protected. Therefore, all parts which are considered to be reparable must be refinished after corrosion removal or the surface must be protected from damage by the use of oil, grease, or corrosion preventive compound prior to refinishing. The restoration of the protective finish on reworked parts is of extreme importance. The procedures and materials used must provide corrosion protection equal to the original finish.

2-29. Corrosion Removal Procedures. The following procedures are recommended for removing corrosion products and deteriorated metal from the alloys and surface indicated.

a. Aluminum surfaces.

(1) Sheet metal parts and extrusions (except rotor blades).

NOTE

See applicable helicopter manual for rework and refinishing procedures for rotor blades.

(2) Light surface attack (filiform, shallow pitting and general corrosion).

(a) Remove corrosion products by hand sanding with abrasive pad (C-407) or fine abrasive paper. Remove sanding residue with a solvent or detergent.

(b) Apply chemical treatment.

(c) Rinse and dry.

(d) Evaluate the surface. If the damage exceeds the before repair limits, rework in accordance with the procedure for moderate to severe corrosion, step (3). Otherwise, proceed to step (e).

(e) Refinish. Refer to paragraph 2-28 above.

(3) Moderate to severe corrosion (deep pits, intergranular attack, etc).

(a) Remove visible damage by hand sanding, scraping, or glass bead cleaning. Remove sanding residue with a solvent or detergent.

(b) Apply chemical treatment.

(c) Rinse, dry and visually inspect.

(d) Repeat steps (a), (b), and (c) until all visual evidence of corrosion is removed.

(e) Polish and blend the reworked area into surrounding surface.

(f) Refinish. (Refer to paragraph 2-28.)

b. Machine parts, forgings and castings.

CAUTION

Mechanical metal removal is not permitted on certain surfaces of power transmission parts. Refer to Chapter 6.

(1) Light surface attack (shallow pitting).

(a) Remove corrosion products by hand sanding with abrasive pad or fine abrasive paper. Remove sanding residue with a solvent or detergent.

(b) Apply chemical treatment.

(c) Rinse and dry.

(d) Refinish. (Refer to paragraph 2-28).

(2) Moderate to severe corrosion (deep pits, intergranular attack, exfoliation, fretting, etc.).

(a) Remove visible corrosion damage by hand sanding, scraping, glass bead cleaning or abrasive blasting. Remove sanding residue with a solvent or detergent.

(b) Apply chemical treatment.

(c) Rinse, dry and visually inspect.

(d) Repeat steps (a), (b), and (c) until all visible evidence of corrosion is removed.

(e) Hand polish the reworked area to a surface finish equal to or better than the original and blend the area into the surrounding surface.

(f) Refinish. (Refer to paragraph 2-26.)

NOTE

If the original surface is anodize or hard anodize, blend the smallest area necessary.

c. Steel surfaces.

(1) Steel plated surfaces and/or painted surfaces. The majority of the parts involved will be cadmium plated. Bell Helicopter Textron does not authorize recadmium plating of structural parts in the field. Therefore, adjacent plating should be protected by masking or other means when corrosion is being removed.

(a) Remove corrosion products by hand sanding, glass bead cleaning or abrasive blasting.

(b) Apply chemical treatment.

(c) Rinse and dry.

(d) Rework damaged area by hand sanding or scraping and repeat chemical treatment, rinse and dry.

(e) Evaluate the reworked area. If the reworked area exceeds the after repair limits specified in the applicable helicopter manual the part must be removed from flight status. Otherwise, proceed to step (f).

(f) Polish reworked area to a finish equal to the original surface and blend into the surrounding surface.

(g) Refinish. (Refer to paragraph 2-28.)

d. Steel surfaces not plated or painted. this includes areas such as splines on main rotor mast and in the tail rotor drive system, parts with black oxide finish and other functional surfaces. No refinishing is required on these surfaces. However, the surfaces must be protected by oiling or corrosion preventive compound if stored prior to installation.

CAUTION

Due to the nature of the surfaces involved, the applicable chapter must be checked closely for inspection and rework procedures.

e. Stainless steel.

NOTE

Stainless steel surfaces which are cadmium plated originally must be treated the same as a plated steel part. Corrosion products should be removed from other stainless steel surfaces by hand sanding or wire brushing. Stainless steel surfaces should be refinished if they were finished originally.

f. Magnesium surfaces.

CAUTION

Refer to applicable chapter for specific rework procedures for power transmission system parts.

NOTE

Removal of corrosion products is mandatory prior to refinishing or reuse or magnesium parts.

(1) Remove corrosion products by hand sanding or glass bead cleaning.

(2) Apply chemical treatment (chromic acid).

(3) Rinse and dry.

(4) Repeat steps (2) and (3) until all visible evidence of corrosion products are removed.

(5) Rework area to remove damaged metal by hand sanding or scraping.

(6) Repeat steps (2) and (3).

(7) Polish and blend the reworked area into the surrounding surface.

(8) Refinish within 24 hours or protect from corrosion with oil or preventative compound.

2-30. HONEYCOMB PANELS.

2-31. Description — Honeycomb Panels.

Structural panels consisting of aluminum alloy core with metal facings and/or glass cloth facings are used in forward fuselage structure. (Figure 2-5).

2-32. Classification of Damage — Honeycomb Panels. Refer to table 2-3 for classification of damage.

Table 2-3. Classification of Damage — Honeycomb Panels

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
a. Dents	a. Dents Smooth contoured dents up to 5 percent of panel thickness provided: 1. Total damage does not exceed 5 percent of panel area. 2. No voids under dent. 3. Maximum diameter does not exceed 4.0 inches for a single dent. (Dents closer than 1.0 inch are classified as one dent.) 4. Edge of dent is 1.0 inch minimum from supporting structure or beveled edge of panel. Smooth contoured dents up to 10 percent of panel thickness provided.	a. Damage exceeds negligible damage limits. No cracks, holes, or voids (figure 2-12). Dent has sharp nicks, hole or crack. Damage penetrates only one surface and does not exceed 0.5 inch after cleanup. Refer to paragraph 2-31. b., and figure 2-13. If cleanup exceeds 0.5 inch, refer to paragraph 2-31. c. and figure 2-14.	a. Damage exceeds repairable limits. Corrosion in honeycomb core.

Table 2-3. Classification of Damage — Honeycomb Panels (Cont)

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	1. No voids under dent.		
	2. Maximum diameter does not exceed 0.75 inch for a single dent.		
	3. No more than three dents can be encompassed by a 4.0 inch diameter circle.		
	4. Edge of dent is minimum 1.0 inch from supporting structure or beveled edge.		
	5. Total damage does not exceed 2 percent of panel area.		
b. Voids.	b. Voids up to 0.25 square inch (.50 x .50) provided:	b. Damage exceeds negligible limits. (Figure 2-16.)	b. Damage exceeds repairable limits.
	1. No more than two such areas can be encompassed by a 4.0 inch circle.		
	2. The edge of any voids is a minimum of 3.0 inches from supporting structure, panel edge bevel or insert or fitting. (Voids closer than 1.0 inch are classed as one void.) Edge separation is never classed as negligible damage.		
c. Nicks and scratches (metal facing).	c. Nicks and scratches not exceeding 10 percent of metal facing thickness and 4.0 inches square after cleanup. Damage located 1.0 inch minimum distance from supporting structure after cleanup.	c. Damage exceeding negligible limits. See figures 2-13 and 2-14 for aluminum faced panel and see figure 2-17 for titanium faced panels. (Excluding center service deck.)	c. Damage exceeds repairable limits. Replace any panel having evidence of water or corrosion in the

Table 2-3. Classification of Damage — Honeycomb Panels (Cont)

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
d. Corrosion	d. Corrosion not to exceed 10 percent of metal facing thickness and 4.0 square inches after cleanup. Damage located minimum 1.0 inch distance from supporting structure.	d. Damage not to exceed 2 percent of panel area. Maximum diameter of any area after cleanup is 1.0 inch. One repair per bay allowed. Minimum distance between repairs is 3.0 inches. No repair within 1.0 inch of supporting structure, inserts, beveled edge.	d. Same as listed for nicks and scratches.
e. Cracks, holes, and punctures.	e. None.	e. Cracks, holes or punctures with. 1. Damage affecting only one skin and core (figure 2-13) provided: (a) Damage limited to two holes within a 4.0 inch dia. circle. (b) Holes separated by 1.0 inch of undamaged material. NOTE: Holes closer than 1.0 inch are classed as one hole. (c) Hole diameter is 0.5 inch or less after cleanup. (d) Edge of cleanup is minimum 3.0 inches from supporting structure beveled edge, or mounting surface. 2. Damage exceeds 0.5 inch dia. After cleanup (figure 2-14) provided: (a) Damage limited to 12.0 square inches when only one skin	e. Same as listed for nicks and scratches.

Table 2-3. Classification of Damage — Honeycomb Panels (Cont)

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
		and core are affected, or 10.0 square inches when both skins and core are affected.	
		(b) Maximum two repairs per panel with 5.0 inches of undamaged material between repairs.	
		(c) Edge of cleanup minimum 3.0 inches from panel edge, cutout of supporting structure.	
f. Loose or damaged inserts.		f. Replace as required. (Figure 2-15.)	

2-33. Repair or Replacement — Honeycomb Panels.

Premaintenance Requirements for Repair of Honeycomb Panels

CONDITIONS	REQUIREMENTS
Model	UH-1H-II
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-331, C-317, C-324, C-309, C-325, and C-308) Abrasive pad, Abrasive cloth or paper
Special Environmental Conditions	

a. Repair nonpenetrating damage to external honeycomb panels (excluding titanium faced panels).

(1) Smooth contoured dents on surface may be filled and faired providing damage does not exceed limits of figure 2-12.

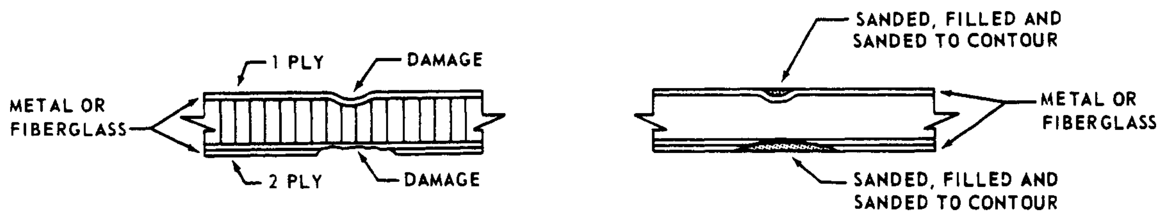
(2) Apply paint and primer to match surrounding area.

b. Repair holes, sharp dents and dents exceeding 10 percent of honeycomb panel thickness (excluding titanium faced panels). Repair damage (table 2-3) in accordance with figure 2-13 and the following instructions:

(1) Protect opening to prevent entry of cleaning materials.

(2) Remove paint and primer from surface extending 3.0 inches from edge of damage.

(3) Cut away skin and core to remove all damage. (Figure 2-13.)



FIBERGLASS AND METAL FACED HONEYCOMB PANELS — STRUCTURAL

DESCRIPTION OF DAMAGE

FIBERGLASS FACED PANELS

Dents, scratches, scars, or erosion in facings with no holes, cracks, or voids.

METAL FACED PANELS

Smooth dents or depressions in the skins with no holes, cracks, or voids.

LIMITS — REPAIRABLE DAMAGE

Fiberglass faced panels:

1. Maximum depth: 25% of panel thickness.
2. Minimum distance from an edge bevel: 0.500 inch.

Metal faced panels:

1. Maximum diameter of damage: 1.00 inch.
2. Maximum depth: 20% of panel thickness.
3. Maximum area of all dents combined in any one bay: 3% of area of bay.
4. Maximum of two 1.00 inch Dia. dents in a 3 square inch area.
5. No voids may exist under damage.
6. Minimum of 1.0 inch from panel beveled edge.

REPAIR PROCEDURES

FIBERGALSS AND METAL FACED

1. Remove paint and/or primer from damaged area.
2. Smooth out damaged area by lightly sanding with Scotchbrite pad (C-407) or No. 400 grit abrasive paper (C-423).
3. Clean sanded area with MEK (C-309) and wipe dry.
4. Apply adhesive (C-317) with suitable tool, such as spatula, putty knife, etc. Level to panel contour and allow to cure.
5. Sand smooth with Scotchbrite pad (C-407) or No. 400 grit paper (C-423).
6. Apply two coats of lacquer of color to match original finish.

UH-1H-II-M-02-12

Figure 2-12. Honeycomb panels — repair of dents, scars and scratches

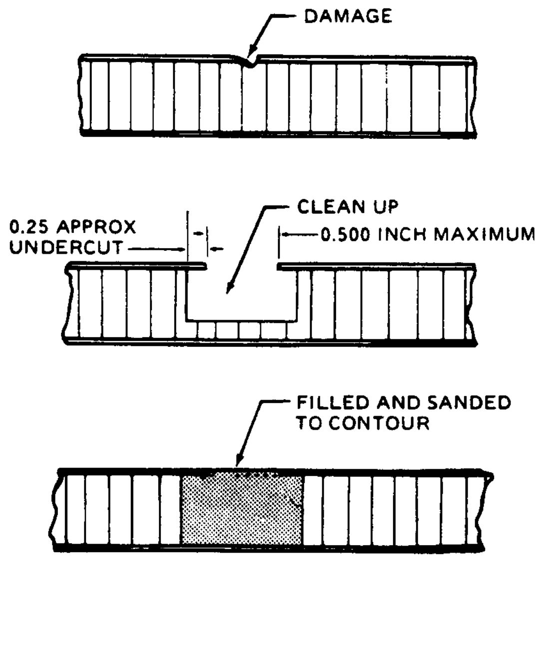


Figure 2-13. Honeycomb panels — minor damage repair

CAUTION

All corrosion and damage must be removed. do not cut into inner skin or panel. No corrosion or water allowed in core.

(4) Flush cavity with MEK (C-309). Dry immediately with clean compressed air.

(5) Fill cavity with adhesive (C-324).

(6) Sand adhesive to contour (after curing) and refinish area to match surrounding finish.

c. Repair honeycomb panels requiring a cleanup hole in excess of 0.50 inch diameter (excluding titanium faced panels) in accordance with figure 2-14 and the following instructions

CAUTION

Repairs to honeycomb panels must be applied subject to component limitations, and must not be accomplished if weight and balance, structural integrity, interchangeability or operational characteristics will be adversely affected.

(1) Protect the opening to prevent entry of cleaning agents and solvents.

(2) Remove paint and primer from an area extending 3.0 inches beyond the edge of damage.

(3) Cut away skins and core to remove all damaged and contaminated material. Undercut core approximately 0.10 inch from edge of cleanup. Use a minimum of 0.500 inch radius at corners. Do not exceed cleanup limits of table 2-3.

CAUTION

Any core of skin contaminated by fuel, oil, water, corrosion or debris must be cut out. Replace panel if water or corrosion is found in panel.

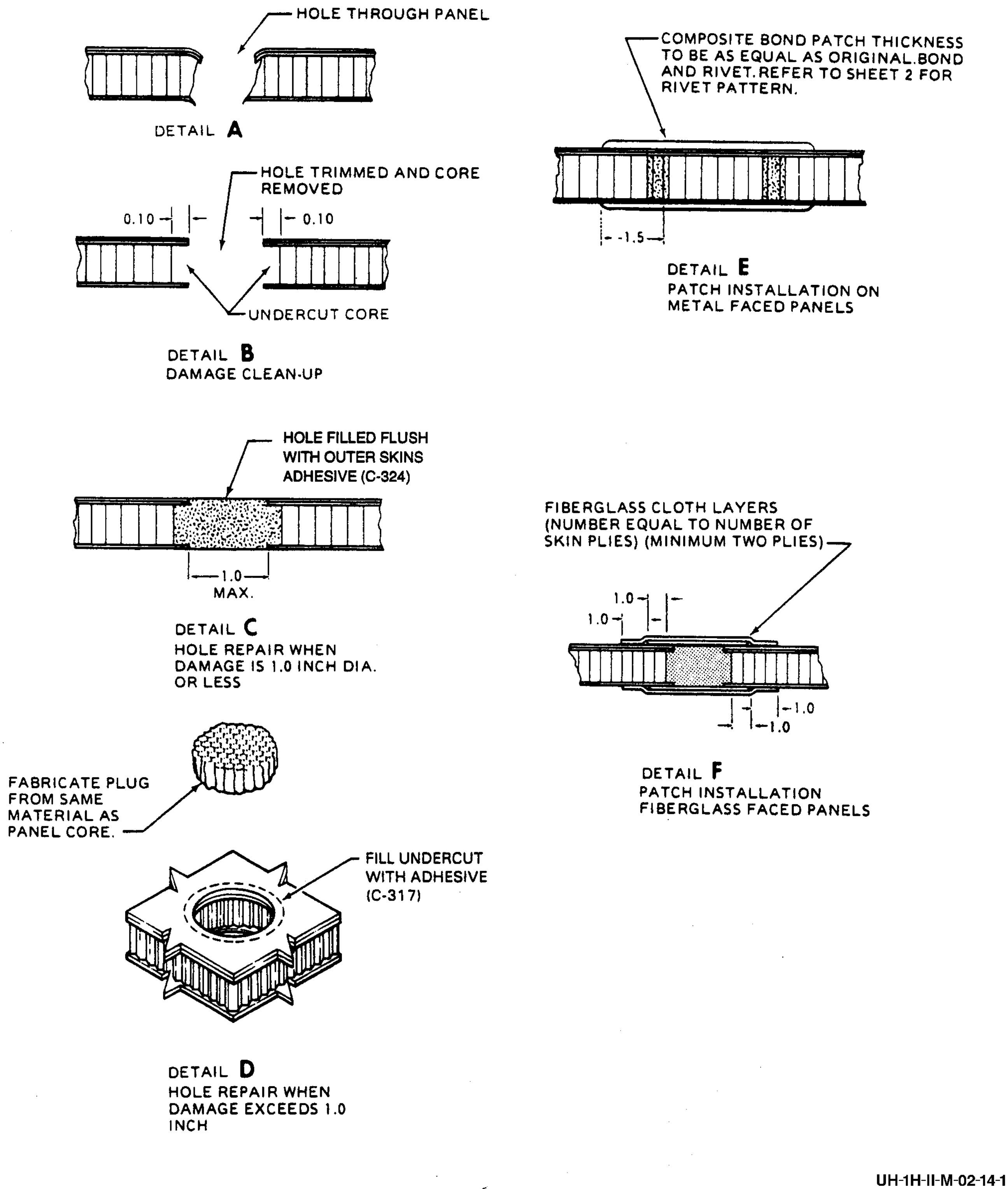


Figure 2-14. Honeycomb panels (Sheet 1 of 2)

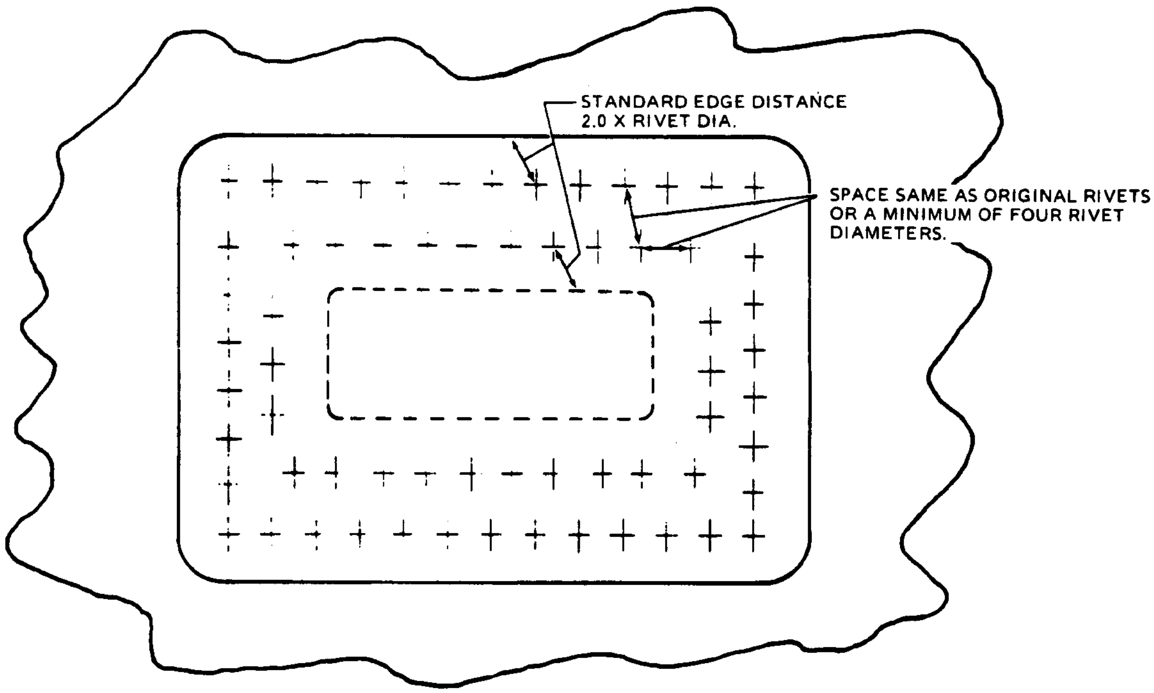


Figure 2-14. Honeycomb panels (Sheet 2 of 2)

NOTE

Where damage is limited to one skin, the opposite skin may be left intact provided cleanup operations do not cut into the skin.

(4) Flush the cavity with MEK (C-309). Dry promptly with clean dry compressed air.

(5) Fill the cavity as follows:

(a) Damage of 1.0 inch or less in diameter may be filled with adhesive (C-324) and smoothed to contour of skins. (Figure 2-14, Detail C.)

(b) Damage exceeding 1.0 inch in diameter must be filled with a core plug of like honeycomb material. Refer to following steps 1 through 5. (See Detail D.)

1. Cut a core plug (use only clean material of the same type as original) to fit the damaged area allowing approximately 0.10 inch gap for adhesive at the edges.

2. Flush the plug with MEK (C-309) and dry immediately with dry filtered air.

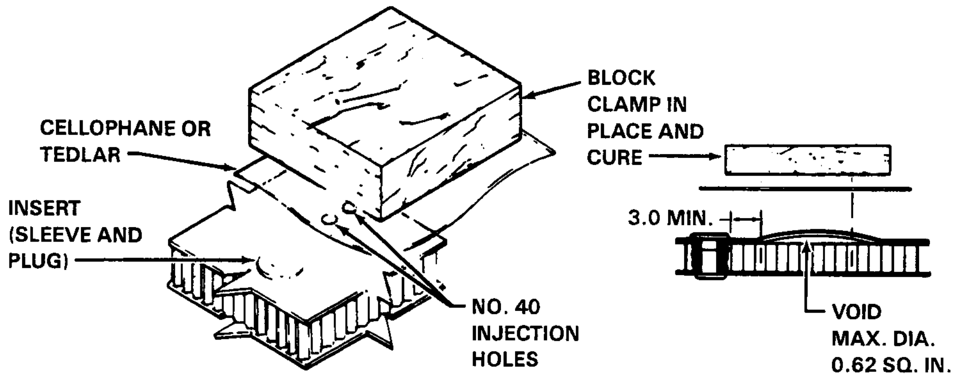
3. Apply a 0.20 to 0.30 inch film of adhesive to a piece of P.V.F. Tedlar (area to be equal to surface area of plug).

4. Place the core plug on the adhesive, apply firm contact to five PSI pressure, and allow adhesive to cure.

NOTE

This will seal the core cells and provide a better bonding surface. If both panels skins are affected, both sides of plug should be sealed.

5. Protect the core plug from contamination until ready for use.



INSERT OF BONDED PANELS

APPLICATION A:

Void existing in area of metal insert bonded in honeycomb panel.

RESTRICTIONS A:

1. Void area not to exceed 0.62 inch square.
2. Insert not to be damaged.
3. Edge of void 3.0 inch minimum from insert.

REQUIRED A:

Adhesive (C-331)

PROCEDURE A:

1. Drill No. 40 holes at each end of void.
2. Inject adhesive (C-331) into one hole until it flows out opposite hole.
3. Clamp flat and cure.
4. If void enlarges or still exists after full cure, submit for re-evaluation.
5. Refinish as required if void is eliminated.

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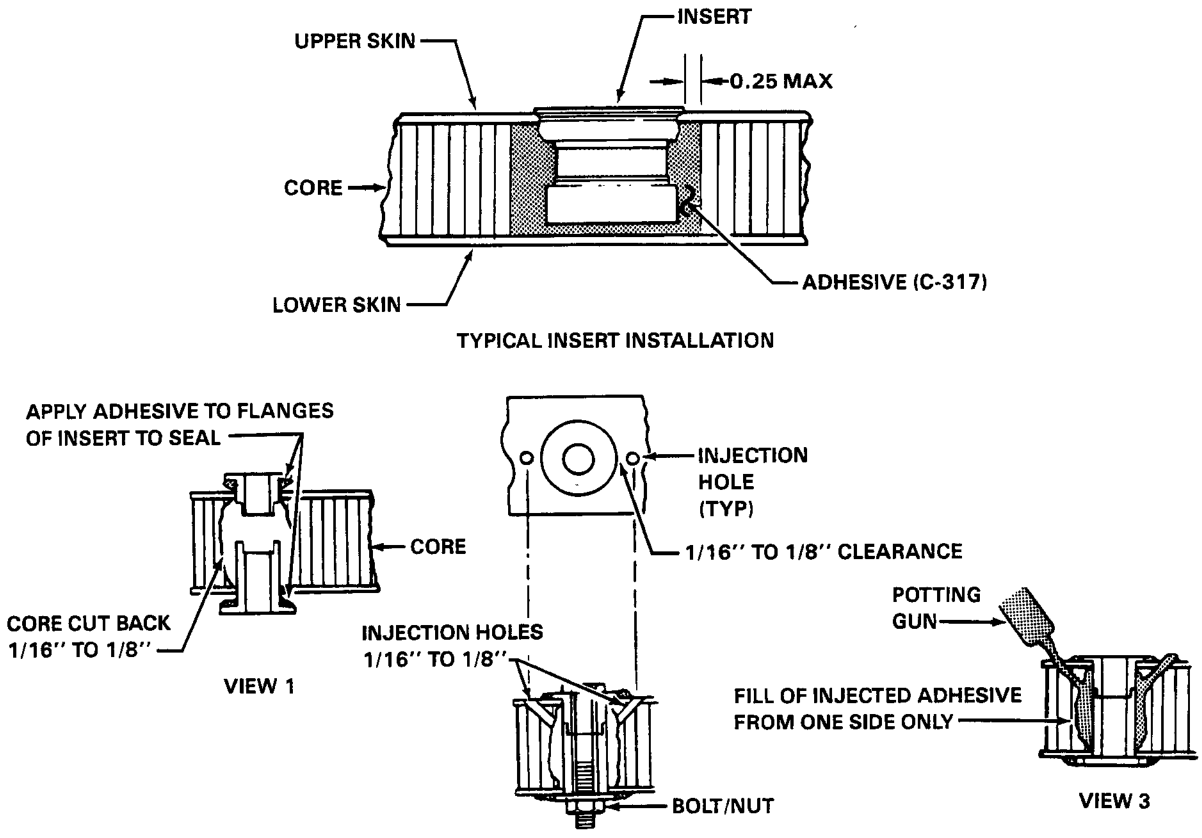
Figure 2-15. Inserts of bonded panels (Sheet 1 of 2)



TYPICAL SLEEVE AND PLUG INSTALLATION

INSERTS OF BONDED PANELS

APPLICATION B:

Damaged or improperly installed potted insert that can be removed by counterboring without enlarging the blueprint size hole in the panel surfaces.

RESTRICTIONS B:

1. **Adhesive (C-317) 33 parts "B" to 100 parts "A".**

REQUIRED B:

1. **Adhesive (C-317) 33 parts "B" to 100 parts "A".**
2. **Insert.**

PROCEDURE B:

1. **Counterbore to depth required to remove discrepant inserts without enlarging existing holes through outer skins.**
2. **Install insert with adhesive (C-317) and fair.**
3. **Refinish as required.**

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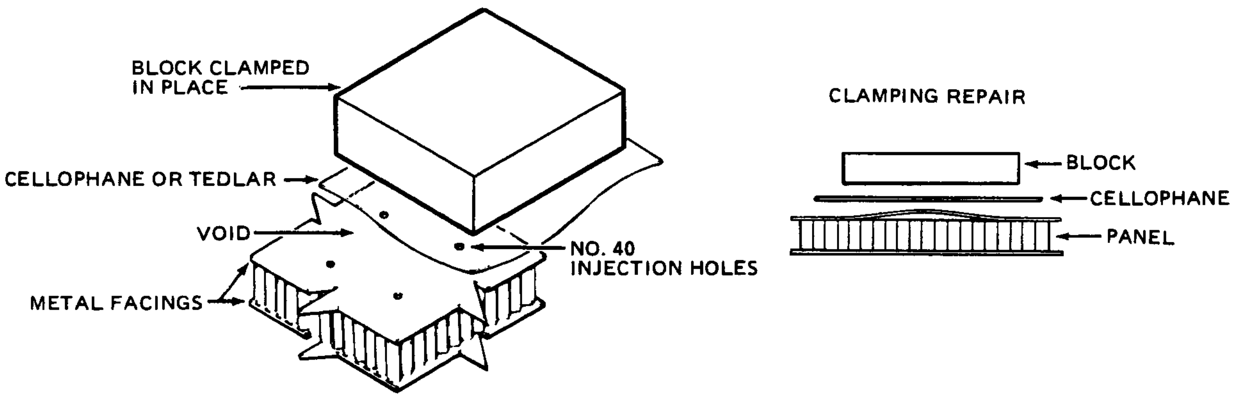
Figure 2-15. Inserts of bonded panels (Sheet 2 of 2)



REPAIR OF VOIDS IN METAL SURFACED BONDED PANELS

APPLICATION A

DAMAGE DESCRIPTION A:

Adhesion voids between metal skin and core less than 1.5 square inches.

RESTRICTIONS A:

1. Total area of voids shall not exceed 3 percent of total panel area.
2. A minimum of two inches between voids is allowable.
3. Voids shall not occur within 3.0 inches of an insert of adjacent structure.
4. Prior Approval. Engineering authorization required.
5. If void spreads or is not eliminated at injection and/or curing, panel is to be resubmitted to engineering for evaluation.

REQUIRED A:

1. Adhesive (C-331).
2. Adhesive (C-317)

PROCEDURE A:

1. Drill No. 40 holes around edge of damage a minimum of 1.0 inch apart. Use as many holes as required to ensure complete filling of cavity.
2. Inject adhesive (C-331) with hypodermic syringe until forced out opposite hole.
3. Cover repair with cellophane and level out by clamping with blocks. Allow to cure.
4. Seal holes with adhesive (C-317).
5. Clean up and smooth with sandpaper. Refinish as required.

UH-1H-II-M-02-16-1

Figure 2-16. Repair of voids in metal surfaced bonded panels (Sheet 1 of 2)

REPAIR OF VOIDS IN METAL SURFACED BONDED PANELS

APPLICATION B

DAMAGE DESCRIPTION B

Edge voids or delaminations.

RESTRICTIONS B

1. Voids shall not extend into attachment holes.
2. Void must be less than four inches in length.
3. No more than three voids per panel.
4. Minimum distance between two distinct voids to be 1.0 inch.
5. Prior Approval. Engineering authorization required.
6. If void spreads or is not eliminated at injection and/or curing panel is to be resubmitted to engineering for evaluation.

REQUIRED B

1. Adhesive (C-331).
2. Sealant (C-308)

PROCEDURE B

1. Inject void with adhesive.
2. Sealant may be used for edge sealer.
3. Cover repair with cellophane or tedlar and level out by clamping. Cure under pressure.
4. Clean up and smooth with sandpaper.

UH-1H-II-M-02-16-2

Figure 2-16. Repair of voids in metal surfaced bonded panels (Sheet 2 of 2)

(6) Patch metal faced panels as follows:

(a) Cut a skin patch of composite bond material (prebond), sufficiently large to provide a 1.5 inch overlap outside of the damaged skin trim. Remove the peel ply protecting and adhesive and apply adhesive (C-324) evenly to the patch 0.020 to 0.030 inch thick. Minimum patch thickness to be that of existing skin. (Figure 2-14, detail E.)

NOTE

Where the panel is curved, the skin patch must be shaped to match.

(b) Install skin patch over the repair area.

NOTE

Rivets are to be installed within the pot life of the adhesive.

(c) Add NAS1738-4-1 rivets or equivalent around patch in the overlap area at a maximum spacing of one and one-half inches and with 2 D edge distance.

(d) Apply pressure to the patch in the cavity area to ensure a good bond.

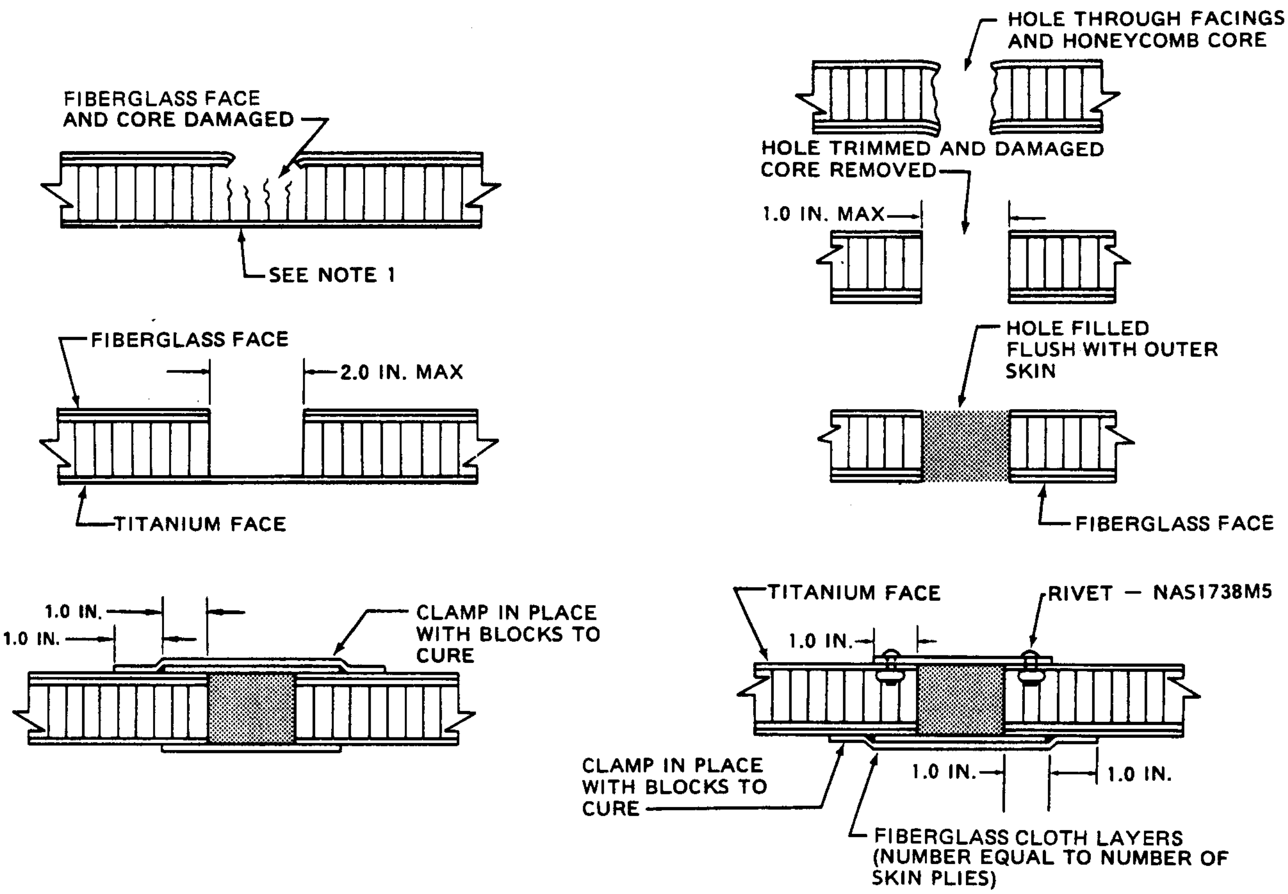
(7) Patch fiberglass faced panels as follows:

NOTE

Fiberglass repairs should be accomplished after core plug has cured.

(a) Prepare a patch of fabric layers (equal to number of plies lost) or minimum of two plies to provide a minimum of 1.0 inch minimum overlap outside the damaged skin trim and to provide a minimum of 1.0 minimum overlap over each preceding layer. (Figure 2-14, Detail F.)

(b) Saturate the first patch with adhesive (C-331). Apply resin to the exposed filler and to the exposed clean area of the panel around the damage.



NOTE 1

If the titanium face has been damaged, the damage after clean-up shall not exceed the limits of repairable damage for titanium facing. Repair in accordance with titanium face repair procedures.

NOTE 2

If water or corrosion is found in the honeycomb, the entire panel must be replaced.

FIBERGLASS AND METAL FACED HONEYCOMB PANELS-STRUCTURAL

DESCRIPTION OF DAMAGE

FIBERGLASS FACE

Damage penetrating one or both facings and extending into core. The following limits apply only to fiberglass facings and core damage associated with it.

TITANIUM FACE

Damage penetrating titanium facing greater than 0.50 inch diameter, and damage extending completely or paritally through panel.

UH-1H-II-M-02-17-1

Figure 2-17. Honeycomb panel — repair of damage penetrating titanium and fiberglass facings and cover (Sheet 1 of 2)

LIMITS — REPAIRABLE DAMAGE

FIBERGLASS FACE

1. Maximum damaged area after clean-up: Total of 3.0 square inches. Applies whether a single area of combination of separate areas.
2. Maximum length of damage: 2.0 inches in any direction.
3. Maximum diameter of cleanup hole 2.0 inches.
4. Minimum distance of completed repair from an edge bevel: 1.0 inch.
5. Minimum distance between adjacent repairs 2.0 inches (distance measured from edge of patch).
6. Maximum of one repair per bay.

TITANIUM FACE

1. Maximum diameter of any hole after cleanup is 1.0 inch.
2. Only one 1.0 inch hole is permitted per bay, except in critical edge areas.
3. Minimum distance from existing repair is 2 inches.
4. Minimum distance from an edge bevel is 1.0 inch.
5. Minimum distance between adjacent repairs 3.0 inches (distance measured from edge of patch).
6. Minimum distance between edge of patch, fitting, hard point, or insert is 3.0 inches.

REPAIR PROCEDURE

FIBERGLASS FACE

1. Clean up damage with counterbore or hole cutter. If damage is limited to one side of panel, counterbore only deep enough for proper cleanup.
2. Pack hole with adhesive (C-317). Allow to cure and lightly sand with Scotchbrite pad (C-407) to smooth surface. Clean with Methyl-Ethyl-Ketone (C-309) and wipe dry.
3. Cut fiberglass plies from 181 weave fiberglass cloth (C-404) as necessary to equal the number of plies in the area being repaired. Each ply shall be of sufficient size to overlap the ply being covered by 1.0 inch in all directions. Saturate all plies with adhesive (C-331).
4. While still wet, position fiberglass plies over repair area as shown.
5. Cover repair area with cellophane PD-600, FSCM 82348, or P.V.F. Pedlar No. 40S, FSCM 82348. Press down to smooth and allow to cure.
6. Remove cellophane or Tedlar after curing and sand lightly, if necessary, with Scotchbrite pad (C-407).
7. Apply two coats of paint of color to match original finish.

TITANIUM FACE

1. Clean up damage with counterbore or hole cutter. If damage is limited to one side of panel, counterbore only deep enough for proper cleanup.
2. Pack hole with adhesive (C-317). Allow to cure and lightly sand with Scotchbrite pad (C-407) to smooth surface. Clean with Methyl-Ethyl-Ketone (C-309) and wipe dry.
3. Cut patch from stainless steel or titanium sheet.
4. Bevel the edges of patch.
5. Clean all surfaces with Methyl-Ethyl-Ketone (C-309).
6. Lay out rivet pattern (space rivets to a minimum of 4D or equivalent spacing of adjacent edge attachments) and position patch in place and drill. Deburr all holes.
7. Apply adhesive (C-317) to patch and position patch in place. Rivet patch to panel at predrilled location using NAS1738M5 rivets.
8. Apply two coats of paint of color to match original finish.

UH-1H-II-M-02-17-2

Figure 2-17. Honeycomb panel — repair of damage penetrating titanium and fiberglass facings and cover (Sheet 2 of 2)

(c) Fit the impregnated patch into place. Smooth out air pockets and wrinkles.

NOTE

Ensure the adequate resin is forced through the patch ply in the core area.

(d) Saturate each succeeding ply with adhesive (C-331) and brush coat the entire repair area with resin and apply the patch. Work each ply to remove the wrinkles and entrapped air prior to application of the next ply. Minimum number of plies to be the same as existing skin.

(e) Cover repair with cellophane and apply firm contact pressure to the patch with shot bags, clamps, vacuum bag or other suitable means.

d. Repair bonded panel inserts. Refer to figure 2-15 for repair limitations and instructions.

2-34. Repair or Replacement — Honeycomb Panel Service Decks. Repair engine service decks as follows:

a. Center service deck repair.

NOTE

If any bonding separation is in excess of that defined in the following steps (1) and (2) or if core is damaged, or damage penetrates honeycomb facings, replace center service deck.

(1) If bonding separates around the edge of large hole in canted portion of service deck or at center fuel cell access door, repair in accordance with figure 2-18.

(2) If bonding separates in area of the aft engine mount fittings at station 200, repair as outlined in figure 2-18.

b. Left and right side service deck repair.

(1) Dents in top skin constitute negligible damage and need not be repaired provided the top skin is not pierced and the fiberglass facing on the underside is not cracked.

(2) If bonding separates around edges of large hole in right side service deck repair in accordance with figure 2-18 by injecting adhesive (C-317) and sealing edges.

(3) Repair acceptable voids in accordance with figure 2-16, observing all restrictions.

(4) Repair penetrating damage in accordance with figure 2-17, observing all damage limits.

c. Replace left side or right service deck if repairable limits are exceeded as follows:

CAUTION

All titanium panels except center work deck panels can be replaced providing adequate precautions are taken to prevent airframe distortion during the operation. The precautions include removing all heavy components such as engine, fuel, transmission and tailboom, and supporting the fuselage in a level position while removing and replacing a defective panel, one at a time.

NOTE

Instructions are for either left or right side service decks.

(1) Support tailboom with sling or stand.

(2) Open engine and transmission cowl. Remove engine cowl, tail pipe fairing and lower left or right fairings. Remove compartment doors below engine deck level, left or right side.

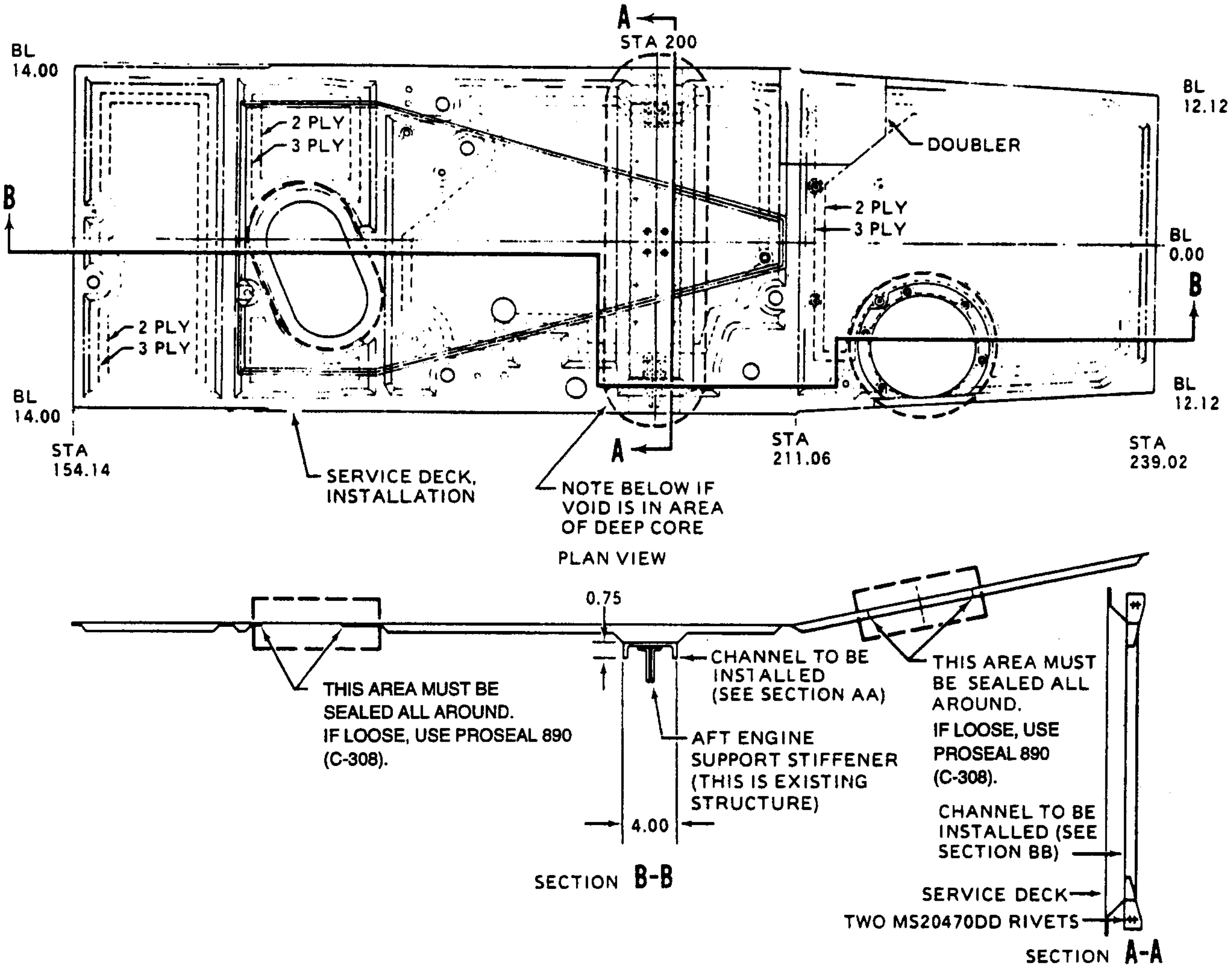
(3) Remove V-band clamp and tail pipe.

(4) Remove screws securing tail rotor driveshaft fireshield to lower aft firewall. Loosen clamp securing driveshaft boot. Remove clamp retaining tail rotor driveshaft to coupling on forward driveshaft support.

(5) Remove screws or fasteners securing upper aft firewall to lower aft firewall.

(6) Remove screws attaching lower aft firewall to service deck. Remove screws from forward and aft brace legs of firewall. Retain any shims under legs for re-use.

(7) Remove upper aft firewall to allow movement of lower aft firewall.



NOTES

1. The area around the hole in the canted deck and the area around the fuel cell access panel must be sealed all around. If voids are present, seal with Pro Seal 890 (C-308). See Section B-B and Plan view.
2. If bonding separation occurs in the area of the engine mount fittings at Station 200, repair as follows:
   a. Fabricate a channel for installation between service deck and aft engine support stiffeners. Make the channel from aluminum alloy sheet 0.025 inch thick, 2024-T3 Alclad, QQ-A-250/5. Make the channel web 4 inches wide with 0.75 flanges on 0.12 inch bend radius as shown in side view. Make channel approximately 25 inches in length to extend from the lower beveled edge on one side of the service deck to the same location on the opposite side as illustrated in Section A-A.
   b. Remove aft engine support stiffeners. There are four stiffeners located under the aft engine mount fittings. There are two screws and two rivets holding each stiffener.
   c. Drill holes in channel to match holes for aft engine support stiffeners (four holes at each end). Drill holes at approximate center of channel to prevent interference with existing holes or nutplates at this location. Deburr holes and apply two coats of unreduced zinc chromate primer (C-201).
   d. Position channel next to service deck with flanges down as illustrated in Section B-B. Install four aft engine support stiffeners with two screws for each stiffener. Install two rivets at end of each support stiffener (see Section A-A).

UH-1H-II-M-02-18

Figure 2-18. Center service deck panel repair

(8) Drill out rivets and remove the turnlock receptacle bracket or angle from edge of the service deck.

(9) Remove three bolts, dowel or shear pin, and bracket from aft outboard corner of service deck and forward fuselage aft bulkhead.

(10) Remove electrical harness, clamps, and clips from service deck.

CAUTION

Be careful when removing rivets to prevent damage to fuselage or elongation of rivet holes.

(11) Remove rivets securing deck to main beams and lateral bulkheads. Remove service deck.

NOTE

Firewall is loosened to permit access to rivets and to allow removal of deck. Slide firewall fore and aft or lift as necessary.

(12) If a new service deck is not to be installed immediately, fabricate a holding fixture or strap to be installed in place of service deck as follows:

(a) Fabricate a strap of aluminum alloy approximately 1/8 inch thick, length sufficient to pick up rivet holes on outboard and inboard sides at approximately station 190.00 and wide enough to pick up two fasteners at each end.

(b) Install fixture or strap on helicopter by back-drilling holes in ends of straps through existing rivet holes and using 1/8 steel screws and nuts to secure.

(c) Holding fixture should remain installed until new service deck is ready for installation. Place sign in area to prevent personnel from climbing on fuselage at location of repair.

(13) Position service deck on main beams and lateral bulkheads. Hold or clamp tightly in place and back-drill existing rivet holes, fastening deck with cleco fasteners or equivalent, as drilling progresses.

(14) Check all screw and bolt holes for alignment. Install service deck using MS20426AD4, MS20470AD4, and MS20615M4 rivets as indicated in figure 2-19. Omit rivets on edge of deck where turnlock receptacle in located.

(15) Position aft firewall on service deck and install previously removed shims under the forward and aft brace legs.

(16) Install screws through firewall lower flange and through fore and aft legs. Install all screws prior to tightening.

(17) Install bracket with dowel or shear pin and three bolts at the aft outboard corner of the service deck and the forward fuselage aft bulkhead. Install two bolts from inside track, heads down. (Figure 2-19, detail A.)

(18) Install turnlock receptacle bracket or angle (lower cowl) on edge of service deck using MS20470AD4 or NAS1738B-4 rivets

(19) Secure upper aft firewall to lower aft firewall.

(20) Secure tail rotor driveshaft clamp retaining coupling to forward driveshaft. Install screws securing tail rotor driveshaft fireshield to lower aft firewall. Tighten clamp securing driveshaft boot.

(21) Install electrical harness, clips and clamp to service deck.

(22) Install tail pipe and V-band clamp.

(23) Install tail pipe fairing, engine cowl, and lower left or right fairings. Install compartment doors below engine deck lever, left or right side.

(24) Close cowl and remove tailboom support.

d. Remove fuel cell cover as follows:

(1) Remove screws and bolts retaining fuel cell cover to airframe.

(2) Using a suitable tool, separate the fuel cell cover from sealant around edges of cover. Remove cover.

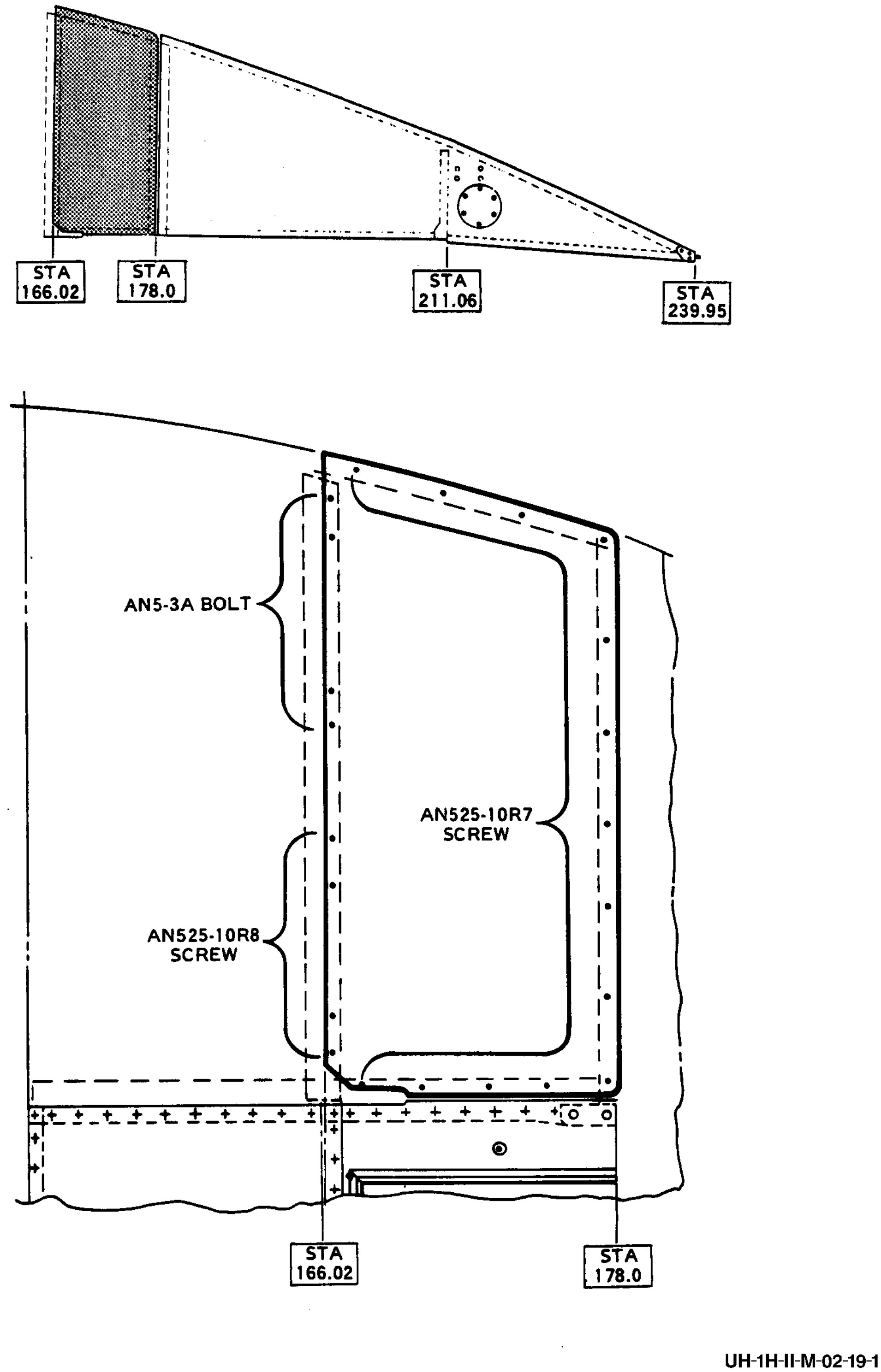


Figure 2-19. Right and left service deck (Sheet 1 of 3)

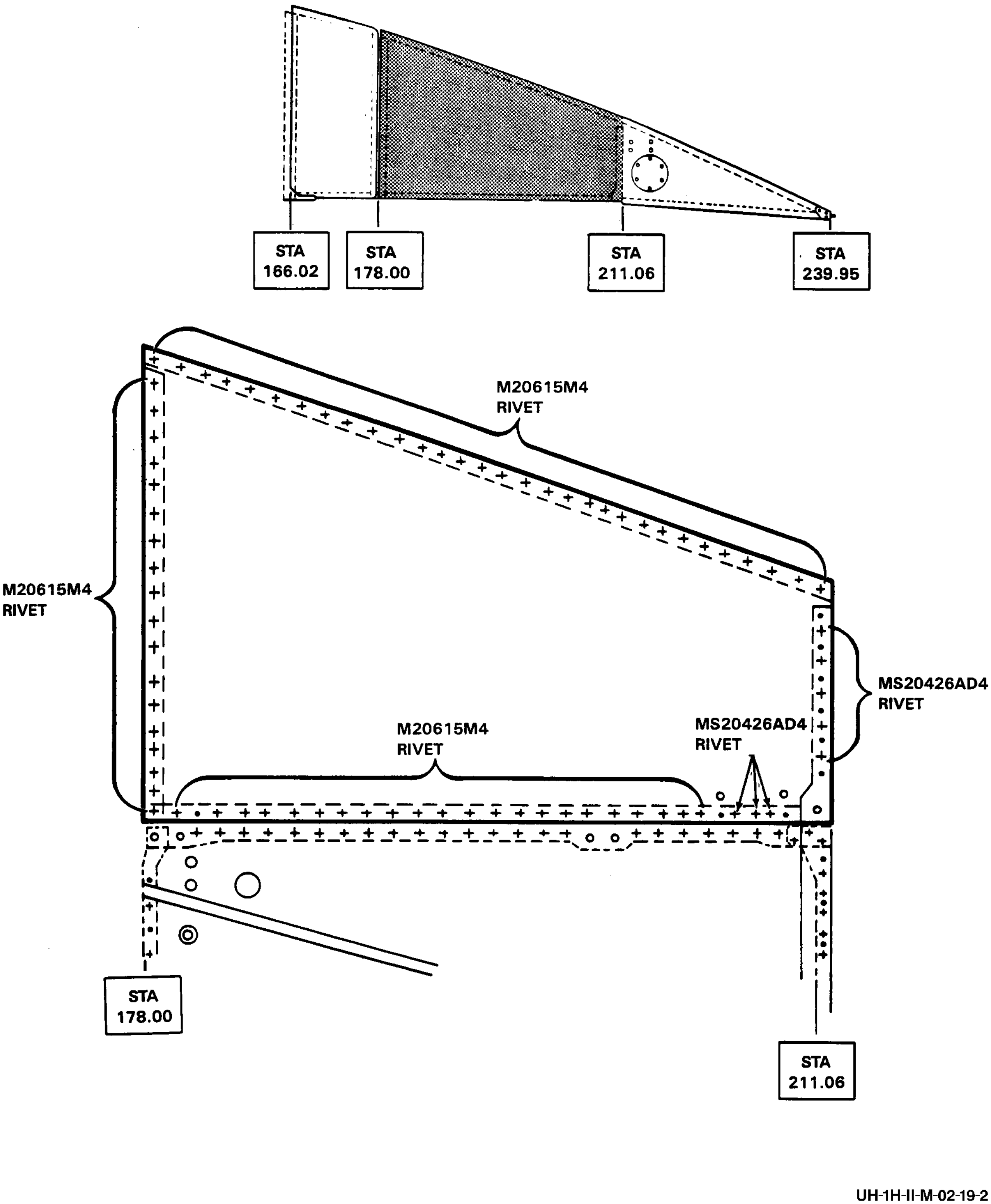
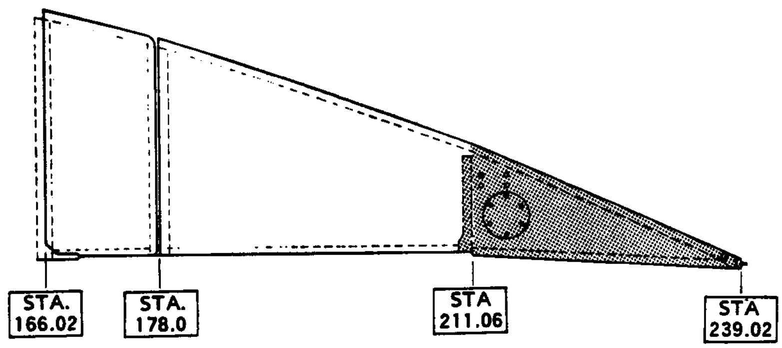
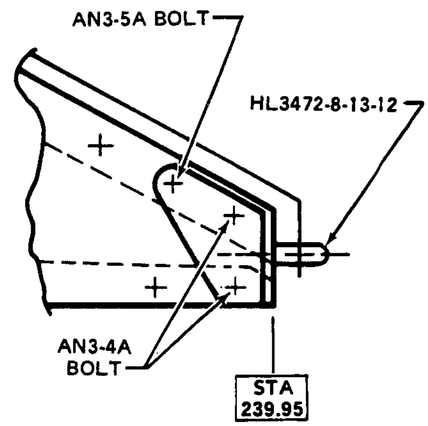


Figure 2-19. Right and left service deck (Sheet 2 of 3)





DETAIL A

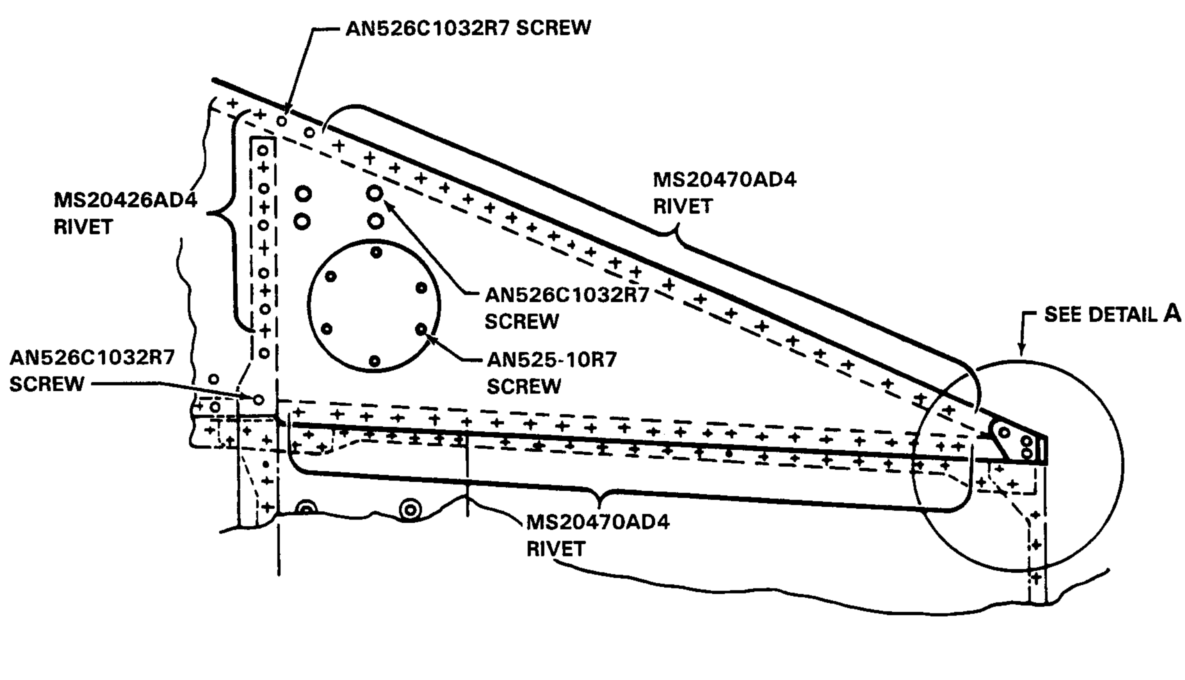


Figure 2-19. Right and left service deck (Sheet 3 of 3)

(3) Apply coat of sealant (BHT Spec 299-974-074, Type 2, Class 1, 2, 3) to edge of fuel cell cover and fuel opening on aircraft. Position cover on airframe and install with previously removed screws and bolts.

2-35. SHEETMETAL SKINS.

2-36. Description — Sheetmetal Skins. The external skins of the forward and aft sections consist of formed aluminum alloy or magnesium skins and aluminum alloy faced honeycomb panels. (Figure 2-5 and 2-6.)

2-37. Classification of Damage — Sheetmetal Skins. Refer to table 2-3 for honeycomb panels, table 2-4 for sheetmetal skins.

Table 2-4. Classification of Damage — Sheetmetal Skins

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
Damaged, loose, missing, sheared, or improperly installed fasteners.		Replace as required.	
a. Dents	a. Smooth contoured dents, free of cracks or gouges. Depth and diameter not to exceed: Depth Diameter 1/64 in. 1.0 in. 3/64 in. 2.0 in. 1/16 in. 3.0 in. Nicks and scratches in a dent not to exceed 10 percent of material thickness after polishing. Dents shall come no closer than 1.0 inch to internal structure and have a minimum of 3.0 inches of undamaged material between dents. NOTE: Dents closer than 1.0 inch are classed as one dent.	a. Damage exceeds negligible limits but does not exceed 25 percent of total area for a single skin panel (including prior repairs). Damage is 6.0 inches minimum distance from a similar repair and comes no closer than 2.0 inches to supporting structure.	a. Damage exceeds repairable limits between any two bulkheads. Damage and subsequent repair interferes with supporting structure.
b. Corrosion	b. Not to exceed 10 percent of material thickness and less than 4.0 square inches	b. Damage exceeds negligible limits. Cleanup shall not exceed 5 percent	b. Damage exceeds repairable damage limits.

Table 2-4. Classification of Damage — Sheetmetal Skins (Cont)

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	after cleanup. Damage 1.0 inch minimum from internal structure.	of skin panel area and come no closer than 2.0 inches to supporting structure.	
c. Holes, cracks and tears.	c. None	c. Cracks or tears no longer than 25 percent of shortest skin dimension. Holes 30 inches max. dia. Cleanup no closer than 2.0 inches to supporting structure and affect no more than 5 percent of skin area.	c. Damage exceeds repairable damage limits.
d. Nicks and scratches.	d. No deeper than 10 percent of material thickness and less than 4.0 square inches after cleanup.	d. Same as preceding step c.	d. Damage exceeds repairable limits.
e. Trapped or stretched skin.	e. Inward or outward bulges located in a sectional area, that can be corrected by removing attaching hardware, allowing skin to shift. Mismatch or rivet holes shall not exceed that which can be cleaned up by drilling and installing one size larger rivet and maintain proper rivet edge distance. However, if condition does not disappear after unloading panel, area is stretched or oil canned and must be replaced or repaired. Oil canning	e. Creased dents not classified as oil can or stretched skin, not exceeding 25 percent of a sectional area and no closer than 1.0 inch to a supporting structure. Oil can condition, free of sharp dents or creases and not extending over or into supporting structure may be repaired by inserting a backup stiffener over the damaged area.	e. Stretched skin, oil cans, or creased dents that cannot be repaired by unloading, insertion repair or backup stiffeners.

Table 2-4. Classification of Damage — Sheetmetal Skins (Cont)

DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	or stretched condition can be determined by pressing in on a sectional area and that section remains depressed and a bulge appears in that section or adjacent structure.		

2-38. Repair — Sheetmetal Skins. Repair acceptable damage to sheetmetal skins as follows:

a. Polish out acceptable nicks, scratches, and corrosion classified as negligible in table 2-4. Treat corroded areas in accordance with paragraphs 2-13 through 2-30 as necessary.

b. Repair mechanical and corrosion damage that is within repairable limits. See figure 2-20 through 2-23 for typical repair illustrations.

c. Refer to TM 55-1500-204-25/1 for additional standard repairs and fastener replacement.

d. Refinish repaired areas ad replace any decals or stencils removed in accordance with TB 746-93-2.

2-39. ACCESS COVERS AND DOORS.

2-40. Description — Access Covers and Doors. Removable access covers and doors are provided for inspection, replacement of parts, servicing and adjustment of parts. Screws are used to secure removable panels in stressed areas. Panels in stressed areas are identified in figure 2-24, with an asterisk and shall be installed prior to towing, jacking or flight.

2-41. Inspection — Access Covers and Doors. Inspect access doors and covers as follows:

a. Smooth contoured dents, free from cracks ad which do not affect function of part are acceptable.

b. Missing or damaged fasteners.

c. Cracks or tears no longer than 25 percent of shortest cover dimension are repairable.

d. Corrosion damage not exceeding 10 percent of material thickness and less than 4.0 square inches after cleanup is acceptable.

2-42. Repair or Replacement — Access Covers and Doors. Repair access covers and doors as follows:

a. Replace damaged, loose, and missing fasteners in accordance with TM 55-1500-204-25/1.

b. Repair cracks, holes, and tears in accordance with TM 55-1500-204-25/1.

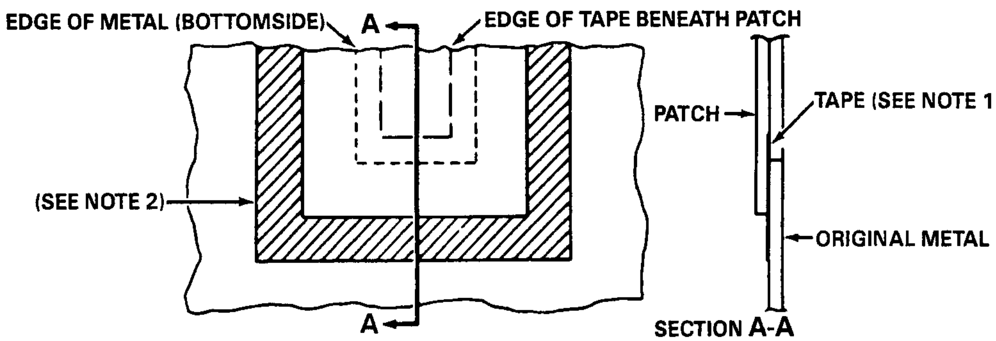
c. Remove and treat corrosion in accordance with TM 55-1500-204/25/1 and CSSD-PSE-87-001.

d. Replace any cover or door if damage is extensive or repair will affect function of door or cover.

e. Paint repaired areas and replace any decals or stencils in accordance with TB 746-93-2.

2-43. CABIN FLOORS PANELS.

2-44. Description — Cabin Floor Panels. The cabin floor (figure 2-25) consists of removable and fixed honeycomb panels. Fittings installed in the floor panels incorporate studs or tie-down rings or a combination of both. The tie-down fittings provide a mounting point for troop seats or litters.

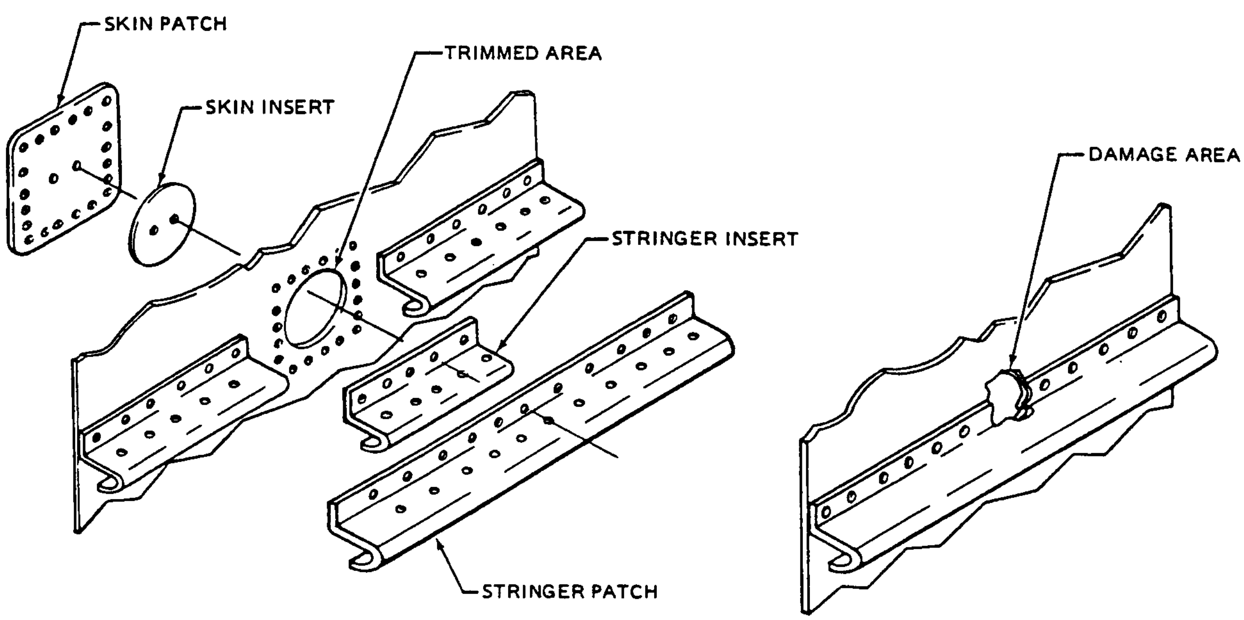


NOTES

1. Apply tape between dissimilar metal joints to extend at lease 1/4 inch past metal joint.
2. Use vinyl tape (C-430).
3. In moisture traps.
   a. The tape shall extend sufficiently past the joints to prevent bridging by water.
   b. Drain holes shall be provided wherever necessary subject to approval of engineer.

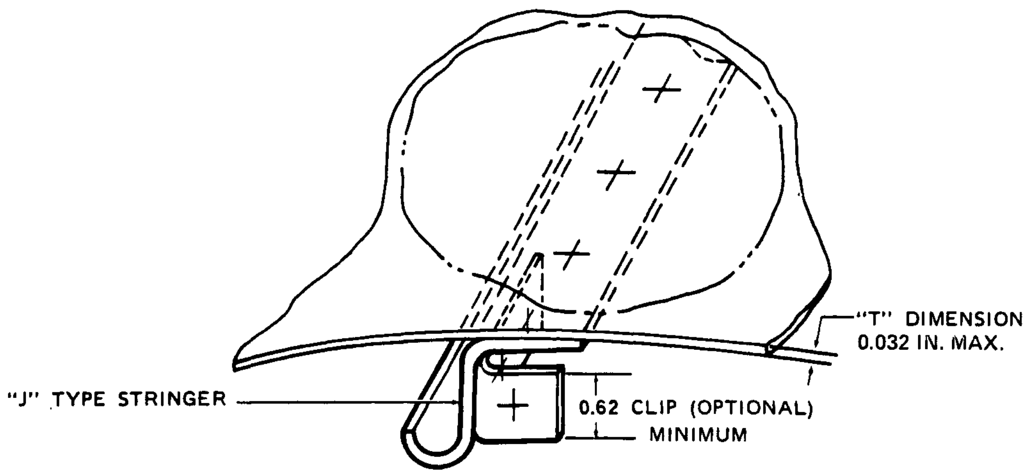
UH-1H-II-M-02-20

Figure 2-20. Dissimilar metal corrosion protection



UH-1H-II-M-02-21

Figure 2-21. Combined skin and stringer repair



OIL CAN REPAIR

APPLICATION:

For components where excess metal exists between structure creating false contour or "Oil Can".

RESTRICTIONS:

(1) Nonapplicable to skins that exceed 0.032 inch thick.
(2) Damage cannot extend into stiffeners or other supporting structure.

REQUIRED:

(1) "J" type stringer (Bell STD No. 120-021-32) of like material grouping.
(2) Clip (optional) of like material grouping.
(3) Rivets compatible with material grouping and dissimilar metals. See procedure, step (1), for diameter, spacing and edge distance.

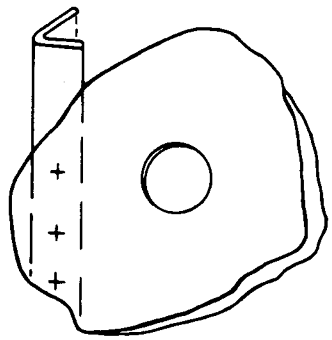
PROCEDURE:

(1) Attach "J" stringer or angle, using rivets same size and pitch as surrounding area. Rivet edge distance equal to two times the diameter of the rivet. Locate "J" stringer or angle through center of "Oil Can" area.
(2) Gauge of clips must be the same gauge as the "J" stringer or angle. Use of clips is restricted to application where adjacent structure permits use, and where clips are needed to secure added members, otherwise not necessary.
(3) Attach clips with three rivets as shown. Rivet size and spacing same as used to attach the "J" stringer.

PRIOR APPROVAL - Engineering authorization required.

UH-1H-II-M-02-22

Figure 2-22. Oil can repair in skin



APPLICATION A

REPAIR BY REMOVING DAMAGED AREA

APPLICATION A:

For damaged internal aluminum webs and similar sheet structure.

RESTRICTIONS A:

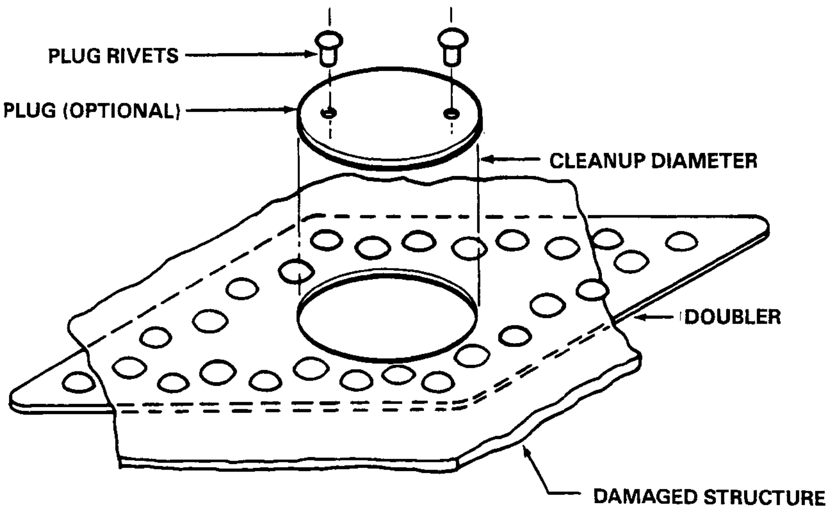
(1) Nonapplicable in areas susceptible to toxic or flammable fumes.
(2) Maximum cleanup to be 0.50 inch diameter.
(3) Location limited to one cleanup diameter from nearest adjacent structure.
(4) Nonapplicable to exterior skins and the tail boom assembly.
(5) Engineering authorization required.

PROCEDURE A:

(1) Stop drill with a No. 40 drill or rout out to minimum diameter (0.50 inch maximum) and deburr.
(2) Touch up raw edges.

UH-1H-II-M-02-23-1

Figure 2-23. Sheetmetal patch (Sheet 1 of 7)



APPLICATION B

SHEETMETAL INSERTION REPAIR

APPLICATION B:

For damaged aluminum webs and skins.

RESTRICTIONS B:

(1) Location limited to a minimum distance of 1.5 inches from edge of cleanup to nearest adjacent structure.
(2) Maximum cleanup area to be 2.0 inches in diameter.
(3) Two repairs to a skin bay section. Damage areas to be no closer than 4.0 inches apart after cleanup. A skin bay section is defined as that area of skin framed on four sides by supporting structure.

REQUIRED B:

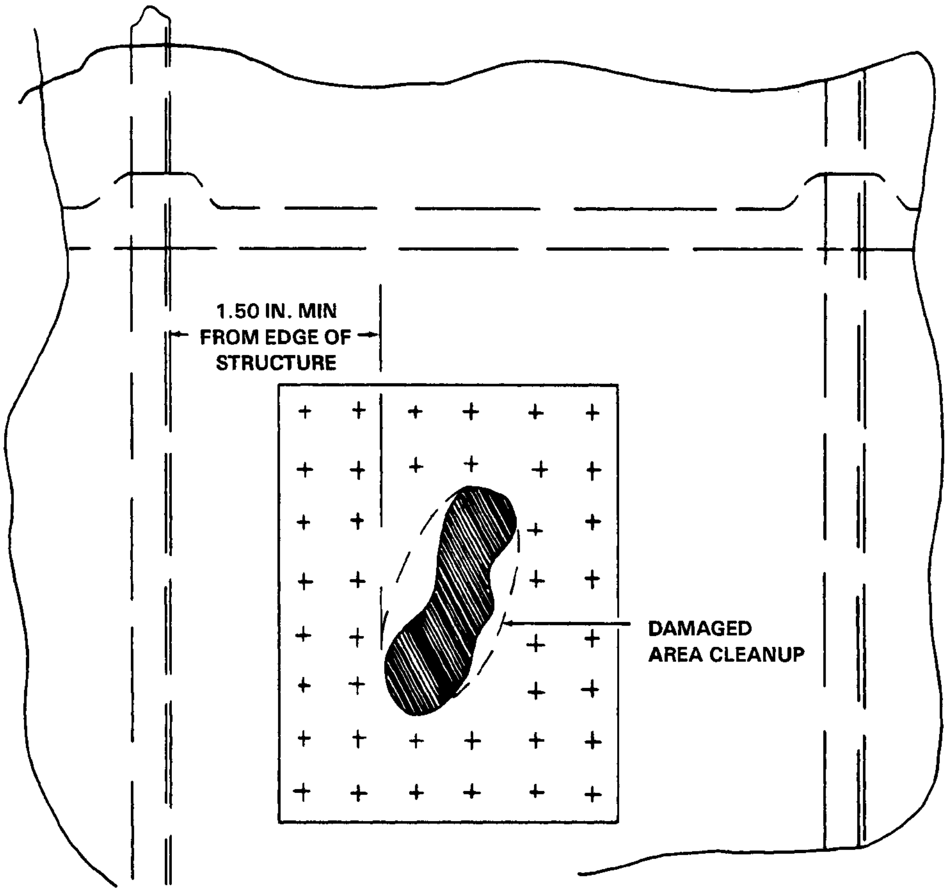
(1) One doubler of the same gauge material as damaged material. Size to be sufficient to allow standard edge distance around edges for double row of rivets or a minimum of 2.00-inch overlap on each edge.
(2) One plug same material and thickness as damaged material and same size as cleanout. (Optional)
(3) Pro Seal 890 (C-308).
(4) Same type rivets installed in immediate area (1/8 inch minimum repair rivet diameter).

PROCEDURE B:

(1) Rout damaged area to minimum diameter.
(2) Touch up all raw edges.
(3) Center doubler over (or under) cleanup. Install two rows of rivets matching pattern and same type attaching damaged member to aircraft structure (minimal size repair rivets 1/8-inch diameter).
(4) If flush surface or appearance is required, install plug with 1/8-inch rivets to ensure conformance to contour.

UH-1H-II-M-02-23-2

Figure 2-23. Sheetmetal patch (Sheet 2 of 7)



APPLICATION C

SHEETMETAL PATCH

APPLICATION C:

For damaged aluminum webs and skins exceeding limits of application B.

RESTRICTIONS C:

(1) Damaged area is limited to a minimum distance of 1.50 inches from edge of cleanup to nearest adjacent structure.
(2) Damaged area is limited to a maximum of 20 percent of the skin area after cleanup.
(3) Overlapping repair doublers is not permitted.
(4) Minimum distance between repair cleanup is 4.0 inches.

REQUIRED C:

(1) One doubler of the same gauge and material as damaged material. Size to be sufficient to allow standard edge distance around edges for double row of rivets or a minimum of 2.0 inches overlap each edge.
(2) Pro Seal 890 (C-308).
(3) Same type rivets installed in immediate area (1/8-inch minimum repair rivet diameter).

UH-1H-II-M-02-23-3

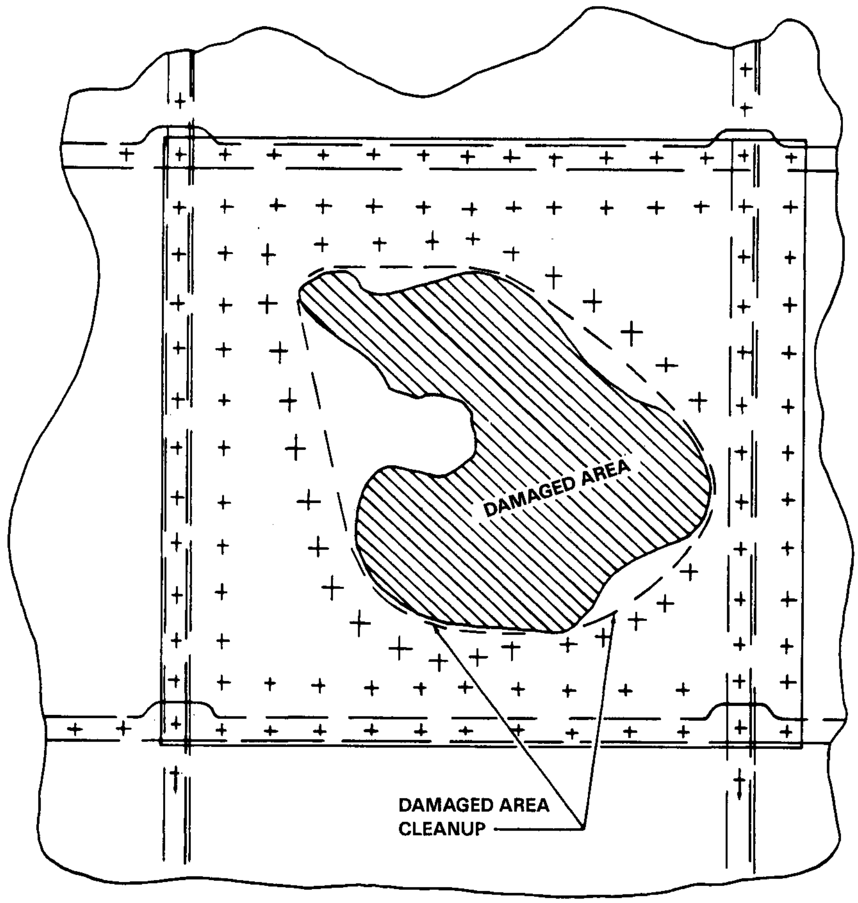
Figure 2-23. Sheetmetal patch (Sheet 3 of 7)

PROCEDURE C:

(1) Rout out damaged area to remove minimum material and to provide a smooth oval or circular cleanup area in accordance with good sheet metal practices. Minimum cleanup corner radius is 0.5 inch.
(2) Deburr and refinish damaged area.
(3) Center doubler over cleanup area. Install two rows of rivets around outer parameter of repair doubler, using same type rivets and matching rivet pattern as rivets in the immediate area. (1/8 inch minimum diameter rivet for repair)
(4) If repair is made on external surface, add bead of Pro Seal 890 (C-308) to all external edges.

UH-1H-II-M-02-23-4

Figure 2-23. Sheetmetal patch (Sheet 4 of 7)



APPLICATION D

SHEET METAL PATCH

APPLICATION D:

For damaged aluminum webs and skins in area of bulkheads and stiffeners.

RESTRICTIONS D:

(1) Damaged area is limited to a maximum of 20 percent of the skin panel (between any two bulkheads) after cleanup.
(2) Overlapped repair doublers is not permitted.
(3) No additional skin repair doublers are permitted in the same bay section with this repair.
(4) On sight engineering review is recommended.
(5) When 50 percent of the skin is removed for cleanup in bay section, the repair doubler is to pick up the supporting structure rivet pattern on all four sides of the bay section. Install double row of rivets around the outer parameter of the repair doubler and where possible install one row of rivets around parameter of the damaged skin area. Maximum one repair between any two bulkheads.

UH-1H-II-M-02-23-5

Figure 2-23. Sheetmetal patch (Sheet 5 of 7)

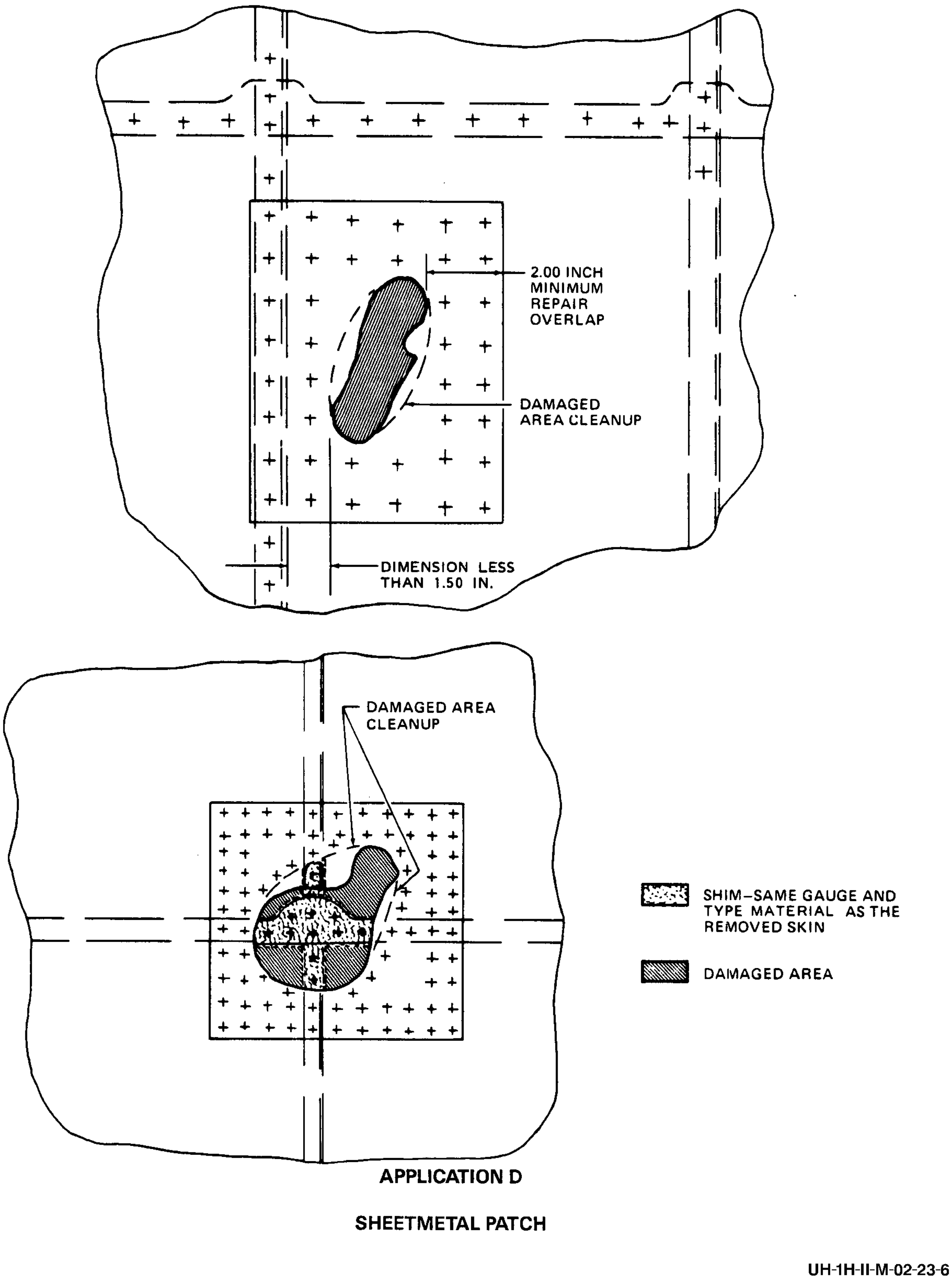


Figure 2-23. Sheetmetal patch (Sheet 6 of 7)

REQUIRED D:

(1) One doubler the same gauge and type material as the damaged skin or web. Size to be sufficient to allow standard edge distance around edges for doubler row of rivets, or a minimum of 2.00 inches overlap each edge.
(2) Pro Seal 890 (C-308).
(3) Same type rivets installed in immediate area (1/8 inch minimum diameter rivet for repair).
(4) A filler the same gauge and type material as the damaged skin or web.

PROCEDURE D:

(1) Rout out damaged area to minimum diameter.
(2) Deburr and refinish damaged area.
(3) Fabricate skin to overlay the skin support structure in damaged area (same gauge as damaged skin).
(4) Fabricate doubler that is symmetrical with the shape of the damaged sections supporting structure.
(5) Where more than 50 percent of the bay section skin is removed for cleaning, install double row of rivets around the outer perimeter of doubler and one row of rivets where possible around perimeter of damaged skin area cleanup.
(6) If repair is made on exterior surface, add bead of Pro Seal (C-308) to all external edges.

UH-1H-II-M-02-23-7

Figure 2-23. Sheetmetal patch (Sheet 7 of 7)

2-45. Removal — Cabin Floor Panels.

a. Remove seats or other equipment, as necessary, to gain access to floor panel being removed.

CAUTION

When removing panels (8 or 16, figure 2-25) with fuel in the aft tanks, the possibility of damaging the fuel cells under the aft portions of the floor exists due to swelling or bulging of the cells. Partially defuel, if necessary, to relieve pressure on forward fuel cells.

b. Remove panel attaching hardware and remove floor panel.

c. Remove aged sealant from mating surfaces of floor panel and cabin floor structure.

2-46. Inspection — Cabin Floor Panels.

a. Inspect cabin floor honeycomb panels for damage. (Paragraph 2-33.)

b. Inspect tie-down rings or studs for damage.

2-47. Repair — Cabin Floor Panels.

a. Repair cabin floor honeycomb panels. (Paragraph 2-34.)

b. Replace tie-down ring (28, figure 2-25) as follows:

(1) Remove cotter pin and remove pin (27) and tie-down ring (28).

(2) Remove pin (30) and washer (29).

(3) Place washer (29) on pin (30) and insert pin through floor panel.

(4) Attach tie-down ring (28) with pin (27). Secure with cotter pin.

(5) Apply sealing compound (C-328) around head of pin (30).

c. Replace stud (33) as follows:

(1) Remove nut (31) and washer (32). Remove stud (33).

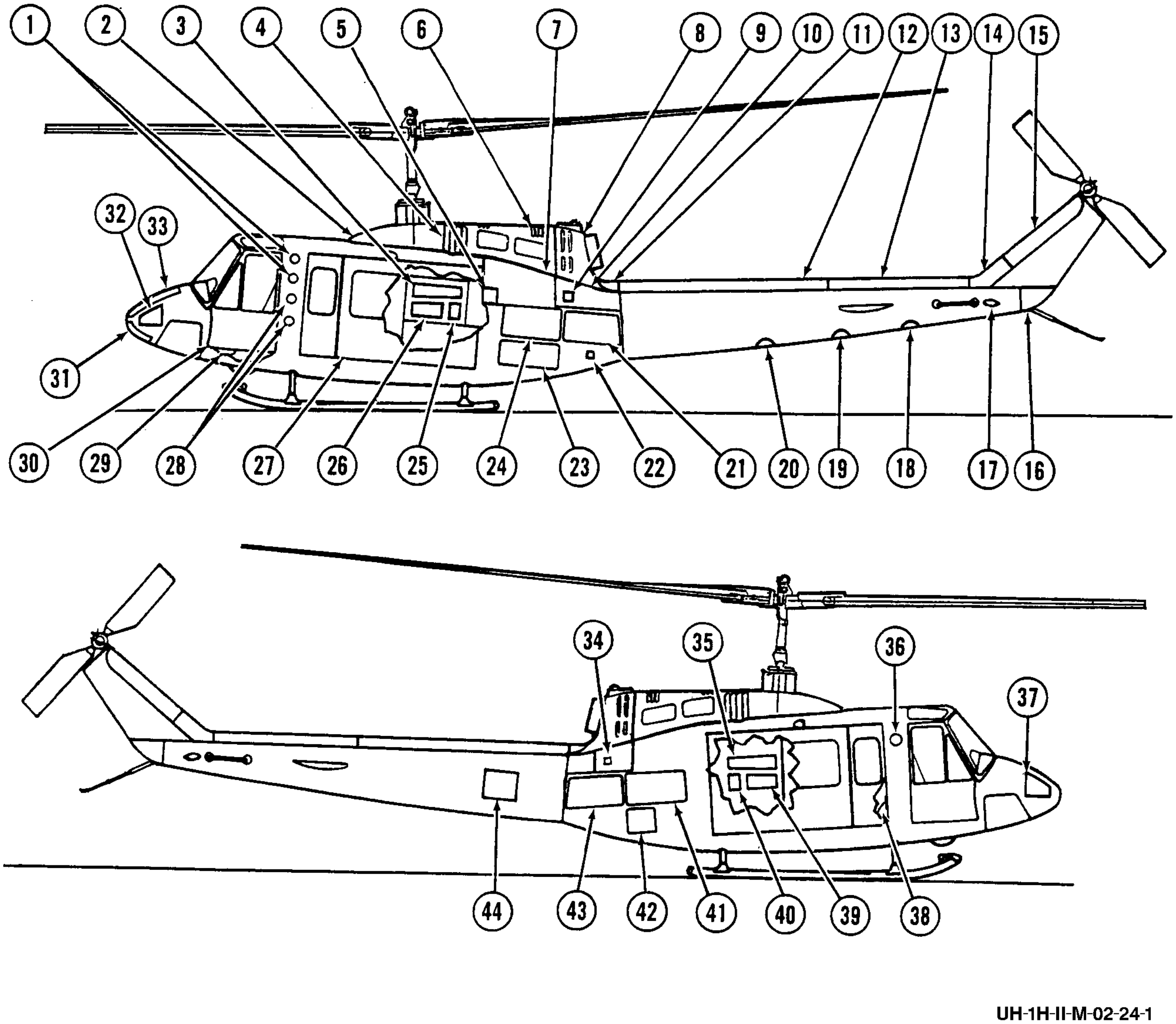
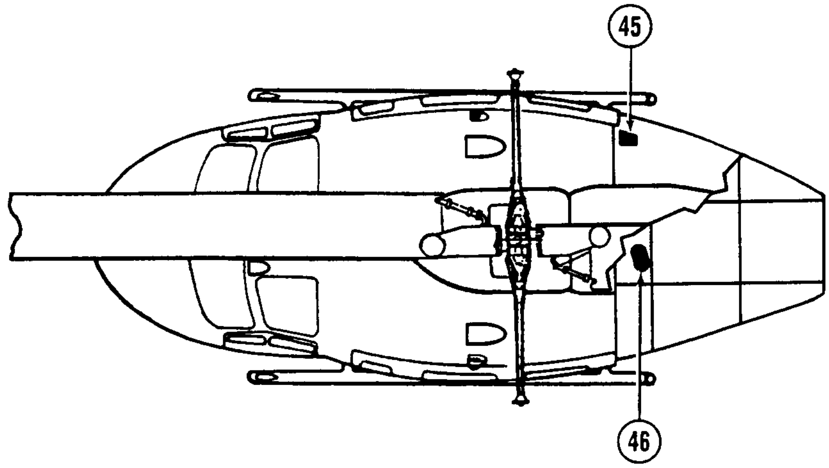
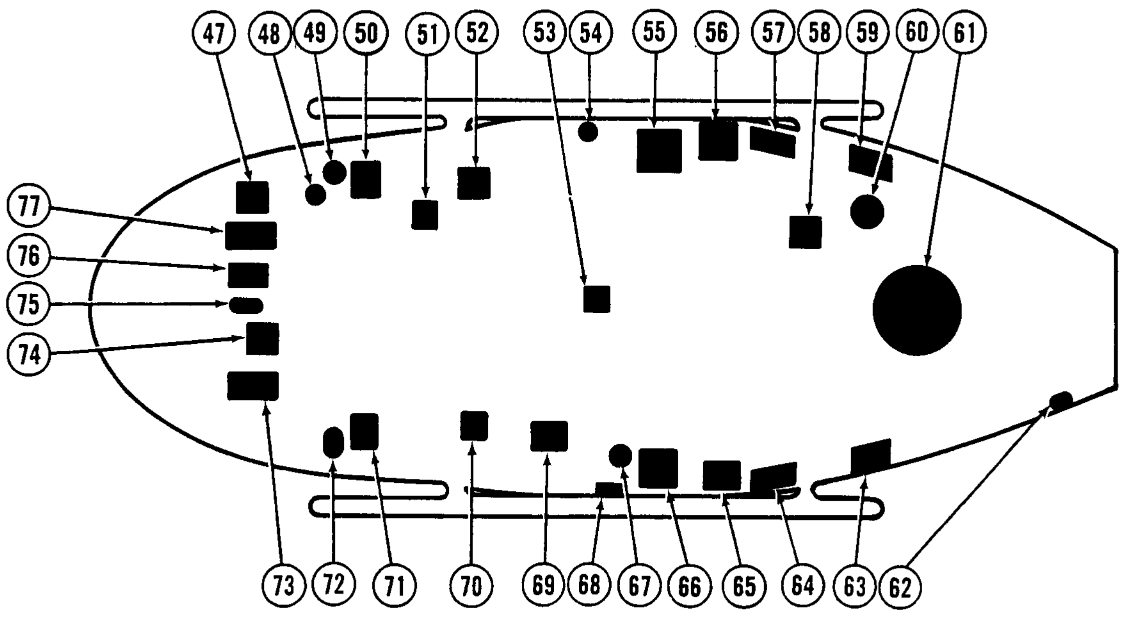


Figure 2-24. Access and inspection provisions (Sheet 1 of 3)

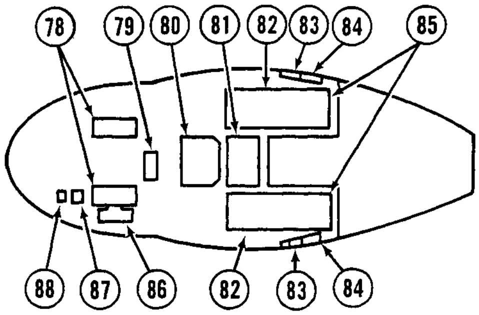


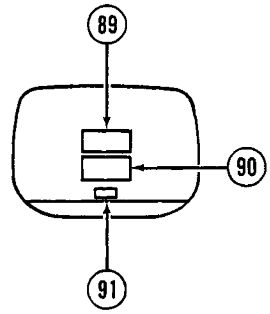


FUSELAGE SKIN — LOOKING UP

UH-1H-II-M-02-24-2

Figure 2-24. Access and inspection provisions (Sheet 2 of 3)



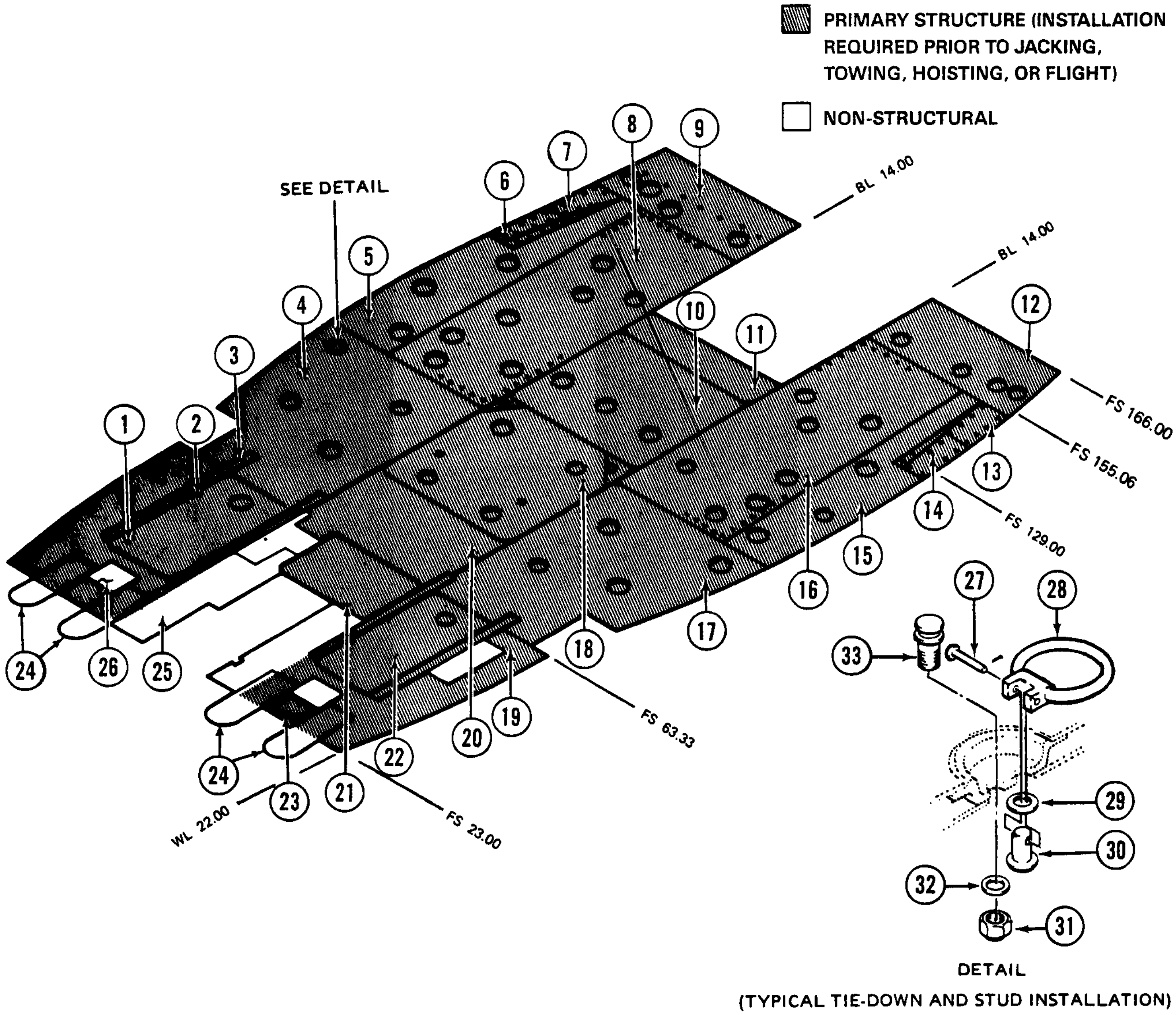


* Structural panels/doors. Installation required prior to jacking, towing, hoisting, or flight.

1. Stowage access door
2. Transmission fairing
*3. Pylon access cover
4. Engine cowl
5. Fire extinguishing access door
6. Upper engine cowl
7. Lower engine cowl
8. Tailpipe fairing (upper)
9. Driveshaft and electrical disconnect access door
10. Tailpipe fairing (lower)
11. Tail rotor driveshaft forward coupling access cover
12. Forward tail rotor shaft access
13. Aft tail rotor shaft access
14. Intermediate gearbox access
15. Vertical fin driveshaft access
16. Ventral fin fairing
17. Position light fairing (access to anti-torque control bellcrank, support and tube)
*18. General access
*19. Flight controls access door
*20. Flight controls access door
21. Electrical controls access door
22. External power access door
23. Electronic equipment access door
24. General access door
*25. Lower pylon aft access cover
*26. Lower pylon forward access cover
27. Cargo door
28. Emergency door release cover plate
29. Lower window access door
30. Crew door
31. Lower nose door
32. Left nose access cover
33. Upper nose door
34. Driveshaft access door
*35. Pylon access cover
36. General stowage access door
37. Right nose access cover
38. General access cover plate
39. Lower pylon forward access cover
40. Lower pylon aft access cover
41. Cargo hook mirror access door
42. General access door
43. General access door
44. Baggage compartment door
45. Engine oil tank access door
46. Fuel cell access door
47. Flight controls access door
48. Flight controls access door
49. Flight controls access door
*50. Flight controls access door
51. Flight controls access door
52. General access door
53. Fuel lines access door
54. External stores jettison cable access door
55. External stores disconnect access door
56. Fuel lines access door
57. Ammunition chute access door
58. Fuel lines access door
59. Cabin heater duct access door
60. Fuel lines access door
61. General access door
62. General access door
63. Cabin heater duct access door
64. Ammunition chute access door
65. Fuel lines access door
66. External stores disconnect access door
67. Fuel lines access door
68. External stores jettison cable access door
69. General access door
70. Cabin heater duct access door
*71. Cabin heater duct access door
72. Flight controls access door
*73. Flight controls access door
74. Flight controls access door
75. Antenna access cover
76. General access door
*77. Flight controls access door
*78. Controls access door
79. Controls access door
*80. General access door
*81. General access door
*82. Fuel cell access door
83. Auxiliary fuel tank fittings cover plate
84. Gun chute tunnel cover plate
*85. Fuel fitting access doors
86. Dual collective stick cover
87. Dual cyclic stick cover
88. Cyclic stick electrical access cover
*89. Hydraulic filter access
*90. Hydraulic and flight controls access cover
91. Armament provisions access cover

UH-1H-II-M-02-24-3

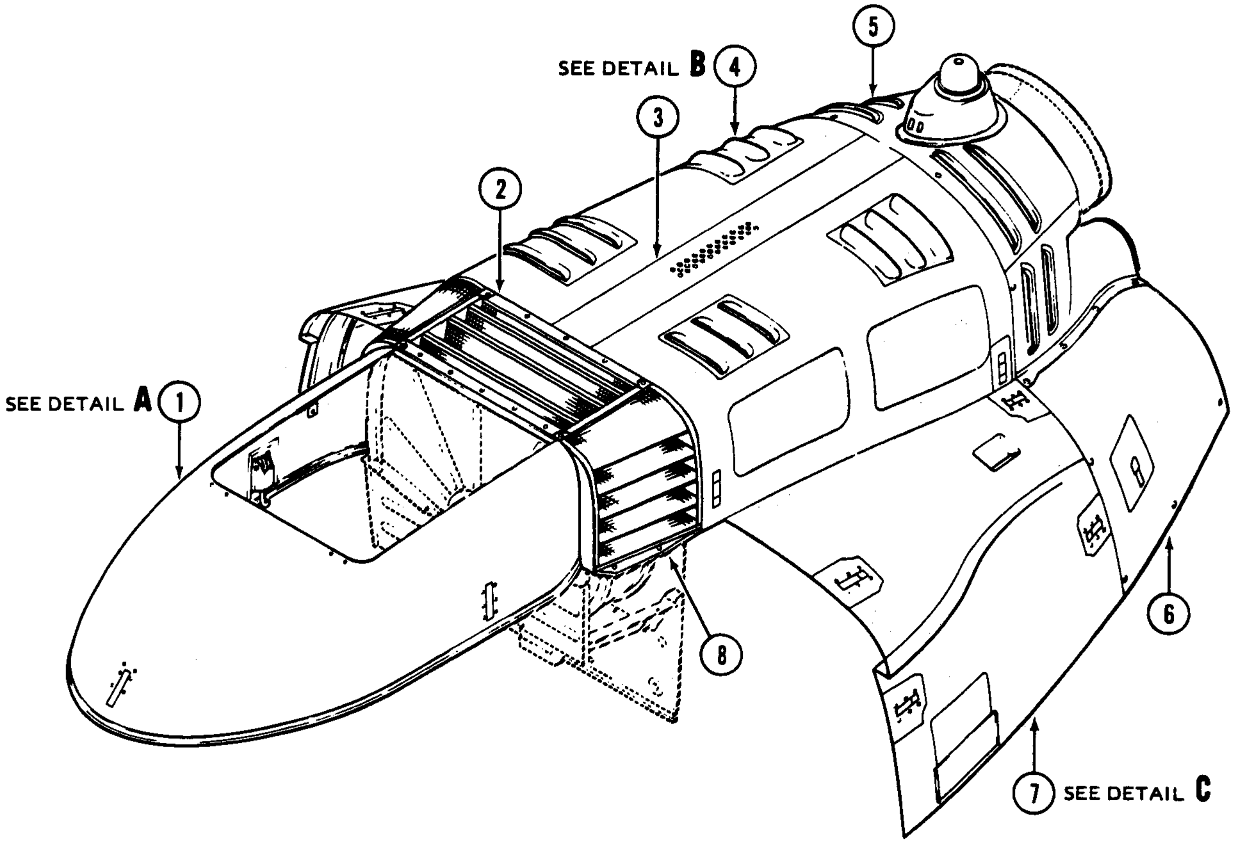
Figure 2-24. Access and inspection provisions (Sheet 3 of 3)



1. Access door
2. Floor assembly
3. Track assembly
4. Floor panel assembly
5. Floor panel assembly
6. Cover plate
7. Cover plate
8. Floor panel assembly
9. Panel assembly
10. Door assembly
11. Skin
12. Floor panel assembly
13. Cover plate
14. Cover plate
15. Floor panel assembly
16. Floor panel assembly
17. Floor panel assembly
18. Door assembly
19. Floor panel
20. Panel assembly
21. Door assembly
22. Access door
23. Access door
24. Heel rest
25. Floor assembly
26. Control stick
27. Pin
28. Ring, tie-down
29. Washer
30. Pin
31. Nut
32. Washer
33. Stud

UH-1H-II-M-02-25

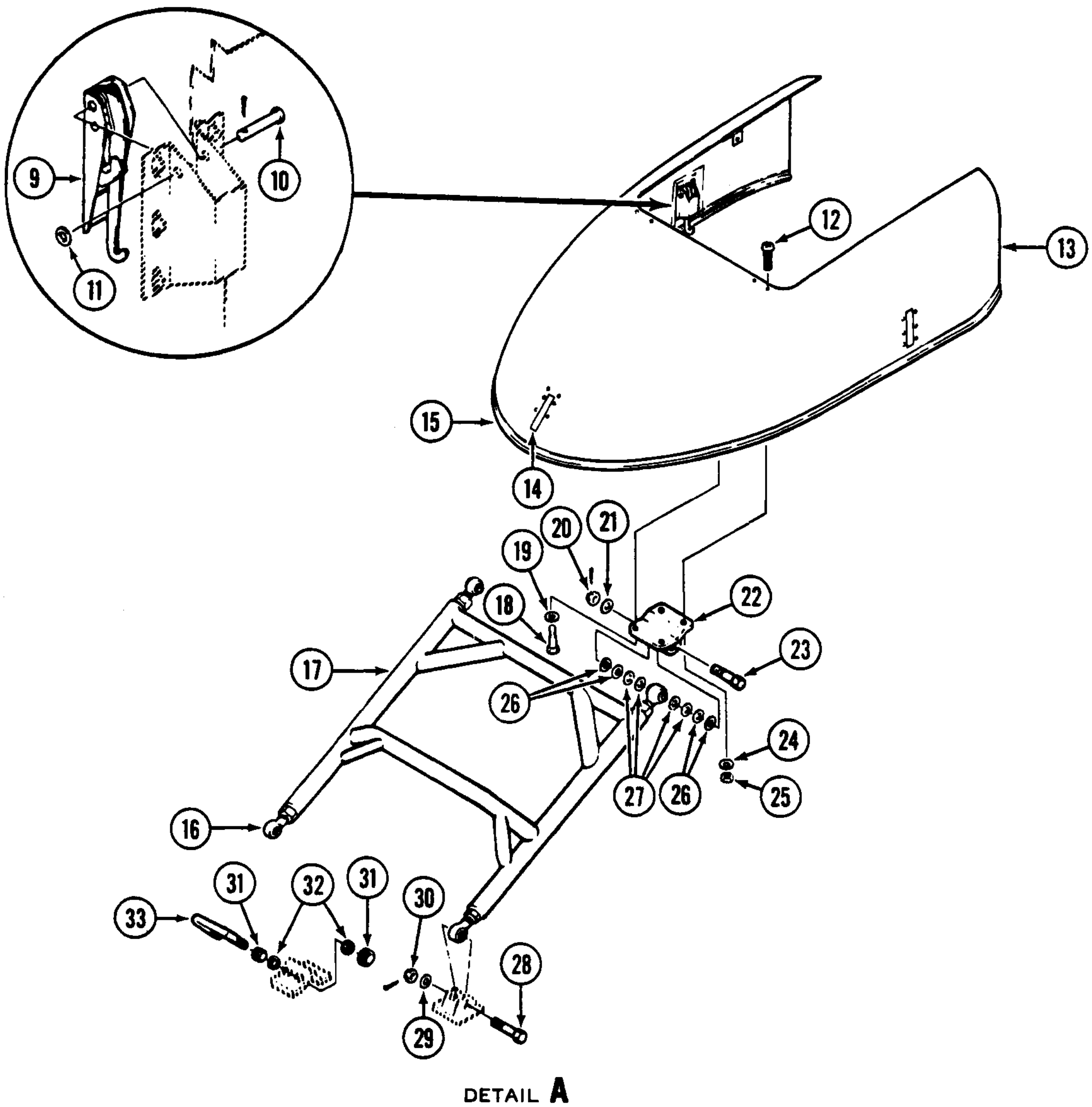
Figure 2-25. Cabin floor



1. Transmission cowling
2. Upper air inlet screen
3. Beam assembly
4. Engine upper cowling
5. Tailpipe upper fairing
6. Tailpipe lower fairing
7. Engine lower cowling
8. Side air inlet screen

UH-1H-II-M-02-26-1

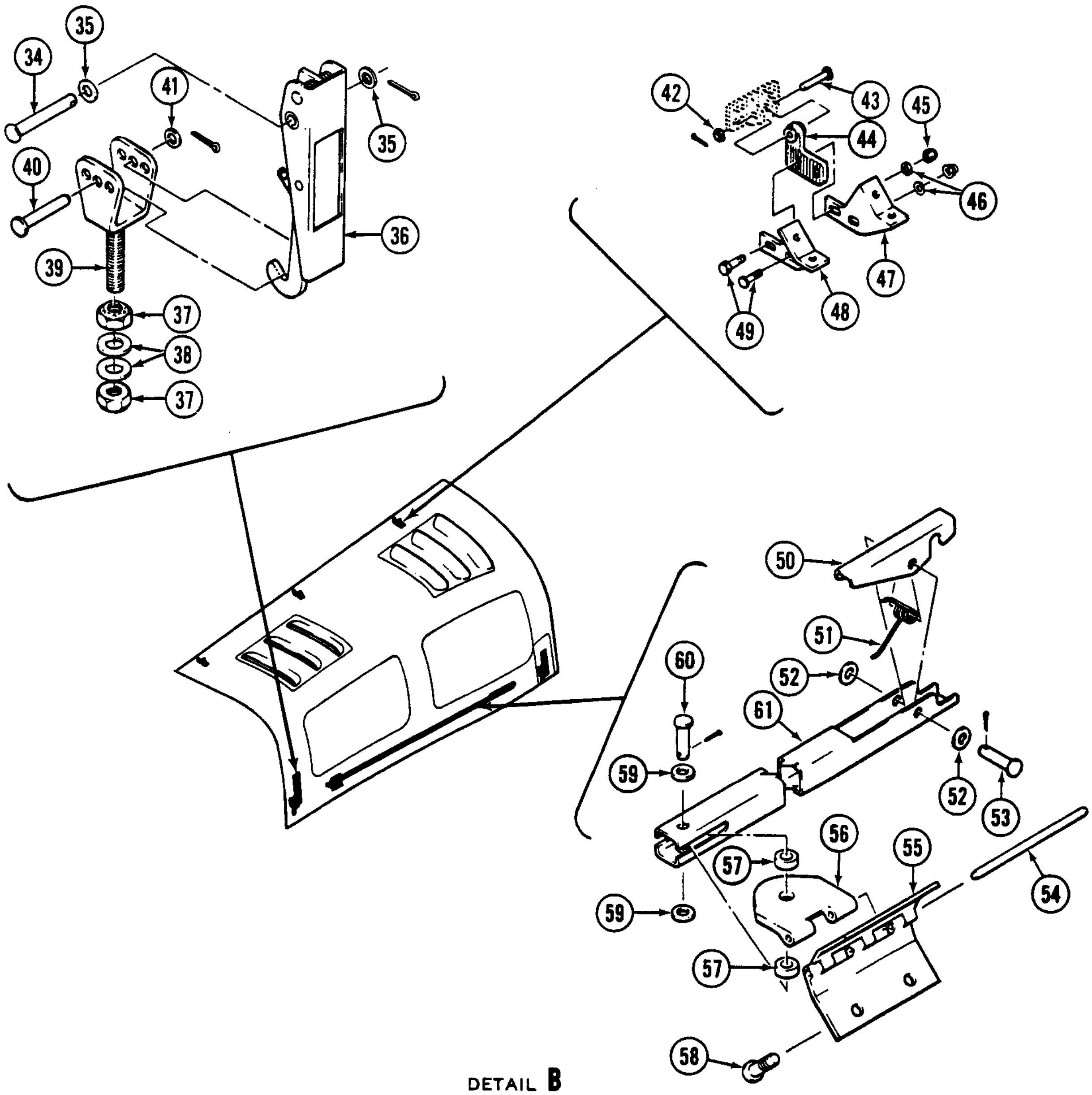
Figure 2-26. Transmission and engine cowling (Sheet 1 of 4)



9. Latch
10. Pin
11. Washer
12. Screw
13. Seal
14. Latch
15. Seal
16. Bearing, rod end
17. Hinge assembly
18. Bolt
19. Washer, aluminum
20. Nut
21. Washer, aluminum
22. Support
23. Bolt
24. Washer, aluminum
25. Nut
26. Washer, aluminum
27. Washer, thin steel
28. Bolt
29. Washer, aluminum
30. Nut
31. Nut
32. Washer, aluminum
33. U-bolt

UH-1H-II-M-02-26-2

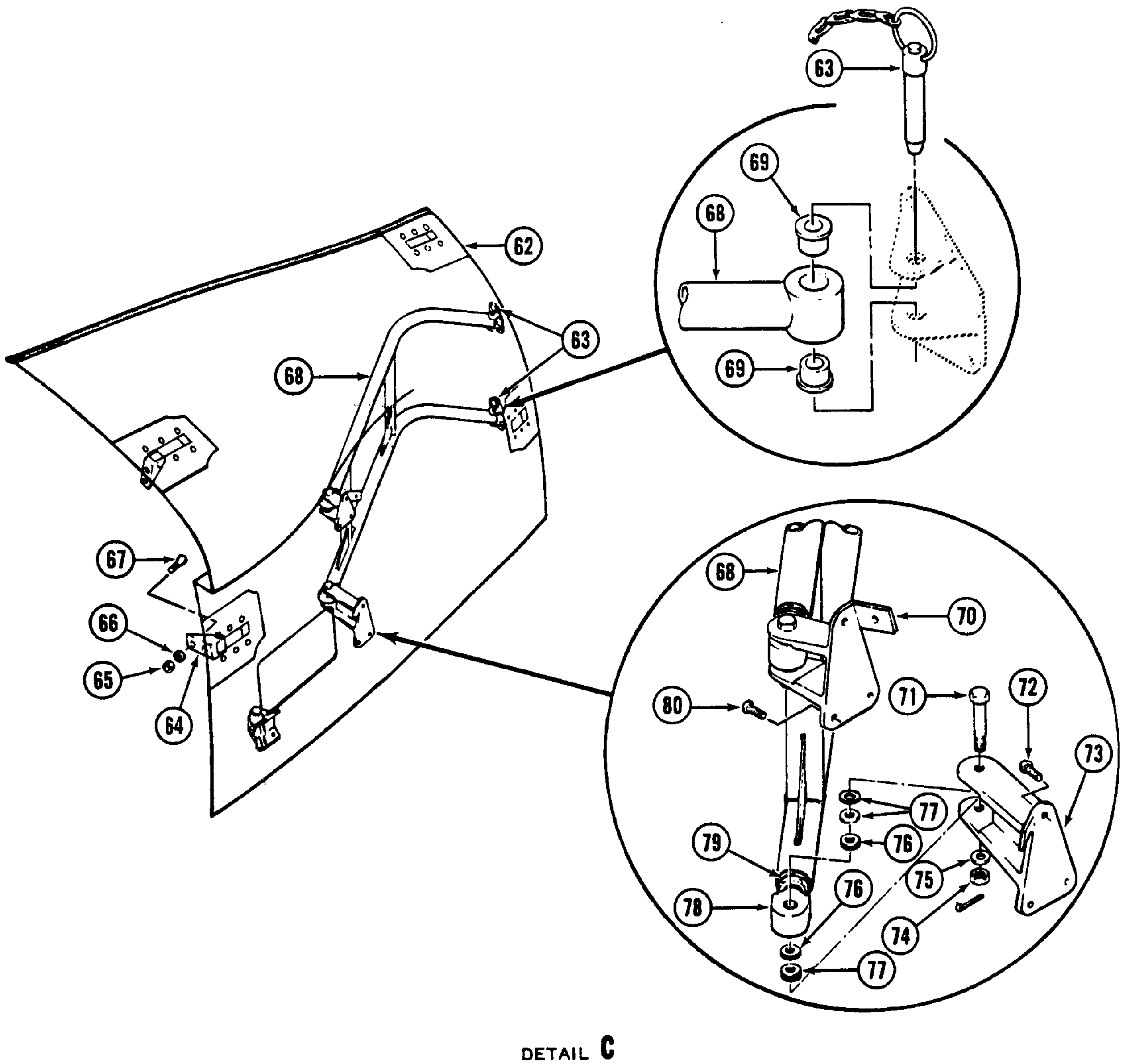
Figure 2-26. Transmission and engine cowling (Sheet 2 of 4)



34.	Pin
35.	Washer
36.	Latch
37.	Nut
38.	Washer
39.	Fitting
40.	Pin
41.	Washer
42.	Washer
43.	Pin
44.	Fitting
45.	Nut
46.	Washer
47.	Fitting
48.	Fitting
49.	Bolt
50.	Latch
51.	Spring
52.	Washer
53.	Pin
54.	Pin
55.	Fitting
56.	Hinge
57.	Spacer
58.	Screw
59.	Washer
60.	Pin
61.	Brace

UH-1H-II-M-02-26-3

Figure 2-26. Transmission and engine cowling (Sheet 3 of 4)



62. Latch
63. Pin, quick-release
64. Fitting
65. Nut
66. Washer
67. Bolt
68. Hinge
69. Bushing
70. Hinge
71. Bolt
72. Screw
73. Hinge
74. Nut
75. Washer
76. Washer
77. Washer, thin
78. Rod-end
79. Nut
80. Screw

UH-1H-II-M-02-26-4

Figure 2-26. Transmission and engine cowling (Sheet 4 of 4)

(2) Place stud (33) through floor panel and install washer (32) and nut (31).

(3) Apply sealing compound (C-328) around nut (31).

2-48. Installation — Cabin Floor Panels.

a. Apply a bead of sealing compound (C-328) to mating surfaces of panel and helicopter structure.

b. Lay floor panel in place and align holes in panel with holes in helicopter structure.

c. Install attaching hardware.

d. Install equipment removed to gain access to panel.

2-49. Painting — Cabin Floor Panels. Refer to TB 746-93-2 for painting instructions.

2-50. COWLING AND FAIRINGS.

2-51. Description — Cowling and Fairings. Cowling and fairings are used to protect and provide easy maintenance access to engine compartment, intake and exhaust tailpipe areas, and top of main transmission.

2-52. TRANSMISSION COWLING.

2-53. Description — Transmission Cowling. A one-piece cowling (1, figure 2-26) over front and sides of transmission upper area is secured by three latches and a hinge assembly. For access, the unlatched fairing can be swung forward to rest on cabin roof.

2-54. Removal — Transmission Cowling.

a. Disengage three latches and swing cowling to open position.

b. Detach hinge (17, detail A, figure 2-26) from fittings on cabin roof by removing cotter pin, nut (30), aluminum washer (29) and bolt (28). Remove cowling.

c. Separate hinge (17) from cowling by removing bolt (23) with nut (20) and aluminum washer (21). Observe position of aluminum washers (26) and thin steel washers (27), used for alignment, for reassembly in same manner.

2-55. Inspection — Transmission Cowling.

a. Inspect hinges, latches and fitting for wear, damage and serviceability.

b. Inspect seals for deterioration and security of bonding.

c. Inspect cowling for dents, cracks, and holes.

2-56. Repair or Replacement — Transmission Cowling.

a. Repair damage to honeycomb in accordance with paragraph 2-33.

b. Replace seals (13 or 15, detail A, figure 2-26) as follows:

(1) Remove old seal and remove old adhesive using fine abrasive cloth or paper (C-423).

(2) Clean with MEK (C-309) to remove residue.

(3) Bond new seal in place using adhesive (299-947-152, Type V, Class 2).

c. To replace side latches (9) remove cotter pin, washer (11), and pin (10). Position replacement latch in support and install pin (10), washer (11), and cotter pin.

d. Replace rod-end bearings (16) if worn sufficiently to prevent proper closing of cowling.

e. To replace forward latch (14), remove attaching screws and remove latch. Position replacement latch to cowl and install screws.

2-57. Painting — Transmission Cowling. Touchup paint on transmission cowl as needed in accordance with TB 746-93-2.

2-58. Installations — Transmission Cowl.

a. If hinge assembly (17, detail A, figure 2-26) was removed from cowling, attach as follows:

(1) Position hinge assembly (17) in supports (22). Arrange aluminum washers (26) and thin steel as necessary for alignment. Aluminum washers should be in contact with support (22).

(2) Install bolt (23), aluminum washer (21), and nut (20). Secure with cotter pin.

b. Position hinge assembly to fittings on cabin roof and install bolts (28), aluminum washers (29), and nuts (30). Secure with cotter pin.

c. Close cowling and check for proper fit and security. Adjust as necessary.

(1) Adjust rod-end bearings (16) to provide proper fit of cowling.

(2) Adjust U-bolt (33) if forward latch does not fasten securely.

2-59. ENGINE COWLING.

2-60. Description — Engine Cowling. Engine compartment between front and rear firewalls is covered by side and upper cowling assemblies (4 and 7, figure 2-26). Each side cowling opens by swinging aft on hinges of the rear firewall and can be secured open by a hinged support assembly attached to the cowling, and snapped into a snap-plate forward of the tailboom. Upper cowlings swing upward on hinges of a beam between tops of firewalls and are held open by rods. Flush-type spring-locking latches provide closure.

2-61. Removal — Engine Cowling.

a. Unlatch and open each lower cowling (7, figure 2-26). Pull pins from hinges on rear firewall to remove cowling sections.

b. To separate hinge (68, detail C) from cowling, remove cotter pin, nut (74), washers (75, 76, and 77) and bolt (71) from hinges (73 and 70).

c. Unlatch upper cowl (4) and raise to open position at each side.

d. Disconnect fire detector wiring at connectors near top of front firewall.

e. Disconnect flexible duct with clamp from starter-generator cooling air intake on cowling support beam.

f. Pull out pins at each end of beam (3) to detach from firewall. Remove beam with upper cowl sections attached.

g. To separate upper cowling (4) from beam (3), remove cotter pin, washer (42), and pin (43) at three hinge points.

2-62. Inspection — Engine Cowling.

a. Inspect cowling for dents, cracks, and holes.

b. Inspect cowling seals for deterioration and security.

c. Inspect hinges, fittings, and latches for wear, damage, and proper operation. If wear is sufficient to prevent proper closing or security of cowling, worn parts should be replaced.

d. Inspect starter-generator air intake for cracks, dents, or holes.

2-63. Repair or Replacement — Engine Cowling.

CAUTION

Blind rivets should not be used when repairing cowling in the area of engine air intake.

a. Repair damage to cowling in accordance with TM 55-1500-204-25/1. Ensure repairs do not interfere with fit of cowling.

b. Replace seals as follows:

(1) Remove old seal and remove old adhesive using fine abrasive cloth or paper (C-423).

(2) Clean with MEK (C-309) to remove residue.

(3) Bond new seal in place using adhesive (299-947-152, Type V, Class 2).

c. Replace damaged or worn parts on upper cowling as follows:

(1) To replace latch (36, detail B, figure 2-26), remove cotter pin, washers (35), and pin (34). Position latch in support and secure with pin (34), washers (35), and cotter pin.

(2) To replace brace (61), remove screws (58) and remove brace. Position replacement brace to cowling and install screws (58).

(3) To replace latch (50) and spring (51), remove cotter pin, washers (52), and pin (53). Position spring (51) and latch (50) in brace (61). Install pin (53), washers (52), and cotter pin.

(4) To replace hinge (56), remove pin (54) to separate hinge from fitting (55). Remove cotter pin, washers (59), and pin (60) and remove hinge (56) and spacers (57) from brace (61). Position hinge (56) and spacers (57) in brace (61) and secure with pin (60), washers (59), and cotter pin. Connect hinge (56) to fitting (55) with pin (54). Bend ends of pin (54) to secure in place.

d. Replace damaged or worn parts or lower cowling as follows:

(1) To replace latch (62, detail C, figure 2-26), remove attaching screws and washers and remove latch. Position replacement latch to cowling and install screws with washers.

(2) To replace hinge (70 or 73), remove attaching screws and remove hinge. Position replacement hinge to cowling and install screws.

e. Replace damaged or worn parts on hinge (68) as follows:

(1) To replace rod-end (78), loosen nut (79) and remove rod-end. Install replacement rod-end (78) with nut (79). Tighten nut to secure rod-end in place.

(2) Replace bushings (69) as follows:

NOTE

Bushings in both arms of hinge should be replaced together to maintain proper alignment.

(a) Support arm of hinge (68) and press out bushings (69).

(b) Coat replacement bushings (69) with zinc chromate primer (C-201) and press into arm of hinge (68) while primer is still wet.

(c) Line ream bushings 0.2495 to 0.2505 inch.

2-64. Painting — Engine Cowling. Touchup paint on engine cowl as needed in accordance with TB 746-93-2.

2-65. Installation — Engine Cowling.

a. Install upper cowl (4, figure 2-26) as follows:

(1) Attach upper cowl (4) to beam assembly (3) using pin (43, detail B), washers (42), and cotter pin.

(2) Lift upper cowling to position. Align ends of beam in brackets on front and rear firewalls and install pins.

(3) Engage support rods to hold upper cowling open.

(4) At right side of engine, connect flexible duct from starter-generator cooling blower to air intake on bottom of cowling support beam. Secure duct with clamp.

(5) Connect fire detector wiring from both cowling sections to connectors near top of front firewall.

b. Install lower cowling (7) as follows:

(1) If separated, attach hinge (68, detail C) to lower cowling with bolts (71). Arrange washers (76) and thin washers (77) as necessary for alignment. Install washer (75) and nut (74). Secure with cotter pin.

(2) Align side cowling sections to hinges on rear firewall and install quick-release pins (63).

c. Close upper cowling with support brace stowed in clips. Check for proper fit and adjust as necessary.

(1) Upper cowling hinge points can be adjusted by loosening nuts (45, detail B) on bolts (49) and repositioning fitting (44) as necessary. Tighten nuts after adjustment is complete.

(2) If latches do not fasten securely, adjust position of fitting (39), located on cabin roof as needed.

d. Close side cowling. Check for proper fit and adjust as necessary.

(1) If cowling does not fit, adjust rod-ends (78, detail C, figure 2-26).

(2) If latches do not fasten securely, adjust position of fittings (64) as needed.

2-66. TAILPIPE FAIRING.

2-67. Description — Tailpipe Fairing. An upper fairing (5, figure 2-26) and two lower fairings (6) cover exhaust tailpipe area behind engine rear firewall, and are secured by cowl fasteners. An anti-collision light is mounted on top of upper fairing.

2-68. Removal — Tailpipe Fairing.

a. Through door in lower left fairing, disconnect anti-collision light wiring at deck connector.

b. Open forward section of tail rotor driveshaft cover.

c. Release fasteners and remove upper fairing and two lower tailpipe fairings.

2-69. Inspection — Tailpipe Fairing.

a. Inspect fasteners for wear, damage and serviceability.

b. Inspect fairing for dents, cracks, holes and damage.

c. Inspect anti-collision light mounting for cracks, holes, and damage.

2-70. Repair — Tailpipe Fairing.

a. Replace damaged or missing fasteners.

b. Repair damage to fairing in accordance with TM 55-1500-204-25/1. Ensure repairs do not interfere with fit of fairings.

2-71. Painting — Tailpipe Fairing. Touch-up paint on fairing as needed in accordance with TB 746-93-2.

2-72. Installation — Tailpipe Fairing.

a. Install and fasten lower fairings and upper fairing. Close driveshaft cover.

b. Through door on lower aft fairing, connect anti-collision light wiring at deck connectors.

2-73. LIFT BEAM.

2-74. Description — Lift Beam. The lift beam absorbs or carries all vertical loads induced through flight. The beam is constructed of aluminum alloy web, stiffeners, and extrusions. Fittings are installed on the beam to provide attachment points for the lift link and cargo hook.

2-75. Classification of Damage — Lift Beam.

a. Negligible damage; small nicks and scratches defined in figure 2-27.

b. Repairable damage as shown on figure 2-27.

2-76. Repair — Lift Beam.

a. If cracks are found in the beam cap, repair as follows:

(1) Remove the rotor assembly, transmission and mast assembly, hydraulic servo cylinders, hydraulic lines, valves and filters, and servo cylinder supports from the lift beam. Refer to chapters 5, 6, and 7.

(2) Drill out rivets and/or remove bolts retaining affected beam cap. Use care in drilling rivets to prevent elongating holes. Remove cap from beam assembly.

(a) Using cap as pattern, fabricate new cap from AND10134-1206 7075-T6 aluminum alloy extrusion and cut to length. Drill holes for rivets and support retention and lift link attach fitting bolts.

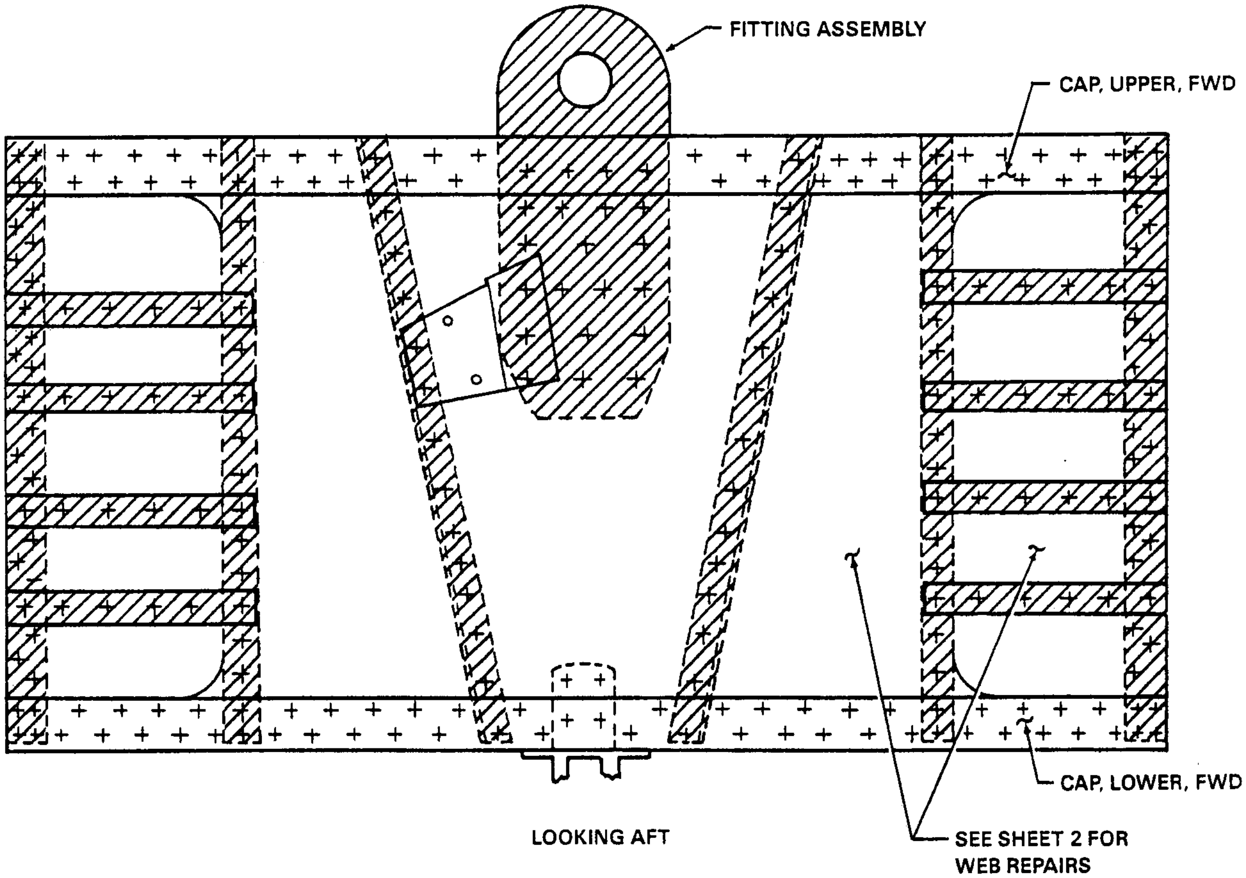
(b) Clean, deburr, and coat new beam cap with primer (C-201).

(c) Position, clamp in place and install beam cap using MS20470AD5 rivets except in area of servo support as indicated in figure 2-27. In area of lift link attach fitting, use two NAS1054-5-3 rivets each side of the fitting and four NAS1054-10-28 rivets where cap attaches to fitting.

b. If cracks are found in the beam web, repairs may be accomplished as follows:

(1) Isolated cracks up to three inches can be stop drilled and patched using aluminum alloy sheet (7075-T6, QQ-A-250/13, one gage thicker than existing web shown on figure 2-28), overlapping length of crack.

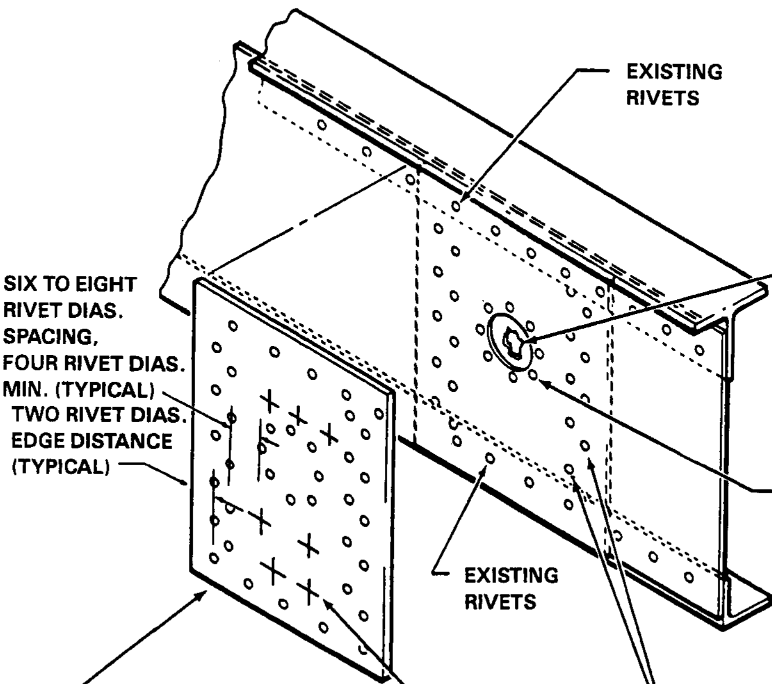
(2) Cracks 3.0 or more inches in length or concentrated within a small area can be repaired by



TYPE OF DAMAGE	DAMAGE AREA REPAIR (hatched): MAXIMUM DAMAGE AND REPAIR DEPTH	DAMAGE AREA REPAIR (open): MAXIMUM DAMAGE AND REPAIR DEPTH
MECHANICAL DAMAGE MAXIMUM DEPTH AFTER BLEND	0.020	0.030 (see note 1)
CORROSION DAMAGE		
BEFORE CLEANUP	0.010	0.020
AFTER CLEANUP	0.020	0.030 (see note 1)
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	0.500	1.00
NUMBER OF NON-OVERLAPPING REPAIRS	Two	Three
LENGTH OF DAMAGE	1.00	2.00
DISTANCE BETWEEN DAMAGE AREAS	1.00	2.00

UH-1H-II-M-02-27-1

Figure 2-27. Lift beam damage limits and repair (Sheet 1 of 2)



NOTES

1. Not to exceed 50% of one individual cap angle leg width.
2. Maximum number of repairs per bay: One.
3. Minimum distance from a structural member, or fitting: 1 inch.
4. Nicks, scratches, and gouges no deeper than 15 percent of web thickness, and not exceeding one inch in length or 0.50 inch width (after cleanup) may be polished out and require no patching.
5. Cracks not exceeding 3 inches in length may be stop drilled and patched.
6. Holes, tears, and damage that exceed the above limits (notes 4 and 5) may be repaired by patching as shown.

UH-1H-II-M-02-27-2

Figure 2-27. Lift beam damage limits and repair (Sheet 2 of 2)

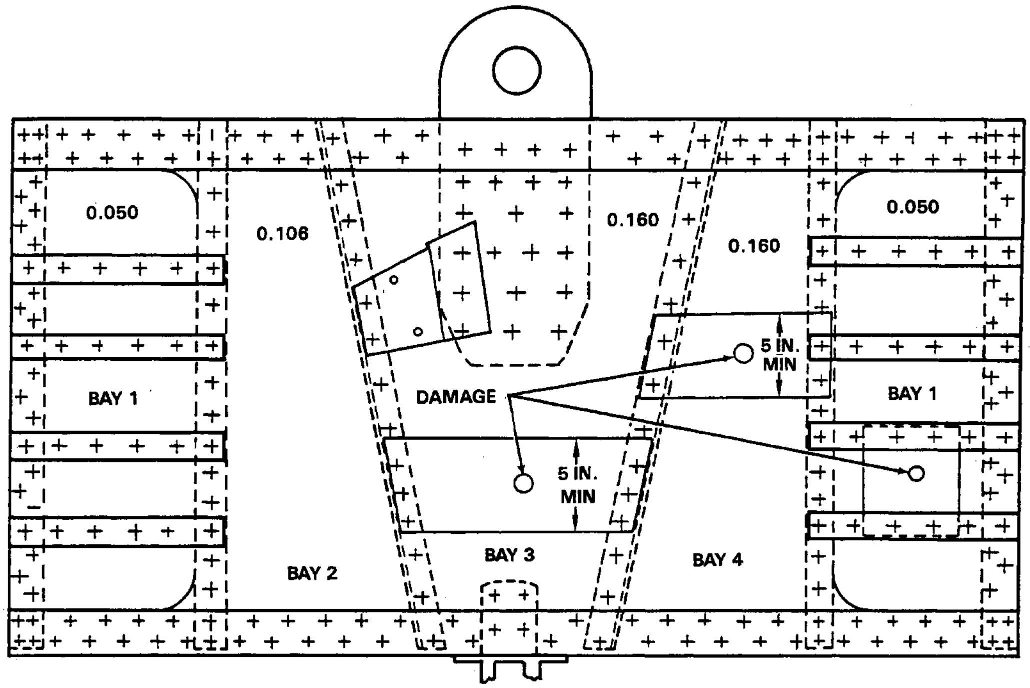


Figure 2-28. Lift beam — repair

cutting out damaged area and using an overlapping patch of aluminum alloy (7075-T6, QQ-A-250/13, one gage thicker than existing web shown on figure 2-28). (Refer to TM 55-1500-204-25/1).

c. Repair - Penetration-Type Damage.

(1) Repair acceptable penetration-type damage to lift beam (figure 2-27).

(2) Apply epoxy polyamide primer (C-204) to repair area.

2-77. FIREWALLS AND HEAT SHIELD.

2-78. Description — Firewalls and Heat Shield. The firewalls and driveshaft heat shield are installed in the engine compartment. Firewalls are constructed of MIL-T-9046 titanium sheet and the heat shield is constructed of rigidized AMS-5510 stainless steel. (Figure 2-29.)

2-79. Classification of Damage — Firewalls and Heat Shield.

a. Negligible Damage. Surface scratches and dents are considered negligible and can be ignored unless the dents are deep enough to interfere with other installations. If this condition exists, it is necessary to bump out the dents until proper clearance is obtained or firewall is restored to its original shape.

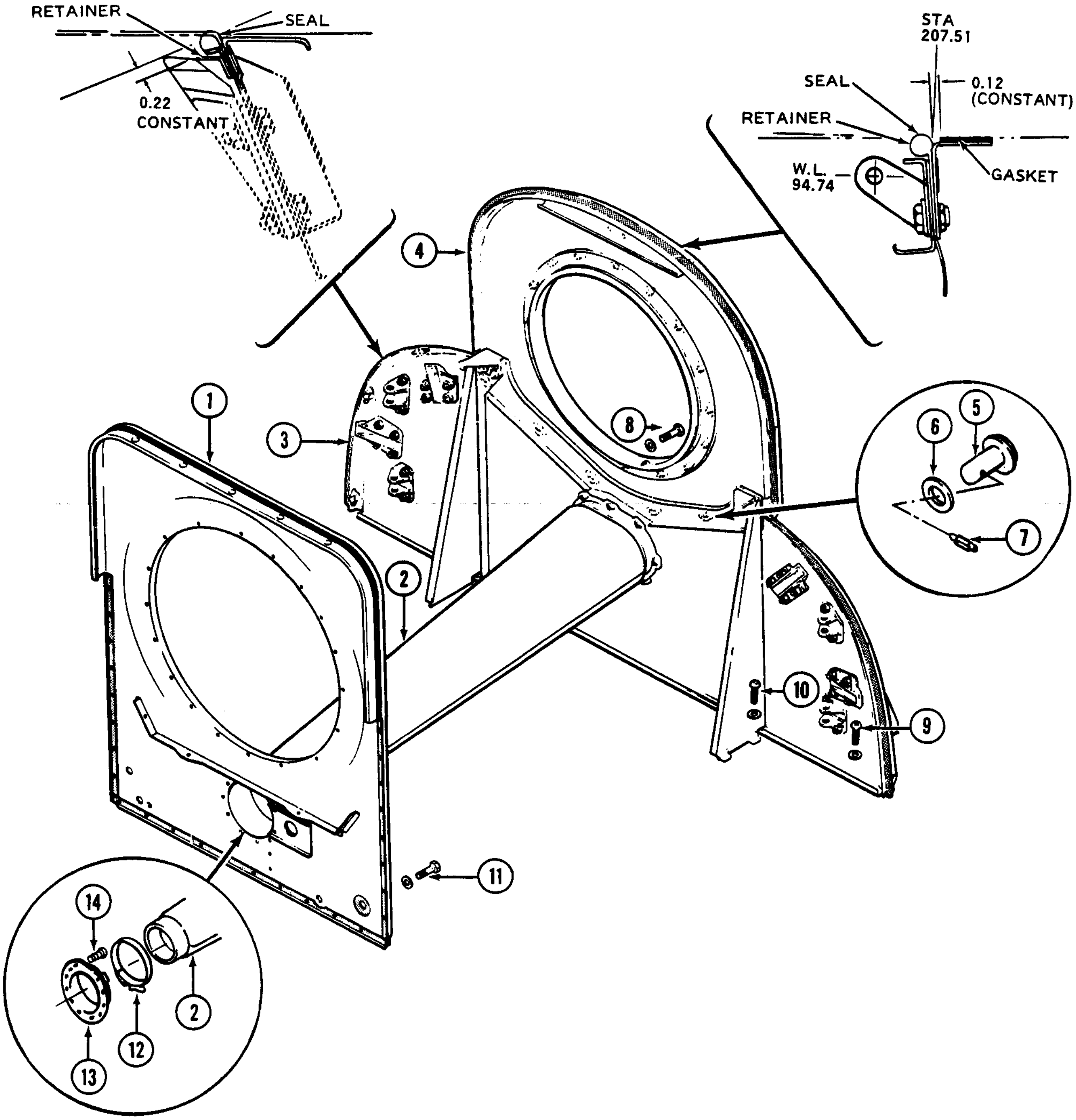
b. Repairable Damage for Firewalls.

(1) Cracks 3.0 inches or less, repair by welding. Cracks exceeding 3.0 inches in length, repair by patching.

(2) Stiffeners, seal retainers, etc., repair by insertion. If damage warrants, replace parts.

c. Repairable Damage for Heat Shield. Damage not exceeding 2.0 inch diameter after clean-up, no closer than 1.0 inch to flange, bellows or adjacent structure and a minimum 6.0 inches from similar type repair. Heat shield is not repairable by insertion repairs.

d. Damage Necessitating Replacement. Damage so extensive that time expended would warrant replacement.



1. Forward firewall
2. Heat shield
3. Firewall, lower aft
4. Firewall, upper aft
5. Stud, turnlock
6. Washer
7. Pin, grooved
8. Screw
9. Screw
10. Screw
11. Screw
12. Clamp
13. Boot
14. Screw

UH-1H-II-M-02-29

Figure 2-29. Firewalls and heat shield

2-80. Removal — Firewalls and Heat Shield.

a. Remove power plant. (Chapter 4.)

b. If forward firewall is to be removed, remove air particle separator. (Chapter 4.)

c. Remove forward section of tail rotor driveshaft. (Chapter 6.)

d. Remove lower aft firewall (3) as follows:

(1) Remove screws (8, figure 2-29) attaching heat shield (2) to upper aft firewall (4).

(2) Remove screws (9) attaching firewall (3) to service deck. Remove screws (10) from forward and aft legs of firewall. Retain shims under legs for reuse.

(3) Remove firewall (3) from helicopter.

(4) If firewall (3) is to be replaced, remove cowling mounting brackets and hardware from firewall. Save for reuse on replacement firewall.

e. Loosen clamp (12) securing driveshaft boot (13). Remove heat shield (2). Remove screws (14) to remove boot (13).

f. Remove forward firewall (1) as follows:

(1) Remove lower left access panel from pylon island.

(2) Disconnect fuel shutoff valve, check valve manifold and fuel inlet hose from firewall.

(3) Disconnect and remove droop compensator control bellcrank at left lower corner of firewall.

(4) Disconnect power plant electrical cable from firewall. Retain screws, nuts, washers and spacers together to use during reinstallation.

(5) Disconnect hydraulic lines at right lower corner of firewall.

(6) Remove mounting screws (11) along both sides and bottom of forward firewall (1). Remove firewall from helicopter.

2-81. Repair or Replacement — Firewalls and Heat Shield.

a. Replace damaged or worn seals.

(1) Drill out rivets securing retainer and seal to firewall. Remove seal.

(2) Position replacement seal and retainer on firewall and secure with metal fasteners. Check that seal is positioned to make proper contact with cowling. (Figure 2-29.)

(3) Drill holes through seal and install MS20435M-3-4 rivets.

b. Replace latch fittings and hinge fittings if broken or unserviceable.

c. Repair firewall webs that are cracked, torn, or have hole damage.

(1) Stop drill cracks. If damage is a hole or tear, cut a round or elongated hole according to shape of damage. (Figure 2-30.) Remove only a sufficient amount of material to clean up damage. Deburr hole.

(2) Fabricate a patch of the same material and gage or next heavier gage. Allow approximately three-fourths inch overlap around cleaned area. The three-fourths inch overlap will give the required edge distance for riveting.

(3) Drill holes through firewall and patch maintaining a minimum four diameter spacing and two diameter edge distance. Remove patch and deburr holes.

(4) Cut a piece of firewall fabric J-M89, same size of patch or coat patch with sealing compound (BHT Spec 299-947-074, Type 2, Class 1, 2, 3).

(5) Position patch and rivet in place with monel rivets, MS20615M.

d. Replace damaged or broken fasteners.

e. Replace damaged or worn gaskets on firewall.

(1) Remove gasket and aged adhesive from firewall.

(2) Abrade metal surface and replacement seal with 80-grit abrasive cloth or paper. Clean abraded areas with toluene (C-306). Wipe dry with clean cloths.

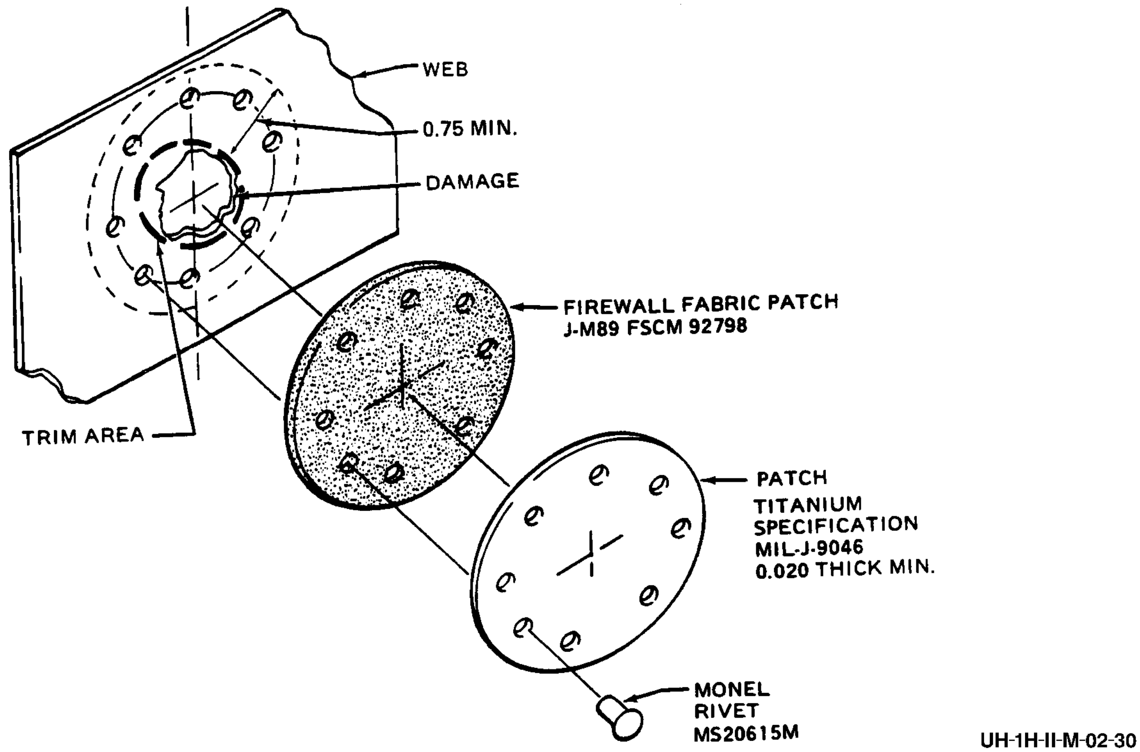


Figure 2-30. Firewall repair

(3) Apply adhesive (C-311) to gasket and metal surface. Position gasket on metal surface and air dry minimum of 4 hours.

(4) Remove adhesive squeeze-out with MEK (C-309).

f. Repair heat shield.

(1) Clean up damage area not to exceed limits of paragraph 2-79. Stop-drill cracks.

(2) Fabricate a patch of 0.016 inch rigidized corrosion resistant steel AMS-5510. Patch must overlap cutout by 0.50 inch. Patch should be of uniform shape according to shape of damage. Shape patch to contour of heat shield.

(3) Apply sealant (BHT Spec 299-947-074, Type 2, Class 1, 2, 3) to mating surfaces of patch and heat shield.

(4) Install patch using CR2539-4 rivets at approximately 0.75 inch spacing.

2-82. Installation — Firewalls and Heat Shield.

a. Install forward firewall (1, figure 2-29) as follows:

(1) Coat surfaces of firewall which mate with service deck and side structure with firewall sealing compound (C-353).

(2) Position firewall in place and install screws (11) along sides of bottom of firewall. Install all screws before tightening.

(3) Connect power plant electrical wiring to forward firewall using previously removed screws, nuts, washers and spacer.

(4) Connect hydraulic lines at right lower corner of firewall.

(5) Install and connect droop compensator bellcrank at left lower corner of firewall.

(6) Install fuel shutoff valve and check valve manifold on forward side of firewall. Connect fuel inlet line to fitting on shutoff valve.

b. Position clamp (12) and driveshaft heat shield (4) on boot (2) and tighten clamp. Support driveshaft fireshield until aft lower firewall is installed.

c. Install aft lower firewall (3) as follows:

(1) Install cowling mount brackets on firewall if new firewall is being installed.

(2) Position aft firewall (3) in place and install sufficient shims under forward and aft legs to prevent legs from bending when mounting screws are tightened.

(3) Install screws (9) through firewall lower flange and screws (10) through forward and aft legs. Install all screws before tightening.

(4) Install screws (8) to secure driveshaft heat shield (4) to aft firewall (6).

d. Install forward sections of tail rotor driveshaft. (Chapter 6.)

e. Install firewall (4) on engine. (Chapter 4.) Install power plant in helicopter. (Chapter 4.)

f. Install air particle separator. (Chapter 4.)

g. Check rigging of power turbine governor controls. (Chapter 4.)

CAUTION

Ensure throttle is closed and STARTER-GENERATOR switch is in STANDBY position.

h. Turn battery switch ON and move MAIN FUEL switch to ON. Check for leaks at fuel shutoff valve and check valve manifold. Move MAIN FUEL switch to OFF and turn battery switch OFF.

i. Install access panel on pylon island.

2-83. INDUCTION BAFFLE ASSEMBLY.

2-84. Description — Induction Baffle Assembly. The three piece baffle assembly forms the bottom and forward areas of the engine air induction system. The baffle in conjunction with the forward firewall provides a mounting surface for the air inlet filters.

2-85. Removal — Induction Baffle Assembly. Refer to Chapter 4.

2-86. Repair — Induction Baffle Assembly. Use standard repair methods (TM 55-1500-204-25/1). Do not use blind type fasteners in baffle assembly.

2-87. Installation — Induction Baffle Assembly. Refer to Chapter 4.

2-88. NOSE DOOR.

2-89. Description — Nose Door. A hinged door provides access to the nose compartment. The door (1, figure 2-1) is of fiberglass faced honeycomb construction and swings up after release of two manually activated latches.

2-90. Removal — Nose Door.

a. Open nose door (1, figure 2-1).

b. Remove nose door by removing screws which attach top of door to hinges and releasing latches.

2-91. Inspection — Nose Door.

a. Inspect door structure for damage, cracks, and holes.

b. Inspect door hinges for wear or damage.

2-92. Repair or Replacement — Nose Door.

a. Repair honeycomb structure of door as required. (Paragraph 2-33.)

b. Replace hinges if unserviceable.

2-93. Installation — Nose Door.

a. Position nose door to structure and align attachment holes at top of door with holes in hinges.

b. Install and tighten screws, close door and secure latches.

2-94. Painting — Nose Door. Refer to TB 746-93-2 for painting.

2-95. CREW DOORS.

2-96. Description — Crew Doors. The two crew doors (14, figure 2-1) are hinged on the forward side and are equipped with a latch assembly, which may be operated from either side of the door, to secure the door in the closed position. Each door incorporates three transparent acrylic plastic windows, termed the forward, upper, and adjustable windows. In an emergency, doors may be jettisoned by pulling the EMERGENCY RELEASE handle mounted forward of each door inside the cabin.

2-97. Inspection — Crew Doors (Installed).

NOTE

The following inspections should be performed to determine serviceability prior to removing door.

a. Visually inspect seal strips around inner edge of door for deterioration and damage.

b. Examine door hinges (10, figure 2-31) for cracks, condition of spring assemblies, rubber bumper, and shim. Door hinges may be inspected by fluorescent penetrant method.

c. Visually inspect sliding window stop assembly, located at forward end of lower window channel.

d. Check roller assemblies (2) for smoothness of operation in channel and for condition of threads.

NOTE

With door in locked position, tops of roller assemblies (2) should clear channel by 0.08 inch.

e. Visually inspect all components of the ejection mechanism. Adjust emergency jettison device so rounded end of pins are visible above the upper hinge and below the lower hinge.

NOTE

Actuate emergency jettison device to make certain pins clear hinges and door can be properly jettisoned. If door does not jettison, readjust as necessary.

f. Inspect door for cracks, dents and damage.

2-98. Removal — Crew Doors.

a. Open crew door and hold in open position.

b. Pull EMERGENCY RELEASE ejection handle assembly (9, figure 2-31) and lift door from helicopter.

2-99. Repair or Replacement — Crew Doors.

a. Replace seal strips around inner edge of door if deteriorated or damaged. Attach new seal with adhesive (299-947-152, Type V, Class 2).

b. Replace door hinges, spring assemblies, rubber bumper, or shim if unsuitable for continued use.

NOTE

Bond rubber bumper in place with cement (EC1357). Shim is to be bonded with adhesive (MIL-A-9117) or with adhesive (C-322).

c. Replace any part of sliding window stop assembly located at forward end of lower window channel which appears to be unsuitable for continued use.

d. Replace components of latching mechanism if unserviceable. (Paragraph 2-103.)

e. Replace components of ejection mechanism if unserviceable. (Paragraph 2-109.)

f. Repair skin and structure. (TM 55-1500-204/25/1.)

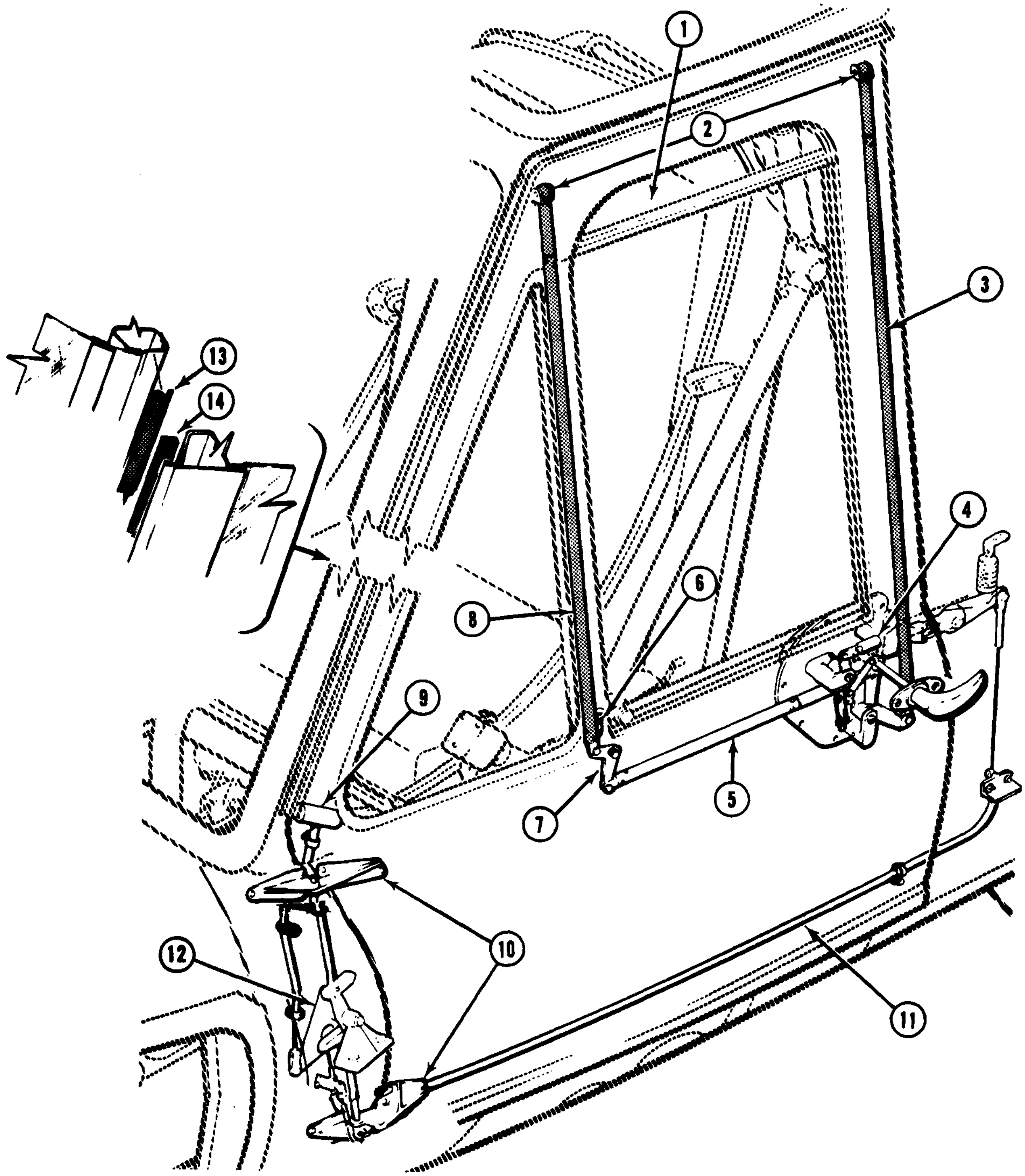
2-100. Painting — Crew Doors. Refer to TB 746-93-2 for painting information.

2-101. Installation — Crew Doors.

a. Lift door to position, pull ejection handle assembly (9) to retract hinge pins, align hinge halves. Release handle to engage hinge pins.

b. Close door slowly, observing action of latch. Slowly move handles to lock position, observing engagement of latch rods with upper strikers and for clearance above each rod when fully extended.

c. Check adjustment of latching and ejection mechanism (paragraph 2-102).



1.	Acrylic plastic panels	6.	Latch release spring	11.	Striker ejection cable
2.	Door roller assemblies	7.	Bellcrank	12.	Ejection mechanism
3.	Aft vertical latch tube	8.	Forward vertical latch tube	13.	Seal
4.	Door latch	9.	Ejection handle assembly	14.	Seal
5.	Lower horizontal latch tube	10.	Door hinges		

UH-1H-II-M-02-31

Figure 2-31. Crew doors

2-102. Adjustment — Crew Door.

a. With door handle in locked position, adjust latch tubes. (Paragraph 2-108.)

b. Loosen screws and adjust strikers located on upper door structure as necessary for proper engagement with rollers. (2, figure 2-31.)

c. Adjust ejection mechanism. (Paragraph 2-114.)

d. If hinge halves, located on cabin nose, are replaced, adjust shims as needed for proper alignment.

2-103. LATCHING MECHANISM — CREW DOORS.

2-104. Description — Latching Mechanism. The latching mechanism (figure 2-32) consists of a latch assembly, with inside and outside handle, rods, and bellcrank. Actuation of either handle will release rollers on vertical rods and latch catch from strikers mounted on cabin structure.

2-105. Removal — Latching Mechanism.

a. Remove crew door. (Paragraph 2-98.)

NOTE

Remove latch mechanism only to extent necessary for parts replacement.

b. Disconnect latch rod (15, figure 2-32) from latch arm by removing cotter pin and pin (18).

c. Remove inner access door and lower plug button from inner face of door.

d. Disconnect rod (11) from bellcrank (6) by removing cotter pin and pin (10). Unscrew aft end of rod from rod-end on latch assembly (14). Remove rod through inboard side of door.

e. Remove attaching screw and remove inner handle (13).

f. Remove nine screws (12) to detach latch plate from inner face of door. Hold latch shaft (19) while sliding latch assembly (14) off inboard end.

g. To disassemble latch proceed as follows:

(1) Remove cotter pin and pin holding latch spring (1, figure 2-33) in catch (2). Remove pin fastening roller assembly (3) to ram (4) and unscrew roller assembly from ram assembly.

(2) Remove cotter pin and pin attaching ram assembly (4) to lever assembly (5). Remove ram assembly.

(3) Back off setscrew attaching latch shaft (6) to arm assembly (7) and remove spindle.

(4) Remove cotter pin and pin attaching arm assembly (7) to upper latch links (8) and remove arm assembly. Remove snap rings attaching upper latch links to latch lever (5) and remove links.

(5) Unhook and remove latch centering spring (9).

(6) Remove cotter pin and pin attaching lower latch links (10) and rod end (11) to jackshaft (12), and remove links and rod end.

(7) Remove cotter pin and pin (13) attaching jackshaft (12) and remove jackshaft.

(8) Remove cotter pin and pin (13) attaching lever assembly (5) and remove lever.

h. Remove outer handle (16, figure 2-32) by removing two screws (17) attaching handle to door. Pull outer handle off end of latch shaft (19).

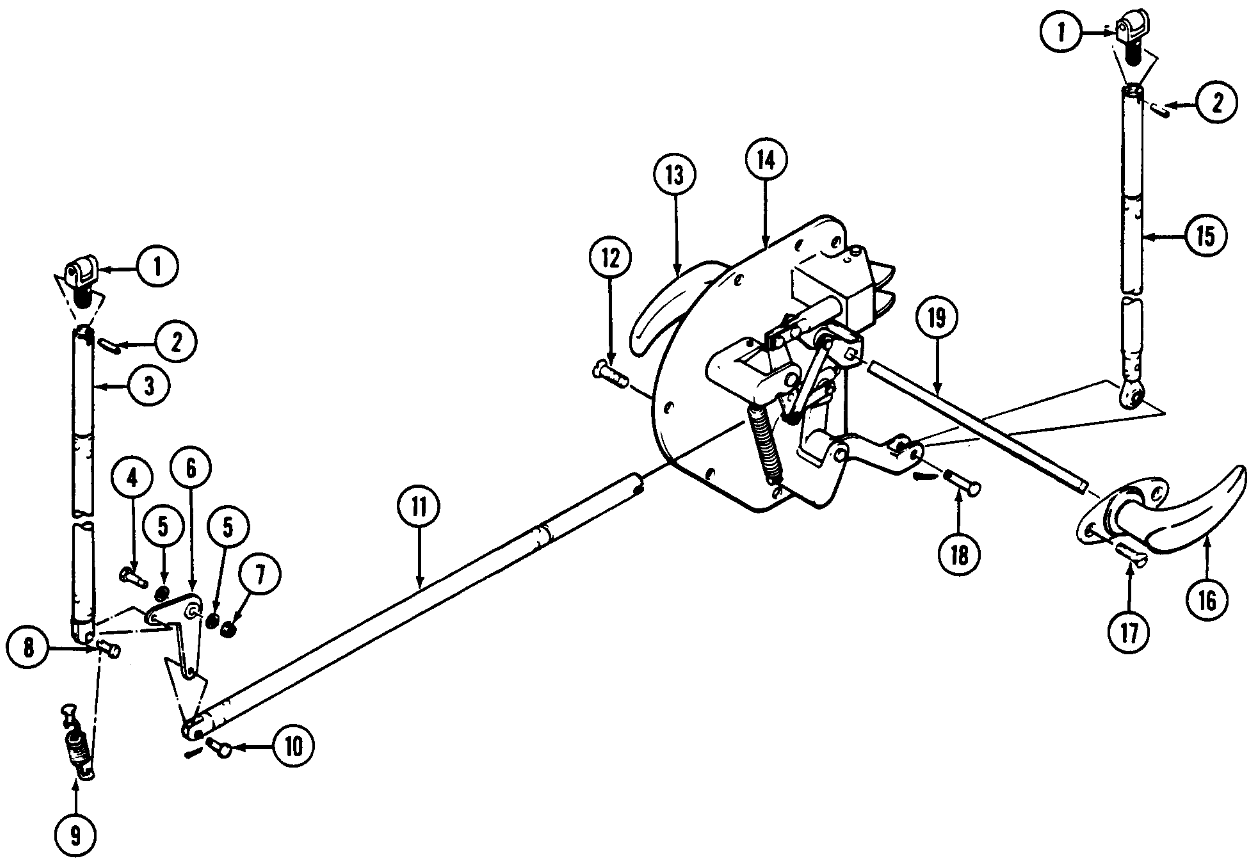
i. Disconnect latch rod (3) from bellcrank (6) by detaching spring (9) and removing pin (8). Remove upper plug button from inner face of door and remove shouldered bolt (4) with nut (7) and washers (5) to detach bellcrank from its support.

j. To remove either latch rod (3 or 15), remove spring pin (2), unscrew latch rod roller (1), and remove rod downward through door.

2-106. Inspection — Latching Mechanism.

a. Inspect rollers (1, figure 2-32) for roughness and wear.

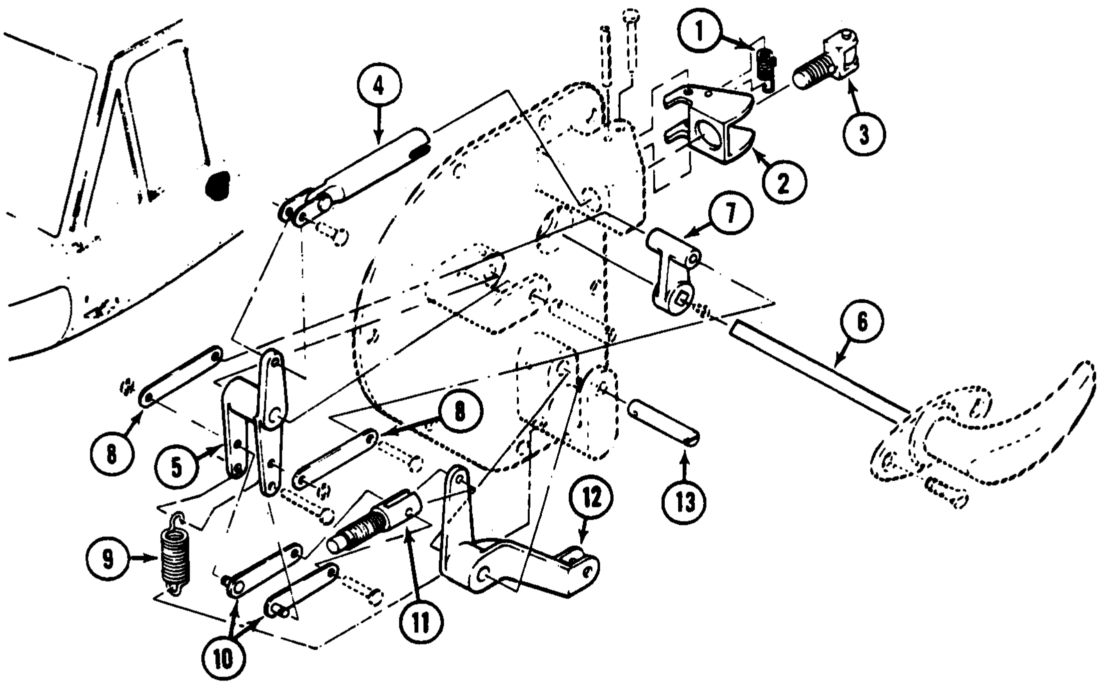
b. Inspect rods (3, 11, and 15) for wear in clevis pin holes, damage to internal threads or damage to rod which would hinder proper operation.



1. Roller
2. Pin
3. Latch rod
4. Shouldered bolt
5. Washer
6. Bellcrank
7. Nut
8. Pin
9. Spring
10. Pin
11. Rod
12. Screw
13. Inner handle
14. Latch assembly
15. Latch rod
16. Outer handle
17. Screw
18. Pin
19. Latch shaft

UH-1H-II-M-02-32

Figure 2-32. Crew door latching mechanism



1. Latch spring
2. Catch
3. Roller assembly
4. Ram assembly
5. Lever assembly
6. Latch shaft
7. Arm assembly
8. Upper latch links
9. Latch centering spring
10. Lower latch links
11. Rod end
12. Jackshaft
13. Pin

UH-1H-II-M-02-33

Figure 2-33. Crew door latch — disassembly

c. Check bellcrank (6) for bushing wear. If bushing appears worn, and is loose on shouldered bolt (4), bushing should be replaced.

d. Inspect latch release spring (9) for initial tension of 0.30 pound, spring rate of 3.54 pounds per inch, and a load of 2.0 pounds (plus or minus 0.30 pound) at 1.75 inches extended length.

e. Inspect components of latch assembly as follows:

(1) Inspect roller assembly (3, figure 2-33), ram assembly (4), latch links (8 and 10), latch shaft (6), pin (13), jackshaft (12), and lever assembly (5) for damage, wear, and serviceability.

(2) Inspect internal threads of ram (4), arm assembly (7), and threads of rod end (11) for damage.

(3) Check arm assembly (7) for latch shaft fit.

(4) Inspect links (8 and 10) for damage or wear of end pin, hole elongation of distortion.

(5) Inspect latch centering spring (9) for initial tension of 1.66 pounds, spring rate of 9.15 pounds per inch, and a load of 15.39 (plus or minus 1.5) pounds at 2.96 inches extended length.

2-107. Repair or Replacement — Latching Mechanism. Replace components that fail to meet inspection requirements.

2-108. Installation — Latching Mechanism.

NOTE

Lubricate hinge and pivot points with a light coat of grease (C-014) during assembly.

a. Assemble latch as follows (figure 2-33):

(1) Install jackshaft (12) with pin (13) and cotter pin.

(2) Position ram assembly (4) in latch housing.

(3) Position lower latch links (10) and upper latch links (8) on lever assembly (5) and secure with snap rings.

(4) Position lever assembly (5) in latch housing and secure with pin and cotter pin.

(5) Connect rod end (11) and lower latch links (10) to arm of jackshaft (12) with pin and cotter pin.

(6) Connect forward end of upper latch links (8) to arm assembly (7) with pin and cotter pin.

(7) Install latch shaft (6) through arm assembly (7) and secure with set screw.

(8) Attach ram assembly (4) to arm of lever assembly (5) with pin and cotter pin.

(9) Connect latch centering spring (9).

(10)Position catch (2) and spring (1) in latch housing. Install pin and cotter pin.

(11)Screw roller assembly (3) into ram assembly (4) and install pin to secure in place.

b. Insert latch rods (3 and 15, figure 2-32) up through door structure, forward and aft of sliding window opening, until ends pass through guides at top of door. Install a latch rod roller (1) into end of each rod with not less than 0.30 inch thread engagement. Install spring pin (2).

c. Position bellcrank (6), with longest arm down, in support. Install shouldered bolt (4) from inboard side with washers (5) and nut (7).

d. Connect spring (9) to end of pin inserted through hole in window frame. Connect latch rod (3) to short arm of bellcrank (6) with pin (8) and cotter pin. Hook spring into end of pin.

e. Position outer handle (16) on latch shaft (19), and attach escutcheon to door with two screws (17).

f. Position latch assembly (14) on inboard end of latch shaft. Attach plate of latch to door with nine screws (12).

g. Install inboard handle (13) with screw.

h. Position rod (11) horizontally in door and screw threaded end of mating rod-end on latch assembly until bottomed. Adjust by backing off rod to connect to lower arm of bellcrank (6) with pin (10) and cotter pin, with rod (3) fully extended. Final adjustment will be made with door installed.

i. Connect latch rod (15) to arm on latch assembly (14) with pin (18) and cotter pin.

j. Install door (paragraph 2-101). Check adjustment of latching mechanism.

(1) Adjust aft vertical latch tube (3, figure 2-31) so a clearance of 0.08 inch is obtained between top of door roller assembly (2) and bottom of channel.

(2) Adjust forward vertical latch tube (8) so a clearance of 0.08 inch is obtained between top of door roller assembly (2) and bottom of channel.

k. Install access doors and plug buttons on door after adjustment of latching mechanism.

2-109. EJECTION MECHANISM — CREW DOORS.

2-110. Description — Ejection Mechanism. The crew door ejection mechanism consists of an ejection handle, hinge pins and a cable assembly. When the ejection handle is pulled the hinge pins (8 and 11, figure 2-34) are retracted and allow the door hinge halves to separate. The cable assembly will cause the door post latch striker (21) to pivot upward and release from latch on door.

2-111. Removal — Ejection Mechanism.

NOTE

Remove ejection mechanism only to extent necessary for parts replacement.

a. Remove cotter pin, washer, and headed pin to detach cable assembly (5, figure 2-34) from plate (6). When required, detach two clamps (2) which secure tube (3) to support angle and pull handle assembly (1) up through grommet (4) to remove.

b. Detach swivel (13) from plate (6) by removing nut and washer. Pull swivel from end of ejection cable (12). Keep nut and washer with swivel.

c. Remove two bolts and washers to detach support (10) from structure. Pull hinge pins (8 and 11) free of hinge bushings, and remove assembled ejection mechanism from inboard side of nose structure.

d. Disassemble ejection mechanism as follows:

(1) Remove cotter pins and headed pins to detach upper and lower hinge pins (8 and 11) from plate (6) and link (9).

(2) Remove bolt with nut, washers, and spacer (7) to separate plate (6) and link (9) from support (10).

e. To remove ejection cable, disconnect aft end fork of ejection cable (12) from latch striker (21) by removing cotter pin and headed pin. Pull cable aft out of flex tube (16) leaving tube in place.

2-112. Inspection — Ejection Mechanism.

a. Inspect cable assembly (5, figure 2-34) and tube (3) for kinks or damage which would prevent operation.

b. Inspect hinge pins (8 and 11) and link (9) for damage and wear.

c. Inspect plate (6) and support (10) for damage and wear.

d. Inspect ejection cable (12) for kinks which would prevent operation.

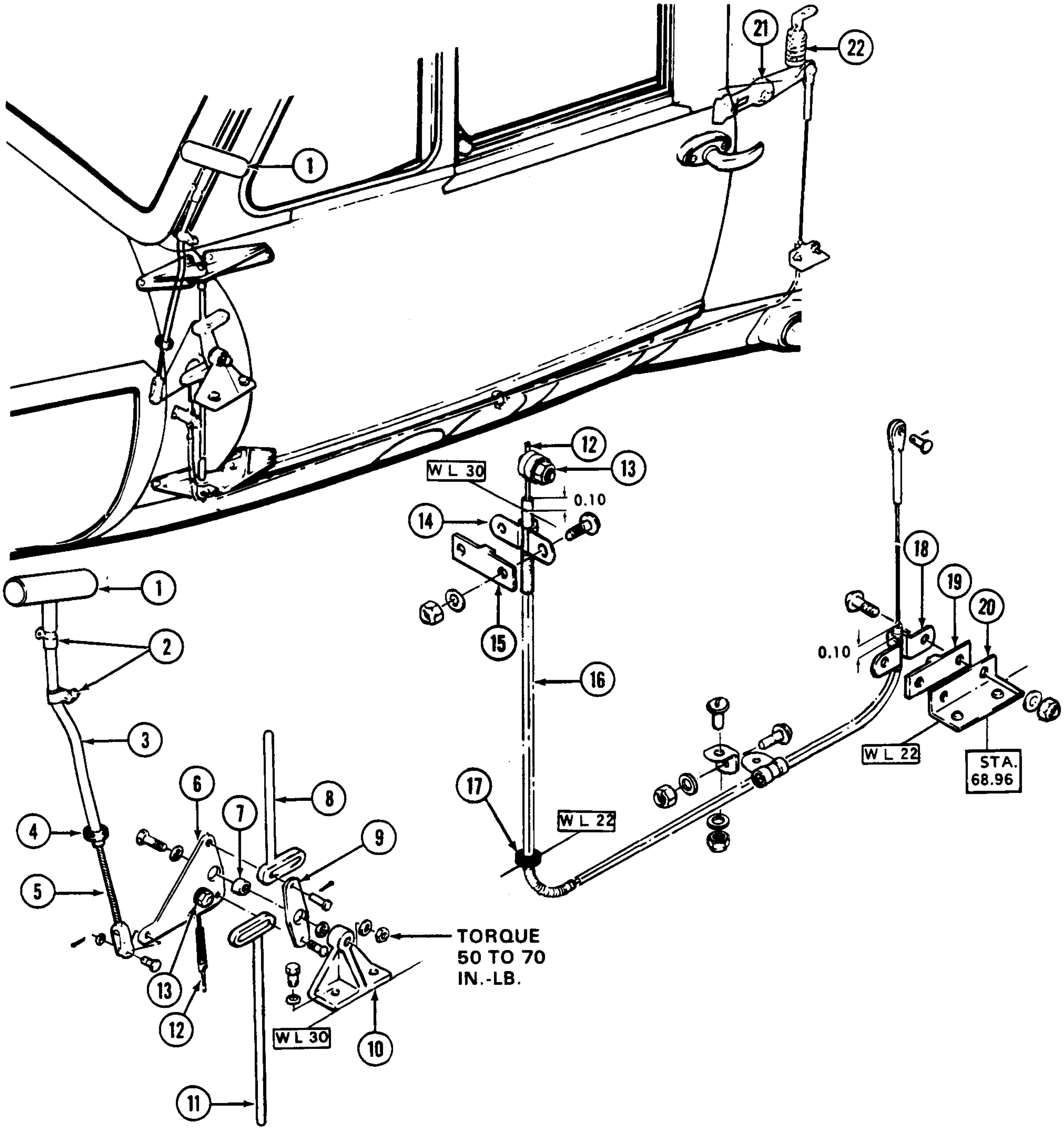
2-113. Repair or Replacement — Ejection Mechanism. Replace components that fail to meet inspection requirements.

2-114. Installation — Ejection Mechanism.

a. Check ends of flex tube (16) for proper installation.

(1) Aft end of flex tube (16, figure 2-34) should be positioned vertically at Station 68.96 in door post, secured between clamp (18) and spacer (19) attached to bracket (20) on structure with two screws, washers and nuts. End of tube should extend 0.10 inch above clamp.

(2) Forward end of flex tube (16) should pass up through grommet (17) in nose structure forward of door opening, and be secured between clamp (14) and spacer (15) attached to structure with two screws, washers and nuts. End of tube should extend 0.10 inch above horizontal angle at WL 30.



1. Ejection handle
2. Clamps
3. Tube
4. Grommet
5. Cable assembly
6. Plate
7. Spacer
8. Upper hinge pin
9. Link
10. Support
11. Lower hinge pin
12. Ejection cable
13. Swivel
14. Clamp
15. Spacer
16. Flex tube
17. Grommet
18. Clamp
19. Spacer
20. Bracket
21. Latch striker
22. Spring

UH-1H-II-M-02-34

Figure 2-34. Crew door ejection mechanism

b. Thread plain end of ejection cable (12) through flex tube (16) from aft end. Attach ejection cable fork terminal to aft end of latch striker (21) with headed pin secured by cotter pin. Check that spring (22) is attached between striker and bracket in door post. Forward end of cable will be attached during installation of ejection mechanism.

c. Install ejection handle (1) and hinge (8 and 11) pin as follows:

(1) Insert spacer (7) through pivot holes of plate (6) and link (9). Place standard steel washer on bolt, and insert bolt from plate side through spacer. Place thin aluminum alloy washer on bolt next to spacer, and insert bolt through support (10). Install nut and aluminum alloy washer on outboard end of bolt and torque 50 to 70 inch-pounds.

(2) Position slotted ends of hinge pins (8 and 11) between plate (6) and link (9), align holes, and install headed pins secured by cotter pins.

(3) Position assembly in nose structure, with hinge pins inserted in hinge bushings and support (10) resting on horizontal structural member at WL 30. Align support to holes with plate nuts and install two bolts with aluminum alloy washers. Torque bolts 20 to 25 inch-pounds.

(4) Position ejection handle (1) with tube (3) inserted through grommet (4) at WL 35.56. Align clamps (2) to mounting holes in angle and attach with two screws, washers, and nuts.

(5) Connect fork terminal cable (5) to forward end of plate (6) with headed pin, washer, and cotter pin.

d. Connect ejection cable (12) with swivel (13) to hole with bushing in middle of plate (6). Adjust cable length to remove slack with hinge pins extended and latch striker (21) held in latching position, and tighten nut on swivel to hold end of cable securely.

e. Pull ejection handle (1) and check for smooth operation, with hinge pins (8 and 11) retracting and latch striker (21) moving up to release position. Allow handle to return to normal position, observing that hinge pins extend and latch striker moves down to latching position.

(1) Adjust linkage of ejection mechanism so rounded ends of hinge pins (8 and 11) are visible above the upper hinge and below the lower hinge.

(2) Support door and pull ejection handle (1). Ensure hinge pins (8 and 11) clear hinges and door can be jettisoned. Adjust ejection linkage as necessary.

(3) Lockwire ejection handle (1) with 0.020 inch copper wire (C-414) after adjustments are complete.

f. Lockwire ejection handle (1) with 0.020 inch copper wire (C-414).

2-115. HINGED PANEL.

2-116. Description — Hinged Panel.. A hinged panel is attached to the door post, forward of each cargo door to provide a wider cargo-passenger opening. The panel is attached to the fuselage with hinges and quick release pins. A positioning spring with detent is provided to hold panel open during loading and unloading operations.

2-117. Inspection and Adjustment — Hinged Panel (Installed).

a. With hinged panel closed and latched, check that upper and lower latch pins (9, figure 2-35) are securely engaged in holes in structural channels of door opening.

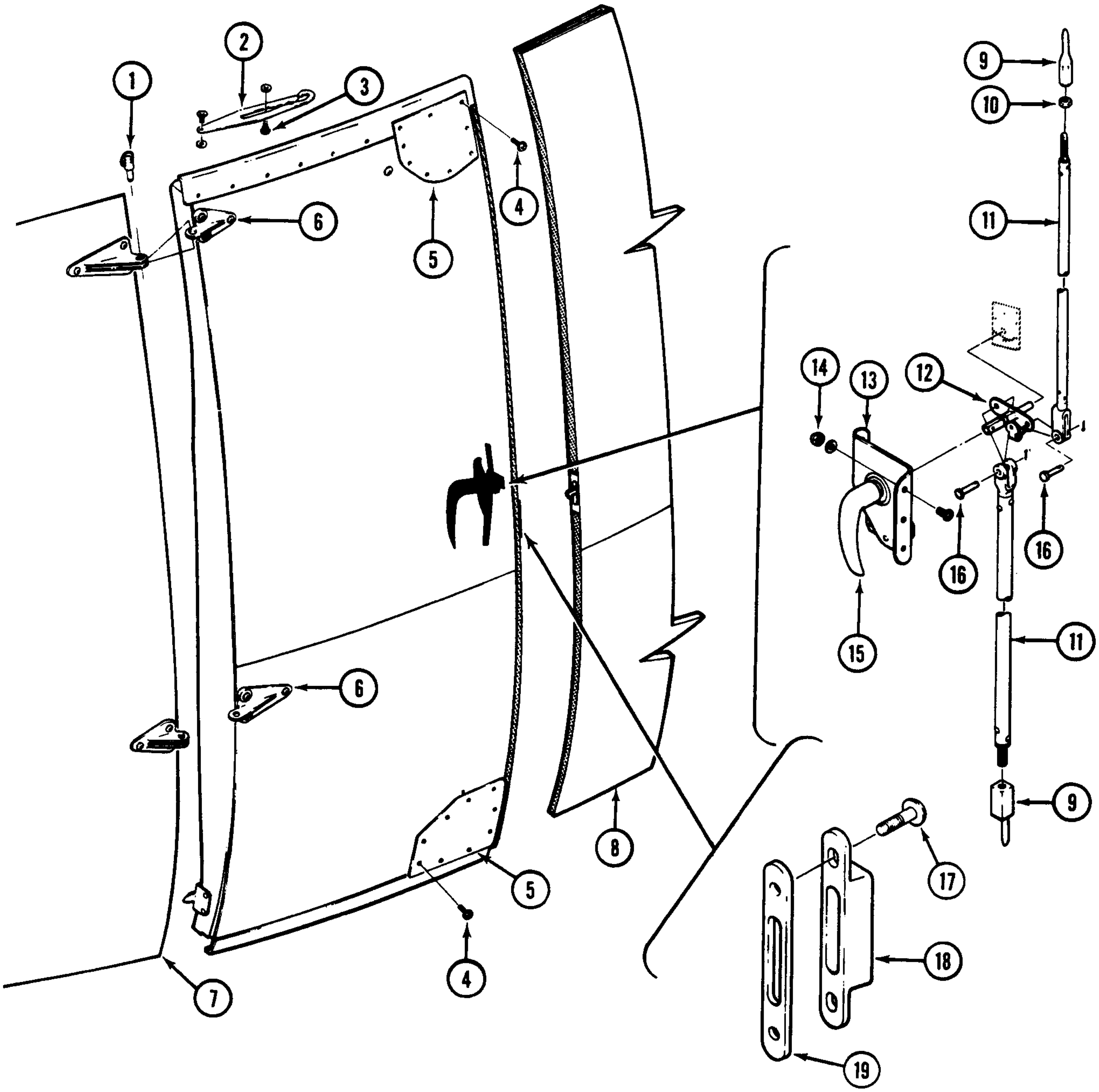
b. Operate handle (15) to open panel, checking that upper and lower latch pins retract to clear top and bottom of door opening.

c. Check action of pivoting spring (2) on pivot (3) as panel is opened. Detent in spring slot should catch and hold panel at approximately ninety degrees to fuselage, and hook of spring should catch when door is forced beyond detent.

d. If necessary to adjust either or both pins (9), remove screws (4) and covers (5) for access. Adjust pins on threaded ends of latch tube assemblies (11) to obtain secure engagement and proper release. Install covers after adjustment.

e. Check condition of hinges, hinge pins, and seals. Replace unserviceable parts.

f. With panel closed and latched, slowly close cargo door to check for proper position of catch (18). When necessary, adjust catch by means of slotted holes or by peeling laminated shim (19) under catch.



1. Quick release pin
2. Pivoting spring
3. Pivot
4. Screws
5. Covers
6. Hinges
7. Door post
8. Cargo door
9. Pins
10. Check nut
11. Tube assembly
12. Spindle assembly
13. Escutcheon
14. Cap nut
15. Handle
16. Pin
17. Screw
18. Catch
19. Laminated shim

UH-1H-II-M-02-35

Figure 2-35. Hinged panel assembly

2-118. Removal — Hinged Panel.

a. Unlatch and slide cargo door aft. Unlatch and open hinged panel.

b. Unhook pivoting spring (2, figure 2-35) from pivot (3) at top of door opening.

c. Pull quick release pins (1) from hinges (6) and remove panel.

2-119. Disassembly — Hinged Panel.

NOTE

Disassemble hinged panel only to extent necessary for replacement of unserviceable parts.

a. Remove eight screws and three cap nuts (14, figure 2-35) with washers to detach escutcheon (13). Remove handle (15) and escutcheon (13) as an assembly.

b. Remove screws (4) and upper and lower covers (5).

c. Remove cotter pins and headed pins (16) to disconnect tube assemblies (11) from spindle assembly (12). Pull tubes inboard until pins (9) are free of guides in panel.

d. Unscrew pins (9) from ends of tube assemblies (11). Remove tubes and pins through upper and lower access openings.

2-120. Inspection — Hinged Panel.

a. Inspect hinged panel for cracks, dents, holes, or other structural damage.

b. Inspect seal for deterioration.

c. Inspect hinges (6, figure 2-35) for cracks. Hinge can be checked for cracks by accomplishing fluorescent penetrant inspection. (TM 55-1500-204-25/1.)

d. Check tube assemblies (11) for damage or distortion. Check clevis ends for wear and threaded ends for damaged threads.

e. Check pins (9) for wear and distortion.

f. Check pivoting spring (2) for cracks and distortion.

2-121. Repair or Replacement — Hinged Panel.

a. Repair structural damage to hinged panel. (TM 55-1500-204-25/1.)

b. Replace components that fail to meet inspection requirements.

c. Replace seal on door as follows:

(1) Remove old seal and remove old adhesive using fine abrasive cloth or paper.

(2) Clean with MEK (C-309) to remove residue.

(3) Bond new seal in place using adhesive (299-947-152, Type V, Class 2).

2-122. Assembly — Hinged Panel.

a. Inspect tube assemblies (11, figure 2-35) into panel through access openings.

b. Screw pin (9) on threaded end of lower tube assembly (11), and check nut (10) and pin on upper tube. Insert pins through guides at top and bottom of panel.

c. Position each tube clevis on spindle (12), and install a headed pin (16) secured by a cotter pin.

d. Position handle (15) and escutcheon assembly (13) to inner side of panel, with handle engaged on spindle. Install eight attaching screws and three cap nuts with washers.

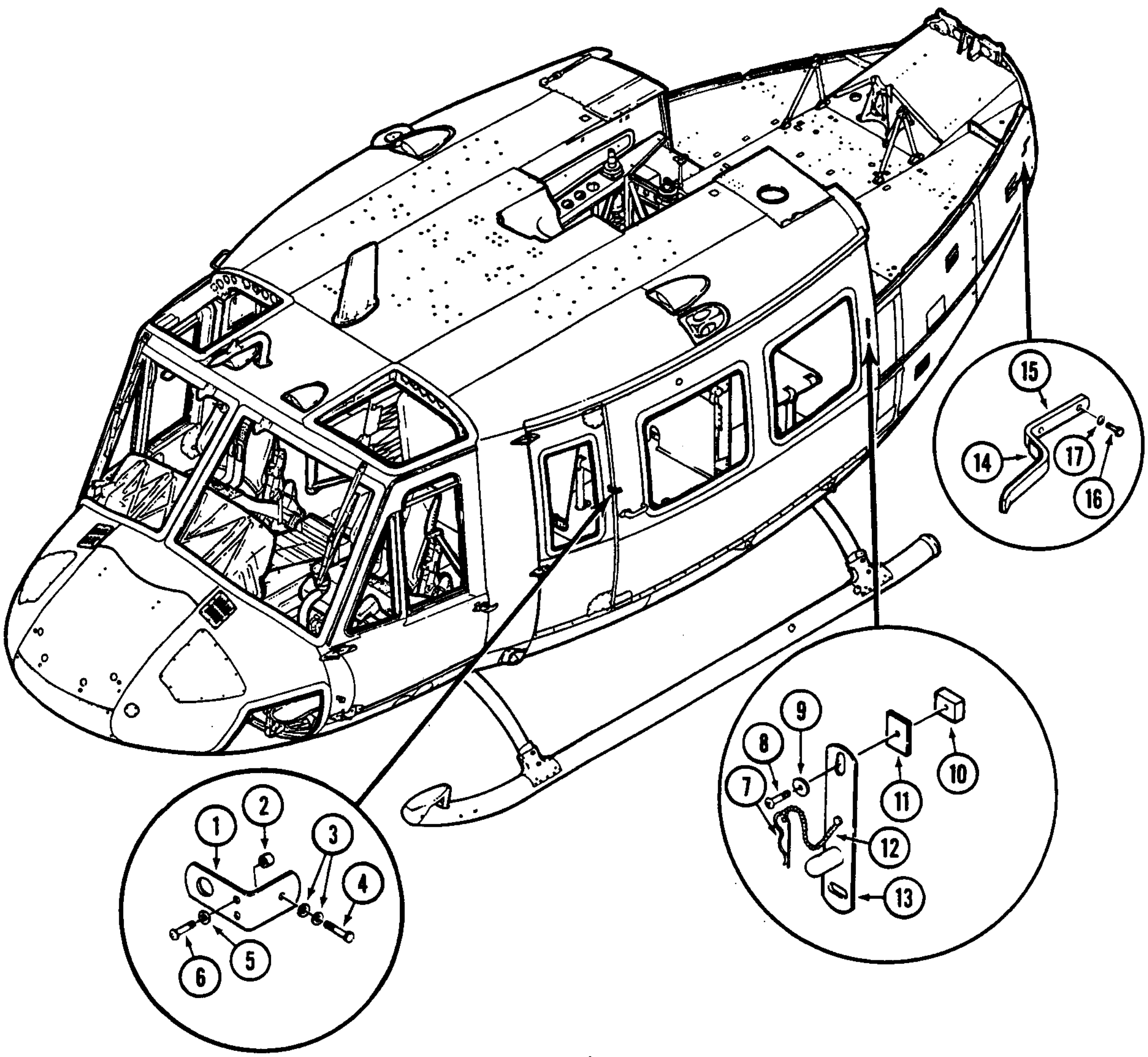
e. Install panel. (Paragraph 2-124.) Make adjustments of latch pins as required. (Paragraph 2-95.)

f. Install covers (5) with screws (4).

2-123. Painting — Hinged Panel. Refer to TB 746-93-2 for painting instructions.

2-124. Installation — Hinged Panel.

a. Position panel to align hinges (6, figure 2-35) and install quick release pins (1).



1. Retainer
2. Spacer
3. Washer
4. Bolt
5. Washer
6. Screw
7. Pin
8. Screw
9. Washer
10. Spacer
11. Doubler
12. Chain
13. Retainer assembly
14. Padding
15. Strap assembly
16. Bolt
17. Washer

UH-1H-II-M-02-36

Figure 2-36. Cargo door installation

b. Hook pivoting spring (2) on pivot (3) at top of door opening.

c. Close panel and check operation and adjustment. (Paragraph 2-117.)

2-125. CARGO DOOR.

2-126. Description — Cargo Doors. A large sliding door operating on rollers and tracks gives access to cargo-passenger area on each side of cabin. Each sliding door has a latch for closed position, and two jettisonable windows which can be used as emergency escape hatches. The door can be secured in open position by a retainer located on rear bulkhead of cabin.

2-127. Removal — Cargo Doors.

a. Unlatch door. Remove retainer (1, figure 2-36) by removing screws (6) with washer (5) and spacer (2) and bolt (4) with washers (3).

b. Remove bolts (16), washers (17), and strap assemblies (15) from aft end of upper and lower tracks on fuselage behind door.

c. Slide door aft, guiding rollers and slider out of tracks.

2-128. Inspection — Cargo Door.

a. Inspect door for dents, damage and cracks.

b. Inspect latch for binding, wear or damage.

c. Inspect slider (14, figure 2-37) for excessive wear.

d. Inspect rollers (3 and 11) for excessive wear.

2-129. Repair or Replacement — Cargo Door.

a. Repair structural damage to door in accordance with TM 55-1500-204-25/1.

b. Replace seals that are cut, torn or show signs of deterioration. Rubber seals with fabric reinforcement shall be installed with reinforcement on the inboard side.

c. For repair of door latch, refer to paragraph 2-136.

d. To replace worn rollers (3 and 11, figure 2-37), remove cotter pin, washer and roller. Install roller on roller support (1, 7, or 9) and install washer and cotter pin.

e. If slider (14) is worn excessively, remove nut (17), washer, spacer (15), screw (13) and slider. Slider can be rotated 180 degrees and reinstalled, or replaced as necessary. Replace slider when phenolic is worn down to metal. Position slider (14) and spacer (15) to slide assembly (19). Install screw (13) with washer and nut (17).

2-130. Painting — Cargo Door. Refer to TB 746-93-2 for painting instructions.

2-131. Installation — Cargo Door.

a. Position door with forward edge in line with aft end of door tracks.

b. Start roller and slider through cutouts at aft ends of tracks. Push door forward.

c. Install strap assemblies (15, figure 2-36) with washers (17) and bolts (16) at aft end of upper and lower tracks on fuselage.

d. Position retainer (1) with two spacers (2) on cargo door and secure with two screws (6), washers (5), bolt (4), and washers (3).

e. Check adjustment of door. (Paragraph 2-132.)

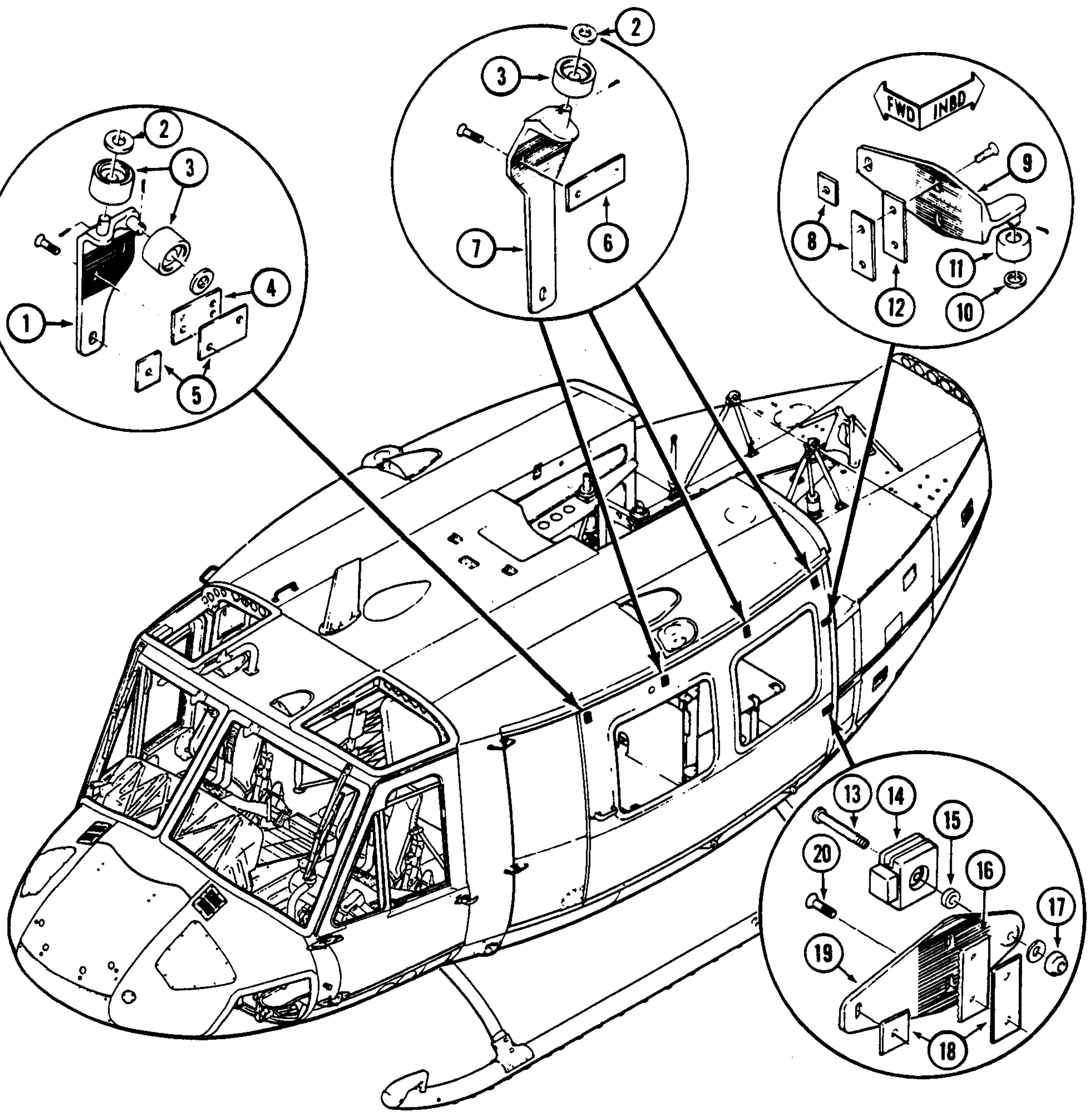
2-132. Adjustment — Cargo Door. Both sliding cargo doors must be properly aligned to be secure in all flight conditions and to operate correctly. Check and adjust fit of each door according to procedure outlined below.

a. Place door to full closed and latched position. Check that upper edge of door is parallel to top of cabin door frame.

b. If door is out of alignment, adjust as follows:

(1) Loosen mounting screws in slide assembly (19, figure 2-38) and aft upper roller support (9).

(2) Adjust slide assembly (19) to raise or lower door to align upper edge parallel to door frame. Tighten screws (20).



1. Forward roller support
2. Washer
3. Roller
4. Serrated plate
5. Shims
6. Serrated plate
7. Upper roller support
8. Shims
9. Aft upper roller support
10. Washer
11. Roller
12. Serrated plate
13. Screw
14. Slider
15. Spacer
16. Serrated plate
17. Nut
18. Shims
19. Slide assembly
20. Screw

UH-1H-II-M-02-37

Figure 2-37. Cargo door — parts replacement

(3) Adjust roller support (9) so that roller (11) is fully engaged in track. Tighten mounting screws.

c. Operate door through full travel while checking that all rollers on upper edge are fully engaged in track at all positions. Adjust roller supports as required.

d. With door fully closed and latched, check that lower door track is engaged not less than 0.25 inch in cabin door channel. If required, loosen screws attaching lower track on door and adjust track to provide maximum engagement in cabin door channel without restricting door travel through full range from closed to open positions. Ensure that door track attaching screws are tightened after adjustment.

e. Check door latch for proper operation and adjust if required. (Paragraph 2-137.)

2-133. CARGO DOOR LATCH.

2-134. Description — Cargo Door Latch. A latch is provided for each door to maintain the door in the closed position.

2-135. Removal — Cargo Door Latch.

a. Unhook tension spring (1, figure 2-38) from latch hook (10) and from hanger directly below on door structure.

b. Remove outer handle (6) as follows:

(1) Remove setscrews (5) which secures handle (6) to latch shaft (9).

(2) Remove two screws to detach door handle plate (7) from door. Pull handle and door handle plate assembly off end of shaft. When necessary, remove retaining ring (8) to separate parts.

c. Withdraw latch shaft (9) to remove inner handle (12) and hook (10) with washers (11).

d. Leave hook adjustment setscrew (3) and handle stop (4) in place in door structure channel (2), unless replacements are necessary.

2-136. Inspection and Repair — Cargo Door Latch.

a. Inspect components of latch for wear or damage.

b. Replace parts which are worn or damaged sufficiently to prevent proper operation.

2-137. Installation — Cargo Door Latch.

NOTE

Lubricate hinge and pivot points with a light coat of grease (C-014) during assembly.

a. Check that hook adjustment setscrew and angle fitting which serves as stop (4, figure 2-38) for inner handle (12) are installed in door structure channel (2).

b. Place latch hook (10) in fork of inner handle (12). Insert a washer (11) between hook and handle at outboard side.

c. Place hook and handle assembly into door structure channel (2), with hook through guide slot. Align holes and insert latch shaft (9) from inboard side.

d. Check that door handle plate (7) is secured on outer handle (6) with retaining ring (8).

e. Place outer handle (6) over end of latch shaft (9). Check alignment of parts before installing setscrew (5) through handle into shaft.

(1) Outer handle (6) should be pointing aft and horizontal when inner handle (12) is upright, with stop (4) face against angle fitting in bottom of door structure channel (2). If necessary, change position of latch shaft (9) to align holes for setscrew, and adjust position of stop fitting.

(2) Secure door handle plate (7) to door with two screws.

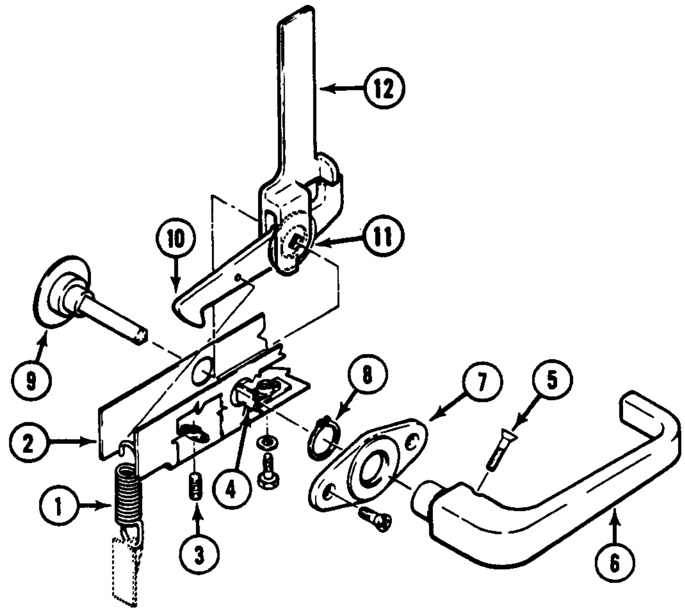
f. Connect tension spring (1) between hook (10) and hanger located below on door structure.

g. Check operation of latch. Adjust setscrew under latch hook so that hook will positively engage striker in panel door.

2-138. CARGO DOOR TRACKS.

2-139. Inspection — Cargo Door Tracks.

a. Inspect track for damage or wear caused by roller or slider vibration.



1. Tension spring
2. Door structure channel
3. Hook adjusting screw
4. Stop
5. Setscrew
6. Outer handle
7. Door handle plate
8. Retaining ring
9. Latch shaft
10. Hook
11. Washer
12. Inner handle

UH-1H-II-M-02-38

Figure 2-38. Cargo door latch — typical

b. Inspect inboard and lower surface of track for wear in roller areas when cargo door is fully open and fully closed. Wear pads should be installed when wear is evident.

c. Inspect hinged panel latch hole in upper track for damage or wear. Hole can be repaired by installation of bushing.

d. Inspect hinged panel latch hole in lower track for damage or wear. Repair can be made by installation of striker plate.

2-140. Repair of Cargo Door Tracks by Patching.

a. Using a suitable tool, clean up damaged area of door track caused by roller or slider vibration. (Figure 2-39.) Radius corners of cleaned up area and break all sharp edges.

b. Fabricate patch from 0.032-inch stainless steel material. Length and width of patch will be determined by amount of cleanup required to remove damage to track.

c. Drill out rivets retaining skin to track, in damaged area. Install patch in position and drill holes in patch, picking up existing rivet holes.

d. Remove patch. Clean and deburr holes. Install, patch using MS20470AD4 or MS20470AD5 rivets depending on condition of rivet holes. Where flush rivets are required, use MS20426AD4 or MS20426AD5 rivets.

e. Should damage to the cargo door track be found on the forward section in the fuel cell area, it will be necessary to drain the fuel and open fuel cell compartment by removing work decal panel.

f. Fuel cell should be unlaced and moved back from fuel cell bulkhead, and provisions made to catch and retain chips and rivets during installation of patch. After installation of rivets in patch, exposed rivets inside fuel cell bulkhead should be covered with adhesive (C-308) to protect fuel cell.

g. Where blind rivets are required, or can be more conveniently installed, use CR2249-4 or CR2249-5 rivets depending on rivet hole condition.

h. After installation of patch on track, fill any existing gaps between track and ends of patch with adhesive (C-313). Smooth flush and refinish as necessary.

2-141. Repair of Cargo Door Tracks — Installation of Wear Pads.

NOTE

At the first indication of wear (0.010 to 0.020 inch) on the cargo door tracks in the full open and full closed positions, stainless steel wear pads should be installed.

a. Remove cargo door. (Paragraph 2-127.)

b. Defuel helicopter and remove lower fuel cell on side of helicopter that wear pads are being installed on. (Chapter 10.)

c. Fabricate wear pads from 0.025-inch stainless steel, quarter hard, three inches in length. The pads shall be wide enough to cover the inboard and lower track surface where roller or slider would rest. (Figure 2-40.)

CAUTION

Use care in drilling so that end of drill bit does not damage parts on inboard side of track.

d. Form wear pad to shape and place in track at aft end of cut out. Move into position, lay out, and mark for rivets. Drill rivet holes, using No. 30 drill through wear pad material and door track.

e. Countersink or dimple wear pad. Countersink door track if wear pad is dimpled. Remove wear pad, clean and deburr. Clean door track and apply adhesive (C-313) to wear pad location. Slide wear pad into location and install with MS20426AD4 rivets. Clean excess adhesive from pad and door track with cloth moistened with MEK (C-309). Clamp or wedge wear pad to lower surface of track for 24 hours to allow adhesive to cure.

f. Repeat above steps for each door track.

g. Install cargo door and functionally check to ensure that it operates properly.

h. Clean fuel cell cavity and install fuel cell. (Chapter 10.)

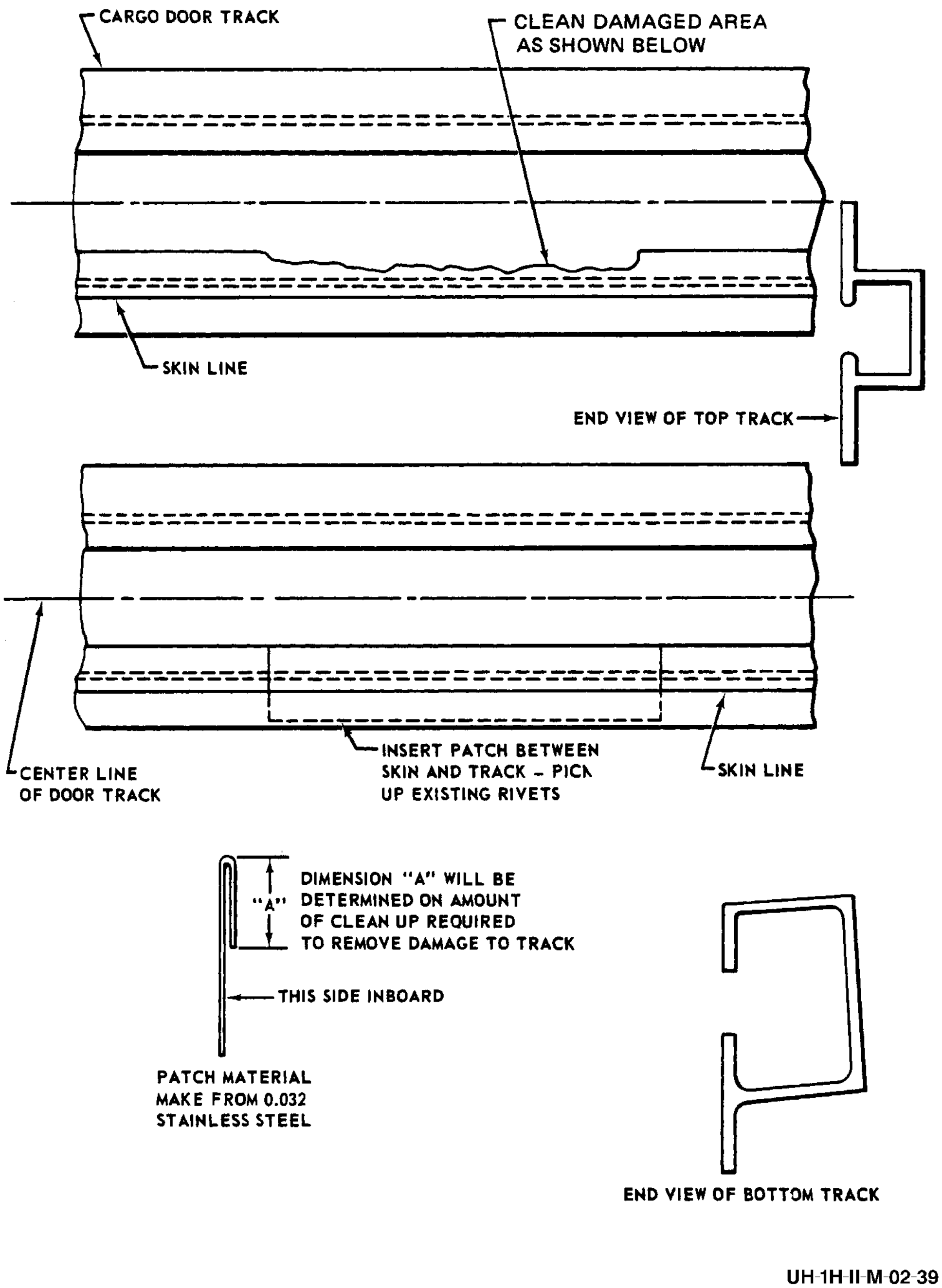


Figure 2-39. Cargo door track — patching

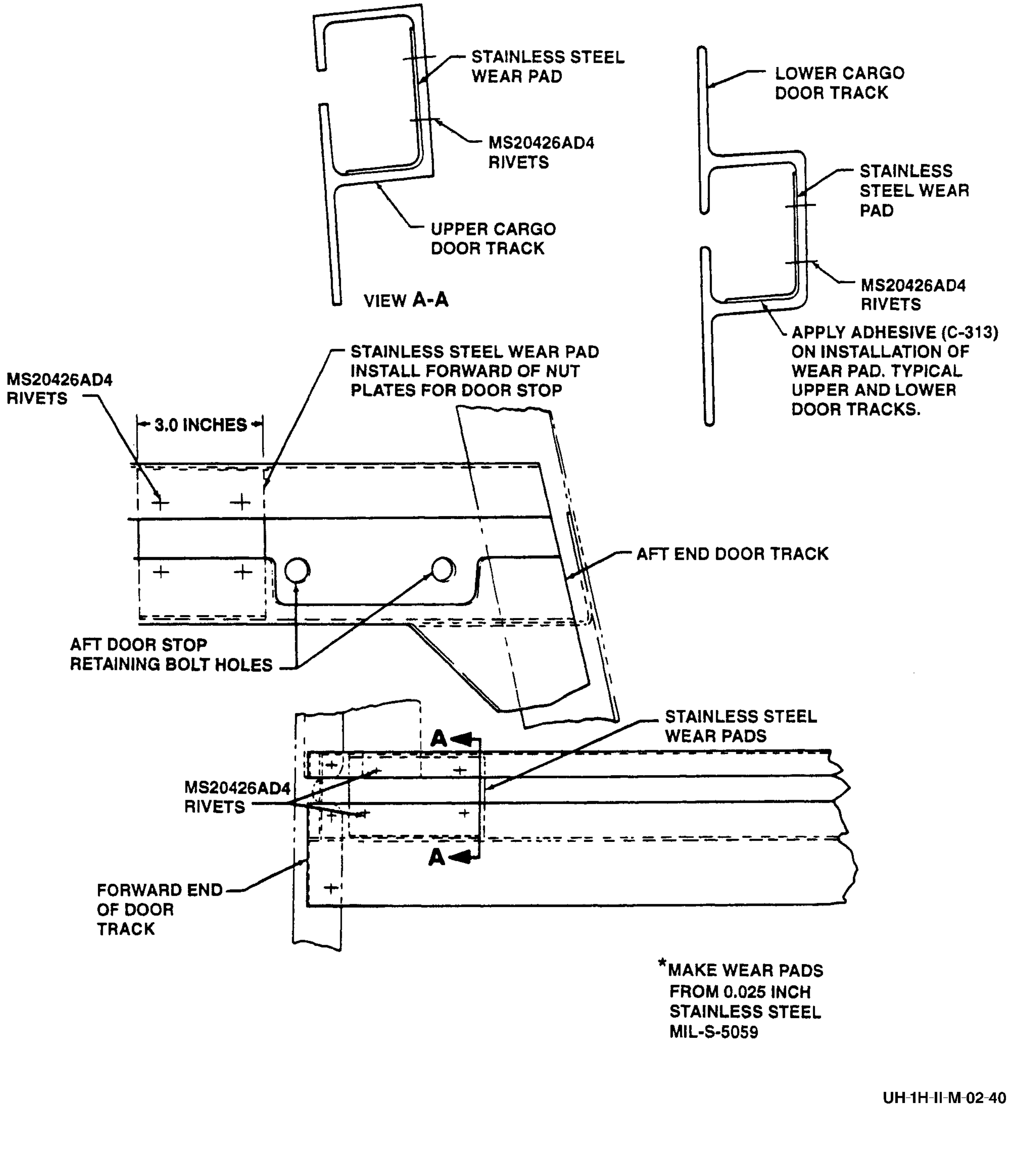


Figure 2-40. Cargo door track — installation of wear pads

2-142. Repair of Cargo Door Tracks — Installation of Bushing in Hinged Panel Upper Latching Pin Hole.

NOTE

This repair is applicable to the latching pin holes for hinged panel in upper cargo door track at station 91.15.

a. Open hinged panel to the locked open position.

b. Remove two MS20426AD4 rivets retaining the guide block. Remove guide blocks.

c. Place guide blocks in vise and drill out existing latching pin hole to 0.250 inch. Counterbore the upper surface at closed end of guide slot to depth of 0.0625 inch and diameter of 0.375 inch. (Figure 2-41.)

d. Coat bushing with adhesive (C-313) and install a guide block. Clean excess adhesive from guide block and allow adhesive to cure for 24 hours.

e. Position guide block in track and install two MS20426AD4 rivets flush on lower side as illustrated.

f. Close hinged panel and check to ensure that latch pins will engage bushing properly.

2-143. Repair of Cargo Door Tracks — Installation of Striker Plate at Hinged Panel Lower Latching Hole.

a. Move cargo door to aft position. Open hinged panel.

b. Fabricate striker plate from 0.040-inch 4130 steel. (Figure 2-42.)

c. Temporarily install striker plate on cargo door track with center of striker plate over locking hole in the track. Locate hole in striker plate.

d. Drill hole in striker plate using a 0.187-inch diameter drill.

e. Locate and drill two 0.128-inch diameter holes. (Figure 2-42.)

f. Clean mating surfaces of the track and striker plate with aliphatic naphtha (C-305).

g. Coat mating surface of striker plate with adhesive (C-313), and install on track with holes aligned.

h. Install two rivets (CR2249-4-5).

i. Wipe excessive adhesive from track and allow to dry for 24 hours.

j. Paint reworked area with epoxy polyamide primer (C-204).

2-144. WINDSHIELDS.

2-145. Description — Windshields. The cabin windshields are constructed of acrylic plastic MIL-P-8184. The bonded edging around the windshields is constructed of three ply fiberglass. The right windshield has provisions for mounting of thermometer with bonded nylon laminate doublers on each side of the glass.

2-146. Removal — Windshield.

a. Loosen ten screws (13, figure 2-43) and remove cover (10) from center windshield post.

b. Pull wire bundle from channel (9). Remove three screws (11) with washers (12) attaching channel to clips (8). Remove channel from center windshield post.

c. Lift windshield wiper arm to the up position and install a suitable pin in hole of arm (Chapter 12) to relieve spring pressure. Remove nut and washer attaching wiper arm to serrated end of shaft of wiper motor and remove arm and blade assembly.

d. Mark location of stop (4) to adjacent structure and remove stop from windshield.

e. Mark location of fitting (5) on adjacent structure and remove two screws (6), washers and nuts from (instrument panel brace) fitting.

f. Remove thermometer (7) (if removing pilots windshield).

g. Remove sealant from around cabin air drain hose, located at upper outboard corner of windshield, and pull hose from windshield.

h. If both windshields are being replaced at the same time, observe and mark location of three clips (8) to adjacent structure and remove clips.

i. Remove screws (1), washers (2), and nuts (3) from windshield.

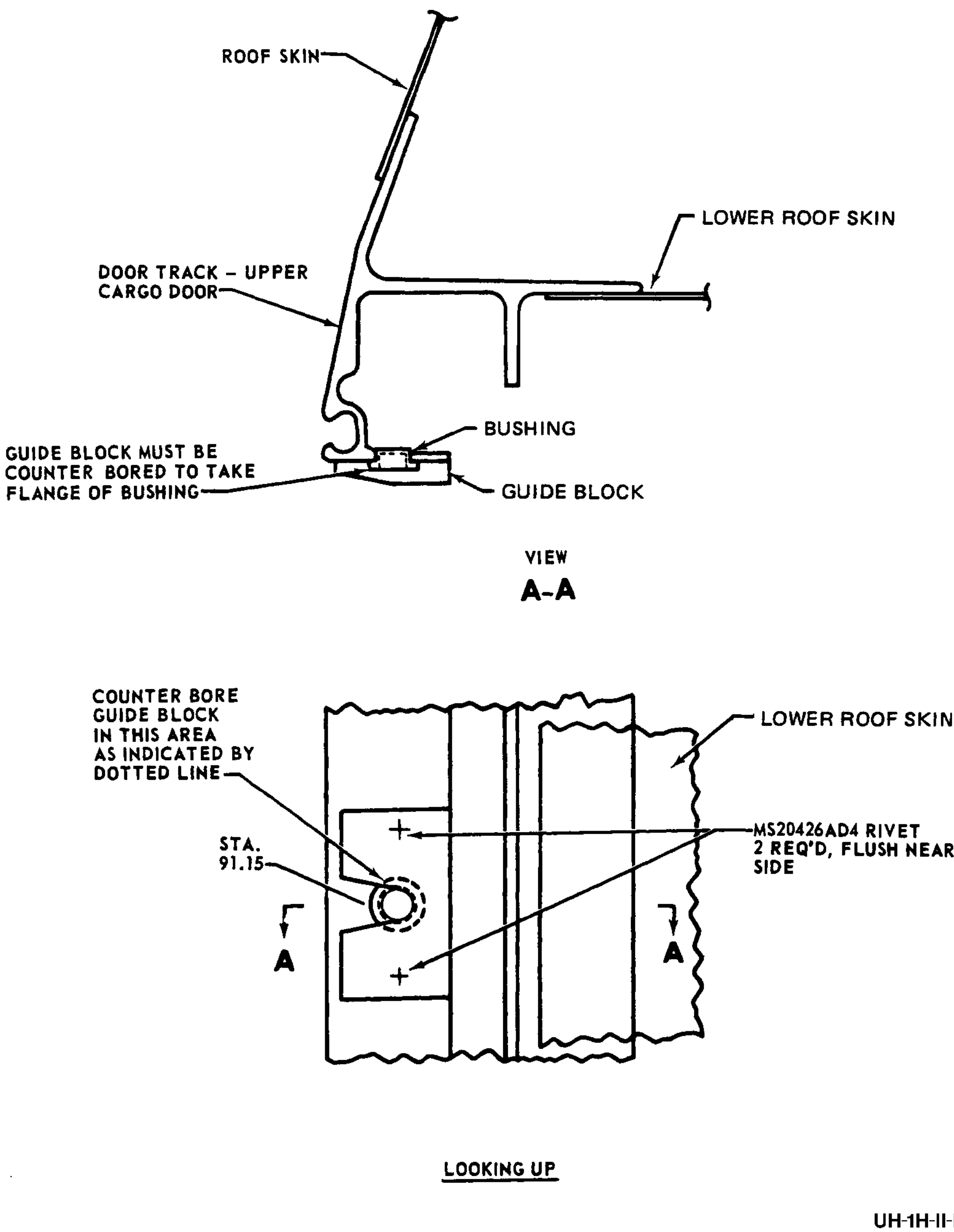
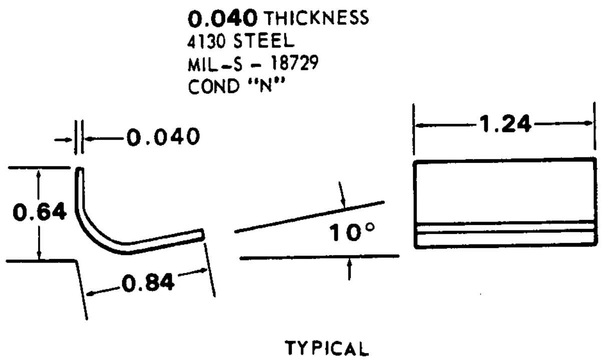
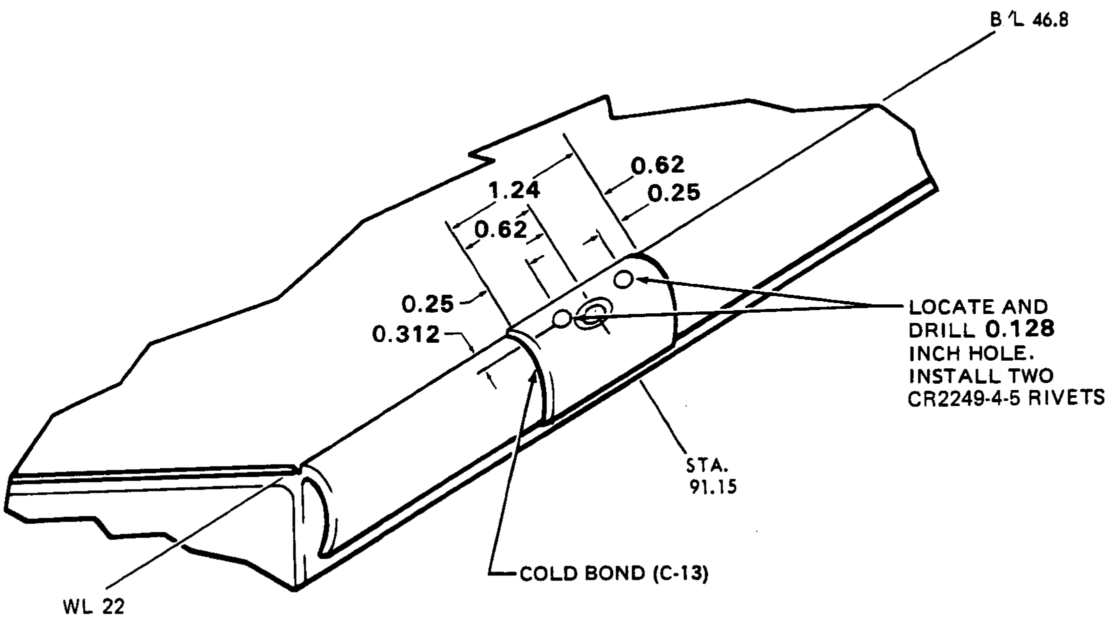


Figure 2-41. Upper cargo door track — installation of steel bushings



STRIKER PLATE FABRICATION



STRIKER PLATE INSTALLATION

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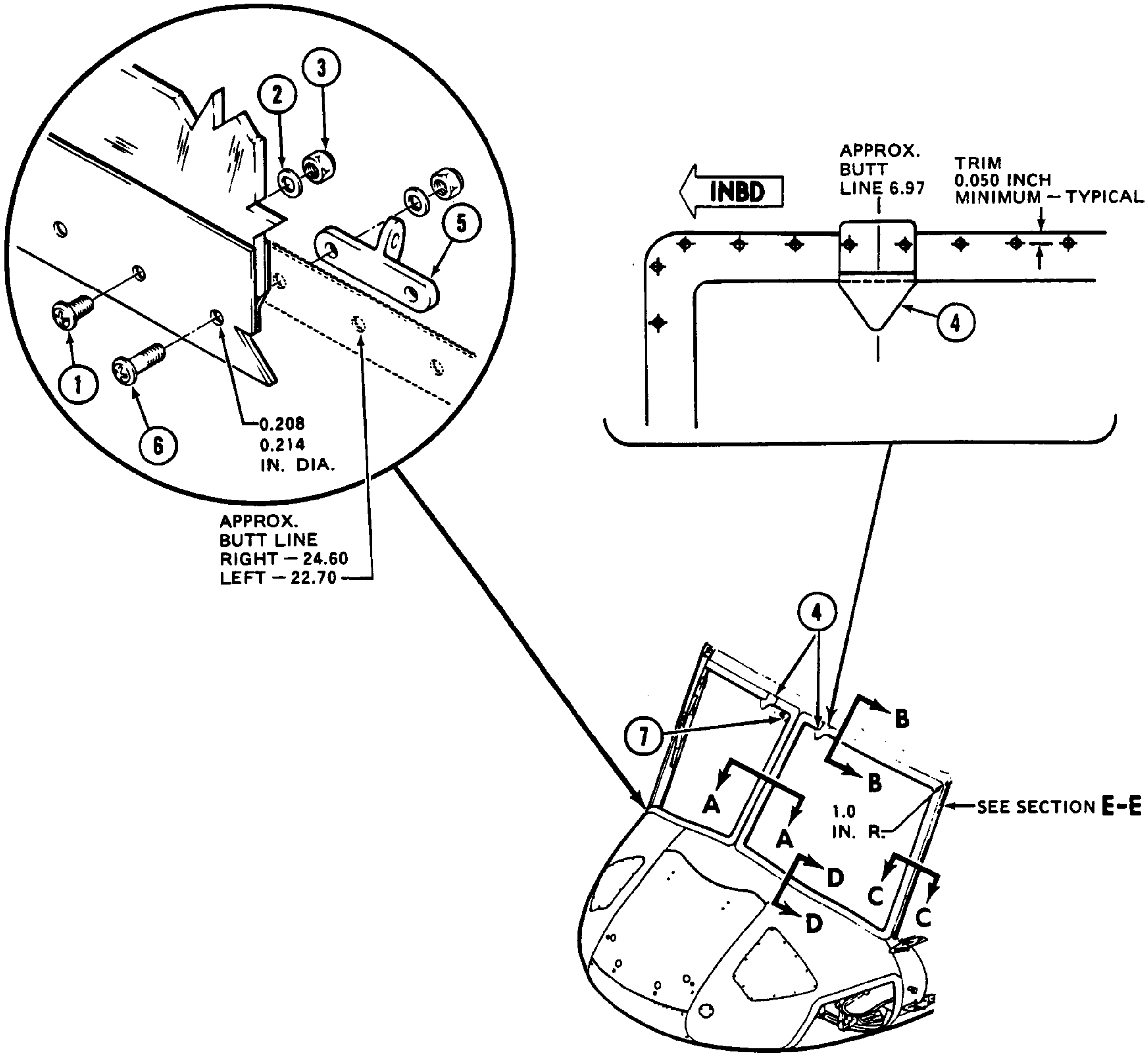
Figure 2-42. Lower cargo door track — installation of striker plate



1. Screw
2. Washer
3. Nut
4. Stop
5. Fitting
6. Screw
7. Thermometer
8. Clip
9. Channel
10. Cover
11. Screw
12. Washer
13. Screw

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Figure 2-43. Windshield installation (Sheet 1 of 2)

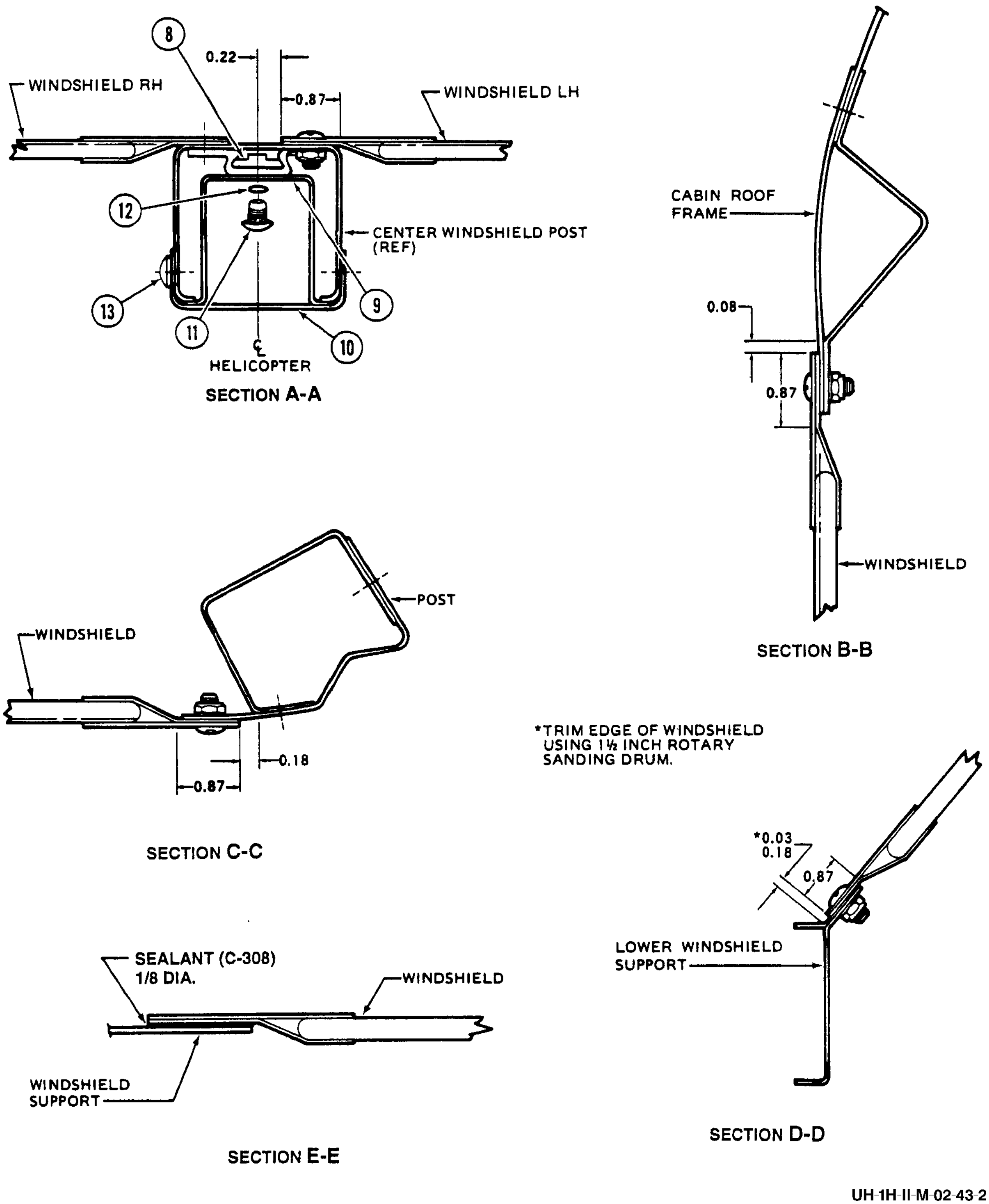


Figure 2-43. Windshield installation (Sheet 2 of 2)

j. Using a plastic scraper, separate and remove windshield from structure.

WARNING

MEK is extremely flammable and highly volatile. Keep away from heat and open flame. Avoid prolonged breathing of vapor and use with adequate ventilation. Avoid prolonged or repeated contact with skin.

k. Remove aged sealant from structure with a rag saturated with MEK (C-309).

l. Prime outer surface of structure (by spray method) with epoxy polyamide primer (C-204).

2-147. Cleaning — Windshield. Refer to TM 55-1500-204-25/1.

2-148. Inspection — Windshield. Refer to figure 2-44.

2-149. Repair or Replacement — Windshield. Replace if damage is greater than practical to repair. Repair damage in accordance with TM 55-1500-204-25/1.

2-150. Installation — Windshield.

CAUTION

Do not trim windshield to final size until all mounting holes have been drilled.

NOTE

Bottom of windshield will not lay flat against structure.

a. Position windshield to cavity of structure. Apply a mark at top and bottom edge (inboard side that overlaps adjacent windshield). Remove and trim excess from windshield to clear adjacent windshield.

b. Position windshield against structure. While maintaining equal clearance (refer to Sections B-B and C-C, figure 2-43) from structure (minimum 1/8 inch clearance) and using a wooden block as a backup, back drill two 0.190 to 0.196 inch holes approximately 12 inches apart in top center edge of windshield and install two 3/16 cleco fasteners.

c. Using 1 1/2 inch rotary sanding drum, trim lower end of windshield 0.030 to 0.180 inch clearance from top edge of nose skin as shown in Section D-D.

d. Starting at center (top and lower end) of windshield and working in toward inboard and outboard directions, back drill every third hole and install a 3/16 cleco fastener. Back drill remainder of holes in windshield.

e. Remove cleco fasteners and windshield from structure.

f. Drill holes to final size, 0.208 to 0.214 inch. Deburr holes, both sides.

g. Apply a mark 0.50 inch from outer edge of all holes in windshield. Draw a line adjoining all marks and trim windshield.

h. Radius, by trimming, lower outboard cover (approximately 2.0 inches) of windshield maintaining 0.50-inch edge distance from outer edge of holes.

i. Trim two inboard corners of windshield to approximately 1 1/2 inch radius. Radius upper outboard corner as required to maintain minimum 0.50-inch hole edge distance.

j. Using a hand file, round all windshield edges approximately 0.015-inch radius.

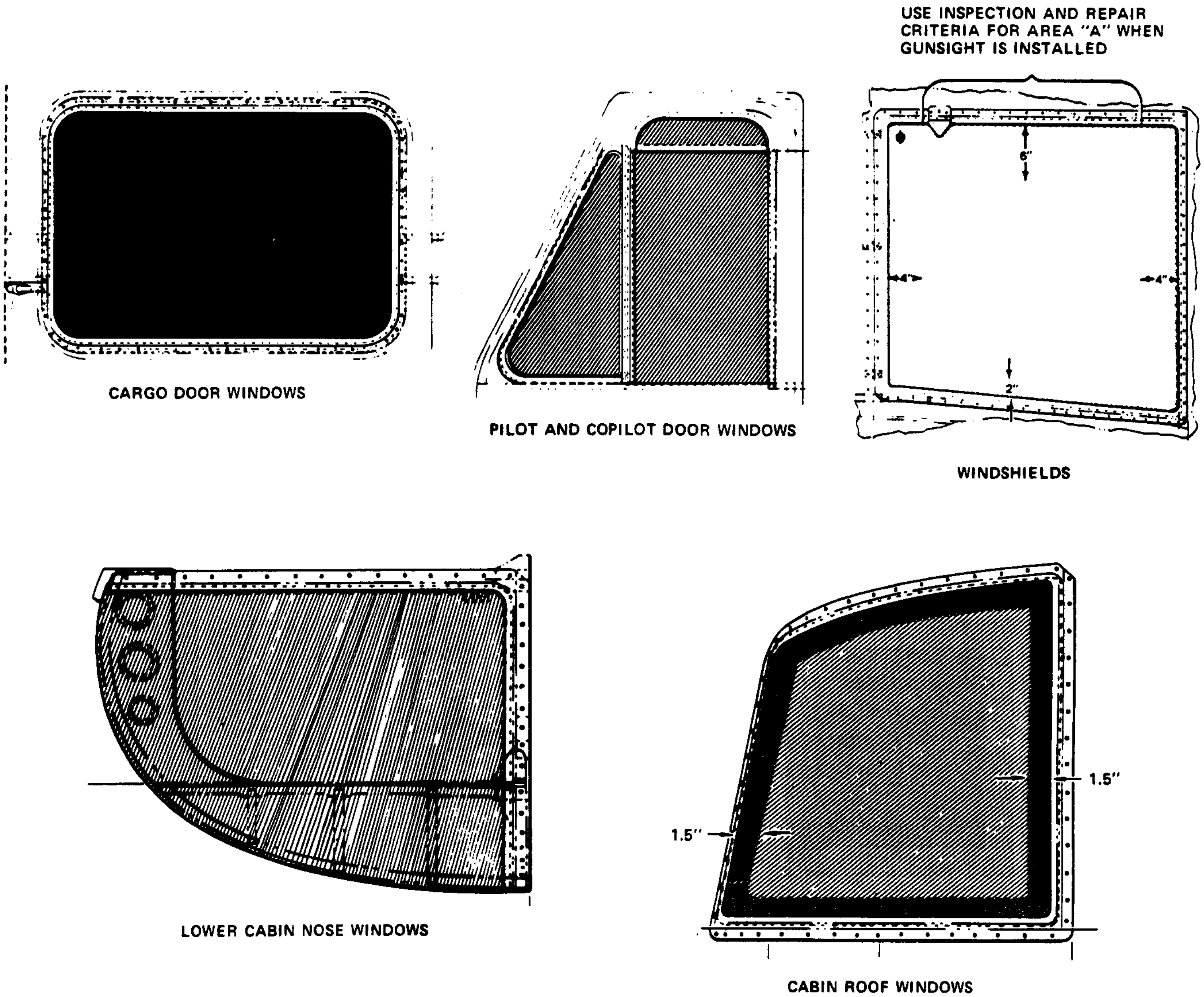
k. Wipe file dust from windshield. Apply a 1/8 inch bead of watertight adhesive (C-308) on mating surface along inboard and outboard side of holes of windshield and structure.

l. Install two 3/16 cleco fasteners in top of windshield, approximately 24 inches apart. Position windshield to structure and secure cleco fasteners. Install cleco fasteners in every other hole.

NOTE

Observe locations of stop (4, figure 2-43) and fitting (5). If clips (8) have been removed, do not install screws in holes at three locations at this time.

m. Install screws (1), washers (2), and nuts (3) in all open holes in windshield with the exception of mounting points for stop (4) and fitting (5). Remove cleco fasteners and install hardware in remainder of holes.



AREA "A": Scratches and pits may be polished out to the extent that vision is not distorted. Distortion of vision is cause for replacement. Cracks, holes or other damage may be temporarily repaired, if vision of crew members will not be impaired, by stop drilling, patching or other approved methods (refer to TM 55-1500-204-25/1), but window must be replaced at the earliest opportunity.

AREA "B": Scratches and pits are permitted in this area provided they are not so numerous or form such a pattern as to be objectionable to the viewer. Cracks, holes or other damage may be temporarily repaired by stop drilling, patching or other approved methods (refer to TM 55-1500-204-25/1), but window must be replaced at the earliest opportunity.

AREA "C": Scratches and pits are permitted in this area, providing the structural integrity of the window is not impaired. Cracks, holes or other damage may be repaired by stop drilling, patching or other approved methods provided structural integrity is not impaired (refer to TM 55-1500-204-25/1).

UH-1H-II-M-02-44

Figure 2-44. Windshields and windows — critical areas and repair

n. Install stop (4).

o. Position fitting (5) at approximately Buttock Line 24.60 and install two screws (6), washers, and nuts.

p. If three clips (8) have been removed, install clips with screws (1), washer (2), and nuts (3) in same locations from which they were marked when removed.

q. Position channel (9) to clips (8) and install three screws (11), and three washers (12).

r. Install wire bundle (hanging from overhead console) into channel (9). Position cover (10), while engaging slots over screws (13) and washers, and tighten screws.

s. Back drill hole, located at upper outboard corner and inside of cabin, through windshield for cabin air (water drain) hose. Deburr hole.

t. Install cabin air (water drain) hose to penetrate through window approximately 1/2 inch. Apply adhesive (C-308) around hose and fair and smooth sealant.

u. Clean excess sealant from around inboard edge of structure and outer edge of windshield.

v. If pilots windshield is being replaced, install thermometer (7). Apply adhesive (C-308) around nut and washer (outside of cabin) and fair and smooth sealant.

w. Mask and paint fiberglass area of windshield. (Refer to TB 746-93-2.)

x. Remove protective film from inner and outer surface of windshield. Clean and polish inner and outer surface of windshield. (Refer to TM 55-1500-204-25/1.)

y. Install windshield arm and blade assembly (Chapter 12) to shaft of wiper motor at same position from which it was removed. Install bolt, washer and nut. Remove pin from arm.

2-151. UPPER DOOR WINDOW — CREW DOOR.

2-152. Description — Upper Door Window. A small, fixed transparent acrylic plastic window (7, figure 2-45, detail B) is located at top of both pilots and copilots crew door. The window is secured to crew door with screws, washers, and nuts.

2-153. Removal — Upper Door Window.

a. Remove nuts (5, figure 2-45, detail B), washers (6), and screws (8) from window (7).

b. Using a spatula or putty knife, separate window (7) from sealing compound and remove window from door (3).

c. Remove old sealant from mounting flange of door (3) with plastic scraper, spatula, or other suitable non-metallic tool.

CAUTION

When cleaning mounting flange and window, use only aliphatic naphtha, type 2 (C-305).

d. Wipe and clean mounting flange and edge of window (7) with aliphatic naphtha (C-305).

2-154. Cleaning — Upper Door Window. Refer to TM 55-1500-204-25/1.

2-155. Inspection — Upper Door Window. Refer to figure 2-44.

2-156. Repair or Replacement — Upper Door Window. Replace window if damage is greater than practical to repair. Repair window damage in accordance with TM 55-1500-204-25/1.

2-157. Installation — Upper Door Window.

NOTE

Do not trim replacement window to final size until all mounting holes have been drilled.

a. Position replaceable window (7, figure 2-45) over opening. Trim surplus edge to permit window to mate against mounting flange.

b. Position window against mounting flange. Using a No. 23 drill, back drill two 0.146 to 0.156 inch holes on each edge of window.

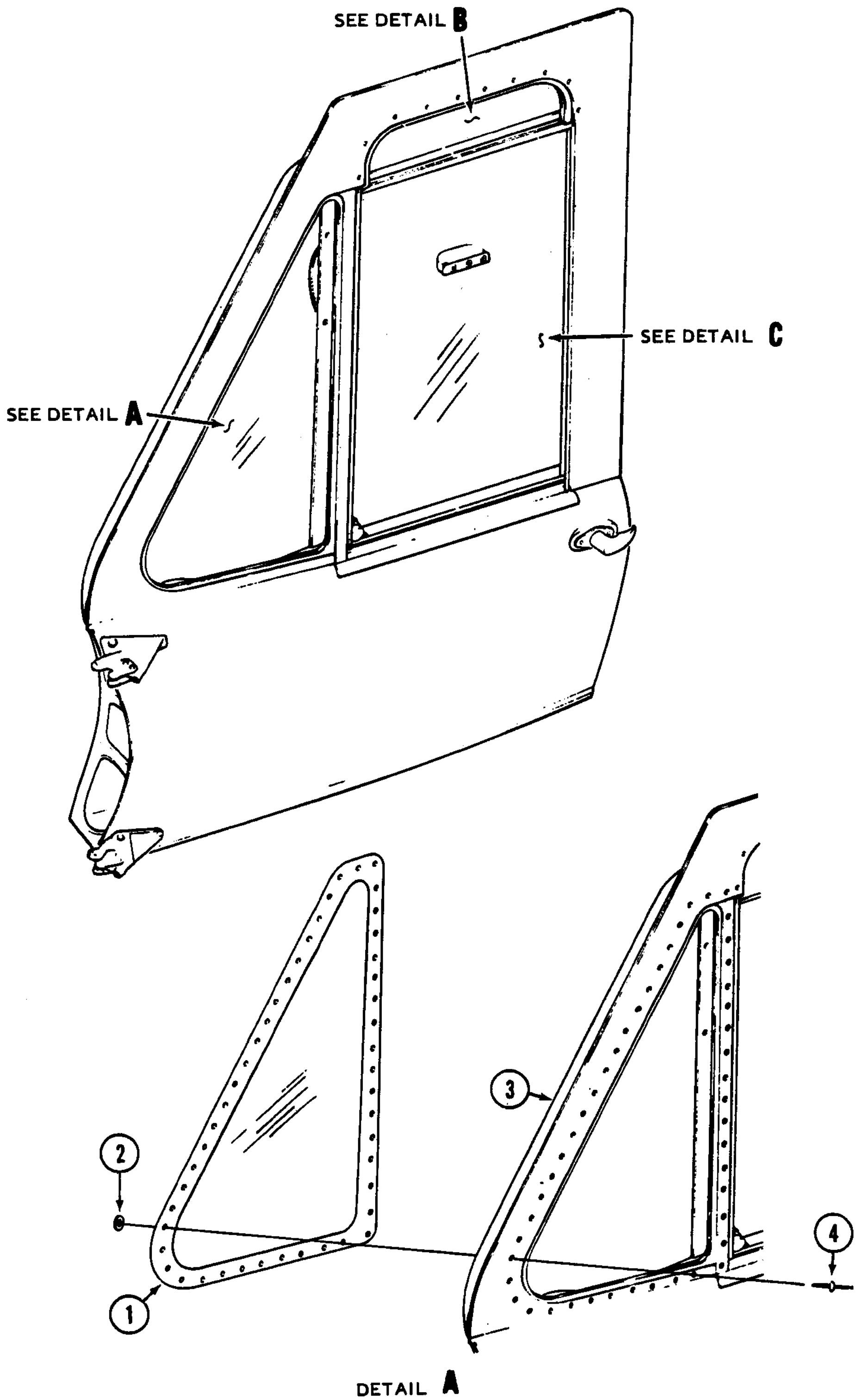


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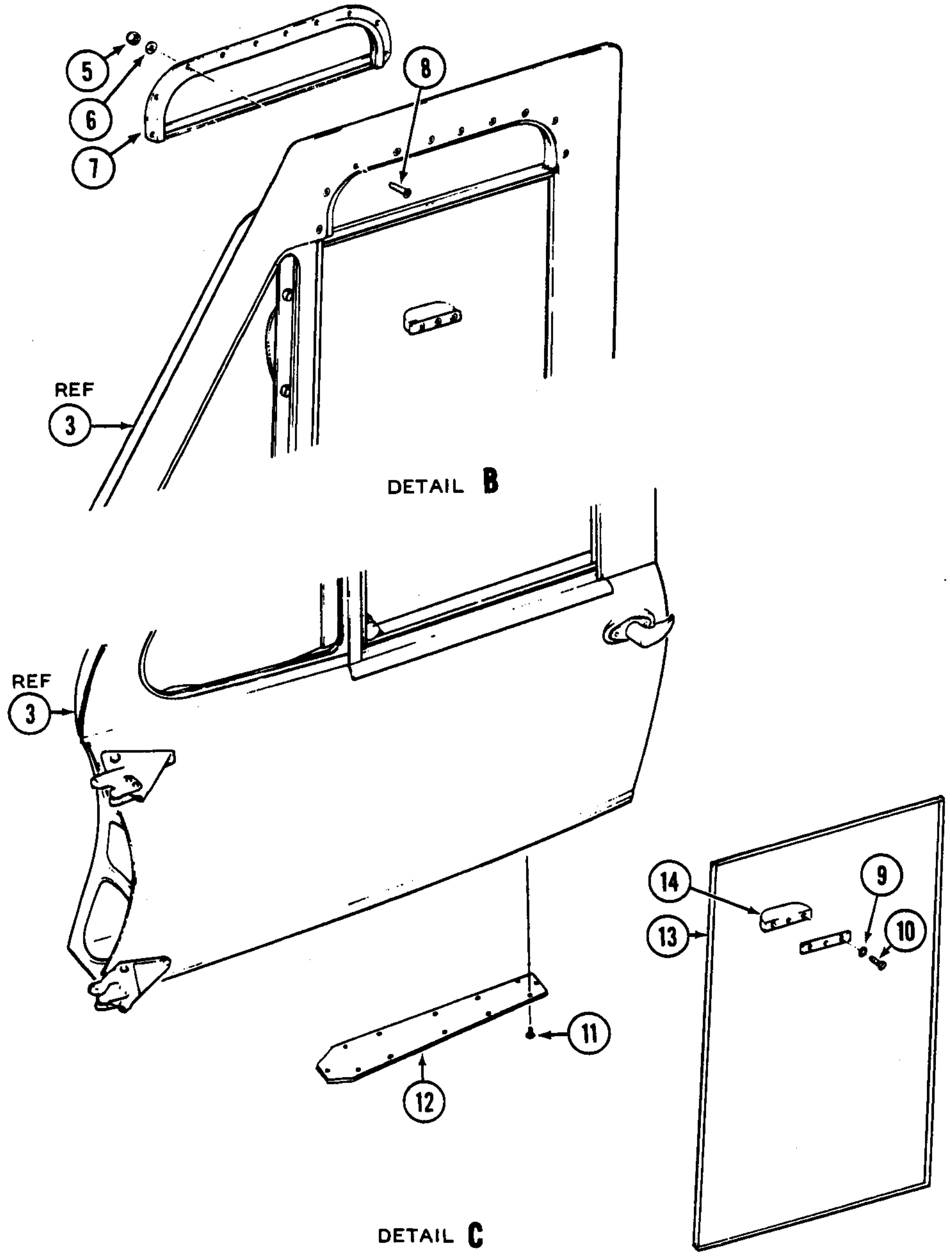
Figure 2-45. Crew door windows — remove/install (Sheet 1 of 2)



1. Window
2. Rivet washer
3. Door
4. Rivet
5. Nut
6. Washer
7. Window
8. Screw
9. Washer
10. Screw
11. Screw
12. Door
13. Window
14. Handle

UH-1H-II-M-02-45-2

Figure 2-45. Crew door windows — remove/install (Sheet 2 of 2)

c. Secure window to mounting flange with four cleco fasteners or screws, washers, and nuts. Lightly tighten nuts and drill remainder of holes.

d. Remove window. Mark a line 0.50 inch from outer edge of holes and trim window.

e. Using a suitable file, radius edge of window. Deburr rivet holes on both sides of window.

f. Remove all dust and foreign matter from mating area of window and mounting flange of door.

g. Apply a 1/8 inch bead of adhesive (C-308) along each side of mating surface of window and mounting flange of door.

h. Position windows (7) to mounting flange and install screws (8), washers (6), and nuts (5).

CAUTION

When cleaning window, use only aliphatic naphtha, type 2 (C-305).

i. Remove excess sealing compound from around window using aliphatic naphtha (C-305). Remove protective film from window. Clean and polish window. Refer to TM 55-1500-204-25/1.

2-158. FORWARD DOOR WINDOW — CREW DOOR.

2-159. Description — Forward Door Window. A triangle shape transparent acrylic plastic window (1, figure 2-45, detail A) is located at the forward side of pilots and copilots crew door. The window is secured to crew door with rivets and rivet washers.

2-160. Removal — Forward Door Window.

a. Using a No. 41 drill, drill rivet shanks from rivets.

NOTE

If steel (blind) rivets with a locking collar are installed, use No. 27 (0.144) drill. If aluminum (blind) rivets are installed, use No. 30 (0.128) drill.

b. Drill rivets (4, figure 2-45) and rivet washers (2) from windows (1).

c. Using a spatula or putty knife, separate window (1) from sealing compound and remove window from door (3).

d. Remove old sealant from mounting flange of door (3) with plastic scraper, spatula, or other suitable non-metallic tool.

2-161. Cleaning — Forward Door Window. Refer to TM 55-1500-204-205/1.

2-162. Inspection — Forward Door Window. (Figure 2-44.)

2-163. Repair or Replacement — Forward Door Window. Replace window if damage is greater than practical to repair. Repair window damage in accordance with TM 55-1500-204-25/1.

2-164. Installation — Forward Door Window.

NOTE

Do not trim replacement window to final size until all mounting holes have been drilled.

a. Position replacement window (1, figure 2-45, detail B) over opening. Trim surplus edge to permit window to mate against mounting flange.

NOTE

If steel (blind) rivets with a locking collar were removed, use No. 27 (0.144) drill. If aluminum (blind) rivets were removed, use No. 30 (0.128) drill. Radius of window must not foul mounting flange. Check for equal clearance.

b. Position window (1) against mounting flange. Back drill four holes and secure window to door with 5/32 cleco fasteners or screws, washers, and nuts and lightly tighten nuts. Drill remainder of holes.

c. Remove window. Mark a line approximately 0.50 inch from outer edge of holes to clear radius of mounting flange of door. Trim window.

d. Using a suitable file, radius edge of window. Deburr rivet holes on both sides of window.

e. Remove all dust and foreign matter from mating area of window and mounting flange of door.

f. Apply a 1/8 inch bead of adhesive (C-308) along each side of mating surfaces of window and mounting flange of door.

g. Position window (1) to door (3) and install a 5/32 cleco fastener in every other hole.

h. Install steel (blind) rivet (4) with washer (2) on inboard side of window. While holding washer against window with a piece of 3/16 tubing or suitable tool, secure rivet. Remove cleco fasteners and install remainder of rivets.

CAUTION

When cleaning window, use only aliphatic naphtha, type 2 (C-305).

i. Remove excess sealing compound from around window using aliphatic naphtha (C-305). Remove protective film from window. Clean and polish window. Refer to TM 55-1500-204-25/1.

2-165. ADJUSTABLE WINDOW — CREW DOOR.

2-166. Description — Adjustable Window. The lower large transparent plastic window in the crew door is the adjustable window.

2-167. Removal — Adjustable Window.

a. Remove screws (11, figure 2-45, detail C) and remove door (12).

b. Remove screws (10), washers (9), and handle (14).

c. Guide window (13) downward through slot in bottom of door and remove window.

2-168. Cleaning — Adjustable Window. Clean window in accordance with TM 55-1500-204-25/1.

2-169. Inspection — Adjustable Window. Inspect in accordance with figure 2-44.

2-170. Repair or Replacement — Adjustable Window. Replace window if damage is sufficient to impair vision or greater than practical to repair. Repair window damage in accordance with TM 55-1500-204-25/1.

2-171. Installation — Adjustable Window.

a. Guide window (13, figure 2-45, detail C) upward through slot in bottom of door and into window channels.

NOTE

Check progress through opening in aft edge of door.

b. Place window in partially closed position and install handle (14) with washers (9) and screws (10).

c. Install door (12) with screws (11).

2-172. CABIN ROOF WINDOWS.

2-173. Description — Cabin Roof Windows. Two transparent plastic windows are installed above the pilot and copilot in the cabin roof.

2-174. Removal — Cabin Roof Windows.

a. Remove nuts, washers, and screws attaching window to cabin roof.

b. Separate window from sealant and remove window.

WARNING

MEK is extremely flammable and highly volatile. Keep away from heat and open flame. Avoid prolonged breathing of vapor and use with adequate ventilation. Avoid prolonged or repeated contact with skin.

c. Remove aged sealant from structure using a rag moistened with MEK (C-309).

2-175. Cleaning — Cabin Roof Windows. Clean in accordance with TM 55-1500-204-25/1.

2-176. Inspection — Cabin Room Windows. Inspect in accordance with figure 2-44.

2-177. Repair or Replacement — Cabin Roof Windows. Replace window if damage is sufficient to impair vision, or greater than practical to repair. Repair window damage in accordance with TM 55-1500-204-25/1.

2-178. Installation — Cabin Roof Windows.

a. Trim, fit and drill window in accordance with instructions and dimensions in paragraph 2-157.

b. Apply a 1/8 inch bead of adhesive (C-308) to mating flanges of windows and structure.

c. Position window to structure and install screws, washers, and nuts.

CAUTION

When cleaning window, use only aliphatic naphtha, type 2 (C-305).

d. Remove excess sealing compound using aliphatic naphtha (C-305).

e. Remove protective film from window. Clean window in accordance with TM 55-1500-204-25/1.

2-179. LOWER FORWARD CABIN WINDOWS.

2-180. Description — Lower Forward Cabin Windows. Two transparent plastic windows are located forward and below each set of the tail rotor control pedals.

2-181. Removal — Lower Forward Cabin Windows.

a. Remove rear view mirror if removing right window. (Paragraph 2-188.)

b. Remove nuts, washers, and screws attaching window to cabin structure.

WARNING

MEK is extremely flammable and highly volatile. Keep away from heat and open flame. Avoid prolonged breathing of vapor and use with adequate ventilation. Avoid prolonged or repeated contact with skin.

c. Remove aged sealant from structure using a rag moistened with MEK (C-309).

2-182. Cleaning — Lower Forward Cabin Windows. Clean in accordance with TM 55-1500-204-25/1.

2-183. Inspection — Lower Forward Cabin Windows. Inspect in accordance with figure 2-44.

2-184. Repair or Replacement — Lower Forward Cabin Windows. Replace window if damage is sufficient to impair vision, or greater than practical to repair. Repair window damage in accordance with TM 55-1500-204-25/1.

2-185. Installation — Lower Forward Cabin Window.

a. Trim, fit, and drill window in accordance with instructions and dimensions in paragraph 2-157.

b. Apply a 1/8 inch bead of adhesive (C-308) to mating flange of window and structure.

c. Position window to structure and install screws, washers, and nuts.

WARNING

When cleaning windows, use only aliphatic naphtha, type 2 (C-305).

d. Remove excess sealing compound using aliphatic naphtha (C-305).

e. Remove protective film from window. Clean window in accordance with TM 55-1500-204-25/1.

f. If removed, install and adjust rear view mirror. (Paragraphs 2-189 and 2-190.)

2-186. REARVIEW MIRROR.

2-187. Description — Rearview Mirror. The helicopter is equipped with an adjustable rearview mirror located outside the forward cabin below the pilot lower window. This mirror, when properly adjusted, enables the pilot to visually check the operation of the external cargo suspension hook. When the helicopter is employed on missions which do not require use of the external cargo suspension, the rearview mirror may be covered or removed and stowed.

2-188. Removal — Rearview Mirror.

a. Remove bolts, washers, nuts and/or quick-release pins, which attach braces and supports to structure. Remove mirror assembly from helicopter.

b. To remove mirror from brace assembly, remove mirror cover and remove spring pins from adjustment handles.

2-189. Installation — Rearview Mirror.

a. Install braces and supports to structure, using previously removed bolts, washers, nuts and/or quick-release pins.

b. Position rearview mirror and align mounting holes.

c. Screw adjustment handles through mounting holes. Adjust mirror to desired angle and tighten adjustment handles. Insert spring pins in threaded ends of handles.

d. Slide protective cover over mirror and fasten holding snap.

2-190. Adjustment — Rearview Mirror.

a. Remove spring pin and loosen adjustment handles.

b. Manually adjust mirror to desired angle.

c. Tighten adjustment handles. Insert spring pins.

2-191. SOUNDPROOFING BLANKETS.

2-192. Description — Soundproofing Blankets. The cabin interior is covered with blankets of soundproofing material to reduce noise level for crew and passengers during operation. Blankets are attached to structure by hook-and-pile and snap-type fasteners, and can be detached for maintenance access.

2-193. Removal — Soundproofing Blankets. Release snap fasteners and hook-and-pile attachments holding blankets to structure. Remove blankets.

2-194. Inspection — Soundproofing Blankets. Visually inspect blankets for cuts and tears. Inspect for missing and damaged buttons and sockets.

2-195. Repair or Replacement — Soundproofing Blankets.

a. Repair cuts or tears.

(1) Cut a patch from glass cloth (C-404) large enough to overlap all sides of the tear or cut.

(2) Apply a thin, even coating of adhesive (C-324) to back of patch. Allow to dry until tacky.

(3) Center patch over tear or cut with adhesive side against blanket.

(4) Apply firm, even pressure to patch in such a manner that it will adhere securely to blanket without wrinkles or irregularities.

b. Replace missing or damaged buttons and sockets.

(1) Cut a patch from glass cloth (C-404) large enough to overlap all sides of the damaged area around button or socket.

(2) Center patch over damaged area and sew securely in place with thread (C-475).

(3) Install new button or socket, using press and dies.

2-196. Installation — Soundproofing Blankets. Position blankets in helicopter and attach to structure with snap fasteners and hook-and-pile attachments.

2-197. BLACKOUT CURTAINS.

2-198. Description — Blackout Curtains. A blackout curtain may be installed behind pilot and copilot seats, between forward and aft cabin sections. Other blackout curtains may be installed over both cargo door windows and window in removable door post.

2-199. Removal — Blackout Curtains. Release fasteners and screws attaching curtains to structure. Remove curtains.

2-200. Inspection — Blackout Curtains. Inspect curtain for cuts, tears, missing attachment buttons and sockets. Inspect slide fasteners for operation and damage.

2-201. Repair or Replacement — Blackout Curtains.

a. Repair cuts and tears in blackout curtains as follows:

(1) Cut a patch of twill (style 665-602) large enough to overlap all sides of the cut or tear.

(2) Center patch over cut or tear. Sew in place with thread (C-492).

NOTE

All sewing shall be in accordance with Federal Specification DDD-S-751.

b. Replace damaged or missing buttons and sockets.

(1) Repair area surrounding damaged or missing buttons and sockets.

(2) Install new button or socket, using press and dies.

c. Repair damaged slide fasteners.

(1) Rip out stitching attaching slide fastener to curtain material. Remove damaged slide fastener.

NOTE

Visually inspect flap of blackout material attached to curtain back of slide fastener.

(2) Repair area to which new slide fastener and flap will be attached.

(3) Position new slide fastener and flap and sew in place with thread (C-492).

2-202. Installation — Blackout Curtains. Position curtains. Attach with screws and fasteners.

2-203. PARATROOP STATIC LINE CABLE.

2-204. Description — Paratroop Static Line Cable. A paratroop static line cable may be installed on the center of the aft cabin bulkhead. This installation consists of a static line cable (6, figure 2-46), compression tube (1), two attach plates (3), two fittings (4), and attaching hardware.

2-205. Removal — Paratroop Static Line Cable.

a. Remove nuts, washers, and bolts securing attach plates (3, figure 2-46) to fittings (4).

b. Remove bolts and washers securing fittings (4) to canted bulkhead. Remove cable installation from bulkhead.

c. Remove cotter pins, washers and pins (5) from fittings (4). Remove static line cable (6) from cable installation.

d. Remove nuts (2) and washers from compression tube (1). Remove compression tube from fittings (4).

2-206. Inspection — Paratroop Static Line Cable. Inspect cable for wear, broken or frayed wires and security of installation.

2-207. Repair or Replacement — Paratroop Static Line Cable.

a. Replace cables that are worn.

b. Replace cables that have broken or frayed wires.

c. Replace cables that fail security of installation inspection.

2-208. Installation — Paratroop Static Line Cable.

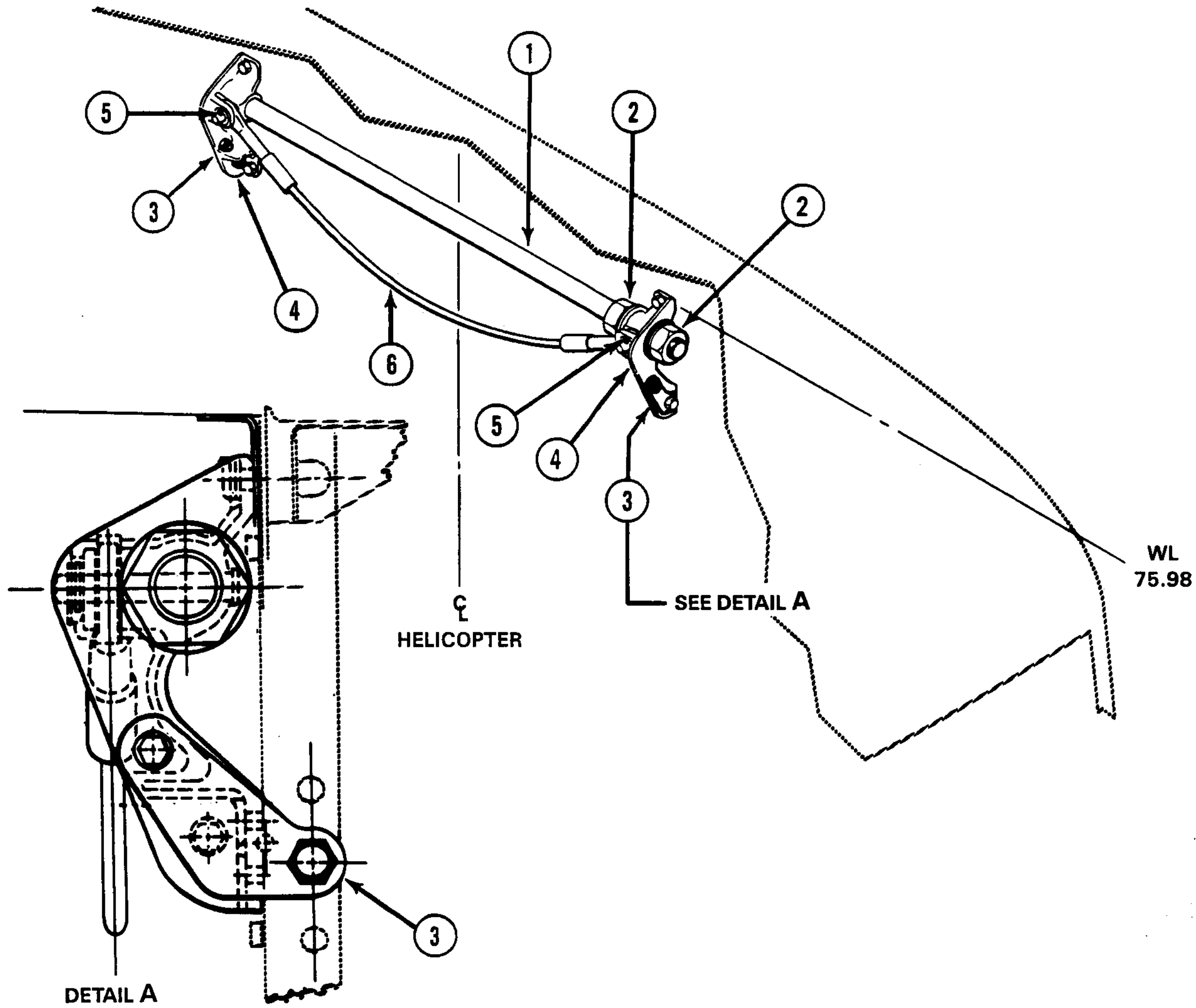
a. Install nut (2, figure 2-46) lockwasher and flat washer on compression tube (1). Position fittings (4) on compression tube. Align holes in tube, fittings, and static line cable (6) attach points; and insert pins (5). Secure with washers and cotter pins.

b. Position compression tube (1) and fittings (4) to canted bulkhead. Install attaching washers and bolts. Tighten both nuts (2) on compression tube against fitting.

c. Position attach plates (3) to fittings (4) and install bolts, washers, and nuts.

2-209. JACK FITTINGS.

2-210. Description — Jack Fittings. The two forward jack pads are located just ahead of front crosstube at each side. The two aft jack pads are located behind aft crosstube. The jack fittings provide a mounting point for the mooring fittings.



1. Compression tube
2. Nut
3. Attach plate
4. Fitting
5. Pin
6. Static line cable

UH-1H-II-M-02-46

Figure 2-46. Paratroop static line cable

2-211. Removal — Jack Fittings.

a. Remove bolts and washers.

b. Remove jack fitting.

2-212. Inspection — Jack Fittings. Inspect jack fitting for wear, cracks, or elongated mounting holes.

2-213. Repair or Replacement — Jack Fittings. Replace jack fitting if worn, or cracked, or if mounting holes are elongated.

2-214. Installation — Jack Fittings.

a. Position jack fitting on fuselage and align bolt holes.

b. Install bolts and washers.

c. Torque bolts 50 to 70 inch-pounds.

2-215. MOORING FITTINGS.

2-216. Description — Mooring Fittings. The mooring fitting is a shackle type assembly which attaches to each jack fitting.

2-217. Removal — Mooring Fittings.

a. Remove bolt and washer.

b. Remove mooring fitting.

2-218. Inspect — Mooring Fittings.

a. Inspect mooring fitting for wear.

b. Inspect bushing in jack fitting for wear or cracks.

c. Inspect mooring fitting for cracks.

d. Check mooring fitting for security.

2-219. Repair or Replacement — Mooring Fittings.

a. Replace shackle if worn.

b. Replace bushing in jack fitting if worn or cracked.

c. Replace shackle if cracked.

2-220. Installation — Mooring Fittings.

a. Position mooring fitting on jack fitting.

b. Install bolt and washers.

2-221. MAP AND DATA CASE.

2-222. Description — Map and Data Case. A case with a hinged, lock-down cover is installed on aft end of lower pedestal between crew seats.

2-223. Removal — Map and Data Case. Remove four screws attaching case to mounting brackets.

2-224. Inspection — Map and Data Case. Inspect hinges, screws, and mounting brackets for security.

2-226. Installation — Map and Data Case. Position case on brackets and install four screws.

2-227. ARMORED CREW SEAT.

2-228. Description — Armored Crew Seat. The seat, constructed from a composite ceramic-metal material, is designed to protect crew members against small arms fire and armor piercing ammunition. A segmented construction is used to permit the replacement of any damaged components. Armored seats are equipped with a quick release. Activating the quick release will recline seats to aid in removal of injured personnel. (Figure 2-47.)

2-229. Removal — Armored Crew Seat.

a. Remove bolt, nut, and washers securing seat belt to floor fittings.

b. Remove bolts securing stops (8 or 9, figure 2-47) from each side of tracks (4).

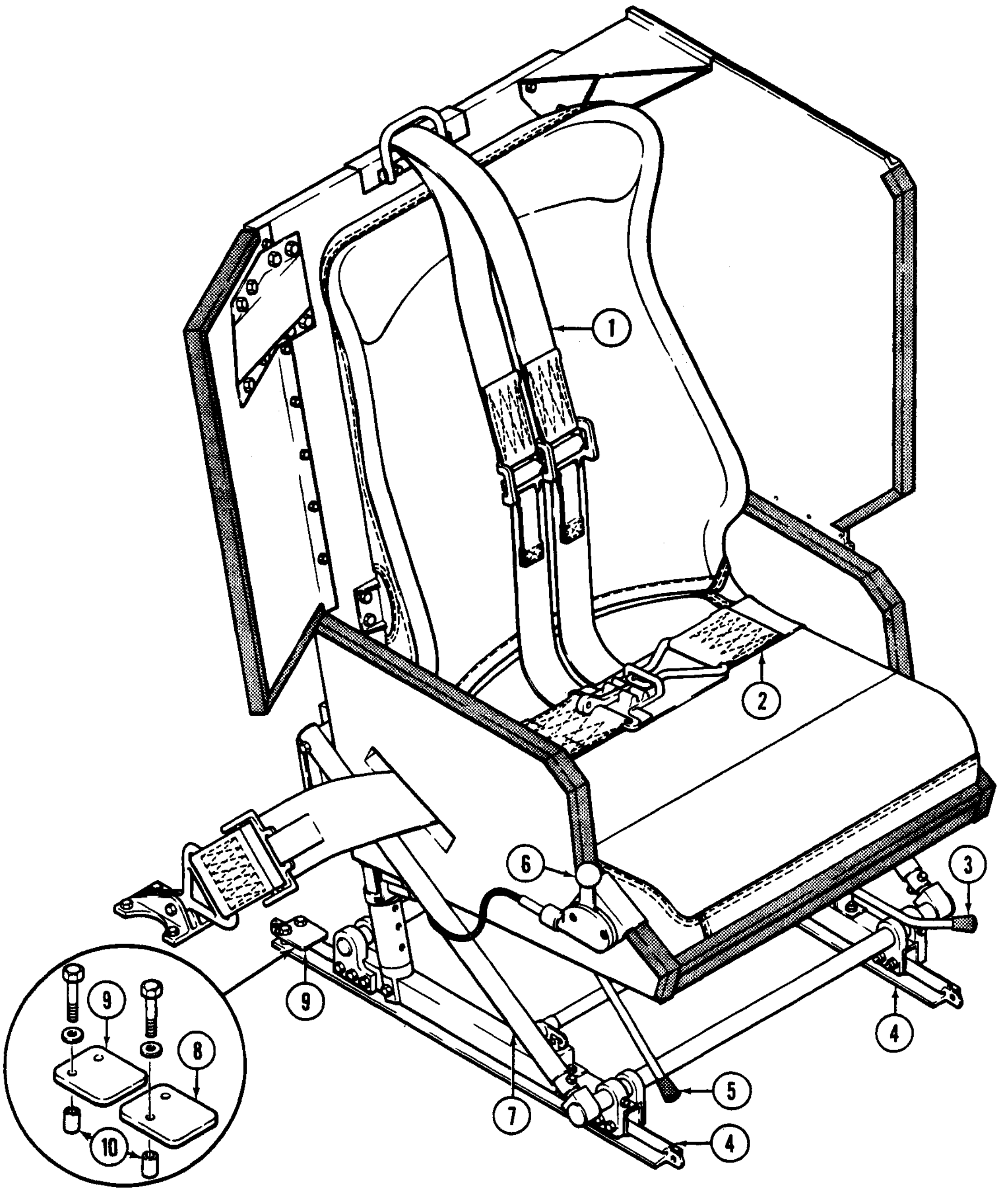
c. Lift the fore and aft seat adjustment handle and slide the seat aft until seat clears tracks.

2-230. Inspection — Armored Crew Seat.

a. Visually inspect armor panels for bonding separation, cracks, or any unserviceable condition.

b. Inspect quick release (figure 2-48) for condition and lockwire installation.

c. Inspect seat hardware, belts, shoulder harness for condition and security.



1. Shoulder harness
2. Seat belt
3. Seat adjustment handle
4. Tracks
5. Seat adjustment handle
6. Shoulder harness release handle
7. Telescoping tube
8. Pilots seat stop
9. Copilots seat stop
10. Spacers

UH-1H-II-M-02-47

Figure 2-47. Armored crew seat

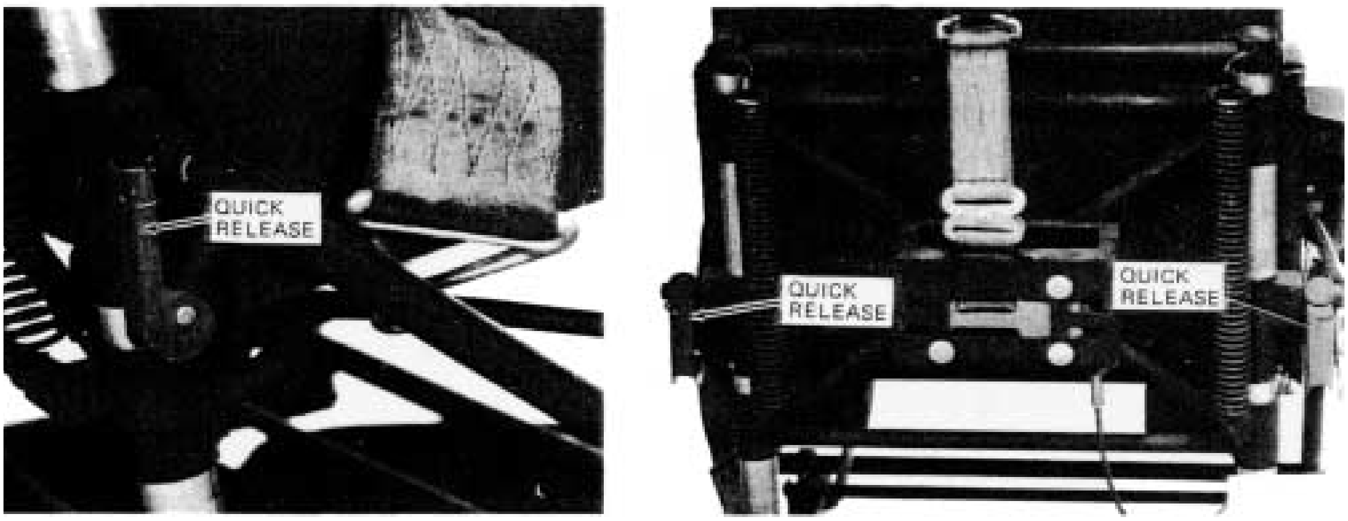


Figure 2-48. Crew armored seat reclining quick release

2-231. Repair or Replacement — Armored Crew Seat

a. Replace unserviceable parts.

b. Replace head guard and attaching hardware as required. (Figure 2-49).

c. Lockwire quick release handle using 0.020 inch copper shear wire (C-414). Lubricate quick release mechanism with graphite grease (C-004).

2-232. Installation — Armored Crew Seat. (Figure 2-47).

a. Position seat rollers on aft end of tracks (4). Lift seat adjustment handle (3) on left side of seat and slide seat forward on tracks.

b. Install stops (8 and 9) on aft end of tracks (4). Note that pilots seat stops are positioned more forward than copilot seat stops.

c. Attach seat belts to floor fitting using bolts, washers, and new self locking nuts.

d. Functionally check all seat controls.

CAUTION

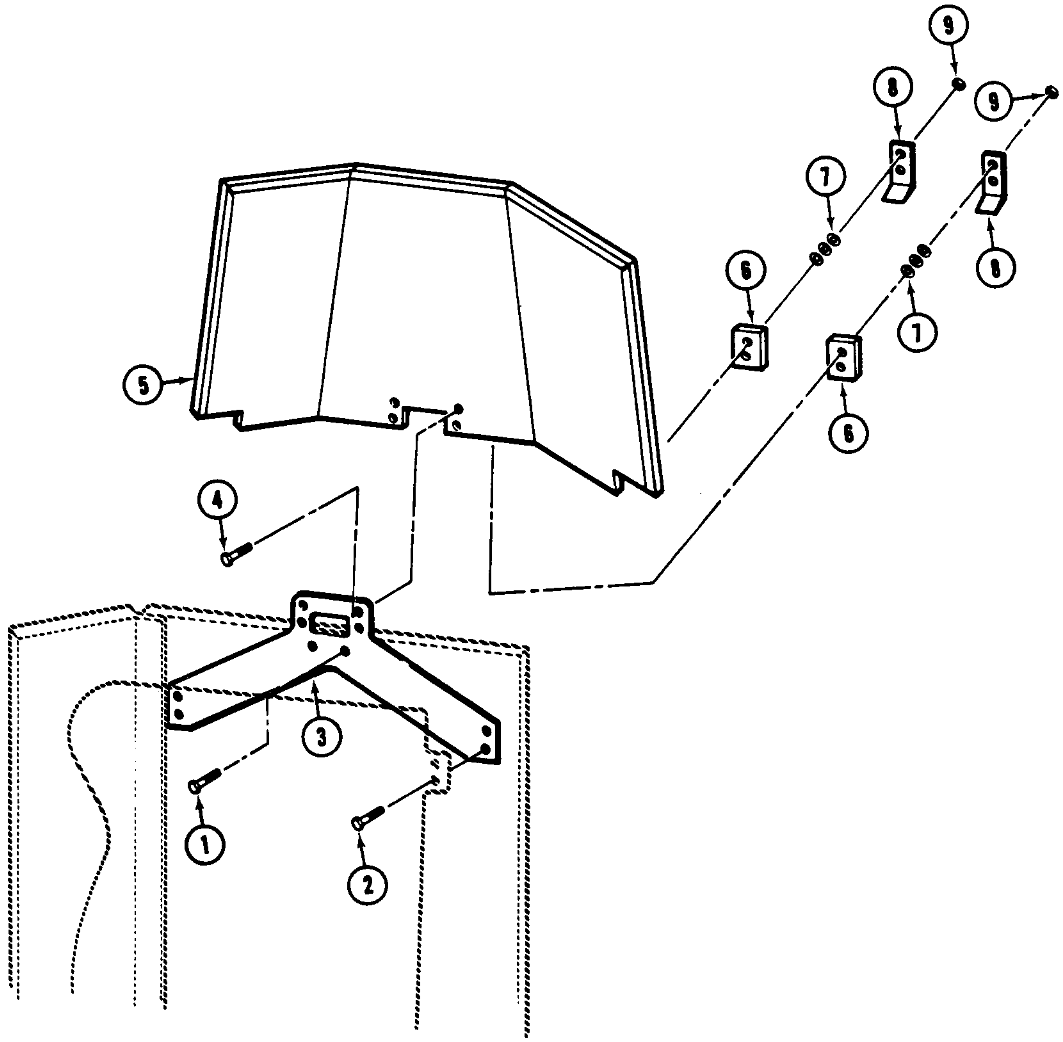
Ensure that the armored seat reclining mechanism is locked in position. The two red-painted handles at the lower aft of the seat must be positioned so that the telescoping tube (7) is locked. The handles must be restrained with 0.020 inch copper shear-type lockwire (C-414).

2-233. TROOP SEATS.

2-234. Description — Troop Seats.

a. Arrangements have been made in aft section of the forward fuselage section for seating eleven passengers. Either of the two following arrangements may be used for passenger seating.

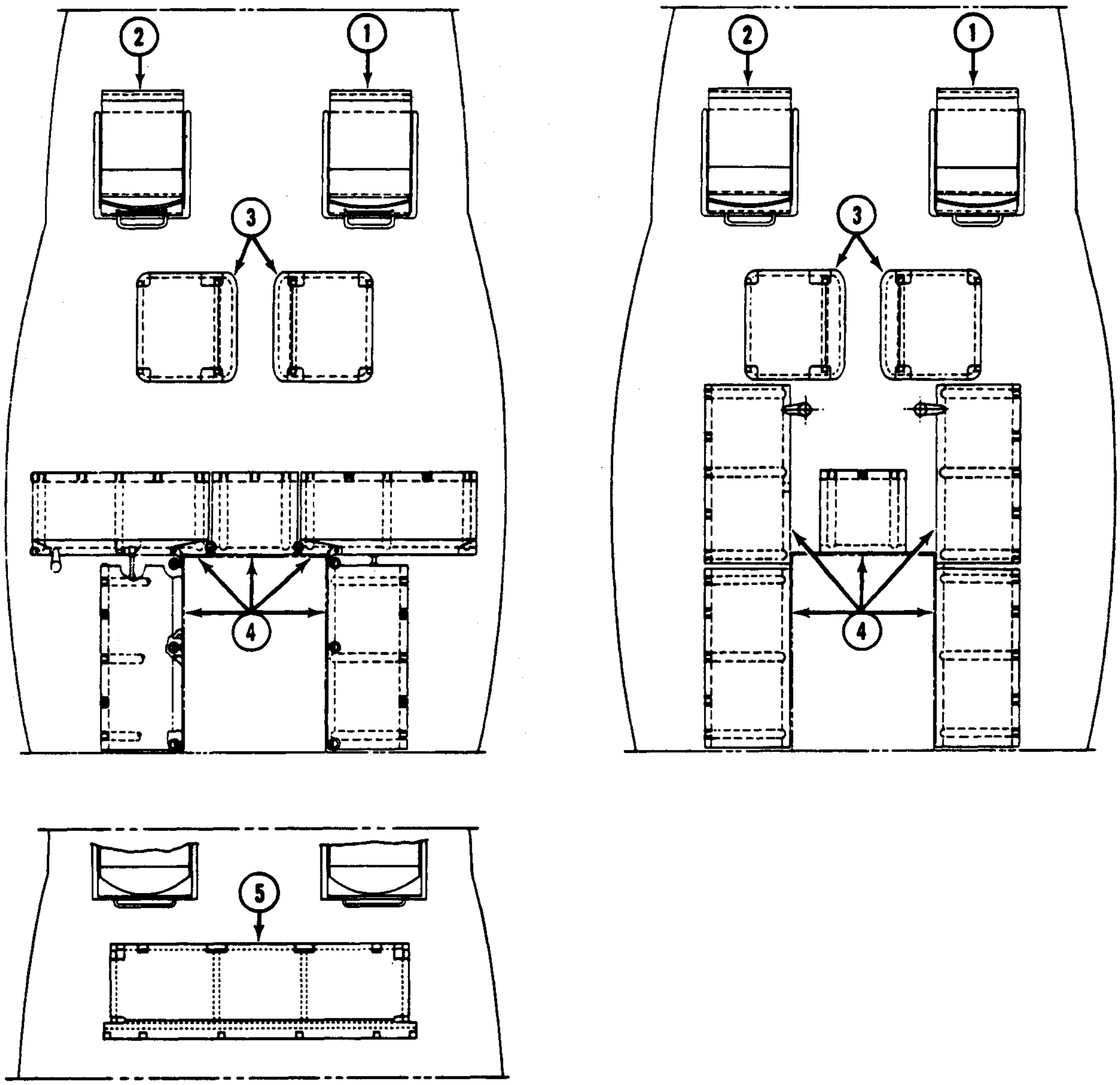
(1) Three seats facing forward, and accommodating five passengers may be placed across cabin immediately forward of the transmission support structure. A one-passenger seat, without back rest, is located between two two-man seats (4, figure 2-50) which have backs. Two more two-man



1. Screw
2. Screw
3. Support bracket
4. Bolt
5. Armor panel
6. Spacer plate
7. Washer
8. Support clamp
9. Nut

UH-1H-II-M-02-49

Figure 2-49. Armored crew seat headguard



1. Pilot seat
2. Copilot seat
3. Passenger seats (folding)
4. Passenger seats
5. Passenger seats (nonfolding)

UH-1H-II-M-02-50

Figure 2-50. Seating arrangement

seats (4), without the backs, are located parallel to the helicopter centerline aft of the five passenger seats. Passengers in these seats face outboard. Two single-passenger folding seats (3), with backs are located just aft of the crew seats.

(2) Four two-man seats, facing outboard, may be placed, two on each side of the helicopter center line, approximately in line with the side faces of the transmission support structure. The two forward seats (4) are equipped with backs. A one-passenger seat without back rest, is located immediately forward of the transmission support structure on the helicopter centerline and faces forward. Two single-passenger folding seats (3), with backs are located aft of the crew seats.

NOTE

Single passenger seat can be installed facing aft or toward either side of the helicopter.

b. A three-man non-folding troop seat kit is provided for use in place of the two single-passenger folding seats, located just aft of the crew seats.

2-235. Removal — Troop Seats.

a. Remove one-man seat without back as follows:

(1) Slide collar of each leg attachment fitting upward from the floor to release fittings from floor studs.

(2) Disengage aft tube assembly from spring-loaded lock fittings and remove seat assembly from the helicopter.

b. Remove one-man seat with back as follows:

(1) Slide collar of each leg attachment fitting upward from the floor to release fittings from floor studs.

(2) Pull the quick-release pin attaching seat back support tubes to each side of the seat bottom and fold seat back forward onto seat bottom.

(3) Pull the quick-release pin attaching diagonal leg brace to forward leg brace to forward leg and fold each leg inboard against seat bottom.

(4) Remove seat assembly from helicopter.

c. Remove two-man seat without back as follows:

(1) Slide collar of each leg attachment fitting upward from the floor to release fittings from floor studs.

(2) Disengage aft tube assembly from fittings and fold seat legs against seat bottom.

(3) Remove seat assembly from the helicopter.

d. Remove two-man seat with back as follows:

(1) Pull upper and lower quick-release pins attaching seat back to stanchion assembly fittings.

(2) Slide collar of each leg attachment fitting upward from the floor to release fittings from floor studs and fold seat assembly legs against bottom of seat.

(3) Remove seat from helicopter.

(4) Slide collars of upper and lower attachment fittings on stanchion assemblies toward center of assembly to release stanchions from roof and floor studs, and remove stanchion assemblies from the helicopter.

e. Remove three-man troop seats with back as follows:

(1) Slide collar on each leg attachment fitting upward from the floor to release fittings from floor studs.

(2) Remove seat from helicopter.

2-236. Disassembly — Troop Seats.

a. Slide upper aft seat tube assembly from loops in back of seat.

b. Remove nuts, bolts, and washer securing seat legs to forward seat tube assembly. Remove legs.

c. Remove nuts, bolts, and washer securing crosstubes extending from forward tube assembly to lower aft tube assembly.

d. Slide seat cover off tubes.

e. Remove bolts, nuts, and washers securing fittings to legs. Remove fittings.

2-237. Inspection — Troop Seats.

a. Visually inspect fabric for tears.

b. Visually inspect seat support tubes for damage.

c. Check seat leg attachment fittings for positive engagement in floor studs, legs for dents and damage.

d. Inspect seat support fittings for secure engagement of seat support tubes.

2-238. Repair or Replacement — Troop Seats.

a. Repair fabric if torn.

b. Replace tubes if damaged or unserviceable.

c. Replace fittings if necessary.

d. Replace seat legs if damaged or unserviceable.

2-239. Reassembly — Troop Seats.

a. Replace seat cover on tubes.

b. Secure crosstubes from forward to lower aft tube assembly with bolts, nuts, and washers.

c. Replace fittings on legs and secure with bolts, nuts, and washers.

d. Attach legs to forward seat tube assembly with bolts, washers, and nuts.

e. Replace upper aft seat tube assembly in loops of seat back.

2-240. Installation — Troop Seats.

a. Install one-man seat without back as follows:

(1) Position seat assembly in helicopter. Engage aft tube assembly in spring-loaded lock fittings.

(2) Position seat assembly support legs on floor studs. Secure legs to floor by sliding attachment fitting collars downward as far as possible.

b. Install one-man seat with back as follows:

(1) Unfold diagonal leg brace and attach to forward leg with quick-release pin.

(2) Raise seat back to vertical position. Attach seat back support tubes to each side of seat bottom by installing quick-release pins.

(3) Position seat assembly support legs on floor studs. Secure legs to floor by sliding attachment collars downward as far as possible.

c. Install two-man seat without back as follows:

(1) Position seat assembly in helicopter. Engage aft tube assembly in fittings.

(2) Unfold seat assembly support legs and position on floor studs. Slide leg attachment fitting collars downward as far as possible to secure legs to floor.

d. Install two-man seat with back as follows:

(1) Position stanchion assemblies in helicopter between roof and floor studs. Slide attachment fitting collars as far as possible toward studs to secure stanchion assemblies to roof and floor.

(2) Unfold seat assembly support legs. Position on floor studs. Slide leg attachment fitting collars downward as far as possible to secure legs to floor.

(3) Position seat back in stanchion assembly fittings. Install upper and lower quick-release pins.

(4) Position seat assembly support legs on floor studs. Secure legs to floor by sliding attachment fitting collars downward as far as possible.

2-241. TROOP SEAT BELTS.

2-242. Description — Troop Seat Belts. Individual lap-type seat belts are provided for all troop seats. The same belts, with web extensions, are provided for litter patients when helicopter is used for rescue missions.

2-243. Removal — Troop Seat Belts.

a. To remove seat safety belts from seats, unsnap both ends of the belt from rings.

b. To remove safety belts and extensions from litters, disconnect belt from extension.

2-244. Inspection — Troop Seat Belts. Inspect belts for fraying, wear, and loose stitching.

2-245. Repair or Replacement — Troop Seat Belts. Replace worn or unserviceable belts.

NOTE

Seat belts are replaced after a service life of 60 months. (TM 55-1500-204-25/1.)

2-246. Installation — Troop Seat Belts.

a. To install seat safety belts on seats, position belt across seat bottom and attach both ends to rings.

WARNING

Assemble each belt with release handle pointing left.

b. To install safety belts and extension on litters, connect one end of belt to extension. Pass belt and extension combination around litter and connect other ends.

NOTE

Two safety belts and extension combinations are required for each litter.

2-247. ENGINE MOUNTS.

2-248. Description — Engine Mounts. The engine is suspended at three points by supports made of steel tubing. These supports are attached to fittings on service deck. Bipod support, on right-hand side, and tripod support on left-hand side, both have pillow blocks with hinged bearing caps. These caps retain bearings of two trunnion fittings installed on mounting pads at each side of engine diffuser housing. (Figure 2-51.)

2-249. Removal — Engine Mounts.

CAUTION

Do not use jacks to raise the engine.

a. Attach engine sling to the engine and take up slack until the sling is supporting the weight of the engine.

b. Open bearing caps (8, figure 2-51) to release main trunnion bearings (7).

c. Remove bolts, nuts and washers securing bipod mount (1) to service deck. Support spring (13) is secured by bolt attaching rear leg and clamp on rear leg.

NOTE

A flat spring is installed on the aft leg of bipod to hold bipod upright when engine is removed.

d. Remove bolts, nuts and washers securing forward support tube (12) and tripod mount (10) to service deck.

e. To separate pillow block (2) from bipod mount (1) or tripod mount (10) remove attaching nut, washers, and bolts.

f. To remove main trunnion (6) from engine, remove bolts and washers securing trunnion to engine. A support for engine electrical wiring is on lower forward bolt of left trunnion.

g. Remove nut and washer to remove bearing (7) from main trunnion (6).

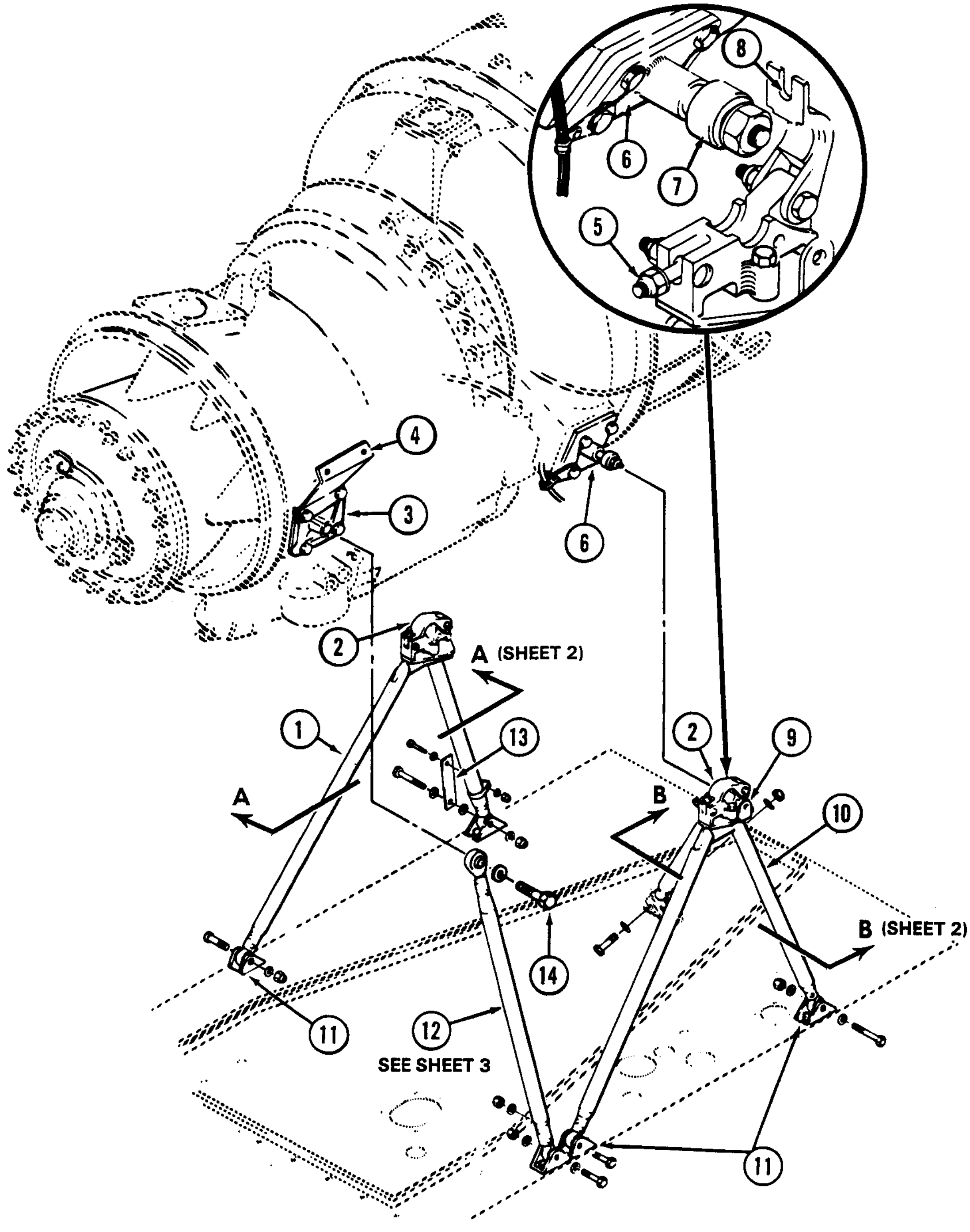
h. To remove forward trunnion (3), remove bolts securing trunnion to engine. Upper bolts also secure cambox bracket (4).

i. Leave deck fittings (11) in place except when removal is required for inspection, replacement, or change of shims to correct driveshaft alignment. To remove fittings (11) and shims, remove bolts and screws through deck.

2-250. Inspection — Engine Mounts.

a. Inspect forward support tube (12, figure 2-51), bipod mount (1) and tripod mount (10) for bent, cracked or damaged tubes.

(1) Permanent bends (bends which do not straighten after load is removed) are not permitted.



1. Bipod mount
2. Pillow block
3. Forward trunnion
4. Cambox bracket
5. Latching eyebolt
6. Main trunnion
7. Bearing
8. Bearing cap
9. Bellcrank bracket
10. Tripod mount
11. Deck fitting
12. Forward support tube
13. Support spring
14. Retaining bolt

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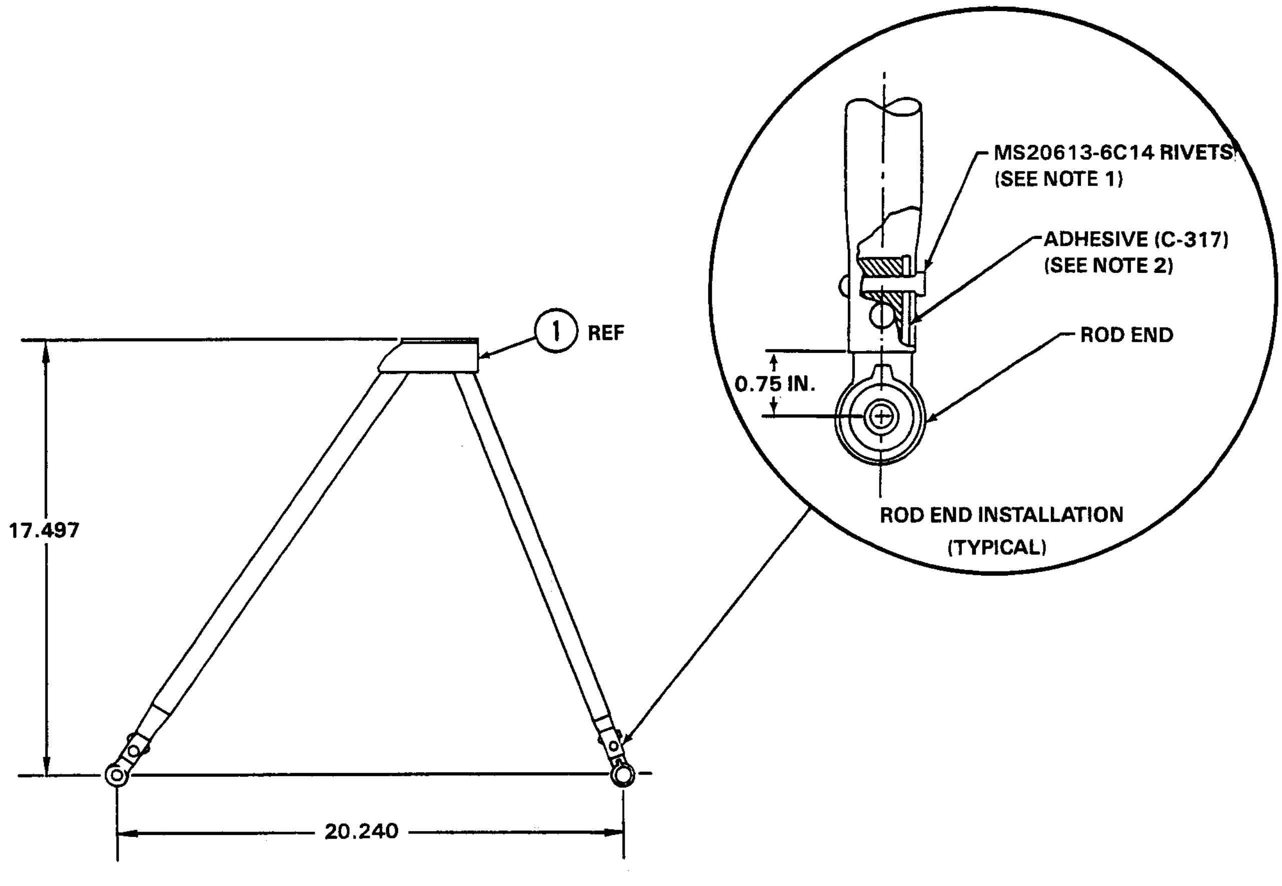
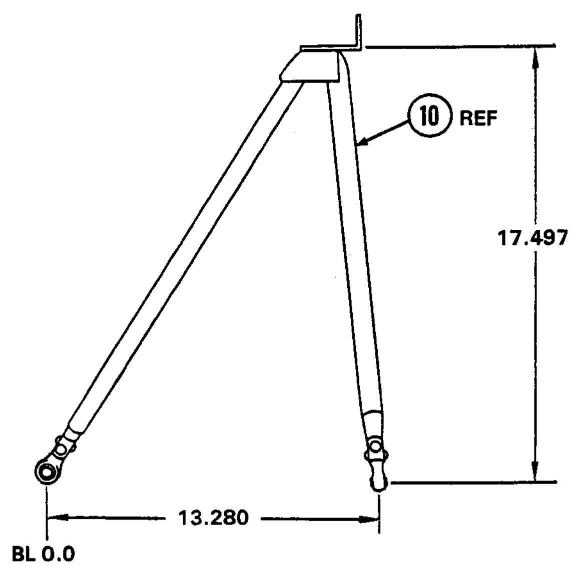
Figure 2-51. Engine mount (Sheet 1 of 3)



VIEW A-A



VIEW B-B

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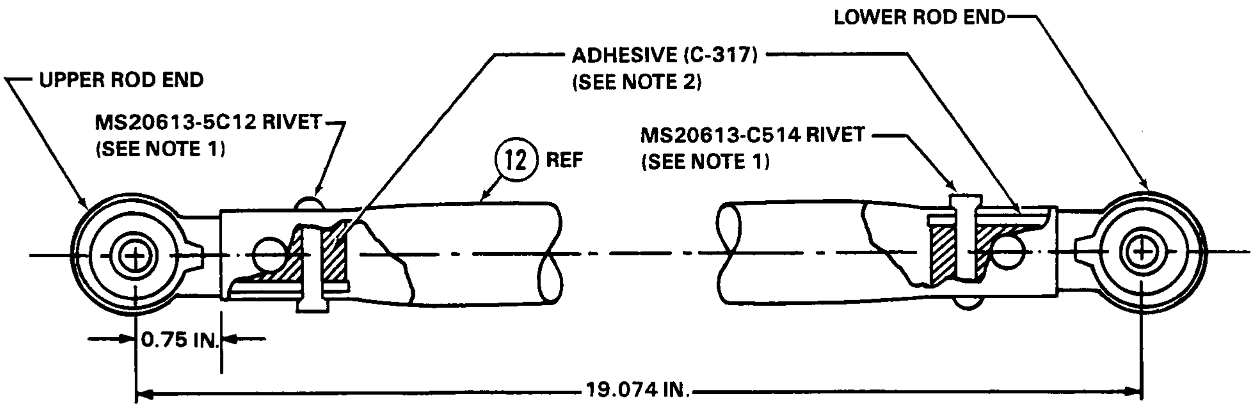
Figure 2-51. Engine mount (Sheet 2 of 3)



TUBE ASSEMBLY, FORWARD SUPPORT

NOTES

1. Attach rod ends with MS20613 rivets IF RIVET HOLES ARE NOT ELONGATED. Elongated rivet holes may be enlarged to accommodate HL32 and HL86 fasteners listed below DO NOT USE FASTENERS LARGER THAN AUTHORIZED ALTERNATIVES.

2. Fill all rod end cavities with adhesive (C-317).

TUBE ASSEMBLY ROD END LOCATION	ROD END ATTACHING RIVET	AUTHORIZED ALTERNATIVE FASTENER
BIPOD/TRIPOD MOUNTS, ALL ROD ENDS	MS20613-6C14	HL32PB8-11 RIVET HL86KP-8 COLLAR
FORWARD SUPPORT, UPPER ROD END	MS20613-5C12	HL32PB6-8 RIVET HL86KP-6 COLLAR
FORWARD SUPPORT, LOWER ROD END	MS20613-5C14	HL32PB6-11 RIVET HL86KP-6 COLLAR

UH-1H-II-M-02-51-3

Figure 2-51. Engine mount (Sheet 3 of 3)

(2) Scratches not exceeding 0.004 inch depth in tube may be repaired. Transverse scratches longer than one-fourth circumference are not acceptable.

(3) Scratches or dents adjacent to welded areas are not acceptable.

(4) No dents are permitted in the middle third of tube. Smooth dents of large diameter which do not cause bending of the tube (end to end) are permitted, provided there is not crimping or cracking in the dent and there is not visible deformation adjacent to the dents.

(5) Dents may not exceed a total depth of 0.030 inch.

(6) No cracks allowed in area.

b. Inspect bearings (7) for wear and excessive play (0.006 inch radial and 0.012 inch axial maximum).

c. Inspect all rod end bearings for wear and excessive play (0.005 inch radial and 0.020 inch axial maximum).

d. Inspect main trunnion (6) for cracks, damage, or scored bearing shaft.

e. Inspect forward trunnion (3) for cracks or damaged threads.

f. Inspect all deck fittings for security, cracks and general condition.

g. Replace support spring (13) if cracked or broken.

2-251. Repair or Replacement — Engine Mounts.

a. If rod end bearings exceed wear limits, replace rod ends as follows:

(1) Remove rivets securing rod end bearing(s) to mount. Refer to figure 2-51.

(2) Apply heat to mount/rod end in bonded area, to facilitate removal of rod end. Do not exceed 300°F (149°C).

(3) Remove rod end(s) and inspect inner and outer surfaces of mount tube(s) for corrosion and mechanical damage. Refer to paragraph 2-250.

(4) Internal or external mechanical damage or corrosion in excess of 0.003 inch in depth, after clean-up, is cause for rejection. Damage affecting a surface area in excess of 0.5 square inch is cause for rejection.

(5) Remove loose adhesive from mount tube bore with bristle brush and MEK.

(6) Inspect rivet holes for elongation. Rivet size may be increased to next larger size if necessary. Do not exceed max size specified on figure 2-51.

CAUTION

A bent mount tube is cause for rejection. Do not install bent tubes on helicopter.

(7) Establish rod end position and ensure mount dimensions are in accordance with figure 2-51 prior to drilling rivet holes. Rod ends to be oriented in-line and parallel to fittings. Drill holes undersize and line ream to within 0.001 inch of rivet size.

(8) Deburr rivet holes on both inside and outside surfaces of tube and rod end.

(9) Flush internal surface of mount tube(s) with MEK (C-309) and apply a coat of epoxy polyamide primer (C-204) to inside of mount tube(s) and allow to air dry.

(10)Apply a coat of aluminized lacquer (C-215) to inside of mount tube(s) and allow to air dry.

(11)Using MEK (C-309), remove lacquer and primer from mount tube internal faying surface. Clean faying surface of rod end using MEK.

(12)Apply adhesive (C-317) to faying surface of mount tube and rod end bearing. Fill rod end bearing internal cavity with adhesive and install rod end.

(13)Secure rod end(s) using appropriate rivets. (Figure 2-51.)

b. Repair engine mounts by polishing out allowable scratches with fine aluminum oxide cloth (C-406). Length of blend shall be at least 30 times the depth of the scratch but no longer than 2.25 inches and shall not exceed 0.3125 total peripheral dimension at any one section. Paint repaired area with epoxy polyamide primer (C-204).

c. Replace any parts with wear or damage exceeding inspection limits.

2-252. Installation — Engine Mounts.

a. Install forward trunnion (3, figure 2-51) on mount pad at left side of engine inlet housing.

(1) Position trunnion (3) to engine with cambox (4) bracket over upper holes. Place washer and bracket for hose support clamps over forward upper bolt. Use thin washer on upper rear bolt.

(2) Place washer and support for fuel control vent hose on lower rear bolt. Use thin washer on lower forward bolt.

(3) Torque bolts 480 to 690 inch-pounds.

(4) Install lockwire (C-405) on bolt heads in pairs.

b. Install bearing (7) on shaft of main trunnion (6) with washer and nut.

c. Install two main trunnions (6) on mount pads of engine diffuser housing, each secured by four bolts and thin washers. On lower forward bolt of left trunnion, install stand-off clip for electrical cable support clamp. Lockwire (C-405) bolt heads in pairs.

d. Install pillow blocks (2) on bipod mount (1) and tripod mount (10) with two bolts, washers, and nuts.

e. Check installation of deck fittings (11). Place rod ends of tripod (10) in three fittings at left and rear of deck. Install close tolerance bolts with washers under heads and nuts.

f. In similar manner, install bipod (1) in right deck fittings (11). Attach spring under bolt head on outboard side of rear fitting and attach upper end of spring with bolt to clamp on bipod leg.

g. Install forward support tube (12) in left forward fitting (11).

h. Open hinged bearing caps (8) on pillow blocks (2). Lower engine to seat main trunnion bearings (7). Close bearing caps and secure with latching eyebolts.

i. Align rod end of support tube (12) with forward trunnion (3). Install bolt (14) with washer. Torque bolt 50 to 60 inch-pounds. Lockwire (C-405) bolt (14) to upper aft trunnion mounting bolt.

j. If shims under deck fitting (11) have been changed, check driveshaft alignment (11). (Chapter 6.)

SECTION II — TAILBOOM

2-253. TAILBOOM ASSEMBLY.

2-254. Description — Tailboom Assembly. The tailboom (figure 2-52) is of semimonocoque construction. External components consist of formed aluminum alloy skins and driveshaft covers, and fiberglass fairing, and one aluminum alloy honeycomb cover. Internal components of the boom and synchronized elevator are of aluminum alloy. The tailboom supports the tail rotor driveshafts, gearboxes and driveshaft hangers. The baggage compartment is located in the forward end with the door on the right side.

2-255. Tailboom Structure Repair. Refer to TM 55-1500-204-25/1 for structural maintenance.

2-256. Removal — Tailboom.

NOTE

Tailboom support assembly, T102012, or equivalent is required to support the tailboom.

a. Open combining gearbox side panels.

b. Remove clamps from number two (short driveshaft and remove driveshaft section. (Chapter 6.)

c. Open access door on right aft side of forward fuselage. Disconnect electrical harnesses and antenna cables.

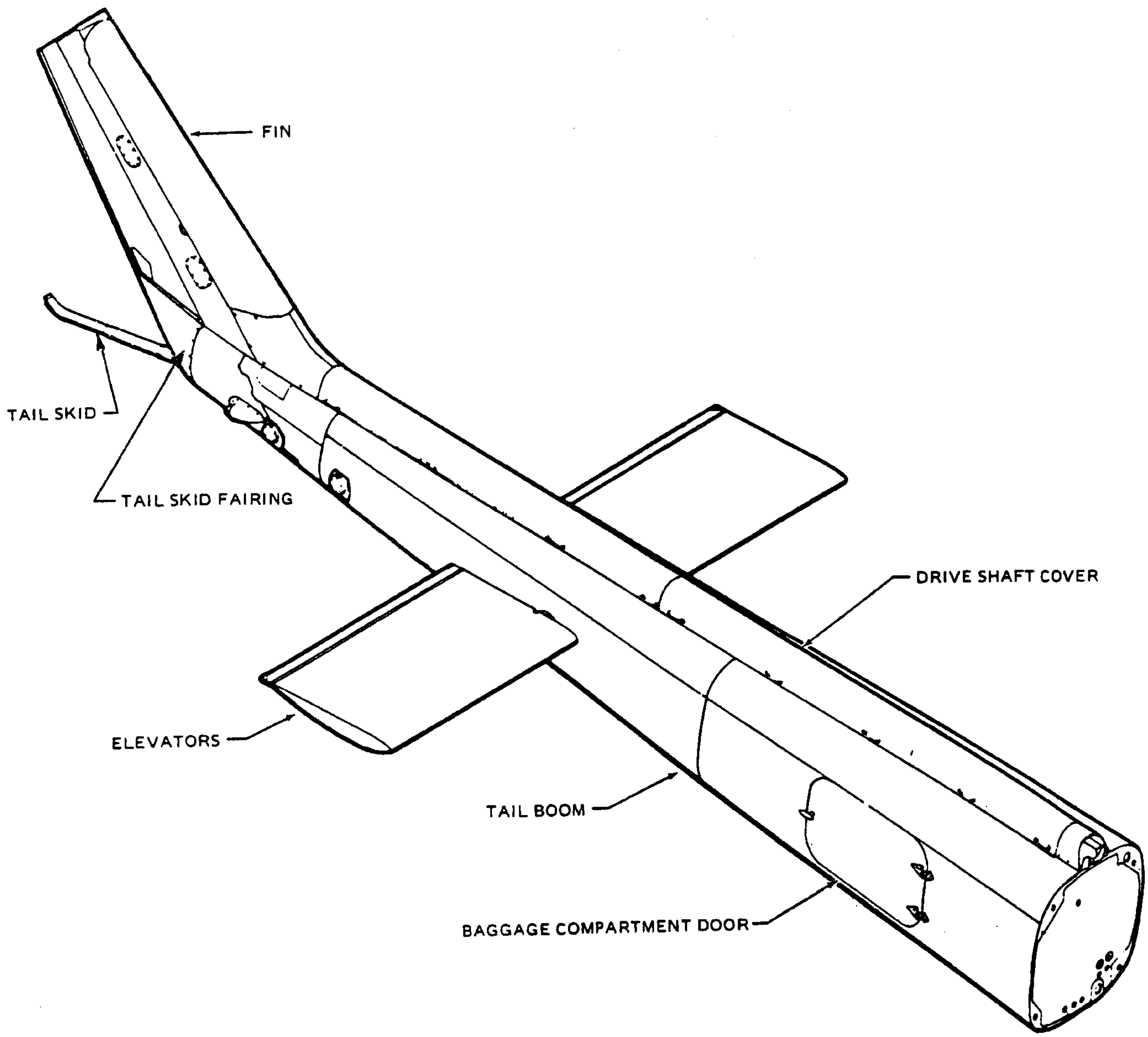


Figure 2-52. Tailboom

d. Disconnect tail rotor and synchronized elevator control tubes. (Figure 2-53 and Chapter 11.)

e. Remove plug bottoms from four tailboom attaching points.

f. Support tailboom using (T102012) tailboom support assembly (S21) or equivalent (figure 2-3) and remove bolts attaching tailboom to fuselage (figure 2-54).

g. Remove tailboom.

h. If tailboom is to be hoisted, refer to Chapter 1.

2-257. Inspection — Tailboom.

a. Inspect doors, covers, and access panels for misalignment, damage, and security of mounting.

b. Inspect tailboom skin for dents, corrosion, scratches, or other damage.

c. Inspect structure for cracks, distortion, corrosion, or loose rivets.

d. Inspect diameter of tailboom to fuselage attaching holes. The allowable limits are as follows:

LOCATION	MINIMUM DIAMETER INCH	MAXIMUM DIAMETER INCH
Upper Right	0.501	0.516
Upper Left	0.563	0.578
Lower Left	0.376	0.391
Lower Right	0.376	0.391

e. Inspect corresponding four tailboom-to-fuselage attaching bolt holes in fuselage fittings for elongation.

2-258. Repair or Replacement — Tailboom.

a. Replace damaged or unserviceable doors, covers, and access panels. (Paragraph 2-39.)

b. Remove tail rotor driveshaft cover chafing tape as follows:

(1) Remove anti-chafing tape from driveshaft cover.

(2) Clean area with MEK (C-309), allow to air-dry.

(3) Apply one coat of high temperature primer (C-222) and one coat of polyurethane enamel (C-218). Allow 1 hour drying time between coats.

c. Replace damaged or unserviceable fasteners and hinges on tail rotor driveshaft covers.

d. Replace tailboom if attaching holes in tailboom fittings exceed inspection tolerances. (Paragraph 2-257.)

e. When replacing tailboom, remove the following and install on replacement tailboom.

(1) Tail rotor controls. (Chapter 11.)

(2) Electrical and avionics components. (Chapter 9 and Avionics Manual.)

(3) Synchronized elevator controls. (Chapter 11.)

(4) Synchronized elevator. (Paragraph 2-259.)

(5) Tail rotor driveshaft and hanger and bearings. (Chapter 6.)

(6) Intermediate gearbox. (Chapter 6.)

(7) Tail rotor gearbox. (Chapter 6.)

(8) Tail rotor driveshaft covers and vertical fin cover.

(9) Access doors and inspection panels.

2-259. Installation — Tailboom.

a. Position tailboom to forward fuselage and line up bolt holes.

b. Place countersunk washer (figure 2-54) on each bolt with countersunk side of washer toward bolt head. Install bolts using washers, as required, between countersunk washer and fitting so that not less than one thread nor more than two threads are showing. Torque bolts as follows:

(1) Upper left — 1300 to 1600 inch-pounds.

(2) Upper right — 1000 to 1200 inch-pounds.

(3) Both bottom bolts — 400 to 430 inch-pounds.

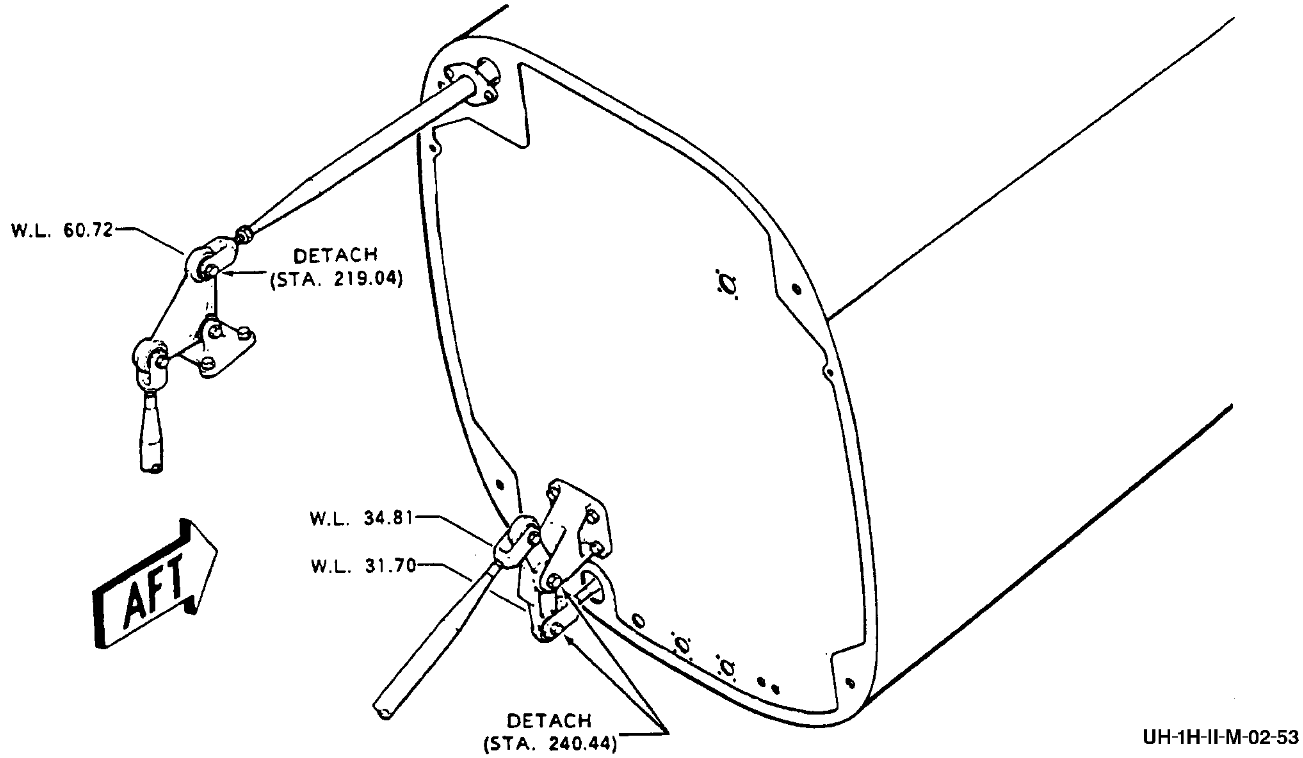


Figure 2-53. Control disconnect points for tailboom removal

c. Install plug buttons in tailboom attaching points.

d. Connect tail rotor and synchronized elevator control tubes. (Figure 2-53 and Chapter 11.)

e. Connect electrical harnesses and antenna cables. (Chapter 9 and Avionics Manual.)

f. Install number two (short) tail rotor driveshaft section. (Chapter 6.)

g. Install matched clamp sets on couplings. (Chapter 6.)

h. Close access doors and inspections panels.

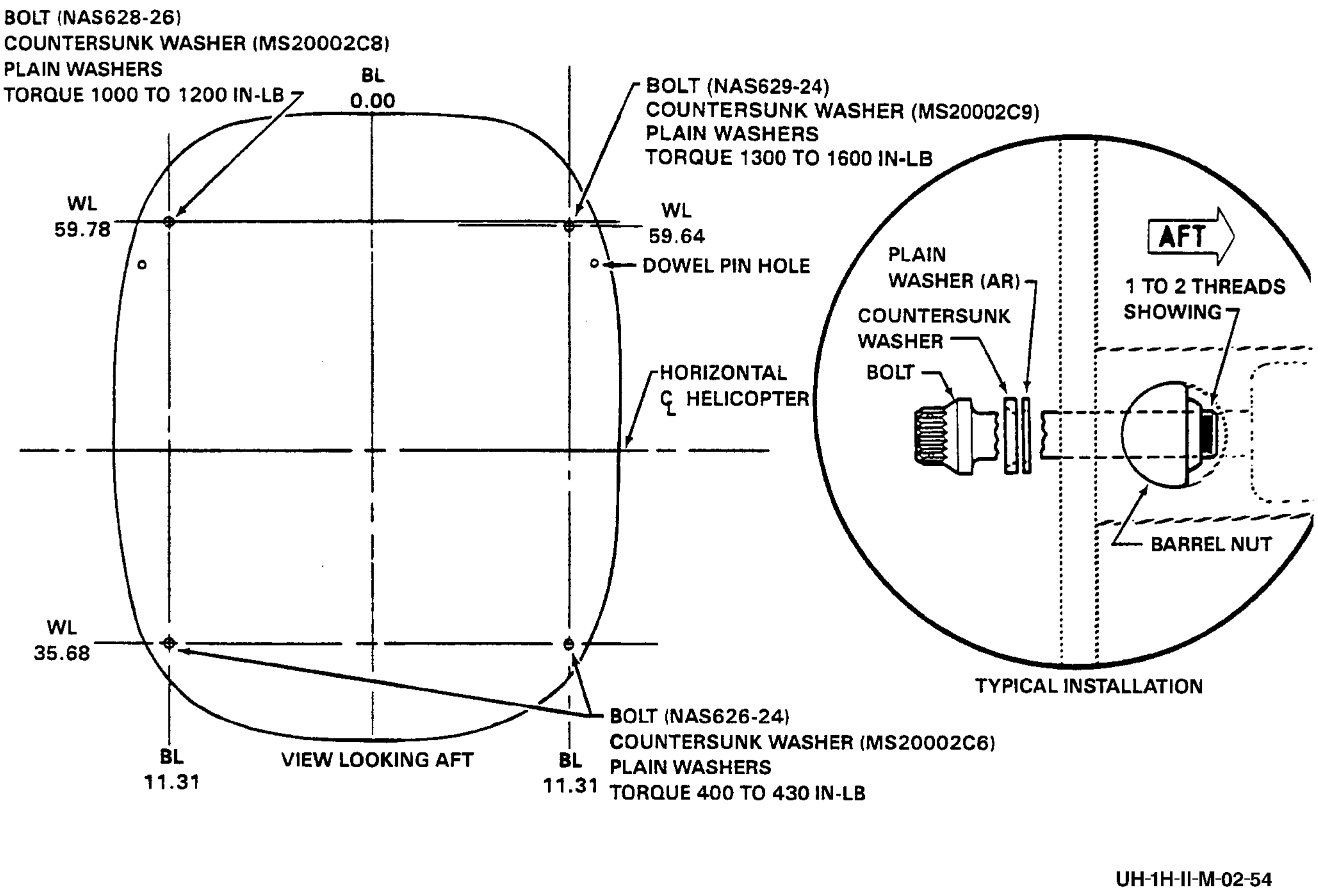


Figure 2-54. Tailboom attaching bolts

CHAPTER 3

ALIGHTING GEAR

SECTION I — LANDING GEAR

3-1. LANDING GEAR ASSEMBLY.

3-2. Description — Landing Gear Assembly. The landing gear assembly consists of two skid tubes attached on ends of two arched crosstubes secured to fuselage structure by four padded caps. Each skid tube is fitted with a forward end step, a towring fitting, two saddles with sockets for crosstubes, a two-piece replaceable skid shoe along bottom, a rear end cap, and two eyebolt fittings for mounting of ground handling wheel assemblies. Crosstubes are fitted with bearing straps at fuselage mounting points.

3-3. Removal — Landing Gear Assembly. The landing gear assembly (figure 3-1A) can be removed as a complete assembly, or skids and crosstubes can be removed separately.

a. Remove complete landing gear assembly as follows:

(1) Position helicopter on smooth surface.

(2) Support helicopter, but do not raise on hoist or jacks.

NOTE

Identify cap assemblies for correct installation.

(3) Remove bolts (1 and 5), washers (2 and 4), and nuts (3) from two cap assemblies (6).

(4) Remove bolts (1 and 5), washers (2 and 4), and nuts (3) from two cap assemblies (7).

(5) Remove landing gear assembly from helicopter.

b. Remove skids (1, figure 3-1B) from crosstube (2) as follows:

(1) Remove bolts (5 and 7) and washers (6 and 8) from saddle (3).

(2) Remove bolts (9 and 11) and washers (10 and 12) from saddle (4).

(3) Separate skids (1) from crosstubes (2).

3-4. Installation — Landing Gear Assembly.

NOTE

Through bolts are not to be used for repair of loose plate nuts.

a. If separated, assemble skids (1, figure 3-1B) by inserting ends of crosstubes (2) into sockets of saddles (3 and 4).

(1) Install bolts (5 and 7) with washers (6 and 8) into saddle (3).

(2) Install bolts (9 and 11) with washers (10 and 12) into saddle (4).

b. Position landing gear assembly under helicopter and carefully lower helicopter to seat the four mounting points of structural beams on bearing straps of crosstubes.

c. Install cap assemblies (7, figure 3-1A) over landing gear assembly with bolts (1 and 5) with washers (2 and 4). Tighten bolts to a snug fit.

d. Install cap assemblies (6) over landing assembly with bolts (1 and 5) with washers (2 and 4). Tighten bolts to a snug fit.

NOTE

Ensure that the four short bolts are used in the first two holes at each end of cap assembly. The two long bolts must be used in the two middle holes.

e. Lower the helicopter and remove hoist or jacks. Ensure helicopter settles on crosstubes correctly before tightening bolts through cap assemblies to proper torque.

f. Ensure bearing straps are centered and fully seated in crosstubes saddles. On forward and aft crosstubes, viewing from outside, no more than two bearing plate studs should be seen at each position. If more than two studs are seen, loosen straps and reposition.

3-5. CROSSTUBES.

3-6. Description — Crosstubes. Crosstubes are formed of aluminum alloy tubes. The tubes are secured on both ends to skid tube assemblies using saddle assemblies and bolts and washers. The upper crosstubes are secured to helicopter by four cap assemblies.

3-7. Removal — Crosstubes. Refer to paragraph 3-3 for removal of complete landing gear. Separate the skid tube from crosstube.

3-8. Inspection — Crosstubes.

a. Inspect crosstubes for scratches, dents, holes, and nicks or other obvious damage.

b. Inspect crosstube bearing plates for looseness.

c. With landing gear installed, inspect landing gear crosstubes for proper deflection. Inspect for some clearance between crosstube fitting and shim.

(1) At a full gross weight of 9500 pounds, use a dimension of 102 inches between centerline of skid tubes to determine if a further check of crosstube deflection is necessary. If measurement is 102 inches or more, proceed as follows:

(a) Position helicopter on a smooth surface.

(b) Raise helicopter off the surface with hydraulic jacks, removing all weight from landing gear.

(c) Level helicopter (paragraph 1-38).

(d) Measure the distance between the crosstube bearing plates, and divide the distance to determine helicopter centerline.

(e) Drop a plumb bob from helicopter centerline to ground or floor surface (figure 3-1). Measure from plumb line to centerline of each skid tube at crosstube locations.

NOTE

Distance should be 48 inches from the centerline of skid tube to plumb line. If distance exceeds 50 inches from centerline, and 100 inches between skid tube centerlines, replace defective crosstube.

(f) Lower helicopter and remove jacks or hoist.

3-9. Repair or Replacement — Crosstubes.

a. Minor scratches, scuffs, and nicks in landing gear crosstubes may be polished out to the depth of damage. Do not exceed 10 percent of crosstube wall thickness or the limits shown in figure 3-2.

b. Replace crosstube if deflection dimension exceeds inspection requirement.

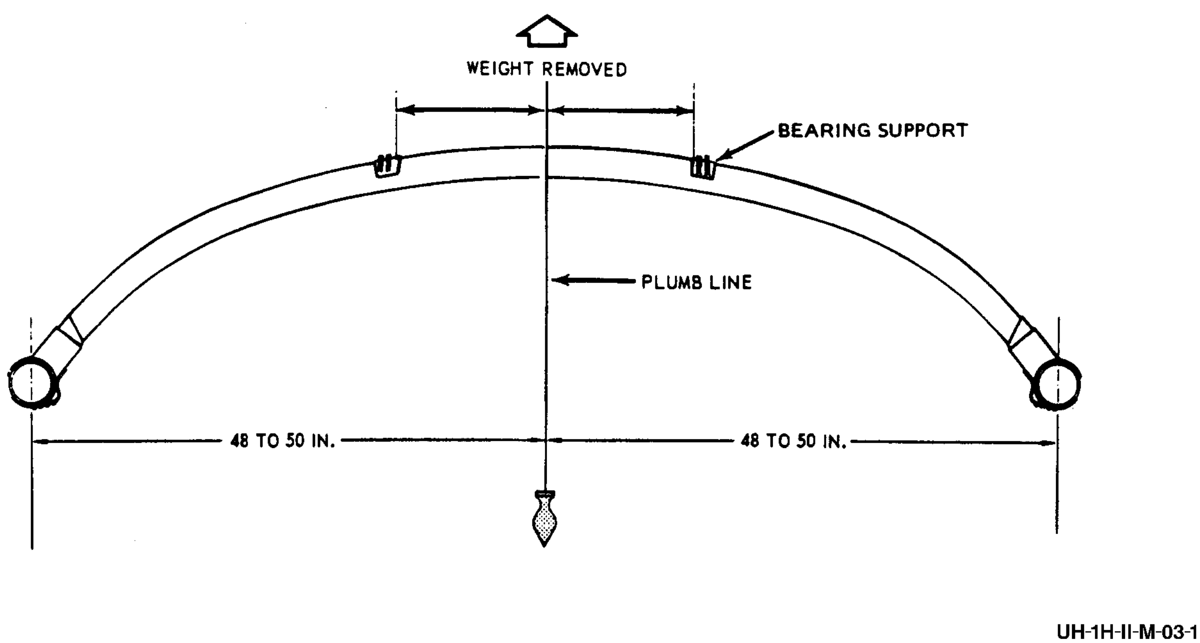
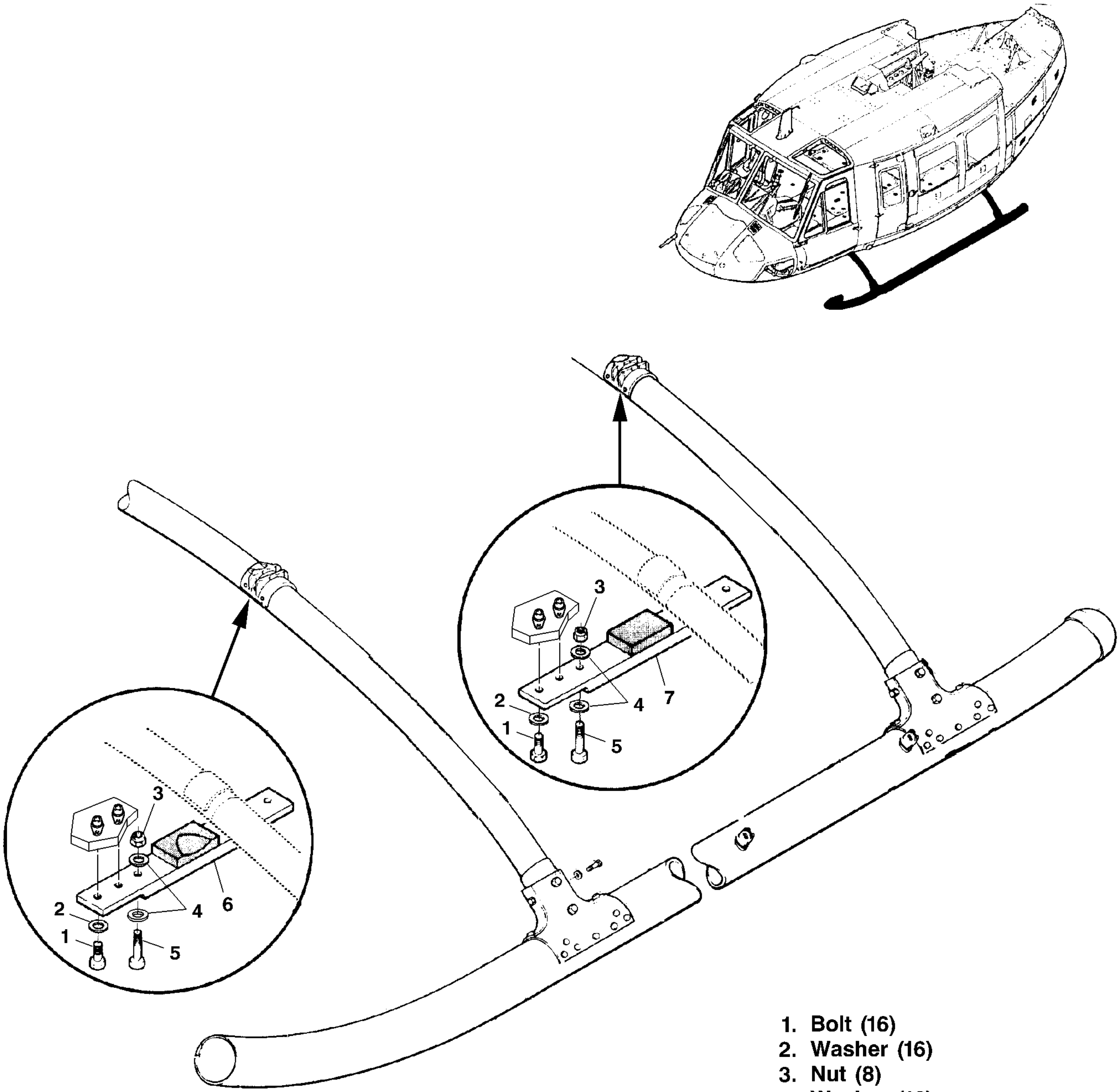
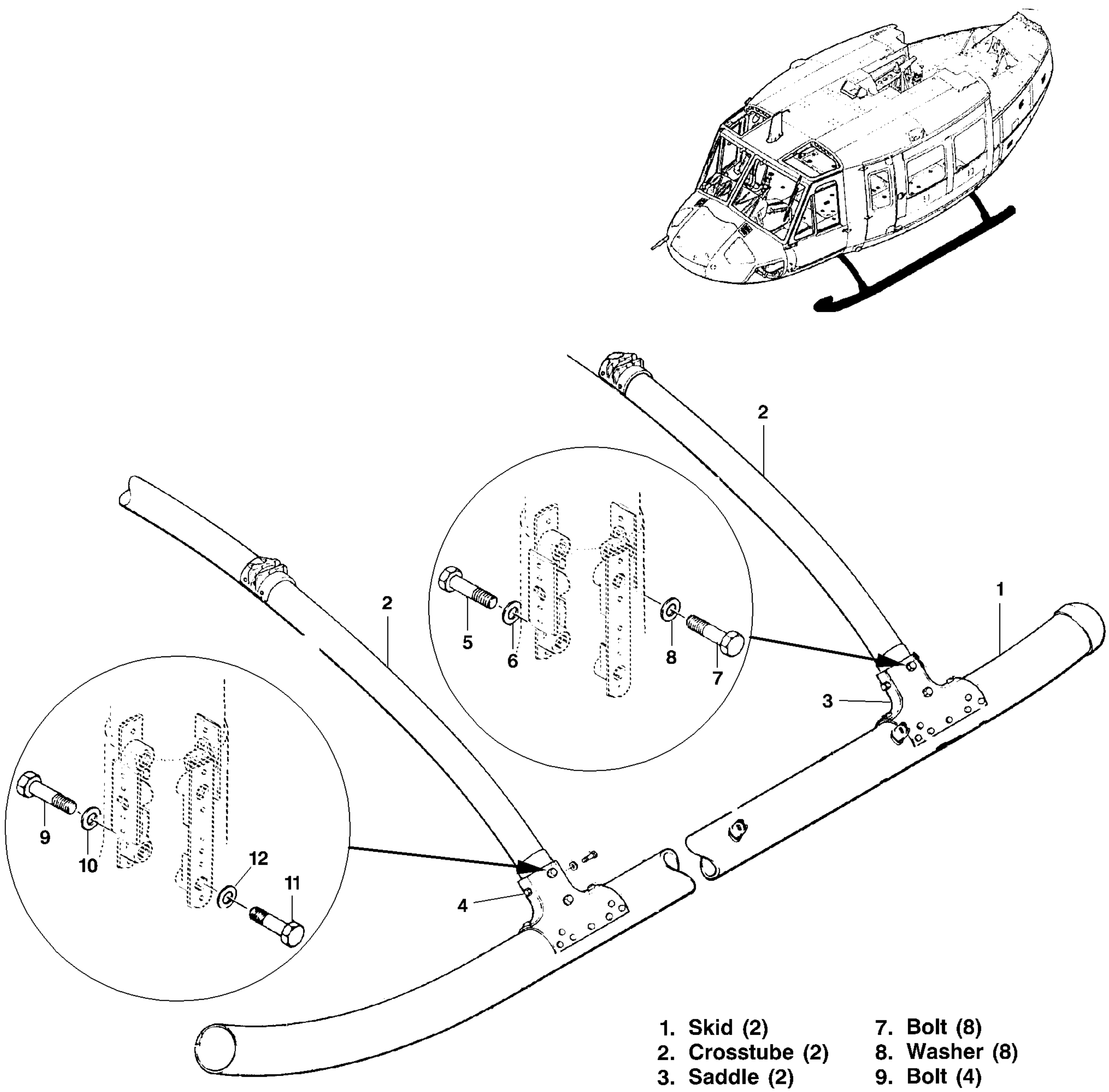


Figure 3-1. Checking landing gear crosstubes



1. Bolt (16)
2. Washer (16)
3. Nut (8)
4. Washer (16)
5. Bolt (8)
6. Cap assembly (2)
7. Cap assembly (2)

Figure 3-1A. Landing gear assembly skid



1. Skid (2)
2. Crosstube (2)
3. Saddle (2)
4. Saddle (2)
5. Bolt (4)
6. Washer (4)
7. Bolt (8)
8. Washer (8)
9. Bolt (4)
10. Washer (4)
12. Bolt (8)
13. Washer (8)

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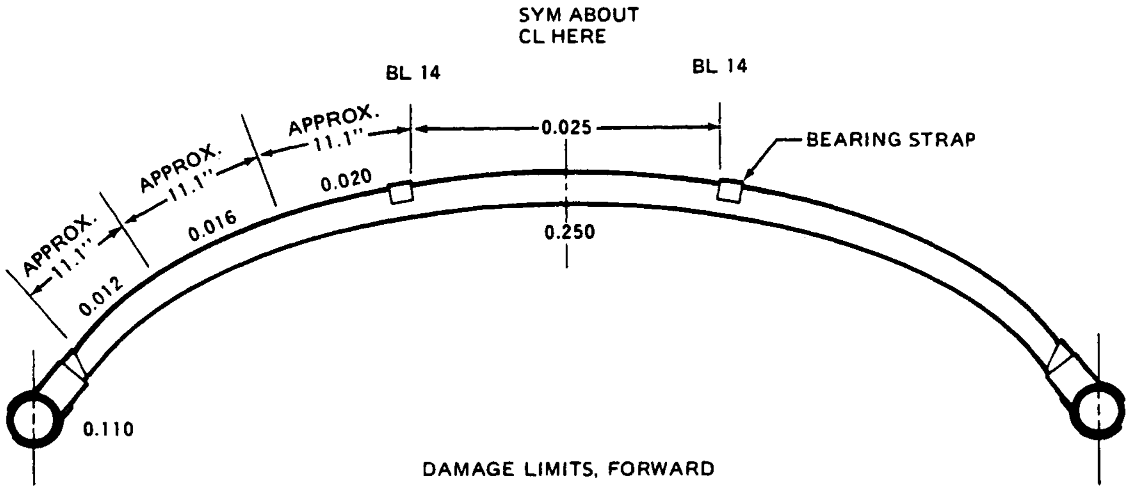
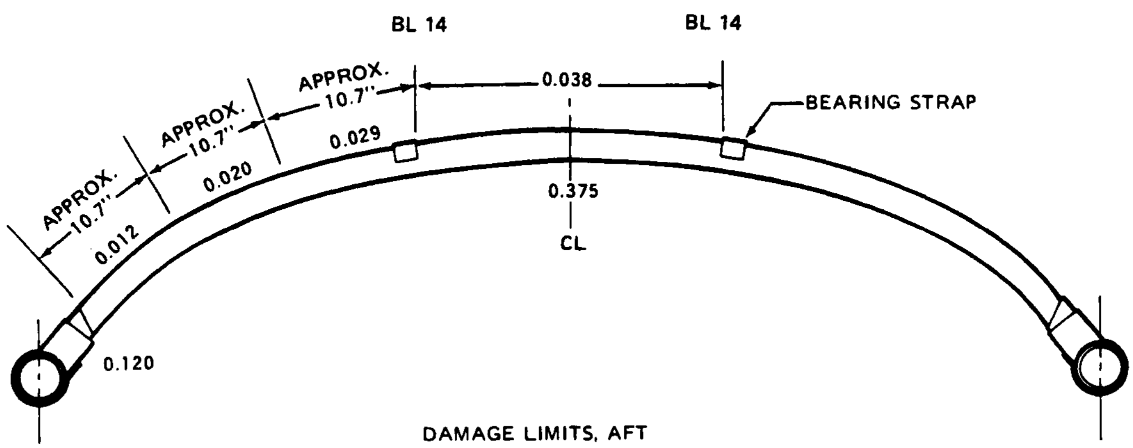
Figure 3-1B. Landing gear assembly



DAMAGE LIMITS, FORWARD



DAMAGE LIMITS, AFT

NOTE

The forward crosstube wall thickness taper is 0.110 to 0. 25 inch. The aft crosstube wall thickness taper is 0.120 to 0.375 inch. Refer to paragraph 3-9 for repair.

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Figure 3-2. Crosstubes damage limits

c. If crosstube has dents or holes severe enough to affect its function, replace crosstube.

3-10. Installation — Crosstubes. (Refer to paragraph 3-4.)

3-11. Painting — Crosstubes. (Refer to BHT-ALL-SPM).

3-12. SKID TUBES.

3-13. Description — Skid Tubes. The skid tube is a one piece formed aluminum alloy tube with a forward end step, rear end cap, two eyebolts for mounting a ground handling wheel assembly, two saddles with sockets for crosstubes, a towring fitting, and a two-piece shoe on the bottom of skid.

3-14. Removal — Skid Tubes. Remove landing gear assembly and separate crosstubes and skids (paragraph 3-3).

3-15. Inspection — Skid Tubes.

a. Inspect forward end of skid tubes and fittings for damage.

b. Inspect skid tubes for scratches, scuffs, wear, dents, holes and nicks.

c. Inspect the area between the crosstube saddles for obvious damage.

3-16. Repair or Replacement — Skid Tubes.

a. Replace damaged end step and fittings.

b. Replace skid tubes that show excessive wear or damage.

c. Scratches and dents may be polished out of the skid tubes as follows:

(1) Smooth dents in skid tube between crosstube saddles up to 0.25 inch deep and from 1.00 to 1.02 inches in diameter.

(2) Scratches in skid tube between crosstube saddles running any direction except straight across the top of skid tube.

(3) Surface scratches running straight across top of skid tube between crosstube saddles not exceeding 0.03 inch deep and 1.00 to 1.02 inch long.

d. Scratches, dents, or holes in the skid tube forward of crosstube saddle and aft of aft crosstube saddle may be repaired at the discretion of the local maintenance officer.

e. Skid tube damage repairable by patching. Scratches running straight across top more than 0.03 inch deep and 1.02 inches to a maximum of 4.0 inches long, dents more than 0.25 inch deep and 1.02 inches to a maximum of 4.0 inches long, dents more than 0.25 inch deep and 1.02 inches to a maximum of 4.0 inches across, and any holes up to 4.00 inches in diameter, through one surface of tube only. Such repair will be at the discretion of local maintenance officer.

NOTE

Patch repairs are limited to the top side of skid tube and to areas as shown in figure 3-3.

(1) Repair skid tube by patching as follows: (figure 3-3.)

(a) Lift the helicopter and remove skid tubes (paragraph 3-3).

(b) Polish out scratches and trim and smooth rough edges of holes.

(c) Fabricate a patch from aluminum alloy of the required size or make a patch from material salvaged from scrap skid tube.

(d) Lay out the rivet hole pattern and form patch to fit contour of skid tube (figure 3-3).

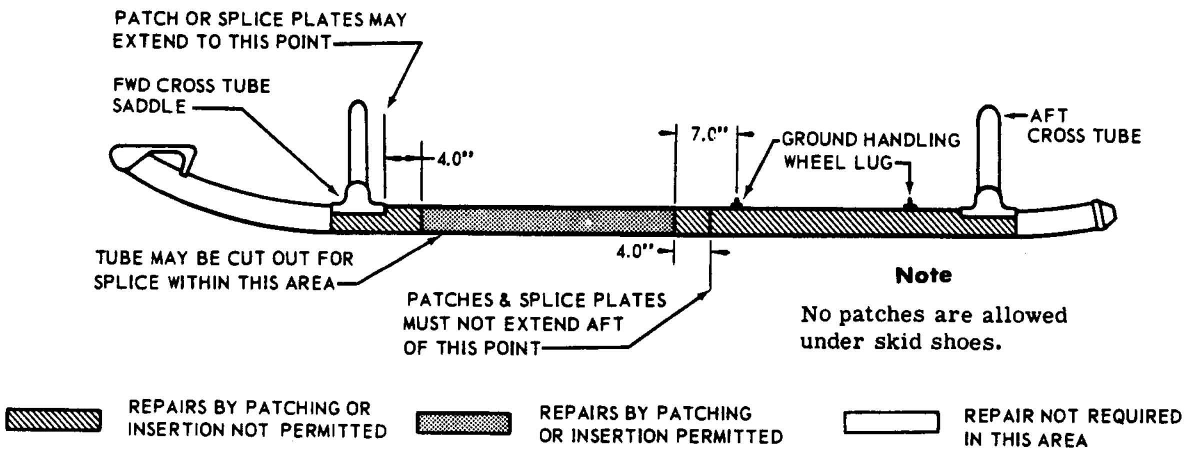
(e) Securely clamp patch in place on skid tube and drill holes using No. 10 drill. Remove patch and deburr holes.

(f) Secure patch to skid tube using blind rivets (figure 3-3).

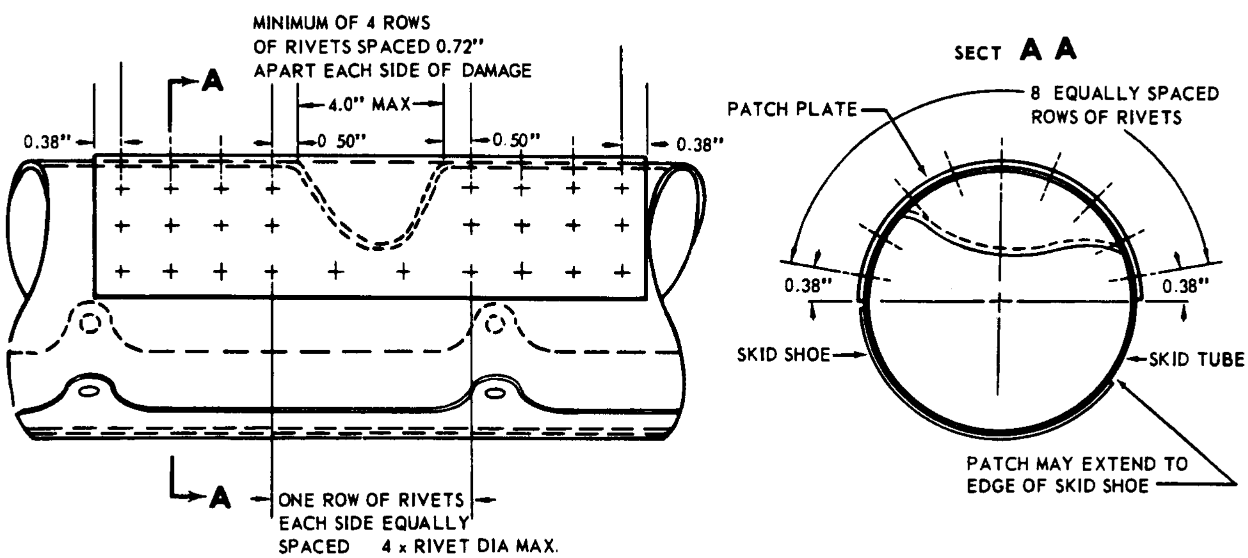
(g) Apply epoxy polyamide primer, (C-204) and lacquer to match color in accordance with instructions in BHT-ALL-SPM.

(h) Install skid tube and lower helicopter (paragraph 3-4).

f. Dents and holes on either top or bottom side of skid tube which are greater than four inches across in any direction shall be repaired by insertion.



SKID TUBE REPAIR LIMITS



TYPICAL PATCH REPAIR

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Figure 3-3. Landing gear skid tube repair (Sheet 1 of 2)

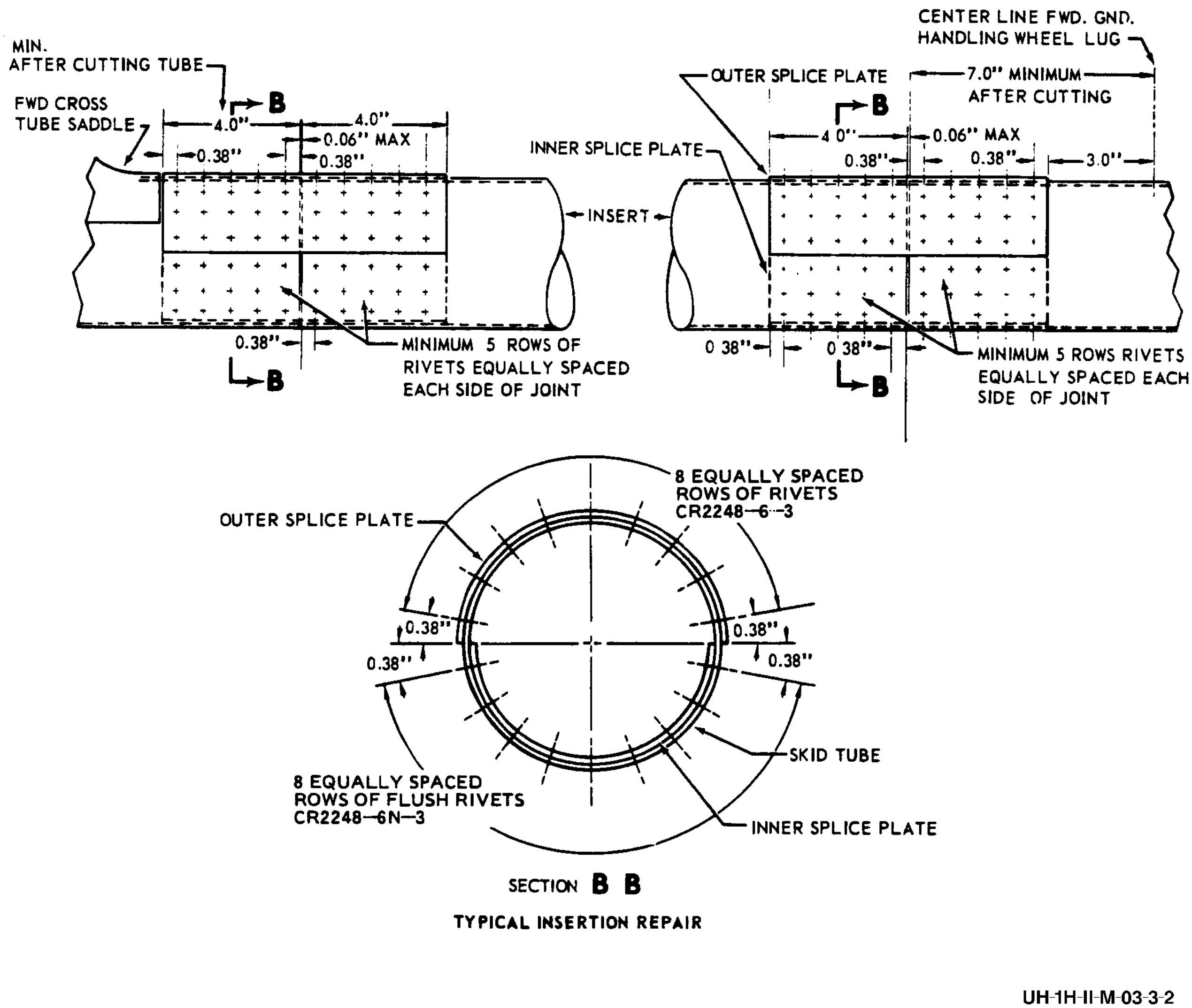


Figure 3-3. Landing gear skid tube repair (Sheet 2 of 2)

Such repairs are restricted to the areas shown in figure 3-3.

(1) Repair skid tube by insertion as follows:

(a) Lift and support the helicopter and remove skid tube (paragraph 3-3).

(b) Cut out damaged portion of skid tube.

(c) Fabricate an insert of the required length from tubing of 0.095 wall thickness or from scrap skid tube.

(d) Fabricate splice plates as follows:

1. Cut four plates to the required dimensions from aluminum alloy sheet or use material salvaged from scrap skid tube.

2. Form two plates to fit the outside diameter of skid tube and two plates to fit the inside diameter of skid tubes as shown in figure 3-3.

(e) Apply a coat of epoxy polyamide primer (C-204) to plates and skid tube.

(f) Lay out rivet hole pattern on upper splice plates and lower sides of skid tubes as shown in figure 3-3.

(g) Maintaining proper alignment, assemble and securely clamp splice plate and tube together.

(h) Drill rivet holes in plates and tubes with a No. 10 drill. Countersink lower holes with a 100 degree countersink. Remove plate and deburr holes. Install blind rivets in upper half and lower half of splice as shown in figure 3-3.

(i) If repair involved removal of skid shoe bolt sleeves, mark new sleeve location using skid shoes as a template. Install new sleeves in these places (paragraph 3-24).

(j) Apply a touchup coat of epoxy polyamide primer (C-204) and lacquer to match color.

(k) Install skid tube to landing gear and lower helicopter to ground (paragraph 3-4).

g. Damage to skid tubes beyond the limits for repairs by patching or insertion, as shown in figure 3-3, requires replacement of skid tube.

3-17. Installation — Skid Tubes. (Refer to paragraph 3-4.)

3-18. Painting — Skid Tubes. (Refer to BHT-ALL-SPM.)

3-19. SKID SHOES.

3-20. Description — Skid Shoes. The skid shoe is a two-piece replaceable steel shoe secured along the lower surface of skid tube with bolts and steel washers. The shoes prevent abrasion and damage to landing gear skid tubes when the helicopter contacts the ground.

3-21. Removal — Skid Shoes.

a. Raise the helicopter clear of ground using jacks or hoist.

b. Remove the front and rear sections of skid shoes from skid tube by removing bolts and steel washers.

3-22. Inspection — Skid Shoes. Inspect skid shoes for damage and for loose or damaged bolt inserts, expander nut and sleeve combination, and suitability for continued service.

3-23. Repair or Replacement — Skid Shoes.

a. Replace excessively worn skid shoes. Remove skid shoes (paragraph 3-21).

b. Remove loose or damaged inserts in skid tube as follows:

(1) Remove skid shoes from skid tube (paragraph 3-21).

(2) Carefully drill the damaged or loose expander nut and sleeve using a 1/4 inch drill.

(3) Carefully drill off the countersunk portion of sleeve head from skid tube. Do not damage the original drilled hole in the skid tube.

(4) Remove the remaining portion of expander nut and sleeve using a 5/16 inch or smaller punch.

(5) Remove damaged expander nuts and sleeves from skid tube.

3-24. Installation — Skid Shoes.

a. Install new expander nut and sleeve using installation tool (T4).

b. Torque nut to 215 to 240 inch-pounds.

CAUTION

Overtorquing the nut may result in cracking the sleeve inside skid tube.

c. Remove tool (T4) from completed installation.

d. Install skid shoes on skid tube. Position rear skid shoe to the mounting holes on skid tube. Install necessary bolts and thin steel washers. Align front skid shoe overlapping the end of rear skid shoe and install steel bolts and steel washers.

e. Lower the helicopter.

3-25. Paint — Skid Shoes. (Refer to BHT-ALL-SPM.)

3-26. SKID SADDLES.

3-27. Description — Skid Saddles. The skid saddles are installed on each skid tube, forward and aft to hold the ends of the crosstube. The saddles are manufactured of formed aluminum alloy material and contoured to the shape of skid tube. The saddle assembly consists of two parts, inboard and outboard, which are riveted together. The landing gear assembly requires four saddle assemblies, two on each skid tube. The saddle assemblies are secured to skid tube with blind rivets.

3-28. Removal — Skid Saddles.

a. Remove landing gear (paragraph 3-3).

b. Remove bolts securing saddles to crosstube and separate skids (paragraph 3-3).

c. Drill out existing rivets attaching saddle to skid tube.

d. Stand skid tube vertically to clear chips and rivet collars from inside tube.

3-29. Inspection — Skid Saddles. Check saddles for damage and distortion.

3-30. Repair or Replacement — Skid Saddles. Replace saddles if damaged or distorted.

3-31. Installation — Skid Saddles.

a. Position saddles on skid tube.

b. Install rivets securing saddles to skid tube.

c. Install bolts attaching saddles to crosstube.

d. Replace landing gear on helicopter (paragraph 3-4).

3-32. Painting — Skid Saddles. (Refer to BHT-ALL-SPM.)

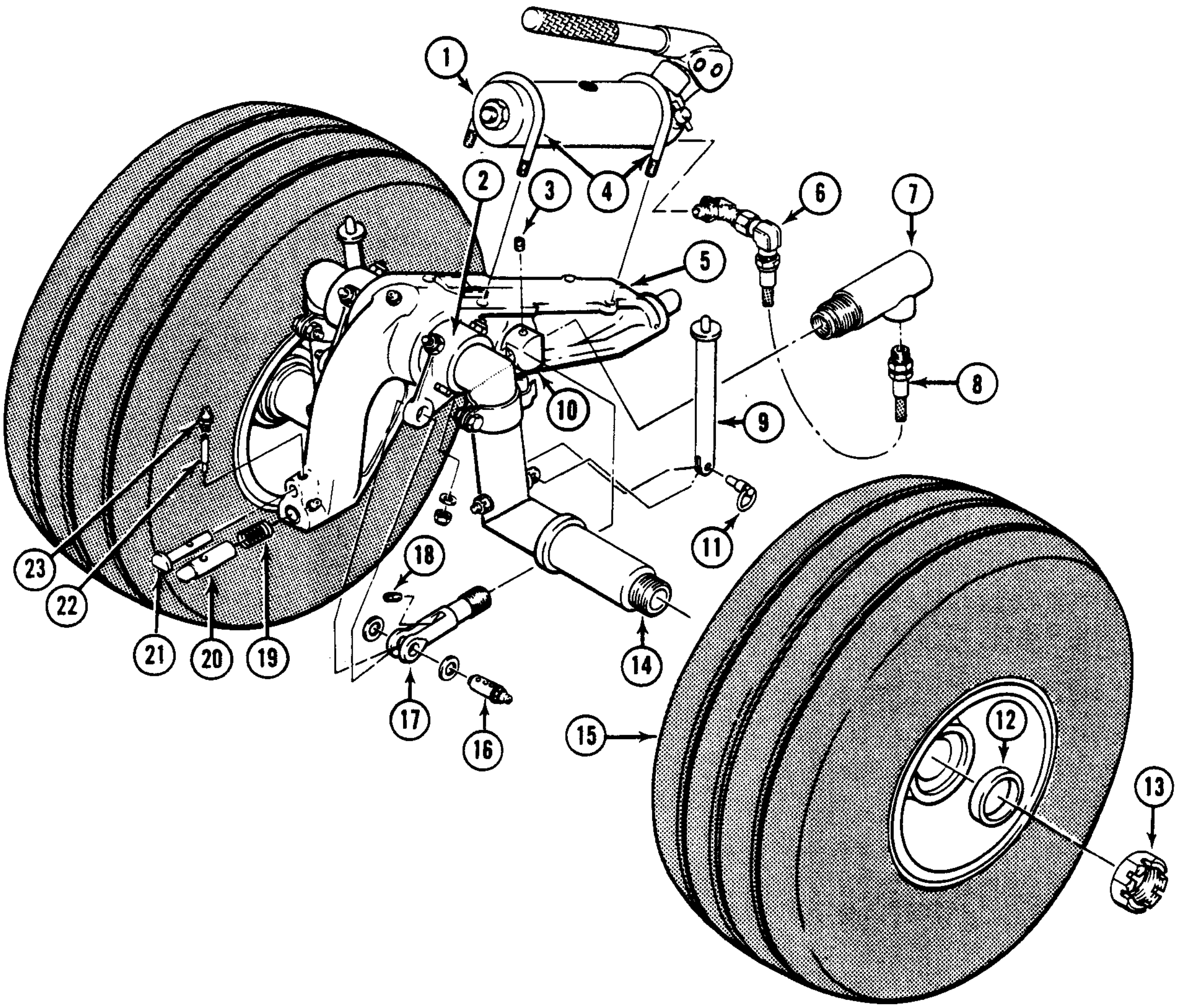
3-33. GROUND HANDLING GEAR.

3-34. Description — Ground Handling Gear. Two ground handling gear assemblies are provided for moving helicopter on the ground. Each assembly consists of two wheels (15, figure 3-4) on an offset axle (14), a supporting cradle assembly (5), and a hand-operated hydraulic pump (1) with two hydraulic rams (7) which actuate axle (14) to extend or retract wheels. The cradle assembly (5) is mounted to eyebolts on landing gear skid by a fixed rear pin and a spring-loaded front pin. Two support rods stowed on axle can be engaged in holes on skid to secure assembly with wheels (15) up, when landing gear is left in place during flight.

CAUTION

To prevent possible damage to handling wheels, the forward portion of the skids should be raised by pulling the tail skid down while extending the wheels. To further prevent damage to ground handling gear equipment, release pressure slowly, allowing the helicopter to be lowered slowly.

3-35. Removal — Ground Handling Gear. If support rods (9) are engaged, release hydraulic pressure and raise wheels (15) to detach rods from skids and stow in clips. Press release pin on front of cradle assembly (5) to withdraw support pin from eyebolt. Lift ground handling gear assembly off skids.



1.	Hydraulic pump	9.	Support rod	17.	Clevis
2.	Ram arm	10.	Trunnion	18.	Setscrew
3.	Setscrew	11.	Ball lock pin	19.	Spring
4.	U-bolts	12.	Retainer	20.	Support pin
5.	Cradle assembly	13.	Nut	21.	Release pin
6.	Hose and fittings	14.	Axle	22.	Connecting pin
7.	Hydraulic ram	15.	Wheel assembly	23.	Lubricator fitting
8.	Hose	16.	Lubricator pin		

UH-1H-II-M-03-4

Figure 3-4. Ground handling gear

3-36. Disassembly — Ground Handling Gear.

a. Remove ball lock pin (11, figure 3-4) and remove support rod (9) from axle (14).

b. Remove wheel (15) with tire and tube assembled (paragraph 3-43).

c. Disconnect and remove flexible hose (8) from tee on hydraulic pump (1) and hydraulic ram (7).

d. Remove nuts and washers and lift U-bolts (4) attaching hydraulic pump (1) to cradle assembly (5). Remove hydraulic pump (1).

e. Remove cotter pin, washer, and lubricator pin (16) attaching ram arm (2) to clevis (17) of hydraulic ram (7).

f. Back out setscrew (3) and remove hydraulic ram (7) from trunnion (10). Using clevis (17) as handle, hold ram housing of cylinder. Separate ram piston from cylinder.

g. Remove lubricator fitting (23), unscrew and remove connecting pin (22) and release pin (21).

NOTE

When connecting pin (22) is removed, support pin (20) can be released and spring (19) will slide from cradle.

h. Remove trunnion (10) from cradle (5).

3-37. Inspection — Ground Handling Gear.

a. Inspect ball lock pin (11, figure 3-4) for damage and distortion.

b. Inspect lubricator pin (16) for damage, wear, and distortion.

c. Inspect internal threads of trunnion (10) for damage and set screw (3) and its internal threads in trunnion for damage.

d. Inspect connecting pin (22), support pin (20), and spring (19) for damage or distortion.

e. Inspect flexible hose (8) for leaks and damage.

f. Inspect axle (14), cradle assembly (5), and sleeve for wear and cracks.

g. Inspect hydraulic ram assembly (7) for leaks or damage.

h. Inspect hydraulic pump (1) for leaks and damage.

i. Inspect packings, seals, and gaskets of hydraulic pump (1) for wear or damage.

j. Inspect washers, screws, retaining rings, clips, and springs of hydraulic pump (1) for wear or damage.

k. Inspect screens of hydraulic pump (1) for damage.

l. Inspect balls in hydraulic pump (1) for pitting, damage, and corrosion.

m. Inspect hole in rod (25, figure 3-5) for clearance and no obstructions.

3-38. Repair or Replacement — Ground Handling Gear.

a. Replace ball lock pin (11, figure 3-4) if unserviceable.

b. Replace lubricator pin (16) if worn or distorted.

c. Replace trunnion (10) if the internal threads are damaged.

d. Replace lubricator fitting (23) if damaged.

e. Replace connecting pin (22), support pin (20) and spring (19) if damaged.

f. Replace flexible hose (8) if leaking or damaged.

g. Replace axle (14) or cradle assembly (5) if cracked or damaged.

h. Repair hydraulic pump if leaking. Use service kit Part No. JS953 (T-6).

(1) Replace the following parts in hydraulic pump:

(a) Replace clip (5, figure 3-5) and leather and rubber packings (9 and 10).

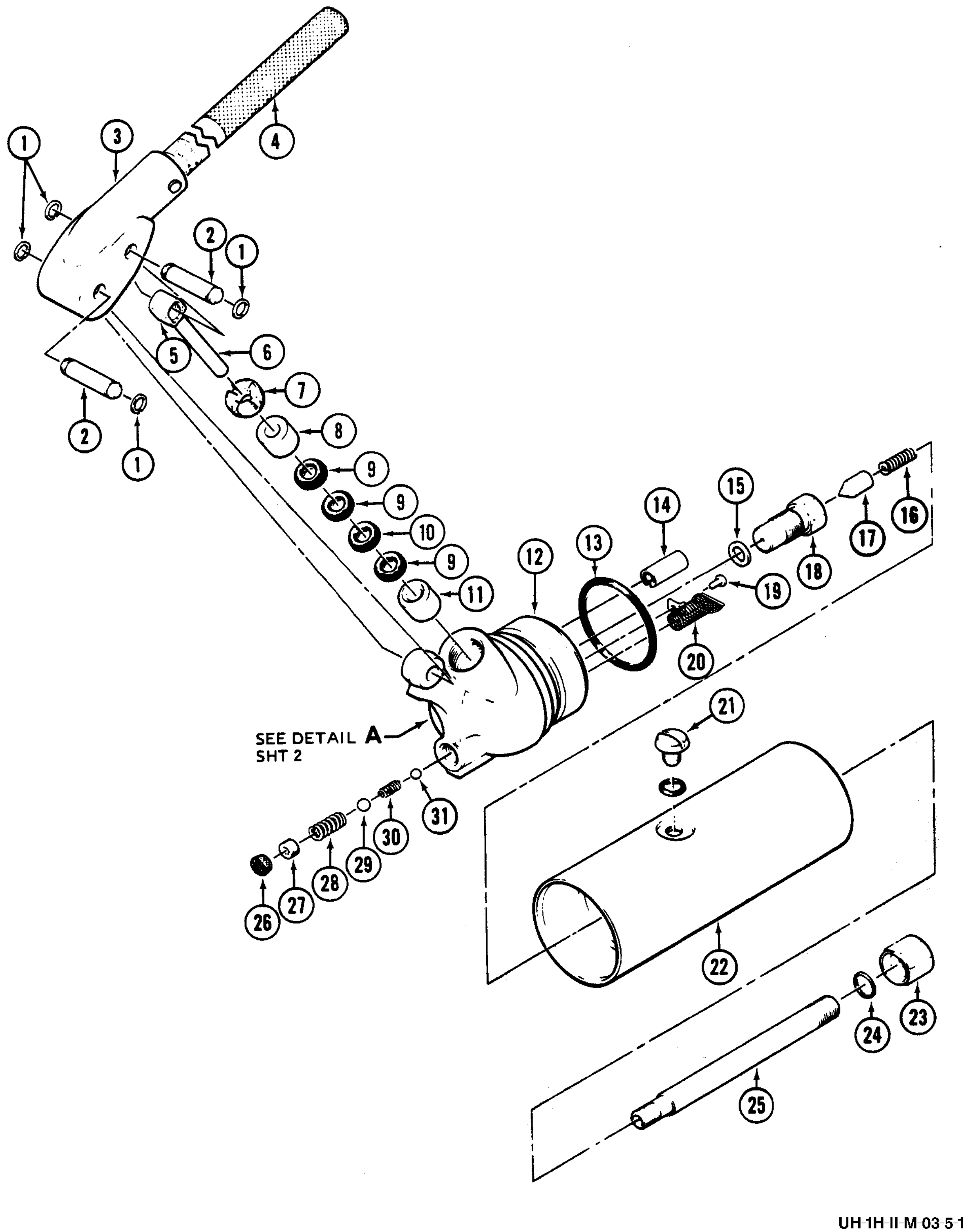
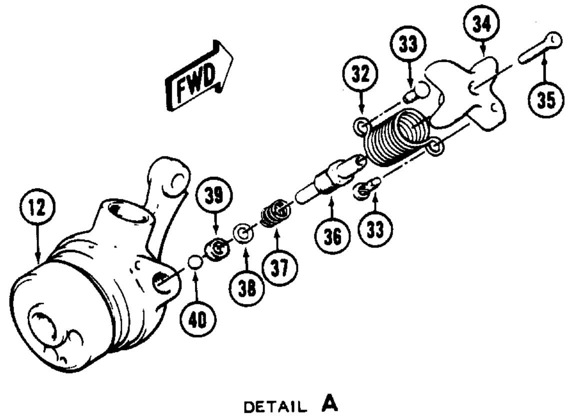


Figure 3-5. Ground handling gear — pump assembly (Sheet 1 of 2)



1.	Retaining ring	15.	Gasket	29.	Ball (5/16" dia.)
2.	Pin	16.	Spring	30.	Spring
3.	Handle assembly	17.	Plunger	31.	Ball (3/16" dia.)
4.	Handle	18.	Valve body	32.	Spring
5.	Clip	19.	Screw	33.	Pin
6.	Piston	20.	Screen	34.	Knob
7.	Gland nut	21.	Screw	35.	Screw
8.	Support	22.	Tank	36.	Valve stem
9.	Leather packings	23.	Nut	37.	Spring
10.	Rubber packing	24.	Preformed packing	38.	Washer
11.	Spreader	25.	Tie rod	39.	Packing
12.	Pump body	26.	Screen	40.	Ball (5/16" dia.)
13.	Seal	27.	Screw		
14.	Magnet	28.	Spring		

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Figure 3-5. Ground handling gear — pump assembly (Sheet 2 of 2)

(b) Replace filter screen (26), discharge valve spring (28), 5/16 inch ball (29), suction valve spring (30), and 3/16 inch ball (31).

(c) Replace release valve spring (37) washer (38) packing (39) and 5/16 inch ball (40).

(d) Replace packing (24), seal (13), screw (19) and screen (20).

(2) Remove hydraulic pump from ground handling gear as follows:

(a) Release hydraulic pressure by turning T-handle valve on pump (1, figure 3-4) to open.

(b) Place suitable vessel to catch fluid. Disconnect hydraulic hose from tee fitting on pump. Cap the hoses. Remove fitting (6) from pump (1) and install plug.

(c) Remove four nuts and washers from U-bolts (4) to detach hydraulic pump (1) from cradle assembly (5). Keep the U-bolts with pump.

(3) Disassemble hydraulic pump as follows:

(a) Remove retaining rings (1, figure 3-5) and fulcrum pins (2) to separate handle assembly (3) from pump body (12).

(b) Remove filler screw (21) and drain oil from tank.

(c) Pull out piston (6) and remove clip (5) by spreading clip slightly. Unscrew gland nut (7) using adjustable spanner wrench and remove support (8), leather packing (9), rubber packing (10) and spreader (11).

(d) Pry out filter screen (26). Remove screw (27), spring (28), ball (29), spring (30), and ball (31).

(e) Remove screw (35). Grasp knob (34) and detach from valve stem (36). Unhook loop of spring from pin on pump body. Slip knob (34) onto valve stem (36). Remove spring (37), steel washer (38), packing (39), and ball (40).

(f) Remove nut (23) and packing (24). Twist tank (22) off pump body (12). Remove seal (13).

(g) Remove screw (19) and screen (20). Discard screen.

(h) Remove overload valve body (18) from rod (25). Remove spring (16) and plunger (17) from body (18).

(4) Clean parts as follows:

(a) Clean all foreign particles from magnet assembly (14, figure 3-5) using clean cheesecloth.

(b) Thoroughly clean recessed hole, into which screen (20) fits, using solvent (C-304).

(c) Thoroughly clean inside of valve body (18) using solvent (C-304).

(d) Clean rod (25) using solvent (C-304) to ensure clear passage through hole in end of rod.

(5) Reassemble hydraulic pump as follows:

(a) Insert trunnion (10, figure 3-4) in cradle (5) with threaded openings aft.

(b) Insert spreader (11, figure 3-5) in pump body (12) with flat side down.

(c) Slide support (8) onto piston (6).

NOTE

The “V” must face away from groove on piston.

(d) Dip two leather packings (9), on rubber packing (10), and third leather packing in hydraulic fluid (C-002) and assemble in the order shown in figure 3-5.

NOTE

The “V” on packing must rest on brass spreader.

(e) Place assembly bushing (T14) into top of hole in pump body (12).

(f) Insert piston (6), with packings installed, into bellmouth of assembly bushing (T14).

(g) Slip packing seating tool (T15) over piston.

(h) Drive piston and packing down solid, using medium weight hammer on seating tool.

(i) Remove packing guide.

(j) Install and tighten nut (7, figure 3-5) using an adjustable spanner wrench.

(k) Replace clip (5).

(l) Insert ball (31) spring (30), ball (29), and spring (28) into body (12) and install screw (27).

(m) Install filter screen (26) in hose hole.

(n) Insert ball (40), packing (39), washer (38) and spring (37) into pump body (12).

CAUTION

Do not overtighten knob (34).

(o) Install valve stem (36) in pump body (12) down against ball (40) by slipping knob (34) onto stem and tightening.

(p) Remove knob (34) from stem (36).

(q) Position spring (32) over knob (34) and hook one eye of spring onto pin (33). Place knob and spring over valve stem (36) and hook eye of spring onto pin (33) in pump body (12).

NOTE

Do not place knob onto hex of valve stem.

CAUTION

An improperly operating valve means improper assembly and an inoperative pump.

(r) Hold pump body (12) and valve system (36) firmly and twist knob (34) to the left two faces of the hex. Push knob onto hex of valve stem at this position. Insert flat head socket screw (35) and tighten. Try knob action to see if closing is positive. If action is not positive, move knob to the left another face on hex.

NOTE

Knob and valve stem should work freely and valve should close firmly when opened and released.

(s) Install screen (20) in pump body (12) and secure with screw (19).

(t) Install plunger (17) and spring (16) in valve body (18). Screw rod (25) into valve body (18), and position in tank (22).

(u) Install gasket (15) and seal (13) and assemble tank (22) to body (12).

(v) Install packing (24) and nut (23) and tighten nut lightly. Rotate tank so that filler hole is on top and in line with pump handle. Tighten nut (23).

(w) Replace tank filler hole screw (21).

(x) Position handle assembly (3) to body (12) and secure with pins (2) and retaining rings (1).

(6) Test hydraulic pump as follows:

(a) Fill the oil tank to proper level with hydraulic fluid (C-002) (paragraph 3-39).

(b) Connect a 10,000 psi pressure gage to outlet hole.

(c) Operate pump until pressure builds up and overload valve unloads. Proper setting is 8000 to 8300 psi. If pressure goes too high, turn tie rod (25) counterclockwise using a screwdriver. If pressure is too low, turn rod clockwise. Test and readjust as required until proper setting is obtained.

(d) When proper setting is obtained, tighten nut (23).

NOTE

Hold tie rod in position using screwdriver in slot to prevent rod turning with nut.

i. Remove hydraulic ram, if required, as follows:

(1) Remove cotter pin, washer, and pin (16, figure 3-4) attaching arm (2) to clevis (17) of hydraulic ram (7).

(2) Back out setscrew (3) and remove hydraulic ram (7) from trunnion (10). Using clevis (17) as handle, hold ram housing or cylinder. Separate ram piston from cylinder.

(3) Remove lubricator fitting (23) and unscrew and remove connecting pin (22) and release pin (21).

NOTE

When connecting pin (22) is removed, support pin (20) can be released and spring (19) will slide from cradle.

(4) Remove trunnion (10) from cradle (5).

j. Repair hydraulic ram as follows:

NOTE

If hydraulic ram does not have a piston Part No. 330617, which is machined for packing and backup ring, requisition new piston Part No. 330617.

(1) Carefully slip new backup ring over inboard end (end opposite clevis) of piston P/N 330617 and into packing groove.

(2) Carefully slip new packing over inboard end of piston and into groove.

NOTE

Make certain packing is not spiraled in groove.

(3) Burnish scratches inside hydraulic ram cylinder that are less than 0.005 inch deep, using crocus cloth (C-500).

(4) Replace hydraulic ram if inside of cylinder has nicks, scratches, or pits deeper than 0.005 inch.

3-39. Installation — Ground Handling Gear.

NOTE

To prepare a new hydraulic pump (1) and hydraulic ram assembly (7) for installation, remove pipe plug on each and drain original fluid.

a. Install hydraulic ram on ground handling gear as follows:

(1) Install hydraulic ram (7) on each end of trunnion (10) to bottom out in hole. Back off until hydraulic outlet is directed down. Secure with set screws (3).

(2) Position hydraulic ram arm (2) on sleeve, insert axle (14) and secure with bolts. Insert sleeve through cradle assembly (5) and install hydraulic ram arm (2) and axle on opposite end.

NOTE

Hydraulic ram arm must be forward of wheel hub centerline 1.98 inches (figure 3-6).

b. Install hydraulic pump on ground handling gear as follows:

(1) Position hydraulic pump (1, figure 3-4) on cable assembly (5). Install U-bolts over pump and through flange of cradle assembly and secure with washer and nuts.

(2) Install reducer and tee fitting (6) in outlet, aligning open ends of tee across end of pump cylinder.

(3) Install ram clevis (17) with hydraulic ram fully extended and adjust clevis to hold 1.98 inches dimension (figure 3-6).

(4) Insert pin (20, figure 3-4) in aft end of cradle assembly (5). Align holes and secure with spring pin.

(5) Insert release pin (21) in upper forward orifice of cradle. Insert spring (19) and pin (20) in forward orifice of cradle. Align holes in both pins and install connecting pin (22).

(6) Attach support rod (9) to pin and insert pin (11).

(7) Connect hoses (8) from each ram (7) to outlet tee of pump.

(8) Fill pump with hydraulic fluid (C-002).

(9) Pump handle several strokes.

(10) Loosen hydraulic hose fitting at tee of pump.

(11) Pump until no air is expelled. Tighten hydraulic hose connection.

(12) If air is still present in hydraulic ram (10), refill pump and repeat procedures.

(13) Tighten or replace any hardware as necessary.

(14) Build up hydraulic pressure with the pump to check for any possible leaks. Extend and retract the ground handling wheels to ensure that system functions properly.

c. Test ground handling gear hydraulic ram as follows:

(1) Pump until overload in hydraulic pump goes off with ram against trunnion stop.

(2) Check for leaks.

(3) Release pressure and pump ram out half-way. Allow to stand a few minutes.

(4) Check for leaks. The hydraulic ram is acceptable when no leaks are detected.

3-40. Painting — Ground Handling Gear. Clean components. Paint or touch up components in accordance with BHT-ALL-SPM.

3-41. WHEELS AND TIRES — GROUND HANDLING GEAR.

3-42. Description — Ground Handling Wheel.

Each ground handling gear assembly has two 7.00-6, 6-ply rating, type III aircraft tires.

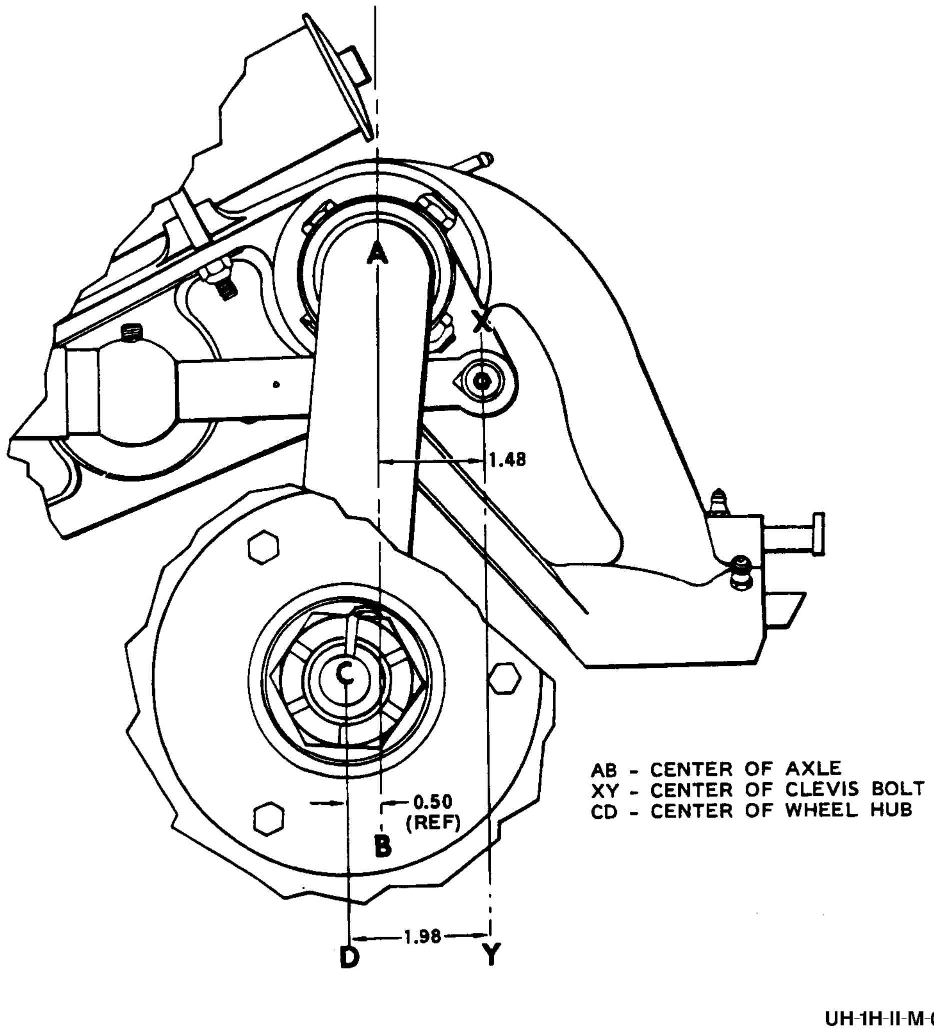

Figure 3-6. Position — wheel and ram clevis

3-43. Removal — Ground Handling Wheel. Remove ground handling gear from skid. Remove either wheel from axle (14, figure 3-4) by removing cotter pin, nut (13), and retainer (12).

3-44. Inspection — Ground Handling Wheel. Inspect tires for cuts, excessive wear and 50 PSIG air pressure.

3-45. Repair or Replace — Ground Handling Wheel.

a. Replace tire if badly cut or excessively worn.

b. Inflate tire to 50 PSIG air pressure.

c. Repair or replace tires as required.

3-46. Installation — Ground Handling Wheel. Place wheel (15, figure 3-4) on axle (14) and secure with retainer (12), nut (13), and cotter pin.

SECTION II — SKIDS/STRUTS

(Not Applicable)

SECTION III — FLOATS

(Not Applicable)

SECTION IV — SKIS

(Not Applicable)

SECTION V — BRAKES

(Not Applicable)

CHAPTER 4

POWER PLANT

SECTION I — POWER PLANT

4-1. POWER PLANT ASSEMBLY.

4-2. Description — Power Plant Assembly (Figures 4-1 and 4-2). The power plant installation consists of a shaft turbine equipped with adapting parts and connections to fuel, oil, electrical, instrument, and engine control systems. Maintenance instructions which pertain specifically to the engine are contained in T53-L-703. Special tools required will be found in T53-L-703. Refer to paragraph 4-122 for buildup of quick change assembly.

4-3. Engine Maintenance Precautions.

WARNING

Prolonged contact with lubricating oil may cause a skin rash. Those areas of skin and clothing that comes in contact with lubricating oil should be thoroughly washed immediately. Area in which lubricating oil is used should be adequately ventilated to keep and mist and fumes to a minimum.

Cleaning materials are flammable and toxic. Avoid skin contact and breathing of solvent vapors.

CAUTION

Do not use tape to seal fuel or oil openings, since tape adhesive is soluble and can cause contamination.

Ensure tools used on engine on are not cadmium plated. Cadmium plating tends to chip from tools. Chips entering engine can contamination oil system and cause magnesium parts to deteriorate.

The use of nonapproved marking materials such as common lead pencils on materials subjected to high temperatures may cause engine contamination or cracking of detailed parts.

a. Marking on materials subject to high temperatures shall be done only with one of the following: marking pencil, marking ink, marking ink pencil, or felt ink.

b. Use extreme caution to prevent dirt and foreign objects from entering engine. Place temporary covers on all exposed openings when engine components are remove or disconnected. All open hoses and tubing should be protected with plastic or metal caps. If suitable caps are not available, use commercial grade aluminum foil crimped to fit the particular opening.

c. Apply penetrating oil (C-125) as required to assist in removal of parts during disassembly. On parts to be reinstalled, remove all traces of penetrating oil with solvent (C-304).

d. Protect engine from dust and inclement weather. When possible, perform maintenance in a sheltered area.

e. Before removing engine components, disconnect wiring harness at ignition exciter unit and ground the ignition leads.

f. Carefully inspect condition of all parts to be installed on engine.

g. Replace removed lockwire, cotter pins, tabwashers, lockpins, lockwashers, gaskets, and performed packings with serviceable parts.

h. Replace hoses and tubing that may be damaged during removal of engine components.

i. In removal of external lines and components, brackets will be left in place whenever possible to facilitate reinstallation.

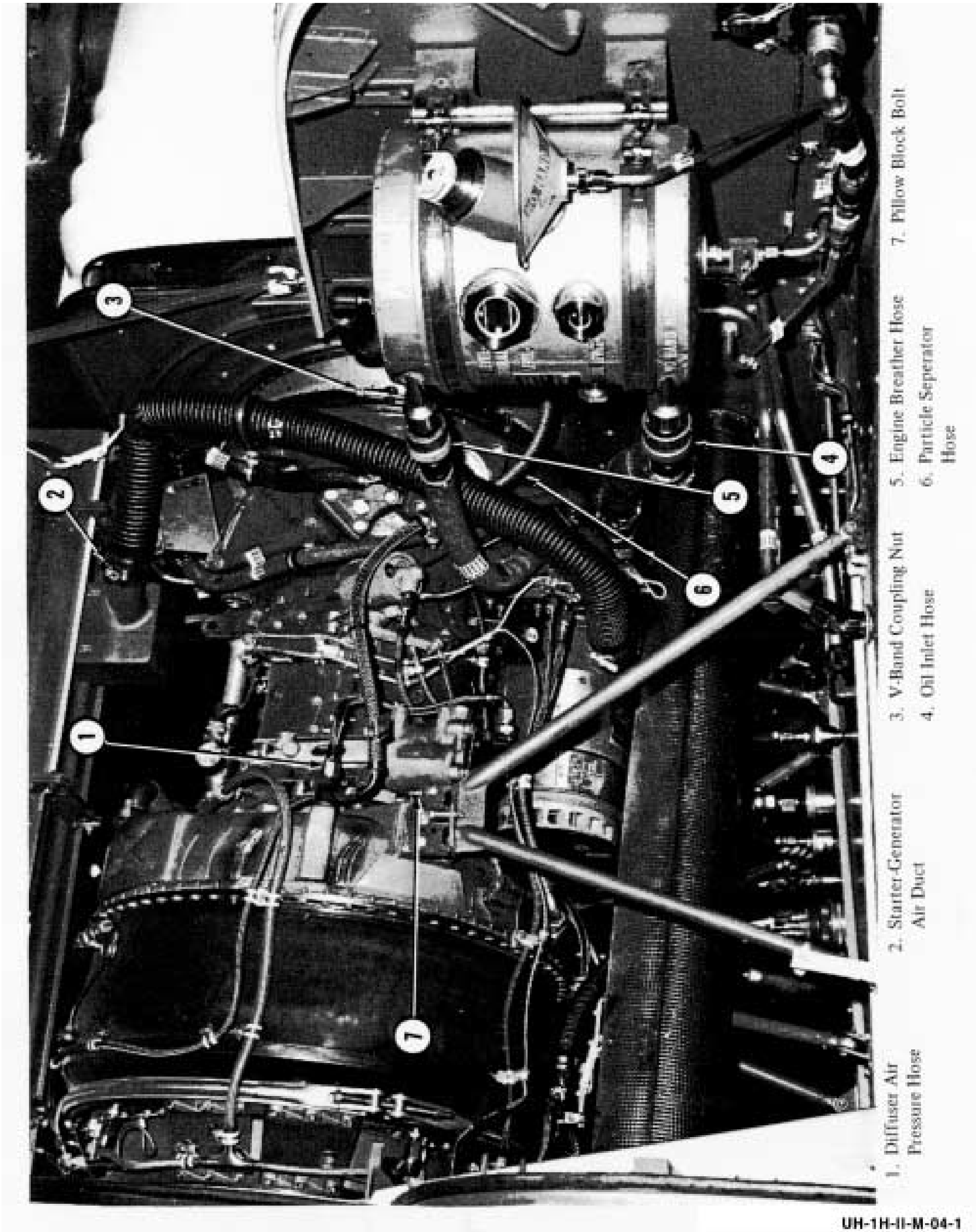

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Figure 4-1. Power plant installation — right side

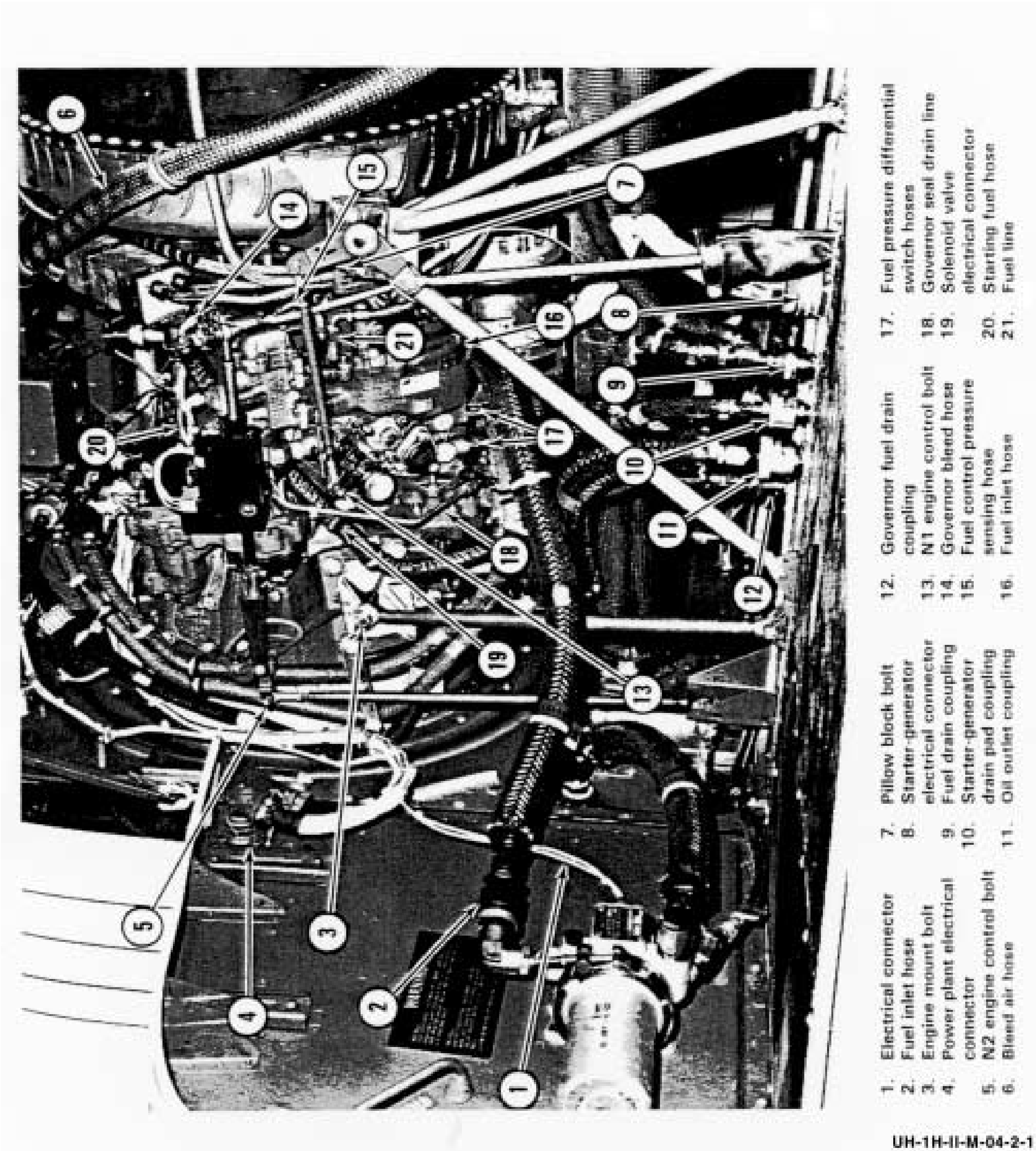


Figure 4-2. Power plant installation — left side (Sheet 1 of 2)

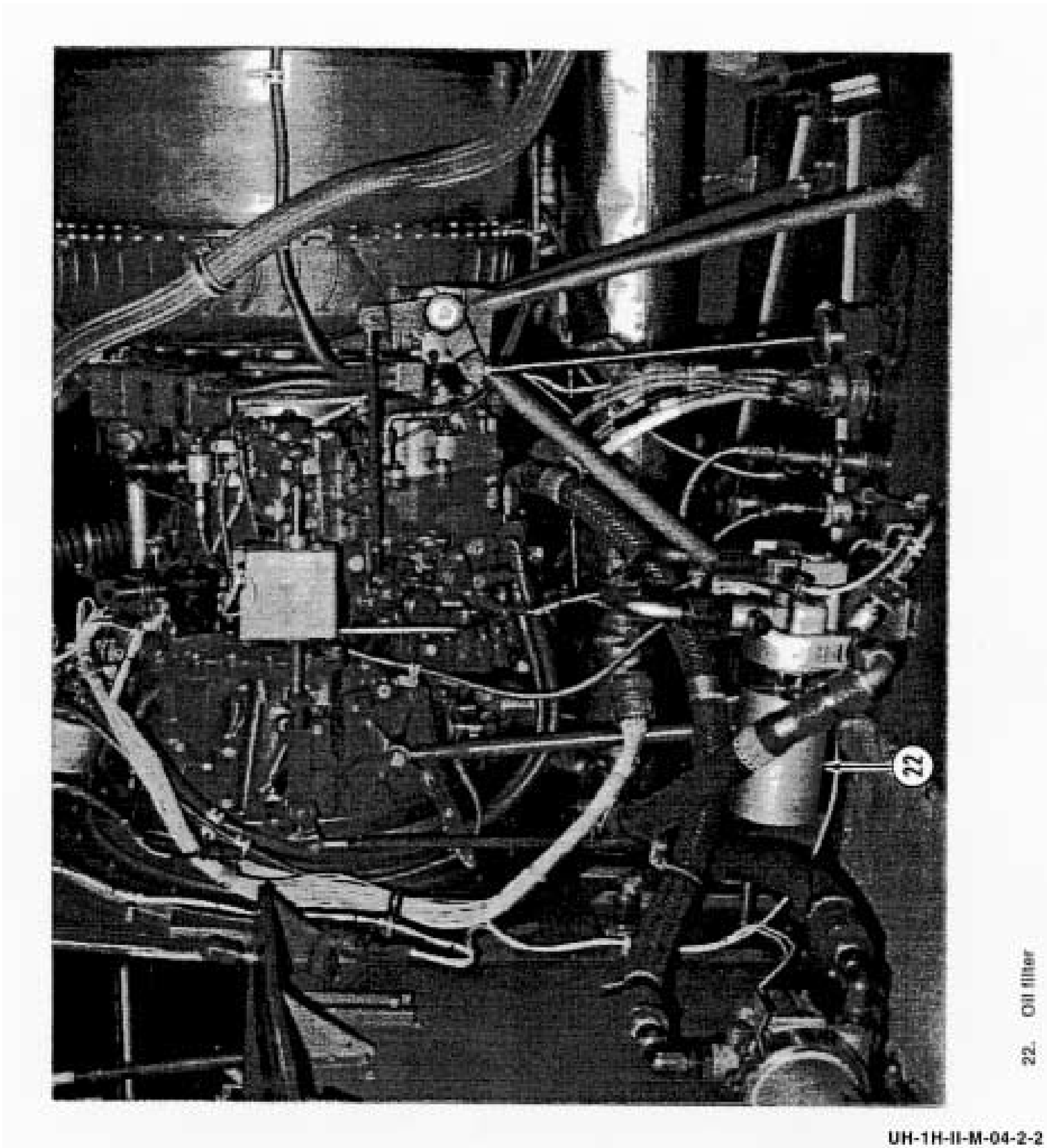


Figure 4-2. Power plant installation — left side (Sheet 2)

j. When removing or installing engine fuel, oil, or air hoses, do not apply torque to the narrow hex nut of the sleeve and nipple (figure 4-3). Apply torque to the wide hex nut only. When loosening or tightening the wide hex nut, hold the nipple or sleeve to prevent twisting of the hose.

k. Properly route and clamp all hose assemblies securely to prevent chafing. Proper clamping and chafe pads shall be used at all times.

4-4. Cleaning — Power Plant Assembly.

Premaintenance Requirements For Cleaning Power Plant Assembly

CONDITIONS	REQUIREMENTS
Special Tools	None
Part No. or Serial No.	All
Test Equipment	None
Support Equipment	Portable air compressor
Minimum Personnel Required	Two
Consumable Materials	(C-302), (C-304), (C-385), Engine Cleaner B and B3100, Anti-detonating Injection Fluid
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated

NOTE

Clean engine when inspection reveals an accumulation of dirt, when engine performance decreases excessively, and whenever engine gas temperature increases steadily during normal operation. Cleaning of air inlet area, inlet guide vanes, and compressor rotor blades is performed while engine is installed in aircraft by spraying a 1 to 4 ratio engine cleaner and fresh water mixture into inlet housing intake while motoring the engine with the starter.

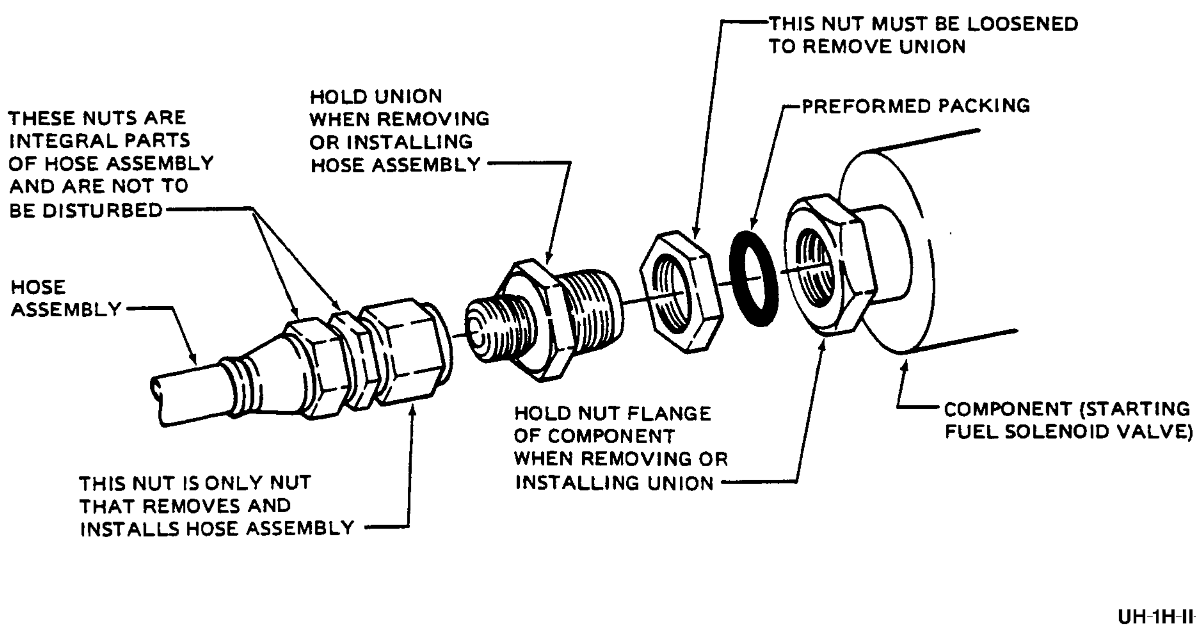


Figure 4-3. Engine hose assembly replacement — typical

a. Exterior Cleaning of Engine.

(1) Exterior of engine and attached components can be cleaned, when thoroughly cool, with solvent (C-304). Dry parts thoroughly after cleaning.

(2) When sprayed solvents or compressed air are used on or around engine, take suitable precautions to avoid forcing dirt, solvent, or moisture into engine openings, bearings, or electrical units or connections. Choice of any particular cleaning agent or process depends on nature and composition of parts to be cleaned and type of contaminants to be removed.

b. Interior Cleaning of Engine.

(1) Preparation for cleaning:

(a) Remove upper half of air particle separator. Special attention should be given to lower strut area in 6-o'clock position that is not readily accessible for inspection and cleaning.

(b) Disconnect fuel control pressure-sensing hose (15, figure 4-2) from inlet housing. Cap inlet housing fitting with AN929-4 cap and seal pressure sensing hose with AN806-D4 plug.

(c) Shield starter-generator by placing a rubber sheet (approximately 6 x 8 inches) between starter-generator and bleed band ports.

(d) Manually position ANTI-ICE switch in cockpit to OFF.

(e) Disconnect engine bleed air hose (6, figure 4-2) from adapter on engine. Cap adapter with AN929-16 cap, and seal engine bleed air hose with AN806-D16 plug.

(f) Disconnect diffuser air pressure hose (1, figure 4-1) and particle separator hose (6) from diffuser. Cap diffuser fitting with AN929-6D cap. Seal hose (6) with AN806-D6 plug.

(g) Disconnect fuel control air bleed hose from union on interstage bleed actuator. Install AN929-4 cap on union and AN806-D4 plug in free end of hose.

(h) Connect source of metered compressed air to pressure hose (1) AN815-6 union or similar attachment).

(i) Supply 30 to 40 psi metered air pressure to pressure hose (1).

NOTE

Do not exceed 40 psi maximum metered air pressure to pressure hose (1). When pressure is applied, actuator should close bleed band. Leave bleed band closed and proceed with step (2).

(2) Clean engine, using a mixture of engine cleaner (Band B3100) and water. Mixture of cleaner and water may be prepared in a 2 1/2 gallon water type fire extinguisher equipped with a 12-foot extension hose and nozzle.

CAUTION

If a water type fire extinguisher is selected for use, external surfaces should be painted yellow and clearly stenciled for easy identification.

(a) Combine 1/2 gallon of cleaner (Band B3100) with 2 gallons of water.

CAUTION

A cooling cycle of 45 minutes minimum shall be observed after engine operation, prior to spraying compressor. A mandatory cooling period is required to prevent warpage of internal engine components.

(b) Disconnect lead from ignition unit. Motor engine with starter and spray cleaner solution evenly into inlet area. Direct spray completely around engine inlet housing to ensure uniform application to all inlet guide vanes.

NOTE

A 30-second motoring cyclic will allow approximately one gallon of the cleaner solution to be sprayed into engine, without exceeding time limit for starter operation. Effective cleaning is dependent on a five-minute soak period.

(c) With engine static, distribute remaining cleaner solution by spraying inlet housing struts and areas leading to compressor section. Several applications may be required to exhaust cleaning solution, with dry-out rate governing exact time interval between applications. This time interval will also allow for starter cooling.

CAUTION

To prevent damage to starter, do not exceed following limitations.

ON	OFF (Cooling Period)
30 seconds	1 minute
30 seconds	5 minutes
30 seconds	15 minutes

After 15 minutes, cycle can start over again.

NOTE

Due to 30-second time limit imposed on starter operation, it may be necessary to remove nozzle from 12-foot extension hose, to allow a greater volume of water during rinse cycle. Use entire 2 1/2 gallons of water during 30-second motoring cycle.

(d) Rinse container and refill with 2 1/2 gallons of clear water. With ignition off, motor engine while spraying water evenly around engine inlet.

NOTE

On engines with extremely heavy accumulations of dirt and grease, it may be necessary to clean inlet guide vanes with a small, round, fiber brush with long handle, using same solution of cleaner (Band B3100) and water, and then repeating steps (b) through (d).

(e) Inspect engine inlet area, paying particular attention to inlet guide vanes and visible compressor blades.

(f) Remove shield from starter-generator.

(g) Reconnect lines for normal operations. Reinstall upper half of air particle separator.

(h) Following a 5-minute minimum time period to allow for starter cooling, start engine and operate for 3 minutes at flight idle or above with anti-ice and heater air on.

NOTE

Engine compressor section will not require spraying of corrosion preventive compound unless engine is to be prepared for storage.

To avoid freezing at ambient temperatures below 35° F (1.7° C), use anti-detonating injection fluid or a mixture containing 40 percent methanol, (C-302) and 60 percent water. (Isopropyl alcohol, (C-385) may be substituted for methanol).

(i) If engine performance has not improved after interior cleaning procedures have been accomplished, it will be necessary to remove upper and lower halves of air particle separator. (Paragraph 4-14.) Repeat engine interior cleaning procedures.

(j) After 2 to 4 hours of engine operation following compressor cleaning, remove, inspect, and clean air bleed actuator strainer.

4-5. Operational check — Power Plant Assembly.

NOTE

Operational checks of the power plant assembly will be performed in accordance with BHT PUB-92-004-10 and T53-L-703.

4-6. ENGINE ASSEMBLY.

4-7. Description — Engine Assembly. The basic engine consists of an inlet housing and reduction gear section, an axial-centrifugal compressor and diffuser, a combustion chamber, a gas producer turbine driving the compressor, a power turbine driving a power shaft, and an exhaust diffuser. Fuel control, starting and ignition, lubrication, and air systems are separately discussed in detail. Considered functionally, the engine is made up of two mechanically independent groups: the gas producer turbine and associated components, the rotational speed of which is commonly designated as N1 on charts and other references; and the power turbine and associated components with rotational speed designated as N2.

4-8. Inspection — Engine Assembly.

Refer to T53-L-703.

Premaintenance Requirements For Engine Removal and Installation

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T8), (T9), (T10), (T18), (T22), (T49), (T58), (T87)
Test Equipment	None
Support Equipment	Hoist-1000 lbs Capacity minimum
Minimum Personnel Required	Two
Consumable Materials	(C-452), (C-405), (C-471)
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated

4-9. Removal — Engine Assembly.

NOTE

Remove engine from helicopter as a quick- change assembly, with adapting parts attached as outlined below. Preservation should be accomplished, as applicable, before removing engine. (Appendix E and T53-L-703.)

a. Disconnect battery, open door, and disconnect starter-generator air duct (2, figure 4-1) at upper end.

b. Remove doors and cowling.

NOTE

Position rotor blades to allow for engine removal.

c. Remove air particle separator. (Paragraph 4-32.)

d. Disconnect oil inlet hose (4, figure 4-1) and engine breather hose (5) from oil tank.

e. Disconnect air particle separator bleed hose (6, figure 4-1) from forward firewall.

f. Loosen nut (3, figure 4-1) on V-band coupling, release latch, and remove coupling from flange on engine air inlet.

g. Disconnect electrical connector (1, figure 4-2) from fuel filter.

h. Disconnect fuel inlet hose (2) from fuel filter.

i. Disconnect power plant electrical connector (4) at firewall. Remove twine securing fire detector wiring to power plant wiring harness.

j. Disconnect droop compensator control tube from cambox assembly by removing cotter pin, nut, washers, and bolt (5).

k. Disconnect power lever control tube from power lever control arm by removing cotter pin, nut, washer, and bolt (13).

l. Disconnect starter-generator electrical connector (8) at service deck.

m. Disconnect following quick-disconnect coupling at service deck:

(1) Fuel drain coupling (9).

(2) Starter-generator drain pad coupling (10).

(3) Governor fuel drain coupling (12).

n. Disconnect external mounted engine oil filter outlet at service deck.

o. Disconnect bleed air hose (6) at fitting forward of aft firewall.

p. Disconnect tail pipe drain hose from fitting on service deck.

q. Release fasteners securing upper aft firewall to lower firewall.

r. Position hoist (T58 or T49 or suitable hoist), with a lifting capacity of at least 1,000 pounds, over engine. (Figure 4-4.)

CAUTION

Engine is nose heavy. Adjust engine sling as required.

s. Install sling (T10) on engine. Attach sling to hoist and support weight of power plant on hoist.

t. Check area around power plant to ensure all hoses, lines, and electrical cables are disconnected.

u. At each engine mount pillow block, open hinged bearing caps by loosening nuts on pillow block bolts (7, figure 4-2).

v. Remove engine mount bolt (3) with washer from engine mount trunnion.

WARNING

Do not stand underneath engine while engine is suspended from maintenance hoist. Do not stand between engine and airframe while engine is suspended from the maintenance hoist.

w. Hoist power plant from helicopter, carefully guiding engine inlet from mounting flange of forward firewall.

NOTE

Before engine can be installed in engine maintenance stand, upper forward trunnion mount bolt must be removed (figure 4-5, Detail A) to prevent damage to the support and fuel hose.

x. Install power plant in engine stand (T9, T87, or T18) or on engine trailer (T8) and adapter (T22). Remove tailpipe (paragraph 4-48). Retain removed parts for installation on replacement power plant.

y. Install suitable inlet cover.

z. Remove air particle separator hose (6, figure 4-1) and attaching parts to be used on new power plant as follows:

(1) Remove bolt attaching clamp on air particle separator hose to clamp on starter-generator air duct.

(2) Disconnect engine diffuser air pressure hose (1).

(3) Remove bolt and gaskets securing elbow and air particle separator hose to engine.

(4) Retain removed parts for installation on replacement power plant.

aa. Move rotor blades to stowed position and install blade tie-down.

NOTE

Refer to paragraph 4-130 for buildup instructions of quick-change engine assembly.

ab. To convert a quick-change engine assembly to a bare engine assembly, strip off parts not included on or with engines as supplied in shipping containers. Remove all adapting parts when preparing an engine for shipment or storage in container, or remove parts only to extent required when preparing for partial disassembly of engine. With engine on a stand, remove parts in any order found practical, using outlined steps as guide and checklist.

(1) Remove retaining bolt, lockwasher, and output shaft adapter.

(2) Remove starter-generator, cable, starter-generator fan assembly, and seal drain hose as follows:

(a) Remove cooling ducts from aft end of starter-generator and at starter-generator shroud assembly.

(b) Loosen hose clamps at each side of starter-generator fan assembly and remove hose sections from fan. Remove clamp on inlet housing and long hose from engine.

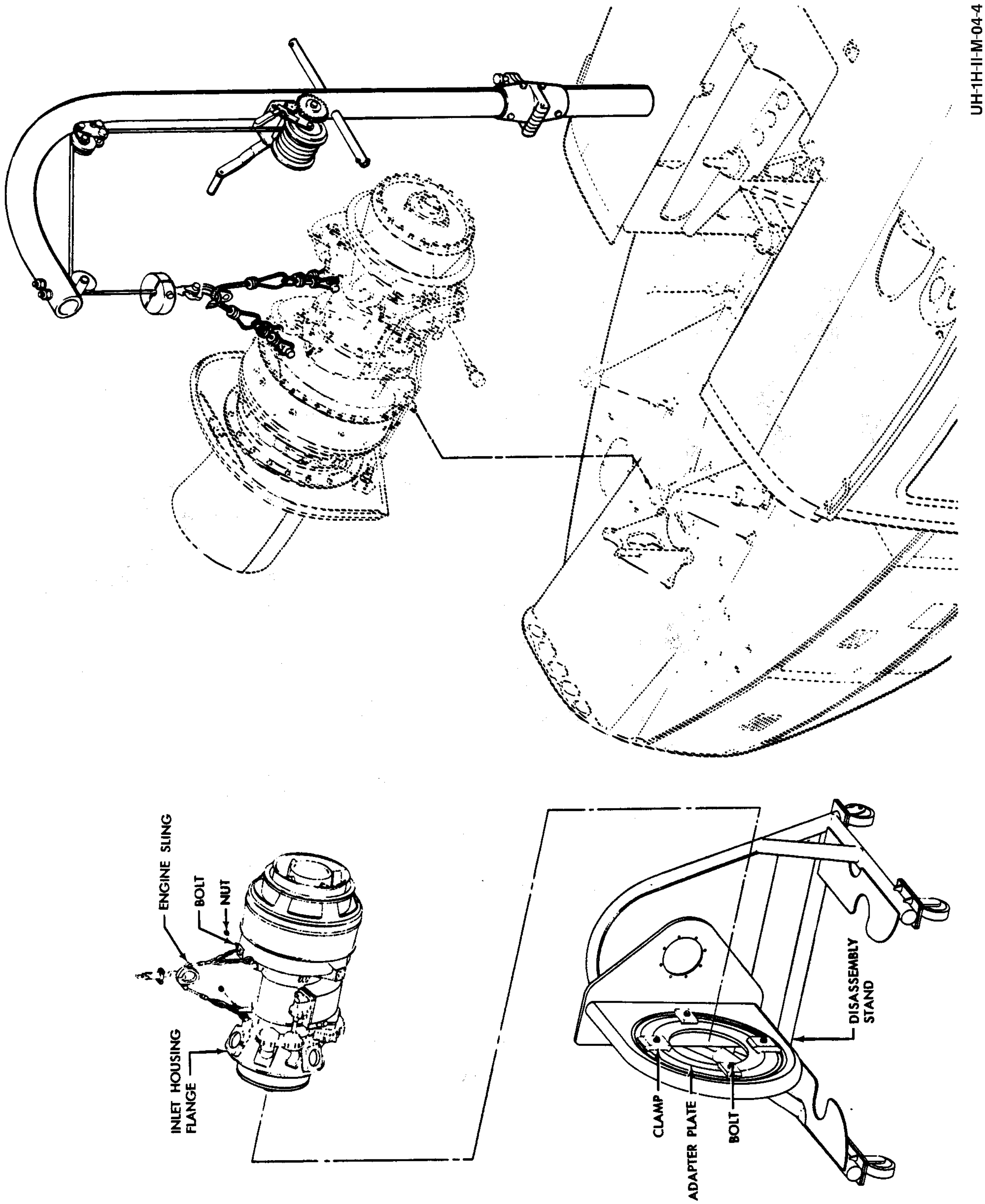
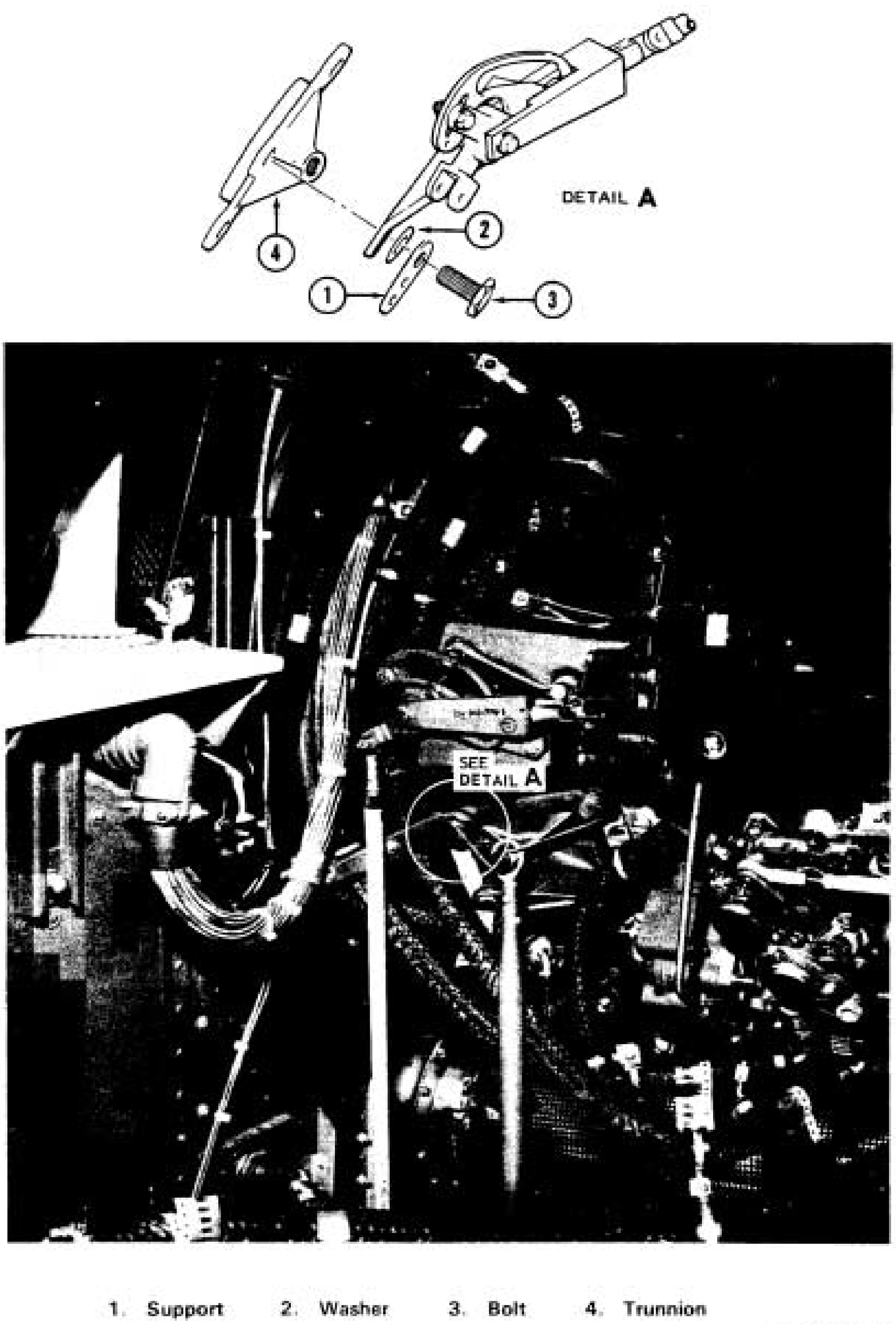


Figure 4-4. Engine removal from helicopter



1. Support 2. Washer 3. Bolt 4. Trunnion

UH-1H-II-M-04-5

Figure 4-5. Pressure transmitting and fuel hose replacement

(c) Remove starter-generator fan assembly and cable. Remove seal drain hose and fitting at underside of drive pad and install plug. Install drive pad cover.

(3) Remove main electrical cable by disconnecting leads from harness and units on engine and from exhaust thermocouple connector on rear firewall, and by detaching cable support clamps and brackets.

(4) Remove linear actuator, governor control shaft lever, and droop compensator cambox and bracket assembly. Remove power lever control arm.

(5) Remove tachometer generators from drive pads on overspeed governor drive box and on right rear of accessory drive gear box. Install drive pad covers.

(6) Remove fuel control inlet hose and cap fitting.

(7) Disconnect two differential pressure switch hoses from restrictor fittings on fuel control. Replace fittings with plugs.

(8) Disconnect hoses from combustion chamber drain valve and from drain tee on fuel control drive pad.

(9) Remove governor seal drain tube, fitting, and drain tee.

(10) Remove fuel control vent hose and fittings from inboard side of governor.

(11) Plug open ports and cap lines.

(12) Detach support clamps and brackets of fuel differential pressure switch hose and oil pressure hose from left side of engine inlet housing.

(13) Remove oil pressure transmitters, pressure switch, brackets, and hoses.

(14) Disconnect pressure hose from oil filter.

(15) Disconnect torquemeter pressure transmitter hoses from left side of inlet housing and left front of accessory drive gear box.

(16) Replace fittings with plugs.

(17) Remove oil pressure switch and transmitter from support. Remove support assembly from top of inlet housing.

(18) Remove oil pump inlet and outlet hoses and engine breather hose, replace fittings with plugs.

(19) Remove bleed air hose and elbow from port at top of centrifugal compressor housing. Remove hose support clamps and bracket from engine. Install cover and gasket on studs at bleed port.

(20) Remove exhaust tailpipe with V-Band coupling.

(21) Disconnect exhaust thermocouple cable from connector on rear firewall.

(22) Remove upper rear firewall assembly by releasing V-band clamp around support cone flange and working adapter ring carefully aft over thermocouple tubing.

(23) Remove engine mount trunnions.

4-10. Replacement — Engine Assembly.

4-11. Installation — Engine Assembly. This procedure applies to engine built up with adapting parts resulting in a quick change assembly.

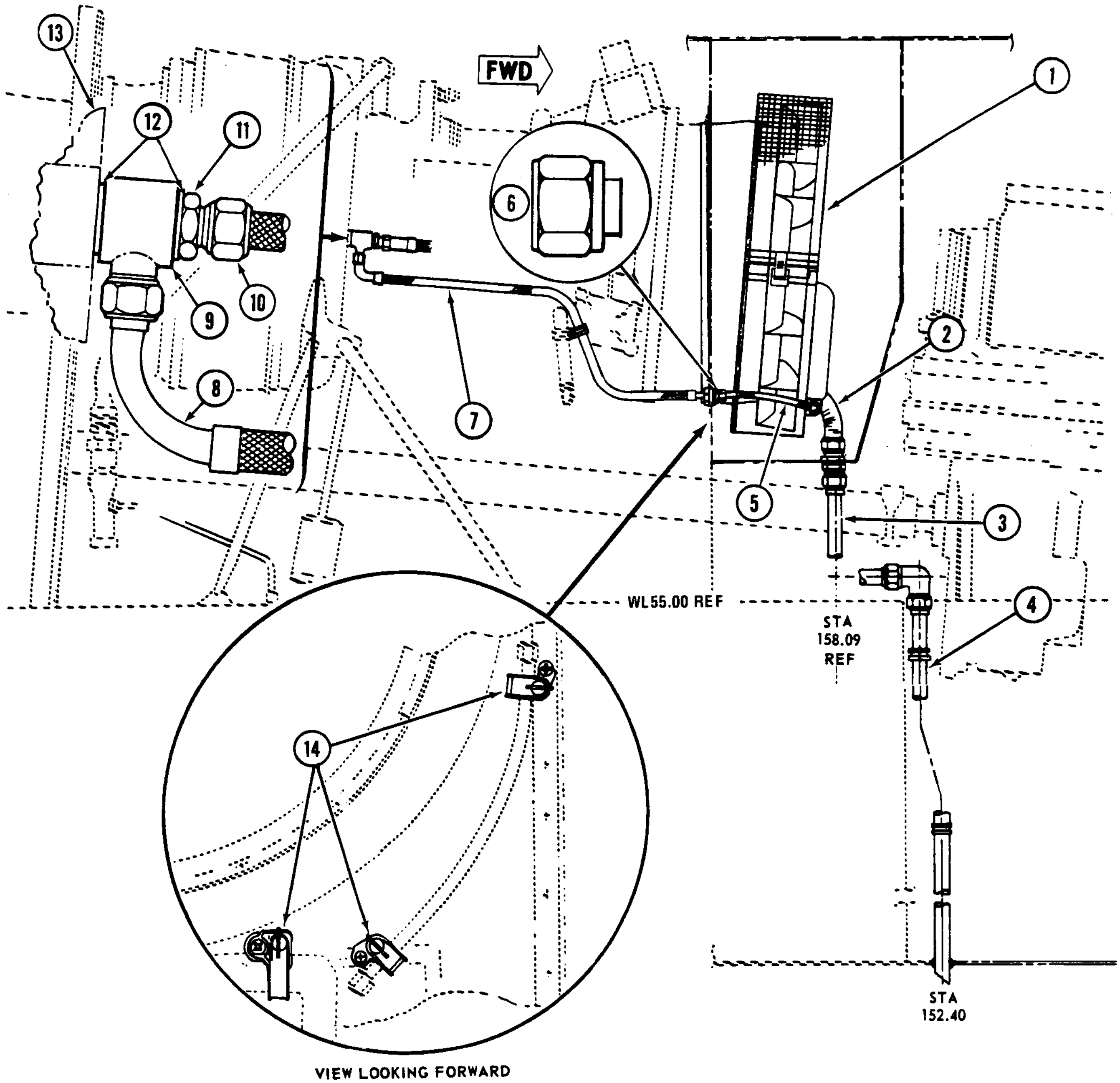
NOTE

Refer to paragraph 4-130 for assembly of quick-change engine assembly.

a. Install particle separator hose (6, figure 4-1) on new engine assembly using parts removed from old engine assembly.

(1) Disconnect existing bleed valve actuator hose and remove nipple from diffuser case port.

(2) Install connector (9, figure 4-6) with washer (12) and bolt (11) in diffuser case port, using antiseize compound (C-452) on bolt.



1. Particle separator
2. Hose assembly, left side
3. Tube assembly, discharge
4. Tube assembly, overboard discharge
5. Hose assembly, right side
6. Cap
7. Hose assembly, air bleed
8. Hose assembly
9. Connector
10. Engine line
11. Bolt
12. Washer
13. Engine
14. Clamps, stowage

UH-1H-II-M-04-6

Figure 4-6. Self-purging separator bleed air installation

CAUTION

Do not over-torque bolt (11). Cracking of diffuser mounting boss will require engine replacement.

(3) Torque bolt (11) 160 to 260 inch-pounds. Connect engine line (10). Connect hose (7), and torque. Clamp hose (7) to torquemeter vent hose.

(4) Remove bolt from clamp on starter-generator air duct. Attach clamp on particle separator hose to clamp on starter-generator air duct using bolt, spacer, washers, and nut from removed power plant.

(5) On removed engine assembly, install bolt, spacer, washer, and nut to secure clamps on starter-generator air duct and torquemeter vent line. Install packing and nipple at port in combustion diffuser. Connect diffuser air pressure hose to nipple.

NOTE

Position rotor blades to allow for positioning hoist and installing engine.

b. Position hoist (T58 or T49 or suitable hoist) with a lifting capacity of at least 1,000 pounds, at helicopter.

CAUTION

Engine is nose heavy. Adjust engine sling as required.

c. Install sling (T10) on engine. Attach sling to hoist and raise to support weight of power plant. Disconnect power plant from stand or trailer.

d. Position engine assembly over engine mounts. Guide engine inlet to align with mounting flange of forward firewall while lowering engine assembly until trunnion bearings rest on engine mount pillow blocks.

e. Align forward support tube with hole in forward mount. Install bolt (3, figure 4-2) with washer. Torque bolt 50 to 60 inch-pounds. Lockwire to trunnion mounting bolt.

f. Close bearing caps of mount pillow blocks and tighten nuts on pillow block bolts (7). Torque nuts 50 to 70 inch-pounds.

g. Remove engine lifting sling (T10) from engine, and maintenance hoist from helicopter.

h. Check to ensure that flange of engine inlet aligns with flange of forward firewall. Loosen screws on forward firewall mounting flange slip joint if alignment is necessary.

i. Position V-band coupling over engine inlet flange and mounting flange of forward firewall. Close latch of coupling and secure. Torque V-band coupling nut (3, figure 4-1) 40 to 50 inch-pounds. Tap around clamp to seat and retorque nut 40 to 50 inch-pounds. If loosened, retighten screws on firewall mounting flange slip joint.

j. Attach upper aft firewall to lower firewall by securing fasteners. If fasteners in upper and lower firewall do not align, screws around slip joint in upper firewall may be loosened for alignment (figure 4-7). If screws around slip joint are loosened, retighten after firewall fasteners are secured.

k. Connect air particle separator hose (6, figure 4-1) to forward firewall.

l. Connect oil inlet hose (4) and engine breather hose (5) to engine oil tank.

m. Connect bleed air hose (6, figure 4-2) at fitting forward of aft firewall,

n. Connect tailpipe drain hose to coupling on service deck.

o. Connect starter-generator electrical connector (8). Safety connector to receptacle mounting with lockwire (C-405).

p. Connect the following quick-disconnect couplings at service deck:

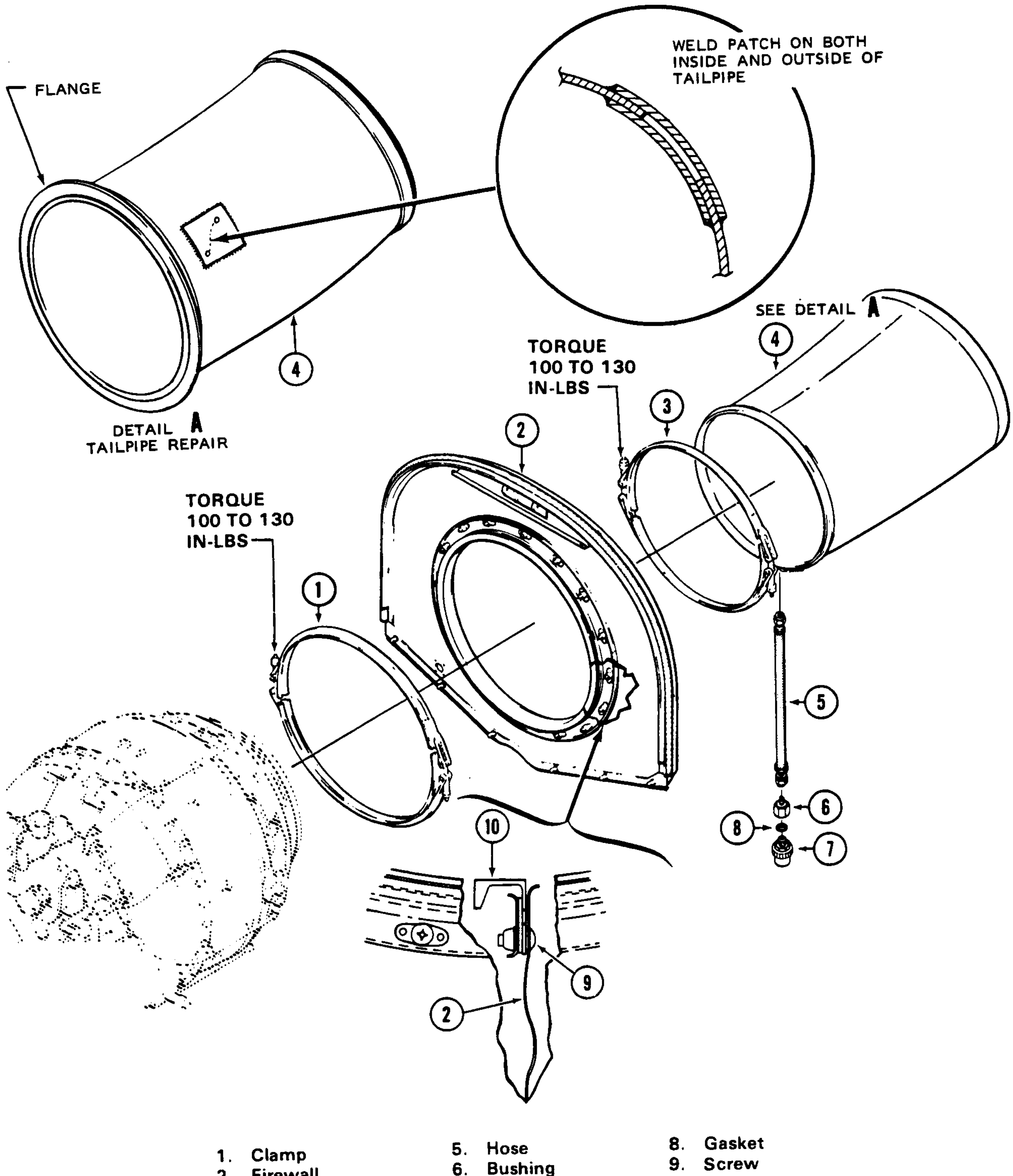
(1) Fuel drain coupling (9, figure 4-2).

(2) Starter-generator drain pad coupling (10).

(3) Governor fuel drain coupling (12).

q. Connect external mounted engine oil filter outlet at service deck.

r. Connect fuel inlet hose (2) to coupling fuel filter.



1. Clamp
2. Firewall
3. Clamp
4. Tailpipe
5. Hose
6. Bushing
7. Coupling half
8. Gasket
9. Screw
10. Ring

UH-1H-II-M-04-7

Figure 4-7. Tailpipe replacement and repair

s. Connect power plant electrical connector (4) to receptacle on firewall. Safety connector to receptacle mounting screw with lockwire (C-405).

t. Connect electrical connector at fuel filter. Secure fire detector wiring to power plant wiring harness using nylon cord (C-480).

NOTE

Check engine-to-transmission alignment only if necessary (Chapter 6).

u. Install air particle separator assemblies. (Paragraph 4-36.) Install main driveshaft. (Chapter 6.)

v. Connect power lever control tube to power lever control arm by installing bolt (13, figure 4-2), washer, nut, and cotter pin.

w. Connect droop compensator control tube to cambox assembly by installing bolt (5), washers, nut, and cotter pin. Place support (1, figure 4-5) and washers (2) on bolt (3) and install through upper forward holes of cambox and trunnion (4). Torque bolts 480 to 690 inch-pounds. Safety bolts in pairs with lockwire (C-405).

x. Install doors and cowling.

(1) Connect antenna and anti-collision light wiring at deck connectors.

(2) Connect fire detector wiring at connectors on cowling doors.

y. Connect starter-generator air duct (2, figure 4-1) at upper end.

z. Check rigging adjustment of power lever controls. (Paragraph 4-101.)

aa. Check rigging adjustment of droop compensator power turbine governor RPM controls. (Paragraph 4-117.)

ab. Check servicing. Reconnect battery. Accomplish post-installation inspection and ground functional checks. (Chapter 1 and BHT PUB-92-004-10.)

SECTION II — COOLING SYSTEM

(Not applicable.)

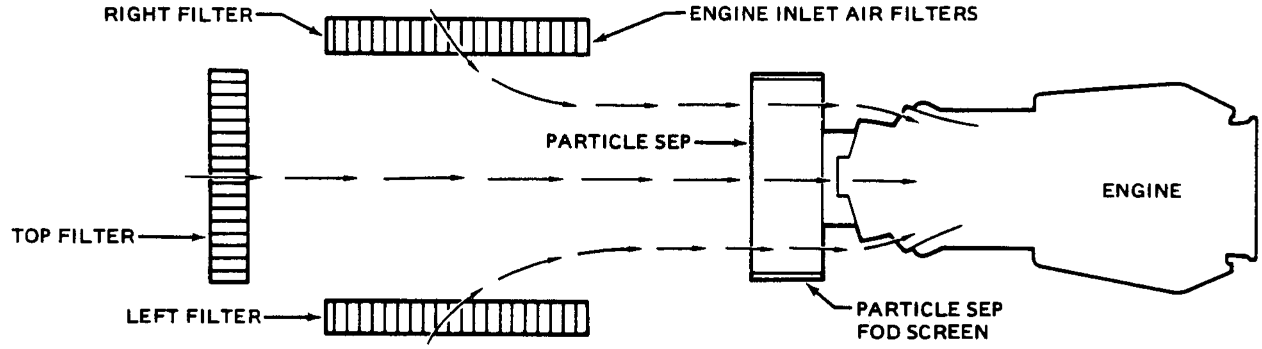
SECTION III — AIR INDUCTION SYSTEM

4-12. AIR INDUCTION SYSTEM.

4-13. Description — Air Induction System. The helicopter is equipped with a self-purging air particle separator air induction system. Figure 4-8 depicts the air induction filter configuration. Helicopters equipped with self-purging particle separators have engine air inlet filters described in paragraph 4-16.

4-14. AIR PARTICLE SEPARATOR — SELF-PURGING — AIR INDUCTION SYSTEM.

4-15. Description — Air Particle Separator — Self- Purging — Air Induction System. The air induction system consists of an inertial-type sand and dust separator. An upper and lower assembly half, a deflector, a mounting ring assembly, a flange assembly and seal, gaskets, and attaching hardware constitute the major components of the separator. (Figure 4-6, 4-10 and 4-11.) Removal of the upper assembly half permits maintenance of the main driveshaft and inspection of the engine inlet. The lower assembly half mounts the air cleaner which collects particles removed from the engine inlet air and ejects them overboard. A flange assembly provides for attachment of the separator to the engine inlet housing. The foreign object damage (FOD) screen consists of two halves which fit around the sand and dust separator inlet to prevent large foreign objects from entering the engine. Two latch assemblies hold the halves together. Engine inlet air passes through the FOD screen, where any large objects are caught immediately, and enters the



SELF-PURGING PARTICLE SEPARATORS

SCHEMATIC OF AIR FLOW AND AIR FILTER REQUIREMENTS

WARNING

Never use engine inlet air filters with foam inserts when engine is equipped with any particle separator.

UH-1H-II-M-04-8

Figure 4-8. Filter and particle separator configuration

separator through a curved, annular, radial inflow bellmouth provided in the upper and lower assembly halves. Separation occurs when the contaminated air is drawn through a turn, causing particles such as sand and dirt to be forced to the concave inner flow wall and caught by a protruding lip of the deflector assembly. Clean air continues into the engine inlet area while contaminated air is drawn through a second turn, causing further separation. The clean air resulting from the second turn is returned to the engine inlet area while particle-laden air flows into a large annular chamber and through an air cleaner mounted on the lower half of the separator. Engine compressor discharge (P3) air from a fitting mounted on the engine air diffuser flows through the venturi effect ejector and carries the particles overboard through airframe plumbing. (Figure 4-6.)

4-16. Air Inlet Filters — Particle Separator. The three filter sections (4 and 5, figure 4-9) have metal frames and are secured in place by cowling fasteners or bolts. The top section is made up of hinged panels with actuating levers, but in this installation the panels are always secured in closed position by means of metal channels and links.

4-17. Removal — Air Inlet Filters.

a. Open transmission fairing.

b. Remove each of two side sections of inlet filters by releasing fasteners or bolts at top and bottom edge.

c. Remove top filter by releasing fasteners or bolts along forward and aft edges.

d. Remove the top section of induction baffle assembly (1, figure 4-9).

e. Protect induction area from entry of FOD while filters are not in place.

4-18. Cleaning — Air Inlet Filters. Wash filters in a water solution of detergent soap (C-355). Flush from inside with clear water. Allow filters to drain and air dry thoroughly. Do not use compressed air drying.

4-19. Inspection — Air Inlet Filters. Examine filter assemblies for visible damage or shifting of filter material from normal position. Check condition and security of seals around edges.

4-20. Repair or Replacement — Air Inlet Filters. Replace filter assemblies which cannot be made serviceable by cleaning and repair of edge seals by replacing foam tape.

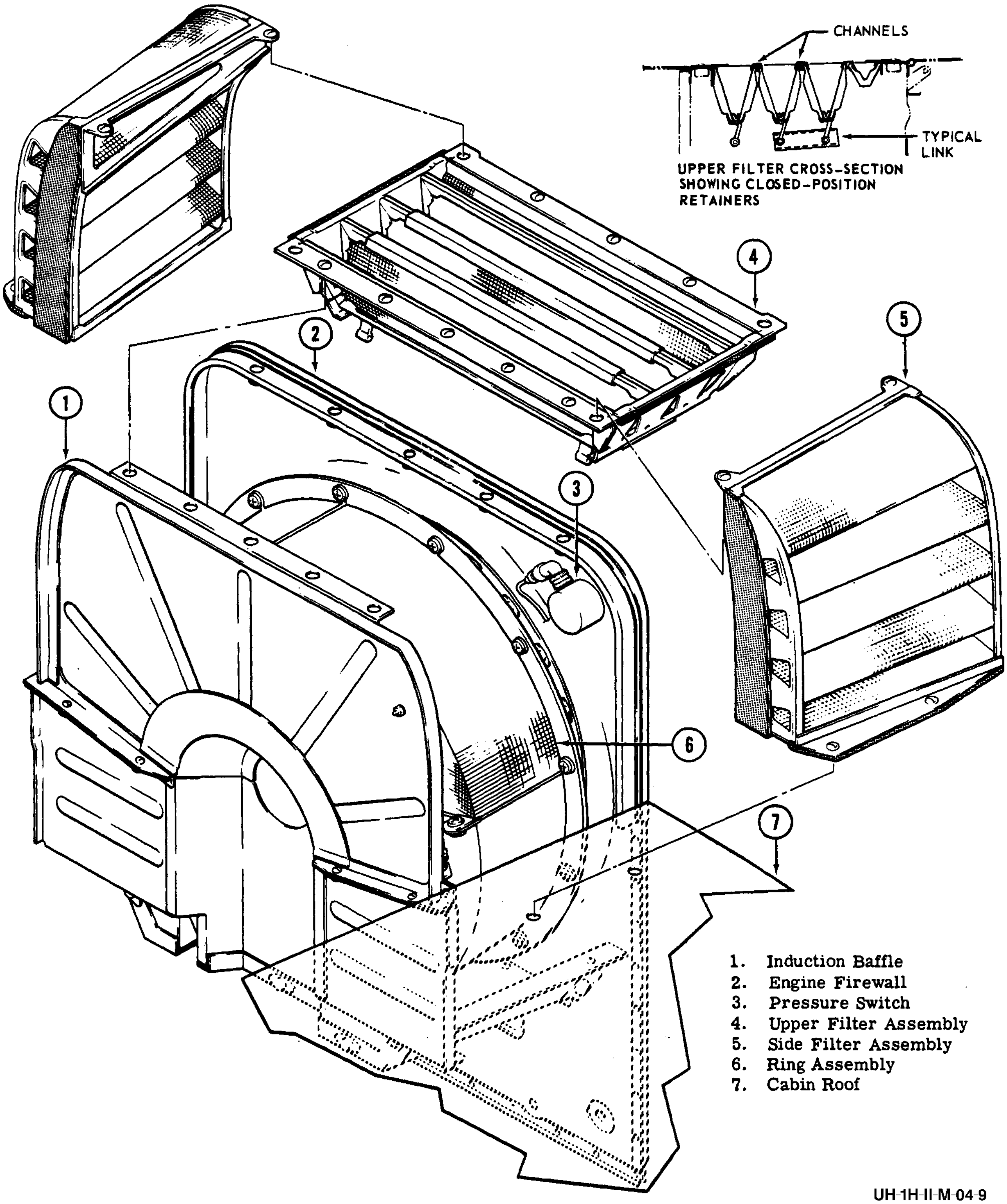
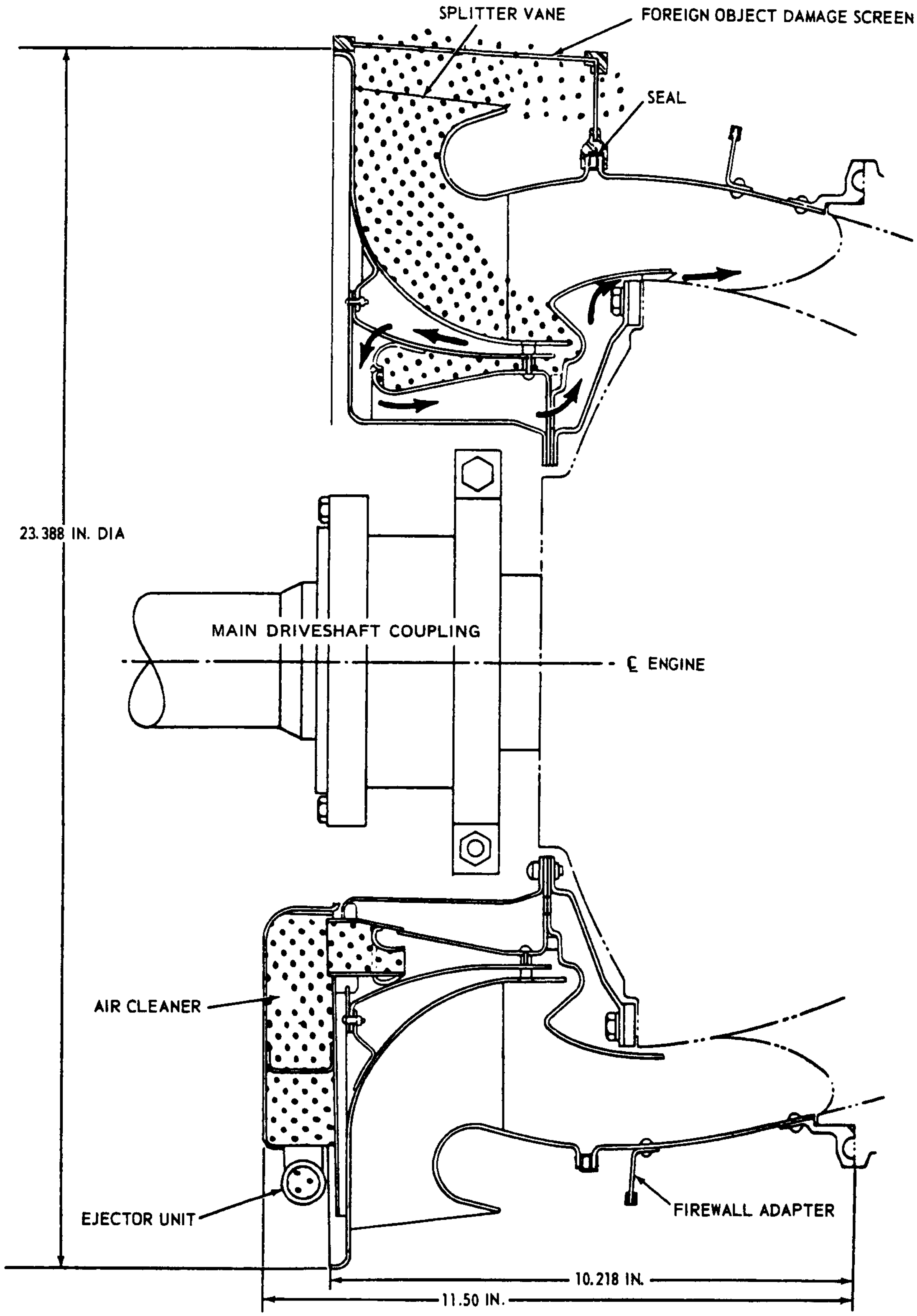
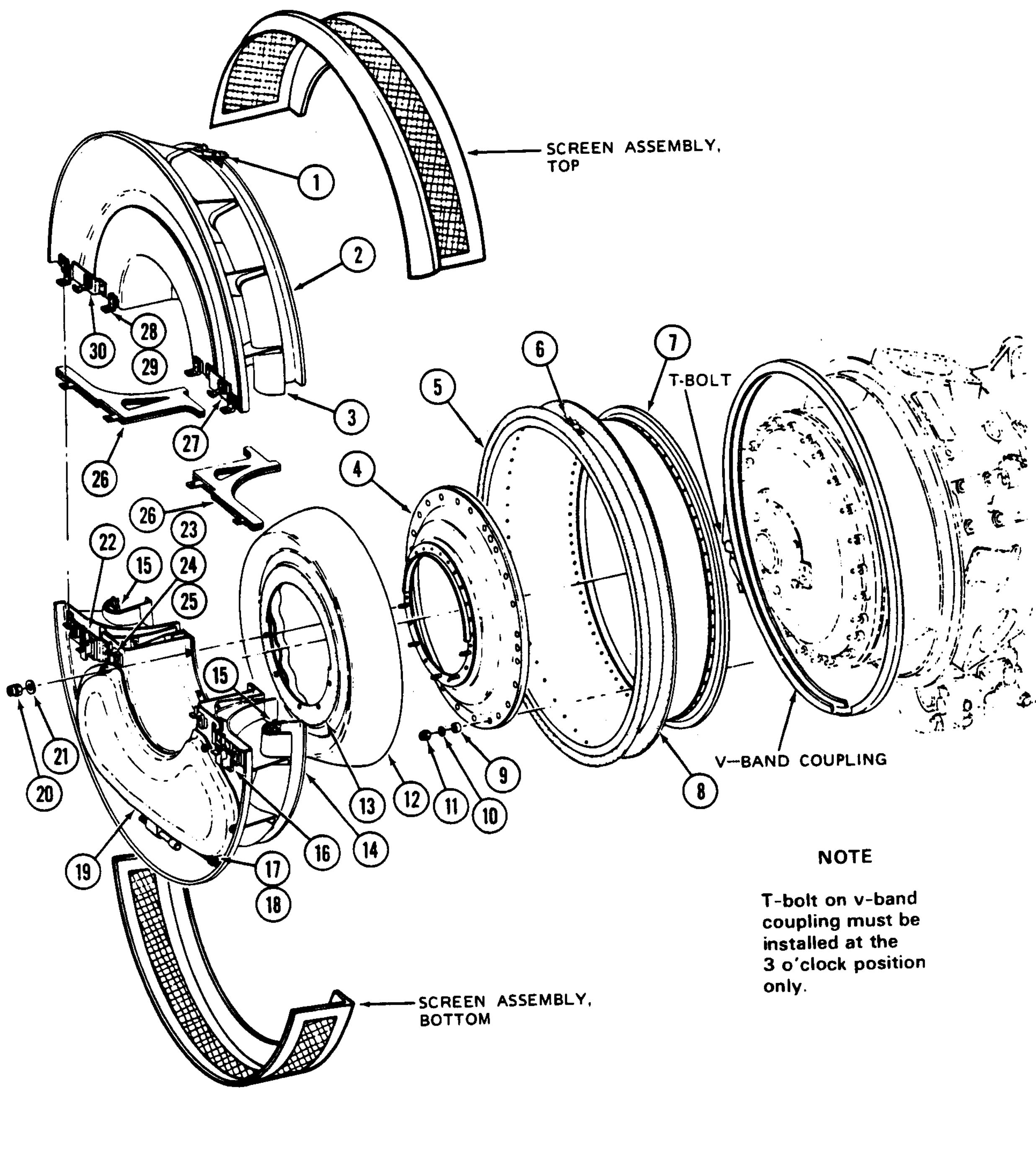


Figure 4-9. Engine air inlet filter installation



UH-1H-II-M-04-10

Figure 4-10. Particle separator air flow diagram



NOTE

T-bolt on v-band coupling must be installed at the 3 o'clock position only.

UH-1H-II-M-04-11-1

Figure 4-11. Particle separator (Sheet 1 of 2)

1. Latch
2. Upper assembly half
3. Hook
4. Mounting ring assembly
5. Seal
6. Hook assembly
7. Mounting flange assembly (use with 1-010-500-07) mounting flange assembly (use with 1-010-500-08)
8. Gasket
9. Sleeve spacer
10. Washer
11. Nut
12. Deflector assembly
13. Gasket
14. Lower assembly half
15. Latch
16. Latch assembly, right hand
17. Nut
18. Washer
19. Air cleaner
20. Nut
21. Washer
22. Latch assembly, left hand
23. Positioning pin
24. Angle bracket
25. Spacer
26. Gasket assembly
27. Hook assembly
28. Angle bracket
29. Spacer
30. Hook assembly

UH-1H-II-M-04-11-2

Figure 4-11. Particle separator (Sheet 2 of 2)

4-21. Installation — Air Inlet Filters.

NOTE

In areas where operational experience shows grass and foliage accumulation to be a problem, it is recommended that this inspection be performed before each flight.

a. Clean engine air intake. (Paragraph 4-22.)

b. Inspect engine air intake. (Paragraph 4-23.)

c. Check that panels of top filter assembly are held securely in closed position by channels installed on upper side over two forward panel joints, and on under side by two links bolted to aft pairs of actuating levers.

d. Align top filter assembly on upper edges of induction baffle and firewall. Secure cowling fasteners or bolts.

e. Align each side filter assembly to mounting holes. Secure fasteners at upper end, and fasteners (or bolts) to cabin roof.

4-22. Cleaning — Engine Air Intake. Remove all obstruction, deposits and dirt. Detached parts can be cleaned with solvent (C-304). Clean engine as necessary by appropriate cleaning procedures. (Paragraph 4-4.)

4-23. Inspection — Engine Air Intake.

NOTE

In areas where operational experience shows grass and foliage accumulation to be a problem, it is recommended that this inspection be performed before each flight.

a. Inspect all parts for condition and for any indications that foreign objects have entered engine.

b. Inspect engine inlet housing ducts carefully for signs of internal damage, oil streaks, and for accumulated dirt which may occur as a coating conforming to contour of air flow.

4-24. Repair — Engine Air Intake. Replace damaged components.

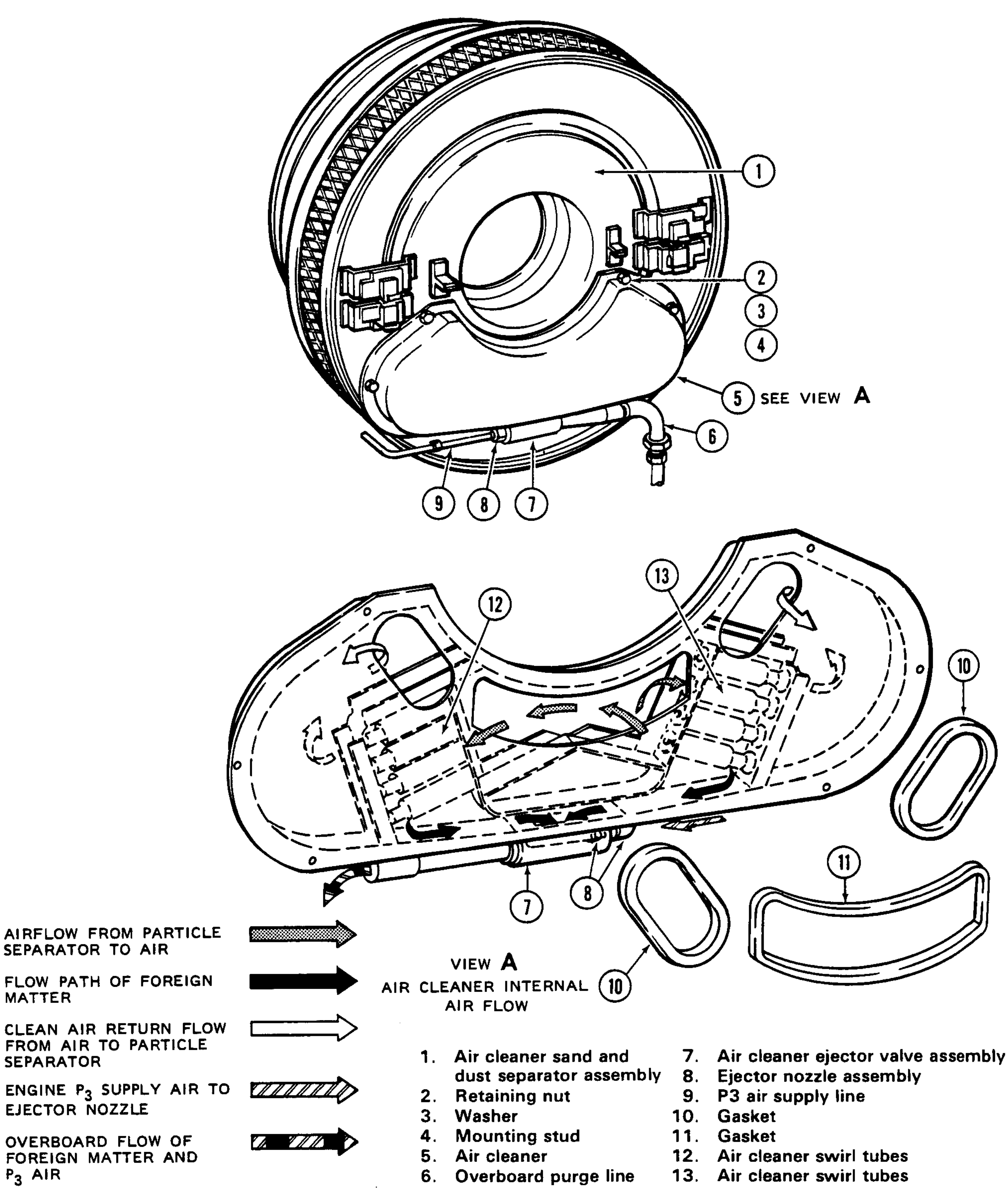
4-25. Inlet Foreign Object Damage (FOD) Screen — Air Particle Separator. The foreign object damage screen consists of two halves which fit around the air particle separator inlet to prevent large foreign objects from entering engine. (Figure 4-11.)

4-26. Removal — FOD Screen.

a. Remove air inlet filters. (Paragraph 4-17.)

b. Remove top half of FOD screen from the sand and dust separator as follows: (Figure 4-12 and 4-13.)

(1) Unlock both latches.



UH-1H-II-M-04-12

Figure 4-12. Self-purging air filter and foreign object screen

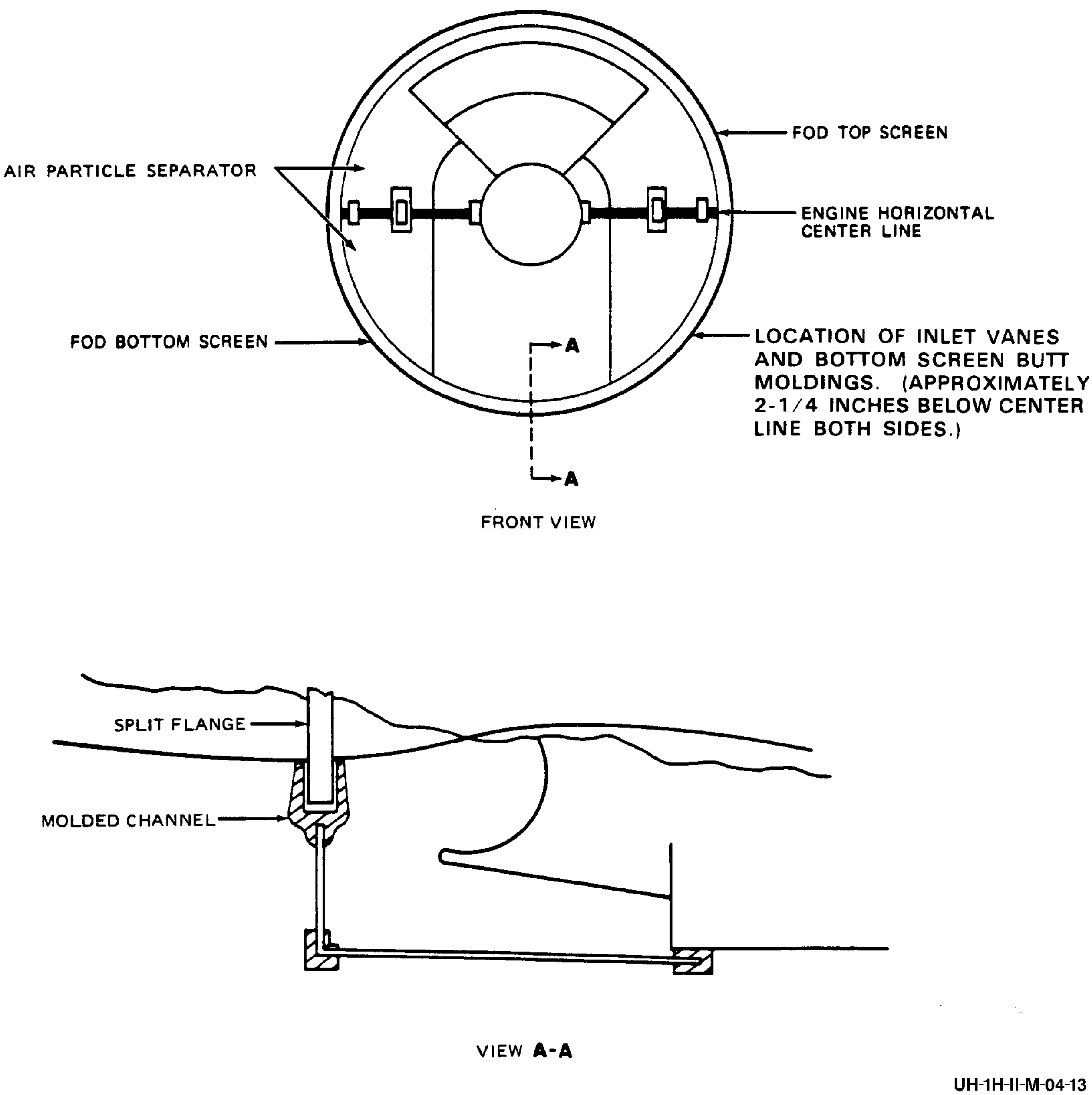


Figure 4-13. Foreign object damage screen replacement

(2) Disengage hook portions

(3) Lift screen free of the sand and dust separator.

NOTE

Do not remove lower half of screen during periodic inspection unless additional inspection is required.

c. If required, remove upper assembly half of particle separator. (Paragraph 4-32.)

d. Remove bottom half of FOD screen from the sand and dust separator as follows:

(1) Lift forward split portion of the butt molding free of the vane and hold in that position.

(2) Lift rear (notched) portion free of the curled inlet of the sand and dust separator.

(3) Repeat steps (1) and (2) for the other side.

(4) Withdraw bottom half of FOD screen from under the sand and dust separator.

4-27. Cleaning — FOD Screen. Clean screen with solvent (C-304).

4-28. Inspection — FOD Screen.

a. Inspect exterior of FOD screen for damage which would permit foreign object entry.

b. Inspect aft molding for cuts or other damage.

c. Inspect latch assemblies for damage as follows:

(1) Erosion or damage that may cause tightness or binding.

(2) Cracks.

(3) Loose or missing rivets.

d. Inspect FOD screen for deformation.

4-29. Repair — FOD Screen.

a. Reshape deformed parts, if feasible. If reasonable conformity cannot be obtained, replace either half or both as required.

b. Replace parts having severe damage.

c. Replace screen halves that have missing or loose rivets.

4-30. Installation — FOD Screen.

a. Position bottom half of the FOD screen, aft molding side toward engine inlet, under the sand and dust separator so butt molding is approximately 2-1/4 inches below horizontal centerline and aft molding is seated over the sand and dust separator split flange.

CAUTION

Improper seating of the aft molding over the separator split flange can result in cuts or other damage to the molding as well as placing excessive stress on all portions of the screens and latches. To check for proper seating, run hand along the lower split flange to ensure that the molding channel is properly seated over both sides of the split flange. (Figure 4-13.)

b. Insert aft molding while holding butt molding away from the vane in the separator. (Step I and II, figure 4-14.)

c. Align slot in forward portion of butt molding with the vane over which it is to be fitted and press into place. (Step III, figure 4-14.)

NOTE

When properly installed, the notched area of the butt molding should be positioned behind the sand and dust separator inlet curl, and the forward portion of the molding should have one part of the split on the top of the vane and one part underneath the vane as shown in figure 4-14.

d. If removed, install top half of the sand and dust separator.

e. Position top half of the FOD screen to engage the aft screen molding slot over the separator split flange. Position the screen cut-out over the latch at the 12-o'clock position of the separator.

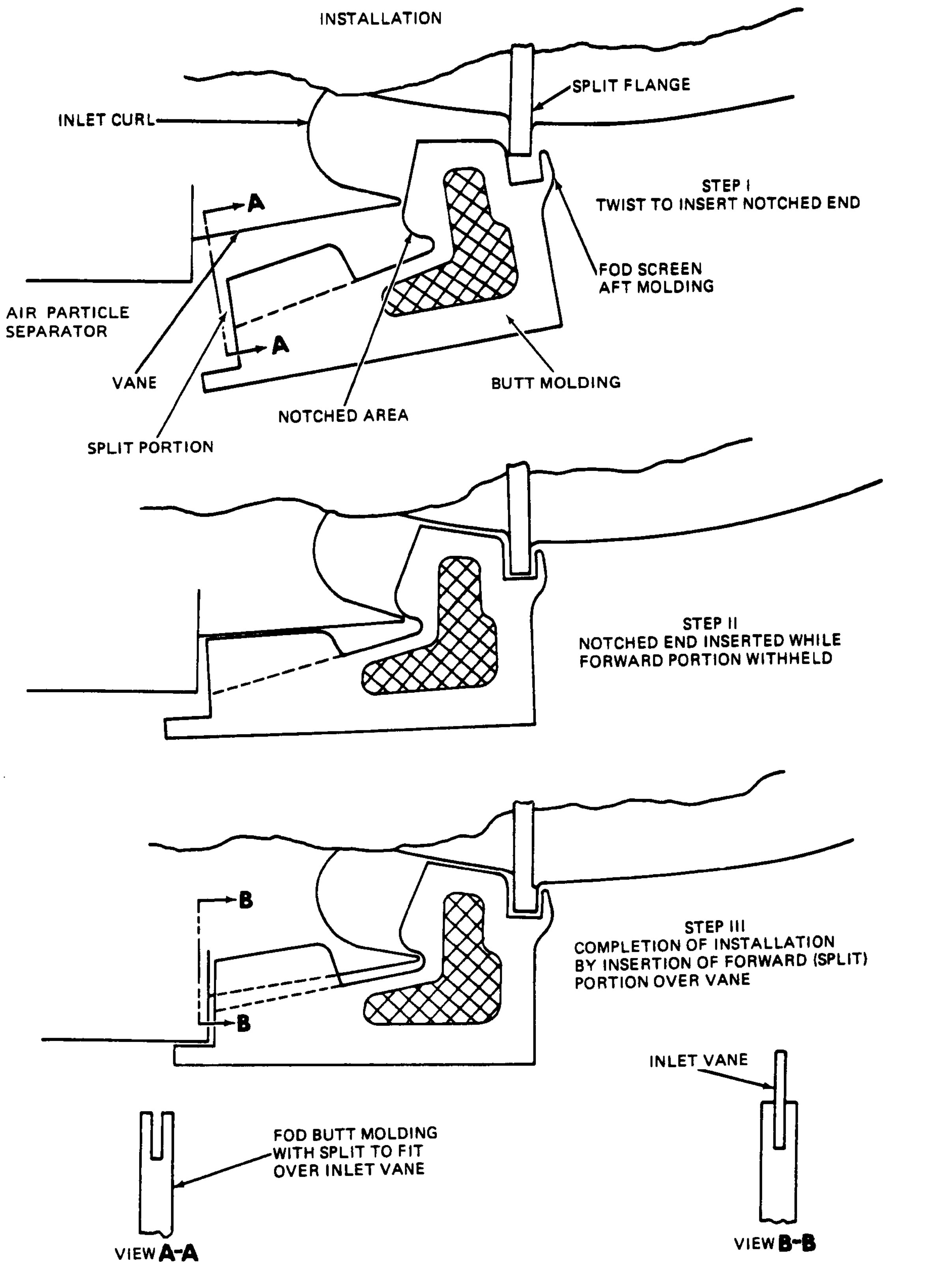


Figure 4-14. Foreign object damage screen installation (bottom half)

NOTE

Both latches must be engaged with the mating hooks before closing either latch to a locked position.

f. Secure top half to the bottom by engaging and locking both latches (figure 4-11).

4-31. Air Particle Separator. The air particle separator consists of an upper and a lower assembly half, a deflector, a mounting ring assembly, a flange assembly and seal, gaskets and attaching hardware. Removal of the upper assembly half permits maintenance of the main driveshaft and inspection of the engine inlet. The lower assembly half mounts the air cleaner which collect particles removed from the engine inlet air and ejects them overboard. A flange assembly provides for attachment of the separator to the engine inlet housing.

4-32. Removal — Air Particle Separator.

a. Open transmission fairing.

b. Remove filter assemblies (4 and 5, figure 4-9).

c. Remove the top section of induction baffle assembly (1).

d. Remove top half of FOD screen. (Paragraph 4-26.)

e. Release two latches (15, figure 4-11) and latch assemblies (16 and 22) on front and rear faces of upper and lower separator halves (2 and 14) by simultaneously pressing the safety latch up and lifting up on the release catch. Release latch (1) on top of the separator upper half and remove the upper half.

f. Remove gasket assemblies (26).

NOTE

It is not necessary to further disassemble the separator unless the inspection procedures indicate that gaskets and seals may be damaged. If further inspection is required, proceed with the following steps.

g. Remove lower half of FOD screen. (Paragraph 4-26.)

h. Remove main driveshaft from aircraft as a complete assembly (Chapter 6) and remove curvic coupling adapter from engine output shaft.

CAUTION

In following step, use a suitable size open end wrench to hold and prevent the ejector valve assembly body from rotating.

i. Disconnect hose assemblies (2 and 5, figure 4-6) and overboard plumbing from air cleaner (5, figure 4-12) fittings.

j. Remove five nuts (20, figure 4-11) and five washers (21). Remove lower half of separator (14) and deflector assembly (12).

k. Remove air cleaner (5, figure 4-12) as follows:

CAUTION

Use care to prevent damage to gaskets (10 and 11, figure 4-12).

(1) Remove six nuts (2) and six washers (3).

(2) Pull air cleaner (5) forward and remove from mounting studs.

(3) Immediately cover openings in separate lower half to prevent FOD.

l. Remove 24 nuts (11, figure 4-11), 24 washers (10), 24 sleeve spacers (9), and remove mounting ring assembly (4).

NOTE

Loosely install spacers, washers, and nuts on engine inlet housing studs.

m. Remove washers, screws, and split ring assembly securing mounting flange assembly (7) to helicopter.

n. Loosen V-band coupling and remove mounting flange assembly.

4-33. Cleaning — Air Particle Separator.

Premaintenance Requirements for Cleaning Air Particle Separator

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-304), Engine Cleaner B and B3100
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated

a. Clean air cleaner (19, figure 4-11).

(1) Using a pneumatic cleaning gun and regulated air pressure source, clean the airframe overboard purge line (4, figure 4-6) of possible dirt accumulation as follows:

(a) Apply 10 psi air pressure to end of line (2) which was disconnected from ejector valve assembly. Check for free flow of air from airframe overboard discharge port.

CAUTION

If airflow is not evident, the line obstruction must be isolated and removed prior to continuing cleaning operation.

(b) To clean any foreign matter accumulation from line, repeat preceding step (a) except, using a suitable air/solvent vaporizing gun, apply 60 psi air pressure together with one quart of cleaner (Band B3100) mixed with four parts water.

(c) Repeat previous step (a), except apply 60 psi air pressure to the line to purge residual cleaning solution.

(2) Using a pneumatic cleaning gun and regulated air pressure source (60 psi), clean air cleaner (19, figure 4-11) using solution of four parts water to one part cleaner (Band B3100).

(a) Support air cleaner in an upright (as installed) position. Spray cleaning solution down through both left and right air cleaner swirl tubes (12 and 13, figure 4-12). Ensure any accumulation of foreign matter is completely rinsed out of air cleaner housing and ejector valve assembly body.

(b) Using air pressure, purge ejector valve assembly of residual cleaning solution.

b. Clean all other metal parts of particle separator, only as required to facilitate inspection, using solvent (C-304).

4-34. Inspection — Air Particle Separator.

a. Inspect seal (5, figure 4-11) on mounting flange assembly (7) for tearing and/or ripping at the edges and for lack of adhesion.

b. Inspect gasket (8) on each side of flange assembly (7) for damage or lack of adhesion.

c. Inspect gasket assemblies (26) for a permanent set and lack of adhesion.

NOTE

Cracks are acceptable provided there is no chance of fractured segments entering engine.

d. Inspect all metal surfaces for cracks or other damage.

e. Inspect for loose or missing rivets. If rivets are loose or missing in upper or lower assembly half, repair the assembly half.

f. Inspect for weld cracks or weld separation (particularly in area on inlet vanes in both the upper and lower assembly halves). If cracks or separation is evident, repair affected assembly half.

g. Inspect for damaged or inoperable safety latches, damaged positioning pins (23), and angle brackets (24 and 28). If damage is evident, repair affected assembly half.

h. Inspect airframe mounted P3 air supply hose (5, figure 4-6) and overboard discharge line (4) for integrity.

i. Inspect air cleaner for defective swirl tubes (12 and 13, figure 4-12) and/or cracks in air cleaner. Replace cleaner if defects of swirl tubes are noted. Minor nonstructural air cleaner housing (sheet metal) cracks may be repaired by stop drilling.

j. Inspect gaskets (10 and 11) for damage and proper bonding to air cleaner. Replace damaged gaskets. Refer to paragraph 4-35 for procedure.

k. Inspect all other parts for evidence of erosion. Replace damaged parts.

4-35. Repair or Replacement — Air Particle Separator.

Premaintenance Requirements for Repair of Air Particle Separator

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Welding Equipment
Minimum Personnel Required	One
Consumable Materials	(C-309), (C-311), (C-334), (C-423) (C-430), Silastic 140, Rubber RTV Silicone, Adhesive EC1357
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated

a. General repair procedures. Refer to TM55-1500-204-25/1 series manual for methods of repair on all defects.

CAUTION

Ensure integrity of repairs. Materials used to make repairs may be ingested by engine if not properly secured.

(1) Repair nonconverging cracks by stop-drilling crack ends. Where necessary to prevent air leakage, seal with tape or silicone rubber.

(2) Using solid rivets or tack welds, patch-repair converging cracks following standard airframe sheet metal repair procedures.

NOTE

Any standard solid aluminum aircraft rivets of proper size may be used including Huck, etc. for all rivet repairs except hardware replacement. Blind rivets will not be used.

(3) Using solid rivets to tack welds, patch-repair punctures too large to repair with silicone rubber. Follow standard airframe sheet metal repair procedures.

(4) Repair torn tack and spot welds with tack, interrupted, or plug weld repairs, using doublers as needed. (Figure 4-15.) Rivet repairs using doublers and solid rivets (as needed) are also acceptable.

(5) Repair serious erosion damage by replacing damaged parts or using doublers.

(6) Reshape deformed parts, if feasible. If reasonable conformity cannot be obtained (particularly at mating edges, seal surfaces, etc.) replace part.

b. Repair loose seals and gaskets as follows:

(1) Repair loose gasket (8, figure 4-11) by cementing gasket to mounting flange assembly with adhesive EC1357. Clean mating surfaces with MEK (C-309).

(2) Repair loose gasket (13 and 26, figure 4-11) by cementing gaskets to mating surface with adhesive (C-311). Clean mating surfaces with MEK (C-309).

(3) Repair loose seal (5, figure 4-11) by recementing seal to mating surface, using Silastic

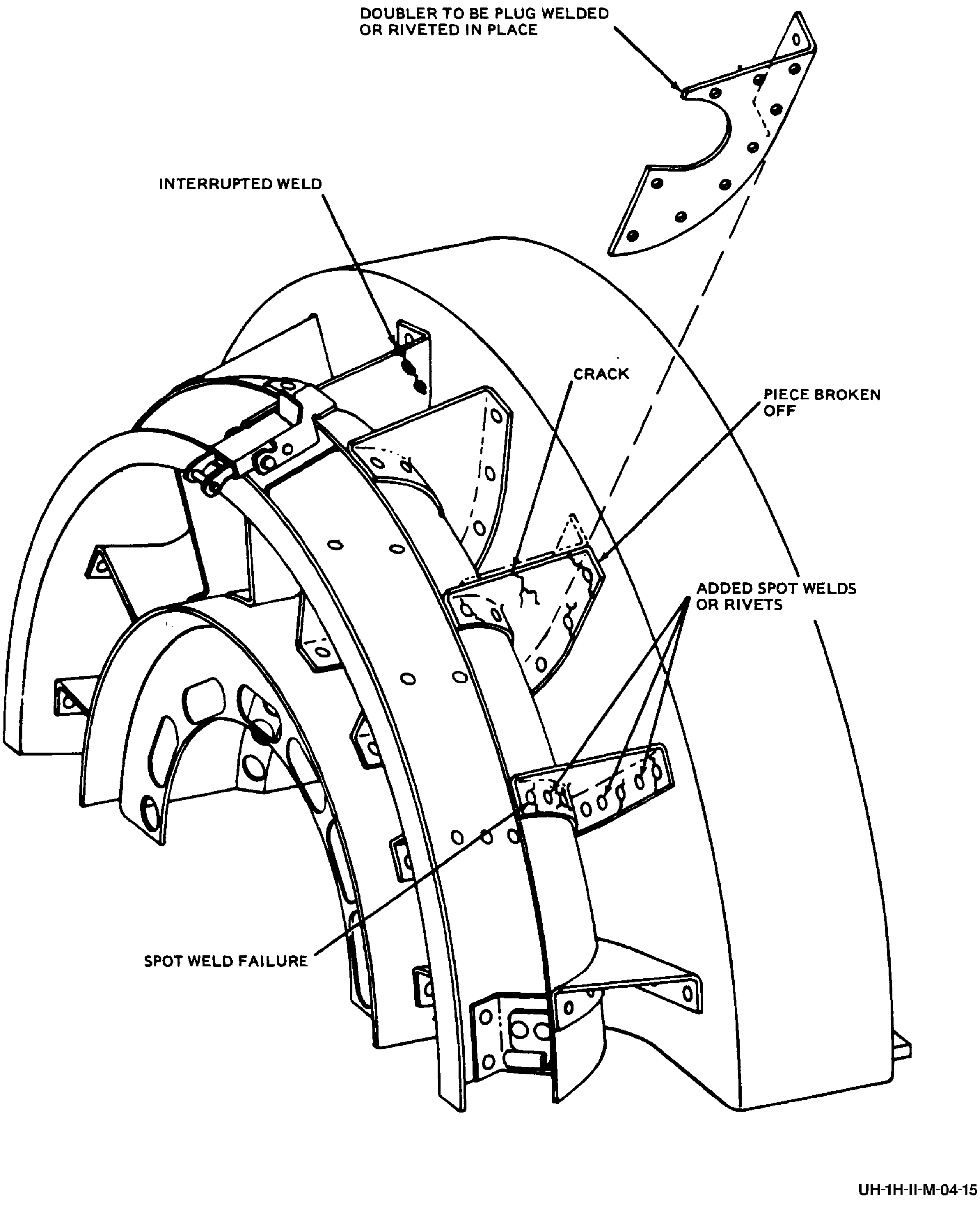


Figure 4-15. Particle separator welding repairs — typical

140. Clean mating surfaces with d trichloroethane (C-334) and then with MEK (C-309).

c. Replace damaged gaskets (13, figure 4-11) and gaskets (10 and 11, figure 4-12) as follows:

(1) Remove defective gasket and old adhesive from deflector assembly.

NOTE

All grease, oil, or other surface contaminants must be removed from the bonding surface.

(2) Wipe all metal surfaces to be bonded with lint-free gauze moistened (not dripping) with MEK (C-309). Continue wiping surface, changing frequently, until gauze remains clean.

NOTE

Porous surfaces which have been contaminated with oil or grease cannot be satisfactorily cleaned to ensure proper bonding and shall be discarded.

(3) Using clean, stiff brush, remove contaminants from surface of new gasket.

(4) Using clean applicator (clean fingers may be used), apply a continuous uniform film of adhesive (C-311) to surfaces to be bonded. Allow adhesive to thoroughly air dry for approximately 3 hours.

(5) After adhesive coating has dried, apply a second uniform, continuous film of adhesive to surfaces to be bonded. Allow adhesive to thoroughly air dry for approximately 3 hours.

(6) Align surfaces to be bonded to obtain contact over entire surface.

(7) Apply light compressive load (1/4 to 1/2 psi) to surfaces being bonded. Allow adhesive to cure under this pressure for a minimum of 4 hours.

d. Replace damaged seal (5, figure 4-11) on mounting flange assembly (7) as follows:

(1) Remove defective seal. Remove old adhesive film from metal surfaces with a knife blade. Then use a wire brush or abrasive paper (C-423).

(2) Wipe metal surfaces to be bonded with lint-free gauze, moistened (not dripping) with trichloroethane (C-334) followed by MEK (C-309).

CAUTION

Ensure integrity of repairs. Materials used to make repairs may be ingested by engine if not properly secured (rivets, patches, or doublers). Refer to TM55-1500-203-25/1 series manuals fro methods of repairs.

e. Replace damaged hooks on upper screen as follows:

(1) Remove rivets and remove hook.

(2) Assemble upper and lower screens and position hook in line with latch on lower screen.

(3) Scribe lines to position hook.

(4) Separate assembly halves.

(5) Position latch within scribe lines and drill 0.128 to 0.133 inch holes for rivets.

NOTE

If during drilling, rivet holes are elongated or new holes are drilled, back up sheet metal with a doubler before riveting.

(6) Secure hook with two MS20427F4-5 rivets.

f. Replace damaged latches on lower screen as follows:

(1) Remove rivets and latch.

(2) Assemble upper and lower screens and position latch on lower screen in line with hook on upper screen.

(3) Mark lines to position latch.

(4) Separate assembly halves.

NOTE

If during drilling, rivets holes are elongated or new holes are drilled, back up sheet metal with a doubler before riveting.

(5) Position latch within lines and drill 0.128 to 0.133 inch holes for rivets.

g. Replace damaged latches on lower assembly half as follows:

NOTE

Teflon tape patch between hardware items and assembly half must be replaced if damaged during removal of hardware.

(1) Remove two rivets and remove latch.

(2) Assemble upper and lower assembly halves without gaskets installed between halves.

(3) Position latch on lower assembly half in line with hook on upper assembly half. Mark lines to position latch.

(4) Separate the assembly halves.

(5) Position latch on lower assembly half within lines, and drill 0.128 to 0.133 inch holes for rivets.

NOTE

If, during drilling, rivet holes are elongated or new holes are drilled, back up sheet metal with doubler before riveting.

(6) Secure latch with MS20426AD4-8 rivets.

h. Replace damaged positioning pins or angle brackets on lower assembly half as follows:

(1) Remove rivets, bracket and spacer.

(2) Assemble upper and lower assembly halves without gaskets.

(3) Position spacer and bracket on lower assembly half in line with bracket on upper assembly half. Top of bracket will be slightly higher than the edge of the assembly half. Mark lines to position spacer and bracket.

(4) Separate assembly halves.

(5) Position spacer and bracket within scribed lines and drill two 0.128 to 0.133 inch holes for rivets.

NOTE

Use barrier tape (C-430) between spacer and bracket.

(6) Secure bracket to spacer with two rivets.

(7) Align assembly halves and identify center on bracket in line with hole of bracket on upper assembly half.

(8) Drill a 0.250 to 0.252 inch hole through bracket.

(9) Install new pin in bracket and tack weld in two places, 180 degrees apart, using wire filler.

i. Replace damaged hooks on upper assembly half as follows:

(1) Remove rivets and remove hook.

(2) Assemble upper and lower assembly halves without gasket assemblies.

(3) Position hook on upper assembly half in line with latch on lower assembly half. Mark lines to position hook.

(4) Separate assembly halves.

(5) Position hook within scribed lines and drill 0.128 to 0.133 inch holes for rivets.

(6) Apply barrier tape (C-430) between hook and mounting surface. Secure hook with two MS20426AD4-8 rivets.

4-36. Installation — Air Particle Separator.

a. Wipe engine inlet housing clean with clean cloth moistened with solvent (C-304).

NOTE

Leave mounting flange assembly loose enough to be rotated.

b. Position mounting flange assembly (7, figure 4-11) in front of airframe firewall and on engine inlet housing. Retain mounting flange loosely with V-band coupling and on firewall with split ring assembly. Insert screws with washers from back of firewall to secure ring assembly.

c. Remove spacers, washers, and nuts from engine inlet housing studs.

NOTE

Ensure that five studs on ring assembly are at the bottom, with the center stud located at the 6 o'clock position.

d. Position mounting ring assembly (4) on engine inlet housing studs.

e. Secure mounting ring assembly with 24 sleeve spacers (9), 24 washers (10), and 24 nuts (11). Torque nuts 70 to 80 inch-pounds.

f. Position deflector assembly (12) over locating pins and studs on mounting ring assembly (4) and press in until firmly seated.

g. Install air cleaner (19) on lower assembly half (14) as follows:

(1) Ensure gaskets (10 and 11, figure 4-12) are properly installed on air filter.

(2) Ensure interior of air filter is free of foreign matter.

(3) Remove protective covering from separator lower half and inspect interior for foreign matter.

(4) Position air cleaner (19, figure 4-11) on mounting studs. Install six washers (18) and nuts (17) on mounting studs. Torque nuts 40 to 45 inch-pounds.

(5) Secure lines to ejector inlet and discharge ports before installing lower assembly half.

NOTE

Nut and washer at 6 o'clock position are not required and if omitted will permit removal of bottom half of separator without removing main driveshaft.

h. Position lower assembly half (14, figure 4-11) on locating pins and studs on mounting ring assembly (4). Secure with five washers (21) and five nuts (20). Torque nuts 30 to 35 inch-pounds.

i. Position upper assembly half (2) on lower assembly half (14).

NOTE

Do not install two gasket assemblies (26) at this time.

j. Rotate mounting flange assembly (7) on inlet housing to align hook assembly (6) with latch (1) on upper assembly half (2).

NOTE

V-band coupling clamp shall be installed at approximately the 3 o'clock position. This will position the 3.25 inch cut-out in the V-band clamp at the 6 o'clock position to assist in preventing corrosion on mating surface of engine inlet housing.

k. Secure mounting flange assembly (7) with V-band coupling. Torque V-band coupling nut 40 to 50 inch-pounds. Tap around coupling from middle toward each end with a soft-faced mallet to seat properly. Safety V-band coupling nut with lockwire (C-405).

l. Tighten screws to secure flange assembly to firewall.

m. Remove upper assembly half (2).

n. Install curvic coupling in output shaft of engine and install main driveshaft. (Chapter 6.)

o. Connect pressure and overboard plumbing to air cleaner fittings.

p. Install baffle panels (1, figure 4-9).

q. Position gasket assemblies (26, figure 4-11) over positioning pins (23) on lower assembly half.

r. If FOD screen is to be installed, install lower half. (Paragraph 4-30.)

s. Position upper assembly half (2) on lower assembly half (14).

NOTE

Tilt top slightly forward to position assembly on four positioning pins (23).

t. Engage upper assembly half (2) to mounting flange assembly (7) with latch (1).

u. Engage latch assemblies (16 and 22) on front face and latch assemblies (15) on rear curl of separator.

CAUTION

Ensure that safety catch on latches is engaged by exerting a slight pull on release catch. Catch should not be open.

v. Visually check for proper seating of seals. Approximately 1/8 inch of rubber on gasket assemblies will be uniformly exposed. Seal (5) on flange assembly will be approximately half way compressed.

w. If FOD screen is to be installed, install top half. (Paragraph 4-30.)

x. Install inlet filters. (Paragraph 4-21.)

y. Close transmission fairing and secure with latches.

SECTION IV — EXHAUST SYSTEM

4-37. EXHAUST SYSTEM.

4-38. Description — Exhaust System. The engine exhaust diffuser has inner and outer housings, separated by hollow struts across exhaust passage. Inner housing, which supports power turbine assembly, is capped by a cover plate. A tailpipe, clamped on outer diffuser flange, directs exhaust gases aft and slightly up away from tailboom. Pipe has a drain hose from lowest point. A rigid harness, with either three or six thermocouple probes attached and inserted through diffuser into the path of exhaust gases, is connected through flexible cable to cockpit engine gas temperature indicator. A support cone, around diffuser, provides mounting for rear firewall.

4-39. CLAMP — EXHAUST SYSTEM.

4-40. Description — Clamp. Clamp is used to attach tailpipe to outer diffuser flange of engine.

4-41. Removal — Clamp. Refer to paragraph 4-48.

4-42. Cleaning — Clamp. Clean clamp with solvent (C-304).

4-43. Inspection — Clamp.

a. Inspect clamp (3, figure 4-7) for security when installed on tailpipe and outer diffuser. Torque should be 100 to 130 inch-pounds.

b. Inspect clamp for cracks, corrosion, dents and nicks.

4-44. Repair or Replacement — Clamp.

a. Replace clamp with new part when cracked.

b. Polish out all nicks, scratches, and corrosion using 180-grit or finer abrasive cloth or paper (C-423). Polish to a smooth, scratch free finish with crocus cloth (C-500). Blend edges of repair into surrounding area.

4-45. Installation — Clamp. Refer to paragraph 4-52.

4-46. TAILPIPE — EXHAUST SYSTEM.

4-47. Description — Tailpipe. Tailpipe is constructed of 0.032 inch corrosion resistant steel (AMS-5532), Condition N-155). It is clamped on outer diffuser flange and directs hot exhaust gases aft and slightly up away from tailboom. Tailpipe has a drain hose from lowest point to service deck. (Figure 4-7.)

4-48. Removal — Tailpipe.

a. Open access door at lower left on tailpipe fairing and disconnect antenna and anti-collision light wiring at service deck. Open section of driveshaft cover which overlaps end of tailpipe fairing. Release fasteners and remove fairing.

b. Disconnect coupling half (7, figure 4-7) at service deck.

c. Loosen nuts and remove clamp (3) from flange on tailpipe. Remove tailpipe.

d. If same tailpipe is not to be reinstalled, remove hose (5), bushing (6), coupling half (7) and gasket (8) from tailpipe.

e. To remove tailcone or cover plate from inner housing flange, cut lockwire and remove eight bolts.

f. Protect exhaust diffuser opening with fabric cover normally used on tailpipe.

4-49. Cleaning — Tailpipe. Clean tailpipe with solvent (C-304).

4-50. Inspection — Tailpipe.

a. Scratches and shallow dents are considered negligible and do not require repair.

b. Inspect tailpipe for cracks, dents, burned out, or buckled areas.

4-51. Repair or Replacement — Tailpipe.

a. Large dents which cannot be straightened without deforming tailpipe contour, buckling, or similar damage are cause for replacement of tailpipe.

b. Cracks, tears, or punctures (small holes) in any area of the tailpipe that do not exceed patching limits will be patched as follows:

(1) Stop drill end of each crack or tear.

(2) Smooth the contour of holes and prepare a patch as follows:

(a) Fabricate patch made of 0.032 inch corrosion resistant steel (AMS-5532, Condition N-155).

(b) Although total number of patches used for repair is not limited, ensure maximum allowable size of any one patch is 20 square inches.

(c) Ensure outside patch overlaps approximately 0.750 inch of any damaged area.

(d) Ensure inside patch is approximately 0.500 inch larger than the outside patch in all dimensions.

(3) Heliarc weld patch on both inside and outside surfaces of tailpipe. Weld in accordance with MIL-W-8611.

(4) If tailpipe ring is welded, file or machine the flange to a flat surface after welding to provide a flat seat against the attachment point of the engine.

c. Replace tailpipe if burned out parts or damage is greater than that which is repairable by patching.

4-52. Installation — Tailpipe.

a. Remove protective cover from engine exhaust diffuser.

b. If removed, install cover plate as follows:

(1) Position cover plate with new seals over center opening of diffuser. Install eight bolts, with tab washers under heads and tabs hooked over outer edge of diffuser housing, through cover into captive nuts of mounting flange. Use antiseize compound (C-440). Torque bolts 70 to 75 inch-pounds.

(2) After final torque of bolts, bend both tabs of washers up tight against side of bolt head to prevent bolt from backing out or losing torque.

NOTE

Lockwire may be used to safety bolt heads if tab washers are not available.

(3) Position exhaust diffuser cover over cover plate. Ensure that slots of covers are aligned and install tablock into slots.

(4) Install bolt into diffuser cover while holding tablock in position. Torque bolt 70 to 75 inch-pounds. Safety wire (C-405) tablock to bolt.

c. If removed, install hose (5, figure 4-7) on tailpipe (4). Install bushing (6), gasket (8), and coupling half (7) on hose.

NOTE

Use new self-locking nuts when installing V-band coupling clamps.

d. Install tailpipe as follows:

(1) Position tailpipe on outer flange of diffuser, with drain fitting down and locating dowels engaged.

(2) Ensure inside of pipe is aligned with exhaust diffuser.

(3) Secure with V-band clamp around flange joint.

(4) With a V-band split connector located at 6 o'clock, seat clamp by tapping with soft mallet from middle toward ends while tightening nuts on clamp bolts.

(5) Torque nut 100 to 130 inch-pounds.

(6) Repeat this procedure at least twice to seat and torque application. Check torque again after test flight or engine ground check.

e. Connect drain hose from tailpipe to coupling on fuselage.

f. Install tailpipe fairing and connect antenna and anti-collision light wiring at deck connectors. Close driveshaft access door.

g. Place protective cover on tailpipe.

4-53. HEAT SUPPRESSOR.

4-54. Description — Heat Suppressor. Provisions may be installed to accept infrared suppression equipment. (Refer to Chapter 12 for more details.)

4-55. Removal — Heat Suppressor. Refer to Chapter 12 for procedures.

4-56. Cleaning — Heat Suppressor. Refer to Chapter 12 for procedures.

4-57. Inspection — Heat Suppressor. Refer to Chapter 12 for procedures.

4-58. Repair or Replacement — Heat Suppressor. Refer to Chapter 12 for procedures.

4-59. Installation — Heat Suppressor. Refer to Chapter 12 for procedures.

SECTION V — OIL SYSTEM

4-60. OIL SYSTEM.

4-61. Description — Oil system. (Figures 4-16 and 4-17.) Oil is supplied from a tank mounted on forward firewall at right side of engine compartment. Oil flows through a quick-disconnect hose to inlet of engine-driven dual-element pump on front of accessory gearbox. The pump, which is equipped with a pressure relief valve and a thermo bulb for oil in temperature and pressure gauge, delivers oil through internal passages and a filter on left side of accessory gearbox for distribution through engine lubrication system. Oil pressure transmitter and pressure switch for ENG OIL PRESS LOW caution panel light are mounted at top engine inlet housing and connected by external hose to pressure tap on filter. The torquemeter, incorporated in reduction gearing to provide continuous gauge readings of engine output torque, requires oil at higher than normal pressure. A boost pump on overspeed governor and tachometer drive gearbox supplies oil to torquemeter through internal passages at boosted pressure regulated by an adjustable bypass valve. A second element of boost pump scavenges oil from governor drive assembly. A torque gauge transmitter has two hose connections; from pressure port of transmitter to torquemeter tap above right mount pad of inlet housing, and from vent port to a tap on cover of an unused drive pad at right front on accessory drive gearbox. Scavenge oil drains into accessory drive gearbox from inlet housing and through external lines from aft end of engine, passing through a screen and transfer tube into gearbox. Scavenge element of engine-driven pump circulates this oil through external lines to a filter assembly on engine deck through a thermal bypass valve on the oil cooler, in fuselage compartment below deck, and returns it to supply tank. Separate drain lines, with manual valve, are provided at filter assembly and at supply tank. A breather hose from right side of accessory drive gear box is vented into tank through a quick-disconnect coupling. A chip-detector type drain plug is located at lower right on accessory gearbox.

4-62. Lubrication. (Refer to Chapter 1.)

4-63. OIL LINES, HOSES, AND FITTINGS.

4-64. Description — Oil Lines, Hoses, and Fittings. Oil system plumbing consists of flexible hose, metal tubing, valves and connector fittings. Flexible hose is used in low-pressure systems where components are subjected to vibration. Metal tubing is used in high-pressure or critical systems.

4-65. Removal — Oil Lines, Hoses, and Fittings.

NOTE

Remove hoses and tubing that may be damaged during removal of engine

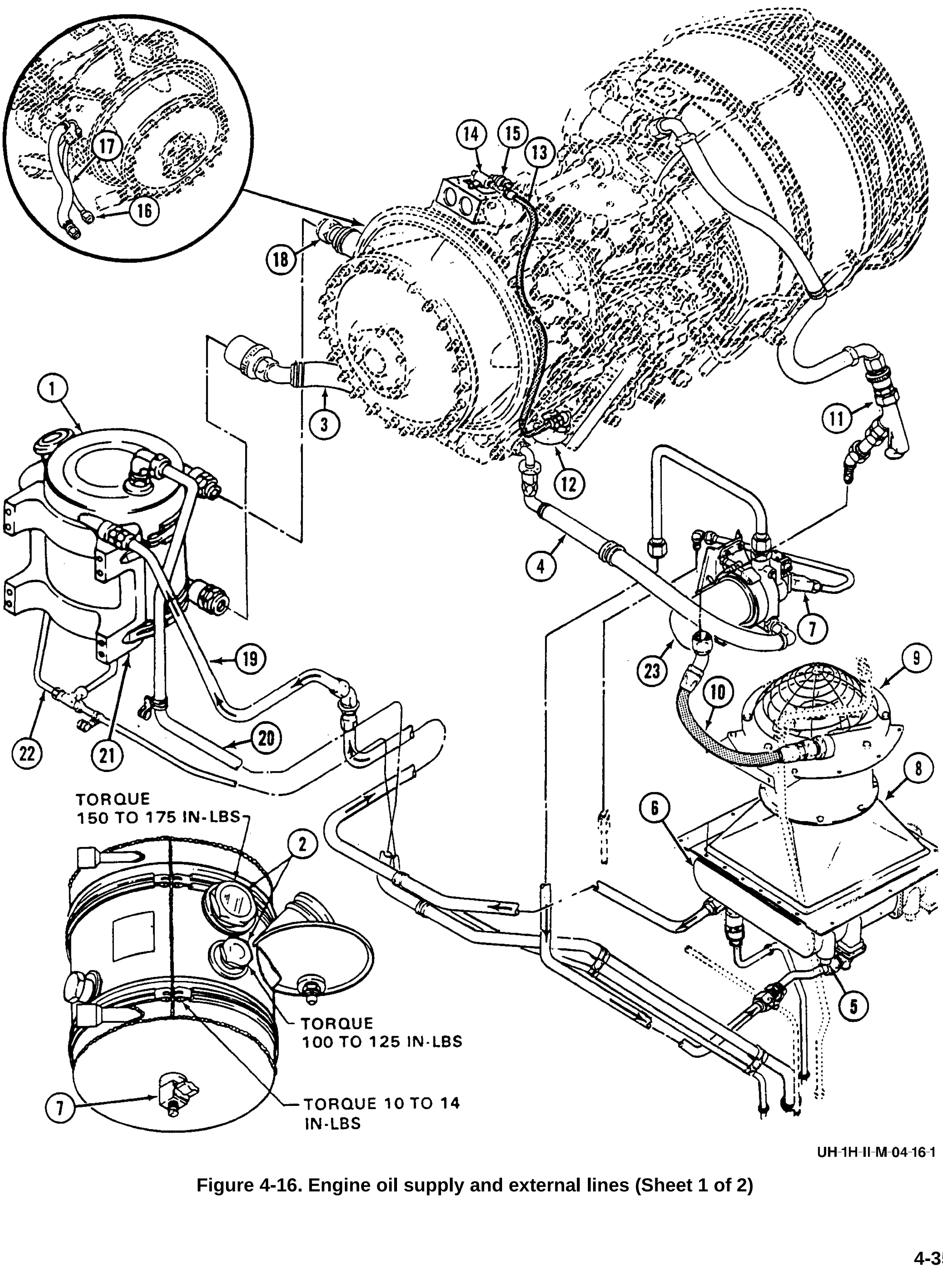


Figure 4-16. Engine oil supply and external lines (Sheet 1 of 2)

1. Oil tank
2. Sight gages
3. Pump inlet hose
4. Scavenge pump outlet hose
5. Thermal bypass valve
6. Oil cooler
7. Drain valve
8. Duct
9. Turbo blower
10. Blower air inlet hose
11. Engine bleed air valve
12. Engine oil filter
13. Pressure tap hose
14. Oil pressure switch
15. Oil pressure transmitter
16. Torque transmitter pressure hose
17. Torque transmitter vent hose
18. Engine breather hose
19. Tank return oil line
20. Tank vent line
21. Tank drain valve
22. Tank scupper drain line
23. Filter assembly

UH-1H-II-M-04-16-2

Figure 4-16. Engine oil supply and external lines (Sheet 2 of 2)

components. Before removing any tube or hose, be sure it is properly identified and its route understood for replacement in same manner. When possible, leave supporting brackets in place to simplify reinstallation.

a. When removing or installing oil hoses, do not apply torque to the narrow hex nut of sleeve and nipple. (Figure 4-3.) Apply torque to the wide hex nut only. When loosening or tightening wide hex nut, hold nipple or sleeve to prevent twisting of hose.

b. Cap or cover openings immediately when hoses, lines, or fittings are disconnected. Take all possible precautions to prevent contamination or dirt from entering oil system.

4-66. Inspection — Oil Lines, Hoses, and Fittings.

a. Inspect metal lines and fittings for cracks, corrosion, scratches, dents, deformation, damaged threads, and leakage.

b. Inspect hose assemblies for signs of deterioration indicated by separation of the rubber cover or braid from the inner tube, cracks, hardening, deformation, and damaged threads and linkage.

4-67. Repair or Replacement — Oil Lines, Hoses, and Fittings.

a. All nicks, scratches and corrosion no deeper than 15 percent of wall thickness and not in a bend will be removed by polishing. Replace lines when damage exceeds 15 percent of wall thickness or is damaged in bend.

b. Replace oil lines that are cracked or bent.

c. Smooth dents of less than 20 percent of tubing diameter are permitted provided they are not in a bend radius. Replace tube with dents exceeding limit.

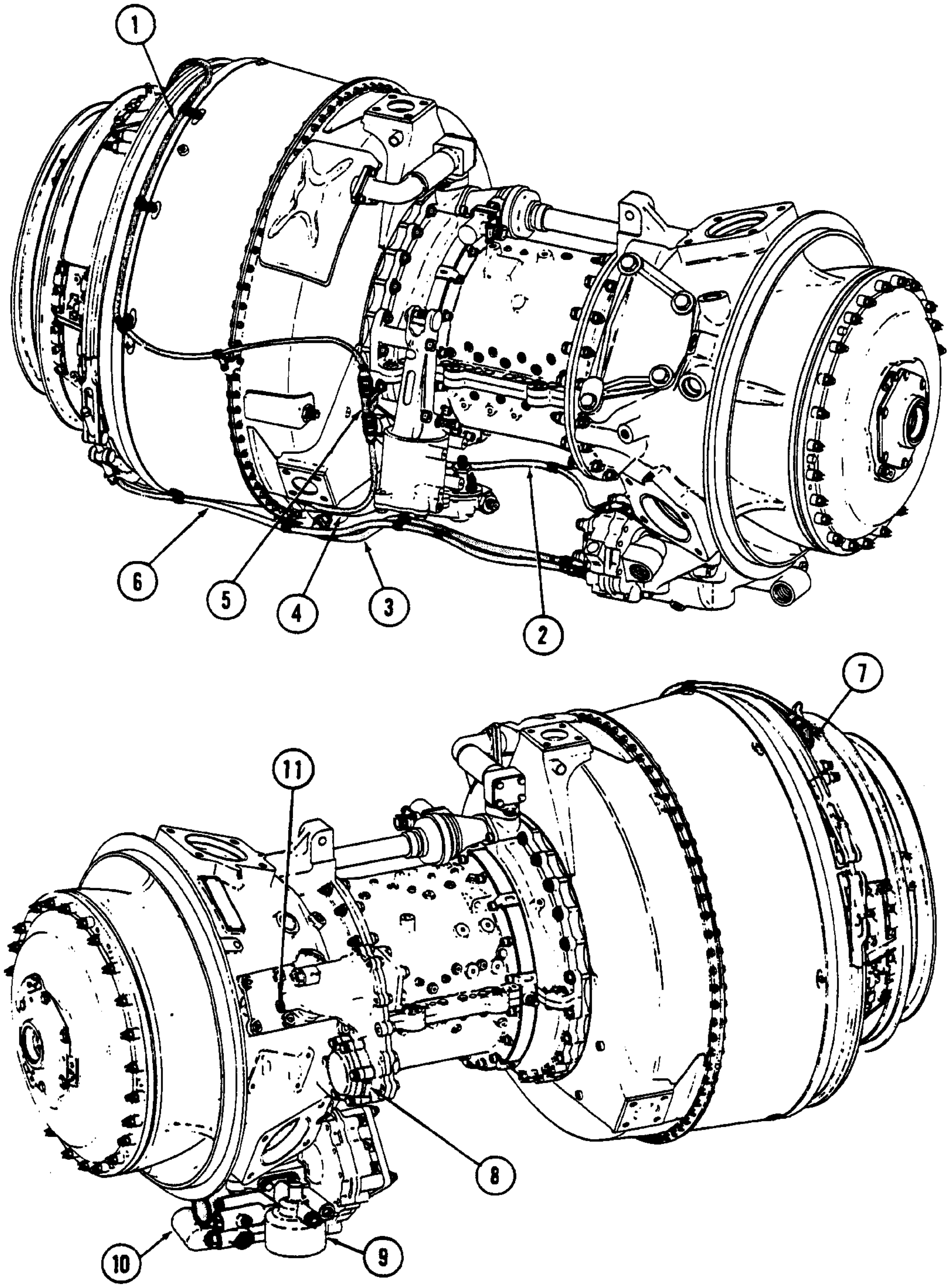
d. Replace tubes or fittings with leaks or damaged threads.

e. Replace hoses containing any of the defects listed in paragraph 4-66, step b.

4-68. Installation — Oil Lines, Hoses, and Fittings.

a. Replace any unserviceable external lines, hoses, fittings, units, gaskets, and preformed packings which are accessible without unauthorized disassembly.

b. Carefully inspect condition of all tubing and/ or hoses to be installed on engine. Remove any caps or plugs installed in tube openings.



1. No. 3 and 4 Bearing Pressure Line
2. Pressure Line to Manifold
3. No. 2 Bearing Scavenge Line
4. No. 2 Bearing Pressure Line
5. Pressure Manifold
6. No. 3 and 4 Bearing Scavenge Line
7. No. 3 and 4 Bearing Inlet Strainer
8. Torquemeter Booster Pump
9. Main Oil Filter
10. Oil Pump
11. Test Gage Connection

UH-1H-II-M-04-17

Figure 4-17. Engine oil system components

c. Properly route and clamp all hose assemblies securely to prevent chafing. Proper clamping and chafe pads shall be used at all times.

d. Attach tubing or hose. Refer to TM 55-1500-204-25/1 for standard torque values.

4-69. ENGINE OIL TANK.

4-70. Description — Engine Oil Tank. Engine oil supply tank (1, figure 4-16) is a welded metal container equipped with filler neck and cap, two oil level sight plugs, a scupper with drain, and fittings for connection of outlet, return, vent, drain, and engine breather lines. Filler neck and vent have internal screens and oil return port has an internal baffle. Tank is secured by straps in a padded support on right side of forward firewall.

4-71. Removal — Engine Oil Tank.

a. Open right engine cowling. Drain tank by opening valve (below tank) in drain line which discharges at left aft side of fuselage.

b. Disconnect all lines from tank. Cap or cover openings.

c. Cut lockwire, loosen tank strap turnbuckles, and remove tank from support.

4-72. Cleaning — Engine Oil Tank. Flush out tank with solvent (C-304) removing cap and fittings as necessary. Ensure screens in filler neck and vent port are clean and undamaged. Drain thoroughly. Filtered compressed air may be used for drying.

4-73. Inspection — Engine Oil Tank.

a. Inspect tank for the following:

(1) Punctures or leaks.

(2) Torn or punctured internal screens.

(3) Damaged threads in fittings.

(4) Damage which affects capacity or function.

(5) Inspect for loose, missing, or improperly installed hardware.

b. Inspect sight plugs for discoloration, damage and proper safetying. Inspect removed fittings for damage.

c. Inspect tank support straps and strap pads for damage.

d. Inspect tank support (removed from firewall) for cracks or damage at mounting points.

4-74. Repair or Replacement — Engine Oil Tank.

NOTE

Upon completion of any sheet metal repairs, the tank must be thoroughly cleaned and pressure-tested to 5 psi.

a. Replace tank for punctures or leaks that cannot be welded, torn or punctured internal screens, damaged threads in fittings, or any damage which affects capacity or function. Refer to TM 55-1500-204-25/1 for welding instructions.

b. Replace preformed packings at reinstallation.

c. Replace any damaged sight gauge plugs or other removable fittings. Torque top sight gauge plug 150 to 175 inch-pounds. Torque bottom sight gauge plug 100 to 125 inch-pounds.

d. Replace unserviceable pads on tank straps and support. Replace support assembly if straps are unserviceable.

4-75. Installation — Engine Oil Tank.

a. Check that pads are in place on tank support and straps. Open straps to place tank in support with filler neck to right. Connect straps around tank with turnbuckles loose enough to permit alignment.

b. Install fittings and connect tubes to tank ports.

c. Torque tank strap turnbuckles 10 to 14 inch-pounds. Install lockwire (C-405).

4-76. OIL COOLER ASSEMBLY.

4-77. Description — Air Induction System. The oil cooler assembly (6, figure 4-16) for engine oil is mounted in bottom of fuselage behind engine, and is connected into oil return line through a filter assembly. Cooling air flow is provided by a turbo blower driven by bleed air from engine diffuser housing. Another cooler, for transmission oil, is mounted side by side with engine oil cooler. There is no functional connection between these two oil systems. A thermal bypass valve is mounted in the oil cooler at the engine oil inlet line. When the engine oil temperature is 158° F (70° C) or below, the thermostat will be completely open and oil will return to oil tank without passing through oil cooler. Between 158 and 178° F (70 to 81° C), the thermostat will be partially closed, allowing a portion of the oil to pass through the oil cooler. At a maximum temperature of 178° F (81° C), the thermostat will be completely closed and all of the oil will pass through the oil cooler prior to returning to the oil tank.

4-78. Removal — Oil Cooler Assembly.

NOTE

The neoprene seal on bleed air line quick disconnect fitting becomes brittle from bleed air heat, and shall be replaced with silicone seal when line is disconnected. Ensure parts from old seal do not fall into bleed air line and blower.

a. Remove turbo blower and duct as follows:

(1) Open access door at right side of fuselage below engine tailpipe.

(2) Remove blower screen.

(3) Disconnect air hose from blower inlet fittings.

(4) Remove nuts, bolts, and washers to detach blower from support bracket on fuselage bulkhead.

(5) Remove bolts and washers to detach blower from duct. Remove blower assembly.

(6) Remove bolts and washers which secure upper flanges of cooler and mount to sides of duct. Remove duct.

b. Remove engine oil cooler as follows:

NOTE

Engine and transmission coolers must be removed as one unit.

(1) Drain engine oil from oil cooler by cutting lockwire and removing plug on bottom of cooler.

(2) To reduce oil loss, disconnect transmission inlet and outlet oil hoses at quick-disconnect couplings. Drain transmission cooler lines by opening two drain valves located in forward left side of center fuel cell access compartment.

(3) Disconnect inlet and outlet lines from both coolers and drain line from transmission cooler.

(4) Remove bolts and washers from both lower mounting flanges to detach engine and transmission coolers from support at bottom of fuselage compartment. Remove coolers by lifting straight up to clear support mounts. Retain shim.

(5) Remove bolts securing the two coolers together.

c. Remove engine oil thermal valve as follows:

(1) Ensure that lower part of oil system has been drained through drain plug at engine oil cooler.

(2) Remove engine oil thermal valve by cutting lockwire. Remove valve and discard packing.

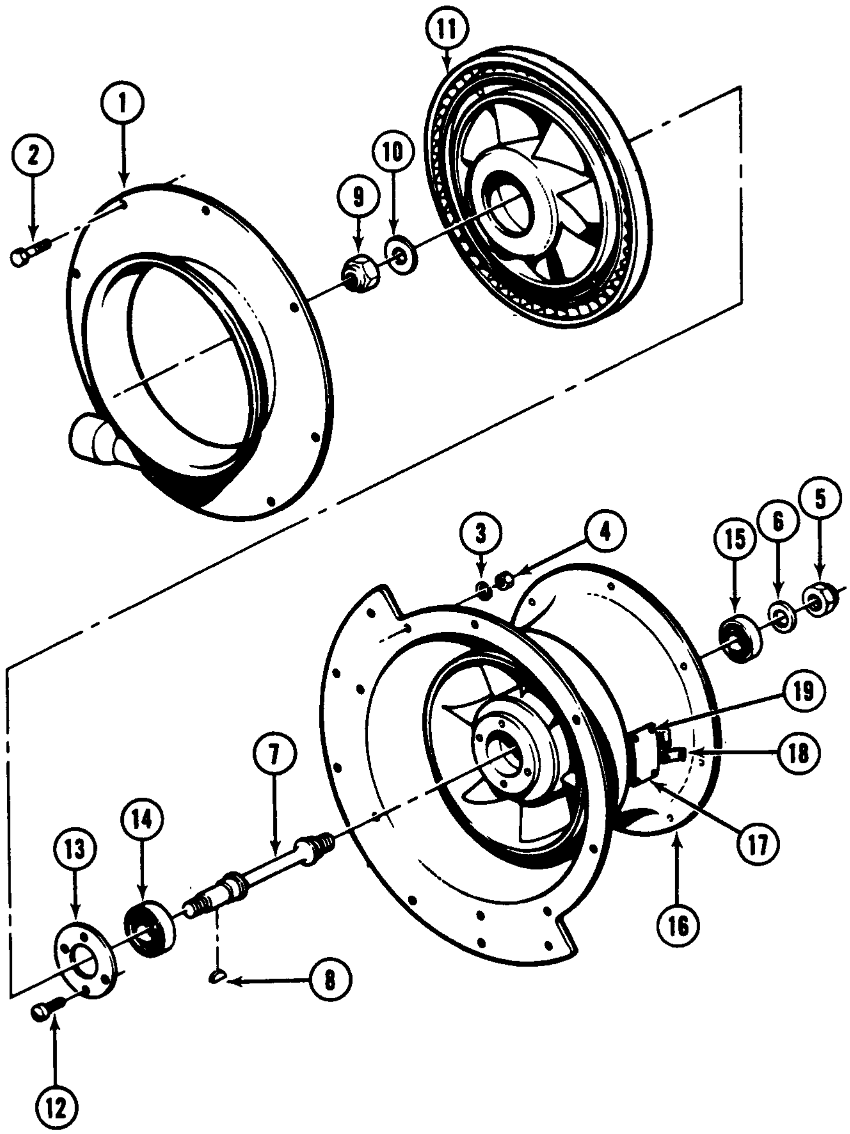
4-79. Disassembly — Oil Cooler Turbo Blower.

a. Remove bolts (2, figure 4-18), nuts (4), and washers (3) from covering assembly (1) and remove cover assembly from housing (16).

b. Using spanner wrench, remove locknut (5) and washers (6) from aft end of shaft (7).

c. Remove locknut (9) and washer (10) from shaft (7); then remove fan and turbine assembly (11) and woodruff key (8) from shaft.

d. Cut lockwire and remove four screws (12) and retainer (13) from housing. Carefully pull shaft (7), with bearings (14 and 15) from housing as a unit.



1.	Cover assembly	11.	Fan and turbine assembly
2.	Bolt	12.	Screw
3.	Washer	13.	Retainer
4.	Nut	14.	Bearing, front
5.	Locknut	15.	Bearing, rear
6.	Washer	16.	Housing
7.	Shaft	17.	Identification plate
8.	Key	18.	Directional arrow
9.	Locknut	19.	Rivet
10.	Washer		

UH-1H-II-M-04-18

Figure 4-18. Oil cooler turbine blower assembly

NOTE

Do not remove identification plate (17) or directional arrows (18) unless damaged, or unless housing replacement is required.

e. Using suitable bearing puller, remove bearings (14 and 15) from shaft.

4-80. Cleaning — Oil Cooler Assembly. When the oil cooler is removed after a prolonged period of service, it shall be cleaned both internally and externally as follows:

NOTE

When the oil cooler is removed from the helicopter after a prolonged period of service, or having been in use with an engine having internal failure, refer to TM-1-7R-1-33.

a. Clean exterior of oil cooler with steam or similar vapor-pressure agent. Remove any obstructions from air fins with compressed air.

b. Clean cooler internally by pressure flushing with suitable equipment, which should include a centrifugal pump capable of a flow rate of 10 gpm at 30 psig pressure, suitable tanks and hoses, and two 100-mesh screens (installed at inlet and outlet ports).

NOTE

After each flushing operation, examine filter screen. If metallic particles are found, it is an indication that oil cooler was used with an engine which failed internally. Scrap the cooler unless an approved salvaging method is available.

(1) Ensure that drain plug is installed: then connect cleaning equipment to inlet and outlet port.

(2) Preclean cooler interior to remove any sludge by circulating solvent (C-304) in opposite direction from normal flow for 30 minutes or until fluid appears clean after passing through cooler. Drain cooler.

(3) Remove carbon deposits, engine oil, gums, lead deposits, and other contaminants from cooler interior with oil cooler solvent cleaning compound (C-130). Flush opposite normal flow direction for 30 minutes; reverse lines and flush for another 30 minutes.

(4) Rinse cooler for 10 minutes with solvent (C-304). Blow cooler dry with compressed air.

c. In event of internal failure, disassemble and clean oil thermal valve, replace oil cooler, and flush out all connecting lines and fitting. Use solvent (C-304).

d. Inspect and clean air passages of oil cooler in accordance with inspection requirements, or as frequently as operating conditions warrant.

e. Clean disassembled blower compartments as follows:

(1) Clean all parts with lint-free cloths saturated with solvent (C-304). Soft brush may be used to dislodge stubborn deposits. Wipe clean and dry with filtered compressed air.

(2) Remove corrosion deposits on shaft (7, figure 4-18) and housing (16) bearing liners using fine crocus cloth (C-500) with lubricant (C-015). Clean parts after removing corrosion.

4-81. Inspection — Engine Oil Cooler.

a. Inspect oil cooler for unserviceable or damaged fittings, gaskets, performed packings, tubes, support clamps and bracket. Inspect the oil cooler for distortion in air fins and passages, damaged and bulged plates, cracked castings, broken welds, stripped threads and core assembly for foreign matter, leakage, and scoring. Repair or replace cooler as necessary.

b. Inspect turbo blower.

(1) Visually inspect all parts for nicks, burrs, scratches, dents, and weldment cracks and for evidence of excessive wear.

(2) Inspect ball bearings (14 and 15, figure 4-18) for wear or damage.

(3) Inspect fan and turbine assembly (11) for cracks, nicks, and scratches and for bent or cracked fan blades.

(4) Inspect parts for dimensional tolerances. (Table 4-1.)

c. Inspect thermal valve for cracks and damaged threads.

Table 4-1. Turbine Blower Dimensional Tolerances

FIG. NO.	INDEX NO.	NOMENCLATURE	REMARKS
4-18	1	Cover	Replace if throat diameter is over 0.3420 inch.
4-18	7	Shaft	Replace if front end bearing journal is not within 0.6695 to 0.6691 inch diameter or if rear end bearing journal is not within 0.4726 to 0.4722 inch diameter.
4-18	16	Housing	Replace if front bearing insert is not within 1.3791 to 1.3780 inch diameter or if rear bearing insert is not within 1.1034 to 1.1024 inch diameter.

4-82. Repair or Replacement — Engine Oil Cooler.

a. Repairs to oil cooler are limited to straightening of air fins, using duck-bill pliers which have been ground to fit between cooling tubes.

b. Replace oil cooler if any of the following conditions exist:

(1) Tubes blown or bulged.

(2) Leaks in tube walls or seams, tubes to headers, tanks to headers, or castings.

(3) Cracked or broken flanges, shrouds, ducts, or castings.

(4) Major dents and similar damage in tube edges or in tanks which do not leak but could impair oil cooler performance.

(5) Damaged air fins which cannot be straightened.

(6) Damaged threads in drain port and thermal valve port or on inlet and outlet pad studs.

c. Replace unserviceable fittings, packings, tube and support clamps, or bracket as required.

d. Replace or repair turbo blower as follows:

CAUTION

Do not attempt to remove nicks or scratches from turbine blades. If the turbine blades are damaged, replace fan and turbine assembly (11, figure 4-18).

(1) Remove burrs and blend minor nicks and scratches with a fine India stone (C-464).

(2) Refinish all exposed aluminum surfaces, after repair, with chemical film material (C-100) and repaint with one coat of epoxy polyamide primer (C-204).

(3) Replace bearings (14 and 15, figure 4-18) if they do not meet inspection criteria.

(4) Replace components which do not meet the dimensional tolerances in table 4-1.

(5) Replace nuts (4, 5 and 9, figure 4-18).

e. Repair oil cooler ducts by inert welding in accordance with Military Specification MIL-W-8604. Weld bead must not interfere with the function of the sponge rubber seal or the alignment of plate nuts with turbine fan installed.

f. Replace thermal valve if it has cracks or damaged threads.

4-83. Reassembly — Oil Cooler Turbo Blower.

a. Press new bearing (14 and 15, figure 4-18) onto shaft (7), seating bearings firmly against shoulder on shaft.

CAUTION

Do not force bearings into housing. If they do not slip in with slight hand pressure, check bearing liners for burrs or corrosion.

b. Insert shaft, with bearings attached, into housing shaft bore. Position retainer (13) and secure to housing with screws (12). Safety screws with lockwire (C-405).

c. Install fan and turbine assembly (11) on shaft, aligning keyway in fan with key (8) on shaft.

d. Install washer (10) and locknut (9) on shaft while firmly holding fan and turbine assembly to prevent rotation. Torque locknut (9) 115 to 140 inch-pounds.

e. Install washer (6) and locknut (5) on aft end of shaft. Holding fan and turbine assembly against rotation, torque locknut 48 to 55 inch-pounds.

f. Install cover assembly (21) to housing (16), using bolts (2), washers (3), and nuts (4).

4-84. Testing — Oil Cooler.

a. Perform air leak and hydrostatic test on oil cooler as follows:

(1) Plug either inlet or outlet port and connect air line to the open port. Immerse cooler in water at ambient room temperature and apply 10 psig air pressure. Heat water to 120 to 130° F (49 to 54° C) and gradually increase air pressure to 100 psig. Check for air bubbles in water, indicating leaks in cooler. Remove cooler from water, vent air from system, and blow cooler dry with compressed air. If leakage is indicated, replace cooler.

(2) Plug either inlet or outlet port, and apply water at 75° F (24° C) at 400 psig to other port. Lock fluid in cooler for 10 minutes and examine cooler for leaks. Release water pressure, drain cooler, and dry with compressed air. If leakage is indicated, replace cooler.

NOTE

The interior of the cooler must be completely dry before final flush with oil and corrosion preventive compound.

b. Flush oil cooler thoroughly using mixture of three parts oil (C-038) and one part corrosion preventive (C-106).

4-85. Installation — Oil Cooler Assembly.

a. Install engine oil thermal valve as follows:

(1) If thermal element was removed, install a new packing, apply antiseize compound (C-452) to threads and tighten element in oil cooler assembly (2). apply torque of 375 to 425 inch-pounds and install lockwire (C-405).

b. Install engine oil cooler as follows:

(1) Assemble gasket and fitting on cooler inlet, secured by nuts and washers on four studs. Assemble fitting on cooler outlet in same manner. Install drain plug in port below cooler outlet.

(2) Position cooler assembly, with inlet and outlet forward, in support at bottom of fuselage compartment below engine tailpipe. Install bolts, with thin aluminum alloy washers under heads, through slotted holes in lower side flanges of cooler into plate-nuts of support.

NOTE

If there are any voids between the oil cooler mounting flange and the mating flange of the oil cooler support assembly, use 205-060-110-1 filler to prevent the flanges from being secured under stress, resulting in cracks to the oil cooler mounting flanges.

(3) Install bolts through mating flanges of engine and transmission oil coolers.

(4) Connect oil tubes to cooler inlet and outlet fitting and connect drain tube to valve.

(5) Position duct between upper flanges of cooler and mount. Install eight bolts, with thin aluminum alloy washers under heads, through mounting flanges into plate-nuts of duct.

c. Install turbo blower as follows:

(1) Install reducer with preformed packing in blower inlet.

(2) Check that support bracket is secured with three screws and washers on fuselage bulkhead above oil cooler location.

(3) Position blower assembly, with inlet pointing forward at left side, to align mounting holes with duct flange and support bracket.

(4) Attach blower to duct with eight bolts and thin aluminum alloy washers.

(5) Attach blower to support bracket with three bolts, using thin aluminum alloy washers under each bolt head and nut.

(6) Connect hose from bleed air valve line to blower inlet.

(7) Install screen on blower flange in the following sequence: bolt, washer, grommet, screen edge, grommet, washer, blower flange, washer, and self-locking nut. Ensure nuts are tightened and grommets compressed to 0.500 inches between bolt and blower flange.

d. Service oil tank. (Chapter 1.) Check disturbed fittings for leaks following next engine run up.

4-86. CHIP DETECTOR.

4-87. Description — Chip Detector. A chip detector is mounted on the lower right side of the accessory drive gear box.

4-88. Removal — Chip Detector.

a. Disconnect electrical wiring from chip detector.

b. Position suitable container to catch oil.

c. Unscrew and remove chip detector and preformed packing. Discard packing.

4-89. Inspection — Chip Detector.

a. Inspect chip detector for evidence of oil contamination. Record type and amount of contamination on engine historical record.

b. Inspect electrical connector for loose or broken terminals ends and wires for damage.

c. Inspect chip detector threads for damage.

d. Inspect chip detector for leakage and security. Check electrical connections for security.

4-90. Repair or Replacement — Chip Detector.

a. Replace damaged electrical connector or damaged wires. (Chapter 9.)

b. Replace packing on installation of chip detector.

c. Replace chip detector with damaged threads.

d. If excessive amount of chips is found on engine oil filter element and/or chip detector, but output reduction carrier and gear assembly has freedom of movement and emits no unusual noises, proceed as outlined in steps (1) through (10). If contamination is caused by carbon particles, refer to step (11).

(1) Remove chips from oil filter element and retain for analysis. Clean filter element and reinstall.

(2) Drain all oil from accessory drive gearbox, oil tank and oil cooler.

(3) Remove chips from chip detector and retain for analysis. Clean chip detector and reinstall.

(4) Remove and inspect strainer for No. 2 bearing and strainer for No. 3 and 4 bearings for presence of metal chips. Remove and inspect three reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil throttle strainer. Forward engine to overhaul if metal chips have clogged more than one-third of flow area of any one of strainers. If amount of metal chips is not excessive, clean and reinstall strainers and proceed to step (5).

(5) Presence of chips in previously mentioned strainers indicates bypass of oil filter has occurred. Proceed as follows:

(a) Remove engine mounted oil filter (T53-L-703).

(b) Install new engine mounted oil filter (T53-L-703).

(c) Replace external mounted engine oil filter element as follows:

<u>1.</u> <u>Open left engine cowling.</u>

<u>2.</u> <u>Open drain valve to remove oil from filter.</u>

<u>3.</u> <u>Remove V-band clamp.</u>

<u>4.</u> <u>Remove filter body and element and discard packing from top of filter body.</u>

<u>5.</u> <u>Remove filter element from filter body. Remove and discard packings from boss in bottom of body and from boss on filter head.</u>

6. Install new packing in bottom of filter body and on filter head.

7. Place new filter element in filter body and seat firmly on boss.

8. Install new packing around upper body lip of body next to flange.

9. Install body with element and packing into filter head.

10. Install V-band clamp around mating flanges of filter body and head. Torque V-band nut to 50 inch-pounds.

11. Service oil tank (Chapter 1) and check for oil leaks after next run-up.

(6) Disconnect oil scavenge hose assembly for No. 2 and No. 3 and 4 bearings and determine whether residual oil in hose assemblies is contaminated with chips. If oil is contaminated, remove engine and overhaul. (T53-L-703.)

(7) Fill oil tank to capacity with new oil. (Chapter 1.)

CAUTION

Any oil pressure fluctuation in excess of plus or minus 5 psi, or any rapid rise in oil temperature at any preset power setting, is cause for immediate engine shutdown.

(8) Have qualified pilot start engine and run at flight idle until temperatures have stabilized. Check instrument for proper engine operation. Increase speed to 70 to 80 percent N1 and maintain for 5 minutes.

(9) Shut down engine and again inspect oil filter element, chip detector, and strainers.

(10) If quantity of chips remains same after second engine run, do not clean filter, strainers or chip detector. Remove engine and oil cooler for additional inspection. Flush all airframe mounted engine oil lines and engine oil tank.

NOTE

Chips in oil filter may come from oil tank; chips on chip detector come from engine.

(11) If amount of carbon particles found on filter element is excessive proceed as follows:

(a) Drain all oil from accessory drive gearbox, oil tank, and oil cooler.

(b) Remove and inspect oil strainers for No. 2 bearing and for No. 3 and 4 bearings. If carbon particles are present, oil filter has bypassed. Remove, clean, and reinstall reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil filter assembly (torquemeter). Clean and reinstall No. 2 and No. 3 and 4 bearing strainers.

(c) Clean and reinstall engine mounted oil filter assembly. (T53-L-703.)

(d) Replenish engine oil system. (Chapter 1.)

(e) Have qualified pilot start engine and run at 70 to 80 percent N1 RPM for 15 minutes.

(f) Shut down engine. Remove, inspect, clean, and reinstall oil filters and strainers.

(g) If contamination is excessive, repeat procedure until filter is clean after run.

4-91. Installation — Chip Detector.

a. Place packing on chip detector. Install chip detector in accessory drive gearbox. Torque 90 to 100 inch-pounds and install lockwire.

CAUTION

Not more than 15 inch-pounds of torque shall be applied to the chip detector centerpost nut when installing the chip detector wiring.

b. Connect electrical wiring.

4-92. OIL STRAINERS.

4-93. Description — Oil Strainers. Five oil strainers in the engine assembly can be inspected and cleaned. The No. 2 bearing housing oil strainer is located in a fitting on lower right side of the engine diffuser housing at the pressure oil inlet to No. 2 main bearing. The power turbine oil strainer is located in a fitting at top left on the engine exhaust section at the pressure oil inlet to the No. 3 and 4 main bearings. Three oil strainers are mounted on internal ends of three oil transfer tubes located on the forward face of the output reduction carrier.

4-94. Removal — Oil Strainers.

a. Remove No. 2 bearing oil strainer as follows:

(1) Remove lockwire and turn hexagon portion of No. 2 bearing housing oil strainer (5, figure 4-19) counterclockwise and lift out strainer.

(2) Remove metal gasket (6).

(3) Note part number of removed oil strainer. If strainer is to be replaced, it must be replaced with one having the same part number.

b. Remove power turbine oil strainer as follows:

(1) Disconnect hose assembly (1) from power turbine oil strainer housing adapter (2).

(2) Remove lockwire, unscrew and remove adapter and power turbine oil strainer.

c. Remove strainers (4, figure 4-20) from face of output reduction carrier (7).

(1) Remove air particle separator upper half (paragraph 4-32).

(2) Straighten tabwasher (2, figure 4-20) and remove bolt (1).

(3) Insert bolt with 1/4-28 thread into oil transfer tube (3) and pull oil transfer tube from output reduction carrier.

(4) Remove packings (5 and 6) from oil transfer tube. Do not remove oil strainer (4) from oil transfer tube unless replacement is required.

(5) Remove other two oil transfer tubes following procedures in steps (2) through (4).

4-95. Cleaning — Oil Strainers.

NOTE

Inspect strainers for metallic chips prior to cleaning.

a. Clean strainers and attaching parts with a bristle brush and solvent (C-304).

b. Rinse oil strainers with clean solvent to remove clogging.

4-96. Inspection — Oil Strainers.

a. Inspect strainers for clogging or damage.

b. Inspect threaded parts for damaged or stripped threads.

c. Inspect strainers for metal particles or carbon particles. Record type and amount of contamination on engine historical record.

d. Inspect oil transfer tubes for damage.

e. If installed, inspect oil strainer tubes, housings, and fittings for security and leakage.

4-97. Repair or Replacement — Oil Strainers.

a. If contamination was found during inspection, determine amount by following procedure outlined in paragraph 4-90, step d.

b. Replace parts that have damaged threads.

c. Replace strainers if clogging cannot be removed by cleaning, or if damaged. (Paragraph 4-95.)

d. Install all new packings when installing strainers.

e. Replace damaged oil transfer tubes.

4-98. Installation — Oil Strainers. (Figure 4-19.)

a. Install No. 2 bearing oil strainer as follows:

(1) Install new metal gasket (6) on No. 2 bearing oil strainer (5).

(2) Screw strainer (5) into diffuser housing. Torque 80 to 90 inch-pounds and safety with lockwire.

b. Install power turbine oil strainer as follows:

(1) Place new packing (4) on power turbine oil strainer housing adapter (2).

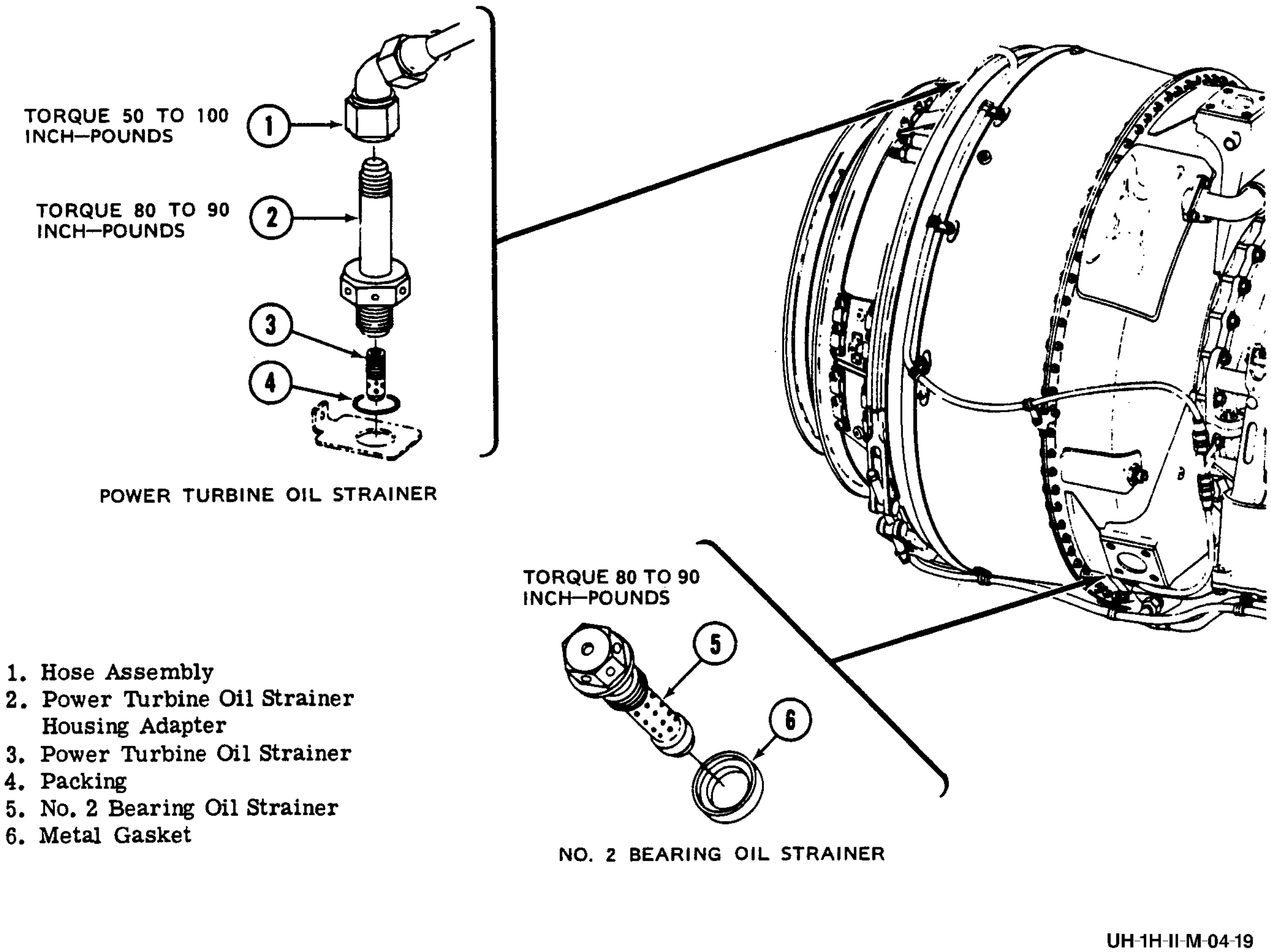


Figure 4-19. Power turbine and No. 2 bearing oil strainer

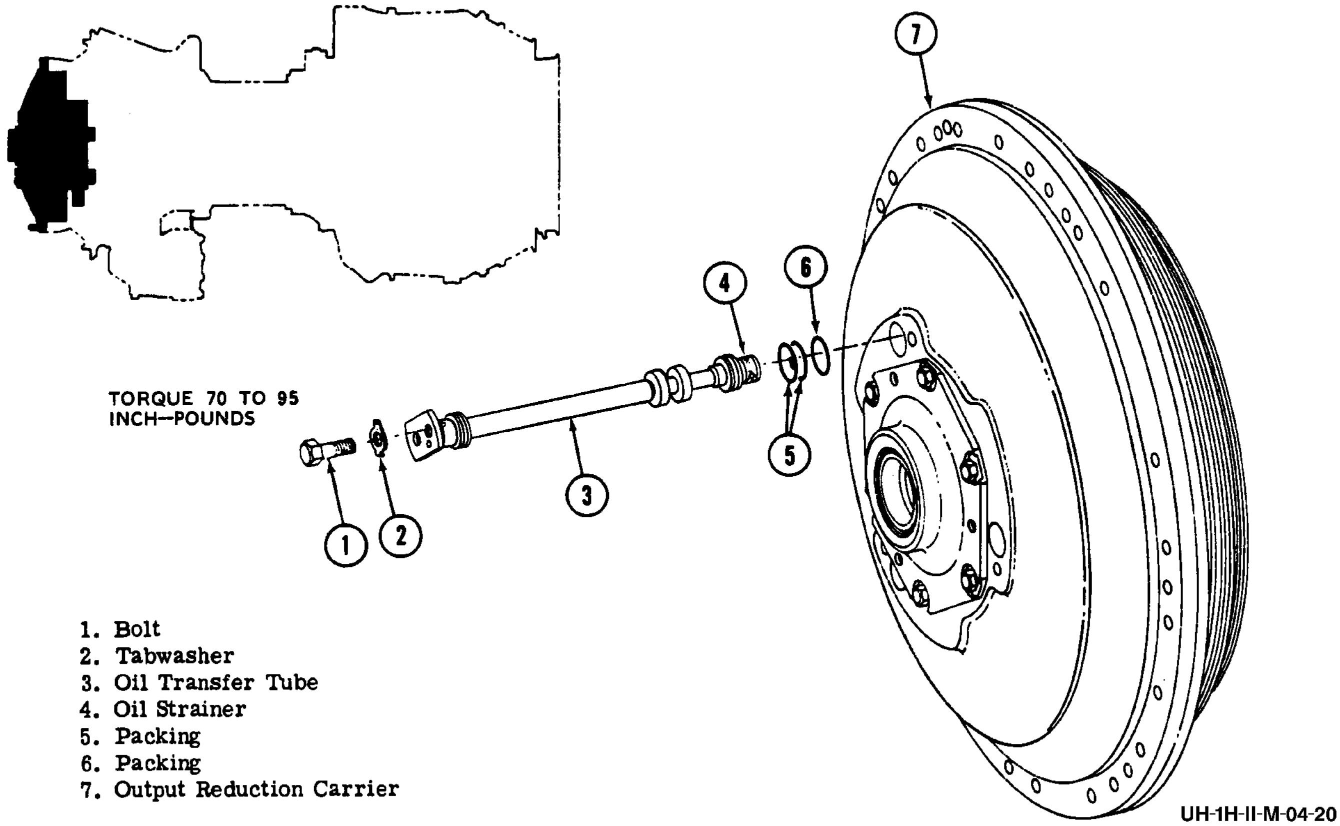


Figure 4-20. Oil transfer tube and strainer

(2) Screw power turbine oil strainer (3) into power turbine oil strainer adapter (2) fingertight.

(3) Screw adapter (2) into tube. Torque 80 to 90 inch-pounds and install lockwire (C-405).

(4) Connect hose assembly (1) to adapter (2). Torque 50 to 100 inch-pounds.

c. Install strainers in output reduction carrier as follows:

(1) Install new packings (5 and 6, figure 4-20) on oil transfer tube (3).

(2) Install oil transfer tube (3) into output reduction carrier port.

(3) Secure oil transfer tube (3) with tabwasher (2) and bolt (1).

(4) Torque bolt (1) 70 to 95 inch-pounds. Secure by one tab of tabwasher against flat of bolt and one tab into hole provided in oil transfer tube.

(5) Install other transfer tubes following procedures in steps (1) through (4).

(6) Install air particle separator (paragraph 4-32).

SECTION VI — IGNITION SYSTEM

NOTE

Refer to T53-L-703 for ignition system data.

SECTION VII — POWER CONTROLS

4-99. POWER LEVER CONTROLS.

4-100. Description — Power Lever Controls. A mechanical linkage system, actuated by twist-grips on collective pitch control sticks, provides manual control of power lever on fuel control unit, modulating engine from zero to full power by controlling gas producer (N1) turbine rpm. Linkage is a series of control tubes, bellcranks, and a torque tube, with adjustable tubes at each end of series and between control sticks. One bellcrank has an adjustment to provide correct travel of entire airframe-mounted linkage. Power lever shaft is serrated and grooved to accept a control arm and has a quadrant marked with power settings in travel range between stops preadjusted by engine manufacturer or overhaul facility. (Figure 4-21.) An adjustable stop, on bellcrank below engine deck, contacts plunger of a solenoid to arrest travel of control linkage at flight idle position when power is reduced from higher settings. Stop release is accomplished by actuation of ENGINE IDLE STOP REL pushbutton switch on collective stick to retract solenoid plunger.

4-101. Adjustment — Power Lever Controls.

a. Ensure flight idle stop (15, figure 4-21) is removed and that control tube (10) is disconnected from power lever control arm (1) on power lever shaft of fuel control.

b. Install control arm (1) on power lever shaft of fuel control, positioned as nearly parallel to power lever pointer (35) as serrations will permit. Install retaining screw (36) through control arm and engage in groove around shaft. Safety screw head with lockwire (C-405).

NOTE

The rod end adjustments must be kept as near nominal as possible to ensure safe thread engagement.

c. Position control arm (1) on fuel control against either stop (34). Turn twist grip to its stop in the corresponding direction. Adjust length of control rods (10 and 25) with equal over-travel in each direction of the free rod end slightly past the bolt hole in control arm. Attach control rod (10) to control arm (1) with bolt, washers, nut, and cotter pin. Tighten rod end jam nut.

NOTE

If binding occurs, recheck entire installation for correct linkage and length of control rods.

d. Adjust serrated attachment of upper control tube on bellcrank (30) so that power lever pointer (35) will bottom out on stops at fuel control, short of extreme positions of twist-grip by 5 (±2) degrees.

e. Adjust flight idle stop. (Paragraph 4-102.)

4-102. Adjustment Flight Idle Stop and Release Solenoid — Power Lever Controls.

NOTE

With linkage disconnected from fuel control, the torque required to rotate twist grip shall not exceed 5 inch-pounds.

a. Check that plunger of solenoid operates freely through bracket bushing. If necessary, shim on four mounting screws between solenoid and bracket to obtain plunger alignment.

b. Attach flight idle stop (15, figure 4-21) on extended spacer of bellcrank (14), with stop projection aft. Secure stop with two bolts and serrated washers.

c. Position solenoid on serrated base plate to obtain 0.040 (±0.010) inch clearance between tip of plunger and surface of stop projection when solenoid is in actuated position (figure 4-22). Secure by tightening four bolts, with thin aluminum washers under heads, through slotted holes in bracket into mounting pad.

d. Use twist-grip to position power lever pointer (35, figure 4-21) at 38-degree mark on fuel control quadrant. This is approximate flight idle position.

e. Adjust stop so that projection rests against side of solenoid plunger. Tighten bolts to engage mating serration of lockwashers and stop face.

CAUTION

Do not attempt to obtain proper flight idle speeds through adjustment of engine fuel control. Aircraft flight idle speed does not necessarily correspond to fuel control flight idle position.

f. Check operation of flight idle stop (15) during ground run. If necessary, readjust stop to obtain 68 to 72 percent rpm indicated on the gas producer N1 tachometer. Check release by actuating the solenoid. Recheck clearance dimension of 0.040 (±0.010) inch between tip of solenoid plunger in return position.

NOTE

Check flight idle rpm by rolling the twist-grip against the stop and applying friction.

g. Inspect throttle friction lock for positive locking.

4-103. Removal — Power Lever Controls.

a. Remove parts of control system as necessary for inspection, lubrication, or replacement. To facilitate reinstallation, identify removed parts as to location and keep attaching hardware in place or in sets.

b. Obtain access to forward linkage by removing access doors (Chapter 2) along center of cabin floor and on structural pylon island. Obtain access to linkage aft of cabin through openings in lower side of fuselage and by opening engine compartment cowling on left-hand side.

c. To remove torque tube (23, figure 4-21), disconnect control tubes from both arms. At each end of tube, remove four screws and washers which secure bearing cup and shims (22) to mounting pad on structural beam. Remove torque tube assembly. Separate bearing cup and shims from left end of tube. Remove shims, attaching nut, washers, and bearing cup from right end.

d. To remove any bellcrank in fuselage, disconnect control tubes by removing bolts, nuts, washers, and spacer (33). Remove cotter pin, nut, and washer to pull bellcrank (20) (typical) from mount (16). To detach mount from structure, remove three screws and washers.

e. To remove boot (12), disconnect control tube from bellcrank on engine mount. Loosen clamp and detach boot (12) from housing assembly (13) and retainer (11). Remove snapring and bushing (9) and slip retainer and boot off upper end of control rod.

f. To remove bellcrank (6), disconnect both control tubes. Remove pivot bolt and nut to detach bellcrank and spacer from bracket on pillow block of engine mount.

g. To remove control arm (1) from power lever shaft on fuel control, cut lockwire and remove retaining screw. Pull control arm off splined shaft. Reinstall screw in arm.

4-104. Inspection — Power Lever Controls.

a. Inspect control linkage for cracks, scratches, dents, and corrosion. (Refer to figures 4-23 through 4-25 for damage and repair limits.)

b. Inspect control linkage bearings for excessive wear and roughness. Refer to table 4-2 for wear limits.

c. Inspect mounting brackets and plates for cracks, corrosion, security, and elongated bolt holes.

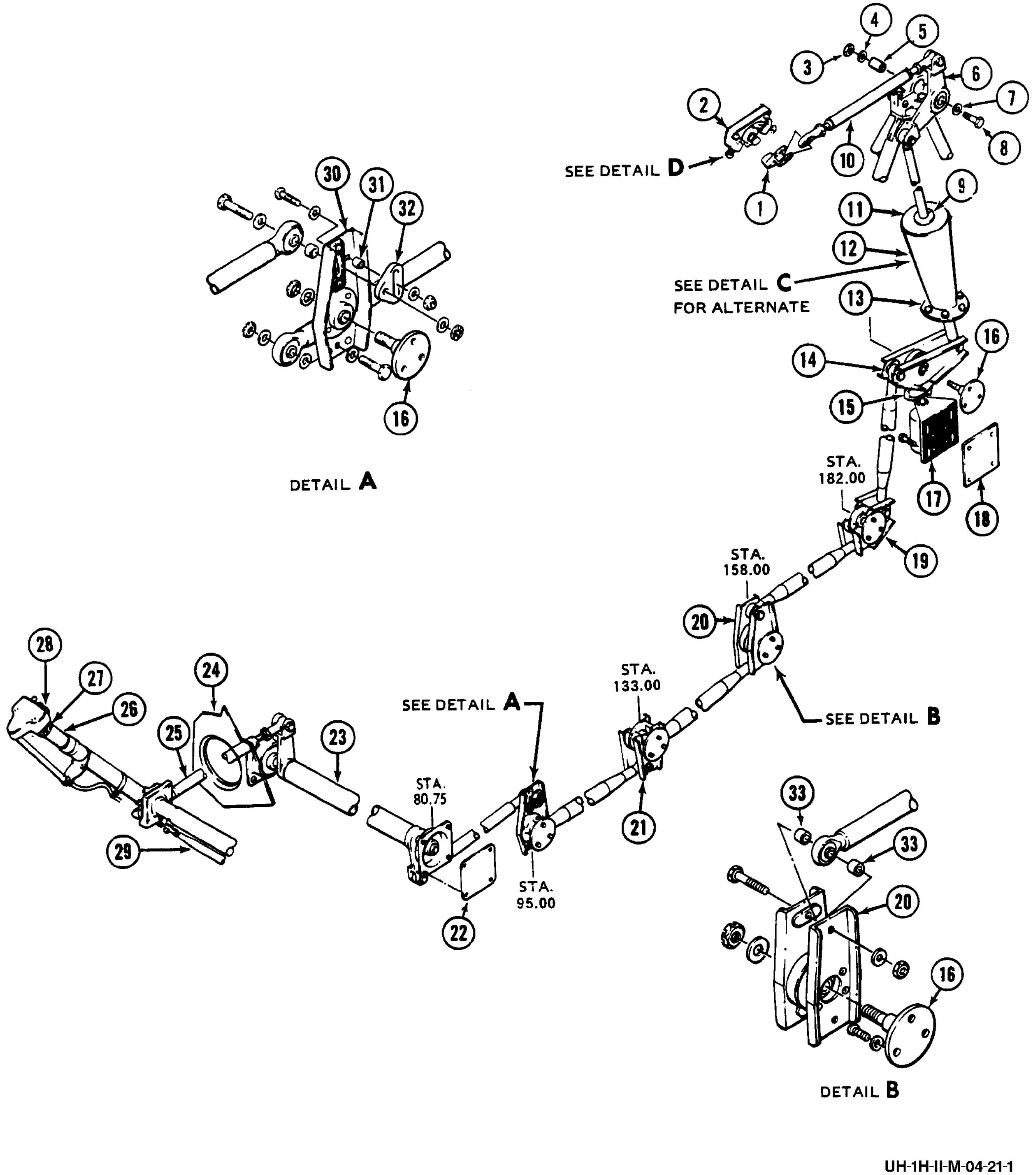
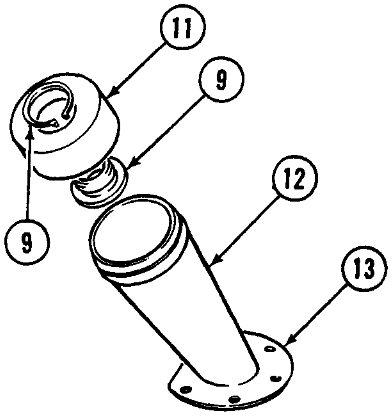
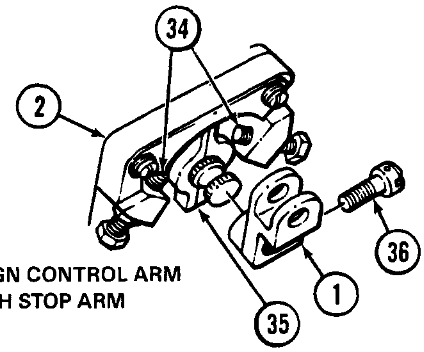


Figure 4-21. Power control lever system (Sheet 1 of 2)



ALTERNATE
DETAIL C



DETAIL D

1. Control arm
2. Fuel control power lever shaft and stops
3. Nut
4. Washer
5. Spacer
6. Bellcrank (on engine mount)
7. Washer
8. Bolt
9. Split bushing and ring
10. Tube (adjustable)
11. Retainer
12. Boot assembly
13. Housing
14. Bellcrank
15. Flight idle stop
16. Mount
17. Bracket, solenoid
18. Serrated base
19. Bellcrank
20. Bellcrank
21. Bellcrank
22. Shims
23. Torque tube
24. Bulkhead (station 74.25)
25. Tube (adjustable)
26. Twist grip control
27. Friction adjustment
28. Switch, idle stop release
29. Tube
30. Bellcrank (adjustable)
31. Spacer
32. Serrated plate
33. Spacer
34. Stops
35. Power lever pointer
36. Retaining screw

UH-1H-II-M-04-21-2

Figure 4-21. Power control lever system (Sheet 2 of 2)

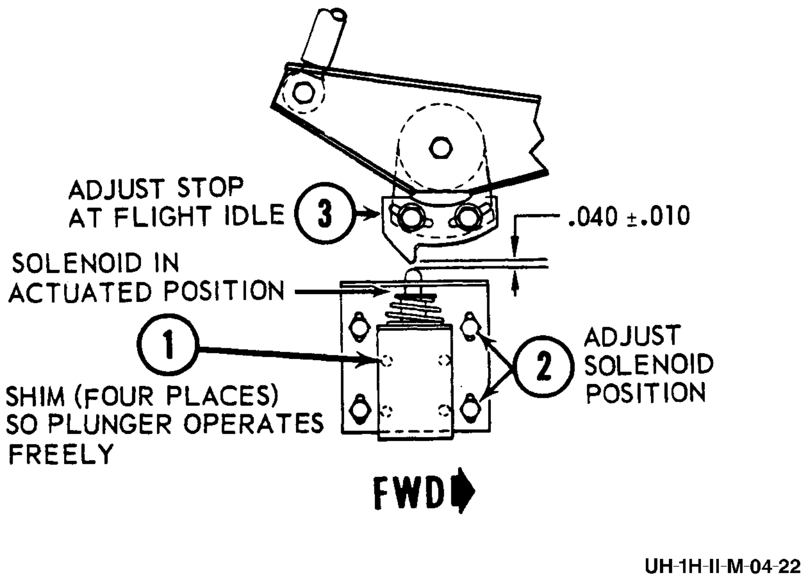


Figure 4-22. Flight idle stop adjustment

Table 4-2. Power Lever Control Bearings Wear Limits

BEARING PART NUMBER	MAXIMUM RADIAL WEAR	MAXIMUM AXIAL WEAR
AN207DPP4	0.006 IN.	0.015 IN.
AN951REB3N	0.005 IN.	0.015 IN.
MS20200KP4	0.006 IN.	0.030 IN.
RE3S7	0.005 IN.	0.015 IN.

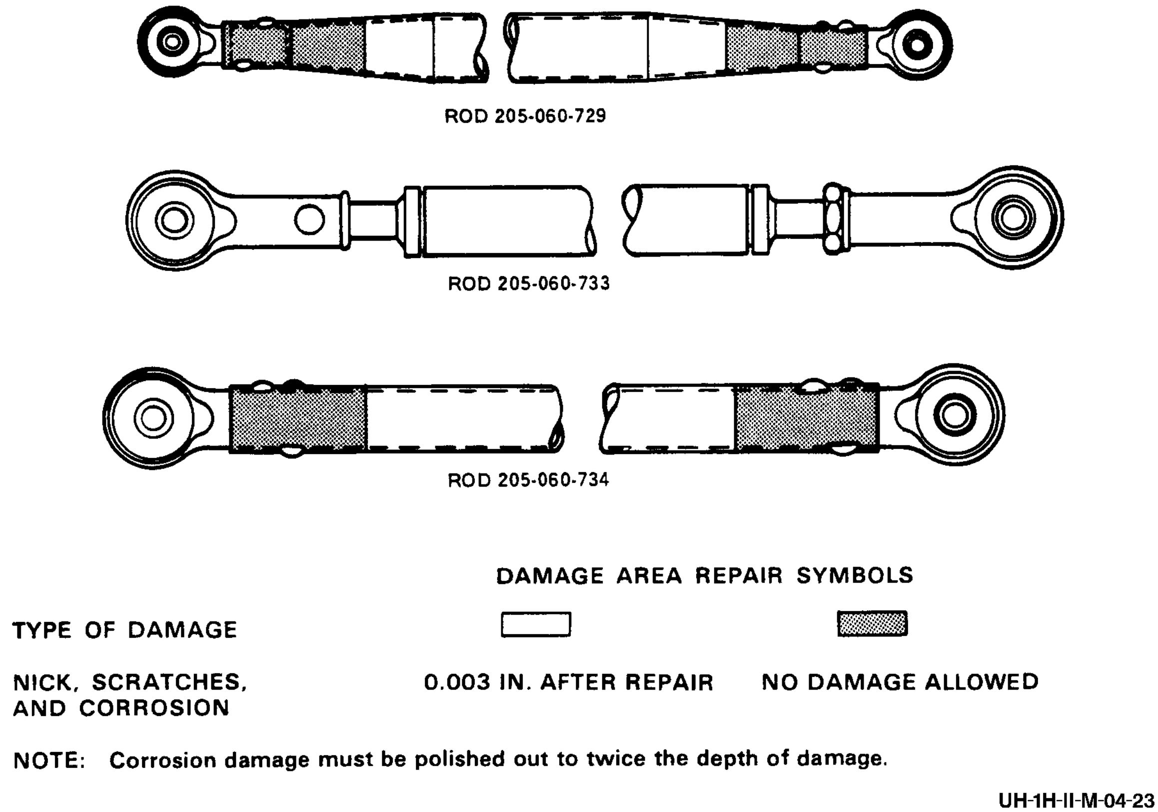


Figure 4-23. Power lever control tube — damage and repair limits

d. Inspect solenoid (1, figure 4-24) for loose or missing hardware and cracks or dents. Check electrical connection for security and broken wires.

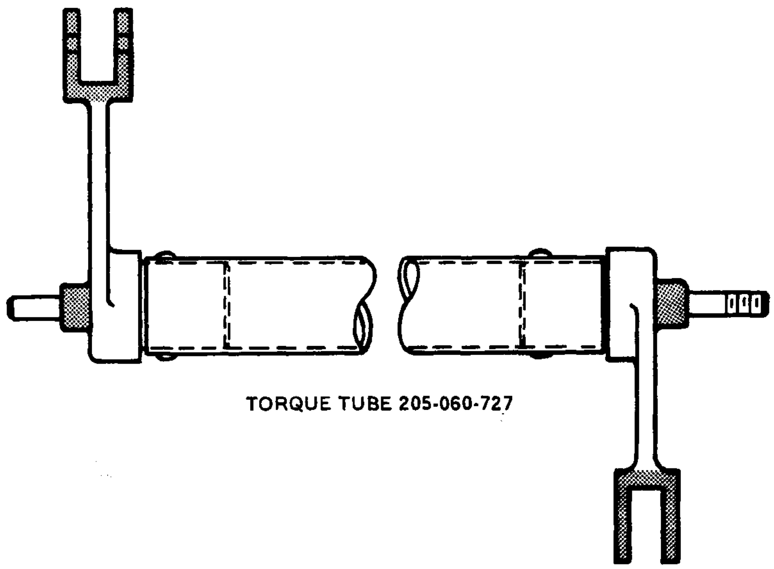
e. Inspect boot assembly (12, figure 4-21) for tears, cuts, deterioration and security.

4-105. Repair or Replacement — Power Lever Controls.

a. Scratches and corrosion in control and torque tubes, bellcranks, and/or serrated washers that are not in excess of the limits of figure 4-23 through 4-25 may be polished out as follows:

Premaintenance Requirements For Repair of Power Lever Controls

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-406), (C-204)
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated



DAMAGE AREA REPAIR SYMBOLS

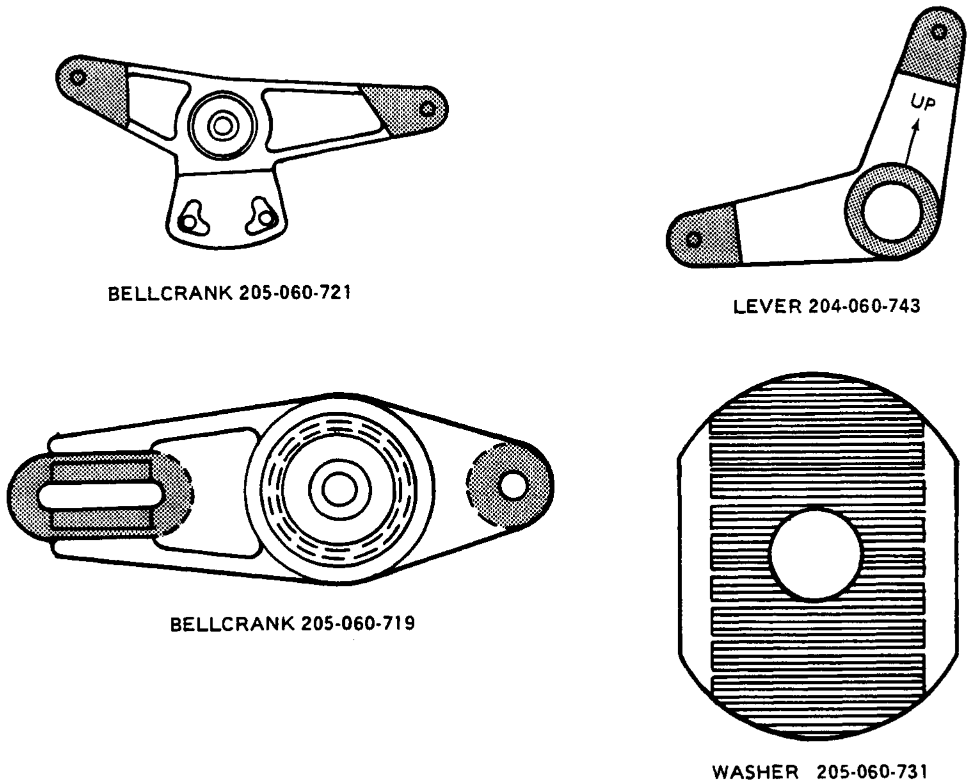
TYPE OF DAMAGE	MAXIMUM DEPTHS	REPAIR AREAS ALLOWED
NICKS AND SCRATCHES (AFTER REPAIRS)	0.015 IN.	0.010 IN.
CORROSION		
(BEFORE REPAIR)	0.0075 IN.	0.005 IN.
(AFTER REPAIR)	0.015 IN.	0.010 IN.
MAXIMUM AREA OF FULL DEPTH REPAIR	1.0 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 IN.	0.05 IN

BORE DAMAGE: 0.002 IN. DEPTH FOR 1/4 CIRCUMFERENCE

NOTE: Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-24

Figure 4-24. Power lever torque tube — damage and repair limits



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (unshaded area)	(shaded area)
NICKS AND SCRATCHES (AFTER REPAIR)	0.015 IN.	0.010 IN.
CORROSION		
(BEFORE REPAIR)	0.0075 IN.	0.005 IN.
(AFTER REPAIR)	0.015 IN.	0.010 IN.
MAXIMUM AREA OF FULL DEPTH REPAIR	1.0 IN. SQ.	1.0 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 IN.	0.04 IN.

BORE DAMAGE: 0.002 INCH DEPTH FOR 1/4 CIRCUMFERENCE

NOTE 1. No damage allowed to serrations.

2. Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-25

Figure 4-25. Power lever controls bellcrank and serrated washer — damage and repair limits

(1) Remove corrosion and scratches that are within limitations with aluminum oxide cloth (C-406) to obtain a smooth scratch-free surface.

(2) Apply one coat of epoxy polyamide primer (C-204) to repaired area.

b. Replace any cracked control tube.

c. Replace any mounting bracket or plates that are cracked or have elongated bolt holes. Remove corrosion or scratches. (Refer to step a.)

d. Replace damaged electrical connector or damaged wires. (Chapter 9.)

e. Replace solenoid when cracked or dented.

f. Replace boot assembly (12, figure 4-21) when torn, cut, or excessively deteriorated.

g. Replace rod end bearings when wear exceeds limits of Table 4-2. Refer to Chapter 11 for replacement procedures.

4-106. Installation — Power Lever Controls.

a. Assemble bearing cup, washer, and retaining nut of pin at right end of torque tube (23, figure 4-21). Tighten until 0.032-inch clearance exists between inboard side of bearing and shoulder of torque tube lever.

NOTE

Clearance of 0.032 inch is a minimum requirement. Greater clearance is acceptable if no end play exists which results in lost throttle motion. If such end play is noted, additional shims will be required to maintain 0.032 to 0.060 inch clearance. The clearance reading shall be taken with the torque tube chucked against the opposite end while clearance is being measured.

b. Place bearing cup on opposite end of torque tube and position tube assembly between mounting pads on structural beams. Install shims, as required, to a maximum of six at each end of tube. (Figure 4-26.) Secure each bearing cup and shims to beam inserts with four screws and thin washers.

c. If removed, install mounts (16, figure 4-21) and bellcranks (30, 21, 20, 19 and 14) as shown. To install bellcrank (6), use spacer on pivot bolt between bracket and pillow block of engine mount tripod and install bolt (8) and washer (7) under bolt head. Secure with nut and cotter pin on bolt at inboard side of pillow block.

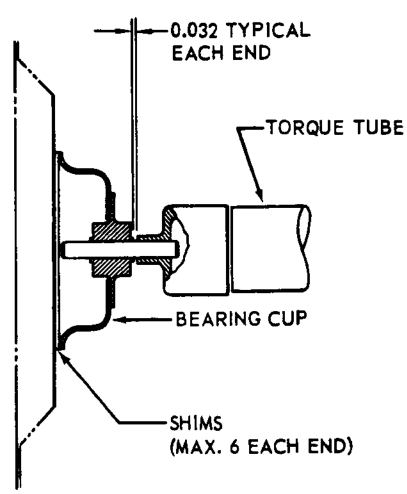


Figure 4-26. Power lever controls torque shimming procedures

d. Reinstall any nonadjustable control tubes, using spacers between bellcranks and rod ends as shown in figure 4-21. Install boot (12) and retainer (11) before connecting both ends of tube between bellcranks (14 and 6). Insert split bushing through retainer and secure with snap ring at upper side. Secure boot on retainer (11) with clamp and install to plate with five washers and bolts.

NOTE

With linkage disconnected from fuel control, the torque required to rotate twist grip shall not exceed 5 inch-pounds.

e. Set pilots twist grip control at mid-travel. Set copilots control at same position, checking that gear on lower end of control stick is centered on mating gear sector. Install interconnect tube (29) between control stick lever arms. Actuate controls through full range to check for correct gear engagement and freedom of operation.

f. Connect adjustable control tubes (25 and 10) and install control arm (1) during adjustment procedure. (Paragraph 4-102.)

4-107. LINEAR ACTUATOR.

4-108. Description — Linear Actuator. An electrically operated linear actuator, remotely controlled by a GOV RPM INCR/DECR switch on each collective pitch control stick, moves a lever on overspeed governor of fuel control unit to accomplish settings of power turbine rpm (N2).

4-109. Adjustment — Linear Actuator.

a. Disconnect actuator shaft from governor control lever (3, figure 4-27) by removing bolt.

CAUTION

To prevent internal damage, stop screw adjustment must be performed with actuator at midpoint of stroke.

b. Electrically position actuator shaft to approximate midpoint of stroke. Set actuator travel to 1.20 inches.

(1) If actuator with two adjusting screws is installed, turn both positive stop adjusting screws to obtain maximum stroke. (Detail A.) Reduce stroke by turning each screw ten full turns away from maximum adjustment to obtain actuator nominal position.

NOTE

One full turn of the adjusting screw, on actuator with single adjusting screw, will cause a change in both the retract and extend position of 0.032-inch. (Detail B.)

(2) If actuator with single adjusting screw if installed, positive stops can be adjusted, is necessary, for travel range of 0.500 inch to 1.75 inches without affecting nominal position.

c. Fully retract actuator shaft by holding GOV RPM switch to INCR. Move collective stick to full up position.

NOTE

When tightening jamnut on actuator shaft, center rod-end in clevis of lever so that self-aligning bearing will absorb any rotation of shaft.

d. Install bolt connecting actuator to governor control lever. Adjust actuator shaft rod end to obtain 0.010 inch clearance between governor power lever pointer and upper stop screw, measured with a feeler gage. (Detail A.) If necessary, reposition control lever on governor shaft to accomplish this adjustment while keeping safe thread engagement of rod ends. Attach actuator shaft rod end with AN96010L washer on each side of bearing into clevis of governor control lever, with bolt, washer, and nut. Torque nut 12 to 15 inch-pounds. Insert cotter pin. Refer to paragraph 4-117, steps j. and k. for adjustment of lower stop screw.

4-110. Operational Check — Linear Actuator.

a. Turn electrical power on.

b. Position GOV RPM switch on pilots collective stick to INCR. Check that governor rpm actuator on the engine retracts.

c. Position GOV RPM switch to DECR. Check that actuator extends.

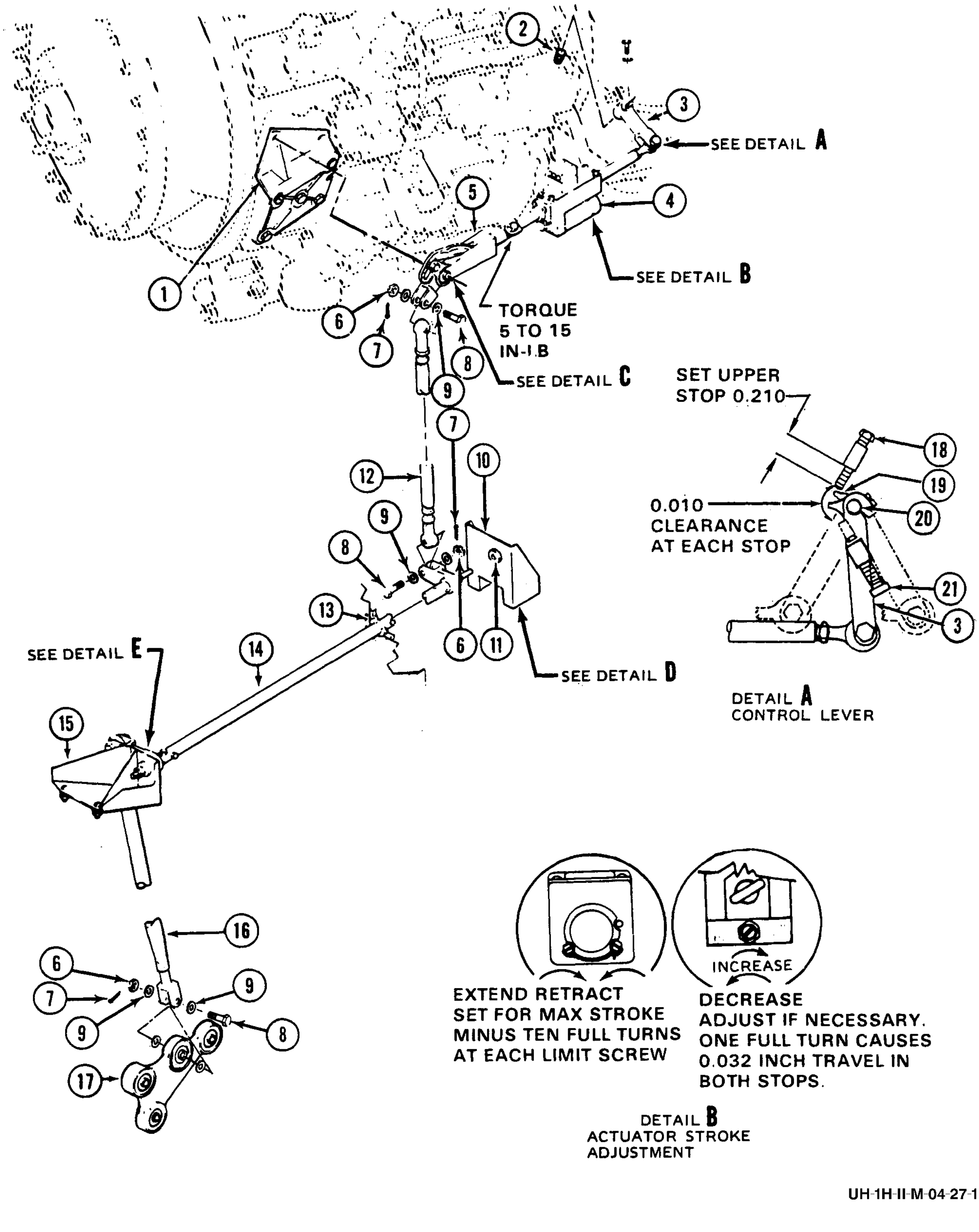
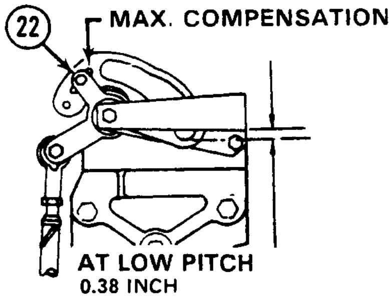
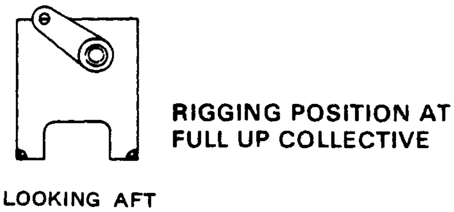


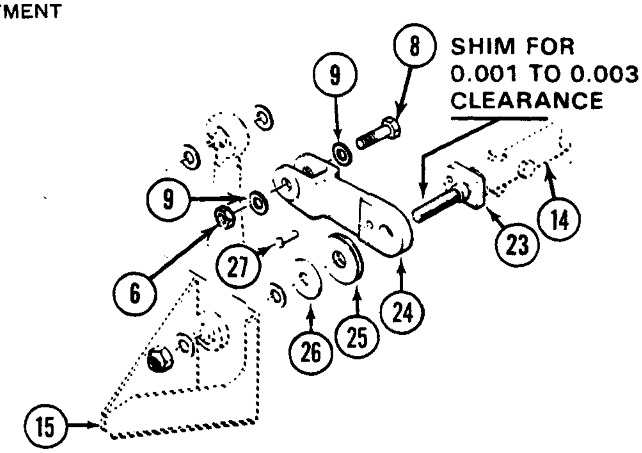
Figure 4-27. Power turbine governor RPM controls (Sheet 1 of 2)



DETAIL C
CAMBOX
ADJUSTMENT



DETAIL D



DETAIL E
SHEAR JOINT

1. Bracket, cambox
2. Shear fitting
3. Control lever
4. Linear actuator
5. Cambox assembly
6. Nut
7. Cotter pin
8. Bolt
9. Washer
10. Support
11. Bearing
12. Control tube
13. Firewall seal
14. Torque tube
15. Bracket assembly
16. Control tube
17. Bellcrank, collective pitch
18. Stop, high rpm
19. Stop-arm shaft
20. Governor control shaft
21. Stop, low rpm
22. Cam adjustment
23. Shear fitting
24. Bellcrank
25. Shims
26. Retaining washer
27. Shear pin

UH-1H-II-M-04-27-2

Figure 4-27. Power turbine governor RPM controls (Sheet 2 of 2)

d. Repeat steps b. and c. using copilots GOV RPM switch.

4-111. Removal — Linear Actuator.

a. Open engine compartment cowling at left side.

b. Remove terminal cover with attaching screws from top of actuator (4, figure 4-27). Disconnect and mark electrical leads for installation. Reinstall cover.

c. Detach actuator jackshaft end-fitting from control lever (3) on governor, and forward end-fitting from slider of cambox (5) by removing nuts, bolts, and washers.

CAUTION

Use care to avoid losing spring washer installed between actuator clevis and cambox slider.

d. Remove lockwire and clamping bolt to pull lever from serrated shaft (20) at top of overspeed governor.

4-112. Inspection — Linear Actuator.

a. Inspect hardware attaching linear actuator to cambox (5, figure 4-27) and control lever (3) for security, cracks, corrosion, wear, elongation, and damaged threads.

b. Inspect linear actuator housing for cracks, corrosion, nicks, scratches, and security. Check attached parts for security.

c. Inspect electrical terminals for security, corrosion, cracks, and proper installation on wires.

d. Inspect rod-end bearing for binding, wear, corrosion, cracks, and security. Ensure rod-end bearing wear does not exceed 0.010-inch axial or 0.005-inch radial.

e. Inspect motor housing for security, corrosion, cracks, nicks, and scratches.

4-113. Repair or Replacement — Linear Actuator.

a. Replace missing, cracked, worn, or elongated hardware. Remove corrosion with abrasive cloth (C-406) to obtain a smooth scratch-free surface. Treat parts in accordance with Specification QQ-P-416.

b. Refer to TM 55-2995-213-40 for housing maintenance procedures. Replace linear actuator if housing is cracked.

c. Replace broken or improperly installed terminals. Tighten terminals, when loose, at attaching point.

d. Purge binding rod-end bearing with grease (C-007) while rotating bearing. Replace rod-end bearing if worn, binding, cracked, or if threads are damaged. Tighten locknut if rod-end bearing shaft is loose in drive tube.

e. Refer to TM 55-2995-213-40 for motor maintenance procedures. Replace linear actuator when motor housing is cracked or when motor is inoperative. Tighten attaching screws when motor is loose on housing.

NOTE

When tightening jamnut on actuator shaft, center rod-end in clevis of lever so that self-aligning bearing will absorb any rotation of shaft.

4-114. Installation — Linear Actuator.

a. Place control lever (3, figure 4-27) on governor control shaft (20) as near 90-degree angle to centerline of shaft stop-arm (19) as serrations permit. Install retaining bolt, with washer, from aft side into lever and through shaft groove. Lockwire bolt head to shank of lever. Manually move lever (3) to full increase. If lever contracts overspeed governor body, remove lever and reinstall 1 to 2 serrations to rear from 90 degree position.

b. Align actuator front end-fitting clevis on end of cambox slider. Insert spring washer between clevis and underside of cambox slider. Install bolt from top and secure with washer and nut. Torque nut 5 to 15 inch-pounds. Insert cotter pin.

c. Attach actuator shaft rod-end with one AN960-10L washer on each side of rod-end bearing into clevis of governor control lever (3) with bolt. Secure with washer and nut. Torque nut 12 to 15 inch-pounds. Omit cotter pin until rigging is complete. If necessary, loosen bolts attaching cambox bracket (1) on engine to align actuator (4) to lever (3). After installing actuator, tighten and lockwire (C-405) bracket bolt.

d. Remove actuator terminal cover. Connect electrical leads on terminals (wiring diagrams, GOV RPM Actuator, Appendix F). Reinstall terminal cover.

e. Check linear actuator for proper adjustment and operation. (Paragraphs 4-109 and 4-110.)

4-115. DROOP COMPENSATOR CONTROLS.

4-116. Description — Droop Compensator Controls. Droop compensation stabilizes rpm as engine load fluctuates with changes in main rotor pitch by providing translation of collective pitch control motion from bellcrank (17, figure 4-27) through the compensator cambox and mechanical linkages to the N2 governor control lever (3). Compensator linkage consists of two control rods and a torque tube. The torque tube has a shear pin in its forward arm to assure unhindered operation of collective pitch controls if compensator linkage should become fouled.

4-117. Adjustment — Droop Compensator Controls.

a. Ensure that collective pitch control system rigging has been completed. (Chapter 11.)

b. Lock collective pitch control stick in full up position. Adjust droop compensator control tube (16, figure 4-27) to align center of bolt hole in aft arm of torque tube (14) approximately level with top of support bracket (10). Due to shimming, manufacturers tolerance, etc., variation of 0.250-inch from top of support bracket is possible and acceptable. (Detail D.)

c. Set cam adjustment (22) to middle of slot. (Detail C.)

d. Move collective pitch control stick to full down position and lock.

NOTE

This is a nominal setting and is subject to change, if necessary, in following steps.

e. Adjust control tube (12) attached to cam bellcranks so that approximately 0.38-inch of cam slot is visible below cambox housing.

f. Check installation of governor control lever (3) as near 90 degree angle to stop arm as serration alignment permits. (Figure 4-27, Detail A.)

NOTE

The adjustment of the upper stop screw to 0.210 inch is the initial adjustment and may be subject to change to maintain proper clearance in the following steps. Never shorten either stop screw on governor to less than 0.060 inch length from inner side of boss.

g. Adjust upper governor stop screw to 0.210-inch measured from inner side of mounting boss. (Detail A.) Remove and discard lead seal on lockwire if existing.

h. Disconnect actuator from governor control lever (3) by removing bolt.

i. Adjust linear actuator. (Paragraph 4-109.) Accomplish operational check of linear actuator. (Paragraph 4-110.)

j. Fully extend actuator shaft by holding GOV RPM switch to DECR. Lock collective pitch control stick in full down position.

k. Adjust lower stop screw for 0.010-inch clearance with governor stop arm, measured with a feeler gage. Remove and discard lead seal on lockwire if existing. Observe minimum length limitation. Refer to NOTE preceding step g.

l. On initial ground run, with collective pitch control stick full down, check for 6000 to 6700 (±50) rpm range controlled by GOV RPM switch. If necessary, readjust actuator stroke length to obtain required range, repeating clearance checks and adjustment at both governor stop screws. After final adjustment is made, lockwire (C-405) both stop screws.

NOTE

Readjust governor stop screws for clearance after any change in rigging.

m. Make final adjustments of droop compensator cam as required by flight checks. Set cam to maintain 6600 N2 (±40) rpm from full low pitch to full power. If RPM droop occurs, move adjustment bolt (22, figure

4-27) toward inner (maximum compensation) end of slot. If maximum compensation adjustment does not correct droop, lengthen control tube (12) to increase amount of cam slot showing below housing. Ensure roller does not bottom out at end of cam slot in either extreme travel.

4-118. Removal — Droop Compensator Controls.

a. Disconnect control rod (12, figure 4-27) from bellcrank of cambox (5) by removing bolt (8) with nut (6) and washers (9). Disconnect rod from torque tube arm at support (10).

NOTE

If cambox is removed from bracket, ensure shims remain in place on bellcrank pivot bolt between inner race of bearing and sides of housing.

b. Remove cambox and bracket as an assembly by removing lockwire and two bolts at top of forward engine mount trunnion. Reinstall bolts to secure mount trunnion.

c. To remove control tube (16), enter fuselage through opening below pylon to disconnect tube clevis from collective pitch control bellcrank by removing bolt (8) with nut (6), washers (9), and cotter pin (7). Disconnect upper end of tube from torque tube bellcrank (24) in same manner.

d. Remove bellcrank (24) and shear pin (27) from torque tube (14) by removing retaining nut and washer from torque tube fitting at forward side of bracket (15). Remove four screws and washers to detach bracket from structure. Remove bracket assembly (15), washers, retaining washer (26), shims (25), bellcrank (24), and shear pin (27) from shear fitting (23) of torque tube (14).

e. When complete removal of torque tube (14) is necessary, remove screws to detach support (10) from deck. Place an index mark, with suitable crayon or marking material, on shear fitting (23) and end of tube. Remove two bolts, with nuts and washers, and pull fitting (10) from forward end of tube. Remove tube aft through firewall seal (13).

4-119. Inspection — Droop Compensator Controls.

a. Inspect cambox assembly and bracket attaching parts for evidence of damage, fouling, corrosion and for loose, missing or improperly installed hardware. Inspect cam for wear, binding and smooth operation. Replace part when damage exceeds repair limits provided in figure 4-28.

b. Inspect linkage for damage, evidence of fouling, corrosion, or other faulty condition, inspect for loose, missing or improperly installed hardware. Replace parts when damage exceeds repair limits provided in figure 4-29 through 4-34.

c. Inspect torque tubes, control rod, bellcranks, rod ends, and attaching parts for lost motion, excessive looseness, damage, and corrosion. Inspect for missing or improperly installed hardware. Replace parts when damage exceeds repair limits provided in figure 4-29 through 4-34.

4-120. Repair or Replacement — Droop Compensator Controls.

Premaintenance Requirements For Repair of Droop Compensator Controls

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-406), (C-204)

a. Replace cambox assembly, bracket, or attaching parts when repair limits shown in figure 4-31 are exceeded.

b. If necessary, replace cam (13, figure 4-35) as follows:

(1) Remove cotter pin, nut (10), washers (9), shims (11), and bolt (8). Remove bellcrank assembly (12), cam (13), and slider assembly (1) from housing (7) and bracket as an assembly.

(2) Remove pin (2) and separate cam (13), bearing (3), and slider assembly (1).

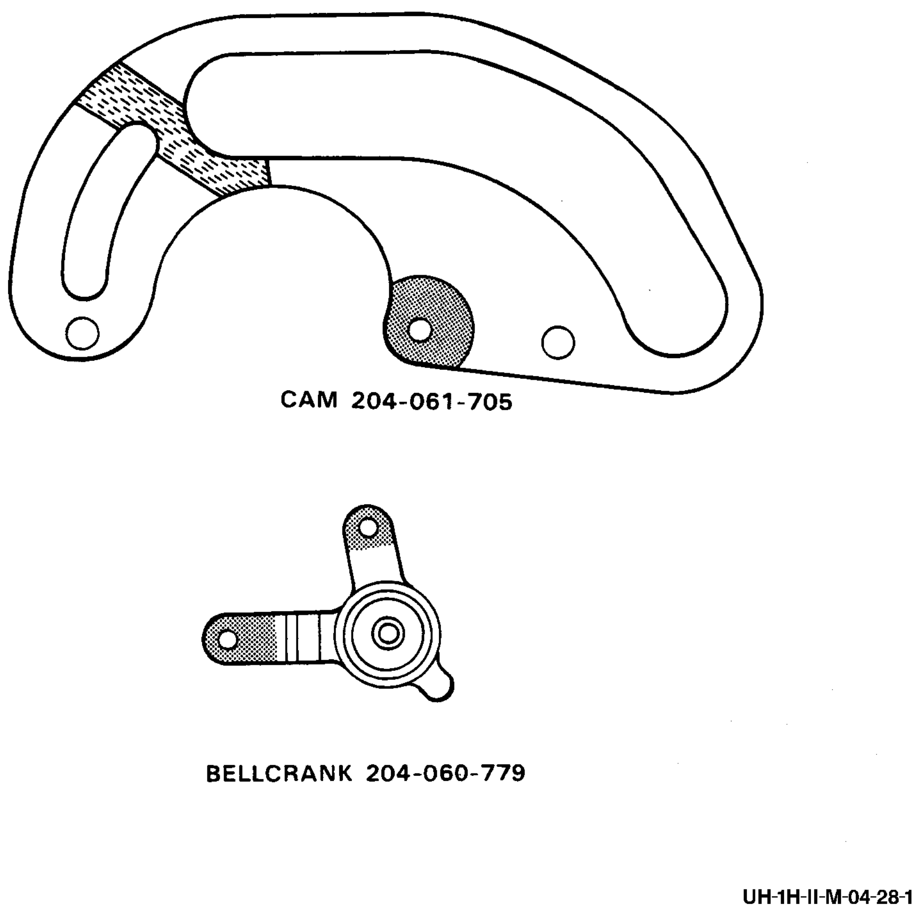
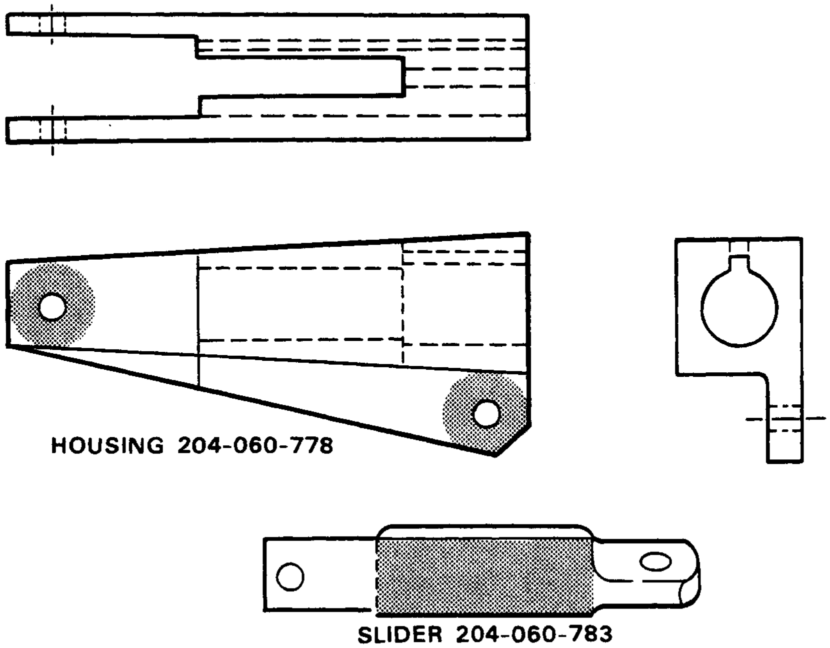


Figure 4-28. Cambox assembly — damage and repair limits (Sheet 1 of 2)



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
NICKS AND SCRATCHES (AFTER REPAIR)	0.015 IN.	0.005 IN.
CORROSION		
BEFORE REPAIR	0.0075 IN.	0.005 IN.
AFTER REPAIR	0.015 IN.	0.010 IN.
MAXIMUM AREA OF FULL DEPTH REPAIR	1.0 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 IN.	0.04 IN.

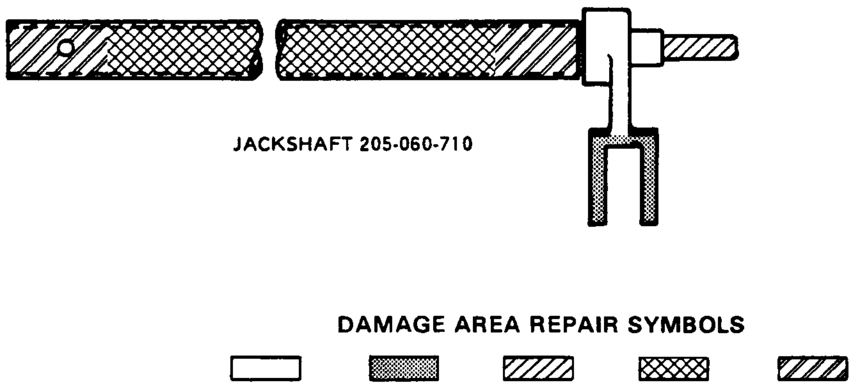
BORE DAMAGE: 0.002 INCH DEPTH FOR ONE-FOURTH CIRCUMFERENCE

NOTES:

1. No repairs allowed in area of serrations or on surfaces contacted by cam follower.
2. Maximum allowable radial play is 0.005 inch for both the AN201KP-3A and MS27644-3 bearings.
3. Maximum permissible repair on 23S5-3A sleeve is 0.002 inch for one-fourth of circumference on inner or outer surfaces but not on both surfaces in the same quadrant.
4. Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-28-2

Figure 4-28. Cambox assembly — damage and repair limits (Sheet 2 of 2)



TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED				
NICKS, SCRATCHES AND CORROSION (AFTER REPAIR)	0.015 IN.	0.010 IN.	0.005 IN.	0.003 IN.	0.001 IN.

BORE DAMAGE: 0.002 IN. DEPTH FOR 1/4 CIRCUMFERENCE

NOTE: Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-29

Figure 4-29. Droop compensator controls jackshaft — damage and repair limits

(3) Remove nut (15), serrated lockwasher (14), flat washer (4), and bolt (5). Remove rivet (6) and detach bellcrank assembly (12) from cam (13).

(4) Position bellcrank assembly (12) on replacement cam (13) and install rivet (6).

(5) Install bolt (5) with flat washer (4) under head and serrated side of lockwasher (14) facing cam (13) under nut (15).

(6) Assemble cam (13), bearing (3), and slider assembly (1) with pin (2).

(7) Position assembled bellcrank, cam and slider assembly in housing (7). Install bolt (8), shims (11), washers (9), nut (10), and cotter pin. Use a maximum of four shims to obtain 0.001 to 0.003-inch clearance before applying torque to bolt. Torque bolt.

c. Replace shear pin in forward arm of torque tube in event of failure. Investigate cause of failure and correct any fouling of linkage or other faulty condition.

d. Replace damaged or unserviceable torque tube, control rods, removable rod ends, or attaching parts when repair limits shown in figure 4-29 through 4-34 are exceeded.

e. Scratches and corrosion in rods, torque tubes, bellcranks, brackets, fittings, and levers that are not in excess of limits of figures 4-28 through 4-34 may be polished out as follows:

(1) Remove corrosion and scratches that are within limitations using abrasive pad (C-406) to obtain a smooth scratch free surface.

NOTE

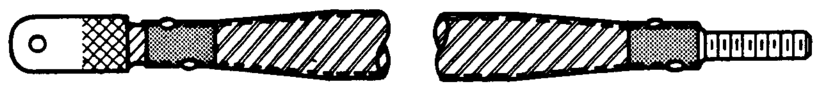
Do not prime mating surfaces of parts.

(2) Apply one coat of epoxy polyamide primer (C-204) to repaired external surfaces.

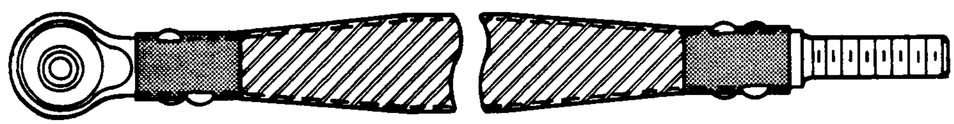
f. Check rigging adjustment and operation of system after replacement of parts.

4-121. Installation — Droop Compensator Controls.

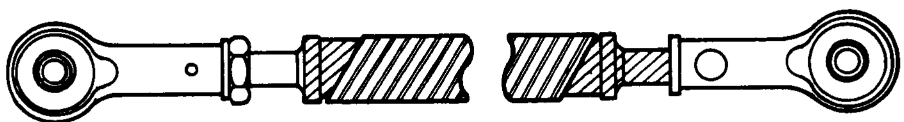
a. Install cambox bracket (1, figure 4-27) on two upper bolts of forward mount trunnion at left side of engine inlet housing. Use thin steel washers.



TUBE 205-060-702



TUBE 205-060-711



ROD 205-060-712

DAMAGE AREA REPAIR SYMBOLS

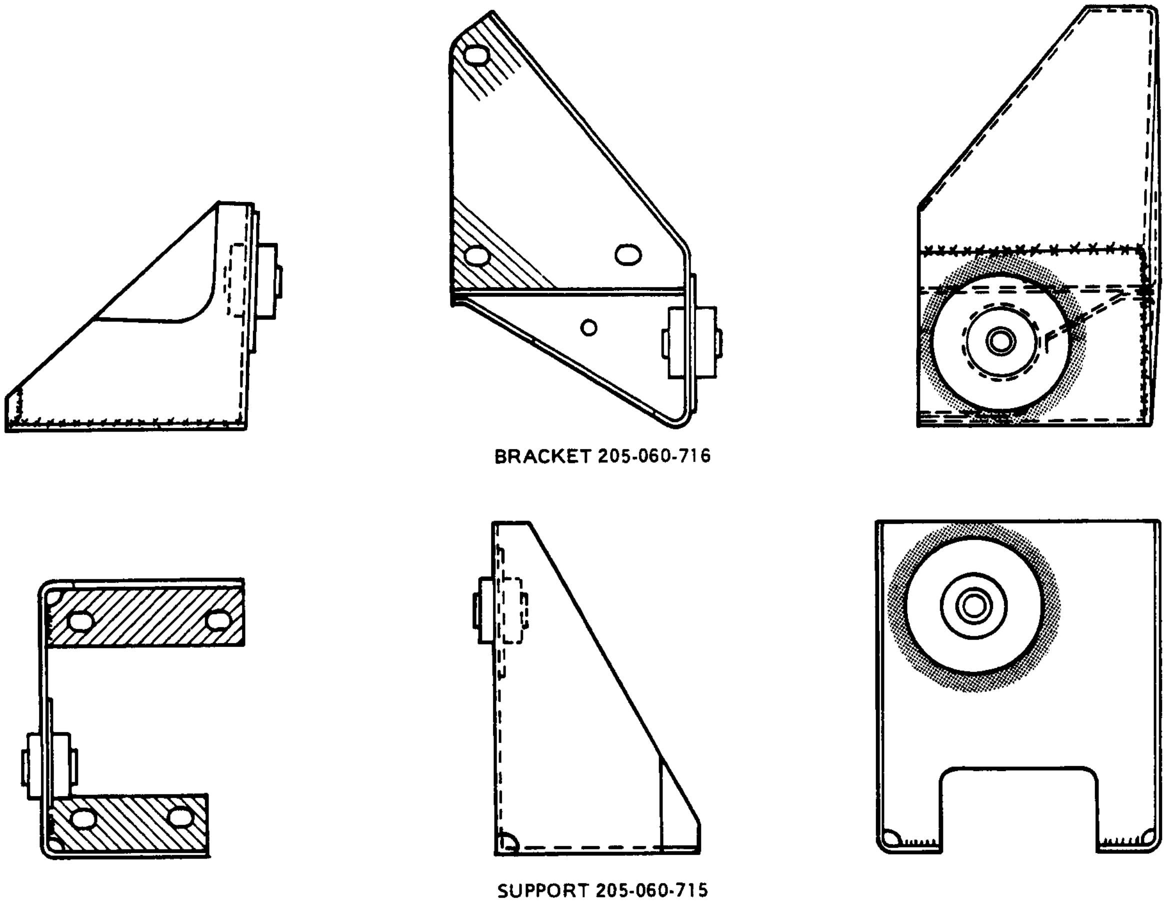
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED				
NICKS, SCRATCHES AND CORROSION (AFTER REPAIR)	0.015 IN.	0.010 IN.	0.005 IN.	0.003 IN.	0.002 IN.

BORE DAMAGE: 0.002 IN. DEPTH FOR 1/4 CIRCUMFERENCE

NOTE:
1. Maximum area of full depth repair is 0.10 In. Sq.
2. No damage allowed on threads.
3. Corrosion damage must be polished out to twice the depth of damage.
4. Maximum allowable radial play for rod end bearings is 0.010 inch. Maximum axial play is 0.015 inch.

UH-1H-II-M-04-30

Figure 4-30. Droop compensator controls rod and tube — damage and repair limits



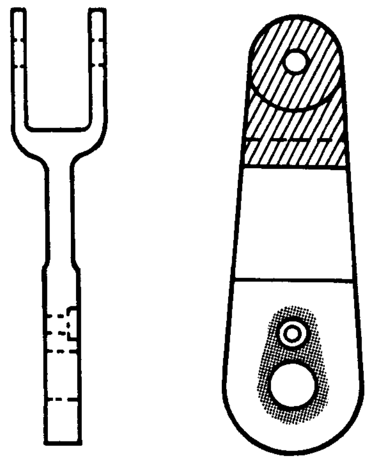
DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
NICKS, SCRATCHES AND CORROSION (AFTER REPAIR)	0.015 IN.	0.010 IN.	0.005 IN.

NOTES: 1. Maximum allowable radial play is 0.006 inch for both the MS20218-1 and AN218P4 bearings.
2. Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-31

Figure 4-31. Bracket and support — damage and repair limits



BELLCRANK 205-060-751

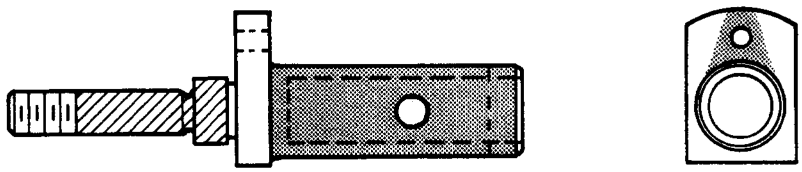
	DAMAGE AREA REPAIR SYMBOLS		
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
NICKS, SCRATCHES AND CORROSION (AFTER REPAIR)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA OF FULL DEPTH REPAIR	1.0 IN. SQ.	0.10 IN. SQ.	0.10 IN. SQ
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 IN.	0.04 IN.	0.04 IN.

BORE DAMAGE: 0.002 INCH DEPTH FOR ONE-FOURTH CIRCUMFERENCE

NOTE: Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-32

Figure 4-32. Bellcrank — damage and repair limits



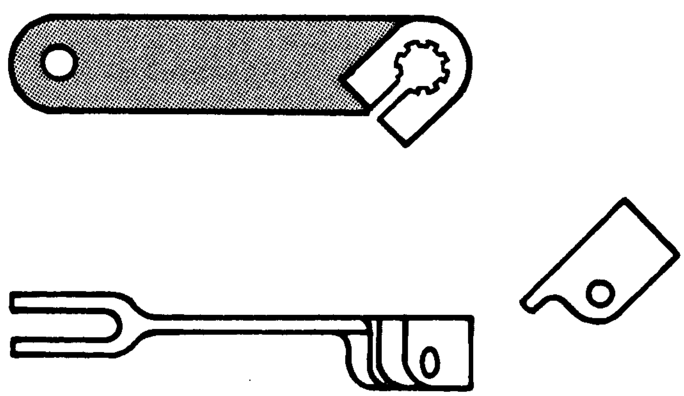
FITTING (SHEAR) 205-060-752

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS: MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (clear)	(shaded)	(hatched)
NICKS AND SCRATCHES (AFTER REPAIR)	0.015 IN.	0.010 IN.	0.005 IN.
CORROSION			
(BEFORE REPAIR)	0.0075 IN.	0.005 IN.	0.0025 IN.
(AFTER REPAIR)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA OF FULL DEPTH REPAIR	1.0 IN. SQ.	0.10 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 IN.	0.04 IN.	0.04 IN.

NOTES:
1. No damage allowed to threads.
2. Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-33

Figure 4-33. Shear fitting — damage and repair limits



LEVER 204-060-765

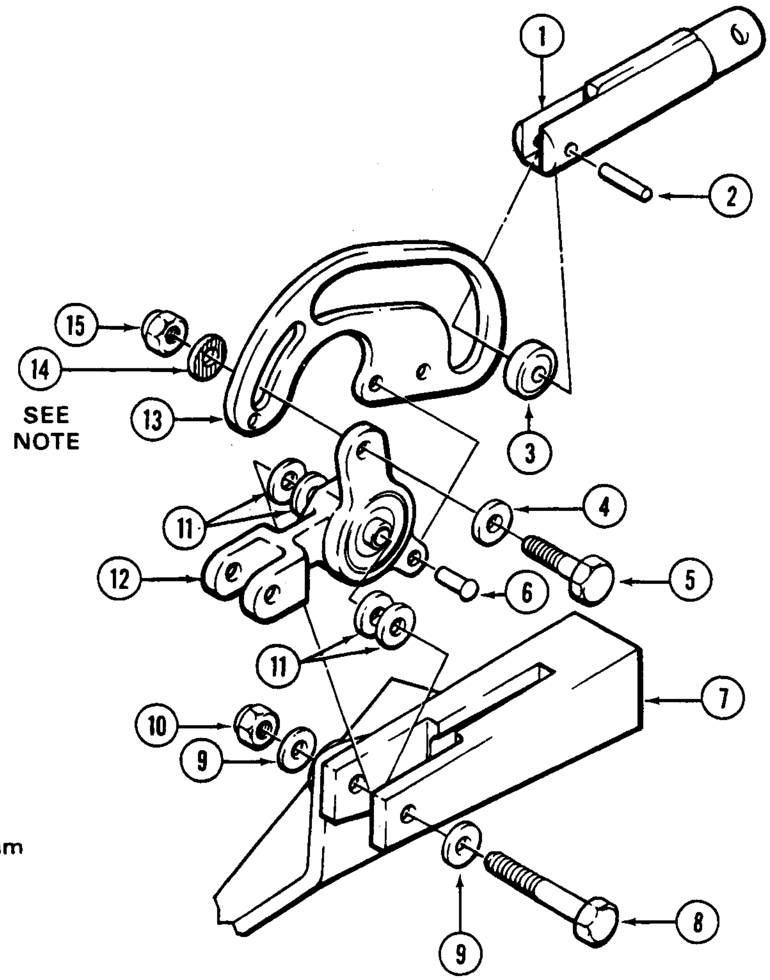
TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS — MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
NICKS, SCRATCHES AND CORROSION	0.010 IN.	0.005 IN.

BORE DAMAGE: 0.002 INCH DEPTH FOR ONE-FOURTH CIRCUMFERENCE.

NOTE: Corrosion damage must be polished out to twice the depth of damage.

UH-1H-II-M-04-34

Figure 4-34. Lever — damage and repair limits



NOTE

Serrated side of washer toward cam

1. Slider assembly
2. Pin
3. Bearing
4. Washer
5. Bolt
6. Rivet
7. Housing
8. Bolt
9. Washer
10. Nut
11. Shim
12. Bellcrank
13. Cam
14. Serrated lockwasher
15. Nut

UH-1H-II-M-04-35

Figure 4-35. Droop compensator cam replacement

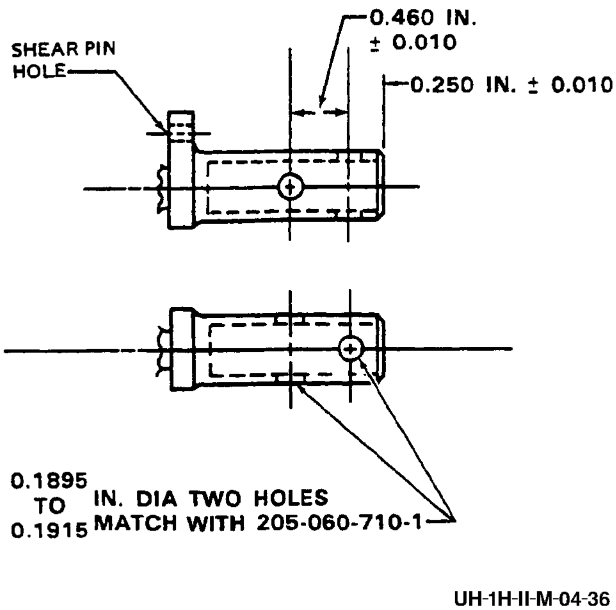


Figure 4-36. Shear fitting hole location

NOTE

Upper forward or lower aft bolt hole of bracket is oversize for alignment of actuator to governor control lever. Accomplish final tightening and lockwiring of bracket mounting bolts after connecting actuator to lever.

b. If cambox (5) is separated from bracket, attach cambox with two bolts through housing and bracket and secure by nuts at inboard side. Use shims on bellcrank pivot bolt between bearing and housing at each side to provide 0.001 to 0.003 inch clearance before tightening bolt. Position thin steel washers next to bearing to prevent wear of laminated shims.

c. If torque tube (14) was completely removed, insert end of tube through firewall seal (13) from rear side. Place shear fitting (23) in end of tube, align index marks and bolt holes, and install two bolts secured by washers and nuts. Position support (10) to mounting holes in engine service deck and secure with torque tube in support bearing.

CAUTION

Shearpin (27) substitution is not authorized.

d. If replacement shear fitting is received without the two holes drilled for attachment to torque tube, the two holes should be drilled at the time of assembly. Hole size 0.1895 to 0.1915 inch match holes in torque tube. Holes are to be drilled as shown in figure 4-36.

e. Place bellcrank (24, figure 4-27) on end of shear fitting (23), align holes, and install shearpin (27) with head seated in counterbore recess on front of bellcrank.

f. Assemble shims (25), retaining washer (26), washer, bracket, washer, and retaining nut on threaded stud of shear fitting. Check for 0.001 to 0.003 inch clearance between bellcrank (24) and shear fitting (23). Change shim thickness if necessary.

g. Position bracket (15) to mounting holes at left side of pylon supporting structure and secure with four screws and washers.

h. Connect clevis end of control tube (16) on collective pitch system bellcrank (17) using washers between bearing and sides of clevis, and thin washers (9) under bolthead (8) and nut (6). Install cotter pin (7).

i. Adjust control tube (16) to position torque tube arm correctly. Connect tube (16) to torque tube bellcrank (24) using thin steel washers between bearing and sides of bellcrank clevis, and thin alloy washers (9) under bolthead (8) (install bolt with its head facing aft) and nut (6).

j. Connect nonadjustable end of control rod (12) to arm at rear end of torque tube (14) with bolt (8), two washers (9), nut (6), and cotter pin (7). Connect upper end of control rod (12) to cambox (5) bellcrank during adjustment procedures.

k. Adjust droop compensator controls (paragraph 4-117).

SECTION VIII — QUICK CHANGE ASSEMBLY

4-122. ENGINE QUICK CHANGE ASSEMBLY.

4-123. Description — Engine Quick Change Assembly. Procedures contained herein include all information required for the build-up of the Lycoming engine quick change assemblies. These procedures include the following: removal of bare engine from shipping container, installation of engine in work stand, installation of all components and accessories necessary for preparation of engine for installation on helicopter or storage preservation, and inspection of completed engine quick change assemblies. Also included in this section is a listing of special tools, test equipment, and special instructions required for the build-up operations. This section is designed to enable a maintenance crew to perform the assigned functions with maximum efficiency.

4-124. Special Tools — Engine Quick change Assembly. All special tools required in the build-up of the Lycoming series engines, as quick change engine assemblies, are called out and identified by number in Premaintenance Requirements for Engine Quick Change Assembly.

Premaintenance Requirements For Engine Quick Change Assembly

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T10), (T19), (T20), (T88)
Test Equipment	None
Support Equipment	Hoist-1000 lbs capacity minimum
Minimum Personnel Required	Two
Consumable Materials	(C-317), (C-405), (C-012), (C-355), (C-446), (C-201)
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated

4-125. Special Instruction — Engine Quick Change Assembly. In locating various engine components, the parts are described in relation to the position of the engine as installed in the airframe. The air intake is to the front of engine and exhaust at the rear of engine. Reference to the left side and the right side of the engine is made with the observer standing at the rear of the engine looking forward. Components such as the cambox and actuator are on the left side of engine. The starter-generator is on the bottom right side of engine. Information regarding engine model number, serial number, etc., can be obtained from data plate attached to engine case at left top side of engine just above cambox assembly.

4-126. Standard Torque Values — Engine Quick Change Assembly. Consult BHT-ALL-SPM for the torque values of items in this section requiring standard torques.

4-127. ENGINE BUILD-UP PREPARATION.

4-128. Inspection. Visual inspection of the engine should be accomplished prior to accomplishing any build-up procedures. Inspect the engine upon receipt from manufacturer or storage as follows:

a. Ensure that container is unpressurized prior to removal of cover.

b. After container is opened but before engine is removed from container, check the following:

(1) Check that engine records are enclosed and current.

(2) Check that humidity indicator indicates SAFE (blue).

(3) Visually inspect engine as mounted in container for bent or broken lines, and overall engine surfaces for evidence of nicks, pitting, and corrosion.

4-129. Engine Removal From Shipping Container.

a. Remove engine records from receptacle on outside of shipping container. (Figure 4-37.)

b. Check humidity indicator.

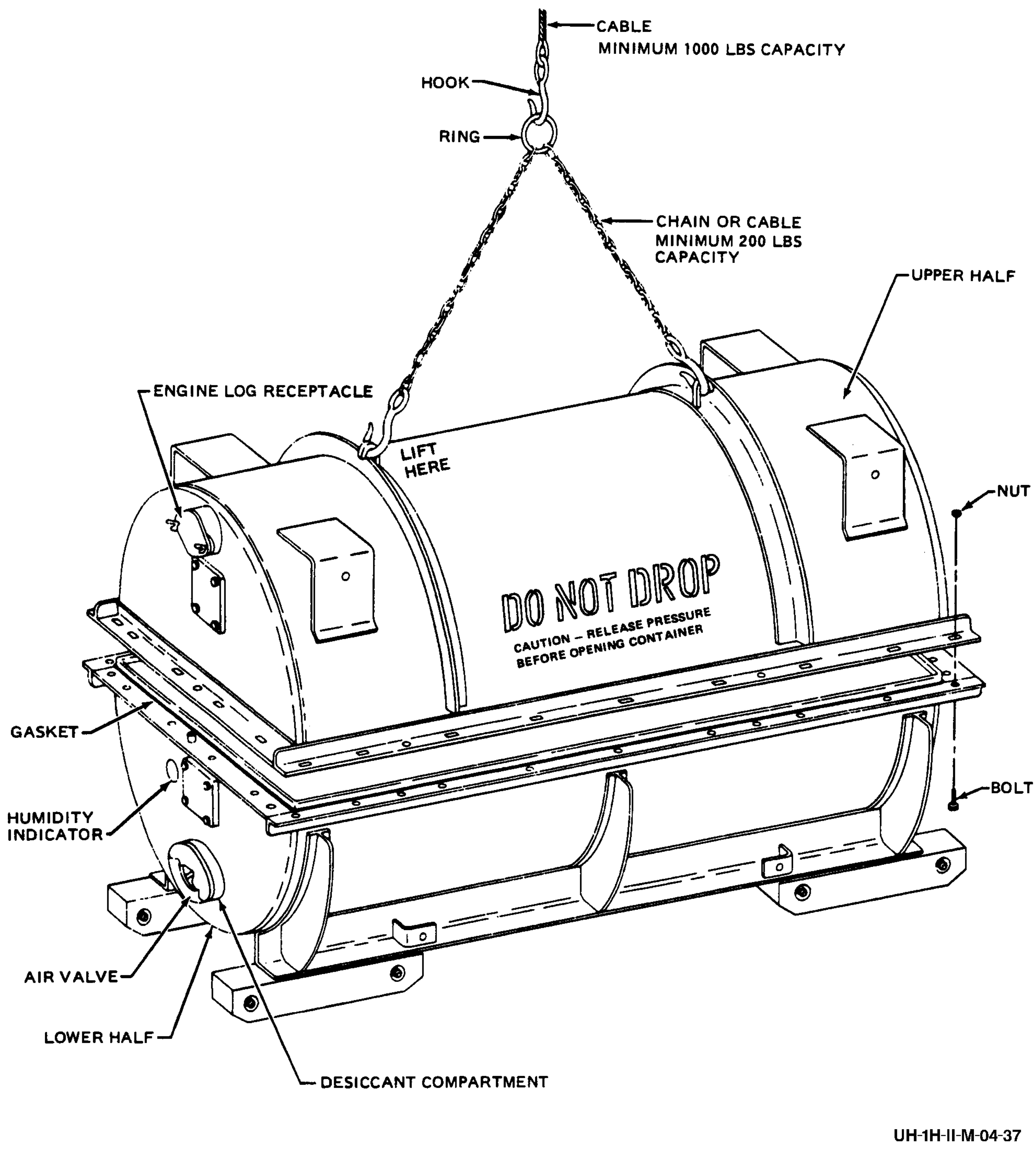


Figure 4-37. Removing shipping container cover

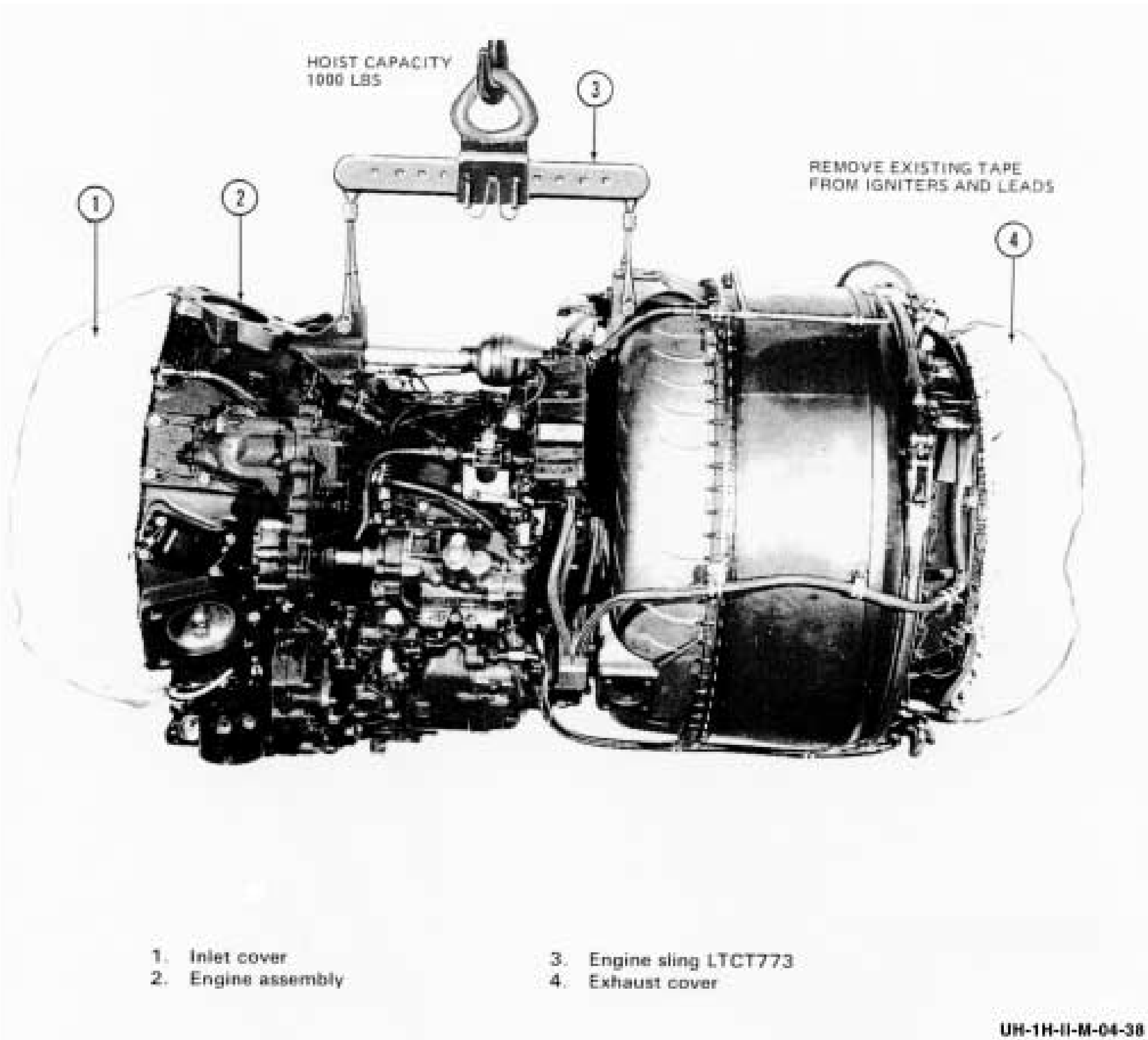


Figure 4-38. Engine sling installation

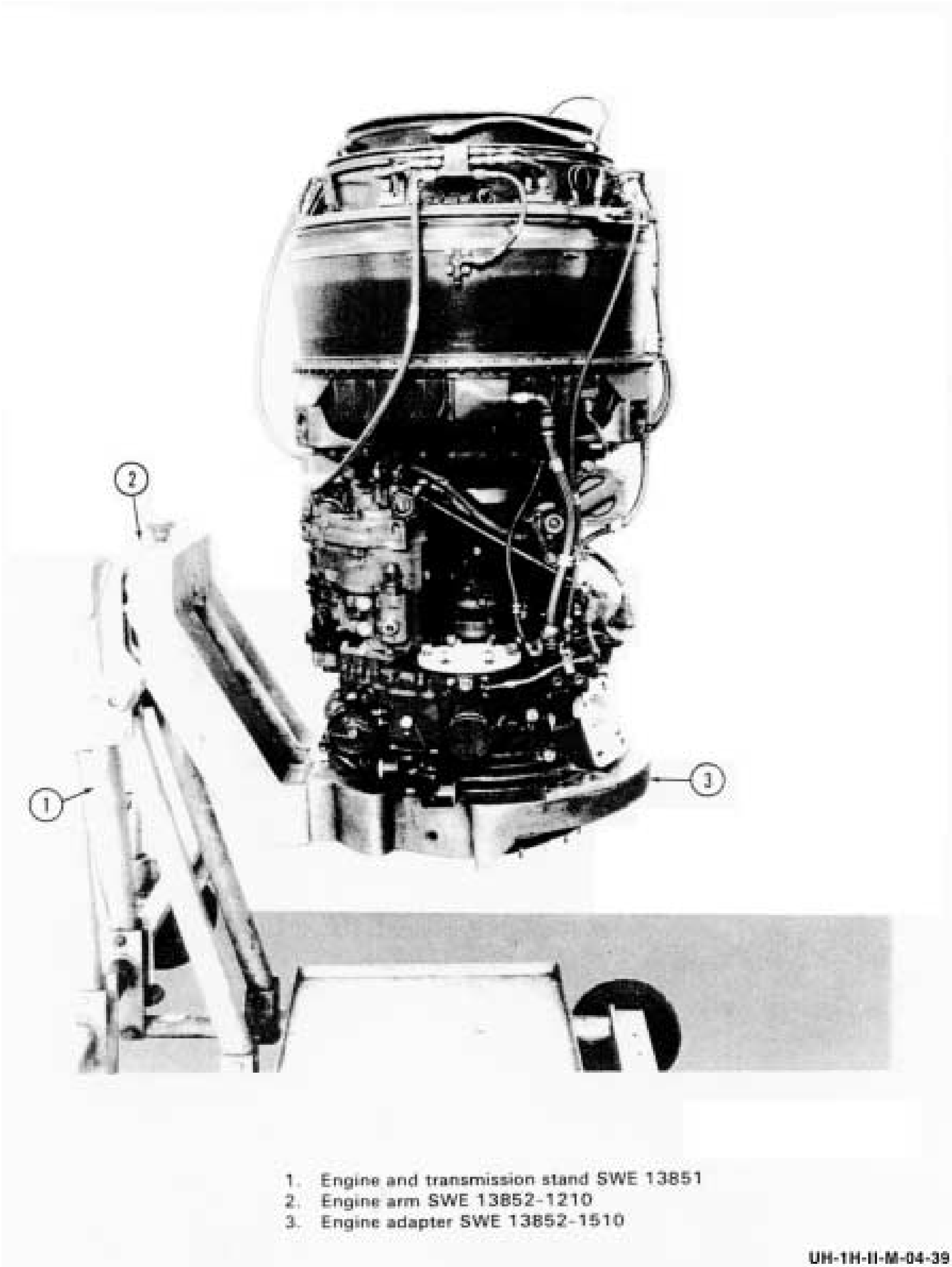
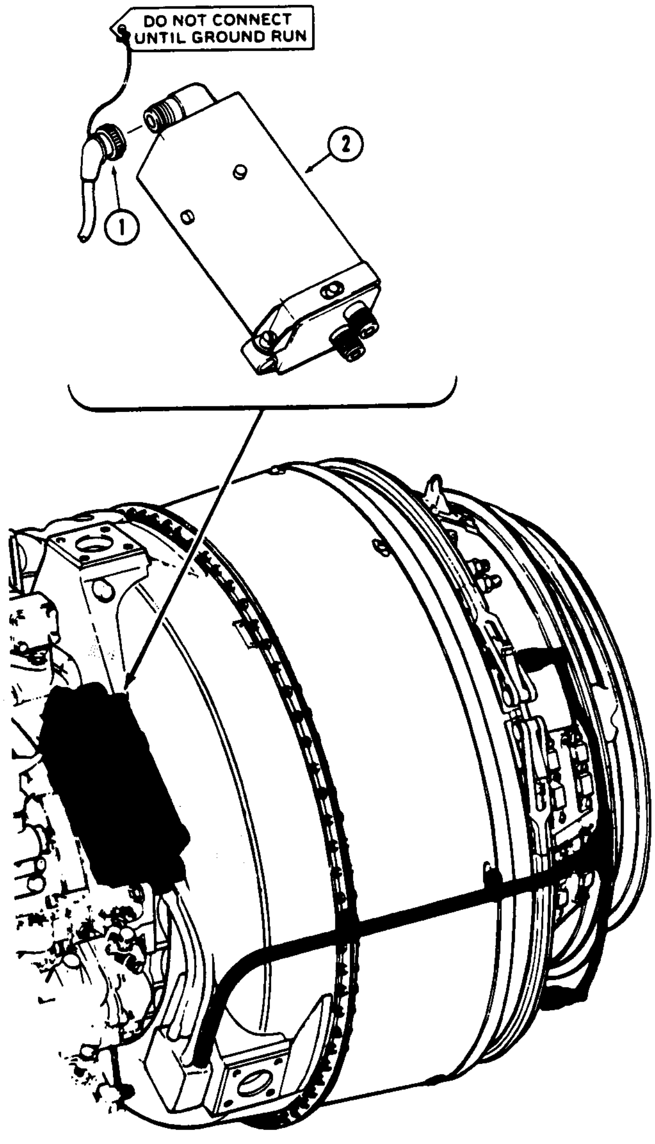


Figure 4-39. Engine build-up stand



1. Electrical lead
2. Ignition unit

UH-1H-II-M-04-40

Figure 4-40. Ignition unit

c. Release air pressure in container by removing filler valve core.

WARNING

Do not open container until completely depressurized.

d. Remove shipping container cover bolts after all pressure has been dissipated.

e. Position a suitable lift cable or chain on hoist and attach cable or chain to container cover. Cable capacity must be minimum 200 pounds. Hoist capacity must be minimum 1000 pounds. (Figure 4-37.)

CAUTION

Lift cover straight up to avoid striking or damaging the engine.

f. Remove cover from container.

g. Attach lifting sling assembly (T10) to engine attach points. (Figure 4-38.) Remove 8 engine container bolts and lift engine clear of container. Remove lockwire from 16 bolts securing four shipping mounts to engine. Remove 16 bolts and 4 mounts from engine.

h. Remove plastic cover from engine.

i. Install engine on buildup stand (T18).

NOTE

Use of a buildup stand which will allow the engine to be placed in vertical position will facilitate installation of engine accessories.

(1) Remove engine inlet cover (1, figure 4-38).

(2) Adjust hoist as necessary and guide engine into stand. (Figure 4-39.)

(3) Loosen nuts securing clamps to ring of stand and slide clamps toward outside diameter of plate. Secure clamps in this position.

(4) Guide front end of engine into opening of plate so that inlet housing is flush against rear of plate.

(5) Position clamps over inlet housing flange and tighten nuts to secure engine to plate.

(6) Remove hoist and lifting sling.

j. Remove shipping trunnions from engine mount pads.

k. Disconnect electrical lead (1, figure 4-40) from ignition unit (2). Install danger tag stating, “DO NOT CONNECT UNTIL GROUND RUN.”

l. Rotate engine in maintenance stand until in the vertical position.

m. Remove all plastic plugs from around engine inlet housing.

n. Remove existing tape from igniters and leads. Apply antiseize compound (C-440) or equivalent on igniter threads. Install igniters on engine and connect leads. Lockwire leads to existing screws on engine.

o. If another engine is not to be installed in shipping container, proceed with following:

(1) Reinstall shipping trunnions in bottom half of shipping container.

(2) Place top half of shipping container on bottom half. Install four bolts and nuts, one at each corner, and tighten fingertight. Shift upper half of container as necessary to align flange bolt holes in top and bottom halves of container.

(3) Install bolts and nut at midpoints of sides and ends of shipping container, and the bolts and nut at midpoints between them. Install all remaining bolts and nuts. Torque nuts, in order of installation, 500 to 640 inch-pounds.

(4) Install covers (previously removed) on inlet and exhaust ends of engine.

(5) Using clean dehydrated air, pressurize container 4 to 6 psi. Check container seals for leaks by applying detergent (C-355) and observing for air bubbles.

4-130. ENGINE QUICK CHANGE ASSEMBLY BUILDUP.

4-131. Firewall and Tailpipe Assembly Installation.

a. Inspect condition of parts to be installed on engine.

b. Position clamp (2, figure 4-41) and firewall (4) on engine flange with flat side of firewall down.

c. Align cowling beam support bracket (3) with the top center line of engine.

NOTE

Position clamp so there is no interference with exhaust diffuser support cone.

d. Tighten nuts on clamp (2) evenly. Torque clamp nuts 100 to 130 inch-pounds.

e. Tap around clamp (2) with soft faced mallet to ensure clamp is properly seated. Retorque nuts 100 to 130 inch-pounds.

NOTE

To install tailpipe removed from old power plant, follow steps f. through h. If new tailpipe is being installed, follow steps f. through i.

f. Position clamp (5) and tailpipe (6) on engine flange with dowel pins in tailpipe aligned with indentions in engine flange.

g. Tighten nuts on clamp evenly. Torque clamp nuts to 100 to 130 inch-pounds.

h. Tap around clamp with soft faced mallet to ensure clamp is properly seated. Retorque nuts to 100 to 130 inch-pounds.

i. Install hose (7) on fitting in bottom of tailpipe. Install bushing (8) in lower end of hose. Place gasket (9) on coupling half (10) and install coupling half in bushing (8).

4-132. Engine Mount Fittings Installation.

a. Position fitting (12, figure 4-41) on left and right side of engine and install bolts (14) with washers (13) under heads. Place bracket (11) on lower forward bolt of left fitting only.

b. Torque bolts (14) and lockwire.

c. Place bearing (15), washers (16), and nut (17) on fittings (12); torque nut.

4-133. Governor Arm and Fuel Control Shaft Lever Installation.

NOTE

Install bolts for securing lever and arm with bolts through unthreaded portion of lever and arm.

a. Remove lockwire securing existing stop arm to adjustment screw on fuel governor control shaft. Move stop arm against top stop screw.

b. Install lever (1, figure 4-42) on governor control shaft at 90 degree angle to centerline of shaft stop arm as serrations permit. Place washer (2) under head of bolt (3) and torque bolt (3) 20 to 25 inch-pounds. Lockwire (C-405) bolt (3) to lever (1).

c. Remove lockwire securing existing stop arm to adjustment screw on fuel control shaft. Install arm (52) on shaft in line with existing stop arm, with existing stop arm set against aft stop screw. Secure arm to shaft with screw (53) and torque 7 to 12 inch-pounds. Secure screw to arm with lockwire (C-405).

4-134. Trunnion, Cambox, and Linear Actuator Installation.

a. Apply zinc chromate primer (C-201) to trunnion (21, figure 4-42) and engine mounting pad. Let dry completely.

NOTE

Properly align trunnion prior to fully seating it in mounting pad.

b. Position trunnion (21) on left side of engine. Install bolts (15), one in upper forward corner and one in lower aft corner of trunnion. Snug bolts down evenly until trunnion is fully seated.

c. Remove bolt (15) from trunnion. Place thin washer (16) on short bolt and install bolt through lower forward corner of trunnion.

d. Place thin washer (16) on short bolt (15) and install through bracket (20) and lower aft holes of trunnion (21). Torque bolts 480 to 690 inch-pounds and lockwire (C-405) in pairs.

e. Position cambox assembly (14) over top mounting holes of trunnion (21). Place washer (19) on

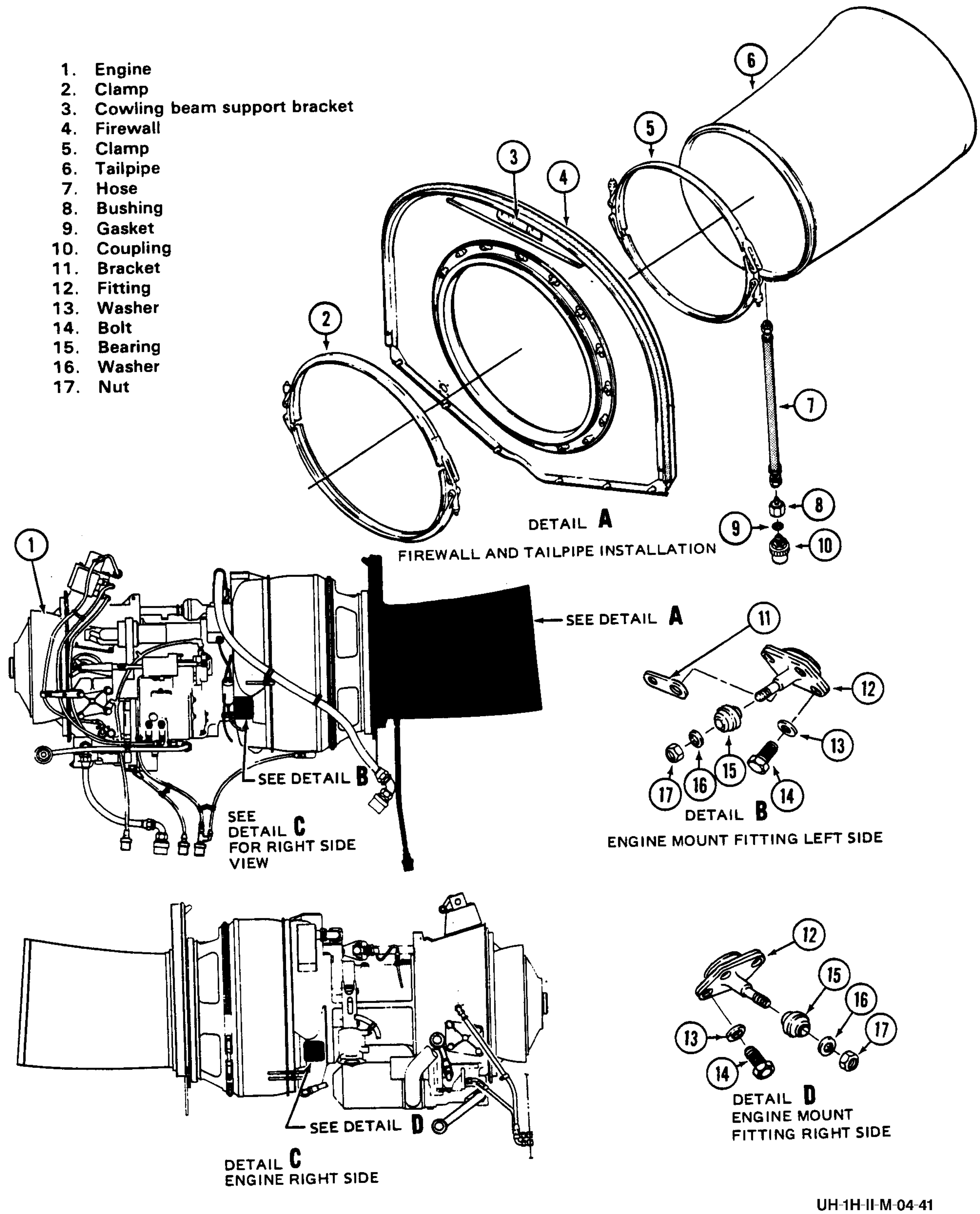
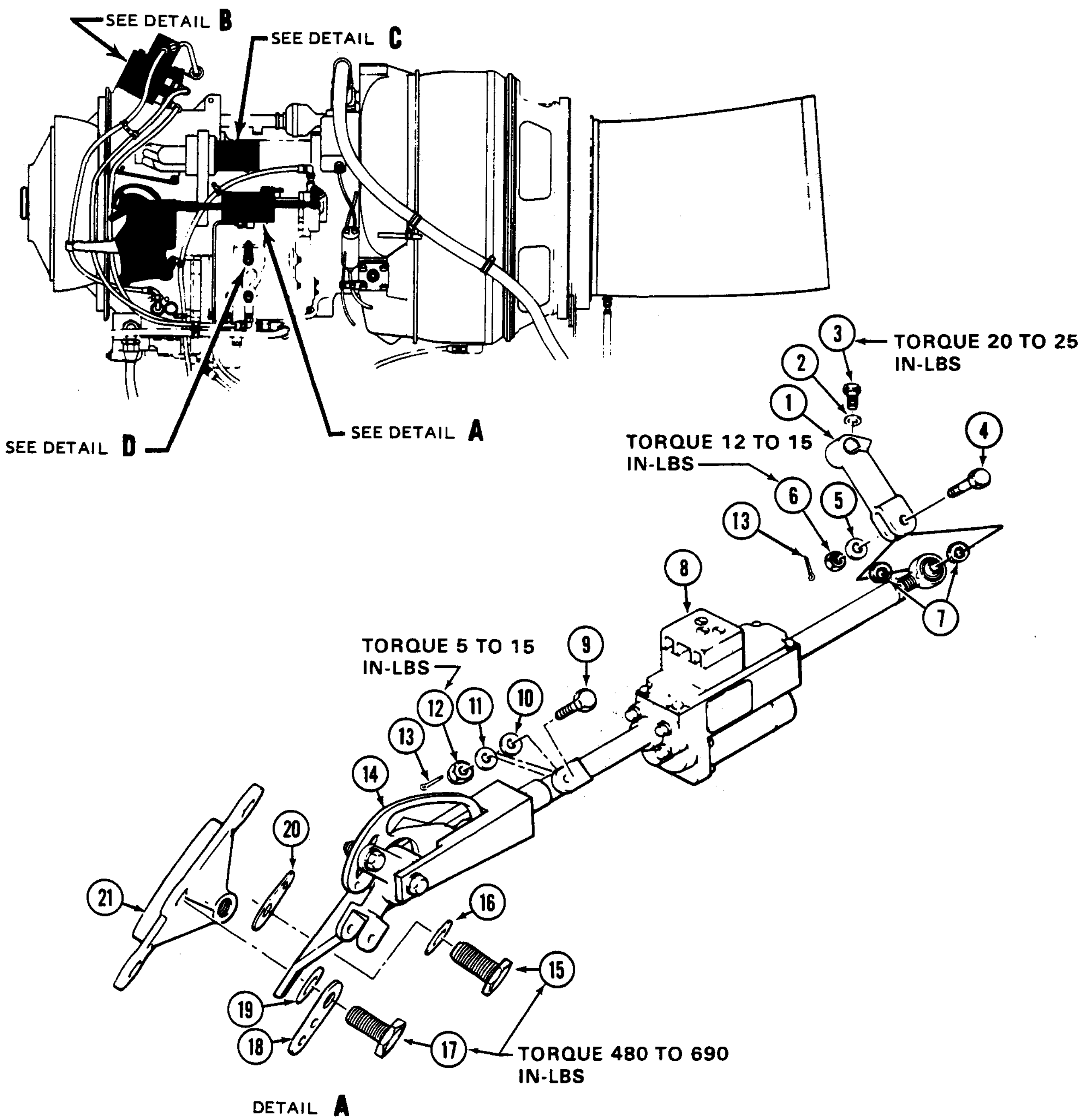


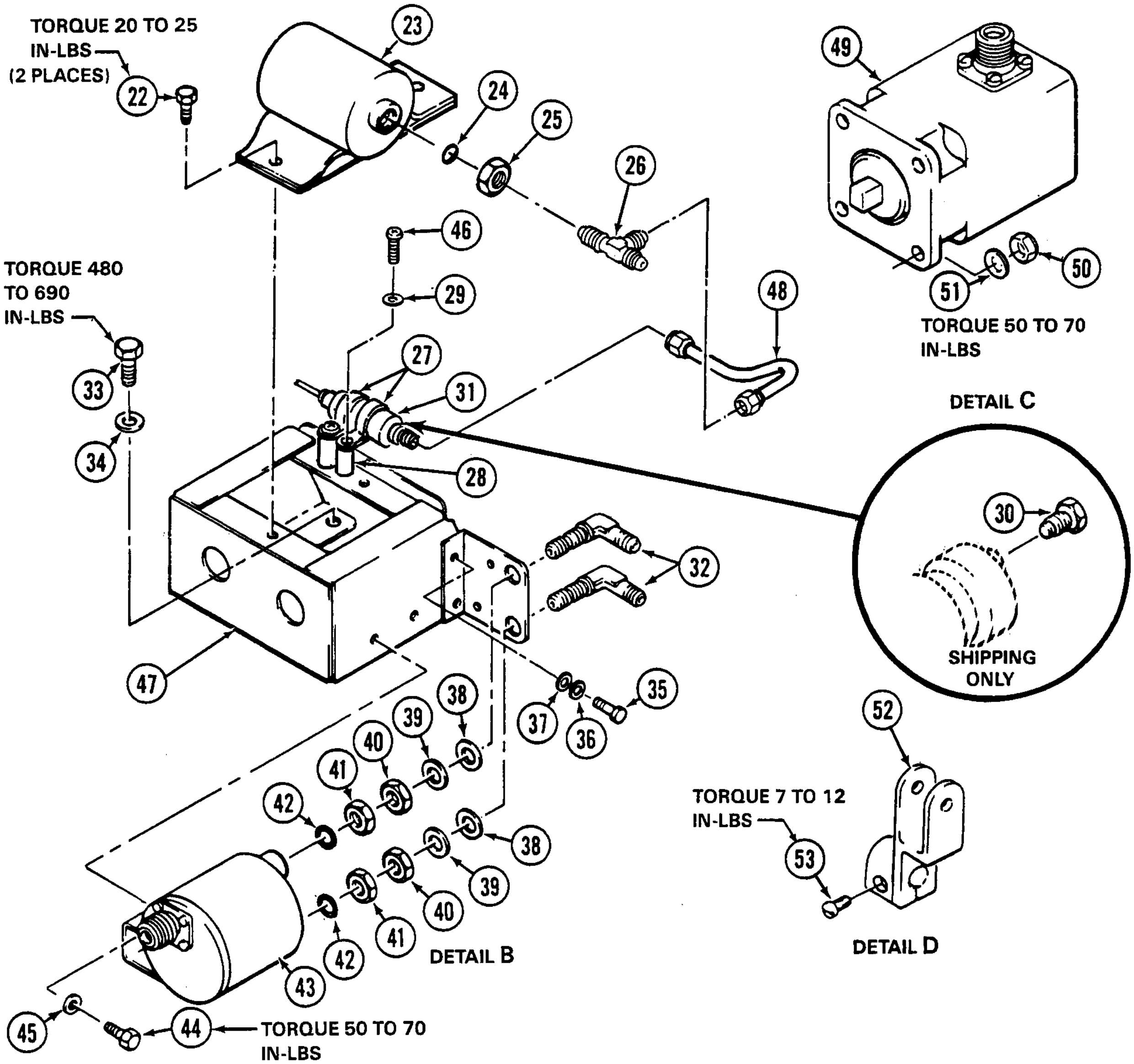
Figure 4-41. Firewall and tailpipe installation



1. Lever
2. Washer
3. Bolt
4. Bolt
5. Washer
6. Nut
7. Washer
8. Actuator, linear
9. Bolt
10. Washer
11. Washer
12. Nut
13. Cotter pin
14. Cambox assembly
15. Bolt
16. Washer
17. Bolt
18. Bracket
19. Washer
20. Bracket
21. Trunnion, left hand

UH-1H-II-M-04-42-1

Figure 4-42. Engine accessory installation — left side (Sheet 1 of 2)



22. Bolt
23. Switch, oil pressure
24. Preformed packing
25. Nut
26. Tee
27. Clamp
28. Spacer
29. Washer
30. Plug
31. Transmitter, oil pressure
32. Elbow
33. Bolt
34. Washer
35. Bolt
36. Washer
37. Washer
38. Washer
39. Washer
40. Nut
41. Nut
42. Preformed packing
43. Switch, fuel pressure
44. Nut
45. Washer
46. Screw
47. Support
48. Tube assembly
49. Tachometer generator, power turbine
50. Nut
51. Washer
52. Power lever control arm
53. Screw

UH-1H-II-M-04-42-2

Figure 4-42. Engine accessory installation — left side (Sheet 2 of 2) bolt (17) and install through upper aft holes of cambox assembly (14) and trunnion (21).

NOTE

Support (18), washer (19), and bolt (17) cannot be installed in the upper forward trunnion holes at this time. Due to the lack of space between the engine inlet housing and the maintenance stand, these items must be installed during engine installation into the helicopter or after installation on maintenance trailer.

f. Position engine governor control shaft to mid position between stops.

g. Attach linear actuator (8) to lever (1) as follows:

(1) Position linear actuator with terminal block facing up. Position rod end of linear actuator (8) in clevis of lever (1) with thin washers (7) on each side of rod end.

(2) Install bolt (4) through rod end and clevis. Place washer (5) and nut (6) on bolt (4). Torque nut (6) 12 to 15 inch-pounds and install cotter pin.

h. Attach linear actuator (8) to cambox assembly as follows:

(1) Position slider of cambox assembly (14) in clevis of linear actuator (8) with spring washer (10) positioned against lower side of slider.

(2) Install bolt (9) through slider and clevis. Install washer (11) and nut (12). Torque nut 5 to 15 inch-pounds. Install cotter pin (13).

i. Adjust linear actuator and droop compensator controls. (Paragraph 4-109 and 4-117.)

4-135. Oil Pressure Transmitter, Oil Pressure Switch, and Fuel Differential Pressure Switch Installation.

NOTE

Ensure that all openings are covered and that all unconnected hoses and lines are covered or capped after each installation.

a. Position one elbow (32, figure 4-42) through hole in bracket on support (50). Place thin washer (38) and washer (39) on elbow. Install nut (40) on elbow with inside chamfer against washer (do not tighten nut). Place nut (41) and packing (42) on elbow.

b. Repeat step a. to install remaining elbow (32).

c. Position fuel differential switch (43) to bracket on support (50) and install elbow (32) onto switch until mounting holes in switch (43) align with mounting holes in support (50).

d. Install washers (45) and bolts (44).

e. Position end of elbows (32) pointing outboard and tighten nuts (40).

f. Place packings (42) against mating surface of switch (43) and tighten nuts (41).

NOTE

If AN3-4A bolt between upper edge of bracket and support (50) is not installed, install bolt, two AN960C10 washers, and MS21042L3 self-locking nut.

g. Coat mating surfaces of engine and support (47) with zinc chromate primer (C-201) and allow to completely dry. Position support over matching holes in engine. Place washers (34) on bolts (33) and install bolts. Lockwire bolts in pairs.

h. Position transmitter (31) on support (47) and secure with clamp (27), spacer (28), washer (29), and screw (46), two places.

i. Place nut (25) and packing (24) on tee (26) and install tee in oil pressure switch (23). Position switch on support (47) with tee (26) to right and install bolts (22).

j. Attach tube assembly (48) to transmitter (31) and tee (26). Tighten nuts to secure tube assembly and tee.

4-136. Hoses, Tubes, and Attaching Parts Installation on Engine Left Side.

a. Install bleed air hose (23, figure 4-43) as follows:

(1) Remove bolts, cover and gasket from bleed air adapter on engine.

(2) Position gasket (15) on adapter (16) with fitting up and slanted 45 degrees toward the front of the engine, to engine bleed air adapter.

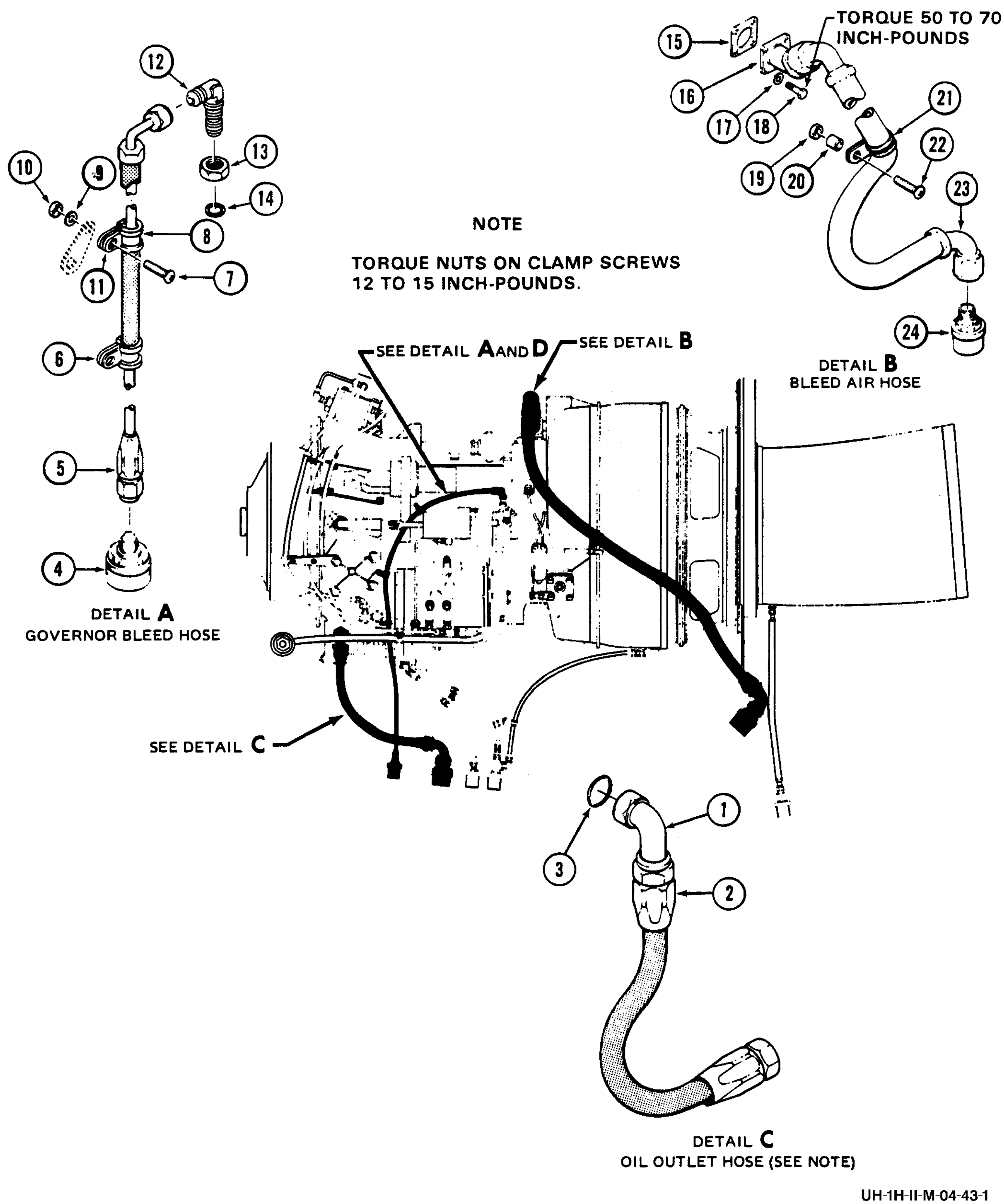
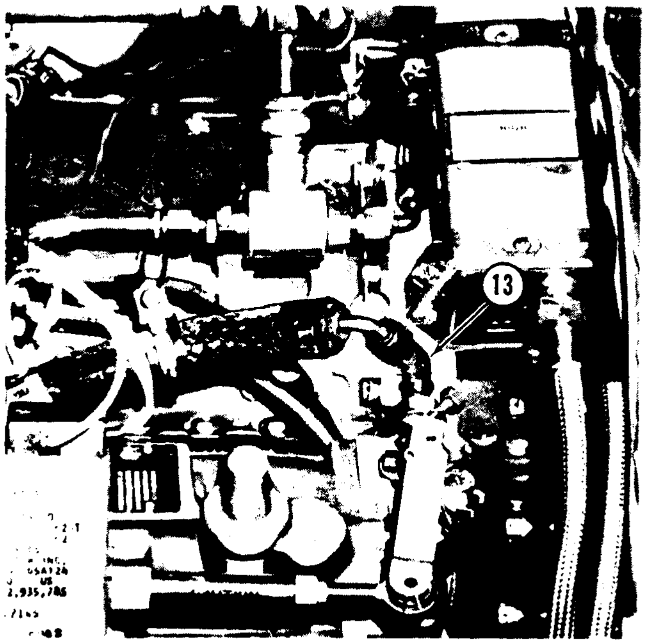


Figure 4-43. Bleed air and oil inlet hoses installation (Sheet 1 of 2)



DETAIL D

1. Elbow
2. Oil outlet hose
3. Preformed packing
4. Coupling half
5. Governor bleed hose
6. Clamp
7. Screw
8. Clamp
9. Washer
10. Nut
11. Clamp
12. Elbow
13. Nut
14. Preformed packing
15. Gasket
16. Adapter
17. Washer
18. Bolt
19. Nut
20. Spacer
21. Clamp
22. Screw
23. Bleed air hose
24. Coupling half

UH-1H-II-M-04-43-2

Figure 4-43. Bleed air and oil inlet hoses installation (Sheet 2 of 2)

(3) Install hose (23) and adapter (16).

(4) Install coupling half (24) on other end of hose (23).

(5) Remove existing screw and nut, attaching clamp on ignition lead to bracket on flange of combustion turbine. Retain nut for use on clamp installation.

(6) Position clamp (21) on hose (23). Install screw (22) through clamp (21), spacer (20) and clamp on ignition lead; reinstall nut (19).

(7) Install hose assembly (23) on engine using washers (17) and bolts (18), four places.

(8) Torque bolts (18) 50 to 70 inch-pounds and lockwire (C-405) in pairs.

b. Install governor bleed hose (5) as follows:

(1) Remove shipping plug from overspeed governor post above governor control shaft.

(2) Place nut (13) and packing (14) on elbow (12). Install elbow in port and tighten nut to secure elbow in position. (Detail D, Figure 4-43.)

(3) Install hose (5) on elbow (12) and route hose down between the overspeed governor body and next to the compressor case.

(4) Place clamp (8) on hose and attach to support on engine mount trunnion with screw (7), washer (9), and nut (10).

(5) Place clamps (6) and (11) on hose; do not secure at this time.

c. Install oil outlet hose (2) as follows:

(1) Remove shipping plug from engine oil pump port.

(2) Install preformed packing (3) on elbow (1) and install in oil pump port. Torque elbow (1) nut at oil pump port 300 to 325 inch-pounds.

(3) Install hose (2) on elbow (1) and torque 750 to 850 inch-pounds.

d. Install fuel pump and combustion chamber drain hoses as follows:

(1) Remove shipping plugs from overspeed governor and fuel control drain ports.

(2) Place packing (10, figure 4-44) on reducer (9) and install reducer in overspeed governor drain port.

(3) Place nut (6) and packing (5) on tee (7) and install tee in fuel control drain port.

(4) Install tube assembly (8) between reducer (9) and tee (7), turning tee to align. Tighten nut (6) to secure tee in position.

(5) Install hose (17) on tee (7). Install reducer (18), packing (19), tee (20), packing (23), and coupling half (24) on lower end of hose.

(6) Install hose (16) on drain port on bottom of combustion chamber.

(7) Install packing (21) on union (22) and install in tee (20). Connect hose (16) to union (22).

(8) Remove shipping plug from starter-generator pad left hand drain port. Place packing (4) on restrictor (3) and install in port. Connect hose (2) to restrictor and install coupling half (1) in lower end of hose. (Detail B, figure 4-44.)

(9) Position clamp (13) on hose (2) and clamp (15) on hose (17) and secure with screw (14), washer (12), and nut (11).

(10) Position clamp (15) on hose (16) and clamp (13) on hose (17) and secure with screw (14), washer (12), and nut (11). Torque screw 12 to 15 inch-pounds.

e. Install pressure transmitting hoses as follows:

(1) Connect hose (1, figure 4-45) to oil pressure switch. Connect hose (3) with 45 degree elbow to upper elbow in fuel differential switch and hose (2) with 45 degree elbow to lower elbow.

(2) Remove lower forward mount bolt (19) and washer 918) from overspeed governor tachometer drive assembly. Place support (17) on bolt. Reinstall bolt and washer and lockwire bolt.

(3) Remove plugs from lower set of ports in fuel control directly above fuel control data plate. Place

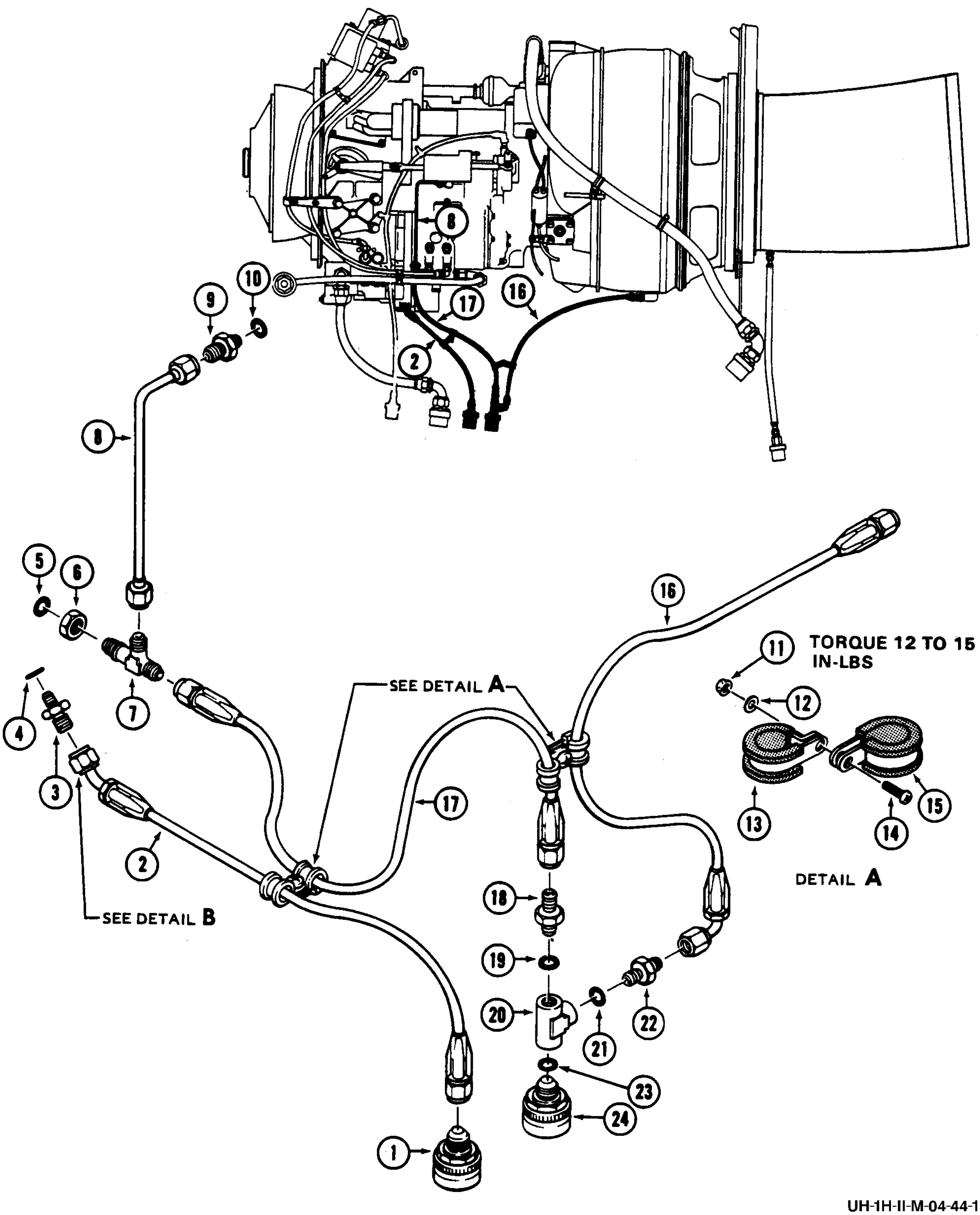
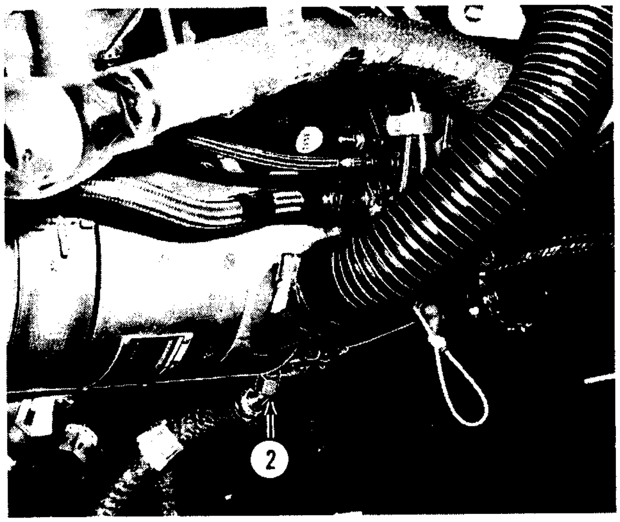


Figure 4-44. Fuel and oil drain hoses installation (Sheet 1 of 2)



DETAIL B

1. Coupling half	13. Clamp
2. Hose	14. Screw
3. Restrictor	15. Clamp
4. Packing	16. Hose
5. Packing	17. Hose
6. Nut	18. Reducer
7. Tee	19. Packing
8. Tube assembly	20. Tee
9. Reducer	21. Packing
10. Packing	22. Union
11. Nut	23. Packing
12. Washer	24. Coupling half

UH-1H-II-M-04-44-2

Figure 4-44. Fuel and oil drain hoses installation (Sheet 2 of 2)

packing (5) on restrictor (4) and install in forward port. Place packing (6) on restrictor (7) and install in aft port. Install hose (2) on restrictor (4). Install hose (3) on restrictor (7).

(4) Remove shipping plug from port in oil filter. Place nut (9) and gasket (10) on restrictor (8) and install restrictor in port. Position restrictor, pointing upward, and secure with nut (9). Install hose (1) on restrictor (8).

(5) Position clamp (34) on hose (1) and clamp (35) on hose (3). Secure clamps together with screw (36), washer (33), and nut (32).

NOTE

Steps (6) through (9) cannot be completed at this time due to the lack of space between the engine inlet housing and the maintenance stand. These items must be installed during engine installation.

(6) Position clamp (22) on hose (3) and clamp (21) on hose (2). Secure clamps to support (17) with screw (20), washer (6), and nut (15).

(7) Position clamp (40) on hose (2) and clamp (38) on hose (3). Secure to inboard hole in support on engine mount bolt with screw (39), washer (41), and nut (42).

(8) Position clamp (46) on hose (1). Secure outboard hole in support on engine mount bolt with screw (37), spacer (45), washer (44), and nut (43).

(9) Position clamp (30) on hose (2) and secure to clamp (6, figure 4-43) on governor bleed hose with screw (31, figure 4-45), washer (29), and nut (28).

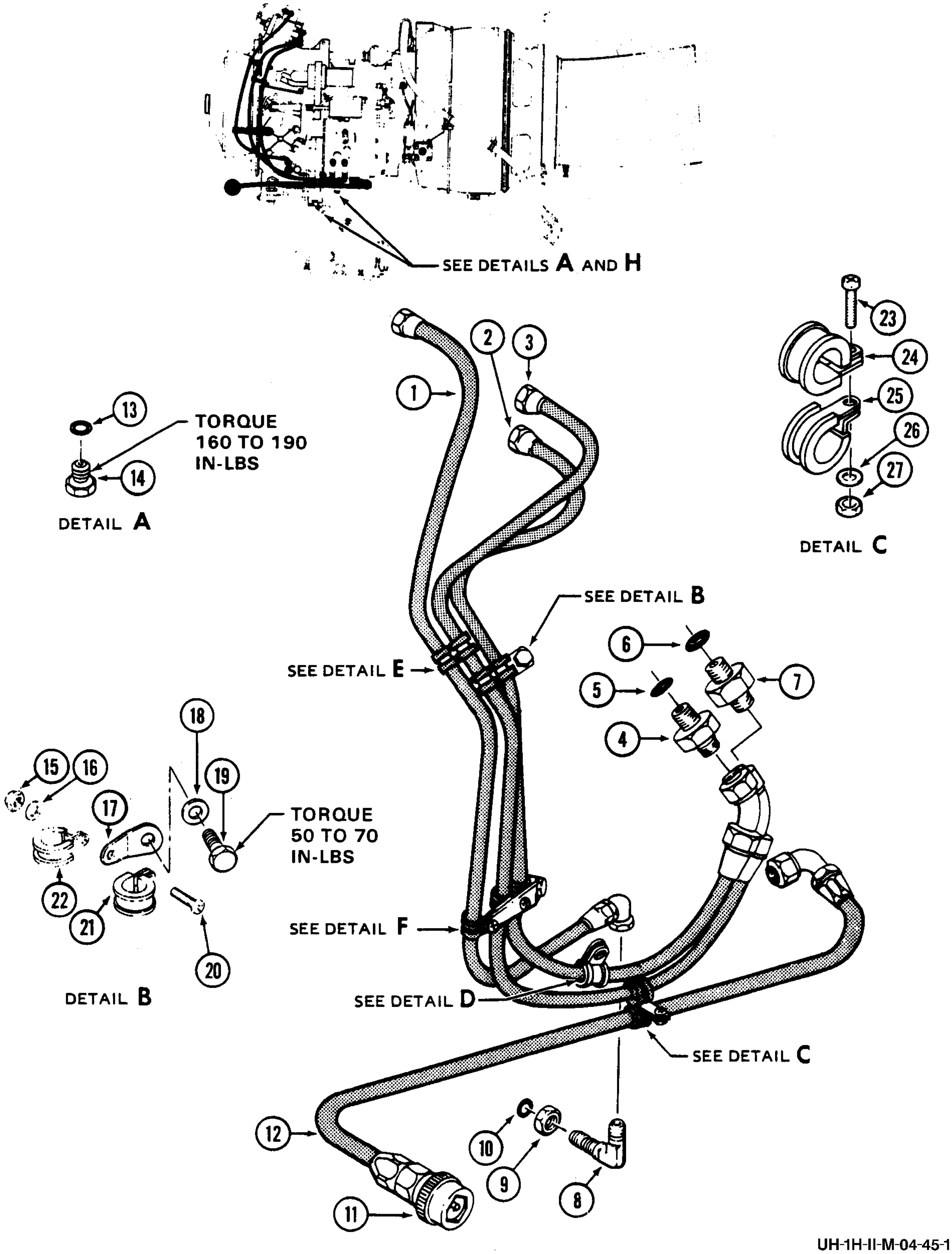
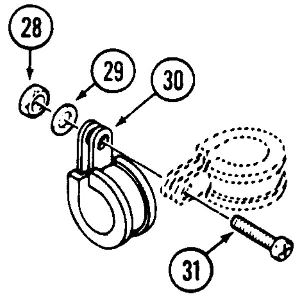
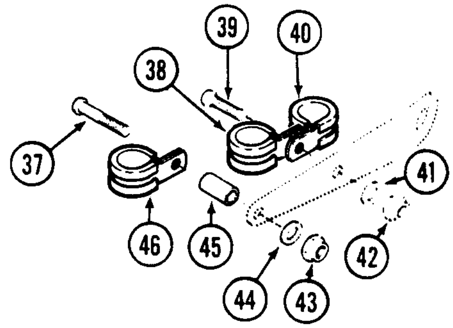


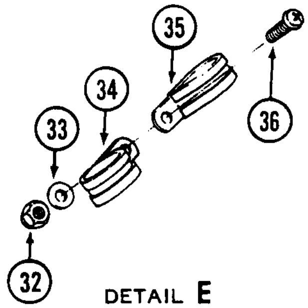
Figure 4-45. Pressure transmitting and fuel inlet hoses installation (Sheet 1 of 3)



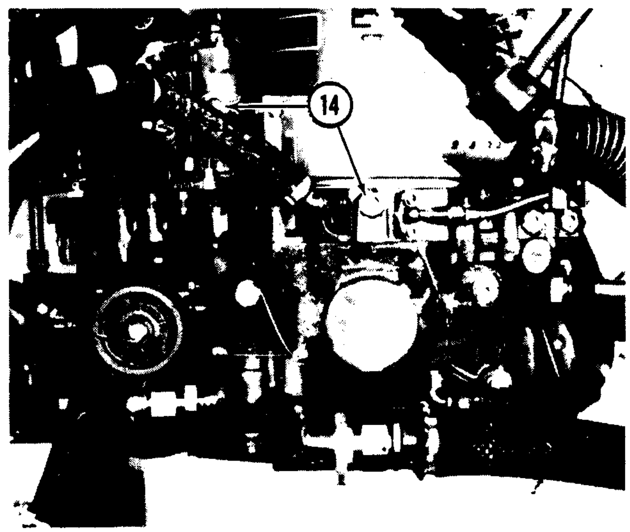
DETAIL D



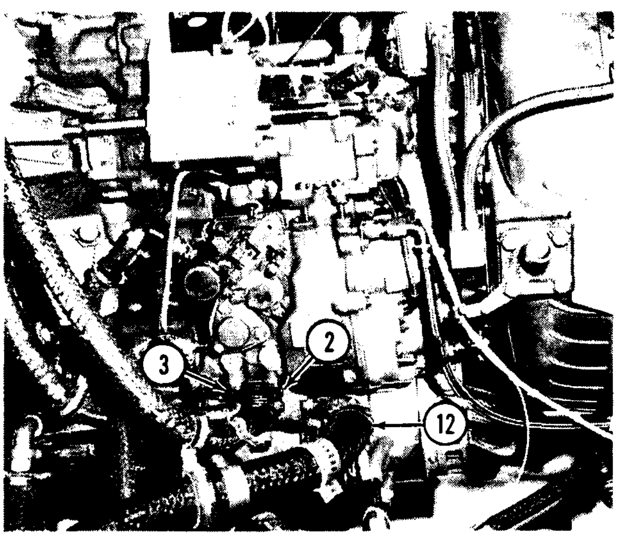
DETAIL F



DETAIL E



DETAIL H



DETAIL G

NOTE

TORQUE NUTS ON CLAMP SCREWS 12 TO 15 INCH-POUNDS.

UH-1H-II-M-04-45-2

Figure 4-45. Pressure transmitting and fuel inlet hoses installation (Sheet 2 of 3)

1.	Hose	24.	Clamp
2.	Hose	25.	Clamp
3.	Hose	26.	Washer
4.	Restrictor	27.	Nut
5.	Preformed packing	28.	Nut
6.	Preformed packing	29.	Washer
7.	Restrictor	30.	Clamp
8.	Restrictor	31.	Screw
9.	Nut	32.	Nut
10.	Gasket	33.	Washer
11.	Coupling	34.	Clamp
12.	Fuel inlet hose	35.	Clamp
13.	Preformed packing	36.	Screw
14.	Plug	37.	Screw
15.	Nut	38.	Clamp
16.	Washer	39.	Screw
17.	Support	40.	Clamp
18.	Washer	41.	Washer
19.	Bolt	42.	Nut
20.	Screw	43.	Nut
21.	Clamp	44.	Washer
22.	Clamp	45.	Spacer
23.	Screw	46.	Clamp

UH-1H-II-M-04-45-3

Figure 4-45. Pressure transmitting and fuel inlet hoses installation (Sheet 3 of 3)

f. Install fuel inlet hose (12) on fitting at bottom of fuel control. (Detail G, figure 4-45.) Install coupling half (11) on other end of hose.

g. Position clamp (25) on hose (12) and clamp (24) on hose (3) and secure with screw (23), washer (26), and nut (27).

h. Remove shipping plugs from bottom of fuel control inlet and bottom of accessory gear case. Install plug (14) with packing (13) in each port. Torque plugs 160 to 190 inch-pounds. Lockwire (C-405) plugs. (Detail H, figure 4-45.)

4-137. Hoses and Attaching Parts — Installation on Engine Right Side.

a. Remove shipping plug from port on forward right side of accessory gearbox. Place packing (1, figure 4-46) on union (2) and install in port. Connect hose (3) to union (2). (Detail A, figure 4-46.)

b. Remove shipping plug from torque pressure port. Place packing (6, figure 4-46) on restrictor (5) and install restrictor in torque pressure port (16). Connect hose (4) to restrictor (5).

c. Remove shipping plug from port on right side of oil pump. Place packing (7) on fitting (8) and install in port. (Detail D, figure 4-46.)

d. Connect oil inlet hose (9) to fitting (8) and install coupling half (10) on opposite end of hose.

e. Remove shipping plug from port forward of tachometer generator drive. Place packing (11) on union (12) and install in port. (Detail C, figure 4-46.)

f. Connect engine breather hose (13) to union (12) and install coupling half (14) on opposite end of hose. (Detail C, figure 4-46.)

g. Install trunnion (right hand) (19) on engine and secure with bolts and washer (17 and 18). Install trunnion with center bolt hole towards top and front of engine. Lockwire (C-405) bolts (17) in pairs.

4-138. Starter-Generator Installation.

NOTE

Retain shipping covers, plugs and hardware for installation on

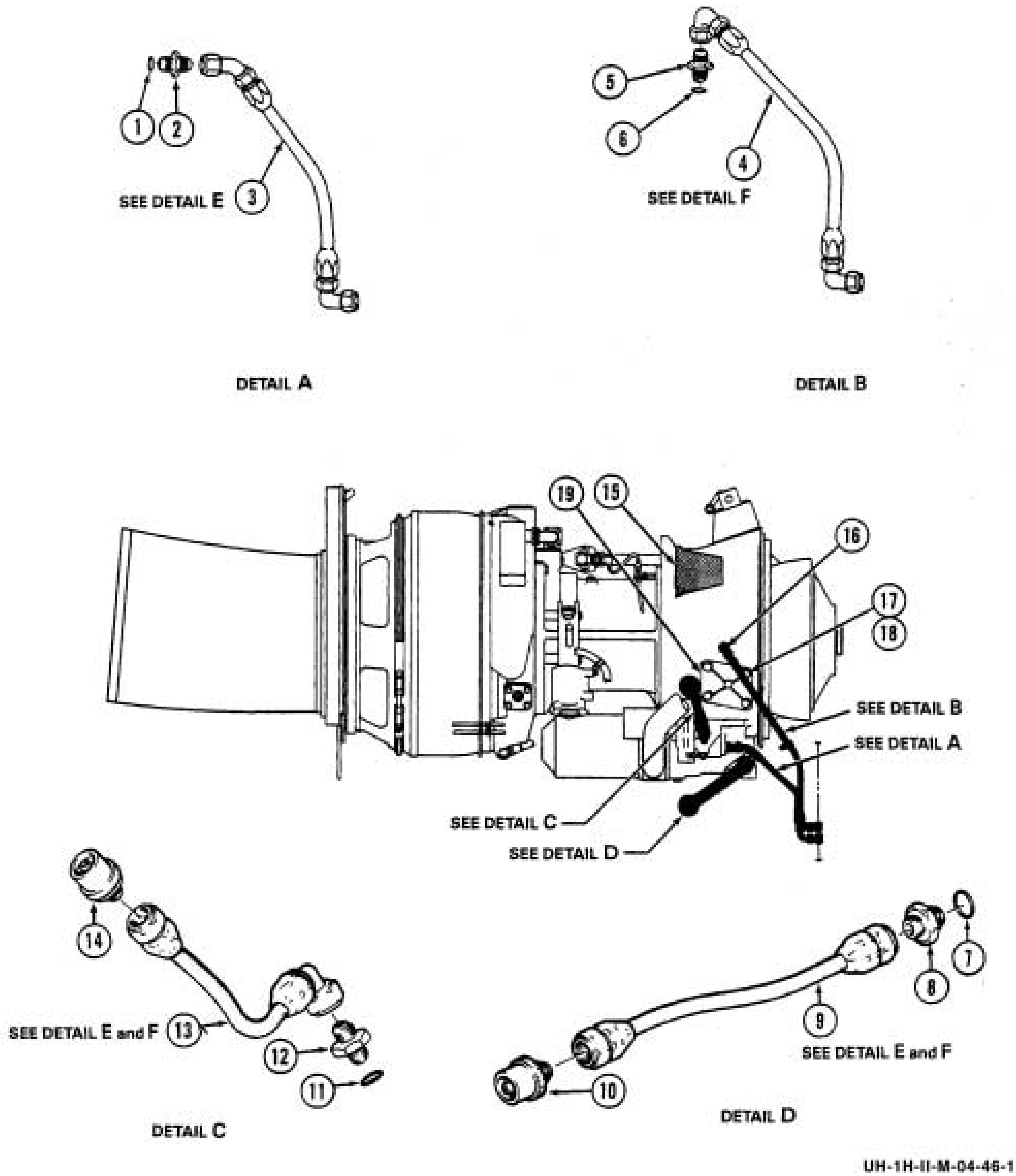
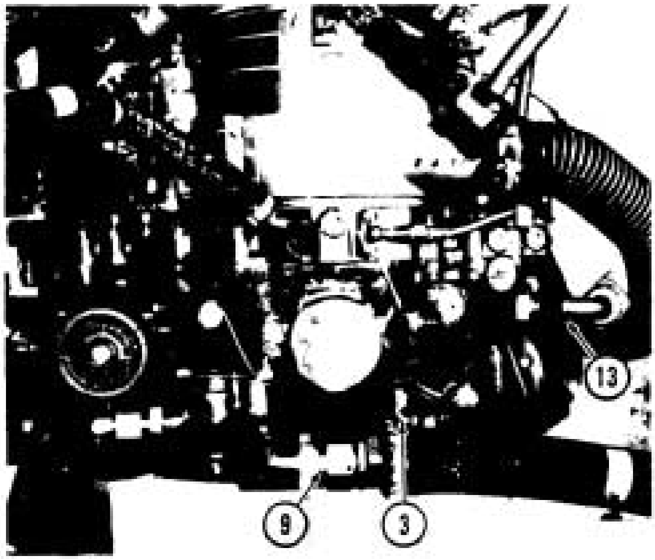
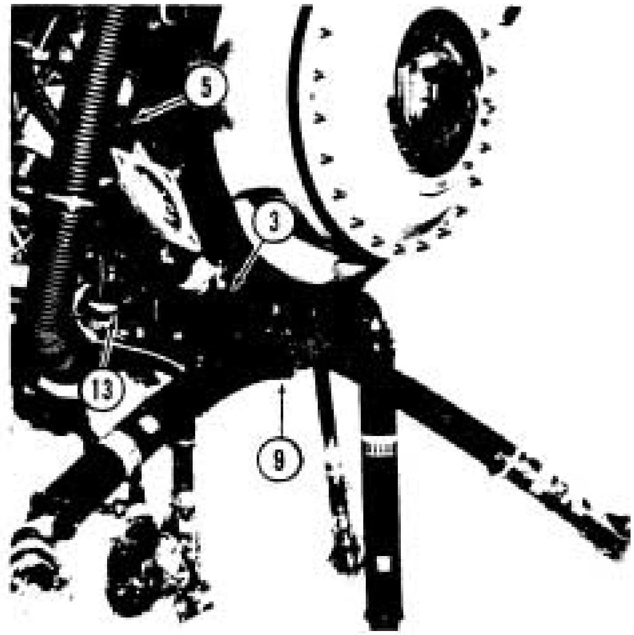


Figure 4-46. Engine hoses installation — right side (Sheet 1 of 2)



DETAIL E



DETAIL F

1. Packing
2. Union
3. Torquemeter vent hose
4. Torquemeter pressure hose
5. Restrictor
6. Packing
7. Packing
8. Fitting
9. Oil inlet hose
10. Coupling half
11. Packing
12. Union
13. Engine breather hose
14. Coupling half
15. Cover
16. Torque pressure port
17. Bolt
18. Washer
19. Trunnion

UH-1H-II-M-04-46-2

Figure 4-46. Engine hoses installation — right side (Sheet 2 of 2)

unserviceable engine, during preservation, for return to overhaul. Retain six nuts, six washers, and gasket for use when installing starter.

a. Remove nuts (16, figure 4-47) and washers (15) and remove shipping cover from starter-generator mounting pad.

b. Inspect gasket on mounting pad for serviceability. Replace gasket if necessary.

NOTE

Due to inaccessibility, upper left nut and washer may be omitted.

c. To aid in starter-generator installation, washers (15) may be cemented to nuts (16) using adhesive (C-317) or equivalent. Install nuts (16) and washers (15) on starter-generator mounting studs.

d. Coat starter-generator shaft and pack female splines in gearbox 2/3 full with lubricant (C-012). Position inlet shroud (11) on starter-generator (14) with flange of shroud toward starter-generator mounting flange. Install bolts (12) with washers (13) under head; do not tighten at this time.

e. Position the brush inspection cover clamp screw (1, figure 4-48) to approximately the 3 o'clock position.

f. Lockwire (C-405) screws (2) located around the rear housing of the starter.

g. Position starter-generator (14, figure 4-47) on drive splines and mounting studs with electrical terminals pointing to seven o'clock position.

NOTE

Shaft splines may be aligned by rotating the N1 tachometer generator drive with a 1/4 inch drive extension.

h. Slide starter-generator onto mounting studs over nuts and washers until flush with mounting pad. Rotate starter-generator to lock in small end of holes on mounting flange. Torque nuts (16) 160 to 190 inch-pounds.

NOTE

Mark serial number of starter-generator on end of case to permit ease of checking number after engine is installed in helicopter. Use a contrasting color paint.

i. Position inlet shroud (11, figure 4-47) over starter-generator air inlet ports with hose connection on right side of starter and torque bolts (12) 20 to 25 inch-pounds.

NOTE

The hose connection of shroud must be horizontal.

j. Secure flex hose (9) to inlet shroud (11) with clamp (10). Flex hose and sleeve (21 and 22) may be used as alternates.

k. Remove lower forward bolt (2) with washer (1) from cover (20) on inlet housing. Place bracket (4) under bolt and install washer and bolt. Tighten to finger tight only at this time.

l. Route flex hose (9) upward and position and secure to bracket (4) by attaching clamp (5), screw (3), washer (8) and nut (7). Torque nut (7) 25 to 30 inch-pounds.

m. Torque bolt (2) 260 to 190 inch-pounds. Lockwire (C-405) after engine is installed.

n. Place clamp (6) around upper end of flex hose, to be used when installing engine in aircraft.

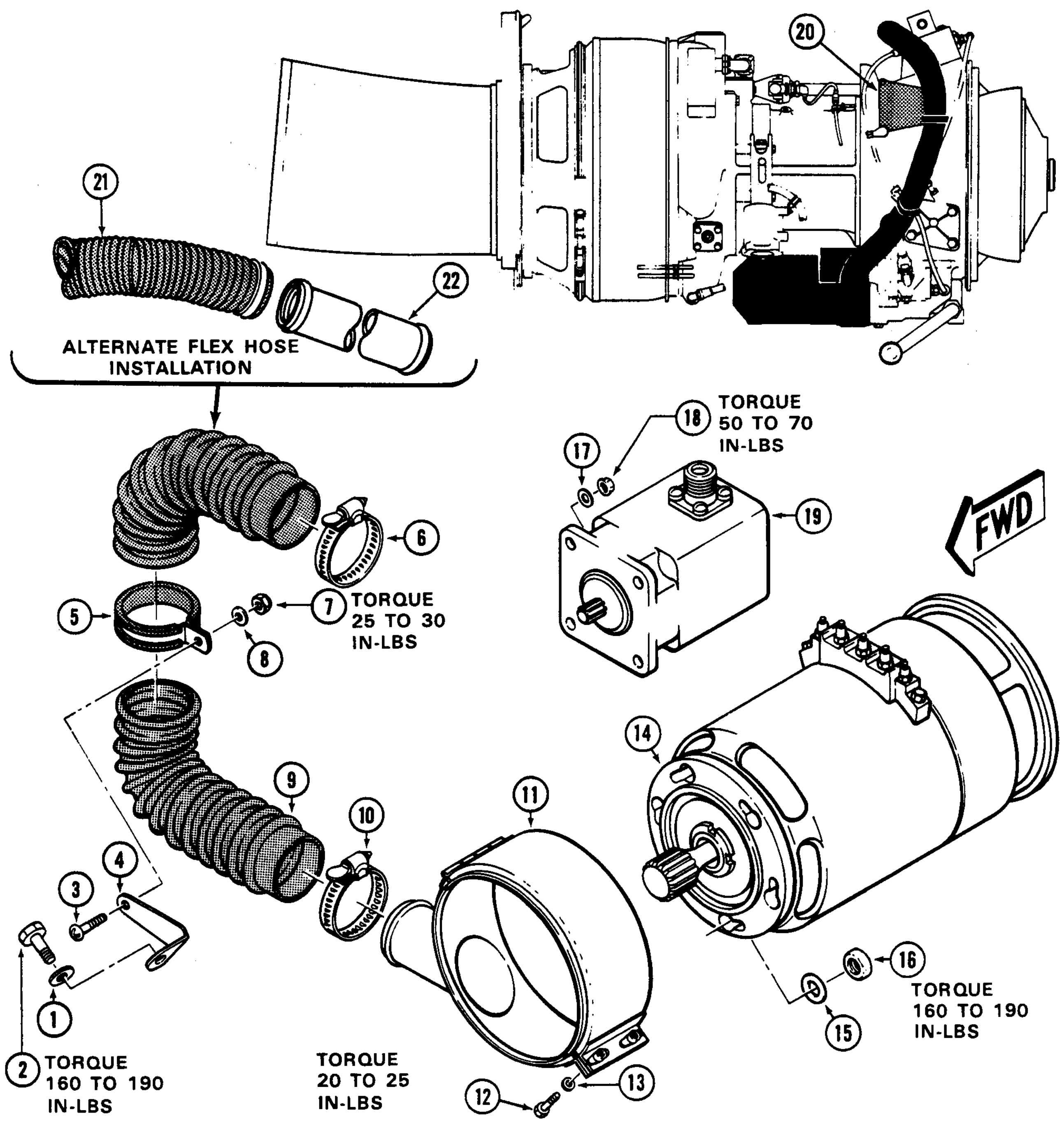
4-139. Gas Producer Tachometer Generator Installation.

a. Remove nuts (18, figure 4-47) and washer (17) and remove shipping cover from tachometer generator mounting pad, located on aft right side of accessory gear box.

b. Inspect gasket on mounting pad for serviceability. Replace gasket if necessary.

c. Lubricate tachometer shaft with lubricant (C-012).

d. Position tachometer generator (19) on mounting pad with electrical receptacle pointing to top of engine.



1. Washer
2. Bolt
3. Screw
4. Bracket
5. Clamp
6. Clamp
7. Nut
8. Washer
9. Flex hose (one piece)
10. Clamp
11. Inlet shroud
12. Bolt
13. Washer
14. Starter-generator
15. Washer
16. Nut
17. Washer
18. Nut
19. Tachometer generator, gas producer
20. Cover

UH-1H-II-M-04-47

Figure 4-47. Starter-generator and gas producer tachometer generator installation

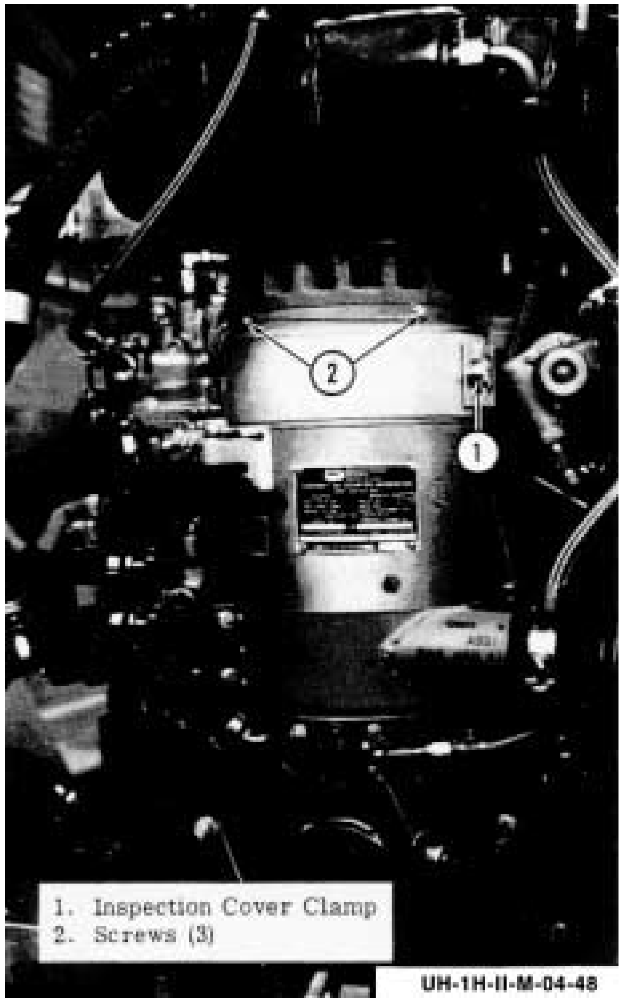


Figure 4-48. Starter-generator installation

e. Install washers (17) and nuts (18). Torque nuts (18) 50 to 70 inch-pounds. Install lockwire (C-405) and electrical connector.

4-140. Power Turbine Tachometer Generator Installation.

a. Remove nuts (50, figure 4-42) and washers (51) and remove shipping cover from tachometer generator mounting pad.

b. Inspect gasket on mounting pad for serviceability. Replace gasket if necessary.

c. Lubricate tachometer shaft with lubricant (C-012).

d. Position tachometer generator (49) on mounting pad with electrical receptacle pointing to top of engine.

e. Install washers (51) and nuts (50). Torque nuts (50) 50 to 70 inch-pounds. Install lockwire (C-405) and electrical connector.

4-141. Power Plant Electrical Cable Installation.

NOTE

Refer to Appendix F for wiring or connector identification.

a. Install nipples (5, figure 4-49) over ends of wires of starter-generator cable (7) as follows:

(1) One nipple on wires K5C4 and K5A4.

(2) One nipple on wire P37A1.

(3) One nipple on wires K4B4 and K4D4.

b. Remove nuts and washers from terminals C, B and E of starter-generator.

NOTE

If terminals of starter-generator are too short, thin washers may be used.

c. Position wires K5C4 and K5A4 on terminal E, wire P37A1 on terminal B, and wires K4B4 and K4D4 on terminal C. Reinstall washers and nuts. Place nipples (5) over terminals and secure with nylon cord (C-480).

d. Position power plant cable (1) on power plant and connect and lockwire (C-405) electrical connector (4) to engine electrical receptacle.

e. Connect electrical connector (3) to oil pressure transmitter. Connect electrical connector (2) to fuel pressure differential switch. Lockwire electrical connector (3, figure 4-49). Connect and lockwire (C-405) electrical connector (2) to oil pressure switch.

f. Connect electrical cable for oil pressure transmitter to transmitter support with clamp (21, figure 4-49) screw (22), spacer (20), washer (19) and nut (18) as shown in Detail B.

g. Secure bracket (11) and bracket (16) together with screw (17), washer (13), and nut (12).Mount bracket (16) on upper forward bolt forward of tachometer-generator drive.

h. Secure electrical cable to bracket (11) with clamp (10), screw (9), washer (15), and nut (14) as shown in Detail A.

NOTE

Step i. cannot be accomplished at this time, due to the lack of space between the engine inlet housing and the maintenance stand. This item must be installed during engine installation.

i. Remove nut from screw through outboard hole of support. Position clamp (8) on electrical cable and secure with removed nut.

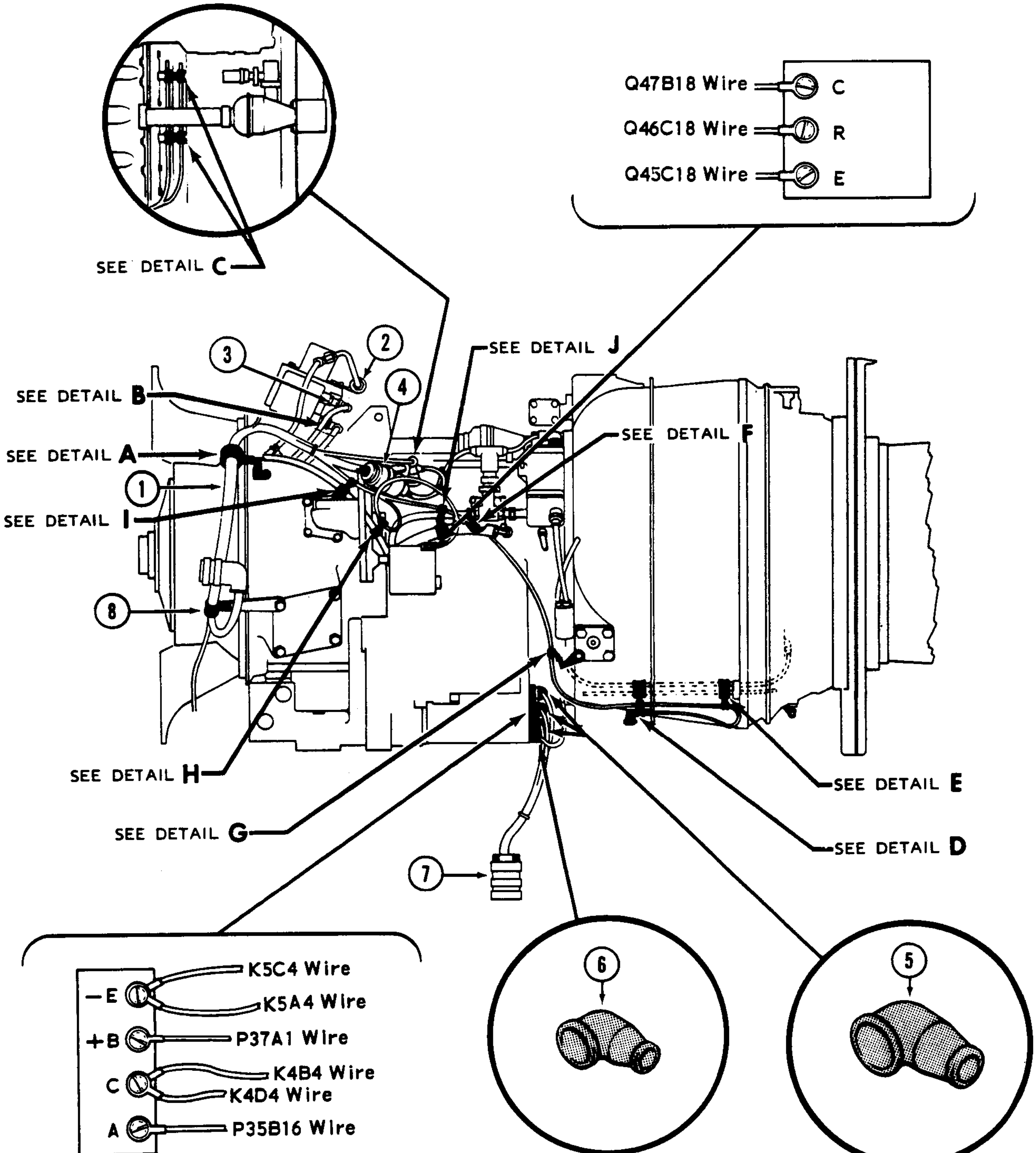
j. Secure wiring to support on aft upper mounting bolt for tachometer-generator drive by removing screw, nut and washer holding clamp for air pressure- sensing hose to support. Position clamp (60) on wiring and reinstall screw, washer, and nut as shown in Detail I.

k. Secure wires for linear actuator to engine air pressure-sensing hose by positioning clamp (59) on hose and clamp (57) on wires. Secure with screw (58), washer (56), and nut (55) as shown in Detail H.

l. Remove cover from linear actuator and connect wiring (Figure 4-49) as follows:

(1) Connect wire Q47B18 to terminal C.

(2) Connect wire Q46C18 to terminal R.



NOTE

TORQUE ALL 3/16 INCH NUTS ON CLAMP SCREWS 12 TO 15 INCH-POUNDS.

UH-1H-II-M-04-49-1

Figure 4-49. Electrical cable installation — left side (Sheet 1 of 3)

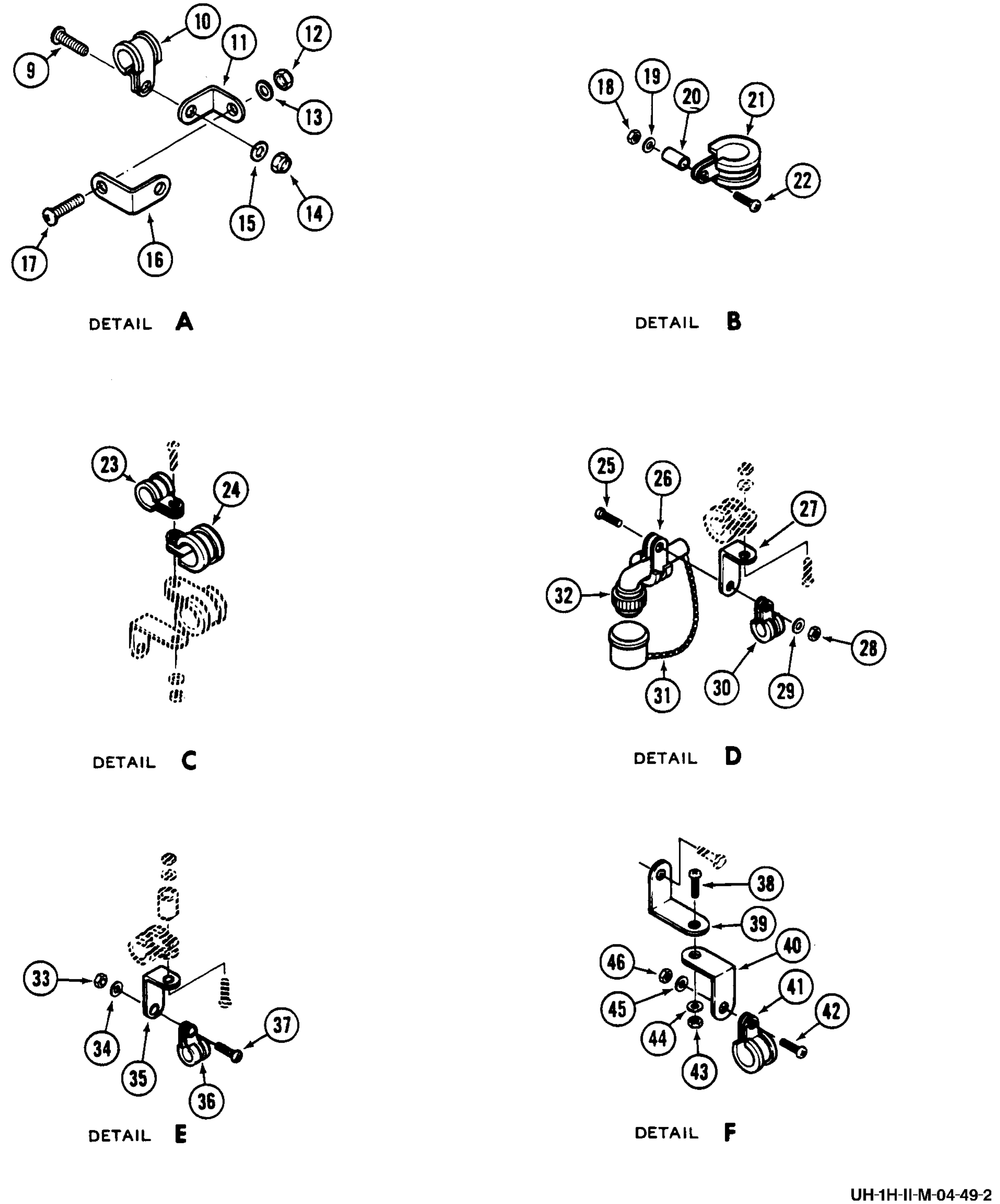
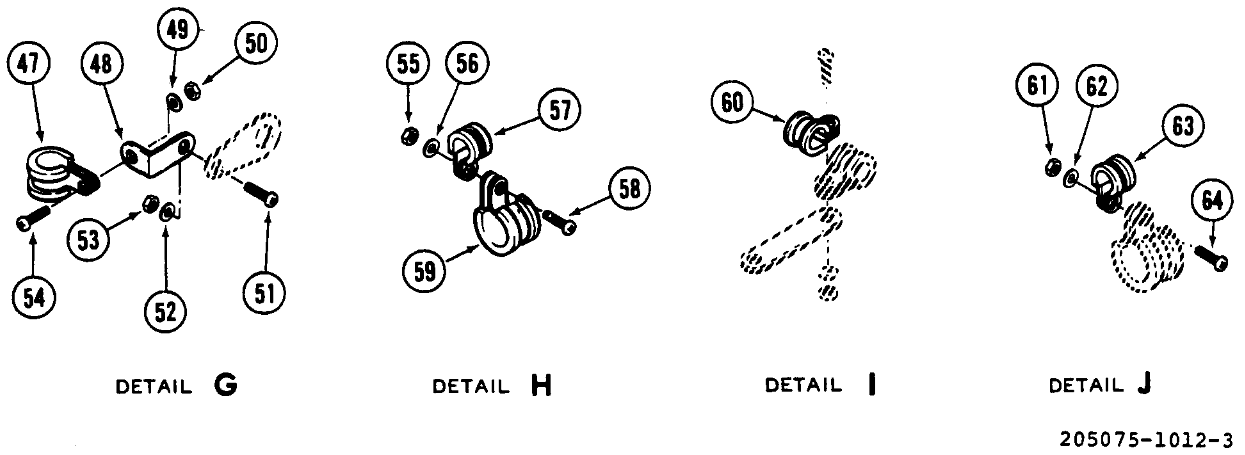


Figure 4-49. Electrical cable installation — left side (Sheet 2 of 3)



1. Power plant cable
2. Electrical connector
3. Electrical connector
4. Electrical connector
5. Nipple
6. Nipple
7. Starter-generator cable
8. Clamp
9. Screw
10. Clamp
11. Bracket
12. Nut
13. Washer
14. Nut
15. Washer
16. Bracket
17. Screw
18. Nut
19. Washer
20. Spacer
21. Clamp
22. Screw
23. Clamp
24. Clamp
25. Screw
26. Clamp
27. Bracket
28. Nut
29. Washer
30. Clamp
31. Cover
32. Electrical connector
33. Nut
34. Washer
35. Bracket
36. Clamp
37. Screw
38. Screw
39. Bracket
40. Bracket
41. Clamp
42. Screw
43. Nut
44. Washer
45. Washer
46. Nut
47. Clamp
48. Bracket
49. Washer
50. Nut
51. Screw
52. Washer
53. Nut
54. Screw
55. Nut
56. Washer
57. Clamp
58. Screw
59. Clamp
60. Clamp
61. Nut
62. Washer
63. Clamp
64. Screw

UH-1H-II-M-04-49-3

Figure 4-49. Electrical cable installation — left side (Sheet 3 of 3)

(3) Connect wire Q45C18 to terminal E.

(4) Reinstall cover on linear actuator.

m. Secure electrical cable to clamp (11, figure 4-43) on governor bleed hose using clamp (63, figure 4-49), screw (64), washer (62), and nut (61) as shown in Detail J.

n. Remove lower forward mounting bolt from starting fuel solenoid. Secure brackets (39 and 40) together with screw (38), washer (44), and nut (43) as shown in Detail F. Mount bracket (39) on starting fuel solenoid mounting bolt and lockwire bolt. Secure electrical cable to bracket (40) using clamp (41), screw (42), washer (45), and nut (46).

o. Route electrical cable downward to support on engine mount. Secure bracket (48) to support with screw (51), washer (52), and nut (53) as shown in Detail G. Attach cable to bracket (48) with clamp (47), screw (54), washer (49), and nut (50).

p. Secure bracket (35) to existing clamp screw on engine main fuel hose as shown in Detail E. Position clamp (36) on electrical cable and secure with screw (37), washer (34), and nut (33).

q. Secure bracket (27) to existing clamp screw on engine main fuel hose as shown in Detail D. Position clamps (26) and (30) on electrical cable and secure with screw (25), washer (29), and nut (28). Install cover (31) on electrical receptacle and secure chain of cover.

r. Position nipple (6) on wire P35B16. Install wire P35B16 on terminal A of starter-generator. Place nipple (6) over terminal and secure with nylon cord (C-480).

s. Route thermocouple cable and chip detector cable between top of engine and anti-icing air tube, secure to existing bracket for tachometer generator lead with clamps (23) and (24) in two places as shown in Detail C.

t. Route thermocouple cable and chip detector cable downward and attach to bracket for tachometer generator cable with clamp (9, figure 4-50) on thermocouple cable and clamp (10) on chip detector cable.

u. Position clamp (6) on inlet guide vane actuator hose. Position clamp (5) on thermocouple cable. Position remaining clamp (5) on chip detector cable. Secure clamps with screw (8), spacer (7), washer, and nut (4).

v. Secure chip detector cable (2 places) to bracket and clamp for inlet vane actuator drain hose with clamp (15) using existing hardware.

w. Place nipple (14) on chip detector cable and secure to chip detector with washer (11), lockwasher (12), washer, and nut (13). Position nipple (14) over chip detector terminal and secure with nylon cord (C-480).

x. Route thermocouple cable aft and mount bracket (18) on existing bracket for oil scavenge line. Attach thermocouple cable to bracket (18) with clamp (19), screw (20), washer (17), and nut (16).

y. Position bracket (23) under existing mounting screw for oil pressure line, two places. Secure thermocouple cable in two places to bracket (23) with clamp (22), screw (21), washer (24), and nut (25).

z. Connect thermocouple cable to aft firewall as follows:

(1) Place connector (29) in opening in aft firewall. Install one drilled head screw (26) from forward side with one thin washer (28) under head. Install one thin aluminum washer (30) and nut (27) on screw.

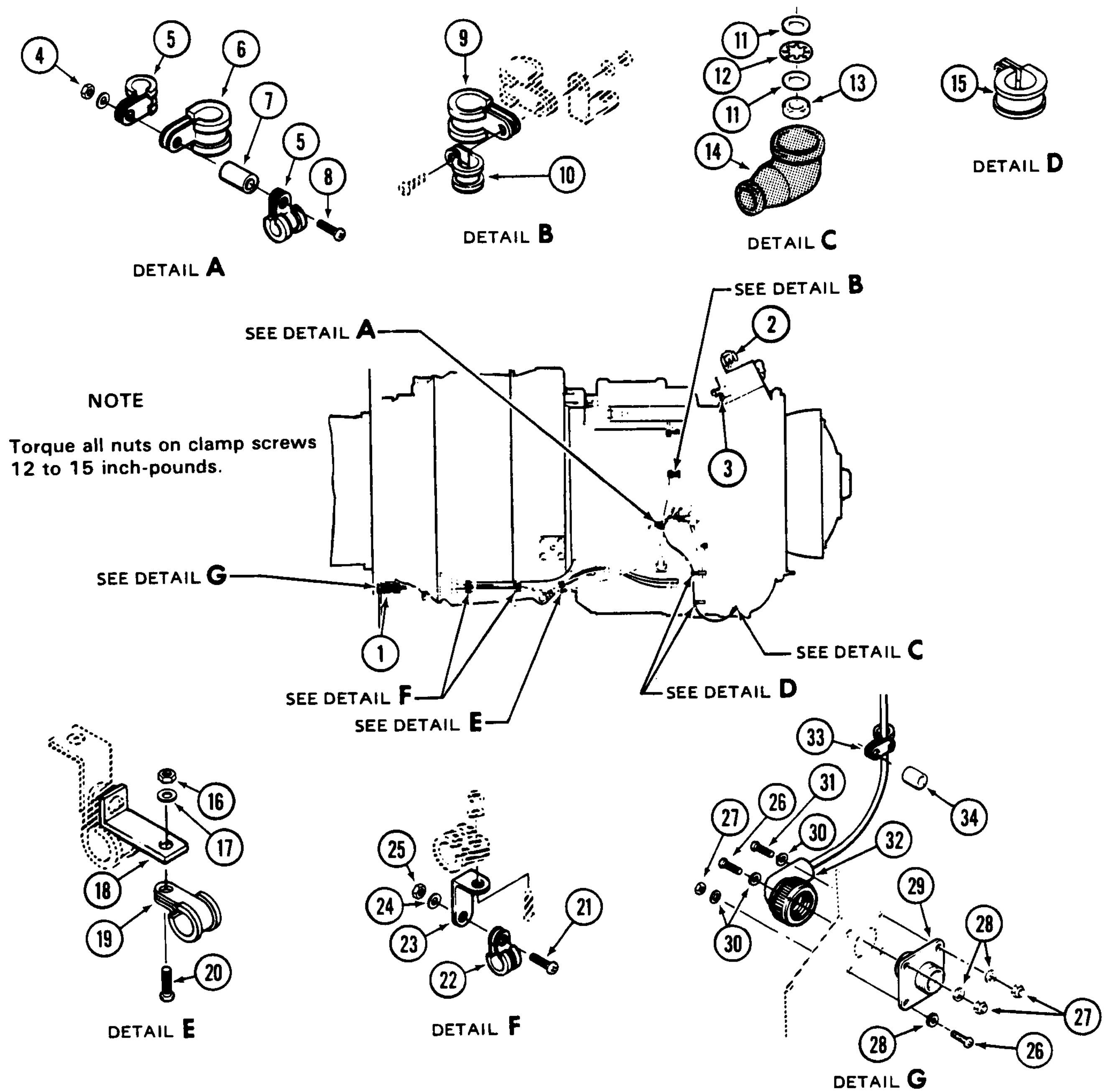
(2) Install one drilled head screw (26) and two undrilled screws (31), with thin aluminum washers (30) under heads, from aft side of firewall. Install one thin washer (28) and nut (27) on each screw.

(3) Connect thermocouple cable (1) to forward side of connector (29). Lockwire (C-405) connector to drilled head screw.

(4) Remove screw from aft firewall inner ring and secure engine thermocouple lead (32) to firewall using clamp (33), spacer (34) and screw.

(5) Connect engine thermocouple lead (32) to aft side of connector (29). Lockwire (C-405) connector to drilled head screw.

aa. Connect and lockwire (C-405) electrical connector (3) to torque pressure transmitter.



1. Thermocouple cable
2. Electrical connector
3. Electrical connector
4. Nut
5. Clamp
6. Clamp
7. Spacer
8. Screw
9. Clamp
10. Clamp
11. Washer
12. Lockwasher
13. Nut
14. Nipple
15. Clamp
16. Nut
17. Washer
18. Bracket
19. Clamp
20. Screw
21. Screw
22. Clamp
23. Bracket
24. Washer
25. Nut
26. Screw, drilled head
27. Nut
28. Washer, thin
29. Connector
30. Washer, aluminum thin
31. Screw, undrilled (2)
32. Engine thermocouple lead
33. Clamp
34. Spacer

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Figure 4-50. Electrical cable installation — right side

CHAPTER 5

ROTORS

SECTION I — MAIN ROTOR SYSTEM

5-1. MAIN ROTOR SYSTEM.

5-2. Description — Main Rotor System. Main rotor system (figure 5-1) includes a two-blade, semirigid rotor, a stabilizer bar with dampers, a swashplate and support, a scissors and collective sleeve, and interconnecting linkage. The rotor is underslung on its trunnion mounting through two pillow blocks which provide a flapping axis. All-metal blades are attached to grips which rotate on yoke spindles to change blade pitch. The trunnion engages splines at top of mast, supported by a cone set and secured by a retaining nut which also serves as mast cap and lifting eye. In operation collective pitch control stick movements cause angular changes of both blade grips equally and simultaneously. Tilting of main rotor for pitch and roll control is accomplished by independent changes of each blade grip by means of cyclic control input. Stabilizer bar, mounted with its flapping axis crosswise to the main rotor, is connected to rotor controls to provide greater stability for all flight conditions.

5-3. MAIN ROTOR HUB AND BLADE ASSEMBLY.

5-4. Description — Main Rotor Hub and Blade Assembly. Main rotor blades are all-metal bonded assemblies, set in hub grips and secured by a retaining bolt. Each blade is formed of four major sections: main spar, honeycomb core, trailing edge extrusion and nose block extrusion, all bonded to skin by adhesive applied under heat and pressure. Reinforcing doublers, grip plates and drag plates are attached on blade butt end. Stainless steel strips cover leading edges for resistance to abrasion. A trim tab is provided on trailing edge for tracking adjustments. A fitting on blade tip, which is used in flag-tracking procedure, also has a hole for attachment of rotor tie-down. An adjustable drag brace connects trailing edge of blade to hub, providing a means of aligning blades. Blade grips and pillow blocks on hub are lubricated with same type oil as that used for engine, transmission, and gearboxes. Oil levels can be checked through transparent covers. On main rotors, torsion on the retention strap within each blade grip counteracts aerodynamic forces which tend to change blade pitch. Control linkage connects to a pitch horn on leading side of each blade grip. To ensure correct reassembly a color coding system is used. Red dots identify all parts connected to the red blade; white dots identify all parts connected to the white blade.

5-5. Cleaning — Main Rotor Hub and Blade Assembly.

a. Clean main rotor hub by wiping with a clean cloth moistened with solvent (C-304). Do not use pressure cleaning equipment or attempt to clean grip seals.

b. Wash main rotor blades with a solution of mild soap and water.

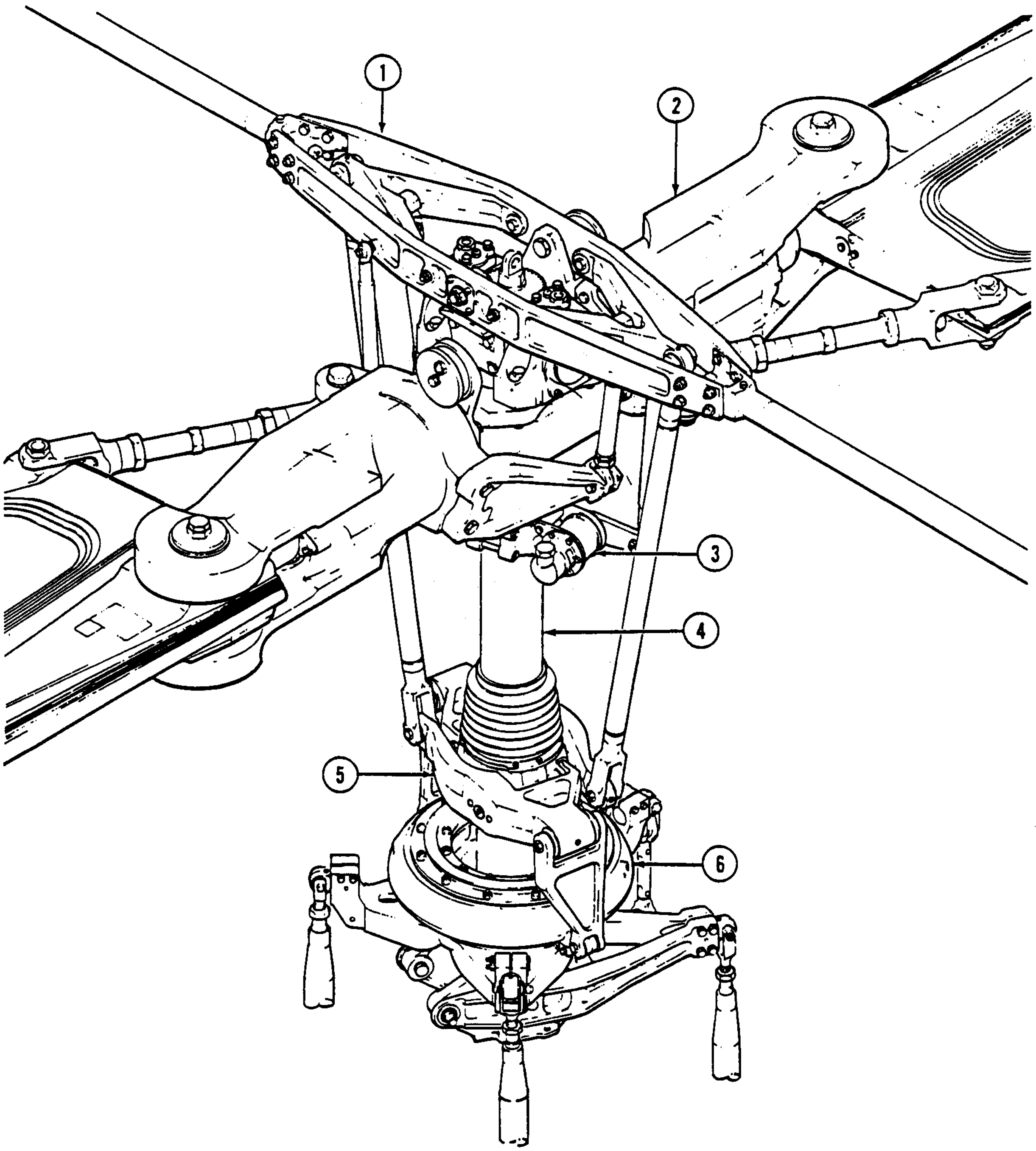
5-6. Lubrication — Main Rotor Hub and Blade Assembly. Refer to Chapter 1 for lubrication and servicing.

5-7. Alignment — Main Rotor Hub and Blade Assembly.

Premaintenance Requirements for Main Rotor Hub and Blade Alignment

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T37), (T42), (T43), (T44), (T68)
Test Equipment	None
Support Equipment	Hoist, Protractor, and Supports for Blades
Minimum Personnel Required	Two
Consumable Materials	None
Special Environmental Conditions	None

a. Remove main rotor. (Paragraph 5-11.) Ensure that grip positioning links (T44) are installed. (Figure 5-2.)



1. Stabilizer bar assembly
2. Main rotor hub and blades assembly
3. Stabilizer dampers
4. Mast
5. Scissors and sleeve assembly
6. Swashplate and support assembly

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Figure 5-1. Main rotor system

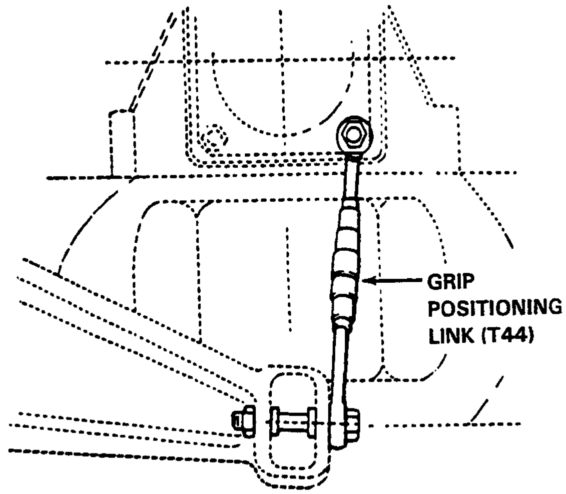

Figure 5-2. Grip positioning link

NOTE

Failure to support blades properly at preconed angle (2.75 degrees) and to set zero grip angle will result in blade misalignment.

b. Level buildup bench (T37). Position main rotor with hub trunnion supported on bench. Place alignment cradles or other suitable supports under both blades to position blade straight at normal preconed angle throughout blade length.

c. Install two flap stops (T68) attached with bolts and washers to each side of hub trunnion at lower set of holes.

d. Adjust grip positioning links (T44) to set hub grips at zero pitch angle, measured with a propeller protractor placed across outboard machined surface on each grip.

e. Position support assembly (T42) (4, figure 5-3) across hub pillow blocks and secure with two 1/4-28 bolts, 2.25 inches long. Place scope assembly (T43) (5) in support.

f. Check scope for zero adjustment:

(1) Sight through scope at a surface approximately 50 feet away. Draw a straight vertical mark on surface aligned with vertical cross hair.

(2) Loosen clamp screws on scope mount, rotate scope 180 degrees on tube axis, and tighten screws. Take another sight to check that vertical cross hair aligns on target mark.

(3) If vertical crosshair fails to align on target mark, make a second mark at new alignment of vertical hair, then a third mark midway between first and second marks. Adjust screw marked 'L' on side of scope to align vertical crosshair on third mark. Rotate scope 180 degrees and recheck alignment. Repeat procedure until alignment is satisfactory.

NOTE

Blade alignment point (screwhead) (2) will vary in its location, and is to be used for reference only during blade alignment.

g. Sight through scope to blade alignment point (screwhead) (2), located near leading edge strip and tip, on upper surface of either blade. Center of screw head should align on vertical crosshair within 0.100 inch forward and 0.400 inch aft. Adjust blade drag brace as necessary. Torque drag brace jamnuts 275 to 325 foot-pounds. (Figure 5-4.)

h. Reverse scope in support. Repeat step g to align opposite blade. Blade-to-blade difference must not exceed 0.050 inch.

i. When alignment is correct, remove scope and support assemblies. Paint a reference line across drag brace barrel and locknut to indicate original

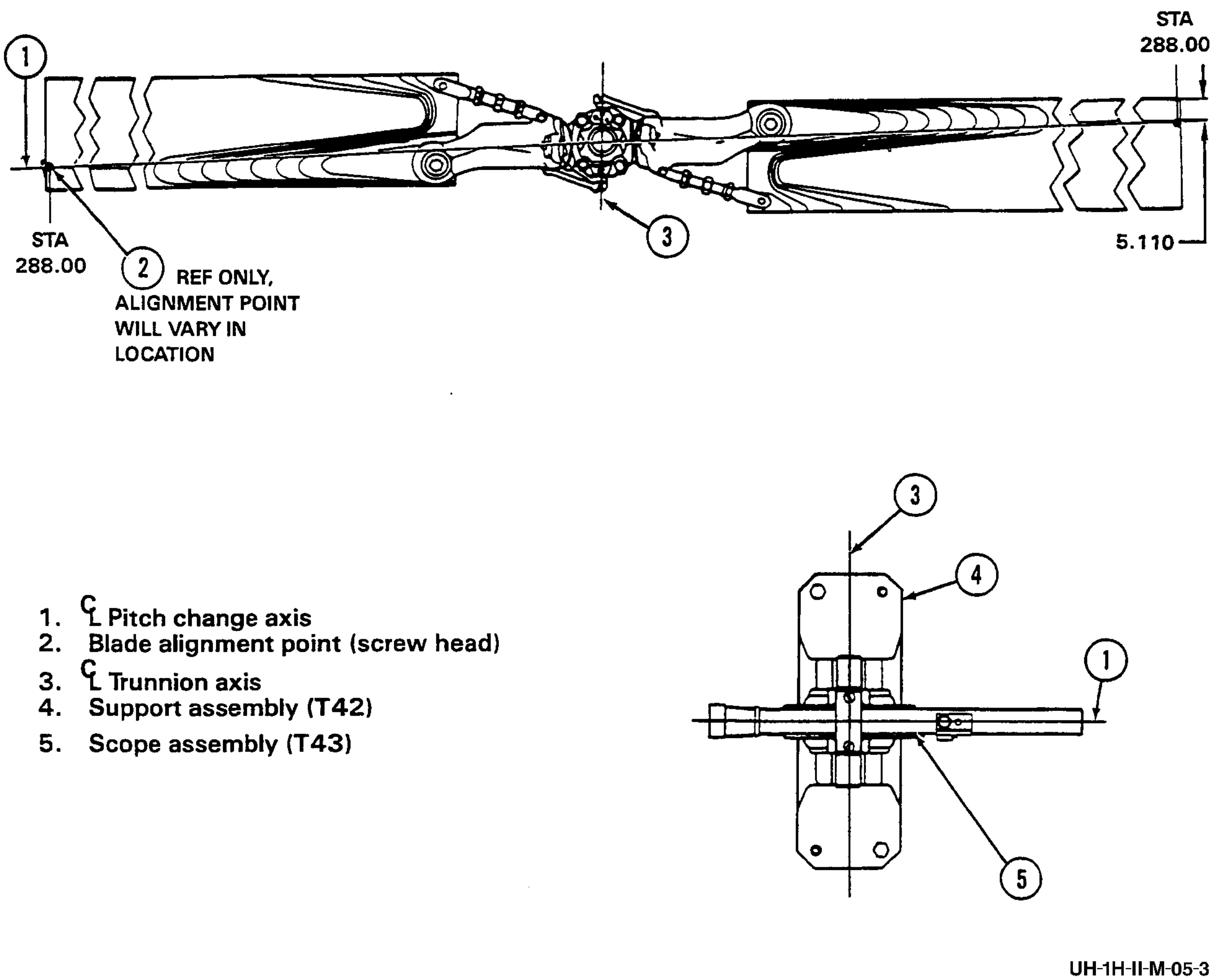

Figure 5-3. Main rotor blade alignment

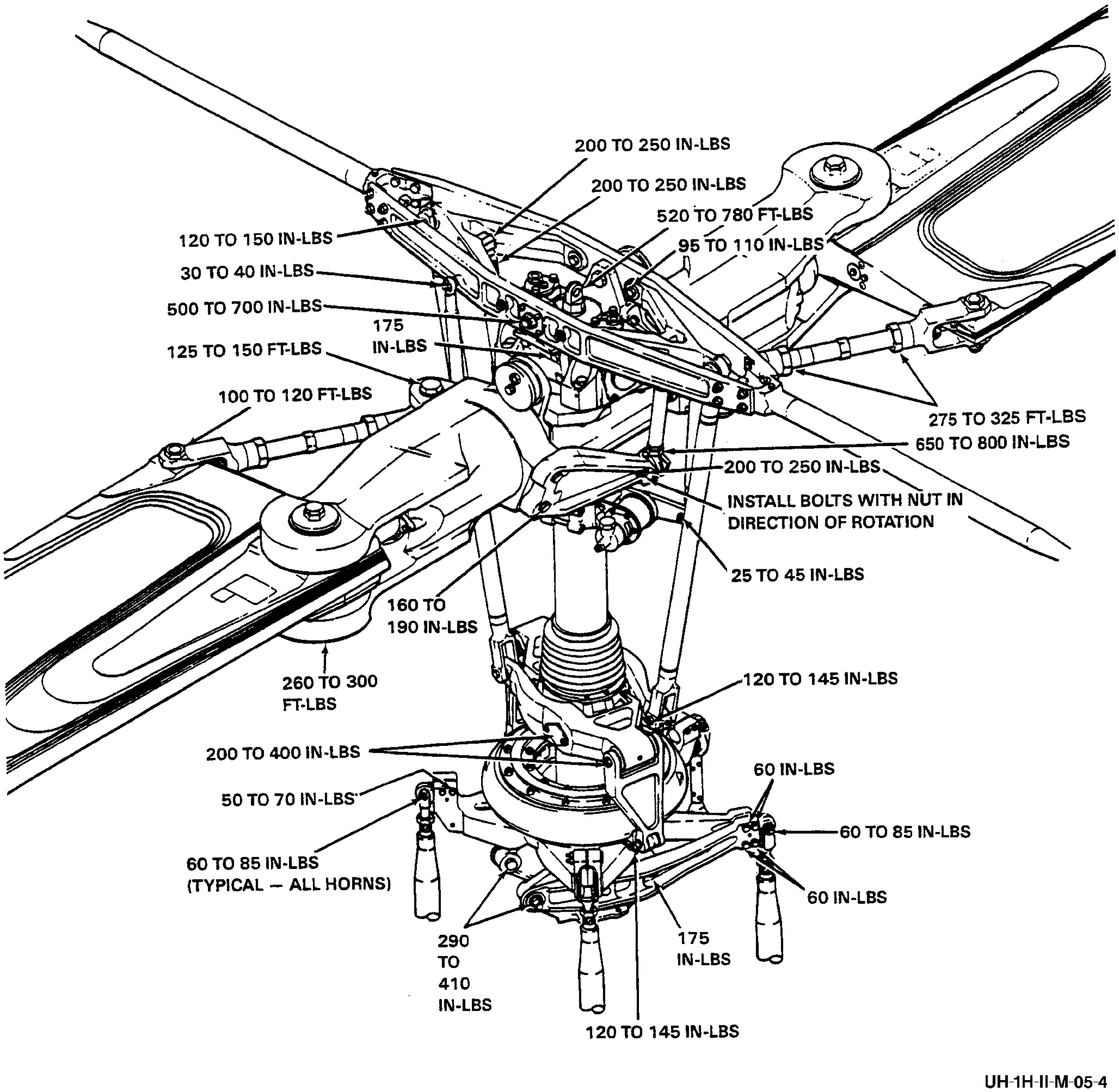

Figure 5-4. Main rotor system torque values

alignment position for use in vibration troubleshooting.

5-8. Operational Check — Main Rotor Hub and Blade Assembly. Operational check consists of checking main rotor for vibration, and for proper track, sweep, and autorotation rpm adjustment while in operation. After main rotor hub and/or blades replacement or removal and reinstallation, perform the following checks.

a. Track main rotor blades. (Paragraph 5-115.)

b. Perform a maintenance test flight per BHT PUB-92-004-MTF.

c. When corrective action is required proceed as follows:

(1) If excessive vibrations are encountered perform tracking operations and vibration correction procedures. (Paragraphs 5-114, 5-115, and 5-116.)

(2) If autorotation rpm is not within limits refer to paragraph 5-9.

5-9. Autorotation RPM Adjusting — Main Rotor Hub and Blade Assembly.

a. Check rotor rpm in autorotation. Make straight ahead autorotative descent at constant 70 knots indicated airspeed. (Turns and changes of airspeed affect rotor rpm.) Throttle should be at flight idle and collective full down. When in steady autorotative descent note rotor rpm. (Refer to BHT PUB-92-004-10 for allowable autorotation rpm.)

CAUTION

Do not allow rotor to exceed 339 RPM.

b. If rotor rpm is high, shorten both pitch change links (3, figure 5-5) equally. One turn of pitch link barrel changes rotor rpm approximately 2.5 percent.

c. If rotor rpm is low, lengthen both pitch change links equally.

d. Tighten locknuts. Secure bottom locknut to barrel, and top locknut to barrel and clevis with lockwire (C-405).

NOTE

After final pitch link adjustment, exposed thread length of upper and lower fittings shall be equal within 2 1/2 threads for pitch links without thread engagement inspection holes. For pitch links with thread engagement inspection holes, exposed thread lengths shall be equal within 5 threads, provided adequate thread engagement is indicated at inspection hole.

e. Recheck rpm in flight and repeat adjustment as necessary.

5-10. Troubleshooting — Main Rotor Hub and Blade Assembly. A chart of possible main rotor troubles, causes, and corrective action is shown on Table 5-1. Refer also to Section VII for additional information, specific testing, and mechanical procedures for adjusting the main rotor.

NOTE

Potential troubles which may occur in the main rotor assembly are listed in table 5-1 with the probable causes indicated and corrective action recommended. Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. Stabilizer bar assembly
2. Mixing lever
3. Pitch change link
4. Damper link tube
5. Control tube
6. Stabilizer support
7. Bolt
8. Retaining nut lock
9. Retaining nut
10. Washer
11. Main rotor
12. Mast
13. Cone set
14. Stabilizer dampers
15. Scissors and sleeve assembly

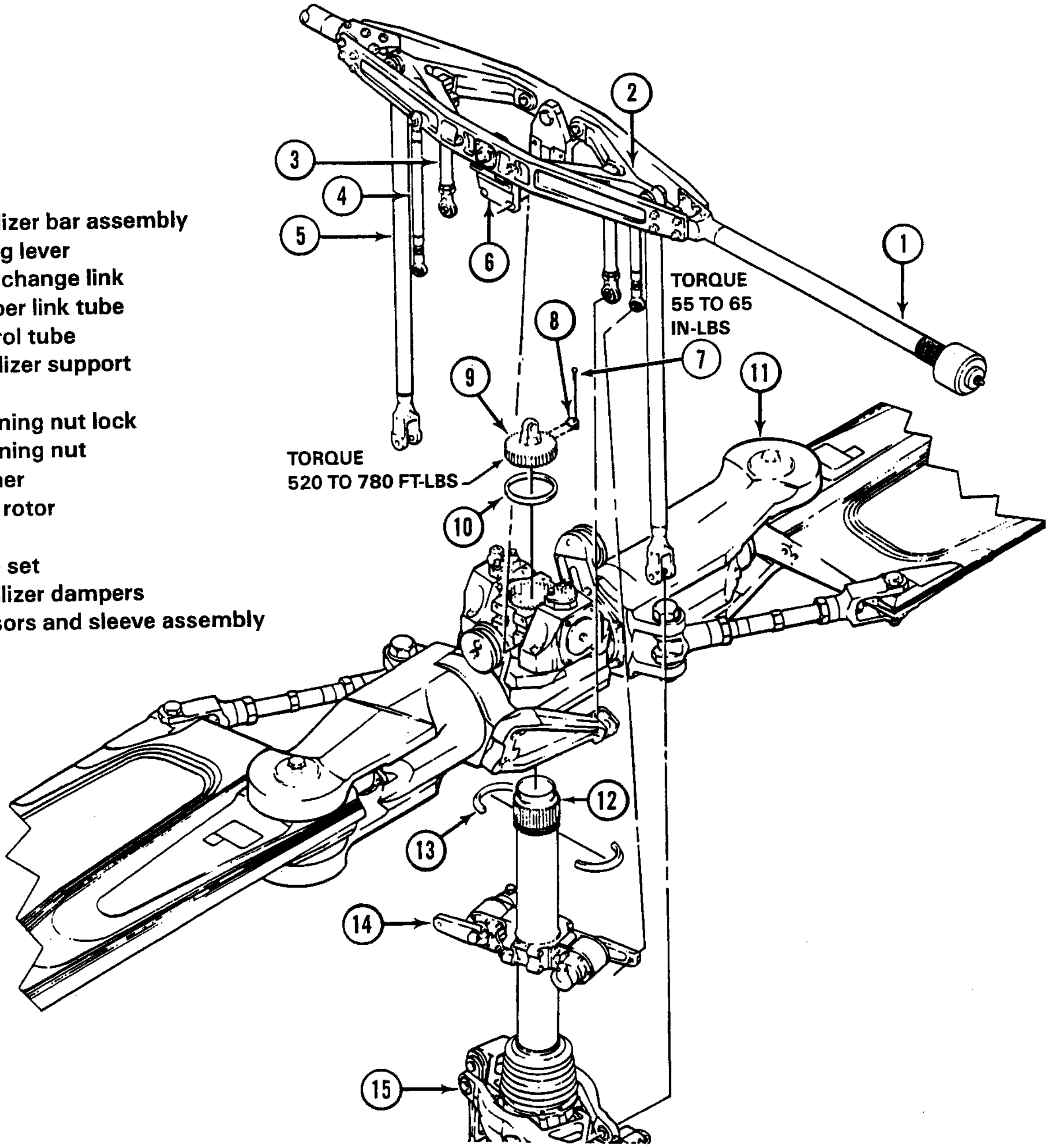

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Figure 5-5. Main rotor system

Table 5-1. Troubleshooting Main Rotor System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Lateral vibration.

STEP 1. Rotor spanwise unbalanced.

Check and spanwise balance main rotor. (Paragraph 5-116.)

STEP 2. Rotor chordwise unbalanced.

Check and chordwise balance main rotor (sweeping blade). (Paragraph 5-117.)

STEP 3. Stabilizer bar unbalanced.

Check and balance stabilizer bar. (Paragraph 5-43.)

2. Vertical 1/rev vibration.

STEP 1. Rotor blades out of track.

Track blades. (Paragraph 5-115.)

STEP 2. Worn bearings in collective lever assembly and link.

**Replace worn bearings. (Paragraph 5-64.)*

STEP 3. Worn pitch change link rod end bearing.

**Replace if bearing wear is excessive. (Paragraph 5-40.)*

STEP 4. Excessive wear in collective scissors assembly.

**Replace scissors and sleeve assembly. (Paragraph 5-70.)*

STEP 5. Internal wear or damage in main rotor hub assembly.

Replace hub. (Paragraph 5-14.)

3. Collective stick light or heavy in down stroke.

STEP 1. Balance spring on collective cylinder out of adjustment.

Adjust spring on servo valve to provide equal force to move collective either direction. (Chapter 7.)

**Wear at one bearing or combined wear at these locations significantly contributes to vibrations.*

Table 5-1. Troubleshooting Main Rotor System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. Slow control response.

STEP 1. Internal leakage in servo cylinder.

Replace cylinder or seals as necessary. (Chapter 7.)

5. High frequency vibration.

STEP 1. Loose elevator linkage at swashplate horn.

Replace worn bushings. (Paragraph 5-54.)

STEP 2. Loose elevator.

Shim bearing. (Chapter 2.)

STEP 3. Tail rotor out of track.

Track tail rotor. (Paragraph 5-118.)

STEP 4. Tail rotor out of balance.

Balance tail rotor. (Paragraph 5-90.)

STEP 5. FM antenna mount loose or cracked.

Tighten mount or replace. (Chapter 2.)

6. Pylon rock.

STEP 1. Defective pylon mount.

Inspect pylon mount for bond separation between rubber core and inner and outer sleeves. Replace mount if separation exceeds 0.25 inch maximum depth for 1/3 circumference of mount or if separation exceeds 0.75 inch at any one point. (Chapter 6.)

STEP 2. Defective pylon dampers.

Check dampers for binding, rough movement or lack of movement by stationing personnel around pylon mounting points and move pylon fore and aft using mast as a lever to rock pylon. Replace pylon dampers. (Chapter 6.)

STEP 3. Defective pylon mount bolts.

Inspect mount bolts for looseness, wear, bottoming and stripped threads. Replace or tighten mount bolts. (Chapter 6.)

Table 5-1. Troubleshooting Main Rotor System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

7. Engine and rotor rpm increases + 100 and stabilizes with the application of power.

STEP 1. Main rotor pitch change links out of adjustment (nominal setting incorrect).

Adjust both pitch change links to obtain nominal setting. (Paragraph 5-13.)

8. 2/rev vibration, approximately ten per second.

STEP 1. Pylon mounts deteriorated.

Replace mounts. (Chapter 6.)

9. Rotor rpm high or low in autorotation.

STEP 1. Low pitch blade angle incorrect.

Adjust both pitch change links equally. (Paragraph 5-9.)

5-11. Removal — Main Rotor Hub and Blade Assembly.

Premaintenance Requirements for Removal of Main Rotor Hub and Blade Assembly

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T11), (T12), (T13), (T24), (T37), (T44), (T52)
Test Equipment	None
Support Equipment	Tie-down, blade support assembly, Hoist
Minimum Personnel Required	Three
Consumable Materials	None
Special Environmental Conditions	None

a. Remove stabilizer bar (1, figure 5-5) as follows:

CAUTION

Grip positioning links must be installed to prevent damage to main rotor strap assemblies. If grip yoke rotates more than 80°, main rotor strap must be replaced.

(1) Disconnect pitch change links (3) from main rotor pitch horns and install grip positioning links (T44) as shown in figure 5-2 to hold blades in normal position.

(2) Check that assembly is color coded.

(3) Disconnect control tubes (5, figure 5-5) from scissor levers, and damper link tubes (4) from damper levers. Pad stabilizer bar outer tube to protect control tubes and secure control tubes to bar with tape.

(4) Detach each stabilizer support (6) from main rotor trunnion by removing lockwire and four bolts.

(5) Lift off stabilizer bar assembly (1).

b. Remove lockwire, bolt (7), and retaining nut lock (8) at side of retaining nut (9). Use power wrench (T11), reaction torque adapter (T13), and mast nut socket (T12) to remove nut (9) with washer (10).

c. Position suitable hoist above mast. Attach to hub of main rotor (11) with two lifting slings (T24).

CAUTION

Do not allow split cones to fall from mast. If split cones are dropped, inspect per figure 5-6.

NOTE

Fasten split cones together and retain as a matched set.

d. Guide and steady rotor by means of tie-down assembly, while lifting hub clear of mast (12, figure 5-5). Remove split cone set (13).

e. Place main rotor assembly on buildup bench (T37) equipped with adapter buildup bench plate (T52). Place supports under blades.

5-12. Inspection and Repair — Main Rotor Hub and Blade Assembly.

NOTE

If records or physical appearance indicate that the hub has been involved in an accident or incident, refer to Chapter 1 for inspection requirements.

a. Inspect main rotor (11, figure 5-5) for scratches, nicks, dents, and corrosion.

b. Inspect pitch change link (3) for scratches, nicks, dents, and corrosion. Repair as outlined in paragraph 5-41.

c. Inspect retaining nut (9) for scratches, nicks, dents, and corrosion. (Figure 5-7.)

d. Inspect retaining nut lock (8, figure 5-5) for functional engagement. Replace if cracked.

e. Inspect cone set (13) for mechanical and corrosion damage. Repair as outlined in figure 5-6.

f. Inspect oil reservoir for evidence of leakage and discolored sight glass.

g. Polish out minor scratches, nicks, dents, and corrosion on main rotor hub.

h. Inspect blades. (Paragraph 5-29.)

5-13. Installation — Main Rotor Hub and Blade Assembly.

Premaintenance Requirements for Installation of Main Rotor Hub and Assembly

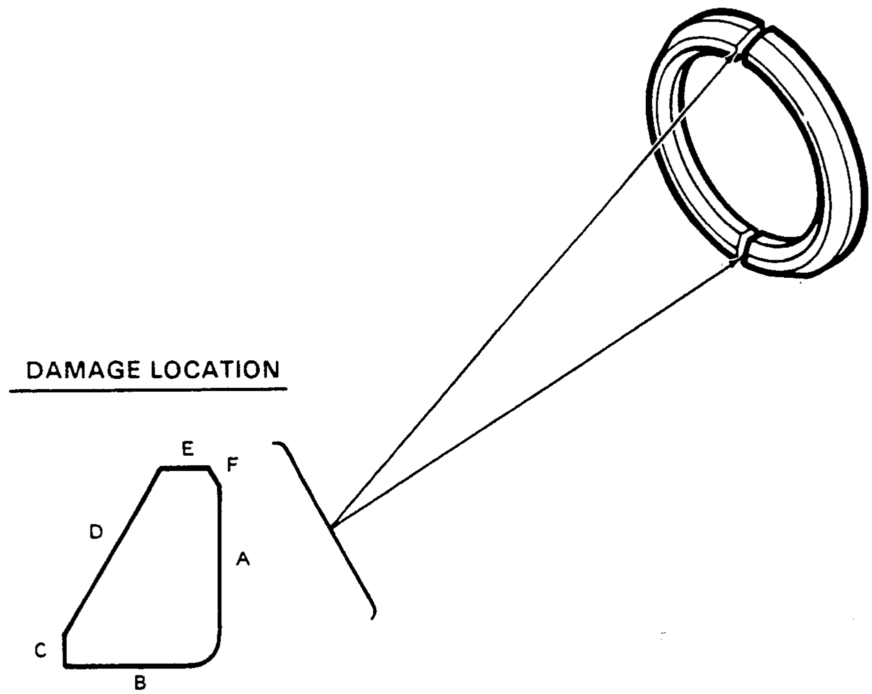
CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T11), (T12), (T13), (T24), (T44)
Test Equipment	None
Support Equipment	Tie-down assembly, Hoist
Minimum Personnel Required	Three
Consumable Materials	(C-101), (C-405)
Special Environmental Conditions	None

CAUTION

Install two lifting slings so that both grip assemblies are lifted at the same time to prevent possibly dropping the rotor hub assembly.

a. Attach two lifting slings (T24) to suitable hoist and lift main rotor (11, figure 5-5) to position above mast (12). Use rotor tie-down assembly to guide and steady rotor during handling.

b. Coat splines of mast (12) and rotor hub trunnion with coat of corrosion preventive compound (C-101). Place cone set (13), with bevel side up, in groove of upper mast splines and with gaps equal at ends of cone sets.



SURFACES	MAXIMUM DAMAGE AND REPAIR DEPTH
A, C, E, and F	Damage may be considered negligible and not requiring repair if the depth does not exceed 0.010 inch, and the minimum radii observed in the damage area are not less than 0.025 inch.
B	Damage not exceeding depth of 0.005 inch may be repaired with the use of a surface plate. Both halves of the cone set must be surfaced exactly the same amount so that the distance from surface B to D is identical for both halves.
D	Surface must not have any protrusions above the surrounding surface. Dents and scratches not exceeding depth of 0.010 inch may be polished out.
Edge Chamfer to Remove Damage	0.030 inch.

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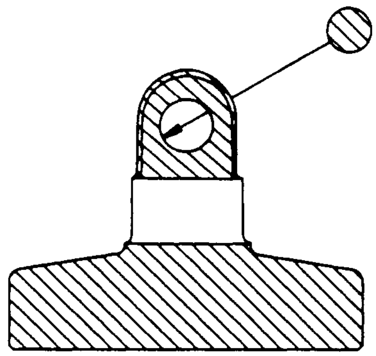
Figure 5-6. Main rotor cone set damage limits and repair



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
NICKS, SCRATCHES, DENTS, AND CORROSION		0.010 Inch	0.030 Inch
MAXIMUM AREA PER FULL DEPTH REPAIR		0.10 Sq. In.	Not Critical
NUMBER OF REPAIRS		Not Critical	Not Critical
EDGE CHAMFER		0.030 Inch	0.060 Inch
THREAD DAMAGE:	Length: Depth: Number:	0.50 Inch 1/3 of Thread Two	

UH-1H-II-M-05-7

Figure 5-7. Main rotor retaining nut damage and repair limits

CAUTION

Rotor must be aligned directly over mast to avoid damaging mast threads.

c. Align master splines and lower rotor onto mast, until seated on split cone. Verify that gaps are still equal at end of cone sets.

d. Ensure mast threads and mast nut threads are clean. Install washer (10) and retaining nut (9) on mast. Use power wrench (T11), reaction torque adapter (T13), and mast nut socket (T12) to torque retaining nut (9) 520 to 780 foot-pounds. Install retaining nut lock (8), engaged with nut splines and secured to hub trunnion by a bolt (7). Torque bolt 55 to 65 inch-pounds and lockwire (C-405) head to trunnion.

e. Observing color code, position stabilizer bar over main rotor trunnion. Attach each stabilizer support (6) with four bolts and washers, assemble washers on bolts. Short bolts go in lower holes. Lockwire (C-405) bolts in vertical parts.

f. Connect control tubes (5) to levers on scissors and sleeve assembly (15), with bolt heads to direction of rotation with two steel washers under each bolt head. Torque nuts 120 to 145 inch-pounds and secure with cotter pins. (Paragraph 5-44.)

NOTE

On initial installation, pitch change links should be adjusted to nominal length of 9.750 and equal within 0.005 inch. Length may be changed during rigging and troubleshooting procedures.

g. Remove each grip positioning link (T44) and connect pitch change link (3) to main rotor pitch horn, installing bolt with nut end toward rotation. Torque nut 200 to 250 inch-pounds and secure with cotter pin. (Paragraph 5-44.)

h. Connect damper link tubes (4) from stabilizer bar to leading sides of levers on stabilizer dampers (14). Install bolts from leading side with safety washer next to head, two steel washes between rod-end bearing and lever, and washer between lever and nut. Torque nuts 25 to 45 inch-pounds and secure with cotter pins. (Paragraph 5-44.)

i. Check minimum blade angle and safety pitch change link as follows:

(1) Lock collective stick in full down position and cyclic stick at approximately neutral, using friction locking devices.

(2) Holding main rotor (11) and stabilizer bar assemblies (1) from flapping, place a protractor chordwise on outboard machined surface of blade grips and record each reading.

(3) Add readings in step (2), and divide by two. This will give minimum blade angle.

(4) Adjust each pitch change link (3) equally until a total reading of 16 degrees plus or minus 1 degree is obtained. This will give correct minimum blade angle of 8 degrees plus or minus 1/2 degree. The exposed threads on rod end bearing and clevis shall be equal within 0.0330 inch. (Paragraph 5-115.)

NOTE

After final pitch change link adjustment, the exposed thread length of upper and lower fittings shall be equal within 2 1/2 threads for pitch change links without thread engagement inspection holes. For pitch change links with thread engagement holes, exposed thread lengths shall be equal within 5 threads, provided adequate thread engagement is indicated at inspection hole.

(5) Torque pitch change link jamnuts 650 to 800 inch-pounds. Lockwire (C-405) lower jamnut with double safety from nut to barrel and back to nut. Lockwire (C-405) upper jamnut to barrel, back to nut and then to clevis.

j. Perform operational check. (Operational check consists of checking main rotor for vibration, and for proper track, sweep, and autorotation rpm adjustment while in operation.)

SECTION II — MAIN ROTOR HUB

5-14. MAIN ROTOR HUB.

5-15. Description — Main Rotor Hub. The main rotor hub attaches the main rotor blades to the top of the mast through a trunnion to provide rotor tilt through pillow block bearings. Blade grips rotate on yoke spindles to provide pitch change of blades.

5-16. Removal — Main Rotor Hub.

a. Remove main rotor hub and blade assembly. (Paragraph 5-11.)

b. Remove blades from hub. (Paragraph 5-28.)

5-17. Disassembly — Main Rotor Hub.

Premaintenance Requirements for Disassembly of Main Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T37), (T45)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C-304), (C-309)
Special Environmental Conditions	None

a. Remove grip reservoirs as follows:

NOTE

Removal procedure of either rotor grip oil reservoir is identical; therefore only one side will be explained.

(1) Remove bolt (1, figure 5-8), lockwashers (2), steel washer (3), aluminum washer (4), and packing (5).

(2) Remove reservoir cover (6), packings (7 and 9), and sight glass (8).

b. Remove pillow block reservoirs as follows:

NOTE

Removal procedure of either pillow block oil reservoir is identical; therefore only one side will be explained.

(1) Remove bolts (1, figure 5-9), lockwashers (2), steel washers (3), and aluminum washers (4).

(2) Remove reservoir cover (5) and packing (6) from reservoir.

(3) Remove reservoir (7) and packings (8) from pillow block (9).

c. Replace pillow block bolts as follows:

CAUTION

When replacing main rotor pillow block bolts, replace one bolt at a time.

(1) Remove nut (13), washer(s) (12), and bolt (10).

(2) Install new bolt (10) with two washers (12) and nut (13). Torque nut (13) 64 to 79 foot-pounds. If full depth thread does not show through nut, remove one washer and retorque nut.

d. Remove nuts (20, figure 5-10), washers (2 and 19), and drag brace bolt (1) to detach drag brace assembly (30) from grip (3).

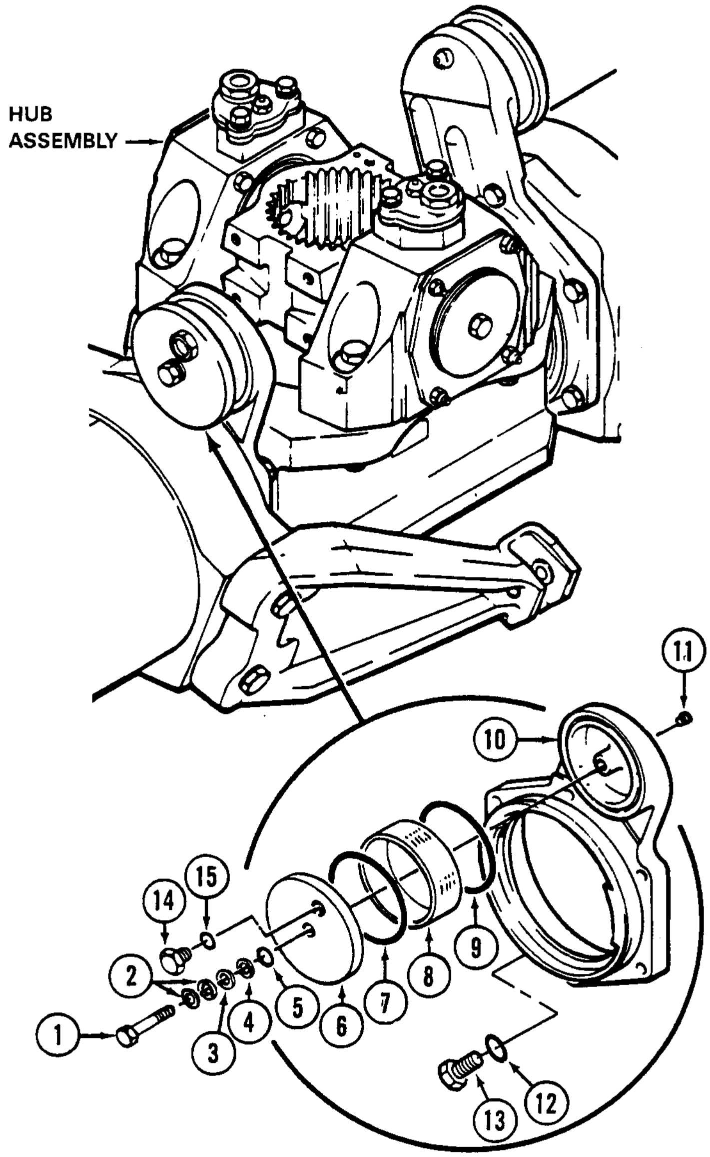
e. Cut lockwire and remove bolts (18) and washers (17) attaching pitch horn (16) to grip (3). Remove pitch horn.

f. Remove lockwire and two bolts (9) and two washers (8) securing static stop (10) to yoke (7).

g. Remove grip for seal replacement as follows:

NOTE

Removal procedure of either rotor grip is identical; therefore only one side will be explained.



1. Bolt
2. Washer (split lock)
3. Washer (thin steel)
4. Washer (aluminum)
5. Packing
6. Reservoir cover
7. Packing
8. Sight glass
9. Packing
10. Plate assembly
11. Relief plug
12. Packing
13. Drain plug
14. Filler plug
15. Packing

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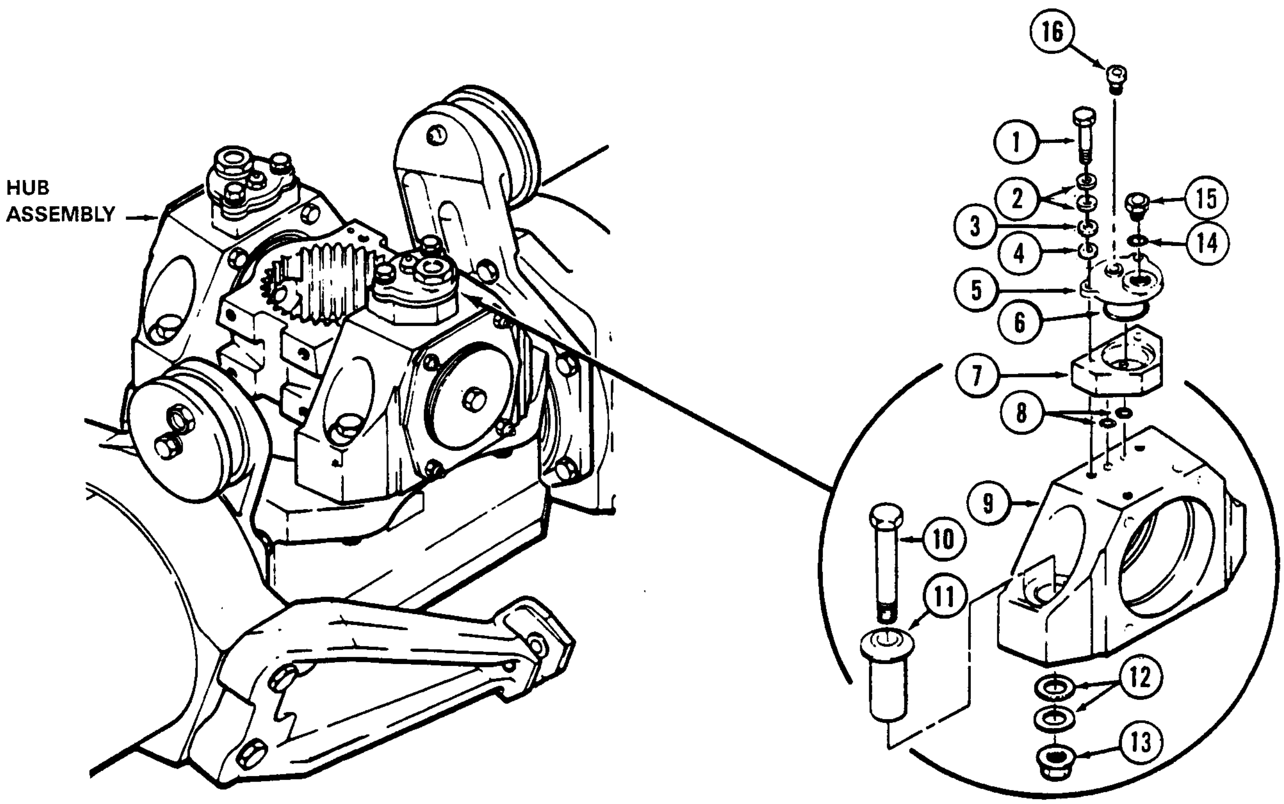
Figure 5-8. Main rotor hub grip reservoirs



1. Bolt
2. Washer (split lock)
3. Washer (thin steel)
4. Washer (aluminum)
5. Reservoir cover
6. Packing
7. Reservoir
8. Packings
9. Pillow block
10. Bolt
11. Bushing
12. Washers
13. Nut
14. Packing
15. Filler plug
16. Relief fitting plug

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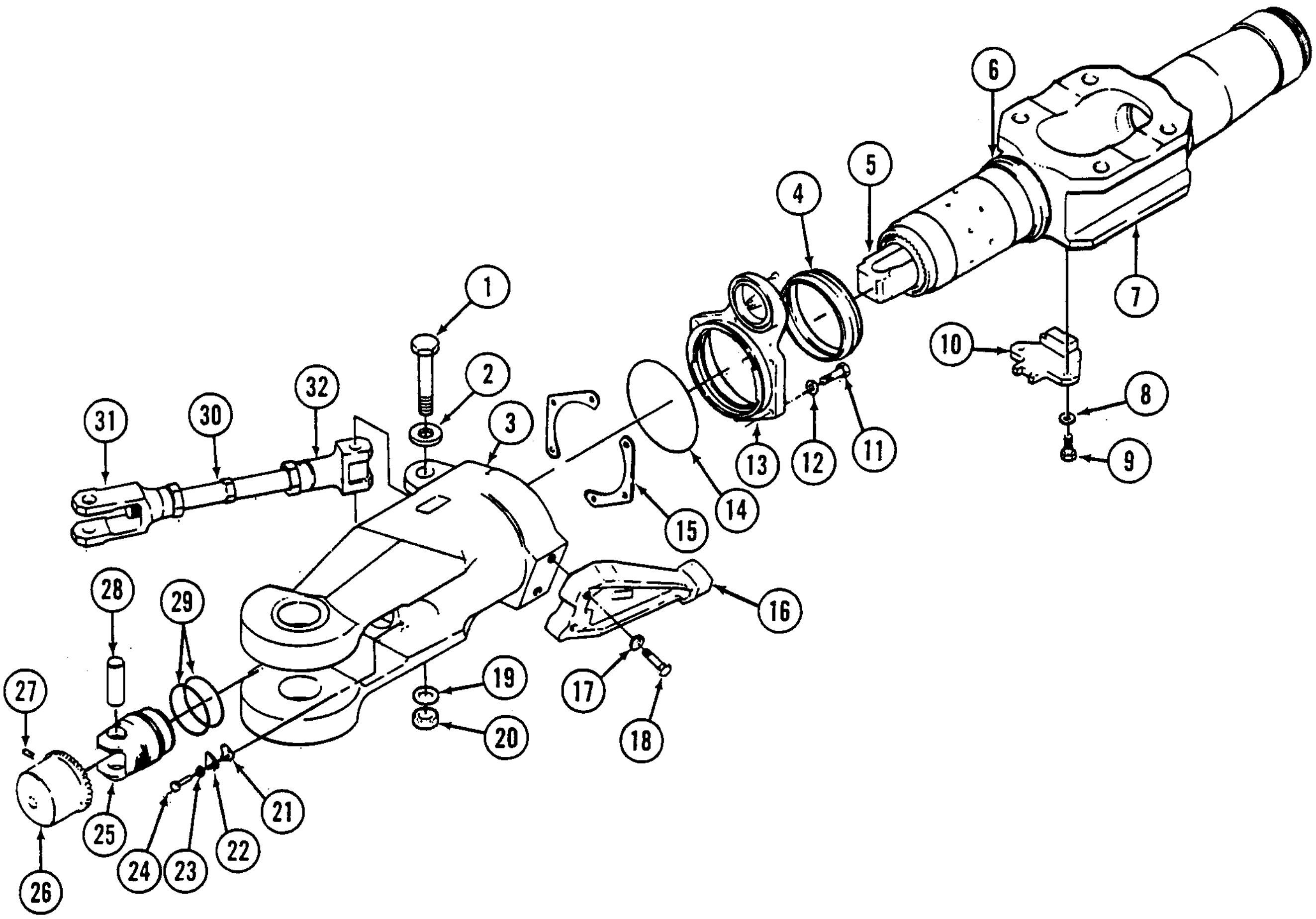
Figure 5-9. Main rotor hub pillow blocks



1. Drag brace bolt
2. Washer
3. Grip
4. Grip seal
5. Retention strap
6. Radius ring
7. Yoke
8. Washer
9. Bolt
10. Static stop
11. Bolt
12. Washer
13. Grip plate
14. Packing
15. Grip plate shim
16. Pitch horn
17. Washer
18. Bolt
19. Washer
20. Nut
21. Retainer strap lock
22. Clamp
23. Washer
24. Bolt
25. Retention strap fitting
26. Strap retainer nut
27. Key
28. Retaining pin
29. Packing
30. Drag brace assembly
31. Clevis
32. Fitting

UH-1H-II-M-05-10

Figure 5-10. Main rotor hub outboard section

(1) Drain grip reservoirs.

(a) Cut lockwire, remove drain plug (13, figure 5-8), packing (12), and drain oil.

(b) Remove relief plug (11) on inboard side of plate assembly (10) to relieve vacuum while draining oil. Install relief plug (11) after draining oil.

(2) Remove bolt (24, figure 5-10), washer (23), clamp (22), and retainer strap lock (21). Remove strap retainer nut (26) and key (27).

(3) Push retaining pin (28) out of retention strap fitting (25) and remove fitting. Identify pin (28) and retention strap (5) to retain as mating parts. Separate packings (29) from retention strap fitting (25). Press grip (3) inboard and rotate approximately 90 degrees counterclockwise to disengage from radius ring (6). Support grip and pull outboard to remove.

(4) Cut lockwire and remove six bolts (11) and washers (12) attaching grip plate (13) to grip (3).

(5) Remove grip plate (13), grip seal (4), grip plate shim (15), and packing (14). Identify shims for reinstallation in the same location.

(6) Clean all cement and grease from grip plate (13).

(7) If lubricating oil has entered the retention strap cavity, replace outboard seals. Visually inspect the strap assembly while installed. If the urethane covering has deteriorated to the extent that the wires are exposed, return the hub for overhaul. If no wires are exposed, no further inspection is required. Discoloration without deterioration is not in itself cause for rejection.

h. Disassemble yoke as follows:

NOTE

The grip bearings and inner races (9 and 11, figure 5-11) are matched sets therefore all parts must be installed in their original position.

(1) Remove hub assembly from buildup bench (T37).

(2) Tap outboard end of retention strap (8) inboard with nonmetallic hammer until inboard fitting (15) is centered in yoke opening.

(3) Slide backup ring (17) outboard to clear retaining pin (16). Push pin (16) out of fitting. Identify retaining pin (16) and retention strap (8) to retain as mating parts.

(4) Remove inboard fitting (15), packing (14), and backup ring (17) from center of yoke (12).

(5) Pull retention strap (8) through outboard end of yoke spindle.

(6) Remove seal sleeve (3) with packings (1 and 7) and channel seal (2) from yoke spindle. Separate seal sleeve, packings, and seal. Place yoke (12) on buildup bench (T37).

(7) Remove screws (4) and lockplate (5) from yoke spindle.

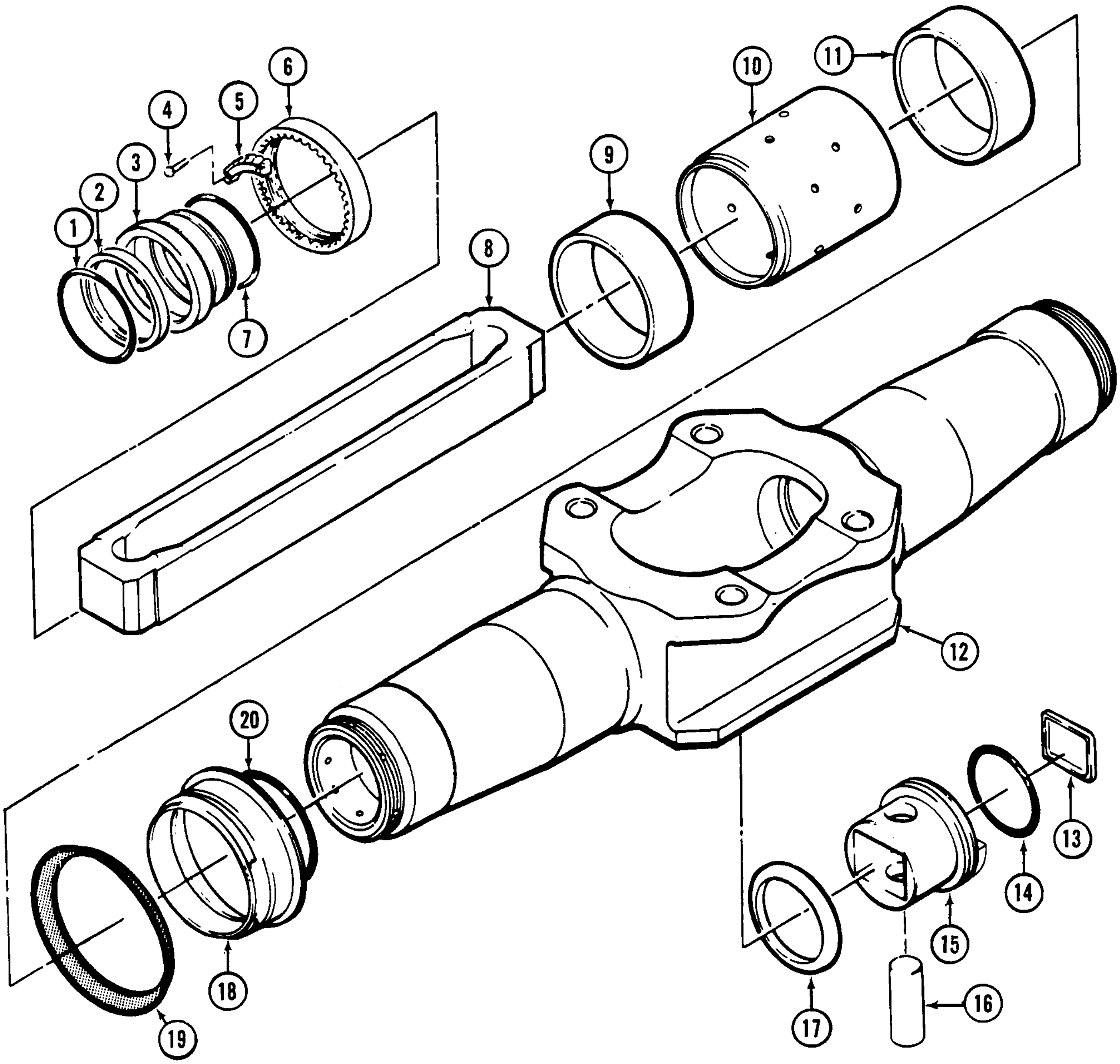
(8) Use strap retainer nut (26, figure 5-10) as a wrench to remove nut (6, figure 5-11).

(9) Using bearing puller (T45) remove bearing inner race (9), spacer (10), bearing inner race (11), and radius ring (18) from yoke (12). (See figure 5-12 for bearing puller (T45) usage.) Remove packing (20, figure 5-11) and shield (19) from radius ring (18). Identify bearing inner races (9 and 11) for proper location.

5-18. Cleaning — Main Rotor Hub.

a. Clean all parts with solvent (C-304).

b. Clean sealant from retaining pins and strap fittings using MEK (C-309) and plastic scraper.



1. Packing
2. Channel seal
3. Seal sleeve
4. Screw
5. Lockplate
6. Nut
7. Packing
8. Retention strap
9. Bearing inner race
10. Spacer
11. Bearing inner race
12. Yoke
13. End cap
14. Packing
15. Inboard fitting
16. Pin
17. Backup ring
18. Radius ring
19. Shield
20. Packing

UH-1H-II-M-05-11

Figure 5-11. Main rotor yoke

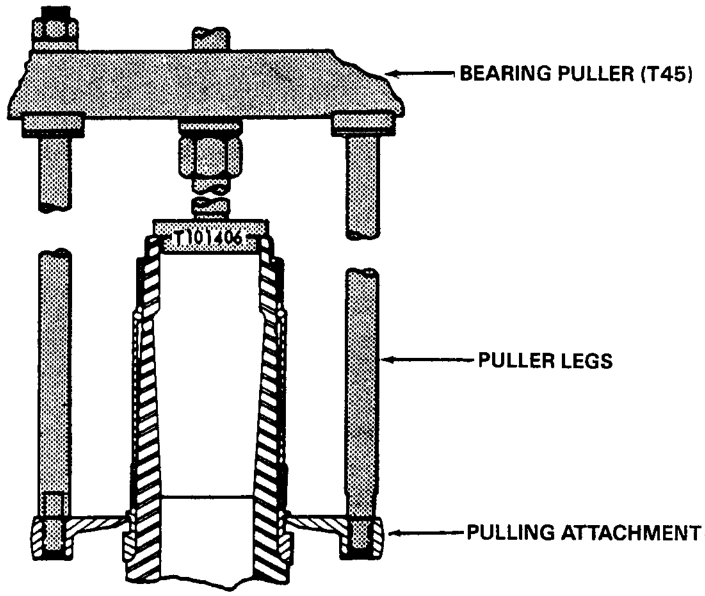


Figure 5-12. Removal of shield and bearing races from yoke spindle

5-19. Inspection — Main Rotor Hub (Disassembled).

Premaintenance Requirements for Inspection of Main Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-326)
Special Environmental Conditions	None

a. Inspect grip reservoir and pillow block reservoir sight gages for scratches, cracks, and for transparency.

b. Inspect pitch horn (16, figure 5-10) for cracks, dents, nicks, and corrosion. Inspect bushings for looseness and elongation of bolt holes. (Figure 5-13.)

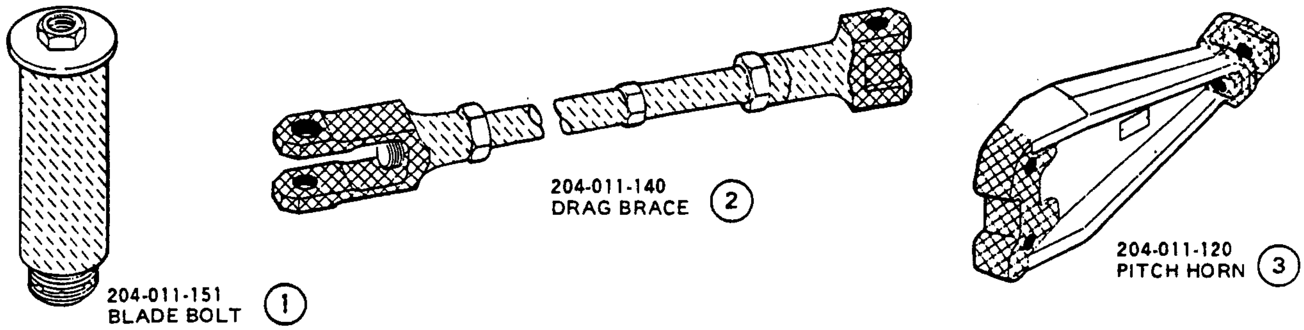
c. Inspect strap retainer nut (26, figure 5-10) for cracks, nicks, damage, and corrosion. Inspect threads on nut (26) for galling and damage. Inspect retention strap fitting (25) for damage. (Figure 5-14.)

d. Inspection attaching hardware for damage, deformation, and crossed or damaged threads. Inspect retaining pins (28, figure 5-10) and (16, figure 5-11) for damage and corrosion. Inspect bonded washers for security.

e. Inspect static stop (10, figure 5-10) for elongation of bolt holes and excessive wear at point of contact with mast.

f. Inspect yoke (7) for scratches and corrosion. (Figure 5-15.) Inspect bearing seats (Figure 5-16) if visual inspection indicates wear. Inspect threads for galling and damage. (Figure 5-15.)

g. Inspect retention strap (8, figure 5-11) for wire strand failures and for abnormalities, such as displacement of urethane wedges between bushing and inner surface of wire bundle as follows:



DAMAGE AREA REPAIR SYMBOLS

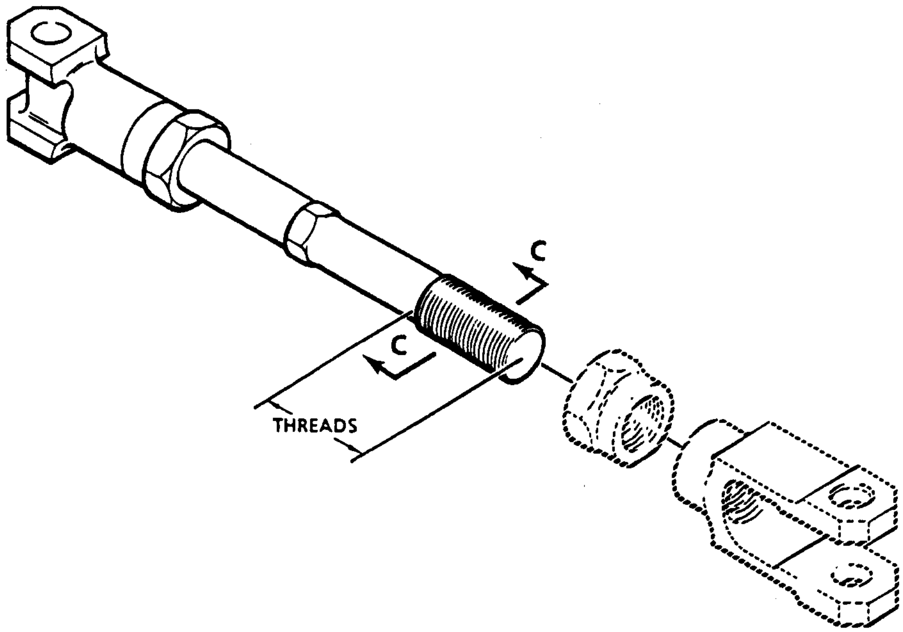
TYPE OF DAMAGE		MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
MECHANICAL AND CORROSION	1		0.005 In. Before and After Repair	0.010 In. Before and After Repair
	2	0.010 In. Before and After Repair	0.020 In. Before and After repair	0.030 In. Before and After Repair
MECHANICAL	3	0.010 In. Before and After Repair		0.030 In. Before and After Repair
CORROSION	3	0.005 In. Before Repair and 0.010 After Repair		0.015 In. Before Repair and 0.030 In. After Repair
MAXIMUM AREA PER FULL DEPTH REPAIR	1		0.25 Sq. In.	Not Critical
	2	0.25 Sq. In.	0.35 Sq. In.	Not Critical
	3	0.10 Sq. In.		0.50 Sq. In.
NUMBER OF REPAIRS	1		Two	Not Critical
	2	One Per Tang	Two Per Segment	Not Critical
	3	Two Per Segment		Not Critical
EDGE CHAMFER	1		Not Aplicable	0.030 In.
	2	0.030 In.	0.030 In.	0.060 In
	3	0.030 In.		Not Critical

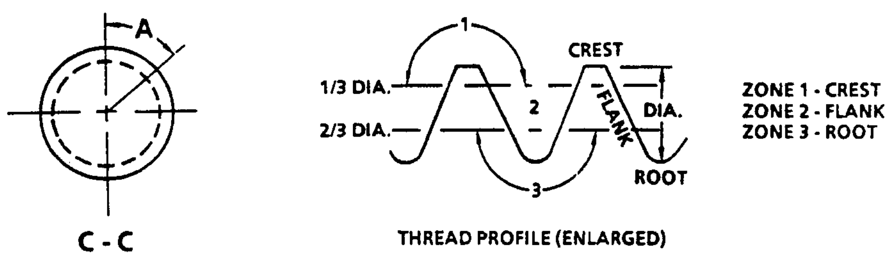
THREAD DAMAGE:			
	Depth:	1	One-Third of Thread
	Length:	1	One-Half Inch
		2	Refer to Sheet 2
	Number:	1	One
		2	Refer to Sheet 2

BOLT HOLE DAMAGE: ● 0.001 Inch for 1/4 Circumference.

UH-1H-II-M-05-13-1

Figure 5-13. Blade bolt, drag brace, and pitch horn damage limits (Sheet 1 of 2)

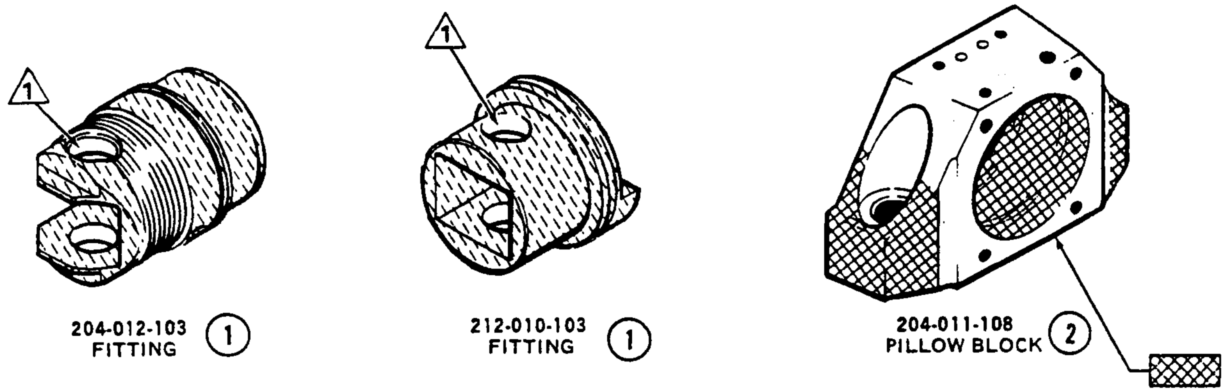




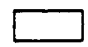
TYPE/LOCATION OF DAMAGE	THREAD REPAIR
MECHANICAL DAMAGE:	
Zone 1	1/5 dia., A = 45°, 2 occurences per thread, 1/3 total no. thread
Zone 2	0.005 in., A = 45°,1 occurence per thread, 1/4 total no. thread
Zone 3	None allowed
CORROSION DAMAGE:	
Zone 1	1/5 dia., A = 45°, 2 occurences per thread, 1/3 total no. thread
Zone 2	0.005 in., A = 45°,1 occurence per thread, 1/4 total no. thread
Zone 3	0.002 in., A = 45°, 2 occurences per thread, 1/2 total no. threads (maintain original root radius, blend to flank)
CRACKS:	None allowed

UH-1H-II-M-05-13-2

Figure 5-13. Blade bolt, drag brace, and pitch horn damage limits (Sheet 2 of 2)



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE				
		MAXIMUM DAMAGE AND REPAIR DEPTH		
CORROSION (Before and after Repair	1		0.005 in.	
MECHANICAL (Before and after repair)	1		0.005 in.	
	2	0.020 in.		0.040 In.
CORROSION (Before repair) (After repair)	2	0.010 in. 0.020 in.		0.020 in. 0.040 in.
MAXIMUM AREA PER FULL DEPTH REPAIR	1		0.50 square in.	
	2	0.10 square in.		0.25 square in.
NUMBER OF REPAIR AREA	1		One inside One outside	
	2	One per segment		Not critical
EDGE CHAMFER	1		0.020 in.	
	2	0.060 in.		0.100 in.

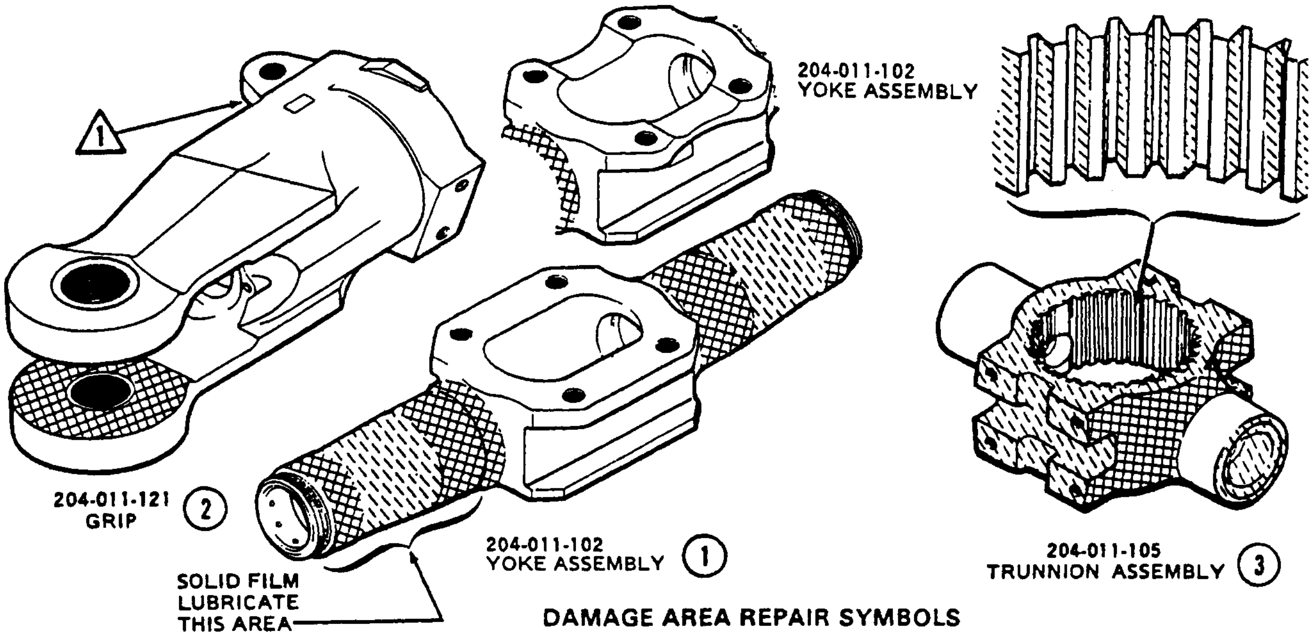
THREAD DAMAGE:
- DEPTH: One-quarter of thread
- LENGTH: One-half inch
- NUMBER: One

STRAP PIN HOLE: 1 0.0005 Inch for 1/4 circumference

BOLT HOLE DAMAGE: ● 0.001 Inch for 1/4 circumference

UH-1H-II-M-05-14

Figure 5-14. Outboard fitting, inboard fitting, and pillow block damage limits



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED			
MECHANICAL AND CORROSION	1	0.002 In. Before and After Repair (Restore to RHR 125	0.005 In. Before and After	0.020 In. Before and After Repair
MECHANICAL	2	0.020 In. Before and After Repair		0.060 In. Before and After Repair
CORROSION	2	0.010 In. Before and 0.020 In. After Repair		0.030 In. Before Repair and 0.060 In. After Repair
MECHANICAL AND CORROSION	3	0.010 In. Before and After Repair	0.020 In. Before and After Repair	0.002 In. Before and After Repair
MAXIMUM AREA PER FULL DEPTH REPAIR	1	0.50 Sq. In.	0.50 Sq. In.	Not Critical
	2	See Note		Not Critical
	3	0.10 Sq. In.	0.50 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	1	Two Per Side Diametrically Opposed	Not Critical	Not Critical
	2	Not Critical		
	3	One Per Segment	Not Critical	Not Critical
EDGE CHAMFER	1	0.030 In.		0.040 In.
	2	0.060		0.100 In.
	3	0.040 In.	0.040 In.	0.040 In.

UH-1H-II-M-05-15-1

Figure 5-15. Main rotor grip, yoke, and trunnion damage limits (Sheet 1 of 2)

SPLINE DAMAGE:	3	Depth	One-Third of Spline
	3	Length:	One-Half of Spline
	3	Number:	Three Splines
THREAD DAMAGE:	1 3	Depth:	One-Third of Thread
	1	Length:	One-Half Inch
	3		One-Quarter Inch
	1	Number	Two Per Segment
	2		One Per Segment
BOLT HOLE DAMAGE:	●		0.002 Inch for 1/4 Circumference

NOTE: 1 Area of repair on surfaces mating with blade or drag brace shall not exceed one-half of any quadrant.

UH-1H-II-M-05-15-2

Figure 5-15. Main rotor grip, yoke, and trunnion damage limits (Sheet 2 of 2)

(1) A total of 25 broken wires (50 loose ends) protruding through urethane coating of any one of the 8 outside corners is cause for rejection. A total of 400 loose ends found over the entire strap surface is cause for rejection.

(2) Strap bulge in excess of 0.06 inch outside the normal straight contour is cause for rejection. Bulging of strap cross-section in any area from the ends of the strap to 4.0 inches inboard is normal and not cause for rejection.

(3) Cracks in urethane coating are not permitted. Delamination between urethane wedges and spools is acceptable.

(4) Delamination of urethane coating from the bushings is acceptable. Delamination in any other area is cause for rejection.

(5) A permanent set in twist may occur and is not cause for rejection.

(6) Strap stiffness can vary when flexed in an unloaded condition and is not cause for rejection.

(7) Oil contamination resulting in swelling of the urethane coating is cause for rejection. If oil has come in contact with strap but swelling has not occurred, strap assembly shall be cleaned with denatured alcohol (C-326) to remove all traces of oil.

(8) Displacement of urethane wedges between bushings and inner surface of wire bundle is cause for rejection.

(9) Cracks in strap bushings are cause for rejection. Inspect using a 10-power magnifying glass.

(10) Inspect bushings for fretting corrosion. A maximum of 0.005 inch in depth for 25 percent total area is allowed on bushing flange surfaces. A maximum of 0.002 inch in depth is allowed for 1/4 of total bushing bore surfaces.

h. Inspect inboard fitting (15, figure 5-11) for nicks, damage, and corrosion. (Figure 5-14.)

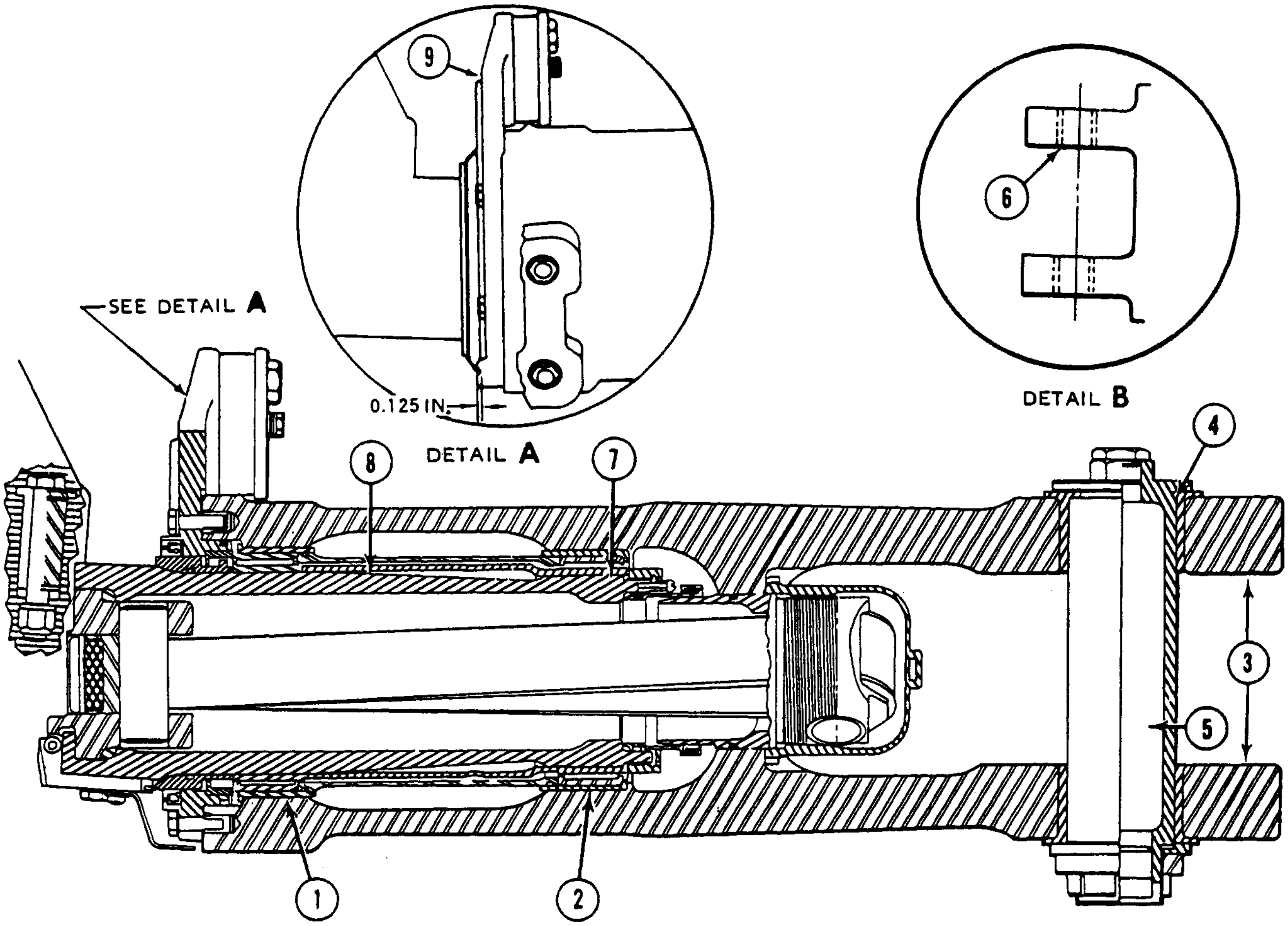
i. Inspect backup ring (17, figure 5-11) for cracks, nicks, damage, and distortion.

j. Inspect spacer (10) for corrosion.

k. Inspect nut (6) for cracks, corrosion, and damaged threads.

l. Inspect bearing inner races (9 and 11) for evidence of spalling of outer diameter and discoloration due to overheat. Inspect for signs of races turning on yoke.

m. Inspect radius ring (18) in seal contact area for signs of grooving. Grooving depth not to exceed 0.020



			MIN.	MAX.
			INCHES	
1.	Liner	ID	5.624	5.631 Avg.
2.	Liner	ID	5.374	5.381 Avg.
3.	Grip (Width) ⚠1		4.492	4.516
4.	Bushing	ID	2.500	2.504
5.	Bolt (Blade Retaining)	OD	2.4982	2.4999
6.	Bushing (Drag Brace) (See Detail B)	ID	0.8745	0.8770
		Width	2.874	2.876
7.	Spindle (Yoke)	OD	4.493	4.4985
8.	Spindle (Yoke)	OD	4.743	4.7485
9.	Plate (Measure from unworn surface)			0.125

NOTES:

⚠1 Measured at centerline of blade bolt hole.

UH-1H-II-M-05-16

Figure 5-16. Main rotor hub — wear limits inch. Inspect rings for cracks and corrosion damage (none allowed). Inspect shield (19) for tears, bonding, or other damage.

n. Inspect grip plate (13, figure 5-10) for cracks, elongated bolt holes and distortion.

o. Inspect grip plate shims (15) for curled or damaged laminations.

p. Inspect reservoir cover (6, figure 5-8) and sight glass (8) for cracks and damage.

q. Inspect grip (3, figure 5-10) surfaces for mechanical and corrosion damage. (Figure 5-15.) Inspect for worn or chipped protective paint on inside surface of tangs. Inspect rosan inserts for security and damaged threads. Inspect main rotor bolt hole, drag brace bushings, width between grip tangs and bearing liner inside diameter to limits if visual evidence of wear is present. (Figure 5-16.)

r. Inspect trunnion for nicks, damage, and corrosion. (Figure 5-15.) Inspect dry-lube film on spindles for scratches and wear.

s. Inspect reservoir (7, figure 5-9) and reservoir cover (5) for cracks and damage.

t. Inspect pillow block (9) for damage and corrosion. (Figure 5-14.)

u. Inspect retainer strap lock (21, figure 5-10), clamp (22), and key (27) for cracks and damage.

5-20. Repair or Replacement — Main Rotor Hub.

Premaintenance Requirements for Repair of Main Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None

Premaintenance Requirements for Repair of Main Rotor Hub

CONDITIONS	REQUIREMENTS
Consumable Materials	(C-005), (C-100), (C-108), (C-245), (C-204), (C-207), (C-301), (C-328), (C-344), (C-407), (C-411), (C-464), (C-486), (C-500)
Special Environmental Conditions	None

a. Replace all packings and seals. Replace self-locking nuts and unserviceable attaching hardware.

b. Replace parts having mechanical or corrosion damage that exceed repair limits of figures 5-13, 5-14, and 5-15.

c. Replace parts that exceed wear limits of figure 5-16 or any part if defects are found for which no damage limits are established.

d. Replace shims if laminations are curled or damaged.

e. Replace radius ring (shield assembly) (18, figure 5-11) if damage penetrates hard anodized finish or if groove in seal area exceeds 0.020 inch in depth. If radius ring shield (19) is torn or damaged, replace as follows:

(1) Remove damaged shield and clean off aged adhesive.

(2) Vapor degrease shield and ring.

(3) Apply adhesive (C-301) to mating surfaces of both the shield and ring and to inside diameter of shield. Mix and cure adhesive to specifications listed on container.

(4) Position shield on radius ring and apply sealing compound (C-328) to bridge gap between shield and machined breakout of ring (two places). Apply light pressure to the assembly and cure for 24 hours at 160°F (71°C), or five days at room temperature.

f. Repair drag brace assembly (30, figure 5-10) as follows:

(1) Externally.

(a) Polish out minor nicks, scratches, and dents with crocus cloth (C-500). (Figure 5-13.) Coat repaired areas with LHE cadmium plating solution (C-108). (Refer to BHT-212-CR&O for prescribed cadmium plating method.) Replace components if damage or corrosion exceed limits. (Figure 5-13.)

NOTE

Allow enamel to air dry approximately 30 minutes prior to elevated temperature curing.

(b) Repaint, two coats as required, inside tang surfaces of clevis (31, figure 5-10) and outboard flat surfaces of fitting (32) with epoxy enamel (C-207). Allow enamel to cure at 65 to 85°F (18 to 29°C) for 48 hours or elevated temperature of 180°F (82°C) for two hours.

(2) Internally.

(a) Remove internal corrosion from fitting (32) with alcoholic phosphoric cleaner (C-344), abrasive pad (C-407), or steel wool (C-411). If corrosion cannot be removed by either method, replace fitting.

NOTE

Do not allow primer on threads of barrel or fitting.

(b) Treat area of corrosion removal by assembling fitting to barrel. Fill and drain fitting and barrel with epoxy polyamide primer (C-204).

(3) Polish damaged areas of drag brace bolts (1) blending edges of damage into surrounding surface to a smooth contour, using crocus cloth (C-500). Damage area shall not exceed one-fourth of bolt circumference after cleanup. Replace bolts if outside diameter is less than the following limits.

(a) Inboard drag brace bolt 0.8721 inch.

(b) Outboard drag brace bolt 0.8721 inch.

g. Blade bolt. (Figure 5-13.)

(1) Polish out minor scratches, score marks, and damage with crocus cloth (C-500). (Figure 5-13.)

(2) Replace blade bolts if scored, corroded, or worn in excess of limits in figures 5-13 or 5-16.

(3) Coat repaired areas with LHE cadmium plating solution (C-108). (Refer to BHT-212-CR&O for prescribed cadmium plating method.) Replace solid film lubricant (C-005) by spray or dip method if damaged or removed for inspection. Apply 0.0002 to 0.0005 inch thick on all exterior surfaces. (Refer to BHT-212-CR&O.)

h. Pitch horn (16, figure 5-10).

(1) Polish out minor nicks, dents, and scratches with crocus cloth (C-500).

(2) Coat repaired areas with brush chemical film material (C-100).

(3) Replace pitch horn if cracked, damaged, or corrosion exceeds limits of figure 5-13.

(4) Replace bushings that are loose or out-of-round.

i. Strap retainer nut (26, figure 5-10) and retaining pin (28).

(1) Polish out minor nicks and scratches.

(2) Replace part if cracked, damaged, or corroded.

j. Static stop (10, figure 5-10). Replace static stop if bolt holes are elongated or cracked or if part is distorted.

k. Yoke (7).

(1) Polish out minor scratches and damage on noncritical areas of yoke with crocus cloth (C-500).

(2) Longitudinal scratches on spindle not in excess of 0.002 inch deep need not be completely removed. Surface burrs should be removed using crocus cloth (C-500). Clean up minor damage to threads. (Figure 5-15.)

(3) Replace yoke if cracked, if bearing seats are worn beyond limits of figure 5-16, or if damaged beyond repair.

l. Strap (8, figure 5-11).

(1) Replace strap if severely ruptured or if loose wire ends protrude through the urethane coating, exceeding the following limits:

(a) Fifty loose ends in any one corner.

(b) A total of 400 loose ends over entire surface.

(2) Loose ends should be snipped off flush with urethane coating and the number found entered in hub historical record. If subsequent inspection reveals additional loose ends, this number should be added to entry in hub record to determine disposition of strap.

m. Inboard fitting (15, figure 5-11) and retention strap fitting (25, figure 5-10).

(1) Polish out minor nicks and corrosion damage. (Figure 5-14.)

(2) Replace fitting if cracked or badly corroded.

n. Backup ring (17, figure 5-11).

(1) Polish out minor nicks, scratches, and dents.

(2) Replace ring if cracked or distorted.

o. Replace retaining pin (16) or spacer (10) if corroded or cracked.

p. Nut (6).

(1) Clean up minor damage to outer surface.

(2) Replace if cracked, damaged, or corroded.

q. Replace radius ring (18) if cracked, corroded, damaged or if outside diameter is less than 5.488 inches.

r. Replace grip plate (13, figure 5-10) if cracked, distorted or if bolt holes are elongated, or if shield contact area on plate reservoir drain port exceeds a depth of 0.150 inch.

s. Replace grip plate shims (15) if laminations are curled or damaged.

t. Replace reservoir cover (6, figure 5-8) and sight glass (8) if cracked or damaged.

u. Grip repair.

(1) Polish out nicks, dents, and corrosion on outer surface of grip (3, figure 5-10). (Figure 5-15.) Treat repairs with brush chemical film material (C-100).

(2) Vapor degrease grip using trichloroethylene (O-T-634, Type II) at 188 to 193°F (87 to 89°C) and abrasive pad (C-407). After cleaning, apply a film of water to surface and check for water break free surface. If a flashout occurs within 25 seconds after flow of water stops, repeat cleaning and testing.

(3) Apply brush coat of chemical film material (C-100) to surface. Rinse grip with clean water and dry with cheesecloth (C-486) or tack rag.

(4) Apply epoxy polyamide primer (C-204) to surface. Prime shall be overcoated in not less than 1 hour and not more than 8 hours. If prime was applied at elevated temperatures, apply overcoat in not less than 30 minutes and not more than 3 hours.

NOTE

Surfaces not overcoated within 1 hour requires being tack rag wiped prior to application of next coat.

(5) Apply coating (C-245) within time limits of step (4). Apply a second coat after a minimum 30 minutes drying time.

(6) Cure by air drying for 1 hour and baking at 160°F (71°C) for one hour. Alternate cure is air dry at room temperature for 4 to 6 hours.

(7) Replace grip if dimensions of bearing liners, bushings or grip tangs exceeds limits of figure 5-16.

v. Trunnion Repair.

(1) Clean up minor nicks, burrs, and scratches on splines with fine India stone (C-464).

(2) Replace trunnion if cracked, damaged, or corrosion limits of figure 5-15 are exceeded.

w. Replace reservoir (7, figure 5-9) and reservoir cover (5) if cracked or damaged.

x. Pillow Block Repair (9).

(1) Polish out minor nicks and scratches in pillow block with crocus cloth (C-500). (Figure 5-14.)

(2) Coat repaired areas with brush chemical film material (C-100).

(3) Replace pillow block if damaged, cracked, or damaged beyond limits in figure 5-14.

5-21. Assembly — Main Rotor Hub.

Premaintenance Requirements for Assembly of Main Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T37), (T52)
Test Equipment	None
Support Equipment	Heat lamp
Minimum Personnel Required	Two
Consumable Materials	(C-015), (C-017), (C-101), (C-204), (C-304), (C-308), (C-309), (C-316), (C-328), (C-368), (C-405)
Special Environmental Conditions	None

a. Assemble yoke as follows:

NOTE

Following procedure is for one side only. Opposite side is identical and should be assembled at same time.

(1) Position yoke (12, figure 5-11) on edge and temporarily install static stop (10, figure 5-10).

(2) Position adapter buildup bench plate (T52), flat surface down, on buildup bench (T37). Place yoke on buildup bench and plate.

(3) Coat inside diameter of yoke (12, figure 5-11) with corrosion preventive compound (C-101).

(4) Install radius ring (18) as follows:

(a) Clean inboard side of radius ring (18) and spindle radius on yoke (12) with a cloth dampened with solvent (C-304).

(b) Install packing (20) in radius ring (18).

(c) Place radius ring under heat lamp for approximately 30 minutes prior to installation.

(d) Apply a bead of sealing compound (C-328) to yoke spindle radius.

(e) Position radius ring and packing on yoke and tap lightly using a nonmetallic drift to ensure seating on yoke spindle radius. Fair sealant squeeze out to ensure that no sealant voids exist between radius ring and adjacent yoke surfaces.

NOTE

Bearing inner race (9 and 11) may be installed with chamfer inboard or outboard. Both inner race and bearing must be installed with chamfer in the same direction.

NOTE

Do not mix lubricants (C-015 or C-017).

(5) Apply lubricant (C-015 or C-017) to inside diameter of bearing inner races (9 and 11) and to yoke spindle bearing seats. Apply heat lamp to bearing inner race (11) and install on spindle against radius ring (18). Slide spacer (10) on spindle with stepped end outboard. Install outer bearing inner race (9) next to spacer. Note direction of chamfer on bearing races (9 and 11).

(6) Using strap retainer nuts (26, figure 5-10) as a wrench, install nut (6, figure 5-11) on spindle, torque nut (6) 85 to 170 foot-pounds. Tap nut with a nonmetallic hammer to seat bearing races, spacer, and radius ring. Retorque nut (6) 85 to 170 foot-pounds. Back off nut (6) to give 0.005 to 0.015 inch clearance between nut and inner race of bearing.

NOTE

Lockplate may be installed on spindle of yoke with either face next to spindle to allow alignment with screw holes in spindle end.

(7) Install lockplate (5) and secure with two screws (4). Secure screws with lockwire.

(8) Remove static stop (10, figure 5-10), insert retention strap (5) through spindle from outboard

end. Place backup ring (17, figure 5-11) over strap end in center of yoke (12) with flat surface inboard. Install packing (14) on inboard fitting (15) and install fitting on inboard end of strap (8) with tabs on fitting down. Insert retaining pin (16) and slide backup ring (17) on inboard fitting (15) tight against shoulder of fitting. Press fitting (15) and strap (8) into cavity of yoke spindle.

(9) Install static stop (10, figure 5-10) on yoke (7) and secure with washers (8) and bolts (9). Tighten bolts and secure bolt heads with lockwire (C-405).

(10) Clean seal sleeve (3, figure 5-11) groove with MEK (C-309).

(11) Clean channel seal (2) with acetone (C-316) or MEK (C-309). Treat with tetra-etch (C-368) and rinse with acetone (C-316) or MEK (C-309).

(12) Coat seal sleeve (3) internal groove, packing (1), and channel seal (2) faying surfaces with adhesive (C-308).

(13) Install packing (1) and channel seal (2) in sleeve (3). Wipe off excess adhesive (C-308) with acetone (C-316) or MEK (C-309).

(14) Cure at room temperature 72 hours minimum with outboard strap fitting or simulated fitting engaged. Alternate cure 338 to 356°F (170 to 180°C) for two hours minimum.

(15) Install packing (7) on seal sleeve (3).

(16) Coat external surface of seal sleeve assembly (3) and internal mating surface of spindle with lubricant (C-017). Install seal sleeve assembly (3) into yoke spindle.

b. Grip reassembly as follows:

NOTE

Procedure is given for one side only. Opposite side is identical and should be installed at same time.

(1) Position grip plate (13, figure 5-10) flat side down on bench.

(2) Place packing (9, figure 5-8) on reservoir surface of plate. Install packing (7) on reservoir cover. Place sight glass (8) on plate. Place cover on sight glass. Place two spring washers (2), a light steel washer (3), aluminum alloy washer (4), and packing (5) on bolt (1). Install bolt (1) in cover (6) and tighten bolt until spring washers (2) are completely compressed. Back bolt off one full turn (six, plus or minus 1/2 wrench flats). Install filler plug (14) and packing (15) in cover (6). Secure filler plug (12) to bolt (1) with lockwire (C-405).

CAUTION

Sealant shall not cover lubrication ports in grip plate.

(3) Install grip plate (13, figure 5-10) on grip (3) with six bolts (11) and washers (12). Tighten bolts (11) snug and measure gap between grip and plate face. Remove plate and install packing (14) and grip plate shims (15) to give 0.003 to 0.007 inch clampup on bearings. Clean OD of grip seal (4) with MEK (C-309). Install grip seal (4) in inboard side of grip plate (13) with head of sealant (C-328) around outside diameter of seal on inboard side. Reinstall grip plate (13) and secure with bolts (11) and washers (12). Install drain plug (13, figure 5-8) with packing (12) and relief plug (11). Secure drain plug (13) and two bottom bolts (11, figure 5-10) together with lockwire (C-405). Secure remaining bolt (11) in pairs with lockwire (C-405).

c. Reassemble pillow block reservoirs as follows:

(1) Install packings (8, figure 5-9), reservoir (7), packing (6) and reservoir cover (5). Place washers on bolts (1) in this order: two spring washers (2), one thin steel washer (3) and one aluminum alloy washer (4). Install bolts (1) and tighten bolts until spring washers (2) are completely compressed. Back bolt off one full turn (6, plus or minus 1/2 wrench flats).

(2) Install filler plug (15) with packing (14) and relief fitting plug (16) in reservoir cover (5).

d. Main rotor hub final reassembly as follows:

NOTE

Grip installations on 204-012-101-023 main rotor hub assemblies do not require 90 degrees rotation.

(1) Position yoke (7, figure 5-10) on buildup bench (T37). Position grip (3) on yoke spindle with

tangs of grip approximately vertical. Press grip inboard and rotate approximately 90 degrees clockwise, if applicable, to lock grip to radius ring (6).

(2) Place packings (29) on retention strap fitting (25) and install on outboard end of retention strap (5) with keyway of fitting and grip aligned. Secure fitting (25) with pin (28). Apply a bead of adhesive (C-308) approximately 0.06 inch diameter around each end of pin (28). Insert key (27) into aligned keyway of grip. Lubricate fitting (25) and strap retention nut (26) threads with approved oil and install nut. (Refer to BHT-212-CR&O.) (Final setting of nut (26) will be accomplished in step (7)).

(3) Apply corrosion preventive compound (C-101) to ID and threaded parts of drag brace assembly (30). Install clevis (31) on data plate end of barrel and fitting (32) on opposite end. Adjust drag brace length to a 19.02 inch dimension between hole centers in clevis and fitting. Check for 0.620 inch thread exposure at clevis end of drag brace. This is initial setting only. (Figure 5-17.)

(4) Attach drag brace assembly (30, figure 5-10) to grip (3) with drag brace bolt (1), washer (2), washer (19), and nut (20). Torque nut (20) 125 to 150 foot-pounds.

(5) Apply corrosion preventive compound (C-101) to bolt (1), washer (2), washer (19), and nut (20).

(6) Apply epoxy polyamide primer (C-204) to faying surfaces of pitch horn (16) and grip (3). Position pitch horn (16) on grip (3) and secure with bolts (18) and washers (17). Torque bolts and secure bolt heads with lockwire (C-405).

(7) Wipe following areas clean with cloth dampened with solvent (C-304) and apply a bead of adhesive (C-308) to following areas:

(a) Pillow block bushing (11, figure 5-9) flanges and adjacent pillow block surface.

(b) Bolt heads (10) and adjacent bushing surface.

(c) Perimeter of pillow block (9) and yoke mating surface.

(d) Pillow block bolt nuts (13) and adjacent yoke surface.

(8) Tighten strap retainer nut (26, figure 5-10) until grip (3) is inboard as far as it will go. Striking outboard end of grip with a plastic mallet while nut (26) is being tightened will aid in seating parts.

(9) Place packing (12, figure 5-8) over drain hole and install drain plug (13) in drain hole. Tighten drain plug (13) and secure with lockwire (C-405).

(10)Fill both grip and pillow block reservoirs with approved oil to show one-half full in the sight glass. Work out air as oil is added. (Refer to Chapter 1 for servicing.)

5-22. Grip Spacing — Main Rotor Hub.

Premaintenance Requirements for Grip Spacing on Main Rotor Hub

CONDITIONS	REQUIREMENTS
Model	UH-1H-II
Part No. or Serial No.	All
Special Tools	(T37), (T44), (T52), (T64), (T68), (T100)
Test Equipment	None
Support Equipment	Bubble Protractor
Minimum Personnel Required	Two
Consumable Materials	(C-405)
Special Environmental Conditions	None

a. Position hub on level buildup bench (T37) (8, figure 5-18) equipped with adapter buildup bench plate (T52) (7). With flap stops (T68) (5) installed, used bubble protractor to check for zero degrees flap. Determine if the top surface of trunnion is parallel to the spanwise top surface of the yoke.

NOTE

When positioning protractor on the grip surface ensure that the protractor is parallel to the protractors position on the yoke surface. Orient protractor in the same direction as when the plane was determined.

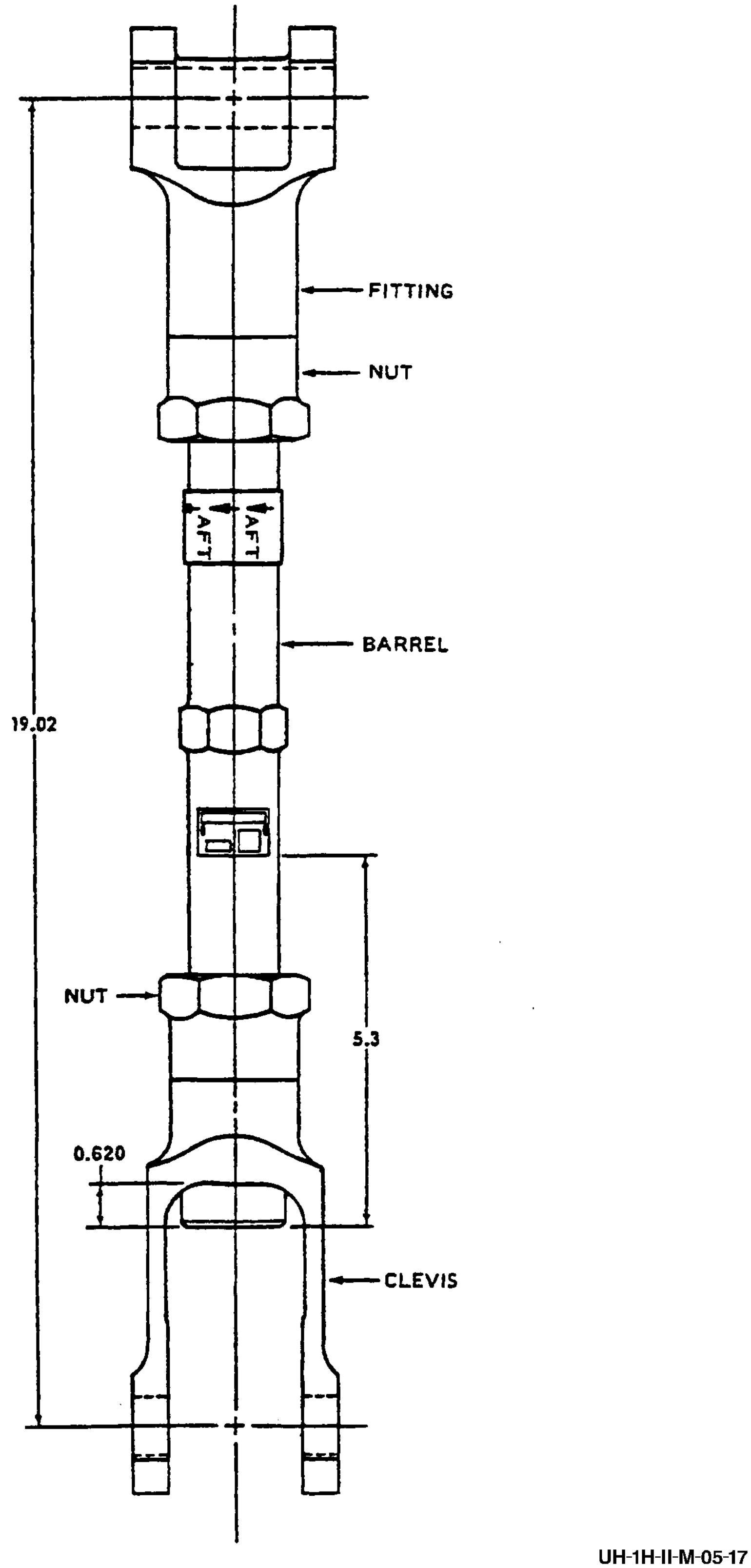
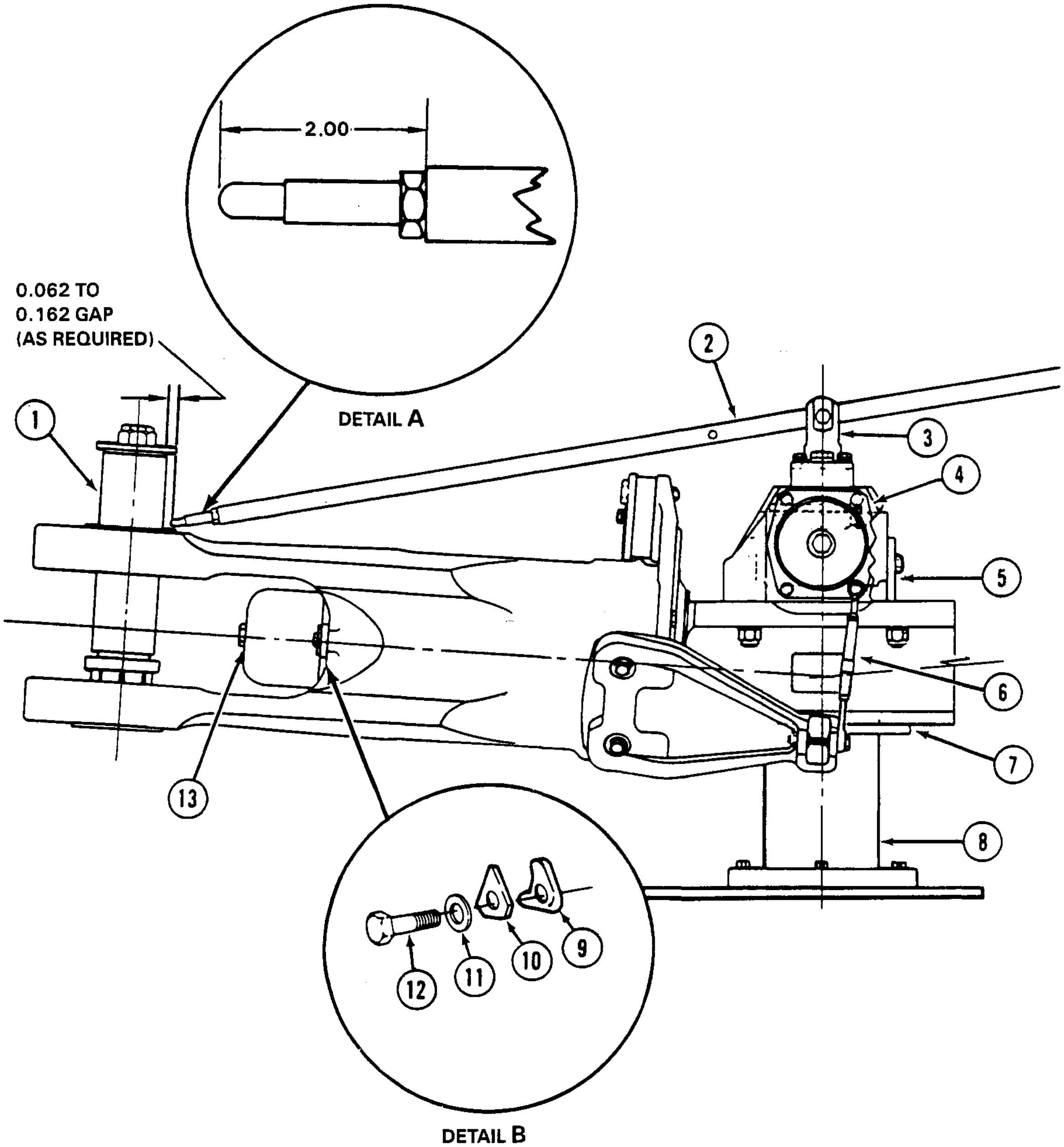


Figure 5-17. Drag brace assembly



1. Blade bolt
2. Grip spacing gage (T64)
3. Plug (T100)
4. Knurled bolt
5. Flap stop (T68)
6. Grip positioning link (T44)
7. Adapter buildup bench plate (T52)
8. Buildup bench (T37)
9. Lock
10. Clamp
11. Washer
12. Bolt
13. Nut

UH-1H-II-M-05-18

Figure 5-18. Main rotor hub grip spacing

b. Install grip positioning links (T44) (6). Place a bubble protractor chordwise on top surface of yoke to establish reference plane, then place the protractor chordwise on grip top surface just outboard of blade bolt bushing. Adjust links to position grips to zero degrees angle.

c. Tighten nut (13) until hub grip is fully seated inboard and then back off nut (13) one full turn. Tap grip outboard using a heavy plastic mallet to aid in seating hub parts. Repeat on opposite side of hub.

d. Insert plug (T100) (3) in trunnion bore and back off knurled bolt (4) to secure plug (3) in trunnion. Set adjustable end of grip spacing gage (T64) (2) to the 2.00 inch dimension shown in detail A, figure 5-18. Position gage on plug and secure gage to plug at hole marked 204-012-101. Locate the adjustable end of gage on grip bushing flange and position blade bolt (1) as shown in figure 5-18.

NOTE

If the 0.062 inch dimension cannot be obtained or grip binding occurs, a gap up to 0.162 is acceptable. Assure grip spacing is the same on both grips within 0.002 inch.

e. Check dimension between tip of grip spacing gage (2) and barrel of blade bolt (1). Adjust nut (13) until gap between gage and bolt is 0.062 inch. Tap grip outboard after each adjustment and recheck dimension.

f. Rotate grip spacing gage (T64) (2) and plug (T100) (3) to the opposite grip and accomplish steps c. and e.

g. Install lock (9), clamp (10), washer (11), and bolt (12) to secure nut (13) on each grip. Lockwire (C-405)bolts (12). Remove grip spacing tools.

5-23. Balancing — Main Rotor Hub.

Premaintenance Requirements for Balancing Main Rotor Hub

CONDITIONS	REQUIREMENTS
Model	UH-1H-II
Part No. or Serial No.	All
Special Tools	(T37), (T44), (T68), (T76), (T77), (T78), (T79), (T80), (T81), (T83), (T90), (T93), (T94), (T96), (T97), (T98), (T112), (T114), (T115), (T116)
Test Equipment	None
Support Equipment	Hoist, Bubble Protractor
Minimum Personnel Required	Two
Consumable Materials	(C-304), (C-405)
Special Environmental Conditions	Draft Free

NOTE

Step a. balancing procedures are for Bell Helicopter balancing tools. Step b. is an alternate procedure using Marvel balancing tools.

a. Main rotor hub balancing using Bell Helicopter balancing tools.

(1) Install grip positioning links (T44) (6, figure 5-18) on each side of hub.

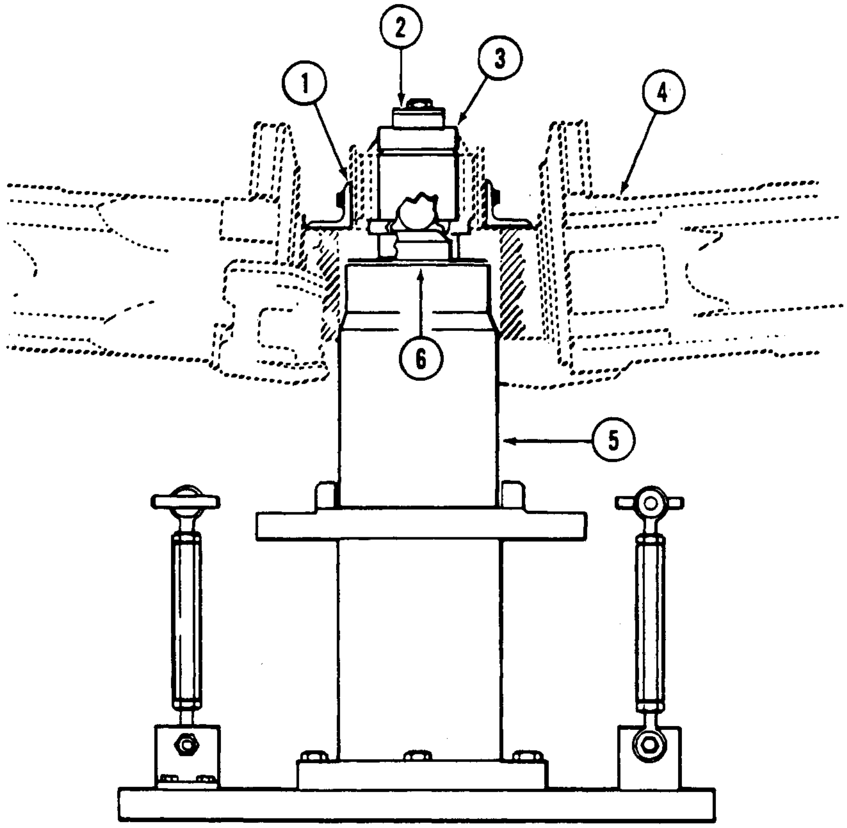
(2) Install flap stops (T68) (1, figure 5-19) on each side of trunnion.

(3) Position balancing set (T96) on buildup bench (T37) (5), with stud of balancing plug (T98) (6) in socket (T97) (3) on top of buildup bench (T37) (5).

(4) Using a plastic mallet, tap on heads of blade bolts (1, figure 5-18) to seat grips in their outward positions.

(5) Position drag braces to symmetrical angular positions (equal angles relative to grips by measuring from blade bolt to blade drag brace bolt hole).

(6) Fill reservoirs with approved oil. An equal amount of oil should be in each grip. (Refer to Chapter 1 for servicing.)



1. Flap stop (T68)
2. Level, bull's-eye (810550)
3. Socket (T97) and spacer (T99)
4. Hub assembly
5. Buildup bench (T37)
6. Plug (T98)

UH-1H-II-M-05-19

Figure 5-19. Main rotor hub balancing

(7) Position main rotor hub assembly on balancing set (T96).

(8) Place a sensitive spirit bulls-eye level (2, figure 5-19) on top surface of balancing set (T96). Balance hub spanwise by inserting lead weight into cavity of the appropriate blade bolt, as required, to center bubble in spirit bulls-eye level. Install and secure plugs in blade bolts with lockwire (C-405).

(9) Balance hub assembly chordwise by attaching balance weights (16 maximum) and/or AN970-6 washers (16 maximum), as required, to bolt in center of pillow block liner. Use AN bolts of sufficient length and washer to secure weights and washers without bottoming of bolt in liner.

(10) Color code parts for future reassembly.

(11) Remove hub from balancing stand. Remove flap stops (T68) (1) and grip positioning links (T44) (6, figure 5-18).

b. Main rotor hub balancing using Marvel balancing tools. (Alternate procedure.)

(1) Assemble balancing kit (T90) (1, figure 5-20) with tube assembly (T116), part of (T90) (3), instead of tube assembly (T112), part of (T90) (2) to provide additional hoist arm length.

(2) Center fixture (T79), part of (T93) (1, figure 5-21) on work stand.

(3) Install Sleeve (T80), part of (T93) (2) over top of fixture (1) and seat sleeve on upper shoulder of fixture's central projection.

(4) Install adapter (T83), part of (T94) (3), heavy end downward, over top of fixture (1) and seat on top of sleeve (2). Lock adapter in this position by tightening adapter setscrew (4).

(5) Before positioning hub on fixture, alternately hold grips down to bleed air from grip. Continue filling reservoir and bleed until grips are filled, thereby equalizing oil in both grips. Secure filler plugs with lockwire (C-405). (Refer to Chapter 1 for servicing.)

(6) Attach suitable hoist and carefully lower rotor hub assembly (8) over fixture (1) aligning inside diameter of splined trunnion with piloting diameter of adapter (3). Ensure that cone surface of splined trunnion seats firmly on cone surface of adapter (3).

(7) Install grip positioning links (T44) (6, figure 5-18) and adjust blade grips to symmetrical pitch positions. To accomplish this, place a bubble protractor on flat top surface of rotor hub across the grip pitch axis; adjust protractor to center bubble. Transfer protractor, keeping it in same transverse position, to bottom inside surface of either blade grip fork and align protractor base with the transverse milled line in the fork surface. Adjust grip pitch to center protractor bubble. Transfer protractor in same transverse position to opposite grip fork and repeat grip pitch adjustment.

(8) Place a block of wood against the heads of rotor blade bolts. Tap the block moving the grips in radially outward direction to ensure blade grips are fully seated in their radially outboard position.

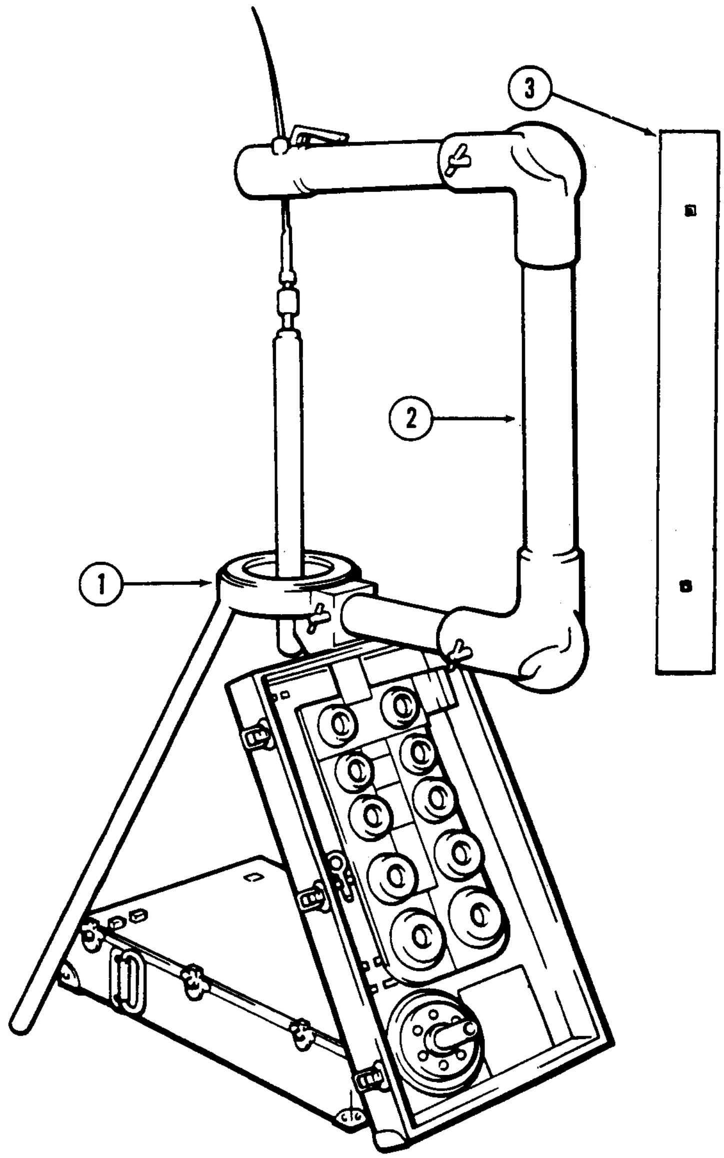
(9) Spot clean hub with solvent (C-304).

(10) Install yoke (T115), part of (T94) (5, figure 5-21), legs downward, over top end of balancing arbor (T78), part of (T90) (6) and positioned so that the top surface of its locking collar (sensitivity setting reference) aligns with arbor scale (7) at 14.75 inches. Lock yoke (5) firmly in this position on arbor with its collar screws, using a 3/16 inch hex wrench. (Balancing Kit (T94).)

(11) Install balancing arbor (6) downward through rotor trunnion and fixture (1) assembly, seating both yoke (5) legs firmly on flat top surface of rotor hub, in line with blade grip pitch axis.

(12) Install spacer (T76) (9) over lower end of balancing arbor (6). Install hand wheel (T77) (14) in bottom end of arbor and tighten to clamp yoke (5) firmly against top surface of rotor hub.

(13)Using drag strut positioning gage (T81), part of (T94) (11), as illustrated, adjust drag brace struts (10) to symmetrical angular position. Use gage outer position (13). Remove gage from rotor assembly during balance check.



1. Balancing kit (T90)
2. Tube assembly (T112)
3. Tube assembly (T116)

UH-1H-II-M-05-20

Figure 5-20. Balancing kit

1. Fixture (T79) (part of (T93))
2. Sleeve (T80) (part of (T93))
3. Adapter (T83) (part of (T94))
4. Adapter set screw
5. Yoke (T115) (part of (T94))
6. Balancing arbor (T78) or (T114) (part of (T90))
7. Arbor scale
8. Rotor hub assembly
9. Spacer (T76)
10. Drag strut
11. Drag strut position gage (T81) (part of (T94)
12. Gage inner position
13. Gage outer position
14. Handwheel (T77)
15. Stand table (T113) or (T117) (part of (T90))
    or
    (Part of 7BAL052 Kit)

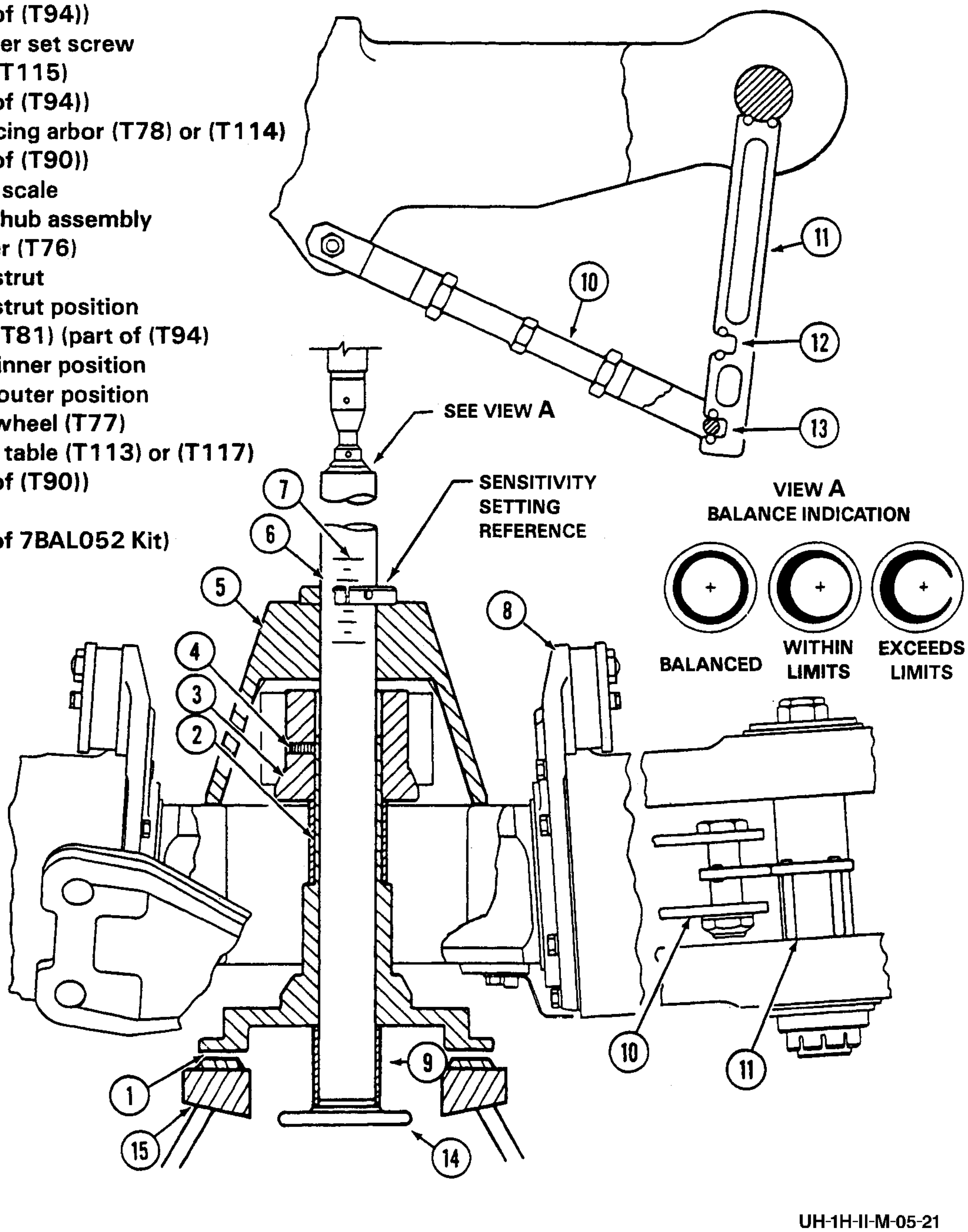


Figure 5-21. Main rotor hub balancing (alternate procedures)

NOTE

To ensure hand wheel is free of interference within the inside diameter of table, it may be necessary to adjust level of stand by installing suitable wood blocks or spacers under the two tubular stand legs.

(14) Install quick-disconnect assembly with 3/16 inch cable on balancing arbor (6). Suspend rod-end and engage cable in lifting plate of hydraulic pump assembly (Kit (T90)). Carefully attach suitable hoist and lift entire assembly approximately 1/4 inch off work stand. Check to ensure that suspended assembly is free from interference with work stand other objects and note balance conditions indicated by black indicator disc at top end of arbor. (View A, figure 5-21.)

(15) Balance hub spanwise by inserting lead into cavity of blade bolt to achieve balance within limits.

(16) Balance hub chordwise by attaching weights and/or small washers, as required, to pillow block liner. A maximum of sixteen weights may be attached with an AN bolt of sufficient length to secure weights without bottoming bolt in liner.

(17) Install and lockwire (C-405) plugs in blade bolts.

(18) Color band parts to maintain their respective positions.

(19) Remove main rotor hub from balancing stand.

5-24. Installation — Main Rotor Hub.

a. Install main rotor blades in hub. (Paragraph 5-34.)

b. Install hub and blade assembly. (Paragraph 5-13.)

5-25. Painting — Main Rotor Hub.

Premaintenance Requirements for Painting of Main Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Paint Spray Gun
Minimum Personnel Required	One
Consumable Materials	(MIL-C-22750), (C-204)
Special Environmental Conditions	Dust Free

NOTE

Painting of main rotor hub is limited to touchup painting of previous painted parts.

a. Apply one coat of epoxy polyamide primer (C-204) to bare metal surfaces.

b. Apply paint (MIL-C-22750) over primer and allow to air dry for 12 hours.

SECTION III — MAIN ROTOR BLADES

5-26. MAIN ROTOR BLADE.

5-27. Description — Main Rotor Blade. The main rotor blade is an all metal bonded assembly, consisting of four major sections; a main spar, a honeycomb core, a trailing edge extrusion, and a nose block extrusion. Fiberglass straps are bonded inside the upper and lower spar surfaces. These straps act as redundant structure to provide secondary and load paths to carry primary loads should the spar be damaged or develop fatigue cracks. Skins, stabilized by honeycomb core, are bonded to the major section by adhesive applied under heat and pressure. Reinforcing doublers, grip plates and drag plates are bonded to the blade butt end. Stainless steel strips cover the leading edge for resistance to abrasion. This basic portion of the blade has a chord length of 21.00 inches. From station 85.00 to the tip of the blade the trailing edge is extended aft 2.38 inches. The extension consists of 2 skins 0.020 inch thick, a core 0.063 inch thick and a spacer 0.050 inch thick. This extension will increase the length of the chord to 23.38 inches outboard of blade station 93.00. A trim tab is provided on the trailing edge for tracking adjustments. A fitting on blade tip, which is used in flag tracking procedure, has a hole for attachment of rotor blade tie-down.

5-28. Removal — Main Rotor Blade.

Premaintenance Requirements for Removal of Main Rotor Blade

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T37), (T48), (T52), (T82)
Test Equipment	None
Support Equipment	Support for Blades
Minimum Personnel Required	Three
Consumable Materials	None
Special Environmental Conditions	None

a. Place main rotor hub on buildup bench (T37) equipped with plate (T82). Support each blade (5, figure 5-22) so that leading edge is straight.

NOTE

Do not change adjustment of drag brace. Assure that blade bolt is identified for reassembly in same grip from which removed. Assure that blade is identified (only required if blade is to be reassembled to same grip of same hub and blade assembly from which removed).

b. Remove bolt (7) with shims (6), washers (9), and nut (10) to detach drag brace (8) from blade (5). Secure shims (6) to brace or to blade for use in reassembly.

c. Remove screws (14), with nut (11) and washer (12) to unlock nut (13). Remove nut (13) and washer (15) from lower end of blade retaining bolt (4).

CAUTION

Reason for lifting blades is because they are preset to 2-3/4 degree cone, and elevation is necessary to free bolts.

d. Gently raise tip of blade until blade bolt (4) can be readily removed. Remove blade from grip.

e. Remove opposite blade in same manner.

5-29. Inspection — Main Rotor Blade.

NOTE

Refer to tables 5-2 and 5-3 for limitations.

a. Trailing edge and skin inspection.

(1) Nicks and scratches anywhere on the surface of the skins or trailing edge strip not in excess of 0.008 inch in depth are acceptable if they are polished out.

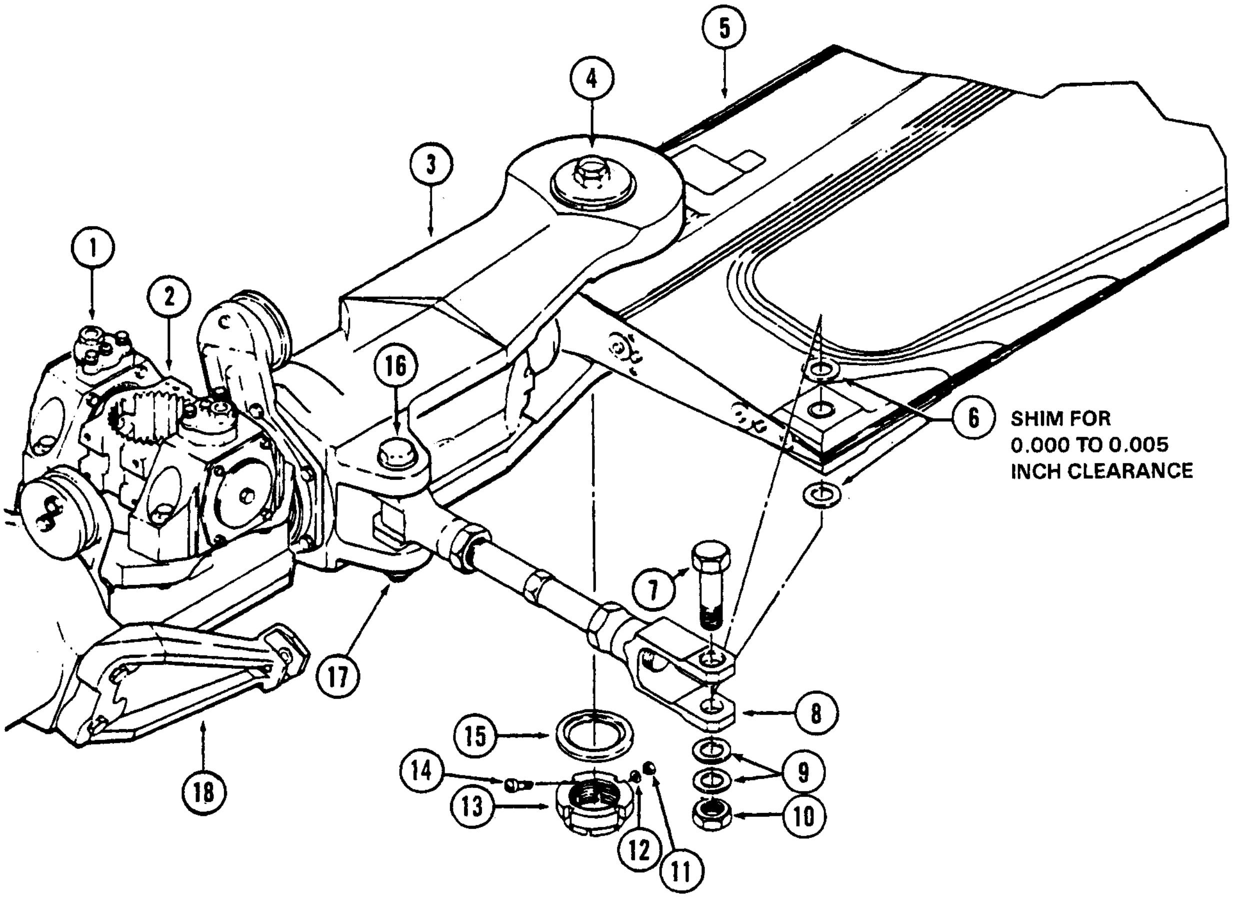
Table 5-2. Main Rotor Blade — Repairable Nicks and Scratch Limits

PARTS AFFECTED	MAX DEPTH OF DEFECT	SPAN STATION
Skin	0.008	Entire Span
Abrasive Strips	0.012	Entire Span
Doublers, Grip and Drag Plates	0.012	Doubler Area
Trailing Edge	0.060	Extrusion and Extension

Table 5-3. Main Rotor Blade — Dent Limits

PARTS AFFECTED	DEPTH OF DEFECT INCHES	DENT SEVERITY	SPAN STATION
Skin	Not visible on opposite side of blade	—	Trailing edge extension
Skin	*Any Depth without puncture	—	Outboard four feet
Skin	0.060	—	Inboard of a station four feet from the tip

*In the outboard four feet of the blade any dent in the skin that does not tear the skin, produce an unacceptable void or affect flight characteristics, is acceptable.



1. Pillow block
2. Hub trunnion
3. Grip
4. Blade bolt
5. Main rotor blade
6. Shims
7. Drag brace bolt
8. Drag brace
9. Washer
10. Nut
11. Nut
12. Washer
13. Nut
14. Screw
15. Washer
16. Drag brace bolt
17. Nut
18. Pitch horn

UH-1H-II-M-05-22

Figure 5-22. Main rotor hub and blade assembly

(2) Nicks in the extreme trailing edge (12 and 14, figure 5-23) that are not in excess of 0.060 inch deep shall be polished out over a distance of at least 2.0 inches each side of the nick.

(3) Any dent in the skin, in the outboard 4 feet of the blade that does not tear the skin, or produce a void detectable when tapping, or effect flight characteristics is acceptable.

(4) Dents in the skin inboard of a station 4 feet from the tip of the blade that are not in excess of 0.060 inch deep are acceptable.

(5) If a nick or scratch exists in a sharp dent in the skin, total depth of both shall not exceed 0.060 inches.

(6) Dents in the skins of the trailing edge extension are permissible provided the dent is not visible on opposite side of blade.

NOTE

There is no center abrasive strip on 212-015-501 main rotor blade.

(7) Nicks or scratches in the abrasive strips, doublers, grip plates that are not in excess of 0.012 inch in depth are acceptable if they are polished out.

b. Inspect scarf joints at leading edge stations 83 and 170 for loss of filler material and corrosion.

c. Inspect trim tab for looseness, cracked fairing compound, and corrosion.

d. Grip plate and drag plate inspection.

(1) Inspect grip plates and drag plates for nicks and scratches. Refer to table 5-2 for limitations. Damage within limits of table 5-2 are acceptable if they are polished out.

(2) Inspect grip plates and drag plates for cracked paint indications along bond lines. Further inspect for voids using a 10-power magnifying glass when paint indications are discovered. Verify whether indications are voids or aging paint.

e. Doubler inspection.

(1) Inspect doublers for dents, nicks, and scratches. Refer to table 5-2 for limitations. Nicks and scratches within limits of table 5-2 must be polished out.

(2) Inspect doublers at edge for cracked paint indications along bond lines. Further inspect for voids using a 10-power magnifying glass when paint indications are discovered. Verify whether indications are voids or aging of sealing compound.

f. Foreign object damage inspection. Main rotor blades receiving damage in the form of nicks, scratches, or dents in the skin may be repaired if within repair limitations. (Figure 5-23 and Tables 5-2 and 5-3.)

g. Inspect for voids as follows:

(1) Voids in the spar assembly, outboard of station 100. (Figures 5-23 and 5-24.)

(a) A 1 inch wide (maximum) void between abrasive strip and nose block at extreme leading edge is acceptable to within 1 inch of the tip of the blade. If void runs through splice joint between center and outboard abrasive strips, it must be completely sealed.

(b) Other voids not exceeding 30 square inches with a maximum of 10 square inches in any single void are acceptable. If voids come closer than 1 inch to each other, they are to be considered a single void.

(c) Voids within 0.38 inch of the edge of the abrasive strip are not acceptable. However, edge voids 0.08 inch maximum deep by any length or 0.25 maximum deep by 3.0 inches maximum length may be sealed with adhesive.

(d) Voids between the reinforcement doubler and the spar not larger than 1 by 3 inches are acceptable. Minimum spacing between centers is 5 inches. Maximum total area of voids to be 30 square inches.

(e) Any void described which is apparent at the tip end is to be sealed with adhesive (C-317, C-313, or C-322).

(2) Voids in the spar assembly, inboard of station 100. (Figures 5-23 and 5-24.)

(a) A 1 inch wide (maximum) void between abrasive strip and nose block is acceptable.

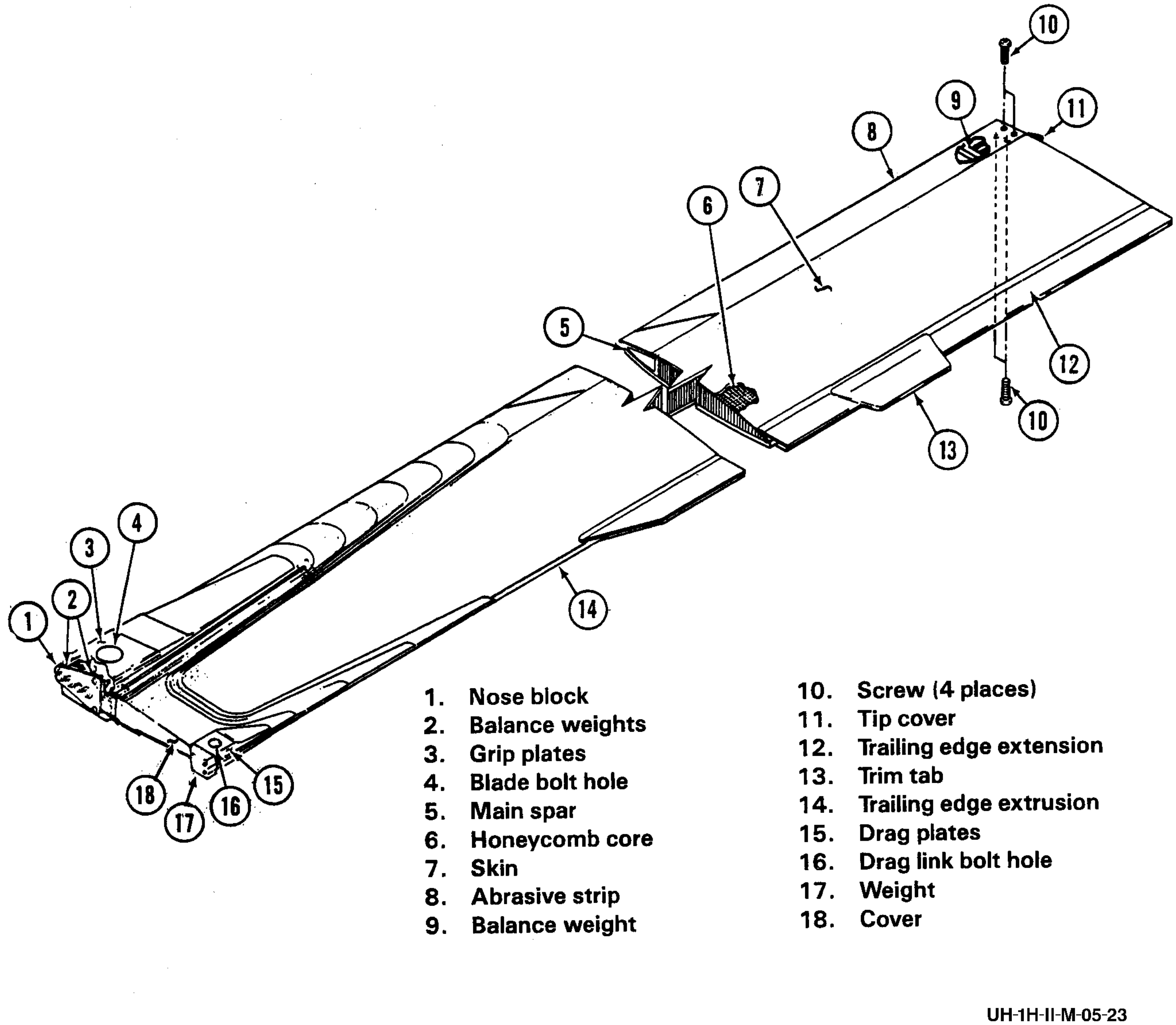


Figure 5-23. Main rotor blade

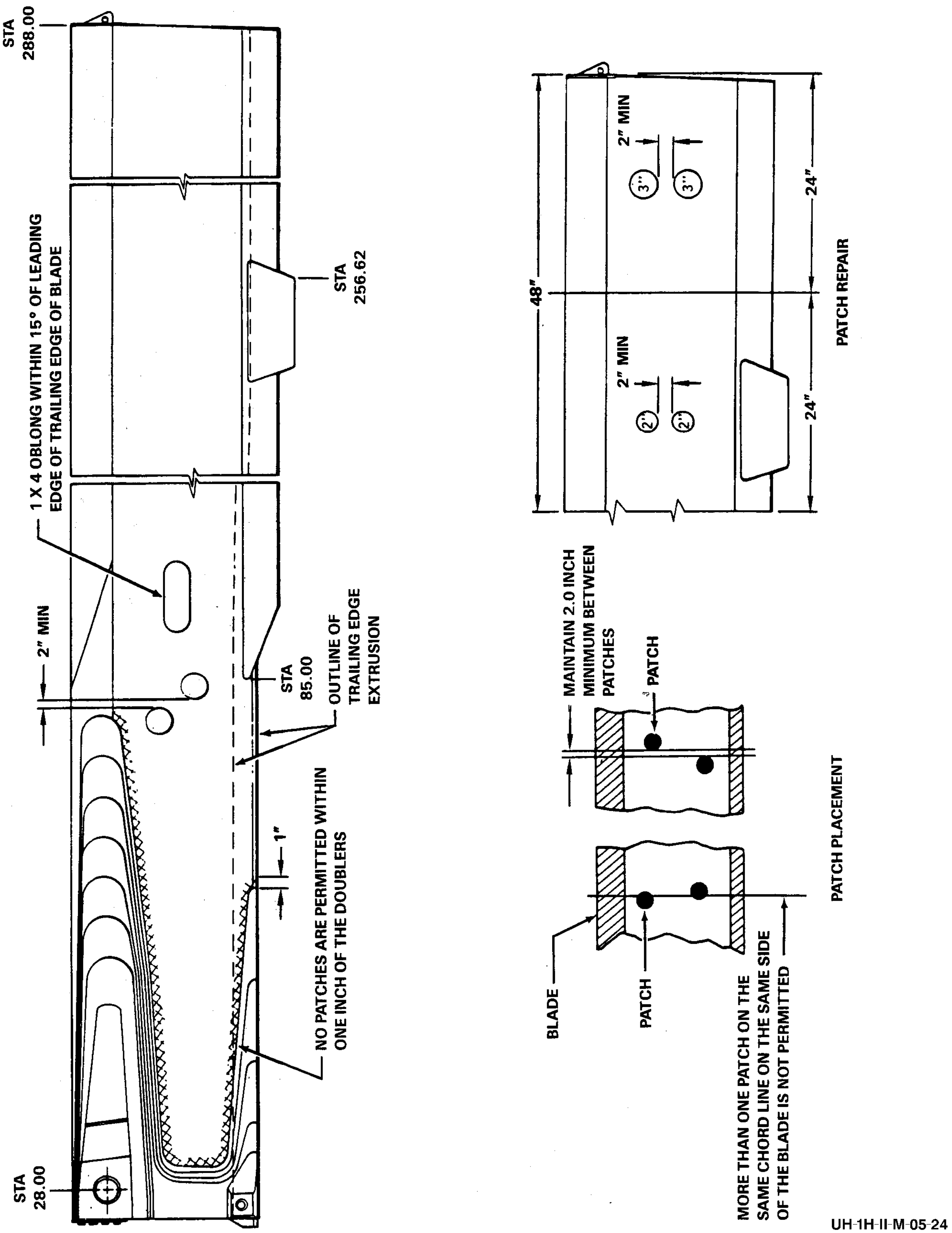


Figure 5-24. Main rotor blade — damage and repair

(b) Voids between abrasive strip and reinforcement doubler not exceeding 10 square inches with a maximum of 2 square inches in any single void are acceptable. Minimum spacing between void centers shall exceed 3 inches.

(c) Voids within 0.38 inch of the edge of the abrasive strip, except at the butt end are not acceptable.

(d) Voids between the reinforcement doubler and the spar, not larger than 0.5 by 1 inch, are acceptable. If voids come closer than 1 inch to each other, they are to be considered as a single void. Maximum total area of voids not to exceed 10 square inches.

(e) Any void described which is apparent at the butt end is to be sealed with adhesive (C-317, C-322, or filler putty C-424).

(3) Voids at butt end of blade. (Figures 5-23 and 5-24.)

(a) Voids between trailing edge extrusion and skin not deeper than 1 inch, or wider than 1 inch, are acceptable.

(b) Any other void not longer than 1 inch or deeper than 0.35 inch is acceptable.

(c) Voids are not acceptable within 0.5 inch of the front or rear edge of either grip plate, (viewing the section of the butt end).

(d) Any void described which is apparent at the butt end is to be sealed with adhesive (C-317, C-322, or filler putty C-424).

(4) Voids in retention area, inboard of station 100. (Figures 5-23 and 5-24.)

(a) Inspect main rotor blade grip pads for edge voids, corrosion and condition of adhesive squeeze-out. Hair line cracks in the paint finish should be suspect for possible voids. Single edge voids on any one side which are 0.060 inch in depth and 2 inches in length are acceptable but must be sealed. Edge voids in excess of these limits are not repairable and is cause for blade replacement. Seal acceptable edge voids with adhesive (C-317 or C-322).

(b) Voids between the doublers or innermost doubler and skin 2 inches wide maximum (chordwise) by 4 inches long maximum (spanwise) are allowable, providing they are not closer than 1 inch to the edge of the doubler or to another void. Total allowable area of voids between all doublers shall not exceed 10 square inches.

(c) Voids between the skin and the core in 5 inch wide region running adjacent to the trailing edge extrusion, not wider than 1 inch or longer than 10 inches, with a minimum width of 1 inch of good bond between them, are permissible. In the remaining area, the width of the void may not exceed 0.5 inch. The total area of all voids is not to exceed 30 square inches.

(d) Edge voids between the edge of the skin and the trailing edge extrusion, that are less than 0.060 inch wide by any length of less than 0.25 inch wide by 7 inches long are acceptable if they are sealed with adhesive (C-322 or filler putty C-424).

(e) Voids within 1 inch of the main blade bolt hole, in any bond line, are not permissible.

(f) Other voids between the skin and the trailing edge extrusion which do not exceed 1/3 the width of the mating surfaces by 10 inches long are acceptable.

(g) Voids between the skin and the box beam reinforcement doubler wider than 0.25 inch are not acceptable.

(5) Voids under the skin, outboard of station 100. (Figure 5-23 and 5-24.)

(a) Voids between the skin and the skins of the trailing edge extension shall not exceed 1/3 the width of the mating surfaces.

(b) Voids between the skin and the core shall not exceed 1 inch in width by 35 inches long. Voids within 1 inch of each other are to be considered as one void. Outboard of Sta. 228 voids between the skin and core shall not exceed 1 inch chordwise by 20 inches spanwise.

(c) Voids of any length between the skin and the box beam reinforcement doubler not exceeding 0.25 inch width are acceptable. Voids not larger than 0.38 inch by 2 inches are acceptable provided spacing between void centers exceeds 6 inches. Edge voids are not acceptable.

(d) Edge voids between the edge of the skin and the skins of the trailing edge extension less than 0.06 inch wide by any length are acceptable if they are sealed with adhesive (C-322 or filler putty C-424).

(e) Edge voids between the trailing edge skins and the 0.050 inch thick spacer at the extreme trailing edge of the blade are acceptable, up to 0.060 inch maximum depth, provided they are sealed with adhesive (C-317, C-322, or filler putty C-424).

(f) Where two voids of different types, void between skin and spar next to a void between the skin and the core, are closer than 1 inch apart, they shall be considered as one void, and the stricter limitation shall apply.

(6) Any crack in any location in the main bonded part of the blade is cause for replacement. The blade should be removed and Bell Helicopter Textron, Product Support Department notified if the crack was not caused by an accident.

(7) The condition of the paint on any stainless steel abrasive strip or leading edge is unimportant.

(8) If paint is deteriorating immediately behind the stainless steel leading edge, it may be due to galvanic action which may result in deep pits in a short period of time. If this appears to be happening, the blade should be removed and the local area coated with corrosion preventive compound (C-101) or any grade of grease, until refinishing can be accomplished. Refinish blade as soon as possible.

5-30. Nonrepairable Damage — Main Rotor Blade.

a. Water or corrosion in the honeycomb core.

b. Any blade that has reached the maximum service life.

c. If one or more cracks develop and extend from a previously repaired area and the crack exceeds allowable repair limits.

d. Holes in the skin larger in area than allowed for patching.

e. Any corrosion that penetrates entirely through the skin and is beyond patch limitations.

f. Voids between the skin and honeycomb core of the basic blade larger than 25 square inches.

g. Any penetration through the spar, trailing edge extrusion, doublers, grip plates, or drag plates.

h. Edge voids deeper than 0.50 inch at the tip end of any of the root end doublers or grip plates.

i. Edge voids in the leading edge of the doublers that exceed 0.060 inch in depth and at the trailing edge of the doublers that exceed 0.10 inch in depth.

j. Major damage to the trailing edge extension that does not damage the basic blade (trailing edge extrusion and skins) should be sent to an authorized blade repair station.

k. Obvious deformation of blade.

5-31. Repair or Replacement — Main Rotor Blade.

a. Repair skin as follows:

NOTE

If a nick or scratch in the skin in excess of 0.008 inch deep can be polished smooth without leaving the skin in the polished area so thin that it can be dented with fingernail pressure, then a patch may be applied over the area without cutting a hole. (Refer to BHT-212-CR&O for main rotor blade patching procedures and patching limitation.) Nicks and scratches in the skin trailing edge strip or skin of trailing extension that are 0.008 inch or less must be polished out.

(1) Nicks and scratches on skin exceeding allowable limits of table 5-2 may be patched the same as a hole. Do not exceed limits shown on figure 5-24.

NOTE

Remove only enough material to completely remove the nick or scratch.

(2) Polish out all acceptable nicks and scratches using 180 grit abrasive paper (C-423) followed by 400 grit. Final polish with 600 grit abrasive paper (C-423). Steel wool may be used on the abrasive strip to polish out defects. Acceptable dents need not be filled and faired. Accomplish sanding in a spanwise direction.

(3) If a nick or scratch cannot be polished out, it shall be cut out and patched if within allowable limits for patching.

(4) Polish out nicks or scratches anywhere on the surface of the skins or trailing edge strip (figure 5-25) that are not in excess of 0.008 inch in depth. Accomplish sanding in a spanwise direction using 200 grit or finer abrasive cloth or paper (C-423).

(5) Dents in the skin inboard of a station 4 feet from the tip of the blade that are not in excess of 0.060 inch deep are acceptable. Dents in excess of this value shall be polished, smoothed, and patched, if within allowable limitations for patching.

(6) Nicks or scratches in the abrasive strips, doublers, grip plates that are not in excess of 0.012 inch in depth are acceptable if they are polished out. Sanding to be accomplished in a spanwise direction.

(7) If paint is worn through over the aluminum metal surface, the blade should be given a touch-up refinish operation as soon as practical, as described in paragraph 5-32.

b. Repair voids as follows:

(1) All acceptable edge voids should be mechanically cleaned out, where possible, and “swabbed out” with filler before trying to fill the cavity. All edge voids must be filled as deeply as possible by placing extra filler material over the cavity, and quickly pressing the filler into the cavity with the flat side of the blade. Repeat this operation several times. Fill and seal all edge voids with adhesive (C-313, C-317, C-322, or filler putty C-424). Smooth and allow to cure according to manufacturers recommendation.

(2) Blades with voids which exceed allowable limits should be forwarded to depot for evaluation and repair. (Paragraph 5-29.)

5-32. Painting — Main Rotor Blade.

a. Clean area with solvent (C-304).

b. Repair all scratches, nicks, and dents within inspection limits.

c. Using abrasive pad (C-407) remove all surface oxides and all aged chemical film material from all bare aluminum surfaces.

NOTE

Do not handle unpainted surfaces with bare hands, for remainder of operation.

d. Wash blade with cleaning compound (C-318), mixed 10 to 15 percent by volume, in water. Achieve water break free surface, which will be evident by continuous unbroken film of water on surface after thoroughly rinsing soap from surface.

e. On all bare aluminum, apply brush or spray application of chemical film material (C-100).

f. Thoroughly dry the cleaned surfaces. Apply one light coat of epoxy polyamide primer (C-204). Allow to air-dry from one hour minimum to eight hours maximum, before next step.

g. Apply adhesive (C-322) spray coating over reworked areas only. Three coats over trim tab and doublers, one coat over butt joint of skin to abrasive strip and skin to trailing edge extension and one coat over a patch, as follows:

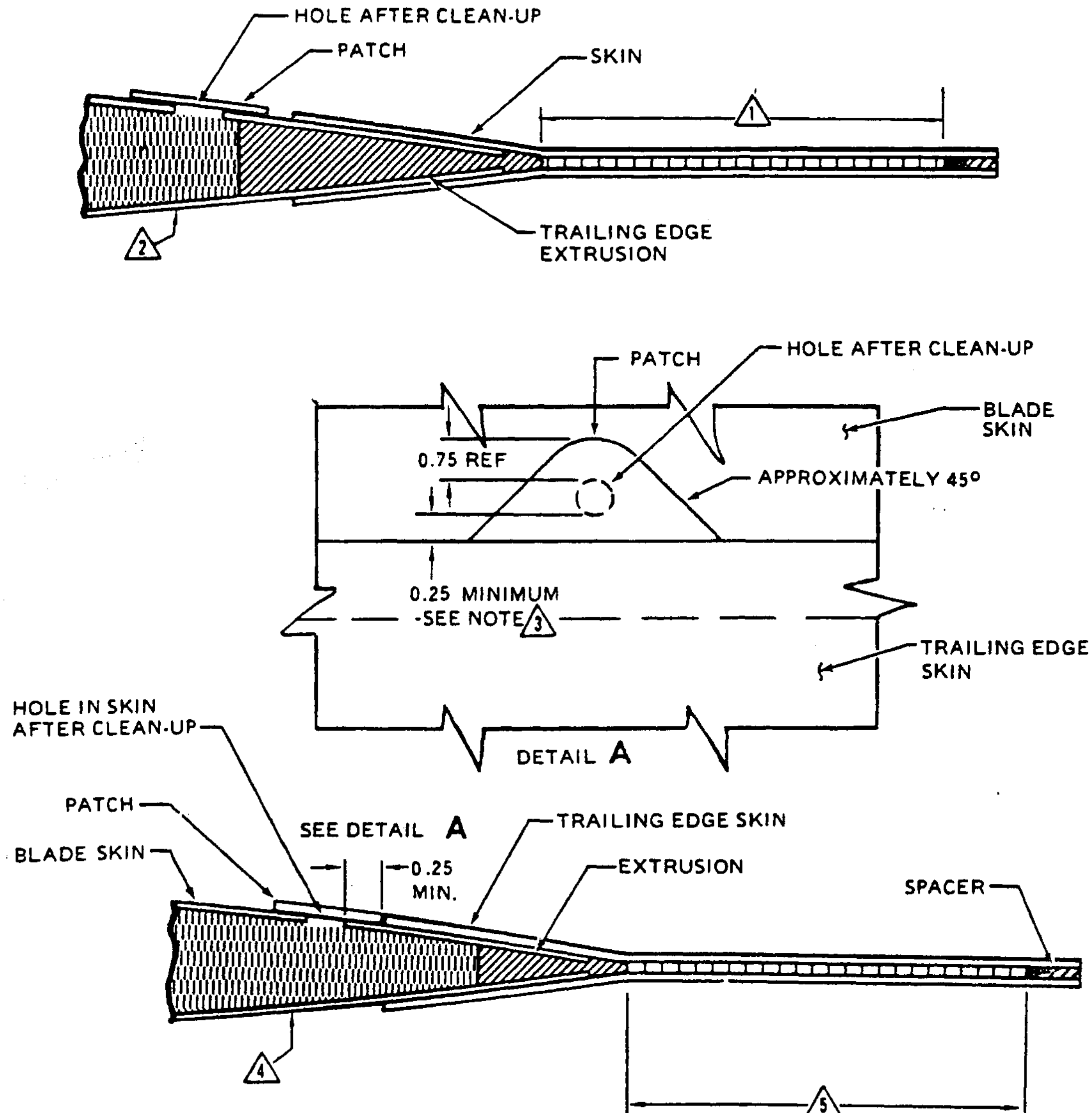
(1) Mix adhesive (C-322). Mixing ratio is by weight, 100 parts of base to 140 parts of hardener, then mix 13 to 15 percent (by weight) of primer (C-204) into adhesive (C-322) and mix thoroughly.

(2) Thin to a sprayable consistency by adding MEK (C-309) not to exceed 50 percent by volume of the above mixture, approximately 35 percent by volume will produce a sprayable consistency. Pot life of this mixture is approximately three hours.

h. Apply a light mist coat of epoxy polyamide primer (C-204), adhesive (C-322) and allow to dry one hour minimum to eight hours maximum.

i. Apply first coat of coating (C-245) to match original color to touchup areas of blade. Allow one hour minimum drying time, then apply a second coat. Allow one hour minimum drying time before putting any other paint over second coat. Spray only repaired areas. If required, apply orange-yellow coating (C-245) color no. 13538 to blade tip.

j. Refer to BHT-212-CR&O for complete main rotor blade refinishing.



NOTES

1. Patch repair is permitted in this area provided the trailing edge extrusion has not sustained any damage.

2. Patch repair, inboard portion of main rotor blade where trailing edge extrusion is forward of trailing edge skins.

3. If edge distance is 0.750 or more a round patch may be used instead of the triangular patch.

4. Patch repair, outboard portion of main rotor blade where trailing edge skins are forward of trailing edge extrusion.

5. Patches are allowed in this area provided no damage has occurred to trailing edge extrusion and spacer.

UH-1H-II-M-05-25

Figure 5-25. Main rotor blade trailing edge repair

5-33. Polyurethane Tape — Main Rotor Blade.

WARNING

Use solvent in well ventilated area. Do not inhale vapors, or allow to come in contact with skin, eyes or clothing.

NOTE

Polyurethane tape is optional with individual operator. Its use is recommended for protection against abrasion of leading edge of blade in areas of high sand and dust conditions. The tape affords medium protection against rain. It may be removed and replaced with new tape as often as necessary.

a. New blades with final paint finish fully cured shall be wiped with a clean cloth or rag dampened with aliphatic naphtha (C-305) and wiped dry prior to full evaporation of naphtha.

b. Blades that have been in service shall have all contamination cleaned off using abrasive pad (C-407) or equivalent followed by wiping with clean cloth dampened with aliphatic naphtha (C-305) and wiped dry prior to full evaporation of naphtha.

NOTE

Blades having tape replaced are to be treated same as blades that have been in service.

c. Cut a piece of tape 112 inches long and 5 inches wide. Tape must be same width and length (within reasonable limits) for each blade of a set to prevent an out of balance condition.

d. Apply tape to blade with a minimum of two people. Place one end of tape flush with tip end of blade so that equal coverage will be applied to bottom and top surfaces. Using a plastic spatula or equivalent, firmly affix tape to extreme leading edge of blade for full length of tape.

e. Using spatula or equivalent, affix tape firmly to each side of leading edge. In the event that an air bubble is entrapped, raise that area of tape, releasing air and reaffix tape firmly. Properly applied tape should show no evidence of air bubbles.

f. Inspect tape daily for proper adhesion and tape condition. Replacement is to be based on daily inspection findings.

5-34. Installation — Main Rotor Blade.

Premaintenance Requirements for Installation of Main Rotor Blade

CONDITIONS	REQUIREMENTS
Model	All
Part No. or Serial No.	All
Special Tools	(T37), (T44), (T48), (T82)
Test Equipment	None
Support Equipment	Supports for Blades
Minimum Personnel Required	Three
Consumable Materials	(C-110)
Special Environmental Conditions	None

NOTE

If blades are being reinstalled on the same rotor hub from which they were removed, the drag braces need no further adjustment. To avoid disturbing rotor balance, reinstall blades and blade bolts in grips as originally installed.

NOTE

If a different blade is being installed on the rotor hub, set each drag brace length to 19.02 inches.

a. Support main rotor hub on buildup bench (T37) equipped with plate (T82). When buildup bench (T37) is not available, a shipping container for main rotor hub can be used for a buildup stand in the following manner.

(1) Remove top of shipping container.

(2) Remove eight bolts and lift out of frame of container base.

(3) Relocate frame 90 degrees on container base and secure with four camlock fasteners.

(4) Position rotor hub 90 degrees to frame, and tighten center nut.

b. Be sure that grip positioning link (T44) is installed between pitch horn and stud on pillow block. (Figure 5-2.)

c. Prior to installation of blade bolts, coat the bolt shank, blade bushing, grip, bolt hole, drag brace and drag plate bolt holes with corrosion preventive compound (C-102).

CAUTION

Foreign material or misalignment of bolt holes will result in damaged parts.

d. Insert main rotor blade (5, figure 5-22) into grip (3), observing color coding. Apply a thin coat of corrosion preventive compound (C-102) to blade bolt shank (4) but not to threads. Align bolt holes and insert bolt (4) through grip (3) and blade from top. To find best alignment gently move tip of blade up and down while inserting bolt.

e. Support end of installed blade. Assemble washer (15), with counter bore up, and nut (13) on blade bolt (4). Do not fully tighten nut.

f. Align clevis of drag brace (8) on bolt hole of the blade drag plates. Install shims (6) between clevis and upper and lower drag plates to obtain 0.000 to 0.005 inch clearance. Install drag brace bolt (7) and secure with two washers (9) and nut (10) on lower end.

g. Install opposite blade in same manner.

h. Torque nuts (10) on drag brace bolts (7) 100 to 120 foot-pounds.

i. Apply corrosion preventive compound (C-101) to bolts (7), washers (9), and nuts (10).

CAUTION

Support end of blade during torque application.

j. Assemble washer (15) with counterbore up, and nut (13) on blade bolt (4). Do not fully tighten nut.

k. Torque nut (13) on each blade bolt 260 to 300 foot-pounds, using wrench (T48). Safety each nut by installing screw (14) through aligned holes of nut and blade bolt. Secure with nut (11) and washer (12).

l. Apply corrosion preventive compound (C-101) to nut (13), screw (14), nut (11), and washer (12).

NOTE

Retorque nut after 25 hours of operation after initial installation. Proper torque is 260 to 300 foot-pounds. Support tip end of blade during retorque procedures.

m. Torque nuts (17) on inner drag brace bolts (16) 125 to 150 foot-pounds.

n. Apply corrosion preventive compound (C-101) to nuts (17) and bolts (16).

SECTION IV — MAIN ROTOR CONTROLS

5-35. STABILIZER BAR ASSEMBLY.

5-36. Description — Stabilizer Bar Assembly.

The stabilizer bar is attached to the mast at the main rotor hub trunnion. The bar is connected into the main rotor system in such a manner that the inherent inertia and gyroscopic action of the bar is induced into the rotor system and provides a measure of stability for all flight conditions. If, while hovering, the helicopter is disturbed, the bar due to its gyroscopic action tends to remain in its present plane. The relative movement between the bar and the mast causes the hub and blade assembly to feather and return the rotor to near its original plane of rotation. If the bar were completely unrestrained it would remain in its original plane of rotation and would induce stability to the point of removing all control from the pilot. Due to restraining and dampening action, the bar possesses a mast following characteristic. This following time is regulated by two hydraulic dampers connected to the bar in such a manner that a movement of the mast is transmitted to the bar through the dampers at a rate determined by the internal adjustment of the dampers. A compromise is met to which the bar provides the desired amount of stability and still allows the pilot complete responsive control of the helicopter.

5-37. Removal — Stabilizer Bar.

a. Disconnect pitch change links (25, figure 5-26) from main rotor pitch horns (29) by removing cotter pin (30), nut (31), washers (26), and bolt (27).

b. Install grip positioning links (T44) to hold blades in normal position. (Figure 5-2.)

c. Check that assembly is color coded.

d. Disconnect control tube (15, figure 5-26) from scissors by removing cotter pin (19), nut (18), washers (17), and bolt (16).

e. Disconnect damper link tube (12) from damper levers by removing cotter pin (21), nut (22), washers (23 and 24), safety washer (14), and bolt (13).

f. Disconnect damper link tubes (12) from stabilizer bar (5) by removing cotter pin (32), nut (33), washers (34 and 35), safety washer (9), and bolt (8).

g. Secure loose tube assemblies with tape and protective padding to prevent scratches and dents.

h. Support stabilizer bar assembly with a suitable hoist. Remove lockwire from four bolts (37) and four washers (38) at each stabilizer support (39) from main rotor trunnion (36).

i. Lift stabilizer bar assembly from mast.

5-38. Disassembly — Stabilizer Bar.

a. Remove cotter pins (11, figure 5-27), nuts (12), washers (10), bolts (31), and washer (26) attaching support assemblies (21) to centerframe (16). Remove support assemblies.

b. Remove cotter pins (34), nuts (33), washers (32), bolts (28), and washers (29) attaching mixing levers (27) to centerframe (16). Remove levers, washer/shim (25), and washer (24).

c. Remove nuts (15), washers (17 and 19), and bolts (20) attaching outer tube assemblies (8) to centerframe (16). Remove tube assemblies.

d. Remove nuts (1), retainer (2), bushing (3), and washer (4).

e. Cut lockwire and back off nut (6) until lock (7) is free of slot in weight (5). Turn weight (5), nut (6), and lock (7) off end of tube (8).

f. Remove cable assembly (40) by removing nut (38), bolt (41), and seal washers (39).

g. Cut lockwire and remove screws (9) attaching bearing retainers (13) to centerframe (16). Remove bearing retainers. Remove pivot bearing sets (14).

5-39. Cleaning — Stabilizer Bar.

a. Remove sealant from weights and outer tubes using a plastic scraper.

b. Wash all parts in solvent (C-304) and dry with compressed air.

5-40. Inspection — Stabilizer Bar. (Disassembled)

a. Visually inspect all parts for wear, damage and general condition. (Figure 5-27.)

b. Inspect stabilizer bar tube for cracks, paying particular attention to the inboard six inches of the tube. (Figure 5-28.)

c. Inspect stabilizer bar centerframe and pivot bearings for general condition and freedom of movement.

d. Inspect mixing lever and bearings for general condition. (Figure 5-29.)

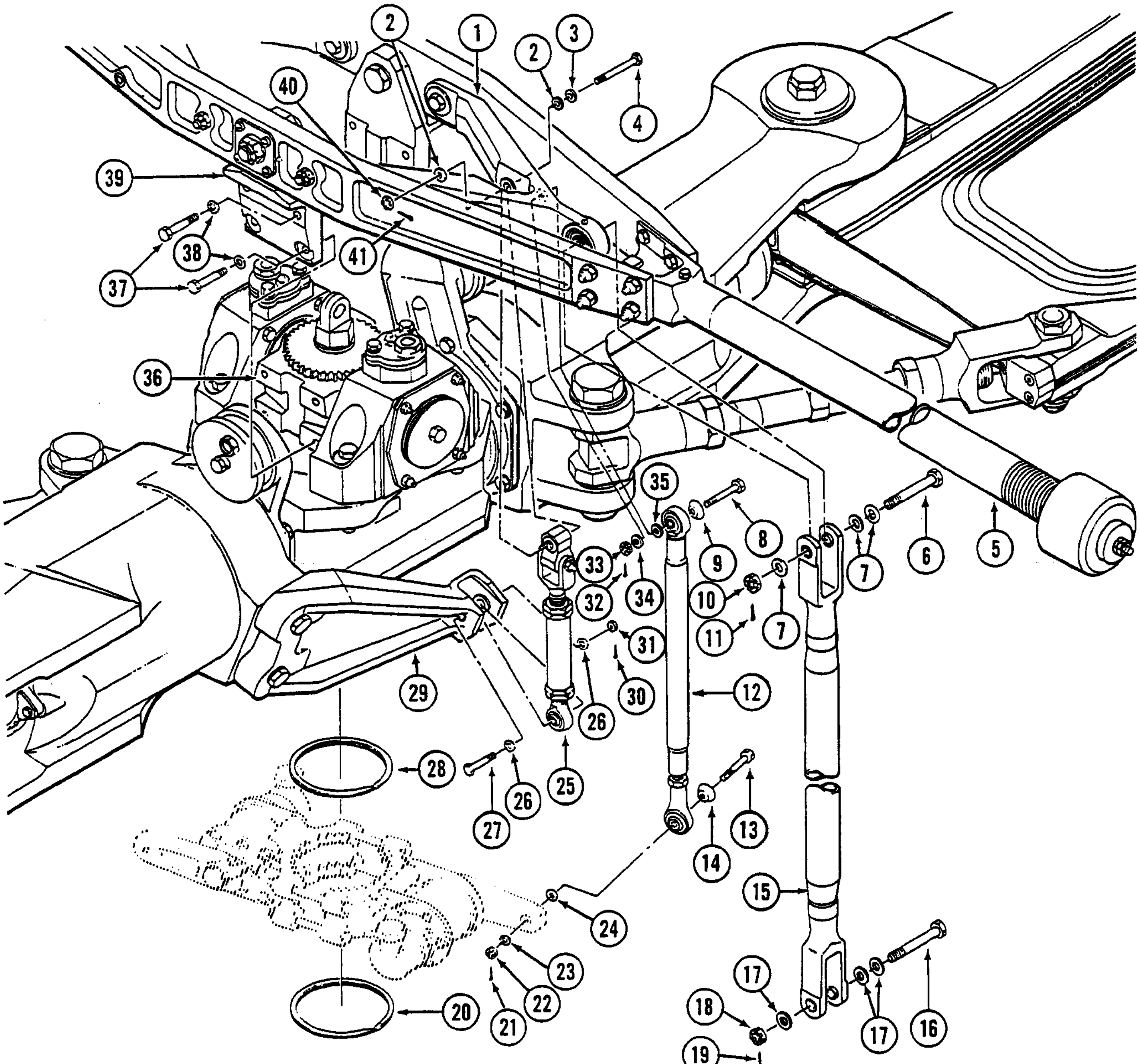
e. Inspect stabilizer bar support for condition and security.

f. Inspect main rotor pitch change links and bearings for general condition and looseness. (Figure 5-30.)

g. Inspect stabilizer bar damper link tubes for foreign object damage and bearings for looseness. (Figure 5-31.)

h. Allowable wear limits for the damper control tube bearings permit a maximum of 0.010 inch radial play and 0.030 inch axial play. Some of these tube assembles may be equipped with alternate 47-140-252-5 rod end bearings. Tube assemblies so equipped have 0.012 inch radial and 0.012 inch axial maximum allowable wear limits. Replace bearing/control tube that exceed allowable bearing wear limits.

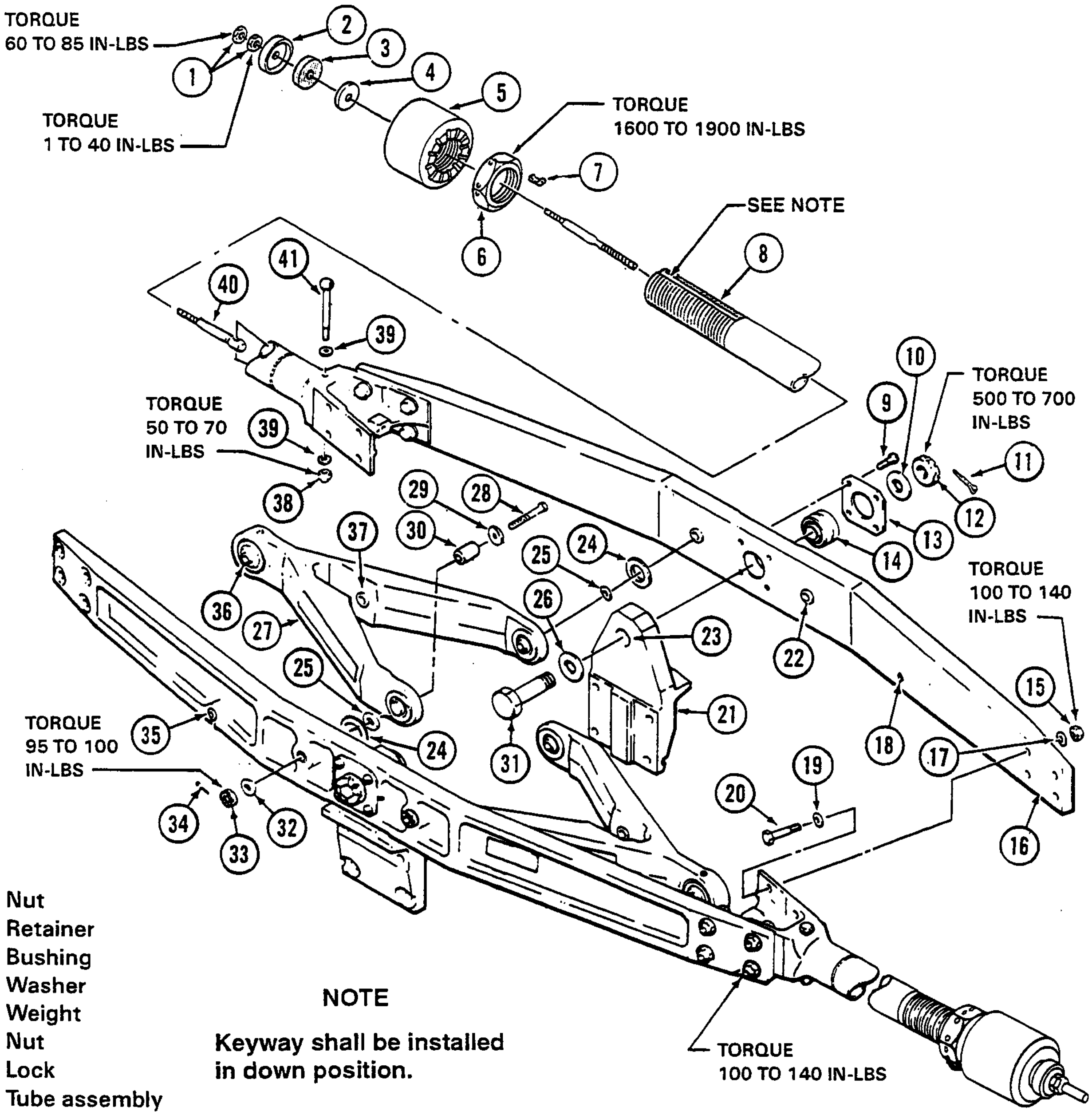
i. Inspect control tube for foreign object damage and adequate bolt shank clearance at scissor arm attachment point. (Figure 5-32.)



1. Mixing lever
2. Washer
3. Washer (countersunk)
4. Bolt
5. Stabilizer bar
6. Bolt
7. Washer
8. Bolt
9. Washer (safety)
10. Nut
11. Cotter pin
12. Damper link tube
13. Bolt
14. Washer (safety)
15. Control tube
16. Bolt
17. Washer
18. Nut
19. Cotter pin
20. Retainer ring
21. Cotter pin
22. Nut
23. Washer (aluminum)
24. Washer (steel)
25. Pitch change link
26. Washer
27. Bolt
28. Retainer ring
29. Pitch horn
30. Cotter pin
31. Nut
32. Cotter pin
33. Nut
34. Washer (aluminum)
35. Washer (steel)
36. Main rotor trunnion
37. Bolt
38. Washer
39. Stabilizer support
40. Nut
41. Cotter pin

UH-1H-II-M-05-26

Figure 5-26. Rotating control tubes



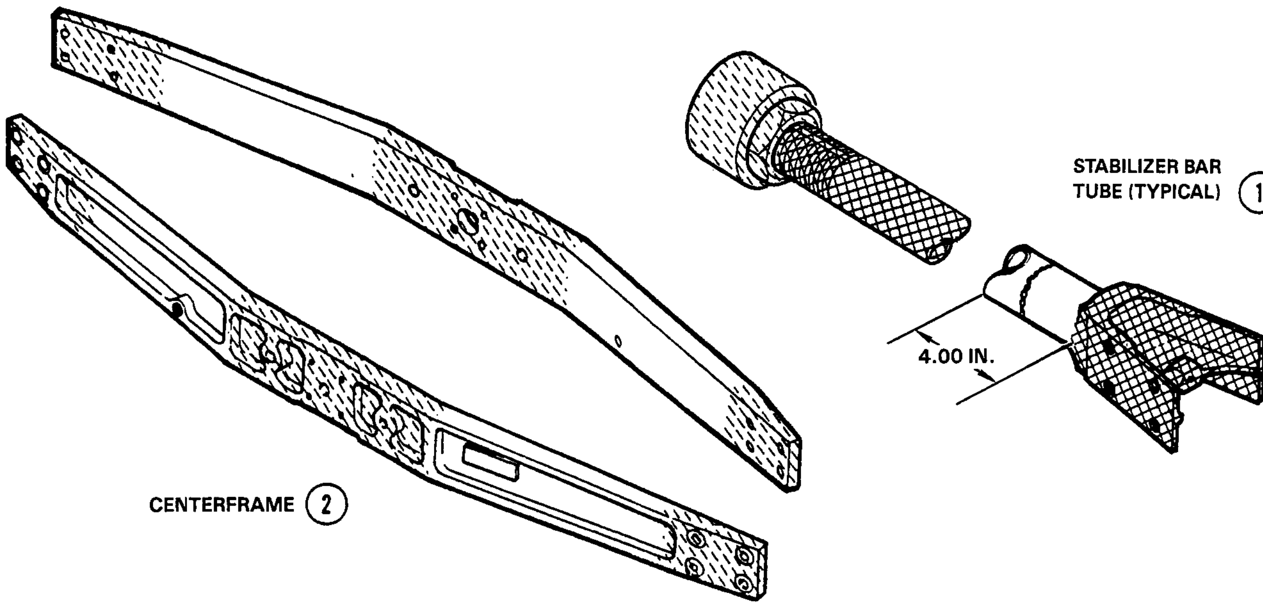
1. Nut
2. Retainer
3. Bushing
4. Washer
5. Weight
6. Nut
7. Lock
8. Tube assembly
9. Screw
10. Washer
11. Cotter pin
12. Nut
13. Retainer, bearing
14. Bearing
15. Nut
16. Centerframe
17. Washer
18. Bushing
19. Washer
20. Bolt
21. Support assembly
22. Bushing
23. Bushing
24. Washer
25. Washer/s (shim)
26. Washer
27. Mixing lever
28. Bolt
29. Washer
30. Bushing
31. Bolt
32. Washer
33. Nut
34. Cotter pin
35. Bushing
36. Bearing
37. Bushing
38. Nut
39. Stat-o-seal
40. Cable assembly
41. Bolt

NOTE

Keyway shall be installed in down position.

UH-1H-II-M-05-27

Figure 5-27. Stabilizer bar



DAMAGE LOCATION SYMBOLS

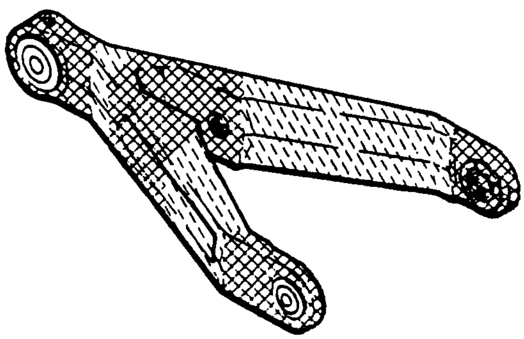
TYPE OF DAMAGE		MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
MECHANICAL AND CORROSION BEFORE AND AFTER REPAIR	1	0.005 In.	0.010 In.	See note
MECHANICAL BEFORE AND AFTER REPAIR	2	0.035 In.		0.020 In.
CORROSION	2			
BEFORE REPAIR		0.017 In.		0.010 In.
AFTER REPAIR		0.035 In.		0.020 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1	0.25 Sq. In.	0.50 Sq. In.	
	2	0.75 Sq. In.		0.50 Sq. In.
NUMBER OF REPAIRS	1	Two	Not critical	
	2	Not critical		Two per segment
EDGE CHAMFER	1	Not applicable	0.030 In.	
	2	0.100 In.		0.050 In.
THREAD DAMAGE:	1			
DEPTH:		One-third of thread		
LENGTH:		One-quarter inch		
NUMBER:		Two		

NOTE

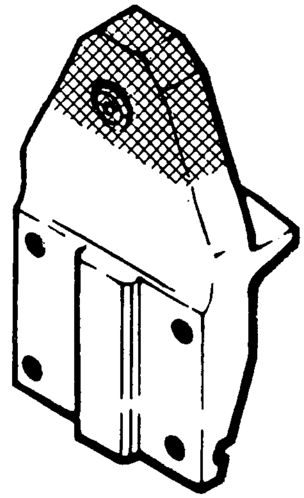
Small nicks and dents may be suitably treated by coating with epoxy polyamide primer (C-204).

UH-1H-II-M-05-28

Figure 5-28. Stabilizer bar tube and centerframe damage limits



MIXING LEVER



SUPPORT

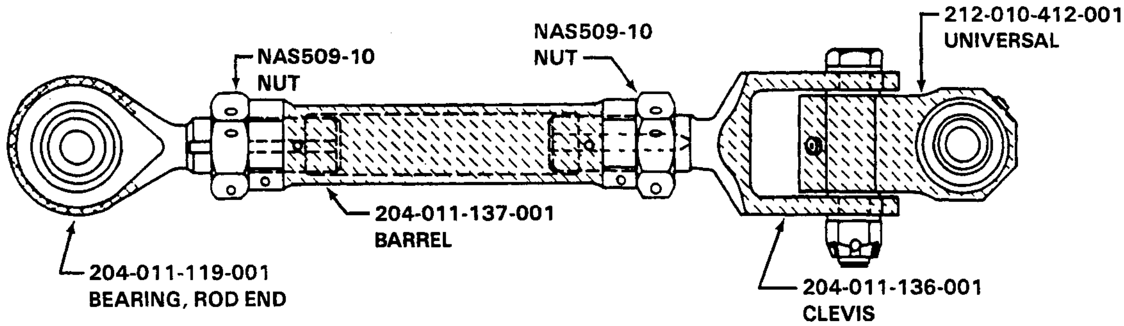
DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL (Before and after repair)	0.010 in.	0.035 in.	0.035 in.
CORROSION (Before repair) (After repair)	0.005 in. 0.010 in.	0.017 in. 0.035 in.	0.017 in. 0.035 in.
AREA OF FULL DEPTH REPAIR	0.10 sq. in.	0.25 sq. in.	0.25 sq. in.
NUMBER OF REPAIR AREAS	One per segment	One per segment	Two
BORE DAMAGE ●	0.002 inch 1/4 of circumference		

NOTE: All edges may be radiused or chamfered 0.060 inch to remove nicks and dents.

UH-1H-II-M-05-29

Figure 5-29. Stabilizer bar mixing lever and support damage limits



DAMAGE AREA REPAIR SYMBOLS

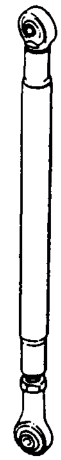
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
NICKS, SCRATCHES AND SHARP DENTS	0.005 In.	0.010 In.	0.020 In.
CORROSION	0.005 In.	0.010 In.	0.020 In.
AREA PER FULL DEPTH REPAIR	0.25 Sq. In.	0.10 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	Two per zone	Two per zone	One per zone
EDGE CHAMFER	0.020 In.	0.020 In.	0.040 In.
THREAD DAMAGE:			
DEPTH:	One-third of thread		
LENGTH:	One-quarter inch		
NUMBER:	Two per segment		

NOTE

1. The width of repair at any section shall not exceed one-third of the circumference.
2. Damage limits in drilled hole of clevis shank are 0.010 inch.
3. Apply epoxy polyamide primer (C-204) to internal surface of barrel and clevis.

UH-1H-II-M-05-30

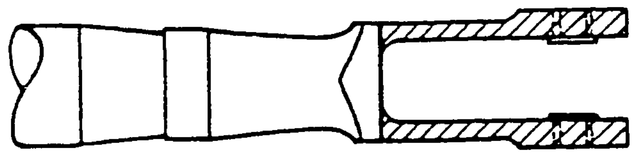
Figure 5-30. Pitch change link damage and repair limits



TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED
NICKS, SCRATCHES AND SHARP DENTS	0.010 In.
CORROSION	0.005 In. before repair 0.010 In. after repair
AREA PER FULL DEPTH REPAIR	0.10 Sq. In.
NUMBER OF REPAIR AREAS	Two
MAXIMUM NUMBER OF REPAIRS	Two
ROD END MAXIMUM NUMBER OF REPAIRS	Two
THREAD DAMAGE:	
DEPTH:	One-third of thread
LENGTH:	One-quarter inch
NUMBER:	Two

UH-1H-II-M-05-31

Figure 5-31. Damper tube damage and repair limits



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
NICKS AND DENTS	0.005 inch	0.010 inch
CORROSION	0.0025 inch	0.005 inch
AREA OF FULL DEPTH REPAIR	0.10 Sq. In.	Not Critical
NUMBER OF REPAIR AREAS	One Per Lug	Not Critical
EDGE CHAMFER	0.020 inch	0.040 inch
BORE DAMAGE:	0.001 For 1/4 Circumference	

NOTE:

1. The width of repair at any section of tube should not exceed one-third of the circumference.

UH-1H-II-M-05-32

Figure 5-32. Stabilizer bar control tube damage and repair limits

5-41. Repair — Stabilizer Bar.

a. Replace parts that are not acceptable for continued usage.

b. Repair mechanical and corrosion damage by polishing out the damage and blend repair smoothly into surrounding area using fine India stone (C-464). Do not exceed depth and area limits of figure 5-28 through 5-32.

c. Touch up bare areas on aluminum surfaces as follows:

(1) Clean surface with aliphatic naphtha (C-305).

(2) Wash area with cleaning compound (C-318).

(3) Rinse thoroughly with water.

NOTE

Keep surface wet with chemical film material for one to three minutes.

(4) Apply chemical film material (C-100) to bare metal surfaces.

(5) Clean off excess chemical film material with cloth saturated with water. Dry with compressed air or clean cheesecloth (C-486).

d. Touch up bare areas where cadmium plating is removed with epoxy polyamide primer (C-204).

5-42. Assembly — Stabilizer Bar.

a. Install pivot bearing sets (14, figure 5-27) in centerframe assemblies (16). Position pivot bearing retainers (13) and install attaching screws (9). Lockwire (C-405) screw heads.

b. Assemble centerframes (16) and tube assemblies (8) with bushings (18) in centerframes down and keyway in threaded portion of outer tube assemblies (8) down. Install bolts (20) with one washer (19) under bolt head and one washer (17) under nuts (15). Install longer bolts in inboard positions and shorter bolts in outboard positions. Ensure that minimum of one thread of bolts is exposed after tightening nuts (15, figure 5-27). Torque nut (15) 100 to 140 inch-pounds.

c. Place washer (26) on bolt (31) and insert through inboard side of support (21). Position support on inboard side of centerframe (16). Install washer (10) and nuts (12) on bolt. Install cotter pins (11) after balancing has been accomplished.

d. Install mixing lever (27) as follows:

(1) Install stabilizer bar on a trunnion to establish 5.190 to 5.210 inch dimension between inboard faces of support assemblies (21).

(2) Install washer (11, figure 5-33) over shouldered bushing (10) in centerframe (2).

(3) Position mixing lever (3), grease fitting up, between centerframes.

(4) Install bolt (7), washer (6), and bushing (8) through one bearing (5) in mixing lever (3) to engage bushing (10). Install nut (1) and tighten enough to secure inner race stack against bushing (10) in centerframe (2). (Detail A.)

(5) Arrange opposite side of lever as follows:

(a) Install a 3/8 inch positioning bolt through centerframe (2) from outside. Install bushing (8) through bearing (5) in lever (3). (Detail B.)

NOTE

Slightly reducing the outside diameter of the (AN960-616 and AN960-616L) washers/shims (9) may be required to allow them to slide through bearing (5).

(b) While holding mixing lever (3) against centerframe (2), slide floating bushing (8) against fixed bushing (10) in centerframe (2). Insert threaded

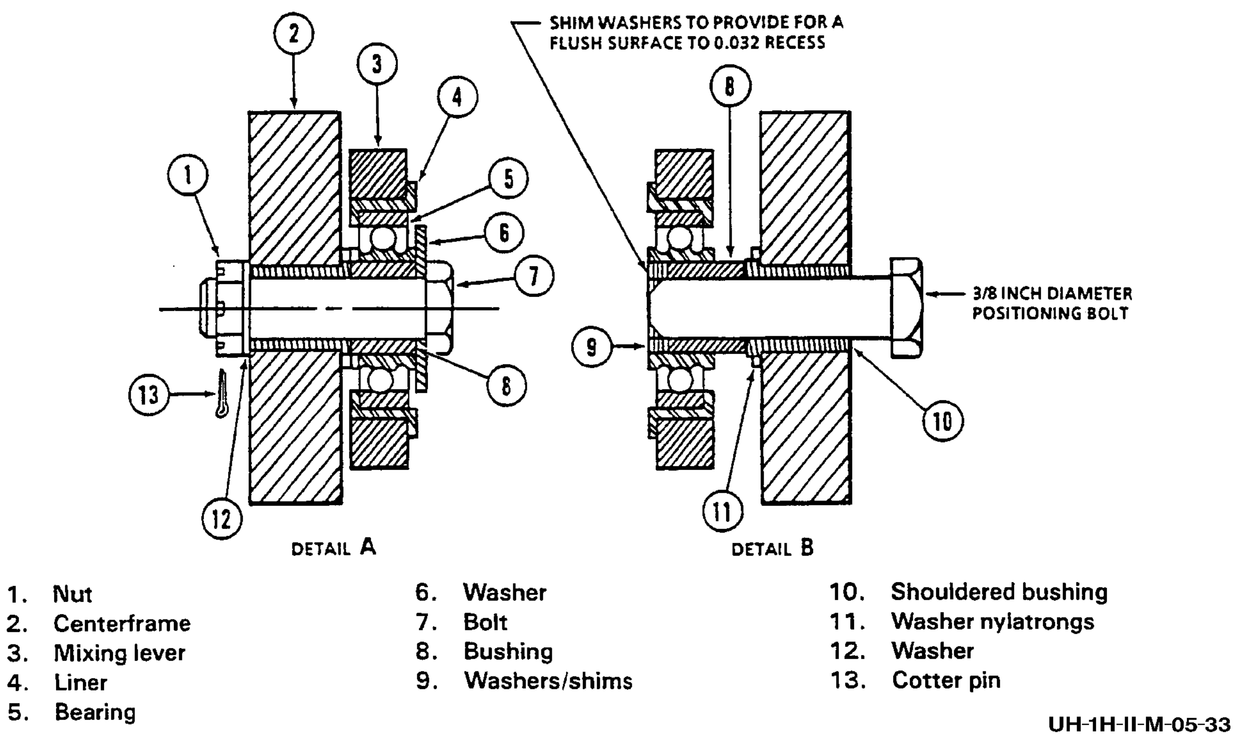


Figure 5-33. Shimming procedure for mixing lever

end of a 3/8 inch diameter positioning bolt flush with inside race of bearing (5). Measure space by placing washers/shims (9) flat against bushing (8) to fill space between bushing (8) and flush with inner race of bearing (5). Remove and divide washers/ shims (9) into two groups to fill equal space on each side of mixing lever (3) within one thin washer/ shim.

(6) Remove bolt (7), washer (6), bushings (8), and positioning bolt. Install bolts (7) with washers (6), bushings (8), and measured group of washers/ shims (9) through bearings (5). Push bolts (7) through bushings (8) in centerframes (2). Install washers (12) and nuts (1). Torque nuts (1) 95 to 100 inch-pounds. Install cotter pins (13).

NOTE

Deleted.

(7) Perform steps (1) through (6) for opposite mixing lever (27, figure 5-27).

e. Position cable assembly (40) in tube assembly (8) with cable threads outboard. Align holes on cable fitting of cable assembly (40) and tube (8) and install bolt (41) with one stat-o-seal (39) under bolt (41) head and one under nut (38). Install bolt with head up and through hole in cable assembly. Install opposite cable assembly in same manner.

f. Install weight on tube assembly as follows:

(1) Clean internal threads of weight (1, figure 5-34), external thread of cable (4), and outboard end of tube (12) with MEK (C-309).

(2) Install nut (9) and lock (11) on end of tube (12) with lock in keyway and lockwire end of lock inboard. Install nut (9) in past the center of tube threads. Install weight (1) on tube with slotted end inboard. Adjust weight to 51.8 inches from center of bolt. (Detail A.)

(3) Turn nut (9) outboard and engage lock (11) into nearest slot of weight (1). Install packing (8) on bushing (7), slide bushing (7) onto cable (4) and into tube (12) as shown in detail A. Install bushing (2) onto cable (4) until it is against bushing (7). Install retainer (3) onto cable (4) until it covers bushing (2). Install nut (6). Torque nut (6) 1 to 40 inch-pounds. Install nut (5). Torque nuts (5) 60 to 85 inch-pounds. Torque nut (9) 133 to 158 foot-pounds and secure with lockwire (C-405) to lock (11).

(4) Lubricate stabilizer bar bearings with grease (C-007) at all lubrication fittings.

g. Balance stabilizer. (Paragraph 5-43.)

5-43. Balancing — Stabilizer Bar.

a. Remove support assemblies (21, figure 5-27) from centerframes (16). Insert a round bar, smaller than the inside diameter of the pivot bearing set (14), through the center of the bearings and support the bar on a reasonably level surface in such a manner that the stabilizer bar is suspended. (Figure 5-35.)

NOTE

There is too much friction in the support bearings to properly balance the bar while resting on the supports; therefore, a rod smaller than the bearing inside diameter must be used.

b. Support the mixing levers by inserting bolts of equal length through the outboard bearings and resting the bolts on the centerframes (16). (Figure 5-35.)

c. If necessary, adjust weight as follows:

(1) Remove lockwire and loosen nut (9, figure 5-34) from weight (1). Adjust weight (1) to the closest locking position. Turn nut (9) outboard and engage locks (11) in weight slots.

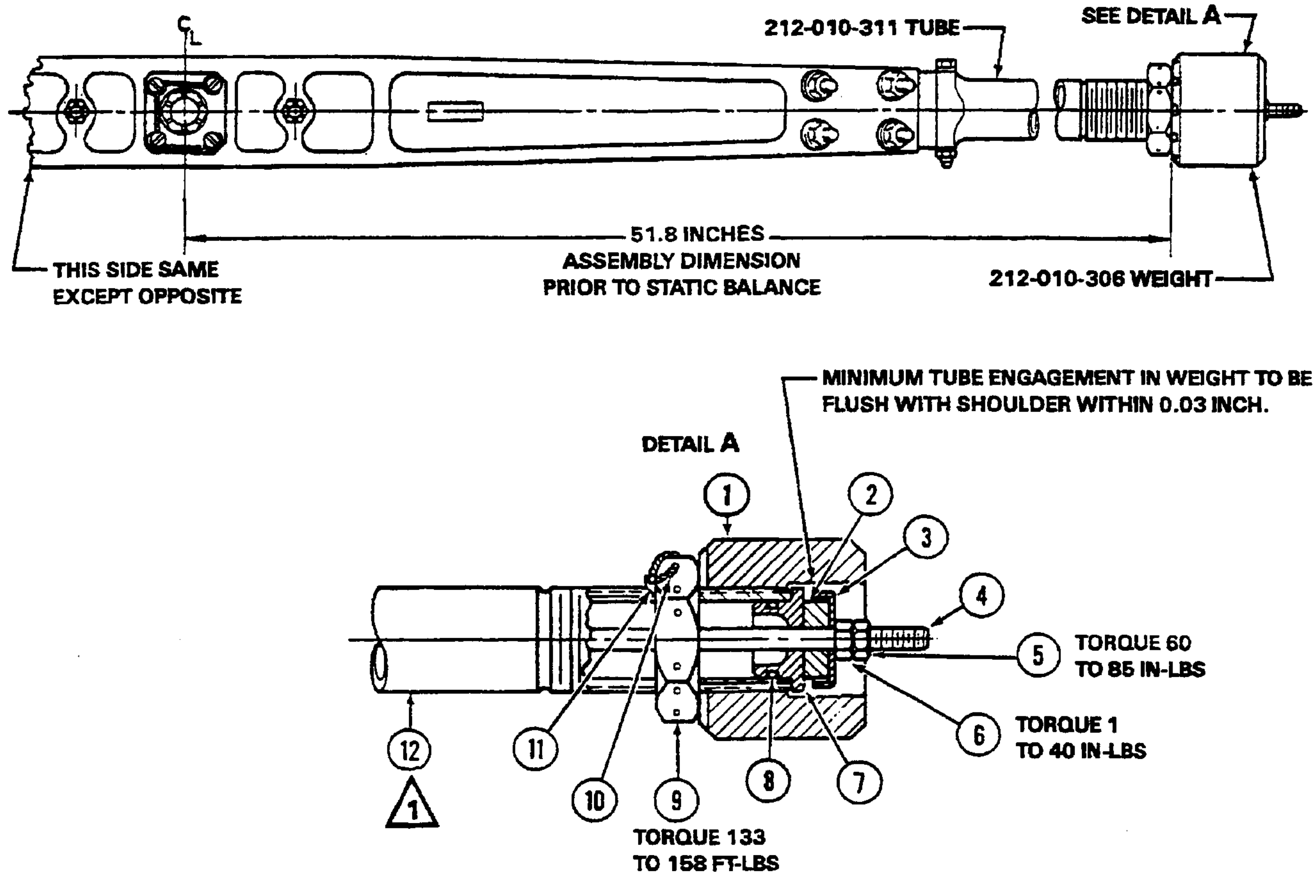
(2) With stabilizer bar balanced, leave bar at rest for two to three minutes to determine if it will remain level.

(3) Torque nut (9) 133 to 158 foot-pounds. Secure nut (9) to lock (11) with lockwire (C-405).

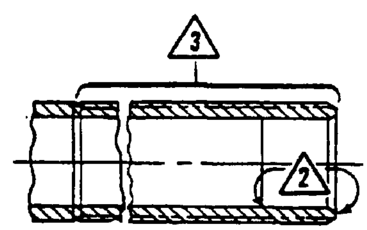
(4) Back off nut (5) one turn. Check torque on nut (6) to be 1 to 40 inch-pounds. Bring nut (5) against nut (6) and torque nut (5) 60 to 85 inch-pounds.

5-44. Installation — Stabilizer Bar.

a. Observing color code, position stabilizer bar (5, figure 5-26) over main rotor trunnion (36). Attach



1. Weight
2. Bushing
3. Retainer
4. Cable
5. Nut
6. Nut
7. Bushing
8. Packing
9. Nut
10. Lockwire
11. Lock
12. Tube (1)



(1) Tubes 212-010-311 must be installed in pairs.

(2) Omit primer coating and coat with corrosion preventive compound (C-101).

(3) Omit primer and paint.

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Figure 5-34. Tube assembly 212-010-311

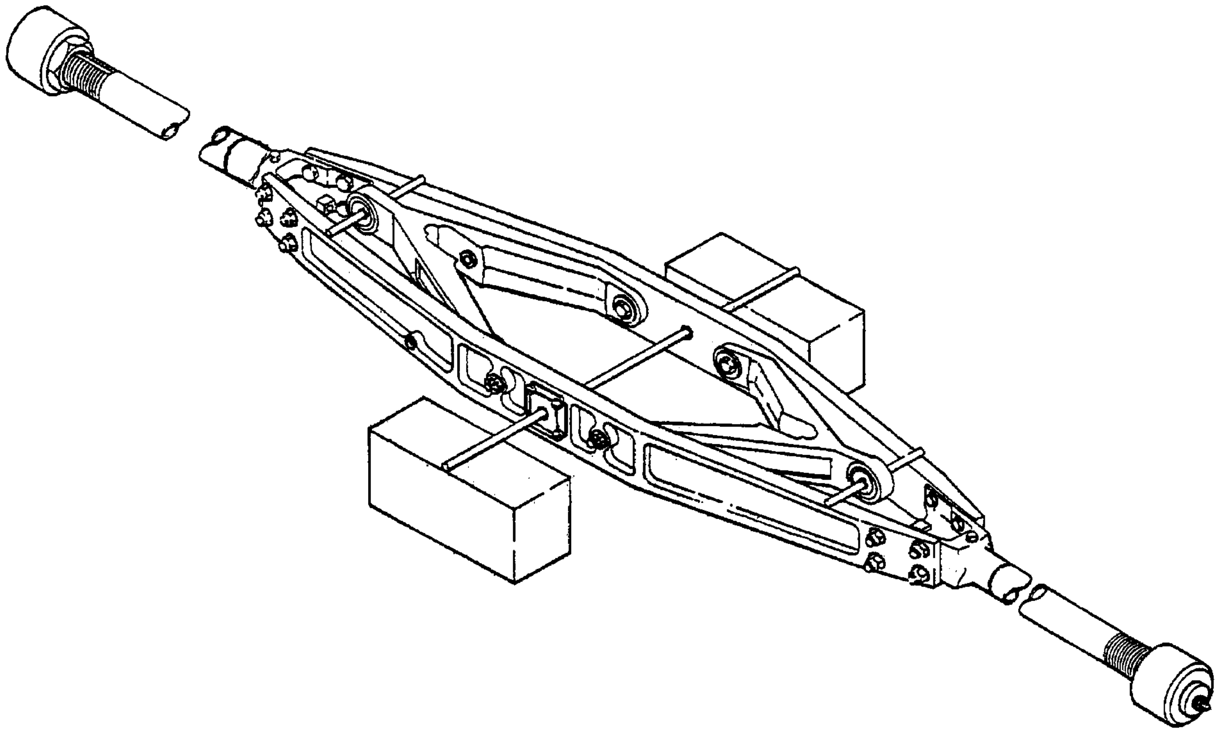


Figure 5-35. Stabilizer bar balancing

each stabilizer support (39) with four bolts (37) and washers (38). Assemble washers on bolts (short bolts go in lower holes). Lockwire (C-447) bolts in vertical pairs.

b. Connect control tubes (15) to scissor levers with bolts (16). Use two washers (17) under bolt head. Torque nuts (18) 120 to 145 inch-pounds and secure with cotter pins (19).

c. Remove grip position links (T44) and connect pitch change links (25) to main rotor pitch horns (29). Install bolt (27) with head inside of pitch horns. Torque nuts (31) 200 to 250 inch-pounds and secure with cotter pins (30).

d. Place safety washer (14) on bolt (13). Install bolt (13) through rod end bearing and lever with steel washer (24) between bushing in lever and rod end bearing, and aluminum washer (23) between lever and nut (22). Torque nut (22) 25 to 45 inch-pounds and secure with a cotter pin (21).

NOTE

Allowable cleanup is 0.005 inch to the leading edge of the mixing lever and 0.015 inch to the trailing edge site. The bumper washer may be locally fabricated from approximately 0.031 inch rubber with a 1.5 inch OD and a 0.250 inch ID.

5-45. DAMPERS AND ADAPTER.

5-46. Description — Dampers and Adapter. The double action dampers are bolted to a frame which is secured to the mast by a split-splined clamp. Adjustment of dampers determine the following time of the stabilizer bar in relation to the mast inclination for purposes of maneuvering. In order for the pilot to experience maneuverability of the helicopter, such as rolling from one turn to another, stabilizer bar must follow and become perpendicular to the mast within a reasonable period of time. Should the dampers become maladjusted and give inadequate damping to the stabilizer bar, the control response is slow. Should the dampers become maladjusted to give excessive damping to the stabilizer bar, the control responses would be rapid and the stability of the helicopter would be jeopardized.

5-47. Removal — Dampers and Adapter.

a. Disconnect damper link tubes (12, figure 5-26). (Paragraph 5-37.) Lift top retainer ring (4, figure 5-36) from mast splines.

b. Remove four nuts (15), washers (7 and 16), and bolts (6). Remove damper (5) and adapter (10) from mast. Remove lower retainer ring (4).

c. Remove four nuts (2), washers (3 and 17), and bolts (14) to separate the dampers from the adapter.

CAUTION

Do not heat above 200°F (93°C).

d. Remove nut (8), washers (9 and 11), and bolt (12). Heat joint of lever arm (13) and shaft to 160°F (71°C). Tap lever arm (13) lightly to remove from damper.

5-48. Cleaning — Dampers and Adapter.

a. Clean levers, dampers, and adapter splines with solvent (C-304) and dry thoroughly.

b. Protect areas of dampers and levers that are not to be stripped and clean aged metalset adhesive from wingshaft and lever splines with paint remover (C-242). Apply with brush and allow to soak for 30 minutes maximum.

c. Repeat applications and scrub with a stiff bristled brush as necessary to remove adhesive.

d. Rinse thoroughly with water, then apply a low pressure and small volume of water directly into a clean scrub brush while brushing splines. Dry thoroughly.

5-49. Inspection — Damper and Adapter.

a. Inspect lever arm (13, figure 5-36) for scratches, nicks, dents, and corrosion. (Figure 5-37.)

b. Inspect adapters (10, figure 5-36) and damper assembly (5) for scratches, nicks, dents, and corrosion. (Figure 5-38.)

c. Replace dampers that show indications of leakage beyond recommended rates. (Paragraph 5-53).

d. Inspect splined area of shaft for chipped or broken teeth. Up to nine chipped and/or broken teeth are acceptable when no more than 5 damaged teeth are adjacent. The broken and/or chipped surface shall be blended and smoothed, using die makers riffler file or equivalent.

e. Using a 10-power magnifying glass, inspect the end and teeth of the shaft for cracks. No cracks in the body of the shaft are acceptable. Small cracks in splined tooth area will be removed by using a small hand grinder, rubber abrasive wheel and/or crocus cloth (C-500). (Restrictions will be in accordance with step d.) Dye penetrant inspect shafts for body cracks. (Refer to BHT-212-CR&O.) Apply a film of corrosion protective oil (C-109) to areas of wingshaft and lever which were affected by paint remover.

5-50. Repair or Replacement — Damper and Adapter. Replace damper or parts which fail to meet inspection requirements.

5-51. Installation — Dampers and Adapter.

a. Install lever arm (13, figure 5-36) on damper assembly (5) as follows:

(1) Clean damper shaft splines and lever arm splines with solvent (C-304).

(2) Apply adhesive (C-313) to splines of damper shaft and lever arm.

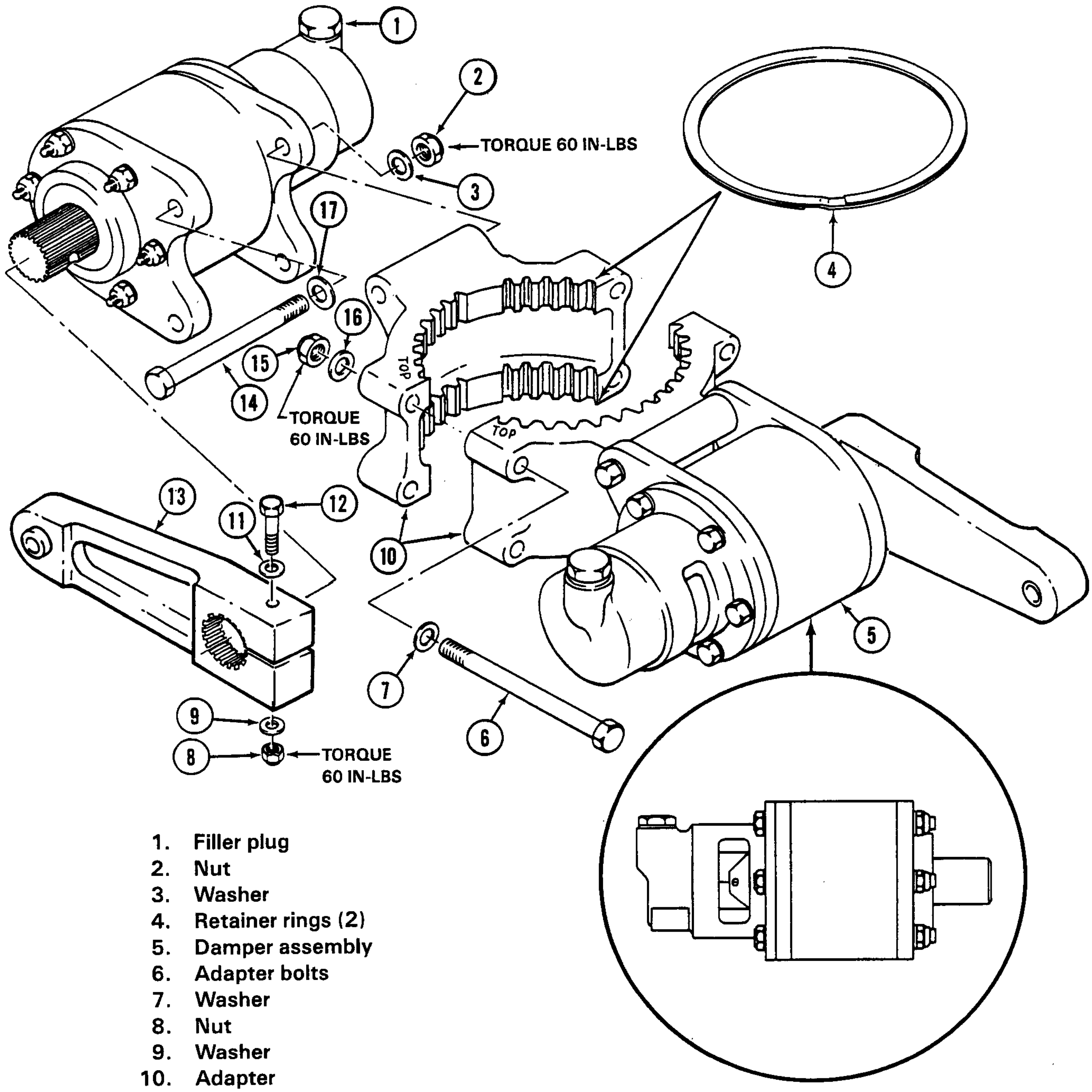
CAUTION

Incorrect torque of bolt (12) will cause wear, fretting, or shearing of shaft splines.

(3) Install lever arm (13) on shaft with wingshaft notch aligned with slot in lever. Install bolt (12) with washer (11) under bolt head and washer (9) under nut (8). Torque nut (8) 60 inch-pounds.

(4) Allow adhesive to cure at room temperature for 24 hours or at 150°F (66°C) for one hour plus additional two hours at room temperature before operating the damper assembly.

(5) Position dampers (5) on adapters (10), with wingshafts toward direction of rotation, and install two bolts (14) in each adapter with washer (17) under each head and washer (3) under nut (2). Torque nut (2) 60 inch-pounds.



1. Filler plug
2. Nut
3. Washer
4. Retainer rings (2)
5. Damper assembly
6. Adapter bolts
7. Washer
8. Nut
9. Washer
10. Adapter
11. Washer
12. Retaining bolt
13. Lever arm
14. Damper mounting bolts
15. Nut
16. Washer
17. Washer

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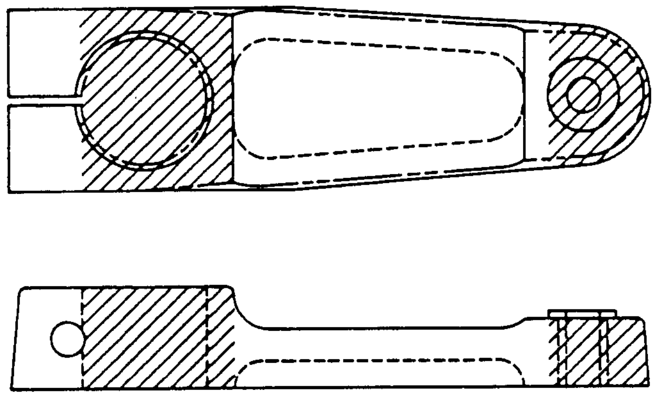
Figure 5-36. Stabilizer bar dampers

212-010-301 LEVER



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
NICKS, SCRATCHES, AND SHARP DENTS	0.010 Inch	0.020 Inch
CORROSION	0.002 Inch Before Repair 0.005 Inch After Repair	0.005 Inch Before Repair 0.010 Inch After Repair
AREA OF FULL DEPTH REPAIR	0.10 Square Inch	0.25 Square Inch
NUMBER OF REPAIR AREAS	One Per Segment	Not Critical
EDGE CHAMFER	0.040 Inch	0.060 Inch
BORE DAMAGE	0.002 Inch for 1/4 Circumference	

SPLINE DAMAGE:
Depth: 1/3 of Spline
Length: 1/2 of Spline
Number: Three

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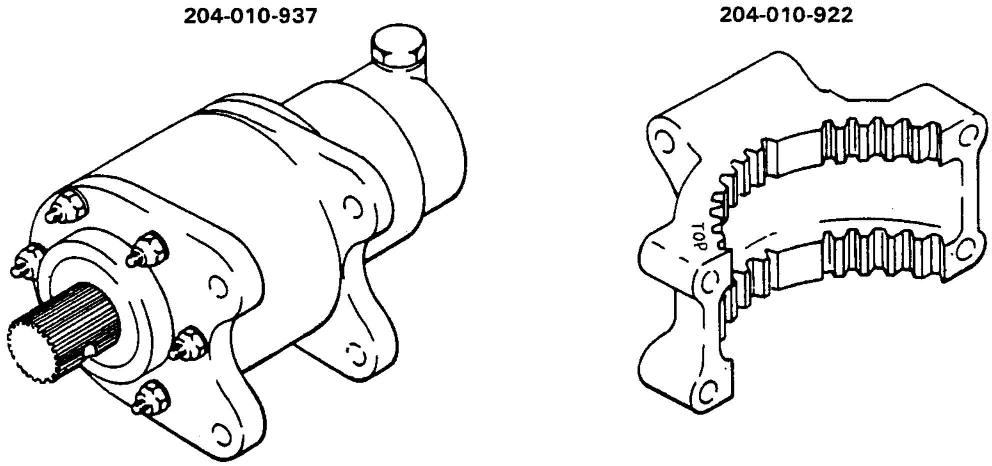
Figure 5-37. Damper lever damage and repair limits



TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED
NICKS, SCRATCHES AND SHARP DENTS	0.010 In.
CORROSION	0.005 In. before repair 0.010 In. after repair
AREA PER FULL DEPTH REPAIR	0.10 Sq. In.
NUMBER OF REPAIR AREAS	Not critical

UH-1H-II-M-05-38

Figure 5-38. Damper and adapter damage and repair limits

b. Clean mast splines and adapter (10) splines with solvent (C-304). Coat mast splines with corrosion preventive compound (C-101).

c. Install spiral retaining ring (4) in lower groove of mast splines. Align adapter halves with etched word “TOP” facing upward. Position adapters according to master splines and slide onto mast.

CAUTION

Do not attempt to pull the adapters into the mast splines by means of the attaching bolts. This may result in chipping or fracturing the support splines, bolt lugs, and/or the entire adapter.

Use alternating procedure to draw four nuts down evenly. Torque each nut in increments of 10 inch-pounds, until a torque value of 60 inch-pounds is obtained.

d. Install four bolts (6) with one washer (7) under bolt heads and washer (16) under nuts (15) and torque evenly. Install retainer ring (4) in groove of mast splines above adapter set.

e. Adjust and connect damper link tube (12, figure 5-26). (Paragraph 5-52.)

5-52. Adjustment — Damper Link Tube.

a. Disconnect damper link tube (12, figure 5-26) from lever arm (13, figure 5-36).

b. Position stabilizer bar perpendicular to mast. Adjust damper link tube (12, figure 5-26), as required, to connect to lever arm with pin lined up with mark on cam as seen through damper window.

c. Place safety washer (14) on bolt (13). Install bolt (13) through rod end bearing and lever with steel washer (24) between bushing in lever and rod end bearing. Install aluminum washer (23) and nut (22). Torque nut (22) 25 to 45 inch-pounds and secure with cotter pin (21).

d. Repeat procedure for opposite damper.

e. Position stabilizer bar (5) against stop. While observing pin in damper window, rapidly return stabilizer bar to neutral and check the time required for the pin to return to the mark on cam. Time required should be five seconds (plus or minus one). If limit is not met, replace damper.

f. Check stabilizer bar (5) for contact between centerframe and stop surface on support (39). If centerframe does not contact stop in either or both directions, proceed as follows:

(1) Disconnect both damper link tubes (12) at lever arm and move bar up to contact support (39). Adjust rod end to align with lever arm, then lengthen one-half turn.

(2) Accomplish preceding step f. and recheck stop contact.

(3) Repeat adjustment on opposite damper.

(4) If centerframe still fails to contact stop, repeat adjustment with stabilizer bar and lever arm in down position.

(5) If above adjustment is required, the pin will not be in line with mark on cam when the stabilizer bar is square to the mast. Pin may be off mark on cam 0.100 inch maximum.

5-53. Lubrication — Dampers and Adapters.

a. Refer to Chapter 1 for servicing of dampers.

b. If damper shows signs of fluid leakage or if level can be seen slightly below top of window, remove filler plug (1, figure 5-36), fill damper with hydraulic fluid (C-002) and reinstall plug. Check damper frequently for further leakage.

c. If fluid level falls more than 1/8 inch below top of window, satisfactory filling without trapped air may not be possible and replacement of damper may be necessary.

d. Check damper timing, as required, to determine serviceability. (Paragraph 5-52.)

5-54. SWASHPLATE AND SUPPORT ASSEMBLY.

5-55. Description — Swashplate and Support Assembly. The swashplate and support assembly consists of an outer rotating ring mounted through a duplex bearing set on the inner nonrotating ring. The inner ring is connected to the swashplate support by a gimbal ring assembly. Control rods connect to two trunnions on the inner ring assembly, to tilt the ring in the desired direction. The outer ring assembly tilts with the inner ring assembly, but rotates independently with the mast and rotor.

5-56. Removal — Swashplate and Support Assembly.

a. Open or remove transmission cowling.

b. Remove stabilizer bar. (Paragraph 5-37.)

c. Remove main rotor hub and blade assembly. (Paragraph 5-11.)

d. Remove stabilizer bar dampers and adapters. (Paragraph 5-47.)

e. Remove lockwire around mast boot (2, figure 5-39). Remove boot (2) and spacer (1).

f. Disconnect collective control tube from trunnion assembly (21).

NOTE

Keep all parts together for reassembly.

g. Remove nuts (11, 16 and 19) and bolts (22 and 23) to detach and remove parts of collective lever (25).

h. Remove lockwire and four screws (24) to detach each bearing and liner assembly (15) from lower end of scissors and sleeve assembly (5).

i. Disconnect both scissor links (4) from swashplate trunnion (28).

j. Remove scissor and sleeve assembly (5).

k. Disconnect cyclic and elevator control tubes from trunnions on swashplate assembly (33). Insert a piece of folded paper or cardboard into each of four gimbal support clevises to prevent damage in handling.

l. Remove eight bolts (26) and washers (27) which secure swashplate support (32) to mast bearing plate (29) on transmission.

m. Carefully lift swashplate and support from mast.

5-57. Disassembly — Swashplate and Support Assembly.

CAUTION

Bolts (1 and 12, figure 5-40) are difficult to remove due to retaining compound and must be driven out. Support the lugs of inner ring (43) and support (16) to prevent damage during bolt removal.

a. Detach swashplate assembly (7) from gimbal ring assembly (8) by removing two bolts (1), with cotter pins (6), nuts (5), washers (2 and 4), and special washers (3). Secure bushings to swashplate inner ring (43).

b. Detach gimbal ring assembly (8) from support (16) by removing two bolts (12) with cotter pins (14), special washers (13), and nuts (15). Secure bushings to swashplate support (16).

c. Remove each of four bearing and liner assemblies (10) with shims (9) from gimbal ring by removing lockwire and screws (11).

d. Remove 24 nuts (17 and 24) and washers (18 and 25) from studs at top of swashplate. Lift off cover (19), outer cap (23), inner cap (20), and two sets of shims (21 and 26). Remove seal (22) from outer cap (45).

e. Lift outer ring (45) and thrust bearing (27) from inner ring (43). Remove bearing and lower seal (44) from outer ring (45).

CAUTION

Excessive spreading of the trunnion clamp area of the ring could cause a crack resulting in loss of rotor control. After removing bolts and plates, insert tangs of tool into slot and tighten screw until trunnion (35) can barely be pulled out. Immediately release screw tension and remove work aid.

NOTE

A work aid is recommended to allow removal of trunnions with less possibility of damage to swashplate rings. (Figure 5-41.)

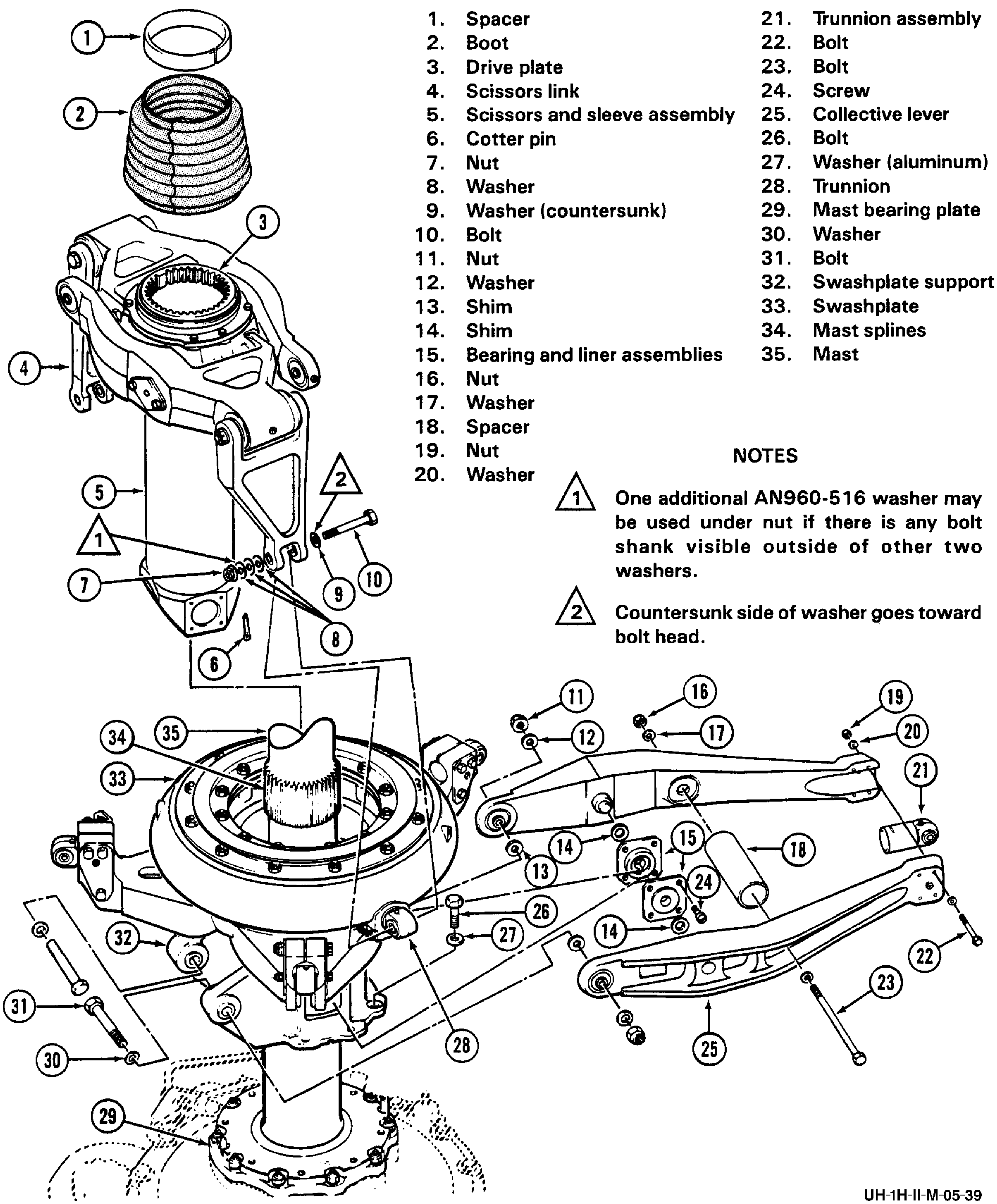


Figure 5-39. Swashplate and collective lever

1. Bolt
2. Washer
3. Chamfered washer
4. Washer
5. Nut
6. Cotter pin
7. Swashplate assembly
8. Gimbal ring assembly
9. Shim
10. Bearing and liner assembly
11. Screw
12. Bolt
13. Special washer
14. Cotter pin
15. Nut
16. Support

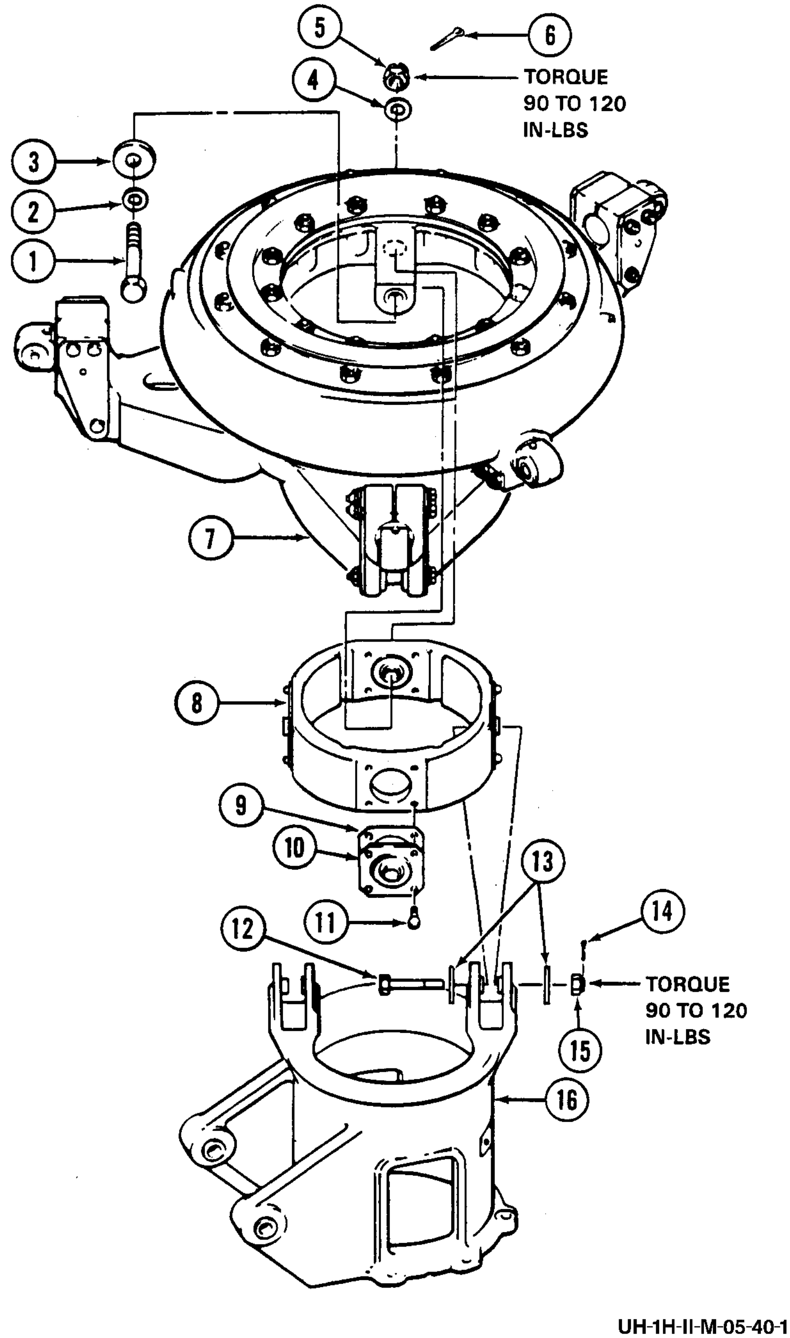


Figure 5-40. Swashplate and support assembly (Sheet 1 of 2)

17. Nut
18. Washer
19. Cover
20. Inner cap
21. Shim set
22. Seal
23. Outer cap
24. Nut
25. Washer
26. Shim set
27. Thrust bearing
28. Bolt
29. Washer
30. Plate
31. Trunnion
32. Washer
33. Nut
34. Bolt
35. Trunnion
36. Washer
37. Nut
38. Bolt
39. Washer
40. Plate
41. Nut
42. Spacer
43. Inner ring
44. Seal
45. Outer ring
46. Bolt
47. Washer
48. Nut
49. Washer
50. Plate
51. Spacer
52. Trunnion
53. Bracket
54. Nut
55. Bolt

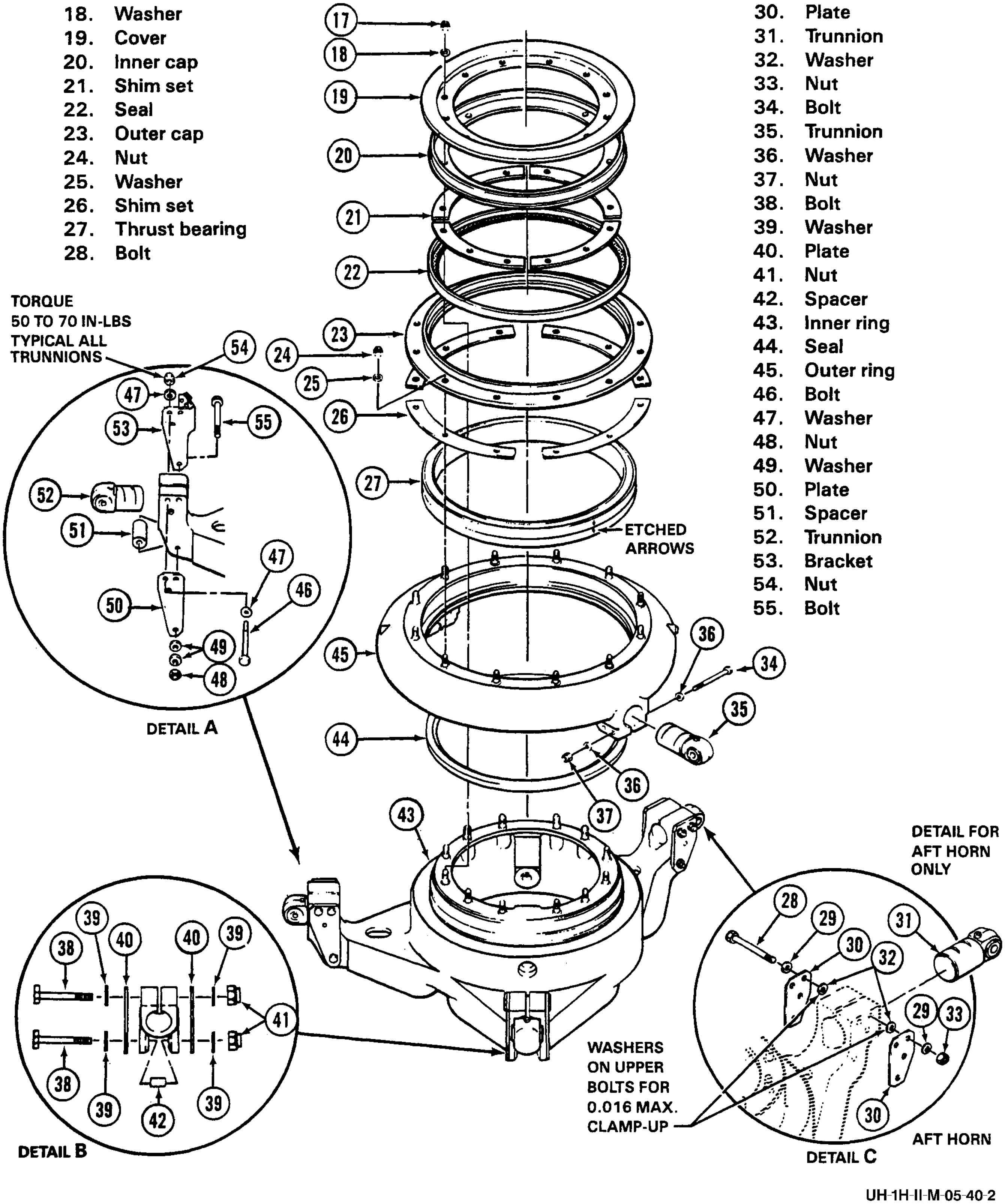


Figure 5-40. Swashplate and support assembly (Sheet 2 of 2)

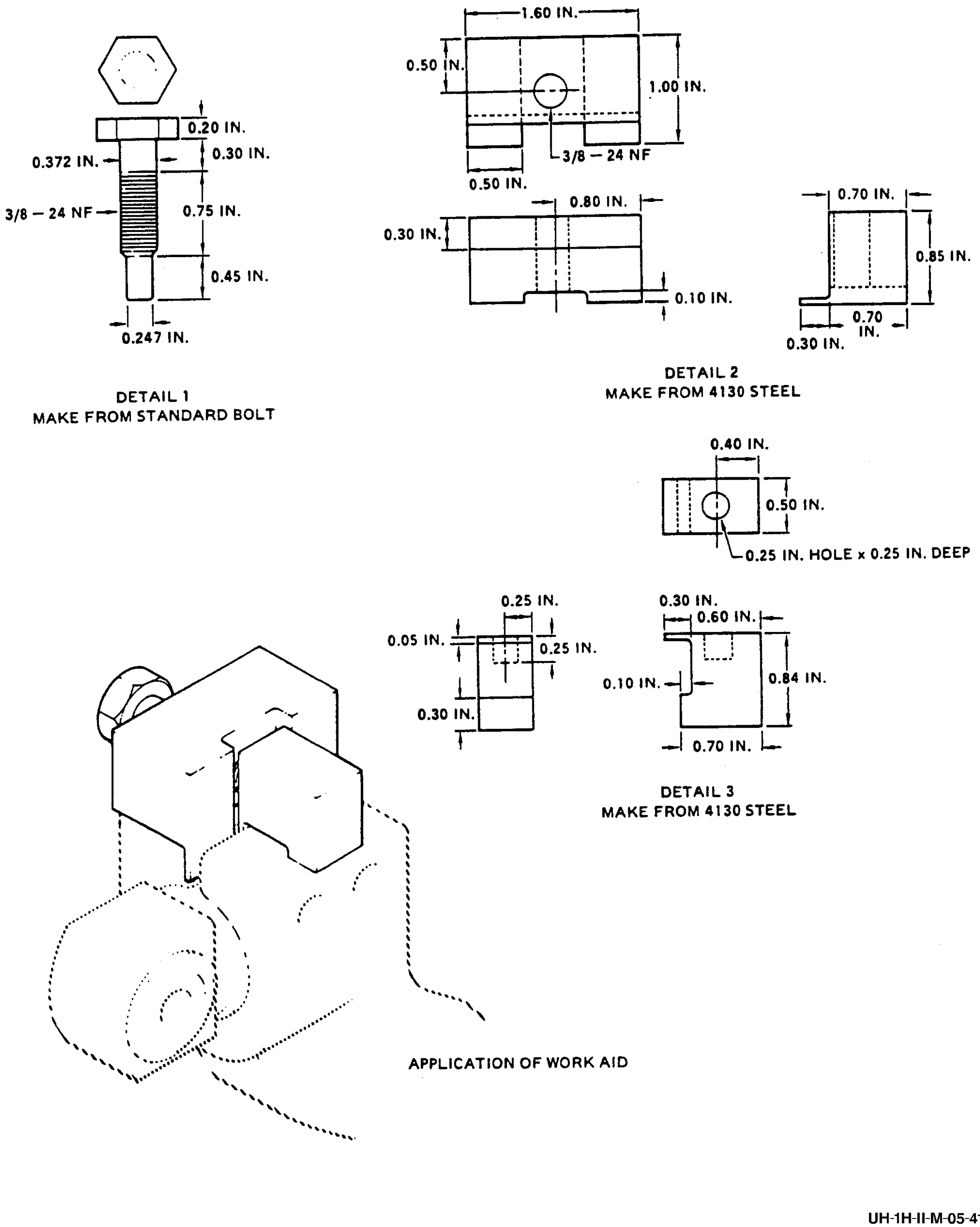


Figure 5-41. Trunnion removal and installation work aid

f. Remove two trunnion assemblies (35, figure 5-40) from outer ring (45) by removing bolts (34) with nuts (37) and washers (36).

g. At each three control horns of inner ring (43), remove trunnion assemblies using work aid. (Figure 5-41.)

5-58. Cleaning — Swashplate and Support Assembly.

NOTE

Do not immerse shielded or sealed bearings in solvent. Wipe clean with solvent dampened cloth.

a. Clean parts with solvent (C-304). Dry with filtered, compressed air.

b. Remove fingerprints or similar contamination from bearing surfaces and steel liners or sleeves with corrosion preventive (C-105) and final rinse with solvent (C-304).

c. Clean bearing liners on inner and outer rings by blasting with glass beads after inspection.

d. Protect bearings from contamination.

5-59. Inspection — Swashplate and Support Assembly (Disassembled).

a. Inspect surfaces of parts for mechanical damage (scratches and nicks) and corrosion damage. Reject parts if surface damage cannot be polished out within the following limits:

(1) Maximum depths of surface damage before and after repair on swashplate inner and outer rings and support. (Figure 5-42 and 5-43.)

(2) Score marks on inside surface of holes or bushings may be polished out if not more than 0.002 inch deep.

b. Inspect parts dimensionally if visual indications of wear are found. (Figure 5-42.)

CAUTION

Rapid or continued rotation will score races of unlubricated bearing.

c. Inspect thrust bearing (27, figure 5-40) for dents, deformation, cracks, corrosion, signs of overheating, and looseness due to wear. Check by feel for indications of internal damage (brinelling, spalling, and cracked or broken balls) by placing cleaned thrust bearing flat on a clean surface and applying even pressure with palms and heels of hands while turning bearing slowly.

NOTE

The trunnion bearings are different from other bearings, which normally can be feel-checked for roughness and ease of rotation. The trunnion bearings are preloaded into the cylinder portion of the trunnion with a 0.0005-inch tight to 0.0005-inch loose tolerance. The bearings are roller type, with no separated roller cages and angular-faced inner and outer races. The normal feel of this assembly is one of tightness, due mainly to the 0.0005-inch tight tolerance. The feeling of roughness is due to the preloaded and the angular faces of the inner and outer races. When grease is applied to the assembly, as required, the normal bearing feel does not exist. The conditions described are inherent in the trunnion bearing assembly. Checking the bearing assembly for tightness should be accomplished by hand movements only of the barrel and the crosshead.

d. Inspect trunnion for general condition.

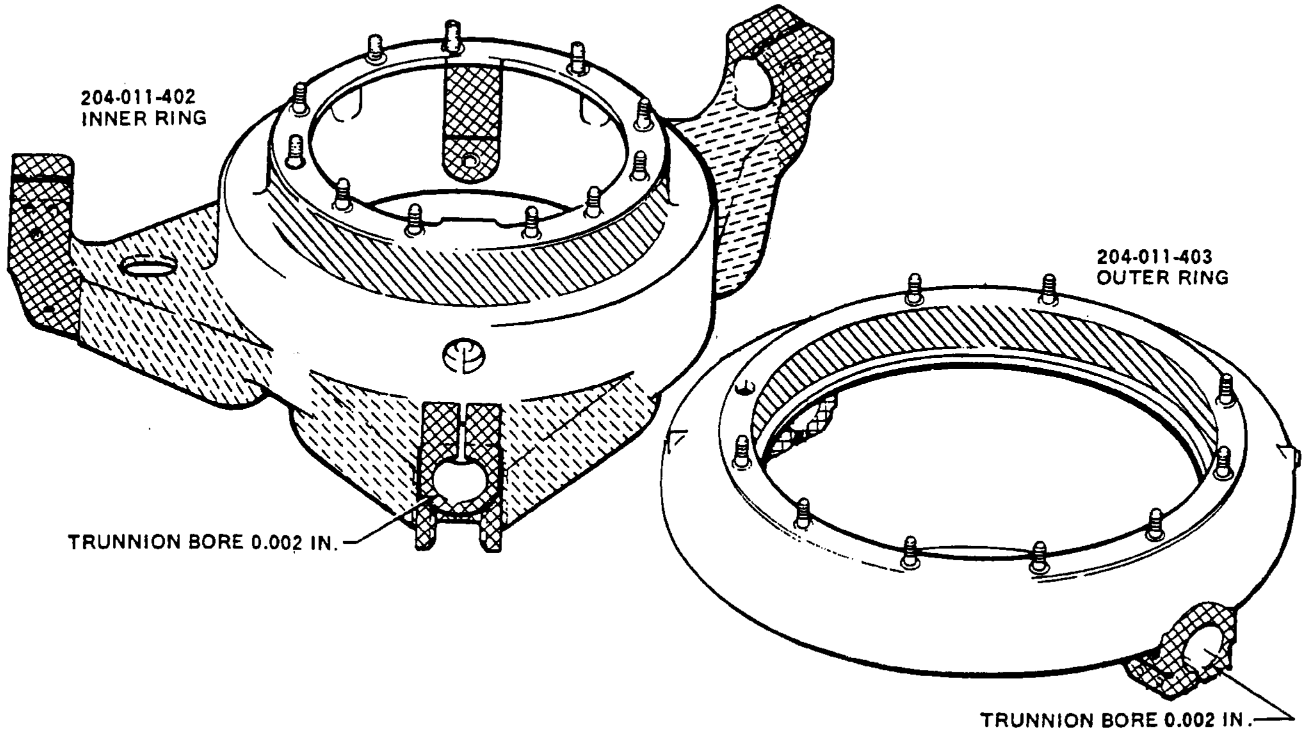
(1) Rotate trunnion bearing and apply slight outboard pressure to determine trunnion bearing position where maximum axial looseness can be felt.

CAUTION

Trunnion bearings that have axial play in excess of 0.019 inch are nonrepairable and nonairworthy and require immediate replacement.

(2) Use a dial indicator and determine the actual amount of axial play. Maximum amount of axial play allowed is 0.019 inch.

(3) Lubricate trunnion bearings with grease (C-007) while rotating trunnion.



DAMAGE LOCATION SYMBOLS

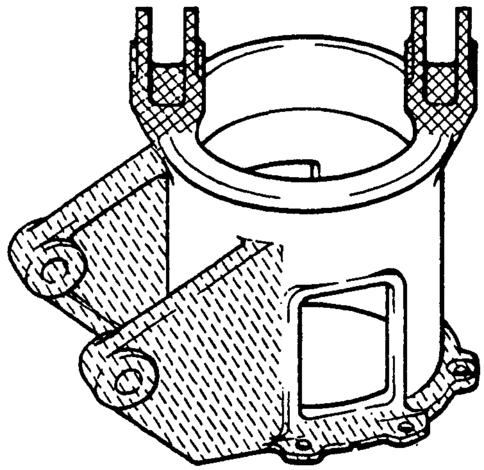
TYPE OF DAMAGE				
	MAXIMUM DAMAGE AND REPAIR DEPTH			
MECHANICAL (Before and after repair)	0.010 In.	0.020 In.	0.020 In.	0.030 In.
CORROSION (Before repair)	0.0025 in.	0.005 in.	0.005 in.	0.0075 in.
(After repair)	0.005 in.	0.010 in.	0.010 in.	0.015 in.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 square inch	0.50 square inch	See note 1	Not critical
NUMBER OF REPAIR AREAS	Two per lug	Two per arm	See note 1	Not critical
EDGE CHAMFER	0.030 inch	0.100 inch	See note 1	0.100 inch
TRUNNION BORE DAMAGE	0.002 inch for 1/4 circumference			
THREAD DAMAGE DEPTH:	One-third of thread			
LENGTH:	One quarter of circumference			
NUMBER:	One			

Note:

1. Surface corrosion may be cleaned up over the entire surface of the liner. Corrosion requiring full depth repair is limited to one-fourth of the total area. Segments of full depth repair should not exceed 2.0 inches in length and should maintain 0.50 inch minimum separation.

UH-1H-II-M-05-42

Figure 5-42. Swashplate inner and outer ring damage limits



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL (Before and after repair)	0.010 in.	0.020 in.	0.035 in.
CORROSION (Before repair)	0.0025 in.	0.005 in.	0.0085 in.
(After repair)	0.005 in.	0.010 in.	0.017 in.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Square in.	0.25 Square in.	0.50 Square in.
NUMBER OF REPAIR AREAS	One per lug	Not critical	Not critical
EDGE CHAMFER	0.040 In.	0.060 in.	0.100 in.
BORE DAMAGE	0.002 Inch in depth for 1/4 circumference.		

UH-1H-II-M-05-43

Figure 5-43. Swashplate support damage limits

e. Inspect the following parts by magnetic particle (Code M) or fluorescent penetrant method (Code F). Index numbers are keyed to figure 5-40. Demagnetize parts after magnetic particle inspection.

NOTE

Refer to BHT-212-CR&O for approved fluorescent penetrant material (Post Emulsified Penetrant System).

Index No.	Nomenclature	Code
8	Gimbal Ring	M
16	Support	F
43	Inner Ring	F
45	Outer Ring	F

f. Inspect studs of inner and outer rings as follows:

(1) Maximum permissible wobble or side-to-side looseness is 0.010 inch per inch of stud height as measured from the mounting surface.

(2) Maximum permissible axial or up-and-down looseness is 0.003 inch.

(3) Looseness in excess of the above requires replacement of studs and inspection of the tapped holes.

(4) Any signs of corrosion or damage to the parent material in the tapped holes or around the stud lock ring in excess of limits reflected on figure 5-42 is cause for rejection of the ring assembly.

g. Check gimbal ring assembly (8) bearing for looseness and roughness in operation.

h. Inspect bearing and liner assembly (10, figure 5-40) for mechanical and corrosion damage. If bearing is worn or binding, replace bearing. Maximum allowable play of bearing is 0.005 inch axial and radial. (Figure 5-44.)

5-60. Repair — Swashplate and Support Assembly.

a. Corrosion and mechanical damage repair.

(1) Remove no more material than necessary, using fine to medium grades of aluminum oxide cloth (C-406) or a fine India stone (C-464), and final polish to smooth scratch-free surface with crocus cloth (C-500). No surface shall be repaired by use of grinding wheel, plugging or patching.

(2) Corrosion damage on aluminum shall be polished out to twice depth of pit, but mechanical damage shall be polished out only deep enough to remove traces of damage. Do not exceed limits of figures 5-42 and 5-43.

(3) Where anodized surface is removed by repairs (not to exceed 10 percent total surface area) restore finish with chemical film treatment (C-100). Anodize part if more than 10 percent of surface area was removed. (Refer to BHT-212-CR&O.)

(4) Where cadmium plating is removed by repairs, restore finish with LHE cadmium plating solution (C-108).

b. Replace defective bushing in inner ring (43, figure 5-40). (Refer to BHT-212-CR&O.)

c. Replace defective bushings in support (16). (Refer to BHT-212-CR&O.)

d. Replace loose or damaged studs in the inner and outer ring (43 and 45). (Refer to BHT-212-CR&O.)

e. Apply coating (C-245) on all exterior surfaces of inner ring (43), from tips of arms to a minimum of four inches inboard, as follows:

(1) Thoroughly clean surfaces with cloth saturated with toluene (C-306) or MEK (C-309). Wipe surface dry with clean cloth before solvent evaporates.

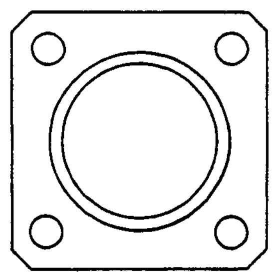
(2) Mask (C-426) inside surfaces of trunnion holes and bolt hole, and other surfaces not to be coated.

(3) Spray apply a wet coat of protective coating (C-245) to exterior surface of three control arms, to include areas one inch inboard of large holes in tops and bottoms of arms.

(4) Air-dry at room temperature for 30 minutes minimum.

(5) Apply second coat.

(6) Cure by air-drying 48 hours minimum at room temperature or air-drying for 15 minutes and cure at 150°F (66°C) for one hour.



BEARING AND LINER ASSEMBLY 204-011-443-1

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED
NICKS, SCRATCHES, AND SHARP DENTS	0.010 inch
CORROSION	0.010 inch
AREA OF FULL DEPTH REPAIR	0.010 Square inch
NUMBER OF REPAIR AREAS	Not critical

UH-1H-II-M-05-44

Figure 5-44. Bearing and liner assembly

f. Replace gimbal ring (8) bearings, seals, bolts, nuts, and cotter pins on reassembly. Replace all unserviceable parts.

g. Lubricate the following parts before assembly.

(1) Hand pack thrust bearing (27, figure 5-40) with grease (C-007). After reassembly of swashplate, use a suitable gun at two lube fittings on outer ring (45) and purge grease past seals to ensure bearing lubrication.

(2) After reassembly, purge lubricate trunnions with hand gun through fittings provided on each rod end and swashplate horn.

5-61. Assembly — Swashplate and Support Assembly.

Premaintenance Requirements for Assembly of Swashplate and Support

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-007), (C-101), (C-201), (C-309), (C-320), (C-325), (C-405)
Special Environmental Conditions	None

a. Apply adhesive (C-325) on outside diameter of upper seal (22, figure 5-40). Press seal, with seal lip pointing up, into top of outer cap (23). Install seal (22) until flush with lip on outer cap (23). Remove any excess adhesive.

b. In same manner, install lower seal (44) with lip pointing down into lower side of outer ring (45).

c. Install trunnion (35) on each mounting point of outer ring (45) as follows:

(1) Lightly coat outside of trunnion barrel with corrosion preventive compound (C-101) and insert into outer ring.

CAUTION

Excessive spreading of the trunnion clamp area of the ring could cause a crack resulting in loss of rotor control. Insert tangs of tool into slot and tighten screw until trunnion can barely be installed. (Figure 5-41.) After installation of bolts (34, figure 5-40), immediately release screw tension and remove work aid. Both bolts (34) must be installed before tightening nuts.

NOTE

A work aid is recommended to allow installation of trunnions with less possibility of damage to swashplate rings. (Figure 5-41.)

NOTE

Apply zinc chromate primer (C-201) on all bolt shanks and on inner faces of all plates and brackets before installing.

(2) Align bolt grooves and holes. Coat bolts (34, figure 5-40) with zinc chromate primer (C-201). Install two bolts (34) with a washer (36) next to each bolt head and nut (37). Torque nuts (37) 50 to 70 inch-pounds.

d. Install trunnion assemblies and attaching parts in three control horns of inner ring (43).

(1) Apply a light coat of corrosion preventive compound (C-101) to trunnion barrel and insert a trunnion into each of three horns of inner ring. Align trunnion bolt grooves with holes in horn.

(2) Place plate (50) and bracket (53) on swashplate horn. (Detail A.) Install two bolts (46) with washers (47) under bolt head and nut (54). At lower hole insert-spacer (51) between faces of horn and install bolt (55) with bolt head outboard. Install two washers (49) and nut (48). Torque nuts (48) evenly 50 to 70 inch-pounds.

(3) Assemble on horn (Detail B) two plates (40), spacer (42), and bolts (38) with one washer (39) under bolt head and nut (41). Install nuts (41) and torque evenly 50 to 70 inch-pounds.

(4) Position plates (30) on aft horn. (Detail C.) Install bolt (28) in lower hole with washer (29) under bolt head and nut (33). At the two upper holes, measure the gap both sides between the plates and horn. Shim the gap with AN960PD416L washers, as required, to obtain a 0.000 to 0.016 inch maximum clamp-up on each side. Install bolts (28) with washer (29) under bolt head and nut (33). Torque nuts (33) evenly 50 to 70 inch-pounds.

e. Fit bearing and liner assemblies (10) to gimbal ring (8) and mating parts to determine shims (9) required to center bearings between bushings of mounting points as follows:

(1) Place two bearing and liner assemblies (10) in opposite sides of gimbal ring assembly (8) without shims (9) or retaining screws (11).

(2) Mount gimbal ring on support (16) with bolts (12) inserted through support bushings and gimbal bearings. Tap gimbal ring to one side of support. Use feeler gage at opposite side of measure clearance between gimbal ring and bearing and liner flange.

(3) Prepare two shims (9), each shim one-half as thick as measured total clearance.

(4) Match-mark gimbal ring and support at one place. Remove gimbal ring.

(5) Remove both bearing and liner assemblies (10). Apply corrosion preventive compound (C-101) to liner surface which will touch gimbal ring, and reinstall with shims (9) in place and retaining screws (11). Secure screws, in pairs, with lockwire (C-405).

(6) In the same manner, fit and install remaining two bearing and liners in gimbal ring, with shims peeled, as required, to center bearings in mounting points of inner ring (43).

f. Prepare parts for final assembly.

CAUTION

Keep solvents and retaining compounds out of working parts of bearings.

(1) Thoroughly clean shanks of four bolts (1 and 12, figure 5-40), and inside diameters of gimbal ring bearings and bushings in mounting points of inner ring (43) and support (16) with MEK (C-309).

(2) Apply sealant (C-320) evenly but sparingly on ID surfaces of bushings and bearing inner races. Place a special washer (13) on bolt (12), washer (2) and special washer (3) on bolt (1) with chamfer toward bolt head. Apply sealant to bolt shanks.

g. Install swashplate assembly (7) and gimbal ring assembly (8) to support (16) as follows:

(1) Position gimbal ring to mounting points of support, observing match-marks. Install two bolts (12) with special chamfered washer (13) next to bolt heads from inboard through support (16). Install special washers (13) and nuts (15). Torque nuts (15) 90 to 120 inch-pounds and secure with cotter pins (14).

(2) Position inner ring (43) over support (16) with control horns located as shown and gimbal ring bearings aligned in mounting points of inner ring. Make sure that elevator horn (aft horn of inner ring) is located farthest away from collective lever mounting bases of support (16). Install two bolts (1), with washers (2) and chamfered washers (3) next to bolt heads, from inboard through bearing and inner ring. Install washers (4) and nuts (5). Torque nuts (5) 90 to 120 inch-pounds and secure with cotter pins (6).

NOTE

Sealant shall cure 12 hours at 75°F (24°C) before service use.

(3) After 30 minutes curing time, tilt swashplate all directions to ensure there is no binding caused by retaining compound entering gimbal bearings.

h. Apply light coatings of corrosion preventive compound (C-101) on inside and outside diameters of thrust bearing (27) and on mating surfaces of outer ring liner (45) and liner on inner ring (43). Hand-pack thrust bearing (27) with grease (C-007).

i. Seat outer ring assembly (45) over inner ring (43), taking care that lower seal passes undamaged over shoulder on inner ring sleeve.

j. Align etched arrows on outer race of thrust bearing (27). Install bearing between inner and outer rings, and tap evenly until seated.

k. Determine height of bearing outer race above top surface of outer ring (45), either by using a depth gage or by placing outer race cap on bearing and measuring gap with a feeler gage. Peel four-section shim (26) 0.009 to 0.012 inch thinner than measured dimension, to provide clamp-up on bearing race.

l. Determine height of bearing inner race above top surface of inner ring (43), by methods similar to step k. Peel four-section shim (21) 0.009 to 0.012 inch thinner than measured dimension.

m. Place prepared shim (21) on inner ring (43) studs. Fill gaps between shim sections with corrosion preventive compound (C-101). Place inner cap (20) on studs.

n. Place prepared shim (26) on outer ring (45) studs. apply corrosion preventive compound (C-101) to fill gaps between ends of shim sections. Install outer cap (23) with 12 washers (25) and nuts (24) on studs. Tighten nuts evenly.

o. Install cover (19) with washers (18) and nuts (17) on inner ring (43) studs. Tighten nuts evenly.

p. Lubricate thrust bearing (27) with grease (C-007) applied with hand gun through fittings on outer ring. Purge grease past seals to ensure lubrication. Purge lubricate trunnions through fittings on rod-ends and on control horns.

q. Check swashplate assembly for freedom of movement.

5-62. Installation — Swashplate and Support Assembly.

a. Apply corrosion preventive (C-101) to all bolts at installation.

b. Carefully lower swashplate assembly (33, figure 5-39) over mast (35) until swashplate support (32) rests on mast bearing plate (29).

c. Align holes and install eight bolts (26) with aluminum alloy washers (27) under heads through flange of support into cap. Use two longest bolts between pivots of collective lever (25). Torque bolts (26) 120 inch-pounds and lockwire (C-405) bolt heads in pairs.

d. Lubricate mast splines and collective sleeve splines with grease (C-007). Lower scissors and sleeve (5) carefully over mast (35) and into swashplate support (32). Install and tighten four screws (24) to secure each bearing and liner assembly (15). Lockwire (C-405) screws in pairs.

NOTE

End play between scissors and drive link should be divided equally on both sides of scissors with total end play not to exceed 0.090 inch. Replace thrust washers if exceeded.

e. Attach scissor links (4) to trunnion bearings (28) on swashplate outer ring with countersunk washer (9) under bolt head (10). Assure bolt head toward rotation. Install washers (8) and nut (7). Torque nuts (7) 120 to 145 inch-pounds and secure with cotter pins (6).

NOTE

Maximum allowable looseness of bearing (15) is 0.005 inch axial and radial.

f. Assemble collective lever halves (25) on swashplate support (32), with pins inserted into shims (14) and bearing and liner assemblies (15) on sleeve and with trunnion (21) and spacer (18) in place. Torque nuts (19) on trunnion retaining bolts (22) 60 inch-pounds. Install nut (16) on bolt (23) through spacer (18). Torque nut (16) 175 inch-pounds.

g. At pivot end of lever (25), install bolts (31) with washers (30) under bolt heads and washers (12) under nuts (11), and with shims (4, figure 5-45) between support and lever as required to give 0.000 to 0.005 inch interference fit at each side, shims equal within 0.005 inch. Torque nuts (11, figure 5-39) on bolts (31) 290 to 410 inch-pounds.

h. Use feeler gage to measure clearance between inner race of bearings (3, figure 5-45) and shoulder of pins (2) on lever on each side. Prepare two shims (1), equal within 0.005 inch, and of total thickness required to provide 0.000 to 0.002 inch clamp-up on bearings. Disassemble lever enough to install shims (14, figure 5-39) on pins, and reassemble as in steps f. and g. Move lever to check for freedom of operation.

i. Connect collective pitch control tube to collective levers.

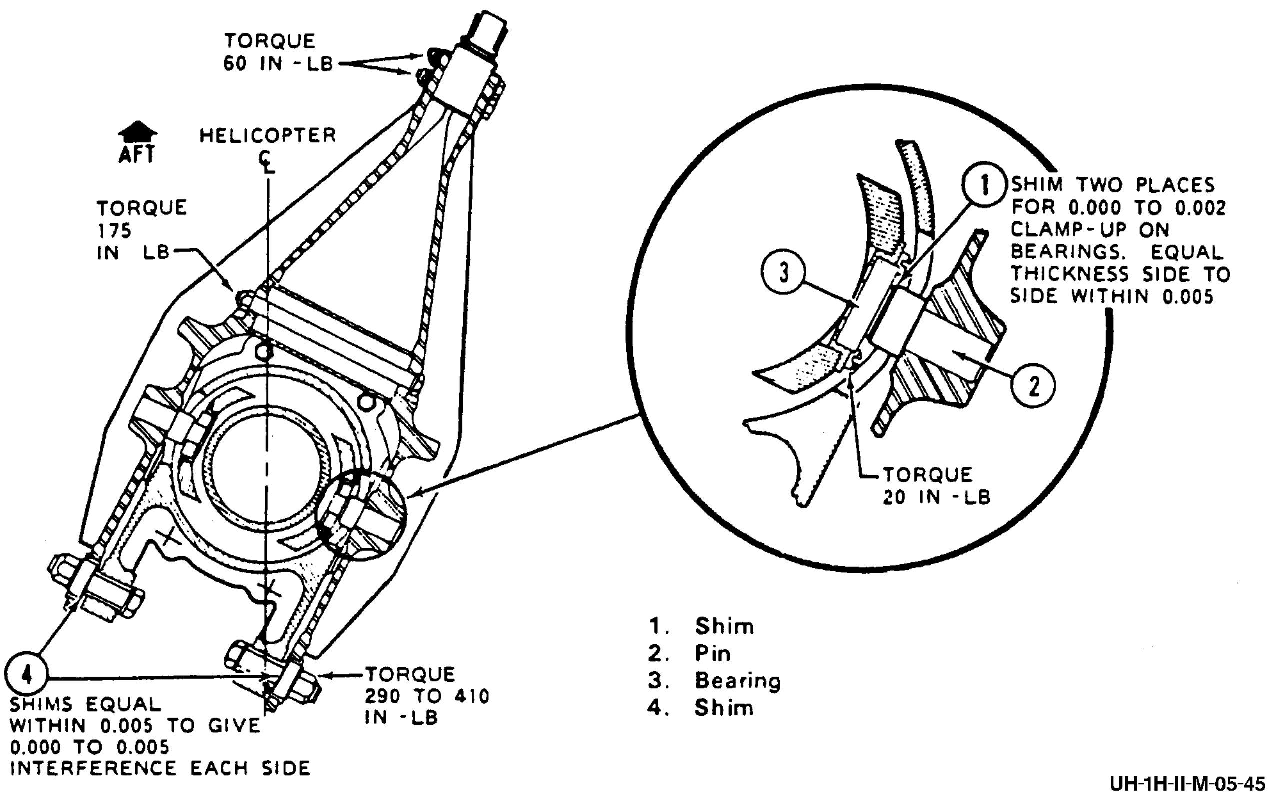


Figure 5-45. Collective lever shimming

NOTE

To prevent possible damage to dust boot during operation, a distance of 10.25 to 10.75 inches must be maintained between top of the boot and lower surface of damper support frame. Position of collective stick will not affect dimension.

j. Slide boot (2) down under flange at top of sleeve assembly and secure with lockwire (C-405). Position spacer (1) around mast, under top edge of boot, and secure with lockwire (C-405). For replacement of split boot refer to paragraph 5-79.

k. Connect cyclic and elevator control tubes to swashplate trunnions.

l. Install stabilizer bar damper and adapter. (Paragraph 5-51.)

m. Install main rotor hub and blade assembly. (Paragraph 5-13.)

n. Install stabilizer bar. (Paragraph 5-44.)

o. Check for looseness between collective lever pin (2, figure 5-45) and bearing (3) as follows:

(1) Station a man to attempt to rotate a main rotor blade on pitch change axis.

(2) Check for movement between bearings (3) on collective sleeve and lever pins (2).

(3) Any movement indicating end play between lever pins and bearing is cause to recheck and correct shims (1).

p. Install and close transmission cowling.

q. Perform on operational check of main rotor assembly.

5-63. Lubrication — Swashplate and Support Assembly. Refer to Chapter 1 for swashplate lubrication.

5-64. COLLECTIVE LEVERS.

5-65. Description — Collective Levers. The collective levers consist of two lever halves mounted to the swashplate and collective sleeve at one end and attached to the hydraulic cylinder of the collective system at the opposite end.

5-66. Removal — Collective Levers.

a. Disconnect collective cylinder control tube from trunnion of collective levers.

b. Remove nuts (11, figure 5-39), washers (12), and bolts (31) with washers (30).

c. Remove nut (19), washers (20), and bolt (22).

d. Remove nut (16), washers (17), and bolt (23).

e. Remove collective levers (25), trunnion (21), spacer (18), and shims (14).

5-67. Inspection — Collective Levers.

a. Inspect lever halves for nicks, scratches, dents, or corrosion within limits. (Figure 5-46.)

b. Inspect bearings for looseness and wear.

5-68. Repair — Collective Levers.

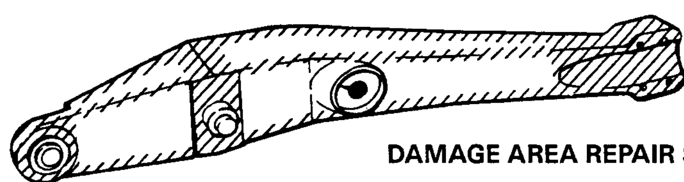
CAUTION

In all repairs, no more material should be removed than necessary to effect repair. Repair by grinding wheel, patching or plugging is not allowed.

NOTE

Whenever cadmium plating is removed by repair, primer (C-204) should be applied to bare metal. Repair areas on anodized surfaces should be recoated using brush chemical film material (C-100). Primer is acceptable for field repairs.

a. Repair damage to levers within limits of figure 5-46. If limits are exceeded lever should be replaced.



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
NICKS, SCRATCHES AND SHARP DENTS	0.020 In.	0.010 In.
CORROSION		
BEFORE REPAIR	0.010 In.	0.005 In.
AFTER REPAIR	0.020 In.	0.010 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In.
NUMBER OF NONOVERLAPPING REPAIR AREAS	Four	One per segment
EDGE CHAMFER OR RADIUS	0.060 In.	0.030 In.
BORE DAMAGE	0.001 In. for 1/4 circumference	

UH-1H-II-M-05-46

Figure 5-46. Collective lever damage limits

NOTE

Replace bearing in collective lever if axial or radial looseness exceeds 0.005 or if bearing feels rough when inner race is rotated.

b. Remove bearing as follows:

(1) Place collective lever (2, figure 5-47) on a suitable support having clearance for bearing.

(2) Press lever bearing (3) from liner (4). Press out liner (4).

c. Repair inside of bearing liner (4) not to exceed depth of 0.0020 inch for mechanical or corrosion damage. Repaired liner ID not to exceed 1.1245 inch diameter.

d. Install lever bearing (3) as follows:

(1) Apply corrosion preventive compound (C-101) to new bearing (3) and liner (4).

(2) Place lever (2) on a suitable support.

(3) Press lever bearing (3) into liner (4). Press liner (4) into lever (2).

NOTE

Pin should not be removed unless mechanical or corrosion damage exceeds damage limits. (Figure 5-48.)

e. Remove pin (1, figure 5-47) as follows:

(1) Place collective lever (2) on a suitable support having clearance for pin (1).

CAUTION

Do not drive pin by impact.

(2) Press pin (1) from lever (2).

f. Repair collective lever (2) in accordance with damage and repair limits. (Figure 5-46.)

g. Install pin (1, figure 5-47) in collective lever (2) as follows:

(1) Apply corrosion preventive compound (C-101) to collective lever (2) and pin (1).

(2) Place lever on a suitable support.

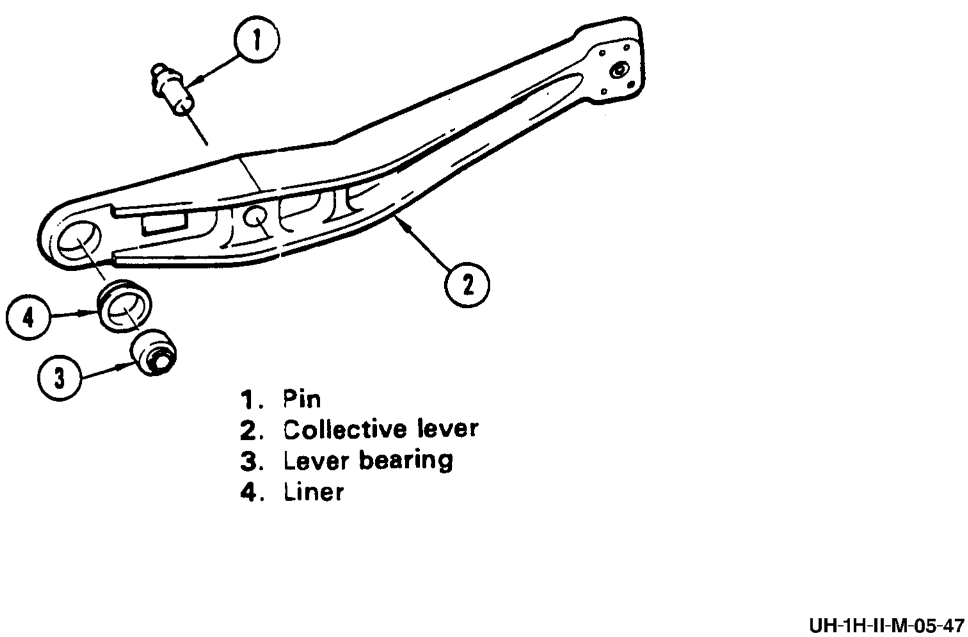
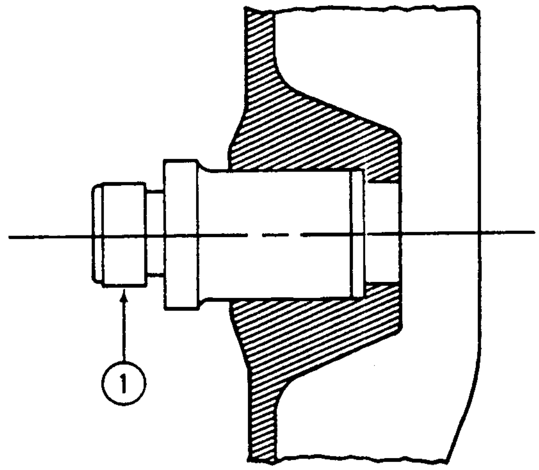


Figure 5-47. Collective lever



ITEM	NOMENCLATURE	MIN. INCH	MAX. INCH
1	PIN	0.6243	0.6250

UH-1H-II-M-05-48

Figure 5-48. Collective lever pin wear limits

(3) Press new pin (1) into collective lever (2). Bottom pin in lever.

5-69. Installation — Collective Levers.

NOTE

Maximum allowable looseness of bearing (15, figure 5-39) is 0.005 inch axial and radial.

a. Assemble collective lever halves (25) on swashplate support (32), with pins inserted into shims (14) and bearing and liner assemblies (15) on sleeve and with trunnion (21) and spacer (18) in place. Torque nuts (19) on trunnion retaining bolts (22) 60 inch-pounds. Install nut (16) on bolt (23) through spacer (18). Torque nut (16) 175 inch-pounds.

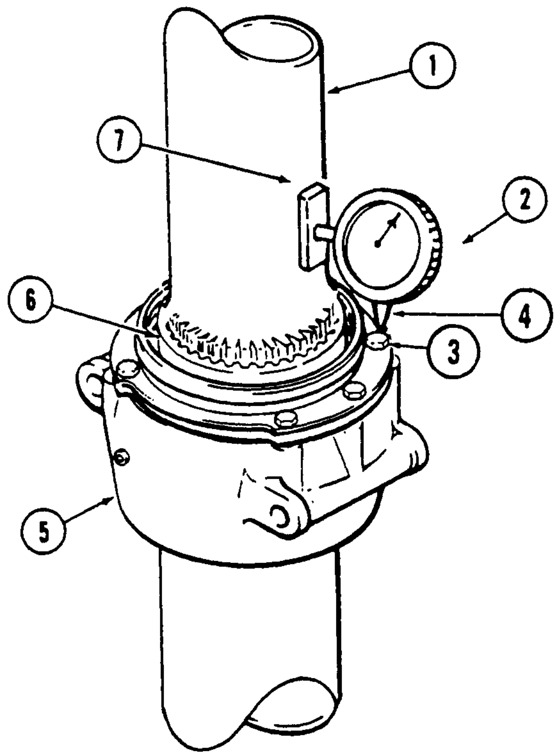
b. At pivot end of lever (25), install bolts (31) with washers (30) under bolt heads and washers (12) under nuts (11), and with shims (4, figure 5-45) between support and lever as required to give 0.000 to 0.005 inch interference fit at each side, shims equal within 0.005 inch. Torque nuts (11, figure 5-39) on bolts (31) 290 to 410 inch-pounds.

c. Use feeler gage to measure clearance between inner race of bearings (3, figure 5-45) and shoulder of pins (2) on lever on each side. Prepare two shims (1), equal within 0.005 inch, and of total thickness required to provide 0.000 to 0.002 inch clamp-up on bearings. Disassemble lever enough to install shims (14, figure 5-39) on pins, and reassemble as in steps a. and b. Move lever to check for freedom of operation.

d. Connect collective pitch control tube to collective levers.

5-70. SCISSORS AND SLEEVE ASSEMBLY.

5-71. Description — Scissors and Sleeve Assembly. The scissor and sleeve assembly consists of two scissor levers and a rotting hub splined to the mast and mounted through ball thrust bearings on the upper end of the nonrotating collective sleeve. The collective sleeve operated between the swashplate support and mast and is actuated by collective levers attached to the lower end. The outboard ends of the scissors are connected to the swashplate outer ring by two drive links. The inboard ends of the scissors are indirectly connected to the pitch horns by two control tubes which transmit collective and cyclic control motions to the mixing levers in the stabilizer bar.



1. Mast
2. Dial Indicator
3. Bolt Head
4. Indicator Probe
5. Hub Assembly
6. Drive Plate
7. Magnet

UH-1H-II-M-05-49

Figure 5-49. Drive plate wear check

5-72. Removal — Scissors and Sleeve Assembly.

a. Open or remove transmission cowling.

b. Remove stabilizer bar. (Paragraph 5-37.)

c. Remove main rotor hub and blade assembly. (Paragraph 5-11.)

d. Remove stabilizer bar dampers and adapters. (Paragraph 5-47.)

e. Remove lockwire around mast boot (2, figure 5-39). Remove boot (2) and spacer (1).

f. Check spline wear on drive plate (6, figure 5-49) by attaching dial indicator (2) to mast (1) with indicator probe (4) in contact with a flat of bolt head (3) (flange attaching bolt head). Move hub assembly (5) back and forth and measure amount of play present. Maximum radial play allowed between mast (1) and drive plate (6) is 0.040 inch at point of measurement.

g. Disconnect collective control tube from trunnion assembly (21, figure 5-39).

h. Remove parts of collective lever (25). Keep all parts together for reassembly. (Paragraph 5-66.)

i. Remove lockwire and four screws (24) to detach each bearing and liner assembly (15) from lower end of scissor and sleeve (5).

j. Disconnect two scissor links (4) from swashplate trunnions (28) by removing cotter pins (6), nut (7), washers (8), and bolts (10) with countersunk washer (9).

k. Remove scissor and sleeve.

5-73. Disassembly — Scissors and Sleeve Assembly.

Premaintenance Requirements for Disassembly of Scissors and Sleeve

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T39), (T40), (T41), (T53), (T63)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	None
Special Environmental Conditions	None

NOTE

Check all pivot joints for binding before disassembly. If sever binding exists, scrap the entire assembly. If scissors and sleeve are being disassembled for replacement of part(s) instead of overhaul, disassemble only to extent necessary to replace part(s).

a. Remove cotter pin (14, figure 5-50), nut (13), washer (10 and 12), bolt (9) and remove link (11) from scissor. Remove shim (6), housing assembly (7), and thrust washer (8). Remove inner race (19).

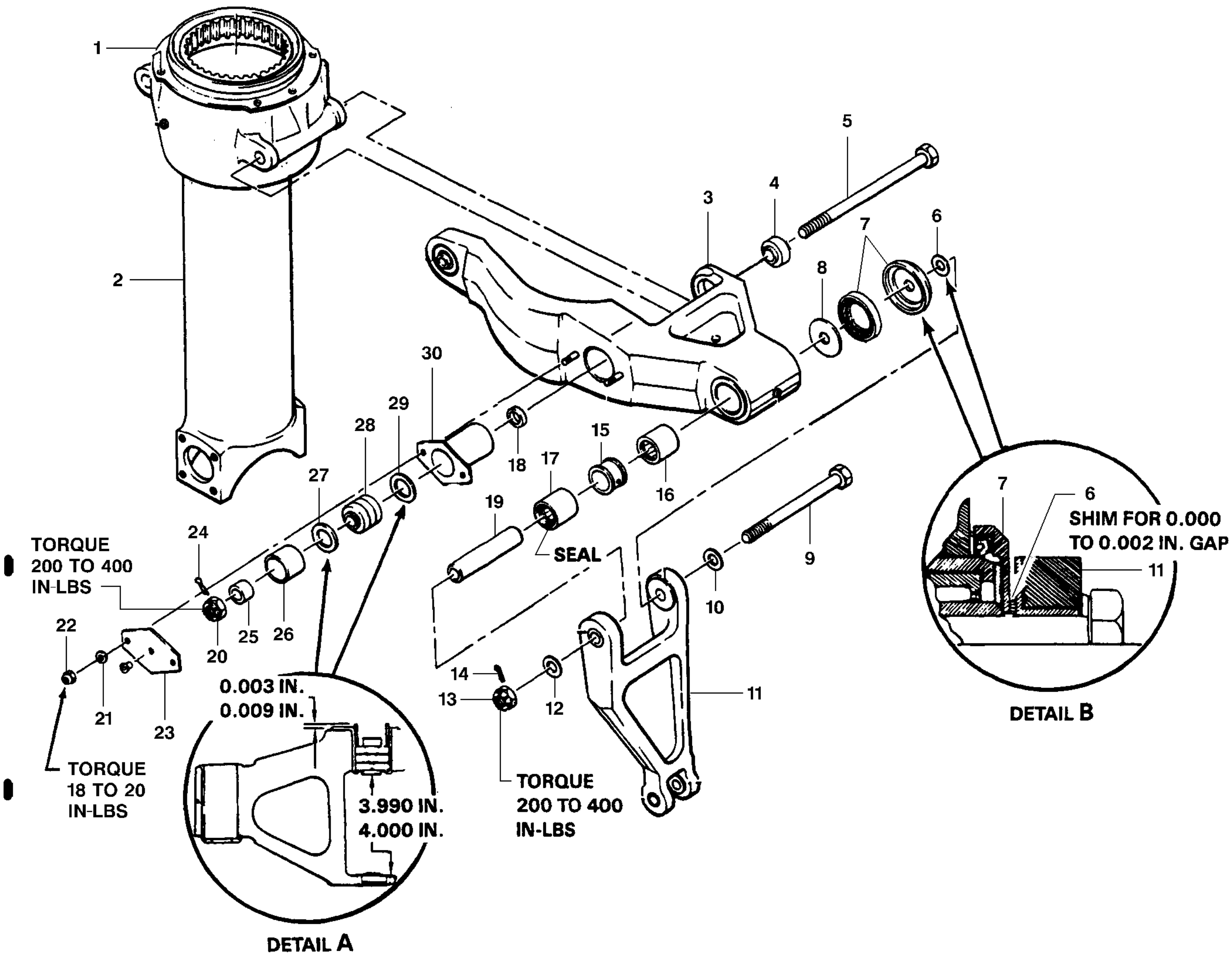
b. Remove nuts (22) and washers (21). Remove cover plate (23). Remove cotter pin (24), nut (20), and spacer (25) from bolt (5). Support scissor assembly (3) and remove bolt (5) with roller bearing inner race (4). Remove scissor from hub assembly (1), removing spacer (18) as it is released.

c. Remove liner (30) from scissors assembly (3). Use bearing removal bar (T53) and press out shims (27 and 29), bearing set (28), and spacer (26) from liner (30).

d. Use bearing removal bar (T53) to remove bearings (16 and 17) and spacer (15) from scissors (3).

e. Remove bolts (35), washers (34) and remove flange (36) and drive plate (37). Remove screws (41) and lockplate (40).

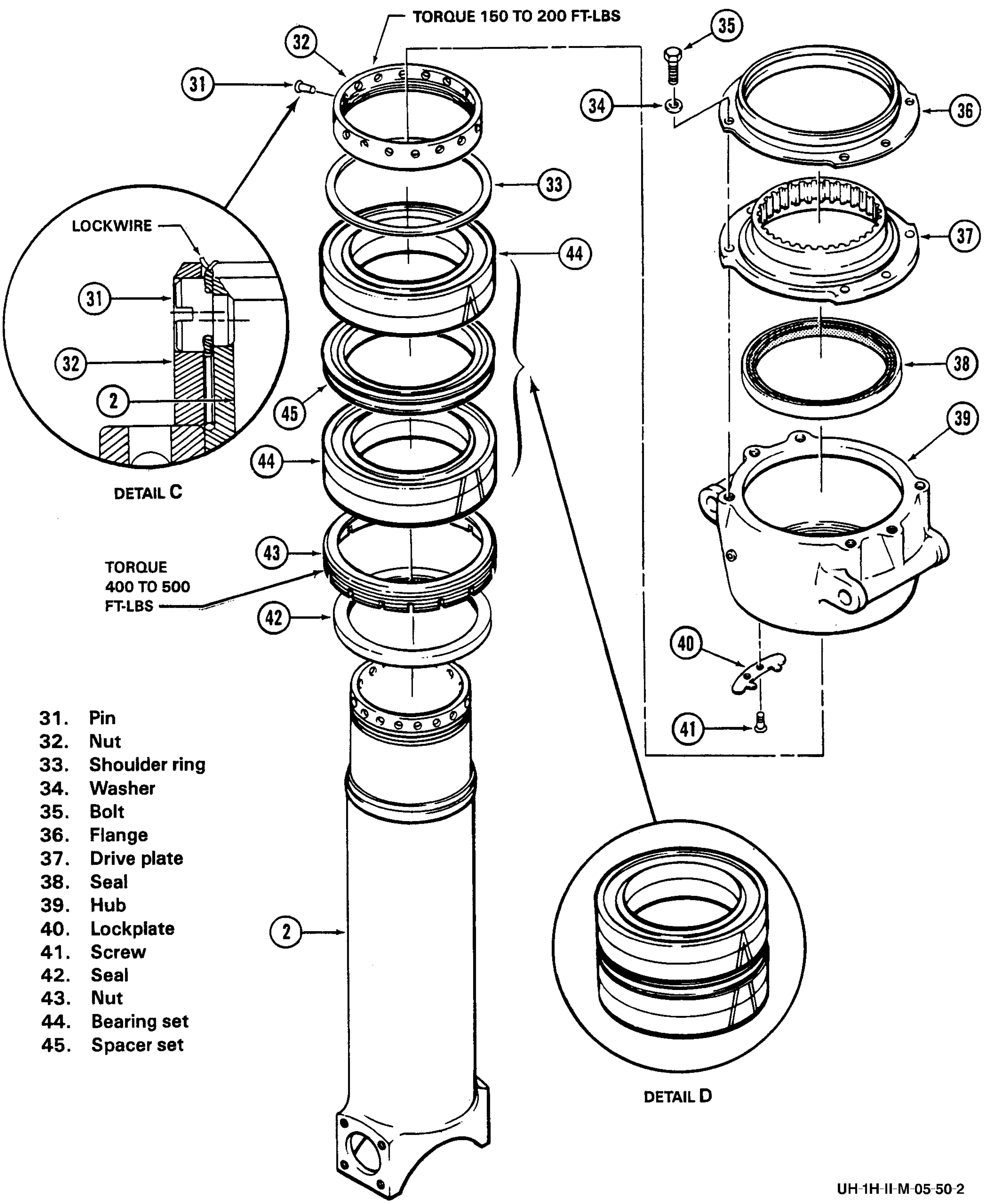
f. Install wrench (T41) on nut (32). Invert hub and sleeve and secure wrench in a vise. Using wrench (T63) turn nut (43) out of hub (39). Remove tools from assembly.



1. Hub assembly	11. Link	21. Washer
2. Collective sleeve	12. Washer	22. Nut
3. Scissor assembly	13. Nut	23. Cover plate
4. Roller bearing inner race	14. Cotter pin	24. Cotter pin
5. Bolt	15. Spacer	25. Spacer
6. Shim	16. Bearing	26. Spacer
7. Housing assembly	17. Bearing (with seal)	27. Shim
8. Thrust washer	18. Spacer	28. Bearing set
9. Bolt	19. Inner race	29. Shim
10. Washer	20. Nut	30. Liner

UH-1H-II-M-05-50-1

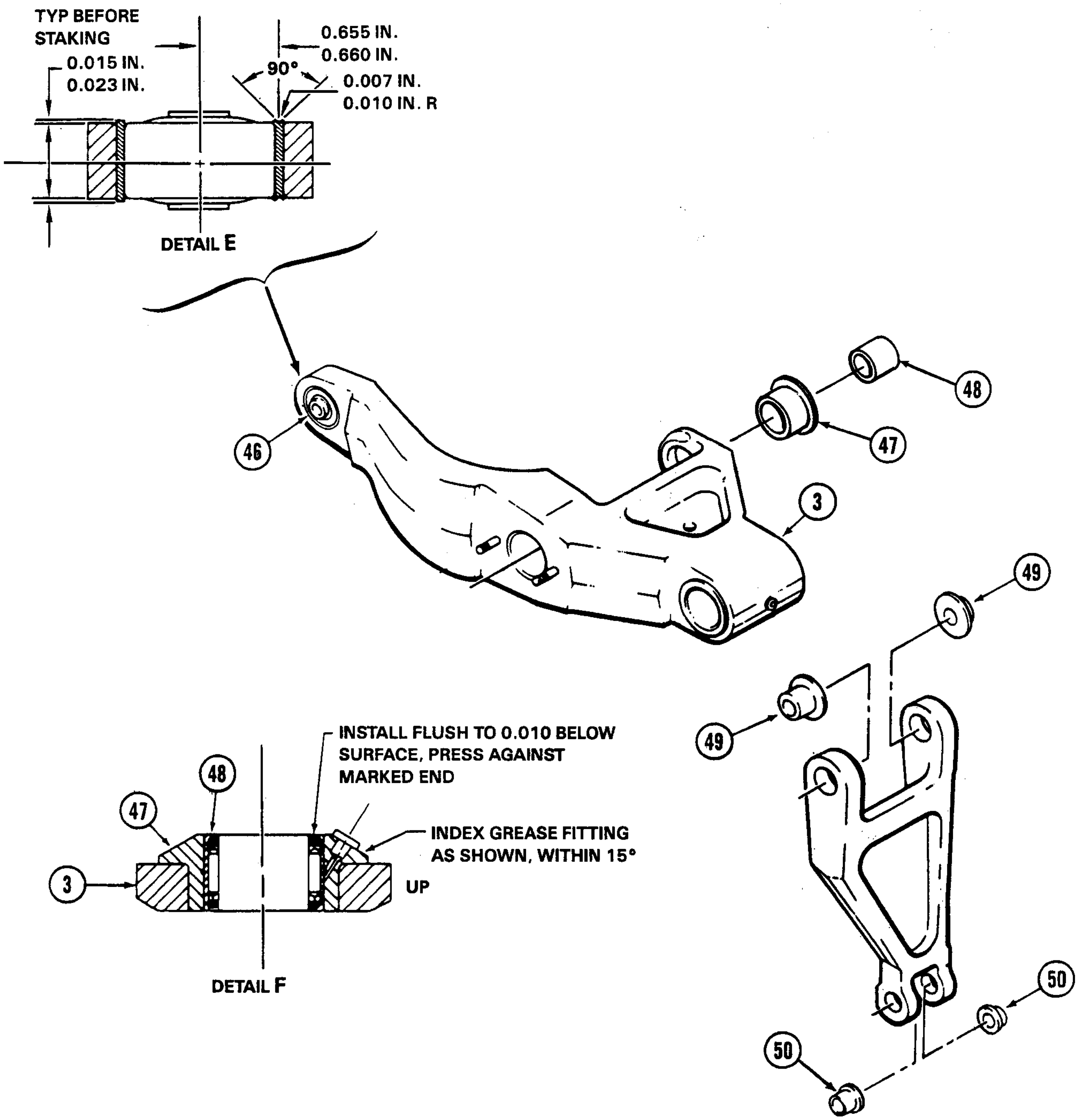
Figure 5-50. Scissors and sleeve (Sheet 1 of 3)



31. Pin
32. Nut
33. Shoulder ring
34. Washer
35. Bolt
36. Flange
37. Drive plate
38. Seal
39. Hub
40. Lockplate
41. Screw
42. Seal
43. Nut
44. Bearing set
45. Spacer set

UH-1H-II-M-05-50-2

Figure 5-50. Scissors and sleeve (Sheet 2 of 3)



46. Bearing
47. Housing assembly
48. Roller bearing
49. Bushing
50. Bushing

UH-1H-II-M-05-50-3

Figure 5-50. Scissors and sleeve (Sheet 3 of 3)

CAUTION

Ensure that bearings will clear supports (T39) during pressing operation.

g. Place assembly upright on a press with support (T39) halves located under hub (39). Place small end of ram adapter (T40) in top of collective sleeve (2) and press sleeve out of hub. Remove seal (38) and shoulder ring (33).

h. Remove pin (31); install wrench (T41) with pins engaged in holes of nut (32). Insert bearing removal bar (T53) in holes at lower end of sleeve. Hold bar and remove left-hand threaded nut (32).

i. Place sleeve on a press with support (T39) halves under lower bearing set (44). Place small end of ram adapter (T40) in upper end of sleeve and press sleeve from bearing set (44) and spacer set (45). Remove seal (42) from nut (43) with ram adapter (T40).

5-74. Cleaning — Scissors and Sleeve Assembly.

a. Clean all parts with solvent (C-304). Do not immerse bearings in solvent.

b. Dry with filtered compressed air.

c. Protect bearing after cleaning from contamination and corrosion.

5-75. Inspection — Scissors and Sleeve Assembly (Disassembled).

a. Inspect drive plate (37, figure 5-50) for spline damage.

b. Inspect parts for mechanical or corrosion damage. (Figures 5-51 and 5-52.)

c. Inspect bearing set (44, figure 5-50) and spacer set (45) as follows:

NOTE

Any brinelling visible under a 5 power magnification or of sufficient depth to cause roughness when the bearing is rotated, shall be cause for rejection.

(1) Inspect bearings for roughness and brinelling.

(2) Inspect for galled or flaked area on balls and raceways under a strong light. Inspect for broken or fractured retainers.

(3) Inspect spacer set (45) for damage and corrosion.

d. Inspect bearings (28 and 46) for smooth operation and damaged seals or shield. Inspect bearing (46) and liner for looseness. Any looseness will require removal of liner and checking the mating hole. Hole elongation not exceeding 0.001 inch for 30 degrees is acceptable.

e. Inspect bearings (16 and 17) for smooth operation. Inspect rollers for looseness due to wear, flaked or flat spots, pitting or scoring. Inspect seals for damage.

f. Inspect inner races (4 and 19), and thrust washer (8). If other than a smooth, unscored surface is found, replace parts.

g. Inspect spacers (15, 18, 25, and 26) and liner (30) for cracks, corrosion, and wear.

h. Inspect drive plate (37) for spline damage.

i. Inspect collective sleeve (2) and hub (39) for thread damage. (Figure 5-52.)

j. Inspect flange (36, figure 5-50), lockplate (40), shoulder ring (33), housing assembly (7), cover plate (23), and pin (31) for damage or deformation.

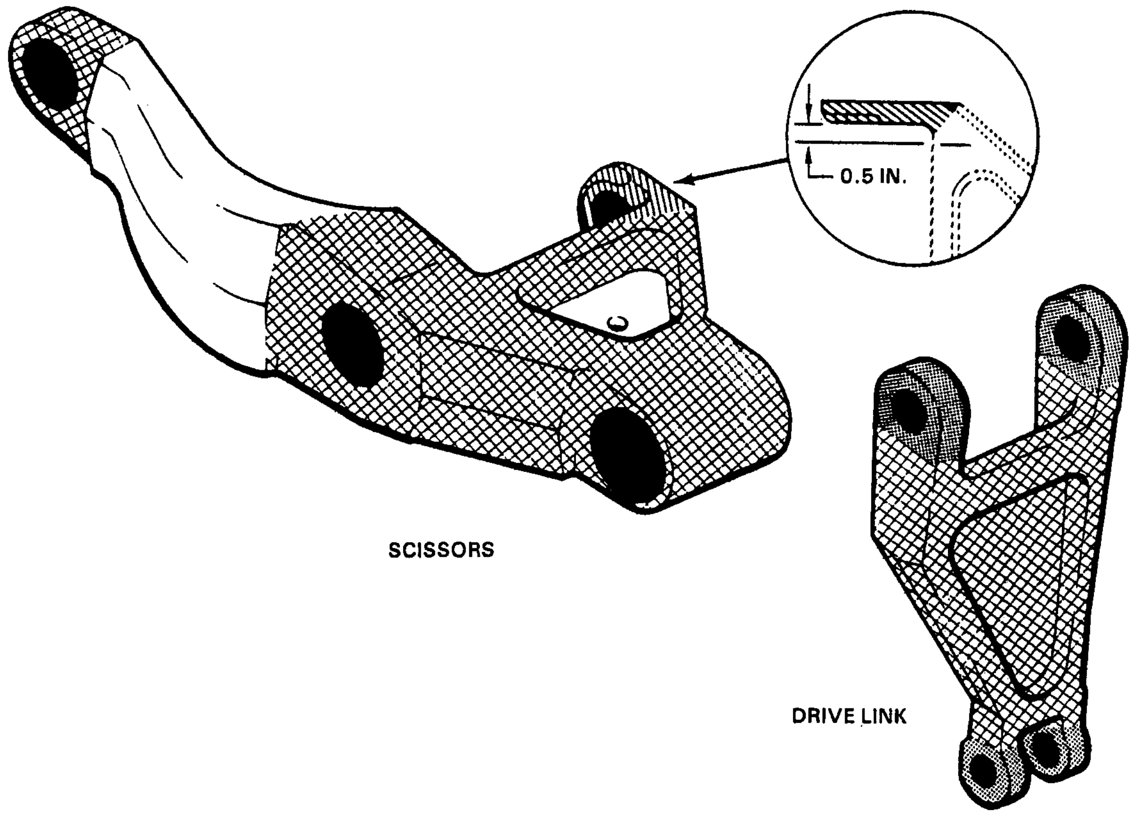
k. Score marks on the ID of holes and bushings not to exceed 0.002 inch are acceptable.

l. Inspect studs in scissor (3) for looseness or damaged threads.

NOTE

Refer to BHT-212-CR&O for approved fluorescent penetrant material.

m. Inspect the following parts by magnetic particle method (code M) or fluorescent penetrant



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED			
MECHANICAL BEFORE AND AFTER REPAIR	0.005 In.	0.010 In.	0.020 In.	0.035 In.
CORROSION				
BEFORE CLEANUP	0.0025 In.	0.005 In.	0.010 In.	0.0175 In.
AFTER CLEANUP	0.005 In.	0.010 In.	0.020 In.	0.0350 In.
AREA OF FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In.	0.25 Sq. In.	0.40 Sq. In.
NUMBER OF REPAIR AREAS	One	One per lug	Not critical	Not critical
EDGE CHAMFER	0.020 In.	0.030 In.	0.040 In.	0.060 In.
BORE DAMAGE	0.002 inch for 1/4 circumference for 1/2 bore length			

NOTE

Damage limits are for all approved scissors and drive links.

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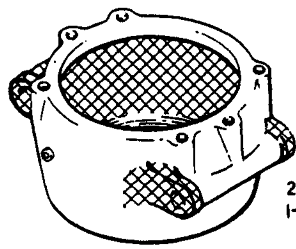
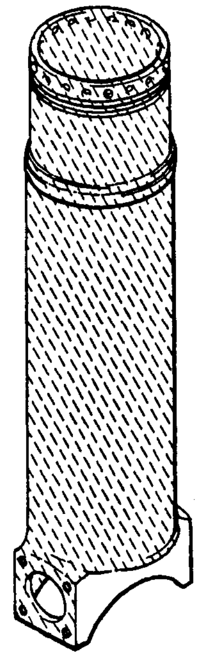
Figure 5-51. Scissors and drive link damage limits





DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
	MAXIMUM DEPTHS AND REPAIR AREA ALLOWED		
MECHANICAL AND CORROSION (Before and after repair)	0.010 in.	0.010 in.	0.020 in.
AREA OF FULL DEPTH REPAIR	0.15 sq. in.	0.50 sq. in.	0.25 sq. in.
NUMBER OF REPAIR AREAS	One per lug	Not critcal	Not critical
EDGE OF CHAMFER	0.020 In.	0.020 In.	0.040 In.
THREAD DAMAGE			
	DEPTH:	One-third of thread	
	LENGTH;	One quarter inch	
	NUMBER:	Two per segment	

UH-1H-II-M-05-52

Figure 5-52. Hub and sleeve damage limits method (code F). Index numbers are keyed to figure 5-50.

Index No.	Nomenclature	Code
2	Sleeve	M
3	Scissors	F
11	Link	F
32	Nut	M
39	Hub	M
43	Nut	M

n. Inspect parts dimensionally if any physical evidence of wear is present. (Figure 5-53.)

5-76. Repair — Scissors and Sleeve Assembly.

a. Replace seals (38 and 42, figure 5-50) and seal in housing (7).

b. Replace parts on which wear limits are exceeded. (Figure 5-53.)

c. Replace parts that fail magnetic particle or penetrant inspection.

d. Replace bolts (5 and 9, figure 5-50), nuts (13 and 20), and washers.

e. Replace parts having nonrepairable thread damage. (Figure 5-52.)

f. Replace unserviceable bearings. Bearing set (28, figure 5-50) must be replaced as a serialized set.

g. Repair acceptable corrosion and mechanical damage. Polish steel parts only to a depth sufficient to remove corrosion and aluminum parts twice depth of deepest pit, not to exceed limits of figures 5-51 and 5-52. Use fine to medium grade aluminum oxide cloth (C-406) and final polish to a scratch free finish with crocus cloth (C-500). Score marks on bushing ID may be polished if damaged and subsequent repair does not exceed 0.002 inch depth. Apply LHE cadmium plating solution (C-108) to repairs on cadmium plated surfaces and chemical film material (C-100) on aluminum surfaces.

h. Replace link bushings (49 and 50, figure 5-50) if wear limits are exceeded as follows:

(1) Properly support tangs of link and press out bushings (49 and 50) as required.

(2) Coat mating surfaces with zinc chromate primer (C-201). Support tang and press in new bushing.

(3) Line ream two bushings (50) 0.3120 to 0.3125 inch after installation. (Refer to BHT-212-CR&O.)

(4) Line ream two bushings (49) 0.4995 to 0.5000 inch after installation. (Refer to BHT-212-CR&O.)

i. Replace defective scissors bearing (46) as follows:

(1) Position scissors over a suitable support having clearance for bearing and sleeve. Press bearing and sleeve out of scissors lever.

(2) Clean lever bore with MEK (C-309). Inspect bore for scoring. Depth of score shall not exceed 0.002 inch after cleanup.

(3) Apply zinc chromate primer (C-201) to mating surfaces of replacement sleeve and scissors bore. Support scissors and press sleeve into scissors bore. (Detail E, Figure 5-50.)

(4) Apply zinc chromate primer (C-201) to mating surfaces of bearing and sleeve. Press bearing into sleeve.

(5) Ring stake sleeve both sides. (Detail E.) Proof load ring staking of bearing to 500 pounds in each direction. Apply load to outer race of bearing. Check bearing for freedom of movement. (Refer to BHT-212-CR&O.)

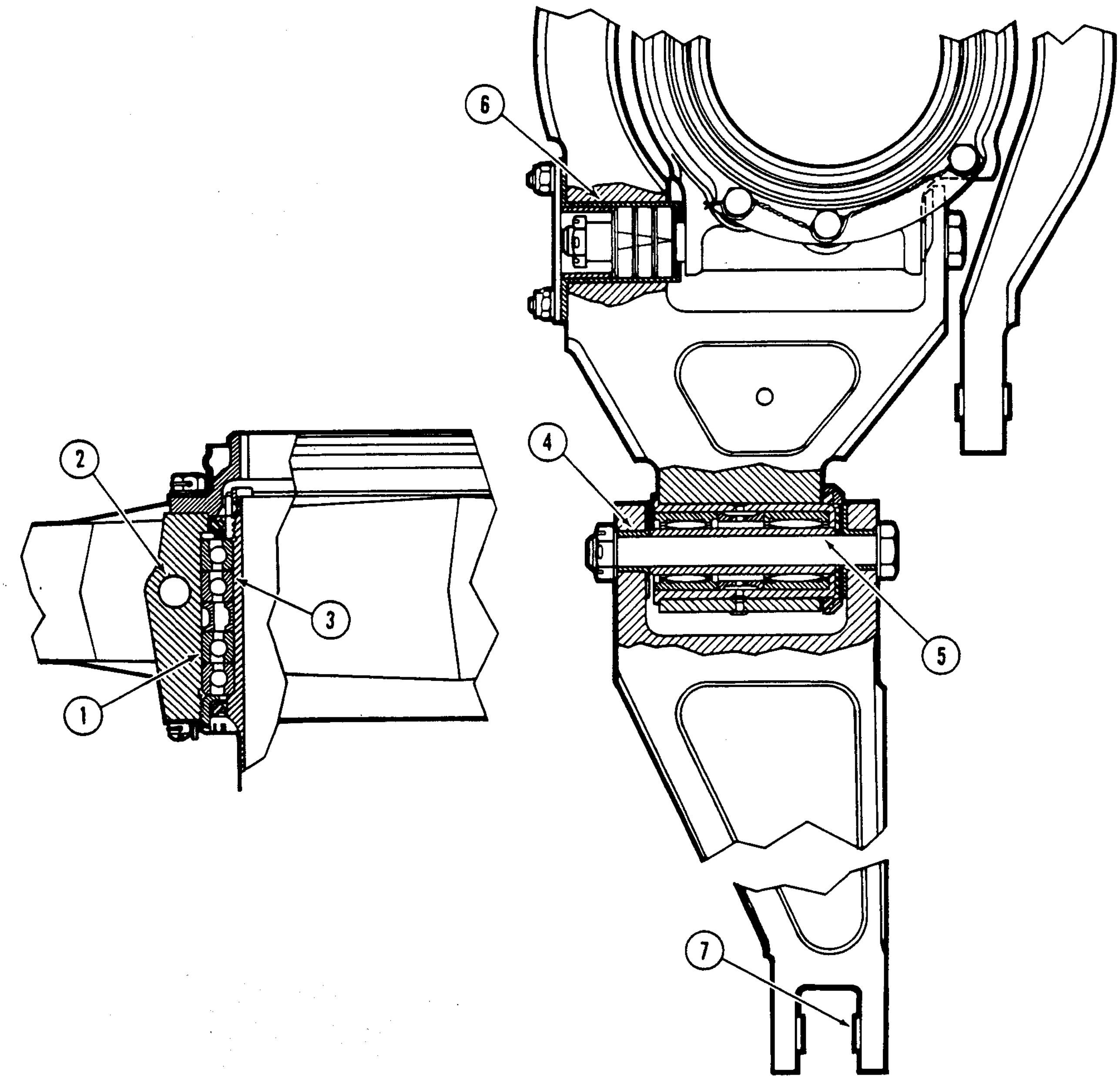
(6) Remove lube fitting from lever. Using lube fitting hole as a guide, drill 0.092 to 0.098 inch hole in sleeve. Exercise caution not to increase fitting hole size. Press new lube fitting in lever. Ream sleeve 1.2488 to 1.2493 inch diameter. Clean sleeve bore with MEK (C-309).

(7) Inspect scissors for cracks.

j. Replace defective housing assembly (47) in scissor (3) as follows:

(1) Support scissor tang and press housing assembly out.

(2) Remove all traces of adhesive from scissor bore with a plastic scraper. Clean bore with MEK (C-309) and blot dry with clean cheesecloth (C-486).



			MIN	MAX
			INCHES	
1	Hub	ID	5.2496	5.2520
2	Hub bolt hole		0.4995	0.5015
3	Sleeve bearing seat	OD	4.2480	4.2507
4	Link bushing	ID	0.4995	0.5010
5	Inner race	ID	0.4995	0.5010
6	Bearing liner	ID	1.1249	1.1270
7	Link bushing	ID	0.3120	0.3140

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Figure 5-53. Scissors and sleeve wear limits

(3) Abrade faying surface of housing assembly and scissor with 180 grit abrasive cloth or paper (C-423) and wipe dry with a dry, clean cloth to remove sanding residue.

(4) Mix adhesive (C-363) in accordance with manufacturers instructions and apply adhesive to faying surfaces of housing assembly and scissor bore. Press housing assembly into scissor with grease fitting up. Cure at 180°F (82°C) for one hour or room temperature for 24 hours.

(5) Press roller bearing assembly (48) into housing assembly (47). Press bearing on marked end. Press flush to 0.010 below surface. (Detail F.)

k. Repair nuts (32 and 43) as follows:

(1) Nicks, scratches, sharp dents, and corrosion may be polished out to maximum depth of 0.005 inch.

(2) Maximum area of full depth repair is 0.25 square inch.

(3) Maximum of two repairs per nut.

(4) Edge chamfer 0.020 inch.

(5) Thread damage: Maximum of two with a length of 1/4 inch and a depth of 1/3 of a thread.

5-77. Assembly — Scissors and Sleeve Assembly.

Premaintenance Requirements for Assembly of Scissors and Sleeve

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T39), (T40), (T41), (T53), (T63)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-007), (C-101), (C-304), (C-405)
Special Environmental Conditions	None

a. Assemble scissors (3, figure 5-50) as follows:

(1) Remove preservative from bearings (16, 17, and 28) with clean solvent (C-304). Air-dry and hand-pack bearings with grease (C-007).

(2) Using a bearing removal bar (T53), press bearing (16), spacer (15) and bearing (17) (seal side outboard) into scissor liner.

(3) Install shim (29) and bearing set (28) (V-mark on outer races pointing inboard) into liner (30). Install liner in scissors and check for a dimension of 3.990 to 4.000 inches between inner race of bearing set (28) and inside face of short leg of scissors. (Detail A.) Peel shim (29) as required to accomplish correct dimension.

(4) Install shim (27) and spacer (26) in liner (30). Check that spacer (26) extends 0.003 to 0.009 inch beyond outer face of liner (30). (Detail A.) Peel shim (27), as required, to obtain desired dimension A.

(5) Accomplish steps (1) through (4) on opposite scissor.

b. Assemble collective sleeve (2) on hub (39) as follows:

(1) Install new seal (42) in nut (43) using ram adapter (T40). Place nut (43) (slotted side down) on collective sleeve (2), below shoulder. Apply coat of corrosion preventive compound (C-101) to threads of nut.

(2) Clean bearing set (44) with solvent (C-304), air dry and hand pack bearings with grease (C-007). Assemble bearing set and spacer set (45) with V-mark on bearing races aligned and pointing up. (Detail D.) Using a ram adapter (T40), press two lower bearings (44) on collective sleeve (2). Press spacer set (45) and upper two bearings on sleeve. Ensure that V-mark is pointing up.

(3) Apply coat of corrosion preventive compound (C-101) to nut (32) threads. Start nut (32) (left-hand thread) on collective sleeve (2). Install wrench (T41) with pins engaged in holes of nut. Hold collective sleeve (2) with bearing removal bar (T53) and torque nut (32) 150 to 200 foot-pounds. Align holes of nut and sleeve (one location) and install pin (31). (Detail C.) Install lockwire (C-405) through hole in pin in space between nut and sleeve (Detail C.)

(4) Press new seal (38) (lip of seal up) into top of hub (39) with ram adapter (T40). Press seal flush with or slightly below top surface of hub seal bore.

(5) Place collective sleeve (2) on a suitable press with support (T39) halves under lower bearing set (44). Place shoulder ring (33) on upper bearings (44) and press hub down over bearings.

(6) Install wrench (T41) on top of hub (39). Invert the hub and sleeve and secure wrench (T41) in a vise. Start nut (43) into hub and using wrench (T63), torque nut (43) 400 to 500 foot-pounds. Install lockplate (40) with tabs engaged in nut (43). Install two screws (41) and secure heads together with lockwire (C-405). Turn assembly upright and remove tools.

(7) Apply corrosion preventive compound (C-101) on bolts (35). Install drive plate (37) and flange (36) on top of hub and secure with bolts (35) and washers (34). Secure bolt heads in sets of three with lockwire (C-405).

c. Install scissor assembly as follows:

(1) Coat bolt (5) with corrosion preventive compound (C-101).

(2) Place roller bearing inner race (4) on bolt (5).

(3) Position scissor assembly (3) on hub assembly (1) with spacer (18) between bearing set (28) and hub assembly (1).

(4) Insert bolt (5) with roller bearing inner race (4) through scissor assembly and hub assembly.

(5) Install spacer (25) and nut (20). Torque nut (20) 200 to 400 inch-pounds and install cotter pin (24).

(6) Check that nut (20) has not bottomed out on bolt (5) and that scissors to hub clamp-up is correct as follows:

(a) Use a torque wrench on head of bolt (5) and attempt to turn clockwise. Bolt should not rotate at less than 180 inch-pounds.

(b) If bolt rotates at less than 180 inch-pounds, remove cotter pin (24) and nut (20).

(c) Place AN960-816 washer on bolt (5) and reinstall nut (20). Torque nut (20) 200 to 400 inch-pounds and install cotter pin (24).

(d) Repeat step (a) to ensure bolt (5) will not rotate at less than 180 inch-pounds. If bolt still rotates at less than 180 inch-pounds, remove scissors from hub and reinstall, following step c.

(7) Install cover plate (23) and secure with washers (21) and nuts (22).

(8) Accomplish steps c. (1) through c. (7) on opposite scissor.

d. Install link (11) on scissors (3) as follows:

(1) Install inner race (19), thrust washer (8) and housing assembly (7), between tangs of link (11). Retain parts in place with bolt (9). Hold assembled parts against opposite side of link and measure gap between housing assembly (7) and tang of link (11).

(2) Peel shim (6) to dimension of gap measured in step (1) within 0.000 to 0.002 inch. (Detail B.) Remove bolt (9) and assembled parts from link (11).

(3) Coat new bolt (9) with corrosion preventive compound (C-101).

(4) Insert inner race (19) in outboard end of scissors (3). Position link (11) on scissor with thrust washer (8), housing assembly (7), and shim (6) of previously determined thickness, between forward tang of link and scissor. Install bolt (9) with washer (10) under bolt head. Install washer (12) and nut (13). Torque nut (13) 200 to 400 inch-pounds and install cotter pin (14).

(5) If end play exceeds 0.090 inch, replace thrust washer (8).

(6) Repeat steps (1) through (5) to install link on opposite scissor.

e. Lubricate scissors and hub through lube fittings with grease (C-007).

f. Check scissors and hub for free operation.

5-78. Installation — Scissors and Sleeve.

a. Apply corrosion preventive compound (C-101) to all bolts at installation.

b. Lubricate mast splines and collective sleeve splines with grease (C-007). Lower scissor and sleeve assembly (5, figure 5-39) carefully over mast (35) and into swashplate support (32).

NOTE

On additional AN960-516 washer may be used under nut if there is any bolt shank visible outside of other two washers.

c. Attach scissor links (4) to trunnion bearings (28) on swashplate (33) outer ring, with bolt heads toward rotation, countersunk washer (9) under bolt head, washers (8), and nut (7). End play between scissor and drive link should be divided equally on both sides of scissors with total end play of 0.038 and 0.090 inch. Torque nuts (7) 120 to 145 inch-pounds and install cotter pins (6).

d. Assemble collective lever halves (25) on swashplate support (32), with pins inserted into bearing and liner assemblies (15) on sleeve and with trunnion (21) and spacer (18) in place. Torque nuts (19) on trunnion retaining bolts (22) 60 inch-pounds, and nut (16) on bolt (23) through spacer (18) 175 inch-pounds.

e. At pivot end of lever, install bolts (31) with washers (30) under bolt heads, washers (12), and nuts (11), and with shims (13) between support (32) and lever (25) as required to give 0.000 to 0.005 inch interference fit at each side, keeping shims equal within 0.005 inch. Torque nuts (11) on bolts (31) 290 to 410 inch-pounds.

f. Use feeler gage to measure clearance between inner race of bearings (3, figure 5-45) and shoulder if pins (2) on lever on each side. Prepare two shims (1), equal within 0.005 inch, and of total thickness required to provide 0.000 to 0.002 inch clamp-up on bearings. Disassemble lever enough to install shims on pins, and reassemble as in steps d. and e. Move lever to check for freedom of operation.

g. Connect collective pitch control tube to collective lever.

h. Slide boot (2, figure 5-39) down under flange at top of sleeve assembly and secure with lockwire (C-405). Position spacer (1) around mast, under top edge of boot, and secure with lockwire. For replacement of split boot refer to paragraph 5-79.

5-78. DELETED.

5-79. Replacement — Scissor and Sleeve Boot.

NOTE

If replacement of dust boot is to be accomplished without removing rotor, follow this procedure.

a. Cut lockwire at each end of boot (2, figure 5-39) and split boot to remove from mast.

b. Coat inner faces of flap and mating surfaces of new boot with adhesive (C-324 or C-325).

c. Allow sufficient time for adhesive to become tacky, then apply a light second coat. Immediately install boot (2) around mast (35) and insert edge of boot into flap. Form into proper shape and expel any trapped air by pressing on external mating surfaces with a small round tool.

d. After adhesive is cured, slide boot (2) down over flange at top of sleeve assembly and secure with lockwire (C-405). Position spacer (1) around mast under top edge of boot and secure with lockwire (C-405).

NOTE

To prevent possible damage to the dust boot during operation, a distance of 10.25 to 10.75 inches must be maintained between the top of the boot and the lower surface of the damper support frame.

5-80. Lubrication — Scissors and Sleeve Assembly. Refer to Chapter 1 for scissors and sleeve lubrication.

SECTION V — TAIL ROTOR SYSTEM

5-81. TAIL ROTOR SYSTEM.

5-82. Description — Tail Rotor System.

A two-blade, controllable pitch tail rotor hub and blade is located on the right side of the tail rotor gearbox. It is composed of two assemblies, the hub and the blades, and is driven through the tail rotor gearbox. The hub assembly employs a preconed, flex-beamed type yoke connected to the blades by means of self-lubricated spherical pitch change bearings, and a delta-hinged trunnion to minimize rotor flapping. The trunnion, splined to the tail rotor shaft, drives the tail rotor hub and blade rotor.

SECTION VI — TAIL ROTOR HUB AND BLADE ASSEMBLY

5-83. TAIL ROTOR HUB AND BLADE ASSEMBLY.

5-84. Cleaning — Tail Rotor Hub and Blade Assembly.

a. Clean tail rotor hub by wiping with a clean cloth moistened with solvent (C-304).

b. Wash tail rotor blades with a solution of mild soap and water.

5-85. Troubleshooting — Tail Rotor Hub and Blade Assembly.

Potential troubles which may occur in the tail rotor are listed in Table 5-4 with probable causes indicated and corrective action recommended.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 5-4. Troubleshooting Tail Rotor System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. High frequency vibration.

STEP 1. Tail rotor out of track.

Check track of tail rotor and adjust pitch change links to obtain track. (Paragraph 5-118.)

STEP 2. Tail rotor out of balance.

Check and balance tail rotor. (Paragraph 5-90.)

Table 5-4. Troubleshooting Tail Rotor System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 3. Loose tail rotor retaining nut.

Torque retaining nut 850 to 900 inch-pounds. (Paragraph 5-91.)

STEP 4. Tail rotor pitch change links bent.

Replace damaged links. (Paragraphs 5-86 and 5-91.)

STEP 5. Worn or loose pitch change tube bearing.

Replace bearing and/or wear sleeve on tube. (Paragraphs 5-86 and 5-91.)

STEP 6. Ninety degree gearbox mounting loose.

Inspect gearbox mounting for loose rivets or studs, or elongated bolt holes. Repair mounting. (Chapter 6.)

2. Inability to make normal right and left turns in flight.

STEP 1. Faulty rigging.

Rig tail rotor controls. (Chapter 11.)

3. Controls creeping.

STEP 1. Hydraulic cylinder in tail rotor controls leaking internally.

Replace faulty hydraulic cylinder. (Chapter 7.)

5-86. Removal — Tail Rotor Hub and Blade Assembly.

a. Remove tail rotor crosshead as follows:

(1) Remove balance bracket (27, figure 5-54).

(2) Disconnect pitch links (10) from each tail rotor blade pitch horn (25) by removing bolt (23). Reinstall bolt fingertight to keep floating bushing (24) with pitch horn (25).

(3) Disconnect counterweight link (12) from support (20) by removing cotter pin (15), nut (19), washers (17 and 18), and bolt (16).

(4) Remove two screws (1) and washers (2) with lock (3) from crosshead (11).

(5) Remove retainer (4) from crosshead (11).

(6) Remove cotter pin (6), nut (5), and washer (7) from end of pitch change control tube (33).

(7) Remove bearing (8) and washer (9) from end of crosshead (11).

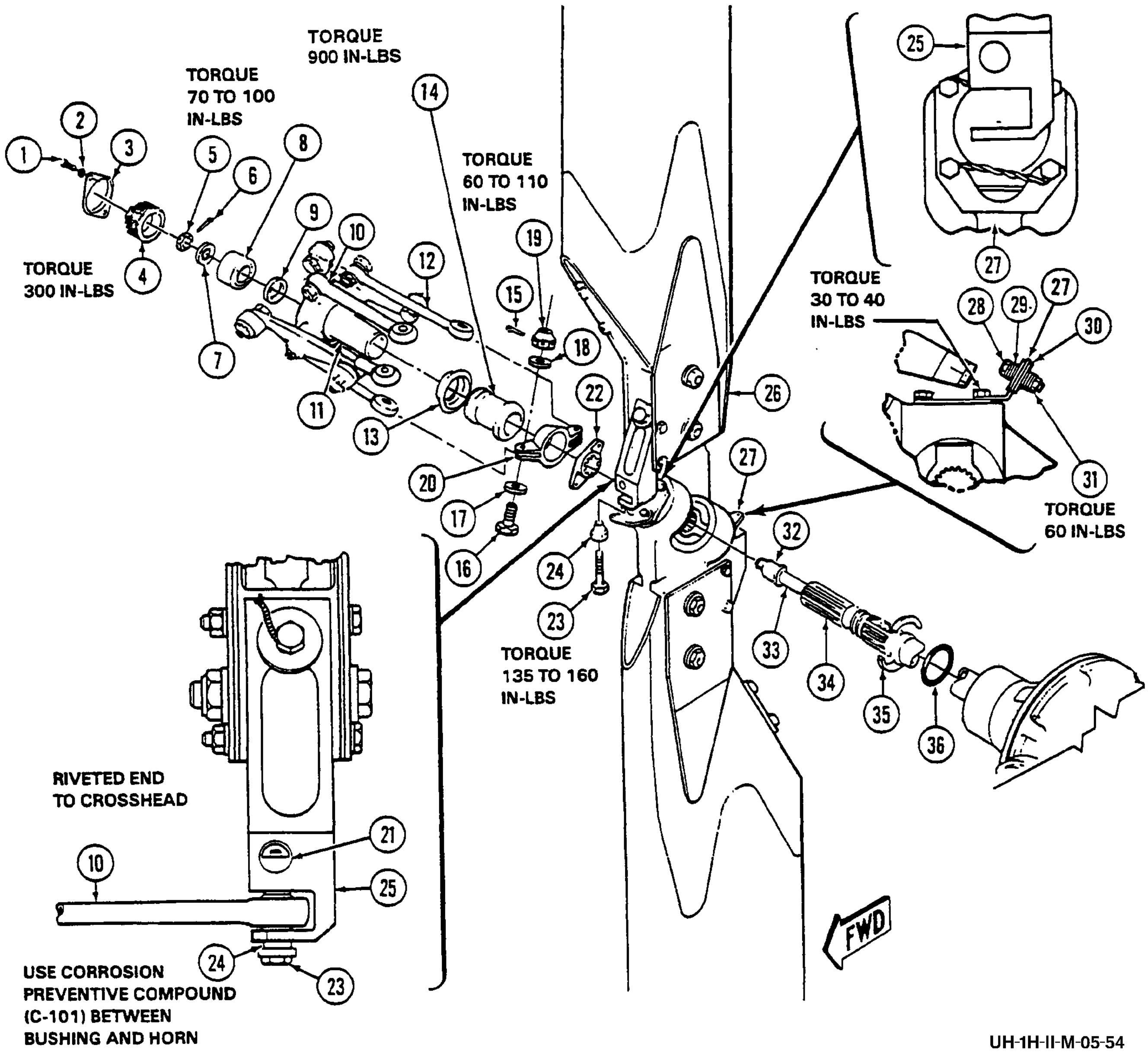
(8) Pull crosshead (11) from shaft.

b. Remove shield (13), retaining nut (14), counterweight support (20), and stop (22).

c. Remove hub and blade assembly (26) from gearbox output shaft (34).

d. Remove packing (36) and split cone set (35).

1. Screw
2. Washer
3. Lock
4. Retainer
5. Nut
6. Cotter pin
7. Washer
8. Bearing
9. Special washer
10. Pitch link
11. Crosshead
12. Counterweight link
13. Shield
14. Retaining nut
15. Cotter pin
16. Bolt
17. Washer
18. Washer
19. Nut
20. Counterweight support
21. Barrel nut and retainer
22. Stop
23. Bolt
24. Bushing
25. Pitch horn
26. Hub and blade
27. Balance bracket
28. Bolt
29. Washer
30. Washer
31. Nut
32. Sleeve
33. Pitch change control tube
34. Gearbox output shaft
35. Split cone set
36. Packing



UH-1H-II-M-05-54

Figure 5-54. Tail rotor hub and blade

NOTE

Sleeve (32) normally remains on pitch change control tube (33), unless sleeve or tube is to be replaced.

e. When necessary, pull sleeve (32) outboard to engage threads and turn until disengaged.

5-87. Disassembly — Tail Rotor Hub and Blade Assembly.

NOTE

Identify bolts, washers, balance washers, blades, and nuts at location from which removed. However, if parts replacement or repairs are required, the hub and blade assembly will require balancing. Disassemble hub and blade only to extend required to accomplish inspection and parts replacement.

a. Remove nuts (1 and 29, figure 5-55), washers (2, 3, 4, 5, 6, 9, 11, 24, 25, 26, 27, and 28), and bolts (10 and 12).

b. Remove pitch horn (18) from rotor blade as follows:

(1) Remove bolt (21) and balance washers (19 and 20).

(2) Remove two bolts (13). Remove pitch horn (18).

c. Remove blade (7) from hub (15).

d. Repeat steps a. through c. for opposite side.

5-88. Inspection — Tail Rotor Hub and Blade Assembly.

a. Inspect pitch change mechanism for mechanical and corrosion damage. (Chapter 11.)

b. Inspect bearing (8, figure 5-54) for metal contamination, lack of lubricant, and roughness. Indication of rough bearing, when rotated by hand, is cause for replacement.

c. Inspect split cone set (35) for nicks, dents, scratches, and corrosion damage. (Figure 5-56.)

d. Inspect sleeve (32), nut (14), and retainer (4) for damage. (Figure 5-57.)

e. Inspect bushing (24, figure 5-54) for maximum 0.002 inch axial scoring on inside diameter and a maximum of 0.499 inch outside diameter.

f. Inspect pitch horn (18, figure 5-55). (Figure 5-58.)

g. Inspect pitch horn by fluorescent penetrant method. Refer to BHT-212-CR&O for procedure.

h. Replace horn if cracked, if limits of figure 5-58 are exceeded, if fixed bushing is loose, if hole for floating bushing exceeds 0.5005 inch, or if horn is corroded.

i. Check retention bolt hole bushings for looseness. Any bushing looseness is cause for replacement.

j. Inspect other areas of hub and blades, as necessary. (Refer to BHT-212-CR&O.)

5-89. Assembly — Tail Rotor Hub and Blade Assembly.

a. Install pitch horn (18, figure 5-55) on each rotor blade:

(1) Position pitch horn (18) between blade grips.

(2) Install two bolts (13), washers (14 and 22), and nuts (23). Torque nuts (23) 150-inch-pounds.

(3) Install bolts (21) and balance washers (19 and 20), as required. Torque bolt (21) 50 to 70 inch-pounds. Lockwire (C-405) bolt (21) to pitch horn (18).

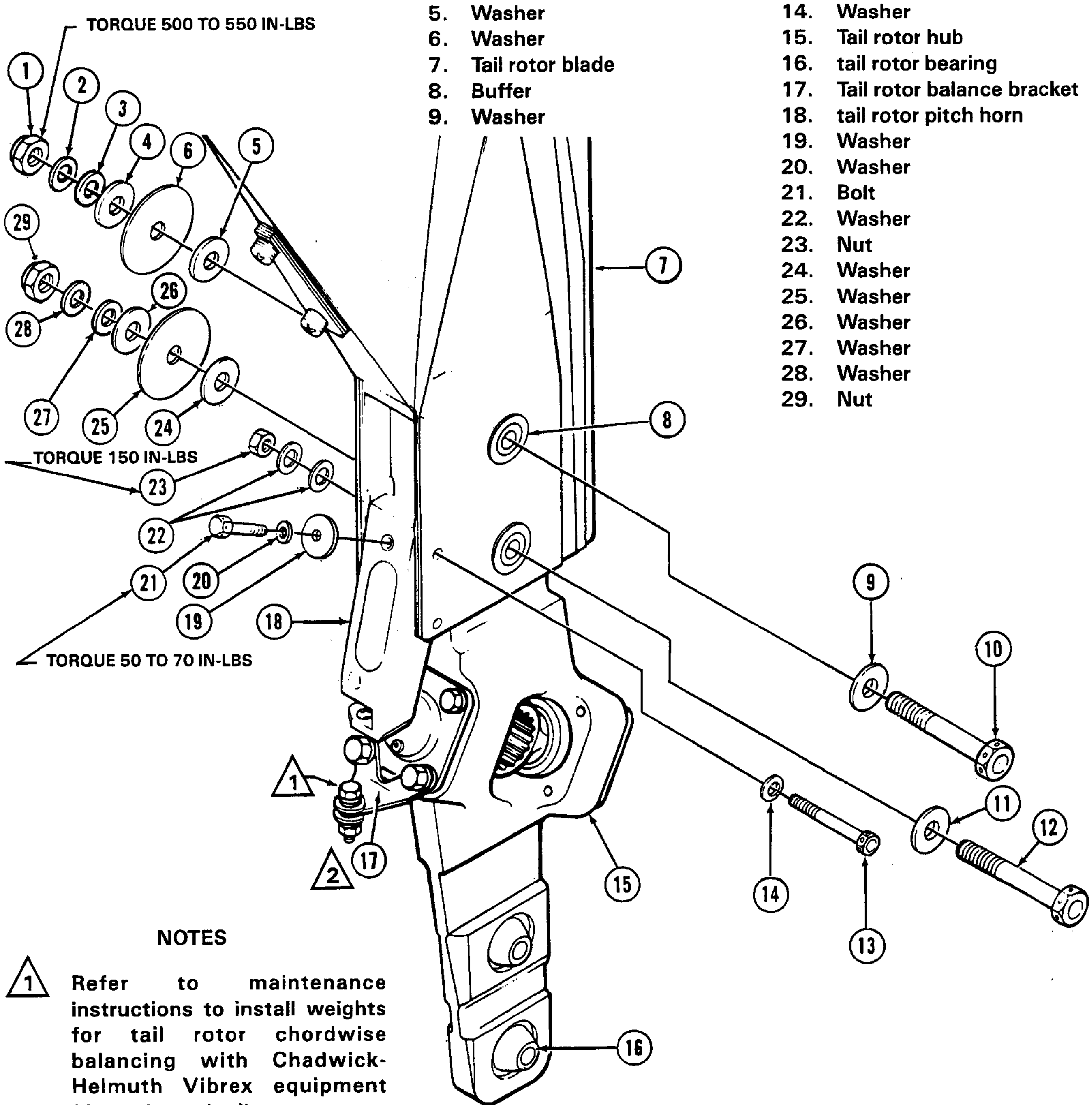
b. Position blade grips over hub (15) with data plate on blades outboard and yoke inboard.

NOTE

Installation of balance washers and torque of nuts (1 and 29) will be accomplished during balancing of hub and blades.

c. Align hub blade bearings (16) with blade bolt holes. Install bolts (10 and 12) and chamfered washers (9 and 11) with bolt heads facing inboard. Install chamfered washers (5 and 24) with nuts (1 and 29).

1. Nut
2. Washer
3. Washer
4. Washer
5. Washer
6. Washer
7. Tail rotor blade
8. Buffer
9. Washer
10. Bolt
11. Washer
12. Bolt
13. Bolt
14. Washer
15. Tail rotor hub
16. tail rotor bearing
17. Tail rotor balance bracket
18. tail rotor pitch horn
19. Washer
20. Washer
21. Bolt
22. Washer
23. Nut
24. Washer
25. Washer
26. Washer
27. Washer
28. Washer
29. Nut



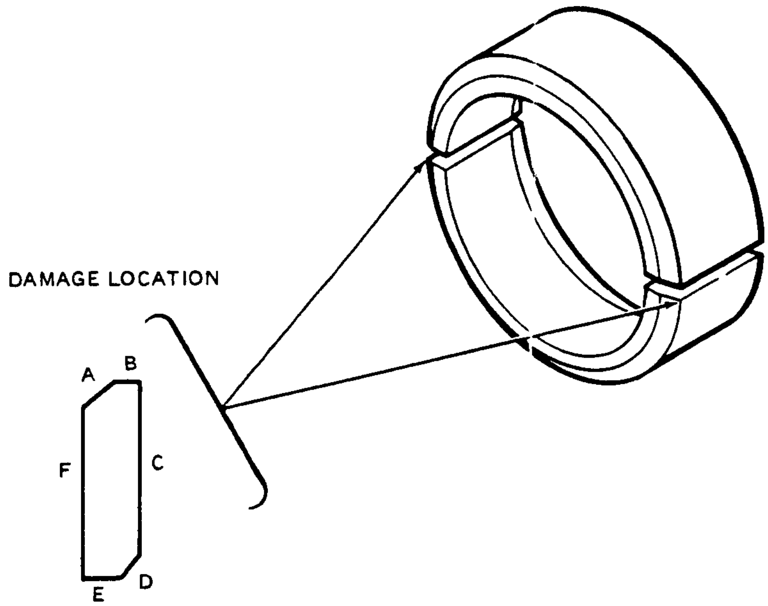
NOTES

1. Refer to maintenance instructions to install weights for tail rotor chordwise balancing with Chadwick-Helmuth Vibrex equipment (dynamic method).

2. Bracket is an installation component.

UH-1H-II-M-05-55

Figure 5-55. Tail rotor hub and blade

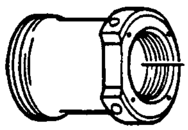


SURFACES	MAXIMUM DAMAGE AND REPAIR DEPTH
A, B, C, D, E, and F	Damage shall not exceed 0.005 inch nor 0.02 square inch. Cone set shall not have more than two repairs.
End of Cone	End of cone may be damaged 0.030 inch, if no material is protruding from the surface or overlapping the edges, the damage may be considered negligible.
A, B, C, D, E, and F	All edges may be chamfered 0.030 inch.
A, B, C, D, E, and F	Surface dents less than 0.005 inch and 0.02 square inch need not be repaired, but metal moved above surrounding surface shall be dressed smooth.

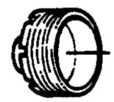
UH-1H-II-M-05-56

Figure 5-56. Tail rotor cone set damage and repair limits

209-011-719-003
SLEEVE



212-010-706-001
RETAINING NUT

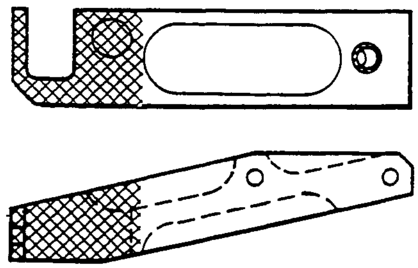


212-010-773-001
RETAINER

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED
NICKS, SCRATCHES, AND SHARP DENTS	0.010 In.
CORROSION	0.010 In.
AREA OF FULL DEPTH REPAIR	0.10 Sq. In.
NUMBER OF REPAIRS	Not critical
THREAD DAMAGE	
DEPTH	One-third of thread
LENGTH	One-quarter inch
NUMBER	Two threads

UH-1H-II-M-05-57

Figure 5-57. Tail rotor components damage limits



212-011-708-105
PITCH HORN

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
MECHANICAL DAMAGE	0.010 In.	0.020 In.
CORROSION DAMAGE		
BEFORE REPAIR	0.005 In.	0.010 In.
AFTER REPAIR	0.010 In.	0.020 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.050 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One	One per segment
EDGE CHAMFER	0.030 In.	0.030 In.
THREAD DAMAGE		
DEPTH	One-third of thread	
LENGTH	0.10 In.	
NUMBER	One per segment	

NOTES

1. Maximum acceptable dimension for hole for sliding bushing is 0.4380 inch.
2. Inspect fixed bushing for secure installation. Loose bushings are not acceptable.

UH-1H-II-M-05-58

Figure 5-58. Tail rotor pitch horn damage limits

d. Balance tail rotor hub and blades. (Paragraph 5-90.)

5-90. Balancing — Tail Rotor Hub and Blade Assembly.

Premaintenance for Balancing Tail Rotor Hub and Blade Assembly

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T90), (T118)
Test Equipment	None
Support Equipment	Model 135M-10A or B Strobex Tracker, 177M5 or 6 Balancer
Minimum Personnel Required	One
Consumable Materials	(C-031), (C-040), (C-405), (C-304), (C-001), C-101)
Special Environmental Conditions	Draft Free

a. Balance (static method) hub and blade assembly as follows:

(1) Prepare balance kit for use as follows:

(a) Immediately prior to use of balance kit (T90), carefully wipe all external and internal mating surfaces with lint-free cloth or paper cleansing tissue to remove old oil and accumulations of fine dust or other foreign matter. Coat components (except spherical bearings) with clean, lubrication oil (C-031). This procedure will facilitate installation of close-fitting pilot adapters, cones, and bushings on balancing arbors. Seizing of cones and bushings on the arbors is usually caused by fine particles of dirt or other foreign matter, or by improper lubrication.

(b) Should excessive oscillation of balance indicator occur due to inadvertent loss of arbor dashpot oil, or should change of dashpot oil become necessary, fill balance arbor dashpot with low viscosity light machine lubricating oil (C-040). One oil hole is located in side of arbor approximately 1-11/16 inches below indicator bushing; another is located in opposite side approximately 2-1/2 inches from lower end of arbor. Remove both oil hole screws, using 1/16-inch hex wrench. Using positive pressure, pump action oil can, pump oil into lower arbor oil hole until oil appears at level of upper arbor oil hole. Install lower and upper filler hole screws. If positive-press-type can is not available, arbor dashpot may be filled through upper hole only. Leave lower screw installed in arbor. In this case, repeat filling operation two or three times at 10-minute intervals to ensure small air spaces are completely filled. Ensure that filler hole screws are installed following filling or draining operation.

(2) Provide a work bench or flat top stand in a draft free area. Provide a suitable means to suspend arbor (3, figure 5-59) and tail rotor above work bench. Arbor must be supported at cable loop (1).

(3) Loosen retaining set screw in indicator collar (2). Depress indicator downward against light spring pressure to position bottom surface approximately 0.005 inch above black indicator disc (18). Lightly tighten set screw. Ensure indicator collar (2) does not contact indicator disc.

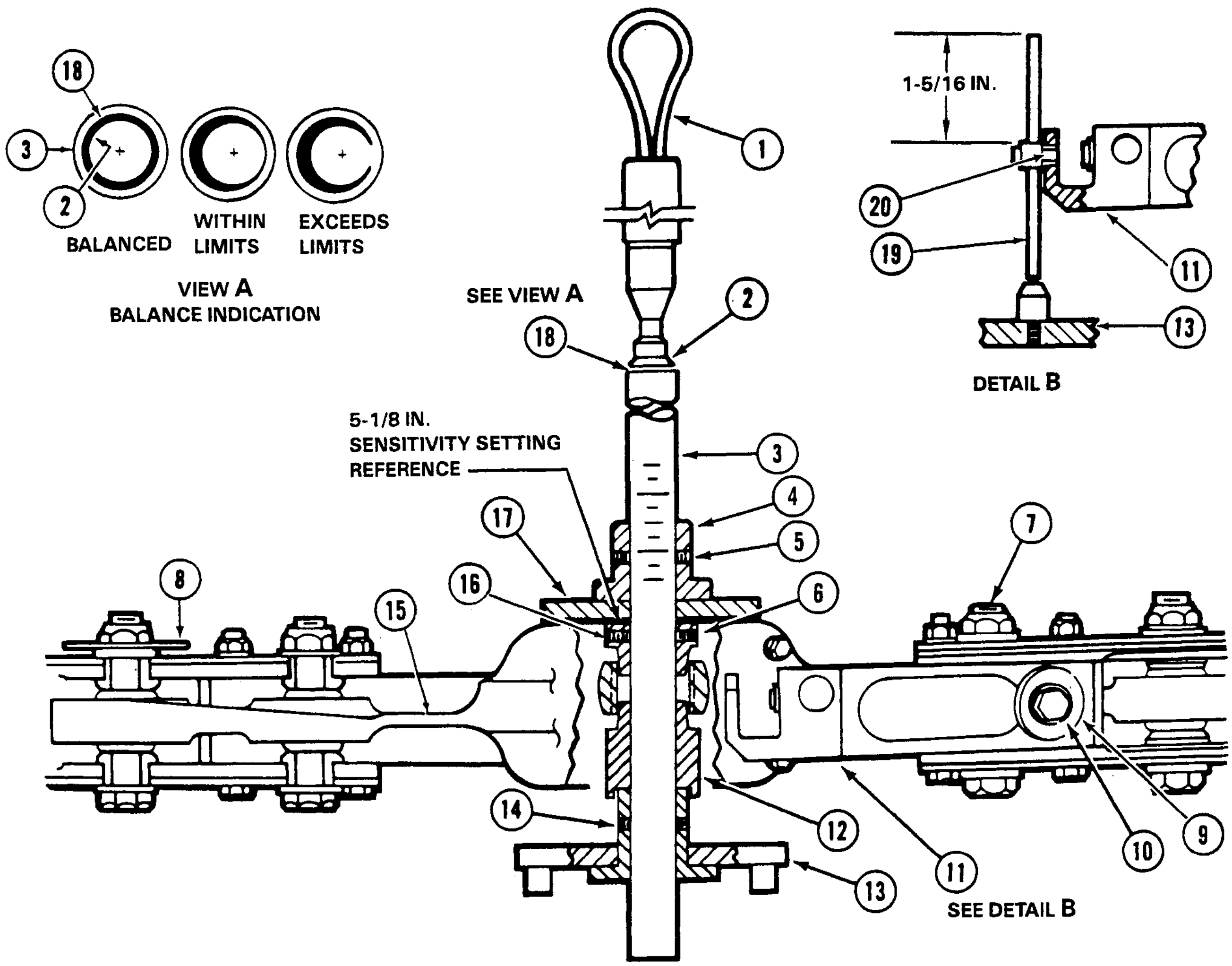
(4) Clean tail rotor hub (15) trunnion bore and cone seat surfaces with soft cloth or tissue.

(5) Place two parallel wooden blocks on work bench to support tail rotor hub and blade assembly (15). Place tail rotor hub and blade assembly on wooden blocks with flat surface of blades outboard of blade attaching bolts in contact with wooden blocks and with heads of rotor blade attaching bolts (7) facing down. Adjust blade pitch to cause blades to rest evenly on blocks. Tail rotor hub name (data) plate should be facing down.

(6) Install pilot bushing (4) and plate (17) on arbor (3). Do not tighten set screws (5) at this time.

(7) Position cone (16) on balance indicating arbor (3) with top of cone (16) at 5.125 inch mark on arbor (3). This is marked “Sensitivity Setting Reference Surface” on illustration. Tighten set screws (6).

(8) Position arbor (3) in tail rotor hub and blade assembly (15).



1. Cable loop
2. Indicator collar
3. Arbor (3165) (part of (T118))
4. Pilot bushing (2533) (part of (T118))
5. Set screws
6. Set screws
7. Blade attaching bolt
8. Spanwise balance washers
9. Chordwise balance washers
10. Bolt
11. Pitch horn
12. Adapter (3378) (part of (T118))
13. Base (3152) (part of (T118))
14. Set screws
15. Tail rotor hub and blade assembly
16. Cone (3380) (part of (T118))
17. Plate (2586) (part of (T118))
18. Indicator disc
19. Post (2939) (part of (T118))
20. Pitch horn bushing

UH-1H-II-M-05-59

Figure 5-59. Tail rotor hub and blade

(9) Install adapter (12) on arbor (3) and seat adapter on tail rotor hub trunnion.

(10)Install base (13) on arbor (3). Tighten set screws (14).

(11) Seat plate (17) against tail rotor hub and blade assembly (15). Seat pilot bushing (4) against plate (17) and tighten set screws (5). Install pitch horn bushing (20) in pitch horn (11). Install post (19) on base (13) and pitch horn (11). Adjust pitch horn height on post to set rotor blade at 0 degrees pitch. Install opposite post in same manner. Ensure that both rotor blades are at 0 degrees pitch.

(12) Carefully engage cable loop (1) with hoist hook and suspend assembly clear of all obstructions without causing change to blade pitch or trunnion position on arbor.

(13) Loosen set screws (5) and firmly reseat plate (17) on hub assembly. Maintain seating pressure and secure by moderately tightening set screws (5).

(14) Recheck position of cone (16) to ensure that sensitivity setting of 5.125 inches that was set at step (7) has not changed. If setting has changed and/ or if arbor is not firmly seated on rotor hub trunnion, repeat steps (5) through (13).

(15) Stabilize movements of suspended rotor and observe balance indicated by concentricity relationship of black indicator disc (18) in top surface of arbor shaft with indicator collar (2). Acceptable balance is indicated when indicator collar remains within the edge limits of the black indicator disc. (View A, Figure 5-59.)

(16) Check that balance indications are not affected by interference from surrounding objects, air drafts, or movements of nearby personnel.

(17) Install washers (19 and 20, figure 5-55) to balance hub and blade assembly chordwise. Use a maximum of ten washers (19 and 20) of any combination. Use bolts (21) of correct length to accommodate washes and obtain proper thread engagement. Bolts (21) may be AN4H4A through AN4H10A. A minimum of one washer (19 or 20) must be under head of bolts (21), after chordwise and spanwise balance is within limits. Torque bolts (21) 50 to 70 inch-pounds. Lockwire (C-405) two bolts (21) to pitch horns (18).

(18) Install washers (5, 9, 11, and 24) next to rotor blades. Install washers (2, 3, 4, 6, 25, 26, 27, and 28) as needed to obtain spanwise balance, starting with heaviest washers next to washers (5 and 24). Use bolts (10 and 12) of correct length to accommodate washers and obtain proper thread engagement. Bolts (10 and 12) may be NAS1308-34 through NAS1308-36.

(19) When balance indication (View A, Figure 5-59) is within limits, torque nuts (1 and 29, figure 5-55) 500 to 550 inch-pounds.

(20) Remove two posts (19, figure 5-59). Secure floating pitch horn bushings (20) to pitch horns (11).

(21) Loosen set screws (14). Remove base (13) and adapter (12).

(22) Remove arbor (3) from tail rotor hub and blade assembly (15).

(23) Loosen set screws (6) and remove cone (16).

(24) Loosen set screws (5) and remove pilot bushing (4) and plate (17).

(25) Loosen set screw in indicator collar (2) and allow internal, spring loaded damping oil seal to move upward and seat. Do not tighten set screw.

(26) Place all balance kit components in storage case. Position storage case in storage so that arbor is upright to prevent seepage of oil around indicator.

b. Balance (dynamic method) hub and blade assembly with Chadwick-Helmuth Vibrex equipment as follows:

(1) Tail rotor assemblies equipped with balance arm can be dynamically balanced and tracked using Model 135M10A or B Strobex Blade Tracker and 177M5 or 6 balancer or equivalent. (Refer to equipment instruction manual for tracking and balancing of tail rotor blades.)

(2) Deleted

(3) A combination of AN970-4 and AN960-416 washers (29 and 30, figure 5-54) may be used on balance bracket (27) to obtain chordwise balance. A total of twenty washers may be used, of which no

more than ten may be AN970-4 and ten AN960-416. Install washers equally under bolt head and nut with heaviest washers next to bracket. Bolts may be NAS1304-1 through NAS1304-14, as required, to accommodate washers and obtain balance. Torque nut (31) 60 inch-pounds.

(4) Correct spanwise balance using a combination of AN960-816, AN960-816L, AN970-5, and 212-010-764-1 washers. Bolts may be NAS1308-34 through NAS1308-36, as required, to accommodate balance washers and obtain balance. Assemble with heaviest washers nest to the 140-007-33-32C4 washers. Blade bolts shall be assembled with heads inboard. Torque nuts (1 and 29, figure 5-55) on blade bolts (10 and 12) 500 to 550 inch-pounds.

5-91. Installation — Tail Rotor Hub and Blade Assembly.

a. Place split cone set (35, figure 5-54), with bevel outboard, in groove between splines and shoulder on shaft. Place packing (36) over cone set, and with gaps equal at ends of cone set.

b. Check that sleeve (32) is installed on threaded end of pitch change control tube (33). Position hub and blade assembly (26) on gearbox output shaft (34).

c. Align master tooth of trunnion to master spline on tail rotor gearbox output shaft (34) and slide hub and blade (26) on shaft until trunnion is seated on cone set (35). Verify that gaps are still equal at end of cone set.

d. Align stop (22) and support (20) on shaft against hub. Install retaining nut (14). Hold rotor at hub and torque retaining nut (14) 900 inch-pounds. Secure nut to counterweight support (20) with lockwire (C-405).

e. Place shield (13), small end first, on inboard end of crosshead (11).

NOTE

When replacing bearing, wash preservative from new bearing with solvent (C-304), and air dry. Hand pack bearing with grease (C-001) before installation.

f. Hand pack bearing (8) and coat crosshead (11) splines with grease (C-001).

g. Assemble washer (9) and bearing (8) in outboard end of crosshead (11). Install crosshead assembly on gearbox output shaft (34), engaging master splines. Install washer (7) and nut (5) on end of pitch change control tube (33). Torque nut (5) 70 to 100 inch-pounds and install cotter pin (6).

h. Fill cavity of retainer (4) with grease (C-001). Install retainer (4) and torque 300 inch-pounds. Position lock (3) over retainer and install screws (1) and washers (2). Secure screws with lockwire. Form lock (3) into notches of retainer (4), two places, near screws (1).

i. Apply two shots of grease (C-001) to lube fitting using hand-type grease gun.

j. Connect each counterweight link (12) to counterweight support (20) by installing bolts (16), washers (17 and 18), and nuts (19). Torque nuts (19) 60 to 110 inch-pounds and install cotter pins (15).

k. Connect pitch link (10) to each pitch horn (25) as follows:

(1) Assemble bolt (23) and bushing (24) with bushing next to bolt head. Apply corrosion preventive compound (C-101) on bushing surface which will mate with bore in horn.

CAUTION

Ensure pitch link rod has riveted end to crosshead for assembly.

(2) Align pitch link (10) rod end, riveted end to crosshead, in pitch horn (25) and install bolt (23) and bushing (24). Torque bolt (23) 135 to 160 inch-pounds and secure bolt head to pitch horn with lockwire.

(3) Install balance bracket (27). Torque bolts 30 to 40 inch-pounds and secure with lockwire (C-405). (Refer to figure 5-54 for lockwiring.)

(4) Lubricate the tail rotor. (Chapter 1.)

l. Check rigging of tail rotor controls. (Chapter 11.) Check track of tail rotor blades. (Paragraph 5-90 or 5-118.)

SECTION VII — TAIL ROTOR HUB AND CONTROLS

5-92. TAIL ROTOR HUB.

5-93. Description — Tail Rotor Hub. The tail rotor hub is delta-hinged mounted on a trunnion which is splined for mounting on the gearbox output shaft. The hub utilizes a grooved yoke and split cone arrangement inboard of the retaining nuts to hold the pitch change bearings in place, and route the centrifugal and oscillatory loads into the yoke at the groove rather than at the retaining nut threads.

5-94. Disassembly — Tail Rotor Hub.

Premaintenance Requirements for Disassembly of Tail Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	None
Special Environmental Conditions	None

a. Remove four bolts (1, figure 5-60), steel washers (2), and tail rotor balance bracket (3).

b. Remove trunnion bearing housing (5).

c. Remove thrust plug (9).

d. Remove shim (10).

e. Remove bearing (6).

f. Remove seal (7).

g. Remove similar parts from opposite side of yoke (12).

h. Remove trunnion (11).

i. Remove inner races (8) from trunnion (11).

5-95. Cleaning — Tail Rotor Hub.

a. Clean all parts with solvent (C-304). Do not immerse bearings in solvent.

b. Dry with filtered compressed air.

c. Protect bearing after cleaning from contamination and corrosion.

5-96. Inspection — Tail Rotor Hub.

a. Visually inspect all components for damage, excessive wear, or corrosion. (Figure 5-61 through 5-63.)

b. Inspect bearing (6, figure 5-60) and race (8) for condition. (Refer to BHT-212-CR&O.)

NOTE

Refer to BHT-212-CR&O for approved fluorescent penetrant material.

c. Inspect the following parts by magnetic particle method (code M) or fluorescent penetrant method (code F). Index numbers are keyed to figure 5-60.

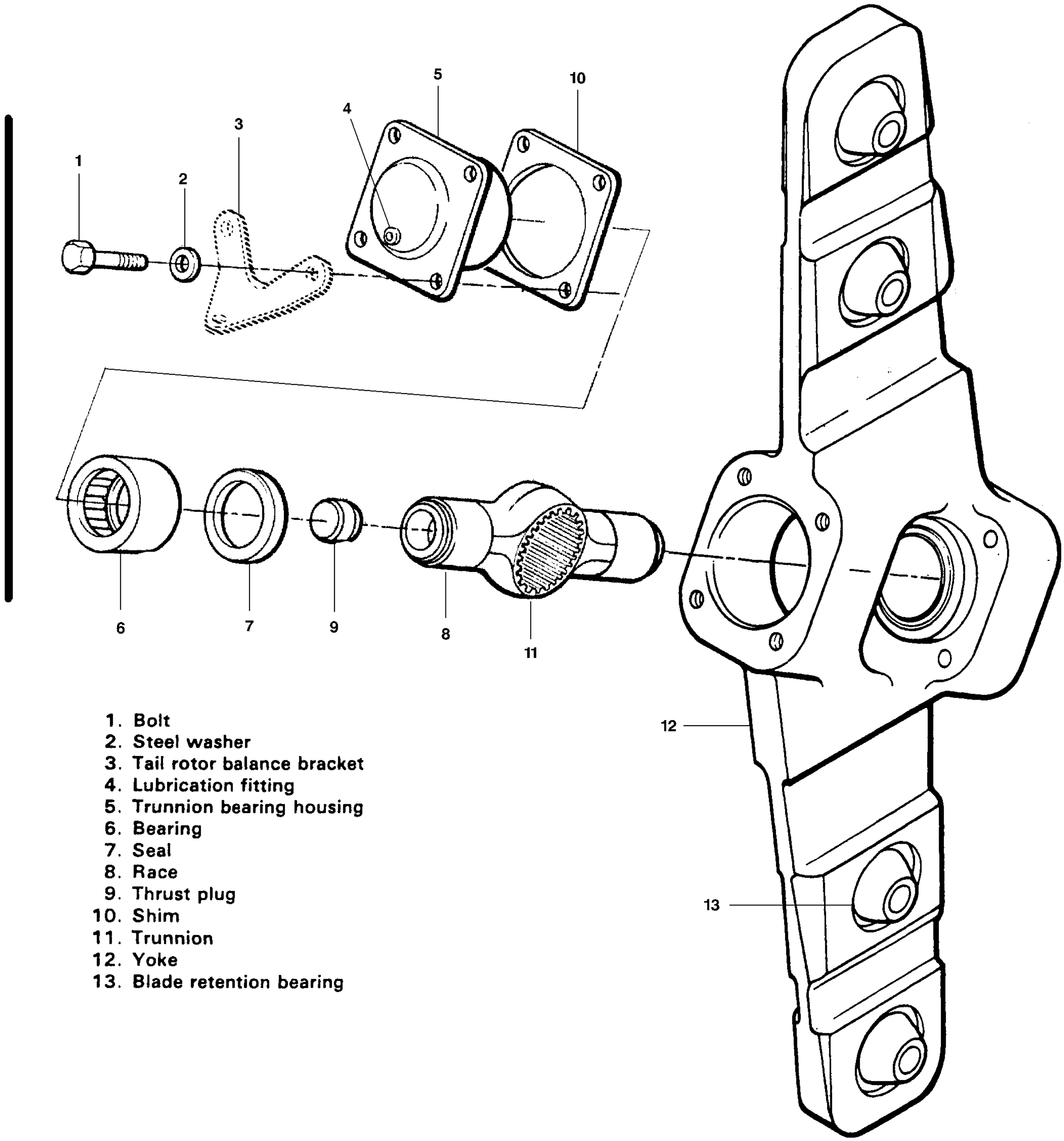
Index No.	Nomenclature	Code
11	Trunnion	M
12	Yoke	M

5-97. Repair — Tail Rotor Hub.

a. Polish out mechanical and corrosion damage on parts shown on figures:

5-61 (yoke)
5-62 (trunnion)
5-63 (housing)

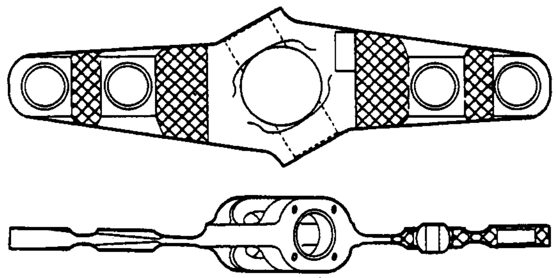
Replace parts if limits are exceeded.



1. Bolt
2. Steel washer
3. Tail rotor balance bracket
4. Lubrication fitting
5. Trunnion bearing housing
6. Bearing
7. Seal
8. Race
9. Thrust plug
10. Shim
11. Trunnion
12. Yoke
13. Blade retention bearing

UH-1H-II-M-05-60

Figure 5-60. Tail rotor hub



212-011-702-001
YOKE ASSEMBLY

DAMAGE LOCATION SYMBOLS

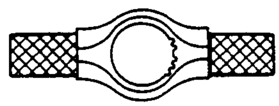
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
MECHANICAL DAMAGE	0.002 In.	0.005 In.
CORROSION DAMAGE	0.002 In.	0.005 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.15 Sq. In.
NUMBER OF REPAIRS	One per segment	
EDGE CHAMFER	0.010 In.	0.020 In.
BORE DAMAGE	0.002 In. for one-fourth circumference	
THREAD DAMAGE		
DEPTH	One-third of thread	
LENGTH	0.25 In.	
NUMBER	One per segment	

NOTE

Maximum acceptable axial play in blade retention bearings is 0.015 inch. Bearing looseness in yoke is not acceptable.

UH-1H-II-M-05-61

Figure 5-61. Tail rotor yoke damage limits



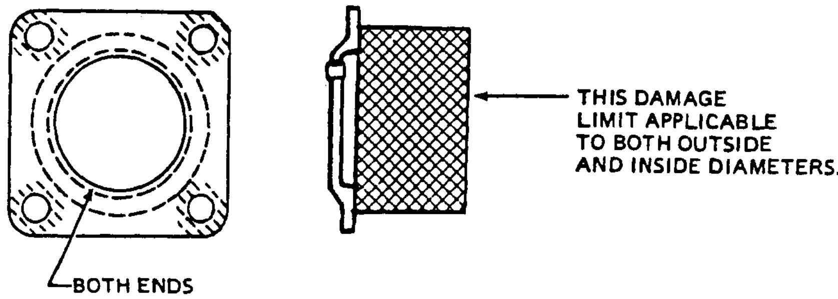
212-011-704
TRUNNION ASSEMBLY

DAMAGE LOCATION SYMBOLS

		
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
MECHANICAL DAMAGE	0.002 In.	0.010 In.
CORROSION DAMAGE	0.002 In.	0.010 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIR AREAS	One per segment	One per segment
SPLINE DAMAGE		
DEPTH	One-third of spline	
LENGTH	One-half of spline	
NUMBER	Three splines	

UH-1H-II-M-05-62

Figure 5-62. Tail rotor trunnion damage limits



TRUNNION HOUSING
212-011-729-101

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
MECHANICAL DAMAGE	0.002 In.	0.005 In.	0.010 In.
CORROSION DAMAGE	0.002 In.	0.010 In.	0.020 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. in.	0.10 Sq. in.	0.10 Sq. in.
NUMBER OF REPAIR AREAS	One per segment	One per segment	One per segment
BORE DAMAGE	0.002 In. for one-fourth circumference		
EDGE CHAMFER	0.030 In.		

NO DAMAGE TO LUBRICATION FITTING
IS ACCEPTABLE

UH-1H-II-M-05-63

Figure 5-63. Tail rotor trunnion housing damage limits

b. Inspect blade retention bearings (13, figure 5-60) in yoke (12) for play. Replace bearings if axial play of bearings exceeds 0.015 inch.

NOTE

All four bearings must be same part number; intermixing is not authorized.

c. Replace blade retention bearings (13). (Refer to BHT-212-CR&O.)

d. Refinish tail rotor hub as follows:

(1) Clean hub with aliphatic naphtha (C-305). Do not allow naphtha to contaminate bearings.

(2) Mask off blade retention bearings (13).

(3) Apply a mist coat of epoxy polyamide primer (C-204).

(4) Paint with gloss white No. 17925 or gloss black No. 17038 coating (C-245).

(5) Remove masking tape.

5-98. Assembly — Tail Rotor Hub.

Premaintenance Requirements for Assembly of Tail Rotor Hub

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-001), (C-304), (C-405)
Special Environmental Conditions	None

a. Prior to assembly, wash bearings (6, figure 5-60) with solvent (C-304) and air dry. Hand pack bearings with grease (C-001).

b. Install new seal (7) and new bearing (6) with stamped end of bearing visible in each trunnion bearing housing (5).

c. Ensure that races (8) are securely installed on trunnion (11). Refer to BHT-212-CR&O for thermal fit procedures.

d. Position housing (5) on yoke (12) to secure parts installed in previous step. Position housing and lubrication fitting (4) as shown. Install bolts (1) and washers (2). Tighten bolts (1) to remove all gap in joint between housing and yoke.

e. Measure thrust plugs (9) to check for equal thickness.

f. Position new shim (10) and thrust plug (9) on one end of trunnion (11). Position trunnion (11) in yoke (12).

g. Install new shim (10), thrust plug (9) and housing (5) on opposite end of trunnion (11). Install bolts (1) and washers (2). Tighten bolts (1) to snug position.

NOTE

Center the trunnion using work aid as outlined in step h., or use the equal shim method outlined in step i.

h. Center trunnion using work aid:

(1) If not previously accomplished, fabricate tail rotor trunnion centering tool work aid. (Figure 5-64.)

(2) Place work aid on bench with pins (2) facing up. Remove insert (3).

(3) Position yoke on work aid with pins (2) through two inboard blade retention bearings.

(4) Position insert (3) through trunnion and into hole in plate (1).

(5) Tighten eight bolts (1, figure 5-60) to snug position. Do not torque at this time.

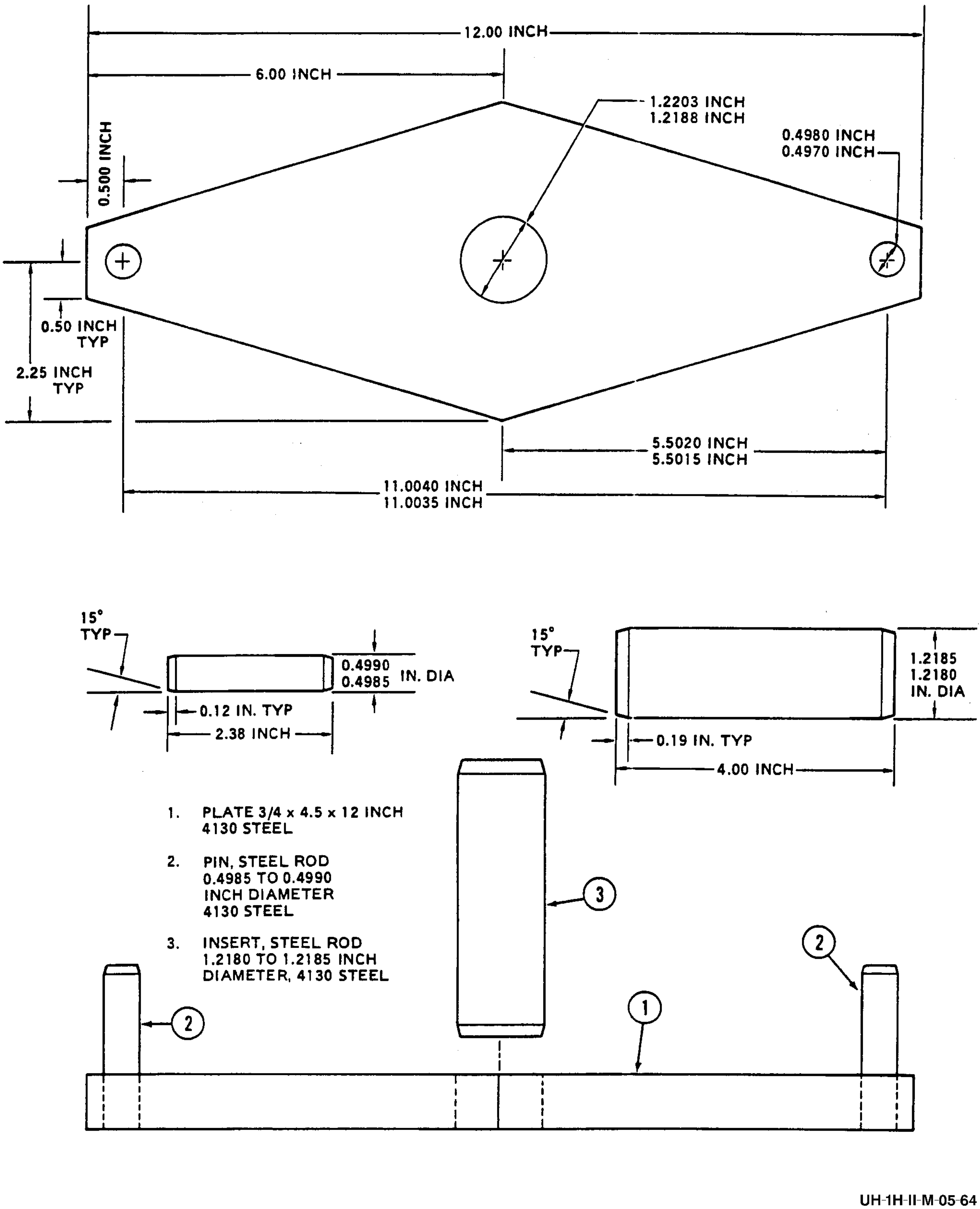


Figure 5-64. Tail rotor trunnion centering tool

(6) Measure gap between housing (5) and yoke (12) with feeler gage and record the dimension.

(7) Remove bolts (1), housing (5), thrust plug (9), and shim (10). Measure and record shim thickness. Peel laminations from shim as required to obtain 0.002 to 0.004 pinch fit on trunnion (11).

(8) Position shim (10), prepared in preceding step, same thrust plug (9) and same housing (5) on same side of yoke with lubrication fitting (4) positioned as shown. Install washers (2) and bolts (1). Torque bolts (1) 30 to 40 inch-pounds.

(9) Prepare shim (10) for opposite end of trunnion (11) and install in same manner outlined in step (5) through (8).

(10) Lockwire (C-405) heads of inboard bolts (1) together in pairs.

(11) Remove hub from work aid.

i. Center trunnion using equal shim method:

(1) Measure gap under the loose trunnion bearing housing (5, figure 5-60) using feeler gage. Record this dimension.

(2) Remove loose housing (5), bolts (1), washers (2), trunnion (11), thrust plugs (9), and shims (10). Measure and record shim thickness.

NOTE

To center trunnion (11) on yoke (12) center line within 0.002 inch, the total thickness of thrust plug (9) and shim (10) at each end of trunnion (11) must be equal.

(3) Peel laminations from both shims (10) equally as required to center the trunnion (11) and to obtain 0.001 to 0.004 inch pitch fit on the installed trunnion (11).

(4) Install trunnion (11), thrust plugs (9), and shims (10) in yoke (12). Install loose housing (5), bolts (1), and washers (2). Tighten bolts (1) to snug position.

(5) Measure gap under the loose housing (5) using feeler gage. This dimension should be 0.001 to 0.004 inch. Check position of lubrication fitting (4).

(6) Torque bolts (1) 30 to 40 inch-pounds. Lockwire (C-405) heads of inboard bolts (1) together in pairs.

NOTE

Bracket (3) will be installed at tail rotor installation.

j. Lubricate hub two places at fittings (4) with grease (C-001). Clean excess grease from hub.

5-99. Lubrication — Tail Rotor Hub. Refer to Chapter 1 for tail rotor hub lubrication.

5-100. TAIL ROTOR CROSSHEAD CONTROLS.

5-101. Description — Tail Rotor Crosshead Controls. The crosshead controls consist of the tail rotor crosshead and the pitch change links. Movement of the crosshead and pitch links is controlled by a pitch change rod, extending from the crosshead through the tail rotor gearbox to the pitch change mechanism.

NOTE

For maintenance instructions on the pitch change rod and the pitch change mechanism, refer to Chapter 11.

5-102. Troubleshooting — Tail Rotor Crosshead Controls. Refer to paragraph 5-85 for troubleshooting procedures.

5-103. Removal — Tail Rotor Crosshead Controls. Refer to paragraph 5-86 for removal of crosshead and pitch change links.

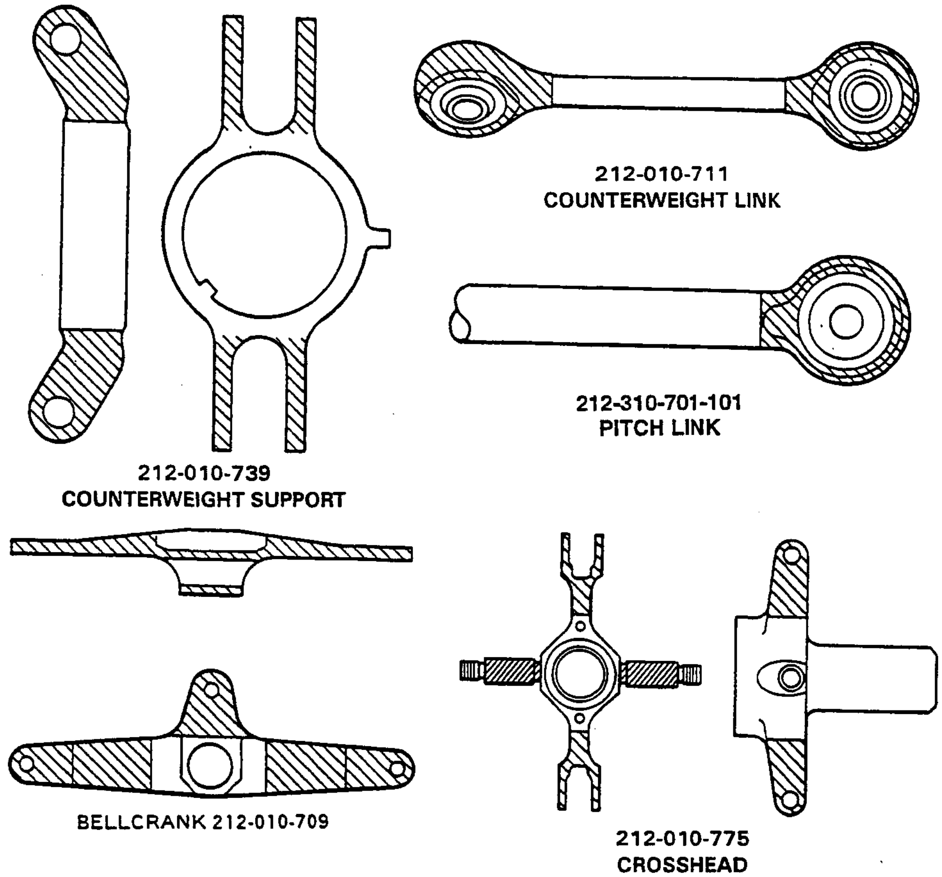
5-104. Inspection — Tail Rotor Crosshead Controls.

a. Inspect crosshead assembly components for damage. (Figure 5-65.)

b. Inspect components for cracks.

c. Inspect pitch link bearing for axial play of bearing exceeding 0.015 inch.

d. Inspect counterweight link for axial or radial play of bearing exceeding 0.020 inch.



DAMAGE LOCATION SYMBOLS

AREA A	AREA B	AREA C

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
NICKS, SCRATCHES, DENTS AND CORROSION	0.005 In.	0.010 In.	0.002 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.10 Sq. In.	0.05 Sq. In.
NUMBER OF REPAIR AREAS	One per lug	One	One per segment
EDGE CHAMFER	0.010 In.	0.020 In.	

THREAD DAMAGE		SPLINE DAMAGE	
DEPTH	One-third of thread	DEPTH	One-third of spline
LENGTH	One-quarter inch	LENGTH	One-third of spline
NUMBER	One per segment	NUMBER	Two

UH-1H-II-M-05-65

Figure 5-65. Crosshead assembly damage and repair limits

5-105. Repair or Replacement — Tail Rotor Crosshead Controls.

a. Repair crosshead assembly components exceeding limits. (Figure 5-65.)

b. Remove all mechanical and corrosion damage that is within limits with abrasive cloth or paper (C-423). Obtain a smooth scratch-free surface.

c. Apply two coats of epoxy polyamide primer (C-204) to repaired area.

d. Replace any components that are cracked.

e. Replace any components that exceed mechanical or corrosion damage limits. (Figure 5-65.)

f. Replace pitch link bearing if axial play of bearing exceeds 0.015 inch.

g. Replace counterweight link if axial or radial play or bearing exceeds 0.020 inch.

5-106. Installation — Tail Rotor Crosshead Controls. Refer to paragraph 5-91 for installation of crosshead and pitch change links.

SECTION VIII — TAIL ROTOR BLADES

5-107. TAIL ROTOR BLADES.

5-108. Description — Tail Rotor Blades.

The tail rotor blade is of all-metal, bonded construction. Upper and lower aluminum alloy skins are bonded to an aluminum honeycomb core. Externally attached balance weights and balance screws inside the blade tip, facilitate blade balancing.

5-109. Cleaning — Tail Rotor Blades. Wash tail rotor blades with a solution of detergent (C-355) and water.

5-110. Inspection — Tail Rotor Blades.

CAUTION

The inspection criteria in this paragraph defining acceptable or rejectable defects are intended to be used as a general guide. Describing and defining all defects that could occur on a tail rotor blade is virtually impossible. Consult qualified engineering before scrapping any blade except in cases where the blades are in obvious scrap category.

a. Negligible damage limits.

NOTE

Nicks and scratches to the skins, doublers, grip plates, and stainless steel spar (leading edge) that fall within the following limits are considered as negligible damage but must be polished out and refinished. (Paragraph 5-11.)

(1) Limits inboard of station 30.0. (Figure 5-66.)

(a) Nicks and scratches running within zero to 15 degrees of the span lines not in excess of 0.005 inch in depth.

(b) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.003 inch in depth.

(c) Sharp dents which are not in excess of 0.005 inch in depth.

(d) Nonsharp dents which are not in excess of 0.015 inch in depth.

(2) Limits outboard of station 30.0.

(a) Nicks and scratches which are not in excess of 0.005 inch in depth.

(b) Sharp dents which are not in excess of 0.015 inch in depth.

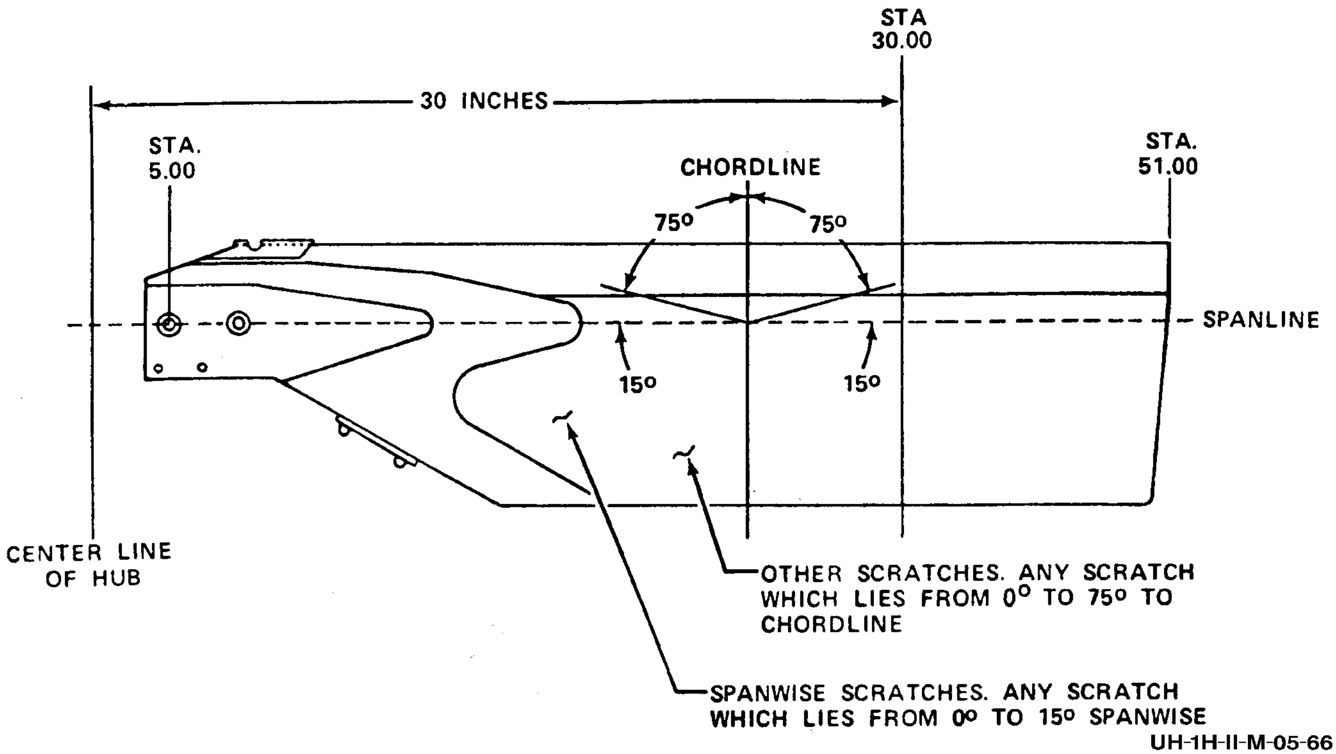


Figure 5-66. Tail rotor blade damage criteria

(c) Nonsharp dents which are not in excess of 0.030 inch in depth.

(3) Limits — trailing edge — inboard and outboard of station 30.0.

(a) Nicks and scratches in the trailing edge up to 0.030 inch in depth (chordwise) are permissible if polished out over a distance of at least three inches each side of the defect.

CAUTION

If a fatigue crack exists in any location, the blade should be forwarded to an authorized blade repair station for evaluation. Hole damage caused by a foreign object may look like a crack, but should be classified as a hole. (Refer to BHT-212-CR&O manual.) Dents should be closely inspected for nicks, scratches, and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone in sub-step 1.a. (1) (c) and (d) and sub-step a. (2) (b) and (c), the blade must be replaced. The depth of nicks and scratches may not exceed those permitted in sub-step a. (1) (a) and (b) and in sub-step a. (2) (a). Polish out all such nicks and scratches as is practical to do so to where the blade can be made to conform with all other inspection limits. If nicks and scratches cannot be satisfactorily polished out as outlined in sub-step a. (3) (a), the blade must be scrapped.

(b) Nicks, dents, and scratches which are less than those permitted in step a. shall be polished out. All allowable dents, whether sharp or non-sharp, deeper than 0.010 inch, must be filled and faired with epoxy filler (C-323) or filler putty (C-424). Damage greater than that specified in step a. is not acceptable.

(4) Voids.

NOTE

Where two voids of different limitations (Example: Void between the core and skin adjacent to a void between the skin and doubler) are closer together than one inch, they shall be considered as one void and the stricter limitations shall apply. All acceptable edge voids described as follows, shall be sealed using adhesive (C-313, C-317, or C-322). (Paragraphs 5-11 and 5-112.)

(a) Edge voids, as follows:

1. Edge voids of 0.250 inch maximum in depth by 1.50 inches maximum in length between the butt block and the spar, or between the butt block and the inner grip plates.

2. Edge voids of 0.060 inch maximum in depth, by 2.0 inches maximum in length, between the grip plates and doublers, the doublers and skins or spar, the inner grip plates and the skins or spar, the butt block and skins, or the skins and spar.

3. Edge voids of 0.120 inch maximum in depth by 3.0 inches maximum in length between the skins and trailing edge strip.

4. Edge voids of 0.50 inch maximum in width (chordwise) between the spar and tip block.

CAUTION

No voids are allowed within 0.50 inch of the edges of the drain hole doubler. No voids allowed between the drain hole doubler and the spar within 0.50 inch of the edge of the drain hole.

(b) Voids, other than edge voids, as follows:

1. No voids shall be allowed between the grip plates and doublers, or between the inner grip plates and skin or spar, except as allowed in step a. (4) (a) (1).

2. A void 0.50 inch maximum chordwise by 2.0 inches maximum spanwise between the doublers and skin, or spar, is acceptable provided it is not within 0.50 inch of the edge of the doubler.

3. A void 0.50 inch maximum chordwise by 2.0 inches maximum spanwise, is acceptable between the skin and spar, provided it is not within 0.250 inch of the edge of the skin. In the outboard area where the skin overlaps the spar, the maximum size for allowable voids is 0.250 inch chordwise by 2.0 inches spanwise.

4. A void 0.50 inch maximum chordwise by 2.0 inches maximum spanwise is acceptable between the skin and core.

5. A void 0.38 inch maximum spanwise by 3.0 inches maximum chordwise is acceptable between the skin and tip closure in either the top or bottom or both, provided it is not within 0.12 inch of the edge of the skin. If the edge distance is less than 0.12 inch, the void may be repaired by lifting the skin and rebonding with Type I adhesive (C-331).

b. Damage necessitating replacement.

(1) Any damage in excess of that outlined in step a. is cause for blade replacement.

(2) Tail rotor blades sustaining the following damage shall be scrapped.

(a) Water in the honeycomb core.

(b) Any blade that has reached the maximum service life.

(c) If one or more cracks develop and extend from a previously repaired area.

(d) Holes in the skin larger than allowed for patching.

(e) Any corrosion that penetrates entirely through the skin.

(f) If the spar is worn completely through at the tip.

(g) Edge voids deeper than 0.50 inch at the tip end of any of the root end doublers or grip plates.

(h) Edge voids in the leading edge or trailing edge of the doublers that are 0.250 inch or more in depth and show indications of corrosion in the void.

5-111. Repair — Tail Rotor Blades.

a. Repair negligible nicks, scratches, dents, and notches as follows: (Refer to paragraph 5-110 for damage classification.)

(1) Polish out all nicks and scratches using aluminum wool (C-422) on all aluminum parts and abrasive cloth or paper (sandpaper) (C-423) on the stainless steel spar. Lightly sandpaper the painted surfaces immediately surrounding the polished areas.

(2) Polish out all nicks and notches which are in the trailing edge strip, and are not more than 0.030 inch in depth (chordwise). Use 180 grit abrasive paper (C-423) followed by 400 grit paper. Final polish with 600 grit abrasive paper.

b. Repair acceptable edge voids as follows:

(1) Clean and swab out with filler before trying to fill cavity. Use adhesive (C-313, C-317, or C-322) to fill voids.

(2) Fill void as deeply as possible by placing extra filler material over the cavity and quickly pressing the filler material into the cavity. Repeat this operation several times. Smooth and allow to cure.

5-112. Painting — Tail Rotor Blades.

NOTE

Touch up refinishing of tail rotor blades is to be accomplished when warranted by paint condition, or when paint is removed to repair scratches, nicks, gouges, dents, or patching.

a. Degrease with mineral spirits (commercial) or solvent (C-386). Apply cleaner to wet area to be painted and wipe dry.

b. Burnish out nicks, dents, or scratches within allowable limits and thoroughly sand area to be repainted with 180 grit or finer abrasive cloth or paper (C-423) until a uniform dull finish is obtained.

c. Mask areas with masking tape (C-426) that are not to be painted.

d. Wash sanded surface using abrasive pads (C-407) and cleaning compound (C-318) to obtain a water break-free surface. Rinse with water and repeat cleaning process until a water break-free surface is obtained.

NOTE

Primer must be overcoated between one and 24 hours. If 24 hours is exceeded, repeat step a. through e.

e. Apply one coat of primer (C-234) to sanded area.

f. Apply one or two light top coats of coating (C-245) gloss white No. 17925 or gloss black No. 17038 as required to match area being painted. Allow 30 minutes to 72 hours air drying time between coats. If 72 hours is exceeded, the initial coat shall be sanded prior to application of the second coat.

g. Remove any masking material used on blade.

h. Refer to BHT-212-CR&O for complete tail rotor blade refinishing.

SECTION IX — TRACKING PROCEDURES

5-113. TRACKING AND OPERATIONAL CHECK — MAIN ROTOR BLADES.

5-114. Vibration Analysis — Main Rotor Blades.

Most vibrations present in the helicopter are always at low magnitudes. It is when the magnitude of any vibration increases that it becomes important. The main problem is deciding when a vibration level has reached the point of being unacceptable. The only sources of vibrations of any frequency are the rotating or moving parts on the helicopter, other parts vibrating only in sympathy with an existing vibration. Extreme low, low frequency, and most medium frequency vibrations are caused by the rotor or dynamic controls. Various malfunctions in stationary components can affect the absorption or damping of the existing vibrations and increase the overall level felt by the pilot. A number of vibrations are present which are considered a normal characteristic of the machine. Two per revolution (2/rev) vibration is the most prominent of these, with 4/rev or 6/rev the next most prominent. There is always a small amount of high frequency present. Flight experience is necessary to learn the normal vibration levels. Even experienced pilots sometimes make the mistake of concentrating on feeling one specific vibration and conclude that the vibration level is higher than normal when actually it isn't. It just seems so because the pilot is concentrating on it. For simplicity and standardization, vibrations are arbitrarily divided in general frequencies as follows:

Extreme low frequency —	Less than 1/rev pylon rock
Low frequency —	1/rev or 2/rev type vibration
Med. frequency —	Generally 4, 5 or 6/rev
High frequency —	Tail rotor or faster (buzz)

a. Extreme low frequency vibration.

Extreme low frequency vibration is limited to pylon rock. Pylon rocking two to three cycles per second is inherent with the rotor, mast, and transmission system. To keep the vibration from reaching noticeable levels, transmission mount dampening is incorporated to absorb the rocking. Malfunctions in the dampening system will allow rocking to start and continue until it can be felt by the pilot. A quick check of the dampening system may be made by the pilot while in a hover. Moving the cyclic fore and aft at about one movement per second will start the pylon rocking. The length of time it takes for the rocking to die out after the motion of the cyclic is stopped is indicative of the quality of the dampening. An abnormal continuation of rock during the check or a continued presence of rock during normal flight is an indication that something is wrong with the transmission mounts or damper. This may be due to wear, parts loosening up, breakage, incorrect installations, or the wrong type parts installed.

b. Low frequency vibration.

Low frequency vibrations 1/rev and 2/rev, are caused by the rotor itself. 1/rev vibrations are of two basic types, vertical or lateral. A 1/rev vertical is caused by one blade developing more lift at a given point than the other blade develops at the same point. A lateral vibration is caused by a spanwise unbalance of the rotor due to a difference of weight between the blades, the alignment of the CG of the blades with respect to the spanwise axis which affects chordwise balance, or unbalance of the hub or stabilizer bar. Rigidly controlled manufacturing processes and techniques eliminate all but minor differences between blades, resulting in blades which are virtually identical. The minor differences which remain will affect flight but are compensated for by adjustments of trim tabs and pitch settings. Initially the rotor is brought into ground track by normal tracking procedures, using the pitch change link (rolling the grip) to make a blade fly higher or lower to bring both blades into the same tip path plane. A track is taken using a higher operating rpm to determine if one blade is climbing (developing more lift) more than the other as its speed increases. This climbing tendency is overcome by using the trim tabs, adjusting them after a flight check is made, then flying again to determine the effect. Because of the physical differences in blades it is sometimes necessary to roll a blade out of track slightly in order to get both blades developing the same amount of lift. Generally, verticals felt predominantly in low power descent at moderate airspeeds (60-70 knots) are caused by a basic difference in blade lift and can be corrected by rolling the grip slightly out of track. Verticals felt mostly in forward flight that get worse as airspeed increases are usually due to one blade developing more lift with increased speed than the other (a climbing blade). This condition is corrected by adjustment of the trim tabs. Smoothing of 1/rev verticals is essentially a trial and error process. A basic straight forward procedure is used but the outcome of any adjustment is uncertain and must be flight-tested and the effect analyzed to determine the path of further action. Because of the idiosyncrasies of the individual blades, it is occasionally necessary to attempt adjustment procedures not normally utilized such as lateral procedures for a vertical, using roll when normally tab is used (and vice versa), on changing both tabs an equal amount.

Associated with the 1/rev vertical is the intermittent 1/rev vertical. Essentially, this is a vibration initiated by a gust effect causing a momentary increase of lift in one blade giving a 1/rev vibration. The momentary vibration is normal but if picked up by the rotating collective controls and fed back the rotor causing several cycles of 1/rev, then it is undesirable. Sometimes during steep turns one blade will “pop” out of track and cause a hard 1/rev vertical. This condition is usually caused by too much differential tab in the blades and can be corrected by rolling one blade at the grip and removing some of the tab, (as much as can be done without hurting the ride in normal flight). Should a rotor or rotor component be out of balance, a 1/rev vibration called a lateral will be present. This vibration is usually felt as a vertical due to the rolling motion it imparts to the aircraft, causing the pilots seats to bounce up and down. It can be noted that the seats bounce up-down out of phase; that is, the pilot goes up while the copilot goes down. An unusually severe lateral can be felt as a definite sideward motion as well as a vertical motion. Laterals existing due to an unbalance in the rotor are of two types: spanwise and chordwise. Spanwise unbalance is caused simply by one blade and hub being heavier than the other (i.e., an unbalance along the rotor span). A chordwise unbalance means there is more weight toward the trailing edge of one blade than the other. Both types of unbalance can be caused by the hub as well as the blades. Another occasional source of a lateral is the stabilizer bar. Improper balancing of the bar prior to installation is the main reason for this problem. Lateral vibrations are usually felt in a hover and in descending moderate airspeed turns and tend to disappear in forward flight. An out-of-ground effect hover is usually the best place to feel a lateral and reducing the rpm to 97% will often make the lateral more prominent. The correction of 1/rev lateral vibration begins by determining if one blade is heavier than the other. This is done by wrapping one or two turns of 2-inch masking tape (or equivalent weight of another type) around one blade, a few inches in from the tip so that it won't be easily torn off by the wind. The aircraft is then hovered, either in or out of ground effect, wherever the lateral was most evident, and the effect of the tape noted. A worsening of the vibration means the tape was placed on the wrong blade. Once the correct blade is determined further tape is added, in amounts depending on the severity of the vibration, until a final best balance using 1/2 wraps of tape is obtained. Should the lateral still be excessive or the tape no help on either blade, then a chordwise unbalance exists and it will be necessary to sweep a blade. One blade is arbitrarily picked and swept aft by shortening the drag link. One flat of turn (1/6 or a full turn) is used to start with. The aircraft is then hovered and the effect determined. Once it is ascertained that the correct blades is being swept, continued sweep adjustment in amounts based on the severity of the vibration is used until the lateral is eliminated, or further sweep fails to help. If still not satisfactory, it will be necessary to return to taping and adjust tape and sweep until the optimum combination is obtained. If it is still not possible to eliminate the lateral, a small amount of grip rolling should be attempted as in the 1/rev vertical procedure, being careful not to adversely affect forward flight. Should the lateral still be present, a small amount of tab may be tried. If still not corrected, the hub and blades should be checked for grip spacing and if no problem found, then removed from the aircraft and the alignment checked and the stabilizer bar balanced.

Two per rev (2/rev) vibrations are inherent with two bladed rotor systems and a low level of vibration is always present. A marked increase over the normal 2/rev level can be caused by two basic factors; a loss of designed dampening or absorption capability or an actual increase in the 2/rev vibration level of the rotor itself. The loss of dampening can be caused by such factors as deteriorated transmission mounts or lift link bushing, or an airframe component loosening up and vibrating in sympathy with the inherent 2/rev. An increase in the 2/rev level of the rotor itself can be caused by worn or loose parts in the rotor hub or looseness in the rotating controls. The correction of excessive 2/rev vibrations is primarily dependent upon the mechanic. The pilot generally cannot determine the exact cause and hence cannot prescribe specific corrective procedures. Occasionally tab settings and sweep will affect the overall 2/rev lever. If no mechanical cause of excessive 2/rev can be found, an attempt to decrease the level by rotor adjustments may be made. A recheck of boost-off forces should be made. It has been found that both blades may be swept in the same direction small amounts and sometimes decrease 2/rev.

c. Medium frequency vibrations.

Medium frequency vibrations at frequencies of 4/rev and 6/rev are another inherent vibration associated with most rotors. An increase in the level of these vibrations is caused by a change in the capability of the fuselage to absorb vibration, or a loose airframe component, such as the skids, vibrating at that frequency. Changes in the fuselage vibration absorption can be caused by such things as fuel level, external stores, structural damage, structural repairs, internal loading, or gross weight. Abnormal vibration levels of this range are nearly always caused by something loose; either a regular part of the aircraft or part of the cargo or external stores. The vibration is felt as a rattling in the aircraft structure. The most common cause is loose skids caused by worn, loose, or improper skid retaining straps. Loose skids can be discovered by shaking the ship with cyclic and feeling if they vibrate or looking out the door at the skids while shaking the aircraft. (Excessive or severe shaking is undesirable and will make even tight skids vibrate.) Many times skids will cause considerable vibration during turns and maneuvers if they are extremely loose. Loose skids is not a serious condition but it can cause annoyance to flight crews and passengers. Other sources of medium frequency vibrations are the elevator, access door, cargo hook, electronic gear, safety belt out the door, and engine/transmission cowling. Sometimes air loads will cause the small fire extinguisher doors and the step doors to vibrate. Occasionally portions of the cabin roof, side panels or doors, will “oil can” rapidly in flight, giving the same sensation as a medium frequency vibration.

d. High frequency vibration.

High frequency vibrations can be caused by anything in the helicopter that rotates or vibrates at a speed equal to or greater than that of the tail rotor. This includes many unusual situations such as hydraulic line buzzing, or starter relay buzzing, to the most common and obvious causes; loose elevator linkage at swashplate horn, loose elevator, or tail rotor balance and track. Pilot experience can help greatly in troubleshooting the cause of a high frequency vibration, as a pilot who has experienced a vibration can often recognize the cause the next time he feels the same vibration. Generally, determining the cause of a high frequency should begin with investigating tail rotor track (ground track using a rubber tipped stick with grease, lipstick, or some marking substance on the tip to mark the blades and determine if one is out of track). Should the rotor be properly in track, balance should be checked by removing the tail rotor and hub assembly and checking on a balance stand. Should tail rotor balance check out also, an inspection for the complete drive shaft should be made. Physical damage like loss of balance tabs would be evident. Observing the shaft with cover removed while the rotor is turning may show up a bent shaft, faulty bearing, or some other obvious malfunction. Attempting to locate the source of the vibration by feeling the fuselage in various places while ground running can sometimes be successful in localizing the cause and at least eliminating some possible causes. It should be recognized that vibrations that are specifically being watched for always appear more severe than when no particular attention is being directed to them. Many points on the airframe, such as the engine mounts, have a surprisingly high level of high frequency vibration and it is easy to decide that the level is higher than normal when actually it isn't. A comparison between the feel of a helicopter without excessive vibration and the aircraft with the vibration is helpful in precluding erroneous conclusions.

5-115. Tracking — Main Rotor Blades.

a. dynamic tracking and balancing of main rotor hub and blade assembly may be accomplished with the use of Chadwick-Helmuth equipment, as follows:

CAUTION

If dynamic tracking and balancing is used, it shall only be conducted in accordance with Chadwick-Helmuth operation and service instruction handbook. If there are any questions concerning use of this equipment, contact the manufacturer. (Table 5-5.)

Table 5-5. Chadwick-Helmuth Tracking Equipment

PART NO.	DESCRIPTION	MANUFACTURER'S ADDRESS
	Operation and Service Instruction Handbook	Chadwick-Helmuth Co., Inc. 111 East Railrod Ave. Monrovia, California 91016
Model 135M-10A	Strobex Blade Tracker	(213) 358-4567
Model 177M-5	Balancer	TELEX 67-5348
Model 171	Phazor	

NOTE: Various part numbers are available with this system, plus additional required items, such as magnetic pickups, brackets, cables, interrupters, accelerometer, etc., must be used.

b. Track main rotor using flag tracking method, as follows:

WARNING

Run-up of helicopter shall be performed only by authorized personnel.

(1) Coat tracking tips of each blade with grease pencil, using a different color on each tip. See figure 5-67 for use of tracking flag.

(2) Take a low-speed blade track (90% rpm) by following the steps in the tracking chart. (Figure 5-68.)

(3) Correct a low speed out-of-track condition by rolling down high blade as follows:

(a) Loosen jamnuts on pitch change link of the high blade. (Figure 5-69.)

NOTE

One flat rotation of barrel will result in approximately three-eights inch in blade track for all rpm.

(b) Turn pitch link barrel one flat at a time to lengthen pitch link.

(c) Tighten jamnuts and lockwire (C-405) barrel to jamnuts.

(d) Recheck track with flag (figure 5-67). Continue adjustments and checks until blades are in track.

(4) Take a high-speed track (100% rpm).

(5) If blades are out of track at high speed, make no adjustments but record which blade is low. (Paragraph 5-116.)

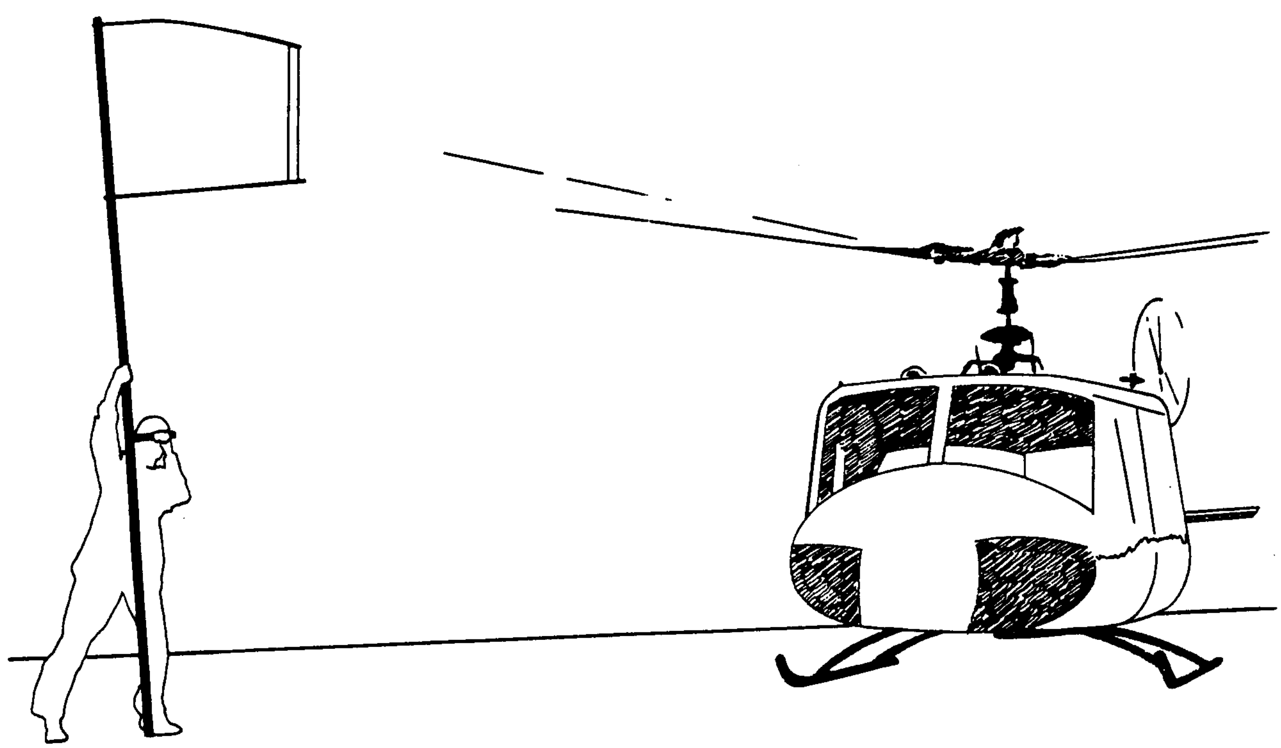


Figure 5-67. Main rotor tracking — tracking flag

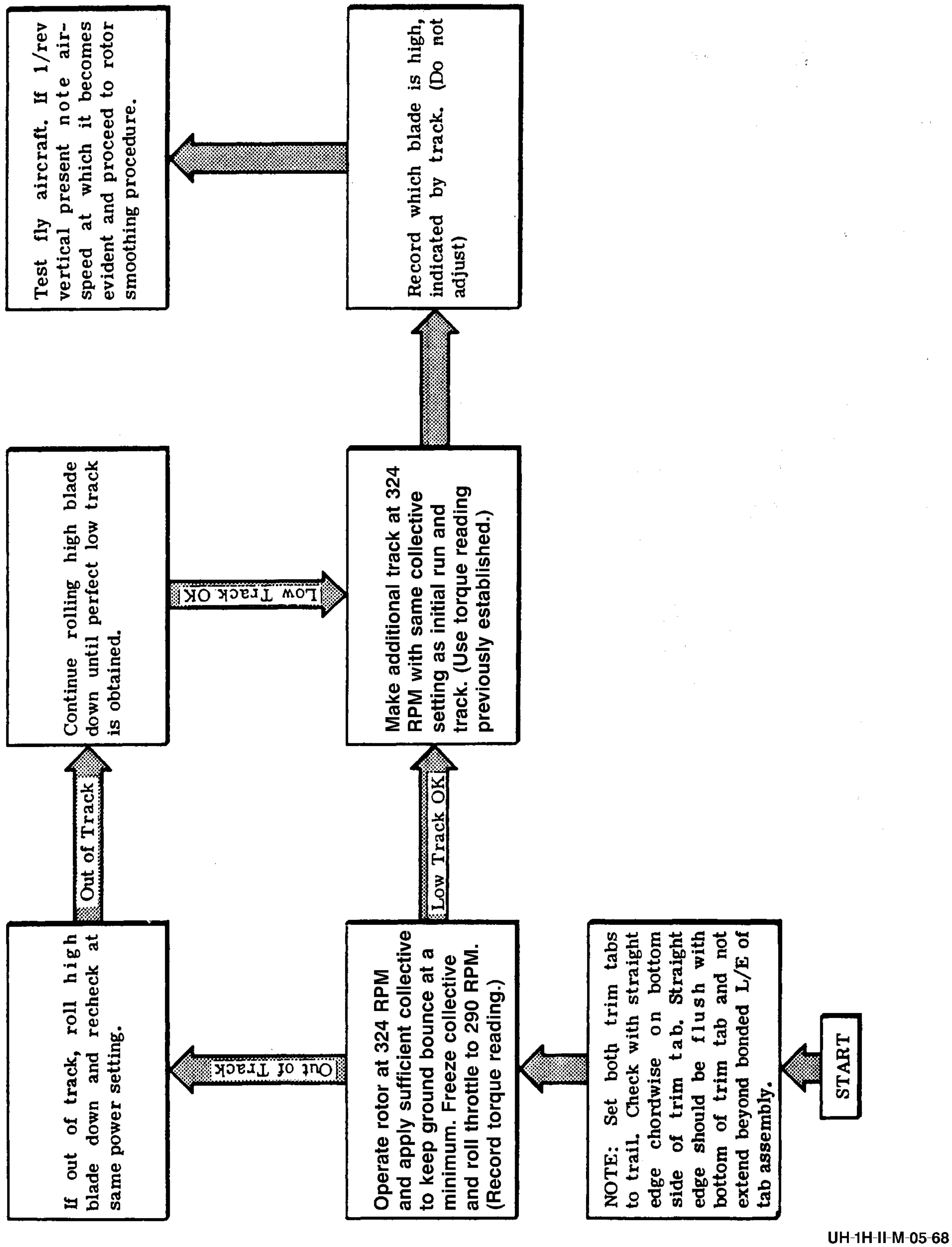


Figure 5-68. Main rotor tracking procedure

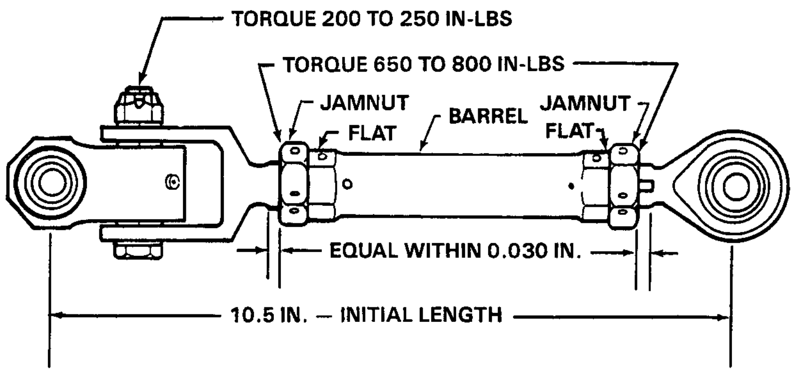


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Figure 5-69. Pitch change link

5-116. Inflight Vibration Checks and Corrections — Main Rotor Blades.

NOTE

When troubleshooting for 1/rev vibrations, ensure that helicopter does not have a lateral 1/rev vibration before troubleshooting for a vertical 1/rev vibration.

a. Fly helicopter through full airspeed range and check for lateral vibration. (Lateral vibrations are usually more pronounced in hover.) Check that adjustments have not changed autorotation rpm.

NOTE

When lateral vibrations have been corrected by taping blades with two-inch masking tape on blade tips, tape is then removed and required weight added to blade bolt.

b. If lateral vibration is felt, follow procedures charted in figure 5-70 by applying two-inch wide masking tape (C-426) around blade tip. (Refer to paragraph 5-117 for main rotor blade sweeping procedure.)

c. Remove tape from blade, counting number of wraps.

d. Remove cap from main blade bolt of taped blade.

NOTE

One full wrap of two-inch masking tape on blade tip equals approximately 3 ounces weight in blade bolt.

e. Add weight (lead wool or shot) in blade bolt to compensate for weight of tape removed from blade tip, calculated as follows:

$$\frac{\text{Tip Station x Tape Weight}}{\text{Bolt Station}} = \text{Weight Required in Bolt}$$

Given: Tip Station = 288
Bolt Station = 28

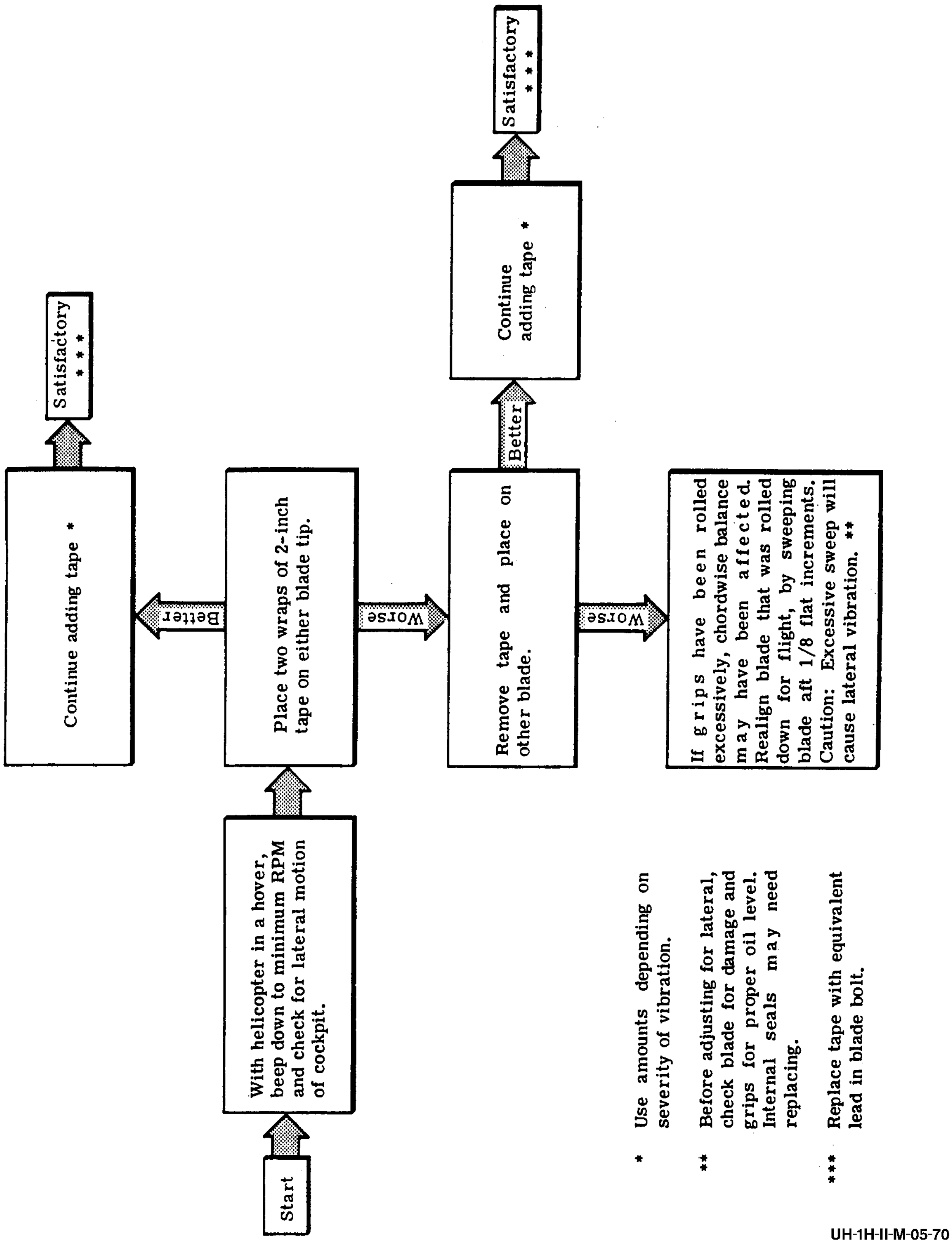


Figure 5-70. Lateral vibration troubleshooting

f. Reinstall and lockwire (C-405) main blade bolt cap.

g. Test fly helicopter. If no vibrations are felt, no further adjustment will be required.

CAUTION

Tabs may be bent to maximum angle of 8 degrees up or down, maximum difference between blades of 16 degrees.

NOTE

When bending taps, experiment to see which tab has best effect with least amount of bending. For example 2 degrees down tap on one blade might, in some instances, have same effect as 6 degrees up tab on opposite blade.

h. If vertical vibrations are felt, designate high blade A and low blade B. Install a tab bender (T101) and a gauge (T102) on blade and begin making blade adjustments. (Figure 5-71.) Use blade designations to keep a running account of adjustments. (See figure 5-72 for tool application.)

i. Test fly helicopter after each adjustment. Continue adjustments until vibration is worked out. Keep accurate record of all adjustments.

5-117. Sweeping — Main Rotor Blade.

a. Loosen jamnuts on drag brace enough to turn barrel one flat AFT as shown by direction of arrows.

b. After adjustment, tighten jamnuts. Record adjustment.

NOTE

If maximum adjustments fail to correct vibrations, rotor shall be removed from helicopter, placed on stand, and aligned using a scope.

c. Make additional adjustments, as required, but do not exceed two full turns of barrel.

5-118. Balancing — Tail Rotor Blades.

NOTE

Static balancing shall be accomplished before attempting dynamic balancing.

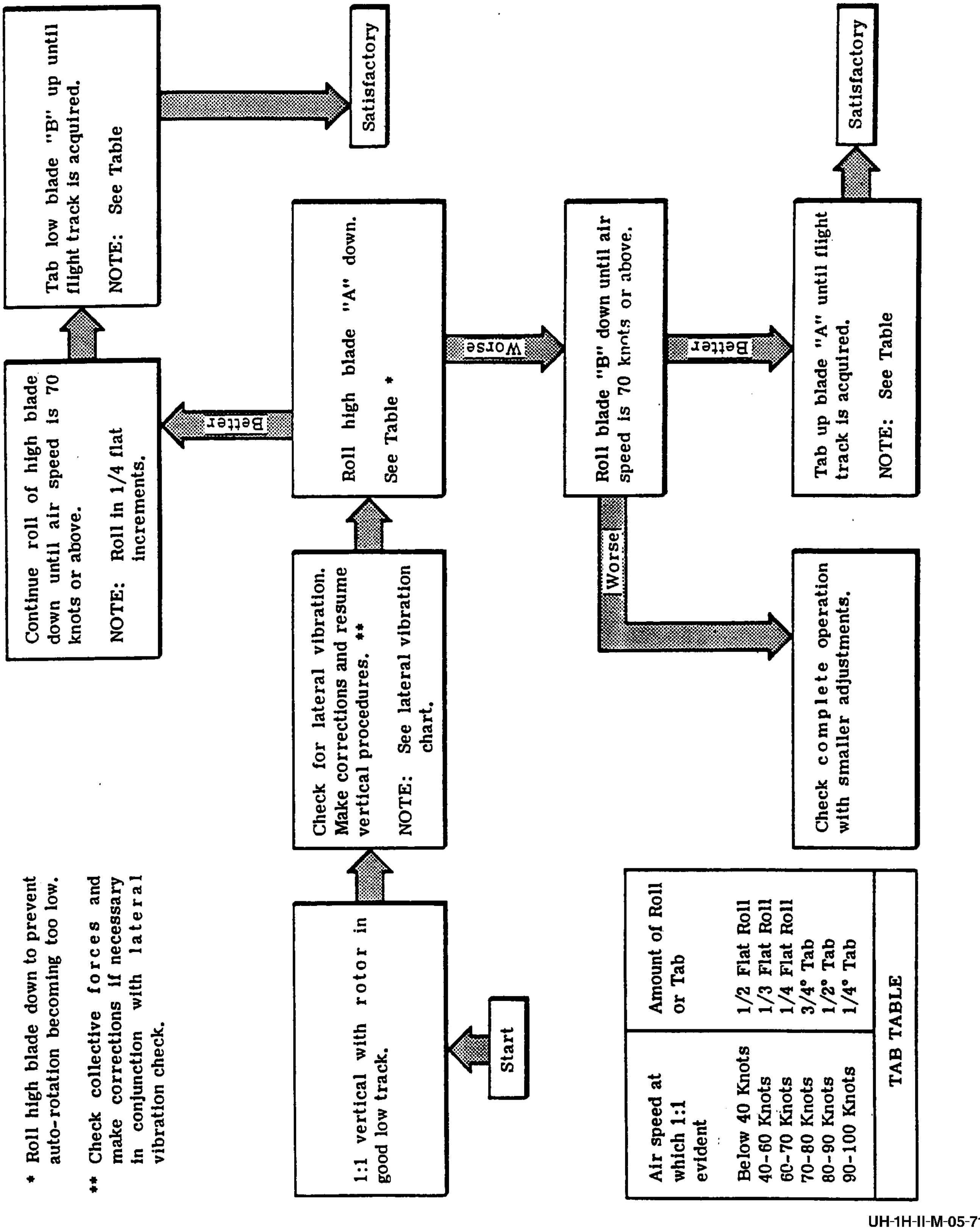
a. Dynamic balancing of tail rotor hub and blades may be accomplished with the use of Chadwick-Helmuth equipment if desired.

CAUTION

If dynamic balancing is used, it shall only be conducted in accordance with Chadwick-Helmuth operation and service instruction handbook. If there are any questions concerning use of this equipment, contact the manufacturer. (Table 5-5.)

NOTE

To balance the tail rotor using MARVEL Mfg. Co. equipment, refer to appropriate MARVEL Mfg. Co. manual and bulletins.



TAB TABLE

Air speed at which 1:1 evident	Amount of Roll or Tab
Below 40 Knots	1/2 Flat Roll
40-60 Knots	1/3 Flat Roll
60-70 Knots	1/4 Flat Roll
70-80 Knots	3/4° Tab
80-90 Knots	1/2° Tab
90-100 Knots	1/4° Tab

Figure 5-71. Rotor smoothing procedure

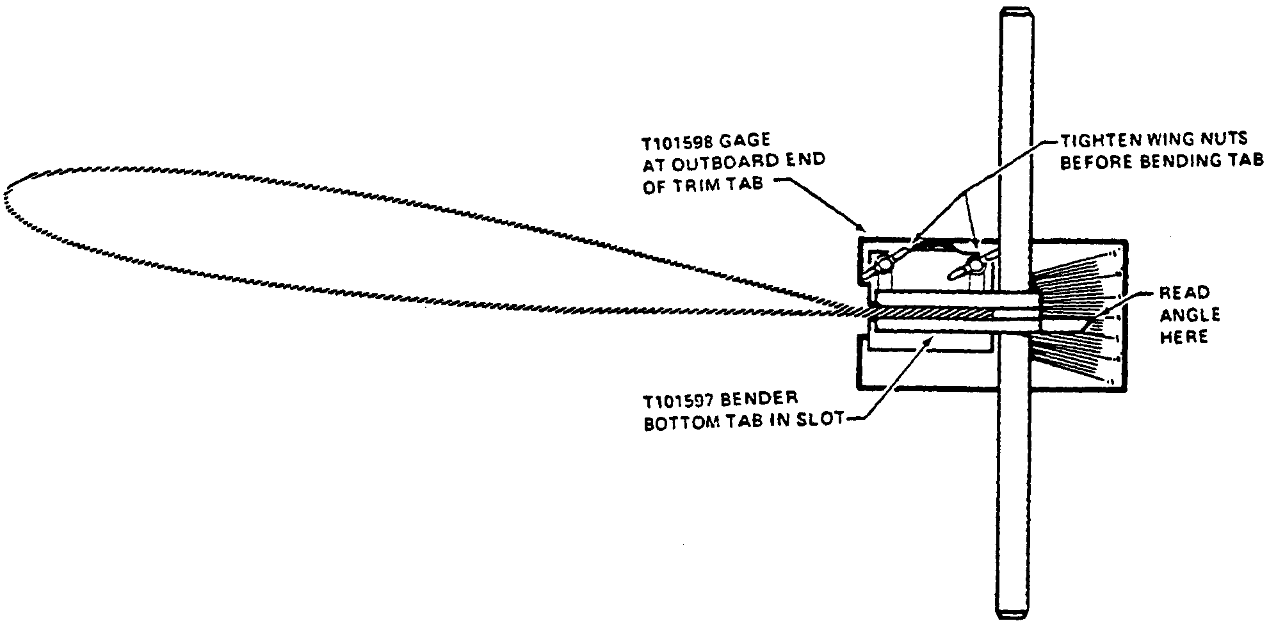


Figure 5-72. Trim tab bender and gauge application

CHAPTER 6

DRIVETRAIN SYSTEM

SECTION I — MAIN DRIVESHAFT

6-1. MAIN DRIVESHAFT.

6-2. Description — Main Driveshaft (figure 6-1).

The main driveshaft is installed between an adapter on the engine output shaft and the freewheel coupling on transmission input drive quill. The main driveshaft has flexible plate couplings installed between an adapter on the engine output and the freewheeling unit on transmission input drive quill. Two coupling clamp sets, of split v-band type, hold mating curvic-splined faces of end fittings in secure contact.

Shaft flexibility is provided by rectangular plates four in each coupling. Each plate flexes providing both angular misalignment and length changes to accommodate movement of transmission and pylon on elastomeric mounts. Each coupling can be considered a truss-work, in which torque loads are carried as axial loads in straight members of each plate.

A fail-safe feature exists which enables uninterrupted drive of the shaft after a failure has occurred in one of the dual load paths provided by the plate couplings. In normal operation a radial clearance exists between center shaft internal diameter and the internal protruding hub of the end fitting. Upon the unlikely event of a plate failure the center shaft shifts contacting the hub surface which restores the load balance, contains the whirling parts and restores stable operation. The off-center operation of center shaft is sufficient to cause a noticeable unbalance which signals that a partial failure has occurred and fail-safe mode is in operation with last remaining load path.

The shaft is dynamically balanced at time of manufacture by the use of washer(s) and screw(s) which are used as balance weights. These weights may be found inside the shaft end fittings. To assure screws are securely fastened a high grade of adhesive is used on the threads. Do not attempt to turn screws as breakage may result due to high lockage force of the adhesive.

6-3. Inspection of Installed Main Driveshaft.

a. Inspect main driveshaft (9, figure 6-1) for mechanical damage.

b. Inspect main driveshaft (9) for secure installation of clamp sets.

6-4. Troubleshooting — Main Driveshaft.

Trouble conditions of main driveshaft can seldom be detected in operation since there are no reliable indications except possibly in an extreme condition. "Suspected vibration" is only partially accurate as a term for such conditions as dynamic out-of-balance or faulty coupling action. Vibration would result as well as abnormal stresses and wear, but would be absorbed in structure and pylon mounts or effectively masked by normal vibrations of the helicopter, providing no distinct indication to pilot. Driveshaft trouble indications are usually those revealed by careful visual inspection. Principle causes of driveshaft trouble are faulty installation procedures, badly degraded elastomeric mounts, and/or incorrect engine alignment.

Table 6-1 is a brief summary of troubles which may be encountered. Conditions and possible causes listed have been limited to those reasonably probable though not necessarily frequent in normal service. The troubles could become known through pilot reports or by inspection methods. They would be subject to some evaluation, although final corrective action by a higher maintenance level might be required in some instances. Conditions involving obvious major damage are omitted, as are those caused by accident or an unusual chain of events which would require evaluation by a competent authority.

6-5. Removal — Main Driveshaft.

a. Open left side engine cowling.

b. Open transmission fairing. Remove engine intake fairing or filters by releasing fasteners at front and rear edges of top panel and fasteners which secure side louvers or filters to cabin roof.

Table 6-1. Troubleshooting Main Driveshaft

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Suspected vibration.

STEP 1. Coupling clamps loose or improperly installed or unmatched.

Install clamp sets properly. (Paragraph 6-11.)

STEP 2. Loose engine adapter.

Replace adapter and any worn associated parts. (Paragraphs 6-5 and 6-11.)

STEP 3. Misalignment.

Align engine and transmission. (Paragraph 6-12.)

Replace driveshaft and associated parts as required. (Paragraphs 6-5 through 6-11.)

STEP 4. Damaged shaft.

Inspect shaft flexible plates and end adapters for damage.

Replace driveshaft and associated parts as required. (Paragraphs 6-5 and 6-11.)

c. Remove induction baffle upper panel by releasing fasteners.

d. Remove intake screen access section at upper left by releasing fasteners. If particle separator is installed, remove upper half of particle separator.

e. Remove coupling clamps (4, figure 6-1) at each end of main driveshaft. Make a felt pen mark at clamp gap. Keep clamps together as matched sets after removal.

WARNING

Compression of shaft is usually necessary to clear the engine adapter and transmission freewheeling unit.

DO NOT APPLY ANY TOOLS OR CLAMPS TO COUPLING PLATES.

To prevent critical damage to plates and/or shaft, locally obtain and make two installation clamp work aids. (Figure 6-2.)

f. Position two installation clamp work aids over bolt heads located on the arms of the end fittings. (Figure 6-3.) Tighten clamps to allow removal of shaft. Remove shaft assembly. Remove clamp work aids.

g. To remove engine shaft adapter, remove lockwire, retaining bolt and key washer. Pull adapter out of engine output shaft.

6-6. Cleaning — Main Driveshaft.

a. Clean shaft assembly, adapter, and attaching parts with solvent (C-304) or MEK (C-309).

b. Dry with filtered compressed air or clean cloth.

6-7. Inspection and Repair — Main Driveshaft.

CAUTION

Do not attempt to loosen or tighten any hardware. Any reason for necessary part removal is cause for shaft replacement.

a. Visually inspect shaft for cracks.

CAUTION

MANY U.S. MILITARY AIRCRAFT ARE EQUIPPED WITH A DRIVESHAFT THAT CLOSELY RESEMBLES THE BHTI P/N 204-040-433-101 DRIVESHAFT. THE U.S. MILITARY DRIVESHAFT IS NOT QUALIFIED FOR USE ON THE BHTI MODEL UH-1H-II.

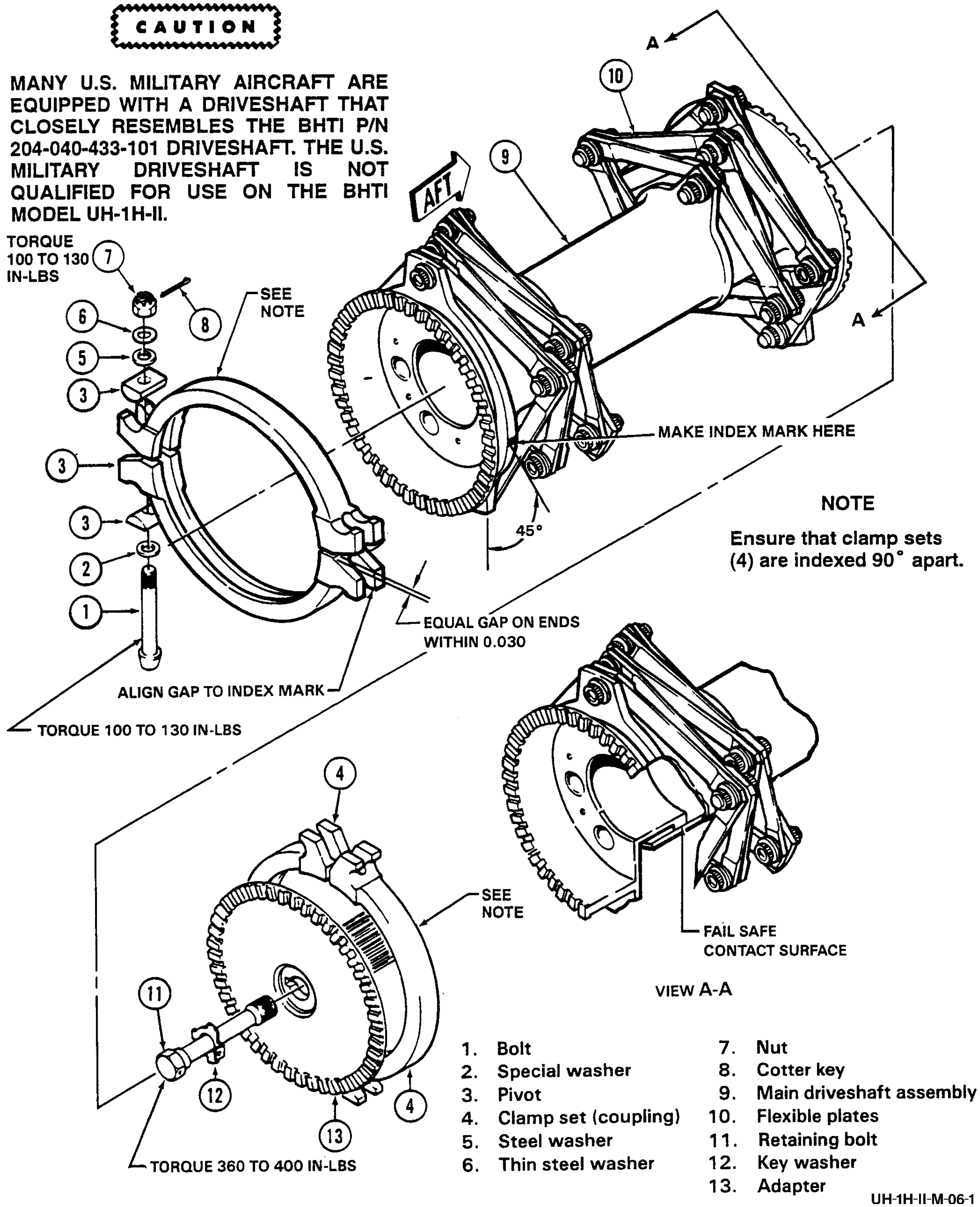


Figure 6-1. Main driveshaft assembly

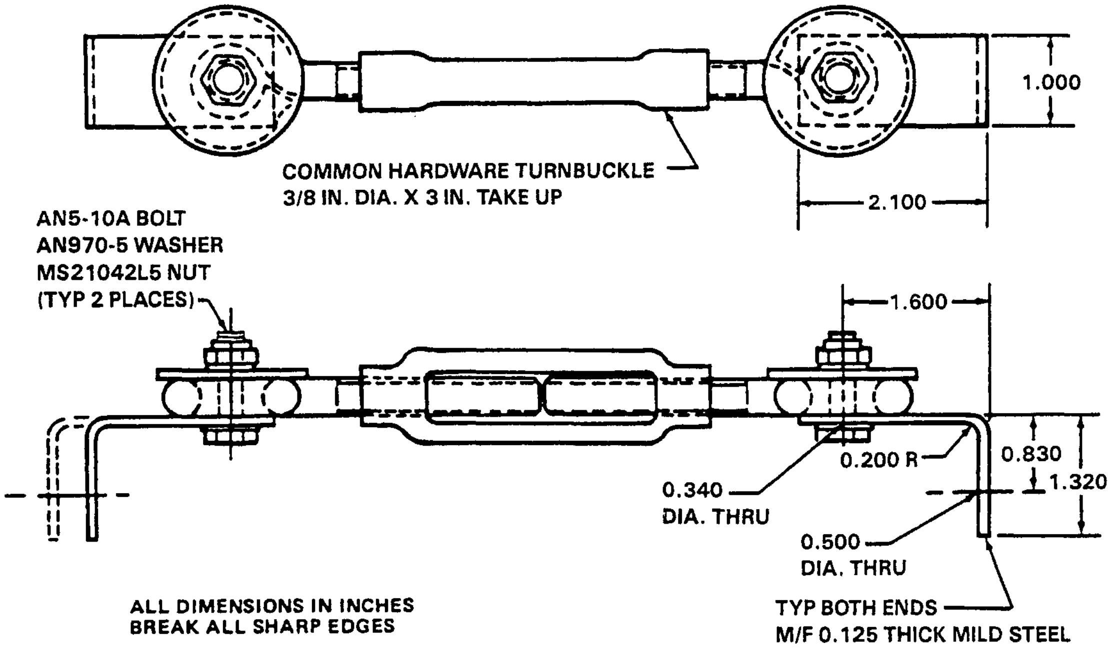


Figure 6-2. Main driveshaft installation and removal tool

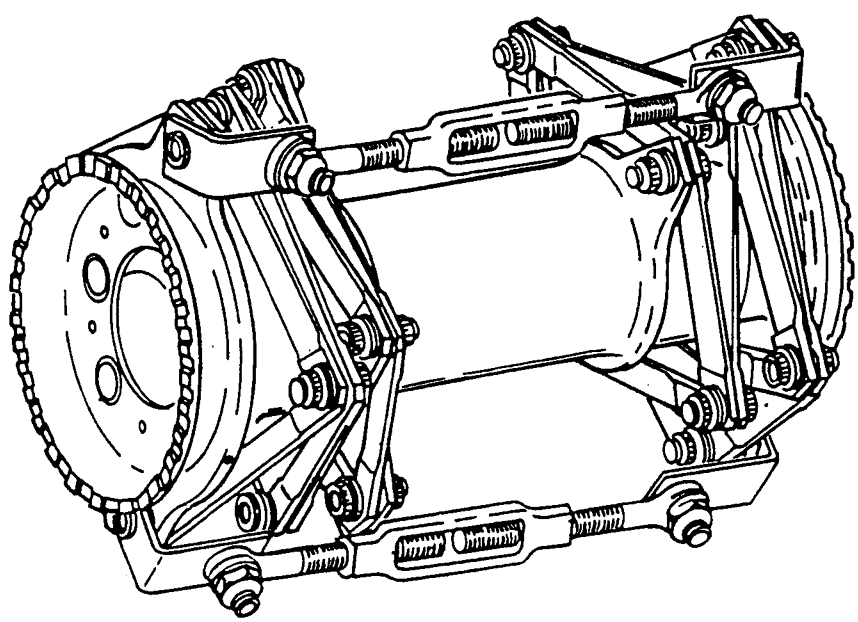


Figure 6-3. Work aid tool installed on main driveshaft

b. Visually inspect shaft for nicks, dents, scratches and corrosion. Figure 6-4 for limits.

(1) Superficial scratches not exceeding 0.002 inch in depth or well rounded dents on part edges not exceeding 0.005 inch in depth do not require repair.

(2) Scratches in the metal deeper than 0.002 inch or with sharp notches shall be smoothly blended into surrounding area, removing minimum material, so that no sharp indentations or edges remain. Repair must be within the limits specified in figure 6-4. Repair by careful hand stoning, using fine abrasive cloth or paper (C-423) for final polishing. Minimize removal of protective coating during repair. Surface finish in repaired areas must not exceed 32 RHR.

(3) Damage to the protective coating (removal to base metal) may be touched up with zinc chromate primer (C-201) and aluminum lacquer (C-215) for appearance and minimal protection from corrosion.

NOTE

Black residue developing around the flex plates is not a cause for rejecting the driveshaft.

c. Check for legibility of stenciled serial number and/or existence of data plate on main driveshaft. If discrepancy exists, stencil serial number on driveshaft.

d. Visually inspect engine adapter (13, figure 6-1) as follows:

(1) Visually inspect splines for chipped or damaged teeth.

(2) Visually inspect for nicks, burrs, corrosion, and pitting.

(3) Maximum allowable damage on the adapter flange is 0.010 inch.

6-8. Installation — Main Driveshaft.

a. If removed, coat adapter (13, figure 6-1) splines with corrosion preventive compound (C-104) and insert into engine shaft. Install retaining bolt (9) and key washer (10) with short tab of washer in adapter slot. Torque bolt 360 to 400 inch-pounds. Lockwire (C-405) bolt head to outer tab of key washer.

b. Position two installation clamp work aids over bolt heads located on arms of the end fitting. (Figure 6-3.) Tighten clamps to allow installation of shaft between engine adapter and transmission freewheeling unit. Install main driveshaft in either direction. Remove both clamp work aids from shaft after installation.

c. Install coupling clamp sets (4, figure 6-1) to secure both ends of shaft as follows:

(1) Check that serial numbers match on each clamp set (4) ensuring both halves are alike and that the serial numbers are on the same side for installation.

(2) Position clamp set (4) so that gap is in line with index mark on the shaft end fitting. (Figure 6-1.)

(3) Clamp set (4) should fit snugly and hold themselves in place without bolts.

(4) Place washer (2, figure 6-1) on bolt (1) with chamfer against head. Install bolt, with head in direction of shaft rotation, through pivots (3) and clamp ends. Install washers (5 and 6) and nut (7).

NOTE

Thick or thin steel washers may be added if required under nut; and using like quantity on opposite bolt to maintain balance.

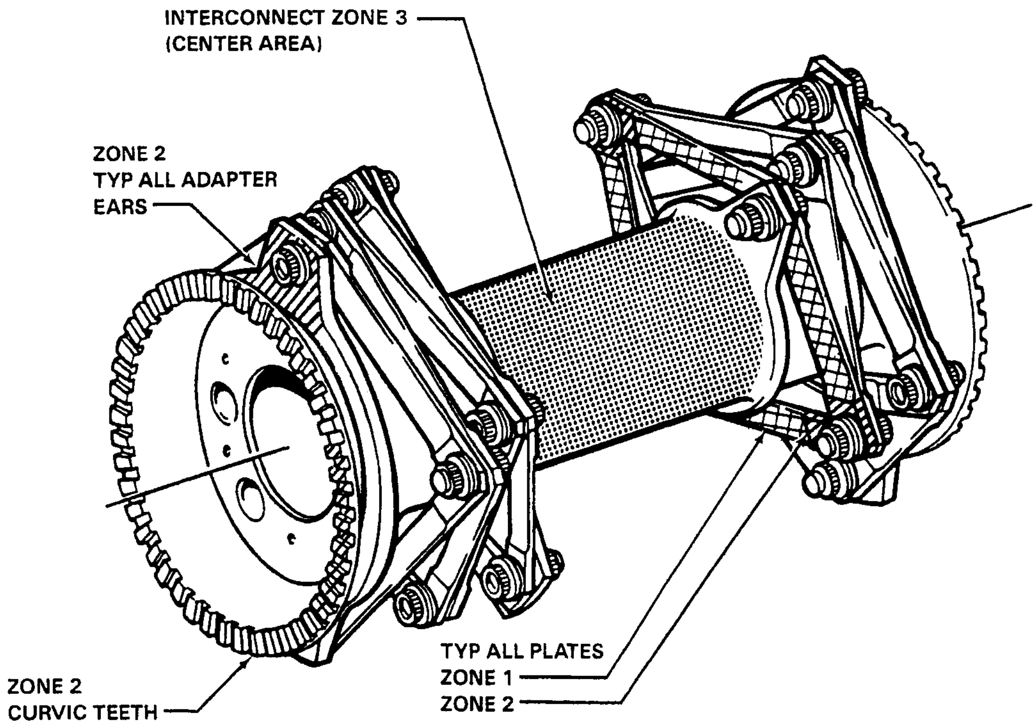
(5) Torque nut (7) 100 to 130 inch-pounds, keeping equal gaps between ends of clamp sets (4) within 0.030 inch. Tap around outside of clamp set (4) with a soft faced mallet to ensure good seating. Recheck torque. Install cotter pin.

(6) Install opposite end clamp set, (4) in the same manner, positioned 90° around shaft in relation to previously installed clamp set.

6-9. Alignment — Main Driveshaft.

Premaintenance Requirements for Main Driveshaft Alignment

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T50), (T54), (T58)



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	ZONE 1	ZONE 2 THICK SECTION	ZONE 3	ZONE 4
NICKS, SCRATCHES, CORROSION	0.002 In.	0.005 In.	0.010 In.	0.015 In.
EDGE DENTS, NICKS	0.005 In.	0.010 In.	N/A	0.025 In.
MAXIMUM AREA PER	0.05 In. Sq	0.10 In. Sq	Not critical (local area only)	
NUMBER OF REPAIRS	2 Max per plate 1 inch minimum separation	One per lug One per plate	Not critical (not to overlap)	

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Figure 6-4. Main driveshaft damage limits

CONDITIONS	REQUIREMENTS
Test Equipment	None
Support Equipment	Dial Indicator
	Micrometer Depth Gage
Minimum Personnel Required	One
Consumable Materials	(C-317), (C-452)
Special Environmental Conditions	None

a. Check alignment of the main driveshaft installation between the transmission input drive quill and the engine output shaft adapter when any of the following conditions exist.

(1) Main driveshaft inspection reveals excessive wear of engine coupling spline or there are cracks in driveshaft components.

(2) Replacement of main transmission.

(3) Hard landing which does not show apparent structural damage.

(4) Replacement of engine or any engine mount component.

(5) Major repair or replacement of components in center fuselage, tailboom, or pylon support structure.

(6) Driveshaft misalignment is suspected for any other reason.

b. Position helicopter on level ground or level as closely as practical via use of jacks. Main rotor, if installed, must not be restrained.

c. Remove transmission and engine cowlings by releasing fasteners attaching lower access doors to pylon support and removing screws attaching upper access doors to pylon.

d. Remove main driveshaft assembly, leaving engine output shaft adapter installed in end of engine output shaft.

e. Position transmission pylon with leveling jacks in accordance with steps f. through o.

f. Remove four pylon lateral mount bolt assembly (6, figure 6-4A), washers (7), and shouldered washers (8).

g. Remove cotter pin (13), nut (12), and washer (11) from upper lift link bolt assembly (10). Do not remove bolt from lift link (14).

h. Remove cotter pin (1), nut (2), and washer (3) from bolt (4) securing 5th mount eyebolt (9) to transmission A-frame (5) and remove bolt (4).

NOTE

Hoist must be positioned so that lifting cable is in line with mast.

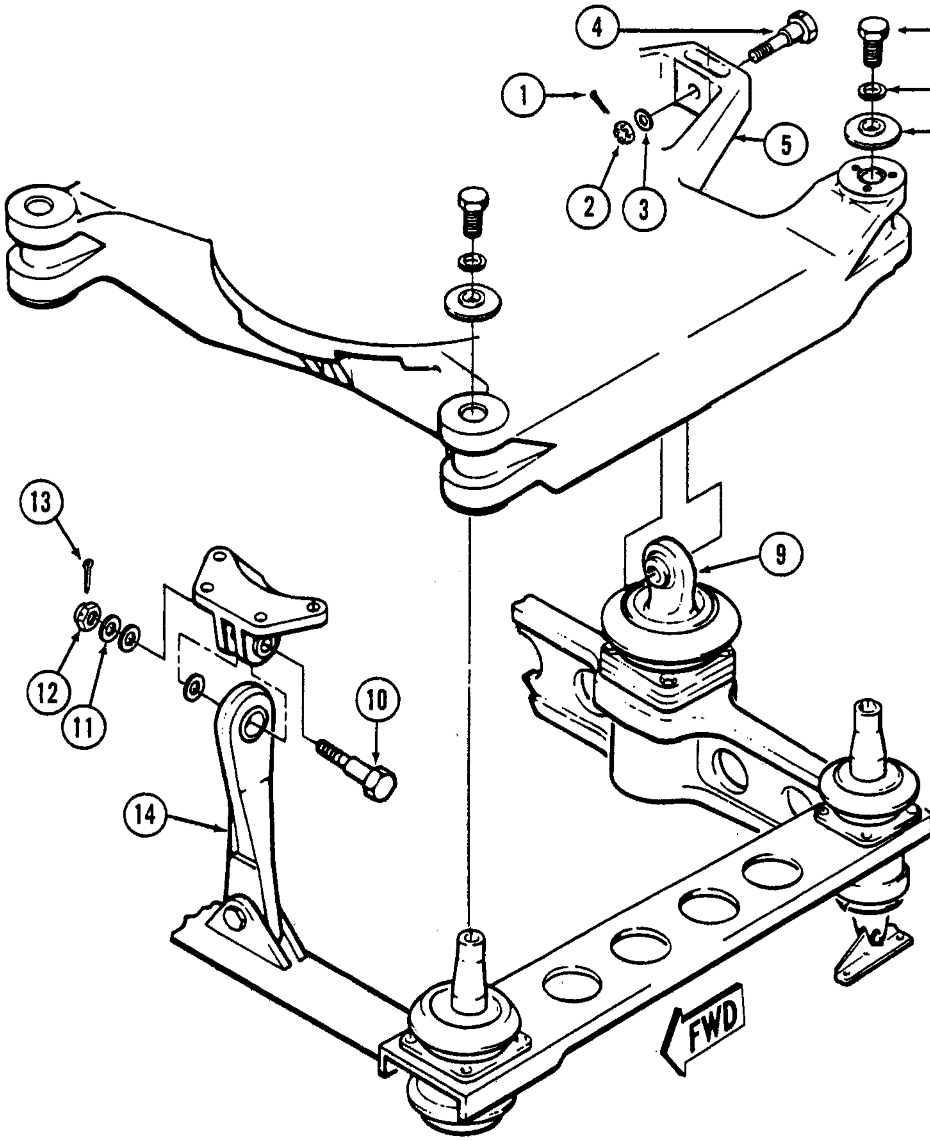
i. Using maintenance hoist (T58) and clevis attached to top of main rotor mast, raise transmission to point where upper lift link bolt (10) may be turned freely by hand. Replace bolt if binding occurs due to corrosion or galling. Apply anti-seize compound (C-452) to bore and OD of bushing. Check lower bolt for same conditions.

j. Install four transmission leveling jacks (T54) (two at each side) between transmission support case and top of pylon support structure. (Figure 6-5.) Use shim plates if necessary to obtain proper jack height.

NOTE

Jacks will not lower simply by rotating jack screw counterclockwise. To lower jack a precise amount, rotate jack screw counterclockwise 1/2 turn past desired point, and tap lightly on end of jack screw to drive in wedge within jack. Rotate jack screw 1/2 turn clockwise to obtain elevation originally desired.

k. Slacken pylon hoist cable.



1. Cotter pin
2. Nut
3. Washer
4. Bolt assembly
5. Support case
6. Bolt (with locking insert)
7. Washer
8. Shouldered washer
9. Eyebolt
10. Bolt assembly
11. Washer
12. Nut
13. Cotter pin
14. Lift link

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Figure 6-4A. Transmission support case pylon attachment

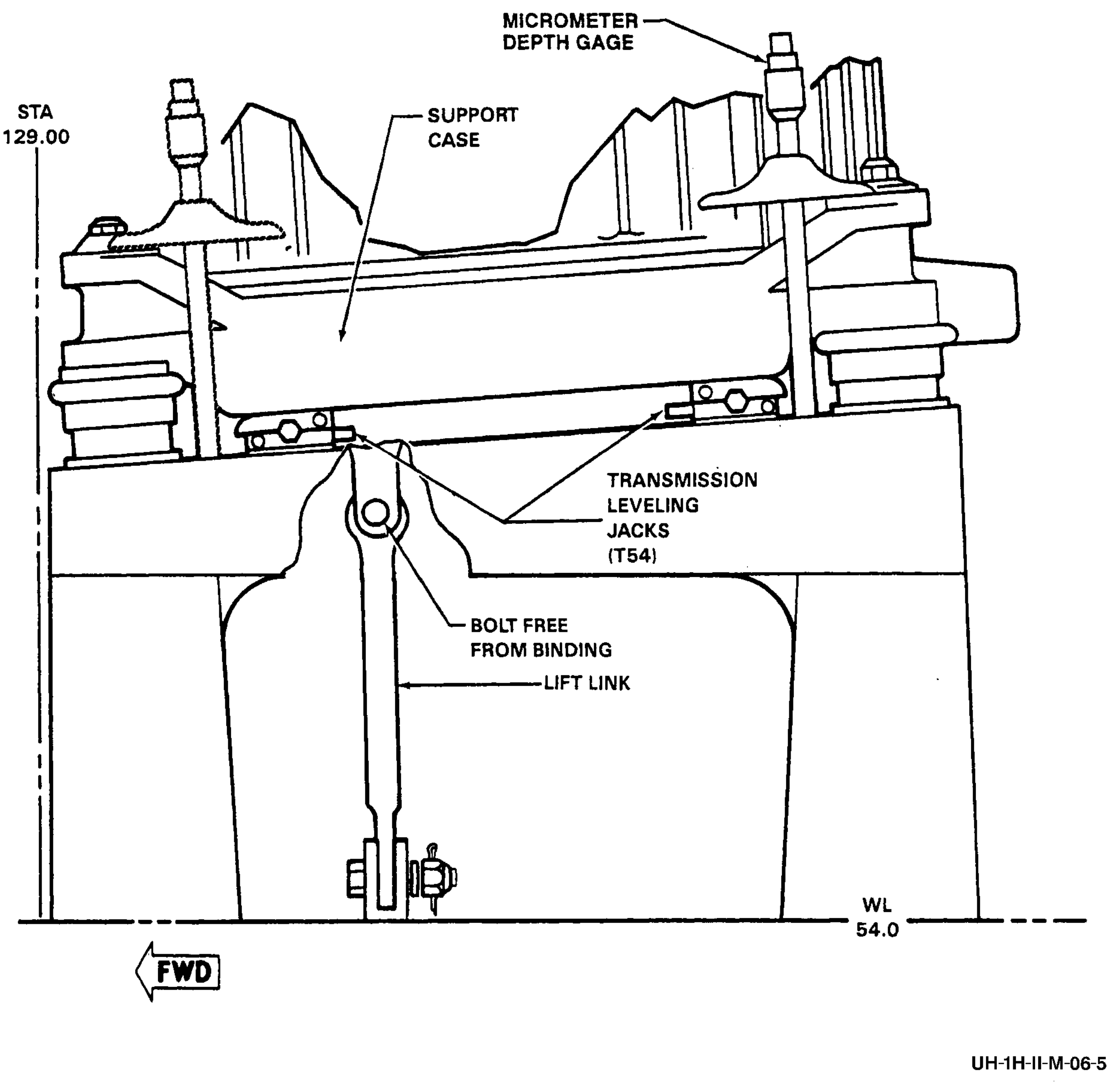


Figure 6-5. Pylon leveling and alignment

l. Carefully adjust four leveling jacks equally so that transmission is held at height where upper lift link bolt turns freely. (Figure 6-5.)

m. Determine that transmission support points are all same height above pylon support structure by measuring at each pylon mount with a depth micrometer. (Figure 6-5.)

WARNING

Transmission jacks are to be used to pitch transmission fore and aft and roll transmission left or right to properly level assembly for driveshaft alignment checks. Extreme care must be taken when "raising" a jack not to deform pylon support structure. This can be avoided by lowering jack or jacks on opposite side or end of transmission same amount as a particular jack is raised. It is also important to determine degree of lift link bolt "looseness" any time a jack is adjusted. If, during rotation of lift link bolt in a check for freedom, bolt appears to get tighter after jack move, STOP. Your move was in wrong direction or you failed to make opposite move on opposite jack or jacks.

n. Use a micrometer depth gage to measure from top surface of each transmission support case mounting washer to top of pylon support structure. Measure at each of four mount locations; measurements should be equal within 0.020 inch. Adjust jacks to achieve required tolerance. After each adjustment, recheck lift link bolt for freedom of movement. If four measurements cannot be brought within tolerance, average two forward corner measurements and adjust aft corners to be within 0.020 inch of this average.

o. Upon completion of transmission leveling, recheck lift link bolt to make sure it can be turned freely with fingers.

p. Alignment shall be checked and engine assembly shall be repositioned as required in accordance with steps q. through t.

q. Set target plate of engine-to-transmission driveshaft alignment tool set (T50) with arrow of center disc indexed at 72.5 degrees on inner scale of outer plate. Secure by tightening two washer-head screws at back of plate. (Figure 6-6.)

r. Install target plate on engine output shaft adapter. (Figure 6-6.)

s. Install alignment gage plunger of tool set (T50) on transmission input quill coupling and secure with coupling clamp set. Rotate engine flanged adapter to align target plate outer scale marking of 71.5 degrees in 12 o'clock position.

CAUTION

Alignment gage must be returned to its retracted position following each check of vertical and horizontal alignment. Do not attempt to reposition engine with plunger inserted in hole of target plate.

NOTE

To indicate correct alignment, largest diameter of plunger must enter hole in target plate. If misalignment is indicated, observe and note amount and direction of such misalignment. No correction of misalignment should be attempted before completion of angular alignment check of step u. Required engine repositioning (shim changes) can be best determined if results of both checks are known.

t. Check horizontal and vertical alignment by inserting a suitable tool through access holes in alignment gage housing and pushing plunger aft, against retracting spring tension, toward target plate hole.

u. Perform angularity check in accordance with steps v. through z.

v. Mount dial indicator on forward end of alignment plunger.

w. Position dial indicator for contact at 2.5 inch radius (just inside outer scale numerals). Zero dial indicator at 12 o'clock position.

x. Rotate transmission input quill such that indicator is at 6 o'clock position. Runout must be +0.018 to +0.042 inch.

y. Rotate transmission input quill such that indicator is at 3 o'clock position. Zero indicator.

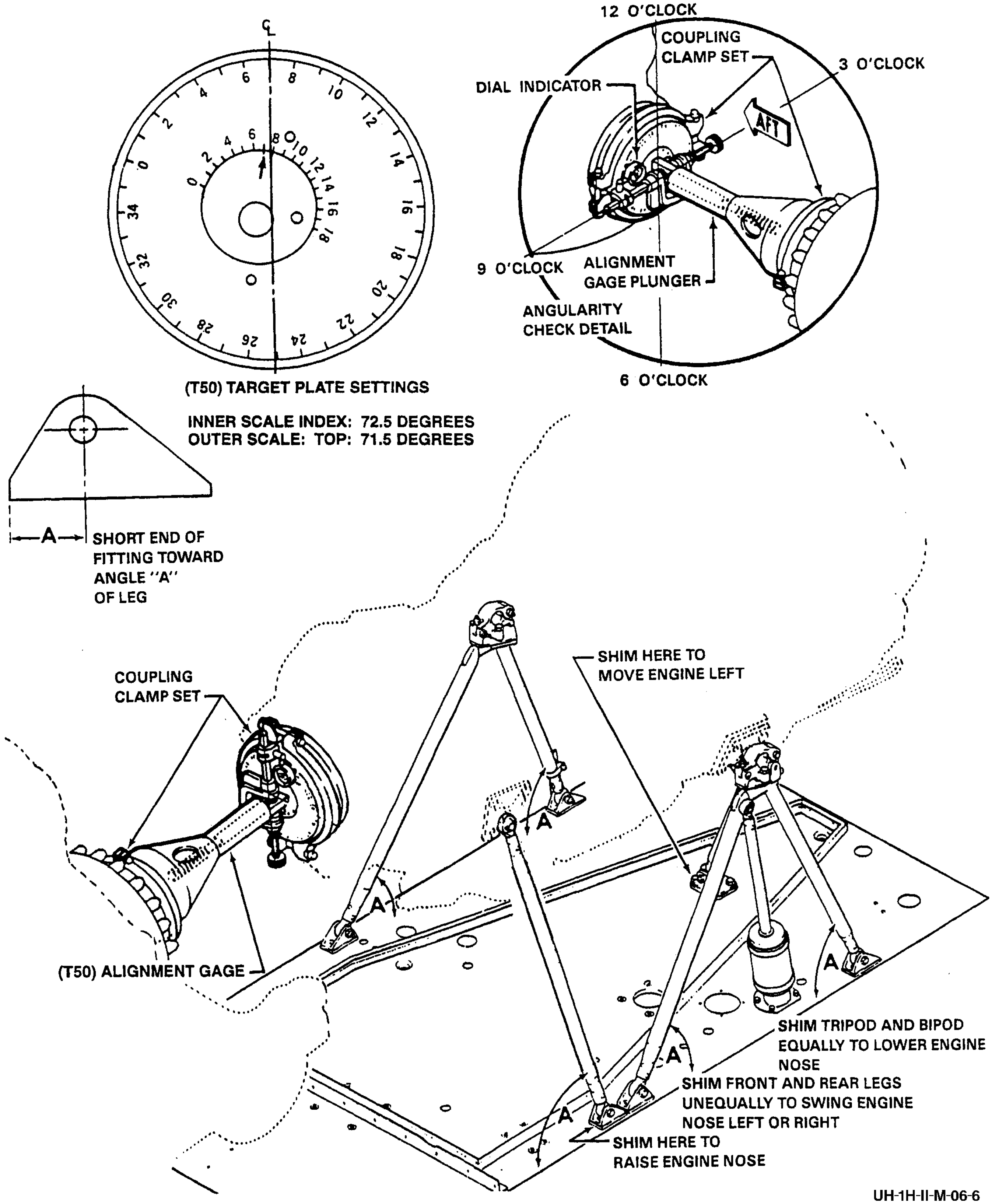


Figure 6-6. Engine to transmission driveshaft alignment

z. Rotate transmission input quill such that indicator is at 9 o'clock position. Runout must be -0.018 to +0.006 inch.

aa.Engine clearance at aft firewall should be a minimum of 0.1 inch. If engine does not clear firewall, engine mounts must also be shimmed to obtain required clearance.

ab.Loosen screws around intake bellmouth in forward firewall and around attaching ring in rear firewall to allow engine to shift as necessary during alignment.

ac. Shim engine tripod, bipod, and monopod as required to obtain required indicator readings and a plunger position that will allow plunger to enter target plate hole. (Refer to step t.) (Table 6-1.)

ad.Check engine-to-firewall clearance to insure 0.100 inch minimum clearance exists. (Refer to step aa.).

ae. If total laminated shim thickness (205-060-137-1 or 205-060-138-1) under any engine support fitting exceeds 0.188 inches, fabricate a plate of 2024-T4 aluminum alloy 0.100 inch thick using same outside dimensions as shim stock. Structural bond plate to engine service deck with adhesive (C-317). Total thickness of shims and plate under any engine mount fitting shall not exceed 0.288 inches.

af. Reinstall engine support fittings with short end of fitting facing toward angle A. (Figure 6-6.). Check support fittings screws and bolts for correct length.

ag. Interference between engine and aft firewall at 9 o'clock position (looking forward) may result with this realignment. If this condition occurs accomplish step ah. through aj.

ah.Remove aft upper firewall assembly and disassemble by removing 16 screws.

ai. Remove aft section of firewall web and enlarge the 16 holes by drilling to 5/16 inch.

aj. Deburr drilled holes. Reassemble firewall assembly using AN970-3 washers over enlarged holes and under the 16 screw heads.

ak.Tighten screws around intake bellmouth in forward firewall and around attaching ring in rear firewall.

al. Check engine-to-firewall clearance to ensure a 0.100 inch minimum clearance still exists. (Refer to step aa.).

am.When alignment is correct, remove engine alignment tool set (T50) and transmission leveling jacks (T54). Retighten screws in firewalls as necessary.

an.Remove maintenance hoist (T58) and clevis from top of main rotor mast.

ao. Install bolt (4, figure 6-4A) through transmission A-frame (5) and 5th mount eyebolt (9) and install washer (3) and nut (2). Torque nut 25 to 33 foot-pounds and install cotter pin (1).

ap.Install washer (11) and nut (12), on upper bolt assembly (10) in lift link (14). Torque nut 60 to 80 foot-pounds and cotter pin (13). Install access doors on pylon island.

aq.Install four shouldered washers (8), washers (7), and pylon lateral mount bolt assembly (6). Torque bolts 90 to 105 foot-pounds.

ar. Install main driveshaft assembly.

as. Check fuel control and governor linkage for proper rigging and cushion.

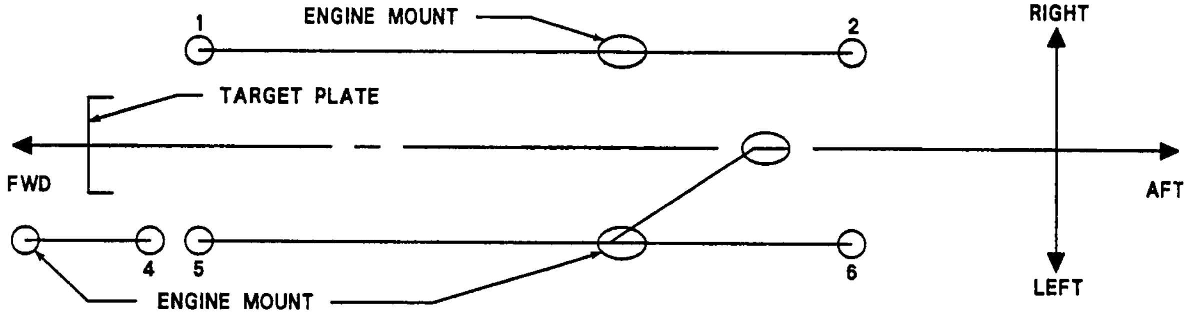
at. Reinstall transmission and engine cowlings.

SECTION II — MAIN TRANSMISSION

6-10. TRANSMISSION ASSEMBLY.

6-11. Description — Transmission Assembly. The transmission is located directly ahead of the engine and is suspended by pylon-isolating mounts on structural supports. The transmission is coupled to the engine by the main driveshaft and provides drive angle change and speed reduction through a train of spiral bevel gears and two-stage planetary gears to the main rotor mast.

Table 6-1A. Engine Mount Shimming



A Shim change of 0.010 inch at the following mounting locations will move the target plate alignment hole and indicator readings the indicated amounts. All shim changes are shown as shim additions. Shim removal will result in motions exactly opposite in direction by identical in magnitude. Proportional changes will occur with shim changes larger or smaller than 0.010 inch.

MOUNT LOCATION	MOVEMENT OF HOLE IN TARGET PLATE (3)	CHANGE IN INDICATOR READING: 6 o'clock (1)	CHANGE IN INDICATOR READING: 9 o'clock (2)
1 - Fwd leg bipod mount	Right 0.0124 Aft 0.0025 Up 0.0014	-0.0018	-0.002
2 - Aft leg bipod mount	Left 0.011 Fwd 0.0017 Up 0.007	-0.001	+0.002
3 - Aft inbrd leg, tripod	Left 0.0023 Fwd 0.0013 Dwn 0.00075	+0.00002	-0.0006
4 - Fwd monopod	Up 0.010 Aft 0.002	+0.0025	-0.000
5 - Fwd leg tripod mount	Left 0.016 Up 0.0023 Fwd 0.00014	-0.0016	+0.0001
6 - Aft leg tripod mount	Right 0.0041 Fwd 0.0013 Dwn 0.0079	-0.0013	-0.0006

NOTES

1. Indicator is assumed to be zeroed at 12 o'clock.
2. Indicator is assumed to be zeroed at 3 o'clock.
3. Equal shim changes under all of the mounts will raise or lower the hole in target plate by the amount of the shim change without changing dial indicator readings.

UH-1H-II-M-06-1A

a. A freewheel clutch in the input quill assembly disengages to allow main rotor and gear train to turn freely when engine is stopped or is idling below rotor driving speed, as in autorotational descent.

b. Secondary gear trains drive tail rotor shaft, DC generator, rotor tachometer generator, hydraulic pump, and transmission oil pump.

c. Output reduction ratios, expressed as revolutions of each driven unit per engine revolution, are as follows:

Main Rotor Mast	0.0491
DC Generator	1.0000
Tail Rotor Driveshaft	0.6516
Hydraulic Pump	0.6516
Tachometer Generator	0.6516
Oil Pump	0.6274

NOTE

After further reduction by 90-degree gearbox, the tail rotor turns at 0.25 engine rpm.

6-12. Lubrication — Transmission Assembly. Refer to Chapter 1 for procedures.

6-13. Inspection — Acceptance/Rejection Criteria — Transmission Assembly. Refer to table 6-2 for acceptance/rejection criteria.

6-14. Troubleshooting — Transmission Assembly. The troubleshooting chart (table 6-3) is a brief summary of troubles which may be encountered. Conditions and possible causes listed have been limited to those reasonably probable though not necessarily frequent in normal service. The troubles could become known through pilot reports or by inspection methods. They would be subject to some evaluation, although final corrective action by a higher level might be required in some instances. Conditions involving obvious major damage are omitted, as are those caused by accident or an unusual chain of events which would require evaluation by overhaul and repair facility.

NOTE

Low oil level will not cause a low oil pressure indication, provided sump contains enough oil to cover pump inlet. Oil temperature, however, might rise.

Effects of an oil leak will depend on its location in system and rate of leakage. An external leak can eventually allow sump to be pumped dry, causing internal failure of transmission. While oil remains to supply pump, the pressure relief valve would tend to maintain normal system pressure, compensating for leakage. This applies especially to leaks located between the pump and relief valve. Leaks occurring beyond relief valve could cause some indication of low oil pressure. Leakage to interior of transmission, while not affecting oil level, could starve lubrication areas beyond the leak and might affect indicated oil pressure and temperature.

Cumulative clogging of oil filter screens will not be shown by a gradual drop of indicated oil pressure. Pressure relief valve would maintain normal system pressure even if filter screens become so clogged as to force oil flow through filter bypass valve.

"Use of wrong oil" is omitted from causes of trouble on chart because any such event would be a special problem as to possible damage and corrective action. As to detecting such a condition, little can be said except that most oils which might be available to use by error would tend to cause high oil pressure and high oil temperature indications or excessive seal leakage.

6-15. Identification of Metal Particles — Transmission Assembly and Gearboxes.

WARNING

When any particles found are readily identifiable as fragments of transmission or gearbox parts, such as gears, nuts, bearings, oil slingers, thrust washers, snap-rings, lockwire, or other components; replace transmission or gearbox.

NOTE

The presence of metal particles does not necessarily indicate that the transmission or gearbox is no longer serviceable. The quantity, source, form and type of metal found, together with the service history of the particular transmission, must be taken into consideration. The time accumulated since the transmission or gearbox was new or overhauled, previous failures and the type of operation are important factors in determining the further serviceability of the unit. The particles found may be steel, tin, lead, aluminum, magnesium, copper (bronze), or phenolic in various shapes and quantities. See figure 6-7 for a detailed explanation of the action made necessary by the presence of each of the possible types of particles in the transmission or gearboxes.

Table 6-2. Inspection Requirements — Transmission Assembly

FIGURE NO.	DEFECTS	METHOD OF INSPECTION	REFERENCE INSPECTION	PARAGRAPH REPAIR
	Metal particles in:			
6-11	Transmission full flow debris monitor	Visual	6-31	
6-11	Magnetic plugs, electric chip detectors and pump screen	Visual	6-69	6-71
6-63	External filter	Visual	None	None
6-8	Transmission hardware, loose, missing or damaged	Visual	6-19	6-22
	Transmission case for cracks, nicks, dents or scratches	Visual	6-19	6-22
	Oil Leakage:			
6-28	Input Quill Assembly	Visual	6-77	6-78
6-33	Generator drive quill	Visual	6-84	6-86
6-36	Hydraulic pump and tachometer drive quill	Visual	6-92	6-94
6-38	Tail rotor drive quill	Visual	6-100	6-102
6-40	Main rotor mast	Visual	6-108	6-110
6-43	Pylon mounts and lift link security	Visual	6-116	6-116
6-44	Friction damper security	Visual	6-122	6-124

NOTE

A visual inspection of color and hardness will occasionally suffice to identify the particles. (Figure 6-7.) When visual inspection does not positively identify the particle, the kind of particle present may be determined by a few simple tests. Equipment to perform tests includes a permanent magnet, electric soldering iron, and concentrated nitric acid (C-432) and hydrochloric acid (C-431).

a. Steel. Steel particles may be isolated using a magnet.

b. Tin and lead. Tin and lead may be distinguished by their low melting points. Clean soldering iron; heat to 500°F. Do not overheat iron. Then tin it with 50-50 solder (50 percent lead and 50 percent tin). Wipe off excess solder. Tin or lead particles dropped on hot, soldering iron will melt and fuse with solder.

c. Aluminum. Aluminum particles may be determined by testing their reaction to hydrochloric acid (C-431). When a particle of aluminum is dropped in hydrochloric (muriatric) acid it will fizz with a rapid emission of bubbles. The particles will gradually disintegrate and form a black residue.

Table 6-3. Troubleshooting — Transmission Assembly and Tail Rotor Drive Installation

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Low oil pressure (on caution panel or pressure gage, but not both).

STEP 1. Faulty caution panel, transmission pressure switch, gage or circuit wiring.

Repair electrical circuit or replace faulty unit. (Chapter 8.)

2. Low oil pressure (shown on both caution panel and pressure gage.)

STEP 1. Pressure relief valve malfunction.

Adjust or replace valve (Paragraph 6-58.)

STEP 2. Clogged pump inlet screen.

Clean screen, check oil for chips or contamination. (Figure 6-7 and paragraph 6-69.)

STEP 3. Clogged debris monitor screen.

Clean screen, check oil for chips or contamination. (Figure 6-7 and paragraph 6-69.)

STEP 4. Clogged external oil filter.

Replace external oil filter element. (Paragraph 6-189.)

STEP 5. Faulty oil pump.

Replace pump. (Paragraph 6-36.)

STEP 6. Leakage or restriction between pressure relief valve and transmission.

Repair oil line connections or replace seals. (Paragraph 6-54.)

3. No oil pressure (with normal oil level).

STEP 1. Faulty gage or transmitter or circuit.

Repair circuit or replace faulty unit. (Chapter 8.)

STEP 2. Oil pump failure.

Replace transmission or if transmission is not internally damaged, pump only. (Paragraph 6-22 or 6-36.)

Table 6-3. Troubleshooting — Transmission Assembly and Tail Rotor Drive Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. No oil pressure (no oil supply).

STEP 1. Leak in system or failure to service.

Replace transmission, (Paragraph 6-17.). Replace oil cooler. (Paragraph 6-185.) Flush and repair external lines. (Paragraph 6-177.) Clean bypass valve and oil sump full flow debris monitor. (Paragraph 6-31.)

5. High oil pressure (on caution panel or pressure gage).

STEP 1. Faulty gage or transmitter or circuit.

Repair circuit or replace faulty unit. (Chapter 8.)

STEP 2. Pressure relief valve malfunction.

Adjust or replace. (Paragraph 6-53 or 6-58.)

6. High oil temperature (on caution panel or temperature gage, but not both).

STEP 1. Faulty caution panel, transmission temperature switch or gage circuit or unit.

Repair circuit or replace faulty unit. (Chapter 8.)

7. High oil temperature (shown on both caution panel and gage).

STEP 1. Thermal bypass valve malfunction. Replace oil cooler thermostatic valve. (Paragraph 6-193.)

STEP 2. Obstructed air flow around transmission.

Clear cowl opening and sump area.

STEP 3. Clogged oil jets.

Clean or replace jets. (Paragraph 6-48.) Replace transmission for internal damage. (Paragraph 6-17.) Inspect external oil filter. (Paragraph 6-187.)

STEP 4. Seized bearings or other internal transmission failure.

Replace transmission and mast assembly. (Paragraph 6-17 and 6-107.) Replace oil cooler and flush transmission oil system. (Paragraph 6-182 and 6-190.) Inspect external filter. (Paragraph 6-189.)

STEP 5. Oil cooler internally or externally clogged or obstructed.

Clean cooler core air passages. Replace cooler if internally clogged, and flush oil lines. (Paragraph 6-182.) Inspect transmission oil sump full flow debris monitor. (Paragraph 6-31.) Inspect pump screen, magnetic plug and electric chip detectors. (Paragraph 6-69.)

Table 6-3. Troubleshooting — Transmission Assembly and Tail Rotor Drive Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 6. Oil cooler blower malfunction (if engine oil temperature also high).

Replace blower or repair bleed air connection. (Chapter 4.)

8. Metal chips on generator drive quill magnetic plug, transmission electric chip detectors pump screen, or oil sump full flow debris monitor.

STEP 1. Internal transmission failure of gears or bearings.

If metal particles exceed limits of figure 6-7, replace transmission. (Paragraph 6-17.) Replace oil cooler and flush transmission oil system (Paragraph 6-182 and 6-192.) Clean external oil filter bypass valve and replace external oil filter element.

9. Excessive pylon motion.

STEP 1. Pylon lateral mounts worn or improperly installed.

Repair or replace mounts. (Paragraph 6-115.)

STEP 2. Faulty pylon mount friction dampers.

Replace friction dampers. (Paragraph 6-120.)

STEP 3. Fifth mount worn or faulty.

Replace (Paragraph 6-115.)

10. Grease leakage at tail rotor drive couplings.

STEP 1. Damaged seal or end cap.

Replace seal in coupling. Inspect end cap for seal damage (outside diameter). (Paragraph 6-102 or Chapter 1.)

11. Tail rotor driveshaft vibration.

STEP 1. Clamps loose or incorrectly positioned.

Torque clamps and ensure correct positioning. (Paragraph 6-134.)

STEP 2. Clamp halves mismatched.

Replace clamp set. (Paragraph 6-133.)

STEP 3. Hanger bearings or couplings incorrect part number.

Replace hanger assembly. (Paragraph 6-139.)

Table 6-3. Troubleshooting — Transmission Assembly and Tail Rotor Drive Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 4. Driveshaft damaged.

Replace damaged driveshaft section.

STEP 5. Driveshaft balance strips bent or missing.

Replace driveshaft section. (Paragraph 6-131.)

12. Binding or roughness when manually rotating driveshaft.

STEP 1. Check hanger assemblies for dry or faulty bearings. Isolate hanger assemblies by disconnecting driveshafts, as required.

Replace faulty hanger assemblies. (Paragraph 6-139.)

STEP 2. Check flexible couplings lack of lubricant, radial looseness, and roughness. Isolate hanger assemblies by disconnecting driveshafts as required.

Replace faulty hangers, quills or gearbox. (Paragraphs 6-98, 6-139, 6-152, or 6-175.)

STEP 3. Disconnect driveshafts from intermediate and tail rotor gearbox. Rotate quills and check for internal binding or roughness.

Replace defective gearbox. (Paragraphs 6-152 or 6-175.)

NOTE

Since magnesium and aluminum react similarly in hydrochloric acid (C-431), when in doubt drop particle into nitric acid (C-432). Aluminum does not react noticeably in nitric acid.

d. Copper or bronze and magnesium. Copper or bronze and magnesium may be differentiated by their respective reactions to nitric acid (C-432). When a particle of copper or bronze is dropped in nitric acid it forms a bright green cloud in the acid. When a particle of magnesium is dropped into nitric acid if fizzes with a rapid emission of bubbles. Phenolic and aluminum do not react noticeably to nitric acid.

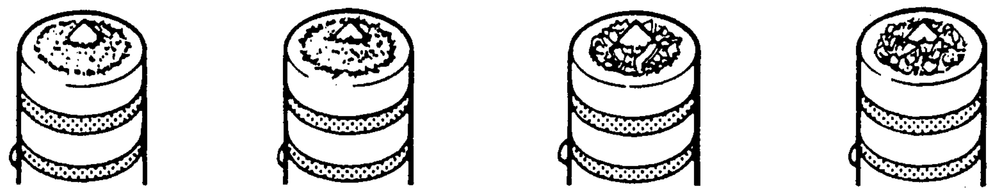
6-16. Serviceability Check For Transmission and Tail Rotor Drive Gearboxes. The following steps shall be performed when any doubt exists as to serviceability of a transmission or tail rotor drive gearbox after finding metal particles in oil.

a. Transmission:

(1) Drain transmission, oil cooler, and connecting lines. Insert magnet in pump screen boss or plug boss to check for additional contamination.

(2) Flush oil cooler and connecting lines with clean approved lubricating oil (C-030).

(3) Clean and reinstall chip detector plugs, pump inlet screen, and oil sump debris monitor. Replace external oil filter element.



DETAIL A DETAIL B DETAIL C DETAIL D

METAL PARTICLES CONTAMINATION — COMPONENT OIL

PARTICLE	QUANTITY AND/OR SIZE	ACTION REQUIRED	NOTES
Steel	Fuzz, Fine hair-line particles. (Detail A.)	None	Result of normal wear. May have exaggrated appearance because of oil.
	Particles in splinter or granular form. (Detail B and C.)	**Disassemble component, as required, to determine extent of damage. Replace component if necessary.	Usually indicates failure.
	Thin flakes not exceeding 1/64 (0.015) inch in thickness and 1/16 (0.060) inch in length. Quantity not to exceed 10 flakes. (Detail D.)	**Disassemble component, as required to determine extent of damage.	Small quantity may not indicate bearing failure.
	More than 10 flakes not exceeding 1/64 (0.015) inch in diameter and 1/16 (0.060 inch in length; and quantity of flakes exceeding the above dimensions.	**Disassemble component, as required to determine extent of damage. Replace component if necessary.	Usually indicate failure. May be bearing in one of accessory quills.
Aluminum or Magnesium	Particles in granular form, or like miniature lathe turnings.	**Disassemble component, as required to determine extent of damage.	May be result of use of these materials as mallets or drifts during assembly. May indicate wear of oil pump interior surfaces or abnormal interference.
Copper (Bronze)	Particles in granular form.	**Disassemble component, as required, to determine extent of damage. Replace component if necessary.	May indicate excessive wear of bearing cages as result of bearing failure.
Phenolic *Rubber		None	Results of the use of mallets and drifts during assembly or same as Copper (Bronze) above.

* From cut packing or gasket.
** Disassembly of drive quills is an overhaul function.

UH-1H-II-M-06-7

Figure 6-7. Particles contamination chart

CAUTION

Condition of packings, seals, and gaskets shall be inspected before installation of units. Replace if damaged.

(4) Service transmission with clean approved lubricating oil (C-030).

(5) Ground run transmission for 1 hour at 100% rpm, with maximum collective pitch that can be maintained without becoming airborne, and with tail rotor pedal position equivalent to flight position.

(6) Drain transmission oil into clean container and inspect for chips. Inspect oil sump debris monitor filter and chip detectors.

(7) If number of particles has increased, or if there are particles that can be visually identified as chips or flakes from a gear or bearing, replace transmission, mast assembly, and transmission oil cooler, and flush oil lines. If number of particles has decreased and only minute particles are found, continue transmission in service.

(8) After 5 hours of operation, inspect oil sump debris monitor filter and chip detector.

(9) If the number of particles has increased, or if there are particles that can be visually identified as chips or flakes from a gear or bearing, replace transmission, mast assembly, and transmission oil cooler, and flush oil lines. If the number of particles has decreased and only minute particles are found, continue the transmission in service.

b. Tail rotor gearbox or intermediate gearbox.

(1) Drain gearbox and inspect oil for chips.

(2) Flush gearbox with clean approved lubricating oil (C-030). Inspect oil for chips.

(3) Clean and reinstall chip detector and drain plug, using serviceable packings and gaskets.

(4) Service gearbox with clean approved lubricating oil (C-030).

(5) Operate gearbox at 100% rpm for 1 hour at flight equivalent tail rotor pedal positions.

(6) Drain oil in clean container and inspect for chips. Inspect chip detector.

(7) If number of particles has increased, or if there are particles that can be visually identified as chips or flakes from a gear or bearing, replace gearbox. If number of particles has decreased and only minute particles are found, continue gearbox in service.

(8) After 5 hours of operation, drain oil in clean container and inspect for chips. Inspect chip detector.

(9) If the number of particles has increased, or if there are particles that can be visually identified as chips or flakes from a gear or bearing, replace gearbox. If the number of particles has decreased and only minute particles are found, continue gearbox in service.

6-17. Removal — Transmission Assembly.

Premaintenance Requirements for Removal and Disassembly of Transmission Assembly

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T11), (T12), (T13), (T21), (T23), (T24), (T44), (T58), (T65)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials (C-030), (C-110), (C-124), (C-204), (C-212), (C-407),(C-410), (MIL-D-3464) (C-007)	(C-014), (C-101), (C-201), (C-203), (C-304), (C-308), (C-427)
Special Environmental Conditions	For disassembly - Clean, Dust Free Area.

a. When the transmission is to be replaced, unless conditions prevent operation, perform a 10 minute ground runup and drain operating oil. If runup is not practical, remove mast assembly and spray the interior of the transmission through the top opening with approximately 1 gallon of lubricating oil (C-030). While spraying, manually rotate internal gears and bearings with input drive quill and drain oil. Attach tag to the transmission stating: TRANSMISSION PRESERVED WITH LUBRICATING OIL.

b. Open transmission fairing and remove engine intake fairing.

c. In cabin remove access doors from both sides of pylon island structure.

d. Disconnect battery and any external power source. Disconnect electrical leads from main DC generator (11, figure 6-8).

e. Disconnect transmission electrical harness at connector on right-hand pylon support.

f. Remove hydraulic pump from drive pad (10) on right side of transmission sump case.

g. Drain oil from transmission sump.

h. Disconnect transmission oil inlet, outlet, and drain hoses (9, figure 6-8).

i. Remove upper section of induction baffle, and upper left section of engine intake screen.

j. Remove main driveshaft (3). (Paragraph 6-5.)

k. Remove other sections of induction baffle.

l. Remove bolt (13) securing eyebolt (14) of pylon fifth mount (15) to support case (7).

m. Disconnect forward section of tail rotor driveshaft by removing coupling clamps at tail rotor drive quill (8) on transmission and at first hanger bearing. (Paragraph 6-131.) Move driveshaft section aft out of way.

n. Erect maintenance hoist (T58) through left aft side of cabin roof, with end fitting in bearing plate on cabin floor (or use any hoist having 1000 pound capacity).

CAUTION

Before using hoist (T58) to remove or install transmission, place suitable support under tail boom to steady fuselage if a tail-heavy condition occurs.

NOTE

For ease of rotating the upper tower of maintenance hoist, the pivot tube and teflon bushings should be cleaned before each use.

o. Removal of rotating controls for removal of transmission.

(1) Remove stabilizer bar (3, figure 6-9) as follows:

(a) Disconnect pitch change link (23) from pitch horn and install grip positioning link (T44).

(b) Disconnect damper link tube (4) from stabilizer damper (18).

(c) Disconnect control tube (5) from scissors and sleeve assembly (16).

p. Remove main rotor hub and blade assembly as follows:

(1) Remove lockwire, bolt, and retaining nut lock (22, figure 6-9) at side of retaining nut (21). Use power wrench (T11), reaction torque adapter (T13), or socket (T12) to remove nut (21) and washer (20).

(2) Position suitable hoist above mast. Attach two lifting slings (T24) to main rotor hub.

(3) Slowly lift main rotor (6), until cone set (19) are free. Remove cone set. Lift hub clear of mast (8).

CAUTION

Do not allow cone set to fall from mast.

(4) Remove upper retainer ring (17). Remove four nuts and washers from adapter bolts (9). Remove stabilizer dampers (18). Remove lower retainer ring (17).

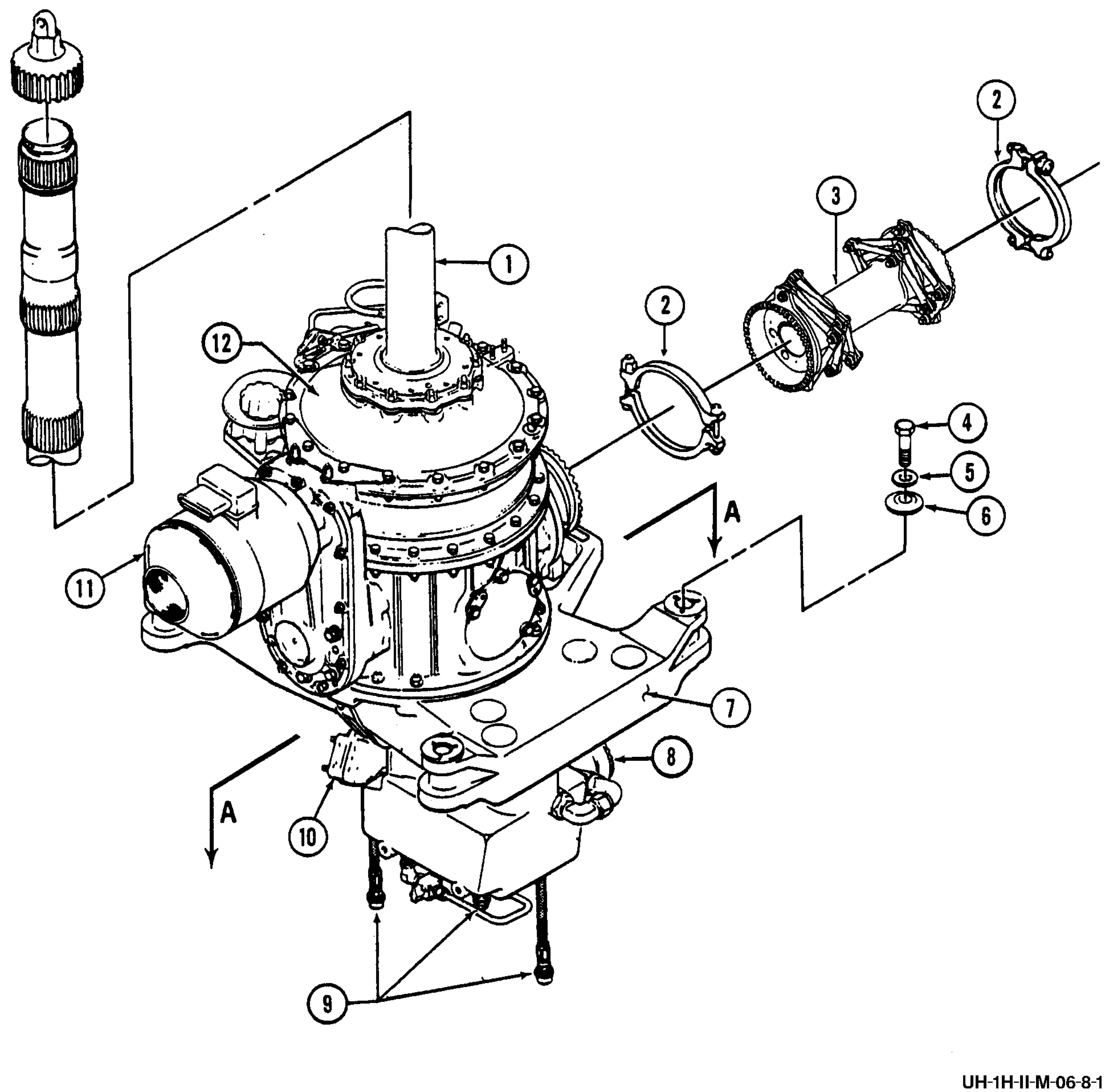
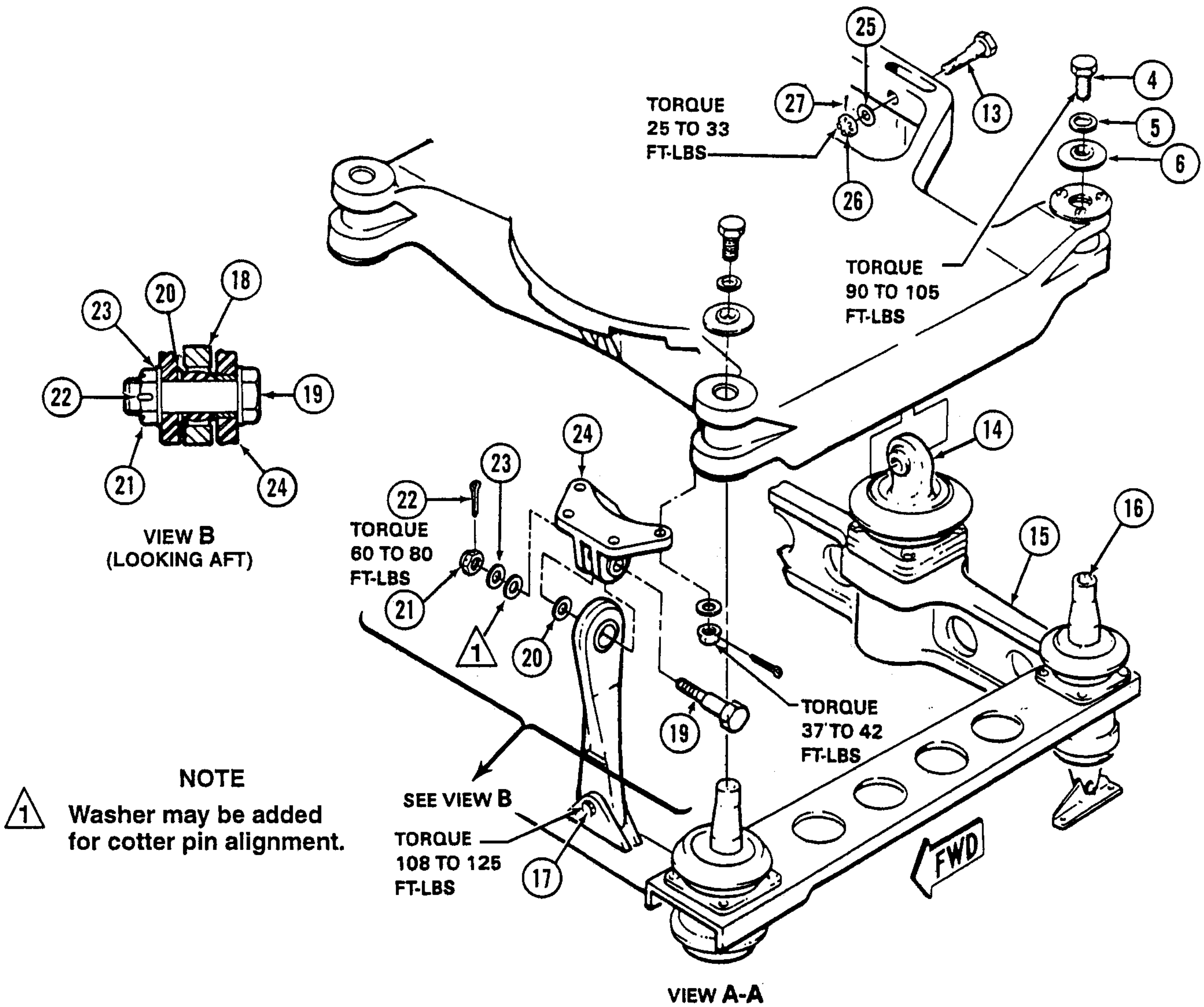


Figure 6-8. Transmission assembly — removal and installation (Sheet 1 of 2)



1. Mast
2. Clamp
3. Main driveshaft
4. Bolt (with locking insert)
5. Washer
6. Shouldered washer
7. Support case
8. Tail rotor drive quill
9. Drain valve
10. Hydraulic drive quill
11. DC generator
12. Transmission
13. Bolt assembly
14. Eyebolt
15. Fifth mount support
16. Bolt
17. Bolt assembly
18. Lift link
19. Bolt assembly
20. Washer
21. Nut
22. Cotter pin
23. Washer
24. Lift link fitting
25. Washer
26. Nut
27. Cotter pin

UH-1H-II-M-06-8-2

Figure 6-8. Transmission assembly — removal and installation (Sheet 2 of 2)

1. Stabilizer support
2. Mixing lever
3. Stabilizer bar assembly
4. Damper link tube
5. Control tube
6. Main rotor
7. Pitch horn
8. Mast
9. Adapter bolts
10. Elevator control tube
11. Elevator control tube bellcrank to swashplate
12. Collective control tube
13. Collective levers
14. Swashplate and support assembly
15. Cyclic control tube
16. Scissors and sleeve assembly
17. Retainer rings (2 reqd)
18. Stabilizer dampers
19. Cone set
20. Washer
21. Retaining nut
22. Retaining nut lock
23. Pitch change link

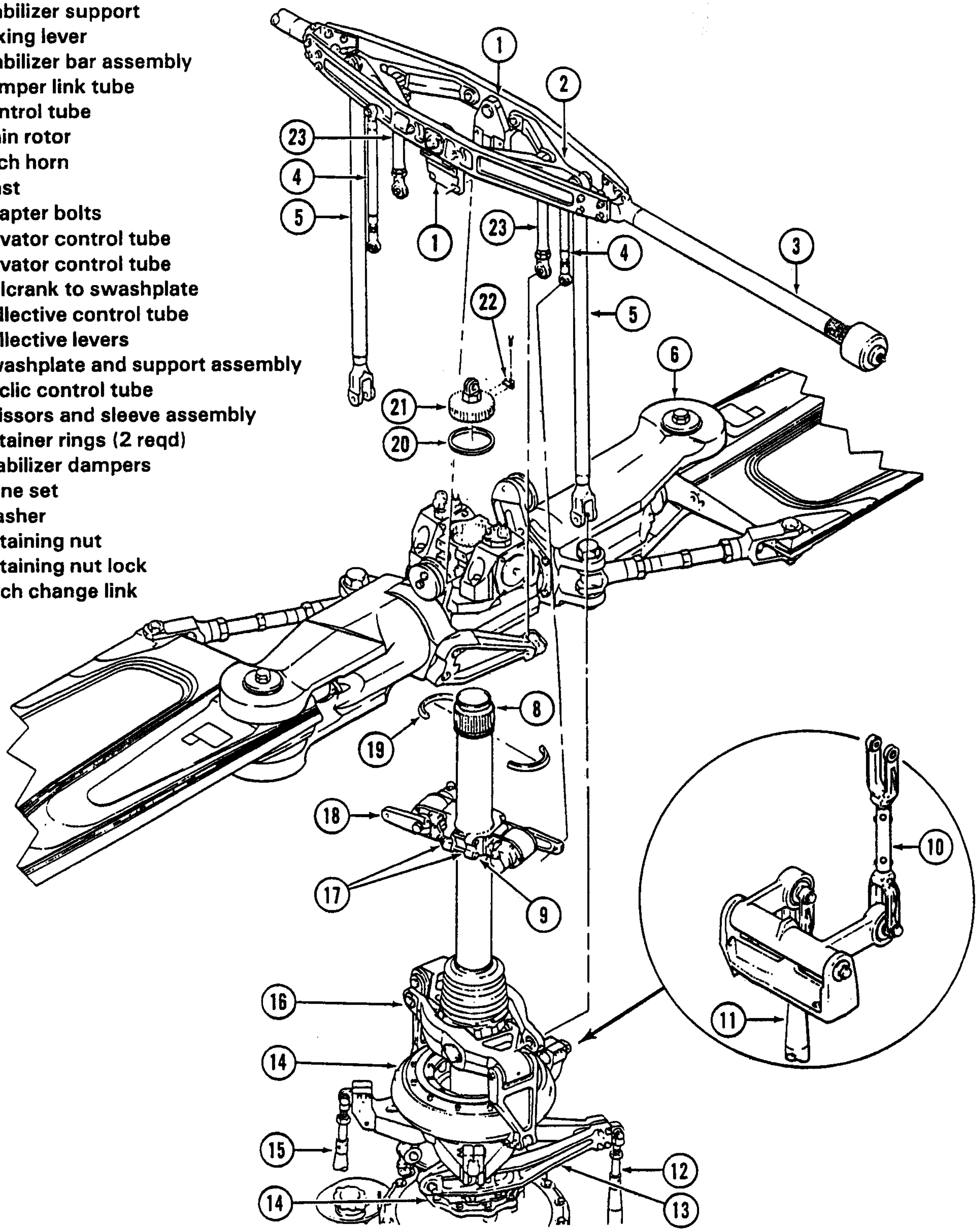


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Figure 6-9. Rotating controls

q. Remove swashplate and support assembly (14) and scissors and sleeve (16) as follows:

(1) Disconnect cyclic and elevator control tubes (10 and 15) from trunnions on swashplate. Insert a piece of folded paper or cardboard into each of four gimbal support clevises to prevent damage in handling.

(2) Disconnect collective control tube (12) from collective levers (13).

(3) Remove eight bolts which secure swashplate support assembly (14) to mast bearing plate on transmission.

(4) Carefully lift assembly from mast (8).

(5) Disconnect elevator control tube (11).

(6) Install nut on top of mast, attach hoist and take up cable slack.

r. Disconnect lift link from transmission as follows:

(1) Remove cotter pin (22, figure 6-8), nut (21), and washers (23) from bolt assembly (19).

(2) Raise transmission sufficiently to free bolt assembly (19) and remove bolt assembly and washer (20). Keep attaching parts with link.

(3) Disconnect fifth mount eyebolt (14) from mounting point on aft side of transmission support case by removing bolt assembly (13). Keep attaching parts with mount. Remove bolts at each end of fifth mount support (15) and remove fifth mount support.

(4) Remove retaining bolt (4), washer (5), and large shouldered washer (6) from top end of each of four main mount bolts (16) at corners of transmission support case.

(5) Carefully hoist mast (1) and transmission (12) assembly clear of fuselage structure.

(6) Place transmission (12) on transmission stand (T23) or equivalent. Secure with bolts through main mount points (four places) on transmission support case.

6-18. Transmission Build-Up.

a. Install adapter, (T21), on stand, (T23).

b. If not previously accomplished, install cover lift plate (3, figure 6-9), steel washers (2) and nuts (1).

c. Remove transmission (5) from shipping container and position on stand, (T23). Secure transmission to stand with bolts.

d. If transmission is to be installed in helicopter immediately, open valve (9) and allow all preservative oil to drain from transmission. After oil has drained, close valve (9).

CAUTION

If any oil lines from a transmission that was removed due to internal failure or metal contamination are to be installed on replacement transmission, ensure that all foreign particles are cleaned from hoses. Mast assemblies from transmissions described above must be overhauled prior to further use.

NOTE

If components from transmission that was removed from helicopter are to be used for build-up of replacement transmission, position the transmissions near each other to facilitate transfer of components.

e. Install mast (18) in transmission (5).

f. Remove cover (17) and install generator drive quill (15) (paragraph 6-88).

NOTE

Hydraulic pump must be installed after transmission is installed in helicopter. Leave cover installed at this time.

g. Remove cover (10) and install tachometer generator (24).

h. Remove plug (22) and packing (21). Install oil pressure transmitter (40) and packing (39).

i. Remove cover input quill port (6) from transmission (5). Install input quill (26).

j. Remove cap (20). Install oil pressure switch (36) and packing (38).

k. Install electrical harness (32) as follows:

NOTE

Refer to Chapter 9 for electrical wiring diagrams if necessary to confirm wire numbers.

(1) Connect electrical connector (42) to oil pressure switch (36).

(2) Connect electrical connector (41) to oil pressure transmitter (40).

(3) Connect ground wire electrical terminal to ground connection (33).

(4) Install six clamps (30).

(5) Remove cover (19). Install electrical terminal and nipple (35) on thermo-switch (23).

(6) Connect electrical terminal and nipple (37) to main input gear quill electric chip detector (8).

(7) Connect electrical terminal and nipple (34) to mast bearing electrical chip detector (4).

(8) Install four clamps (30).

(9) Install electrical terminal and nipple (29) on sump electric chip detector (27).

(10)Install electrical connector (28) on tachometer generator (24) and lockwire (C-405).

(11)Install electrical connector (43) on thermoswitch (25) and lockwire (C-405).

(12)Install caps, covers, and plugs removed in preceding steps on transmission that was removed from helicopter.

6-19. Inspection — Transmission Assembly.

a. Inspect the following transmission parts for metal particles or other contaminants. (Paragraph 6-15 and figure 6-6.)

(1) External oil filter.

(2) Transmission full flow debris monitor.

(3) Transmission screen.

(4) Chip detector plugs four places.

b. Inspect for loose, missing, or damaged bolts or studs.

c. Check for damaged locked-in studs or inserts.

d. Inspect transmission case for damage and/or cracks in the web above input quill.

e. Visually inspect all threaded fittings for thread damage and cracks.

f. Inspect drive quills for condition, leakage, and security of mounting. If removed, inspect for rough or binding bearings, gear wear pattern, nicks, cracks, or galling.

(1) 3100 Hour Scheduled Transmission Inspection. (Paragraph 6-21.)

(2) Input drive quill. (Paragraph 6-74.)

(3) 1200 hour scheduled freewheeling clutch inspection. (Paragraph 6-78 c.)

(4) Generator drive quill. (Paragraph 6-84.)

(5) Hydraulic pump and tachometer drive quill. (Paragraph 6-92.)

(6) Tail rotor drive quill. (Paragraph 6-101.)

g. Inspect pylon mounts and lift link for condition. (Paragraph 6-116.)

h. Inspect friction dampers for condition. (Paragraph 6-122.)

i. Inspect main rotor mast for condition. (Paragraph 6-108.)

j. Inspect transmission oil thermal (bypass) oil cooler, and connecting lines for condition. (Paragraph 6-193.)

k. Inspect cowl opening and sump area for obstruction.

l. Check oil level and service transmission. (Chapter 1.)

6-20. Cleaning — Transmission Assembly.

a. Clean transmission assembly and attaching parts with solvent (C-304). Do not allow solvent to enter transmission openings or to contact elastomeric oil seals.

b. Use a soft bristle brush to aid in removing heavy deposits of grease and oil.

c. Dry parts with filtered, compressed air.

6-21. 3100 Hour Scheduled Transmission Inspection.

a. Disassemble transmission sufficiently to remove the main input driven gear quill. (Refer to BHT-212-CR&O-1.)

b. Remove gear support case and debris collector to gain access to spiral bevel gear retaining bolts.

(1) Using torque wrench, check each of the 32 bevel gear retaining bolts for minimum torque of 300 inch-pounds.

NOTE

Torque check is accomplished with increasing torque, not break away or loosening torque.

(2) If torque value of any one retaining bolt is less than 300 inch-pounds, remove bevel gear and inspect mating surfaces of gear and shaft for fretting damage. (Refer to BHT-212-CR&O-1.)

(3) The maximum acceptable depth is 0.0005 inch. Depth may be measured by using a dial indicator with a needle pointed probe. Pitting of measurable depth is acceptable only in the area on the gear or shaft surface outside of the diameter of the bolt holes, and is not acceptable with 0.100 inch of the edge of a bolt hole. Damage in excess of these limits is cause for rejection of part.

c. Inspect upper flange surface and pilot diameter of ring gear and mating surfaces of top case for fretting and wear. (Refer to BHT-212-CR&O-1.)

d. Inspect lower flange surface and pilot diameter of ring gear and mating surfaces of bevel gear support case for fretting and wear. (Refer to BHT-212-CR&O-1.)

e. Remove transmission port cover (7, figure 6-10) from left side transmission (5).

f. Visually check the vibro-etched, index marks on input pinion and inner race of the bearing set for alignment. Inspection may be accomplished with input quill installed by viewing pinion shaft and bearing inner race between pinion teeth and main case.

NOTE

If index marks indicate rotational movement between the pinion and inner race of the bearing set, remove quill and bearing set and inspect pinion bearing journal for signs of fretting and bearing inner race spinning. Visually inspect oil holes in input quill sleeve to insure that they are free of any foreign material. Inspect detail parts to determine cause for bearing inner race rotation. Replace parts as required.

g. Inspect bevel gear and main input pinion for general condition and wear pattern. (Refer to BHT-212-CR&O-1.)

h. Inspect planetary ring gear, sun gears, and planetary pinions for general condition and wear pattern.

i. Inspect all parts of upper and lower planetary visually for excessive wear and damage. Parts that show evidence of wear or physical damage must be checked dimensionally. (Refer to BHT-212-CR&O-1.)

j. Remove tail rotor drive quill to gain access to accessory drive and sump gears. Visually inspect accessory case input quill gear and tail rotor drive quill gear for general condition and wear pattern. (Refer to BHT-212-CR&O-1.)

k. Inspect freewheeling clutch assembly (paragraph 6-78 c.).

l. Reassemble transmission. (Refer to BHT-212-CR&O-1.)

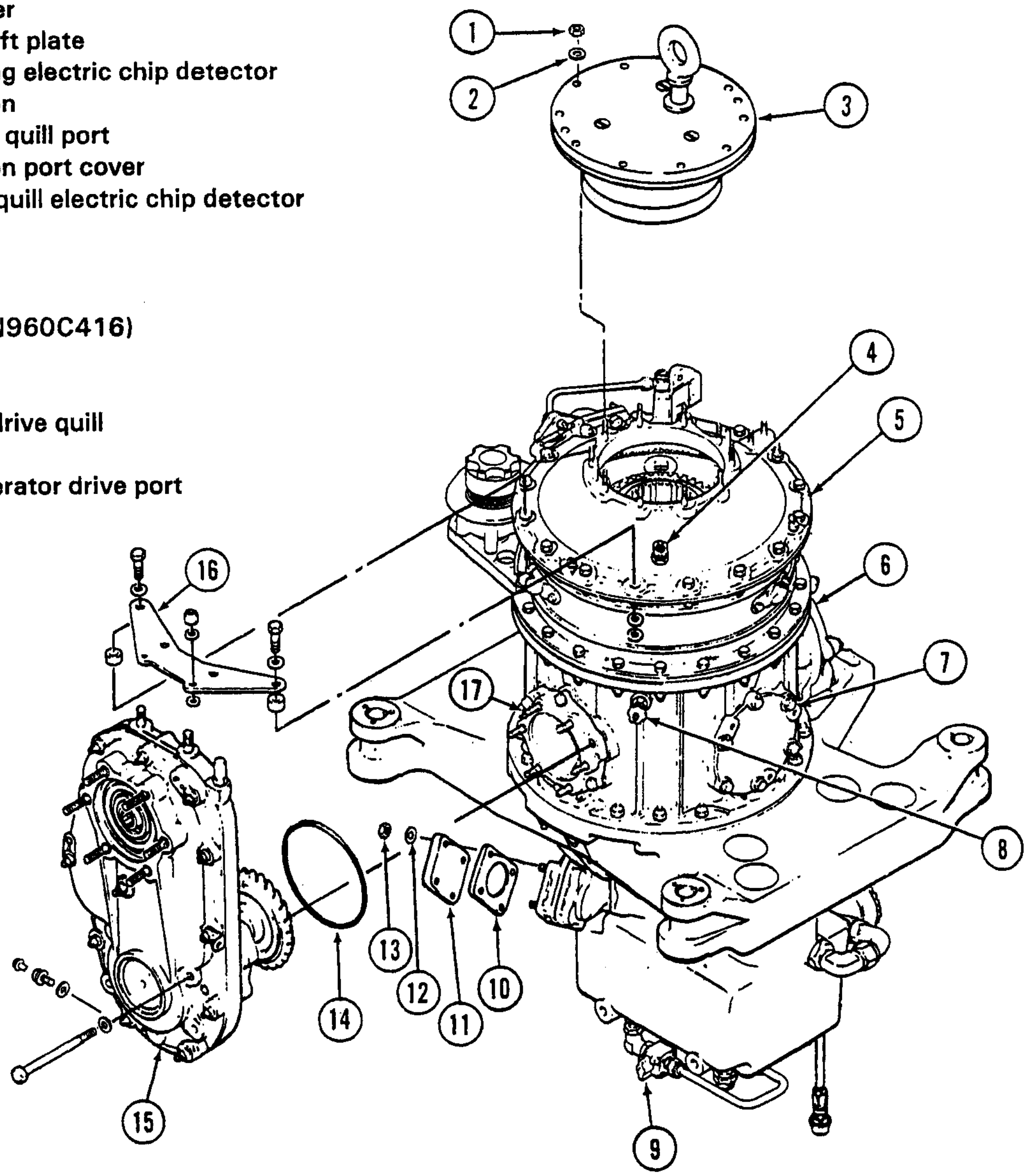
m. For installation of generator drive quill refer to paragraph 6-88.

6-22. Repair or Replacement — Transmission.

CAUTION

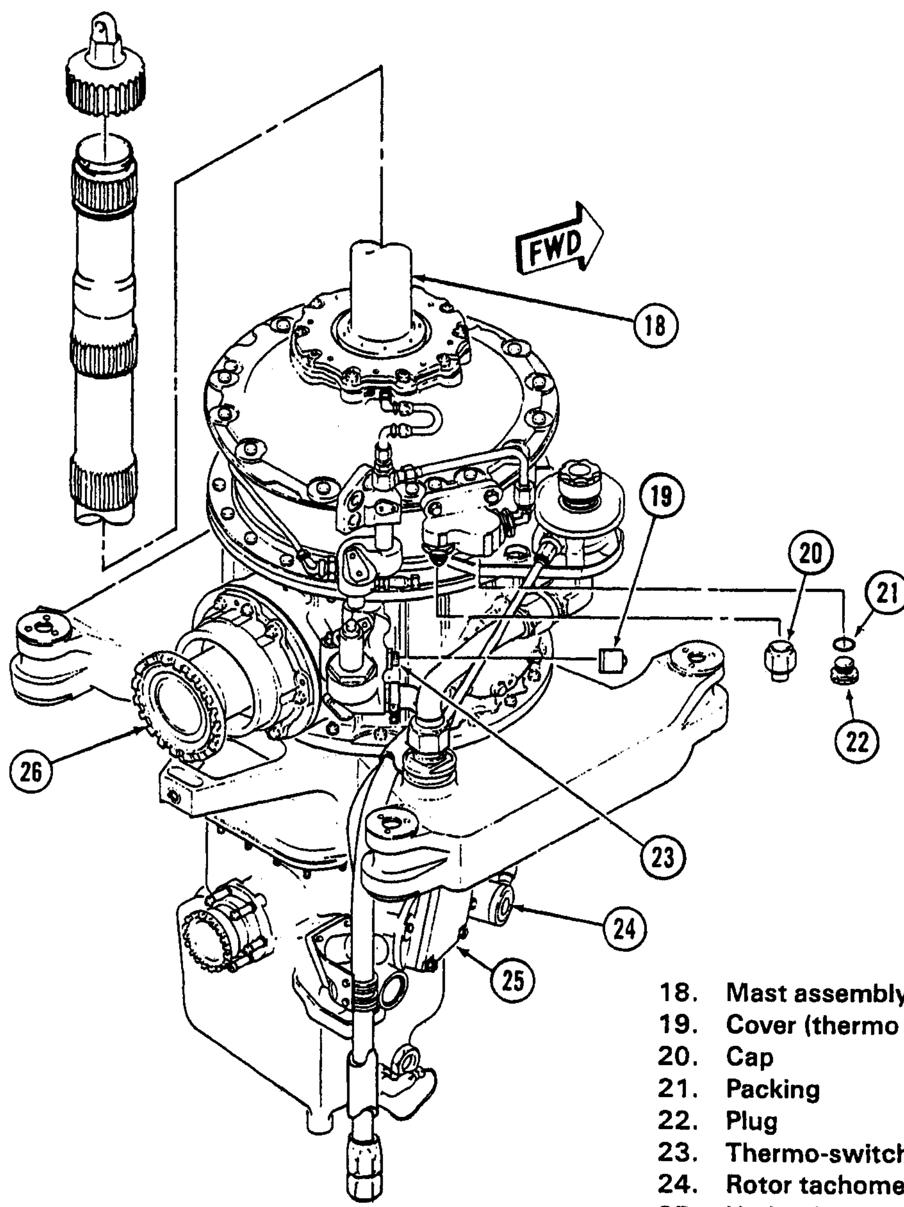
All parts removed from the transmission shall be inspected to determine serviceability. If the transmission was removed prior to normal overhaul life for metal particles in the oil system, the generator drive quill, hydraulic pump and tachometer drive quill, and mast assembly shall not be used on the replacement transmission. In addition, the transmission oil cooler shall be replaced and all hoses, tubes, and fittings shall be flushed. Thermo bypass valve to be cleaned and the external oil filter replaced.

1. Nut
2. Steel washer
3. Cover and lift plate
4. Mast bearing electric chip detector
5. Transmission
6. Cover input quill port
7. Transmission port cover
8. Main input quill electric chip detector
9. Drain valve
10. Gasket
11. Cover
12. Washer (AN960C416)
13. Nut
14. Packing
15. Generator drive quill
16. Bracket
17. Cover, generator drive port



UH-1H-II-M-06-10-1

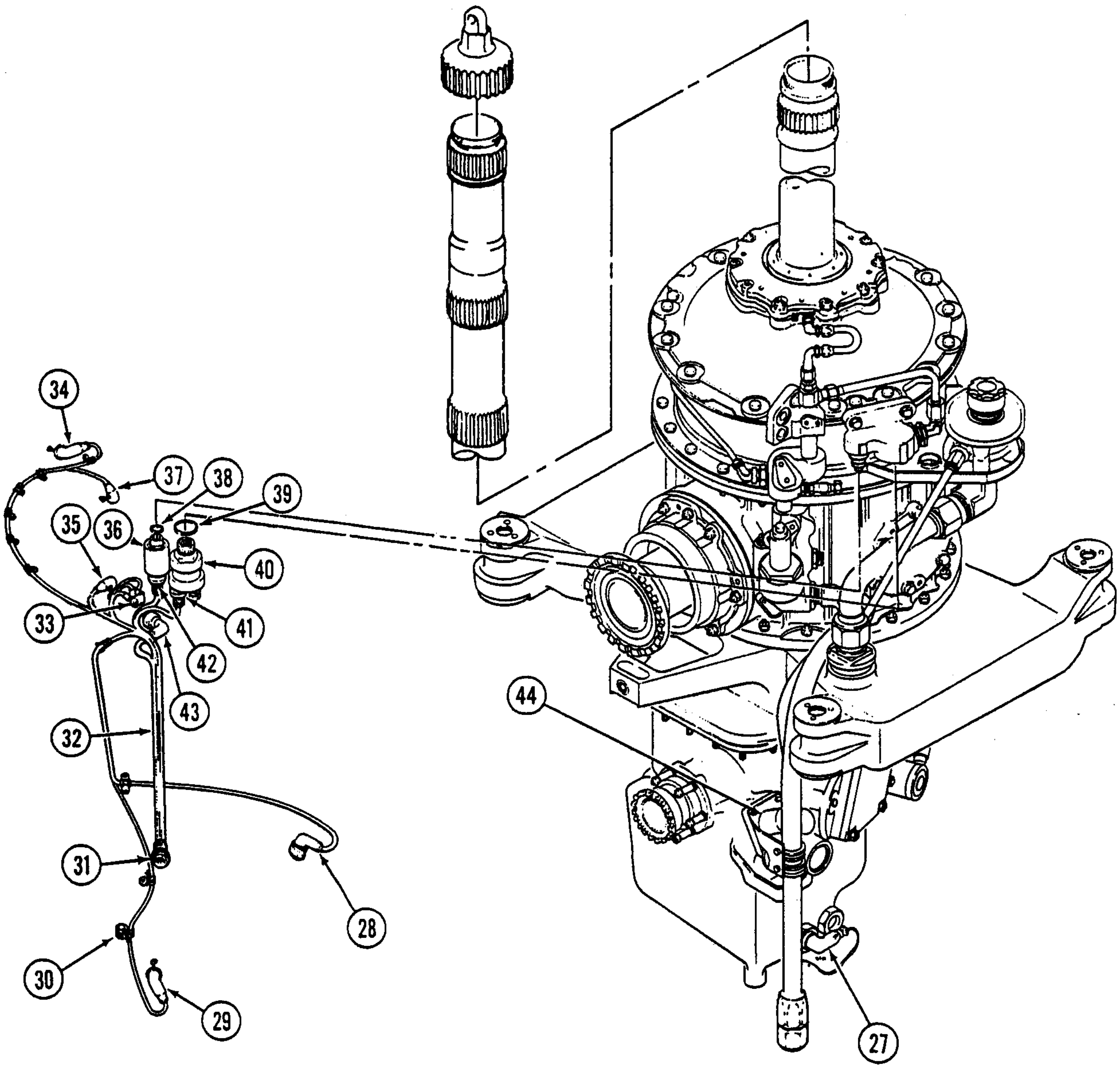
Figure 6-10. Transmission build-up (Sheet 1 of 3)



18. Mast assembly main rotor
19. Cover (thermo switch)
20. Cap
21. Packing
22. Plug
23. Thermo-switch
24. Rotor tachometer generator
25. Hydraulic pump drive quill cover
26. Input quill

UH-1H-II-M-06-10-2

Figure 6-10. Transmission build-up (Sheet 2 of 3)



27.	Sump electric chip detector	36.	Oil pressure switch
28.	Electrical connector	37.	Electrical terminal and nipple
29.	Electrical terminal and nipple	38.	Packing
30.	Clamps (ten)	39.	Packing
31.	Electrical connector	40.	Oil pressure transmitter
32.	Electrical harness	41.	Electrical connector
33.	Ground connection	42.	Electrical connector
34.	Electrical terminal and nipple	43.	Electrical connector
35.	Electrical terminal and nipple	44.	Full flow debris monitor

UH-1H-II-M-06-10-3

Figure 6-10. Transmission build-up (Sheet 3 of 3)

a. If generator drive quill (15, figure 6-10) was removed for installation on a replacement transmission accomplish the following:

(1) Replace (without repair) if metal particles were found in oil system.

(2) Replace (without repair) if quill sleeve OD is less than 4.9989 inches or is corroded and pitted.

(3) Replace (without repair) if quill bearings are rough or binding.

(4) Replace (without repair) if quill gear pattern shows excessive nicks, scratches, or galling.

(5) Replace (without repair) if there are excessive metal particles (figure 6-7) on the generator drive quill chip detector.

(6) Repair of quill leakage or damage. (Paragraph 6-83.)

b. If hydraulic pump and tachometer drive quill (46, figure 6-10) was removed for installation on a universal transmission accomplish the following:

(1) Replace (without repair) if metal particles were found in oil system.

(2) Replace (without repair) if quill sleeve OD is less than 3.6247 inches.

(3) Repair of quill leakage or damage. (Paragraph 6-94.)

c. Replace oil system fittings, hoses, or tube assemblies that are crushed or damaged.

d. Replace (without repair) pylon mounts (10 and 11, figure 6-8) and lift link if damaged or deteriorated. (Paragraph 6-116.)

e. Replace (without repair) friction dampers if damaged or deteriorated. (Paragraph 6-122.)

f. Replace (without repair) main rotor mast (1, figure 6-8) if damaged or corroded. Replace seal. (Paragraph 6-110.)

g. Replace loose or damaged transmission case studs. (Paragraph 6-23.)

h. Repair nicks, scratches, and gouges at transmission lower sump. (Paragraph 6-24.)

i. Replace damaged clamps and hardware. Replace aluminum washers, shims, and preformed packings that have been disturbed.

6-23. Replacement Damaged Studs — Transmission Assembly.

NOTE

These instructions are for standard type studs; threaded directly into transmission case.

a. Measure stud height, if possible, before removal. Using a stud extractor, turn stud out slowly and evenly to avoid seizure and breakage. If broken off, drill hole in stud on center and using stud extractor screw stud out.

b. Select replacement stud by reference which provides an undersize and four oversizes (by 0.003 inch increments) to each standard stud. Generally, next larger oversize will be required for proper installation torque. Start new stud into tapped hole with fingers. If it turns freely beyond two turns, select next oversize which will become tight in one or two turns with fingers.

c. Remove replacement stud, and coat end with unreduced zinc chromate primer (C-201) to prevent contact of dissimilar metals. Start stud into tapped hole.

d. Use a stud driving tool to turn stud slowly and evenly into hole, and check stud for squareness with machined surface of case. As stud is driven to proper depth, check that torque is within following limits.

STUD SIZE	INCH-POUNDS TORQUE
1/4	50 to 95
5/16	100 to 225
3/8	175 to 375

e. Replace any loose or damaged locked-in studs or inserts as follows:

NOTE

These instructions are for those studs and thread inserts which have a serrated locking ring, with inner teeth engaged on a serrated collar of stud or insert and outer teeth broached into material of transmission case. Tools for installation and removal are made by manufacturer of these parts. When such tools are not available, replacement can be accomplished with other tools, provided careful workmanship is applied.

(1) To remove a thread insert, select a drill equal in diameter to that of serrations between locking ring and insert. Drill to depth equal to ring thickness. Remove insert with an extracting tool. If lockring fails to come out, collapse remaining portion of ring with punch.

(2) To remove a stud, use a hollow mill with outside diameter 0.0156 inch less than root diameter of outer serrations of lockring. Mill to depth equal to ring thickness. Remove stud and any remaining portion of ring. If hollow mill is not available, saw stud off, use drill as in step (1).

(3) Check condition of tapped hole and counterbore. Holes are tapped with standard Class 3 tap and counterbore has 90 degree shoulder and can be cleaned up as necessary. Avoid enlargement of holes, since this would require oversize parts.

NOTE

In the following steps, coat surface of parts which will be in contact with material of case with unreduced zinc chromate primer (C-201).

(4) Turn new stud or insert into tapped hole until stop surface of serrated collar is 0.010 or 0.020 inch below surface of parent material, using wrench tool.

(5) Place lockring over stud (or an insert) and line up teeth of ring with teeth of serrated collar. Drive ring into material flush with top of insert or stud collar.

f. Install studs in transmission input drive quill opening by modifying studs at drive quill opening as follows:

NOTE

Modification of main case by installing three special studs at input quill mounting port will allow pusher set (T65) to be used when installing input quill.

(1) Inspect input quill mounting studs at the one, five and nine o'clock position to determine if special studs are installed. Special studs will be internally threaded on outboard end and will have a set screw installed.

(2) Remove standard studs at one, five and nine o'clock positions.

(3) Select stud of size to achieve proper stud height when stud is installed and torqued.

(4) Coat coarse threads of studs with unreduced zinc chromate primer (C-201). Start studs into holes in case.

(5) Use a suitable stud driving tool and torque studs 175 to 250 inch-pounds, maintaining a projected stud height of 1.56 to 1.60 inches.

(6) Install setscrews into internal threaded end of studs.

6-24. Repair Sump Case — Transmission Assembly.

NOTE

Damage to sump case exceeding the following limits shall require replacement of transmission.

a. Scratches or gouges shall be dressed out using abrasive pad (C-407) provided the maximum depth of rework to completely remove the scratch or gouge does not exceed 0.060 inch (figure 6-11, area A or 0.030 inch in area B), and provided the total reworked area does not exceed 2.0 square inches.

NOTE

Area B is defined as all of the unmachined exterior surface within 6.5 inches of the parting surface at the top flange, and that the exterior surface over cored pressure passages as shown in figure 6-12. Area A is all other unmachined exterior surfaces.

b. Scratches or gouges shall be reworked to blend with the original surface and to have a minimum bottom radius of 0.5 inch.

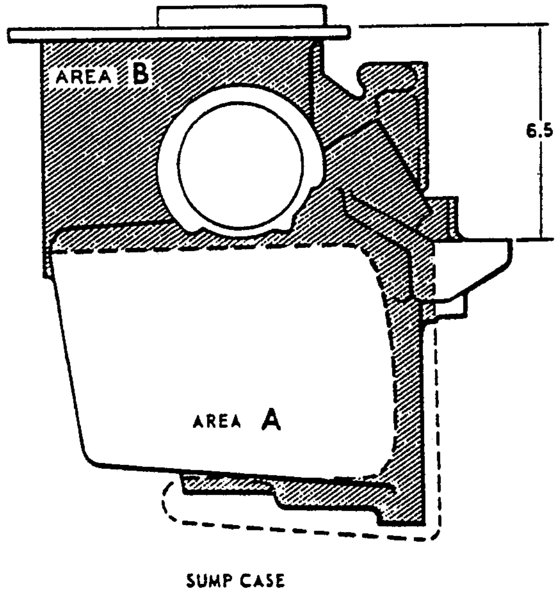


Figure 6-11. Lower transmission case — repair

c. Reworked areas shall be treated to prevent corrosion by applying sodium dichromate (C-212).

NOTE

If epoxy primer is allowed to dry more than 4 hours, paint will not adhere properly.

d. Apply one coat of epoxy polyamide primer (C-204), allow primer to dry a minimum of 30 minutes and a maximum of 4 hours. Apply two coats of coating (C-245) (Color No. 17178) allowing minimum of 30 minutes between coats.

6-25. Return to Overhaul — Transmission Assembly. The following procedures provide instructions for the preservation and packaging of a reparable transmission for shipment to an overhaul facility.

a. Spray the interior of the transmission through the top opening with approximately one gallon of lubricating oil (C-030). While spraying manually rotate the internal gears and bearings with input drive quill and drain the preserving oil.

CAUTION

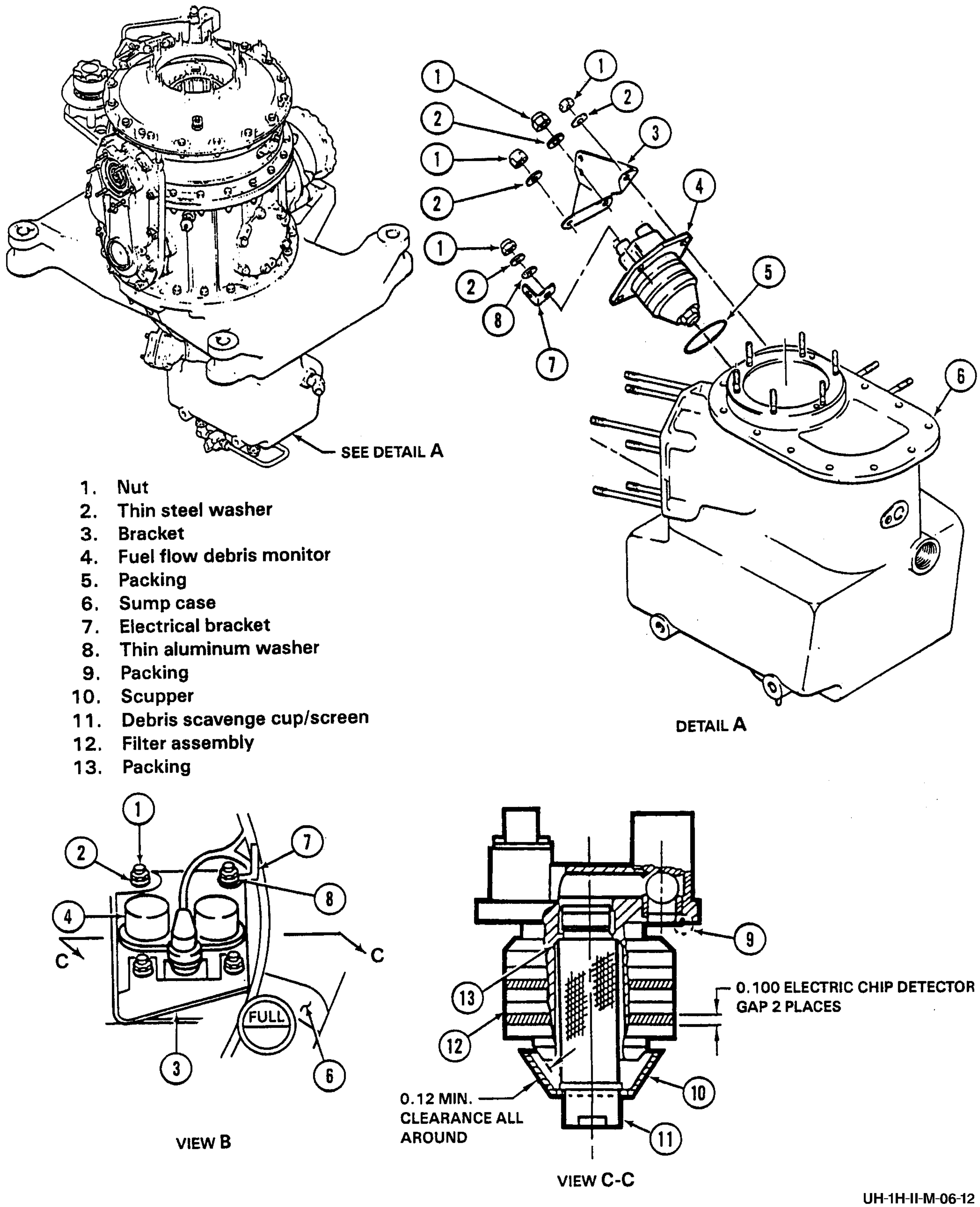
Specified cover and lift plate assembly must be used when transmission is to be transported. Without this part, severe damage may result to internal transmission components.

NOTE

Install transmission cover and lift plate assembly (204-040-929-029) immediately after the mast has been removed from the transmission assembly and the interior preservation has been completed. Keep rubber portions of the transmission pylon mounts (if installed) free of oil, grease, or solvents to prevent deterioration weakening of bonds between rubber and metal.

b. Clean the exterior of the transmission including splines and the threaded areas with solvent (C-304). Air dry or wipe with a clean lint free cloth.

c. Cap or plug all lines, as applicable. (TM 55-1500-204-25/1.) Cover breather holes and all other openings with flexible barrier material (C-427) and secure with tape (C-410). Secure all loose items, as required, to prevent damage during shipment.



1. Nut
2. Thin steel washer
3. Bracket
4. Fuel flow debris monitor
5. Packing
6. Sump case
7. Electrical bracket
8. Thin aluminum washer
9. Packing
10. Scupper
11. Debris scavenge cup/screen
12. Filter assembly
13. Packing

Figure 6-12. Sump full flow debris monitor

CAUTION

Do not allow corrosion preventive compound to contact rubber parts.

d. Apply corrosion preventive compound (C-110) to all exterior bare metal surfaces including splines, studs, and threaded areas.

e. Cover input drive flange and generator drive spline areas with flexible barrier material (C-427) and secure with tape (C-410).

f. Attach a tag to the transmission stating: TRANSMISSION PRESERVED WITH LUBRICATING OIL.

g. Attach directly to the transmission a completed DD Form 1577-2. Unserviceable (Reparable) Tag. A tag or label (DD Form 1577-3) will be securely attached to the exterior of the container in such a manner that will afford maximum protection from handling or weather. (Refer to TM 750-126.)

h. Prepare DA Form 2410 (Component Removal and Repair/Overhaul Record). (Refer to TM 38-750.)

i. If a transmission metal storage and shipping container is available, the preferred method of shipment is in this container.

(1) Carefully lower transmission into the container, align mounting points with bolts on the shock mounted frame, and install washers and nuts. Torque nuts 700-900 inch-pounds.

CAUTION

Care must be taken to prevent desiccant from coming in contact with the transmission or corrosion of transmission will take place.

(2) Insert 56 units of dry desiccant (MIL-D-3464) into the transmission container in such a manner as to prevent desiccant from coming into contact with the transmission during shipment. (Use of desiccant basket may be disregarded.)

(3) Position top of container in place and secure with bolts, washers, and nuts. Torque nuts 265 to 285 inch-pounds.

j. Obliterate old markings from container that do not coincide with the item to be returned. Mark container: (MIL-STD-129.)

k. As a field expedient only, prepare the transmission as stated below.

NOTE

This procedure is based on the assumption that the provisions of step i. cannot be complied with, that the work will be done under less than ideal conditions with limited equipment, and that on some occasions by personnel who are not experts in the field of preservation. This procedure will be used only at locations where facilities for the application of normal preservation procedures do not exist.

(1) Comply with steps a. through h. above to the extent possible with available materials and equipment.

(2) If caps or plugs specified are not available, close openings with flexible barrier material (C-427) and secure with any type of tape that is available. (Other barrier material may be substituted.)

(3) Coat the entire exterior metal surfaces of the transmission with any grease type corrosion preventive compound (CPC) or if CPC is not available, apply a light coat of aircraft grease (C-014) or (C-007). Cover the transmission with flexible barrier material (C-427) and secure with any tape that is available.

(4) Mount the transmission in the best available container (constructed if necessary) of wood or metal. Cushion, block, and brace as necessary.

NOTE

If the field expedient procedure was used, mark the outside of the container as follows: THIS TRANSMISSION IS NOT PRESERVED FOR STORAGE. OVERHAUL OR PREPARE FOR STORAGE AS SOON AS IS PRACTICAL.

(5) Mark the main transmission in accordance with step j.

6-26. Installation — Transmission Assembly.

a. Install maintenance hoist (T58) (or any maintenance hoist with 1000 pound capacity) to helicopter. Attach hoist to mast nut on top of mast.

CAUTION

When replacing transmission for internal failure or metal particles in oil, clean all oil lines and replace oil cooler, external oil filter, and perform mast overhaul.

b. Check condition of pylon mounts. Repair or replace any unserviceable parts. (Paragraph 6-115 through 6-117.)

c. Install mast assembly, if removed. (Paragraph 6-112.)

d. Lift transmission from stand. Lower carefully to position on four main mount bolts, meanwhile guiding lift link into mounting points on transmission support case.

e. Install lift link as follows:

NOTE

Ensure bolt assembly (19, figure 6-8) has a bushing bonded to shank.

(1) Lightly coat bolt assembly (19), washer (20), washer (23), and nut (21) with corrosion preventive compound (C-101).

(2) Align upper end of lift link with holes in lift link fitting (24). Align washer (20) between lift link and right-hand side of lift link fitting and install bolt assembly (19).

(3) Secure bolt assembly (19) with washers (23) and nut (21). Torque nut 60 to 80 foot-pounds. Install cotter pin (22). Check for positive clearance between bolt assembly (19) and face of lift link fitting (24).

f. Install retaining bolt (4), with countersunk washer (5), and large shouldered washer (6), into top of each four main mount bolts (16). Torque retaining bolts 90 to 105 foot-pounds.

NOTE

Ensure countersunk side of washer is toward bolt head.

CAUTION

Eyebolt (14) must be forced sidewards toward the right hand side of the helicopter in order to install bolt (13). Pad tools adequately with plastic or wooden blocks or with cloths so as not to damage the transmission pylon support case as eyebolt (14) is forced into position.

NOTE

It is not permitted to pitch the transmission fore and aft in order to install bolt (13). If pitching if found necessary, the fifth mount vertical shimming is incorrect. Reshim the fifth mount in accordance with paragraph 6-117.

g. Install bolt assembly (13), washer (25), and nut (26). Torque nut 25 to 33 foot-pounds and secure with cotter pin (27).

h. Install main rotor, stabilizer bar, and connect rotating controls. (Chapter 5.)

i. Install forward section of tail rotor driveshaft, with clamps at coupling of drive quill (8, figure 6-8) on sump case and at coupling on No. 1 bearing hanger. (Paragraph 6-134.)

j. Install lower sections of induction baffle.

k. When required, level transmission and check alignment between transmission input drive quill coupling and engine shaft adapter. (Paragraph 6-9.)

l. Install main driveshaft. (Paragraph 6-8.) Install access sections of induction baffle and intake screen.

m. Install hydraulic pump and tachometer generator on drive pad at right-hand side of transmission sump case. (Chapter 7.)

n. Connect electrical leads to DC generator. Connect transmission electrical harness cable at connector on right-hand pylon support.

o. Connect oil drain hose at coupling under sump, sump outlet hose at coupling on left inner wall of compartment below transmission, and oil manifold inlet hose at outlet coupling of filter on right wall of same compartment.

p. Service transmission with oil. Verify actual presence of oil in sight gage. Visually check oil level to full mark on indicator. (Chapter 1.)

q. Perform maintenance operational check. (Refer to BHT PUB-92-004-10.) Inspect for leaks, chafing lines, and proper oil level.

r. If transmission has not previously been qualified on run-in test stand, accomplish alternate run-in and test. (Paragraph 6-27.)

NOTE

If run-in and test is to be accomplished on helicopter, do not install engine or transmission cowlings.

s. Reinstall all firewalls, baffles, fairings, cowlings, and access doors.

6-27. Alternate Run-In and Test Transmission. After overhaul, the transmission shall be test run and inspected. In event a run-in stand is not available, the following functional test is acceptable.

a. Perform a prestart visual inspection of the helicopter in general accordance with the preflight inspection requirements given in the helicopter flight manual.

CAUTION

During some portions of the following ground run, the helicopter will be very light on its skids and may lift from the ground momentarily. Care must be exercised to ensure the safety of personnel and equipment during the operations.

NOTE

Except where otherwise noted, operation of the helicopter during the following ground run shall be in accordance with the helicopter flight manual.

NOTE

Unless otherwise specified during the following ground run operations main rotor cyclic control inputs must be minimized and tail rotor control inputs must be only those required to maintain directional stability of the helicopter.

Throughout the entire run-in procedure which follows, the transmission must be monitored for evidence of oil leakage and abnormal noise. If there is oil leakage or abnormal noise or if there are chip indications or if the transmission fails to meet a specified criteria, the run-in test shall be stopped and appropriate corrective action taken before testing is resumed.

b. Perform a normal engine start and maintain ground idle rpm (68-72% N_1) with "flat" main rotor pitch for 1-1/2 to 2 minutes. At this time the transmission low oil pressure caution light shall have extinguished.

c. While maintaining flat pitch, gradually increase rotor rpm to 88% (5808 rpm N_2, 285 rpm N_R) at a rate of approximately 4% (264 rpm N_2, 13 rpm N_R) every six minutes.

d. Hold at 88% rpm for six minutes while increasing main rotor collective pitch to produce approximately 17 psi torque pressure. The transmission oil pressure should be in the normal operating range (40 to 60 psig) during this step.

e. Slowly return the main rotor to flat pitch then reduce the engine output rpm to ground idle at a rate sufficient to obtain an N_R/N_2 "needle split".

f. Maintain ground idle N_2 until N_R and N_2 realign and stabilize, then shut down the engine.

g. Remove all transmission oil jets, chip detectors and full flow debris monitor. Inspect the components for chips and other foreign material. Evaluate any ferrous material found. Note the type, quantity, and location of any debris found.

h. Clean all oil jets, chip detectors and full flow debris monitor and reinstall.

i. Inspect the transmission oil level and add oil as required. Use only the oils specified.

j. Perform a normal engine start and gradually increase rotor rpm to 88% (5808 rpm N_2, 285 rpm N_R) with the main rotor in flat pitch. Maintain 88% rpm while gradually increasing main rotor collective pitch until 17 psi torque pressure is obtained. Maintain this condition for six minutes.

k. Gradually increase rotor rpm to 100% (6600 rpm N_2, 324 rpm, N_R) at the rate of 3% each 6 minutes. After 100% rpm is obtained, slowly increase rotor collective pitch to obtain 34 psi torque pressure. Operate under these conditions for sufficient time to elevate transmission oil temperature to level required in step 1.

WARNING

Do not attempt to adjust transmission oil pressure while the main rotor is rotating.

NOTE

In the following step it may be necessary to restrict exhaust air flow from the transmission oil cooler (smaller of the two coolers) to obtain the required transmission oil temperature. Do not allow transmission oil to exceed 230°F (110°C).

l. While operating at 100% rpm, check the transmission oil pressure. Pressure should be 52 to 58 psig when the oil temperature is 90 to 100°C. If pressure is not within this range, stop engine and adjust the transmission oil pressure regulator valve

m. Restart engine and gradually increase rotor rpm to 100%. Recheck transmission oil pressure. If pressure is not within required limits, repeat step l. If pressure is within required limits, proceed to step n.

n. Remove any transmission oil cooler air flow restrictions installed prior to step l.

o. While operating at 100% rpm, gradually increase main rotor collective pitch to the maximum position that can be maintained without becoming airborne. Maintain the "light on skids" condition for 30 minutes.

p. Perform a normal engine shutdown.

q. Remove all transmission oil jets, chip detectors, and full flow debris monitor and inspect the components for chips and other foreign material. Evaluate any ferrous material found.

NOTE

If chips are found on the upper mast bearing chip detector, the mast assembly should be inspected for damage.

If any ferrous material found is classified as "significant" or if the quantity of "insignificant" ferrous debris or the quantity of nonferrous debris has increased over the levels found in step g., the transmission shall be disassembled, inspected and repaired as required. Following reassembly of the repaired transmission, the acceptance tests of steps a. through p. shall be repeated.

If the oil jets, chip detectors, and full flow debris monitor are free of debris, or if the material found on these components is benign, i.e.; "insignificant", clean the components and install using new packings.

r. Remove the two P/N 204-040-174-001 cover plates from the right and left-hand sides of the transmission bevel gear case.

NOTE

In most circumstances it will be necessary to wipe the oil from a gear tooth using a clean cloth or cotton swab before visual evaluation of a contact pattern can be made.

s. Using a flashlight, visually inspect the tooth contact patterns on the P/N 204-040-700 input pinion, P/N 204-040-701 gear, and P/N 205-040-100 offset quill pinion. Any indications of gear tooth surface distress as evidenced by areas or lines of black oxide removal particularly in the roots of the P/N 204-040-701 gear teeth are cause for rejection.

t. If gear tooth contact patterns are acceptable, relubricate the teeth of the gears listed in step s. using clean transmission oil and reinstall the P/N 204-040-174 cover plates using new packings.

u. Clean and reinstall jets, oil filters, and chip detectors.

v. Lockwire (C-405) all fasteners at the transmission oil jets.

w. Drain the oil from the transmission sump and discard.

x. Inspect clamps on main driveshaft and tail rotor driveshaft segments for proper torque (paragraph 6-8) and (paragraph 6-134.)

y. Service transmission oil. (Chapter 1.)

z. Install transmission and engine cowling.

6-28. TRANSMISSION OIL SUMP FULL FLOW DEBRIS MONITOR.

6-29. Description — Transmission Oil Sump Full Flow Debris Monitor. The transmission is provided with a full flow debris monitor mounted in a pocket in the right upper aft corner of the sump case with inlet and outlet through internal passages. Filter assembly consists of a 70 micron screen tube assembly attached on a body incorporating a bypass valve for continued oil flow if the screen tube assembly becomes clogged. A cast scupper drain on the sump case is located below the full flow debris monitor mounting pad and is connected to an overboard drain line to drain off spilled oil.

6-30. Removal — Transmission Oil Sump Full Flow Debris Monitor.

a. Obtain access through right side of pylon island in cabin by disconnecting upper part of soundproofing and remove access panel marked TRANSMISSION OIL LEVEL ACCESS.

b. Remove nuts (1) and washers (2, figure 6-12), four places, from sump (6). Remove brackets (3 and 7). (Detail A.)

c. Remove full flow debris monitor (4) from sump (6). Allow excess oil to drain through scupper drain into a suitable container placed under overboard drain outlet at left underside of fuselage.

d. Remove debris scavenge cup/screen (11), scupper (10), and filter assembly (12).

e. Remove and discard packings (9 and 13).

6-31. Cleaning — Transmission Oil Sump Full Flow Debris Monitor.

a. Visually inspect debris scavenge cup/screen (11), scupper (10), and filter assembly (12) for contamination and nonmagnetic debris. Inspect external surface of full flow debris monitor and chip detector for magnetic particles. If contamination or magnetic particles are found; investigate to determine cause and correct.

b. Thoroughly clean debris scavenge cup/screen (11), filter assembly (12), and scupper (10) with solvent (C-304). Clean exterior surface of magnetics with a clean cloth. Thoroughly dry with filtered, compressed air.

6-32. Installation — Transmission Oil Sump Full Flow Debris Monitor.

a. Install packing (13) on filter assembly (12). Install filter assembly (12) on full flow debris monitor (4).

b. Install scupper (10) on full flow debris monitor (4). Secure filter assembly (12) and scupper (10) with debris scavenge cup/screen (11). Torque debris scavenge cup/screen 22 to 30 inch-pounds.

c. Install packing (9) on full flow debris monitor (4).

d. Install full flow debris monitor (4) into sump (6).

e. Install brackets (3 and 7) as shown in view B.

f. Install washers (2) and nuts (1) on existing studs four places. Torque nuts (1) initially 30 inch-pounds in the following sequence; upper forward, lower aft, lower forward, and upper aft. Retorque nuts (1) 70 inch-pounds using the same sequence.

g. Check oil level sight gages; add oil as required. (Chapter 1.)

h. Install access panel and attach soundproofing blanket on right side pylon island.

6-33. OIL PUMP.

6-34. Description — Oil Pump. The transmission oil pump (4, figure 6-12) is mounted in bottom of the sump. Pump is driven by a splined shaft from an accessory drive gear train and turns clockwise as viewed from drive end.

6-35. Removal — Oil Pump.

Premaintenance Requirements for Removal, Disassembly, and Testing of Oil Pump

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-030), (C-304), (C-405)
Special Environmental Conditions	A Covered Area Not Susceptible to Blowing Sand or Dust.

a. Obtain access to cargo-sling compartment through hole at bottom or by opening soundproofing blanket and removing access door at front of pylon island in cabin.

b. Drain transmission oil from sump case (1, figure 6-13).

c. Remove pump inlet screen (18).

d. Remove tubes (11 and 16).

e. Remove nut (9), washer (8). Remove bracket (10), tee connection (15), nut (13) and washer (14) together as an assembly.

f. Clean sealant from puller hole in bottom center of pump. Use care to prevent damage to threads.

CAUTION

Do not use jackscrews to remove pump. Do not let puller bolt bottom out in the threaded hole of pump.

g. Install slide hammer type puller equipped with 1/4-28 UNF threaded shaft on center of pump base.

h. Loosen jamnut on drain valve (12) and rotate counterclockwise for clearance.

i. Remove remaining nuts (7) with washers (5 and 6) and remove pump (4).

j. Remove packings (2) and (3).

6-36. Disassembly — Oil Pump.

Refer to BHT-212-CR&O.

6-37. Inspection — Oil Pump.

Refer to BHT-212-CR&O.

6-38. Cleaning — Oil Pump.

a. Clean all metal parts with solvent (C-304). Use a soft bristled brush to aid in cleaning.

b. Dry parts with filtered, compressed air.

c. Lubricate all bearings and machined surfaces immediately after cleaning with lubricating oil (C-030).

6-39. Repair — Oil Pump.

a. When necessary, replace outer and inner gerotors as a matched set. Refer to BHT-212-CR&O.

b. Replace preformed packings (2 and 3) at reinstallation of pump.

6-40. Assembly — Oil Pump

Refer to BHT-212-CR&O.

6-41. Testing After Assembly — Oil Pump.

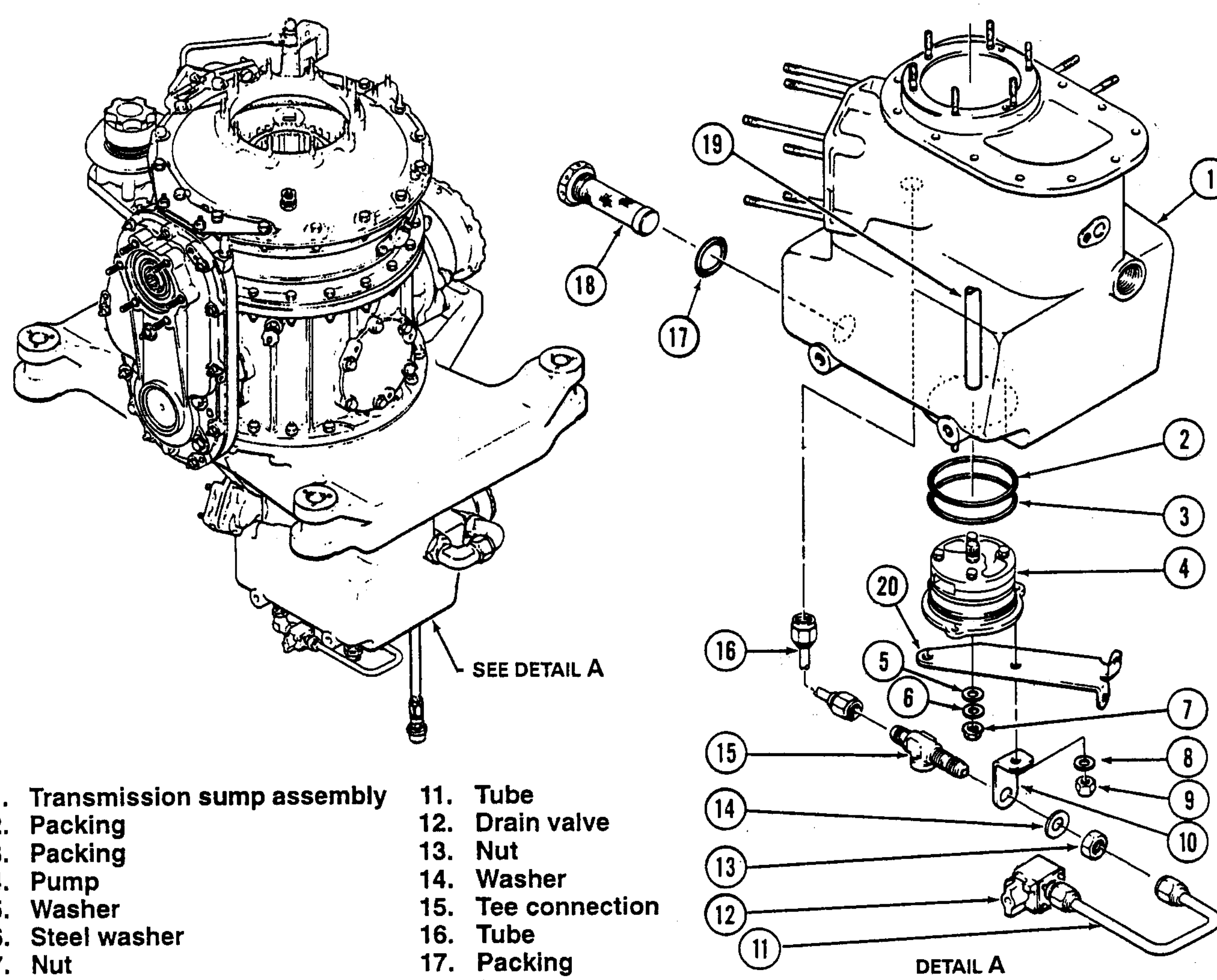
NOTE

Use equipment as shown in schematic diagram (figure 6-16) for suggested test arrangement.

a. Use lubricating oil (C-010) that is clean and entirely free of foreign matter. Oil temperature must be 120°F (49°C) (plus or minus 10°) during test.

b. Rotate pump driveshaft (7, figure 6-15) by hand in both directions. If driveshaft does not rotate freely, replace pump (without repair).

Table 6-4 deleted.



1. Transmission sump assembly
2. Packing
3. Packing
4. Pump
5. Washer
6. Steel washer
7. Nut
8. Steel washer
9. Nut
10. Bracket
11. Tube
12. Drain valve
13. Nut
14. Washer
15. Tee connection
16. Tube
17. Packing
18. Pump screen
19. Shaft
20. Bracket

UH-1H-II-M-06-13

Figure 6-13. Oil pump installation

c. Use pressure and vacuum gages, accurate within 0.5 percent full scale, placed as close to pump as possible and with piping that will cause no appreciable pressure change between gages and pump.

d. Make flow measurements with a meter that is accurate within 1.0 percent.

e. Measure pump speed with a tachometer directly coupled to pump shaft, and accurate within 1.0 percent or 20 rpm, whichever is less.

CAUTION

Ensure that shutoff valves are open before starting pump.

CAUTION

Test pump in a housing having the following bore sizes 2.127 inch dia min at bore adjacent to pump flange 3.002 inch dia min at inboard bore test pump using only MIL-L-7808 oil.

f. Operate pump at 4500 rpm, with oil temperature of 120°F (49°C) (plus or minus 10°) and inlet pressure of 16 to 20 inches of mercury absolute. Check for discharge pressure of 80 psig and for minimum flow of 11.9 gpm.

6-42. Installation — Oil Pump.

a. Install new packing (2 and 3, figure 6-12) in grooves of oil pump (4).

NOTE

Turn main rotor slowly as necessary to obtain alignment of oil pump shaft.

b. Lubricate packing (2 and 3) and mating surfaces of pump and sump case port with same type of oil used in transmission.

c. Warm sump case port with heat lamp and insert pump (4) into mounting part. Align pump shaft with internal splines of transmission shaft (19). Use a flashlight to check engagement of pump (4) and shaft (18) through open port of oil pump screen (17).

d. Install bracket (10), tee connection (15), washer (14) and nut (13), on pump mounting stud. Install steel washer (8) and nut (9). Position drain valve (12) as required and tighten jamnut.

e. Install washers (5), steel washers (6), and nuts (7). Torque two nuts (7) and nut (9) 50 to 70 inch-pounds.

f. Connect drain tubes (11 and 16).

g. Install oil pump inlet screen (18) with new packing (16). Torque oil pump inlet screen (18) 300 to 400 inch-pounds. Lockwire (C-405) screen (18) to chip detector base.

h. Apply adhesive (C-308) to puller hole in bottom center of pump.

i. Service transmission and check for oil leaks at run-up.

j. Install access door.

6-43. OIL JETS.

6-44. Description — Oil Jets. Jet assemblies (figure 6-14 through 6-21) are installed from exterior of transmission at various points, passing through walls of internal passages which carry oil under pressure, and extend inside transmission case to deliver aimed sprays of oil on gears and bearings. Each jet is identified to its mounting port by matching stamped numerals. Attaching screw hole indexes the jet nozzle spray direction. For location and function of transmission oil jets, refer to table 6-5.

6-45. Removal — Oil Jets.

a. Remove planetary oil jets (8, figure 6-14) as follows:

NOTE

Jet on forward side of transmission shown, jet on left side of transmission is similar.

(1) Disconnect tube (2, figure 6-14).

(2) Remove screw (7) and remove jet (8). Inspect jet for particles of metal and/or other materials.

(3) Loosen nut (5) and remove fitting (4) with packing (6).

Table 6-5. Location and Function — Transmission Oil Jets

JET NO.	FIGURE AND INDEX NO.	LOCATION AND FUNCTION
No. 1	(6, figure 6-15)	Right aft on top case. Sprays mast upper bearing, mast driving spline area, and upper stage planetary pinion bearings.
No. 2 and Planetary	(4, figure 6-16) (8, figure 6-14)	On housing at right gear case with two planetary jets (2) fed by external tubes and located 120 degrees apart on ring gear case. Sprays spur gear and pinion bearings of both planetary stages.
No. 3	(7, figure 6-17)	On bottom of oil manifold at right aft on main case. Sprays input bevel gears (leaving mesh) and delivers oil to No. 6 jet inside case.
No. 4	(4, figure 6-18)	On left side of sump case. Lubricates accessory drive gears and tail rotor drive quill.
No. 5	(3, figure 6-19)	Left aft main case beside input drive quill. Lubricates input quill gears (entering mesh).
No. 6	(8, figure 6-20)	Right side of main case near oil manifold. Receives oil from No. 3 jet inside case. Sprays inboard bearing of input drive quill and through end of gear to lubricate bearings of freewheel coupling.
No. 7	(6, figure 6-21)	Through top of manifold at right aft on main case. Lubricates bearing of internal gear quill which is driven by input drive gear quill.
No. 8		Right rear side of upper mast bearing retainer plate. Provides additional lubrication for upper right mast bearing assembly and mast driving spline area.

(4) Remove packing (1) from jet (8).

b. Remove No. 1 oil jet (6, figure 6-15) as follows:

(1) Remove screw (9).

(2) Remove oil jet (6). Inspect oil jet for particles of metal and/or other material.

(3) Remove screw (3) and washers (4 and 5).

(4) Remove packings (7 and 8).

c. Remove No. 2 oil jet (4, figure 6-16) as follows:

(1) Remove screw (1).

(2) Remove jet (4) and packings (2 and 3). Inspect jet (4) for particles of metal and/or other material.

(3) Remove screw (7) with washers (5 and 6).

d. Remove oil jet No. 3 (7, figure 6-17) as follows:

(1) Remove bolt (1), washer (2), and bracket (3).

(2) Remove jet (7) and packings (4, 5 and 6). Inspect jet for particles of metal and/or other material.

(3) Remove screw (10) and washer (8 and 9).

e. Remove oil jet No. 4 (4, figure 6-18) as follows:

(1) Remove access door on right side of pylon support in cabin.

(2) Remove screw (8, figure 6-18).

NOTE

When removing oil jet from sump case ensure that packing (2 and 3) are extracted with the oil jet.

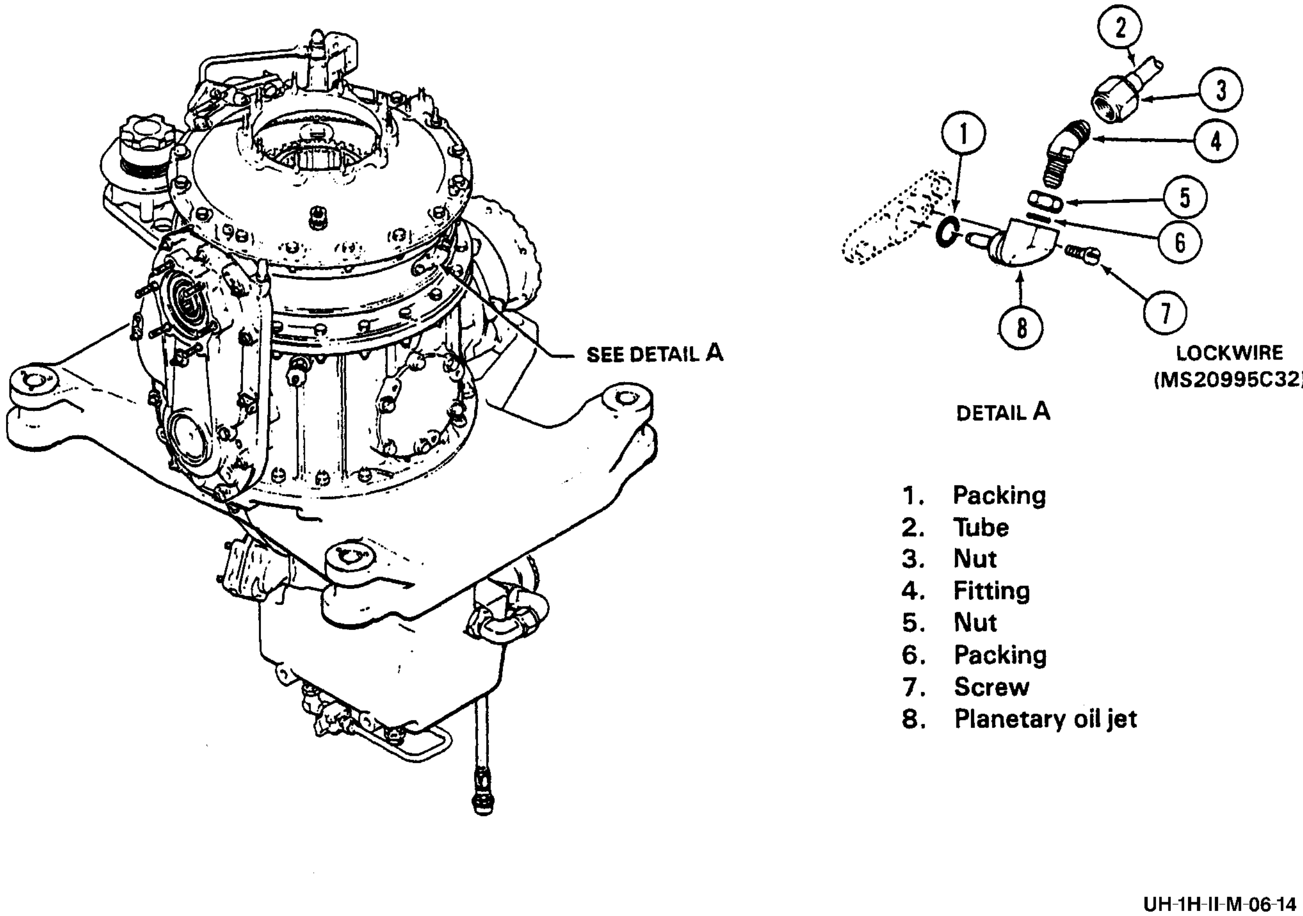
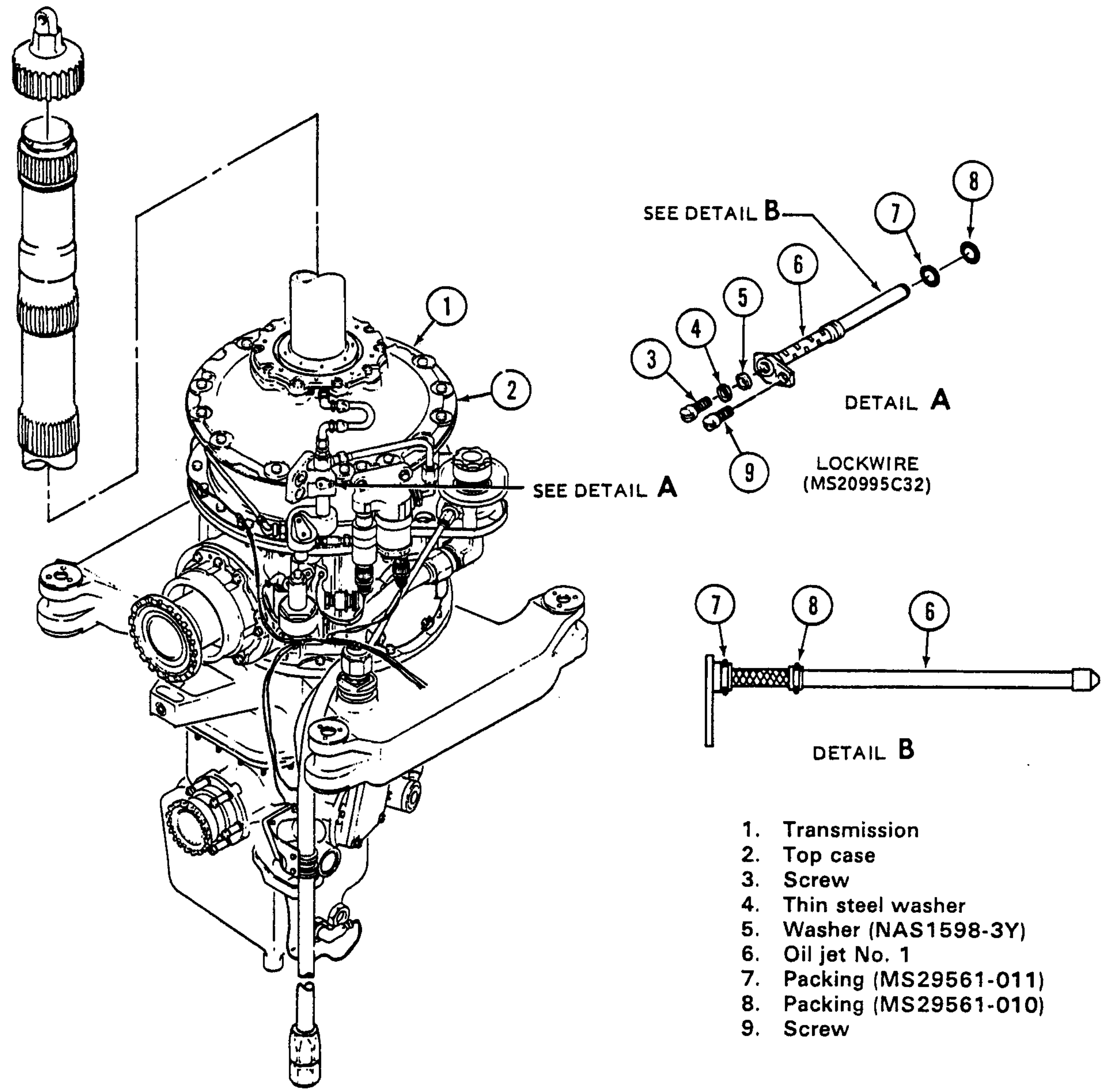


Figure 6-14. Oil jets installation

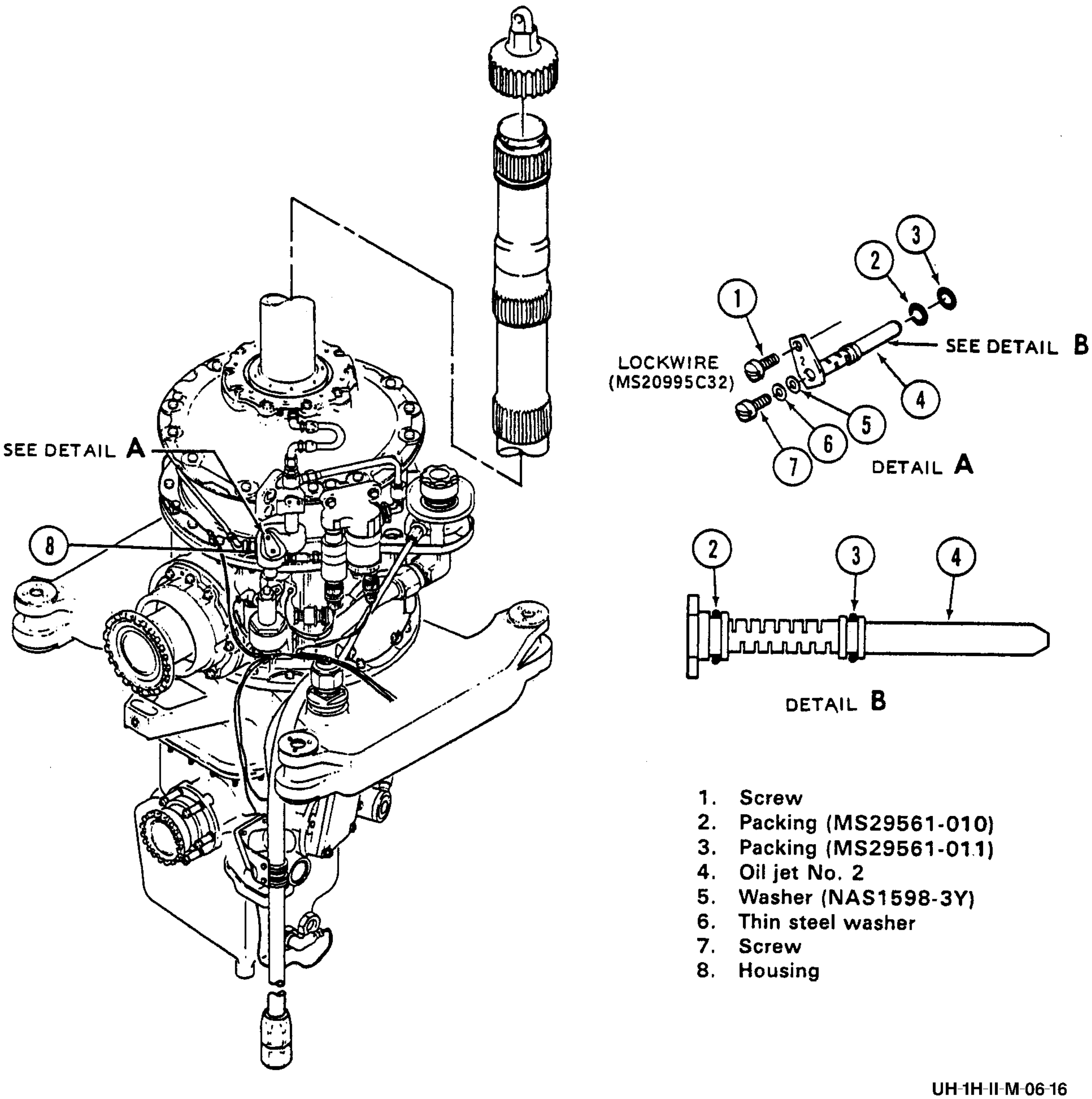


CAUTION

THIS P/N 212-040-261-101 OIL JET ASSEMBLY IS VERY SIMILAR TO ORIGINAL P/N 204-040-261-013 OIL JET ASSEMBLY. THE TWO JETS ARE NOT FUNCTIONALLY INTERCHANGEABLE. USE ONLY THE P/N 212-040-261-101 OIL JET ASSEMBLY.

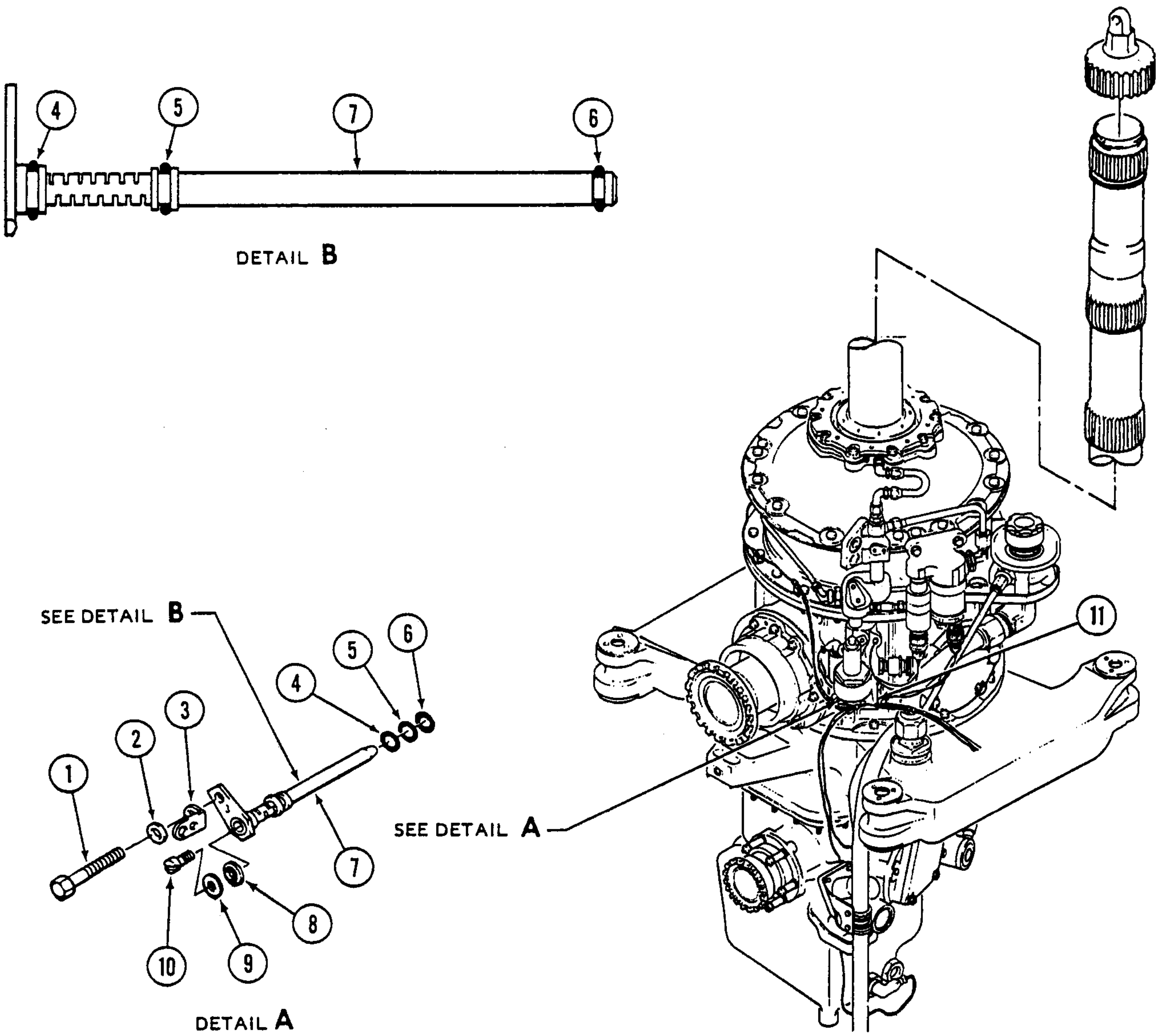
UH-1H-II-M-06-15

Figure 6-15. Oil Jet No. 1 installation



1. Screw
2. Packing (MS29561-010)
3. Packing (MS29561-011)
4. Oil jet No. 2
5. Washer (NAS1598-3Y)
6. Thin steel washer
7. Screw
8. Housing

Figure 6-16. Oil Jet No. 2 installation

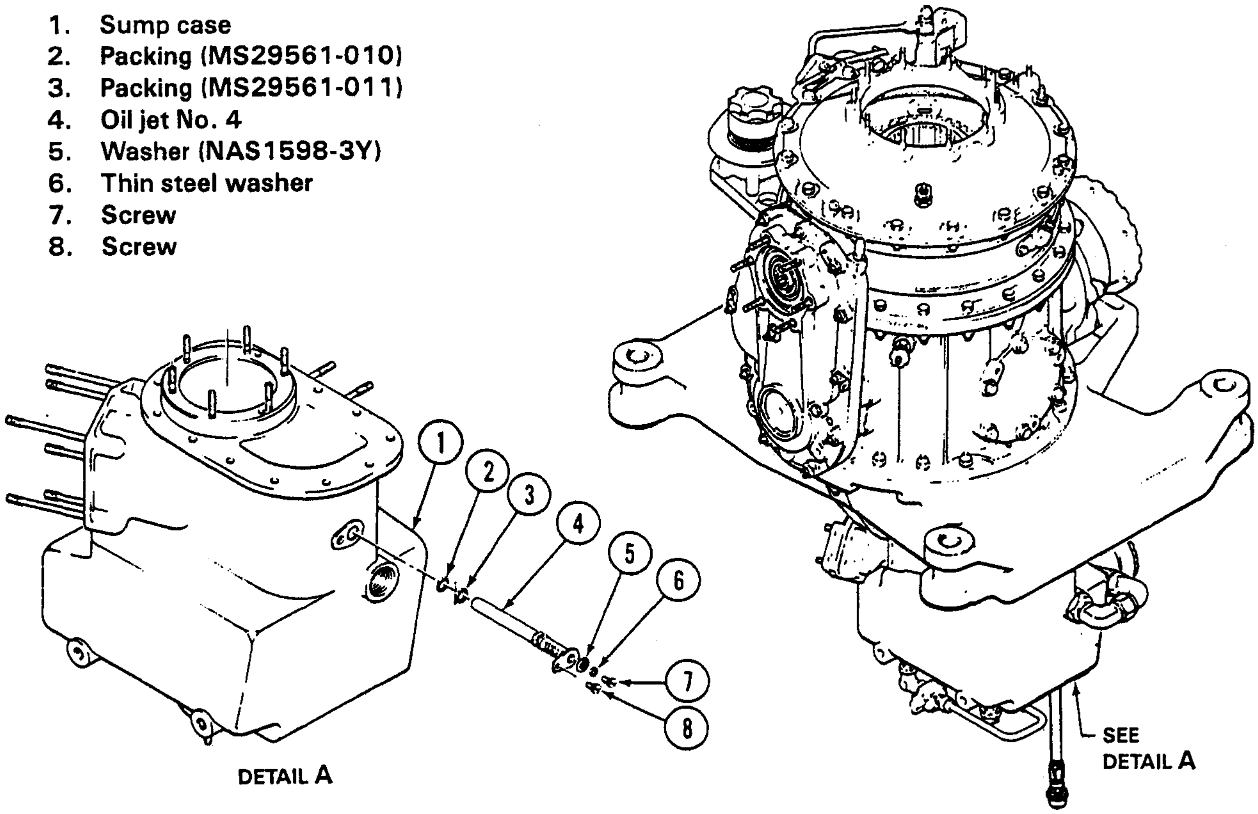


1. Bolt
2. Thin steel washer
3. Bracket
4. Packing (MS29561-011)
5. Packing (MS29561-010)
6. Packing (MS29561-008)
7. No. 3 oil jet
8. Washer (NAS1598-3Y)
9. Thin steel washer
10. Screw
11. Manifold

UH-1H-II-M-06-17

Figure 6-17. Oil Jet No. 3 installation

1. Sump case
2. Packing (MS29561-010)
3. Packing (MS29561-011)
4. Oil jet No. 4
5. Washer (NAS1598-3Y)
6. Thin steel washer
7. Screw
8. Screw



CAUTION

THIS P/N 212-040-221-101 OIL JET ASSEMBLY IS VERY SIMILAR TO ORIGINAL P/N 204-040-298-013 OIL JET ASSEMBLY. THE TWO JETS ARE NOT FUNCTIONALLY INTERCHANGEABLE. USE ONLY THE P/N 212-040-221-101 OIL JET ASSEMBLY.

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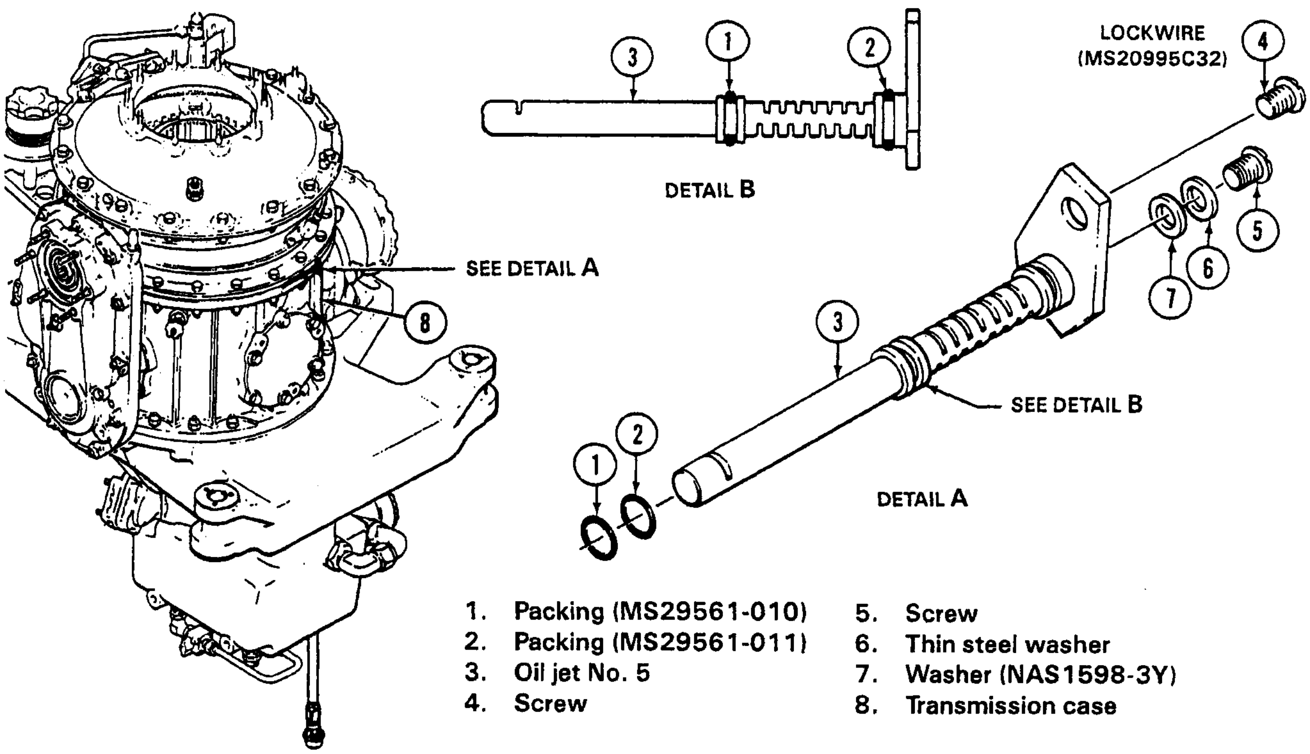
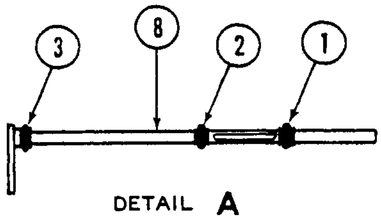
Figure 6-18. Oil Jet No. 4 installation



1. Packing (MS29561-010)
2. Packing (MS29561-011)
3. Oil jet No. 5
4. Screw
5. Screw
6. Thin steel washer
7. Washer (NAS1598-3Y)
8. Transmission case

Figure 6-19. Oil Jet No. 5 installation



1. Packing (MS29561-010)
2. Packing (MS29561-011)
3. Packing (MS29561-011)
4. Washer (NAS1598-3Y)
5. Thin Steel Washer
6. Screw
7. Screw
8. Oil Jet No. 6
9. Transmission Main Case

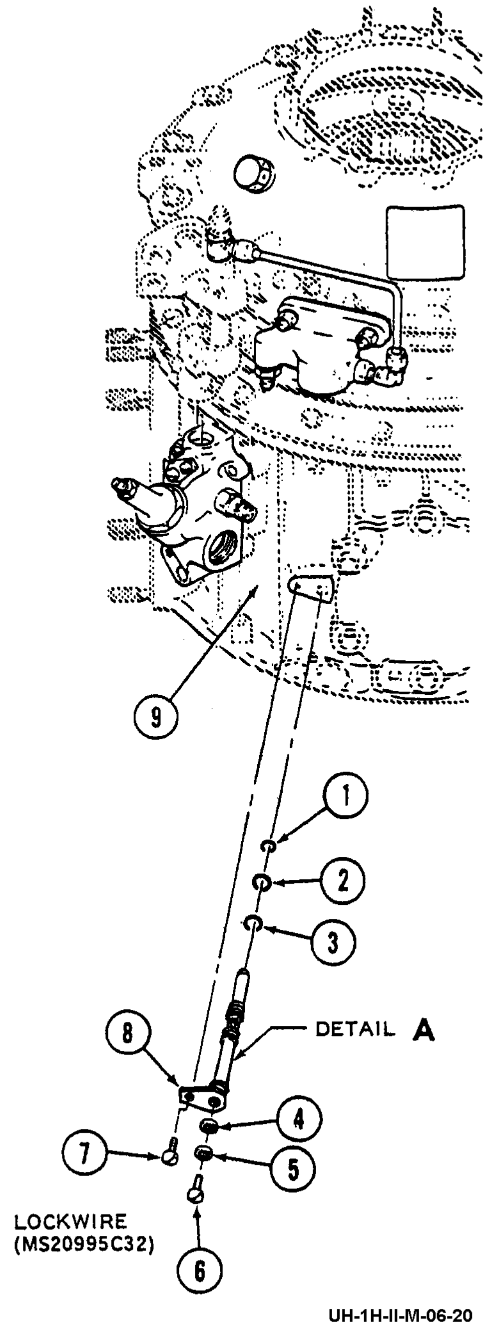
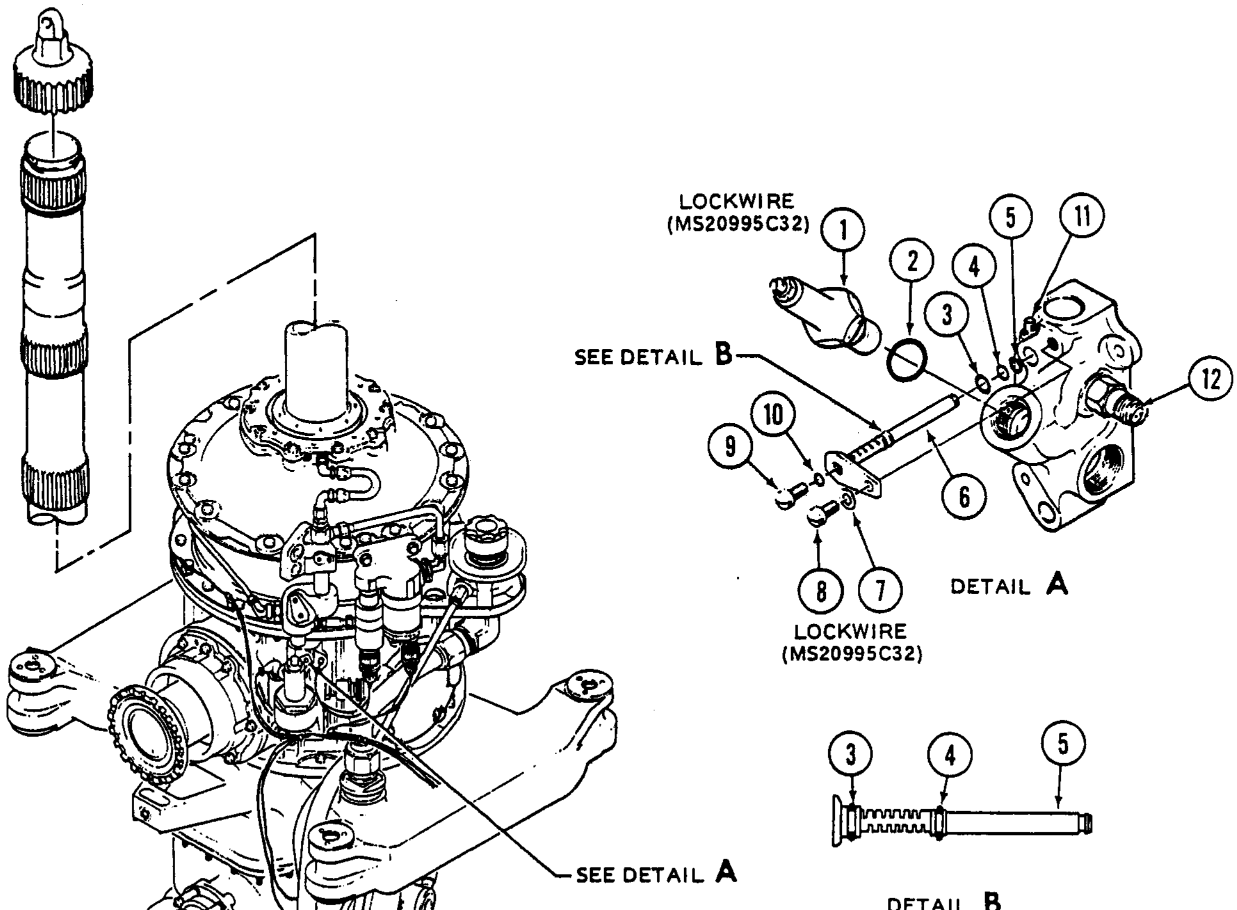


Figure 6-20. Oil Jet No. 6 installation



1. Oil pressure regulating valve
2. Packing
3. Packing (MS29561-010)
4. Packing (MS29561-011)
5. Packing (MS29561-008)
6. No. 7 oil jet
7. Thin steel washer
8. Screw
9. Screw
10. Seal (PRP110-3/16)
11. Thermoswitch
12. Thermobulb

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Figure 6-21. Oil Jet No. 7 installation

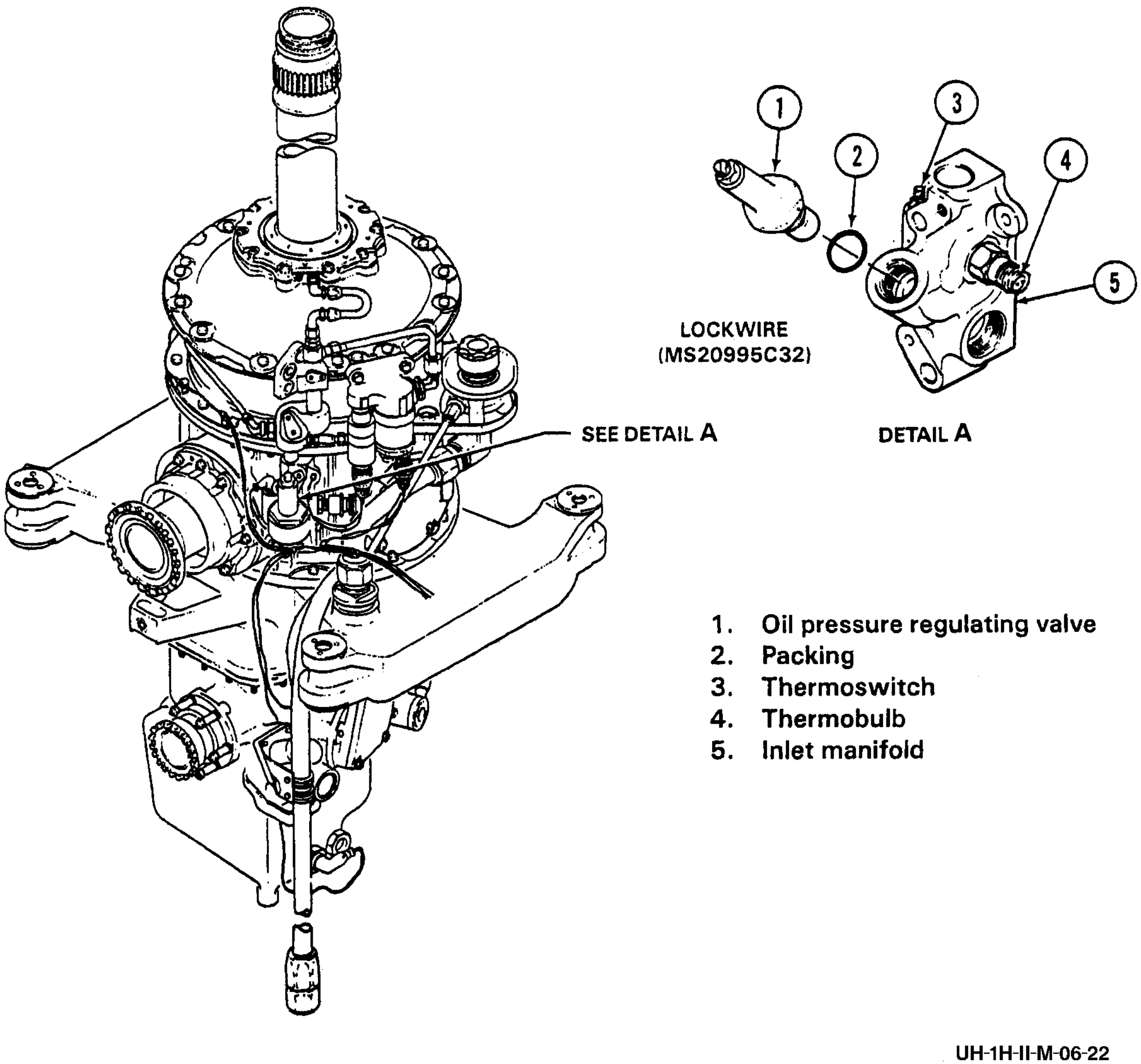


Figure 6-22. Oil pressure regulating valve installation

(3) Extract oil jet (4) from sump case (1). Inspect jet for particles of metal and/or other material.

(4) Remove packings (2 and 3).

(5) Remove screw (7) and washers (5 and 6).

f. Remove oil jet No. 5 (3, figure 6-19) as follows:

(1) Remove screw (4).

(2) Remove jet (3) and packings (1 and 2). Inspect jet for particles of metal and/or other material.

(3) Remove screw (5) and washers (6 and 7).

g. Remove oil jet No. 6 (8, figure 6-20) as follows:

(1) Remove screw (7).

(2) Remove jet (8) and packings (1, 2 and 3). Inspect jet for particles of metal and/or other material.

(3) Remove screw (6) and washers (4 and 5).

h. Remove oil jet No. 7 (6, figure 6-21) as follows:

(1) Remove valve (1) and packing (2).

(2) Remove screw (8) and washer (7).

(3) Extract jet (6) and packing (3 and 5). Inspect jet for particles of metal and/or other material.

(4) Remove screw (9) and seal (10).

6-46. Cleaning — Oil Jets.

CAUTION

Do not attempt to install any metallic objects into jet orifices during cleaning. Clean only with a soft bristle brush and filtered compressed air.

a. Remove screw with seal washers from outer end of jet (except planetary jets) to permit thorough cleaning, draining, and inspection.

b. Wash in solvent (C-304). A soft bristle brush can be used to aid cleaning. Drain and dry with filtered compressed air. Ensure all jet nozzles openings are clear.

c. Install screw with seal washers in outer end of tube.

6-47. Inspection — Oil Jets.

a. Inspect oil jets for damage, cracks, and distortion.

b. Inspect jet for particles of metal and/or other materials. Inspect jet for clogging. If jet passages are clogged, determine source of material that is clogging jet.

c. Inspect jet for corrosion. Superficial corrosion damage on jet plate on exterior transmission is acceptable if products of corrosion are removed.

d. Inspect jet for mechanical damage, cracks and/or distortion are not acceptable.

6-48. Repair — Oil Jets. Replace (without repair) if cracked, corroded, or distorted. Replace seal washers and preform packings.

6-49. Installation — Oil Jets.

CAUTION

Oil jets are numbered and care should be exercised to assure right jet is installed in the right location. Check matching numerals beside port and on jet mounting plate.

a. Install planetary oil jets (8, figure 6-14) as follows:

NOTE

Jet on forward side of transmission is shown, jet on left side of transmission is similar.

(1) Coat new packing (1) with lubricating oil used in transmission and install on jet (8).

(2) Coat new packing (6) with lubricating oil (C-030) used in transmission and install on fitting (4).

(3) Install fitting (4) on jet (8).

(4) Insert jet (8) into housing and install screw (7). Lockwire (C-405) to jet (8).

(5) Connect tube (2) and tighten nut (3).

b. Install oil jet No. 1 (6, figure 6-15) as follows:

(1) Install screw (3) with washers (4 and 5).

(2) Coat packings (7 and 8) with same type lubricating oil (C-030) used in transmission and install on grooves of oil jet (6) as shown.

(3) Carefully insert oil jet (6) into housing.

(4) Install screw (9). Lockwire (C-405) screw (9) to screw (3).

c. Install oil jet No. 2 (4, figure 6-16) as follows:

(1) Install screw (7), washers (5 and 6) in jet (4).

(2) Coat packings (2 and 3) with same type lubricating oil (C-030) used in transmission and install packing (2) on the inner groove and packing (3) on the middle groove of jet (4).

(3) Carefully install jet (4) into housing (8).

(4) Install screw (1) and lockwire (C-405) to screw (7).

d. Install oil jet No. 3 (7, figure 6-17) as follows:

(1) Install screw (10), washers (8 and 9) in jet (7).

(2) Coat packings (4, 5, and 6) with same type oil (C-030) used in transmission and install packing (4) on the inner groove, packing (5) on the middle groove, and packing (6) on the outer groove of jet (7).

(3) Carefully install jet (7) in manifold (11).

(4) Install bolt (1), washer (2), and bracket (3). Torque bolt (1) 50 to 70 inch-pounds and lockwire (C-405) to screw (10).

e. Install oil jet No. 4 (4, figure 6-18) as follows:

(1) Coat packings (2 and 3) with same type lubricating oil (C-030) used in transmission and install packing (2) on the inner groove and packing (3) on the outer groove of jet (4).

(2) Install washer (5), washer (6) and screw (7) on oil jet (4).

(3) Insert oil jet (4) on sump case (1).

(4) Install screw (8) through oil jet (4) and into sump case. Lockwire (C-405), screw (8).

f. Install oil jet No. 5 (3, figure 6-19) as follows:

(1) Install screw (5), washers (6 and 7) in jet (3).

(2) Coat packings (1 and 2) with same type lubricating oil (C-030) used in transmission and install packing (2) in the inner groove and packing (1) in the middle groove as shown in figure 6-19, Detail B.

(3) Carefully install jet (3) in transmission case (8).

(4) Install screw (4) and lockwire (C-405) to screw (5).

g. Install oil jet No. 6 (8, figure 6-20) as follows:

(1) Install screw (6), washers (4 and 5) in jet (8).

(2) Coat packings (1, 2 and 3) with the same type lubricating oil (C-030) used in transmission and install packings as shown in Detail A.

(3) Carefully install jet (8) in transmission case (9).

(4) Install screw (7) and lockwire (C-405) to screw (6).

h. Install oil jet No. 7 (6, figure 6-21) as follows:

(1) Install screw (9) with new seal (10).

(2) Coat packings (3, 4 and 5) with same type lubricating oil (C-030) used in transmission and install packing (3) on inner groove, packing (4) on middle groove and packing (5) on end of jet (6).

(3) Carefully insert jet assembly (6) into manifold housing.

(4) Install screw (8), and washer (7). Lockwire (C-405), screw (8) to screw (9).

6-50. OIL PRESSURE REGULATING VALVE.

6-51. Description — Oil Pressure Regulating Valve. Oil pressure regulating valve (16, figure 6-22) is an adjustable spring-loaded type. The valve controls the oil pressure in the transmission oil system. If the oil pressure from the pump exceeds the setting of the valve, the valve permits oil to return to the transmission sump thereby limiting the pressure. This valve is normally open as the capacity of the pump is greater than the system demand.

6-52. Removal — Oil Pressure Regulating Valve. Cut lockwire and using a wrench on hexagonal shoulder of oil pressure regulating valve (1, figure 6-22), remove valve. Discard preformed packing.

6-53. Inspection — Oil Pressure Regulating Valve. Visually inspect valve for cracks, cleanliness, corrosion, or damage. Inspect the cylinder walls of the housing for scratches and scoring. Replace all defective parts.

6-54. Cleaning — Oil Pressure Regulating Valve.

CAUTION

Do not immerse valve in solvent.

a. Clean parts with solvent (C-304). Dry with filtered compressed air.

b. Lubricate machined parts immediately after cleaning with lubricating oil (C-030).

6-55. Repair — Oil Pressure Regulating Valve. Replace (without repair) damaged or worn parts.

6-56. Installation — Oil Pressure Regulating Valve.

a. Lubricate threads on oil pressure regulating valve (1, figure 6-22) and new preformed packing with lubricating oil (C-030).

b. Insert new preformed packing (2) on valve (1) and install in inlet manifold (5).

c. Lockwire (C-405) to temperature bulb (4) and to thermoswitch (3).

6-57. Adjustment — Oil Pressure Regulating Valve.

a. Back off jamnut on end of adjusting screw at top of oil pressure regulating valve (1, figure 6-22).

b. Turn adjusting screw clockwise to increase or counterclockwise to reduce indicated oil pressure. Adjust to mid-range of operating limits. (Refer to BHT PUB-92-004-10.)

NOTE

If unable to adjust pressure, replace oil pressure regulating valve.

c. Tighten jamnut after adjustment.

6-58. OIL LEVEL SIGHT GAGES.

6-59. Description — Oil Level Sight Gages. Visual indication of oil level in transmission is provided by the oil level sight gages (3 and 7, figure 6-23) (two small transparent plastic plugs) set into right side of sump (5), backed by indicator discs (4 and 6) with FULL and LOW markings.

6-60. Removal — Oil Level Sight Gages.

NOTE

The removal procedure for indicator (4, figure 6-23) is given. The removal procedure for indicator (6) is similar.

a. Detach soundproofing blanket. Remove TRANSMISSION OIL LEVEL ACCESS plate from right side of pylon island in cabin.

b. Drain transmission oil as necessary to a level below the sight gage to be removed.

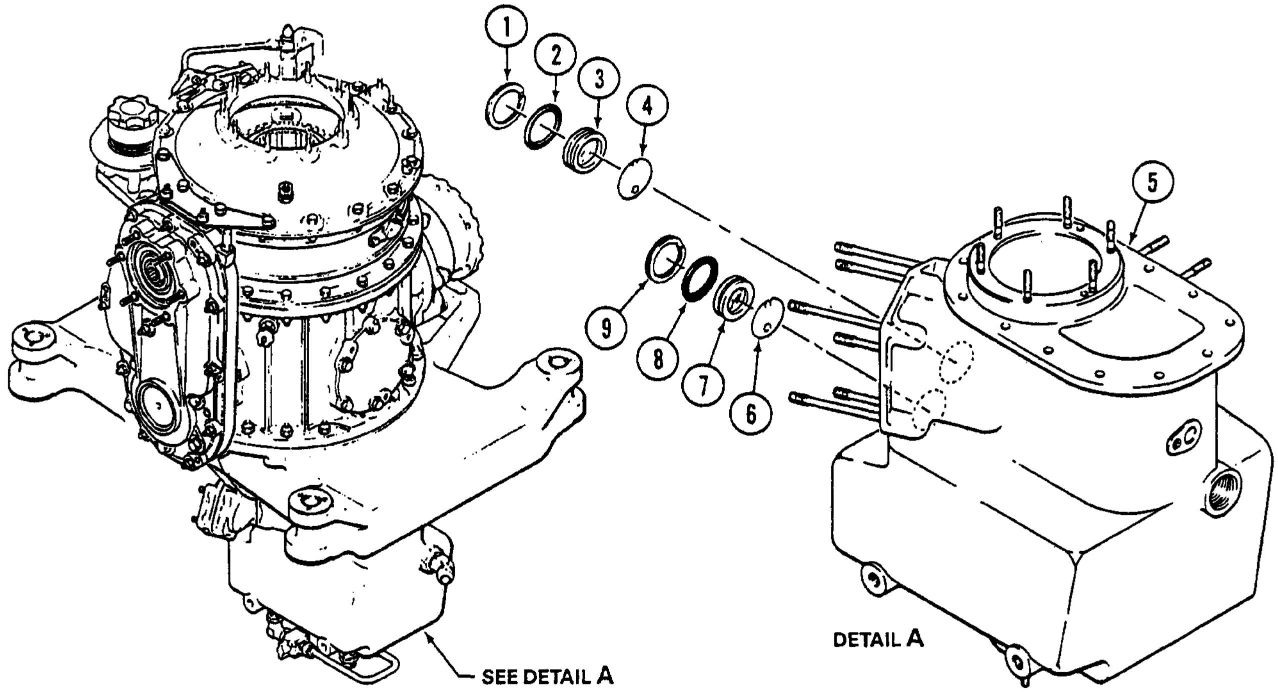
c. Remove retainer ring (1).

d. Carefully remove glass (3) and packing (2).

e. Remove indicator (4).

6-61. Inspection — Oil Level Sight Gages.

a. Inspect glass (3 and 7, figure 6-23) for cracks, crazing and stains.



1. Retainer ring
2. Packing
3. Glass
4. Indicator (204-040-508-5)
5. Transmission sump case
6. Indicator (204-040-508-7)
7. Glass
8. Packing
9. Retainer ring

Figure 6-23. Sight glass installation

b. Inspect indicator (4 and 6) for stains that might present a false oil level.

c. Inspect retainer rings (1 and 9) for distortion, cracks, tool marks and tension.

6-62. Cleaning — Oil Level Sight Gages. Wipe glasses and indicator disc, clean using a soft clean cloth. If unable to clean, replace glass or disc.

6-63. Repair Oil Level Sight Gages. Polish out minor scratches and glazing.

6-64. Installation — Oil Level Sight Gages.

a. Insert correctly marked indicator disc (4 and 6, figure 6-23) in port with indexing tab in notch of inner lip.

b. Install new packing (2) on glasses (3 and 7) and insert glasses on sump assembly (5).

c. Install retainer ring (1 and 9).

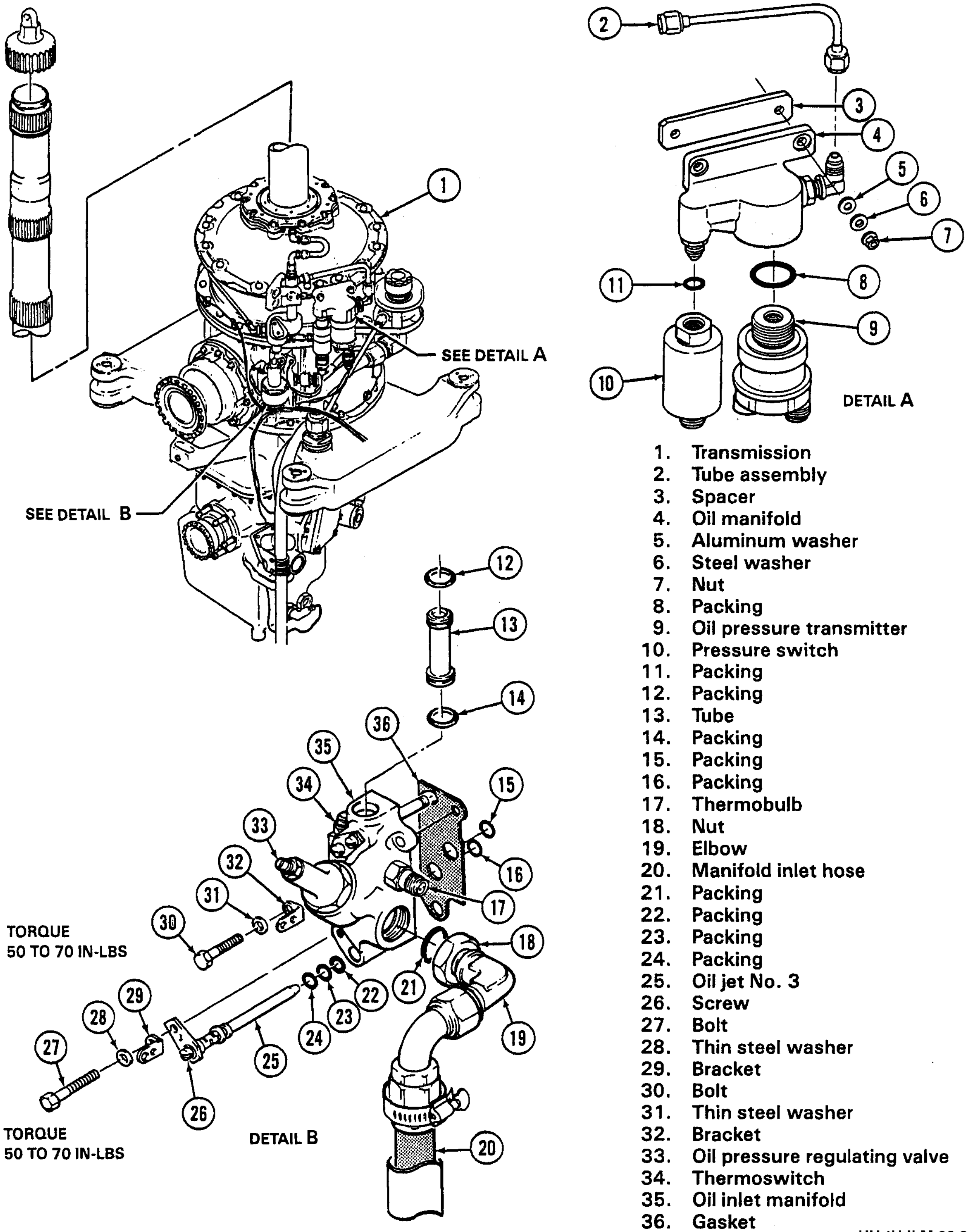
d. Service transmission with approved oil to full mark. (Chapter 1.)

e. Check for leaks around oil level sight gages (3 and 7, figure 6-23). Close access opening.

6-65. LINES, MANIFOLDS, CHIP DETECTORS, SCREENS, AND BRACKETS.

6-66. Description — Lines, Manifolds, Chip Detectors, Screens, and Brackets.

a. Lines and manifolds. An inlet manifold (35, figure 6-24) on right side of transmission main case is provided with a oil pressure regulating valve (33) to regulate system pressure, a thermobulb (7) for oil temperature indicator, and a thermoswitch (34) for caution panel. The manifold inlet hose (20) from the sump delivers oil to manifold and is distributed through various outlets. A second port on inner face of manifold supplies internal passages leading to input drive quill bearings. No. 3 and No. 7 jets extend through manifold into main case. An outlet at top of manifold delivers oil through an external tube to upper part of system.



1. Transmission
2. Tube assembly
3. Spacer
4. Oil manifold
5. Aluminum washer
6. Steel washer
7. Nut
8. Packing
9. Oil pressure transmitter
10. Pressure switch
11. Packing
12. Packing
13. Tube
14. Packing
15. Packing
16. Packing
17. Thermobulb
18. Nut
19. Elbow
20. Manifold inlet hose
21. Packing
22. Packing
23. Packing
24. Packing
25. Oil jet No. 3
26. Screw
27. Bolt
28. Thin steel washer
29. Bracket
30. Bolt
31. Thin steel washer
32. Bracket
33. Oil pressure regulating valve
34. Thermoswitch
35. Oil inlet manifold
36. Gasket

UH-1H-II-M-06-24

Figure 6-24. Transmission manifolds — installation

b. Chip detectors. Electrical chip detectors are located on the forward right side of transmission top case, transmission bevel gear case, generator drive quill, and lower transmission sump case. Chip detectors consist of a single pole of a permanent magnet. When pole attracts sufficient metal chips to complete a circuit between pole and ground "chip detector" segment on caution panel will illuminate. Chip detectors on generator drive quill and sump case incorporate a self-closing valve to prevent loss of oil when magnetic insert is removed to inspect for metal particles.

c. Screen. Oil sump screen (12, figure 6-25) for transmission on oil pump is a wire mesh cylinder attached on a threaded plug externally accessible on lower right side of sump, marked PUMP SCREEN.

6-67. Removal — Lines, Manifolds, Chip Detectors, Screens and Brackets.

a. Disconnect and detach any defective line as required.

b. Remove oil inlet manifold (35, figure 6-24) from right side of main case as follows:

(1) Remove bolt (27), washer (28), and bracket (29).

(2) Remove jet (25) and packings (22, 23, and 24).

(3) Disconnect electrical connector from thermobulb (7).

(4) Remove clamp securing shroud to manifold inlet hose (20).

(5) Remove manifold inlet hose (20), elbow (19), nut and preformed packing (21). Discard packings.

(6) Disconnect electrical connector from thermoswitch (34).

(7) Remove bolt (30), washer (31), and bracket (32).

NOTE

Carefully cut sealant around tube (13) with a sharp plastic scraper.

(8) Carefully work manifold (35) loose and remove manifold (35), tube (13), packing (12, 14, 15 and 16), and gasket (36).

c. Remove oil pressure manifold (4, figure 6-24) as follows:

(1) Remove oil pressure switch (10) and packing (11).

(2) Remove oil pressure transmitter (9) and packing (8).

(3) Remove tube (2).

(4) Remove nuts (7) and washers (5 and 6).

(5) Remove manifold (4) and spacer (3).

d. Remove mast bearing and main input gear quill electric chip detectors (9 and 10, figure 6-25) as follows:

(1) Remove nut (1) and disconnect wire from stud (2).

(2) Push and twist chip detector (4) counterclockwise to disengage locking lugs (3). Remove chip detector (4) from housing (6).

(3) Remove housing (9 and 10) from transmission (8). Plug holes in transmission to prevent entry of foreign objects.

e. Remove sump case and generator drive quill electrical chip detectors (13 and 15, figure 6-25) as follows:

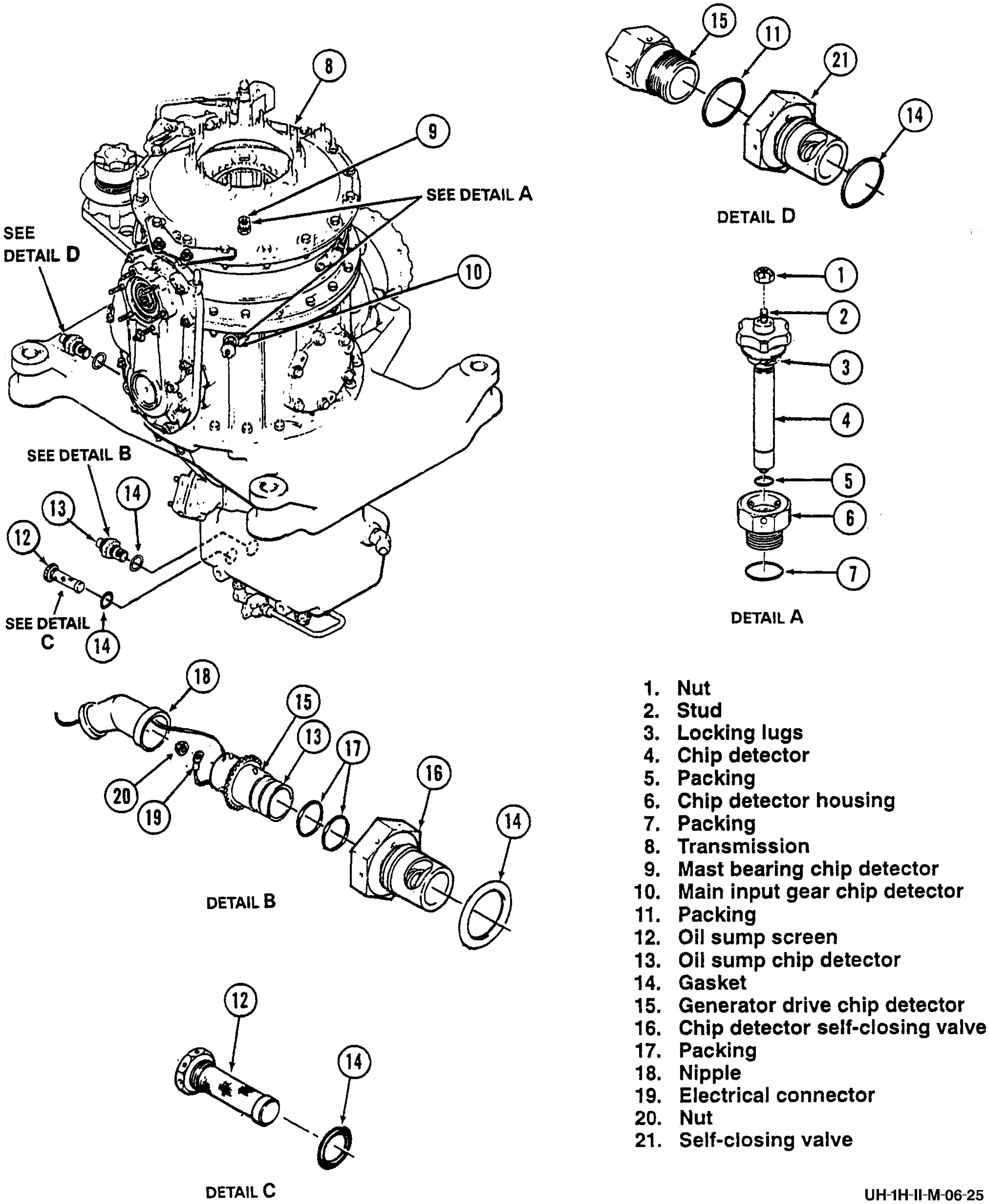
NOTE

Chip detector element (13 and 15, figure 6-25) may be removed for inspection without draining sump case oil. However, if self-closing valve (16) is to be removed, drain sump case oil prior to removing self-closing valve (16).

(1) Remove oil level access door on right side of pylon.

(2) Move nipple (18) back to expose nut (20). Remove nut (20) electrical connector (19) from chip detectors (13 and 15).

(3) Press in on knurl body of chip detector (13 and 15), turn counterclockwise to disengage locking detents and remove chip detectors (13 and 15) from self-closing valve (16).



1. Nut
2. Stud
3. Locking lugs
4. Chip detector
5. Packing
6. Chip detector housing
7. Packing
8. Transmission
9. Mast bearing chip detector
10. Main input gear chip detector
11. Packing
12. Oil sump screen
13. Oil sump chip detector
14. Gasket
15. Generator drive chip detector
16. Chip detector self-closing valve
17. Packing
18. Nipple
19. Electrical connector
20. Nut
21. Self-closing valve

Figure 6-25. Transmission chip detectors and sump screen installation

(4) Inspect chip detectors (13 and 15) for presence of metal particles. If any metal particles are found, refer to figure 6-7.

(5) Remove packings (17) from chip detectors (13 and 15).

(6) Remove self-closing valve (16) from sump case and generator drive quill.

(7) Remove gasket (14) from self-closing valve (16).

f. Remove oil sump screen as follows:

(1) Drain transmission oil sump.

(2) Remove oil sump screen (12, figure 6-25) from transmission sump. Inspect oil sump screen for metal particles. If any metal particles are found, refer to figure 6-7.

(3) Remove packing (11).

g. Remove scupper assembly (1, figure 6-26), mounting bracket (5) and cyclic spring bracket (26) as follows:

(1) Loosen clamp securing shroud to hose (16), disconnect hose (16).

(2) Remove screw (17).

(3) Disconnect line (19).

(4) Remove tube (13).

(5) Loosen nut (10) and remove elbow (11) with packing (9).

(6) Remove nuts (20). Remove scupper assembly (1) from bracket (5).

(7) Remove four bolts (2). Remove bracket (5).

NOTE

Extension cap (15) may be removed by pressing down and twisting to disengage lock.

(8) Remove nuts (28, Detail A) with washer (24).

(9) Remove bolts (25).

(10)Remove bracket (26).

6-68. Disassembly — Oil Inlet Manifold.

a. Remove oil pressure regulating valve (33, figure 6-24). Discard preformed packing from oil inlet manifold (35).

b. Remove thermoswitch (34). Discard preformed packing.

c. Remove thermobulb (17). Discard preformed packing.

d. Remove elbow (19) with nut, preformed packing (21). Discard packings.

6-69. Inspection — Lines, Manifolds, Chip Detectors, Screens, and Brackets.

a. Inspect oil manifolds (4, figure 6-24) for damaged threads.

(1) Inspect oil manifold (4) and spacer (3) for mechanical and corrosion damage.

(2) Inspect tube assembly (2) for cracks or distortion; cracked or severely distorted parts are not acceptable. Superficial dents, nicks and scratches are acceptable without repair.

(3) Inspect oil pressure switch (9), oil pressure transmitter (10) and electrical connector for bent pins and damaged threads.

(4) Inspect oil pressure transmitter (10) and oil pressure switch (9) for dents and other mechanical damage.

(5) Inspect manifold (35, figure 6-24) for damaged threads.

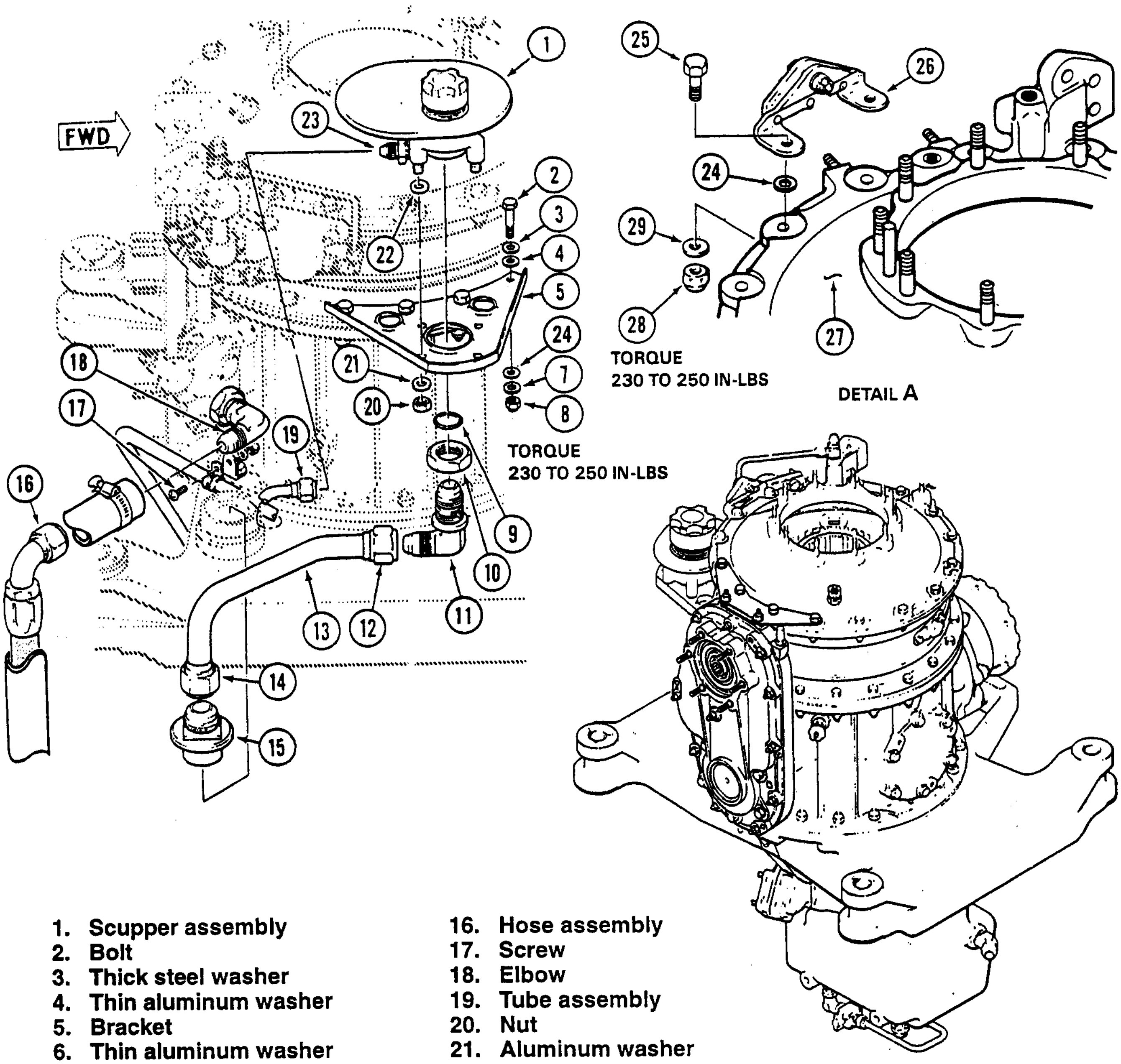
(6) Inspect manifold (35) for mechanical and corrosion damage.

(7) Inspect thermobulb (17), oil pressure regulating valve (33), thermoswitch (34) and electrical connectors for bent pins and damaged threads.

b. Inspect electric chip detectors as follows:

(1) Inspect electric chip detectors (9, 10, 13 and 15, figure 6-25) for presences of metal particles. If metal particles are found refer to figure 6-7 for required action.

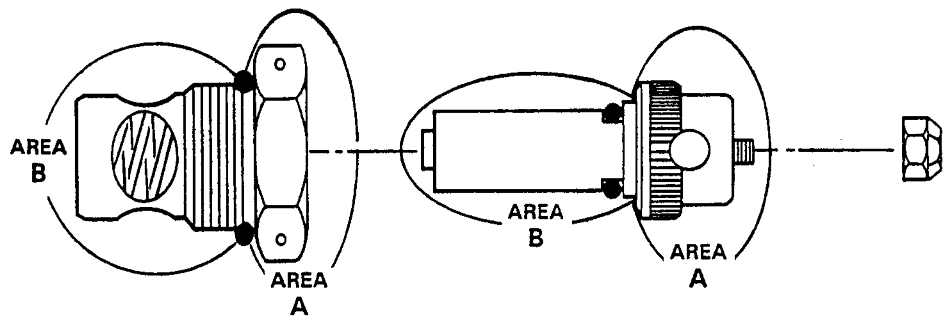
(2) Inspect electrical chip detector components for damage (refer to figure 6-27).



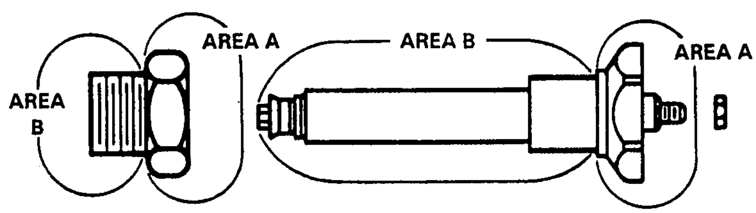
1. Scupper assembly
2. Bolt
3. Thick steel washer
4. Thin aluminum washer
5. Bracket
6. Thin aluminum washer
7. Thick steel washer
8. Nut
9. Packing
10. Nut
11. Elbow
12. Nut
13. Tube
14. Nut
15. Extension cap
16. Hose assembly
17. Screw
18. Elbow
19. Tube assembly
20. Nut
21. Aluminum washer
22. Aluminum washer
23. Fitting
24. Washer (212-040-199-1)
25. Bolt
26. Bracket
27. Transmission top case
28. Nut
29. Thin steel washer

UH-1H-II-M-06-26

Figure 6-26. Scupper, mounting bracket, and cyclic spring bracket — installation



CHIP DETECTOR
B7669B



CHIP DETECTOR
B4430

AREA	LIMITS
All	No cracks allowed.
A	Maximum depth of pitting is 0.030 inch with no more than 40 percent of any 1.0 inch square or 20 percent of any total area of any pitted surface.
B	Maximum depth of pitting is 0.020 inch with no more than 40 percent of any 1.0 inch square or 20 percent of total area of any pitted surface. Thread damage is not permitted.

UH-1H-II-M-06-27

Figure 6-27. Damage limits — electric chip detectors

c. Inspect scupper, mounting bracket and cyclic spring bracket as follows:

(1) Inspect scupper assembly (1, figure 6-26) and oil filler cap for secure installation, cracks and distortion. Loose fitting cap and/or bracket or distorted scupper is not acceptable. Superficial dents, nicks and scratches are acceptable without repair.

(2) Inspect bracket (5) and tube (13) for secure installation and for damage such as distortion and cracks. Loose-fitting, cracked, and/or severely distorted parts are not acceptable. Superficial dents, nicks, and scratches are acceptable without repair.

(3) Inspect cyclic spring bracket (26) for secure installation, cracks and distortion.

6-70. Cleaning — Lines, Manifolds, Chip Detectors, Screens, and Brackets. Clean parts with solvent (C-304). Use fiber bristle brush to dislodge stubborn deposits. Drip or air dry with low pressure compressed air.

6-71. Repair — Lines, Manifolds, Chip Detectors, Screens, and Brackets. Replace standard hardware and defective parts.

6-72. Assembly — Lines, Manifolds, Chip Detectors, Screens, and Brackets.

a. Install thermoswitch (34, figure 6-24) in oil inlet manifold (35) as follows:

(1) Lubricate thermoswitch (34) threads and new preformed packing with lubricating oil (C-030). Place packing on lower end of thermoswitch.

(2) Install thermoswitch (34) in top left side of oil inlet manifold (35), not exceeding 12 inch-pounds of torque on hexagonal body shoulder of thermoswitch.

b. Install thermobulb (17) in oil inlet manifold (35) as follows:

(1) Lubricate thermobulbs (17) threads and new preformed packing with oil (C-030). Place packing on lower end of bulb.

(2) Install thermobulb (17) in top right side of inlet manifold (35).

c. Install oil pressure regulating valve (33) in inlet manifold (35) as follows:

(1) Lubricate oil pressure regulating valve (33) threads and new preformed packing with lubricating oil (C-030). Place packing on lower end of oil pressure regulating valve.

(2) Install oil pressure regulating valve (33) in inlet manifold (35).

d. Safety thermobulb (17), oil pressure regulating valve (33), and thermoswitch (34) together with lockwire (C-405).

e. Install tube (13) in oil inlet manifold (35) as follows:

(1) Lubricate two new preformed packings (12 and 14) for tube (13) with lubricating oil (C-030). Install packings on tube (13).

(2) Insert tube (13) into inlet manifold (35).

6-73. Installation — Lines, Manifolds, Chip Detectors, Screens, and Brackets.

a. Install oil pressure manifold as follows:

(1) Position spacer (3, figure 6-24) and manifold (4) on transmission.

(2) Install two aluminum washers (5) next to manifold. Install two steel washers (6) and nuts (7).

(3) Install tube assembly (2).

(4) Lubricate packing (8) with oil (C-030). Install packing (8) on pressure switch (9).

(5) Install pressure switch (9) on oil pressure manifold (4).

(6) Lubricate packing (11) with oil (C-030). Install packing (11) on fitting located on oil pressure manifold (4).

(7) Install oil pressure transmitter (10) on oil pressure manifold (4).

(8) Perform functional check of pressure switch and pressure transmitter and check for oil leaks at next helicopter ground run.

b. Install oil temperature manifold as follows:

(1) Install packing (21, figure 6-24), nut (18) and elbow (19) on manifold (35). Do not tighten at this time.

(2) Coat packing (12 and 14) with lubricating oil (C-030) and install on tube (13). Install tube (13) in manifold (35).

(3) Coat packing (4 and 5) lubricating oil (C-030) and install in manifold (35). Install gasket (36) on manifold (35).

(4) Carefully work manifold assembly (35) into position. Ensure that tube (13) is seated on oil jet number two manifold and that bushings on bottom of manifold (35) are seated on transmission case.

(5) Install bolt (30) with washer (31) and bracket (32).

(6) Install jet (25) with packings (22, 23, and 24).

(7) Install bolt (27) with washer (28) and bracket (29).

(8) Torque bolts (27 and 30) 50 to 70 inch-pounds and lockwire (C-405) bolt (27) to screw (26) and bolt (30) to thermobulb (17).

(9) Install hose (20) on elbow (19). Tighten nut (18). Install shroud and clamp on hose (20).

(10)Connect electrical plug to thermobulb (17) and lockwire (C-405).

(11)Connect electrical wire to thermoswitch (34).

(12)Apply a bead of adhesive (C-308) to each end of tube (13).

c. Install chip detectors and oil sump screen as follows:

(1) Coat new packings (7, figure 6-25) with lubricating oil (C-030) and install packings (7) on housing (6) for mast bearing chip detector (9) and main input gear chip detector (10).

(2) Remove plugs in transmission and install housings (6) in transmission (8). Torque housings (6) 280 to 300 inch-pounds. Lockwire (C-405) housings (6) to transmission (8).

(3) Insert chip detectors (4) with new packings (5) into housings (6), push and twist, clockwise, to engage locking lugs (3).

(4) Install wire on stud (2). Install nut (1). Do not exceed 4 inch-pounds torque on nut. Position nipple over nut (1).

(5) Lubricate packing (14) with lubricating oil (C-030). Install packing on valve (16). Install valve (16) in sump. Lockwire (C-405) sump screen (12) to valve (16). Lockwire (C-405) valve (16) to plug on bottom of sump.

(6) Lubricate packings (17) with lubricating oil (C-030). Install packings (17) on chip detector (13). Insert chip detector (13) in valve (16), push inboard and rotate clockwise to engage locking lugs. Hole inside of element for electrical connector (19) should face down to avoid entry of water. If hole does not face down, remove chip detector, rotate 180 degrees and reinstall.

(7) Position electrical connector (19) through hole in the side of chip detector (13) and place on stud (2). Install nut (20). Do not exceed 4 inch-pounds torque. Install nipple (18) on electrical connector (19) and position wire lower than electrical connector (19) to form a "drip loop" to prevent water from running down wire and into electrical connector (19).

(8) Check for oil leaks at next ground run.

(9) Lubricate packing (14) with lubricating oil (C-030). Install packing (14) on valve (16). Install valve (16) into generator drive quill. Lockwire (C-405) valve (16) to generator drive quill housing.

(10)Lubricate packing (17) with lubricating oil (C-030). Install packing (17) on chip detector (15). Insert chip detector (15) into valve (16), push inboard and rotate clockwise to engage locking lugs.

(11)Position electrical connector (19) through hole in the side of chip detector (15) and place on stud (2). Install nut (20). Do not exceed 4 inch-pounds torque. Install nipple (18) on electrical connector (19) and position wire lower than electrical connector (19) to form a "drip loop" to prevent water from running down wire and into electrical connector (19).

(12)Check for oil leaks at next ground run.

(13)Install new packing (11, figure 6-25) on screen (12).

(14)Install screen (12) in oil sump. Torque screen (12) 300 to 400 inch-pounds. Lockwire (C-405) screen (12) to plug on bottom of sump and chip detector (13).

d. Install scupper mounting bracket and cyclic spring bracket as follows:

(1) Install four washers (22, figure 6-26) on scupper assembly (1). Position scupper assembly (1) on bracket (5) and install four washers (21) and four nuts (20). Torque nuts 50 to 70 inch-pounds.

(2) Install elbow (11) on scupper assembly (1) with new packing (9). Tighten nut (10).

(3) Position bracket assembly (5) on transmission and install four bolts (2) with steel washers (3) under bolt heads, washers (4) next to bracket, washers (6 and 7) and nuts (8). Torque nuts (8) 230 to 250 inch-pounds.

(4) Install tube (13). Tighten nuts (12 and 14).

(5) Connect tube nut (19) to fitting (23).

(6) Install screw (17), washer and nut.

(7) Connect hose (16) to elbow (18).

NOTE

Extension cap (15) may be installed by inserting cap on transmission, pressing down on cap and twisting to engage lock.

(8) Position bracket (26, figure 6-26) on transmission top case (27).

(9) Install bolts (25) with washers (24) under bolt heads.

(10)Install washers (29) and nut (28). Torque nuts (28) 230 to 250 inch-pounds.

6-74. INPUT QUILL.

6-75. Description — Input Quill. An input quill (figure 6-28), equipped with a freewheeling clutch, is located on aft side of transmission main case. Engine torque is transmitted through main driveshaft and quill, which drives transmission gear trains. Freewheeling clutch and quill operate automatically, engaging to allow engine to drive rotor or disengaging the idling engine during autorotational descent.

6-76. Removal — Input Drive Quill.

NOTE

For replacement of input drive quill seal and wear sleeve refer to paragraph 6-78.

Premaintenance Requirements for Removal and Disassembly Input Drive Quill

CONDITIONS	REQUIREMENT
Part No. or Serial No.	205-040-263-115
Special Tools	(T33), (T62), (T65)
Test Equipment	None
Support Equipment	Heat Lamp
Minimum Personnel Required	One
Consumable Materials	A-A-883, Type I, O-T-634, (C-007), (C-010), (C-011), (C-014), (C-031), (C-078), (C-309), (C-317), (C-327), (C-328), (C-345), (C-406), (C-407), (C-410), (C-427), (C-452), (C-486)
Special Environmental Conditions	For Disassembly and Inspection — Clean, Dust Free Area.

a. Open transmission fairing. Remove engine intake fairing. Remove top section of induction baffle and upper left intake section.

b. Remove main driveshaft. (Paragraph 6-5.)

c. Disconnect drain tube (26, figure 6-28).

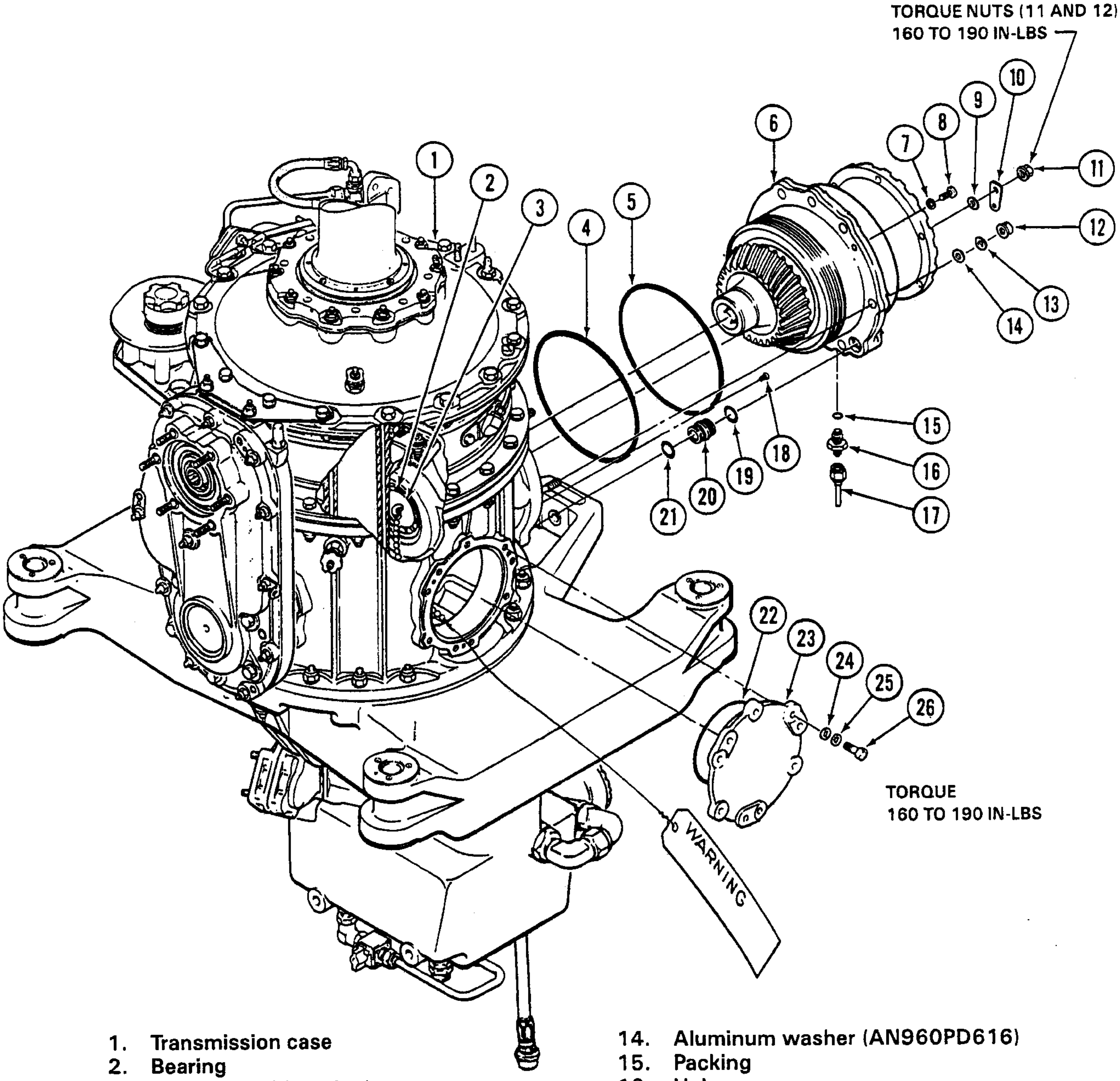
d. Remove nut (11) with clip (10) from lower right stud on transmission.

e. Remove six nuts (12).

f. Use sharp plastic scraper to cut sealant around edge of quill where it contacts transmission case (1).

g. Remove three screws (8).

h. Install three jackscrews (T33) in holes where screws (8) were removed. Tighten jackscrews evenly and carefully pull quill from transmission case. Remove three jackscrews and immediately install three screws (8) and washers (7) to secure cap to quill sleeve.



1. Transmission case
2. Bearing
3. Work aid (rubber plug)
4. Packing
5. Packing
6. Main input quill
7. Aluminum washer
8. Screw
9. Aluminum washer (AN960PD616)
10. Clip
11. Nut
12. Nut
13. Thin steel washer
14. Aluminum washer (AN960PD616)
15. Packing
16. Union
17. Tube (seal drain)
18. Setscrew
19. Packing
20. Oil transfer tube
21. Packing
22. Packing
23. Cover
24. Aluminum washer (AN960PD616)
25. Steel washer
26. Bolt

UH-1H-II-M-06-28

Figure 6-28. Main input quill installation

i. Position quill (6) at right angle for clearance and remove from transmission pylon cavity.

j. Remove oil transfer tube (20). Remove packings (19 and 21).

k. Remove packings (4 and 5).

l. Install cover on transmission case where quill (6) was removed.

6-77. Installation — Input Drive Quill.

a. Uncover opening for input drive quill on aft side of transmission case. Check that mating surfaces of case and quill are clean.

b. Remove any paint or sealant residue on the face and bore of the main case and on mating surface of the quill sleeve using a plastic scraper and a clean cloth moistened with MEK (C-309).

c. Inspect openings for quill in transmission case for the following conditions.

(1) Pitting or surface deterioration in the area, preformed packings, and mating surfaces of close tolerance machine surfaces, is not acceptable if it will affect the proper function and performance of the mating component or assembly.

(2) Any minor scratches in the preformed packing contact surface should be reworked to blend with the surrounding surface, to prevent leakage. Rework using aluminum oxide cloth (C-406) or abrasive pad (C-407).

NOTE

A rubber work aid to facilitate in holding the input quill roller bearing rollers outward is required so no damage will occur to bearings or pinion at installation.

d. Obtain a work aid, made of rubber, of approximately same diameter as bearing race on inboard end of input quill and equipped with an attached change and flag. (Figure 6-29.)

CAUTION

No. 6 oil jet must be removed to prevent it from being damaged when plug is removed. Rubber plug installation procedure must be followed to prevent damage to bearing in transmission when installing quill.

e. Remove three setscrews (18, figure 6-28) from studs in transmission case (1).

NOTE

If rotor brake quill is installed, remove cover from port on opposite side of transmission. If this port is removed, No. 6 oil jet will also require removal to allow clearance for work and plug. (Detail A, Figure 6-29.)

f. Remove bolts (26, figure 6-28), washers (25 and 45). Remove cover (23).

g. Reach through port where cover (23) or opposite cover and No. 6 oil jet were removed and position work aid (3) to hold rollers of bearing (2) against outer race of bearing. See figure 6-29 for sectional view of installed work aid.

h. Heat transmission case (1, figure 6-28) in area of quill port with a heat lamp or 250 watt light bulb. Heating time will vary, but heat case until area near quill port is hot to touch.

i. Lubricate two new packings (19 and 21) with lubricating oil (C-030). Position packings on tube (20). Position tube in transmission case (1).

j. Lubricate new packings (4 and 5) with lubricating oil (C-030) and place on quill. Install packing (5) in groove nearest flange. Install packing (4) in groove nearest pinion. Leave center groove open.

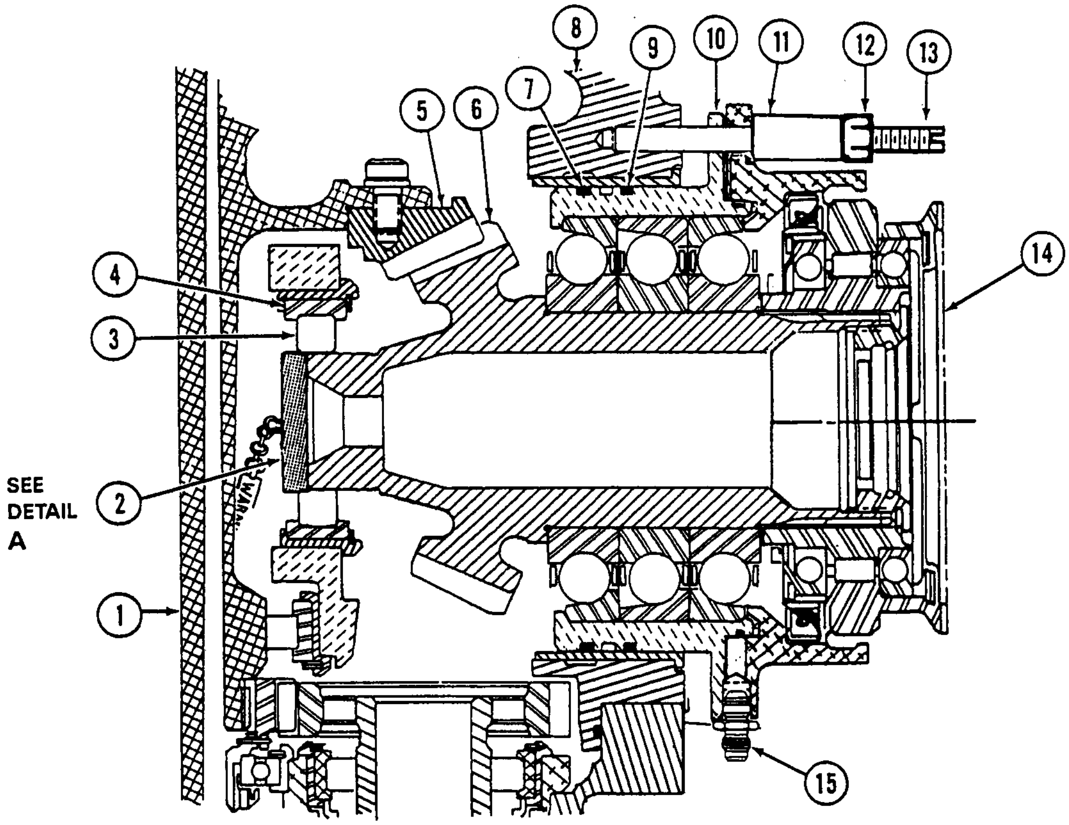
k. Position quill into input quill port with union (15, figure 6-29) from drain tube at bottom.

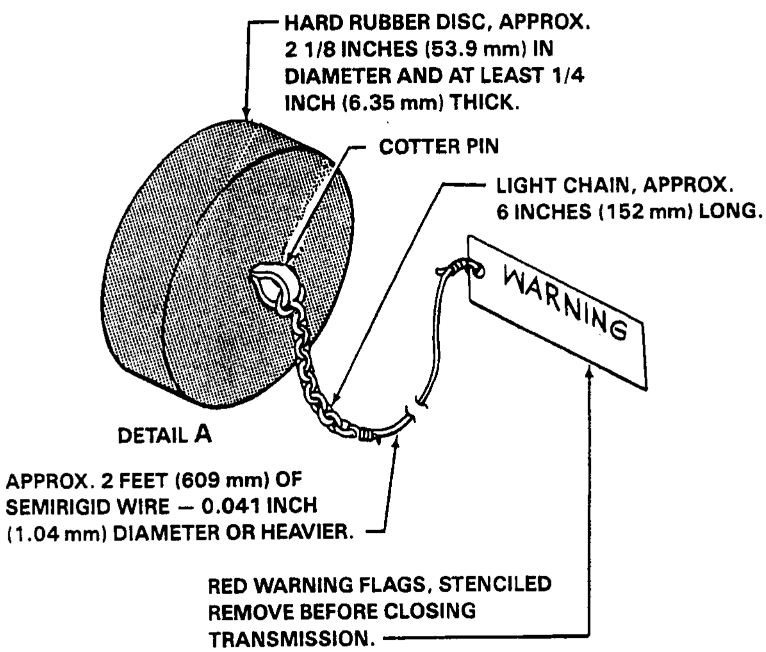
l. Install three studs (13) in holes where setscrews were removed at step f.

m. Carefully slide quill into transmission case. Align pinion (6) teeth with input gear quill (5) teeth. Align front of pinion with bearing rollers (3).

n. Tighten nuts (12) evenly to keep quill aligned. When quill is started into bearing, remove work aid plug (2) to prevent pushing work aid into oil jet No. 6.

o. Continue tightening nuts (12) to fully seat quill. When quill is fully seated, loosen nuts (12) and remove pusher set studs (13) and spacers (11).





1. Main rotor mast
2. Work aid plug
3. Bearing (roller)
4. Bearing outer race
5. Input gear quill (driven gear)
6. Input quill pinion
7. Packing
8. Transmission main bevel gear case
9. Packing
10. Main input quill sleeve
11. Spacer
12. Nut
13. Pusher set stud (T101586-5)
14. Curvic coupling adapter
15. Drain tube union

UH-1H-II-M-06-29

Figure 6-29. Tool application — pusher set (T101586-5)

NOTE

Use only aluminum washers (7 and 14, figure 6-28), AN960PD616. Do not substitute aluminum washers (NAS-1197) or any other washers.

p. Install washer (9), clip (10), and nut (11) on lower right stud. Install six washers (14), six washers (13), and six nuts (12) on remaining studs. Torque nuts (11 and 12) 160 to 190 inch-pounds.

q. Rotate curvic adapter on outboard end of quill (6) by hand. Check for binding and small amount of backlash. A small amount of backlash must be evident. Any binding or roughness is not acceptable and cause must be investigated.

r. Place small amount of anti-seize compound (C-452) on threads of union (16). If removed, place packing (15) on union. Install union (27) in quill. Install tube (17) on union.

s. Install three washers (7) on screws (8). Lockwire (C-405) screws (8) to quill.

t. Install three setscrews (18) into studs on transmission case.

NOTE

If port cover, opposite cover (23), was removed install No. 6 oil jet. (Paragraph 6-50.)

u. Lubricate packing (22) with lubricating oil used in transmission and install on cover (23). Install cover (23) with bolts (26) and washers (24 and 25). Ensure that aluminum washers (23) are next to cover (23). Torque bolts 160 to 190 inch-pounds.

v. Apply a bead of adhesive (C-308) around flange of quill and cover (23 or opposite cover) where they contact gearbox case.

w. Install engine to transmission driveshaft (paragraph 6-8).

x. Close engine and transmission cowling.

y. Perform engine ground run and inspect quill area for oil leaks.

6-78. Seal and Wear Sleeve Replacement — Input Drive Quill.

NOTE

Disassemble quill only to extent necessary to replace seal (13, figure 6-30), if required.

Seal may be replaced without removing quill from transmission.

a. Replace input quill seal as follows:

(1) Remove cowling and main driveshaft in accordance with paragraph 6-5.

(2) Remove retaining ring (7, figure 6-30) and grease retainer (6). Remove and discard packing (5).

(3) Remove locking spring (4). Using T62 wrench set remove nut (3). Remove freewheeling clutch assembly (2).

(4) Disconnect tube (18), remove screws (12), washers (11), nuts (15), and washers (14).

CAUTION

Do not damage laminated shim during removal. Retain shim for later installation.

(5) Remove cap (10) and seal (13) from main input quill (21). Keep shim in place. Press seal (13), from cap (10).

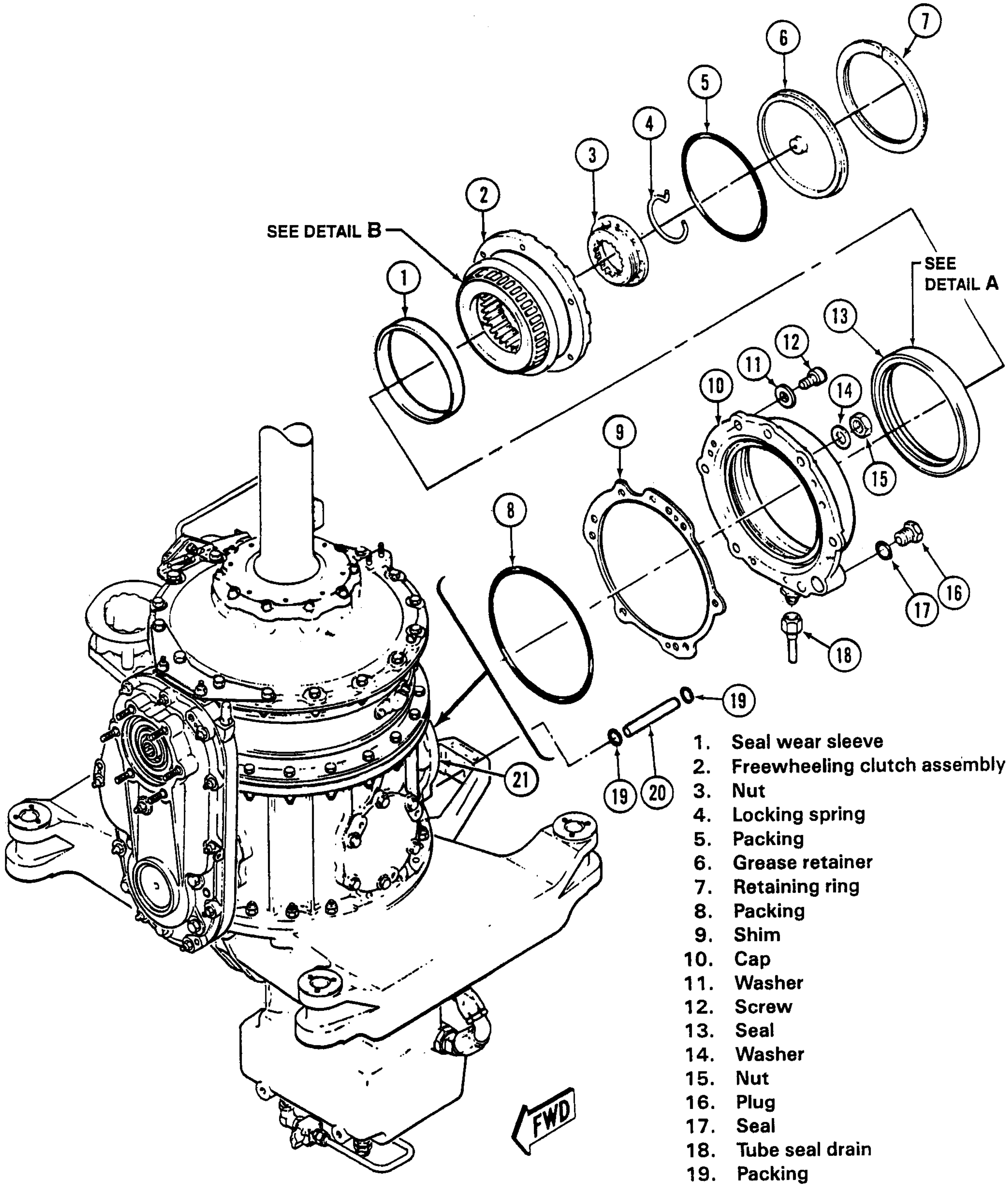
(6) Clean any sealant residue from the machined inboard face of the flange of cap (10) and from the face of main input quill (21). Using a plastic scraper and a clean cloth moistened with MEK (C-309).

(7) Clean shim (9) of any sealant residue using a clean cloth moistened with MEK (C-309). Exercise extreme care to remove any particles which may get between the individual laminates.

(8) Remove seal wear sleeve (1). (Refer to paragraph 6-78, step b.)

(9) Install new seal (13) in cap (10) using adhesive (C-308). Ensure seal (13) is seated against shoulder of cap (10). (See Detail A.)

(10)Lubricate new packing (8) with lubricating oil (C-030) and install in the O-ring groove at outboard end of main input quill (21).



1. Seal wear sleeve
2. Freewheeling clutch assembly
3. Nut
4. Locking spring
5. Packing
6. Grease retainer
7. Retaining ring
8. Packing
9. Shim
10. Cap
11. Washer
12. Screw
13. Seal
14. Washer
15. Nut
16. Plug
17. Seal
18. Tube seal drain
19. Packing
20. Tube
21. Main input quill

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Figure 6-30. Input drive quill (205-040-263-115) seal and wear sleeve replacement (Sheet 1 of 2)

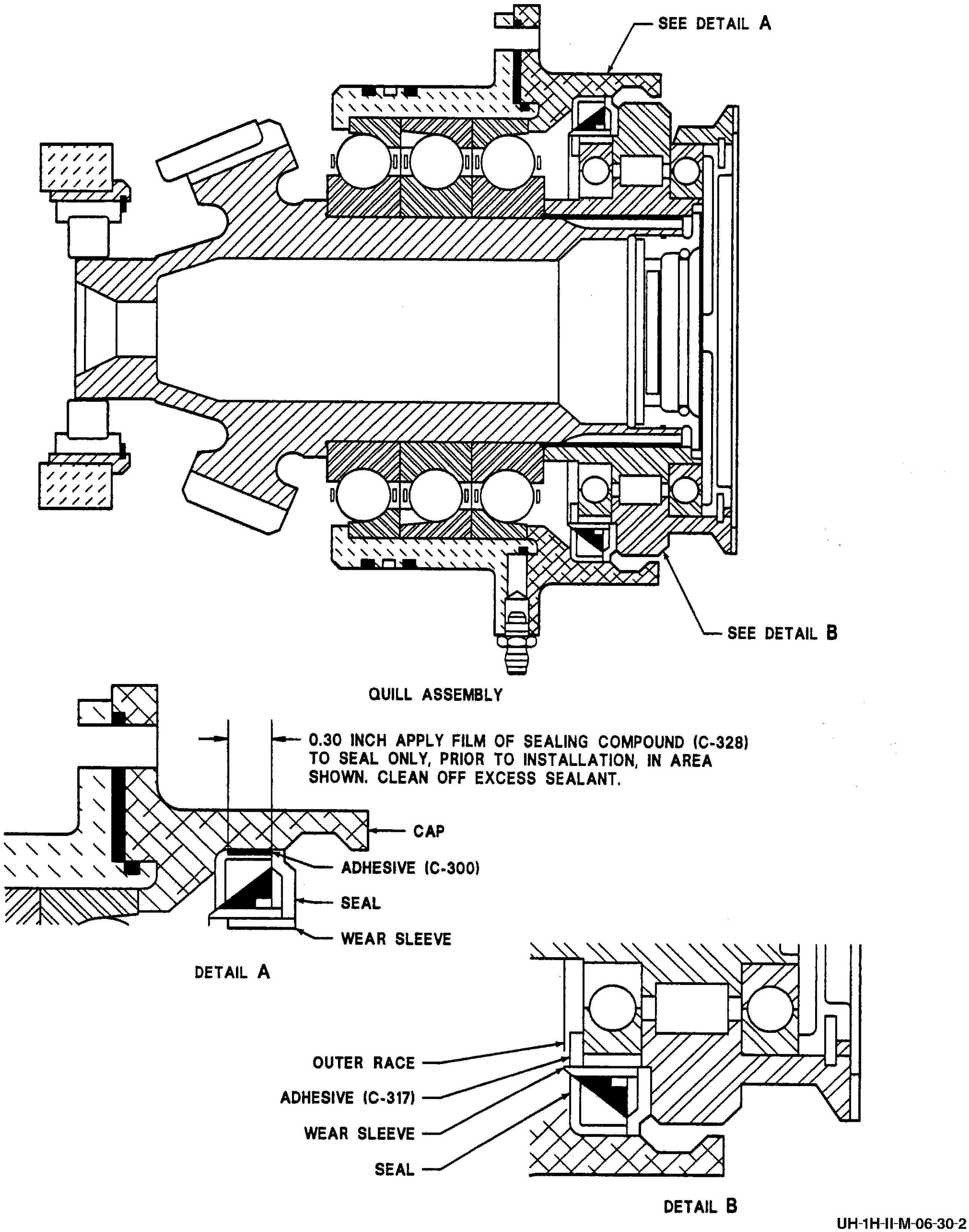


Figure 6-30. Input drive quill (205-040-263-115) seal and wear sleeve replacement (Sheet 2 of 2)

(11)Lubricate new packing (19), install on tube (20).

(12)Install shim (9) and cap (10) on main input quill (21) uniformly, pushing the flange of cap (10) against main input quill (21).

(13)Align screw holes and install screws (12) and washers (11). Leave screws slightly loose. Using a feeler gage, check for 0.001 to 0.004 gap between cap (10) and shim (9).

(14)Install washers (14) and nuts (15). Torque nuts (15) 160 to 190 inch-pounds.

(15)Tighten screws (12) and check for bottoming against shim (9). With screws tightened, washers (11) should not rotate. If washers (11) rotate add thin steel washers between screws (12) and washers (11). Lockwire screws (12) to cap (10) using lockwire (C-405).

(16)Install freewheeling clutch assembly (2) on input pinion.

(17)Install nut (3) using T62 wrench set, torque 350 to 400 foot-pounds and install locking spring (4).

(18)Install new packing (5) on grease retainer (6). Install grease retainer (6) in freewheeling clutch assembly and install retaining ring (7).

(19)Install cowling and main driveshaft in accordance with paragraph 6-8.

b. Replace seal wear sleeve (1, figure 6-30) as follows:

(1) Remove cowling and main driveshaft in accordance with paragraph 6-5.

(2) Remove retaining ring (7, figure 6-30) and grease retainer (6). Remove and discard packing (5).

(3) Remove locking spring (4). Using T62 wrench set remove nut (3). Remove freewheeling clutch assembly (2).

CAUTION

Prior to removing the wear sleeve mask both ends of the clutch assembly to prevent entry of debris into the bearing.

(4) Carefully remove seal wear sleeve (1) from coupling outer race by using a hand-held grinder to grind a groove almost through the old wear ring. Use caution to avoid grinding through wear ring and damage the race. Strike the wear ring with a hard rubber mallet to pop the wear ring off the race. Clean old adhesive from race with a plastic scraper and abrasive pad (C-407).

(5) Inspect new seal wear sleeve (1) and mating surface on coupling outer race for damage. Any nicks or dents on OD of wear sleeve are reasons for scrapping.

NOTE

Refer to paragraph 6-78 for seal replacement.

(6) Installation of a new wear sleeve (1) is accomplished by masking off the outer surface of wear ring, cleaning and drying inner surface of wear ring and mating outer surface of outer coupling race. Scrub grease removing primer (C-345) into the surface thoroughly with abrasive pad (C-407). This is a very important step.

NOTE

The grease removing primer (C-345) must be thoroughly stirred before use. Also, the solvent in the primer is trichlorethylene, and should be used with adequate ventilation.

(7) Allow grease removing primer (C-345) to air dry to a white powder. Remove dry powder with a clean, dry cheesecloth. Apply only enough adhesion promoter (C-327), in a well ventilated area, with a brush to wet surface. Let promoter air dry a minimum of 30 minutes at 65 to 85°F (18 to 29°C) prior to applying adhesive (C-317).

NOTE

Adhesive (C-317) is a two-part component, 33 parts B to 100 parts A with a pot life of 40 minutes.

(8) Assemble seal wear sleeve (1) to coupling outer race with the use of a press. Fabricate a suitable plate to bridge over the coupling inner race so that uniform pressure may be applied around entire circumference of wear sleeve while installing, to avoid cocking and distorting. (Refer to figure 6-31.) Install wear ring with large radius at outer edge of coupling race flush to 0.020 inch recess. Clean excess adhesive from wear sleeve thoroughly and remove all protective masking tape from seal bearing surface of wear sleeve.

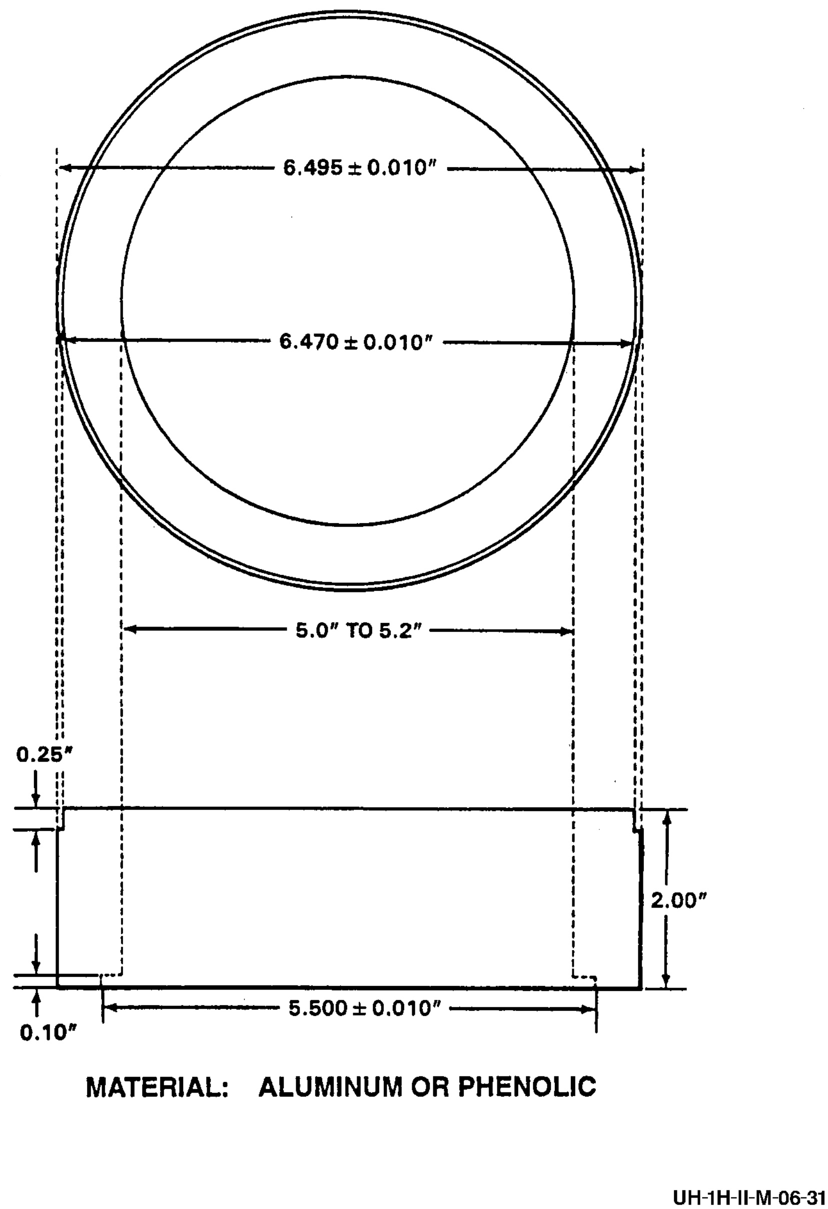


Figure 6-31. Input quill seal wear sleeve work aid

CAUTION

Special attention should be given to assure no excessive bonding material is left between the wear sleeve and coupling race, as it tends to become hard and flake off. This flaking of bonded adhesive has been found between the seal lip and wear sleeve causing leakage.

(9) Spray OD of wear sleeve (1) with dry film lubricant (C-028), if available, and install freewheeling assembly into input quill housing. Do not coat parts, other than wear sleeve (1) and seal (13) with dry film lubricant.

NOTE

If dry film lubricant (C-028) is not available, it is permissible to utilize approved lubricating oil (C-030) for this application.

(10)Install a new preformed packing (5) on grease retainer (6). Install nut (3) using (T62) wrench set torque 350 to 400 foot-pounds. Install lock ring spring (4). Coat preformed packing (5) with lubricating oil (C-030) and install grease retainer (6) and retaining ring (7).

(11)Install main driveshaft and cowling. (Refer to paragraph 6-5.)

c. Inspect freewheeling clutch assembly for 1200 and 3100 hour scheduled inspection as follows:

(1) Remove main driveshaft. (Paragraph 6-5.)

(2) Remove retaining ring (7, figure 6-32), retainer (6), and preformed packing (5) from freewheeling clutch assembly (2).

(3) Remove locking spring (4).

(4) Insert wrench (T62) into the quill, matching the spline teeth of the tool with splines of nut (3). Insert a 3/4 inch square drive extension through wrench and engage inner end of pinion gear.

(5) Loosen nut (3) using a 3/4 inch drive handle.

(6) Remove wrench (T62) and nut (3).

CAUTION

Do not bump or push inboard on the outer race freewheeling clutch assembly (2).

(7) Remove freewheeling clutch (2) as a unit from the quill.

NOTE

Handle freewheeling clutch (2) carefully to prevent displacement.

(8) Remove retainer ring (15) and shield (14). Position outer race (9) on a support with flanged end down. Press inner race (10), and bearing (8) out of outer race.

(9) Remove bearing (8) from inner race. Remove bearing (13) and freewheeling clutch (11) from outer race (9).

(10) Visually inspect freewheeling clutch (11) for wear and damage. Use a 3X or 5X magnifying glass as required. Do not disassemble the sprag retainer assembly during inspection. Replace assembly if any of the following conditions exist.

(11) Inspect retainer for bent or distorted cross bars and flanges. (Figure 6-32, Detail B.)

(12) Check fit of retainer by installing clutch in outer race. Retainer must be round and not bind in outer race.

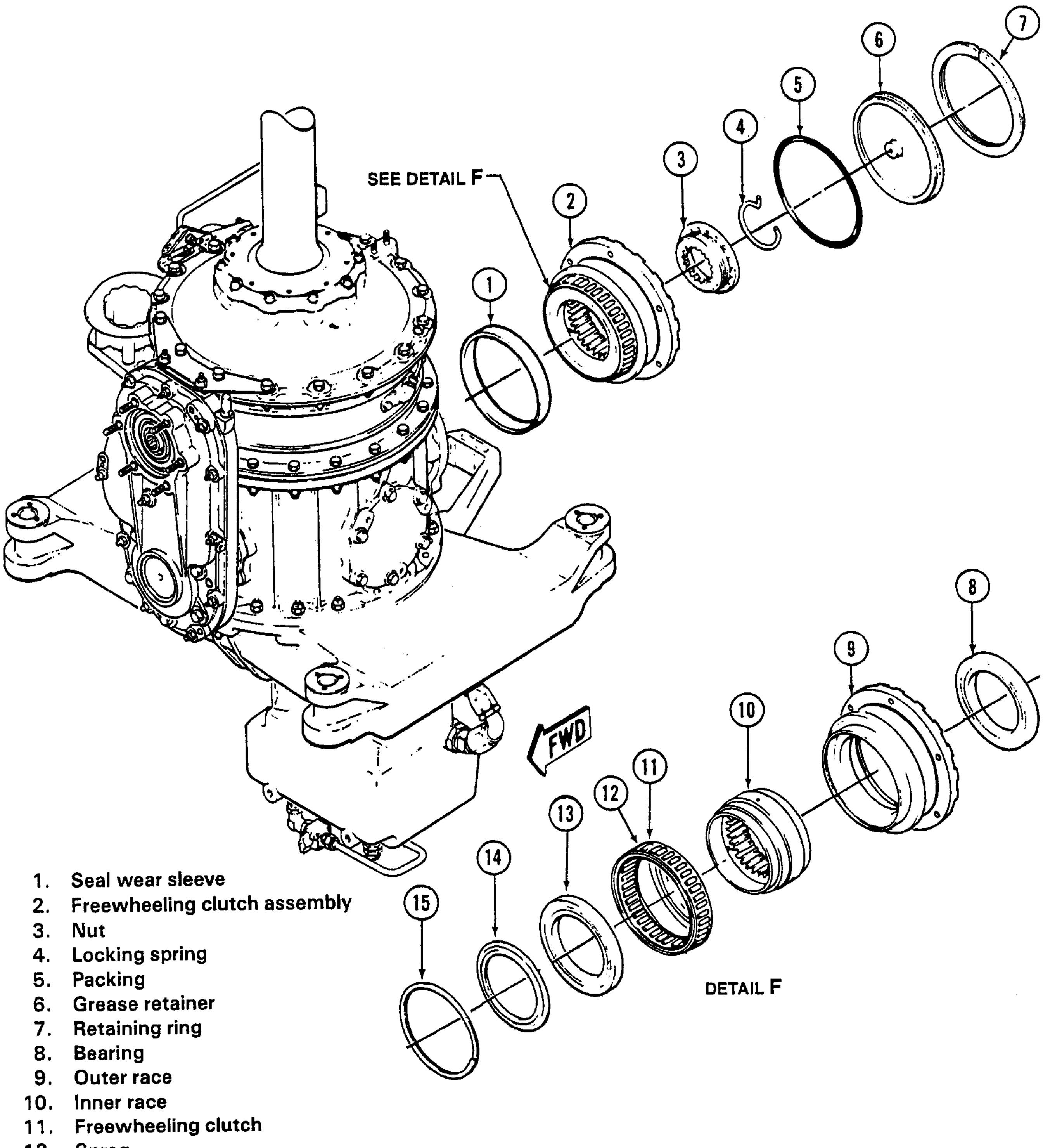
(13) Check for freedom of sprags in retainer slots. Sprags must not bind in retainer.

(14) Inspect retainer for wear on outer diameter and on side flanges. Wear in excess of 0.004 inch depth is not acceptable.

(15) Inspect retainer, sprags, and springs for corrosion. No corrosion pitting is acceptable.

(16) Inspect sprags for heat discoloration, cracks, chips, spalling, or surface breaking which may be from scuffing or scoring. Heat discoloration, cracks, chips spalling (including flaking of formchrome layer), scuffing, or scoring are not acceptable.

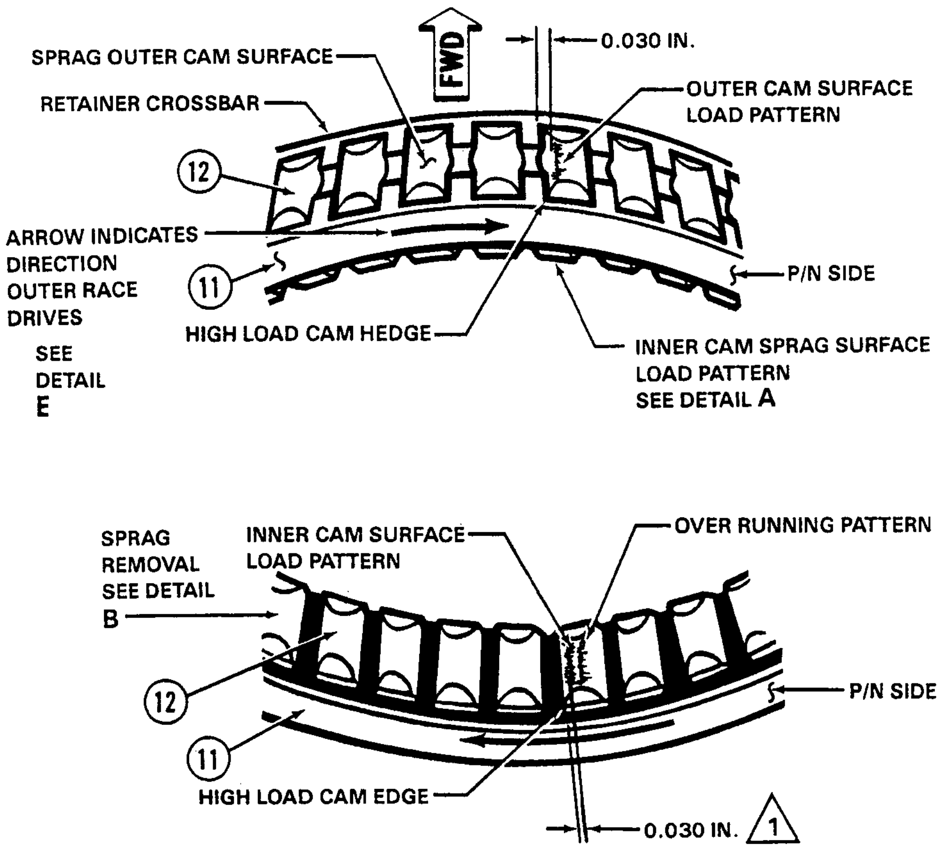
(17) Inspect sprag inner and outer cam surfaces for wear using a 3X or 5X magnifying glass and good light. Flat wear bands that are observable are not acceptable regardless of width if they extend more than 1/5 the length of the sprag. Light polished areas are acceptable.



1. Seal wear sleeve
2. Freewheeling clutch assembly
3. Nut
4. Locking spring
5. Packing
6. Grease retainer
7. Retaining ring
8. Bearing
9. Outer race
10. Inner race
11. Freewheeling clutch
12. Sprag
13. Bearing
14. Shield
15. Retainer ring

UH-1H-II-M-06-32-1

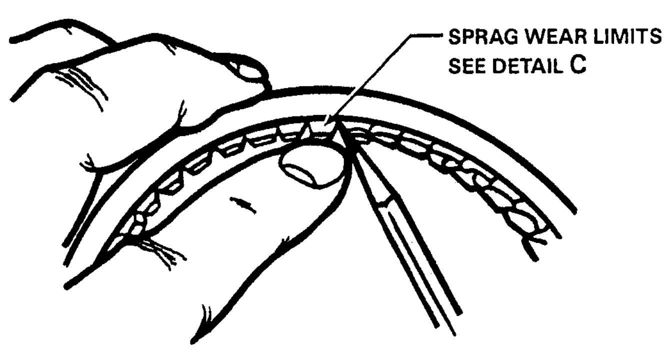
Figure 6-32. Freewheeling clutch inspection (Sheet 1 of 3)



NOTE

1 Replace clutch if contact load pattern is within 0.030 inch of edge of sprag cam.

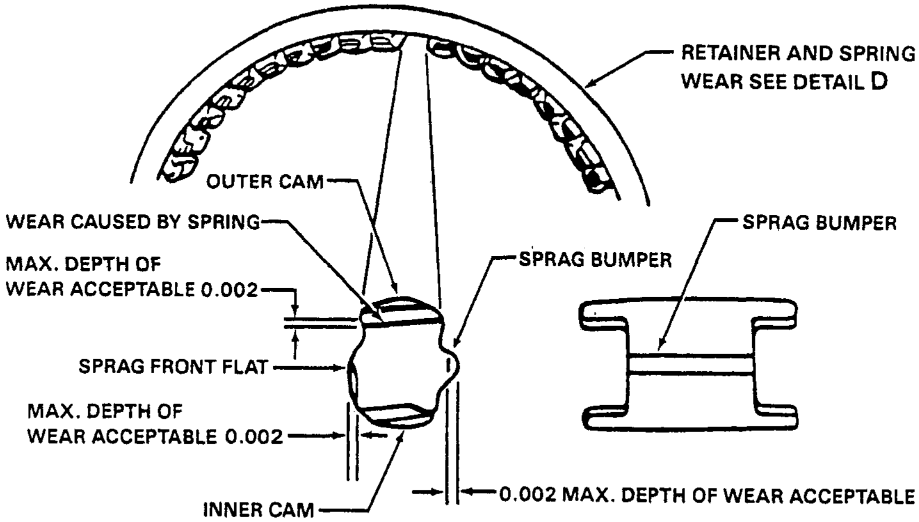
DETAIL A
FREEWHEELING CLUTCH-WEAR PATTERN



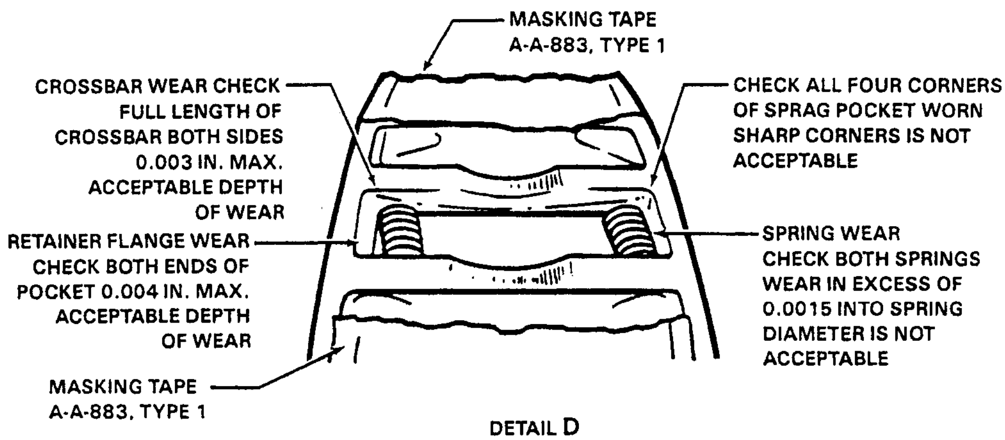
DETAIL B
FREEWHEELING CLUTCH-REMOVAL OR INSTALLATION OF SPRAG

UH-1H-II-M-06-32-2

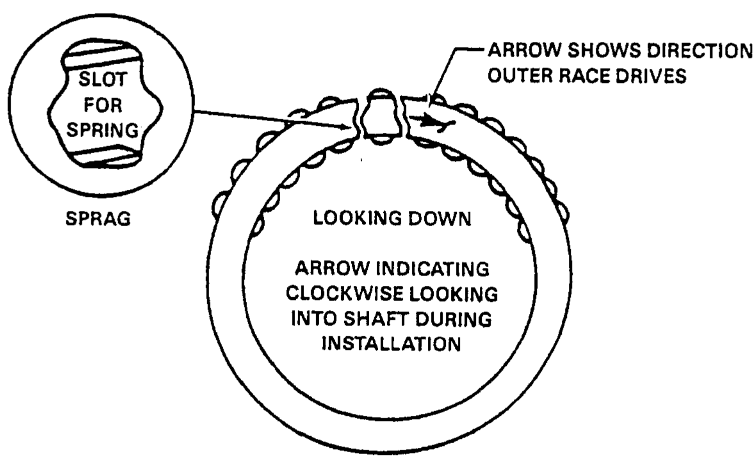
Figure 6-32. Freewheeling clutch inspection (Sheet 2 of 3)



DETAIL C
FREEWHEELING CLUTCH-SPRAG WEAR



DETAIL D
FREEWHEELING CLUTCH-RETAINER AND SPRING WEAR



DETAIL E
FREEWHEELING CLUTCH-ONE WAY CLUTCH ASSEMBLY

UH-1H-II-M-06-32-3

Figure 6-32. Freewheeling clutch inspection (Sheet 3 of 3)

(18) Inspect sprag inner and outer cam surfaces for load contact pattern. An inner and/or outer cam load contact pattern with 0.030 inch of the respective high-load edge of the sprag cam is not acceptable. (Detail A, Note 1.)

(19) Degrease clutch and allow to dry.

(20) With the clutch lying on a flat surface, select one sprag and remove from retainer sufficiently to lift garter spring out of sprag end notch and release the sprag. (Detail B.)

(21) Inspect sides of sprag wear. (Detail C.) Inspect corners of sprag cam surface for chips, dents, or loss of material. Wear in excess of 0.002 inch from original surface, chips, or dents are not acceptable.

CAUTION

The clutch should not be completely disassembled for inspection. Only one sprag shall be removed at a time and be reinstalled in the same orientation as removed. If more than one sprag is inadvertently removed, reassembly must be verified as shown in detail E.

(22) Inspect inside notch at each end of sprag (12) for wear caused by the garter spring. Wear in excess of 0.002 inch depth is not acceptable. (Detail C.)

(23) Inspect garter spring outer diameter and sides for wear by viewing through empty retainer slot. (Figure 6-32, Detail D.) Wear in excess of 0.0015 inch depth is not acceptable.

(24) Inspect vacated retainer slot crossbar and end flanges for wear. Wear in excess of 0.004 inch depth is not acceptable.

(25) Install sprag in retainer slot by inserting notch at lower end of sprag over lower spring. Pull an adjacent sprag inward to uncover upper spring. Lift spring sufficiently to install in upper notch of sprag (12) being installed. Verify correct orientation of sprag (12) to other sprags. (Detail E.)

(26) Repeat sprag (12) removal and inspection operation, steps (10) through (26) on three other sprags (12) approximately equally spaced around retainer.

(27) Inspect inner and outer clutch races (9 and 10) for corrosion, pitting and spalling of sprags (12). Contact surfaces. (No acceptable damage.)

(28) Dimensionally inspect sprag (12) contact diameters of the inner and outer races (9 and 10). Races that exceed the following dimensions must be replaced (inner race outside diameter 3.7397 inch minimum) (outer race inside diameter 5.1181 inch maximum).

(29) Magnetic particle or fluorescent penetrant inspect inner and outer races (9 and 10). Replace if any cracks are found.

6-79. Return to Overhaul — Input Drive Quill. As a field expedite only, prepare the transmission quill for shipment as stated below.

NOTE

The following procedure is based on the assumption that the work will be done under less than ideal conditions with limited equipment, and that on some occasions the work will be done by personnel who are not experts in the field of preservation. This procedure will be used only at locations where the facilities for the application of normal preservation procedures do not exist.

a. Clean quill to extent possible with available materials and dry with a clean cloth.

b. Prepare the necessary forms and tags.

c. Coat entire quill with a heavy coat of any grease type corrosion preventive compound available, or in the absence of material, apply a light coat of aircraft grease (C-014 or C-007).

d. Wrap transmission quill with flexible barrier material (C-427) and secure barrier material with tape (C-410).

e. Insert wrapped quill in the best available container (constructed if necessary) of metal, wood, or weather resistant fiberboard. Cushion, block, and brace as necessary.

6-80. GENERATOR DRIVE QUILL.

6-81. Description — Generator Drive Quill.

Generator drive quill (figure 6-33) for DC generator is an offset quill assembly mounted on front of the transmission, with a generator drive pad above cabin room level. Quill is driven through a gear train from a spiral bevel gear mounted in transmission main case. Quill is equipped with a vent breather and a magnetic plug.

Premaintenance Requirements for Removal and Disassembly of Generator Drive Quill

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T28)
Test Equipment	None
Support Equipment	Heat Lamp
Minimum Personnel Required	One
Consumable Materials	(C-010), (C-011), (C-304), (C-308), (C-309), (C-328), (C-405), (C-464), (C-500)
Special Environmental Conditions	A Covered Area Not Susceptible to Blowing Sand or Dust.

NOTE

Generator drive quill cannot be removed or installed while transmission is in place in helicopter.

a. Remove transmission. (Paragraph 6-17.)

b. Remove DC generator. (Chapter 9.)

c. Remove four bolts (1, figure 6-33), spacers (5), washers (6 and 7), and nuts (8) from transmission top case.

d. Remove two nuts (3), washers (4), support bracket (2), and shims (9) from transmission case and generator drive quill (12).

e. Remove five bolts (15) and washers (14 and 13) securing generator drive quill (12) to transmission case.

CAUTION

When using jackscrews to remove quill assembly, these procedures must be followed: two jackscrews must be screwed in evenly exerting equal pressure on quill sleeve to prevent damage to flanges. Do not use force by prying on flanges. In the event quill cannot be removed by using jackscrews, heat case, and use jackscrews. Do not use torch or open flame to heat case.

f. Use jackscrews (T28) and pull generator drive quill (12) from transmission case. Remove jackscrews.

g. Cover opening in transmission case to prevent entry of foreign materials.

h. Cut lockwire and remove magnetic plug (18) and self-closing valve (17) from generator drive quill (12).

6-83. Disassembly — Generator Drive Quill.

CAUTION

Do not pull on gear (7, figure 6-34) while retaining ring (1) is removed.

a. Remove retaining ring (1, figure 6-34) from generator drive quill (8).

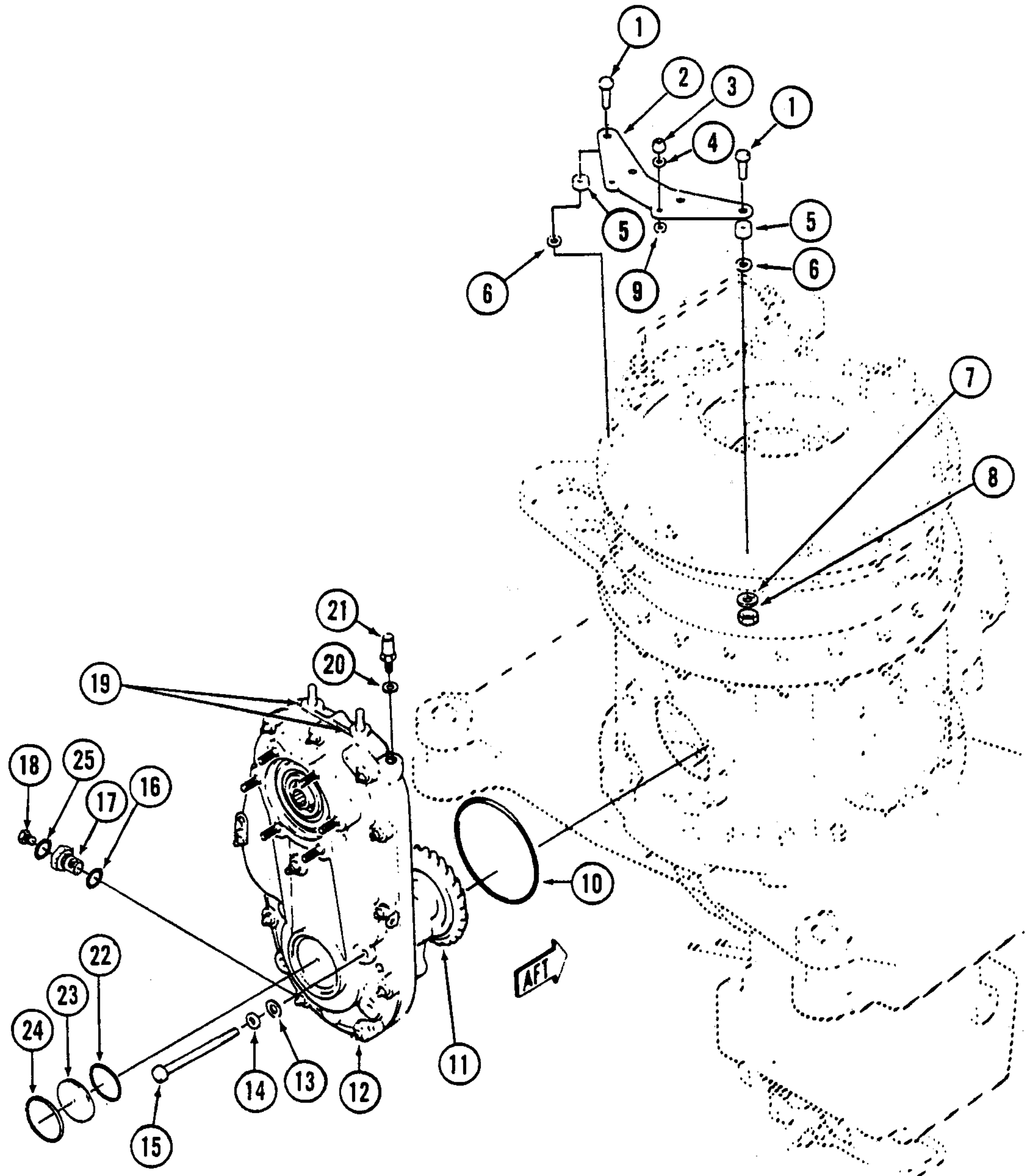
CAUTION

Pad jaws of pliers with suitable material to prevent damage to seal housing (3).

b. Use pliers as shown in figure 6-34, catch lip of seal housing (3) and work from quill.

c. If shim (5) comes out, carefully reinstall against bearing (6). Cover quill.

d. Press seal (4) from seal housing (3). Discard preformed packing (2).



1. Bolt
2. Support bracket
3. Nut
4. Washer
5. Spacer
6. Washer (212-040-199-001)
7. Washer
8. Nut
9. Shim
10. Packing
11. Spiral bevel gear
12. Generator drive quill
13. Washer
14. Washer
15. Bolt
16. Gasket
17. Self-closing valve
18. Magnetic plug
19. Generator quill boss surface
20. Gasket
21. Vent breather
22. Packing
23. Cover plate
24. Retaining ring
25. Packing

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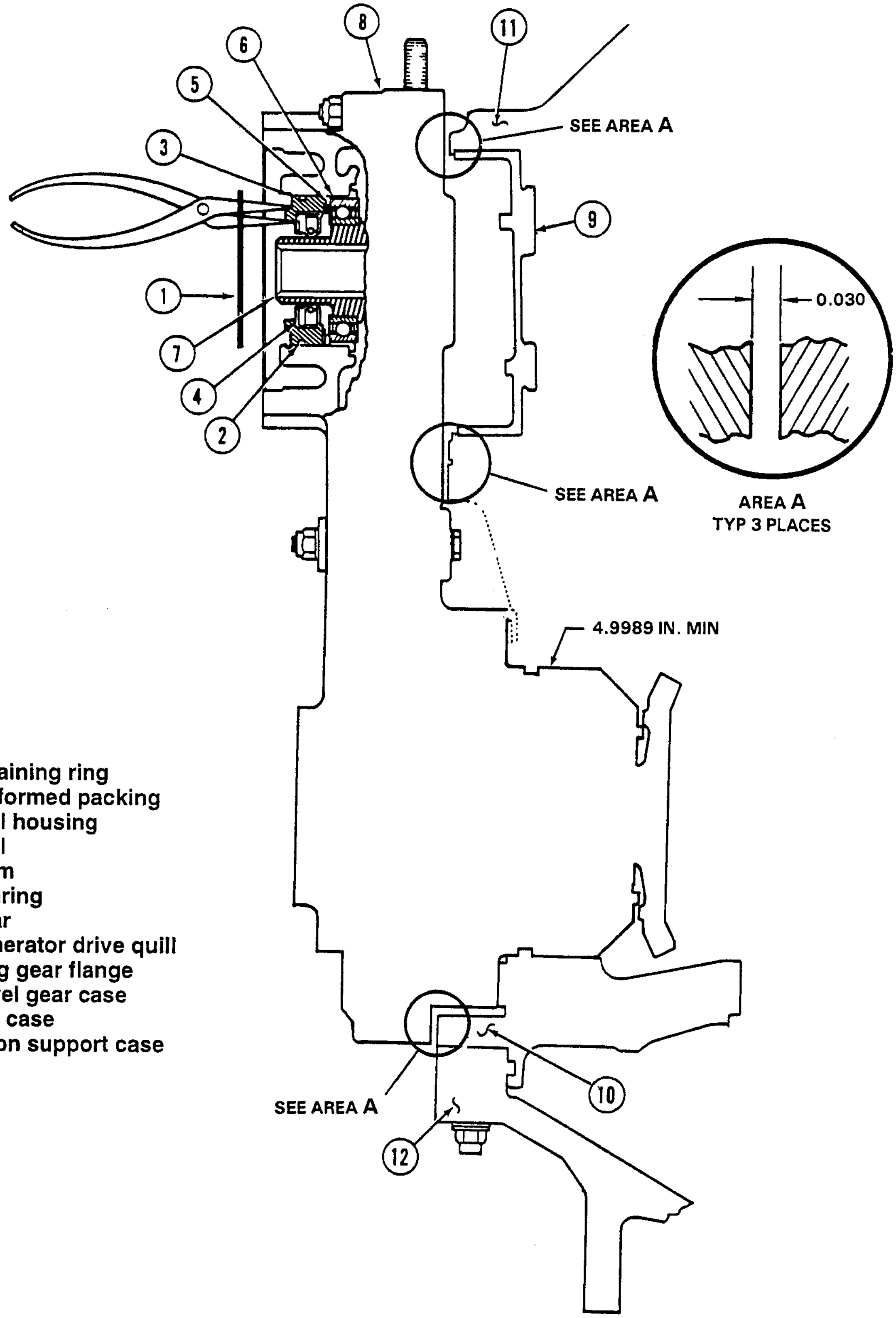
Figure 6-33. Generator drive quill — removal



1. Retaining ring
2. Preformed packing
3. Seal housing
4. Seal
5. Shim
6. Bearing
7. Gear
8. Generator drive quill
9. Ring gear flange
10. Bevel gear case
11. Top case
12. Pylon support case

Figure 6-34. Generator drive quill — seal replacement

6-84. Inspection — Generator Drive Quill.

NOTE

External leakage from seal (4, figure 6-34) is not permitted. However, a small amount of seepage assures a satisfactory seal condition. Continuous flow (droplets) is considered excessive and will require seal replacement.

a. Inspect for evidence of oil leaks.

b. Inspect OD of generator drive quill (8) in area of preformed packing groove for corrosion and wear. Corrosion not permitted; replace quill if OD is less than 4.9989 inches. (Figure 6-34.)

c. Visually inspect case of quill (8) for cracks, chipping, scoring, and wear by slowly rotating spiral bevel gear (11) by hand.

d. Visually inspect teeth of spiral bevel gear (11) for chipping, cracks, scoring, corrosion and wear.

e. Inspect bearings in quill (8) for smoothness and freedom of operation.

f. Check magnetic plug (18, figure 6-33) for metal particles. (Paragraph 6-15 and figure 6-7.)

6-85. Cleaning — Generator Drive Quill.

a. Clean parts with solvent (C-304). Dry with filtered, compressed air.

b. Lubricate bearings and machined surfaces immediately after cleaning with lubricating oil (C-010 or C-011).

6-86. Repair — Generator Drive Quill.

a. Replace seal (4, figure 6-34) if leakage exists. (Paragraph 6-88.)

b. Replace (without repair) if quill boss is corroded or worn beyond replacement limit of 4.9989 inches OD.

c. Replace (without repair) if gear teeth are cracked, chipped, scored, or worn.

d. Replace (without repair) if bearings are binding or rough.

e. If metal particles are noted on magnetic plug, conduct action required by paragraph 6-15 and figure 6-7.

f. Prepare generator drive quill for return to overhaul.

6-87. Assembly — Generator Drive Quill.

a. Install new seal (4, figure 6-34) in seal housing (3) as follows:

(1) Remove old sealant from ID of seal housing (3) using a sharpened plastic scraper.

(2) Scrub ID of seal housing (3) using a cloth dampened with MEK (C-309).

(3) Clean OD of new seal (4) using a cloth dampened with MEK (C-309).

(4) Apply a film of sealing compound (C-328) to OD of seal (4) and ID of seal housing (3).

(5) Using a pressing plate slightly smaller than OD of seal (4); press seal into housing (3) with seal lip facing inboard. Ensure seal is bottomed in housing. Remove excess sealant.

b. Lubricate new preformed packing (2) with lubricating oil (C-030). Place packing in groove of seal housing (3).

c. Inspect seal surface on gear (7) for nicks, scratches, or excessive wear. (Maximum depth of seal wear groove 0.002 inch.)

d. Replace (without repair) if there are nicks, scratches or corrosion on gear area of seal conduct.

e. Superficial corrosion on pinion gear seal area may be removed by light polishing with fine abrasive pad (C-407).

f. Check to ensure that shim (5) is in place against bearing (6).

g. Lubricate lip of seal (4) and OD of gear (7) with lubricating oil (C-030).

h. Carefully press seal housing (3) and seal (4) over gear (7) and into generator drive quill (8). Secure housing with retaining ring (1).

6-88. Installation — Generator Drive Quill.

a. Inspect transmission case at opening for generator drive quill (12, figure 6-33) for the following conditions:

(1) Pitting or surface deterioration in the area of preformed packings, and mating surfaces of close tolerance machine surfaces is not acceptable if it will affect the proper function and performance of the mating component or assembly.

CAUTION

During cleaning operations care must be taken to prevent entry of foreign material into the transmission.

(2) Remove any paint or sealant residue on face and bore of the main transmission case and on mating surface of the quill sleeve using a plastic scraper and clean cloth moistened with MEK (C-309).

(3) Any minor scratches in the preformed packing contact area should be reworked to blend with the surrounding surface to prevent leakage, using aluminum oxide cloth (C-406) or abrasive pad (C-407).

b. Install generator drive quill (12, figure 6-33) in transmission port with packing (10) removed using steps g, h, and i, (1), (2), and (3) paragraph 6-88. Install bolts (15), washers (14 and 13) in generator drive quill (12), torque bolts (15) 40 to 50 inch-pounds.

c. Check for minimum clearance of 0.030 inch between generator drive quill (12) and transmission cases area A (figure 6-34). If minimum clearance is present, remove quill and proceed to step e.

d. If minimum clearance is not obtained proceed as follows:

(1) Remove bolts (15, figure 6-33) washers (14 and 13). Remove generator drive quill (12). Cover quill port in transmission.

CAUTION

Take necessary precautions to prevent entry of debris into transmission assembly.

(2) Remove minimum material from areas A (3 places) (figure 6-34) to obtain the required clearance of 0.030 inch between generator drive quill (12, figure 6-33) and transmission cases.

(a) Do not remove material from ring gear flanges (9, figure 6-34). If interference exists at this point. Replace generator drive quill (12).

NOTE

Do not remove excess material from the flange of any case such that the reworked surface falls below the level of ring gear flange (9, figure 6-34) outer diameter.

(b) Surface finish of any reworked case flange area A to be no greater than 250 microinches AA.

(c) Chemically treat and refinish reworked surfaces in accordance with BHT-ALL-SPM.

NOTE

Top case and beveled gear case are aluminum. Pylon support case is magnesium.

e. Lubricate new preformed packing (10) with oil (C-030). Apply oil film to boss of generator drive quill (12) and opening in transmission case.

f. Place preformed packing (10) on boss of generator drive quill (12).

g. Using a heat lamp, heat the transmission case at opening for quill (12) until case is hot to touch or 250°F. Do not use torch or flame to heat transmission case.

NOTE

A work aid for installing the generator drive quill may be fabricated as shown in figure 6-35.

h. If work aid is required then install the three work aid studs into case threads at equally spaced intervals.

i. Install generator drive quill (12, figure 6-33) as follows:

(1) Align and position generator drive quill (12) over work aid studs.

(2) Install steel washers on work aid studs and against case of generator drive quill (12). Thread work aid pushers onto studs.

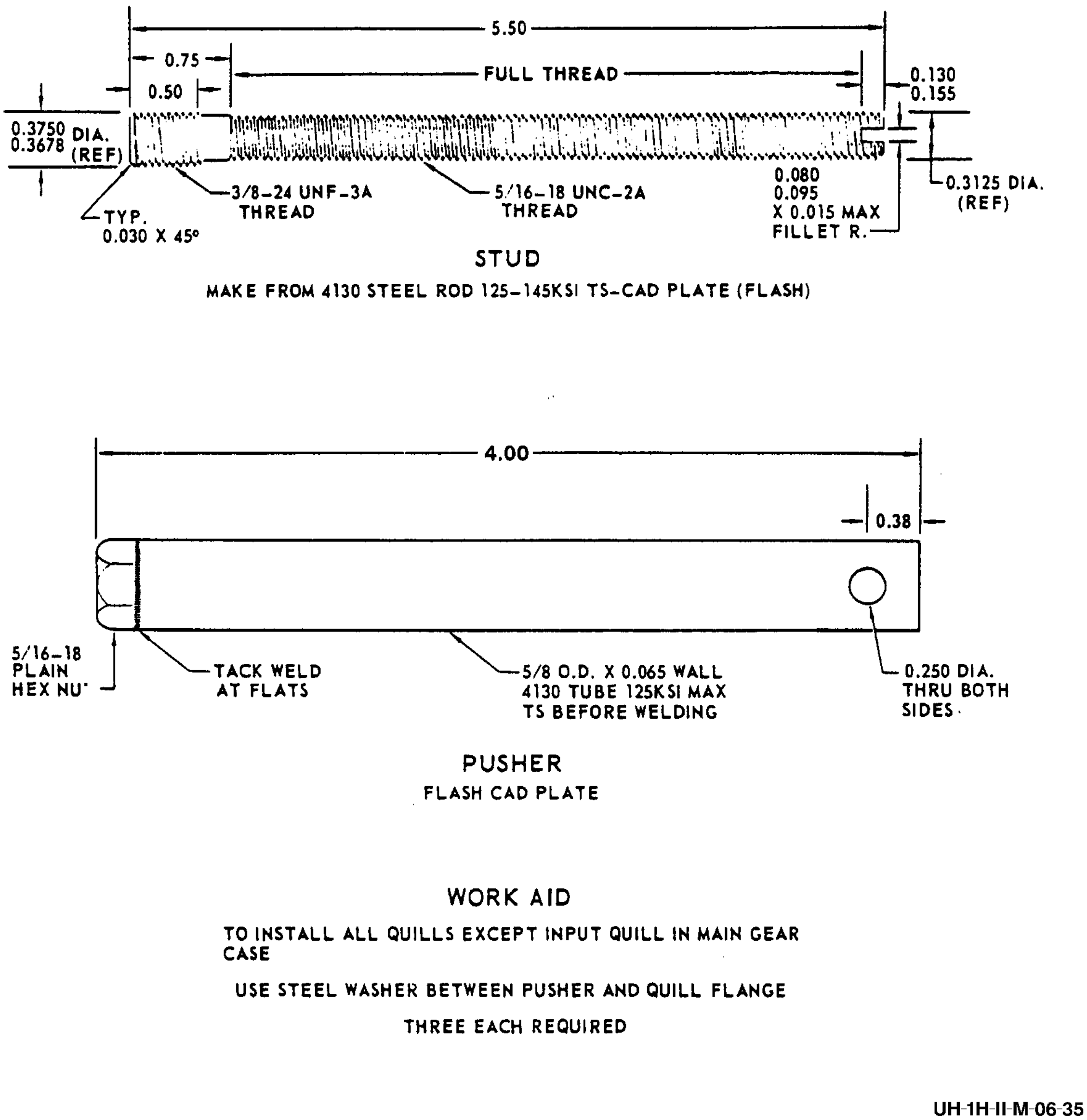


Figure 6-35. Work aid for installing generator

CAUTION

Ensure that gears of generator drive quill (12) and transmission driving gear are properly meshed before seating quill.

(3) Tighten work aid pushers evenly until generator drive quill (12) is fully seated. Remove work aids.

(4) Secure generator drive quill (12) to transmission with five bolts (15), steel washers (14), and aluminum washers (13). Torque bolt 160 to 190 inch-pounds.

(5) Remove retaining ring (24, figure 6-33) and cover plate (23).

(6) Remove packing (22) and discard.

(7) Insert finger into open forward end of generator drive pinion and verify existence of backlash between pinion and mating gear within transmission. If no backlash, replace quill assembly.

(8) Lubricate new packing (22) with lubricating oil (C-030) and install on cover plate.

(9) Install cover plate (23) with packing in quill assembly and install retaining ring (24).

(10)Apply bead of class B-2 adhesive (C-308) around perimeter of generator drive quill (14) and mating edge surfaces of transmission case. Fill jackscrew holes with sealing compound.

j. Install support bracket (2) as follows:

(1) Install support bracket (2, figure 6-33) on transmission case using bolts (1), washers (7), spacers (5), washers (6), and nuts (8). Torque nuts (8) 230 to 250 inch-pounds.

(2) Measure and record each gap between the lower surface of bracket (2) and generator boss surface (19). Thickness of each peel shim (9) to be equal to corresponding gap within 0.003 inch. Shim for each stud on generator quill boss surface (19).

(3) Remove bolts (1), nuts (8), washers (7), spacers (5), washers (6), and bracket (2).

(4) Install shim (9) as marked on each stud located on generator boss surface.

(5) Install bracket (2) on transmission case using bolts (1), washers (7), spacers (5), washers (6), and nuts (8). Torque nuts (8) 230 to 250 inch-pounds.

(6) Install washers (4) and nuts (3) on studs located on generator boss surface. Torque nuts 160 to 190 inch-pounds.

k. If removed, place new preformed packing (22) on vent breather (21).

(1) Install vent breather (21) in top right corner of generator drive quill (14). Torque vent breather 30 to 40 inch-pounds.

(2) Safety vent breather (21) to quill boss with lockwire.

l. Assemble magnetic plug (18) in self-closing valve (17). Install new preformed packing (25).

(1) Install self-closing valve (19) in lower left corner of generator drive quill (12). Install new gasket (16). Torque 200 to 300 inch-pounds.

(2) Safety magnetic plug (18) and self-closing valve (17) to quill boss with lockwire (C-405).

m. Install DC generator. (Chapter 1.)

n. Install transmission. (Paragraph 6-27.)

o. Service transmission. (Chapter 1.)

p. Check generator drive quill for oil leakage and DC generator for operation on first engine runup. (Refer to BHT PUB-92-004-10.)

6-89. HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

6-90. Description — Hydraulic Pump and Tachometer Drive Quill. The hydraulic pump and tachometer drive quill (figure 6-36), located on right side of transmission sump case, is driven by an accessory gear train. Gear shaft of this quill directly drives the hydraulic system pump, and also drives the rotor tachometer generator by means of a chain-and- sprocket offset drive.

1. Nut
2. Aluminum washer
3. Hydraulic pump and tachometer quill drive
4. Oil feed hole
5. Packing
6. Transmission oil sump
7. Drive quill mounting studs
8. Gasket
9. Seal
10. Cover
11. Aluminum washer
12. Thick steel washer
13. Nut
14. Seal
15. Bolt
16. Spiral bevel gear
17. Setscrew (plastic — long)
18. Setscrew (plastic — short)

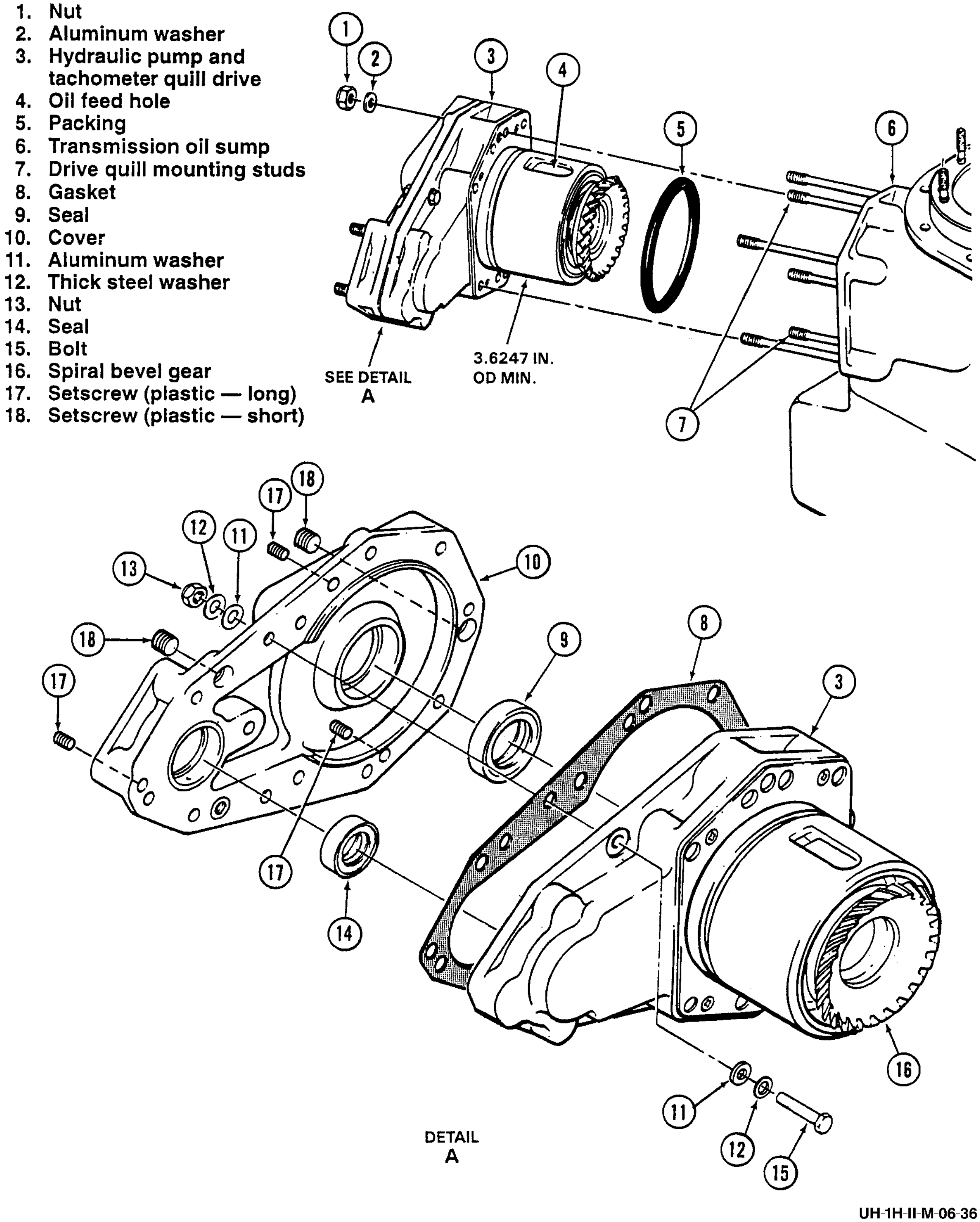


Figure 6-36. Hydraulic pump and tachometer drive quill — removal and installation

6-91. Removal — Hydraulic Pump and Tachometer.

Premaintenance Requirements for Removal and Installation Hydraulic Pump and Tachometer Drive Quill

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T33)
Test Equipment	None
Support Equipment	Heat Lamp
Minimum Personnel Required	One
Consumable Materials	(C-010), (C-011), (C-304), (C-308), (C-464), (C-500)
Special Environmental Conditions	A Covered Area Not Susceptible to Blowing Sand or Dust.

a. Obtain access by detaching sound-proofing blanket and remove access plates on right side of pylon island in cabin.

b. Remove rotor tachometer generator by disconnecting electrical connector and removing four nuts and four washers from four mounting studs through flange of drive quill. Discard gasket. (Chapter 8.)

c. Remove hydraulic pump. (Chapter 7.)

CAUTION

When using jackscrews to remove quill assembly, perform following procedures. Ensure the jackscrews are screwed in evenly, exerting equal pressure on quill sleeve to prevent damage to flanges. Do not use force by prying to remove quill, in the event quill cannot be removed by using jackscrews, heat case, and use jackscrews. Do not use torch or open flame to heat case.

d. Remove two nuts (1, figure 6-36) and washers (2 and 3) from shortest top and bottom studs.

e. Remove three plastic setscrews (17) from quill sleeve (3).

f. Use jackscrews (T33) to pull hydraulic pump and tachometer drive quill (3) from sump case. Remove jackscrews. Discard preformed packing (5).

g. Cover opening in sump case to prevent entry of foreign material.

6-92. Inspection — Hydraulic Pump and Tachometer Drive Quill.

a. Visually inspect for oil leaks.

NOTE

External leakage of quill seals is not permitted. However, a small amount of seepage assures a satisfactory seal condition. Continuous flow (droplets) is considered excessive and will require seal replacement.

b. Check OD of hydraulic pump and tachometer drive quill sleeve (4, figure 6-36) in area of preformed packing groove for corrosion and wear. Corrosion not permitted; replace quill if OD is less than 3.6247 inches. (Figure 6-36.)

c. Visually inspect quill sleeve and cover (3) for cracks, chipping, scoring, and abrasion.

d. Inspect bearings in quill (3) for smoothness and freedom of operation by slowly rotating spiral bevel gear (16) by hand.

e. Visually inspect teeth of spiral bevel gear (16) for cracks, chipping, scoring, and wear.

f. Visually inspect hydraulic pump drive splines and rotor tachometer drive for excessive wear and corrosion.

6-93. Cleaning — Hydraulic Pump and Tachometer Drive Quill.

CAUTION

All openings into the quill assembly, including accessory drive pads, oil feed hole and end of quill at spiral bevel gear must be masked during cleaning to prevent damage to seals and entry of solvents and foreign material into the quill.

a. Clean parts with solvent (C-304). Dry with filtered, compressed air.

b. Pour a small amount of clean lubricating oil (C-030) into oil feed hole (4, figure 6-36) while rotating spiral bevel gear (16) by hand to distribute oil through out quill assembly. Lubricate exposed surfaces of gear and spline.

6-94. Repair — Hydraulic Pump and Tachometer Drive Quill.

a. Replace quill as a complete assembly when quill does not meet inspection requirements, except seals may be replaced as follows:

(1) Remove nuts (1) and washers (2) from studs (7) on hydraulic pump and tachometer quill drive (3).

(2) Remove bolts (15), washers (11 and 12) and nuts (13) securing cover (10) to hydraulic pump and tachometer quill drive (3).

(3) Remove short plastic setscrews (18) three places, install jackscrews (T33). Carefully remove cover (10) from hydraulic pump and tachometer quill drive (3) housing.

NOTE

As cover (10) separates from hydraulic pump and tachometer quill drive (3) housing, top splined end of gear shafts (not shown) where they protrude through seals (9 and 14) to prevent binding of shaft bearings in hydraulic pump and tachometer quill drive.

(4) Remove gasket (8) from sleeve studs.

(5) Press seals (9 and 14) from cover (10).

(6) Clean seal housing in cover (10) and press in new seals (9 and 14).

(7) Position new gasket (8) on hydraulic pump and tachometer quill drive (3) studs (7).

(8) Install cover assembly (10) on hydraulic pump tachometer quill drive (3).

(9) Install bolt (15) with aluminum washers (11) next to quill housing and steel washers (12) next to bolt head.

(10)Install nuts (13) with aluminum washers (11) next to cover (10) and steel washers (12) next to nut. Torque nuts 50 to 70 inch-pounds.

b. Replace preformed packing (5, figure 6-36) if oil leakage is evident between sump case (6) and hydraulic pump and tachometer drive quill.

c. Replace (without repair) if quill (3) boss is corroded or excessively worn beyond replacement limit of 3.6247 inches OD.

d. Replace (without repair) if bearings are binding or rough.

e. Replace (without repair) if gear teeth are cracked, chipped, scored, or worn.

f. Replace (without repair) if hydraulic pump drive splines are excessively worn or corroded such that the dimension between 0.0864 inch diameter pins exceeds 0.4780 inch.

g. Prepare hydraulic pump and tachometer drive quill (4) for return to overhaul.

6-95. Installation — Hydraulic Pump and Tachometer Drive Quill.

a. Inspect sump case at opening for hydraulic pump and tachometer drive quill (3, figure 6-36), for the following conditions.

(1) Pitting or surface deterioration in the area of preformed packings, and mating surfaces of close tolerance machine surfaces is not acceptable if it will affect the proper function and performance of the mating component or assembly.

CAUTION

During cleaning operations, care must be taken to prevent entry of foreign material into the transmission.

(2) Remove paint and/or sealant residue on the face and bore of the main transmission case and on mating surface of the quill sleeve using a plastic scraper and clean cloth moistened with MEK (C-309).

(3) Any minor scratches in the preformed packing contact area should be reworked to blend with the surrounding surface to prevent leakage, using aluminum oxide cloth (C-406).

b. Lubricate new preformed packing (5), boss of quill (4), and mating surfaces in sump case with lubricating oil (C-030).

c. Place preformed packing (5) on boss of quill (4).

d. Using a heat lamp, heat the sump case at opening for quill (3) until case is hot to touch or 250°F (121°C). Do not use torch or flame to heat sump case.

CAUTION

Ensure that gears of quill (3) and sump drive gear are properly meshed before seating quill.

e. Position quill (3) over sump case studs and press in place aligning gear teeth.

f. On two shortest studs on top and bottom of quill; install aluminum washers (2), and nuts (1). Torque nuts evenly 100 to 140 inch-pounds.

g. Verify that backlash exists between quill (3) pinion gear and drive gear by moving hydraulic pump drive gear back and forth. Some backlash must be evident. If no backlash, install new quill.

h. Apply a bead of class B-2 adhesive (C-308) around perimeter of quill (3) and mating edge surfaces of sump case. Install setscrews.

i. Apply a small amount of grease (C-001) to setscrews (17 and 18) and install three long plastic setscrews (17) in cover (10) and three short plastic setscrews (18) in sleeve (3).

j. Apply beads of adhesive (C-308) to protruding ends of setscrews (17 and 18).

k. Install rotor tachometer generator with a new gasket and connect electrical wiring. (Chapter 8.)

l. Install hydraulic pump with new gasket and connect lines. (Chapter 7.)

m. Service transmission. (Chapter 1.)

n. Check hydraulic pump and tachometer drive quill for oil leakage, hydraulic system operation, and rotor tachometer operation on first engine runup. (Refer to BHT PUB-92-004-10.)

6-95A. ROTOR BRAKE QUILL.

6-95B. Description — Rotor Brake Quill. The rotor brake quill (figure 6-36A) is mounted on the left side of transmission case and is driven by the transmission gear train.

6-95C. Removal — Rotor brake quill.

Premaintenance Requirements for Removal and Installation of Rotor Brake Quill

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T28)
Test Equipment	None
Support Equipment	Heat Lamp
Minimum Personnel Required	One
Consumable Materials	(C-304), (C-308),(C-405)
Special Environmental Conditions	A Covered Area Not Susceptible to Blowing Sand or Dust.

a. Open left side engine and transmission cowling to gain access to transmission.

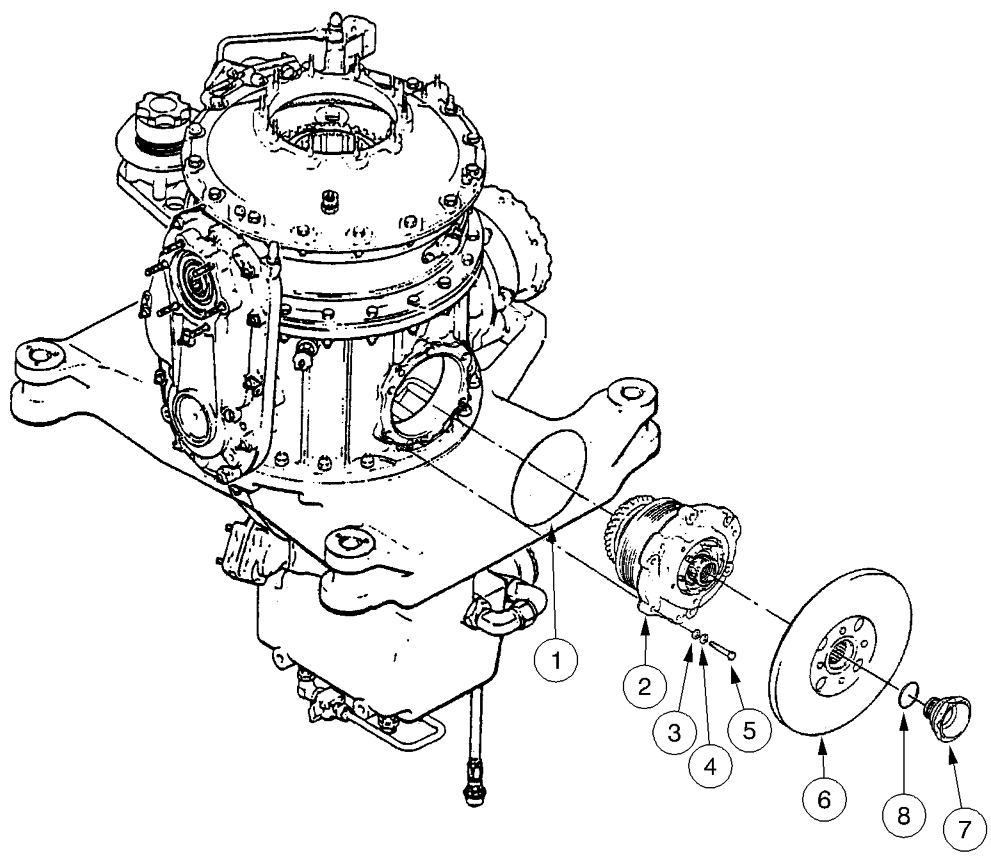
b. Remove brake assembly (Chapter 7).

CAUTION

Rotor brake disc and flange assembly shall be removed as an assembly. Do not attempt to remove disc from flange while installed on quill. Do not separate disc from flange if disc is not being replaced.

c. Cut lockwire and remove nut (7, figure 6-36A) with packing (8). Remove disc and flange from quill.

d. Using a sharp, plastic scraper, cut sealant from between quill mounting flange and transmission case. Clean sealant from jackscrew holes.



1. Packing
2. Rotor brake drive quill
3. Aluminum washer
4. Steel washer
5. Bolt
6. Brake disc and flange assembly
7. Nut
8. Packing

UH-1H-II-M-06-36A

Figure 6-36A. Rotor brake quill

e. Install jackscrews, T100929, and tighten carefully and evenly to remove quill (2) with packing (1) from transmission. Discard packing.

f. Cover mounting port in transmission to prevent entry of foreign material.

6-95D. Cleaning — Rotor Brake Quill.

a. Clean sealant residue from both quill and mating surface of transmission using a sharp, plastic scraper and solvent (C-304).

b. Clean external surfaces of parts using solvent (C-304).

c. Dry with filtered, compressed air.

6-95E. Inspection — Rotor Brake Quill.

a. Inspect quill for signs of leakage.

b. Inspect quill and pinion gear for obvious mechanical and corrosion damage (BHT-212-CR).

c. Rotate pinion and check for rough bearings. Bearing roughness which can be detected by feel is not acceptable.

6-95F. Repair — Rotor Brake Quill.

For complete repair procedures, refer to BHT-212-CR&O).

6-95G. Installation — Rotor Brake Quill.

a. Remove cover from mounting port in transmission.

b. Ensure mating surfaces of quill and transmission are free of all sealant and other foreign matter. Clean as required.

c. Lubricate new packing (1, figure 6-36A) with transmission oil (Chapter 12). Install packing in groove on quill (2).

d. Apply a light coat of transmission oil to bore of transmission quill port and to mating diameter of quill assembly.

e. Using a heat lamp (or 250 watt light bulb), heat sump mounting port until unit is hot to the touch with bare hands.

NOTE

During installation of quill assembly, lightly tap quill inward uniformly around face of quill flange near outer edge with a plastic mallet. Do not strike end of quill shaft.

f. Insert quill into transmission while rotating pinion simultaneously to permit gear mating.

NOTE

Install AN960JD616 aluminum washers (4) under head of bolt (5). Do not substitute any other washer (including NAS 1197).

g. Install NAS1197 washers (3) against flange of quill, AN960JD616 washers (4) under head of bolts (5) and install bolts. Torque bolts 160 to 190 inch-lbs.

h. Check quill pinion for freedom of rotation and existence of backlash.

i. Secure bolts (5) with lockwire (C-405).

j. Fill gap between flange on quill (2) and flange on transmission sump with adhesive (C-308). Also fill jackscrew holes with adhesive. Allow to cure.

k. Apply a light coat of transmission oil to splines on disc and flange assembly (6).

l. Install disc and flange assembly (6) on quill.

m. Lubricate new packing (8) with transmission oil and install on nut (7).

n. Install nut (7) in center of disc and flange assembly. Torque nut to 125 to 150 foot-pounds. Secure nut with lockwire (C-405).

6-96. TAIL ROTOR DRIVE QUILL.

6-97. Description — Tail Rotor Drive Quill. The Tail rotor drive quill (figure 6-37) is mounted into aft side of transmission sump case and is driven by an accessory gear train. A flexible splined coupling provides means of attaching the tail rotor driveshaft.

6-98. Removal — Tail Rotor Drive Quill.

Premaintenance Requirements for Removal and Disassembly of Tail Rotor Drive Quill

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T32), (T33), (T59), (T66)
Test Equipment	None
Support Equipment	Heat Lamp
Minimum Personnel Required	One
Consumable Materials	(C-010), (C-011), (C-015), (C-304), (C-308), (C-309), (C-328), (C-405), (C-464), (C-500)
Special Environmental Conditions	A Covered Area Not Susceptible to Blowing Sand or Dust.

a. Open cowling at either side of transmission.

b. Remove forward section of tail rotor driveshaft. (Paragraph 6-13).)

c. Drain oil level below tail rotor drive quill (2, figure 6-37)

d. Remove nuts (6), washer (3 and 4), spacers (5), clamp (12), and bracket (7), with sump outlet hose assembly (13) from six studs securing tail rotor drive quill (2).

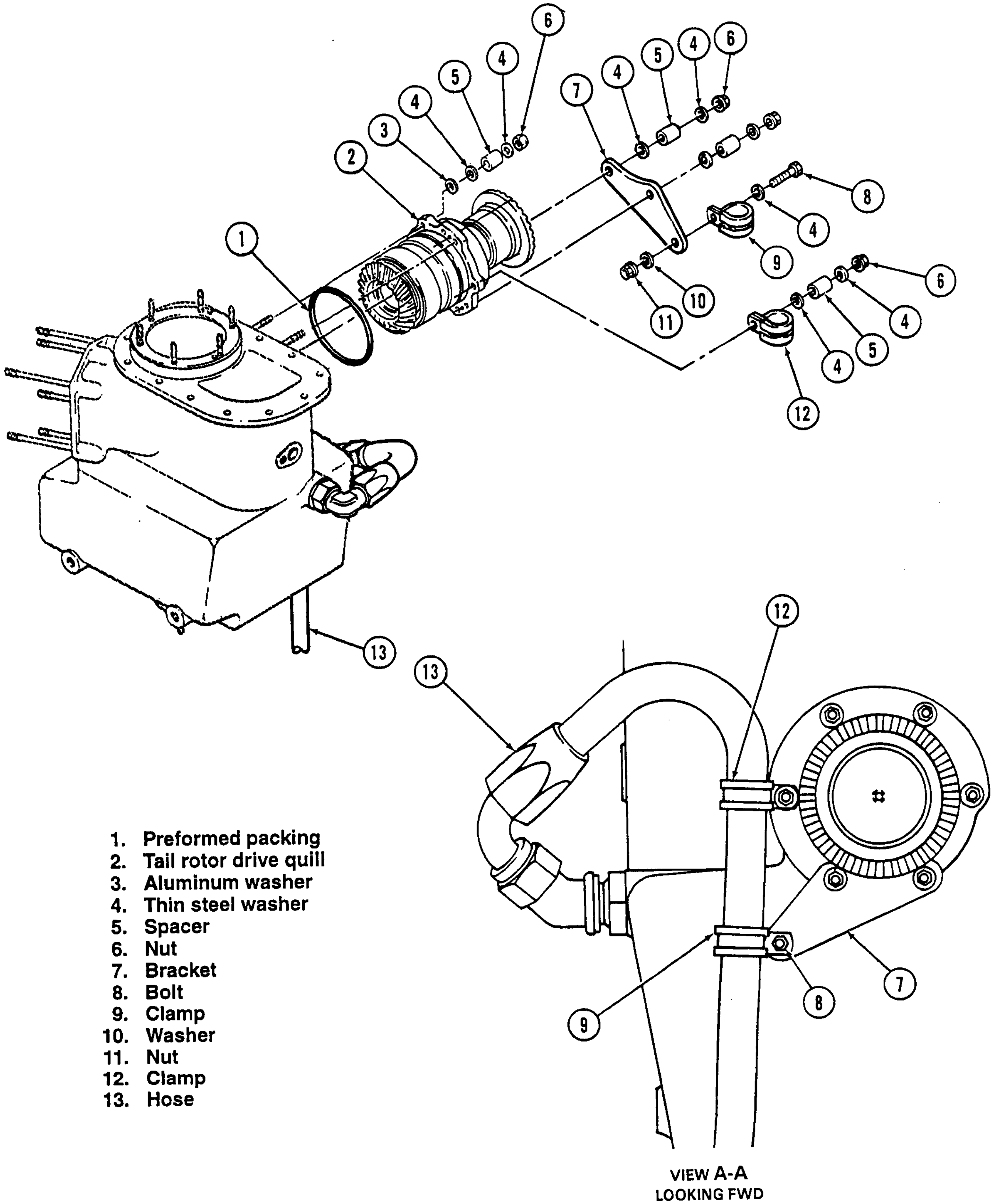


Figure 6-37. Tail rotor drive quill — removal and installation

CAUTION

When using jackscrews to remove quill assembly, perform following procedures. Ensure the jackscrews are screwed in evenly, exerting equal pressure on quill sleeve to prevent damage to flanges. Do not use force by prying to remove quill, in the event quill cannot be removed by using jackscrews, heat case, and use jackscrews. Do not use torch or open flame to heat case.

e. Remove setscrew 3 places in tail rotor drive quill (2) and install jackscrews (T33). Use three jackscrews (T33) to pull quill (2) from sump case. Remove jackscrews (T33). Discard preformed packing (1).

f. Cover opening in sump case to prevent entry of foreign material.

6-99. Disassembly — Tail Rotor Drive Quill.

NOTE

Quill coupling may be lubricated and seals (4 and 7, figure 6-38) replaced with tail rotor drive quill installed in the transmission assembly.

a. Remove retaining ring (17, figure 6-38), plate assembly (16), and centering spring (15).

b. Remove lock spring (14) and retainer (13).

c. Install outer coupling holding tool (T32) on quill coupling (8). Using male end of 1/2-inch square drive extension, remove bolt (11), and washer (10) from spiral bevel gear (1).

d. Remove inner coupling (9) with outer coupling (8), sleeve spacer (6), and seal (7).

e. Cut and remove lockwire from nut (3).

f. Install quill holding tool (T59) on quill housing (2). Using retaining nut wrench (T66), remove nut (3) and seal (4) from sleeve assembly.

g. Press seal (4) from nut (3).

h. Remove seal (7) from outer coupling (8).

6-100. Cleaning — Tail Rotor Drive Quill.

CAUTION

Clean outer coupling (8) and inner coupling (9) with clean, dry cloths only. Do not solvent clean.

a. Wipe couplings (8 and 9, figure 6-38) with clean cloths.

b. Clean all other parts with solvent (C-304). Dry with filtered air.

c. Lubricate bearings and machined surfaces immediately after cleaning with lubricating oil (C-030).

6-101. Inspection — Tail Rotor Drive Quill.

a. Visually inspect for oil leakage.

NOTE

External leakage from quill seal is not permitted. However, a small amount of seepage assures a satisfactory seal condition. Continuous flow (droplets) is considered excessive and will require seal replacement.

b. Inspect tail rotor quill outer coupling (8, figure 6-38) temperature indicator TEMP-PLATE for discoloration and overtemperature conditions. A change in color from white or light gray to black will indicate possible overheating and/or component degradation and require further inspection. Refer to table 6-6 for tail rotor drive system TEMP-PLATE conditions and corrective action.

c. Visually inspect teeth of coupling (9) for corrosion, chips, pitting and damaged teeth.

d. Visually inspect teeth of couplings (8 and 9) for evidence of excessive wear. (Refer to BHT-212-CR&O.)

e. Visually inspect teeth of coupling (8) for corroded or pitted teeth.

f. Visually inspect teeth of spiral bevel gear (1) for cracks, chipping, scoring, corrosion and wear.

g. Inspect bearings for roughness and binding by slowly rotating gear (1) by hand.

Table 6-6. Tail Rotor Drive System TEMP-PLATE Condition and Corrective Action

ONE RED TEMP-PLATE	OTHER RED TEMP-PLATE	PROBABLE CAUSE	SEE NOTE
Black	Good	Defect/Instl.	1
Black	Black	Overtemp	2
Part Black	Good	Chem. Contamination	1
Missing	Good	Defect/Instl.	1
Missing	Missing	Possible Overtemp	2

NOTES:

1. Resume operation. Defective TEMP-PLATE or improper installation, replace defective TEMP-PLATE as soon as is practical.
2. Coupling overtemp condition is very likely. Remove driveshaft or coupling assembly and perform overtemp inspection. Scrap affected male and female couplings if any of these listed below exist.
   a. The cadmium plating on the outer coupling is discolored (circumferential tan or light brown band) or blistered.
   b. The gear teeth of either coupling are discolored (brown or blue) in the normally bright contact patterns.
   c. Under 5X to 10X magnification, the surfaces of the gear teeth of either the inner or the outer coupling exhibit signs of metal smearing or tearing in the contact patterns.
   d. The grease is very viscous (thick) and has a strong pungent color.

NOTE: If none of the above conditions exist, the coupling may be reassembled and returned to service following replacement of TEMP-PLATES.

h. Visually inspect sleeve assembly (2, figure 6-38) for cracks, corrosion, abrasion, and damaged threads.

i. Visually inspect sleeve spacer (6) for corrosion, scoring, and wear.

6-102. Repair — Tail Rotor Drive Quill.

a. Repair by replacement of seal (4, figure 6-38) if there is oil leakage.

b. Replace centering spring (15) if spring rate is less than 13 oz./in.

c. Replace (without repair) if sleeve assembly (2) is corroded or excessively worn. (Refer to BHT-212-CR&O.)

d. Replace (without repair) if bearings are binding or rough.

e. Replace (without repair) if gear teeth are cracked, chipped, scored, or worn.

f. Replace both couplings (8 and 9) if TEMP-PLATES indicate an overtemperature condition.

g. Replace inner coupling (9) and/or outer coupling (8) if there are cracks, chips, corrosion, or excessive wear (refer to figure 6-49).

h. Replace seal (7) as standard practice.

i. Prepare tail rotor drive quill for return to overhaul. (Paragraph 6-79.)

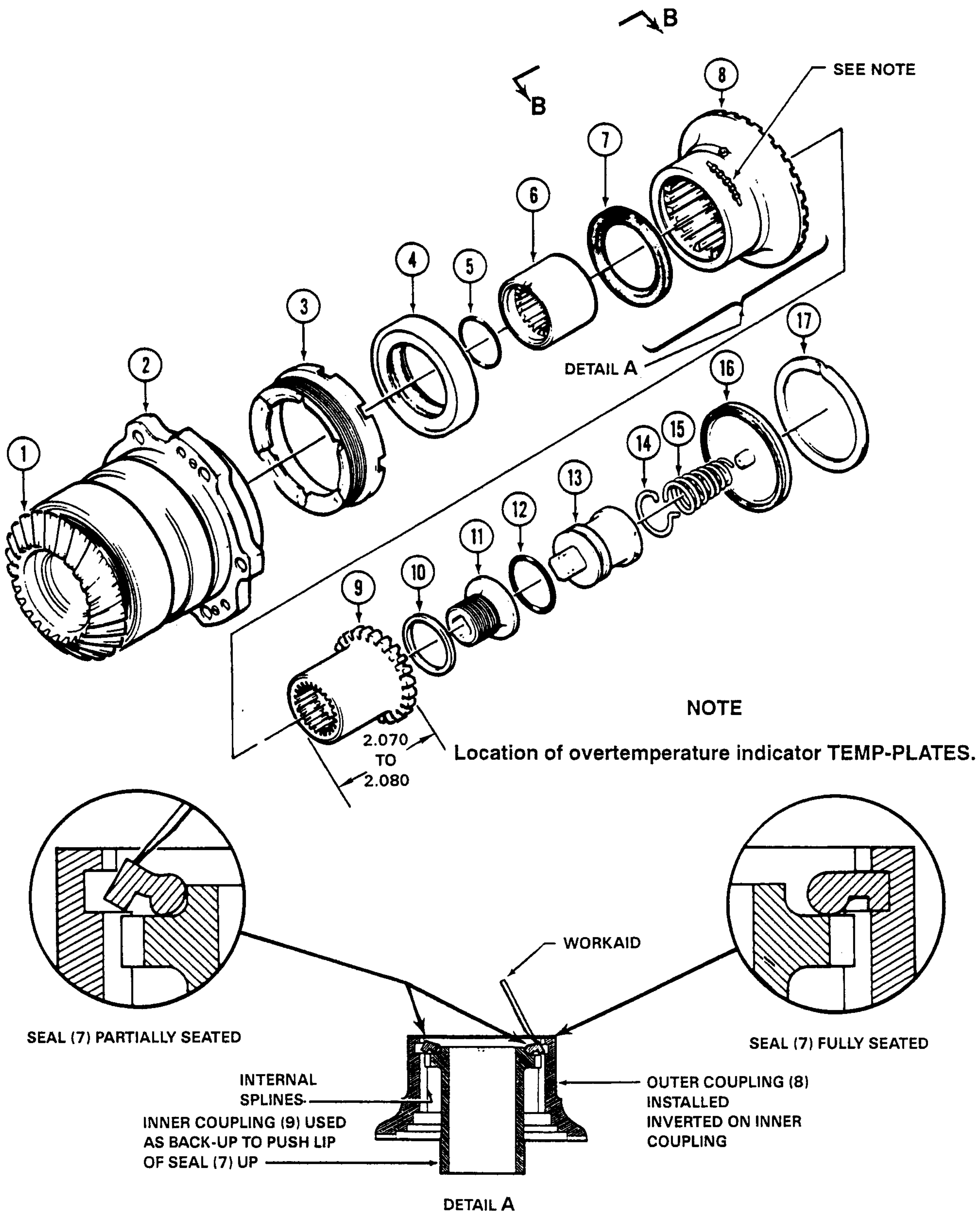
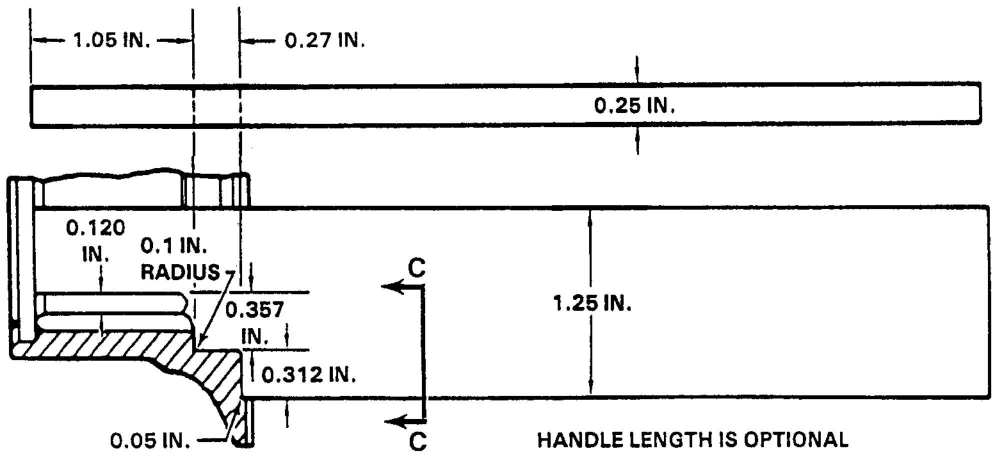
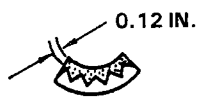


Figure 6-38. Tail rotor drive quill — seal replacement (Sheet 1 of 2)



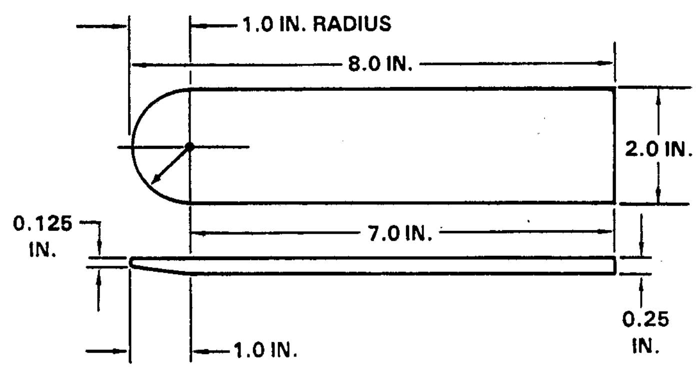
LUBRICATE (C-015) INSTALLATION TOOL

VIEW B-B



(C-015)

VIEW C-C



1. Spiral bevel gear
2. Sleeve
3. Nut
4. Seal
5. Packing
6. Spacer
7. Seal
8. Outer coupling
9. Inner coupling
10. Washer
11. Bolt
12. Packing
13. Retainer
14. Lock spring
15. Centering spring
16. Plate
17. Retaining ring

NOTES

1. Make from plexiglass or similar material.
2. Remove all sharp edges.

SEAL INSTALLATION WORKAID

UH-1H-II-M-06-38-2

Figure 6-38. Tail rotor drive quill — seal replacement (Sheet 2 of 2)

6-103. Assembly — Tail Rotor Drive Quill.

a. Install new seal (4, figure 6-38) in nut (3) as follows:

(1) Remove old sealant from OD of nut (3) using a sharpened plastic scraper.

(2) Scrub ID of nut (3) using a cloth dampened with MEK (C-309).

CAUTION

Carefully wipe any sealant residue from threads in sleeve (2) using a soft cloth moistened with MEK (C-309). Do not allow solvent and debris to enter quill bearing.

(3) Clean OD of new seal (4) using a cloth dampened with MEK (C-309).

(4) Apply a film of sealing compound (C-328) to OD of seal (4) and ID of nut (3).

(5) Using a pressing plate slightly smaller than OD of seal (4), press seal into nut (3) seal lip facing inboard. Ensure seal is bottomed in ring. Remove excess sealant.

b. Lubricate lip of seal (4), new preformed packings (5), and OD of sleeve spacer (6) with oil (C-030).

c. Place new packing (5) on pinion gear (1) at end of splines.

d. Using retaining nut wrench (T66 and T59), install nut (3) in sleeve assembly (2). Torque nut 1200 to 1800 inch-pounds. Remove wrench.

e. Safety nut (3) to sleeve assembly (2) with lockwire (C-405).

f. Install sleeve spacer (6) on pinion gear (1) and carefully press through seal (4) until bottomed.

g. Install seal (7) into outer coupling (8) seal groove as follows:

(1) Apply a light coat of lubricant (C-015) to outer circumference of seal (7).

(2) Install seal (7) into outer coupling (8) seal groove with lip of seal toward internal splines of outer coupling (8), as shown (figure 6-38, detail A).

NOTE

Seal (7) will be partially seated and the inner coupling (9) will be used as a backup, in reverse (see detail A) to fully seat the outer circumference edge of seal into outer coupling (8) seal groove.

(3) Using inner coupling (9) as a backup, and placed, as shown in detail A, firmly press down (hand pressure only) on outer coupling (8), simultaneously tuck outer circumference edge of seal (7) with seal installation work aid into outer coupling (8) seal groove.

(4) Continue pressing around seal (7) with seal installation work aid until seal (7) is fully seated. Remove inner coupling (9) from outer coupling (8).

NOTE

Ensure inner coupling (9, figure 6-38) is correct for tail rotor drive quill, overall length is 2.070 to 2.080 inch. Overall length of coupling for intermediate and tail rotor gearbox is 1.870 to 1.880 inches.

h. Move outer couplings (8, detail A) fully outboard. Hand pack outer coupling (8) with lubricant (C-015) to 0.12 inch depth over full length of internal spline teeth using lubricant installation tool (view B-B).

i. Insert inner coupling (9) into outer coupling (8) with small end through seal (7).

j. Install inner coupling (9) with outer coupling (8) on pinion gear (1) with washer (10) and bolt (11). Torque bolt 960 to 1200 inch-pounds using 1/2 inch drive extension and wrench outer coupling (T32).

k. Coat new packing with lubricating oil (C-030) and install new preformed packing (12) on retainer (13) and press into coupling bolt (11) and inner coupling (9). Check for alignment of one hole in rim of retainer with slot in end of inner coupling. If necessary, reposition retainer by one fourth (1/4) turn to obtain alignment. Install lock spring (14) with tang through aligned hole.

l. Insert large end of centering spring (15) into retainer (13). Hold outer coupling (8) outboard and press in plate assembly (16). Secure with retaining ring (17).

m. Apply a bead of class B-2 sealing compound (C-308) around nut (3) and mating surface of sleeve assembly (2).

n. Install TEMP-PLATES as required.

6-104. Installation — Tail Rotor Drive Quill.

a. Inspect sump case opening for tail rotor drive quill (2, figure 6-37) for the following conditions.

CAUTION

During repair and cleaning operations care must be taken to prevent entry of foreign material into the transmission.

(1) Pitting or surface deterioration in the area of preformed packings and mating surfaces of close tolerance machined surfaces is not acceptable if it will affect proper function and performance of the mating component or assembly.

(2) Any minor scratches on the preformed packing contact surface should be reworked to blend with the surrounding surface to prevent leakage using aluminum oxide abrasive cloth (C-406) or Scotchbrite (C-407).

b. Lubricate new preformed packing (1, figure 6-37), boss of quill (2), and opening in sump case with oil (C-030).

c. Place preformed packing (1) on boss of quill (2).

d. Using a heat lamp, heat sump case at opening for quill (2) until case is hot to touch or 250°F (121°C). Do not use torch or flame to heat sump case.

CAUTION

Ensure that bevel gear and sump driving gear are properly meshed before seating quill.

e. Position quill (2) over sump case studs and press in place aligning gear teeth.

f. Position bracket (7) and clamp (12) on sump case studs with thin aluminum washers (3), spacers (4), steel washers (4), and nuts (6). Torque nuts evenly 50 to 70 inch-pounds.

g. Verify that backlash exists between quill (2), bevel gear, and drive gear by moving driveshaft coupling back and forth. Some backlash must be evident. If no backlash exists, install new quill.

h. Apply a bead of class B-2 adhesive (C-308) around perimeter of quill (21) and mating edge surfaces of sump case. Install setscrews in jackscrew holes.

i. Install forward section of tail rotor driveshaft, secured by clamps to couplings of quill (2) and first bearing hanger. (Paragraph 6-134.)

j. Service transmission. (Chapter 1.)

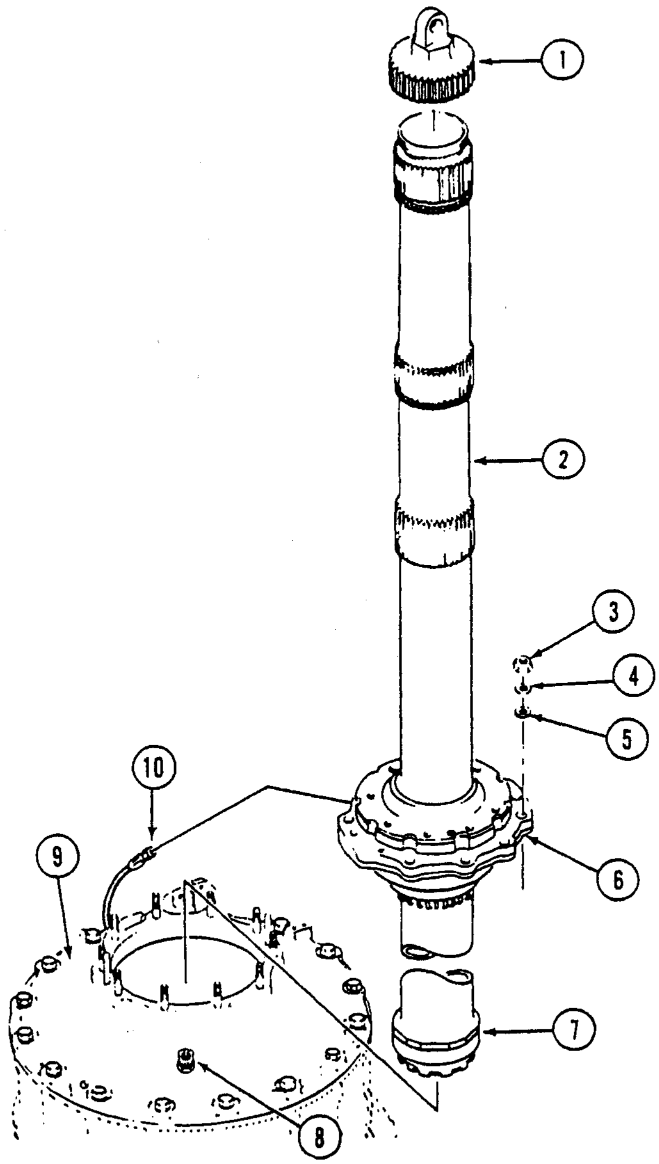
k. Close cowling at either side of transmission.

l. Check tail rotor drive quill for oil leakage on first engine operation. (Refer to BHT PUB-92-004-10.)

6-105. MAIN ROTOR MAST ASSEMBLY.

6-106. Description — Main Rotor Mast Assembly.

The main rotor mast assembly (figure 6-39) is a tubular steel shaft fitted with two bearings which support it vertically in the transmission. Mast driving splines engage with transmission upper stage planetary gear, providing counterclockwise rotation as viewed from above. Splines on upper portion of mast provide mounting for main rotor and control assemblies. The upper bearing retainer plate contains the No. 8 oil jet fed by an external hose.



1. Mast nut
2. Mast
3. Nut
4. Thin steel washer
5. Thick aluminum washer
6. Retainer plate
7. Lower bearing race
8. Upper mast bearing chip detector
9. Transmission
10. Oil hose for No. 8 jet

UH-1H-II-M-06-39

Figure 6-39. Main rotor mast — removal and installation

6-107. Removal — Main Rotor Mast Assembly.

Premaintenance Requirements for Removal and Repair of Main Rotor Mast

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T58), 204-011-178-1
Test Equipment	None
Support Equipment	None
Minimum Personnel Required (MOS)	One
Consumable Materials	(C-007), (C-108), (C-304), (C-308), (C-309), (C-328), (C-423), (C-427), (C-464)
Special Environmental Conditions	A Covered Area Not Susceptible to Blowing Sand or Dust.

a. Open transmission fairing.

b. Use suitable hoist with 100 pound capacity or erect maintenance hoist (T58) through left aft side of cabin roof with end fitting in bearing plate on cabin floor.

c. Remove stabilizer bar, main rotor, dampers and supports, scissors and sleeve, and swashplate and support assemblies. (Chapter 5.)

d. Install mast nut (1, figure 6-39) on top of mast (2).

e. Connect 204-011-178-1 clevis to mast nut. Position hoist cable directly over and in line with mast. Attach hoist to clevis and take up cable slack.

f. Remove nuts (2) and washers (4 and 5) securing retainer plate (6) to transmission (8) case studs.

g. Carefully lift and guide mast (2) out of transmission (8). Immediately install a cover on top of transmission case.

h. Place mast assembly on padded bench.

NOTE

Mast must be placed in a horizontal attitude, supported such that no force is exerted on retainer plate (6).

6-108. Inspection — Main Rotor Mast Assembly.

a. Mast must undergo overhaul evaluation (BHT-212-CR&O) in event of overtorque, overspeed, compressor stall, hard landing or sudden stoppage.

b. Mast Nut. Thoroughly clean mast nut (1) with solvent (C-304). Dry with filtered, compressed air before inspecting for the following conditions.

(1) Visually inspect for nicks and scratches.

(2) Visually inspect for pits and corrosion.

(3) Inspect for cracks.

(4) Inspect hex head for deformation of hole or rounded corners.

NOTE

Mast must be placed in a horizontal attitude, supported such that no force is exerted on retainer plate (6).

c. Inspect mast (2, figure 6-39) visually for yielding or deformation in area contacted by main rotor hub static stops.

d. Inspect mast (2) for nicks, dents, scratches, or corrosion damage, to limits shown in BHT-212-CR&O. Inspect for nicks and scratches with particular attention to the radius and the area just above the upper bearing and the tapered section below the upper bearing.

e. Inspect retainer plate (7, figure 6-41) for corrosion, scratches, nicks, or damage to retaining stud holes, especially in area of seal seat. Any evidence of pitting is cause for rejection.

f. Inspect oil jet for damage or deformation and cracks. Inspect oil passage in retainer plate (6) for clogging.

g. Mast. Remove cap plug and inspect internal and external surfaces of mast (2) for nicks, scratches, and corrosion. Install cap plug.

6-109. Cleaning — Main Rotor Mast Assembly.

Mask seal and bearing area to prevent entry of solvent. Clean mast with solvent (C-304). Dry with filtered, compressed air.

6-110. Repair — Main Rotor Mast Assembly.

a. Mast Nut.

(1) Repair mast nut (1) if nicks, scratches, pits, and corrosion in area A, figure 6-40 do not exceed 0.010 inch depth after rework. Nicks, scratches, pits, and corrosion in area B, figure 6-40 not to exceed 0.040 inch after rework. Repair as follows:

(a) Rework corroded surfaces using coarse abrasive cloth or paper (C-423) or India stone (C-464) until firm, rust-free surface is reached. Continue rework to remove coarse irregularities. Polish surface with fine abrasive paper after rework to obtain smooth contoured finish.

(b) After rework apply LHE cadmium plating solution (C-108).

CAUTION

Bell Helicopter Textron does not authorize cadmium plating of structural parts in field using electro deposited or vacuum deposited procedure.

NOTE

Selective brush cadmium plating is intended to be used for the repair and/or touchup of metal surfaces where existing cadmium plating has been damaged or partially removed.

Bell Helicopter Textron approves the use of LHE brush cadmium plating methods and procedures established by:

Selectrons, Ltd.
116 East 16th Street
New York, New York
or
SIFCO Metachemical
Div. of SIFCO Industries Inc.
5708 Schaaf Rd.
Cleveland, Ohio 44131

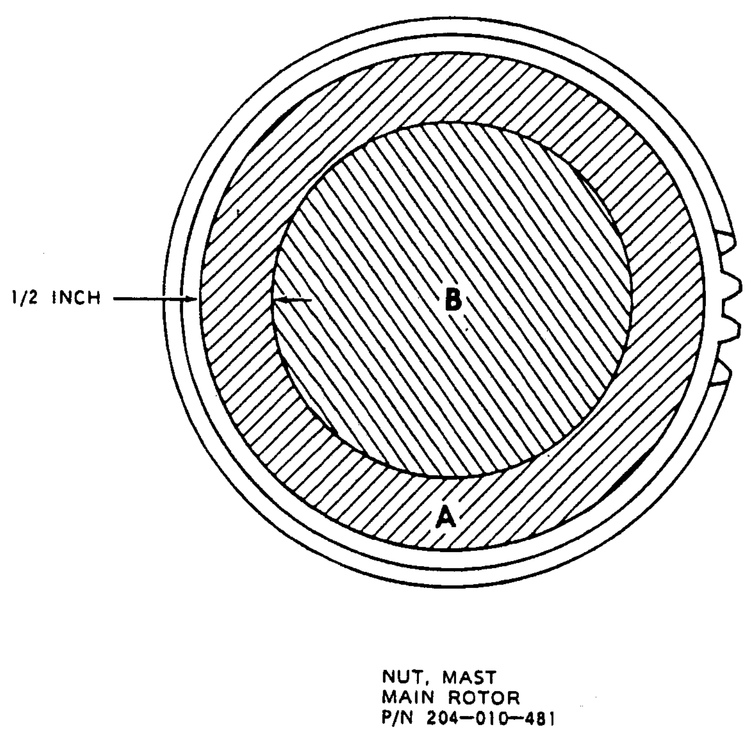
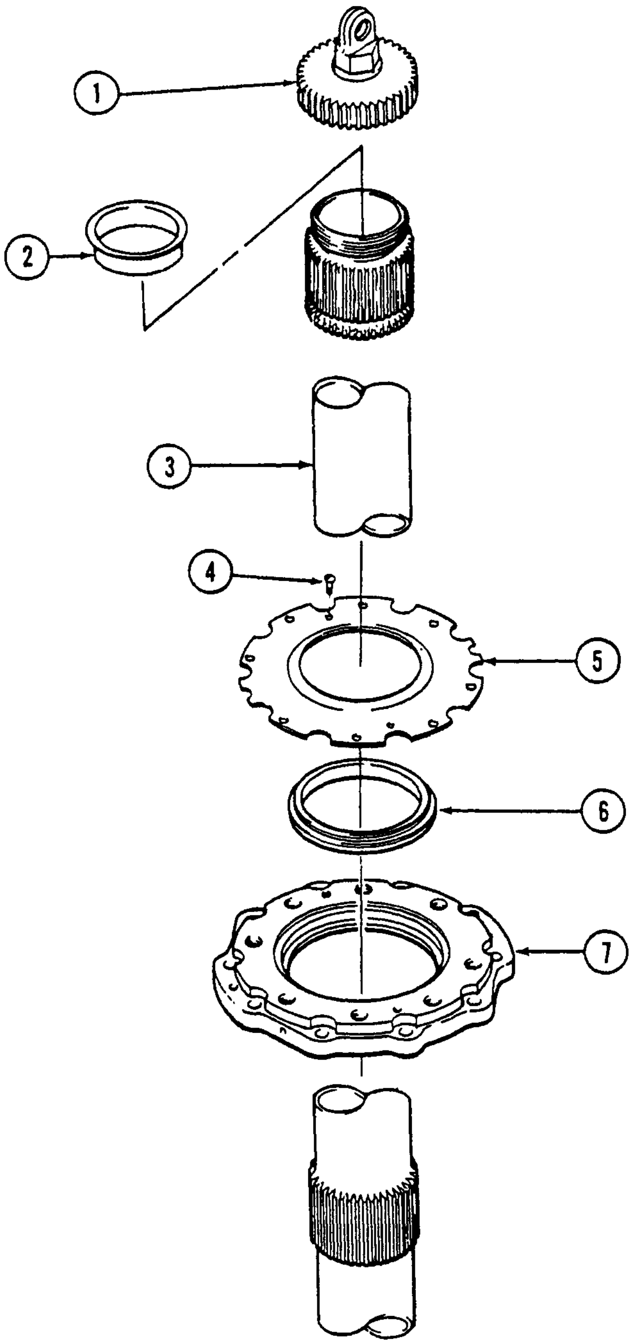


Figure 6-40. Main rotor mast nut — repair areas



1. Mast nut
2. Cap plug
3. Mast
4. Screw
5. Shield plate
6. Seal
7. Retainer plate

UH-1H-II-M-06-41

Figure 6-41. Main rotor mast — seal replacement

(2) Replace mast nut (1) if cracks are found. Use magnetic particle inspection method. (Refer to BHT-212-CR&O.)

(3) Repair mast nut (1, figure 6-41) (within limits) by reworking deformed surfaces of hex head to the extent necessary to accommodate torque wrench.

b. Mast.

(1) Repair mast (3) if nicks, scratches, or corrosion do not exceed 0.010 inch depth after rework. (Refer to BHT-212-CR&O for repair limits.)

(2) Replace mast (3) if nicks, scratches, or corrosion will exceed 0.010 inch depth after rework. (Refer to BHT-212-CR&O for repair limits.)

(3) Replace mast assembly if there is evidence of corrosion on internal surface of mast (3).

(4) Replace mast if there is excessive metal particles on upper mast bearing chip detector.

(5) Replace mast assembly for damage to threads at the upper end of mast (3).

(6) Replace mast assembly if there is corrosion, nicks, dents, or scratches on the lower mast in top of mast (3) bearing inner race (at lower end of mast). Damage can be felt with a probe having a spherical radius of 0.020 inch.

(7) Install plug (2) in top of mast (3).

c. Seal.

(1) Replace seal (6, figure 6-41) as follows:

NOTE

External leakage of seal is not permitted. However, a small amount of seepage assures a satisfactory seal condition. Continuous flow (droplets) is considered excessive and will require seal replacement.

(a) Remove two screws (4) that secure shield plate (5) to retainer plate (7).

(b) Remove seal (6) from retainer plate (7).

CAUTION

Exercise extreme care to prevent entry of foreign material into the upper mast bearing.

(c) Clean surface where seal (6) seats in retainer plate (7) using a sharpened plastic scraper and MEK (C-309) to remove sealing compound.

(d) Lubricate lip of seal (6) and mating surface of mast (3) with lubricating oil (C-030).

(e) Coat OD of new seal (6) and ID of retainer plate (7) with class B-2 or B-4 adhesive (C-308).

(f) Press seal (6) into retainer plate (7) with lip up until firmly seated. Remove excess sealing compound. Be sure four drain holes in retainer plate above seal remain clear.

(g) Install shield plate (5) with bevel lip up over mast (3) and align with retainer plate (7). Secure shield with two screws (4).

6-111. Return to Overhaul — Main Rotor Mast Assembly. The following procedures provide instructions for the preservation and packaging of a reparable main rotor mast for shipment to an overhaul facility.

a. Thoroughly clean main rotor mast with solvent (C-304). Blow out all crevices and holes with dry, filtered, low-pressure, compressed air.

b. Attach a properly filled out (Unserviceable/ Reparable Tag) to the mast assembly.

c. Coat the entire mast to include bearings with any grease type corrosion preventive compound that is available. In the absence of that material, use aircraft grease (C-007 or C-014).

d. Wrap the mast assembly with flexible barrier material (C-427). Secure wrap with any type tape available and insert in the best available container (construct, if necessary) of wood or metal. Cushion block and brace securely as necessary. Mast weight must not rest on retainer plate (7).

e. Obliterate old markings that do not coincide with the item to be returned. Mark container. (MIL-STD-129.)

6-112. Installation — Main Rotor Mast Assembly.

a. Check that mast (2, figure 6-39) as an assembly is clean, that bearing assemblies are serviceable and properly secured, and that mast nut (1) is installed.

b. Install maintenance hoist (T58) through left aft side of cabin roof with end fitting engaged in bearing plate on cabin floor. (Or use any suitable 1000 pound capacity hoist.)

c. Connect 204-011-178-1 clevis to mast nut (1). Attach hoist hook to cover nut on top of mast and take up slack in cable.

d. Uncover opening in top of transmission.

e. Using a cloth moistened with MEK (C-309), remove any sealant residue on the top surface of the transmission top case. Ensure no debris enters the transmission.

f. Perform dimensional check between upper surface of transmission case and upper surface of planetary adapter as follows:

CAUTION

Before installing mast, perform dimensional check of transmission to preclude possibility of damage to planetary assemblies during mast installation.

(1) Measure from top surface of mast adapter (3) in transmission to a straight edge (1) placed across top case opening. (Refer to figure 6-42.)

(2) If dimension is less than 2.570 inches, examine upper and lower planetary support liners (5 and 6) to determine if tangs of upper liner (5) are disengaged from mating slots in lower planetary liner. This can be determined by use of a mirror.

WARNING

Use care in handling parts to avoid possible injury to fingers.

(3) If the tangs are disengaged, the gap between the two liners would be approximately 1/4 inch. If the gap is this large, reindex these two liners by inserting the hands, backs together, through the mast driving adapter. Lift the adapter slightly and rotate the upper liner (5) until the tangs are correctly engaged in the slots. Recheck dimensions from top of adapter (3) to straight edge (1) placed across top case opening.

g. Check that mast assembly is clean, that bearings are serviceable and properly secured. Check that copper pins do not interfere with lower aluminum guide race within transmission and that mast nut (1, figure 6-39) is fully installed on top of mast. Attach hoist to mast nut. Lift mast to position over transmission (9).

h. Apply clean lubricating oil (C-030) to lower unplated surfaces of mast pole and lower bearing race.

i. Ensure the top surface of the transmission top case (3, figure 6-42) and the mating surface of the retainer plate (7, figure 6-41) are clean and free of oil.

CAUTION

Lower mast slowly into transmission, rotating the mast slightly back and forth to ensure smooth engagement of splines in the transmission planetary carrier.

j. Lower mast carefully into transmission (9) guiding lower end into bearing retainer plate to position indicated by FWD arrow marking before plate engages on mounting studs on transmission. Before allowing plate (6) to seat, apply a thin coat of adhesive (C-308), on mating surfaces.

k. Install thick aluminum washers (5, figure 6-34), thin steel washer (4), and nuts (3) on ten studs, top of transmission (9).

(1) Torque nuts (3) evenly to 100 to 140 inch-pounds. Allow sealant to set for 15 to 20 minutes.

(2) Retorque nuts (3) evenly 100 to 140 inch-pounds.

l. Apply bead of sealing compound (C-328) around lower edge surface of retainer plate (6) and mating edge surfaces of transmission (9).

NOTE

Ensure four drain holes in retainer place (6) above seal remain clear.

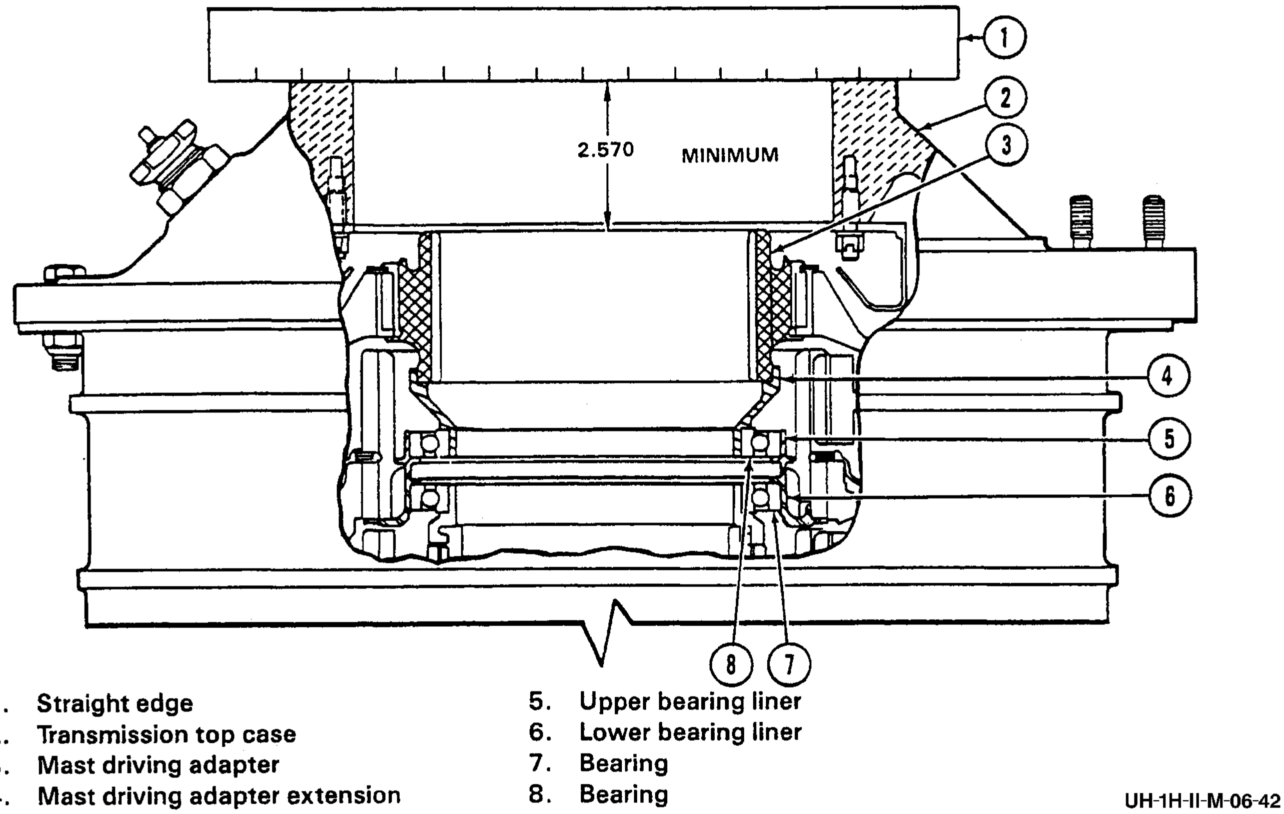


Figure 6-42. Seating of upper planetary adapter — main rotor mast installation

m. Connect oil hose (10) from tee fitting on left rear side of transmission top case to No. 8 oil jet on retainer plate (6).

n. During and after completion of mast installation, the transmission input quill adapter shall be rotated clockwise by hand at least 20 turns to ensure that there is no binding or unusual noise.

o. Install swashplate and support, scissors and sleeve, dampers and supports, main rotor, and stabilizer bar assemblies. (Chapter 5.)

p. Service transmission. (Chapter 1.)

q. Remove maintenance hoist. Close transmission fairing.

6-113. PYLON MOUNTS AND LIFT LINK.

6-114. Description — Pylon Mounts and Lift Link. A lift link and five pylon isolation mounts (figure 6-43) are used to attach transmission to the helicopter fuselage. The forged steel lift link with self-aligning end bearings, is connected between forward underside of the transmission support case and a fuselage beam directly below.

Four main isolation mounts are located on pylon supports under corners of transmission support case. Each mount consists of a cylindrical molded rubber core bonded between steel inner and outer sleeves, with outer sleeve flange secured on pylon support by four bolts.

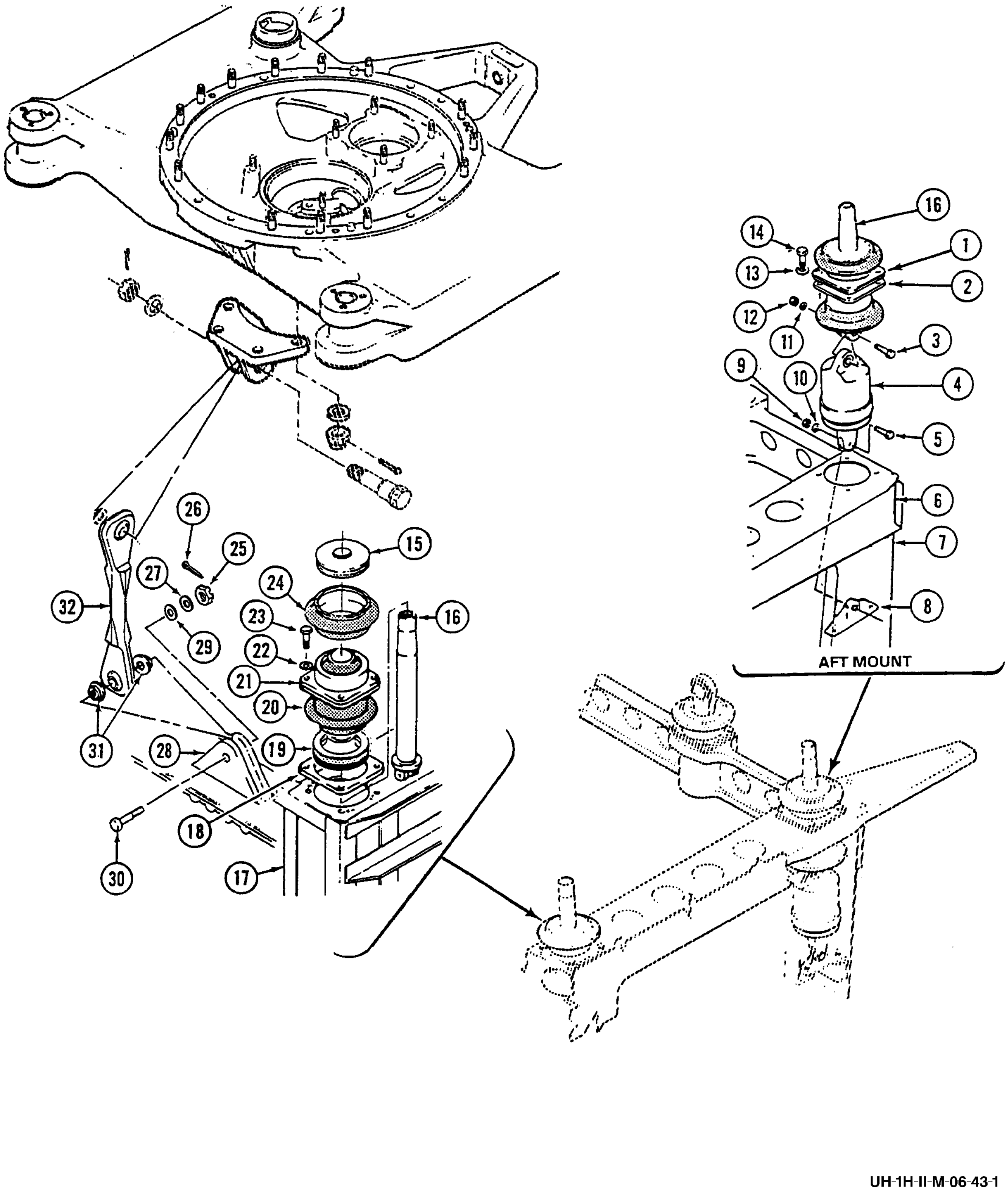
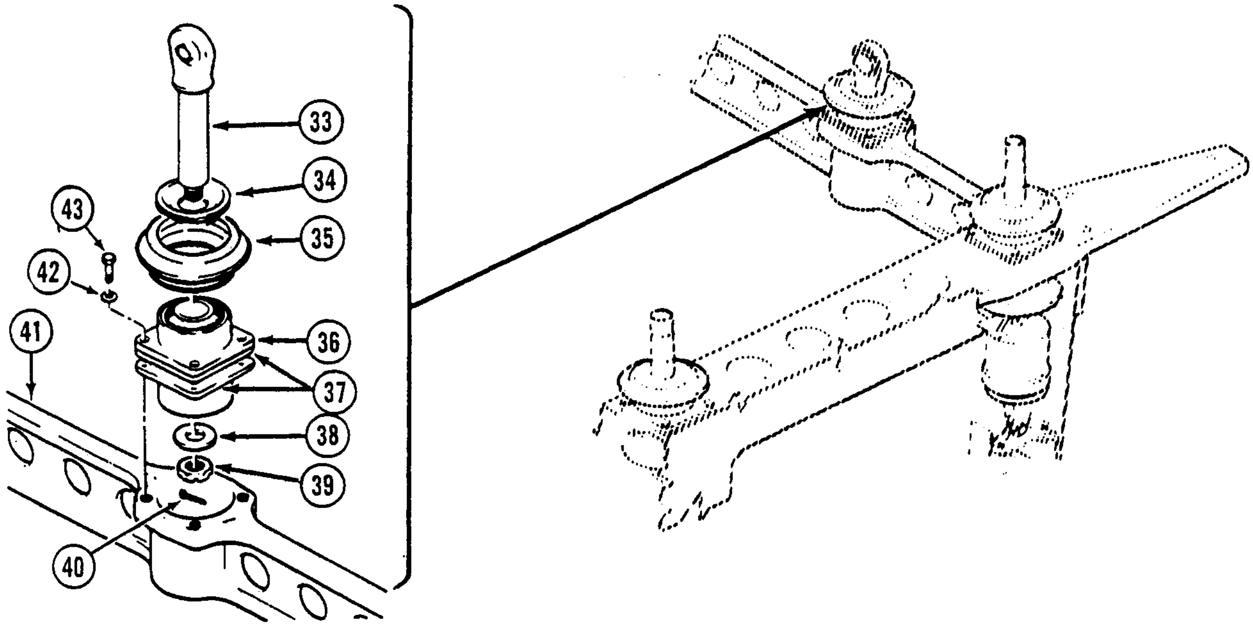


Figure 6-43. Transmission pylon mounts (Sheet 1 of 2)



1. Aft mount
2. Filler plates
3. Bolt
4. Friction damper
5. Bolt
6. Shim
7. Pylon support
8. Damper fitting
9. Nut
10. Washer
11. Washer
12. Nut
13. Washer
14. Bolt
15. Bushing
16. Bolt
17. Pylon support
18. Filler plates
19. Bushing
20. Boot
21. Forward mount
22. Washer
23. Bolt
24. Boot
25. Nut
26. Cotter pin
27. Washer
28. Clevis
29. Washer
30. Bolt
31. Bushing
32. Lift link
33. Eyebolt
34. Washer
35. Boot
36. Fifth mount
37. Laminated filler plates
38. Washer
39. Retaining nut
40. Cotter pin
41. Support fitting
42. Washer
43. Bolt

UH-1H-II-M-06-43-2

Figure 6-43. Transmission pylon mounts (Sheet 2 of 2)

NOTE

The four bolts that secure each mount to the pylon support are not lockwired, this would not be a safety-of-flight condition on a new and/or overhauled aircraft. However, drilled bolts will be installed and lockwired when the transmission is removed or when other maintenance is performed on the pylon.

A large mount bolt extends up through the mount inner sleeve to seat in a steel bushing in transmission support case leg and is secured by a retaining bolt installed from the top through a flat washer and a special washer and is threaded into the threaded upper end of the mount bolt. Silicone rubber protective boots, with supporting bushings, cover both ends of mounts, the aft mounts are provided with displacement dampers, which are cylindrical units connected between the lower ends of mount bolts and fittings in the pylon support structure.
A fifth isolation mount, similar to the four main mounts, is located at center aft of the pylon support structure on a support bridge across the rear side of pylon support. The fifth mount bolt has a self-aligning bearing at upper end, which is attached by a bolt to middle of an A-frame extension of the transmission pylon support case.

6-115. Removal — Pylon Mounts and Lift Link.

Premaintenance Requirements for Removal of Pylon Mounts and Lift Link

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-201), (C-204), (C-313), (C-405), (C-406), (C-464), (C-500)
Special Environmental Conditions	None

a. Remove transmission assembly and fifth amount support beam. (Paragraph 6-17.)

b. Detach lift link (32, figure 6-43) from clevis (28) on lift beam by removing bolt (30), washers (29 and 27), nut (25), bushings (31), and cotter pin (26). Retain hardware for installation.

c. Remove aft and forward mounts (1 and 21) as follows:

(1) Remove four bolts (14) and washers (13) attaching each aft mount (1) to pylon support (7). Remove bolts (3), washers (11), and nuts (12) attaching each aft mount to friction dampers (4). Remove aft mounts.

(2) Remove four bolts (23) and washers (22) attaching each forward mount (21) to pylon support (17). Remove complete forward mount assemblies including bolt (16) from pylon support (17).

CAUTION

Deleted.

(3) On both aft and forward mounts (1 and 21), removing bushing (15), boots (24 and 20) from bolts (16).

d. Remove fifth mount (36) as follows:

(1) Remove four bolts (43) and washers (42) attaching fifth mount (36) to support fittings (41). Remove mount and laminated filler plates (37).

(2) Remove cotter pin (40), retaining nut (39), and washer (38). Separate mount (36), boot (35), and washer (34), from eyebolt (33).

(3) Remove eight bolts and washers attaching fifth mount support fitting (41) to aft side of pylon support (7). Remove fitting and retain shims (6) if loose.

CAUTION

Shims are bonded to pylon support structure and should not be removed unless loose. If loose, shims shall be reinstalled in their original locations upon reassembly.

6-116. Inspection — Pylon Mounts and Lift Link.

a. Inspect rubber core at both ends of aft, forward and fifth mounts (1, 21, and 36, figure 6-43) for deterioration and separation using a 0.060 inch feeler gage. Check for any separation exceeding 0.250 inch maximum depth for 1/3 circumference or separation exceeding 0.750 inch maximum depth at any one point.

b. Inspect boots (20, 24, and 35) on aft, forward and fifth mounts (1, 21, and 36) for rips, cuts, deterioration and proper installation.

c. Check aft, forward and fifth mounts (1, 21, and 36) for evidence of excessive vibration, roughness or bottoming out.

d. Perform spring rate check as follows:

(1) Fabricate a steel support sleeve and pressing button. (Figure 6-44.) Top and bottom of the sleeve must be square in relation to the sides so the mount will be deflected in the vertical plane only.

(2) Place the mount, long end down, into the support sleeve.

(3) Place the support and mount into a suitable arbor press (the pressure gauge of the arbor press should be marked in five point graduations and have a range of 0 to 1,500 pounds maximum).

(4) Apply pressure to the button and mount with the press ram so as to deflect the mount in a vertical plane not to exceed 0.250 inch deflection. Cycle the mount five or six times.

(5) Mount a dial indicator to the arbor press with the finger of the indicator touching the pressing button.

(6) Apply slight pressure to the button with the ram to be certain it is seated.

(7) On 204-031-928-5 pylon mount, apply enough pressure to the pressing button to deflect the mount 0.100 inch. If the pressure required to deflect the mount 0.100 inch is 405 to 495 pounds the mount is serviceable.

(8) On 204-031-927-7 pylon mount, apply enough pressure to the pressing button to deflect the mount 0.100 inch. If the pressure required to deflect the mount 0.100 inch is 900 to 1100 pounds the mount is serviceable.

e. Inspect bearing in fifth mount eyebolt (33, figure 6-43) for wear. Maximum allowable wear is 0.008 inch radial and 0.016 inch axial.

f. Inspect bolts (16) for cracks and damage using magnetic particle method. (Refer to BHT-ALL-SPM.)

g. Inspect support fitting (41) and washer (38) for cracks and damage.

h. Inspect lift link (32, figure 6-43) as follows:

(1) Inspect bearings in lift link (32) for wear. Maximum allowable wear is 0.010 inch radial and 0.0390 inch axial.

(2) Inspect center 8.0 inches of left link (43) for nicks, sharp dents, and scratches. A maximum depth of 0.010 inch is allowed after cleanup. No damage allowed on outer 2.0 inches of either end of link.

i. Replace (without repair) if cracks or damage are found using magnetic particle inspection method.

j. Replace (without repair) if support fitting (41) is found to be cracked using fluorescent penetrant inspection method. (Refer to BHT-ALL-SPM.)

k. Replace (without repair) if washer (38, figure 6-43) is found to be cracked or damaged using fluorescent penetrant inspection method. (Refer to BHT-ALL-SPM.)

l. Replace (within limits) if rubber washer becomes detached from steel bushing (15). Rebond with adhesive (C-313).

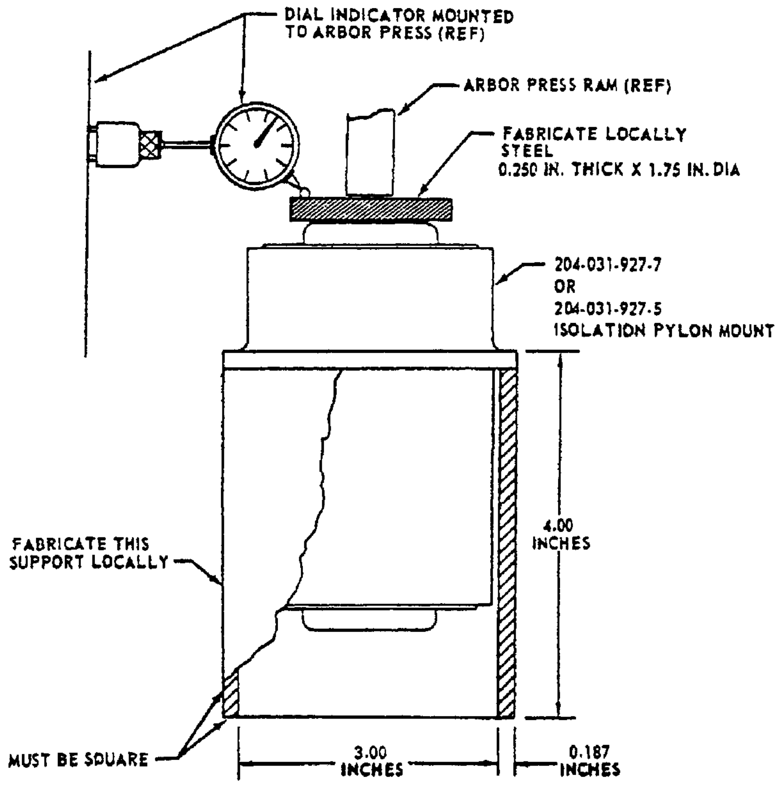


Figure 6-44. Isolation mount test fixture

m. Replace (without repair) if support (41) is found to be cracked using fluorescent penetrant inspection method. (Refer to BHT-ALL-SPM.)

n. Replace (without repair) if bearing of fifth mount (36) exceeds maximum allowable axial play of 0.016 inch or maximum redial play of 0.008 inch.

o. Blend out nicks, dents, and scratches on lift link (32) not to exceed 0.010 inch depth using No. 400 grit aluminum oxide cloth (C-406) or fine India stone (C-464). Polish to a scratch free finish using crocus cloth (C-500). Prime repaired areas with zinc chromate primer (C-201) or epoxy polyamide primer (C-204).

6-117. Installation — Pylon Mounts and Lift Link.

a. Install aft and forward mounts (1 and 21, figure 6-43) as follows:

NOTE

Deleted.

(1) Assemble bushings (15 and 19) and boots (20 and 24) on each forward mount (21). Insert bolts (17) through mounts from lower side.

NOTE

Use P/N AN175-12A bolt in forward mount holes and P/N AN715-11A bolts in aft mount holes.

(2) Position forward mounts (21) to filler plates (18) and pylon support (17). Secure each mount with four bolts (23) and thin steel washers (22).

(3) Assemble aft mounts (1) as outlined in preceding step (1).

NOTE

Use P/N AN175-11A bolts in forward outboard and aft outboard mount holes. Use P/N AN715-10A bolts in forward inboard and aft outboard mount holes.

(4) If disconnected, secure friction damper (4) to damper fitting (8) with bolt (5), washer (10), and nut (9).

b. Position lift link (32) to clevis (28) with bushings (31) and install bolt (30), steel washers (29 and 27), and nut (25). Torque nut 108 to 125 foot-pounds and secure with cotter pin (26).

c. Install fifth mount (36) and support fitting (41) as follows:

(1) Assemble boot (35) with washer (34) (concave side up) on top (shortest end) end of fifth mount (36). Insert eyebolt (33) down through mount and install washer (38) and retaining nut (39). Torque nut 480 to 600 inch-pounds and secure with cotter pin (40).

NOTE

The vertical shimming requirements must be established with the transmission installed and with lift link (18, figure 6-8) and bolt assemblies (17, 19 and 4) installed and fully torqued. The main rotor may be installed or not installed, but, if it is installed, the helicopter must be located on level ground and out of any wind and the rotor must not be tied down.

NOTE

Vertical shimming of the fifth mount must be accomplished following any replacement of fifth mount (36, figure 6-43), eyebolt (33), support fitting (41), aft mounts (1) or (21) or bushings (15).

(2) Remove support fitting (41) from helicopter. Refer to paragraph 6-115, step d. (3).

(3) Position fifth mount assembly (36) in support fitting (41) with one laminated filler plate (37) under the mount flange. Install four bolts (43) and washers (42) but leave the bolts 4 to 5 turns loose.

(4) Check mounting points on rear of pylon support for filler bonded to structure to provide clearance of fitting over rivet head. (Not more than two fillers at each side, bonded at 65 to 85°F (18 to 29°C) with adhesive (C-313). Position fitting on pylon support and attach each end with four bolts and washers.

(5) Insert bolt (13, figure 6-8) through the transmission fifth mount A-frame bushing and fifth mount bolt (33, figure 6-43). If the bolt cannot be easily inserted by hand, loosen bolts (43) further or remove filler plate (37). Do not rock the transmission to install bolt (13, figure 6-8).

(6) Using a thickness gage, measure and record the gap between the lower surface of the flange of mount assembly (36) and filler plate (37). Measurements must be taken at the edge of the mount assembly flange mid-way between bolts (43) on the right and left sides of the mount. Add the right and left measurements and divide the sum by 2. Record the result as dimension "H".

(7) Remove bolt (13, figure 6-8) and support fitting (41, figure 6-43). Refer to paragraph 6-115, step d. (3).

(8) Remove bolts (43), washers (42), and mount assembly (36) from fitting (41). If the single filler plate (37) was in place during the gap measurements of step (6), peel laminates from a second filler plate to obtain a thickness equal to dimension "H" within 0.002 inch. Install the adjusted filler plate on top of the first on support fitting (41).

If it was necessary to remove the filler plate (37) to obtain a gap in step (6), peel the laminates from the filler plate to obtain a thickness equal to dimension "H" within 0.002 inch. Install the adjusted filler plate on top of support fitting (41).

(9) Position fifth mount assembly (36) through the filler plate(s) (37) and install bolts (43) and washers (42). Torque the bolts 50 to 70 inch-pounds and secure with lockwire (C-405).

(10)Check mounting points on rear of pylon support for filler bonded to structure to provide clearance of fitting over rivet head. (Not more than two fillers at each side, bonded at 65 to 85°F (18 to 29°C) with adhesive (C-313). Position fitting on pylon support and attach each end with four bolts and washers.

CAUTION

Eyebolt (33) must be forced sidewards toward the right-hand side of the helicopter in order to install bolt assembly (13, figure 6-8). Pad tool adequately with plastic or wooden blocks or with cloths so as to not damage the transmission pylon support case as eyebolt (33, figure 6-43) is forced into position.

(11)Install bolt assembly (13, figure 6-8) with washer (25) and nut (26). Torque nut (26) 25 to 33 foot-pounds. Secure nut with cotter pin (27).

6-118. FRICTION DAMPERS.

6-119. Description — Friction Damper. Friction dampers (4, figure 6-43) are used to restrain both pylon aft mounts. These cylindrical units connect between lower ends of mount bolts and damper fittings in pylon support structure.

6-120. Removal — Friction Damper.

a. Disconnect friction damper (4, figure 6-43) from damper fitting (8) by removing bolt (5) and nut (9).

b. Disconnect friction damper (4) from lower end of bolts in aft mounts (1) by removing bolt (3), washer (11), and nut (12). Remove damper.

6-121. Disassembly — Friction Damper.

a. Remove molded silicone boot (8, figure 6-45) snap ring (7), two damper washers (4), and curved washer (2) from lower end of damper.

b. Clamp clevis end of damper inner member (9) in a vise with suitable cushioning to prevent damage.

c. Remove housing (1).

d. Remove upper curved washer (2), spacer (3), and damper washer (4) from inner member (9).

CAUTION

Do not remove garter springs (5) from damper discs (6).

e. Press or tap damper discs (6), with garter springs (5) in place, off inner member (9).

6-122. Inspection — Friction Damper.

a. Inspect friction dampers (figure 6-45) for scratches or scuffing.

b. Inspect housing (1) walls for oil.

c. Inspect boot (8) for deterioration tears and cuts.

d. Inspect curved washer (2) for deformation.

e. Inspect bearing for axial and radial play.

6-123. Cleaning — Friction Damper. Clean all parts with solvent (C-304). Dry with filtered, compressed air.

6-124. Repair — Friction Damper.

a. Repair (within limits) scratches and scuffs on friction dampers. (Figure 6-45.)

b. Replace (without repair) any part that fails to meet inspection requirements.

(1) Leakage of oil from damper.

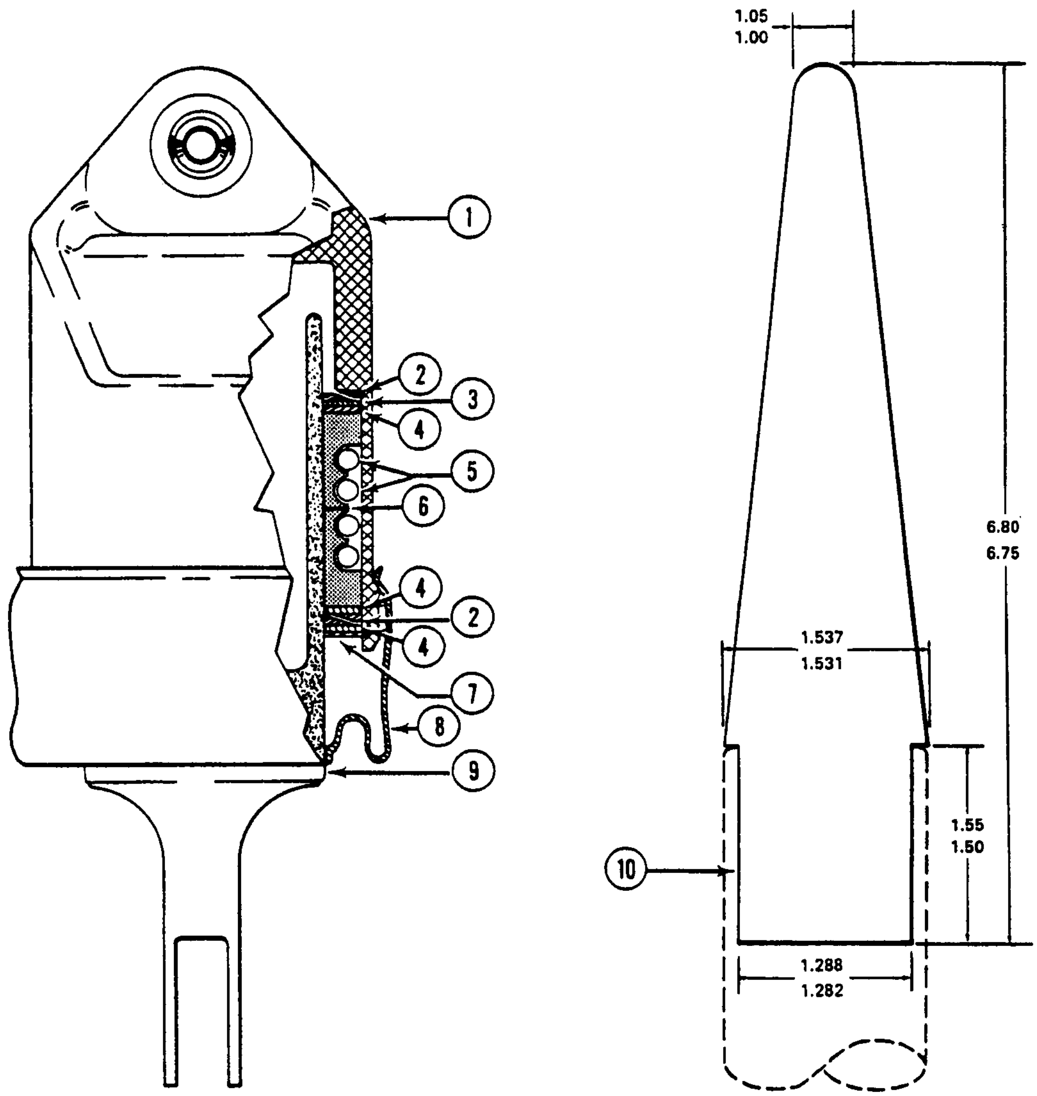
(2) Deterioration boot (8).

(3) Deformed washers (2 and 4).

6-125. Assembly — Friction Damper.

a. Provide and fabricate a reassembly tool (10, figure 6-45) to assist in expanding garter springs during assembly of damper. One end of tool should fit into bore of inner member (9) and maximum diameter should correspond to outside diameter of inner member.

b. With reassembly tool (10), insert into end of inner member (9), press or tap damper discs (6) onto inner member (9). Remove tool.



1. Housing
2. Curved washer
3. Spacer
4. Damper washer
5. Garter springs
6. Damper discs
7. Snap ring
8. Boot
9. Inner member
10. Reassembly tool

UH-1H-II-M-06-45

Figure 6-45. Friction damper and reassembly tool

c. Install damper washer (4), spacer (3), and curved washer (2) on inner member (9) above damper discs (6).

d. Install housing (1).

e. At lower end of assembly, install damper washer (4), curved washer (2), and damper washer (4) between inner member (9) and housing (1). Install snap ring (7) and boot (8).

6-126. Testing — Friction Damper. Check friction dampers (6-45) for loose motion . Loose motion of damper before applying load is plus or minus 0.035 inch. Load should register 115 to 180 pounds for damper (P/N 204-031-920-3) before any motion is determined above the plus or minus 0.035 inch.

CAUTION

Do not extend member (9) of damper over 0.5 inch.

NOTE

Any motion at a lower load could be caused by oil saturation. Clean as necessary.

6-127. Installation — Friction Damper.

a. Position friction damper (4, figure 6-43) between damper fitting (8) and aft mount (1).

b. Secure friction damper (4) to lower end of bolt in aft mounts (1) with bolt (3), two washers (11), and nut (12).

c. Secure friction damper (4) to damper fitting (8) with bolt (5), washer (10), and nut (9).

SECTION III — TAIL ROTOR DRIVESHAFT

6-128. TAIL ROTOR DRIVESHAFT.

6-129. Description — Tail Rotor Driveshaft. Six driveshaft sections are incorporated in power train aft of transmission tail rotor drive quill; these driveshafts serve as a line between four bearing hanger assemblies, an intermediate gearbox on tailboom, and a tail rotor gearbox on vertical fin. (Figure 6-46.) Each shaft section is an anodized aluminum alloy tube with a curvic-splined coupling riveted to each end and is statically balanced by metal strips bonded near middle on tube surface, or dynamically balanced with metal strips near both ends of shaft with an identification plate showing part and serial numbers. Forward shaft section extends through a tunnel between engine firewalls, with ends connected by V-band clamps to mating splined couplings on transmission tail rotor drive quill and on forward bearing hanger. Other shaft sections are mounted in similar manner along tailboom and vertical fin between hangers and gearboxes. The hanger assemblies are mounted with the flexible coupling forward.

6-130. Inspection — Tail Rotor Driveshaft (Installed).

a. Open hinged access doors along top of tailboom and vertical fin by releasing fasteners on left side. Also remove tailpipe fairing and vented cover over intermediate gearbox, as necessary.

b. Inspect all outer hanger couplings (13, figure 6-46) temperature indicator TEMP-PLATES for discoloration and overtemperature conditions. A change of color from white or light gray to black will indicate possible overheating and/or component degradation and require further inspection. Refer to table 6-6 for tail rotor drive system TEMP-PLATE conditions and corrective action.

c. Inspect driveshaft clamps for security and damage.

d. Inspect for rivet failure. Any rivet failure is cause for removal.

e. Visually inspect shaft for cracks. Any indication of cracks is cause for removal and inspection using fluorescent penetrant method. (Refer to BHT-ALL-SPM.)

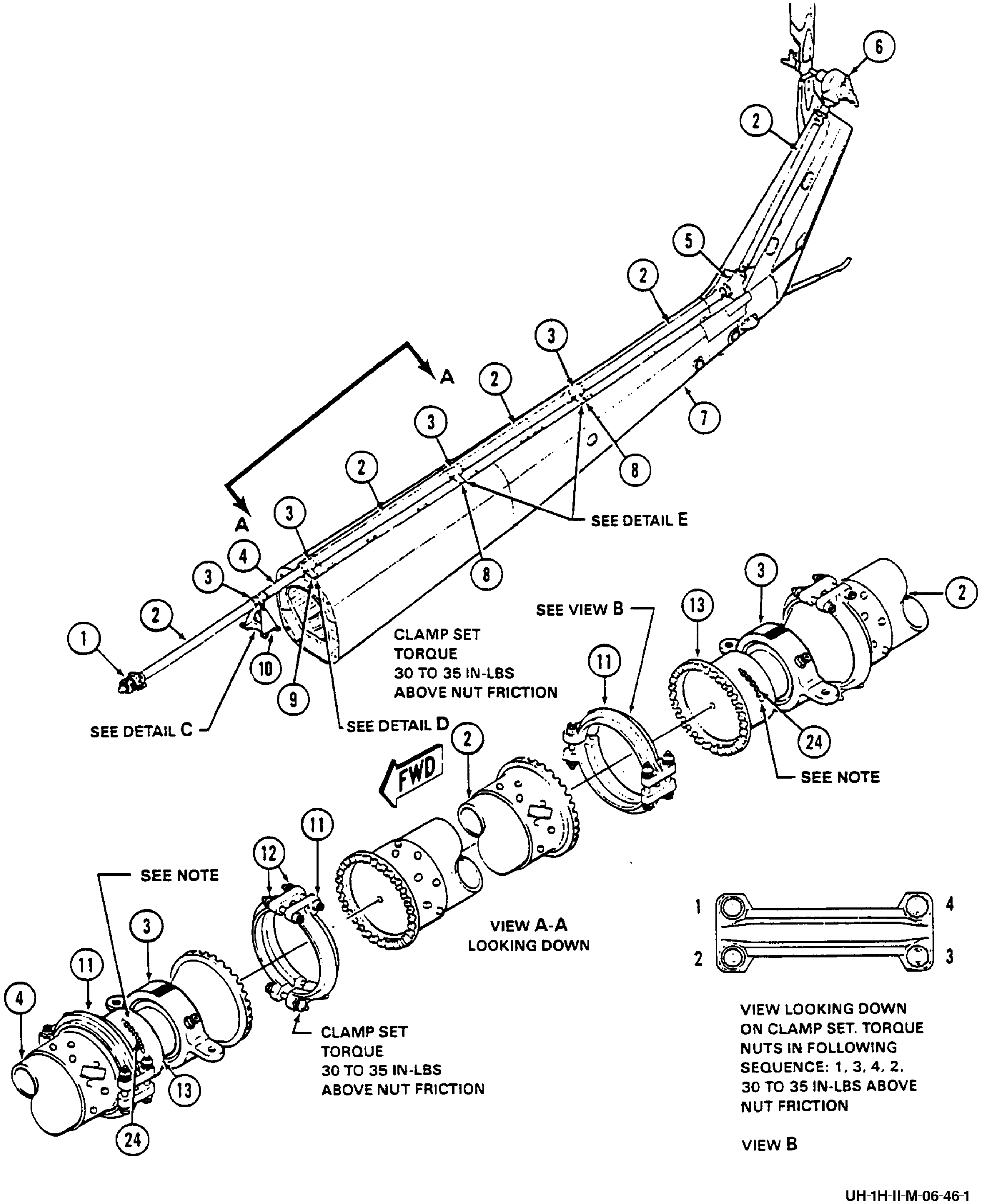
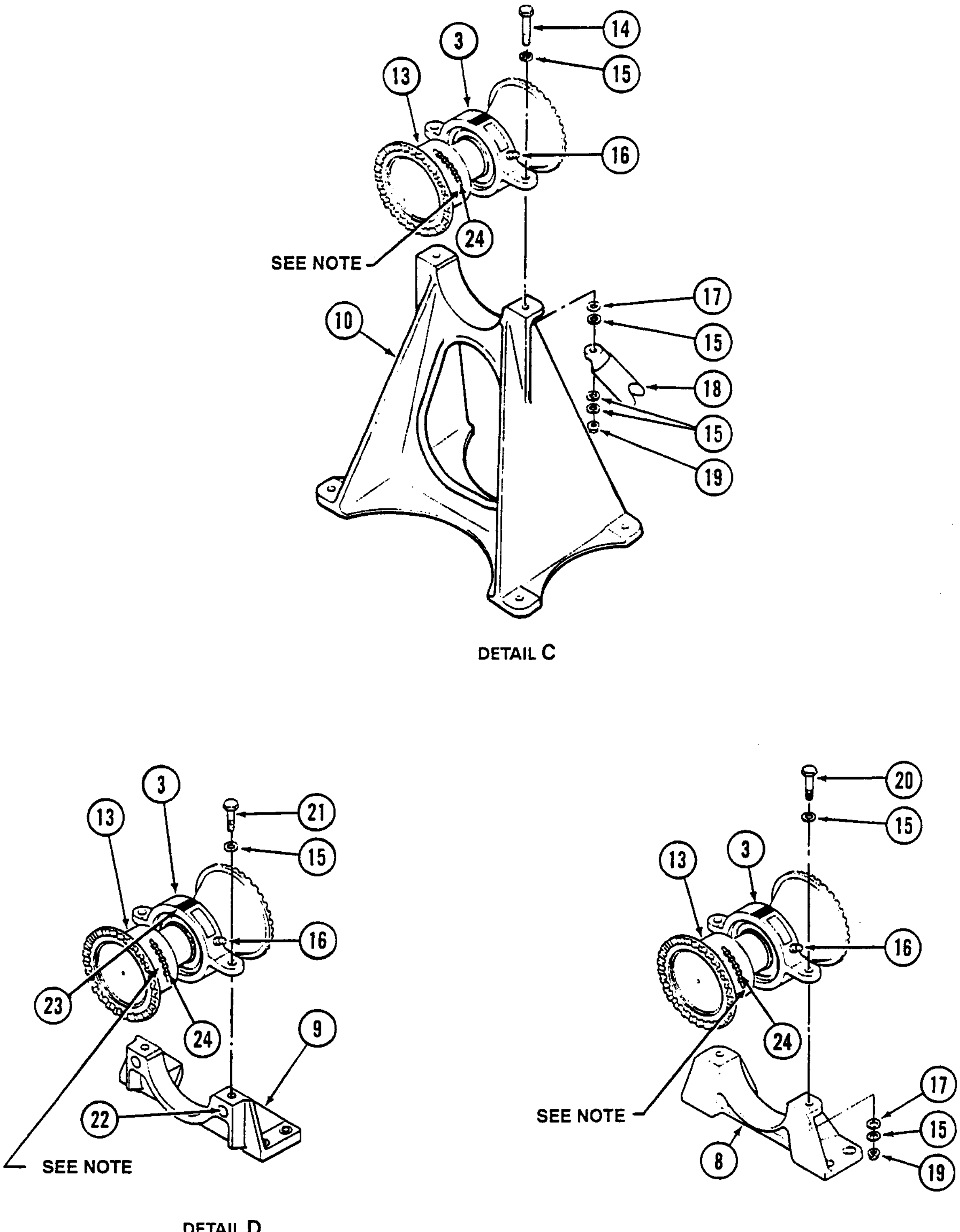


Figure 6-46. Tail rotor driveshaft and hanger installation (Sheet 1 of 3)



NOTE

Location of overtemperature indicator TEMP-PLATES.

UH-1H-II-M-06-46-2

Figure 6-46. Tail rotor driveshaft and hanger installation (Sheet 2 of 3)

1. Tail rotor drive quill
2. Driveshaft assembly (5 places)
3. Hanger bearing assembly (4 places)
4. Driveshaft assembly
5. Intermediate gearbox assembly
6. Tail rotor gearbox assembly
7. Tailboom assembly
8. Support (2 places)
9. Support
10. Support
11. Clamp set (12 places)
12. Bolts, nuts (48 places)
13. Hanger coupling
14. Bolt
15. Steel washer
16. Grease fitting
17. Washer
18. Support
19. Nut
20. Bolt
21. Bolt
22. Barrel nut and retainer
23. Zinc chromate primer (C-201) strip (overheat indicator strip)
24. Temp-plates

UH-1H-II-M-06-46-3

Figure 6-46. Tail rotor driveshaft and hanger installation (Sheet 3 of 3)

f. Check rivets to following inspection criteria. Cracks in rivets are acceptable if they do not exceed the following limits.

(1) Cracks are approximately radial. (Viewing top of shop head.)

(2) No crack extends into an area with a diameter less than 1.25 diameters of rivet shank.

(3) Cracks do not intersect.

(4) The minimum distance between cracks is less than one shank diameter.

(5) A maximum of three such cracks.

(6) Crack width shall not exceed 0.06 inches times the rivet shank diameter.

(7) Not more than 10% of shop heads in any subassembly may have cracks.

g. Inspect shaft for corrosion. Any corrosion is cause for removal of shaft for repair if corrosion is within limits. (Paragraph 6-132.)

NOTE

All dents should be carefully inspected for cracks, nicks, and scratches. No cracks permitted. Nicks or scratches shall be within limits. Total depth of defect shall not exceed limits for dents.

(1) Nicks, scratches, sharp dents, etc., aligned within 15 degrees of the shaft axis are acceptable without repair to a maximum depth of 0.002 inch in area A or 0.004 inch in area B. (Figure 6-47.)

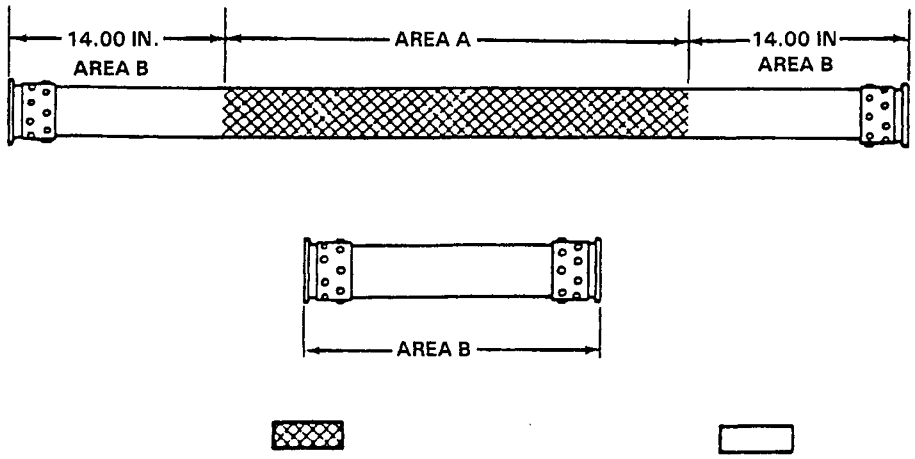
(2) Nonsharp dents are acceptable to a depth of 0.020 inch in area A or 0.030 inch in area B.

(3) Other nicks and scratches is cause for removal of shaft for repair.

NOTE

Do not mistake empty imprints in bonding material next to balance strip, as an indication of a missing balance strip. This spot results from removal of a test coupon to inspect for bonding voids. If a tail rotor driveshaft has more than a single empty bonding imprint. Remove and return to overhaul facility.

h. Inspect shaft for missing balance strips.



AREA A AREA B

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED AFTER POLISHING OUT	
CRACKS ALLOWED	See Note 6	See Note 6
NICKS AND SCRATCHES	0.008 In.	0.012 In.
SHARP DENTS	0.010 In.	0.015 In.
NONSHARP DENTS	0.020 In.	0.030 In.

NOTES:

1. Damage defined on the chart above is acceptable if repaired as follows:
   a. Damage is polished out with fine abrasive cloth (C-423) with minimum radius of 0.5 inch and with surface finish of 32 RMS or better.
   b. Maximum depth after rework does not exceed limits shown in chart.
   c. Reworked area is treated for corrosion prevention.
   d. If reworked area is eight square inches more on one side than the other, shaft balance must be checked.

2. Loss of one or more balance weights is cause to replace driveshaft. One empty bonding space should be open where bond test coupon was removed. If more than one empty space is observed, replace driveshaft.

3. Damaged curvic coupling splines that result in radial play and/or backlash between assembled couplings when fully meshed without clamps are not acceptable.

UH-1H-II-M-06-47-1

Figure 6-47. Damage limits — tail rotor driveshaft (Sheet 1 of 2)

4. Grooves worn on shaft coupling by clamp to extent that wear prevents proper clamping are cause to replace driveshaft.

5. If tail rotor driveshaft distortion is suspected, support driveshaft on "V" blocks and measure runout. Maximum acceptable total indicator reading on long shafts is 0.050 inch. Maximum acceptable total indicator reading on short shaft is 0.020 inch. Do not attempt to straighten driveshaft.

6. Any crack in a driveshaft is cause to replace the affected driveshaft except cracks in rivet heads are acceptable if they do not exceed the following limits:
   a. Cracks are approximately radial when viewing top of shop head.
   b. No crack extends into an area with a diameter less than 1.25 diameters of rivet shank.
   c. Cracks do not intersect.
   d. The minimum distance between cracks is less than one shank diameter.
   e. A maximum of 3 such cracks.
   f. Crack width does not exceed 0.06 inch times rivet shank diameter.
   g. Maximum of ten percent of rivet shop heads may have cracks within above limits.

UH-1H-II-M-06-47-2

Figure 6-47. Damage limits — tail rotor driveshaft (Sheet 2 of 2)

6-131. Removal — Tail Rotor Driveshaft.

a. Open hinged access doors along top of tailboom and vertical fin by releasing fasteners on left side. Also remove tailpipe fairing and vented cover over intermediate gearbox, as necessary.

b. Remove left and right access doors on transmission pylon inside cabin. Gain access to clamp set (11, figure 6-46) securing driveshaft (2) at tail rotor drive quill (1).

CAUTION

Do not intermix parts of clamp sets. Clamps and mounting hardware shall be kept as a matched set. Reassemble clamp sets after removal to prevent intermixing of parts.

CAUTION

Do not displace either end of driveshaft until both clamp sets are removed from driveshaft. Failure to comply may result in damage to driveshaft hanger bearing and/or curvic coupling.

c. Remove bolts and nuts (12) from clamp set (11), four places. Remove clamp set (11) from tail rotor drive quill (1) and driveshaft assembly (2). Reassemble clamp set to prevent intermixing of parts.

d. Remove bolts and nuts (12) from clamp set (11), eight places. Remove clamp set (11) two places from hanger bearing (3) at support (10).

e. Remove bolts and nuts (12) from clamp set (11). Remove clamp set (11) from hanger coupling (13) and driveshaft (4). Depress coupling (13) and remove driveshaft (4).

NOTE

Hanger bearing (3) must be removed prior to removing driveshaft assembly (2) from engine tunnel between transmission tail rotor drive quill and hanger support (10).

f. Remove bolt (14), washers (15 and 17), and nut (19), two places. Remove hanger bearing (3) from support (10). Remove driveshaft assembly (2).

g. Remove bolts and nuts (12) from remainder of clamp sets (11). Remove clamp sets and reassemble to prevent intermixing of parts. Depress couplings (13) and remove driveshafts (2).

6-132. Inspection — Tail Rotor Driveshaft (Removed).

a. All inspection limits of paragraph 6-130 and 6-47 apply.

b. Inspect for cracks using fluorescent penetrant method. (Refer to BHT-ALL-SPM).

c. Inspect shaft for grooves worn by mounting clamps to extent that such wear prevents proper clamping.

d. Inspect shaft for damaged or worn by curvic coupling teeth. There should be no radial play or backlash between mating teeth when fully meshed and mounting clamps removed.

e. Check shaft for straightness using dial indicator and V-blocks. Total indicated runout must not exceed 0.070 inch in center of shaft and 0.020 inch at ends of shaft. No straightening procedures are allowed.

f. Inspect driveshaft in accordance with figure 6-47.

(1) Check two water drain holes are not clogged on contoured surface of curvic coupling.

(2) Inspect curvic coupling splines on face of shaft coupling. There shall be no radial play or backlash between mating couplings when fully meshed without clamps.

(3) Inspect shaft for distortion (figure 6-47).

(4) Inspect balance weights for security. Any weights found debonded may be rebonded. If weight is missing, replace driveshaft.

(5) Inspect clamp sets for cracks, worn bolt holes, and distortion. Damage which can be detected visually requires replacement of clamp set.

(6) Inspect clamp sets for gouges or wear pattern extending into fillet radius at bottom of internal groove. Damage which can be detected visually requires replacement of clamp set.

(7) Inspect clamp sets for mechanical damage on spot face, lug fillets, and internal groove. Damage not exceeding 0.008 inch is acceptable without repair. Damage exceeding this limit is not acceptable and shall be repaired or entire clamp set replaced. Inspect remaining surfaces of clamp set for mechanical damage. Damage not exceeding 0.010 inch is acceptable without repair. Damage exceeding this limit is not acceptable and shall be repaired or clamp set replaced.

6-133. Repair — Tail Rotor Driveshaft.

a. Replace clamp sets that do not meet inspection requirements.

b. Replace shafts which do not meet inspection requirements. (Figure 6-47.)

c. Nicks, scratches, corrosion pitting, or sharp dents shall be polished out with fine abrasive cloth (C-423) provided the maximum depth after repair does not exceed 0.008 inch in area A, and 0.012 inch in area B. Corrosion adjacent to rivets in area B shall be cause for replacement of driveshaft.

NOTE

If total area of repair exceeds 1.3 square inches in area A or 0.8 square inch in area B, driveshaft must be returned to overhaul facility for balance.

d. Repair damage area to anodized finish and reworked areas with chemical film material (C-100).

e. Loss of balance weights. Observe that only one empty bonded space should be open where a bond test coupon was pulled. If balance weights come loose they may be rebonded. Balance of driveshafts will not be required providing original balance weight is used in its original location. Bond balance weight as follows:

(1) Clean the balance weight and shaft in the area where the balance weight will be bonded by abrading lightly with 400 grit abrasive paper (C-423). Remove residue with a clean cloth moistened with naphtha (C-305).

(2) Mix adhesive (C-317) 33 parts B to 100 parts A. Mix the two parts thoroughly. (Pot life is 30 to 50 minutes after mixing.) Apply a thin coat of adhesive to the balance weight and shaft in the area where the balance weight will be bonded. Place a six to ten mil thread in the adhesive on the balance weight. Two pieces of thread positioned lengthwise on the balance weight serves as a spacer, and control bondline thickness.

(3) Position balance weight on shaft. Use a fixture or rubber bands to maintain approximately ten psi pressure on balance weight. Remove surplus adhesive.

(4) Cure bond at 70 to 95°F (21 to 35°C) for 24 hours. Alternate cure may be accomplished by heating area 175 to 190°F (79 to 88°C) for 60 minutes.

(5) Apply chemical film material (C-100) to balance weight. Touch up paint if required.

6-134. Installation — Tail Rotor Driveshaft.

a. Install driveshaft (2, figure 6-46) through tunnel between transmission tail rotor drive quill (1) and hanger support (10).

b. Install hanger bearing (3) on support (10) using bolt (14), washers (15 and 17), and nut (19), two places. (View C.)

c. Install driveshaft assembly (2) between hanger bearings (3) and fixed and flexible coupling (13).

d. Install driveshaft assembly (2) between flexible couplings of intermediate gearbox assembly (5) and tail rotor gearbox assembly (6).

NOTE

Clamp halves are matched by identical vendor and forging lot numbers or by weight. Maximum weight differential for matched halves is one (1) gram. If doubt exists concerning clamp balance, the parts should be forwarded to a higher maintenance level for matching halves. All nuts on any one clamp set must be identical parts.

e. Install clamp set (11), 12 places, on driveshaft assembly (2 and 4). Index clamp sets (11) 90° apart. (View A-A.)

f. Install bolts (12), 48 places, bolt head in direction of rotation. Install nuts (12) on bolts (12), 48 places.

NOTE

Determine friction torque of each nut as follows: thread nut onto bolt until full length of each nut is on attaching bolt, then check torque.

g. Torque clamp nuts (12) evenly 30 to 35 inch-pounds above the nut friction torque noted above. Keep equal gaps at end of clamp set within 0.030 inch. Tap lightly around outer surface of clamps to ensure good seating. Recheck torque.

h. Install tailpipe fairing or gearbox cover. Close access doors and cowling.

6-135. DRIVESHAFT HANGERS.

6-136. Description — Driveshaft Hangers. Four hanger assemblies are utilized for the driveshaft. Each assembly consists of couplings on a short splined shaft, mounted through a single-row sealed ball bearing in a ring-shaped hanger, equipped with two mounting lugs for attachment on a support fitting.

6-137. Inspection — Driveshaft Hangers (Installed).

a. Inspect hanger (3, figure 6-46) visual overheat indicator stripe(s) for discoloration and overheat condition. A change in color of indicator stripe(s) from green to brown will indicate a possible overheat condition and/or component degradation. The cause of indicator stripe(s) discoloration should be determined prior to continued operation.

b. Inspect hanger assemblies (3) for excessive roughness or binding. If condition of bearing is in doubt, inspect as follows:

(1) Disconnect driveshaft (12) from each end of hanger assembly (3).

(2) Rotate bearing while pressing in axially on end of hanger while turning. Bearing may feel smooth when turned with no load but rough when loaded by pressing in with hand.

(3) Obvious roughness, catching, or binding when turned by hand is cause for replacement.

c. Inspect hanger assemblies and adjacent area for evidence of grease leakage. Wetting of adjacent structure by slinging of grease from flex coupling and/or bearings is cause for replacement of hanger assembly. A small amount of grease expelled from around lip of bearing seal indicates slight over-lubrication and is not cause for hanger replacement. Perform an evaluation of hanger as follows:

CAUTION

Do not clean or spray bearing or hanger assembly with any type of solvent during inspection. Use only clean cloths without solvent to clean exterior of hanger.

(1) Wipe grease from seal with clean lint-free cloth.

(2) Record on details, indicating bearing by location and keep under observation.

(3) If amount of grease expelled from bearing seal does not decrease after a period of time, hanger assembly should be replaced.

d. Inspect hanger assembly and bearing for evidence of overheating as follows:

(1) Hanger assemblies normally operate at a temperature range of 100 to 160°F (38 to 71°C) (cool enough to touch). Investigate any installed hanger that is too hot to touch.

(2) Indications of overheating such as discoloration of bearing (blue/black in color) or multicolor appearance of couplings and hanger that darkens adjacent to bearing is cause for replacement.

(3) Brown coloring of bearing shield is normal and is not an indication of overheating.

e. Rust colored fretting debris in areas adjacent to bearing OD/ID is cause for replacement.

f. Inspect hanger ring and attachment lugs for cracks, elongated bolt holes, or other obvious damage.

g. Inspect outer hanger (13, figure 6-46) temperature indicator TEMP-PLATES (24) as follows:

NOTE

Overtemperature indicator dots on TEMP-PLATES are white or light gray color and turn black when exposed to an overtemperature condition. Chemical contamination can also cause indicator DOTS to turn black.

(1) Temperature indicator TEMP-PLATES must not show evidence of overtemperature, deterioration, debonding, or discoloration of the epoxy coating that prevents interpretation of the indicating DOTS. If any of these conditions exist, proceed to step 2.

(2) If one TEMP-PLATE is missing, and no DOT on the other TEMP-PLATE (on the same coupling) is discolored or shows mechanical damage or degradation of the epoxy overcoating, the helicopter may be returned to service.

(3) The discrepant TEMP-PLATES in step 2. should be replaced as soon as practical. If any indicator DOT on either TEMP-PLATE has changed color to black, see figure 6-47A for probable cause and required corrective action.

h. Inspect couplings for damage or excessive wear using the following criteria:

(1) Hold coupling at full outward position, remove retaining ring (1, figure 6-48), seal plate (2), and spring (3) from flexible coupling (8).

(2) Remove pin (16), nut (15), and washers (13 and 14) and bolt (4) with washer (5).

(3) Remove plates (12 and 6) and inner coupling (7) with outer coupling (8) and seal (9).

(4) Remove inner coupling from outer coupling.

CAUTION

Do not use cleaning solvents inside coupling with seal (9) in place.

(5) Remove old lubricant from inner and outer couplings as thoroughly as possible using clean cloth.

(6) Inspect teeth of inner and outer couplings for pitting, wear, and other damage. (Figure 6-49.)

(7) Visually inspect all parts for wear. Parts which indicate excessive wear should be measured for extent of wear. (Figure 6-50.)

(8) Inspect bearing (10, figure 6-48) for roughness, lack of lubrication, or signs of overheating.

(9) If any parts have wear or damage beyond limits, or bearing is defective, reassemble hanger and forward to overhaul.

(10) If couplings are serviceable, hand pack lubricant (C-015) to 0.12 inch depth over tops of internal spline teeth. A work aid may be fabricated as shown in figure 6-50A to obtain proper depth of lubricant.

(11) Insert inner coupling (7) into outer coupling (8) with small end through seal (9).

(12) Position assembled couplings (7 and 8) on splined end of shaft and install plates (6 and 12), bolt (4) with washers (5, 13, and 14) and nut (15). Torque nut (15) 50 to 70 inch-pounds and install cotter pin (16).

(13) Hold outer coupling at its outward limit of travel and install spring (3), seal plate (2), and retaining ring (1).

(14) Inspect retaining ring (1) for security.

CAUTION

Do not attempt to remove or change shims under fittings.

i. Inspect hanger support fitting on tailboom and engine deck for security of attachment and evidence of cracks and damage.

6-138. Lubrication — Driveshaft Hangers.

a. Hold coupling at full outward position, remove retaining ring (1, figure 6-48), seal plate (2), and spring (3) from flexible coupling (8).

b. Remove cotter pin (16), nut (15), and washers (13 and 14) and bolt (4) with washer (5).

ONE RED TEMP-PLATE	OTHER RED TEMP-PLATE	PROBLEM CAUSE	SEE NOTE
Black	Good	Defect/Instl	1
Black	Black	Overtemp	2
Part Black	Good	Chem Contamination	1
Missing	Good	Defect/Instl	1
Missing	Missing	Possible Overtemp	2

NOTES

1. Resume operation. Defective TEMP-PLATE or improper installation, replace defective TEMP-PLATE as soon as practical (BHT-212-CR&O).

2. Coupling overtemp condition is very likely. Remove driveshaft or coupling assembly and perform overtemp inspection in accordance with BHT-212-CR&O and the following instructions. Scrap affected male and female couplings if any of the conditions listed below exist or if required by BHT-212-CR&O inspection criteria.

   a. Cadmium plating on outer coupling is discolored (circumferential tan or light brown band) or blistered.

   b. Gear teeth of either coupling or discolored (brown or blue) in normally bright contact patterns.

   c. Under 5x or 10x magnification, surfaces of gear teeth of either inner or outer coupling exhibit signs of metal smearing or tearing in contact patterns.

   d. Grease is very viscous (thick) and has a strong pungent order.

NOTE

If NONE of the above conditions exist, coupling may be reassembled in accordance with BHT-212-CR&O and return to service following replacement of TEMP-PLATES.

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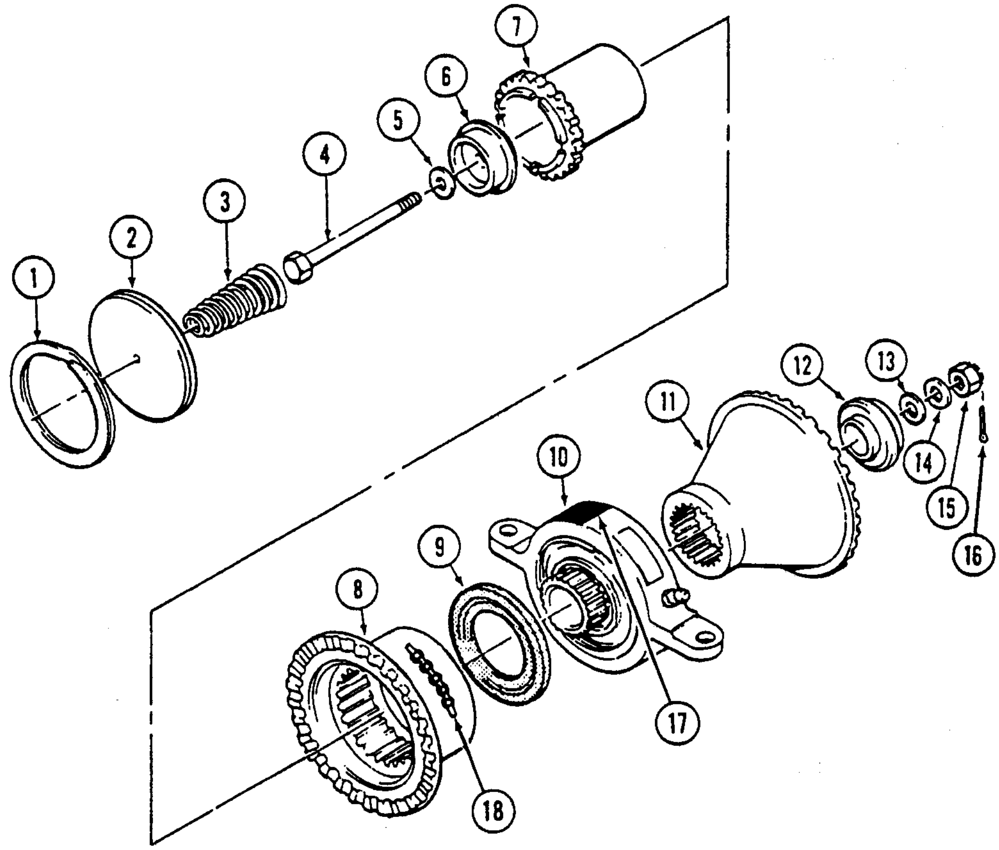
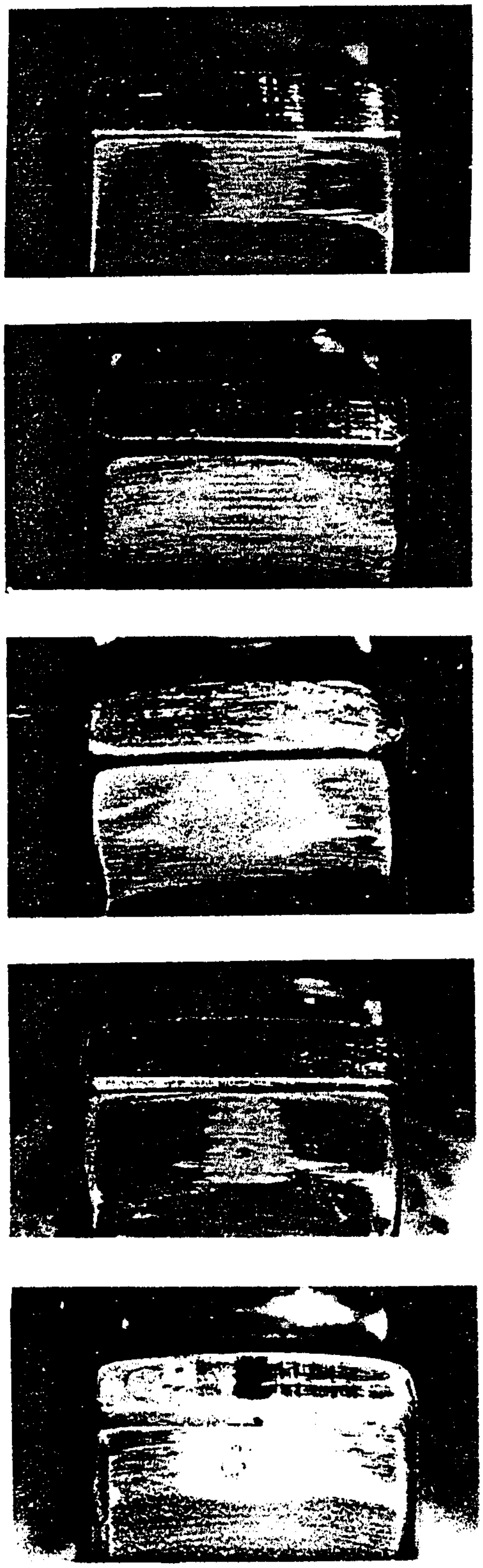
Figure 6-47A. Tail rotor driveshaft coupling TEMP-PLATE condition and correction



1. Retaining ring
2. Seal plate
3. Spring
4. Retaining bolt
5. Aluminum washer
6. Plate
7. Inner (spherical) coupling
8. Flexible coupling
9. Seal
10. Bearing and shaft assembly
11. Rear coupling
12. Plate
13. Aluminum washer
14. Steel washer
15. Nut
16. Cotter pin
17. Overheat indicator strips
18. TEMP-PLATE

UH-1H-II-M-06-48

Figure 6-48. Tail rotor driveshaft hanger



A Acceptable pattern typical of low operating time.

B Acceptable pattern typical of couplings which have operated with normal misalignment for a longer period of time than that shown in A.

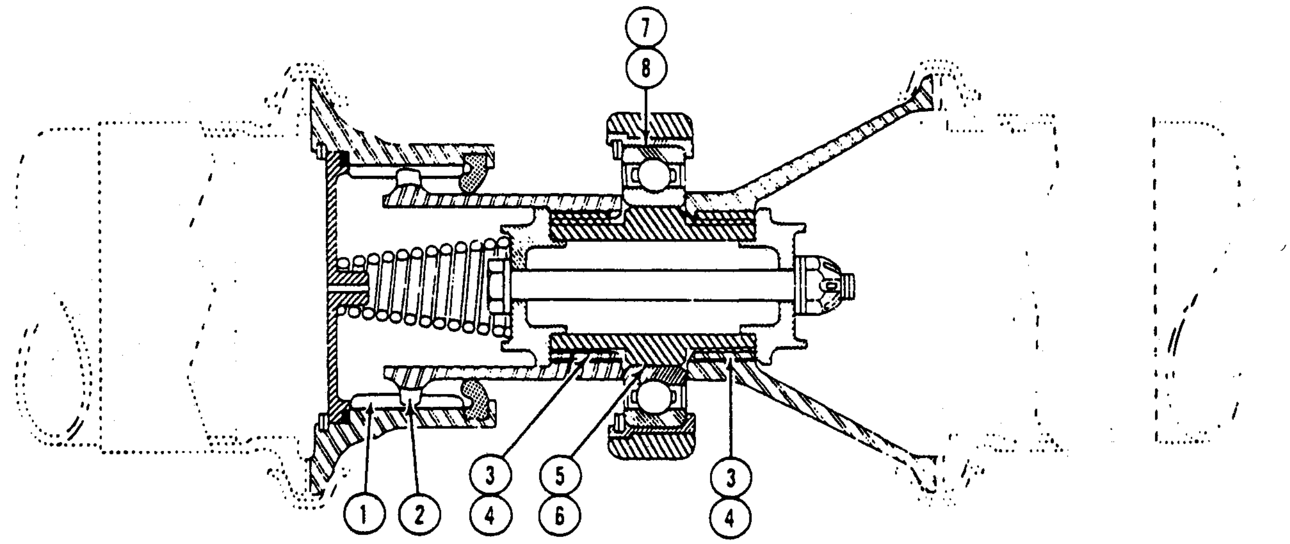
C Acceptable pattern denoting operation at higher torque than that shown in A and B.

D Acceptable pattern showing a pitted tooth. This condition is acceptable on all teeth.

E Pattern shows a more severe condition of tooth pitting than that shown in D. There is no metal projecting above the normal face of the tooth, indicating that the pitted area is polishing over. This condition may exist on all teeth. Couplings with pits larger than 1/32 inch diameter should be replaced.

UH-1H-II-M-06-49

Figure 6-49. Coupling teeth wear patterns — typical



ITEM	NOMENCLATURE	MFG. DIMENSION (Inches) MIN.	MAX.	REPLACE
1	Outer Coupling — Internal Spline (Use 0.1309 Dia. Pins)	1.829	1.836	*
2	Inner Coupling — External Spline (Use 0.1080 Dia. Pins)	2.169	2.174	2.1590
3	Inner Coupling — Internal Spline (Use 0.0720 Dia. Pins)	1.1251	1.1285	1.1336
4	Shaft — External Spline (Use 0.0960 Dia. Pins)	1.3502	1.3518	1.3481
5	Shaft — Bearing Seat	1.3778	1.3784	1.3776
6	Bearing — Inside Diameter	1.3775	1.3780	**
7	Bearing — Outside Diameter	2.4404	2.4409	**
8	Hanger Sleeve — Inside Diameter	2.4401	2.4406	2.4409

* Maximum depth of wear 0.005 inch (measure from unworn face of tooth).
** Bearing is a standard replacement item at overhaul — only mfg. dimensions are given.

UH-1H-II-M-06-50

Figure 6-50. Limits chart — tail rotor driveshaft hanger assembly

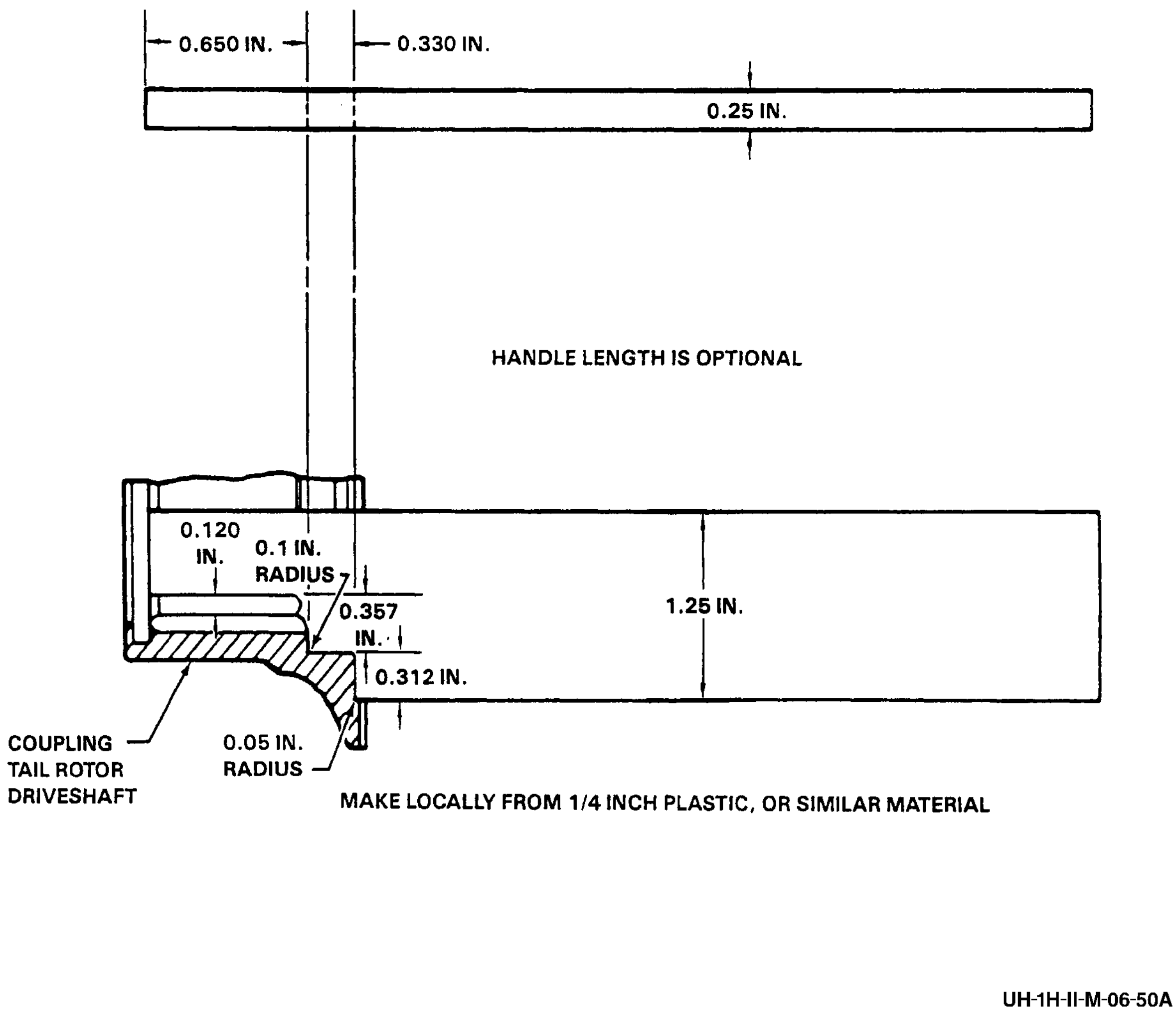


Figure 6-50A. Work aid for lubrication of tail rotor drive coupling

c. Remove plates (12 and 6) and inner coupling (7) with outer coupling (8) and seal (9).

d. Remove inner coupling from outer coupling.

CAUTION

Do not use cleaning solvents inside coupling with seal (9) in place.

e. Remove old lubricant from inner and outer couplings as thoroughly as possible using clean cloth.

f. Hand pack lubricant (C-015) to 0.12 inch depth over tops of internal spline teeth. A work aid may be fabricated as shown in figure 6-50A to obtain proper depth of lubricant.

g. Insert inner coupling (7) into outer coupling (8) with small end through seal (9).

h. Position assembled couplings (7 and 8) on splined end of shaft and install plates (6 and 12), bolt (4) with washers (5, 13, and 14) and nut (15). Torque nut (15) 50 to 70 inch-pounds and install cotter pin (16).

i. Hold outer coupling at its outward limit of travel and install spring (3), seal plate (2), and retaining ring (1).

j. Inspect retaining ring (1) for security.

6-139. Removal — Driveshaft Hangers.

a. Open hinged access doors along top of tailboom by releasing fasteners on left side.

b. Remove tail rotor driveshaft from each side of hanger. (Paragraph 6-131.)

c. Remove bolt (14, figure 6-46), washers (15 and 17), and nut (19), two places. Remove hanger bearing (3) from support (10). (Detail C.)

d. Remove bolt (21) and washer (15), two places. Remove hanger bearing (3) from support (9). (Detail D.)

e. Remove bolts (20), washers (15 and 17), and nut (19), two places. Remove hanger bearing (3) from support (8), two places. (Detail E.)

6-140. Repair — Driveshaft Hangers.

NOTE

Repair is limited to replacement of seal and inspection of internal parts for wear and damage.

a. Disassemble hanger as follows:

(1) Remove retaining ring (1, figure 6-48) while holding seal plate (2) against pressure of spring (3).

(2) Remove seal plate (2) and spring (3).

(3) Remove cotter pin (16), nut (15), washers (13 and 14), and plate (12) from retaining bolt (4).

(4) Remove retaining bolt (4), washer (5), and plate (6).

(5) Remove inner coupling (7) and flexible coupling (8). Remove seal (9) from flexible coupling (8). Remove rear coupling (11).

(6) Clean all grease from couplings by wiping with clean lint-free cloth.

b. Inspect hanger parts for wear and damage, as follows:

(1) Inspect coupling teeth for pitting and wear patterns. (Figure 6-49.)

(2) Visually inspect all parts for wear. Parts which indicate excessive wear should be measured for limits. (Figure 6-50.)

(3) Inspect bearing for roughness, lack of lubrication, or signs of overheating.

(4) If any parts have wear or damage beyond limits, or bearing is defective, reassemble hanger and forward to depot maintenance.

(5) Inspect retraining ring (1, figure 6-48), seal plate (2), and spring (3) for serviceability.

c. Assemble hanger as follows:

(1) Replace grease seal (9, figure 6-48) by installing new seal in small end of flexible coupling (8) with seal lip toward flange end of coupling. Press seal, using burnishing tool, into slot between end of coupling teeth and flange.

(2) Hand pack lubricant (C-015) to 0.12 inch depth over tops of splines of inner coupling (7) and

insert into flexible coupling (8). A work aid may be fabricated as shown in figure 6-50A to obtain proper depth of lubricant.

(3) Install rear coupling (11). Install inner coupling (7) and flexible coupling (8) to (forward) retaining ring side of bearing and shaft assembly (10).

(4) Install aluminum washer (5) and plate (6) against head of retaining bolt (4). Insert bolt through previously assembled parts.

(5) Install plate (12), aluminum washer (13), steel washer (14), and nut (15) on retaining bolt (4). Torque nut (4) 50 to 70 inch-pounds. Install cotter pin (16).

(6) Hold flexible coupling (8) at full outward position. Hand pack lubricant (C-015) to 0.12 inch depth over top of internal spline teeth.

(7) Install spring (3), seal plate (2), and retaining ring (1).

(8) As required, mast hanger support (10) for overheat paint strips (17).

CAUTION

Do not allow MEK (C-309) to come in contact with bearings, packings, or grease seals, as damage will result.

(9) Clean support (10) in area to be painted with clean cheesecloth dampened with MEK (C-309). Wipe dry with clean cheesecloth before MEK evaporates.

(10)Apply one coat of zinc chromate primer (C-201).

6-141. Installation — Driveshaft Hangers.

a. Position hanger bearing assemblies (3, figure 6-46) on attaching supports (8, 9, and 10) with flexible couplings (13) facing forward. Position attaching hole boss of hanger bearings (3) on supports (8, 9, and 10) with identification plate and grease fitting (16) on top.

b. Install fuselage hanger bearing assembly (3) on support (10) by installing bolts (14), washers (15 and 17), and nuts (19), two places. Tighten nut (19) fingertight. (Detail C.)

c. Install forward tailboom hanger bearing assembly (3) on support (9) by installing barrel nut and retainer (22), two places, in support (9). Install bolt (21) and washer (15), two places. Tighten bolts (21) fingertight. (Detail D.)

d. Install two aft tailboom hanger bearing assemblies by installing bolt (20), washers (15 and 17), and nut (19), two places, on each support (8). Tighten nuts (19) fingertight. (Detail E.)

e. Install driveshafts. (Paragraph 6-131.)

NOTE

If one or more hangers are being installed, driveshaft(s) (aft of hanger(s) being installed) should be loosened on both ends prior to final seating of hanger(s) to allow hanger to seek proper position, otherwise hanger can be cocked (misaligned) resulting in reduced hanger bearing service life.

f. After driveshafts have been secured in place, torque hanger attaching nuts and/or bolts 50 to 70 inch-pounds.

6-142. TAIL ROTOR DRIVESHAFT SUPPORT FITTING.

6-143. Description — Tail Rotor Driveshaft Support Fitting. The tail rotor driveshaft support fittings, one on the airframe, and three on the tailboom, are used for attachment of the driveshaft hanger assemblies and support the tail rotor driveshaft. (Figure 6-46.)

CAUTION

Do not remove support fittings for repairs unless necessary. Removal and reinstallation requires realignment of tail rotor driveshaft.

6-144. Removal — Tail Rotor Driveshaft Support Fitting.

a. Remove tail rotor driveshaft hanger. (Paragraph 6-139.)

b. Remove screws securing fitting in place.

CAUTION

Do not remove shims installed under fitting.

c. Ensure that shims under fitting are bonded in place. If shims are loose, identify for reinstallation in proper place.

d. Accomplish tail rotor driveshaft alignment in accordance with paragraph 6-148.

6-145. Inspection — Tail Rotor Driveshaft Support Fitting. Inspect fitting for wear, damage, or corrosion. (Chapter 2.)

6-146. Installation — Tail Rotor Driveshaft Support Fitting.

a. Ensure that shims are in place.

b. Secure fitting to airframe with screws.

c. Install driveshaft hanger. (Paragraph 6-141.)

6-147. Deleted.

6-148. Alignment — Tail Rotor Driveshaft.

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T103224-101), (T103225-117), (T103225-119), (T103226-101), (412-240-033-101), (412-240-034-101) (412-240-035-101))
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-001), (C-305), (C-309), (C-317)
Special Environmental Conditions	Clean Dust Free Area.

a. A tail rotor drive system alignment check shall be made whenever driveshaft misalignment is suspected, when damage to airframe structure in the area of driveshaft hangers requires structural repair or parts replacement, when major structural repairs are performed in any area of tailboom or in the aft section of forward fuselage or when the original intermediate gearbox is replaced with a gearbox of a different part number. Alignment of driveshaft hanger supports and intermediate gearbox shall be accomplished as follows:

(1) Open tail rotor driveshaft covers and intermediate gearbox cover.

(2) Remove tail rotor driveshafts and hangers. (Paragraph 6-131 and 6-139.)

NOTE

Do not remove driveshaft hanger support assemblies from the tailboom or forward fuselage.

(3) Remove intermediate gearbox if installed. Ensure any shims between gearbox and tailboom remain in their original locations on tailboom. (Paragraph 6-153.)

(4) Remove tail rotor gearbox. (Paragraph 6-175.)

(5) Remove tailboom from helicopter and place in suitable support cradle. (Chapter 2.)

(6) Clean surfaces on tailboom and hanger supports where hangers and gearboxes were removed of primer and sealant. Use a plastic scraper and a clean cloth moistened with solvent (C-309) or aliphatic naphtha (C-305).

(7) Install alignment plate (T103225-119) with T103225-117 bushing for left-hand position of plate (looking aft) (figure 6-51, view A, detail A), on forward tailboom bulkhead using AN8-31A bolts or equivalent with AN960-816 washers under bolt heads.

(8) Install tail rotor/90° gearbox simulator (T103226-101) on top of vertical fin.

CAUTION

Ensure three leveling screws in intermediate gearbox simulator are backed off so they do not project below the mounting surface of the simulator before proceeding.

(9) Install intermediate gearbox simulator (T103224-101) using AN4-13A bolts and sufficient number of AN960-416 and AN960-416L washers under heads of bolts so bolt grips do not bottom out in mating tailboom nutplates.

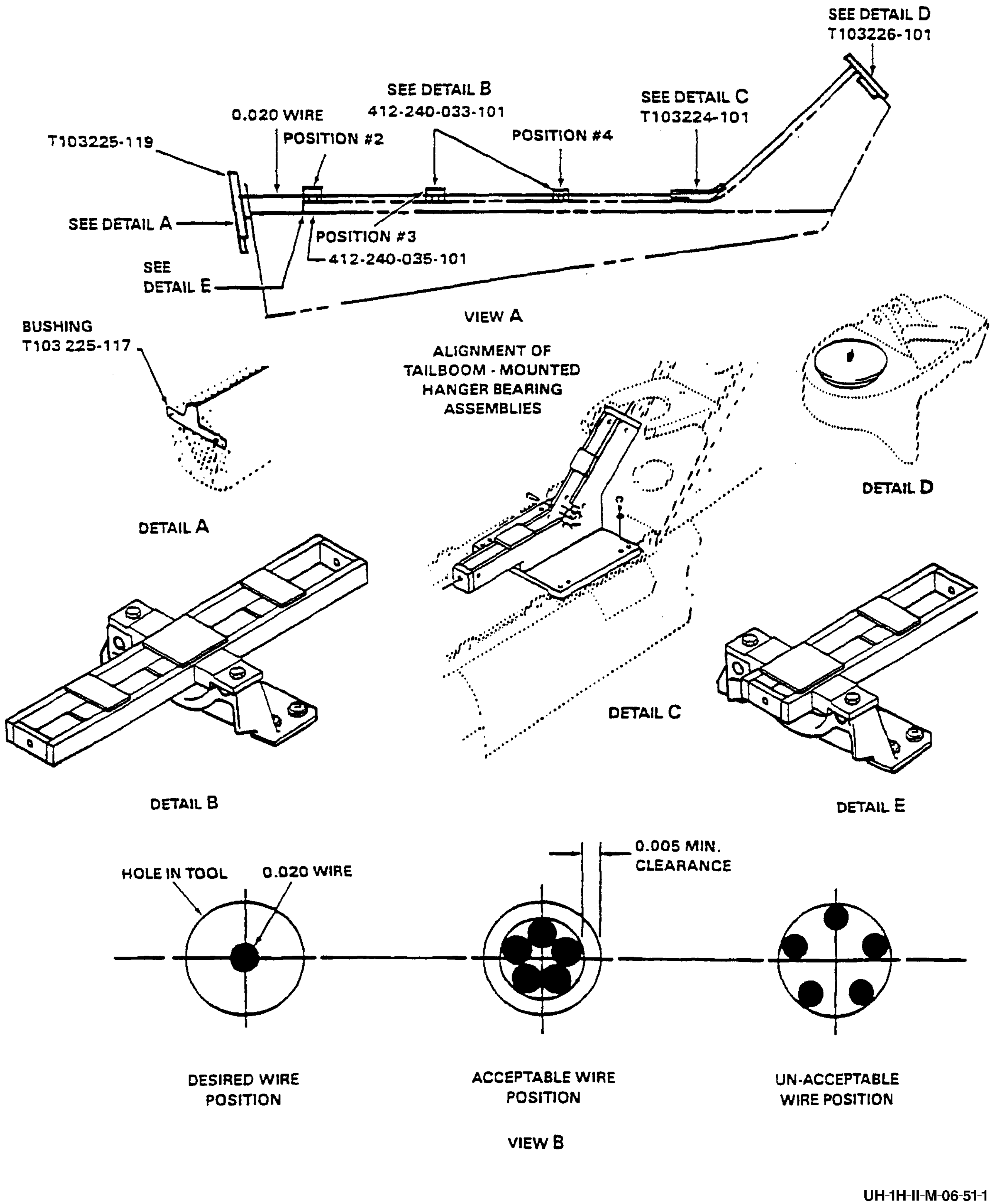
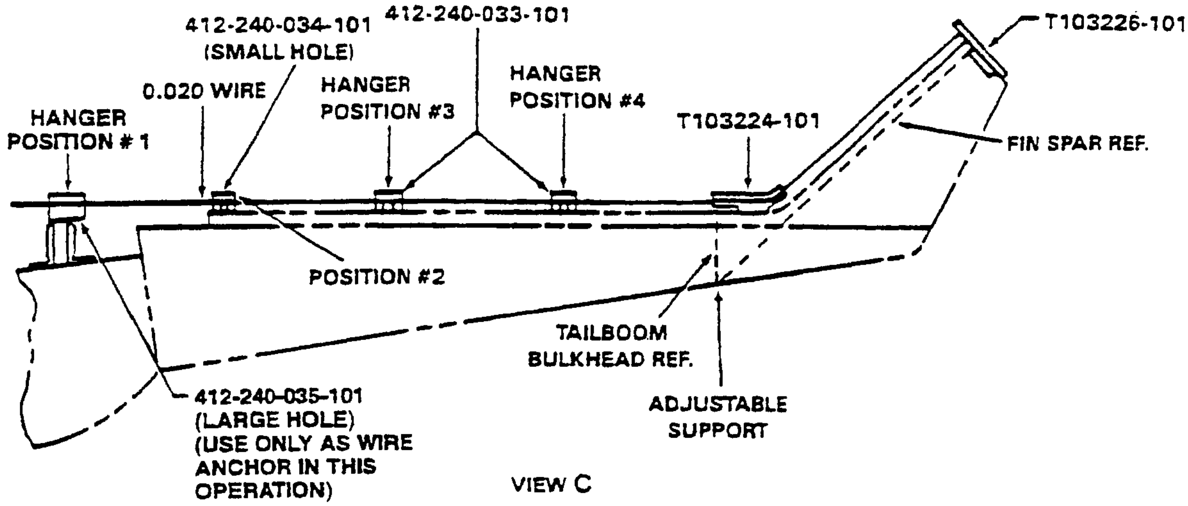
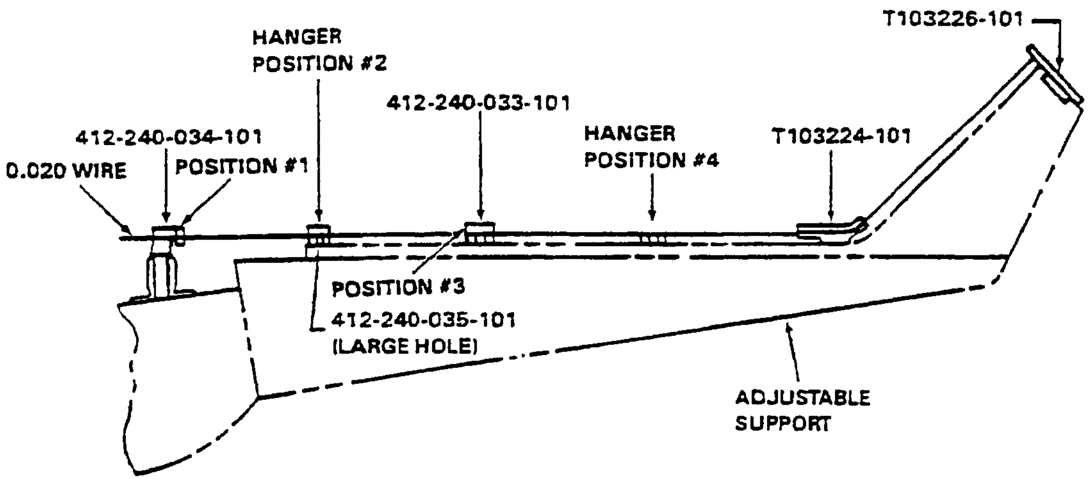


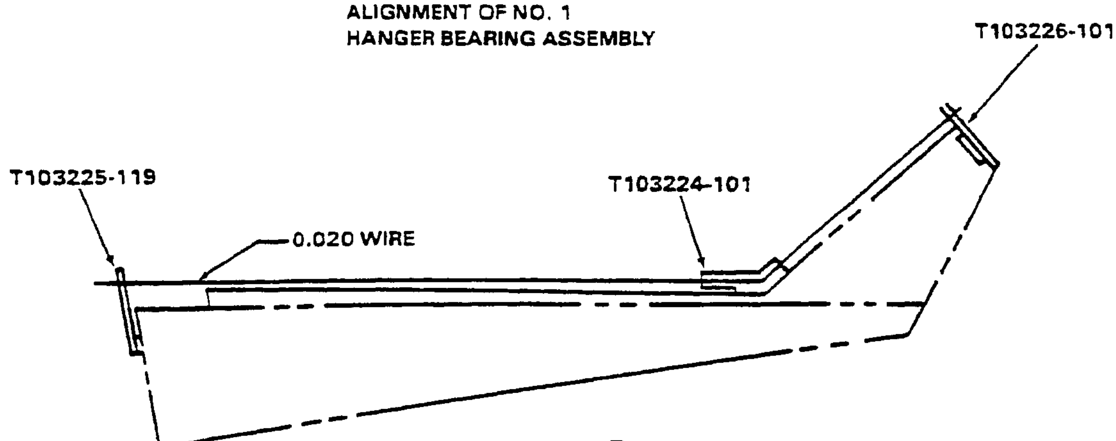
Figure 6-51. Tail rotor driveshaft alignment (Sheet 1 of 2)



VIEW C
ESTABLISHING PROPER
TAILBOOM POSITION



VIEW D
ALIGNMENT OF NO. 1
HANGER BEARING ASSEMBLY



VIEW E
INTERMEDIATE GEARBOX
ALIGNMENT

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Figure 6-51. Tail rotor driveshaft alignment (Sheet 2 of 2)

Figure 6-51. Deleted.

CAUTION

Verify tail rotor gearbox simulator (T103226-101) and (T103226-101) bulkhead alignment plate are secured before proceeding.

(10)Install unkinked 0.020 inch diameter wire in hole of tail rotor gearbox simulator (T103226-101). Secure end of wire on upper side of plate.

(11)Pass other end of wire through hole in top of plate of intermediate gearbox simulator (T103224-101) around "V" groove in pin and out through hole of forward (vertical) end plate (view E).

(12)Pass wire through hole in tailboom bulkhead alignment plate, (T103225-119) and tighten wire until all slack is removed and secure end of wire. Secure end of wire with safety-wire spinner pliers or other positive-locking pliers.

NOTE

Ensure wire is still unkinked and is still positioned in "V" groove in the pin in intermediate gearbox simulator (T103224-101).

(13)Check for alignment of intermediate gearbox by confirming wire clears the edges of holes in top and forward end plates by at least 0.005 inch (view B, figure 6-51). If alignment is not acceptable, proceed directly to step (13) (a). Pluck wire and check to see if the wire continues to vibrate. If vibration continues, tolerance is sufficient to proceed.

or

If alignment is acceptable, loosen 0.020 inch diameter alignment wire and remove intermediate gearbox simulator (T103224-101). Install the P/N 212-040-003 intermediate gearbox and then verify that a minimum of 0.030 inch clearance exists between the lower surfaces of the gearbox (other than the four mounting pads) and the underlying surfaces of the tailboom. If sufficient clearance exists, proceed directly to step (14). If sufficient clearance does not exist, add shims (equal amounts at all four mounting pads) as required to achieve clearance required, then proceed directly to step (13) (b).

(a) Loosen 0.020 inch diameter alignment wire and remove intermediate gearbox simulator (T103224-101).

(b) Remove all shims on tailboom at intermediate gearbox location, note thickness of shim-stacks removed. Using a plastic scraper and a cloth moistened with solvent (C-309) remove any adhesive or sealant residue around gearbox mounting hole locations on tailboom.

(c) Adjust three levelling screws on intermediate gearbox simulator (T103224-101) so they project below mounting surface an amount approximately equal to thickness of shim-stack established in step (13) (b) at corresponding mounting bolt location.

CAUTION

When gearbox simulator (T103224-101) is supported on its three levelling screws, tighten 4 simulator mounting bolts to only 20 to 30 inch-pounds.

(d) Install intermediate gearbox simulator (T103224-101) on tailboom in accordance with step (9) and reinstall alignment wire in accordance with step (11) and (12). Ensure alignment wire is positioned in "V" groove in intermediate gearbox simulator pin.

(e) Loosen or tighten each of four simulator mounting bolts while adjusting each of three levelling bolts until an acceptable simulator position is obtained. See step (13).

(f) Ensure simulator mounting bolts are torqued to only 20 to 30 inch-pounds; then using a thickness gage, measure and record gaps between lower surface of simulator and tailboom at each of the mounting bolt locations.

(g) Size thickness of shim-stacks for each simulator mounting bolt location equal to the respective gaps measured in step (13) (f).

(h) Loosen alignment wire and remove intermediate gearbox simulator (TT103224-101). Retract each of three leveling bolts so it does not project below lower surface of simulator. Install the tail rotor gearbox using shim-stacks manufactured in step (13) (g), then verify that a minimum of 0.030 inch clearance exists between the lower surfaces of the gearbox (other than the four mounting pads). If sufficient clearance exists, proceed directly to next step. If sufficient clearance DOES NOT EXIST, add equal amounts of shims at all four mounting bolt locations as required to achieve clearance required; repeat steps (13) (b) through this step except in step (13) (c) adjust simulator levelling screws such that they project below the mounting surface equal to the total shim thickness established above in this step.

(i) Reinstall simulator in accordance with step (9) using shim-stacks manufactured in step (13) (g) and reinstall alignment wire in accordance with steps (11) and (12). Tighten simulator mounting bolts 50 to 70 inch-pounds and confirm satisfactory wire positions in holes in top and forward end plates of simulator in accordance with step (13). If wire placement is satisfactory, proceed to step (j) otherwise repeat steps (13) (a) through (13) (i) until satisfactory alignment is obtained.

(j) Loosen alignment wire and remove intermediate gearbox simulator (T103224-101) Measure and record final thickness of shims at each of four mounting bolt locations.

(k) Clean shim contact areas on tailboom using aliphatic naphtha (C-305). Apply a light coat of adhesive (C-317) to bottom surface of each of four shim-stacks. Avoid placing adhesive within 0.25 inch of bolt holes.

(l) Install shim-stacks adhesive side down in their original locations on tailboom.

NOTE

Coat bottom surface of intermediate gearbox simulator (T103224-101) threads and shank of each simulator mounting bolt with a very light coat of petroleum jelly or grease (C-001) prior to installation.

(m) Reinstall intermediate gearbox simulator and tighten four mounting bolts 50 to 70 inch-pounds. Do not remove simulator until shim adhesive has set.

(n) Reinstall alignment wire in accordance with steps (11) and (12) and confirm satisfactory wire positions in holes in top and forward end plates of simulator in accordance with step (13).

(14)Remove alignment wire from alignment plate (T100225-119) and thread wire through forward and aft holes of a hanger simulator (412-240-033-101).

(15)Install hanger simulator (412-240-033-101) at number four location on tailboom using two AN4-10A bolts, two MS35650-3252 nuts, and sufficient number of AN960-416L washers under nut to keep nut from bottoming out in bolt grip (detail B). Leave fasteners slightly loose at this point.

(16)Using uniform hand pressure on extreme aft end of simulator, push hanger simulator forward and hold in this position while tightening the two bolts.

(17)Tighten alignment wire in accordance with steps (11) and (12). Ensure alignment wire is positioned in "V" groove in the intermediate gearbox simulator (T103224-101) pin.

(18)Verify acceptable alignment of hanger simulator (412-240-033-101) by confirming alignment wire clears edges of holes in forward and aft end plates of simulator by at least 0.005 inch (view B). Pluck wire and watch wire closely to see if the wire continues to vibrate. If vibration continues, wire clearance in holes is sufficient to proceed. Also verify alignment wire is still in acceptable positions in holes in forward and top end plates of intermediate gearbox simulator (T103224-101). If alignment of hanger simulator is acceptable proceed directly to step (19); otherwise proceed as follows:

CAUTION

Do not loosen hanger support to airframe bolts once "YAW" and "LATERAL POSITION" adjustments have been made.

(a) If hanger simulator (412-240-033-101) position error is in "yaw", loosen four bolts securing hanger support to tailboom and shift support to obtain acceptable alignment. Retighten bolts and verify acceptable alignment in accordance with step (18).

(b) If hanger simulator error is in "pitch" direction, remove four bolts securing hanger support to tailboom. To adjust hanger simulator "pitch" forward, add equal shims under both aft support mounting pads and remove same thickness of shims from under both forward mounting pads. Do the opposite to adjust hanger simulator "pitch" aft. Install four mounting bolts and verify acceptable alignment in accordance with step (18). It will likely be necessary to perform step (18) (a) to restore acceptable "yaw" alignment.

(c) If a "lateral position" error exists at any hanger simulator (not simply a "yaw" error) remove the alignment wire and the hanger simulator. Remove the four bolts securing the hanger support to the tailboom and remove the support. Rework only the problem support in accordance with figure 6-51. Following rework, reinstall the support. Reinstall the hanger simulator and alignment wire in accordance with steps (14) through (17). Loosen the four bolts slightly and adjust the lateral position of the support so as to obtain satisfactory lateral alignment of the simulator. Verify acceptable alignment in accordance with step (18). It will likely be necessary to perform step (18) (a) to restore acceptable "yaw" alignment.

(d) If hanger simulator position error is in "elevation" (vertical position), remove four bolts securing hanger support to tailboom and add or remove same thickness of shims under each of four support mounting pads. Install four mounting bolts and verify acceptable hanger simulator alignment in accordance with step (18). It will likely be necessary to repeat step (18) (a) and (c) to achieve acceptable "yaw" and "lateral position" alignment. If the lateral position is acceptable proceed to step (19).

NOTE

Ensure alignment wire remains free of kinks and is seated in "V" groove in intermediate gearbox simulator pin in the following operations.

(19)Remove hanger simulator (412-240-033-101) from Position No. 4 hanger location and install at Position No. 3, perform steps (15) through (18).

(a) Loosen the alignment wire and remove hanger simulator (412-240-033-101) from hanger Position No. 3.

NOTE

Hanger simulators (412-240-035-101) and (412-240-034-101) are very similar in appearance. Confirm the correct simulator is installed in the following operation.

(b) Install (412-240-035-101) hanger simulator at Position No. 2 hanger location using two AN4H7A bolts and a sufficient number of AN960-416L washers to keep bolts from bottoming out in the bolt grip. Leave fasteners slightly loose at this point. Perform steps (16) through (18) except, in step (18) the hanger simulator will be the (412-240-035-101).

(20)Tail rotor driveshaft hanger assembly alignment on tailboom is now complete. Remove tailboom bulkhead alignment plate (T103225-119), alignment wire, and hanger simulator (412-240-035-101).

(21)Install tailboom on aircraft.

CAUTION

The following procedures for alignment of hanger bearing assembly at hanger Position No. 1 must be performed using a tailboom known to have acceptable Tail Rotor Drive System Alignment.

(22)Install hanger simulator (412-240-034-101) at Position No. 2 hanger location in accordance with instructions given for the (412-240-035-101) hanger simulators (412-240-033-101) at Position No. 3 and Position No. 4 hanger locations and install (412-240-035-101) simulator at Position No. 1 location in accordance with instructions given for the (412-240-033-101) hanger simulator in steps (15) and (16) (view C).

NOTE

In steps (23), (24), and (25), the (412-240-035-101) hanger simulator at hanger Position No. 1 is used as a wire anchor. Alignment of the Position No. 1 hanger support is accomplished per steps (26) through (28).

CAUTION

Do not loosen bolts securing any hanger support to tailboom in an effort to achieve satisfactory alignment in steps (23) through (28).

(23)Install a length of unkinked 0.020 inch diameter wire in accordance with steps (10) and (11). Route wire through each of four hanger simulators. Tighten wire until all slack is removed. Secure wire at forward end of hanger simulator (412-240-035-101) at Position No. 1 hanger location. Secure end of wire with safety-wire spinner pliers or other positive-locking pliers.

NOTE

A stable cushion such as shot bags or a sand bag should be placed between tailboom skin and support so as to distribute the load and prevent damage to tailboom structure. The tension on the alignment wire may require adjustment during the tailboom positioning operation to prevent wire sag.

(24)Position an adjustable support under tailboom. This support should be located at a point approximately 12 inches forward of intermediate gearbox location where extension of canted vertical fin spar approaches adjacent tailboom bulkhead at lower surface of tailboom (view C). Slowly adjust elevation of support as required to position alignment wire within acceptable limits in each of the three tailboom mounted hanger simulators (view B). Once this position is obtained do not reposition helicopter or readjust tailboom support until tail rotor drive system alignment is complete.

(25)Remove alignment wire and hanger simulator (412-240-035-101) from the Position No. 1 hanger location. Reposition hanger simulator (412-240-034-101) from Position No. 2 hanger location to Position No. 1 location on forward fuselage. Install hanger simulator (412-240-034-101) in accordance with instructions given for the (412-240-033-101) hanger simulator in steps (15) and (16) (view D, figure 6-51).

(26)Remove hanger simulator (412-240-033-101) from Position No. 4 hanger location. Install hanger simulator (412-240-035-101) at Position No. 2 hanger location in accordance with step (19) (b).

(27)Install a new length of unkinked 0.020 inch diameter wire in accordance with steps (10) and (11). Route wire through hanger simulators at Position No. 3, No. 2, and No. 1 hanger locations. Tighten wire until all slack is removed and secure wire at the forward end of hanger simulator (412-240-034-101) at Position No. 1 hanger location. Secure end of wire with safety-wire spinner pliers or other positive locking pliers. Also ensure alignment wire is seated in "V" groove in intermediate gearbox simulator (T103224-101) pin.

NOTE

As an alternate procedure, the alignment wire may be anchored at the forward face of hanger simulator (412-240-034-101) and tension/clamped at top end plate of intermediate gearbox simulator (T103224-101).

(28)Verify acceptable alignment of hanger simulator by confirming alignment wire clears edges of holes in forward and aft end plates of hanger simulators on tailboom, in aft end plate of hanger simulator at Position No. 1 location and in forward and top end plates of intermediate gearbox simulator (view B). If alignment of hanger simulator (412-240-034-101) is acceptable, proceed directly to step (29); otherwise proceed as follows:

NOTE

Elongation of the four mounting holes in the Position No. 1 hanger support is not permitted.

(a) If hanger simulator error is in "yaw" direction, loosen four bolts securing hanger support to airframe and shift support to obtain acceptable alignment. Tighten four bolts and verify acceptable alignment in accordance with step (28).

(b) If hanger simulator error is in "pitch" position, relax tension on alignment wire and remove four bolts securing hanger support to airframe. To "pitch" hanger simulator forward, add equal shims under both aft support mounting pads and remove same thickness of shims from under both forward mounting pads. Do just the opposite to "pitch" support aft. Install four support mounting bolts, tighten alignment wire and verify acceptable hanger simulator alignment in accordance with step (28). It may be necessary to perform step (28) (a) to restore acceptable "yaw" alignment.

(c) If hanger simulator error is in "elevation" position (alignment wire hits top or bottom of holes in hanger simulator at Position No. 2 hanger location), relax tension on alignment wire and remove four bolts securing hanger support to airframe. Add or remove equal shim thickness under each of four support mounting pads to obtain required elevation. Install four mounting bolts and verify acceptable hanger simulator alignment in accordance with step (28). It may be necessary to perform step (28) (a) to achieve acceptable "yaw" alignment.

(29)Tail rotor drive system alignment is complete. Remove all alignment tools and tailboom support. Verify bolts securing hanger supports to forward fuselage and to tailboom are properly torqued. Remove any grease remaining on uppermost shim at intermediate gearbox location.

(30)Install the intermediate gear (Paragraph 6-159).

(31)Install rest of tail rotor drive train and related aircraft components.

(a) Install tail rotor gearbox (Paragraph 6-179).

(b) Install driveshaft and clamp assembly. (Paragraph 6-131.) Close tail rotor driveshaft cover.

SECTION IV — INTERMEDIATE GEARBOX

6-149. INTERMEDIATE GEARBOX.

6-150. Description — Intermediate Gearbox. An intermediate gearbox is located on tailboom, at base of vertical fin. This gearbox provides a 42 degree change in direction of tail rotor driveshaft, with no speed change. Gearbox assembly consists of a case with a gear quill in each end. Case is fitted with an oil filter cap, and oil level sight gage and a drain plug equipped with a magnetic insert. Input and output quills have flexible couplings for attachment of driveshafts. Access is provided by a vented cover with quick-release fasteners.

6-151. Lubrication — Intermediate Gearbox.

a. Fill gearbox to sight gage level with oil prescribed by servicing points diagram. (Chapter 1.)

b. Internal splines of couplings on gearbox are packed with grease during assembly. Coupling splines can be lubricated as described below. This procedure can be accomplished with quills in place on gearbox, with driveshaft removed.

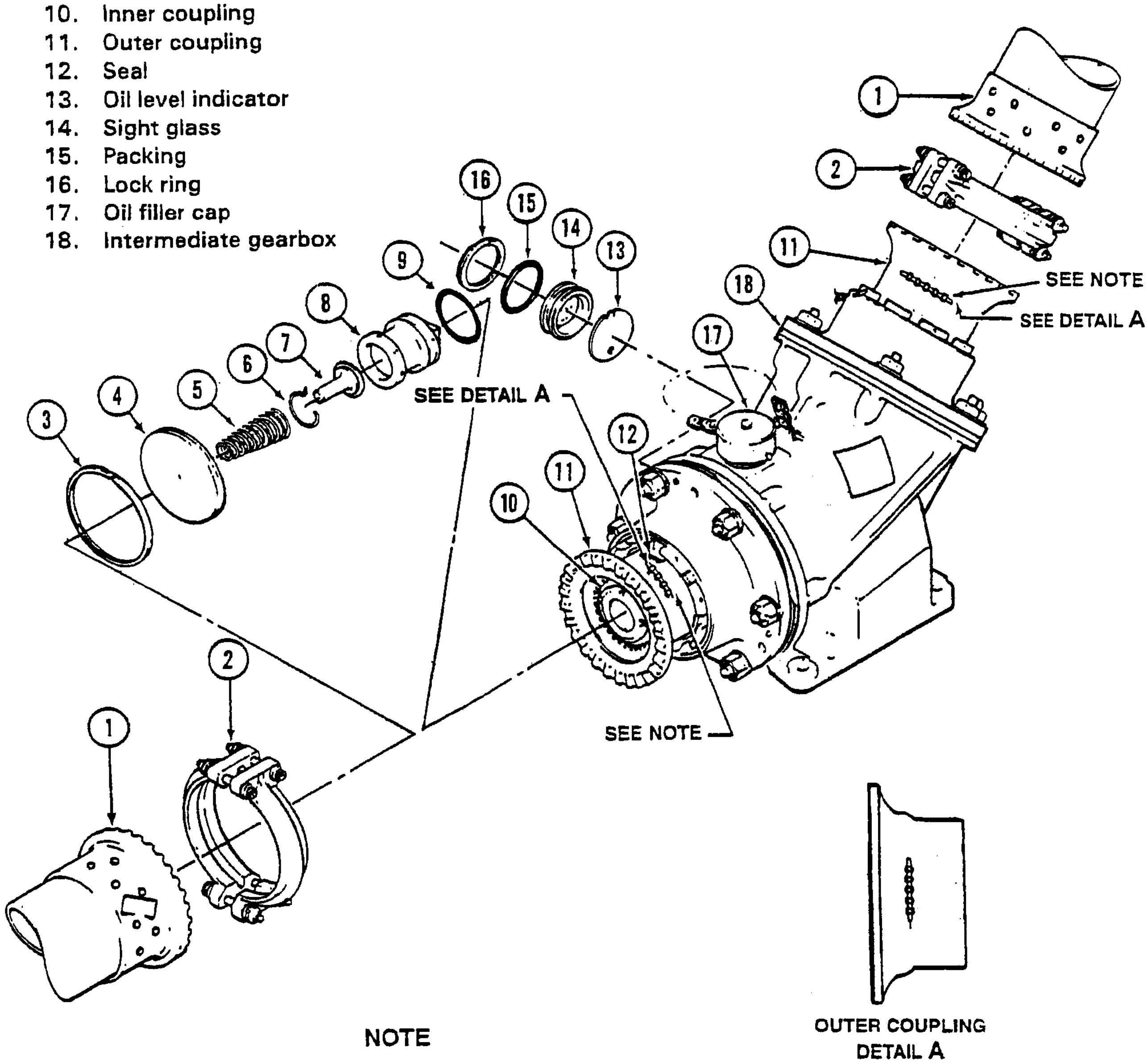
CAUTION

Do not intermix parts removed from forward quill with parts removed from aft quill.

(1) Remove clamps (2, figure 6-52) from driveshaft (1) and outer coupling (11). Remove clamps from opposite ends of driveshafts (1).

(2) Remove retaining ring (3) from coupling (11) while holding plate against spring pressure.

1. Tail rotor driveshaft
2. Clamp assembly
3. Retainer ring
4. Coupling seal plate assembly
5. Spring
6. Lock spring
7. Spacer
8. Retainer
9. Packing
10. Inner coupling
11. Outer coupling
12. Seal
13. Oil level indicator
14. Sight glass
15. Packing
16. Lock ring
17. Oil filler cap
18. Intermediate gearbox



NOTE

Location of overtemperature indicator TEMP-PLATES.

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Figure 6-52. Intermediate gearbox flexible couplings

NOTE

Care must be taken to ensure that the retainer (8) and packing (9) does not become unseated from inner coupling (10).

(3) Remove retaining ring (3), plate (4), and centering spring (5).

CAUTION

Do not use cleaning solvent inside coupling.

(4) Hold coupling at full outward position. Remove old grease as thoroughly as possible using dry, clean cloth or paper towel.

(5) Inspect coupling splines for pitting, chips, and wear.

(6) Hand pack grease to 0.12 inch depth over top of internal spline teeth. Use lubricant (C-015).

(7) Keep coupling at full outward position. Ensure retainer (8) and locking spring (6) are properly seated. Install spacer (7), centering spring (5), plate (4), and retaining ring (3).

6-152. Inspection — Intermediate Gearbox (Installed).

a. Open tail rotor driveshaft covers and remove intermediate gearbox cover.

b. Shake gearbox (11, figure 6-53) and check for looseness on tailboom. Looseness is unacceptable.

c. Check for evidence of fretting corrosion at mating surface between gearbox and tailboom that could be caused by movement of the gearbox on the tailboom. A gray residue is an indication of fretting corrosion. If residue is present, remove gearbox and inspect. (Paragraph 6-156.)

NOTE

Inspection steps d. through h. are not applicable if gearbox is removed at step c.

d. Inspect four bolts (3) for correct torque and correct thread engagement.

e. Inspect outer couplings (10 and 12) for grease leakage. Inspect temperature indicator TEMP-PLATES for discoloration and overtemperature conditions. A change of color from white or light gray to black will indicate possible overheating and/or component degradation and require further inspection. Refer to table 6-6 for tail rotor drive system TEMP-PLATE conditions and corrective action.

f. Inspect oil filler cap. (Paragraph 6-160.)

g. Inspect oil sight glass for correct oil level. Inspect sight glass and indicator for staining and/or cracks and crazing. Damage that could cause oil leakage or make oil level difficult to see is not acceptable.

h. Inspect electrical chip detector for metal particles. Refer to paragraphs 6-166 and 6-167 for procedure to remove and install chip detector element. Refer to figure 6-7 for required action if metal particles are found.

6-153. Removal — Intermediate Gearbox.

a. When the intermediate gearbox is to be replaced, unless conditions prevent operation, perform a ten-minute ground runup and drain operating oil. If runup is not practical, remove intermediate gearbox and flush with its own operating oil. Attach tag to intermediate gearbox stating:

"INTERMEDIATE (42°) GEARBOX
PRESERVED WITH OPERATING
LUBRICANT"

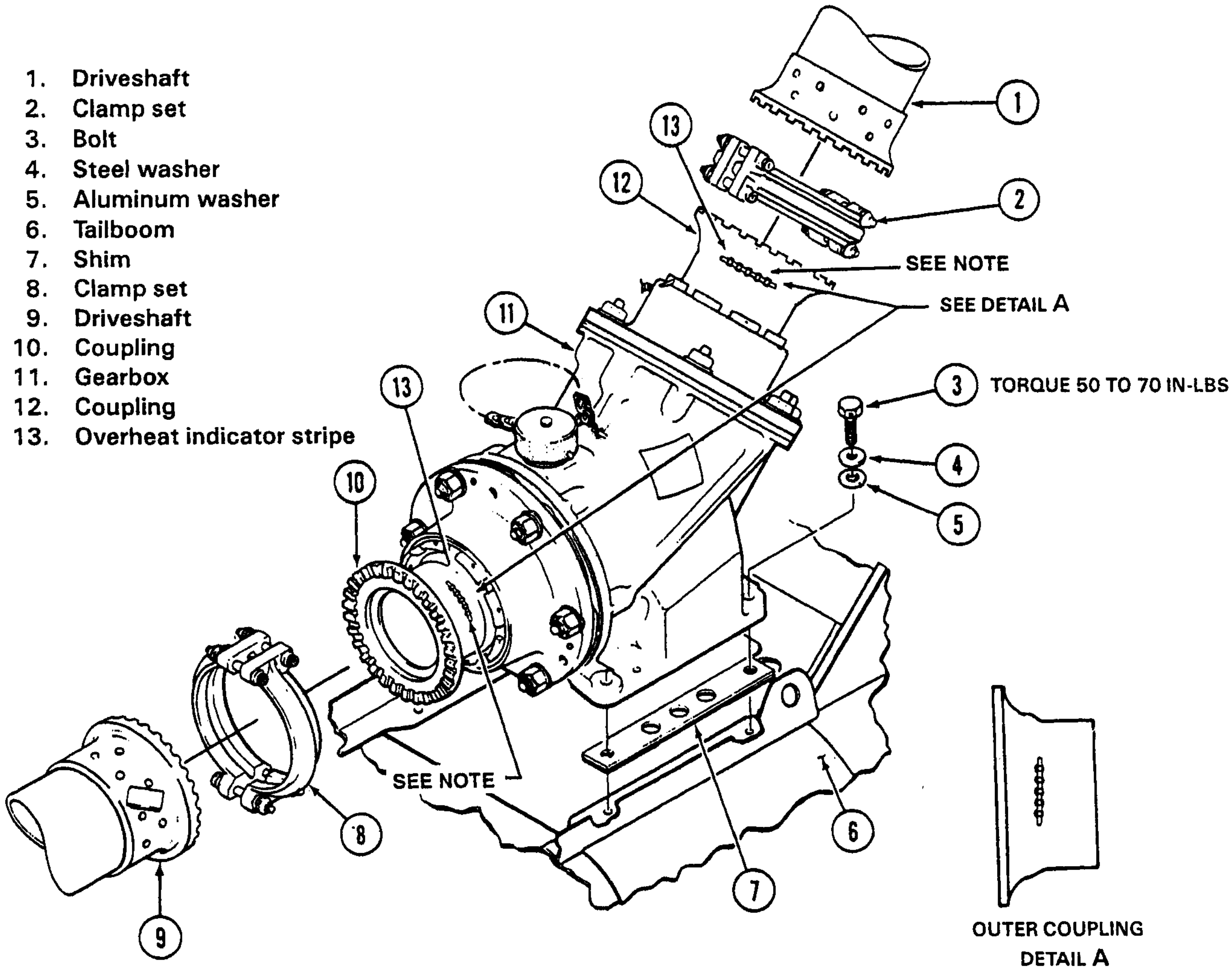
b. Remove gearbox cover and open tail rotor driveshaft access doors.

CAUTION

As shafts are removed from gearbox, support unattached ends to hold shaft alignment on normal operating axis to avoid damage to hanger bearing or coupling.

c. Remove clamp sets (2 and 8, figure 6-53) securing driveshafts (1 and 9) to couplings (10 and 12). Remove clamp sets from opposite end of driveshafts (1 and 9).

1. Driveshaft
2. Clamp set
3. Bolt
4. Steel washer
5. Aluminum washer
6. Tailboom
7. Shim
8. Clamp set
9. Driveshaft
10. Coupling
11. Gearbox
12. Coupling
13. Overheat indicator stripe



NOTE

Location of overtemperature indicator TEMP-PLATES.

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Figure 6-53. Intermediate gearbox installation

d. Remove electrical wire from electrical chip detector.

e. Remove lockwire and four bolts (3), washers (4 and 5) which secure gearbox (11) on tailboom (6). Lift off gearbox assembly. Do not attempt to remove shims (7) from between gearbox and tailboom at mounting points.

6-154. Disassembly — Intermediate Gearbox.

Premaintenance Requirements for Disassembly — Intermediate Gearbox

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T32), (T36), (T66), (T109)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-304)
Special Environmental Conditions	Clean, Dust Free Area.

a. Remove gearbox and drain oil. (Paragraph 6-153.)

NOTE

Either gear quill of intermediate gearbox can be removed to replace seals on quill sleeves in case of oil leakage. Replacement of either or both gear quills is possible, though not recommended as routine procedure since troubles usually would affect other parts, and records of serial- numbered components will be simplified if complete gearbox is replaced.

NOTE

Instructions given as follows for removal, cleaning, inspection, repair, and reassembly are applicable to both input and output quill assemblies unless otherwise noted.

b. Remove nuts (12, figure 6-54) and washers (13 and 14) from studs in case assembly (25).

CAUTION

When using jackscrews to remove quill assembly, the following procedures must be followed: Three jackscrews must be screwed in evenly, exerting equal pressures on quill sleeve to prevent damage to flange. Do not use force by prying to remove quill. In the event quill cannot be removed using this procedure, heat case, then use jackscrews. Do not use torch or open flame to heat the case.

c. Using three jackscrews (T36) (or bolts of suitable length with 5/16-18 NC thread) through threaded holes in sleeve flange to pull gear quill evenly from case.

NOTE

Do not attempt to remove shims from quill sleeve or from gearbox case.

d. Cover quill port opening to prevent entry of foreign material.

e. Disassemble quill for seal replacement as follows:

(1) Remove retaining nut (1, figure 6-54) from outer coupling (10).

(2) Remove plate (2), centering spring (3), lock spring (4), retainer (5), and packing (6) from inner coupling (9).

(3) Remove packing (6) from retainer (5).

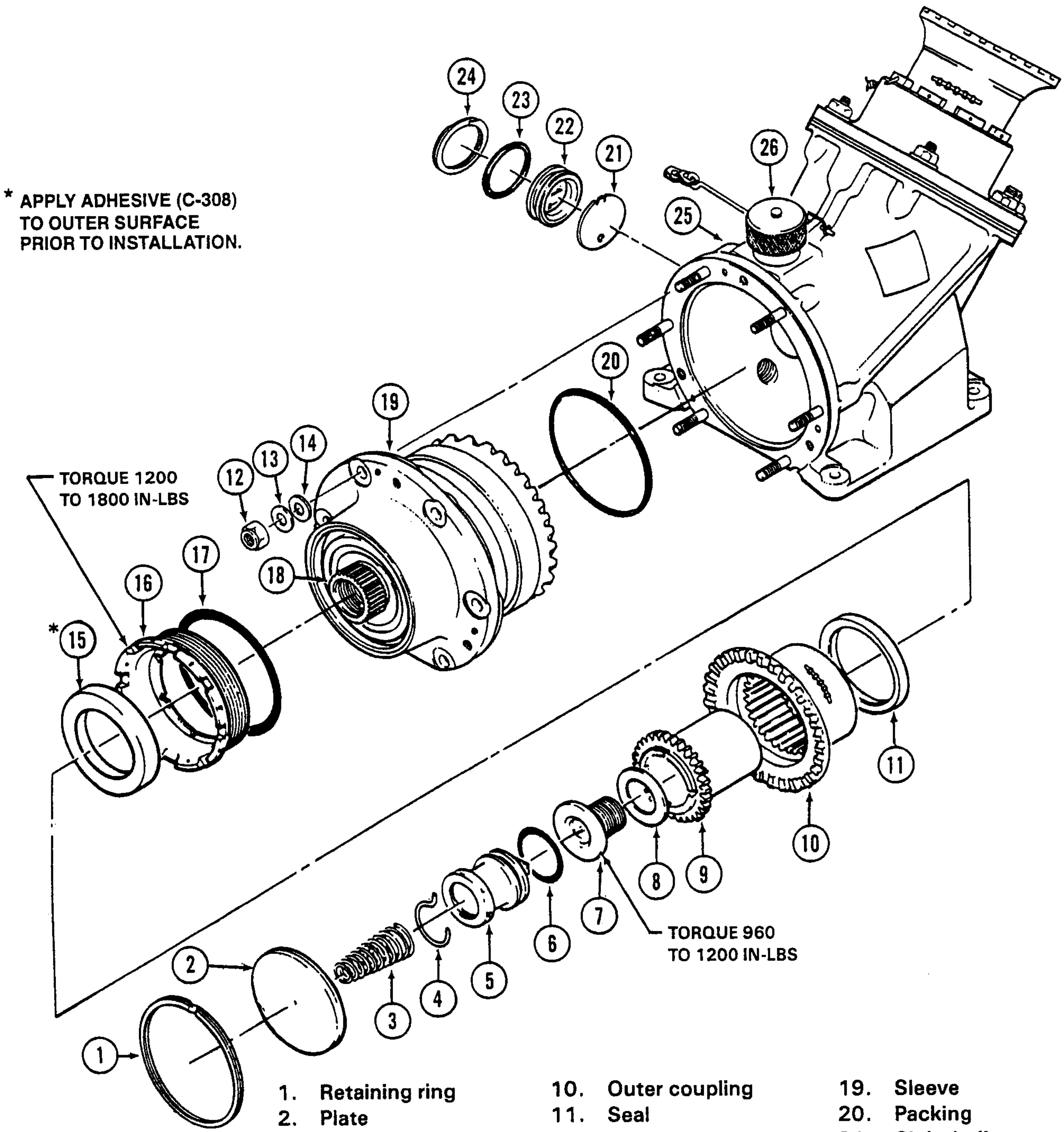
(4) Use wrench (T32) to hold outer coupling (10), use a square adapter through wrench and remove retainer bolt (7) and washer (8) from pinion shaft (18).

(5) Remove inner coupling (9) and outer coupling (10) from splines of pinion shaft (18). Remove inner coupling from outer coupling.

(6) If grease leakage is evident, press seal (11) from outer coupling (10).

(7) Cut and remove lockwires securing nut (16).

(8) Use fixture (T109) to hold sleeve (19) with pins engaged through sleeve flange. Use wrench (T66) to remove nut (16).



1. Retaining ring
2. Plate
3. Centering spring
4. Lock spring
5. Retainer
6. Packing
7. Retainer bolt
8. Washer
9. Inner coupling
10. Outer coupling
11. Seal
12. Nut
13. Washer, steel
14. Washer, aluminum
15. Seal
16. Nut
17. Packing
18. Pinion shaft
19. Sleeve
20. Packing
21. Sight indicator
22. Glass
23. Preformed packing
24. Retaining ring
25. Case assembly
26. Cap assembly

UH-1H-II-M-06-54

Figure 6-54. Intermediate gearbox

(9) Remove packing (17) from nut (16).

(10)Remove packing (20) from sleeve (19).

(11)Press seal (15) from nut (16).

f. Unfasten safety. Remove filler cap assembly (26).

6-155. Cleaning — Intermediate Gearbox.

a. Wipe inner and outer coupling (9 and 10, figure 6-54) with clean cloths.

b. Wash other parts in solvent (C-211). Dry with filtered compressed air.

6-156. Inspection — Intermediate Gearbox.

a. Inspect gearbox case assembly (25, figure 6-54) for cracks, corrosion, or damage.

b. Inspect attachment bolt holes for wear. The maximum allowable wear (elongation) for all 42 degree gearbox attachment holes is 0.005 inch over standard high side dimension (0.287 inch).

c. Inspect inner and outer couplings (9 and 10) for wear, damage, pitting, or corrosion. (Figure 6-49.)

d. Inspect gear for cracks, nicks, scoring, or pitting.

e. Check bearings for smooth rotation. Bearings are to be checked prior to quill disassembly.

f. Check inside of case for ferrous metal particles that indicate bearing failure.

g. Inspect centering spring (3, figure 6-54) by applying a test load of 5.0 plus or minus 0.5 pounds to compress spring to 1.500 plus or minus 0.10 inches.

h. Inspect seals for leakage.

6-157. Repair — Intermediate Gearbox.

a. Replace unserviceable filler cap assembly. (Paragraph 6-160.)

b. Replace seals if leaking.

c. Replace packing during assembly.

CAUTION

Do not intermix oil level indicator disk with the 90 degree gearbox indicator disk.

d. Replace oil level sight gage as follows:

(1) Remove oil level sight gage retaining ring (24, figure 6-54), glass (22), packing (23), and sight indicator (21) to clean, inspect, or replace parts.

(2) To reinstall, place sight indicator in port with indexing tab in notch of inner lip. Place packing in groove around glass, install glass with flat side out, and secure with spiral retaining ring.

e. Replace gearbox assembly if coupling is pitted, corroded, damaged, or worn beyond limits.

f. Replace gearbox assembly if indications of bearing failure are found.

g. Replace gearbox assembly if gears are scuffed, scored, nicked, scratched, or galled.

6-158. Reassembly — Intermediate Gearbox.

Premaintenance Requirements for Disassembly — Intermediate Gearbox

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T32), (T36), (T66), (T109)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-304)
Special Environmental Conditions	Clean, Dust Free Area.

a. Place filler cap assembly (26, figure 6-55) on port in case assembly (25). Secure chain of cap by safety pin through drilled hole in case rib at right of filler neck.

b. Assemble quill as follows:

(1) Apply a bead of adhesive (C-308) to outer surface of new seal (15, figure 6-54) and press new seal into nut (16). Wipe excess sealant from seal and nut.

(2) Install new packing (17) and nut (16).

(3) Lubricate seal lip (15), packing (17) and threads of nut (16) with oil (C-011).

(4) Install nut (16) into sleeve (19). Use fixture (T109) to hold sleeve (19). Use wrench (T66) and torque nut (16) 1200 to 1800 inch-pounds. Lockwire (C-405) nut to sleeve.

(5) Carefully apply a bead of adhesive (C-308) around mating joint of nut (16) and sleeve (19). Smooth sealing compound.

(6) Replace grease seal (11) by installing new seal in small end of outer coupling (10) with seal lip toward flange end of coupling.

(7) Press seal, using burnishing tool, into slot between end of coupling teeth and flange. Hand pack grease to 0.12 inch deep over top of internal spline teeth. Use lubricant (C-015). A work aid may be fabricated as shown in figure 6-50A to obtain proper depth of lubricant.

(8) Insert inner coupling (9, figure 6-54) into outer coupling (10) with small end through seal (11).

(9) Install inner coupling (9) and outer coupling (10) with new seal (11) on pinion shaft (18).

(10)Install washer (8) on retainer bolt (7).

(11)Install retainer bolt (7) in pinion shaft (18). Use wrench (T32) to hold outer coupling (10). Use a square adapter and torque retainer bolt (7) 960 to 1200 inch-pounds.

(12)Install new packing (6) on retainer (5).

(13)Lubricate packing with lubricant (C-015) from coupling and install retainer (5) and packing (6) to inner coupling (9). Check for alignment of one hole in rim of retainer with a slot in end of inner coupling. If necessary, reposition retainer by 1/4 turn increments to obtain alignment. Install lockspring (4) with tang through aligned hole and lot.

(14)Install centering spring (3), and plate (2), and secure with retaining ring (1).

d. Install packing (20) on sleeve (19).

e. Ensure that input drive quill is installed in forward port of gear case, and output drive quill is installed in aft port of gear case.

NOTE

Output drive quill has conical oil collector projecting from center of gear.

f. Heat gearbox case with heat lamp. Lubricate sleeve (21) and packing (20) with lubricating oil (C-011). Carefully align holes in sleeve of mounting flange with studs on gearbox and install quill in gearbox.

g. Install thin aluminum alloy washer (14), thin steel washer (13) and nut (12) on each stud. Manually check meshing of gears while tightening nuts evenly to seal quill sleeve flange on gear case. Torque nuts 50 to 70 inch-pounds.

h. Check gears for freedom of operation by manually turning input coupling.

NOTE

A measurement of gear backlash is not required, however, some backlash must be evident. This may be checked by visually observing gears through filler neck while holding output coupling and rocking input coupling back and forth. This check for backlash could possibly reveal serious assembly error. Proper mounting of gears to have 0.004 to 0.010 inch backlash in assembly has been established during manufacture by means of shims permanently installed on mounting faces of gear case and gear quill sleeve flange.

i. Carefully apply a bead of adhesive (C-308) around flange of gear quill sleeve and gearbox at mating joint. Fill jackscrew holes. Smooth sealing compound.

6-159. Installation — Intermediate Gearbox.

a. Check condition and security of shims at gearbox location on tailboom just ahead of vertical fin.

CAUTION

Do not attempt to remove or change shims installed on tailboom under gearbox, as any resulting misalignment could cause excessive stresses, vibration, wear, and possibly eventual failure of components in tail rotor drive train.

b. Position intermediate gearbox, with oil service fittings at right side, on tailboom shims.

NOTE

Gearbox shall be installed with epoxy polyamide primer (C-204) applied to faying surfaces.

c. Install four bolts (3, figure 6-53) through corners of gearbox base into plate nut in tailboom. Use thin aluminum alloy washers (5) next to gear case and thin steel washers (4) next to bolt heads. Torque each bolt 30 to 40 inch-pounds and check washers under bolt heads for looseness. If any washer is loose, add thin aluminum washers, as required, at each bolt location to ensure no looseness is apparent when the above procedure is repeated. Torque bolts 50 to 70 inch-pounds. Lockwire left rear attachment bolt to left forward attachment bolt. Lockwire right rear attachment bolt through drain plug to right forward attachment bolt.

d. Install driveshafts (1 and 9). Install clamp sets (2 and 8). (Paragraph 6-134.)

e. Service gearbox. (Chapter 1.)

6-160. INTERMEDIATE GEARBOX OIL FILLER CAP.

6-161. Removal — Intermediate Gearbox Oil Filler Cap.

a. Push down on cap (6, figure 6-55) and twist to disengage pin (14) from gearbox (11).

b. Unsnap safety pin (8) from gearbox (11).

6-162. Installation — Intermediate Gearbox Oil Filler Cap.

a. Position cap assembly (6, figure 6-55) on gearbox (11). Push down on cap assembly (6) and twist clockwise to engage pin (14) in slots in gearbox adapter.

b. Secure chain (10) to gearbox (11) with safety pin (8).

6-163. Inspection — Intermediate Gearbox Oil Filler Cap.

a. Inspect filler cap for distortion of pin (14, figure 6-55) or other damage that would affect function.

b. Invert the filler cap to expose washer (18). Depress washer approximately 0.06 inch and release. The washer should spring back against ring (19). If it does not, it indicates aluminum wool packing (17) is dirty or an insufficient amount of aluminum wool is installed.

6-164. Repair — Intermediate Gearbox Oil Filler Cap. Repair intermediate gearbox filler cap assembly by same procedure outlined for tail rotor gearbox filler cap. (Paragraph 6-176.)

6-165. INTERMEDIATE GEARBOX ELECTRICAL CHIP DETECTOR.

6-166. Removal — Intermediate Gearbox Electrical Chip Detector.

NOTE

Chip detector element (3, figure 6-55) may be removed for inspection without draining gearbox oil.

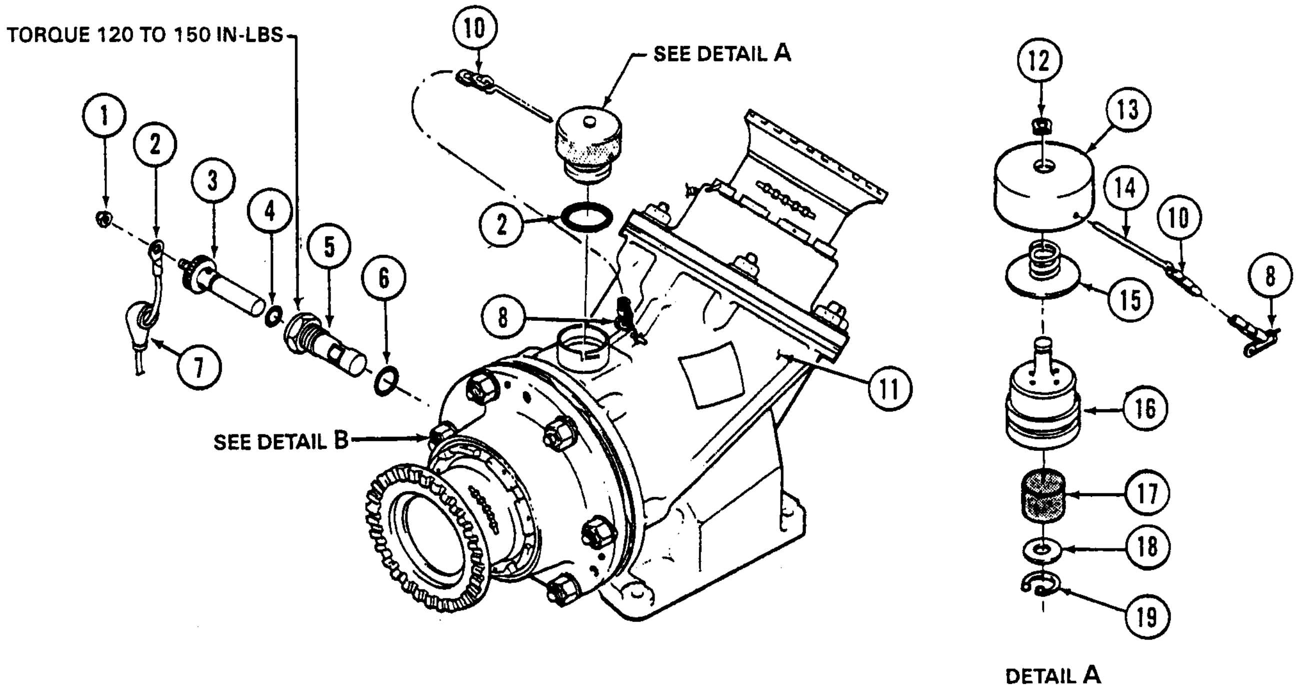
a. Move nipple (7) back on electrical wire (2) to expose nut (1). Remove nut (1) and electrical wire (2).

b. Press in on knurled body of chip detector (3), turn counterclockwise to disengage locking detent and withdraw chip detector (3) from self-closing valve (5). Inspect chip detector (3) for presence of metal particles. If any metal particles are detected. (Paragraph 6-16 and figure 6-7.)

NOTE

If self-closing valve (5) is to be removed, install oil draining line in self-closing valve (5) and allow oil to drain from gearbox.

c. Remove self-closing valve (5) from gearbox (11). Remove gasket (6) from self-closing valve (5).



1. Nut
2. Electrical wire terminal
3. Chip detector element
4. Packing
5. Self-closing valve
6. Gasket
7. Nipple
8. Safety pin
9. Packing
10. Chain
11. Gearbox
12. Ring
13. Cap assembly
14. Pin
15. Spring assembly
16. Plug
17. Packing (aluminum wool)
18. Washer
19. Ring (spiralox)

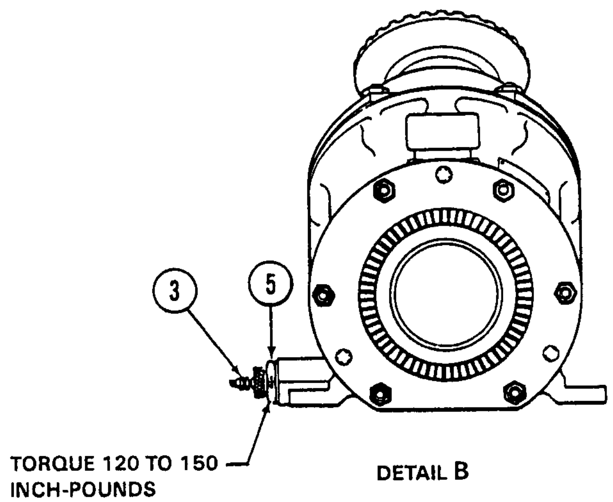


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Figure 6-55. Intermediate gearbox oil filler cap and chip detector installation

6-167. Installation — Intermediate Gearbox Electrical Chip Detector.

a. Lubricate new gasket (6, figure 6-55) with lubricating oil (C-011) used in gearbox and install gasket on valve (5).

b. Install self-closing valve (5) on gearbox case (7). Torque valve (5) 120 to 150 inch-pounds. Lockwire (C-405) valve (5) to gearbox case (7).

c. Lubricate new packing (4) with lubricating oil (C-011) used in gearbox and install packing on chip detector (3). Insert chip detector (3) into valve (5). Push and twist clockwise to engage locking detents.

d. Position electrical wire (2) on chip detector (3) and install nut (1). Do not exceed 4 inch-pounds torque on nut (1). Position nipple (7) over nut (1).

6-168. Inspection — Intermediate Gearbox Electrical Chip Detector.

a. Refer to paragraph 6-16 and figure 6-7 for procedure to inspect electrical chip detector for metal particles.

b. Inspect electrical chip detector components in accordance with figure 6-56.)

6-169. Repair — Intermediate Gearbox Electrical Chip Detector. Repair of the electrical chip detector is restricted to replacement of defective parts.

6-170. Alternate Run-in Test — Intermediate Gearbox and Tail Rotor Gearbox.

a. Perform a prestart visual inspection of the aircraft in general accordance with the preflight inspection requirements given in the helicopter flight manual.

NOTE

Except where otherwise noted, operation of the helicopter during the following ground run shall be in accordance with the helicopter flight manual.

CAUTION

During some portions of the following ground run, the helicopter will be very light on its skids and may lift from the ground momentarily. Care must be exercised to ensure the safety of personnel and equipment during the operations.

NOTE

Unless otherwise specified during the following ground run operations main rotor cyclic control inputs must be minimized and tail rotor control inputs must be only those required to maintain directional stability of the helicopter.

Throughout the entire run-in procedure which follows, the gearbox must be monitored for evidence of oil leakage and abnormal noise. If there is oil leakage or abnormal noise or if there are chip indications or if the gearbox fails to meet a specified criteria, the run-in test shall be stopped and appropriate corrective action taken before testing is resumed.

b. Perform a normal engine start and maintain ground idle rpm (68-72% N_1) with "flat" main rotor pitch for 1-1/2 to 2 minutes.

c. While maintaining flat pitch, gradually increase rotor rpm to 88% (5808 rpm N_2, 285 rpm N_R) at a rate of approximately 4% (264 rpm N_2, 13 rpm N_R) every six minutes.

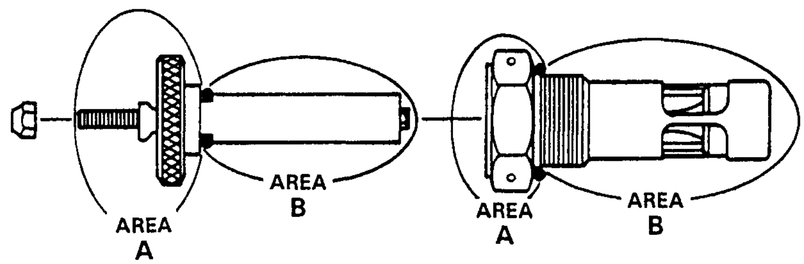
d. Hold at 88% rpm for six minutes while increasing main rotor collective pitch to produce approximately 17 psi torque pressure.

e. Slowly return the main rotor to flat pitch then reduce the engine output rpm to ground idle at a rate sufficient to obtain an N_R/N_2 "needle split".

f. Maintain ground idle N_2 until N_R and N_2 realign and stabilize, then shut down the engine.

g. Stop engines and check the electrical chip detector for foreign material or chips.

h. Clean the electrical chip detector and reinstall.



AREA	LIMITS
All	No cracks allowed.
A	Maximum depth of pitting is 0.030 inch with no more than 40 percent of any 1.00 inch square or 20 percent of total area of any surface to be pitted.
B	Maximum depth of pitting is 0.020 inch with no more than 40 percent of any 1.00 inch square or 20 percent of total area of any surface to be pitted. Thread damage is not permitted.

UH-1H-II-M-06-56

Figure 6-56. Damage limits — intermediate gearbox chip detector (P/N B3703)

i. Perform a normal engine start and gradually increase rotor rpm to 88% (5808 rpm N_2, 285 rpm N_R) with the main rotor in flat pitch. Maintain 88% rpm while gradually increasing main rotor collective pitch until 17 psi torque pressure is obtained. Maintain this condition for six minutes.

j. Gradually increase rotor rpm to 100% (6600 rpm N_2, 324 rpm N_R) at the rate of 3% each 6 minutes. After 100% rpm is obtained, slowly increase rotor collective pitch to obtain 34 psi torque pressure.

k. While operating at 100% rpm, gradually increase main rotor collective pitch to the maximum position that can be maintained without becoming airborne. Maintain the "light on skids" condition for 30 minutes.

l. Perform a normal engine shutdown.

m. Stop engines and drain oil from gearbox. Check gearbox oil and electrical chip detector for an excessive amount of metal particles that might indicate internal failure.

n. Inspect input and output quill couplings and surrounding area for evidence of grease leakage, remove couplings and replace defective parts. Repeat leak test run.

o. Inspect temperature indicator TEMP-PLATE for discoloration and overheat conditions. A change in color from white or light gray to black will indicate possible overheating and/or component degradation and require further inspection. Refer to table 6-6 for tail rotor drive system TEMP-PLATE condition and corrective action.

p. Install electrical chip detector and fill gearbox to specified level with approved lubricating oil.

SECTION V — TAIL ROTOR GEARBOX

6-171. TAIL ROTOR GEARBOX.

6-172. Description — Tail Rotor Gearbox. Gearbox at top of tailboom vertical fin provides 90 degree change in direction of drive and 2.6:1 speed reduction between input driveshaft and its output shaft on which tail rotor is mounted. Gearbox consists of mating input and output gear quill assemblies set into a gear case provided with a breather-type oil filler cap, oil level sight gage, and a drain plug with a chip detector.

The input quill has a flexible coupling for attachment of driveshaft. Control linkage is attached on the left side with a control rod extending through the rotor shaft.

6-173. Lubrication — Tail Rotor Gearbox.

a. Fill gearbox to sight gage level with oil prescribed by servicing points diagram. (Chapter 1.)

b. Internal splines of coupling on gearbox are packed with grease during assembly. Lubricate coupling splines in accordance with paragraph 6-138. This procedure can be accomplished with quills in place on gearbox, with driveshafts disconnected.

6-174. Inspection — Tail Rotor Gearbox.

a. Clean exterior of gearbox assembly with solvent (C-304). Do not permit solvent and dirt to be forced by seals into bearings of flexible coupling by immersion or use of compressed air.

b. Inspect internal splines of couplings when required. (Refer to paragraph 6-137.)

c. Inspect quill for oil and grease leakage.

d. Inspect input quill temperature indicator TEMP-PLATES for discoloration and overtemperature conditions. A change of color from white or light gray to black will indicate possible overheating and/or component degradation and require further inspection. Refer to table 6-6 for tail rotor drive system TEMP-PLATE conditions and corrective action.

e. Visually inspect gearbox for cracks and external damage, oil leaks, and unserviceable fittings.

NOTE

Some cap assemblies have stainless steel mesh plug, part number 20737-10, in lieu of the aluminum wool. The spring back check is not required when the stainless steel mesh plug is installed.

f. Inspect the filler cap by removing the assembly and placing it on a bench inverted so as to expose the NAS669-56 retainer ring and 204-040-509-001 washer which has a 0.125 inch hole. Depress the 204-040-509-001 washer approximately 0.06 inch and release. The washer should spring back against the retaining ring if there is a proper quantity of aluminum wool enclosed. Repair filler cap in accordance with paragraph 6-170 as necessary.

g. Inspect inside of gear case for metal particles that might indicate bearing failure.

h. Inspect gears for cracks, nicks, galling, or scuffing, and check gear pattern for abnormal wear. Refer to BHT-212-CR&O.

i. Check bearings for smooth operation.

j. Check oil filler cap and packings for serviceability.

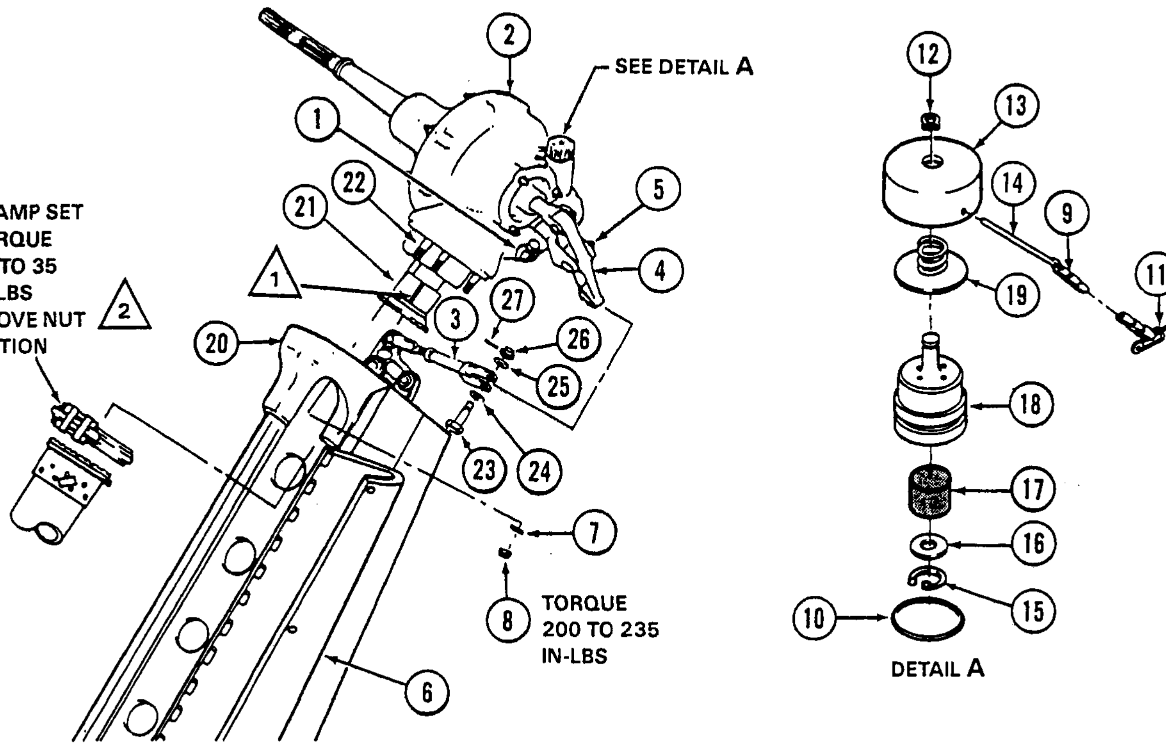
k. Inspect sight gage for damage or stain.

6-175. Removal — Tail Rotor Gearbox.

a. Disconnect electrical lead from chip detector (1, figure 6-59). Remove chip detector assembly and drain oil from gearbox.

b. Remove tail rotor hub and blade assembly. (Chapter 5.)

c. Disconnect control link (3, figure 6-57) from lever (4) on left side of gearbox. If replacing gearbox, also remove idler (5), lever (4), control rod and bearing housing for use on replacement assembly. Install a cover on opening from which bearing housing was removed.



NOTES

1. Location of visual overhead indicator stripe.
2. See figure 6-46 for torquing sequence.

1. Chip detector
2. Gearbox
3. Control link
4. Lever
5. Idler
6. Cover
7. Washer
8. Nut
9. Chain
10. Packing
11. Safety pin
12. Ring
13. Cap
14. Pin15. Ring (spiralox)
16. Washer
17. Aluminum wool (C-422)
18. Plug
19. Spring assembly
20. Gearbox support
21. Coupling
22. Stud
23. Bolt
24. Washer
25. Washer
26. Nut
27. Cotter pin

UH-1H-II-M-06-57

Figure 6-57. Tail rotor gearbox

d. Open cover (6) on front of vertical fin and remove intermediate gearbox fairing.

e. Remove tail rotor driveshaft. (Paragraph 6-131.)

CAUTION

To avoid damage to driveshaft couplings, either remove clamp set (7) from both ends of driveshaft before removing either end of shaft from its mating curvic coupling, or support unattached end of shaft to hold shaft aligned on normal operating axis while gearbox is removed.

f. Remove nuts (8) and washers (7) from six studs to detach gearbox from support (20) on vertical fin.

g. Remove gearbox (2) from gearbox support (20) using tail rotor gearbox pusher (T120) as follows: Refer to figure 6-58.

(1) If not previously accomplished, thread screw assembly (6, figure 6-58) into clamp assembly (5). Allow sufficient clearance for positioning on support (4) and adapter assembly (2).

(2) Position both halves of adapter assembly (2) on tail rotor gearbox (3) against input quill as shown.

(3) Position tail rotor gearbox pusher (1) on gearbox and support with hooks of clamp assembly (5) centered securely over shoulders of support (4) and adapter retainer (7) over both halves of adapter assembly (2).

(4) Tighten screw assembly (6) clockwise with a suitable wrench until tail rotor gearbox (3) separates from support (4). Remove tools and lift gearbox from support.

h. Reinstall nuts (7, figure 6-57) and washers (8) with suitable spacers, on input quill mounting studs to hold parts securely, during handling.

i. Install chip detector assembly (1).

6-176. Disassembly — Tail Rotor Gearbox. Disassembly tail rotor gearbox in accordance with BHT-212-CR&O.

6-177. Cleaning — Tail Rotor Gearbox.

a. Wipe coupling (19, figure 6-59) with clean cloths.

CAUTION

Do not use cleaning solvent inside coupling.

b. Wash other parts in solvent (C-304). Dry with filtered compressed air.

6-178. Repair — Tail Rotor Gearbox.

Premaintenance Requirements for Disassembly — Tail Rotor Gearbox

CONDITIONS	REQUIREMENT
Part No. or Serial No.	All
Special Tools	(T32), (T33), (T66), (T121), (T122), (T123)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-015), (C-201), (C-304), (C-309), (C-328), (C-405), (C-422)
Special Environmental Conditions	Clean, Dust Free Area.

a. Repair filler cap assembly as follows: (Detail A, Figure 6-57.)

(1) Remove oil filler cap assembly from gearbox.

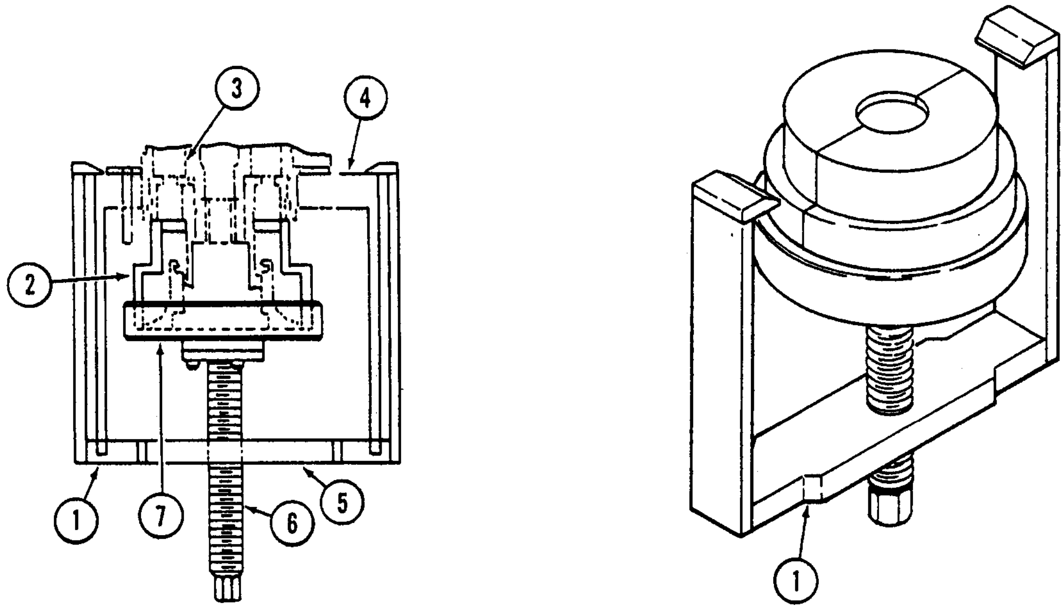
(2) If there is an insufficient amount of aluminum wool (C-422) (17) in the filler cap (13), remove the retainer ring (15) and washer (16) from plug (18).

(3) Discard the old aluminum wool and clean the filler cap of all foreign particles with solvent (C-304).

(4) Install new aluminum wool (C-422) (17) in a 0.009 inch to 0.016 inch thick stand sufficient to obtain a spring back of approximately 0.06 inch.

(5) Install washer (16), retainer ring (15), new packing (10). Install filler cap (13) on tail rotor gearbox.

(6) Secure chain (9) with safety pin (11) through drilled hole in case boss. Ensure that a replacement filler cap (13) is the breather type.



1. Tail rotor gearbox pusher (T120)
2. Adapter assembly
3. Tail rotor gearbox assembly
4. Tail rotor gearbox support
5. Clamp assembly
6. Screw assembly
7. Adapter retainer

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Figure 6-58. Tool application — tail rotor gearbox pusher (T120)

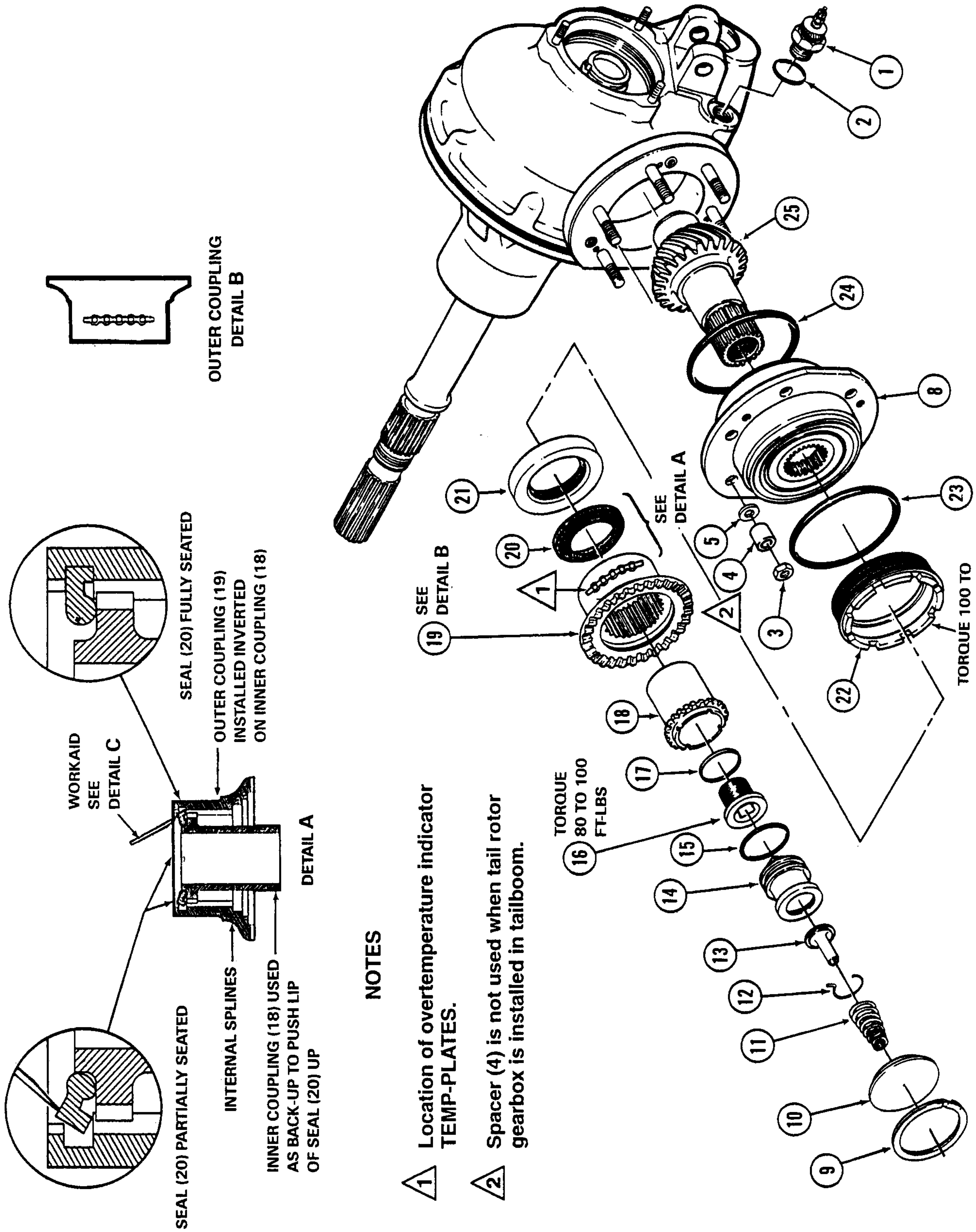


Figure 6-59. Tail rotor gearbox seal replacement (Sheet 1 of 2)

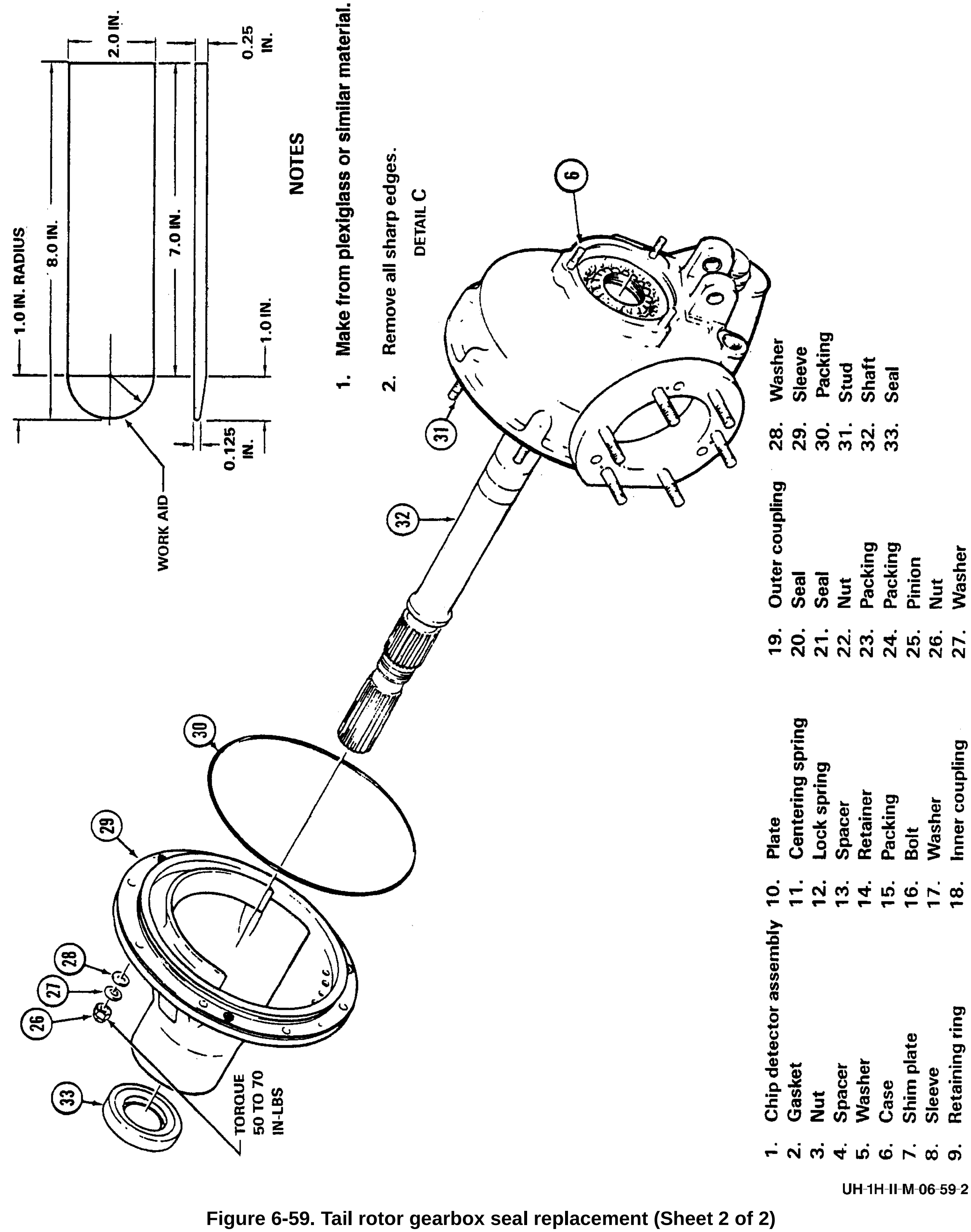


Figure 6-59. Tail rotor gearbox seal replacement (Sheet 2 of 2)

b. Replace gearbox input seal as follows:

(1) Remove chip detector assembly (1, figure 6-59) and gasket (2). Drain oil from gearbox.

NOTE

For ease of maintenance, block the outer coupling so that it will remain in the outboard (extended) position. This will stabilize the outer coupling during disassembly and reassembly.

(2) Remove nuts (3), spacers (4), if installed, and washers (5). Cut sealant between case (6), shim plate (7), and quill (8).

(3) Remove sealant from three jackscrew holes.

(4) Install three jackscrews (T33). Turn jackscrews equally to pull quill from case (6).

(5) Remove packing (24) from sleeve (8).

(6) Remove retaining ring (9), plate (10), and centering spring (11).

(7) Remove spring lock (12), spacer (13), retainer (14) and packing (15).

(8) Remove bolt (16) from pinion (25) and remove washer (17).

(9) Remove inner coupling (18) and outer coupling (19) from pinion (25) and sleeve (8).

(10)Remove seal (20) from outer coupling (19).

(11)Remove lockwire, nut (22), and packing (23).

(12)Remove seal (21) from nut (22).

(13)Remove sealing compound from nut (22), inner coupling (18), and outer coupling (19).

CAUTION

Do not use cleaning solvent inside coupling (19). Wipe clean with clean cloths.

(14)Clean all parts with cleaning solvent (C-304) and coat with approved oil. Do not handle dry bearing with bare hands. Refer to BHT-92-004-10 for approved lubricants.

(15)Apply sealing compound (C-328) and press new seal (21) into nut (22).

(16)Install new packing (23) on nut (22). Lubricate seal lip, packing and threads of nut with lubricating oil (C-010 or C-011).

(17)Position holding fixture (T121) on sleeve (8) and install nut (22). Torque nut 100 to 150 foot-pounds with wrench (T66) and secure with lockwire (C-405).

(18)Inspect outer coupling (19) and inner coupling (18) for wear and damage. (Figure 6-49).

NOTE

A work aid may be fabricated, as shown in detail C to aid installation of seal (20).

(19)Install seal (20) into outer coupling (19) seal groove as follows:

(a) Apply a light coat of lubricant (C-015) to outer circumference of seal (20).

(b) Install seal (20) in outer coupling (19) in accordance with steps c. and d. Refer to detail A, figure 6-59.

NOTE

The inner coupling (18) may be used as an aid for installation of seal (20). Position inner coupling (18) inside the outer coupling (19) so that inner coupling (18) provides a backup surface (detail A.)

(c) Using inner coupling (18) as a backup, firmly press down (hand pressure only) on outer coupling (19). Simultaneously tuck outer circumference edge of seal (20) into outer coupling (19) seal groove using fabricated work aid (detail C).

(d) Continue pressure around seal (20) using work aid until seal (20) is fully seated. Remove inner coupling (18) from outer coupling (19).

(20)Coat internal splines of outer coupling (19) with lubricant (C-015) to 0.12 inch depth over top of spline teeth. A work aid may be fabricated, as shown in figure 6-50A to obtain depth of lubricant.

(21)Insert coupling (18) into outer coupling (19) with small end through seal.

(22)assembled couplings (18 and 19) on splined end of pinion (25).

(23)Coat threads of coupling retaining bolt (16) with approved lubricating oil (C-010 or C-011). Place washer (17) on bolt and thread bolt into pinion (25).

(24)Hold outer coupling (19) with wrench (T32).Position square adapter through wrench and torque bolt (16) 80 to 100 foot-pounds.

(25)Place packing (15) on retainer (14).

(26)Coat packing (15) and retainer (14) with approved lubricating oil (C-010 or C-011) and insert retainer into bolt (16). If one hole in rim of retainer does not align with notch of inner coupling (18), pull retainer out, rotate it ninety degrees and reinstall. Repeat if necessary to obtain alignment. Install lockspring (12).

(27)Place small end of centering spring (11, figure 6-59) on boss of plate (10). Install plate (10), spacer (13) and spring (11) into coupling (18) and install retaining ring (9). Check for security of retaining ring.

(28)Test quill as follows: Hold sleeve and turn coupling. There should be a very light drag caused by the preload of the oil seal and the duplex bearings, but the coupling and pinion should turn smoothly.

c. Replace output shaft seal as follows:

(1) Remove nuts (26) and washers (27 and 28). Cut sealant between case (6) and sleeve (29).

(2) Remove sealant from three jackscrew holes. Install three jackscrews (T33).

(3) Turn jackscrews evenly to pull quill sleeve (29) from case (6).

(4) Carefully remove sleeve from shaft to avoid damage to roller bearing. Remove packing (30) from sleeve.

(5) Support case (6) in flat areas between studs (31) and press shaft (32) out of case (6).

(6) Remove seal (33) from sleeve (29).

(7) Clean all parts with solvent (C-304) and coat with type oil used in gearbox. Do not handle dry bearings with bare hands. Refer to BHT-92-004-10 for approved lubricants.

(8) Press seal (33) into sleeve (29) with lip of seal facing inboard.

(9) Install new packing (30) on sleeve (29).

(10)Apply lubricating oil (C-010 or C-011) used in gearbox on packing (30), lip of oil seal (33) and mounting port of case (6).

CAUTION

When aluminum washers are required for gearbox assembly, use only aluminum washers of AN960 PD series. Do not substitute any other washers.

(11)Heat mounting port of case (6) with a heat lamp. Install sleeve (29) on case and secure with washers (27 and 28) and nuts (26). Torque 50 to 70 inch-pounds.

(12)Turn shaft (32) by hand and check for light drag caused by oil seal and preload in duplex bearings.

d. Install input quill in case (6) as follows:

(1) Install new packing (24) on sleeve (8). Lubricate packing and mating surface of input quill with approved oil.

(2) Heat input quill port in case (6) with heat lamp.

(3) Install quill in gearbox. Exercise care to keep quill aligned as it is installed so that the nose of the pinion (25) enters the roller bearing and the gear teeth mesh properly.

(4) Align quill on studs so that the flats on gearbox case and quill sleeve flange are aligned.

(5) Install washers (5), spacers (4) and nuts (3). Torque nuts 100 to 140 inch-pounds.

Figure 6-60 deleted.

(6) Check that the gearbox turns smoothly by turning the input pinion by hand. Check backlash between input quill pinion and gear in three places 120 degrees apart. Use backlash clamp (T122) and backlash arm (T123). Use outboard pinion arm to measure backlash. Backlash must be 0.005 to 0.011 inch. Record backlash.

CAUTION

Do not alter shim plate (7) to obtain required backlash. If backlash is not within limits, parts are not dimensionally correct or are not correctly assembled.

NOTE

Only use packing (4) (MS83248/-011) on chip detector.

(7) Place new packing (2) on chip detector assembly (1) and install in case. Torque 120 to 150 inch-pounds and secure with lockwire (C-405).

NOTE

Half inch diameter white dot on cap denotes vented cap. Install vented cap on case.

(8) Place new packing (10, figure 6-57) on oil cap assembly and install oil cap on case. Attach safety pin (11) to case.

(9) Refer to BHT-212-CR&O for additional tail rotor gearbox repairs.

6-179. Installation — Tail Rotor Gearbox.

CAUTION

Prior to installation of tail rotor gearbox, accomplish the following:

Ensure that gearbox flexible coupling is properly lubricated.

Rotate flexible coupling and check for binding and for existence of backlash between pinion on input quill and gear on output shaft.

a. Check mounting flange of gearbox (2, figure 6-57) for sealant protruding from the three jackscrew holes. Trim off sealant flush to allow proper seating of tail rotor gearbox (2) flange on gearbox support (20).

b. Remove nuts (3, figure 6-59), spacers (4), and washers (5) from studs around input drive quill. Clean mating surfaces of gearbox (2, figure 6-57) and tailboom support fitting (20). Use MEK (C-309) and plastic scraper. Coat all faying surfaces of gearbox, studs, tailboom mount fitting, holes for studs in mount and washers with zinc chromate primer (C-201). Install gearbox while primer is wet.

CAUTION

Ensure that a minimum of two thread pitches, including the chamfer, extend through nuts (8). Ensure that the nuts do not bottom on grip portion of the studs. Use additional thin steel washers (7) if required.

NOTE

Perform special inspection in accordance with Chapter 1 after installation of tail rotor gearbox.

c. Position tail rotor gearbox (2) on support fitting (20) with coupling (21) and studs (22) through holes in support fitting (20). Install six thin steel washers (7) and nuts (8). Torque nuts (8) evenly in a star pattern 200 to 235 inch-pounds. Repeat the torque pattern until all nuts retain the torque that was initially applied to the first nut in the pattern. The torque value of the first nut will decrease as the other nuts are torqued. Use a 0.005 inch feeler gage to check that no gap exists between the gearbox input quill and gearbox shim.

d. Install driveshaft. Refer to paragraph 6-134.

e. Connect link (3, figure 6-57) to lever (4). Install bolt (23) with one steel washer (24) under bolt head and one steel washer (25) under nut (26). Additional washers (25) may be used to align nut (26) for cotter pin installation. Install cotter pin (27).

f. Install chip detector assembly as follows:

(1) Lubricate new packing (2, figure 6-61) with approved oil (C-010 or C-011) used in gearbox and install packing on self-closing valve (3).

(2) Install self-closing valve (3) on gearbox (1). Torque valve (3) 120 to 150 inch-pounds. Secure valve (3) to gearbox (1) with lockwire (C-405).

(3) Lubricate new packing (4) with approved oil (C-010 or C-011) and install packing on chip detector element (5). Insert element (5) into self-closing valve (3). Push down and twist element until locking detents engage.

(4) Position electrical wire (6) on element (5) and install nut (7). Do not exceed 4 inch-pounds torque on nut. Position nipple (8) over nut (7).

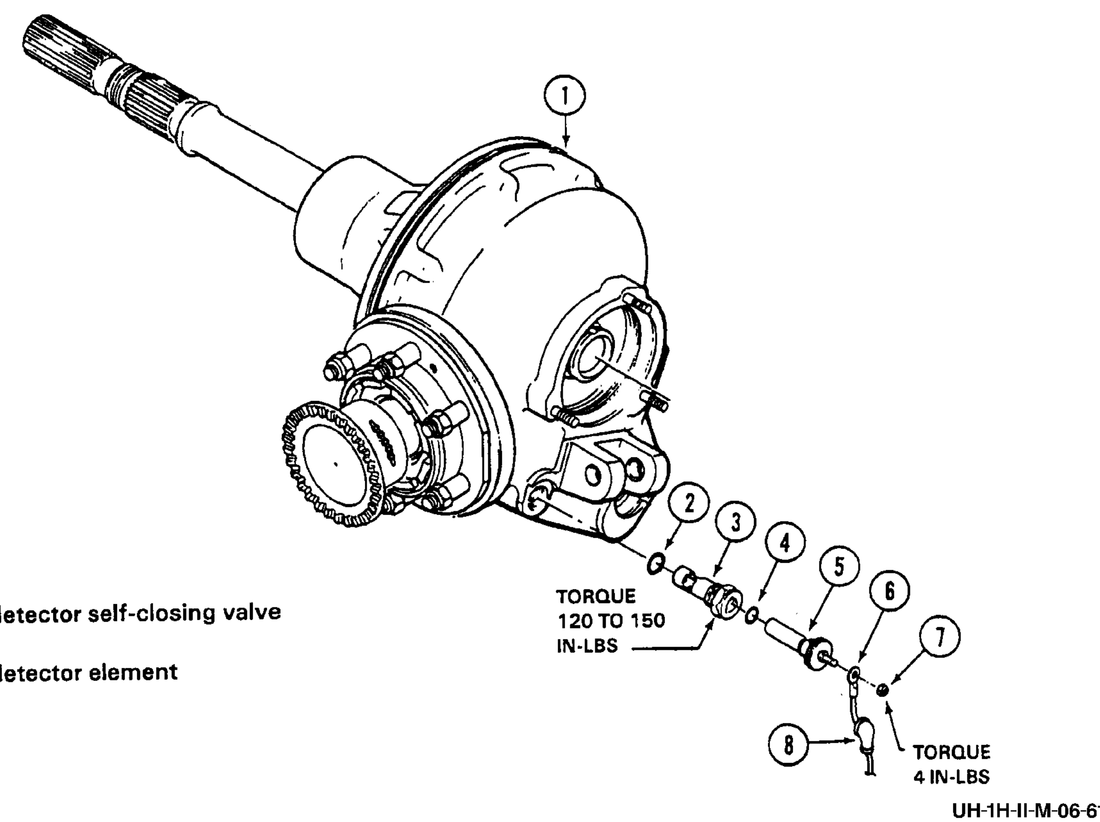
(5) Service gearbox to specified level with approved lubricating oil. (Chapter 1.)

g. Verify actual presence of oil in sight gage and check oil level to full mark on indicator.

h. Close vertical fin cover (6) and install intermediate gearbox fairing.

i. Install and rig tail rotor (Chapters 5 and 11).

j. If gearbox has not previously been qualified on run-in test stand, accomplish alternate run-in and test in accordance with paragraph 6-165.



1. Gearbox
2. Packing
3. Electrical chip detector self-closing valve
4. Packing
5. Electrical chip detector element
6. Electrical wire
7. Nut
8. Nipple

Figure 6-61. Tail rotor gearbox electrical chip detector installation

SECTION VI — OIL SYSTEMS

6-180. TRANSMISSION OIL SYSTEM.

6-181. Description — Transmission Oil System.

a. Oil supply from the transmission sump is circulated under pressure from the transmission oil pump through internal passages and a filter to sump outlet, through external lines to an oil cooler (with a separate thermal bypass valve), and through another filter to a manifold on the transmission main case. This manifold is equipped with a relief valve to regulate system pressure and distribute oil through jets and internal passages to lubricate bearings and gears inside the transmission where oil drains back to the sump.

b. Oil system servicing provisions are mainly accessible from the right side of the transmission. The filler neck is at top right, under transmission fairing. Oil level sight gages on the sump case can be checked through a view port on the pylon island in the cabin. The sump oil filter, pump screen, and magnetic chip detector can be reached through the access door at the same location. A drain valve is located under the transmission sump. Two cooler line drain valves are in the bottom of the fuselage compartment just behind the aft cross tube of the landing gear. Refer to figure 6-62 for transmission oil system schematic.

6-182. Flushing — Transmission Oil System.

NOTE

If the transmission oil system is known to have been contaminated with metal particles (figure 6-7), the external oil filter element and oil cooler shall be replaced, and all lines flushed thoroughly and bypass valve cleaned.

a. Open two drain valves (2, figure 6-63) and drain valve on bottom of transmission sump. Drain oil into a clean container. Check oil for contamination and close valves.

b. Remove external filter (8), and clear filter assembly as necessary with dry filtered compressed air and solvent (C-304), and replace element. (Paragraph 6-189.)

c. Inspect and flush oil cooler (6) in accordance with TM 1-7R-1-3-1-1.

d. Flush all hoses, lines, valves, and fittings between external filter (8, figure 6-63) and oil cooler (1) with warm solvent (C-304). Continue flushing operations until solvent runs clear.

e. Repeat step d., flushing system using lubricating oil (C-010 or C-011) until oil runs clean.

f. Install external filter (8) with new element. (Paragraph 6-189.)

g. If transmission does not require replacement due to contamination, remove, inspect and clean the following:

(1) Transmission full flow debris monitor. (Paragraphs 6-30 through 6-32.)

(2) Pump screen, magnetic plug and electric chip detector. (Paragraphs 6-67 through 6-73.)

h. Service transmission. (Chapter 1.)

6-183. TRANSMISSION OIL SUMP FULL FLOW DEBRIS MONITOR.

6-184. Description — Transmission Oil Sump Full Flow Debris Monitor. The transmission is provided with a full flow debris monitor mounted in a pocket in the right upper aft corner of the sump case with inlet and outlet through internal passages. Filter assembly consists of a 70 micron screen tube assembly attached on a body incorporating a bypass valve for continued oil flow if the screen tube assembly becomes clogged. A cast scupper drain on the sump case is located below the full flow debris monitor mounting pad and is connected to an overboard drain line to drain off spilled oil. (Refer to paragraph 6-30 through 6-32.)

6-185. EXTERNAL OIL FILTER.

6-186. Description — External Oil Filter. An external oil filter is used in the transmission oil system. This external oil filter has a replaceable element and a mechanical means of indicating a bypass condition. The filter is mounted in the pylon island structure below the transmission. The unit contains a pleated-paper type element, and incorporates a bypass valve set to open at 18 to 22

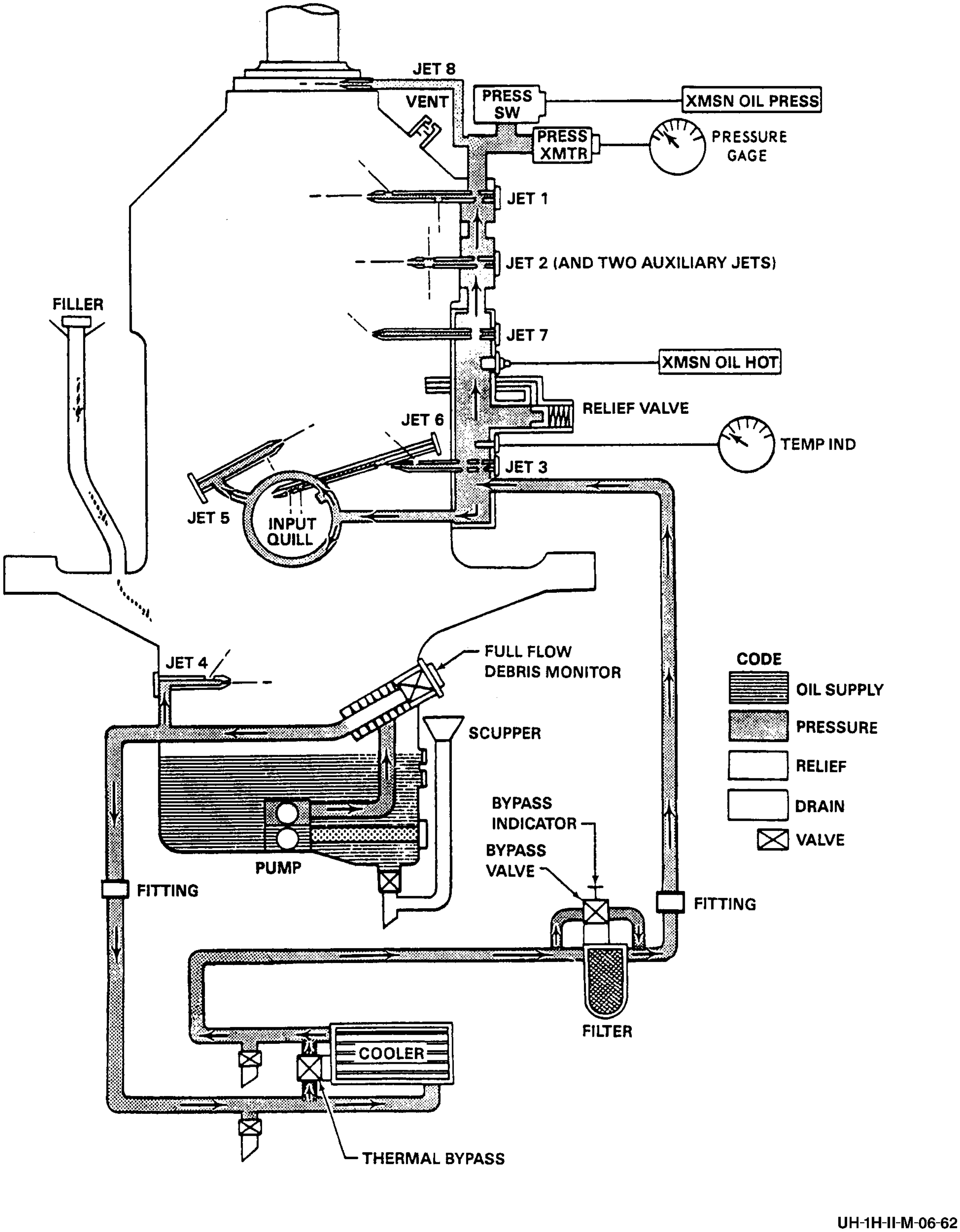
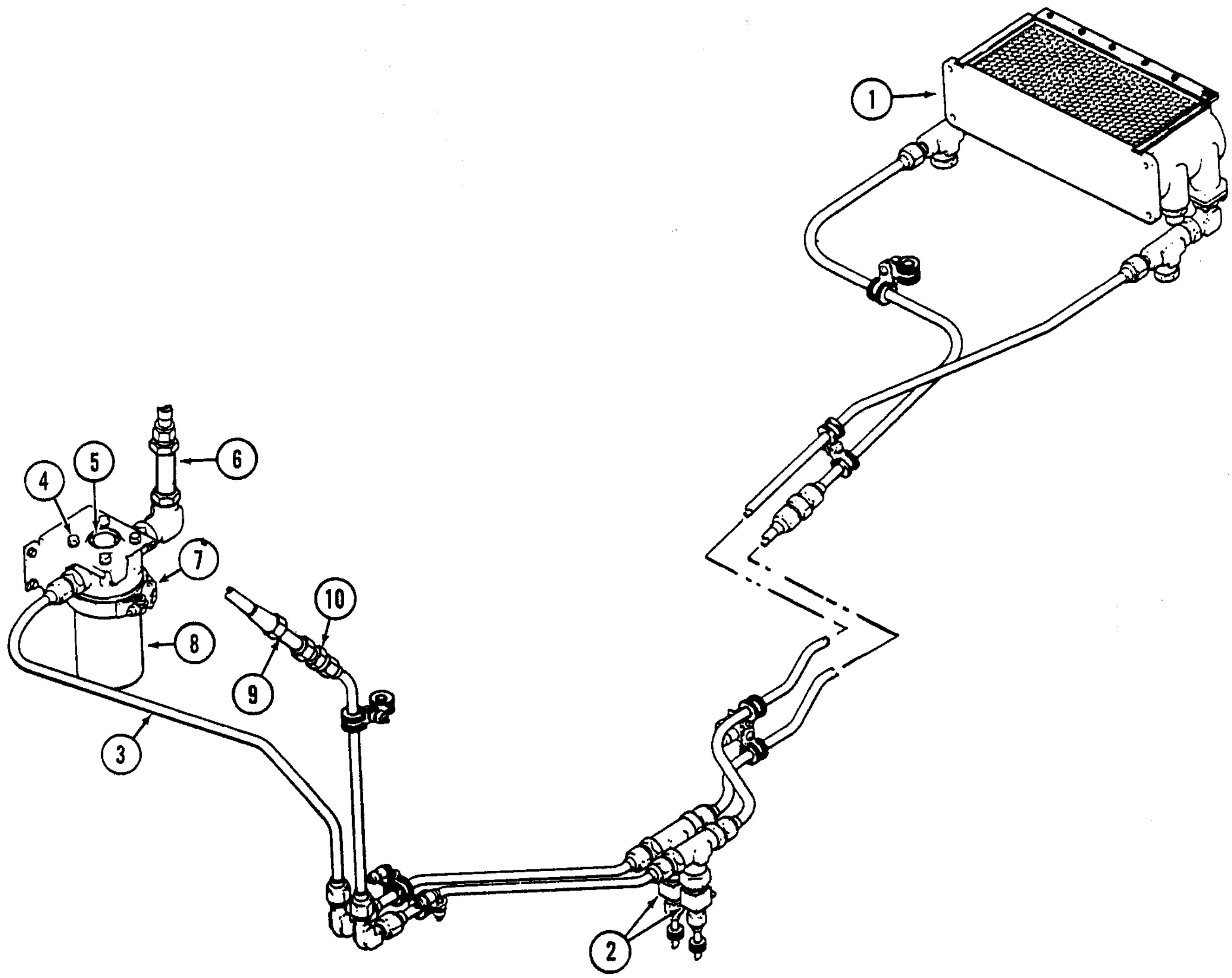


Figure 6-62. Transmission oil system schematic



1. Oil cooler
2. Drain valves
3. Oil line
4. Bolt
   Washer
   Spacers
5. Bypass indicator
6. Hose assembly
7. V-clamp
8. Filter assembly
9. Hose assembly
10. Fitting

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Figure 6-63. Transmission oil filter and oil cooler components and piping psig to assure oil flow if the filter element should become clogged. If clogging conditions should develop in the filter element a visual indicator will be extended by differential pressure. The indicator may be reset manually.

6-187. Removal — Transmission external oil filter.

a. Obtain access to external filter (8, figure 6-63) through hole at bottom of pylon island, or by opening soundproofing blanket and remove door on front of pylon island in cabin.

b. Open two drain valves (2). Drain oil into a clean container. Check oil for contamination and close drain valves.

c. Place a suitable container under filter to catch spilled oil.

d. Disconnect oil line (3) from filter inlet fitting. Cap open line.

e. Remove fitting from hose assembly (6) and filter assembly (8).

f. Remove lockwire and four bolts (4) with washers and spacers (4) to detach filter from bracket. Remove filter assembly.

6-188. Installation — Transmission External Oil Filter.

a. Install union, gasket, and nut in left port at external filter (28, figure 6-63). Install elbow, gasket, and nut in outlet port of filter. Position elbow pointing up.

b. Position external filter assembly (8) to mounting bracket with inlet fitting forward and pointing inboard, and with outlet elbow aligned upward.

c. Install four bolts through bracket into filter, using a spacer between filter and bracket and a thin aluminum alloy washer under head of each bolt. Secure bolt heads with lockwire (C-405).

d. Connect oil tube (3) from oil cooler (1) to filter (8) inlet port.

e. Connect transmission inlet hose to filter outlet fitting and transmission outlet hose to fitting (10) on opposite wall of compartment.

6-189. Replacement — Transmission External Oil Filter Element.

a. Obtain access to external oil filter (8, figure 6-63.) through hole in bottom of fuselage, below transmission.

b. Place a suitable container under filter to catch spilled oil.

c. Remove V-band clamp (7).

d. Remove filter housing (8) and element and remove packing at top of can.

e. Remove filter element. Remove packing from boss in bottom of filter housing and from boss on lower side of filter head. Clean filter head and housing with clean cloths.

f. Install new packing in bottom of filter housing and in filter head.

g. Place new filter element in filter housing and seat firmly on boss.

h. Install new packing around upper lip of filter housing next to flange.

i. Install filter housing with element and packing into filter head.

CAUTION

The t-bolt in V-band clamp shall be of CRES A286 material. The t-bolts manufactured of CRES A286 material can be identified by either a letter B on threaded end or a brown paint spot painted on threaded end. T-bolt of incorrect or unidentified material shall be removed from service.

j. Install V-band clamp (7) around mating flanges of filter housing and head. Torque nut 50 inch-pounds. Secure V-band clamp with lockwire (C-405).

k. Check for oil leakage at first run-up.

6-190. TRANSMISSION OIL COOLER.

6-191. Description — Transmission Oil Cooler. The transmission oil system cooler is mounted in the bottom of the rear fuselage compartment in the same opening as engine oil cooler and served by same turbo blower and air duct. The thermal bypass valve for the transmission cooler is an integral part of the cooler. Two drains with manual valves are provided in the lines between cooler and valve.

6-192. Removal — Transmission Oil Cooler.

a. Drain transmission cooler lines by opening two drain valves (2, figure 6-63) located behind aft landing gear crosstube at left side using access openings in lower skin.

b. Open rear compartment door on right side of fuselage.

c. Remove turbo blower and air duct of engine oil cooler installation.

d. Disconnect oil lines from fittings of smaller cooler at left side. Cap lines and fittings.

e. Support both coolers in position. Remove four bolts and washers which secure lower flange of transmission oil cooler (1) to structural support. Remove bolts, nuts, and spacer washers at four corners of mating flanges of coolers.

f. Lift out transmission oil cooler (1).

NOTE

Be sure engine oil cooler, if installed, is securely supported in place.

6-193. Inspection and Repair — Transmission Oil Cooler.

a. Inspect oil cooler support for damage.

b. Inspect lines and fittings for stripped threads and serviceability.

c. Inspect oil cooler (1, figure 6-64) for damage, clogging or malfunction.

d. Replace unserviceable lines, fittings, gaskets, or support, as required.

e. Replace damaged or malfunctioning oil cooler or thermal valve as assemblies. In the event of transmission internal failure, replace cooler and flush out all connecting lines and fittings thoroughly using solvent (C-304). Dry with filtered compressed air.

6-194. Installation — Transmission Oil Cooler.

a. Align transmission oil cooler (1, figure 6-63), with outlet end forward, with engine oil cooler. At each corner of mating flanges, install bolt and nut with three aluminum alloy washers. Secure lower outboard flange of cooler to structural support with four bolts and washers.

b. Connect oil lines to fittings on cooler (1).

c. Reinstall air duct and turbo blower of engine oil cooler installation.

d. Service system with lubricating oil (C-010 or C-011).

e. Check for leaks and proper operation of the system at ground run-up.

6-195. OIL COOLER BLOWER.

6-196. Description — Oil Cooler Blower. Oil cooler blower is located in the aft fuselage, below the engine tailpipe. Cooling air flow is provided by a turbo blower that is bleed air driven.

6-197. Removal — Oil Cooler Blower.

a. Open access door at right side of fuselage below engine tailpipe.

b. Remove blower screen.

c. Disconnect air hose from blower inlet fittings.

d. Remove three bolts, with nuts and washers, to detach blower from support bracket on fuselage bulkhead.

e. Remove eight bolts and washers to detach blower from duct. Remove blower assembly.

f. Remove eight bolts and washers which secure upper flanges of cooler and mount to sides of duct. Remove duct.

6-198. Installation — Oil Cooler Blower.

CAUTION

Make sure reducer orifice is installed in blower inlet to prevent blower overspeed.

a. Check that support bracket is secured with three screws and washers on fuselage bulkhead above oil cooler location.

b. Position blower assembly, with inlet pointing forward at left side, to align mounting holes with duct flange and support bracket.

c. Attach blower to duct with eight bolts and thin aluminum alloy washers under each bolt head and nut.

d. Attach blower to support bracket with three bolts using thin alloy washers under bolt heads and nuts.

e. Connect hose from bleed air valve to blower inlet.

f. Install screen on blower flange with bolts, washers, grommets, and nuts.

6-199. TRANSMISSION OIL SYSTEM TUBES AND HOSES.

The transmission oil system has various tube and hose assemblies for transfer and return of oil from the transmission through cooler, valves, and fittings.

CAUTION

Use back-up wrenches when removing and installing oil cooler drain fittings, valves, tubes, and hoses. All openings must be capped, to prevent entry of any foreign matter.

6-200. Inspection — Transmission Oil System Tubes and Hoses.

a. Inspect tubes for nicks, scratches, dents, bent areas, and corrosion.

b. Inspect fittings for thread damage.

c. Inspect drain valves (2, figure 6-63) for thread damage, nicks, scratches, corrosion, and malfunction.

d. Inspect hoses for fraying, deterioration, or evidence of leaking.

6-201. Repair Replace — Transmission Oil System Tubes and Hoses.

a. Replace drain valves (2, figure 6-63) for thread damage and malfunction.

b. Replace hoses when frayed, deteriorated, or evidence of leaking exists.

c. Corrosion treat tubes, hoses, valves and fittings as required.

d. Repair nicks and scratches as required.

e. Replace tubes when dented or bent.

f. Replace fitting for thread damage or when excessive corrosion exists.

CHAPTER 7

HYDRAULIC AND PNEUMATIC SYSTEMS

SECTION I — HYDRAULIC SYSTEM

7-1. HYDRAULIC SYSTEM.

NOTE

All preformed packings and threads will have a light film of hydraulic fluid (C-002) applied prior to assembly. Ensure that parts are clean.

7-2. Description — Hydraulic System.

a. The flight control hydraulic system provides power to operate flight control power cylinders. A gravity feed reservoir is used. The basic system includes a variable delivery axial-piston pump, reservoir, filter, relief valve, solenoid valve, directional flow check valves, servo valves, power cylinders, pressure switch, low pressure caution light, couplings for connection of a ground test stand and connecting lines and a control switch located on the pedestal. (Figure 7-1.)

b. The pump is located on the transmission sump case and is accessible through a removable panel on right side of pylon island. Access to the gravity feed reservoir is by opening transmission fairing on cabin roof. The ground test stand couplings are located in the engine compartment on the right side.

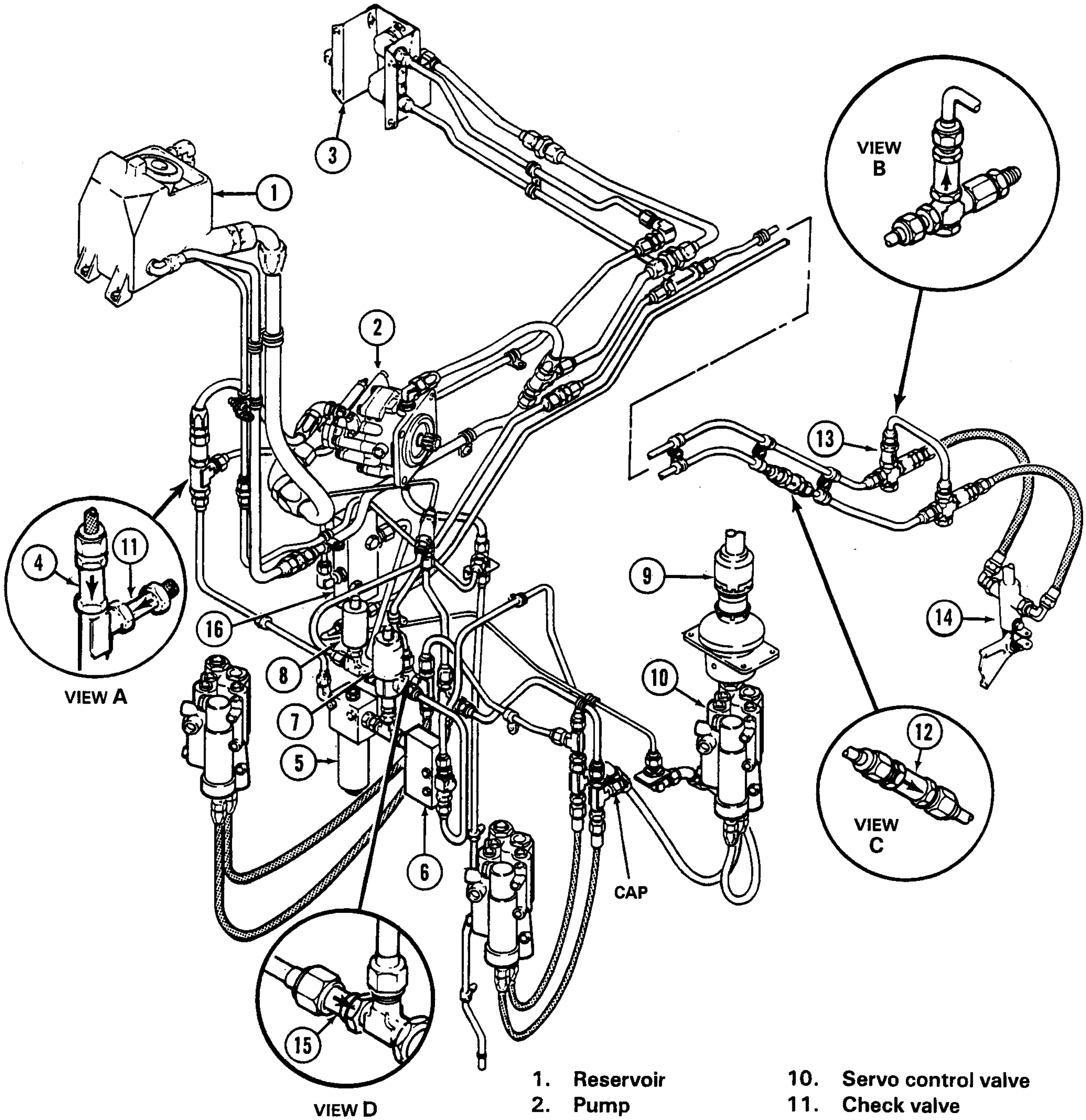
7-3. Operation — Hydraulic System.

a. System pressure (figure 7-2) of 1500 psig is produced by the variable delivery, pressure compensated pump, mounted on the main transmission and driven at 65 percent engine driveshaft speed. Fluid is drawn from the reservoir by the hydraulic pump and pumped to the system through a check valve and a filter to a normally open, solenoid-operated system shutoff valve. When the HYD CONTROL switch is ON, this valve is open and system pressure is supplied to all four of the flight control power cylinders. Each power cylinder assembly includes a servo valve which is mechanically controlled by the flight control linkages. When the linkage moves any servo valve control lever down, the cylinder retracts and vice versa. When the lever is centered, system pressure is applied equally to both sides of the cylinder piston, but the system return port is shut off and cylinder does not move in either direction. An irreversible valve is incorporated as an integral part of the main rotor power cylinder servo valves and used to assist in the control of the main rotor and reduce feedback forces. When system pressure drops to approximately 500 psi a spring-loaded sequence valve in the irreversible valve section of the main power cylinder servo valve closes and blocks both the system pressure and system return ports trapping fluid under 500 psi in the power cylinder assemblies. Each main rotor power cylinder servo valve also incorporates a check valve to isolate surge pressure produced in the hydraulic cylinder from the system pressure lines. A differential relief valve opens automatically to relieve pressure in excess of 500 psi differential. Another feature incorporated into the main rotor power cylinder servo valve allows the power cylinders to be operated manually. The same function is performed by the check valve which interconnects the system pressure line to the system return line adjacent to the tail rotor hydraulic cylinder. When no system pressure is available and the power cylinders are operated manually, fluid flows directly through the irreversible valve section of the main power cylinder servo valve or the tail rotor check valve from the cylinder return port to the cylinder pressure port. Hence the cylinder pumps fluid from one side of the piston to the other.

b. A line-mounted pressure switch is provided in the system pressure line to sense the system pressure. The switch closes a circuit to the caution panel when the system pressure drops below 1000 psig and causes the HYD PRESSURE caution light and the MASTER CAUTION light to be illuminated. When pressure is increasing, the switch should open 1300 psig maximum.

c. A pressure reducing valve is incorporated in the system to drop pressure from 1500 psig to 1000 psig to the collective and directional actuator. (Figure 7-2.)

d. The following provides guide lines for allowable external leakage of in-service hydraulic system components, and some methods of measuring such leakage.



1. Reservoir
2. Pump
3. Test couplings
4. Check valve
5. Filter
6. Relief valve
7. Solenoid valve
8. Pressure switch
9. Power cylinder (typical three places)
10. Servo control valve
11. Check valve
12. Check valve
13. Check valve
14. Tail rotor cylinder valve
15. Check valve
16. Pressure reducing valve

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Figure 7-1. Hydraulic system — flight controls

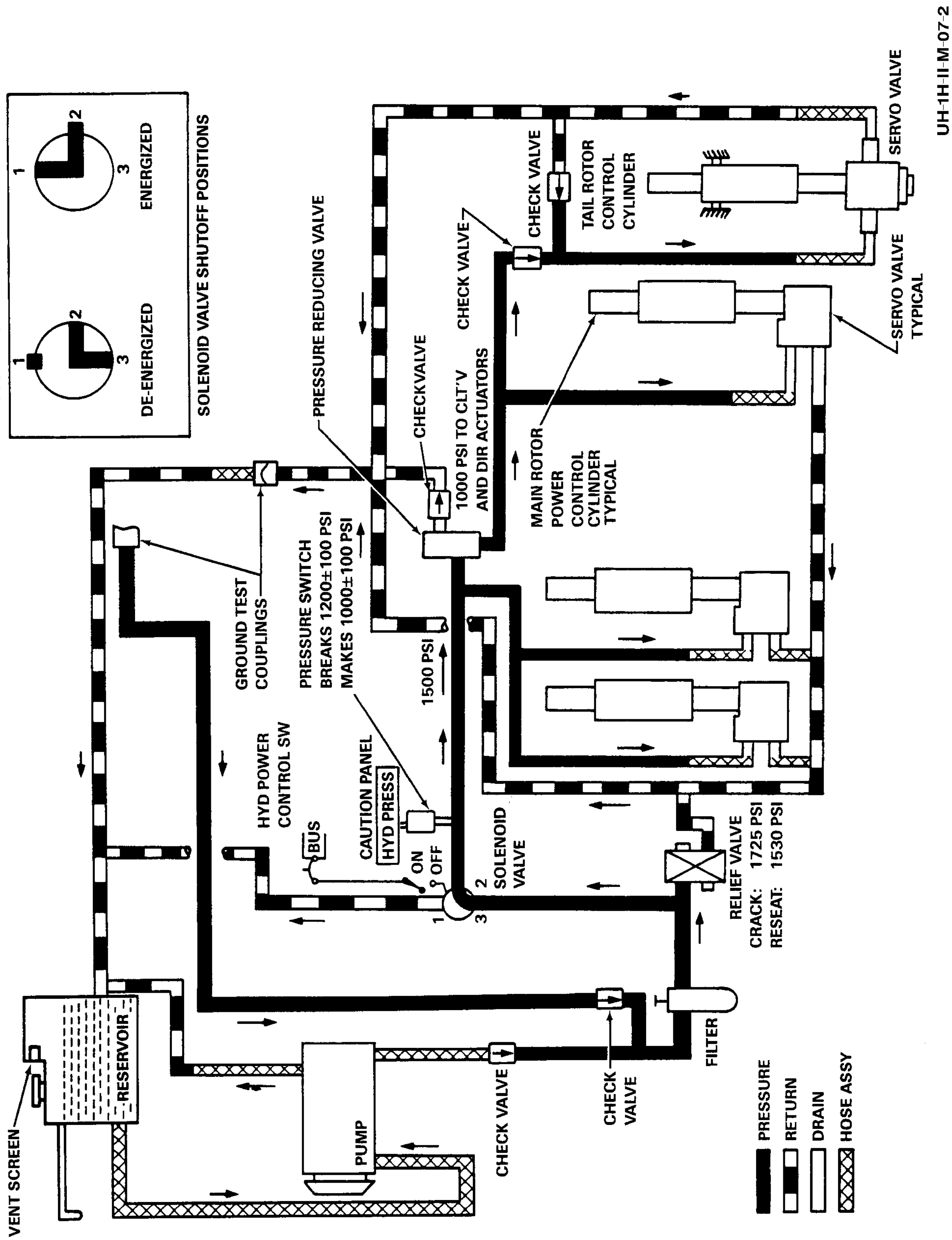


Figure 7-2. Hydraulic system — schematic (gravity feed)

(1) Scope — Limits described are only for components in service in helicopter hydraulic systems. The intent is to minimize replacement of hydraulic components which are still serviceable.

(a) These limits may differ from those contained in various military specifications for components, which are intended to control quality, assembly, and proper functioning of the components for procurement. Components in service sometimes develop leakage rates in excess of specification limits, without necessarily becoming detrimental to the system or failing to provide reliable operation.

(b) These limits are not to be used as basis for acceptance or rejection of components of any bench functional test or systems on new helicopters.

(2) Causes of Leakage — Some seepage is normally present, since static or dynamic seals are not functionally perfect, due to such causes as follows:

(a) A film of hydraulic fluid being retained by metal surfaces, such as piston rods, and thus carried past seals. This film is necessary for seal lubrication.

(b) Pressure and temperature variations affecting seals.

(c) Seals tending to take a permanent set after a period of time.

(3) Classification of Leakage — External leakages of hydraulic fluid can be broadly classified as excessive or allowable.

(a) Excessive Leakage: Fluid leakage such that hydraulic reservoir level may be dangerously lowered or depleted during normal operation, or a fire hazard may be created, or air-worthiness of helicopter may be otherwise compromised.

(b) Allowable Leakage: Fluid leakage such that quantity lost is insignificant, will have no detrimental effect on helicopter operation, and correction does not warrant maintenance time involved.

(c) General: Leakage usually shows as a seepage, stain, or wet area. It is possible for allowable leakage or seepage to collect in a cavity or depression in adjacent structure over a period of time and falsely indicate excessive leakage. Accumulation on a flat area or a white-painted surface often appears to be excessive, though actually being allowable. However, it is also possible to have enough components with allowable leakages that their combined leakage should be classified as excessive.

(4) Leakage Checks — Measurement of leakage rates, for classification according to table 7-1 can be performed as follows:

(a) When hydraulic systems have remained in static unpressurized condition for an appreciable period of time, leakage checks should not be performed immediately after starting operation. Activate systems and operate components several times, then wipe off any leaked hydraulic fluid before making leakage checks.

(b) Where location of a component does not permit direct observation, it is possible to measure leakage on a flat surface (either part of structure below or a panel temporarily positioned for that purpose). Wipe surface clean and place a drop of fluid on area, allow to stabilize, then outline area with soft lead pencil before wiping off fluid. Pressurize and cycle the component to observe leakage rate, comparing wetted surface to marked one-drop area.

(c) Where fluid dropping from a component can be directly observed, pressurize and cycle the component until a drop falls free. Continue operating, observing time until next drop to determine leakage rate.

(d) For tests requiring long periods of time and where fluid can drop, wipe surface clean and dry without using a solvent. Use a clean blotter or white cloth after system has operated or has been idle the required period of time.

7-4. Testing — Hydraulic System.

a. Testing of the hydraulic system in accordance with the following procedures may be accomplished by attaching a hydraulic test stand to the test connectors (located on right side of helicopter, forward of engine) and utilizing an auxiliary power unit for electrical power. Premaintenance

Table 7-1. Allowable Leakage for In-Service Hydraulic Components

COMPONENT	FUNCTION	LEAK TYPE	LEAKAGE RATE (MAX.)
FLIGHT CONTROLS ACTUATORS	Rod Seal	D	1 drop/20 full stroke cycles
		S—D	1 drop/15 min.
	End Cap	S	2 drops/day
	Valve Input	D	1 drop/5 cycles
		S—D	1 drop/5 min.
	Pressure Switch	S—D	1 drop/5 min.
	Valve Body (Weep Holes)	S—D	1 drop/5 min.
PUMP	Output Shaft	D	8 drops/min.
		S—D	1 drop/min.
	Housing (Mating Surfaces)	S	2 drops/day
SWIVELS	Low Pressure	S	1 drop/15 min.
	High Pressure	D	1 drop/5 cycles
		S	1 drop/15 min.
VALVES	Body (Weep Hole)	S	2 drops/day
	Manual Stem	D	1 drop/5 cycles
		S	2 drops/day
	Dump Valve	S	2 drops/day
	Pressure switch	S—D	1 drop/5 min.
	Valve Body (Weep Hole)	S—D	1 drop/5 min.
FITTINGS	Flared or Flareless	S	None
	Compression Seals	S	1 drop/30 min. (less if readily accessible)

NOTES:
1. Leaks Types D = Dynamic
   S = Static
   S—D = Static leakage through dynamic seals.
2. Approx. 20 drips — 1 cubic centimeter.
3. Components in static condition, as in parked aircraft, are allowed maximum leakage of two drops per seal or packing per day.

requirements for testing of hydraulic system are as follows:

Premaintenance Requirements for Testing of Hydraulic System

CONDITIONS	REQUIREMENTS
Special Tools	None
Test Equipment	Hydraulic Test Stand
Support Equipment	Auxiliary Power Unit Work Stand
Minimum Personnel Required	Two
Consumable Materials	(C-002), (C-405)
Special Environmental Conditions	Well Ventilated Area

WARNING

The procedure allows a possibility of air remaining in the system. The gravity feed system is self-bleeding. Therefore, before flight, the system must be bled by cycling tail rotor pedals and cyclic and collective controls a minimum of 10 times with main rotor turning at flight idle. Prior to flight, service the reservoir.

b. Using auxiliary power unit and hydraulic test stand, functionally test hydraulic system as follows:

NOTE

Hydraulic test stand pressure shall be adjusted to 1675 psig.

(1) Apply 1550 psig pressure to system and maintain for at least 15 minutes; meanwhile make following checks:

(a) Leakage: Observe all portions of system for external leakage. Repair as necessary.

(b) Clearance: Slowly cycle all controls to limits of stroke and observe movement of hydraulic servo cylinders. Clearances of all moving parts should be such that no fouling can occur. Check flexible connections carefully to be sure chafing or pinching of hoses does not occur, and that vibration does not loosen attaching fittings.

(2) Check operation of HYD PRESSURE caution panel light.

(a) Apply electrical power to helicopter.

(b) Position HYD control switch to ON.

(c) Slowly decrease hydraulic test stand pressure. Light should illuminate when pressure reaches 1000 psig.

(d) Slowly increase pressure. Caution panel light should extinguish when pressure reaches 1100 to 1300 psig.

(3) With system pressure at 1550 psig, place HYD CONTROL switch to OFF to test operation of solenoid valve. Actuate cyclic, collective, and tail rotor controls. Caution panel lights should illuminate, and more force should be required to operate controls if valve closed properly to shut off hydraulic power assistance.

(4) Check operation of pressure relief valve in hydraulic system. While operating pressure is slowly increased, place hand on relief valve to determine when it opens. Valve should open at 1725 psig. Slowly decrease pressure to 1530 psig minimum to reseat valve.

(5) Check operation of servo actuator valve.

(a) Slowly increase hydraulic pressure until it can be determined that control systems are functioning with hydraulic power. Changeover from mechanical to hydraulic operation should occur at 500 psig minimum.

(b) Reduce pressure to zero.

(c) Check for irreversibility by moving each servo actuator valve control lever to up (extend) or down (retract), then apply approximately 50 pounds force to the power cylinder extension tube and try to move cylinder in direction opposite to servo actuator valve position. Cylinder should not move.

(d) After pressure has been reduced to zero for 3 minutes, examine servo actuator valve on each cylinder for evidence of leakage.

(6) When test is complete, remove auxiliary power unit, refill and bleed system as necessary.

(7) Disconnect hydraulic test stand from ground test coupling.

(8) Attach return line from reservoir to the hydraulic test coupling.

NOTE

When a hydraulic test stand is not available, the transmission-driven hydraulic pump can be used to perform operational checks and to bleed the hydraulic system. Operation of the engine shall be performed in accordance with instructions contained in BHT PUB-92-004-10.

c. Perform operation checks and bleed hydraulic system as follows:

(1) Start and ground-run the helicopter.

NOTE

Ensure that hydraulic system has been bled and filled. (Paragraphs 7-4 and 7-6.)

(2) Increase engine speed to 5800 RPM. Maintain 5800 RPM for at least 15 minutes.

(3) While speed is maintained, place HYD CONTROL switch to ON and make the following checks:

(a) Observe all hydraulic fittings and components for evidence of external leakage.

(b) Repair or replace components and fittings as necessary to correct leakage.

(c) Slowly cycle all (fore and aft, lateral and collective) controls and observe movement of hydraulic cylinder assemblies. No fouling shall occur.

(d) Check flexible hose and hose connections to ensure that pinching and chafing of hoses does not occur.

(e) Place HYD CONTROL switch to OFF. Solenoid valve should energize and close. Caution panel HYD PRESSURE light should illuminate, and more force should be required to operate the controls.

(4) Refill and bleed system as necessary. (Paragraph 7-4 and 7-6.)

7-5. Flushing — Hydraulic System.

a. The complete system must be thoroughly flushed as follows:

(1) Disconnect hoses from three main rotor power cylinders and from tail rotor control boost cylinder. Connect hoses together using part number MS21916D5-4 reducers. Cap ports to main rotor power cylinders and tail rotor control boost cylinder to prevent entry of dirt.

(2) Remove filter element from filter assembly. (Paragraph 7-46.) Place element in clean plastic bag and store for reinstallation. Install bowl to filter head and tighten.

(3) Connect hydraulic test stand hoses to inlet and outlet test fittings on the helicopter.

(4) Inspect complete hydraulic system for attachment and security of components.

(5) Set test stand to a pressure sufficient to maintain 6.0 GPM minimum flow rate thru the helicopter hydraulic system. Flush system for minimum of five minutes.

(6) Throughout the operation observe all portions of system for evidence of external leakage.

(7) Shut down hydraulic test stand and connect hoses to cylinders.

(8) Inspect filter element for cleanliness and install element in filter. Tighten bowl and secure with lockwire (C-405).

Table 7-2. Troubleshooting of Hydraulic System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Pump noisy.

NOTE

Inherent noise of the newer pump Part No. PVB-044-2 is considerably greater than the older yoke type. The noise does not indicate a pump malfunction, but is characteristic of the design.

Table 7-2. Troubleshooting of Hydraulic System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 1. Pump case drain incorrectly installed on bottom of pump, causing air entrapment.

Install properly. (Paragraph 7-22.)

2. Excessive feedback to controls.

STEP 1. Air in system.

Bleed system, by use of hydraulic test stand. Cycle tail rotor pedals and cyclic, collective actuators full stroke a minimum of 10 times.

STEP 2. Rotor not properly adjusted.

Track and adjust rotor. (Chapter 5.)

STEP 3. Loose cylinder bearing housing retaining nut or loose bushing set adjustment nut.

Replace cylinder assembly. (Paragraph 7-78 or 7-89.)

STEP 4. Loose or worn hydraulic cylinder bearing housing mounting studs.

Check for cracks in housing around stud, tighten nuts and/or replace mounting studs.

3. Cyclic/collective cylinder binds or does not operate smoothly.

STEP 1. Servo actuator valve requires more than 8 ounces of force to operate.

Replace servo actuator assembly.

4. Collective control stick will not stay in position.

STEP 1. Friction adjusted too low on collective stick.

Adjust friction and/or balance spring. (Chapter 11.)

5. Tail rotor feedback in pedals.

STEP 1. Tail rotor servo mounting bearing loose or worn.

Replace bearing. (Chapter 11.)

6. High frequency vibration or chatter.

STEP 1. Damper bearing in bellcrank to tail rotor quadrant worn or deteriorated.

Replace bearing. (Chapter 11.)

Table 7-2. Troubleshooting of Hydraulic System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

7. Hydraulic system too hot.

STEP 1. Broken line.

Replace line, replace pump and flush system. (Paragraphs 7-104 or 7-17 and 7-5.)

STEP 2. Pump delivers excessive pressure.

Replace pump. (Paragraph 7-17.)

STEP 3. Relief valve stuck open.

Replace valve. (Paragraph 7-37.)

STEP 4. Pump case drain incorrectly installed.

Install properly. (Paragraph 7-22.)

STEP 5. Check valve in irreversible valve section of servo actuator valve sticking open.

Replace servo actuator assembly.

8. Hydraulic control switch inoperative.

STEP 1. Faulty switch.

Replace switch. (Chapter 9.)

STEP 2. Faulty connections.

Repair connections. (Chapter 9.)

STEP 3. Defective wiring.

Replace wiring. (Chapter 9.)

STEP 4. Defective solenoid valve.

Replace solenoid valve. (Paragraph 7-58.)

STEP 5. No hydraulic pressure.

Refer to caution panel worded segment HYD PRESSURE lighted indication of trouble.

Table 7-2. Troubleshooting of Hydraulic System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

9. Caution panel worded segment HYD PRESSURE illuminated.

STEP 1. Caution light system malfunction.

Perform operation check of HYD PRESSURE light. (Chapter 9.)

STEP 2. Hydraulic pump failure.

Replace hydraulic pump. (Paragraph 7-17.)

10. Hydraulic oil leaks.

STEP 1. Worn gaskets, seals, or preformed packings..

Replace gaskets, seals, or preformed packings.

CAUTION

Do not tighten leaky flareless fittings.

STEP 2. Leaking fittings.

Replace with new tube or hose assembly if nut, sleeve, or tubing or hose is defective.

STEP 3. Improper tightening, presence of foreign matter, or defective part..

(Refer to Table 7-3 for proper torque values of tube connectors.)

Clean and remove all foreign matter.

NOTE

Threads of tube and hose connectors and fittings will have hydraulic fluid (C-002) applied to them prior to torquing. Do not torque with threads dry.

Tighten fitting nut with wrench until a sharp increase in torque is noted. Do not overtorque.

NOTE

If there is any doubt that the point of sharp torque increase has been reached, rapidly loosen and tighten the nut several times (use light torque) until certain that increase in torque is due to the sleeve

Table 7-2. Troubleshooting of Hydraulic System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

and tube touching the fitting seat, and is not due to thread friction.

Tighten nut an additional 1/6 of a turn (one hex flat), from point of sharp torque increase.

If leak is present, tighten nut additional 1/6 of a turn.

If leak still persists, remove tube or hose assembly and install new tube or hose assembly.

7-6. Servicing — Hydraulic System. Fill reservoir (9, figure 7-3) to overflow with hydraulic fluid (C-002).

7-7. HYDRAULIC RESERVOIR.

7-8. Description — Hydraulic Reservoir. The gravity feed hydraulic reservoir is a non-pressurized, magnesium alloy unit with an approximate capacity of 5-1/4 pints at overflow, 2-3/4 pints at refill level and is mounted on the cabin roof, under the right side of transmission fairing. The reservoir has a filler cap, filler screen, internal baffle, fluid level sight gage plug, vent screen, overflow scupper, drain plug, and connections for suction, return, and pump bypass lines. (Figure 7-3.)

CAUTION

Protective covers shall be installed on all open ports and lines.

7-9. Removal — Hydraulic Reservoir.

a. Open transmission fairing and engine cowls for access. (Chapter 2.)

b. Remove lockwire from drain plug (16, figure 7-3).

c. Using a suitable container, remove plug (16) from reservoir (9) and drain reservoir. Remove preformed packing (15) from plug (16). Drain a small quantity of hydraulic fluid from bottom of reservoir and inspect for contaminants. If contaminants are evident, flush system. (Paragraph 7-5.)

d. Disconnect hose assembly (20) from fitting (18). Install protective covers to fitting (18) and hose assembly (20).

e. Disconnect tube assembly (14) from fitting (13). Install protective covers to fitting (13) and tube assembly (14).

f. Disconnect tube assembly (21) from baffle (22). Install protective cover to tube assembly (21). Protect baffle (22) from foreign material.

g. Remove two nuts (19), six washers (2), and four bolts (1). Lift reservoir (9) from cabin roof.

7-10. Disassembly — Hydraulic Reservoir.

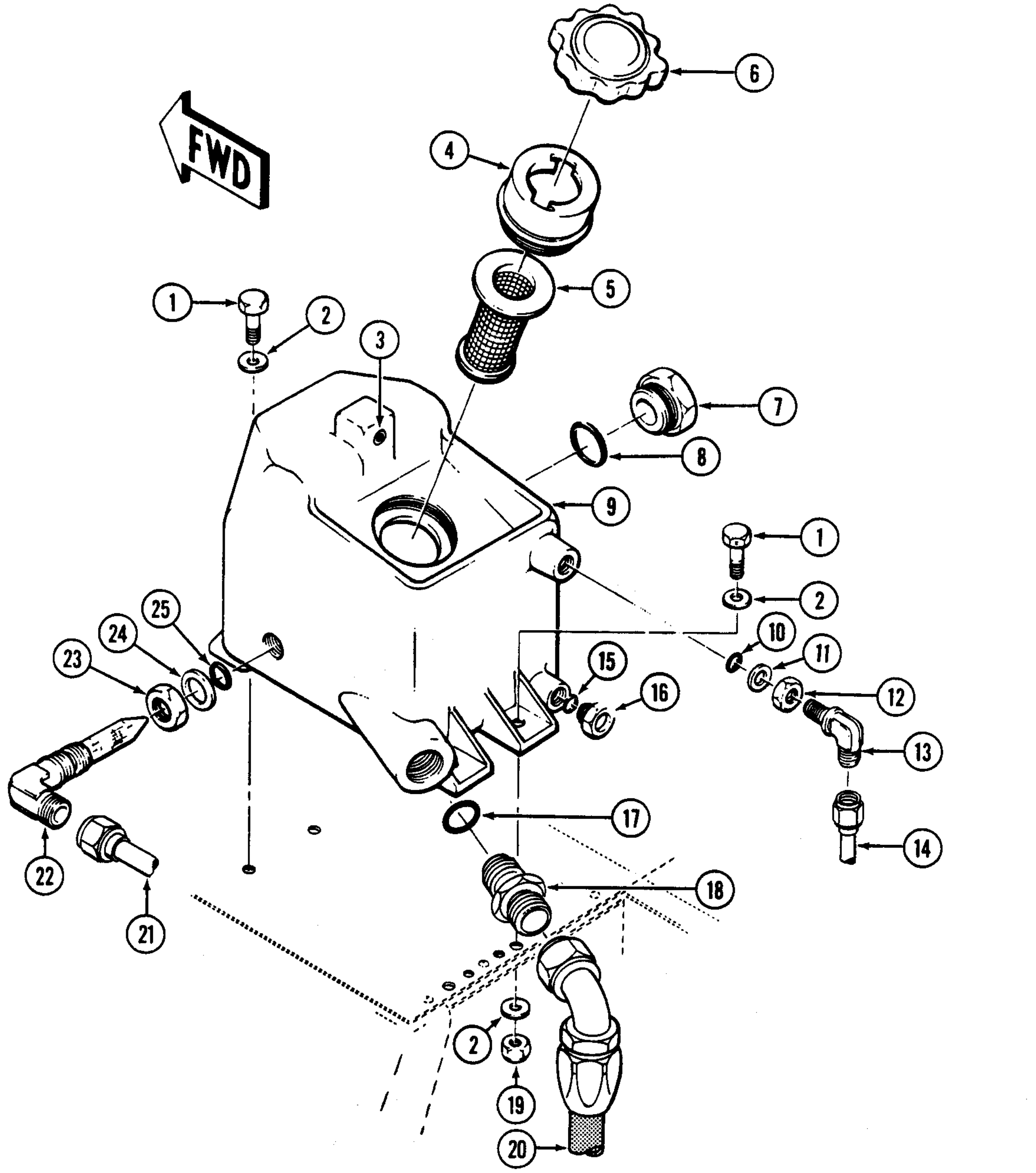
a. Remove cap assembly (6, figure 7-3), adapter (4), and strainer (5) from reservoir (9).

b. Remove baffle (22) from reservoir (9). Remove preformed packing (25), ring (24), and nut (23) from baffle (22).

c. Remove fitting (13) from reservoir (9). Remove preformed packing (10), ring (11), and nut (12) from fitting (13).

d. Remove fitting (18) from reservoir (9). Remove preformed packing (17) from fitting (18).

e. Remove lockwire securing sight plug (7) to reservoir (9) and remove sight plug. Remove preformed packing (8) from sight plug (7).



1. Bolt
2. Washer
3. Vent screen
4. Adapter
5. Strainer
6. Cap assembly
7. Sight plug
8. Preformed packing
9. Reservoir
10. Preformed packing
11. Ring
12. Nut
13. Fitting
14. Tube assembly
15. Preformed packing
16. Plug
17. Preformed packing
18. Fitting
19. Nut
20. Hose assembly
21. Tube assembly
22. Baffle
23. Nut
24. Ring
25. Preformed packing

UH-1H-II-M-07-3

Figure 7-3. Reservoir — hydraulic system — removal and installation

f. Remove vent screen (3) from reservoir if screen is clogged or damaged.

WARNING

Drycleaning solvent is highly flammable with a flash point of 140°F (60°C) and must be used in a well ventilated area. Avoid breathing vapors and do not allow to come in contact with skin or clothing.

7-11. Cleaning — Hydraulic Reservoir.

a. Flush interior of reservoir (9, figure 7-3) with solvent (C-304) and air dry with clean, filtered compressed air.

b. Thoroughly flush interior of reservoir (9) with clean hydraulic fluid (C-002).

c. Clean strainer (5), vent screen (3), and all fittings with solvent (C-304) and air dry with clean, filtered compressed air.

7-12. Inspection — Hydraulic Reservoir.

a. Inspect reservoir (9, figure 7-3) as follows:

(1) Inspect cap assembly (6) and baffle (22) for damage. No cracks allowed in baffle (22).

(2) Inspect strainer (5) and vent screen (3) for rust, corrosion, cleanliness, cuts, and breaks. No damage allowed.

(3) Inspect sight plug (7), hose assembly (20), tube assemblies (14 and 21), plug (16) for thread damage, cracks, dents, leaks, corrosion and loose, missing or improperly installed hardware. No cracks allowed. For treatment of corrosion, refer to TM 55-1500-204/25/1 and CSSD-PSE-87-001.

(4) Damage limits for each boss, port, or fitting are as follows:

(a) Depth — one-third of thread.

(b) Length — one-third of pitch diameter.

(c) Number of repairs: two per segment.

(d) No cracks allowed.

(5) Maximum depth of repairable mechanical damage (reference nicks, scratches, gouges, dents, etc.) to the reservoir (9) is 0.040 inch deep after cleanup. No cracks allowed.

(6) Corrosion damage to reservoir (9) shall not exceed 0.020 inch in depth prior to cleanup and 0.040 inch in depth after cleanup.

(7) Inspect sight plug (7) for discoloration. Any discoloration is not acceptable.

(8) Inspect system for leaks.

(9) Inspect plug (16) and cap assembly (6) for proper locking and safetying.

(10) Inspect drain lines for obstruction.

b. Drain a small quantity of hydraulic fluid from bottom of reservoir and inspect for contaminants. If contaminants are evident, flush system. (Paragraph 7-5.)

c. Inspect reservoir (9) and attaching components for cleanliness and proper security.

7-13. Repair or Replacement — Hydraulic Reservoir.

a. Any parts that fail inspection requirements outlined in preceding paragraph 7-12 require replacement without repair.

b. Parts containing cracks require replacement without repair.

c. Replace sight plug (7, figure 7-3) if discolored.

d. Replace all preformed packings and rings.

7-14. Assembly — Hydraulic Reservoir.

NOTE

All fluid connections shall be torqued in accordance with table 7-3.

a. Install vent screen (3, figure 7-3), if removed, to reservoir (9) and point stake at three places. (Radial location is unimportant.

Table 7-3. Torque Values for Fluid Connections

*TORQUE VALUES FOR AIRFRAME FLUID CONNECTIONS							
		WRENCH TORQUES FOR TIGHTENING AN 818 NUT (INCH/POUNDS)					
Dash Number Reference	Tubing OD (Inches)	Al. Aly. Tubing (Flare MS33583 or MS33584)		Steel Tubing (Flare MS33584)		Hose End Fittings and Hose Assemblies (MS28740) (MS28759)	
		Min.	Max.	Min.	Max.	Min.	Max.
	1/8	—	—	—	—	—	—
-3	3/16	—	—	95	105	70	100
-4	1/4	70	65	135	150	70	120
-5	5/16	70	80	180	200	85	180
-6	3/8	75	125	270	300	100	250
-8	1/2	150	250	450	500	210	420
-10	5/8	200	350	650	700	300	480
-12	3/4	300	500	900	1000	500	850
-16	1	500	700	1200	1400	700	1150
-20	1-1/4	600	900	—	—	—	—
-24	1-1/2	600	900	—	—	—	—
-28	1-3/4	—	—	—	—	—	—
-32	2	—	—	—	—	—	—

*Flareless tubing connections shall be tightened as follows: Tighten the MS21921 nut 1/6 to 1/3 turns (1-2 HEX flats) past the point of sharp torque rise on all sizes and materials for all types of fittings or tubes.

NOTE: The 1/6 to 1/3 turns (performed after the presetting operation) is the final installation torque.

WARNING

Zinc chromate primer is flammable with a flash point at 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

b. Install strainer (5) in reservoir (9). Apply a thin film of zinc chromate primer (C-201) to threads of adapter (4) and install adapter to reservoir.

c. Install cap assembly (6) to reservoir (9).

d. Install preformed packing (8) on sight plug (7) and install sight plug to reservoir. Secure sight plug to reservoir with lockwire (C-405).

e. Place packing (17) on fitting (18) and install fitting to reservoir (9).

f. Install nut (12), ring (11), and packing (10) to fitting (13) and install fitting to reservoir.

g. Install nut (23), ring (24), and packing (25) to baffle (22) and install baffle to reservoir.

h. Place packing (15) on plug (16) and install plug to reservoir (9).

7-15. Installation — Hydraulic Reservoir.

a. Apply barrier tape (C-430) to lower side of mounting pads of reservoir (9, figure 7-3.)

NOTE

Bolt (1) with holes in head will be installed in hole of mounting pad adjacent to drain plug (16). Refer to table 7-3 for proper torquing of all fluid connections prior to installation.

b. Install reservoir on cabin roof with four bolts (1), six washers (2), and two nuts (19).

c. Secure plug (16) to hole in reservoir with lockwire (C-405).

d. Remove protective cover from tube assembly (21) and connect tube assembly to baffle (22).

e. Remove protective cover from tube assembly (14) and connect tube assembly to fitting (13).

f. Remove protective cover from hose assembly (20) and connect hose assembly to fitting (18).

g. Fill reservoir to overflow with hydraulic fluid (C-002).

h. Bleed hydraulic system. (Paragraph 7-4.)

i. Close transmission fairing and right engine cowls. (Chapter 2.)

WARNING

Zinc chromate or epoxy polyamide primer is flammable with a flash point at 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

7-16. Painting — Hydraulic Reservoir. Repairs to external surfaces of reservoir, after being properly treated, may be touched up with zinc chromate primer (C-201) or epoxy polyamide primer (C-204).

7-17. HYDRAULIC PUMP.

7-18. Description — Hydraulic Pump. The hydraulic pump (2, figure 7-1) is a variable-delivery, axial-piston unit mounted on a geared drive pad at right side of transmission accessory drive adjacent to the rotor tachometer generator. Four external ports of the hydraulic pump are provided for connecting suction, pressure, case drain, and seal drain.

NOTE

Maximum allowable leakage for in-service components of the hydraulic pump is as follows:

Output shaft — dynamic — 8 drops/minute.

Output shaft — static (through seal) — 1 drop/minute.

Housing (mating surfaces) — static — 2 drops/day.

7-19. Removal — Hydraulic Pump.

a. Remove right access door from pylon island in cabin area. (Chapter 2.) Provide a suitable container to catch hydraulic fluid and place container under plug (16, figure 7-3).

b. Remove lockwire from plug (16).

WARNING

Hydraulic fluid is flammable. Flash point is 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

c. Remove plug (16) and drain fluid from reservoir (9).

d. Disconnect hose assembly (8, figure 7-4) from fitting (9). Install protective cover on hose assembly.

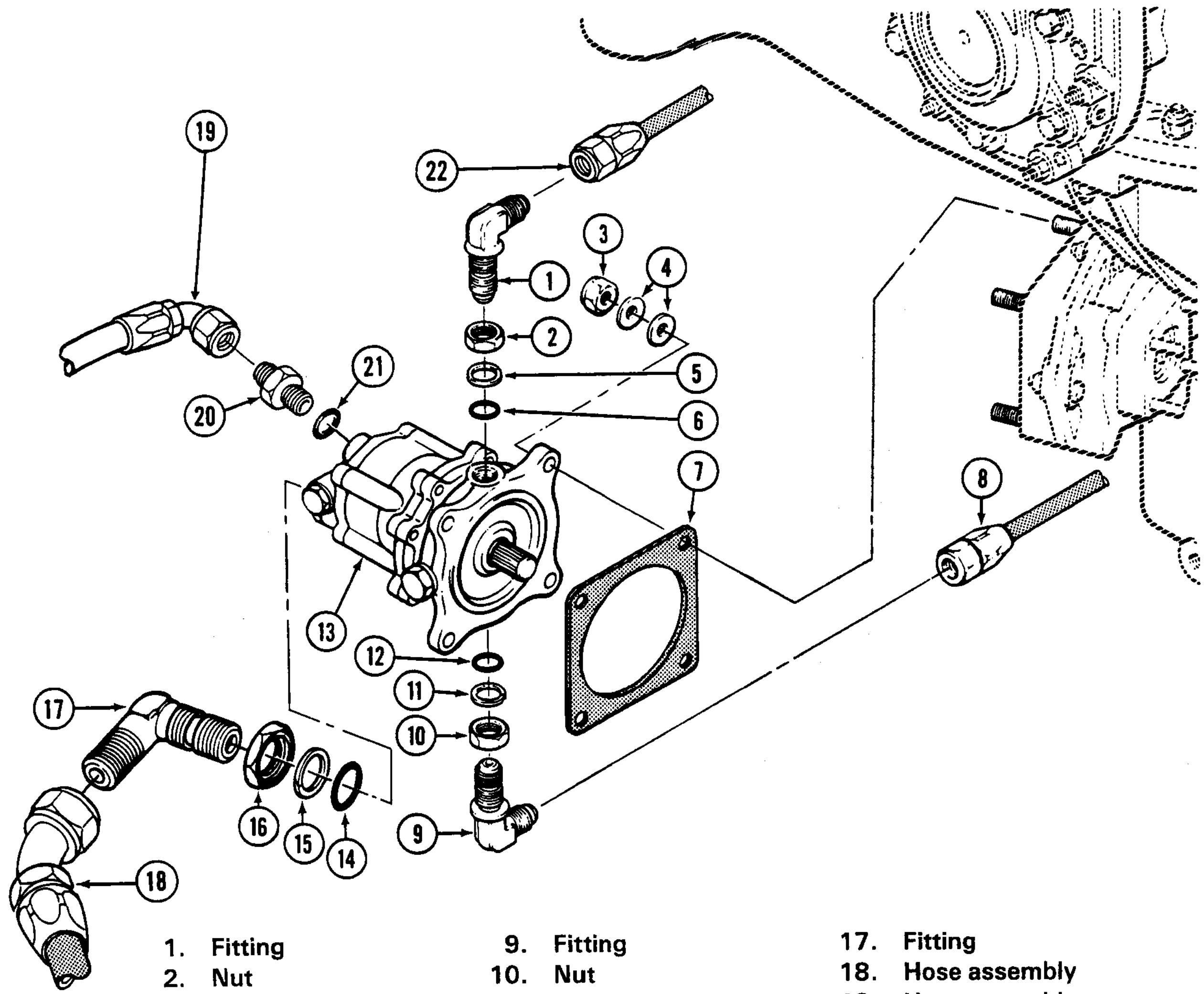
e. Disconnect hose assembly (22) from fitting (1). Install protective cover on hose assembly.

f. Disconnect hose assembly (19) from fitting (20). Install protective cover on hose assembly.

g. Disconnect hose assembly (18) from fitting (17). Install protective cover on hose assembly.

h. Remove fitting (17) from pump assembly (13). Remove preformed packing (14), ring (15), and nut (16) from fitting.

i. Remove fitting (20) from pump assembly (13) and remove preformed packing (21) from fitting.



1. Fitting
2. Nut
3. Nut
4. Washer
5. Ring
6. Preformed packing
7. Gasket
8. Hose assembly
9. Fitting
10. Nut
11. Ring
12. Preformed packing
13. Pump assembly
14. Preformed packing
15. Ring
16. Nut
17. Fitting
18. Hose assembly
19. Hose assembly
20. Fitting
21. Preformed packing
22. Hose assembly

UH-IH-II-M-07-4

Figure 7-4. Hydraulic pump — removal and installation

j. Remove fitting (1) from pump assembly (13). Remove preformed packing (6), ring (5), and nut (2) from fitting.

k. Remove fitting (9) from pump assembly (13). Remove preformed packing (12), ring (11), and nut (10) from fitting.

l. Install protective covers on all open ports of pump assembly (13).

m. Remove four nuts (3), eight washers (4), pump assembly (13), and gasket (7) from transmission.

n. Remove container with drained hydraulic fluid.

o. Install plug (16) on reservoir (9).

7-20. Inspection — Hydraulic Pump.

a. Inspect pump assembly (13) for evidence of leakage.

b. Inspect pump assembly (13) for cracks, corrosion, dents, deep scratches, or damage to splines of shaft. If damage is found pump shall be replaced.

c. Inspect all fittings, nuts, and hoses for deterioration, cracks, corrosion, dents, and thread damage.

d. Inspect pump assembly, nuts, hoses, and tube assemblies for security.

7-21. Repair or Replacement — Hydraulic Pump.

a. Replace unserviceable fittings (1, 9, 17, and 20, figure 7-4), hoses (8, 18, 19, and 22), and nuts (2, 3, 10, and 16).

b. Replace all packings (6, 12, 14, and 23), rings (5, 11, and 15), and gasket (7).

c. Replace pump assembly (13) if damage limits are exceeded or malfunction occurs.

d. Any cracks to pump assembly requires replacement of pump.

7-22. Installation — Hydraulic Pump.

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

NOTE

All fluid connections will be properly torqued in accordance with table 7-3. When preparing replacement pump for installation, ensure that all hose assemblies at locations shown in table 7-4 are clean and are not frayed or cracked.

a. If replacing pump assembly, remove drain plug from new pump and drain shipping preservation fluid.

b. Install case drain plug. Refill pump assembly with clean hydraulic fluid (C-002) and secure case drain plug with lockwire (C-405).

c. Remove protective caps from all open ports.

d. Install nut (10, figure 7-4), ring (11), and packing (12) to fitting (9) and install fitting to pump assembly (13).

e. Install nut (2), ring (5), and packing (6) on fitting (1) and install fitting on pump assembly (13).

Table 7-4. Hydraulic Pump Installation Data

	PUMP LINE LOCATIONS			
PUMP	CASE DRAIN	SEAL DRAIN	PRESSURE LINE	PUMP INLET
PVB-044-2 or AP2V-73	Top-Inboard	Bottom-Inboard	Top-Outboard	Bottom-Outboard

f. Install packing (21) on fitting (20) and install fitting on pump assembly (13).

g. Install nut (16), ring (15), and packing (14) on fitting (17) and install fitting on pump assembly (13).

h. Apply grease (C-001) or compound (C-452). Ensure that pump splines are coated with grease.

i. Position gasket (7) and pump assembly (13) on studs of drive pad on right side of transmission sump case, engaging pump shaft in splined gearshaft. Install eight washers (4) and four nuts (3). Torque nuts (3) 120 to 145 inch-pounds.

j. Remove protective cover from hose assembly (18). Connect hose assembly to fitting (17).

k. Remove protective cover from hose assembly (19). Connect hose assembly to fitting (20).

l. Remove protective cover from hose assembly (22). Connect hose assembly to fitting (1).

m. Remove protective cover from hose assembly (8). Connect hose assembly to fitting (9).

n. Fill hydraulic reservoir (9, figure 7-3) to normal level with clean hydraulic fluid (C-002).

NOTE

With pump installed, placarded plug is located on top, left side, outboard portion of piston chamber.

o. Locate and remove placarded plug from top of pump piston chamber. Trapped air will be expelled from piston chamber when hydraulic fluid drains from plug port. After air is expelled, replace plug, and secure with lockwire (C-405).

p. Bleed and test hydraulic system. (Paragraph 7-4.)

q. Install right access door to pylon island in cabin area. (Chapter 2.)

7-23. Test Procedures — Hydraulic Pump.

a. Start and ground run helicopter at flight idle (BHT PUB-92-004-10) and functionally check operation of hydraulic pump assembly (13, figure 7-4).

b. Check for leakage of fittings or hose connections.

7-24. CHECK VALVES.

7-25. Description — Check Valves. Check valves allow fluid to flow one direction only in lines during movement of flight controls. (Figure 7-1.)

7-26. Removal — Check Valves.

a. Remove soundproofing blanket and right access door from pylon island in cabin area. (Chapter 2.)

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

NOTE

A small amount of fluid will seep while breaking torque on the tube and hose assembly connectors and will require placing a suitable container under check valve.

b. Disconnect pump assembly hose from top of check valve (4, figure 7-1), located right, forward side of cargo hook lift beam. Install protective cap on hose assembly.

c. Remove check valve (4) from fitting (tee). Remove preformed packing from check valve. Install protective plug on fitting (tee).

d. Disconnect ground test pressure tube from back of check valve (11, figure 7-1). Install protective cap on tube assembly.

e. Remove check valve (11) from fitting (tee). Remove preformed packing from check valve. Install protective plug on fitting (tee).

f. Disconnect tube assembly from end of check valve (15). Install protective cap on tube.

g. Remove check valve from fitting (tee). Remove preformed packing from check valve. Install protective plug fitting (tee).

h. Remove lower, aft fuselage door. (Chapter 2.) Disconnect tube assemblies from forward and aft end of check valve (12) and remove check valve. Install protective cap on tube.

i. Disconnect tube assembly from top of check valve (13) and remove check valve from bulkhead fitting (tee). Install protective cap on fitting (tee). Remove preformed packing from check valve (13).

7-27. Inspection — Check Valves.

a. Inspect check valves for cracks.

b. Inspect check valves for corrosion or thread damage.

c. Inspect check valves for security.

d. Inspect check valves for evidence of fluid leakage.

7-28. Repair or Replacement — Check Valves.

a. Any evidence of cracks requires replacement of part. No repairs are allowed.

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Zinc chromate or epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

b. Minor nicks, scratches, dents or corrosion to external surface of check valve is acceptable, provided damaged area is smoothed out to original finish and touched up with chemical film material (C-100) followed with a light coat (by brush) of epoxy polyamide primer (C-204). Any corrosion to internal area or threads of check valve requires replacement of part.

c. Check security of check valves.

d. Replace check valve when there is evidence of fluid leakage (reference pin holes in valve body) due to internal corrosion damage or corrosion damage to threads.

e. Replace check valve when malfunctioning occurs.

7-29. Test Procedures — Check Valves. Perform functional test of hydraulic system. (Paragraph 7-4.)

7-30. Installation — Check Valves.

CAUTION

Ensure that directional flow arrow is pointing in right direction prior to installation. (Views A through D, figure 7-1.)

a. Install packing to end of check valve (13, figure 7-1) that will be adjacent to fitting (tee). Position check valve (13) shown in view B and install check valve to top side of outboard bulkhead fitting (tee).

b. Connect and secure tube assembly to check valve (13).

c. Position and install check valve (12) as shown in view C by connecting forward and aft tube assemblies.

d. Install access door lower aft fuselage. (Chapter 2.)

e. Install packing to end of check valve (15, figure 7-1) that will be adjacent to fitting (tee). Position check valve (15) and install as shown in view D (figure 7-1).

f. Connect and secure tube assembly to valve (15).

g. Install packing to end of check valve (11, figure 7-1) that will be adjacent to fitting (tee). Position check valve (11) and install as shown in figure 7-1.

h. Connect and secure tube assembly to valve (11).

i. Install packing on end of check valve (45, figure 7-1) that installs adjacent to fitting (tee). Position and install check valve (4) as shown in view A to top side of fitting (tee).

j. Connect and secure pump hose assembly to top of check valve (4).

k. Install access door. (Chapter 2.)

7-31. GROUND TEST CONNECTIONS.

7-32. Description — Ground Test Connections. Two ground test connections (figure 7-5) are provided for connection of hydraulic test stand to functionally check hydraulic and flight control systems.

7-33. Removal — Ground Test Connections.

a. Open right-side lower engine cowl. (Chapter 2.) Disconnect coupling half (9, figure 7-5) from coupling half (11). Remove protective cap assembly (19) from coupling half (7). Place protective cover on coupling half (9).

b. Provide a suitable container and place under connectors of tube assemblies (14 and 15) to catch fluid. Disconnect tube assemblies from fittings (13 and 16). Place protective cap on tubes.

c. Remove screws (1), washers (2) and nuts (3) from bracket (18). Remove bracket (18).

d. Remove test connectors and attaching components from brackets (6 and 18) as follows:

(1) Remove fitting (16) from fitting (23) and remove preformed packing 917) from fitting.

(2) Remove fitting (13) from fitting (24). Remove preformed packing (12) from fitting.

(3) Remove screws (4) and washers (5) from bracket (6) and remove bracket (6) from bracket (18).

(4) Break torque on nut (27), remove fitting (24), preformed packing (25), ring (26), and nut (27) from coupling half (7).

(5) Remove screws (8) attaching coupling half (7) to bracket (6) and remove coupling half.

(6) Break torque on nut (20). Remove fitting (23), preformed packing (22), ring (21), and nut (20) from coupling half (11).

(7) Remove screws (10) attaching coupling half (11) to bracket (18) and remove coupling half.

(8) Remove coupling half (9) from hose assembly. Install protective cap on hose assembly.

7-34. Inspection — Ground Test Connections.

a. Visually inspect coupling halves (7, 9, and 11, figure 7-5), cap assembly (19) and brackets (6 and 18) for cracks.

b. Inspect fittings (13, 16, 23, and 24), coupling half (7, 9, and 11) and cap assembly (19) internally and externally for evidence of corrosion.

c. Inspect brackets (6 and 18) for damage in accordance with the following limits:

(1) No cracks allowed.

(2) Surface imperfections (nicks, scratches, corrosion, etc.) shall be blended into the surrounding surface. Minimum acceptable wall thickness after cleanup is 0.032 inch. Cleanup area not critical.

(3) Edge chamfer or dent: 0.060 maximum depth.

d. Inspect coupling halves (7, 9, and 11) and connections of attaching tube assemblies (14 and 15) for evidence of leakage.

7-35. Repair or Replacement — Ground Test Connections.

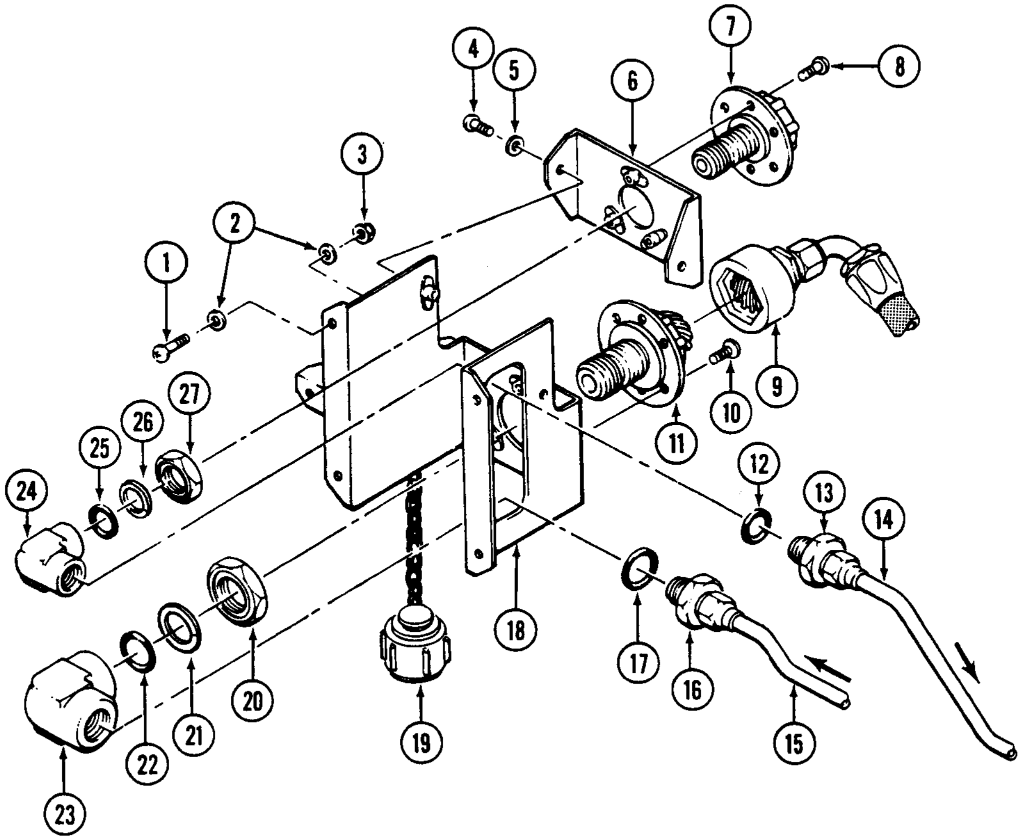
a. Any cracks or damaged threads to test coupling or attaching components requires replacement of part.

b. No corrosion allowed to interior areas of coupling half, fittings or tube assemblies. Replace corroded parts. No corrosion allowed on threaded area of parts.

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Zinc chromate or epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

c. Minor corrosion on exterior surfaces of tube assemblies, fittings, brackets or coupling halves is allowed, provided damaged area are polished out



1. Screw
2. Washer
3. Nut
4. Screw
5. Washer
6. Bracket
7. Coupling half
8. Screw
9. Coupling half
10. Screw
11. Coupling half
12. Preformed packing
13. Fitting
14. Tube assembly
15. Tube assembly
16. Fitting
17. Preformed packing
18. Bracket
19. Cap assembly
20. Nut
21. Ring
22. Preformed packing
23. Fitting
24. Fitting
25. Preformed packing
26. Ring
27. Nut

UH-1H-II-M-07-5

Figure 7-5. Hydraulic test connections — removal and installation with 600 grit abrasive cloth or paper (C-423), treated with chemical film material (C-100), followed with a light coat of zinc chromate primer (C-201) or epoxy polyamide primer (C-204).

d. Any evidence of leaks to coupling half requires replacement of part.

e. Replace all preformed packings.

7-36. Installation — Ground Test Connections.

a. Install coupling half (9, figure 7-5) to hose assembly.

b. Position coupling half (11) to bracket (18) and install screws (10).

c. Install nut (20), ring (21), packing (22), and fitting (23) to coupling half (11).

d. Position coupling half (7) to bracket (6) and install screws (8).

e. Install nut (27), ring (26), packing (25), and fitting (24) to coupling half (7).

f. Position bracket (6) to bracket (18) and install screws (4) and washers (5).

g. Install packing (12) on fitting (13). Install fitting (16) to fitting (23).

h. Install packing (17) on fitting (16). Install fitting (18) to fitting (23).

i. Position bracket (18) and install screws (1), washers (2) and nuts (3).

j. Connect tube assembly (14) to fitting (13).

k. Connect tube assembly (15) to fitting (16).

l. Connect coupling half (9) to coupling half (11) and ensure that both coupling halves are locked.

m. Connect cap assembly (19) to coupling half (7) and ensure that cap assembly is locked.

n. Bleed hydraulic system. (Paragraph 7-4.)

o. Check ground test connectors and attaching components for leakage.

p. Close right lower engine cowl. (Chapter 2.)

7-37. RELIEF VALVE.

7-38. Description — Relief Valve. A relief valve (figure 7-6), located on forward side of cargo hook lift beam, relieves system pressure in excess of 1725 psi into the return circuit to prevent damage to the system or components. This relief valve acts as a safety device that monitors system pressure and must not be used to adjust system pressure.

7-39. Removal — Relief Valve.

a. Remove access door. (Chapter 2.)

b. Remove lockwire from electrical connectors (3 and 4, figure 7-6) and remove connectors.

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

c. Provide a suitable container to catch hydraulic fluid. Disconnect tube assemblies (1, 2, 8, and 9) from hydraulic unit and cap all openings.

d. Remove bolts (16) and washers (15).

e. Remove bolts (21) and washers (20).

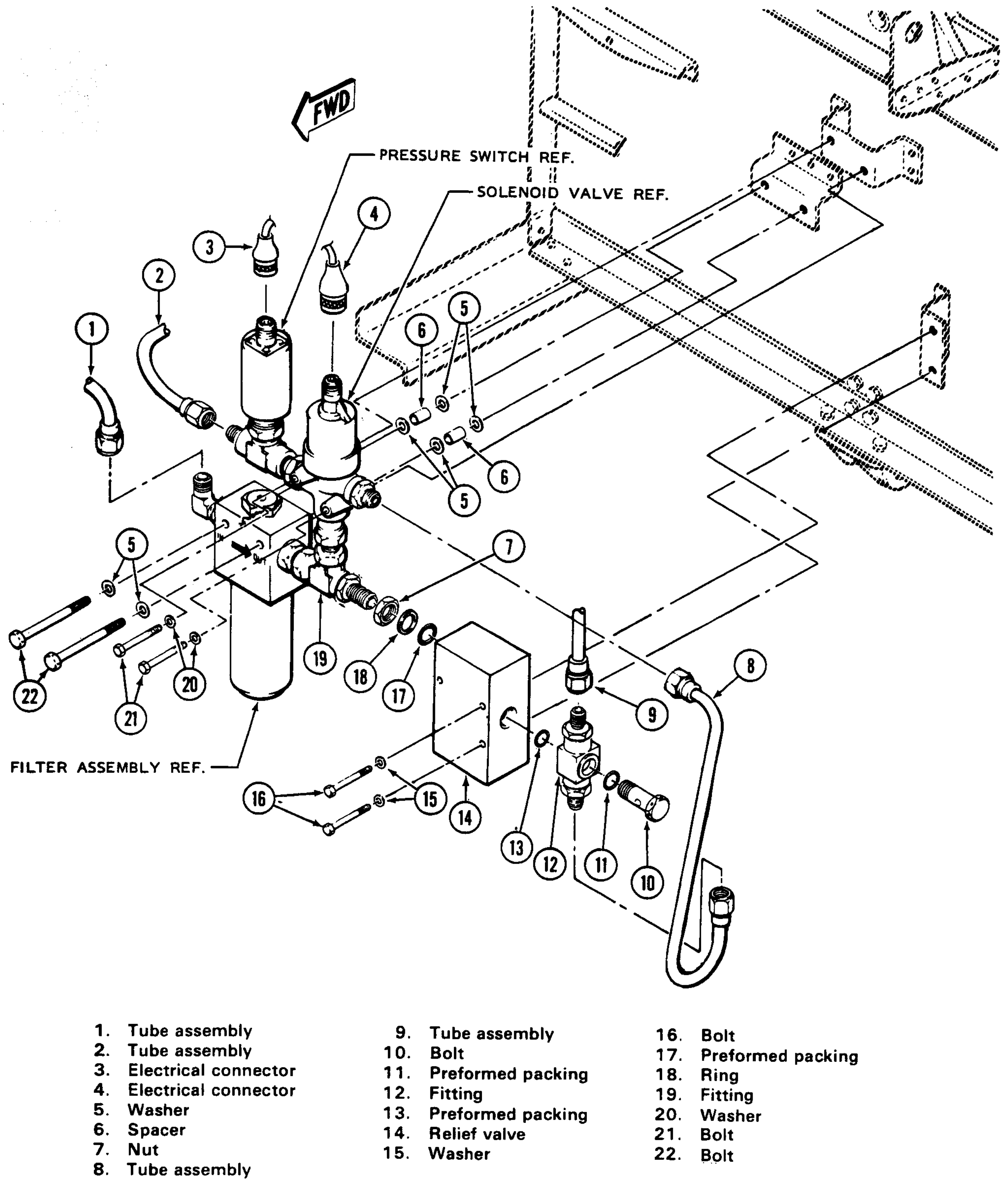
f. Remove bolts (22), washers (5), and spacers (6) attaching filter assembly to lift beam and remove filter assembly.

g. Place hydraulic unit on workbench. Remove lockwire from bolt (10). Remove bolt (10), performed packing (11), fitting (12), and preformed packing (13) from relief valve (14).

h. Break torque on nut (7) and remove relief valve (14) from hydraulic unit.

i. Remove preformed packing (17) and ring (18) from fitting (19).

j. Cap open ports of valve (14).



1. Tube assembly
2. Tube assembly
3. Electrical connector
4. Electrical connector
5. Washer
6. Spacer
7. Nut
8. Tube assembly
9. Tube assembly
10. Bolt
11. Preformed packing
12. Fitting
13. Preformed packing
14. Relief valve
15. Washer
16. Bolt
17. Preformed packing
18. Ring
19. Fitting
20. Washer
21. Bolt
22. Bolt

UH-1H-II-M-07-6

Figure 7-6. Hydraulic relief valve — removal and installation

7-40. Inspection — Relief Valve.

a. Visually inspect relief valve (14, figure 7-6), bolt (10) and fitting (12) for cracks, deep gouges or scratches.

b. Visually inspect relief valve (14) and bolt (10) for thread damage or corrosion.

c. Visually inspect tube assemblies for nicks, scratches, thread damage, dents, or corrosion.

d. Visually inspect relief valve for evidence of leakage.

7-41. Repair or Replacement — Relief Valve.

a. Replace packings (11, 13, and 17, figure 7-6) and ring (18).

b. Replace relief valve (14) when malfunction occurs.

c. Any cracks to relief valve (14), bolt (10), and fitting (12) requires replacement of part.

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Zinc chromate or epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

d. Minor corrosion, scratches, or gouges to the external surface of relief valve are allowed, provided damaged areas are polished out with 600 grit abrasive cloth or paper (C-423) to original finish and treated with chemical film material (C-100) followed with a light brush application of primer (C-201 or C-204).

e. Replace bolt (10), fitting (12), or relief valve (14) when corrosion exists in internal area of components.

f. Any corrosion damage to threaded areas of parts requires replacement of part.

g. Any evidence of leakage to the relief valve (14) requires replacement of part.

7-42. Test Procedure — Relief Valve.

Refer to paragraph 7-4 for test procedures.

7-43. Installation — Relief Valve.

a. Install ring (18, figure 7-6) and packing (17) to fitting (19).

b. Remove protective covers from ports of relief valve (14) and thread relief valve onto fitting (19). Tighten nut (7) against relief valve.

c. Install packing (11), fitting (12), and packing (13) on bolt (10). Install bolt and assembled parts to port of relief valve (14). Secure bolt (10) with lockwire (C-405).

d. Position hydraulic unit to forward side of cargo hook lift beam and install bolts (21) and washers (20).

e. Install bolts (16) and washers (15) to relief valve (14) and bracket on cargo lift beam.

f. Install bolts (22), washers (5), and spacers (6) to filter assembly and bracket on cargo lift beam.

g. Remove protective dust covers and connect tube assemblies (1, 2, 8, and 9).

h. Connect electrical connector (3) to pressure switch and secure with lockwire (C-405).

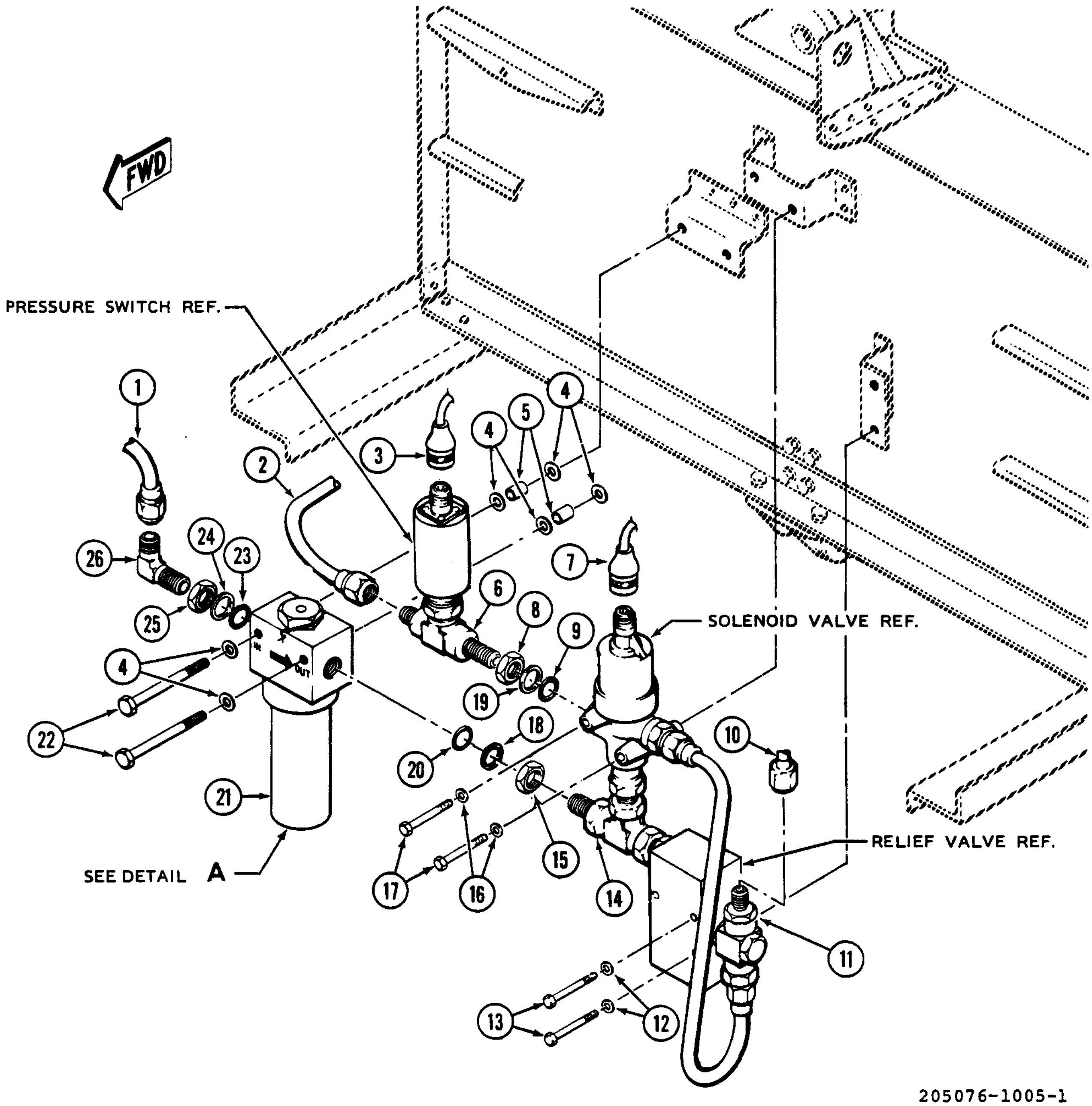
i. Connect electrical connector (4) to solenoid valve and secure with lockwire (C-405).

j. Install upper access panel and soundproofing blanket. (Chapter 2.)

7-44. HYDRAULIC FILTER ASSEMBLY.

7-45. Description — Hydraulic Filter Assembly.

The hydraulic filter assembly (21, figure 7-7) has a cleanable filter element with a filtering capacity of at least 15 microns absolute. A red indicator rises when differential pressure across the element exceeds 70 plus or minus 10 psi. The indicator button is visible through a window on the pylon island in the cabin area. The filter assembly is located on forward side of cargo hook lift beam.



1. Tube assembly
2. Tube assembly
3. Electrical connector
4. Washers
5. Spacers
6. Fitting
7. Electrical connector
8. Nut
9. Preformed packing
10. Tube assembly
11. Fitting
12. Washers
13. Bolts
14. Fitting
15. Nut
16. Washers
17. Bolts
18. Preformed packing
19. Ring
20. Preformed packing
21. Filter assembly
22. Bolts
23. Preformed packing
24. Ring
25. Nut
26. Fitting

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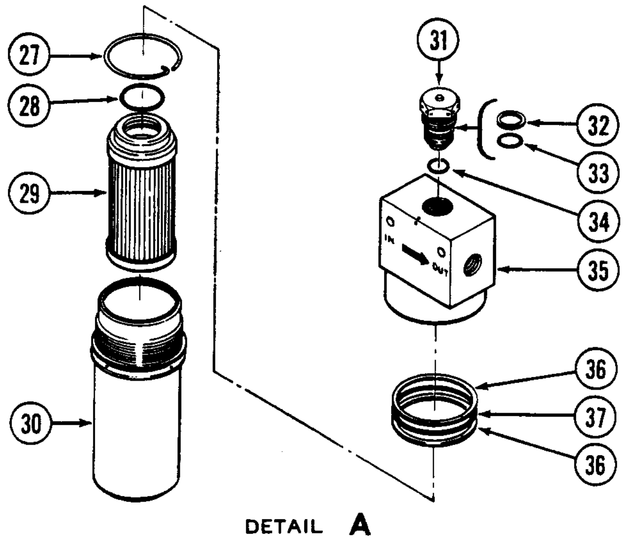
Figure 7-7. Hydraulic filter assembly — removal and installation (Sheet 1 of 2)



27. Retainer
28. Preformed packing
29. Element assembly
30. Bowl
31. Indicator assembly
32. Back up ring
33. Preformed packing
34. Preformed packing
35. Head assembly
36. Back up ring
37. Preformed packing

UH-1H-II-M-07-7-2

Figure 7-7. Hydraulic filter assembly — removal and installation (Sheet 2 of 2)

7-46. Removal — Hydraulic Filter Assembly.

a. Remove filter assembly (21, figure 7-7) as follows:

(1) Remove access door. (Chapter 2.)

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

CAUTION

Ensure protective covers are installed on all open ports to prevent entry of foreign material.

(2) Provide a suitable container to catch hydraulic fluid. Disconnect tube (1 and 2, figure 7-7).

(3) Disconnect tube assembly (10). Cover all open ports.

(4) Remove lockwire from electrical connectors (3 and 7) and remove electrical connectors.

(5) Remove bolts (13) and washers (12) attaching relief valve to bracket on lift beam.

(6) Remove bolts (22), washers (4), and spacers (5) attaching filter assembly (21) to bracket on lift beam.

(7) Remove bolts (17) and washers (16) attaching solenoid valve to bracket and remove filter assembly and attached components.

(8) Place assembly on workbench. Break torque on nut (8). Remove fitting (6) and pressure switch from solenoid valve. Remove preformed packing (9), ring (19), and nut (8) from fitting (6).

(9) Break torque on nut (15) and remove filter assembly (21) from fitting (14).

(10) Remove preformed packing (20), ring (18), and nut (15) from fitting (14).

(11) Break torque on nut (25) and remove fitting (26) from filter assembly (21). Remove preformed packing (23), ring (24), and nut (25) from fitting (26).

(12) When replacement or cleaning of filter element is required, disassemble filter assembly as follows:

(a) Remove lockwire from bowl (30, figure 7-7).

(b) Provide a suitable container and place container under filter assembly. Turn bowl (30) counterclockwise and remove bowl/element from head assembly (35).

(c) Drain fluid from bowl (30). Remove retainer (27) and element (29) from bowl.

(d) Remove preformed packing (28) from element (29).

(e) Remove two backup rings (36) and preformed packing (37) from head assembly (35).

(13) If indicator assembly (31) is being replaced, remove indicator assembly as follows:

(a) Remove lockwire from indicator assembly (31) and remove indicator assembly from head assembly (35).

(b) Remove preformed packings (33 and 34) and backup ring (32) from indicator assembly (31).

7-47. Inspection — Hydraulic Filter Assembly.

a. Inspect filter assembly for internal or external corrosion damage.

b. Inspect filter assembly for security.

c. Inspect filter assembly for cracks. Maximum depth of nicks, scratches, dents and corrosion: 0.015 inch after cleanup. Thread damage: one-third of thread. Length: one-quarter inch cumulative.

d. Inspect ports of filter assembly for thread damage.

e. Disassemble and inspect filter assembly internally for contamination.

f. Inspect attaching components for damage.

WARNING

Dry cleaning solvent is highly flammable with a flash point of 140°F (60°C) and must be used in a well ventilated area. Avoid breathing vapors and do not allow to come in contact with skin or clothing.

NOTE

When ambient temperatures are below minus 20 degrees F (minus 29 degrees C) the indicator buttons may extend.

7-48. Cleaning — Hydraulic Filter Assembly.

a. Cleaning (Exterior). Wipe exterior of filter with a soft cloth dampened with solvent (C-304).

b. Cleaning (Filter element). The filter element is constructed of woven metal fibers and may be cleaned repeatedly providing the element is undamaged. The following methods are procedures that are recommended.

(1) Detergent Cleaning. Filter elements which are removed from the filter module before the differential pressure becomes excessive (Paragraph 7-45) may be cleaned as follows:

(a) Fill the filter cavity with any full strength liquid detergent (bio-degradable) (C-355).

(b) Reverse flush filter element with clean, warm water to remove detergent from filter element.

(c) Thoroughly flush filter until rinse water is clear.

(d) Dry filter element with filtered air or in an oven at 120°F (49°C).

(e) Store filter element in plastic bag until ready to use.

(2) Solvent Cleaning. Filter elements may be cleaned as follows:

(a) Using vigorous agitation, remove surface soil and residual system fluid from filter element, three times, with cold, solvent (C-304), trichloroethane (C-334), JP4 fuel (C-003), or hydraulic fluid (C-002).

(b) Dry filter element with filtered air or nitrogen.

(c) Store filter element in plastic bag until ready to use.

7-49. Repair or Replacement — Hydraulic Filter Assembly.

NOTE

The filter element (29, figure 7-7) is rated at 15 micron. It is of metal construction and should not be confused with other 15 micron filters of fiber or paper constriction. The filter element needs to be changed only if the indicator button on the module is tripped or at the 10th Periodic Inspection. Filter element is cleanable and should not be discarded unless the mesh is penetrated or the filter element is otherwise rendered unusable. The filter element may be cleaned by chemical or detergent cleaning methods. (Paragraph 7-48.)

NOTE

The filter element shall be considered unserviceable if it is cracked, torn, separated, deteriorated, corroded, crushed or collapsed.

a. If the red indicator button extends, remove the filter element, inspect, and if serviceable, reinstall. Reset the button and operate the hydraulic system until normal operating temperature is obtained. If the red indicator button extends again, the filter element will be considered unserviceable and will be removed and replaced with a serviceable element.

NOTE

The differential pressure indicator actuates at 70 ± 10 PSID across filter element. Indicator is inoperative below 35° ± 15°F.

b. If the red indicator for button on the differential pressure indicator extends with known serviceable filter element, replace filter assembly.

c. Replace all preformed packings and backup rings.

d. Replace filter assembly when evidence of corrosion exists in internal area of filter.

e. Check for proper security of filter assembly.

f. Any cracks to the filter assembly requires replacement of part. Replace without repair.

g. Contamination: Flush hydraulic system and replace all filter elements.

7-50. Installation — Hydraulic Filter Assembly.

a. Install filter (21, figure 7-7) as follows:

NOTE

If cleaning or replacement of filter element (29, figure 7-7) or replacement of indicator assembly (31) was required, assemble filter assembly (21) in accordance with preceding step a. (1).

(1) Install nut (25), ring (24), and packing (23) on fitting (26) and install fitting to IN port of filter assembly (21).

(2) Install nut (15), ring (18), and preformed packing (20) on fitting (14).

(3) Thread fitting (14) into OUT port of filter assembly (21) and tighten nut (15) against filter assembly.

(4) Install nut (8), ring (19), and packing (9) on fitting (6). Remove cover from port of solenoid valve and install fitting (6) to solenoid valve. Tighten nut (8) against solenoid valve.

(5) Install bolts (22), washers (4), and spacers (5) to filter assembly (21). Position assembled hydraulic unit to forward side of cargo lift beam and temporarily secure (finger tight) two bolts (22).

(6) Temporarily install (finger tight) bolt (17) and washers (16) to solenoid valve.

(7) Temporarily install (finger tight) bolts (13) and washers (12) to relief valve.

(8) Secure bolts (13, 17, and 22).

(9) Remove covers from connectors of tube assemblies (1, 2, and 10).

(10) Install tube assembly (1) to fitting (26).

(11) Install tube assembly (2) to fitting (6).

(12) Install tube assembly (10) to fitting (11).

(13) Install electrical connector (3) to pressure switch and secure electrical connector with lockwire (C-405).

(14) Install electrical connector (3) to pressure switch and secure electrical connector with lockwire (C-405).

(15) Install electrical connector (7) to solenoid valve and secure electrical connector with lockwire (C-405).

(16) Service and bleed hydraulic system. (Paragraph 7-4.)

(17) Install access door. (Chapter 2.)

7-51. PRESSURE SWITCH.

7-52. Description — Pressure Switch. A pressure switch is provided in the hydraulic system pressure line to sense the system pressure. The pressure switch closes a circuit to the caution panel when pressure is at 1000 psig decreasing pressure, and the HYD PRESSURE caution light and master caution light will then be illuminated. The pressure switch should open at 1200 plus or minus 100 psig increasing pressure.

7-53. Removal — Pressure Switch.

a. Remove access door. (Chapter 2.)

b. Ensure that all electrical power is OFF.

c. Remove lockwire and electrical connector (1, figure 7-8) from pressure switch.

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

d. Position a small container under pressure switch (2) and remove pressure switch from fitting.

e. Remove preformed packing (3) from pressure switch (2).

f. Install protective dust cover to open ports of pressure switch and fitting.

7-54. Inspection — Pressure Switch.

a. Inspect pressure switch (2, figure 7-8) for evidence of fluid leakage.

b. Inspect pressure switch (2) for corrosion (internally and externally). No internal corrosion allowed. Maximum depth of corrosion after cleanup is 0.020 inch.

c. Inspect pressure switch (2) for cracks or thread damage. No cracks allowed. Maximum thread damage: Depth — one third of thread, Length — one quarter inch cumulative.

d. Maximum depth of nicks and scratches 0.010 inch after cleanup. No dents allowed.

e. Inspect pressure switch (2) for security.

7-55. Repair or Replacement — Pressure Switch.

a. Any evidence of leakage to body of pressure switch (2, figure 7-8) requires replacement of part.

b. Replace packing (3).

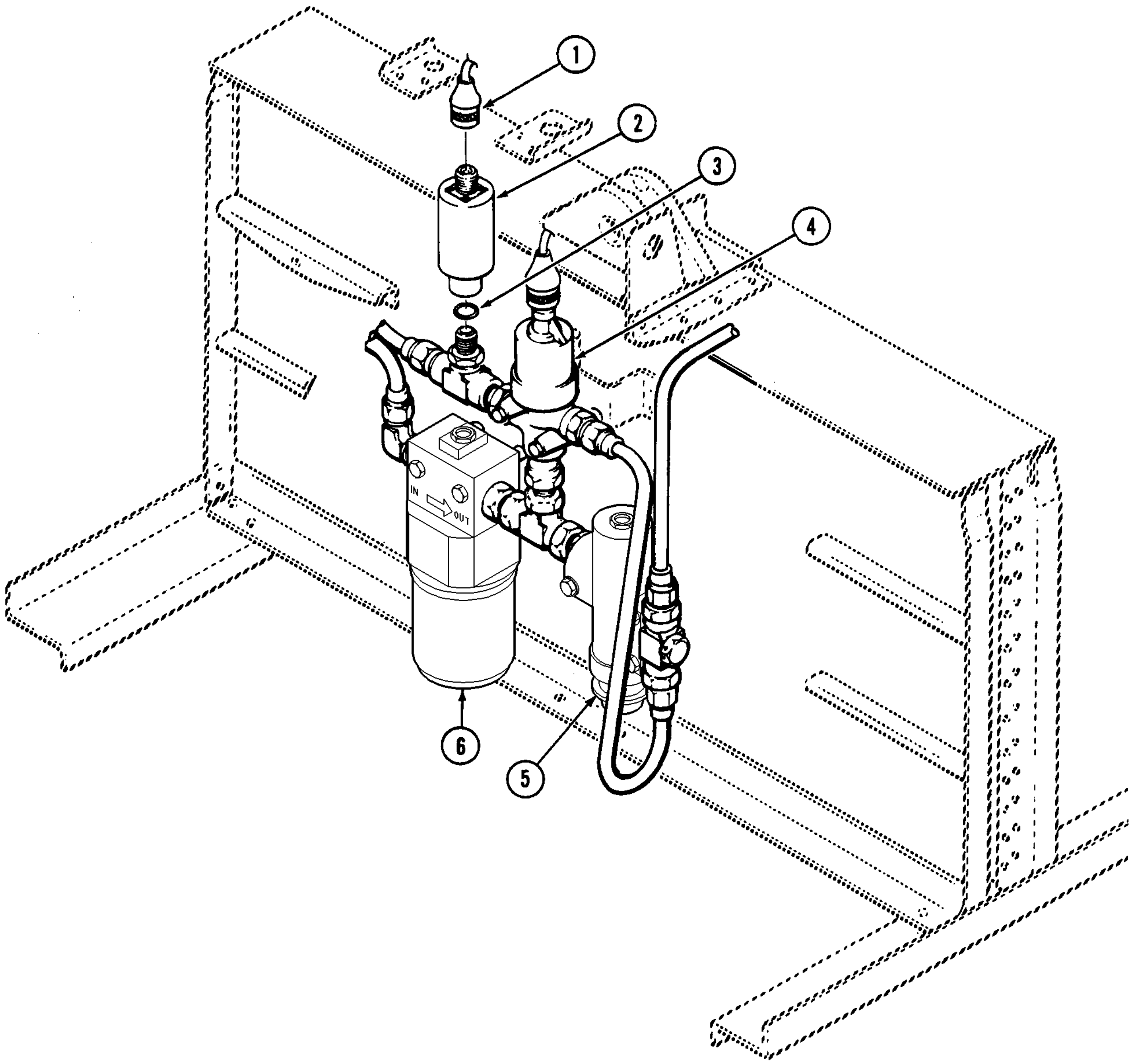
c. Any corrosion to internal area or threads of pressure switch (2) requires replacement of part. No repairs allowed.

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Zinc chromate or epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

d. Polish corrosion, nicks, or scratches to external area of pressure switch (2) in accordance with limits in paragraph 7-54 with 600 grit abrasive cloth or paper (C-423) to original finish and touch-up with chemical film material (C-100) followed with a light application of zinc chromate primer (C-201) or epoxy polyamide primer (C-204).

e. Cracks, or malfunction to the pressure switch (2) requires replacement of part. No repairs allowed.



1. Electrical connector
2. Pressure switch
3. Preformed packing
4. Solenoid valve
5. Relief valve
6. Filter assembly

UH-1H-II-M-07-8

Figure 7-8. Hydraulic pressure switch — removal and installation

f. Any dents to pressure switch (2) requires replacement of part. No repair allowed.

g. When replacing pressure switch, ensure proper security.

7-56. Test Procedures — Pressure Switch. Perform operational check of pressure switch (2). (Paragraphs 7-3 and 7-4.)

7-57. Installation — Pressure Switch.

a. Remove protective covers from ports of pressure switch (2, figure 7-8) and fitting.

b. Install packing (3) to fitting.

c. Install pressure switch (2) to fitting.

d. Install electrical connector (1) to pressure switch and secure with lockwire (C-405).

e. Install access door. (Chapter 2.)

7-58. SOLENOID VALVE.

7-59. Description — Solenoid Valve. A solenoid valve is provided in the hydraulic system as a shutoff valve. When the hydraulic control switch is on, this valve is open and system pressure is supplied to all four of the flight control cylinders.

a. Remove access door. (Chapter 2.)

b. Ensure that all electrical power is off.

c. Remove relief valve (paragraph 7-39) and filter assembly (paragraph 7-46).

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

d. Break torque on nut (11, figure 7-9) and remove solenoid valve (3) from fitting (12).

e. Remove preformed packing (8) and ring (9) from fitting (12).

f. Break torque on nut (14) and remove valve (3) from fitting (13).

g. Remove preformed packing (5) and ring (4) from fitting (13).

h. Remove fitting (7) and preformed packing (6) from valve (3).

i. Install protective covers on open ports of valve (3).

7-61. Inspection — Solenoid Valve.

a. Inspect valve (3, figure 7-9) for cracks. No cracks allowed.

b. Inspect internal and external areas for corrosion damage.

c. Inspect for nicks, scratches or thread damage.

d. Inspect for security.

7-62. Repair or Replacement — Solenoid Valve.

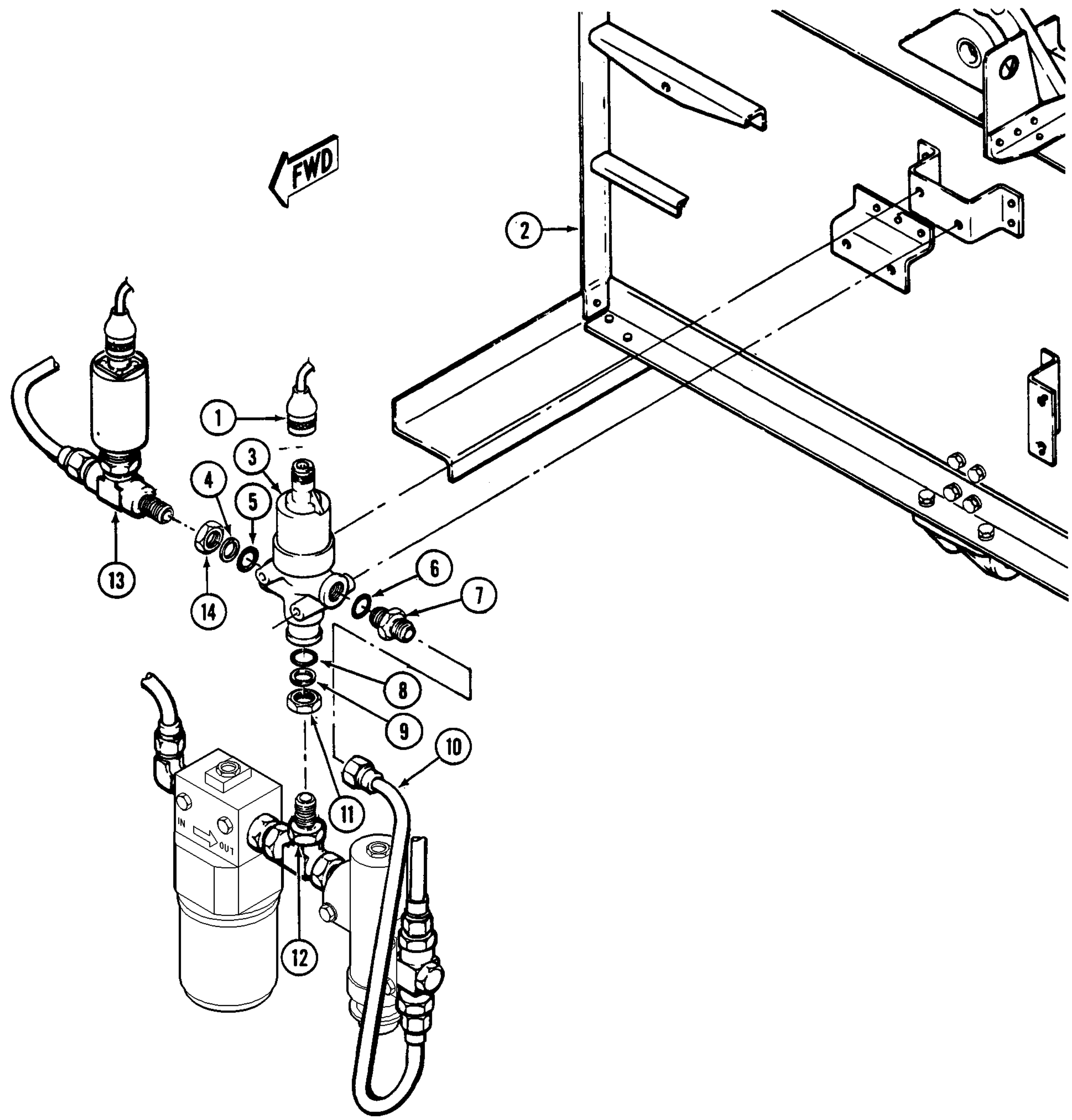
a. Any cracks to solenoid valve (3, figure 7-9) requires replacement of part.

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Zinc chromate or epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

b. Corrosion damage to internal area or threads of valve (3) requires replacement of part. Minor corrosion, scratches or nicks, to external area of solenoid valve is acceptable, provided damage is completely polished to original finish with 600 grit sandpaper (C-423), touched up with chemical film material (C-100), followed with a coat of primer (C-201 or C-204).

c. Replace valve (3) when malfunction exists.



1. Electrical connector
2. Lift beam
3. Solenoid valve
4. Ring
5. Preformed packing
6. Preformed packing
7. Fitting
8. Preformed packing
9. Ring
10. Tube assembly
11. Nut
12. Fitting
13. Fitting
14. Nut

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Figure 7-9. Hydraulic solenoid valves — removal and installation

7-63. Test Procedures — Solenoid Valve. Perform functional check of solenoid valve (3, figure 7-9) during next runup, refer to BHT PUB-92-004-10.

7-64. Installation — Solenoid Valve.

a. Install valve (3, figure 7-9) as follows:

(1) Install packing (6) on fitting (7) and install fitting to port of valve (3).

(2) Install nut (14), ring (4), and packing (5) to fitting (13). Position fitting (with pressure switch up) and install fitting to port of valve and secure nut (14).

(3) Install nut (11), ring (9), and packing (8) to fitting (12).

(4) Install solenoid valve to fitting (12) and secure nut (11) against bottom of valve.

(5) Install to forward side of lift beam (paragraph 7-43) and install filter assembly (paragraph 7-50).

7-65. PRESSURE REDUCING VALVE.

7-66. Description — Pressure Reducing Valve. A pressure reducing valve is provided in the hydraulic system to reduce the 1500 PSI System pressure to 1000 PSI for the collective and directional actuators.

7-67. Removal — Pressure Reducing Valve.

a. Remove access door. (Chapter 2.)

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

b. Position a small container under pressure reducing valve to catch fluid.

c. Remove and cap tube assemblies (2, 3, 4, and 5, figure 7-10).

d. Remove bolts (6), washers (7), and spacers (8).

e. Remove fitting reducer (9) and preformed packing (10).

f. Remove fitting (tee) (11), preformed packing (12), retainer (13), and nut (14).

g. Remove fitting (elbow) (15), preformed packing (16), and retainer (17).

h. Install protective covers on open ports of valve.

7-68. Inspection — Pressure Reducing Valve.

a. Visually inspect pressure reducing valve (1, figure 7-10), bolt (6) and fittings (9, 11, and 15) for cracks, deep gouges or scratches.

b. Visually inspect pressure reducing valve (1) and bolt (6) and fittings (9, 11, and 15) for thread damage or corrosion.

c. Visually inspect tube assemblies (2, 3, 4, and 5) for nicks, scratches, thread damage, dents or corrosion.

d. Visually inspect pressure reducing valve for evidence of leakage.

7-69. Repair or Replacement — Pressure Reducing Valve.

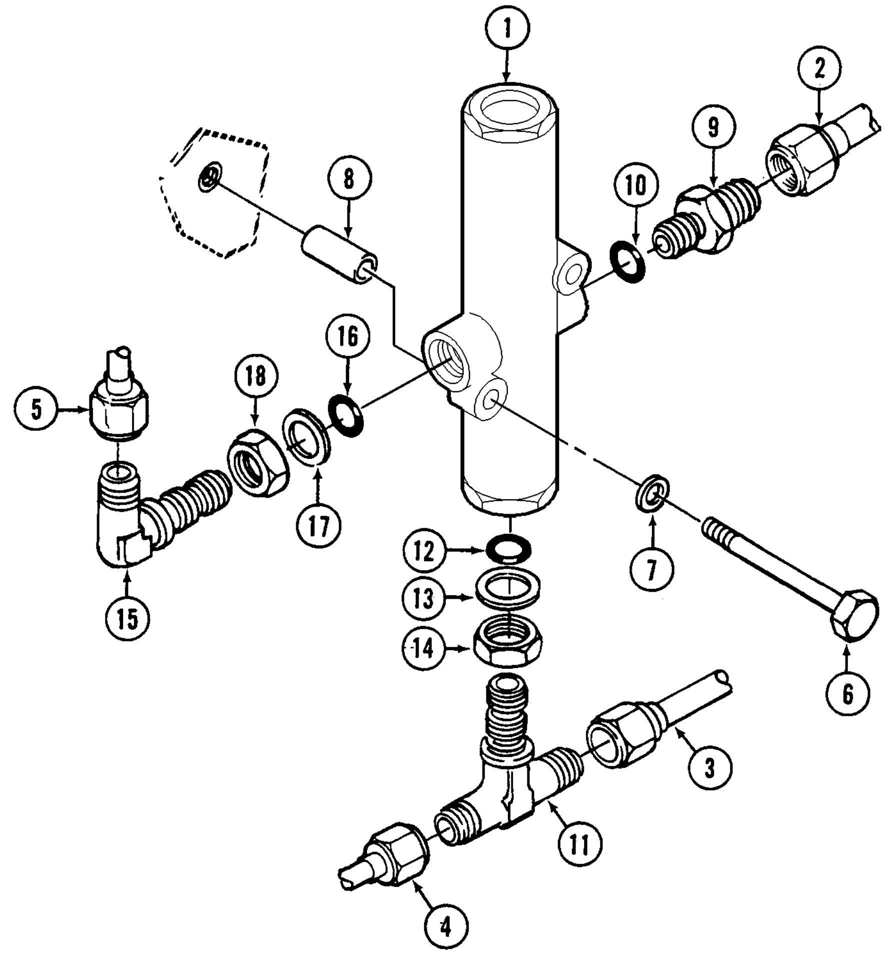
a. Replace packings (10, 12, and 16, figure 7-10) and rings (13 and 17).

b. Any cracks to pressure reducing valve (1), bolt (6), and fitting (9, 11, and 15) requires replacement.

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Zinc chromate or epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

c. Minor corrosion, scratches or gouges to the external surface of pressure reducing valve are



1. Pressure reducing valve
2. Tube assembly
3. Tube assembly
4. Tube assembly
5. Tube assembly
6. Bolt
7. Washer
8. Spacer
9. Reducer
10. Preformed packing
11. Tee
12. Preformed Packing
13. Ring
14. Nut
15. Fitting
16. Preformed packing
17. Ring
18. Nut

UH-1H-II-M-07-10

Figure 7-10. Pressure reducing valve — removal and installation allowed, provided damaged areas are polished out with 600 grit sandpaper to original finish and treated with chemical film material (C-100) followed with a light brush application of primer (C-201 or C-204).

d. Replace pressure reducing valve (1) or fittings (9, 11, and 15) when corrosion exists in internal area of components.

e. Any corrosion damage to threaded areas of parts requires replacement of part.

f. Any evidence of leakage to the pressure reducing valve (1) requires replacement of part.

7-70. Installation — Pressure Reducing Valve.

NOTE

All fluid connections will be properly torqued in accordance with table 7-3.

a. Remove protective covers from ports of valve (1, figure 7-10).

b. Install nut (18), retainer (17), and preformed packing (16) on fitting (elbow) (15) and install on valve (1).

c. Install nut (14), retainer (13), and preformed packing (12) on fitting (tee) (11) and install on valve (1).

d. Install preformed packing (10) on fitting reducer (9) and install on valve (1).

e. Position assembled valve. Install bolts (6), washers (7), and spacers (8).

f. Remove protective caps and install tube assemblies (5, 4, 3, and 2).

g. Service and bleed hydraulic system. (Paragraph 7-4.)

h. Install access door. (Chapter 2.)

7-71. SERVO ACTUATOR VALVE.

7-72. Description — Servo Actuator Valve. The collective pitch and fore and aft lateral cyclic control linkage can be divided into pilot-operated linkage and hydraulically-operated linkage. The pilot-operated linkage terminates at the servo actuator valve (figure 7-11) when hydraulic power is ON. Overhaul of the valve is not authorized.

7-73. Inspection — Servo Actuator Valve.

a. Inspect servo valve (figure 7-11) assembly in accordance with TM 55-1650-294-40 and Paragraph 7-80.

b. Inspect for leakage.

c. Inspect for nicks, scratches, or thread damage. (Paragraph 7-80.)

d. Inspect for cracks. No cracks allowed.

e. Visually inspect internal area of ports and external surfaces of servo valve for corrosion damage.

f. Inspect valve and attaching components for security. Check selector set for sticking or binding.

g. Inspect lever stop for distortion.

7-74. HYDRAULIC CYLINDER ASSEMBLY (CYCLIC CONTROL)

7-75. Description — Hydraulic Cylinder Assembly (Cyclic Control). Two hydraulic cylinder assemblies (6 and 33, figure 7-12) are incorporated to reduce effort required for fore and aft and lateral control and to reduce feedback of forces from main rotor.

7-76. Adjustment — Hydraulic Cylinder Assembly (Cyclic Control).

a. Check clevis adjustment of 2.53 inches as shown in figure 7-13.

b. Check overall dimension A adjustment of hydraulic cylinder assembly as shown in figure 7-13.

c. After final adjustment of length has been accomplished, seal thread area A around top of nut (adjacent to clevis) with adhesive (C-308).

d. Final adjustment of hydraulic cylinder will be made concurrent with rigging. (Chapter 11.)

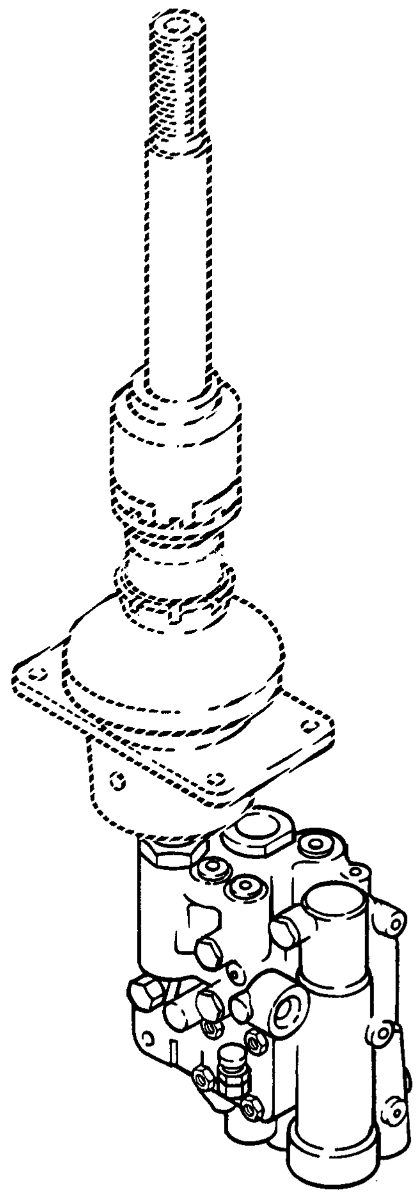


Figure 7-11. Hydraulic servo actuator valve

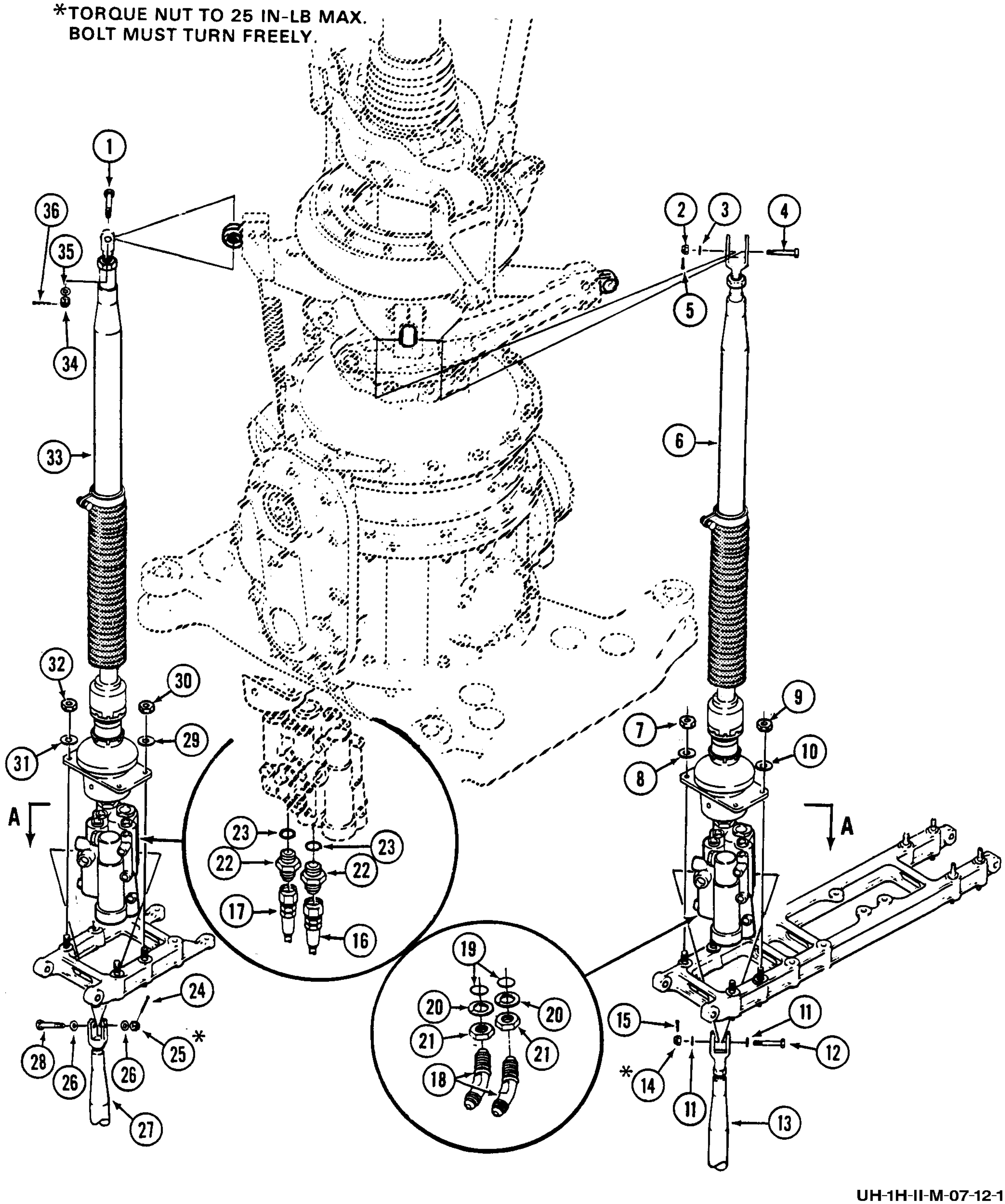
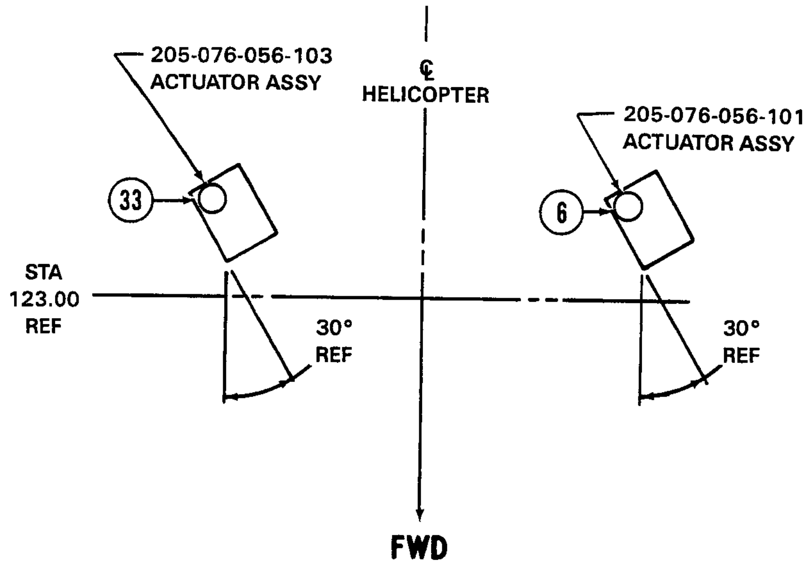


Figure 7-12. Hydraulic cylinder assemblies (fore and aft and lateral cyclic controls) — removal and installation (Sheet 1 of 2)

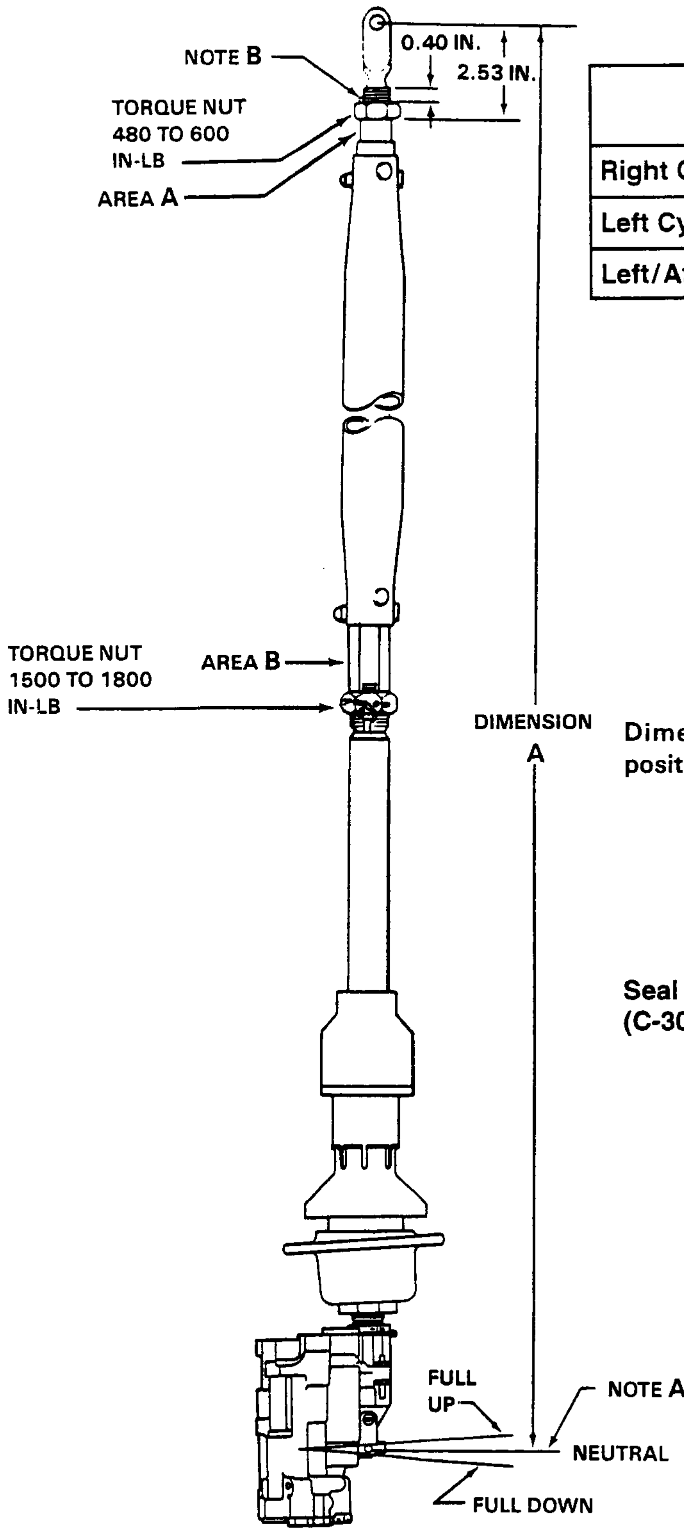


VIEW A-A
LOOKING DOWN CYLINDER AXIS

1.	Bolt	10.	Washer	19.	Preformed packing	28.	Bolt
2.	Nut	11.	Washer	20.	Retainer	29.	Washer
3.	Washer	12.	Bolt	21.	Nut	30.	Nut
4.	Bolt	13.	Control tube	22.	Servo actuator valve	31.	Washer
5.	Cotter pin	14.	Nut	23.	Preformed packing	32.	Nut
6.	Hydraulic cylinder	15.	Cotter pin	24.	Cotter pin	33.	Hydraulic cylinder
7.	Nut	16.	Hose assembly	25.	Nut	34.	Nut
8.	Washer	17.	Hose assembly	26.	Hose assembly	35.	Washer
9.	Nut	18.	Fittings	27.	Control tube	36.	Cotter pin

UH-1H-II-M-07-12-2

Figure 7-12. Hydraulic cylinder assemblies (fore and aft and lateral cyclic controls) — removal and installation (Sheet 2 of 2)



ASSEMBLY	DIMENSION A (INCHES)	±
Right Cylinder (Cyclic)	53.72	.03
Left Cylinder (Cyclic)	53.47	.03
Left/Aft Cylinder (Collective)	48.10	.03

NOTE A

Dimension A is obtained with valve in neutral position.

NOTE B

Seal thread area and witness hole with adhesive (C-308) after final adjustment.

UH-1H-II-M-07-13

Figure 7-13. Hydraulic cylinder adjustment dimensions

7-77. Inspection — (Acceptance/Rejection Criteria) Hydraulic Cylinder Assembly (Cyclic Control).

NOTE

Perform the following inspection functions with hydraulic cylinder assembly installed.

a. Inspect all parts of hydraulic cylinder assemblies (6 and 33, figure 7-12) for damage, corrosion or pitting, and distorted threads. (Paragraph 7-80 and Table 7-5.)

b. Inspect piston rods of hydraulic cylinder assemblies (6 and 33) for nicks, scratches, cracks, and evidence of scoring. Check for smooth operation with cylinders. (Paragraph 7-80.)

c. Inspect housing (10, figure 7-14) for looseness, wear and proper installation. There must be no indication of binding.

d. Inspect hydraulic cylinder assemblies (6 and 33, figure 7-12) for security.

e. Inspect hydraulic cylinder assemblies (6 and 33) for evidence of leakage. (Refer to table 7-1.)

f. Inspect protective boot for cuts, holes, tears and deterioration. Replace boot if any of the above are evident. If shield is dirty or oil soaked, remove boot (paragraph 7-79) and wash inside and outside of boot with a mild detergent and warm water.

NOTE

The actuator assembly uses bearing Part No. KSP 6099-1. This bearing does not require the spring scale torque check. The required friction has been built into this bearing during manufacture and it requires no additional adjustment. The bearing is designed to gimbal freely, thus does not have the characteristic tightness of the uniball bearing which requires the spring scale torque test. The rotational freedom of the KSP 6099-1 bearing should not be interpreted as wear and the axial movement should not be considered as excessive unless feedback is felt in the controls. The bearing requires no lubrication and plugs should be installed in the grease fitting (11) holes.

g. Disconnect hydraulic cylinders (6 and 33, figure 7-12) from the swashplate and control tubes (13 or 27). (Paragraph 7-78.)

NOTE

It is permissible for the main rotor cylinder barrel to turn within the housing assembly, providing there is no vertical movement of the barrel. When vertical movement is detected, replace hydraulic cylinder assembly. (Paragraph 7-78 and 7-84.)

h. Inspect linkage part for wear, elongated bolt holes, cracks, nicks, and surface damage.

i. Inspect hydraulic cylinder servo actuator valve for serviceability.

j. Check selector set for sticking or binding.

k. Inspect housing for cracks. No cracks allowed.

l. Inspect lever stop for distortion.

m. Inspect bolts through arm lever for wear and distortion; bolt to be fingertight only.

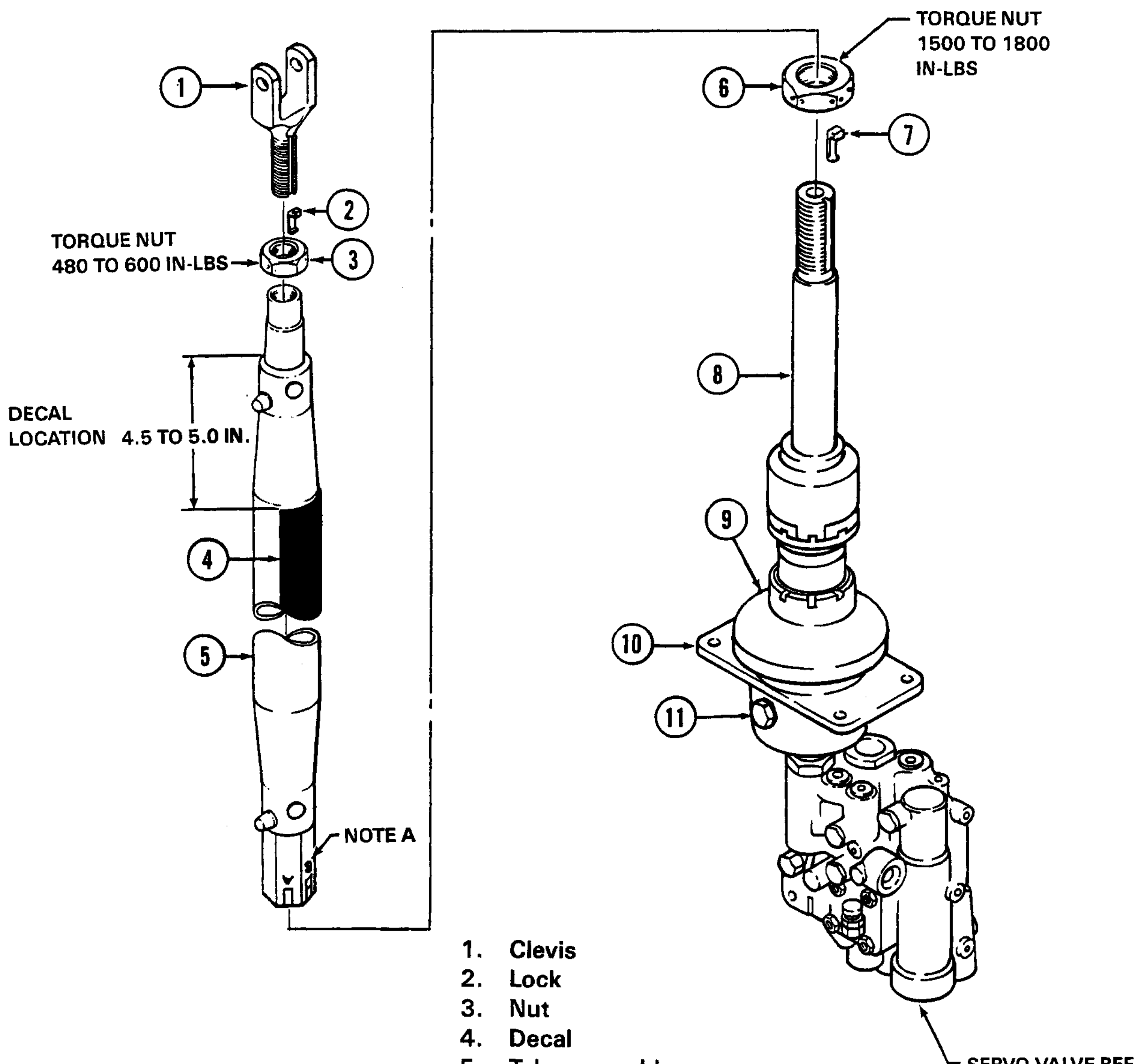
n. Check cotter pins for security.

o. Inspect bearing housing and flange for elongation of holes.

p. Inspect hydraulic cylinder assembly for leaks at all connections and fittings. With power on, seepage around piston rod seals is permissible but not to exceed one drop for every 25 cycles. A cycle is defined as valve position Neutral to full UP to full DOWN to Neutral. (Figure 7-13.)

q. For inspection of the upper cylinder tube (5, figure 7-14), at time of replacement of cyclic control hydraulic cylinder, refer to paragraph 7-83.

r. Inspect moisture seal (sealant) on clevis at top of control tube (5) for looseness or cracking.



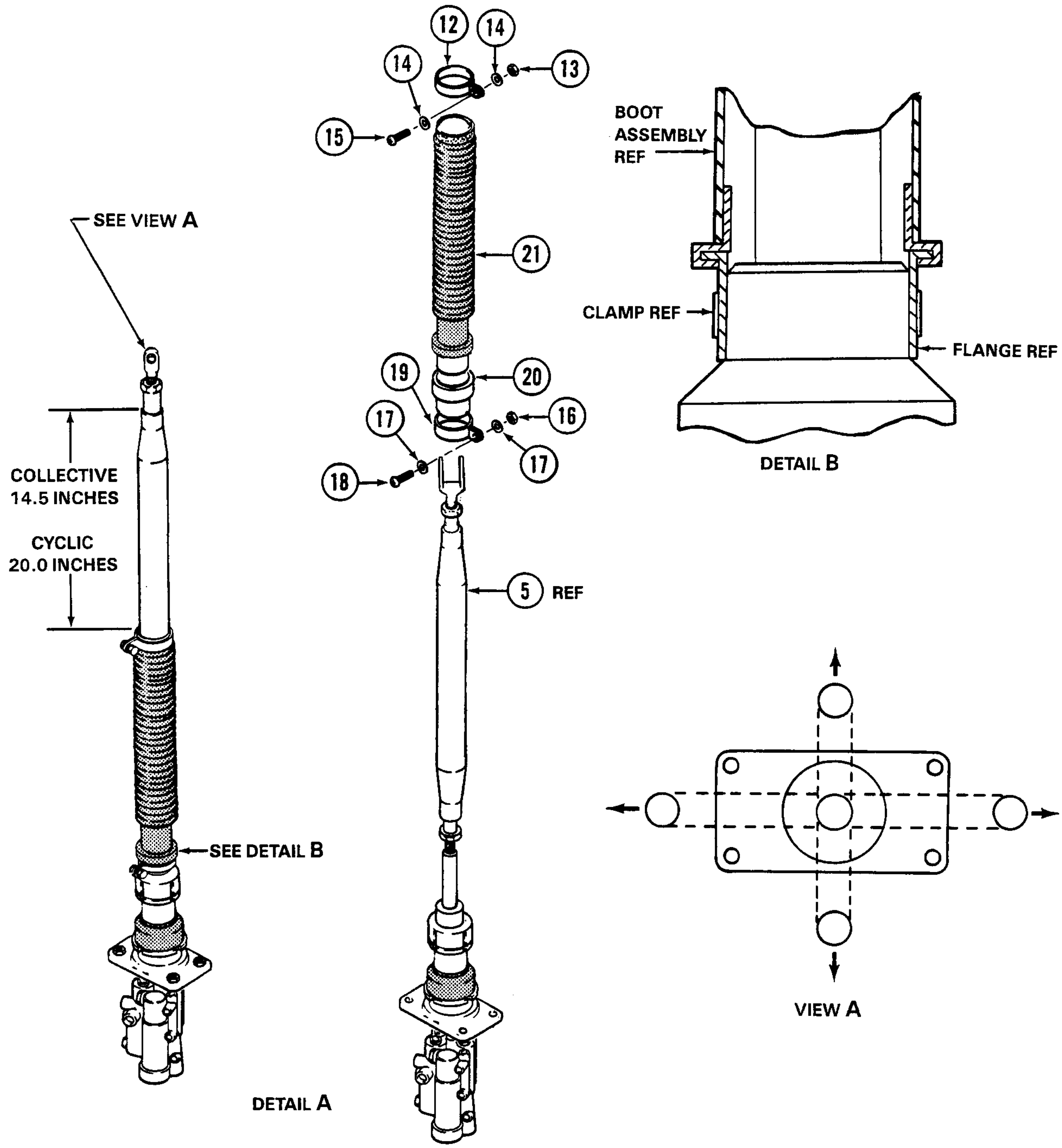
1. Clevis
2. Lock
3. Nut
4. Decal
5. Tube assembly
6. Nut
7. Lock
8. Piston rod
9. Shield
10. Housing
11. Plug

NOTE A

Ensure that the slot labeled ''B'' is used when mating 204-076-267-005 tube assembly with 205-076-055-101 actuator. The slot labeled ''A'' or not identified at all shall not be used at this assembly.

UH-1H-II-M-07-14-1

Figure 7-14. Hydraulic cylinder assembly — disassembly and assembly (Sheet 1 of 2)



12. Clamp
13. Nut
14. Washers
15. Screw
16. Nut
17. Washers
18. Screw
19. Clamp
20. Flange
21. Boot assembly

UH-1H-II-M-07-14-2

Figure 7-14. Hydraulic cylinder assembly — disassembly and assembly (Sheet 2 of 2)

7-78. Removal — Hydraulic Cylinder Assembly (Cyclic Control).

NOTE

Ensure protective covers are installed on all open ports to prevent entry of foreign material.

Premaintenance Requirements for Removal of Hydraulic Cylinder Assembly (Cyclic Control)

CONDITIONS	REQUIREMENTS
Special Tools	None
Test Equipment	None
Support Equipment	Maintenance Work Stands
Minimum Personnel Required	Two
Consumable Materials	None
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated Area

a. Hydraulic Cylinder (6, figure 7-12). Remove hydraulic cylinder assembly in accordance with the following procedures:

(1) Open transmission fairing and left side engine cowls. (Chapter 2.)

(2) Remove soundproofing blankets and left side access doors from pylon island in cabin area. (Chapter 2.)

(3) Remove soundproofing blanket and access door from pylon island in cabin area. (Chapter 2.)

(4) Remove cotter pin (15, figure 7-12), nut (14), washers (11), and bolt (12) from control tube (13) and disconnect control tube from bottom of servo actuator valve.

WARNING

Hydraulic fluid is flammable. Flash point at 200 degrees F (93 degrees C). Avoid prolonged contact with skin or clothing as it will irritate skin or cause a burn. Wash affected area immediately.

NOTE

When disconnecting hydraulic hose assemblies (16 or 17), a small amount of fluid seepage may occur and will require placing a suitable container under fittings of servo actuator valve.

(5) Disconnect hose assemblies (16 ad 17) from fittings (18) of servo actuator valve. Install protective covers on connectors of hose assemblies and fittings.

(6) Install protective covers on open ports of hydraulic servo actuator.

(7) Remove cotter pin (5), nut (21), washer (3), and bolt (4) from clevis of hydraulic cylinder assembly (6).

(8) Remove nuts (9), washers (10), nut (7), and washer (8) attaching hydraulic cylinder (6) to support and remove hydraulic cylinder (6).

b. Hydraulic Cylinder (33, figure 7-12). Remove hydraulic cylinder assembly in accordance with the following procedures:

(1) Open transmission fairing and open right side engine cowls. (Chapter 2.)

(2) Remove soundproofing blankets and right side access doors from pylon island in cabin area. (Chapter 2.)

(3) Remove soundproofing blanket and access door from pylon island in cabin area. (Chapter 2.)

(4) Remove cotter pin (24, figure 7-12), nut (25), washers (26), and bolt (28) from control tube (27) and disconnect control tube from bottom of servo actuator valve.

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate skin or cause a burn. Wash affected area immediately.

NOTE

When disconnecting hydraulic hose assemblies (16 or 17), a small amount of fluid seepage may occur and will require placing a suitable container under fittings of servo actuator valve.

(5) Disconnect hose assemblies (16 and 17) from servo actuator valve. Install protective dust covers to connectors of hose assemblies and fittings.

(6) Remove cotter pin (36), nut (34), washer (35), and bolt (1) from clevis of hydraulic cylinder assembly (33).

(7) Remove three nuts (32), three washers (31), nut (30), and washer (29) attaching hydraulic cylinder (33) to support and remove hydraulic cylinder (33).

7-79. Disassembly — Hydraulic Cylinder Assembly (Cyclic Control). Remove components from hydraulic cylinder (figure 7-14) as follows:

Premaintenance Requirements for Disassembly of Hydraulic Cylinder Assembly

CONDITIONS	REQUIREMENTS
Special Tools	(T111)
Test Equipment	None
Support Equipment	None
Consumable Materials	None
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated Area

NOTE

The extent of disassembly procedures is limited to replacement of boot assembly (21, figure 7-14) and tube assembly (5).

a. Place hydraulic cylinder assembly on a suitable clean workbench in dust free area.

b. Remove lockwire from nuts (3 and 6, figure 7-14).

c. Using a plastic scraper, so as not to damage the threads on clevis (1), clean sealant from top of nut (3) and threads of clevis (1).

d. Mount cylinder assembly in torque adapter (T111) (figure 7-15).

e. Break torque on nut (3) and remove clevis (1), lock (2), and nut (3) from tube assembly (5).

f. Remove nut (13), washers (14), and screw (15) from clamp (12). Remove clamp (12) from boot assembly (21).

g. Remove nut (16), washers (17), and screw (18) from clamp (19). Remove clamp (19) from flange (20).

h. Remove boot assembly (21) and flange (20) from tube assembly (5).

i. Remove nut (6), lock (7), and tube assembly (5) from piston rod (8).

NOTE

Exercise piston rod to discharge residual fluid.

7-80. Inspection — Hydraulic Cylinder Assembly (Cyclic Control).

a. Inspect tube assembly in accordance with the following inspection requirements and limits outlined in figure 7-16 and table 7-5.

(1) Inspect tube assembly (5, figure 7-14) for thread damage, abrasions, and dents. (Figure 7-16.)

(2) Inspect tube assembly (5) for cracks. No cracks allowed.

(3) Inspect installation of tube assembly (5) for security.

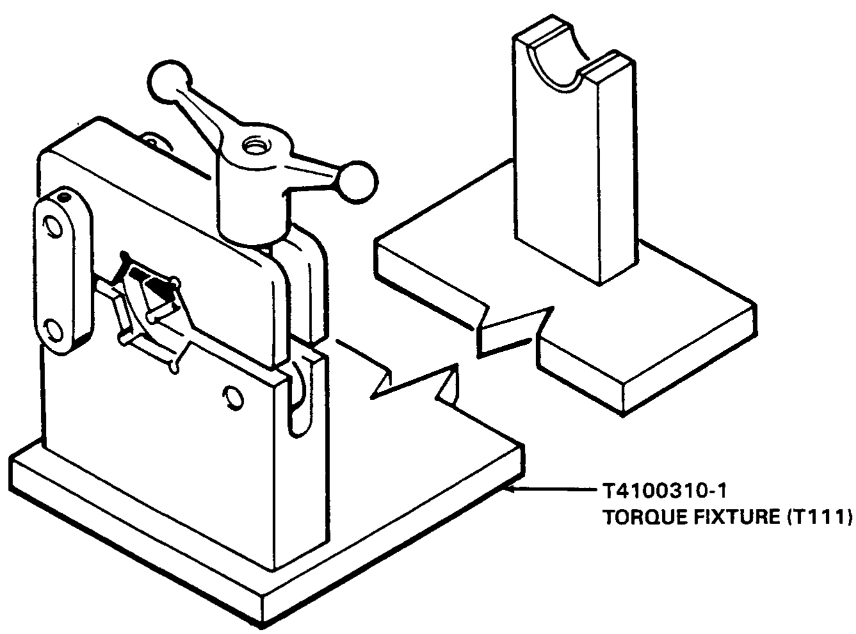
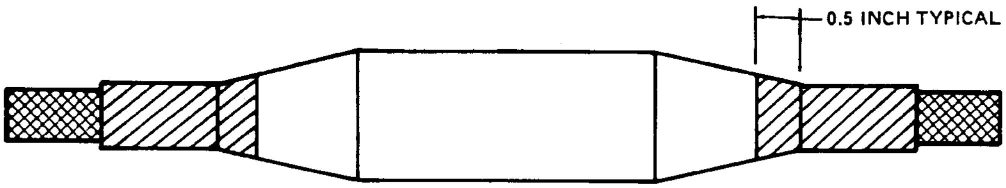


Figure 7-15. Torque fixture — Part No. T41000310-1



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
MECHANICAL BEFORE AND AFTER CLEAN UP	△3	0.005 INCH	0.008 INCH △4
CORROSION BEFORE CLEAN UP AFTER CLEAN UP	△3	0.005 INCH	0.004 INCH 0.008 INCH △5
MAXIMUM AREA PER FULL DEPTH REPAIR	△3	0.10 Sq. IN.	NOT CRITICAL
MAXIMUM NUMBER OF REPAIRS			NOT CRITICAL
EDGE CHAMFER	△3	0.020 INCH	NOT APPLICABLE

THREAD DAMAGE:
- DEPTH: ONE-THIRD OF THREAD
- LENGTH: ONE-QUARTER INCH
- NUMBER: TWO PER SEGMENT

NOTES:

(1) The width of repair at any section shall not exceed one-third of the circumference.

(2) Material: 2024-T4 Al Aly, 1-1/2 OD X 0.083 wall thickness, per WW-T-785, Type 1, Temp-T3.

△3 Critical area — no damage or repair allowed.

△4 Maximum depth of mechanical damage to surface of control tube is 10% of the wall thickness.

△5 Maximum depth of corrosion damage to surface of control tube is 5% before cleanup and 10% after cleanup.

UH-1H-II-M-07-16

Figure 7-16. Tube assembly damage limits — hydraulic cylinder assembly

Table 7-5. Inspection Requirements for Hydraulic Cylinder Assembly

			METHOD OF INSPECTION				REFERENCE PARAGRAPH		
FIGURE 7-	INDEX NO.	NOMENCLATURE	VISUAL	*MAGNETIC PARTICLE	**PENETRANT	TYPICAL DEFECTS	INSPECTION	REPAIR	REMARKS
11		Cylinder Assembly	X			Cracks, corrosion, scratches, thread damage, leaks, bearing looseness and security.	7-80	Refer to TM 55-1650-293-40 and paragraph 7-82.	See figure 7-17.
14	1	Clevis	X	X		Cracks, nicks, scratches, corrosion, thread damage, and security.	7-80	7-82	See figure 7-18.
14	2	Lock	X		X	Cracks, corrosion, or deformed.	7-80	7-82	
14	3	Nut	X	X		Cracks, corrosion, and thread damage.	7-80	7-82	
14	4	Decal	X			Torn or cracked.	7-80	Replace if damaged.	See figure 7-14.
14	5	Tube Assembly	X		X	Cracks, corrosion, bent, thread damage, loose or missing rivets, and deformed.	7-80 and figure 7-16	7-82	See figure 7-16.
14	6	Nut	X	X		Cracks, corrosion, and thread damage.	7-80	Replace if damaged.	
14	7	Lock	X			Cracks, corrosion, or bent.	7-80	Replace if damaged.	See figure 7-14.
14	8	Piston Rod	X			Cracks, corrosion, bent, scratches, and thread damage.	7-80 and TM 55-1650-294 -40.	Refer to TM 55-1650-204-40.	See figure 7-17.
14	9	Boot	X			Cracks, tears and deterioration.	7-80	7-82	
14	10	Housing	X		X	Cracks, corrosion, scratches, and thread damage.	7-80	7-82 damaged.	See figure 7-19.

Table 7-5. Inspection Requirements for Hydraulic Cylinder Assembly (Cont)

			METHOD OF INSPECTION				REFERENCE PARAGRAPH		
FIGURE 7-	INDEX NO.	NOMENCLATURE	VISUAL	*MAGNETIC PARTICLE	**PENETRANT	TYPICAL DEFECTS	INSPECTION	REPAIR	REMARKS
14	12	Clamp	X			Cracks, corrosion, scratches, and bent.	7-80	Replace if damaged.	
14	19	Clamp	X			Cracks, corrosion, scratches, and bent.	7-80	Replace if damaged.	
14	20	Flange	X			Cracked	7-80	Replace if damaged.	
14	21	Boot Assembly	X			Torn or deteriorated	7-80	Replace if damaged.	

* Magnetic Particle inspect per TM55-1500-204/25/1
** Fluorescent Penetrant inspect per TM55-1500-204/25/1

(4) Inspect decal (4) for damage and legibility.

b. Inspect hydraulic cylinder assembly as follows:

(1) Inspect hydraulic cylinder assembly for cracks. No cracks allowed.

(2) Inspect upper and lower end of hydraulic cylinder assembly for evidence of leakage.

(3) Inspect external surfaces of hydraulic cylinder assembly and piston rod (8, figure 7-14) for nicks or scratches. (FIgure 7-17 and table 7-5.)

(4) Inspect external surfaces of hydraulic cylinder assembly and piston rod (8) for corrosion. (Figure 7-17 and table 7-5.) Maximum diameter of damage, after repair, 0.996 inch. Thread damage limits to piston rod are as follows:

(a) Depth — One-third thread.

(b) Length — One-quarter inch cumulative each segment.

c. Inspect clevis as follows:

(1) Inspect clevis (1, figure 7-14) for corrosion.

(2) Inspect clevis for cracks. No cracks allowed.

(3) Inspect clevis in accordance with limits outlined in figure 7-18 and table 7-5.

(4) Inspect clevis for security.

d. Inspect bearing housing as follows:

(1) Inspect bearing housing (10, figure 7-14) for nicks, scratches, corrosion, and sharp dents in accordance with limits outlined in figure 7-19.

(2) Inspect bearing housing for security.

e. Inspect nuts (3) and (6) for maximum thread damage as follows:

(1) Depth — One-third of thread.

(2) Length — 1.0 inch cumulative.

f. Inspect boots as follows:

(1) Inspect boot (21, figure 7-14) for deterioration and tears.

(2) Inspect flange (20) for tears.

(3) Inspect boot for security.

g. Inspect attaching hardware as follows:

(1) Inspect hydraulic cylinder assembly and attaching components for missing or loose hardware.

(2) Inspect all attaching hardware to hydraulic cylinder assembly for cracks or corrosion. No cracks allowed.

(3) Inspect all attaching hardware to hydraulic cylinder assembly for security.

h. Inspect holes in pilot input lever of servo actuator valve (figure 17) and clevis (figure 18) for elongation.

i. Inspect Part Number KSP 9046-5 bearing shield in accordance with the following limits:

(1) No cracks allowed.

(2) Depth of repair for nicks, corrosion, and scratches is 0.010 inch maximum. Number of repairs is not critical.

(3) Dents: 0.040 inch. Number of repairs is not critical.

7-81. Cleaning — Hydraulic Cylinder Assembly (Cyclic Control).

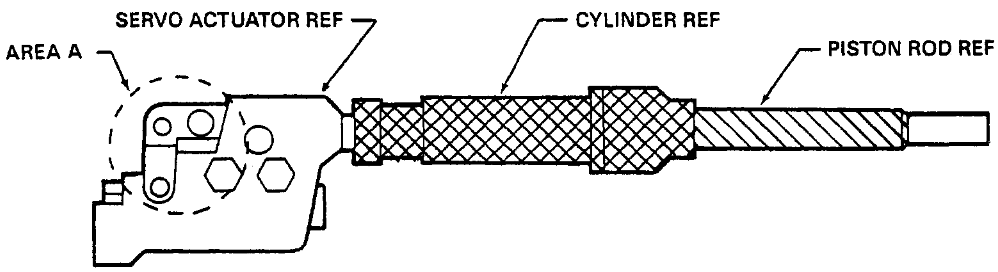
WARNING

Solvent may be toxic. Use in a well-ventilated area. Avoid prolonged inhalation of fumes or contact with skin. Observe necessary fire precautions. Do not direct compressed air against skin.

a. Immerse and wash all metallic parts in solvent (C-304). Pay particular attention to passages and threaded areas.

b. Use a stiff-bristled, non-metallic brush moistened with solvent (C-304) to remove caked dirt from parts.

c. Dry all parts with compressed air at 15 psig (maximum) pressure.



NICKS AND SCRATCHES — DEPTH: 0.025 INCH
DENTS — DEPTH: 0.003 INCH

THREAD DAMAGE — DEPTH: 1/3 THREAD
LENGTH: 1/4 INCH CUMULATIVE EACH SEGMENT

BLEND AND POLISH OUT ALL IMPERFECTIONS:
MINIMUM DIAMETER AFTER REPAIR IS 0.996 INCH.

AREA A HOLE REPAIR: DEPTH: 0.005 INCH
AREA: 1/4 CIRCLE (2 HOLES)

UH-1H-II-M-07-17

Figure 7-17. Hydraulic cylinder assembly — damage limit

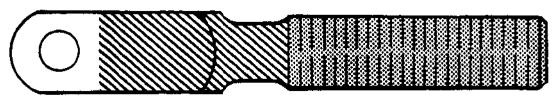
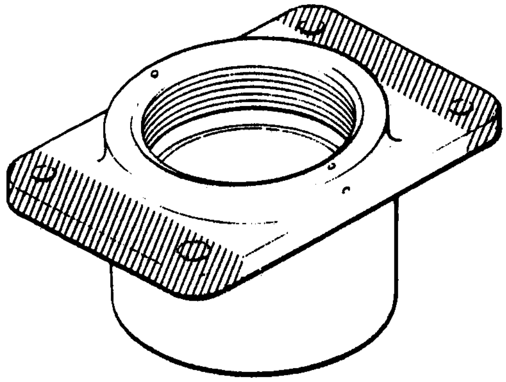


Figure 7-18. Clevis — damage assembly



TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS PARTICULAR	GENERAL
NICKS, SCRATCHES, AND SHARP DENTS	0.020 IN.	0.040 IN.
CORROSION	0.010 IN.	0.020 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 SQ. IN.	NOT CRITICAL
NUMBER OF REPAIRS	NOT CRITICAL	NOT CRITICAL
EDGE CHAMFER	0.040 IN.	0.060 IN.
BORE DAMAGE	0.002 INCH FOR 1/2 CIRCUMFERENCE	
THREAD DAMAGE:		
DEPTH:	ONE-THIRD OF THREAD	
LENGTH:	ONE INCH	
NUMBER:	THREE	

UH-1H-II-M-07-19

Figure 7-19. Repairing housing hydraulic cylinder — damage limits

d. If parts are not to be placed into immediate use after cleaning, flush parts with preservative hydraulic fluid (C-002), wrap with barrier material (C-427) and place in a dust-free container.

e. Wash inner and outer areas of rubber boot (21, figure 7-14) with mild detergent soap and warm water. Rinse thoroughly and allow to air dry or wipe with clean cloth.

7-82. Repair or Replacement — Hydraulic Cylinder Assembly (Cyclic Control).

Premaintenance Requirements for Removal of Hydraulic Cylinder Assembly (Cyclic Control)

CONDITIONS	REQUIREMENTS
Special Tools	None
Test Equipment	None
Support Equipment	Maintenance Work Stands
Minimum Personnel Required	Two
Consumable Materials	None
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated Area

a. Prior to preforming repair or replacement tasks to the hydraulic cylinder assembly, visually check the following items:

(1) Verify that replacement part number is same as part being replaced or that it is completely interchangeable part.

(2) Ensure that caps and plugs remain on open ports, fittings, and lines until part is ready to be installed.

(3) If part being removed is not to be replaced immediately, cap all open ports, lines, and fittings to prevent entry of foreign material into system. Cap openings on part being removed.

b. Service and bleed hydraulic system after replacing hydraulic cylinder assembly. (Paragraphs 7-4 and 7-6.)

c. Replace any lockwire and cotter pins removed.

d. Repair or replace all parts which drive defective. Do not attempt to repair delicate parts or surfaces. Replace damaged parts rather than attempt difficult or extensive repairs.

e. Repair components of hydraulic cylinder assembly as follows:

(1) Repair assembly (5, figure 7-14) as follows:

WARNING

Chemical film material is extremely dangerous. Contact with combustible materials will cause explosion or fire. Avoid contact with skin or eyes. Epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

(a) Polish nicks, corrosion, and scratches with 600 grit abrasive cloth or paper (C-423) and treat repair area with chemical film material (C-100). Touch up treated area with epoxy polyamide primer (C-204). Refer to figure 7-16 for damage limits.

(b) Any cracks to tube assembly (5) requires replacement of part.

(c) Check security of rivets and bonded seams.

(d) Replace decal (4) when damaged.

(e) Inspect the internal threaded area of upper and lower tube assembly (5, figure 7-14) fittings for corrosion damage. (Areas A and B, figure 7-13.) Replace tube assembly if corrosion is found. If no corrosion is noted at time of inspection, flush tube assembly (5, figure 7-14) with epoxy polyamide primer (C-204) as follows:

1. Plug one end and pour epoxy polyamide primer (C-204) into opposite end of tube assembly (5).

2. Rotate tube assembly several times to ensure full coverage of primer on both end fittings.

3. Drain for two hours prior to installation.

NOTE

For new cylinder assemblies that have tubes attached, it is not necessary to remove the tube in order to accomplish the flushing procedure. Remove the rod end or clevis (1, figure 7-14) from upper end of tube (5) and proceed with flushing operation as outlined in following sub-step. In the event a replacement tube is not available, the tube may be continued in service by applying zinc chromate primer (C-201) to the inner circumferences of the end fittings. By this application, the corrosion will be temporarily retarded until a replacement tube becomes available.

(f) Replace tube assembly (5) when threads are corroded or damaged or bent or with any damage that exceeds limits outlined in figure 7-16).

(2) Repair cylinder assembly as follows:

(a) Any cracks to cylinder assembly requires replacement of part.

(b) The extent of repair for leakage to cylinder assembly is limited to replacing fittings (18, figure 7-12), retainers (20) and preformed packings (19). Any leakage to lower or upper end of cylinder assembly requires replacement of assembly.

(c) Minor corrosion to external surfaces of cylinder assembly may be repaired by sanding corroded area with 600 grit abrasive cloth or paper (C-423) to original finish.

WARNING

Solvent is highly flammable with a flash point of 140°F (60°C) and must be used in a well ventilated area. Avoid breathing vapors and do not allow to come in contact with skin or clothing.

(d) Minor nicks and scratches are acceptable, provided the damage area is sanded with 600 grit crocus cloth (C-500) to its original finish of 63 micro-inches or better. Use aluminum oxide cloth (C-406) or equivalent, to polish out minor scoring on aluminum parts. Thoroughly clean any polished parts with solvent (C-304).

(3) Inspect clevis (1, figure 7-14) in accordance with limits outlined in figure 7-18 and table 7-5.

(4) Inspect bearing housing (10, figure 7-14) in accordance with limits outlined in figure 7-19 and table 7-5.

(5) Any cracks, tears, or deterioration to boot (5 or 21, figure 7-14) requires replacement of part. No repairs allowed.

(6) Any damage to flange (20) requires replacement of part.

(7) Replace any damaged hardware.

7-83. Assembly — Hydraulic Cylinder Assembly (Cyclic Control).

Premaintenance Requirements for Main Rotor Hub and Blade Alignment

CONDITIONS	REQUIREMENT
Special Tools	(T111)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C-002), (C-405), (C-308)
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated Area

a. Place lock (7, figure 7-14) inside of nut (6). Align lock with slot in piston rod (8) and thread nut (6) and tube assembly (5) on piston rod (8).

b. Mount cylinder assembly in torque adapter (T111) (figure 7-15).

c. Adjust hydraulic cylinder assembly in accordance with dimension A, figure 7-13, and torque nut (6, figure 7-14) 1500 to 1800 inch-pounds. Secure with lockwire (C-405).

d. Install protective boot (21) on hydraulic cylinder assembly as follows:

(1) Compress and insert (swivel-joint) flange (20) into lower end of boot and engage flange lip in collar.

(2) Slip flange (20) with boot (21) down over tube assembly (5) and cylinder.

(3) Position clamp (19) around flange (20) and install screw (18), two washers (17), and nut (16).

(4) With piston rod (8) in full up position, adjust boot assembly (21) 20 inches from top flange of tube assembly (5) as shown in detail B. Position clamp (12) around top of boot assembly (21) and install screw (15), two washers (14), and nut (13).

(5) Check for proper security of shield (9).

e. Place lock (2) into nut (3). Align lock (2) with slot in clevis (1) and thread nut (3) on clevis.

f. Install and position clevis (1), as shown in figure 7-14, to tube assembly (5) and set adjustment of clevis at 2.53 inches as shown in figure 7-13. This is an initial dimension, which may slightly change during rigging.

g. Torque nut (3, figure 7-14) 480 to 600 inch-pounds and secure with lockwire (C-405).

h. If decal (4) is damaged, position and install new decal as shown in applicable hydraulic cylinder assembly.

i. Remove hydraulic cylinder from torque adapter (T111).

7-84. Installation — Hydraulic Cylinder Assembly (Cyclic Control).

a. Install hydraulic cylinder assembly (33, figure 7-12) in accordance with the following procedures:

(1) Position servo actuator valve as shown in view A-A, figure 7-12. Lower hydraulic cylinder assembly (33) onto studs of cylinder support.

(2) Install washer (29), nut (30), washers (31), and nuts (32). Tighten nuts (30 and 32) evenly using standard torque.

(3) Check position of clevis (figure 7-20) of hydraulic cylinder assembly and connect clevis to swashplate assembly. Install bolt (1, figure 7-12), washer (35), and nut (34), and secure nut with cotter pin (36).

(4) Remove covers from fitting (22) and install hose assemblies (16 and 17) to fittings.

(5) Position control tube (27) to lever of servo actuator and install bolt (28), washers (26), and nut (25). Torque nut (25) to a maximum of 25 inch-pounds; bolt must turn freely. Secure nut (25) with cotter pin (24).

(6) Adjust servo actuator valve. (Figure 7-11 and Paragraph 7-76.)

(7) Rig hydraulic cylinder assembly (33, figure 7-12) to cyclic control system. (Chapter 11.)

(8) Torque nut (3, figure 7-14) 480 to 600 inch-pounds and secure with lockwire (C-405).

(9) After rigging procedures have been accomplished, apply a bead of adhesive (C-308) on top of nut (3, figure 7-14) and adjacent to threads of clevis (1). Ensure that no weep holes exist after applying sealant. Check slot in clevis for positive sealing.

(10) Perform hydraulic system test. (Paragraph 7-4.) Check hydraulic cylinder (33, figure 7-12) for leaks. (Table 7-1.)

(11) Install access door and soundproofing blanket to pylon island in cabin area. (Chapter 2.)

(12) Install right access doors and soundproofing blanket to right side of pylon island in cabin area. (Chapter 2.)

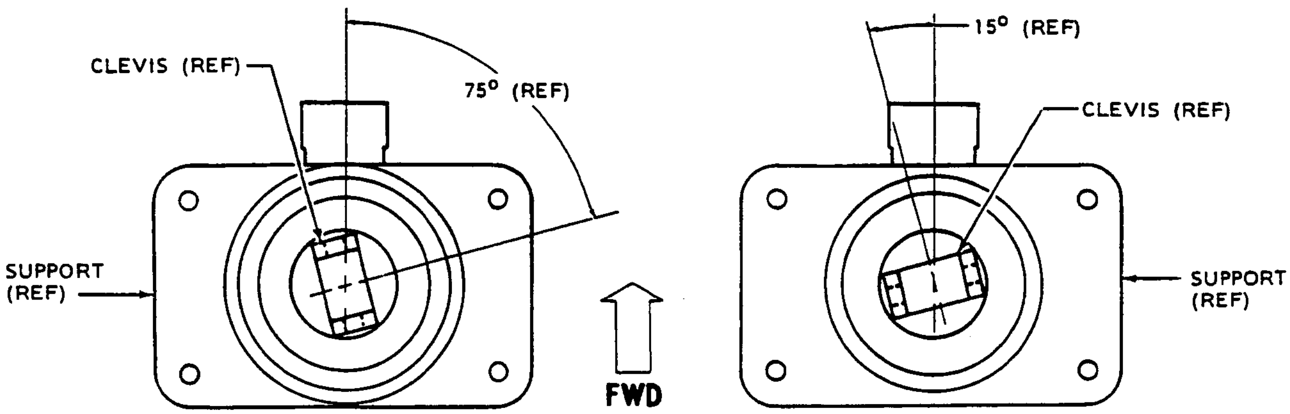
(13) Close and secure right side engine cowls. (Chapter 2.)

b. Install hydraulic cylinder assembly (6, figure 7-12) in accordance with the following procedures.

(1) Position servo actuator valve as shown in view A-A, figure 7-12 and lower hydraulic cylinder assembly (6) onto studs of cylinder support.

(2) Install washer (8), nut (7), washers (10), and nuts (9).

(3) Check position of clevis (figure 7-20) of hydraulic cylinder assembly. Connect clevis to swashplate assembly and install bolt (4, figure 7-12), washer (3), and nut (2). Secure nut with cotter pin (5).



VIEW LOOKING DOWN

NOTE

The above clevis position is for the following hydraulic cylinder assemblies only.

ASSEMBLY NUMBER

205-576-056-101
205-576-056-105

NOTE

The above clevis position is for the following hydraulic cylinder assemblies only.

ASSEMBLY NUMBER

205-576-056-103

UH-1H-II-M-07-20

Figure 7-20. Positioning of clevis to servo cylinder — hydraulic cylinder assembly

(4) Remove protective dust covers from fittings (18) and install hose assemblies (16 and 17) to fittings.

(5) Position control tube (13) to lever of servo actuator valve and install bolt (12, figure 7-12), washers (11), and nut (14). Torque nut (14) to a maximum of 25 inch-pounds; bolt (12) must turn freely. Secure nut (14) with cotter pin (15).

(6) Adjust servo actuator valve (figure 7-11). (Paragraph 7-76.)

(7) Rig hydraulic cylinder assembly (6, figure 7-12) to cyclic control system. (Chapter 11.)

(8) Torque nut (3, figure 7-14) 480 to 600 inch-pounds and secure with lockwire (C-405).

(9) After rigging procedures have been accomplished, apply a bead of adhesive (C-308) to top of nut (3, figure 7-14) and adjacent to threads of clevis (1). Ensure that no weep holes exist after applying sealant. Check slot in clevis for positive sealing.

(10) Perform hydraulic system test. (Paragraph 7-4.) Check hydraulic cylinder (6, figure 7-12) for leaks. (Table 7-1.)

(11) Install access door and soundproofing blanket to pylon island in cabin area. (Chapter 2.)

(12) Install left side access doors and soundproofing blanket to left side of pylon island in cabin area. (Chapter 2.)

(13) Close and secure left engine cowls. (Chapter 2.)

7-85. HYDRAULIC CYLINDER ASSEMBLY (COLLECTIVE CONTROL).

7-86. Description — Hydraulic Cylinder Assembly (Collective Control). A hydraulic cylinder assembly with integral irreversible valve incorporated is used to assist collective pitch control of the main rotor and reduce feedback forces.

7-87. Adjustment — Hydraulic Cylinder Assembly (Collective Control).

NOTE

Ensure that the slot labeled "B" is used when mating 204-076-267-005 tube assembly with 205-076-055-101 actuator. The slot labeled "A" or not identified at all shall not be used for this assembly.

a. Adjust collective hydraulic cylinder as shown in dimension A of figure 7-13 and paragraph 7-76.

b. Adjust clevis as shown in figure 7-13 and paragraph 7-76.

c. Rig collective hydraulic cylinder after installation procedures have been accomplished. (Paragraph 7-77.)

7-88. Inspection (Acceptance/Rejection Criteria) — Hydraulic Cylinder Assembly (Collective Control). Refer to paragraphs 7-77 and 7-80, figure 7-16, and table 7-5.

7-89. Removal — Hydraulic Cylinder Assembly (Collective Control).

a. Hydraulic Cylinder (6, figure 7-21). Remove hydraulic cylinder assembly in accordance with the following procedures:

(1) Open transmission fairing and left engine cowls. (Chapter 2.)

(2) Remove cargo hook assembly. (Chapter 14.)

(3) Remove soundproofing blanket and left access doors. (Chapter 2.)

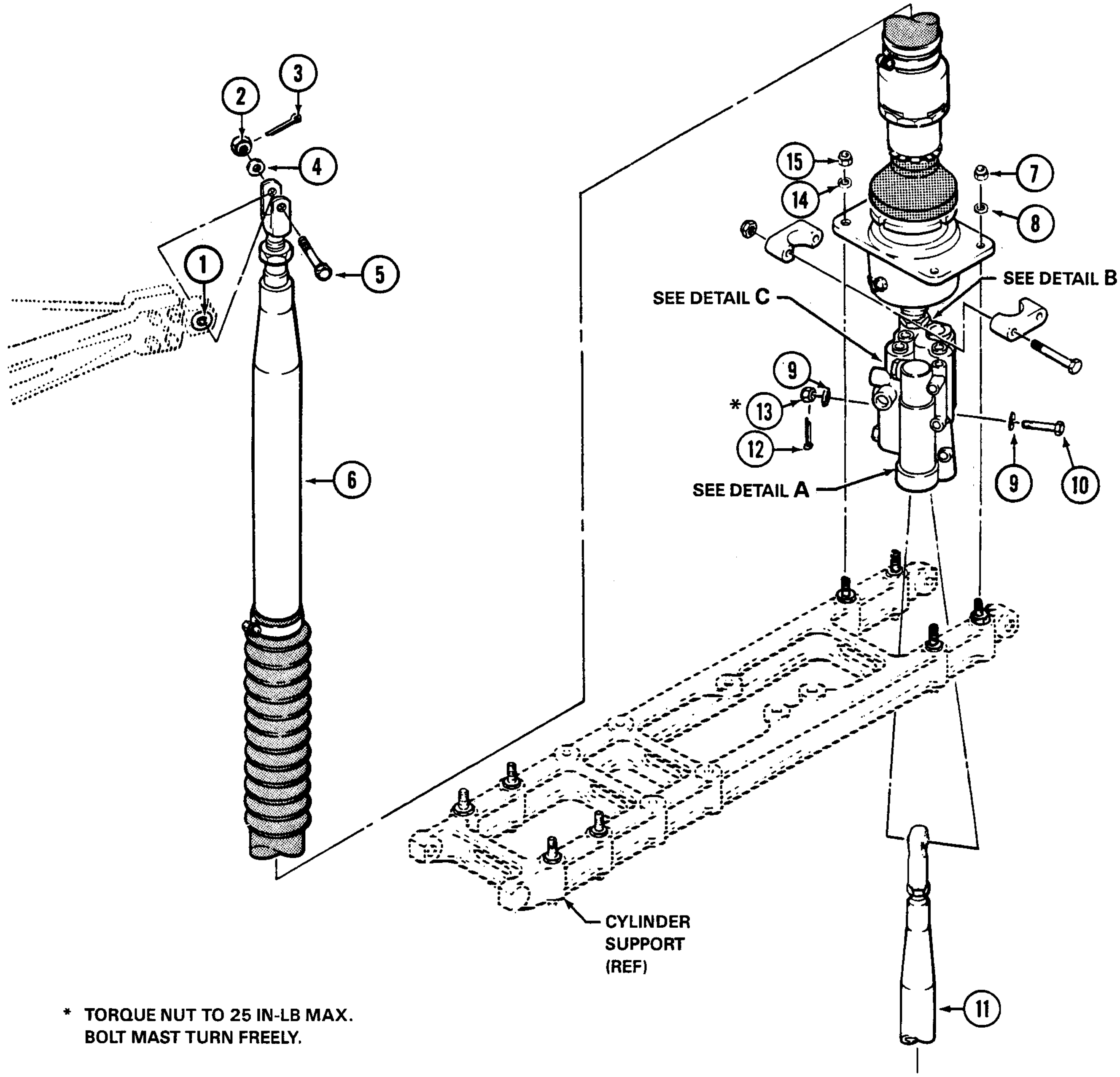
(4) While gaining access through cargo hook opening, remove cotter pin (12, figure 7-21), nut (13), washers (9), and bolt (10) from lever of servo actuator valve. Remove tube assembly (11).

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

NOTE

When disconnecting hydraulic hose assemblies (16 and 17), a small amount of fluid seepage may occur and will require placing a small container under fittings of servo actuator valve.



1. Trunnion bearing
2. Nut
3. Cotter pin
4. Washer
5. Bolt
6. Cylinder assembly
7. Nut
8. Washer
9. Washers
10. Bolt
11. Tube assembly
12. Cotter pin
13. Nut
14. Washer
15. Nut

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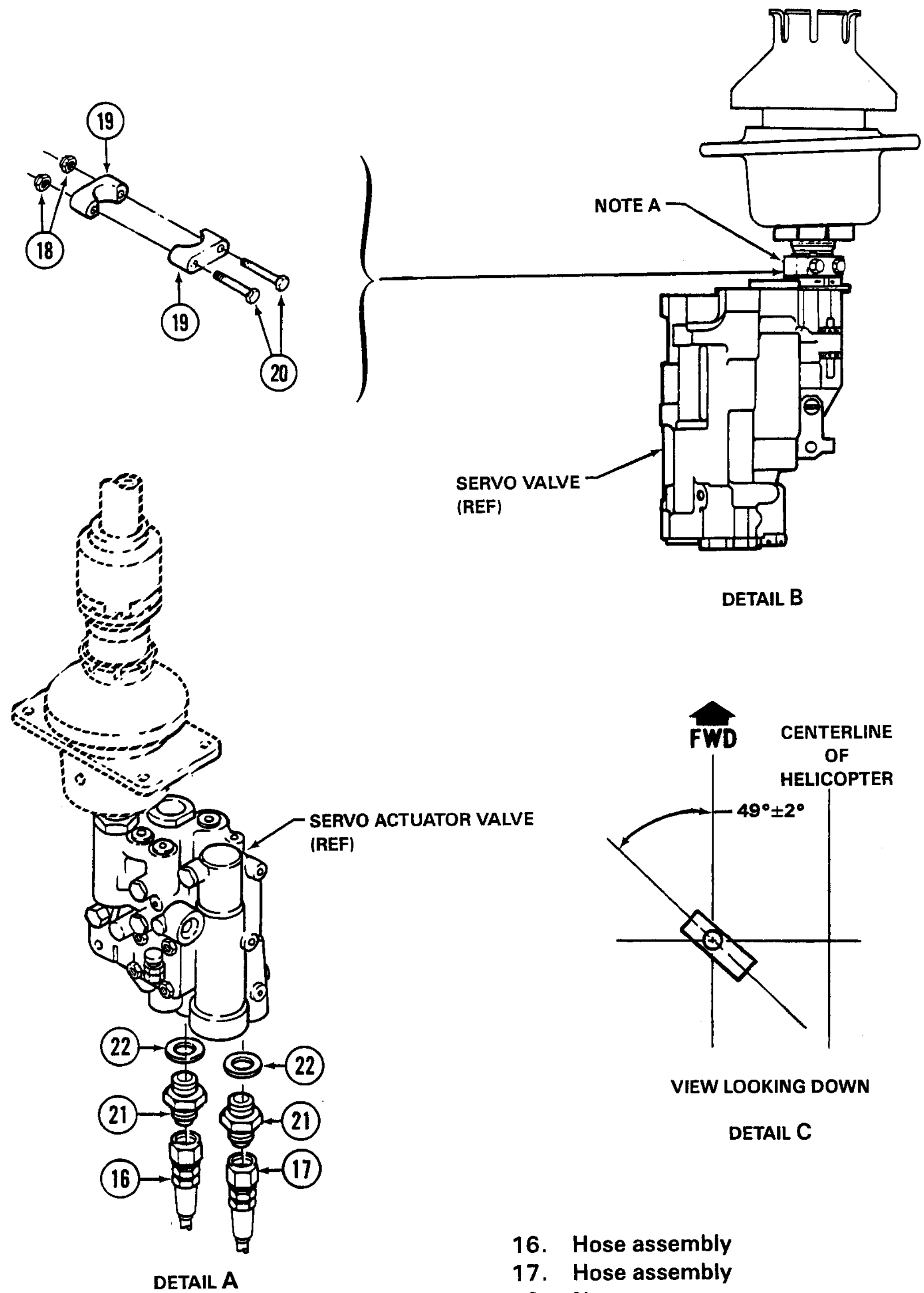
Figure 7-21. Hydraulic cylinder assembly (collective control) — removal and installation (Sheet 1 of 2)



16. Hose assembly
17. Hose assembly
18. Nuts
19. Stops
20. Bolts
21. Fitting
22. Preformed Packing

NOTE A

Stops must be seated firmly on nut.

UH-1H-II-M-07-21-2

Figure 7-21. Hydraulic cylinder assembly (collective control) — removal and installation (Sheet 2 of 2)

(5) Disconnect hose assemblies (16 and 17) from servo actuator valve.

(6) Install protective dust covers to open ports of hydraulic servo actuator valve.

(7) Remove droop compensator jackshaft assembly and bracket on cylinder support. (Chapter 4.)

(8) Remove nuts (7) and washers (8).

(9) Remove nut (15) and washer (14).

(10) Remove cotter pin (3), nut (2), washer (4), and bolt (5) from clevis of hydraulic cylinder assembly and disconnect valve from trunnion bearing (1) of lever assembly.

(11) Carefully rotating hydraulic cylinder assembly, lift hydraulic cylinder assembly from helicopter.

7-90. Disassembly — Hydraulic Cylinder Assembly (Collective Control).

NOTE

Disassembly procedures for collective hydraulic cylinder assembly are same as cyclic control hydraulic cylinder assembly, except for maintenance tasks outlined in the following steps.

a. Remove nuts (18, figure 7-21) and bolts (20) from stops (19).

b. Remove stops (19) from piston rod of collective hydraulic cylinder assembly (6).

c. Remove fittings (21) and preformed packings (22).

d. Disassemble hydraulic cylinder assembly. (Paragraph 7-79.)

7-91. Inspection — Hydraulic Cylinder Assembly (Collective Control). Inspect collective hydraulic cylinder assembly in accordance with inspection limits outlined in paragraphs 7-77 and 7-80, figure 7-16, and table 7-5.

7-92. Cleaning — Hydraulic Cylinder Assembly (Collective Control). (Paragraph 7-81.)

7-93. Repair — Hydraulic Cylinder Assembly (Collective Control). For repairs or replacement to components of collective hydraulic cylinder assembly. (Paragraph 7-82.)

7-94. Assembly — Hydraulic Cylinder Assembly (Collective Control).

NOTE

Assembly procedures for collective hydraulic cylinder assembly are same as cyclic control hydraulic cylinder assembly except for maintenance tasks outlined in the following steps. (Paragraph 7-83.)

a. With piston rod (8, figure 7-14) in full up position, adjust boot assembly (21), 14.5 inches as shown in detail A.

b. Adjust and position clevis (1) 2.53 inches from center of hole in clevis to top of tube assembly (5) as shown in figure 7-13. Torque nut (3, figure 7-14) 480 to 600 inch-pounds and secure with lockwire (C-405). Check dimension A measurements of collective hydraulic cylinder assembly as shown in figure 7-13.

CAUTION

Stops (19, figure 7-21) must be full down against servo nut.

c. Install bolts (20, figure 7-21), stops (19) and nuts (18) to piston rod and against nut (2, figure 7-11).

d. Install preformed packings (22) to fittings (21) and install on servo actuator valve.

7-95. Installation — Hydraulic Cylinder Assembly (Collective Control).

a. Install collective hydraulic cylinder assembly (6, figure 7-21) in accordance with the following procedures:

(1) Position servo actuator valve (figure 7-11) as shown in detail C, figure 7-21 and lower collective hydraulic cylinder assembly (6) onto studs of cylinder support.

(2) Install washers (8), nut (7), washer (14), and nut (15) to studs of cylinder support.

NOTE

Protective dust covers in ports of servo actuator valve (figure 7-11) will have to be removed prior to hookup of clevis to trunnion bearing (1, figure 7-21) for release of cylinder pressure while moving piston rod up or down.

(3) Check position of clevis to servo actuator valve. (Figure 7-20.) Connect clevis of hydraulic cylinder assembly (6, figure 7-21) to trunnion bearing (1) and install bolt (5), washer (4), and nut (2). Secure nut (2) with cotter pin (3).

(4) Position bearing of tube assembly (11) into lever of servo valve and install bolt (10), washers (9), and nut (13). Secure nut (13) with cotter pin (12).

(5) Remove protective dust covers from hose assemblies (16 and 17, figure 7-21).

(6) Install hose assemblies (16 and 17) to fittings located on bottom of servo actuator valve.

(7) Install droop compensator and bracket on cylinder support. (Chapter 4.)

(8) Service and bleed hydraulic system. (Paragraph 7-4.)

(9) Install cargo hook assembly. (Chapter 14.)

(10) Install left access doors and soundproofing blanket to pylon island in cabin area. (Chapter 2.)

(11) Close transmission fairing and left engine cowls. (Chapter 2.)

7-96. Operational Check — Hydraulic Cylinder Assembly (Collective Control).

a. Perform operational check of hydraulic system. (Paragraph 7-4.)

b. With hydraulic test cart attached to hydraulic system, move collective stick up and down and check hydraulic cylinder for leaks. (Table 7-1.)

c. Ensure that servo actuator valve does not foul cabin structure. If fouling does occur, check position of servo actuator valve as shown in detail C, figure 7-21.

7-97. SUPPORT ASSEMBLIES.

7-98. Description — Support Assemblies. The hydraulic cylinder support assemblies (figure 7-22) (located left and right side, and below transmission assembly) are provided for support of two cyclic and collective cylinder assemblies. The supports are attached to the cabin structure and top side of cargo lift beam.

7-99. Removal — Support Assemblies.

a. Remove support assembly (18, figure 7-22) as follows:

(1) Remove soundproofing blanket and right access doors from pylon island in cabin area. (Chapter 2.)

(2) Remove cyclic and collective control hydraulic cylinder assemblies (6 and 33, figure 7-12) and (6, figure 7-21). (Paragraphs 7-78 and 7-89.)

(3) Remove droop compensator jackshaft and support from support assembly (18, figure 7-22). (Chapter 4.)

(4) Remove plug button located outboard of nut (13) on left side of cabin pylon structure.

(5) Remove nut (13), washers (12), and bolts (11) attaching support assembly (18) to pylon structure.

(6) Remove nuts (14), washers (10), shims (21), and bolts (9) attaching support assembly (18) to top of cargo lift beam. Mark shim location and thickness for future assembly.

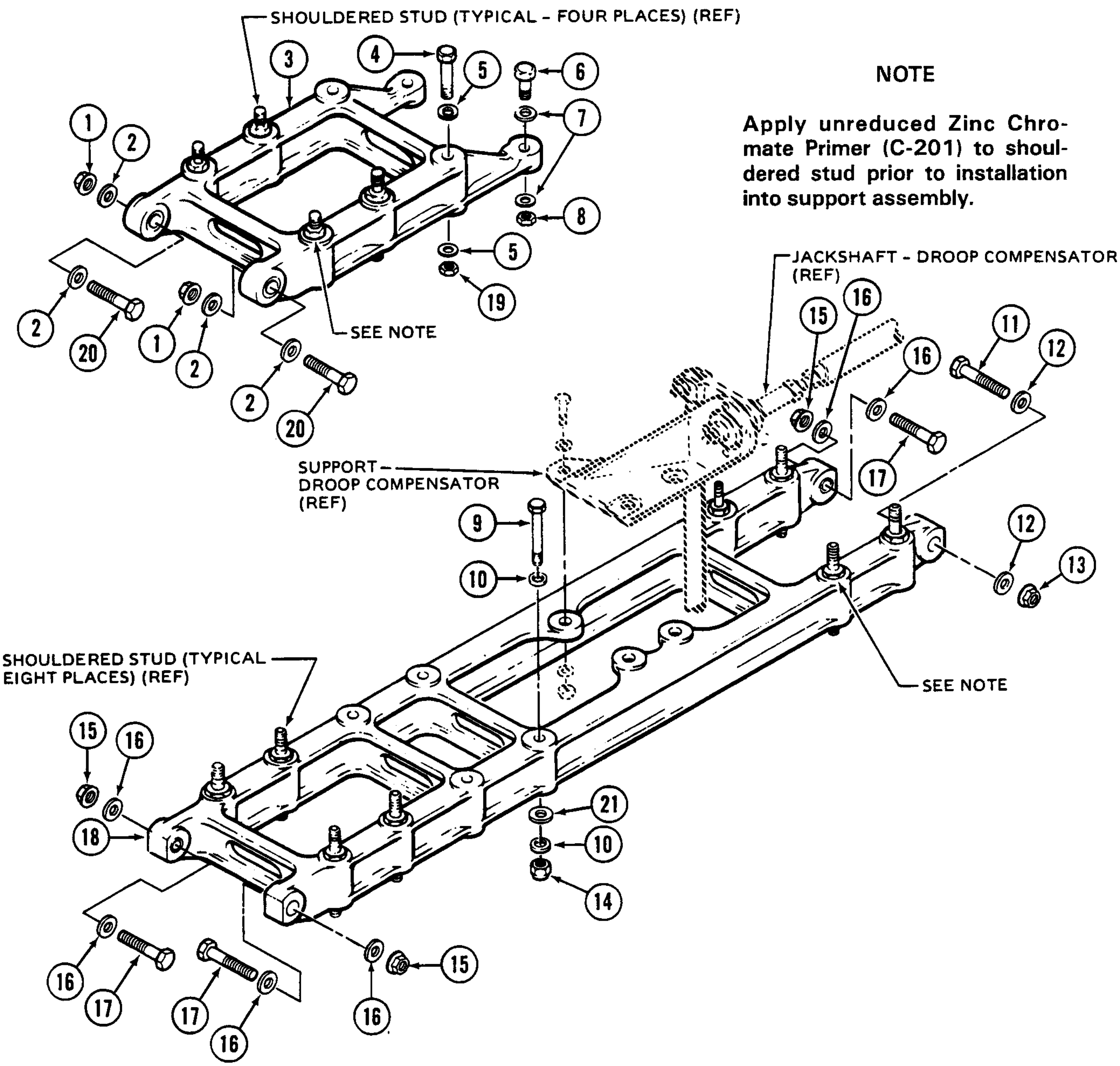
(7) Remove nuts (15), washers 916), and bolts (17) attaching support assembly (18) to pylon structure. Lift, rotate and remove support assembly (18) through access opening.

b. Remove support assembly (3) as follows:

(1) Remove soundproofing blanket and right side access doors from pylon island in cabin lift beam.

(2) Remove cyclic hydraulic cylinder assembly (33, figure 7-12). (Paragraph 7-78.)

(3) Remove nuts (8, figure 7-22), washers (7), and bolts (6) attaching support assembly (3) to top of cargo lift beam.



1. Nut
2. Washer
3. Support assembly
4. Bolt
5. Washer
6. Bolt
7. Washer
8. Nut
9. Bolt
10. Washer
11. Bolt
12. Washers
13. Nut
14. Nut
15. Nut
16. Washers
17. Bolt
18. Support assembly
19. Nut
20. Bolt
21. Shim

UH-1H-II-M-07-22

Figure 7-22. Support assembly — hydraulic cylinder assembly — removal and installation

(4) Remove nuts (19), washers (5), and bolts (4) attaching support assembly (3) to top of cargo lift beam.

(5) Remove nuts (1), washers (2), and bolts (20) attaching support assembly (3) to cabin structure. Lift and remove support assembly through access opening.

7-100. Inspection — Support Assemblies.

a. Inspect support assembly (3, figure 7-22) in accordance with damage limits outlined in figure 7-23 and table 7-6.

b. Inspect support assembly (18) in accordance with damage limits outlined in figure 7-24 and table 7-6.

7-101. Cleaning — Support Assemblies.

WARNING

Solvent is highly flammable with a flash point of 140°F (60°C) and must be used in a well ventilated area. Avoid breathing vapors and do not allow to come in contact with skin or clothing.

a. Clean support assemblies (3 and 18, figure 7-22) with solvent (C-304). A nonmetallic, soft bristle brush may be required to dislodge deposits.

b. Rinse support assemblies with clean water and allow to air dry.

7-102. Repair — Support Assemblies.

a. Any damage to support assembly (3, figure 7-22) exceeding limits outlined in figure 7-23 requires replacement of part. No cracks allowed.

b. Polish nicks, scratches or corrosion to original surface finish with 600 grit abrasive cloth or paper (C-423). Treat repaired area with chemical film material (C-100) following with a light application of zinc chromate primer (C-201) or epoxy polyamide primer (C-204).

c. Thread damage or corrosion to studs or bent studs of support assemblies (3 or 18) requires replacement of part. Apply zinc chromate primer (C-201) to replacement stud prior to installation to support.

d. Any damage to support assembly (18) exceeding limits outlined in figure 7-24 requires replacement of part. No cracks allowed.

e. Polish, treat, and touchup damaged repaired areas of support assembly (18) as outlined in preceding step b.

7-103. Installation — Support Assemblies.

a. Install support assembly (3, figure 7-22) as follows:

NOTE

Do not tighten nuts (1, 8, and 19) until all bolts (4, 6, and 20) are installed with unreduced wet zinc chromate primer (C-201) in support assembly (3).

(1) Position support assembly (3) between attachment supports of pylon structure and align holes in support assembly with holes in top of cargo lift beam. Place washer (5) on two bolts (4). Apply a light coat of primer (C-201) to bolts and install bolts through support assembly (3) and cargo lift beam.

(2) Place a washer (2) on each of two bolts (20). Apply a light coat of zinc chromate primer (C-201) to bolts and install bolts through support assembly (3) and supports of pylon structure.

(3) Place a washer (7) on each of two bolts (6). Apply a light coat of zinc chromate primer (C-201) to bolts and install bolts through support assembly (3) and top of cargo lift beam.

(4) Install washers (2, 5, and 7) and nuts (1, 8, and 19) on bolts (4, 6, and 20) and tighten nuts.

(5) Install hydraulic cylinder assembly (33, figure 7-12). (Paragraph 7-84.)

(6) Install right side access doors and soundproofing blanket to pylon island in cabin roof area. (Chapter 2.)

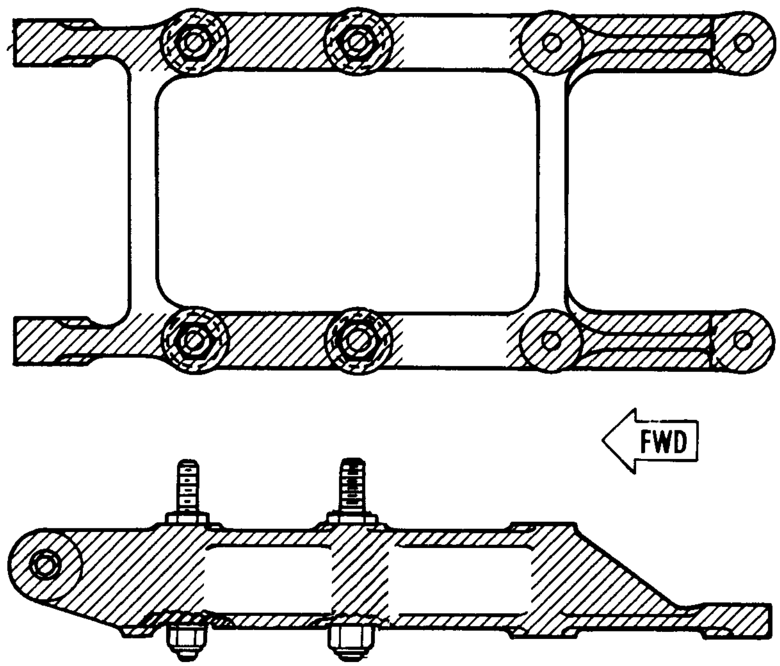
b. Install support assembly (18, figure 7-22) as follows:

NOTE

The following step (1) pertains to installation of a support different than the one removed.

(1) The following adjustment (a) thru (f) should be accomplished prior to installation:

(a) Position support assembly (18) between forward and aft attachment supports of pylon



	DAMAGE AREA AND REPAIR ZONES	
TYPE OF DAMAGE		
MECHANICAL: NICKS, SCRATCHES, ETC.	0.020 INCH	0.030 INCH
CORROSION	0.010 INCH	0.015 INCH
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 SQUARE INCH	0.50 SQUARE INCH
MAXIMUM NUMBER OF REPAIRS	TWO PER SEGMENT	
EDGE CHAMFER	0.040 INCH	0.060 INCH
SURFACE COATING	BRUSH ALODINE	
BORE REPAIR	0.002 — ONE-QUARTER CIRCUMFERENCE	
THREAD DAMAGE:		
DEPTH:	ONE-THIRD OF THREAD	
LENGTH:	ONE-TENTH INCH	
NUMBER:	ONE PER THREADED SEGMENT	
BORE ELONGATION:	0.0015 INCH MAXIMUM	

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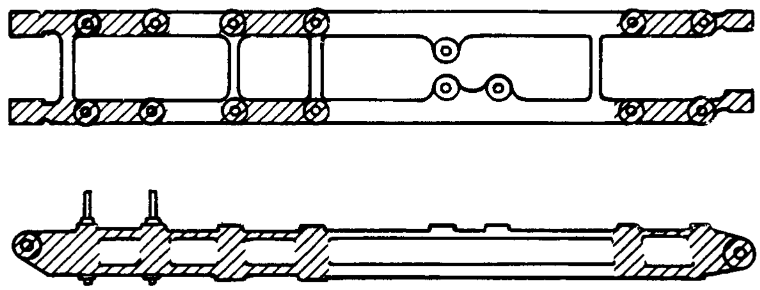
Figure 7-23. Support assembly hydraulic cylinder assembly (P/N 204-001-340) — damage limits



	DAMAGE AREA AND REPAIR ZONES	
TYPE OF DAMAGE		
MECHANICAL: NICKS, SCRATCHES, ETC.	0.020 INCH	0.030 INCH
CORROSION	0.010 INCH	0.015 INCH
MAXIMUM AREA PER FULL DEPTH REPAIR	0.24 SQUARE INCH	0.50 SQUARE INCH
MAXIMUM NUMBER OF REPAIRS	TWO PER SEGMENT	
EDGE CHAMFER	0.040 INCH	0.060 INCH
SURFACE COATING	BRUSH ALODINE	
BORE REPAIR	0.002 — ONE-QUARTER CIRCUMFERENCE	
THREAD DAMAGE:		
DEPTH:	ONE-THIRD OF THREAD	
LENGTH:	ONE-TENTH INCH	
NUMBER:	ONE PER THREADED SEGMENT	
BORE ELONGATION:	0.0015 INCH MAXIMUM	

UH-1H-II-M-07-24

Figure 7-24. Support assembly hydraulic cylinder assembly (P/N 204-001-303) — damage limits

Table 7-6. Inspection Requirements for Support Assemblies

			METHOD OF INSPECTION				REFERENCE PARAGRAPH		
FIGURE 7-	INDEX NO.	NOMENCLATURE	VISUAL	*MAGNETIC PARTICLE	**PENETRANT	TYPICAL DEFECTS	INSPECTION	REPAIR	REMARKS
22	3	Support Assembly	X		X	Nicks, scratches, cracks, warped, corrosion, and hole elongation.	7-100 and figure 7-23	7-102 and figure 7-23	
22	18	Support Assembly	X		X	Nicks, scratches, cracks, corrosion, warped and hole elongation.	7-100 and figure 7-24	7-102 ad figure 7-24	

** Fluorescent Penetrant inspect in accordance with MIL-I-6866 and TM 55-1500-204-25/1 structure and align holes in support assembly. Temporarily install two bolts (17) and two bolts (11) in forward and aft support.

(b) Measure gap between support assembly and lift beam and record the dimensions.

(c) A maximum thickness 0.032 inch shim may be used between support assembly and lift beam. Peel shims to maintain maximum gap of 0.004 inch.

(d) Temporarily install and tighten four bolts (9), washers (10), and nuts (14).

(e) Check forward and aft support bolts (11 and 17) for freedom of movement. If binding occurs reshim for proper gap and freedom of movement for support bolts (11 and 17).

(f) When a proper fit is achieved remove support and mark shims for installation.

NOTE

Do not tighten nuts (13, 14, and 15) until all bolts (9, 11, and 17) are installed with unreduced wet zinc chromate primer (C-201) in support assembly (18).

(2) Position support assembly (18) between forward and aft attachment supports of pylon structure and align holes in support assembly with holes in top of cargo lift beam. Place a washer (10) on each of four bolts (9). Apply a light coat of primer (C-201) to bolts and install bolts through support assembly (18), shims (21), and cargo lift beam.

(3) Place washers (12) on bolt (11). Apply a light coat of zinc chromate primer (C-201) to bolt. Install bolt through support assembly (18) and supports of pylon structure.

(4) Place washers (16) on three bolts (17). Apply a light coat of zinc chromate primer (C-201) to bolts. Install bolts through support assembly (18) and supports of pylon structure.

(5) Install four washers (10), one washer (12), and three washers (16).

(6) Install and tighten nuts (13, 14, and 15).

(7) Install (lateral) hydraulic cylinder assembly (6, figure 7-12). (Paragraph 7-84, step b.)

(8) Install (collective) hydraulic cylinder assembly (6, figure 7-21). (Paragraph 7-95.)

(9) Install droop compensator bracket and jackshaft to support assembly (18). (Chapter 4.)

(10) Install plug button in hole, located outboard of nut (13) on left side of cabin pylon structure.

(11) Service and bleed hydraulic system. (Paragraph 7-4.)

(12) Perform operational check and test of hydraulic system and hydraulic cylinder assemblies (6 and 33, figure 7-12 and 6, figure 7-21). (Paragraph 7-4.)

(13) Inspect hydraulic cylinder assemblies (6 and 33, and figure 7-12) and (6, figure 7-21) and attaching hose connections for leaks. (Table 7-1.)

(14) Install left access doors and sound proofing to pylon island in cabin area. (Chapter 2.)

7-104. HOSES, TUBING AND ATTACHING HARDWARE.

7-105. Description — Hoses, Tubing and Attaching Hardware. Throughout the hydraulic system are hoses, tubing and attaching hardware that interconnects check valves, relief valves, solenoid valve, pressure reducing valve, pump, reservoir and cyclic, collective, and tail rotor cylinder assemblies. The tube assemblies are secured to cabin structure with clamps, spacers, washers, and nuts.

7-106. Removal — Hoses, Tubing and Attaching Hardware.

a. Remove hose assemblies, attaching clamps, and hardware from cabin structure as necessary to perform maintenance functions of hydraulic system.

b. Remove tube assemblies, attaching clamps, and hardware from cabin structure as necessary to perform maintenance functions to the hydraulic system.

7-107. Inspection — Hoses, Tubing and Attaching Hardware.

NOTE

For further inspection criteria and/or testing of hydraulic hose or tube assemblies refer to TM 55-1500-204-25/1.

a. Inspect hose and tube assemblies for leaks.

b. Inspect hose and tube assemblies for security.

c. Inspect hose and tube assemblies for corrosion.

d. Inspect tube assemblies and hose connections for cracks.

e. Inspect hose assemblies for deterioration or fraying.

f. Inspect hose and tube assemblies for deformation.

g. Inspect hose and tube assemblies for wear or binding.

7-108. Repair — Hoses, Tubing and Attaching Hardware.

a. Replace hose or tube assemblies when cracked or deteriorated.

b. Replace clamps or hardware when damaged.

c. Tighten hose or tube assembly when leaking.

d. Tighten hardware attaching hose or tube assembly when loose.

e. Replace hose or tube assembly when compound is deformed.

f. Any wear to hose or tube assemblies as a result of chafing, requires replacement of part.

g. Any damage to hoses, tubes, and hardware that does not warrant time expended for repairs, requires replacement of part.

7-109. Installation — Hoses, Tubing and Attaching Hardware.

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

NOTE

Threads of tube and hose connectors and fittings will have hydraulic fluid applied to them prior to torquing. Do not exceed limits outlined in table 7-3 or torque threads when dry.

a. Install hose assemblies, tube assemblies and attaching clamps and hardware to cabin structure as necessary after accomplishing maintenance functions to the hydraulic system.

7-110. HYDRAULIC CYLINDER AND SUPPORT ASSEMBLY, TAIL ROTOR.

7-111. Description — Hydraulic Cylinder and Support Assembly, Tail Rotor. A hydraulic power cylinder in tail rotor control linkage is vertically mounted in a support (figure 7-25) on Station 211 fuselage bulkhead, accessible through a door on right side.

7-112. Adjustment — Hydraulic Cylinder and Support Assembly, Tail Rotor.

a. Adjust adapter (6, figure 7-26) 1.80 inches from centerline of hole to top surface of piston rod of power cylinder as shown and tighten nut (7) prior to installation of cylinder and support assembly to helicopter.

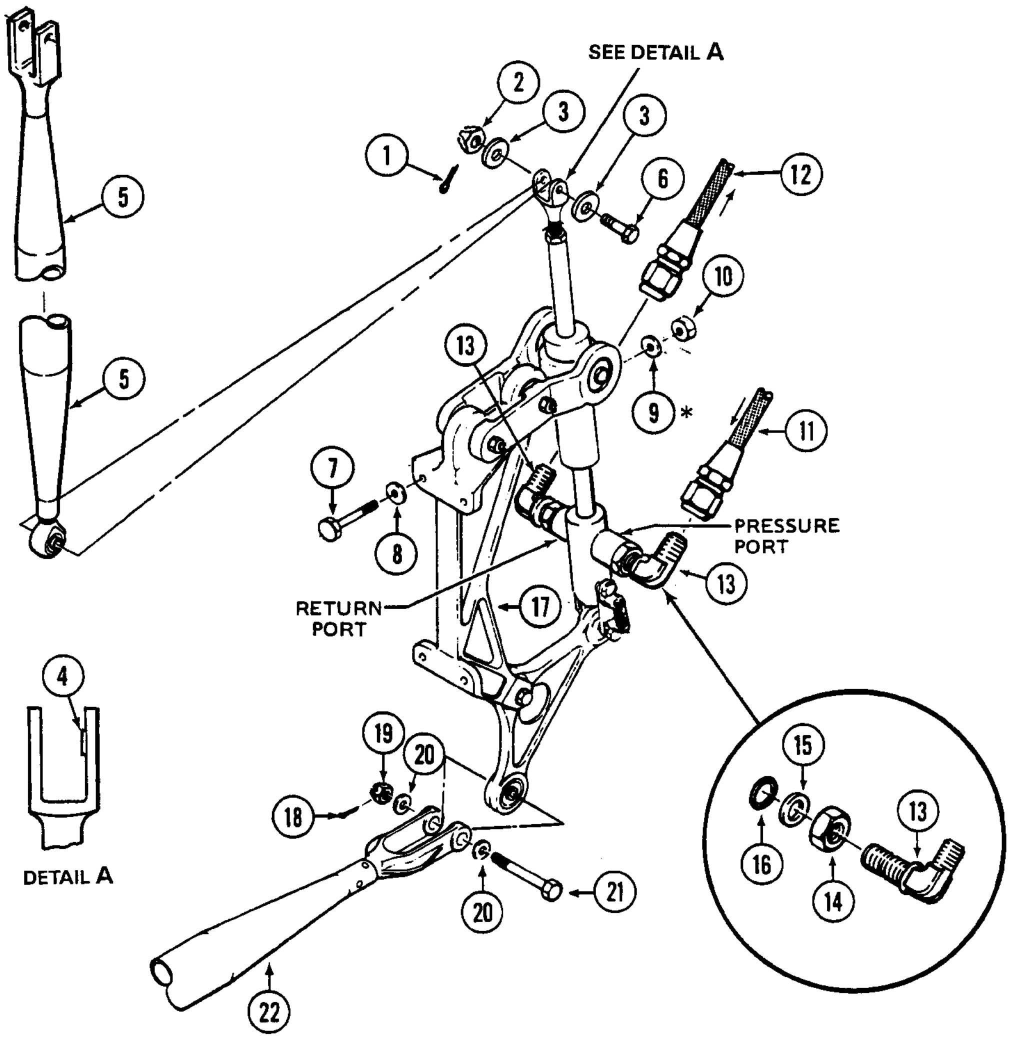
NOTE

After tail rotor control system has been rigged, balance spring tension must be adjusted to prevent either control pedal from creeping forward or aft. Increasing spring tension will prevent left pedal from creeping forward. Decreasing spring tension will prevent left pedal from creeping aft.

b. Rig tail rotor control system. (Chapter 11.) Adjust spring (15, figure 7-26) tension by tightening or loosening nut (9). If motoring persists, after adjusting the balance spring tension, check the hydraulic hoses (11 and 12, figure 7-25) to ensure that there is ample slack to permit smooth operation of the power cylinder. Any tension on the power cylinder by the connecting hoses (11 and 12) can cause motoring.

7-113. Inspection — Hydraulic Cylinder and Support Assembly, Tail Rotor.

a. Check hydraulic cylinder for tightness or binding. Valve should be free to move on shaft. Ensure hose assemblies (11 or 12 figure 7-25) do not restrict valve movement.



1. Cotter pin
2. Nut
3. Washers
4. Shim
5. Tube assembly
6. Bolt
7. Bolt
8. Washer
9. Washer
10. Nut
11. Hose assembly
12. Hose assembly
13. Fitting
14. Nut
15. Ring
16. Preformed packing
17. Cylinder and support assembly
18. Cotter pin
19. Nut
20. Washers
21. Bolt
22. Control tube

* Install aluminum against support.

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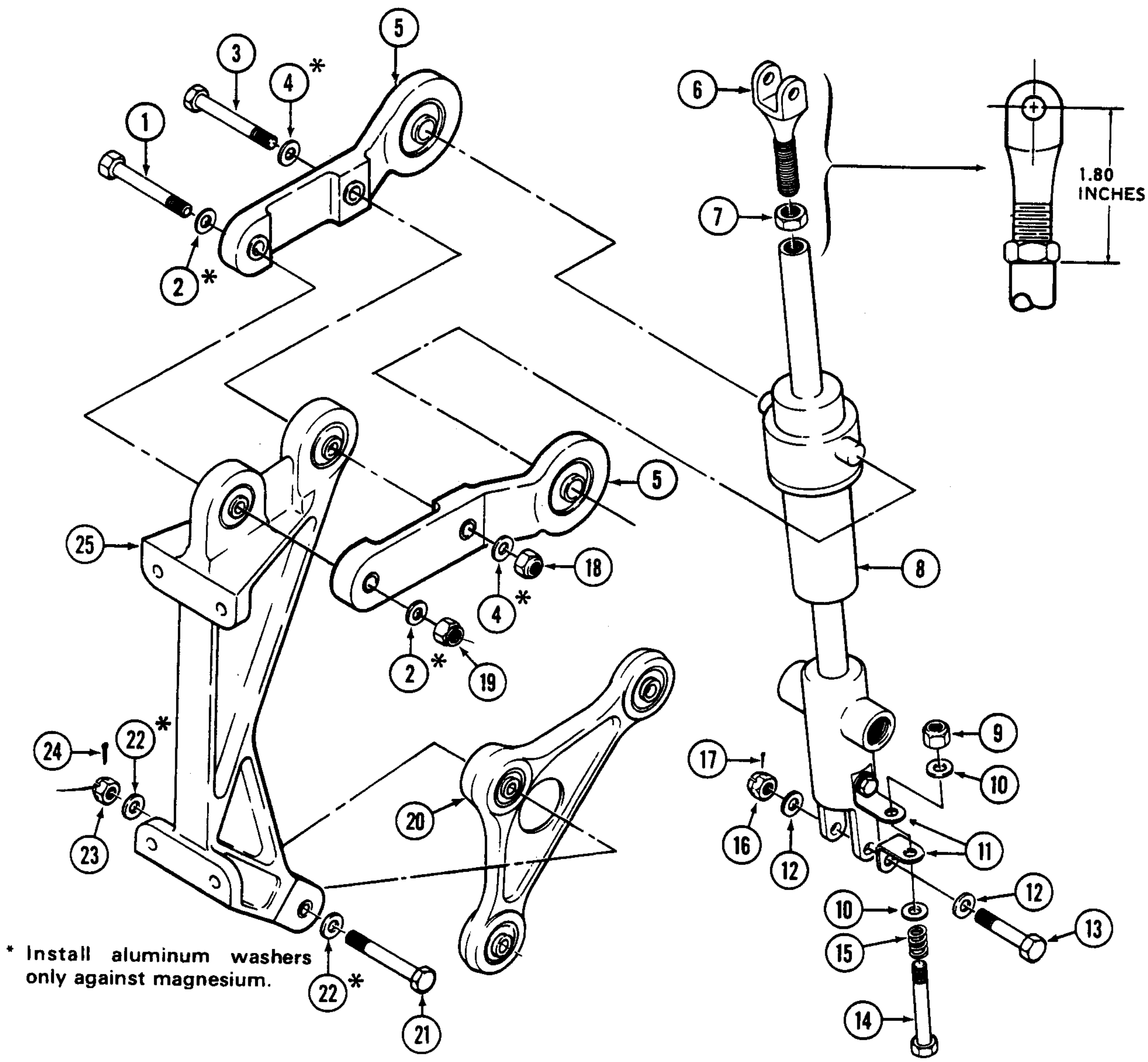
Figure 7-25. Cylinder and support assembly, tail rotor — removal and installation



1. Bolt
*2. Washers
3. Bolt
*4. Washers
5. Arm assembly
6. Adapter
7. Nut
8. Power cylinder
9. Nut
10. Washers
11. Brackets
12. Washers
13. Bolt
14. Bolt
15. Spring
16. Nut
17. Cotter pin
18. Nut
19. Nut
20. Bellcrank assembly
21. Bolt
*22. Washers
23. Nut
24. Cotter pin
25. Support assembly

UH-1H-II-M-07-26

Figure 7-26. Cylinder and support assembly, tail rotor — disassembled view

b. Inspect hydraulic power cylinder for cleanliness, damage, freedom of movement and evidence of leaks. Allowable leakage for this cylinder is one drop per 25 cycles.

c. Inspect cylinder and support assembly (17) and attaching components for security.

d. Inspect piston rod of power cylinder for nicks, scratches, and cracks.

e. Inspect cylinder and support assembly (17) for proper installation.

f. Inspect arm assemblies (5, figure 7-26), bellcrank assembly (20), and support assembly (25) for corrosion damage, pitting, or distortion. (Table 7-7 and Figure 7-27.)

g. Inspect hydraulic fittings (13, figure 7-25) and nuts (14) for corrosion, cracks, and thread damage.

7-114. Removal — Hydraulic Cylinder and Support Assembly, Tail Rotor.

a. Open access door. (Chapter 2.)

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

NOTE

A small amount of fluid seepage will occur when disconnecting hoses.

Ensure protective covers are installed on all open ports to prevent entry of foreign material.

b. Place a suitable container under hose assemblies (11 and 12, figure 7-25) and disconnect hoses from fittings (13). Cap all fittings and hose connectors.

c. Remove cotter pin (1), nut (2), washers (3), and bolt (6) attaching tube assembly (5) to adapter of power cylinder. Keep attaching parts with link assembly.

d. Remove cotter pin (18), nut (19), washers (20), and bolt (21) from control tube (22) and disconnect control tube from bellcrank.

e. Remove nuts (10), washers (8) and 9), and bolts (7) attaching cylinder and support assembly (17) to bulkhead. Remove cylinder and support assembly.

7-115. Disassembly — Hydraulic Cylinder and Support Assembly, Tail Rotor.

a. Disassemble cylinder and support assembly (figure 7-26) as follows:

(1) Place cylinder and support assembly on a clean workbench and remove nuts (18), washers (4), and bolt (3) from arm assembly (5).

(2) Remove nut (19), washers (2), and bolt (1) from arm assembly (5).

(3) Remove cotter pin (24), nut (23), washers (22), and bolt (21) from support assembly (25).

(4) Remove cotter pin (17), nut (16), washers (12) and bolt (13) from power cylinder (8) and bracket (11).

(5) Remove nut (9), washers (10), spring (15), and bolt (14) from brackets (11).

(6) Remove fittings (13, figure 7-25), preformed packings (16), rings (15), and nuts (14) from cylinder assembly.

b. Disassemble power cylinder assembly (8, figure 7-26) in accordance with TM 55-1650-312-40 or TM 55-1650-334-40.

7-116. Inspection — Hydraulic Cylinder and Support Assembly, Tail Rotor.

a. Inspect power cylinder (8, figure 7-26) and adapter (6) in accordance with table 7-7 as follows:

(1) Inspect power cylinder (8) in accordance with TM 55-1650-312-40 or TM 55-1650-334-40.

(2) Inspect power cylinder (8) for cleanliness, damage, freedom of movement, and evidence of leaks.

(3) Inspect adapter (6) for nicks and scratches. (Figure 7-27.)

(4) Inspect for hole elongation to brackets (11), figure 7-26), adapter (6), and lower end of power cylinder (8).

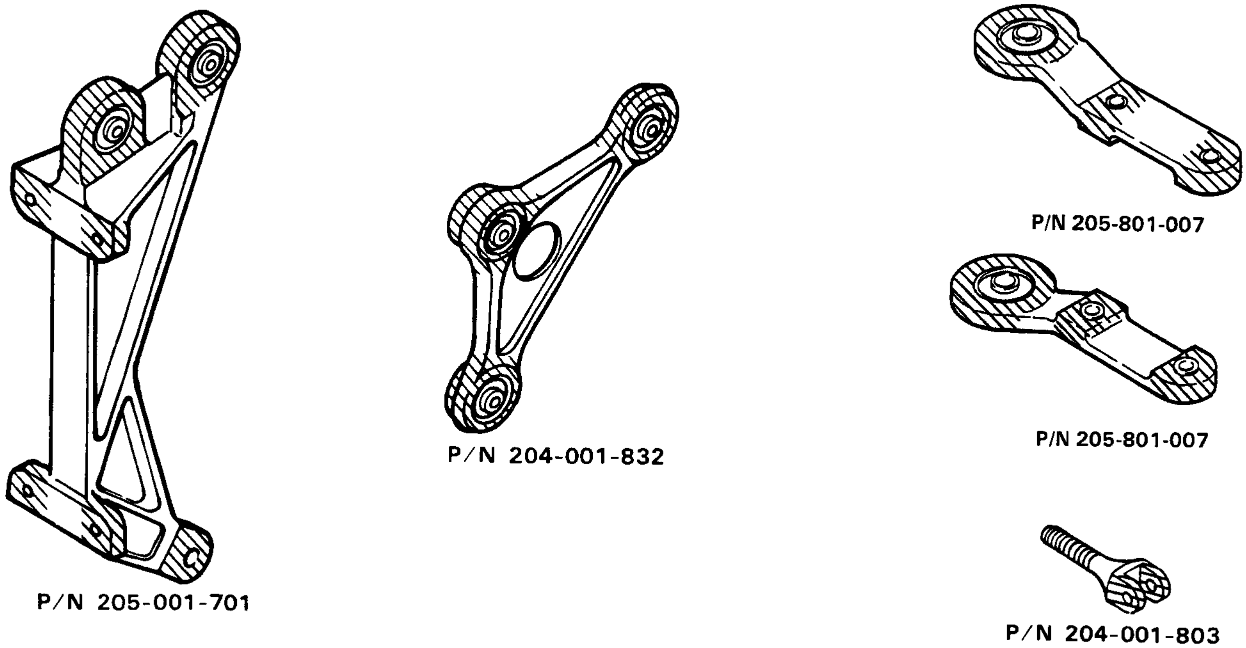
Table 7-7. Inspection Requirements for Cylinder and Support Assembly, Tail Rotor

FIGURE 7-	INDEX NO.	NOMENCLATURE	METHOD OF INSPECTION: VISUAL	METHOD OF INSPECTION: *MAGNETIC PARTICLE	METHOD OF INSPECTION: **PENETRANT	TYPICAL DEFECTS	REFERENCE PARAGRAPH: INSPECTION	REFERENCE PARAGRAPH: REPAIR	REMARKS
25	11	Hose Assembly	X			Cracks, corrosion, frayed wire mesh, deterioration, deformed.	7-113	Replace if damaged.	
25	12	Hose Assembly	X			Corrosion, cracks, frayed wire mesh, deterioration, deformed.	7-113	Replace if damaged.	
25	13	Fitting	X			Corrosion, cracks, and thread damage.	7-113	Replace if damaged.	
25	14	Nut	X			Corrosion, cracks, and thread damage.	7-113	Replace if damaged.	
26	5	Arm Assembly			X	Corrosion, nicks, scratches, cracks, deformed and damaged bearing.	7-113 and figure 7-27	7-117 and figure 7-27	
26	6	Adapter	X	X		Nicks, scratches, cracks, corrosion, and thread damage.	7-113 and figure 7-27	7-117 and figure 7-27	
26	7	Nut	X	X		Corrosion, cracks, and thread damage.	7-113	7-117	
26	8	Power Cylinder	X			Nicks, scratches, cracks, leaks, binding, corrosion, deformed, thread damage, and cleanliness.	7-116 and TM -55-1650-312-40 or TM 55-1650-334-40.	7-116 and TM 55-1650-312-40 or TM 55-1650-334-40.	
26	20	Bellcrank Assembly			X	Nicks, scratches, cracks, corrosion, and damaged bearings.	7-113 and figure 7-27	7-117 and figure 7-27	
26	11	Bracket	X			Cracks, corrosion, nicks, deep scratches, and bent.	7-116	7-117	
26	15	Spring	X			Corrosion, deformed.	7-116	Replace if damaged.	

Table 7-7. Inspection Requirements for Cylinder and Support Assembly, Tail Rotor (Cont)

FIGURE 7-	INDEX NO.	NOMENCLATURE	METHOD OF INSPECTION: VISUAL	METHOD OF INSPECTION: *MAGNETIC PARTICLE	METHOD OF INSPECTION: **PENETRANT	TYPICAL DEFECTS	REFERENCE PARAGRAPH: INSPECTION	REFERENCE PARAGRAPH: REPAIR	REMARKS
26	25	Support Assembly			X	Cracks, corrosion, nicks, scratches, and damaged bearings.	7-116 and figure 7-27	7-117 and figure 7-27	

* Magnetic Particle inspect in accordance with MIL-I-6866 and TM 55-1500-204-25/1
** Fluorescent Penetrant inspect in accordance with MIL-I-6855 and TM 55-1500-204-205/1



TYPE OF DAMAGE	DAMAGE AREA REPAIR ZONES	
MECHANICAL	0.010 INCH MAX. DEPTH	0.020 INCH MAX. DEPTH
CORROSION	0.005 INCH MAX. DEPTH	0.010 INCH MAX. DEPTH
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 SQUARE INCH	NOT CRITICAL
MAXIMUM NUMBER OF REPAIRS	TWO PER ZONE	NOT CRITICAL
EDGE CHAMFER	0.040 INCH MAX.	0.080 INCH MAX.
BORE HOUSING AND BUSHING		

BORE DAMAGE: 0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE

UH-1H-II-M-07-27-1

Figure 7-27. Cylinder and support assembly — damage limits (Sheet 1 of 2)

BEARING DESIGNATION		BEARING WEAR LIMITS
MILITARY STANDARD PART NUMBER	MANUFACTURE PART NUMBER	MAXIMUM RADIAL PLAY
MS27643-4	DSP4, DSRP4	0.006 INCH
MS27643-4	DW4, MDW4, DW4K	0.005 INCH
MS27641-8	KP8A	0.006 INCH

UH-1H-II-M-07-27-2

Figure 7-27. Cylinder and support assembly — damage limits (Sheet 2 of 2)

(5) Inspect piston rod of power cylinder (7) and adapter (6) for stripped or crossed threads.

(6) Inspect spring (15) for corrosion or deformity.

(7) Inspect adapter (6) for cracks using magnetic particle method per TM 55-1500-204-205/1.

(8) Inspect all bearings for maximum axial play in accordance with limits shown in figure 7-27.

b. Inspect support assembly as follows:

(1) Inspect support assembly (25, figure 7-26) left and right arm assembly (5) and bellcrank assembly (20). (Table 7-7 and Figure 7-27.)

(2) Inspect support assembly (25, figure 7-26), two arm assemblies (5), and bellcrank assembly (20) using fluorescent penetrant method per TM 55-1500-204-205/1.

c. Inspect attaching hardware of hydraulic cylinder assembly as follows:

(1) Inspect for loose or missing hardware.

(2) Inspect hardware for corrosion.

(3) Inspect hardware for cracks using magnetic particle method per TM 55-1500-204-205/1. No cracks allowed.

(4) Inspect hardware for security.

(5) Inspect washers for elongated holes.

(6) Inspect all bolts and nuts for thread damage.

(7) Inspect shim (4, figure 7-25) for damage.

7-117. Repair — Hydraulic Cylinder and Support Assembly, Tail Rotor.

Premaintenance Requirements for Repair of Tail Rotor Cylinder and Support Assembly

CONDITIONS	REQUIREMENTS
Special Tools	None
Test Equipment	None
Support Equipment	
Minimum Personnel Required	One
Consumable Materials	(C-100), (C-423), (C-201), (C-317), (C-430)
Special Environmental Conditions	Temperature/ Dust Free/ Well Ventilated Area

a. Repair power cylinder assembly (8, figure 7-26) as follows:

(1) Any cracks in components of power cylinder (8) require replacement of part.

(2) Replace any bearing in support assembly (25), arm assembly (50) or bellcrank assembly (20) that is damaged or exceeds inspection limits outlined in above paragraph 7-116, step a. (8).

(3) For bearing replacement procedures, refer to Chapter 11.

(4) Repair power cylinder assembly (8) as applicable in accordance with TM 55-1650-312-40 or TM 55-1650-334-40.

(5) Replace packings (16, figure 7-25) when removed or leaking.

b. Damages to the support assembly that do not exceed the maximum limits outlined in figure 7-27 may be repaired by polishing the damaged area with 600 grit adhesive cloth or paper (C-423). Treat repaired area with chemical film material (C-100) followed with a light touchup of epoxy polyamide primer (C-204).

c. If shim (4, figure 7-25) is damaged or loose, remove and replace. Bond with adhesive (C-317). Peel shim as required to obtain a dimension of 0.431 to 0.0442 inch between shim and clevis (detail A, figure 7-25).

d. Repair attaching hardware as follows:

(1) Replace any missing hardware.

(2) Tighten hardware when loose.

(3) Any cracks or corrosion requires replacement of part.

(4) Elongated holes in washers require replacement of part.

(5) Replace barrier tape (C-430) on mounting pads of support assembly (25) when missing or torn.

7-118. Assembly — Hydraulic Cylinder and Support Assembly, Tail Rotor.

CAUTION

Aluminum washers only, (2 and 4, figure 7-26) will be installed adjacent to arm assemblies (5).

a. Position arm assemblies (5) to mounting bosses of power cylinder (8) and upper bearings of support assembly (25). Install bolt (3), washers (4), and nut (18).

b. Install bolt (1), washers (2), and nut (19) to arm assemblies (5).

CAUTION

Aluminum washers (22) shall be installed against support assembly (25).

c. Position bellcrank assembly (20) to support assembly (25) and install bolt (21), washers (22), and nut (23). Secure nut (23) with cotter pin (24).

d. Place washer (12) and bracket (11) on bolt (13). Position bellcrank (20) to power cylinder (8) and install bolt (13), washer (12), and nut (16). Secure nut (16) with cotter pin (17).

e. Place spring (15) and washer (10) on bolt (14) and install bolt through two brackets (11). Install washer (10) and nut (9) to bolt (14).

f. Install nut (7) to adapter (6), thread adapter into piston rod of power cylinder (8) and adjust adapter (6) 1.80 inches as shown. Tighten nut (7) against piston rod.

CAUTION

When hydraulic cylinder and support assembly is not scheduled for immediate installation to helicopter, precautionary measures must be exercised at all times to keep component clean and to prevent corrosion.

g. Wrap hydraulic cylinder and support assembly in barrier material (C-427) and secure with tape (C-410).

7-119. Test Procedures — Hydraulic Cylinder and Support Assembly, Tail Rotor. Test power cylinder (8, figure 7-26), as applicable, in accordance with TM 55-1650-312-40 or TM 55-1650-334-40.

7-120. Installation — Hydraulic Cylinder and Support Assembly, Tail Rotor.

WARNING

Epoxy polyamide primer is flammable with a flash point of 50°F (10°C). Use a well ventilated area and avoid breathing spray mist.

CAUTION

Install aluminum washers (9, figure 7-25) against support assembly (25, figure 7-26).

NOTE

Prior to installation of hydraulic cylinder and support assembly, ensure that barrier tape (C-430) on mounting pads of support assembly (25, figure 7-26) is not torn or missing. Tape will extend past edges of mounting pads 1/4 inch. Bolts (7, figure 7-25) will have a light application of zinc chromate primer (C-201) or epoxy polyamide (C-204) applied prior to installation.

a. Position hydraulic cylinder and support assembly (17, figure 7-25) and install bolts (7) with a light coat of epoxy polyamide primer (C-204), washers (8), washers (9), and nuts (10).

b. Insert adapter (6, figure 7-26) into the assembly (5, figure 7-25). Install bolt (6), washers (3), and nut (2). Secure nut (2) with cotter pin (1).

WARNING

Hydraulic fluid is flammable. Flash point at 200°F (93°C). Avoid prolonged contact with skin or clothing as it will irritate or cause a burn. Wash affected area immediately.

NOTE

A small amount of fluid seepage may occur when removing protective dust covers from power cylinders (8, figure 7-26) which will require placing a rag or small suitable container under pressure and return ports to catch seepage.

c. Remove protective dust covers from pressure and return ports of power cylinder (8).

d. The following installation procedures for fitting (13, figure 7-25) are typical for both pressure and return ports of power cylinder.

(1) Install nut (14), ring (15), and packing (16) on fitting (13) and thread fittings into pressure and return ports of power cylinder.

(2) Position fittings (13) approximately as shown and secure nut (14).

e. Install hose assemblies (11 and 12) to fittings (13). Ensure that hose assemblies are not twisted, kinked, and fouled.

f. Position control tube (22) to bellcrank (20), figure 7-26) and install bolt (21, figure 7-26), washer (20), and nut (19). Secure nut (19) with cotter pin (18).

g. Remove rag or container from under power cylinder.

h. Move pedals to full left and full right and check hose assemblies (11 and 12) during both positions for fouling.

i. Service and bleed hydraulic system. (Paragraphs 7-4 and 7-6.)

j. Check rigging of tail rotor flight control system. (Chapter 11.)

k. Close access door. (Chapter 2.)

l. Perform operational check of tail rotor flight control system. (Paragraph 7-4.)

SECTION II — PNEUMATIC SYSTEM

(Not Applicable)

SECTION III — ROTOR BRAKE SYSTEM

7-121. ROTOR BRAKE SYSTEM.

7-122. Description. — Rotor brake system. The hydraulic pressure to operate the rotor brake assembly (1, figure 7-28) is provided by actuation of lever (5) on master cylinder (4) located in cabin roof. Rotor brake components are a master cylinder, rotor brake assembly and disc and rotor quill (Chapter 6).

7-123. TROUBLESHOOTING.

The following list of probable causes, isolation procedures and remedies are intended to aid in rotor brake system troubleshooting.

Table 7-8. Troubleshooting rotor brake system

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No braking action.	Insufficient fluid in system.	Fill and bleed system.
	Foreign substance in fluid.	Purge system.
	Primary valve open.	Replace master cylinder.
	Relief valve open.	Replace master cylinder.
	Excessive brake lining wear.	Replace lining.
Spongy action of control.	Air in system.	Fill and bleed system.
Loss of brake action.	Worn seal in master cylinder.	Replace master cylinder.
	Worn seal in brake assembly.	Replace brake assembly.
	Excessive brake lining wear.	Replace lining.
Leaks at master cylinder.	Worn or damage seals in master cylinder.	Replace master cylinder seals.
Leaks at brake assembly.	Worn or damage seals in brake assembly.	Replace brake assembly seals.
ROTOR BRAKE caution segment inoperative.	Burned out bulbs.	Replace bulbs.
	Loose electrical connection.	Tighten connections.
	Broken or disconnected wire.	Replace or connect wire.
	Improper microswitch adjustment.	Adjust microswitches.
ROTOR BRAKE segment illuminates when brake not applied.	Faulty microswitch.	Replace switch.
	Lining binding.	Clean brake cylinder.

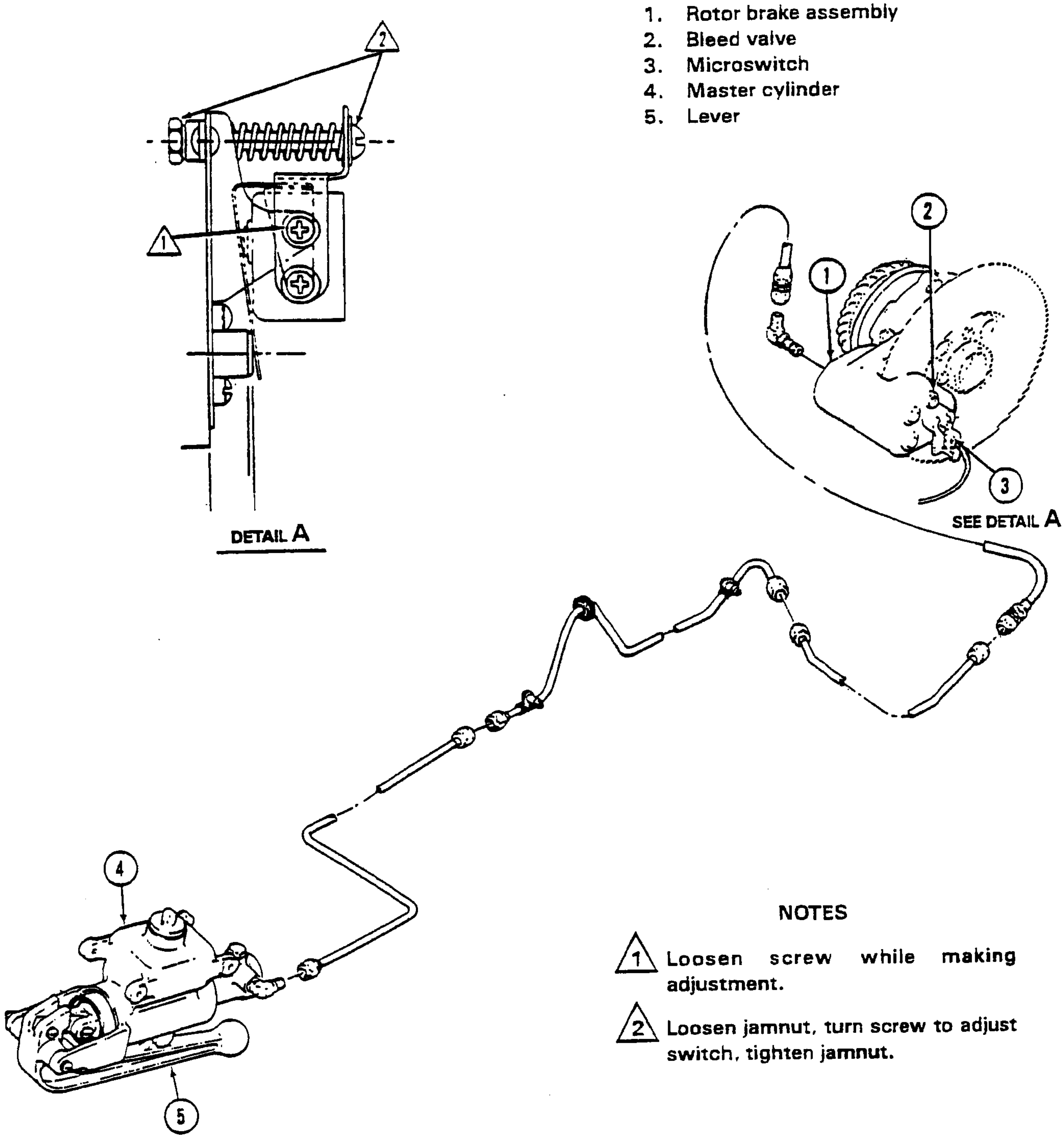


Figure 7-28. Rotor brake system

7-124. SERVICING.

a. Apply rotor brake and leave handle in PARK position.

b. Remove reservoir filler cap of master cylinder, located on top, right forward area of cabin roof.

c. Correct fluid level of reservoir is 0.50 in. below bottom of filler neck; if fluid level is low, replenish with hydraulic fluid (C-002).

d. Install filler cap.

e. Release rotor brake by returning handle of master cylinder to up (off) position.

7-125. BLEEDING.

a. master cylinder (4, figure 7-28) for proper fluid level, (paragraph 7-123).

NOTE

Ensure rubber hose used in following step is clean.

b. Open one bleed valve (2) and slip one end of a length of rubber hose on valve extension. Route other end of hose to a suitable container in order to capture brake fluid discharge during bleeding operation.

c. Slowly pull master cylinder lever (5) down and hold. Do not allow lever to pass center into park position.

d. Close bleed valve (2) and replenish oil in master cylinder. Return master cylinder lever (5) to up (off) position.

e. Repeat steps 2. through 4. until fluid discharged is free of entrained air. No less than one-half pint of fluid should be drain from each valve before conducting bleeding operation.

f. Repeat steps 2. through 5. for bleed valve (2).

g. Remove drain hose and catch receptacle. Install reservoir cover.

h. Close transmission cowl.

7-126. MASTER CYLINDER.

WARNING

CLEANING HYDRAULIC COMPONENTS SHALL BE ACCOMPLISHED WITH SOLVENT (C-304) ONLY. DO NOT USE ALCOHOL.

7-127. Removal — Master cylinder.

a. Remove sealing compound from around top master cylinder reservoir (4, figure 7-28).

b. Loose tubing from end of master cylinder and allow fluid to drain into receptacle.

c. Disconnect tubing from master cylinder. Plug opening to prevent entry of foreign materials.

d. Remove bolts, nuts, and washers attaching master cylinder to roof structure. Remove master cylinder.

7-128. Inspection and repair — Master cylinder.

Refer to BHT-212-CR&O.

7-129. Installation — Master cylinder.

a. Place master cylinder (4, figure 7-28) in install position, right of overhead console in cabin roof and attach to structure with four bolts, four nuts, and eight washers.

b. Apply bead of adhesive (C-308) to roof surface around master cylinder fill port.

c. Attach tubing to master cylinder.

d. Bleed master cylinder (paragraph 7-125).

7-130. ROTOR BRAKE ASSEMBLY AND DISC.

CAUTION

Brake assembly 9450103 replaced by 9450103-1, which uses non-asbestos linings 5009209 (white paint on back). Do not intermix with old linings, 9430521 (green zinc chromate on back).

CAUTION

When replacing brake assembly P/N 9450103-1 on rotor brake quill 412-040-123-101 with a rotor brake quill sleeve P/N 412-040-121-107 installed, an inspection is required to determine if interference exists between the sleeve flange and brake. Refer to paragraph 7-133, step m.

7-131. Description — Rotor brake assembly and disc.

The rotor brake assembly and disc is mounted to the rotor brake quill on the left side of transmission.

7-132. Removal — Rotor brake assembly and disc.

CAUTION

Rotor brake disc and flange assembly shall be removed as an assembly. Do not attempt to remove disc from flange while installed on quill. Do not separate disc from flange if disc is not being replaced.

a. Remove microswitch connector.

b. Disconnect hose (13, figure 7-29) from brake assembly.

c. Remove bolts (9), washers (10), and outboard half of brake assembly (11).

d. Remove brake assembly spacer (12) from transfer tube in inboard half of brake assembly.

e. Remove oil transfer tube from inboard half of brake assembly.

f. Remove packings from counterbored cavities in split-line faces of inboard and outboard halves of brake assembly.

g. Cut lockwire and remove retaining nut (14) with packing. Remove bolts (6) and washers (7).

h. Remove brake disc (8) from flange adapter (5) using plastic mallet if required.

i. Cut lockwire, remove bolts (2), washers (3), and inboard half of brake assembly (4) from brake assembly (1).

7-133. Installation — Rotor brake assembly and disc.

a. Install inboard half of brake assembly (4, figure 7-29) onto rotor brake quill assembly (1). Secure with three bolts (2) with washers (3). Torque bolts 50 to 70 inch-lbs. Secure with lockwire (C-405).

b. Install rotor brake disc (8) on flanged adapter (5) of rotor brake quill assembly with side marked MOUNT THIS SIDE against flange of adapter. Secure with four bolts (6) and washers (7).

c. Lubricate new packing (15) with transmission oil and install on nut (14).

d. Install retaining nut (14) and torque 125 to 150 foot-lbs.

e. Torque bolts (6) 50 to 70 inch-lbs. Secure bolts with lockwire. Secure bolts with lockwire (C-405). Route lockwire spanning each set of bolts (6) through lockwire holes in nut (14), retaining flange adapter of rotor brake quill to quill shaft.

f. Install two packings into counterbored cavities in split-line faces of inboard and outboard of brake halves of brake assemblies.

g. Insert brake oil transfer tube through packing in inboard half of brake assembly unit until it bottoms out in hole.

h. Place brake assembly spacer over protruding oil transfer tube in inboard half of brake assembly.

i. Install outboard half of brake assembly (11) and, while holding in place, align brake assembly spacer (12). Install two bolts (9) with washers (10).

j. Torque bolts (9) 120 to 130 inch-lbs. Secure with lockwire (C-405).

k. Install microswitch connector.

l. Install hydraulic hose in rotor brake assembly.

NOTE

Perform step m. when replacing brake assembly P/N 9450103-1 on rotor brake quill 412-040-123-101 with a rotor brake quill sleeve P/N 412-040-121-107 installed.

m. Using a suitable light source and inspection mirror, carefully inspect rotor brake quill sleeve assembly P/N 412-040-121-107 and brake assembly P/N 9450103-1 for contact interference. If contact exists, make repairs as follows:

(1) Remove rotor brake assembly (paragraph 7-130) and rotor brake quill (chapter 6).

(2) Cover transmission rotor brake quill bore to prevent contamination of the transmission interior.

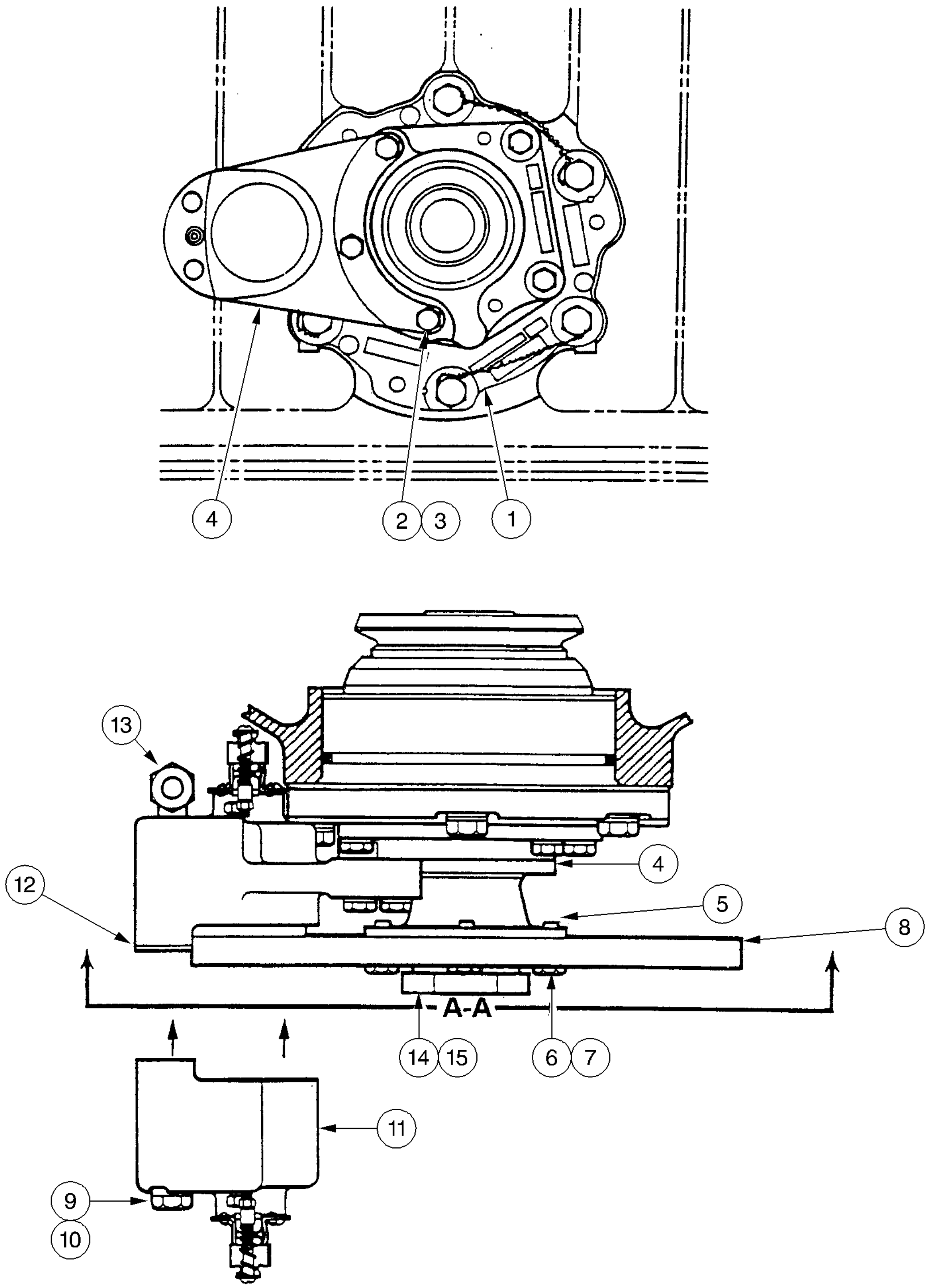


Figure 7-29. Rotor brake assembly and disc (Sheet 1 of 2)

1. Quill assembly
2. Bolt
3. Washer
4. Inboard brake assembly half
5. Flanged adapter
6. Bolt
7. Washer
8. Brake disc
9. Bolt
10. Washer
11. Outboard brake assembly half
12. Spacer
13. Hose
14. Retaining nut
15. Packing

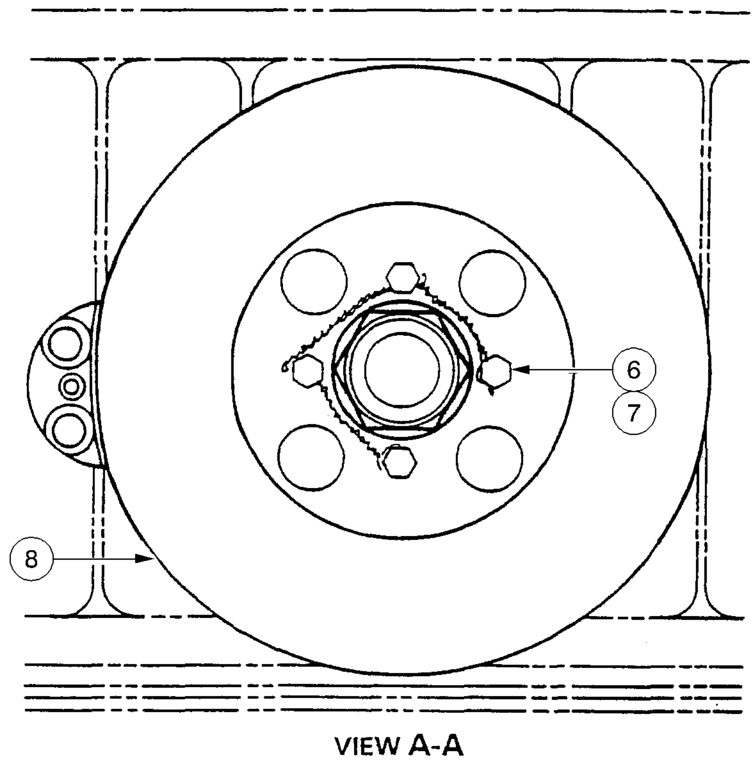


Figure 7-29. Rotor brake assembly and disc (Sheet 2 of 2)

(3) Thoroughly masked inboard end 412-040-123 quill assembly including gear head and end of quill sleeve to prevent entry of debris into quill.

(4) Mask oil feed hole in quill sleeve at approximately 12:00 o'clock position on quill sleeve.

(5) Mask oil drain hole in quill sleeve at approximately 6:00 o'clock position.

(6) Thoroughly masked outboard end of quill assembly including flanged adapter and outboard end of 412-040-122 retainer.

(7) Remove three screws holding shim plate to quill sleeve flange and remove shim plate.

(8) Remove material from flange of 412-040 -121 quill sleeve as shown in figure 7-30. Maintain 125 microinches maximum surface finish in reworked area.

(9) Remove tooling point boss and cut back flange radius if, as cast, the flange exceeds the 0.520 inch dimension. Blend the flange outer radius into each of the two cast bosses using 0.38 inch radius. Refer to figure 7-30.

(10)Break all sharp edges 0.015 inch radius or 0.015x40-50 degree.

(11)Treat reworked areas with Dow 19.

(12)Touchup reworked areas using two coats of polyamide epoxy primer. Absolutely no primer permitted on inside face of quill sleeve flange. Reference painting instructions of BHT-ALL-SPM.

(13)Touch up top coat using aluminized acrylic lacquer. Absolutely no paint is permitted on inside face of quill sleeve flange. Refer to painting instructions of BHT-ALL-SPM.

(14)Remove mask install in steps 3., 4., 5., and 6.

(15)Install shim plate on quill sleeve flange using three original screws. Ensure heads of screws are seated below surface of shim plate.

(16)Reinstall rotor brake quill (Chapter 6) and rotor brake assembly (paragraph 7-133).

(17)Perform operational check of rotor brake.

(18)Close and secure cowlings.

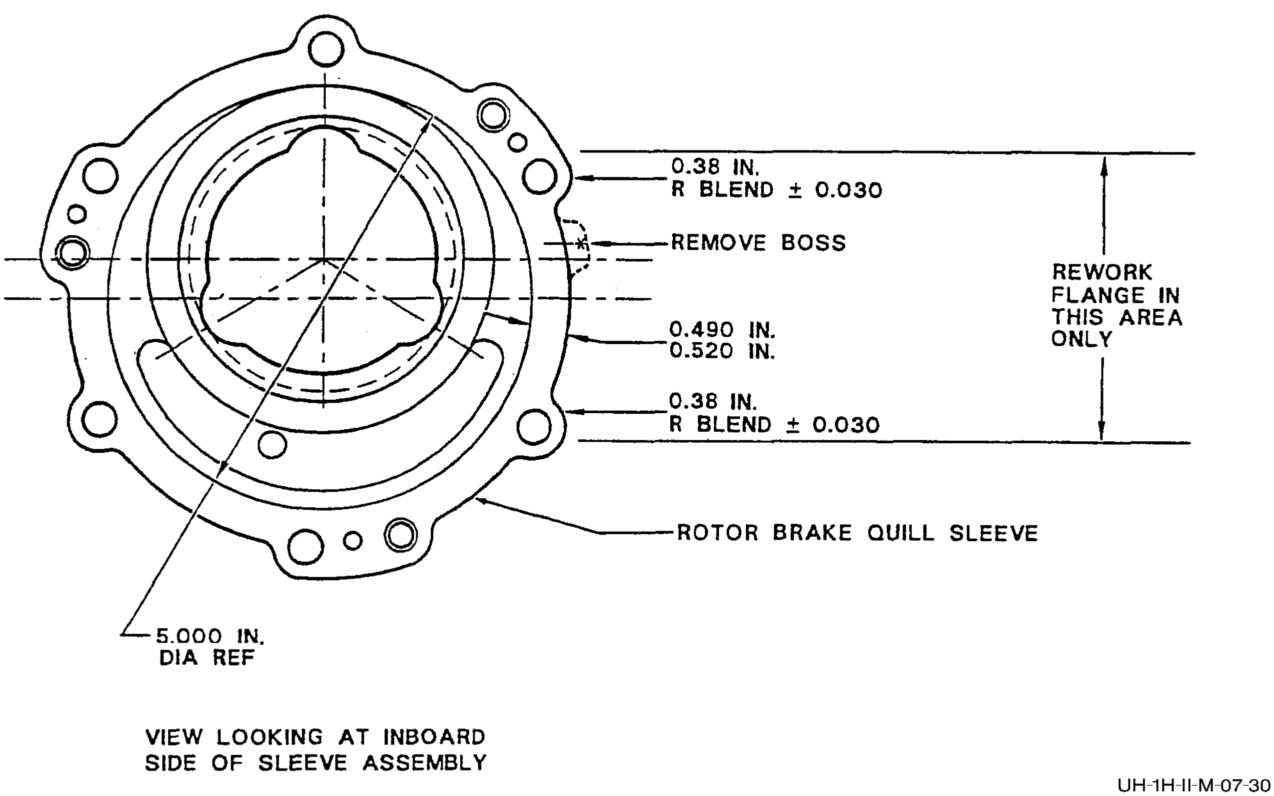


Figure 7-30. Rotor brake quill sleeve (P/N 412-040-121-107) repair

CHAPTER 8

INSTRUMENT SYSTEMS

SECTION I — INSTRUMENT MAINTENANCE

8-1. INSTRUMENT MAINTENANCE.

8-2. Description — Instrument Maintenance. Instrument maintenance refers to general maintenance procedures which are applicable to all instruments mounted in the instrument panel.

8-3. Cleaning — Instrument Maintenance. Clean panel and instrument cover glasses with a suitable soft, lint-free cloth.

8-4. Inspection — Instrument Maintenance.

a. Inspect for loose, cracked, or broken cover glasses.

b. Inspect for proper and secure mounting.

c. Inspect range markings and decals for completeness and legibility.

d. Inspect for proper operation.

8-5. Removal — Instrument Maintenance.

a. Ensure all electrical power is OFF.

b. Disconnect electrical leads or instrument piping from back of panel. Necessary access may be through pedestal and through back of cabin mounting holes in panel after instrument is detached.

c. Protect ends of electrical leads and cap open piping and openings on instrument.

NOTE

A MS28042 clamp will be used to mount certain round instruments. In order to remove this clamp it will be necessary to hold the clamp from the aft side while removing the screw from the front of the panel.

d. Remove mounting screws or loosen mounting clamp screw. Remove instrument.

8-6. Repair or Replacement — Instrument Maintenance.

a. Replace missing or illegible range markings on cover glasses of instruments.

NOTE

When replacing instrument range markings (refer to BHT-92-004-10 for ranges) use a suitable lacquer. Protect markings by applying a light coat of clear adhesive varnish or lacquer. Apply range markings accurately on cover glass.

b. Replace any required decals which are not clearly legible.

c. Replace any instrument if cover glass is loose, cracked or broken, or when found to be unserviceable.

8-7. Installation — Instrument Maintenance.

CAUTION

A MS28042 clamp will be used to mount certain round instruments. The installation technique required to ensure instrument security is that the clamp must be held in place from the aft side while tightened by a screw visible on the front side of the panel. A gap between the head of the screw and the face of the instrument panel may exist. Do not attempt to over-torque the screw to eliminate the clearance since the scissors mechanism of the clamp will be damaged.

a. Position instrument in panel. Install mounting screws or tighten screw of mounting clamp.

CAUTION

When connecting electrical plugs to dual tachometer indicator, ensure that plugs are connected to correct receptacle.

b. Remove protective caps or covers as necessary. Connect electrical leads and instrument piping.

c. Check operation of instrument.

8-8. INSTRUMENT PREMAINTENANCE REQUIREMENTS.

8-9. Description — Instrument Premaintenance Requirements. Throughout this chapter, unless otherwise specified, instrument maintenance, testing, and troubleshooting procedures will utilize only tools and equipment contained in Electronic Equipment Tool Kit, TK100/G and a multimeter (AN/PSM-64 or equivalent).

SECTION II — ENGINE INSTRUMENTS

8-10. ENGINE INSTRUMENTS.

8-11. Description — Engine Instruments. Engine instruments include the dual tachometer, gas producer tachometer, engine oil pressure and temperature, engine gas temperature, fuel pressure, and torque pressure indicating systems.

8-12. TACHOMETER INDICATING SYSTEM.

8-13. Description — Tachometer Indicating Systems. The tachometer indicating systems are self-generating rotary type systems consisting of the dual tachometer, rotor tachometer generator, and power turbine tachometer generator as one system; and gas producer tachometer and gas producer tachometer generator as the other system.

8-14. DUAL TACHOMETER.

8-15. Description — Dual Tachometer. The dual tachometer indicates both main rotor rpm and engine output shaft rpm. Each tachometer has a synchronous motor connected electrically to a separate tachometer generator. The system operates independently of helicopter electrical power systems. The rotor rpm pointer indicates on the inner scale. The engine rpm pointer indicates on the outer scale.

8-16. Cleaning — Dual Tachometer. Refer to paragraph 8-3 for cleaning procedure.

8-17. Inspection — Dual Tachometer. Refer to paragraph 8-4 for inspection procedure.

8-18. Function Test — Dual Tachometer.

a. Disconnect plug (P35) from rotor tachometer generator. Connect plug to the MASTER GENERATOR output plug on tachometer tester TTU-27E. Energize tester and set controls according to the instructions on the cover of the tester.

b. Check that the rotor tachometer portion of the indicator indicates within tolerance of the various check points in the following chart:

TEST POINTS (RPM)	INDICATOR (RPM)	TOLERANCE
0	0	±3
531	40	±4
1063	80	±4
1992	150	±4
2532	190	±4
3055	230	±4
3320	250	±4
3580	270	±3
3851	290	±2
3984	300	±2
4117	310	±2
4250	320	±2
4383	330	±3
4649	350	±3

c. Disconnect plug (P35) from the TTU-27E tester and reconnect it to the rotor tachometer generator. Check that connector is properly mated and secure.

d. Disconnect plug (P86) from the power turbine tachometer generator. Connect plug to the MASTER GENERATOR output plug on the TTU-27E tester. Energize test stand and set controls according to the tester instructions on the cover of the tester.

e. Check that the power turbine portion of the indicator indicates within tolerance of the various check points in the following chart:

TEST POINTS (RPM)	INDICATOR (RPM)	TOLERANCE
0	0	±50
511	800	±70
958	1500	±70
1980	3100	±70
2491	3990	±70
2938	4600	±70
3357	5100	±50
3576	5600	±50
3832	6000	±30
3959	6200	±30
4023	6300	±20
4151	6500	±30
4342	6800	±40
4534	7100	±60

f. Disconnect plug (P86) from the test stand and reconnect it to the power turbine tachometer generator. Check that connector is properly mated and secure.

8-19. Troubleshooting — Dual Tachometer. Use table 8-1 and perform necessary checks to isolate trouble. Broken or shorted wiring is always a probable cause of malfunction or failure and has not been included. (Figure F-2.)

NOTE

All normal operational checks should be completed before using this table.

Table 8-1. Troubleshooting — Dual Tachometer

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Tachometer has excess scale error.

STEP 1. Determine if indicator has internal defects.

Replace indicator if defective. (Paragraph 8-1.)

2. Tachometer indication only half of actual speed.

STEP 1. Determine if electrical connectors are connected to correct receptacle on indicator.

Reconnect electrical connectors if reversed at indicator.

3. No reading on tachometer indicator.

STEP 1. Check for poor connection at indicator or generator.

Clean or tighten connections.

Table 8-1. Troubleshooting — Dual Tachometer (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Determine if internal circuit is defective in indicator or generator.

Replace defective indicator and/or generator. (Paragraph 8-1, 8-22, and 8-31.)

4. High or low reading on indicator either constant or intermittent.

STEP 1. Determine if generator signal to indicator is good.

Replace indicator if defective. (Paragraph 8-1.)

8-20. Removal/Installation — Dual Tachometer.

Refer to paragraphs 8-5 and 8-7 for removal and installation procedures.

8-21. Repair or Replacement — Dual Tachometer. Refer to paragraph 8-6 for repair or replacement criteria.

8-22. POWER TURBINE TACHOMETER GENERATOR.

8-23. Description — Power Turbine Tachometer Generator. The power turbine tachometer generator is mounted on the governor and tachometer drive gearbox on the upper left side of the engine, and is connected to the dual tachometer indicator on the instrument panel.

8-24. Cleaning — Power Turbine Tachometer Generator.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lent-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

8-25. Inspection — Power Turbine Tachometer Generator.

a. Inspect tachometer generator case for cracks, excessive wear, or any visible damage.

b. Check connector for damaged or bent pins and cracked inserts.

c. Check that rotor turns freely and there is no visible indication of excessive wear to bearings.

8-26. Troubleshooting — Power Turbine Tachometer Generator. Refer to paragraph 8-19 and table 8-1 for troubleshooting.

8-27. Removal — Power Turbine Tachometer Generator.

a. Remove cowling from left side of engine.

b. Disconnect electrical receptacle. Remove mounting nuts and washers and lift tachometer generator from engine.

8-28. Repair or Replacement — Power Turbine Tachometer Generator.

a. Replace tachometer generator if case is cracked or damaged.

b. Replace tachometer generator if rotor does not turn freely or if there is visible indication of excessive wear to bearings.

NOTE

Replacement of power turbine tachometer generator will require testing the rpm limit warning system. Refer to Chapter 9 for rpm limit warning system tests.

c. Repair damaged connectors.

8-29. Bench Test — Power Turbine Tachometer Generator.

a. Remove tachometer generator from helicopter and mount on tachometer tester TTU-27E. Connect generator to the TEST GENERATOR INPUT. Operate tester according to instructions on cover and check voltage outputs of the tachometer generator. With a 40 ohm "Y" connected resistance and a shaft speed of 4200 rpm, check voltage output across each phase of generator (A — B, A — C, and B — C). The three voltage outputs should be 21 ± 0.5 Vac.

b. Decrease generator speed to 1,000 rpm and use a 20 ohm "Y" connected resistance.

c. Check the voltage output of the three phases. Voltage should not go below 3.5 Vac.

d. Disconnect tachometer generator and remove from the TTU-27E.

e. Measure the resistance of each phase (A — B, A — C, and B — C). At 77°F (25°C), the resistance should be between 15 and 20 ohms. The resistance value of each phase should be within 1 ohm of the other two phases.

f. At completion of testing, install tachometer generator and connect electrical plug. Check for proper mating and security.

8-30. Installation — Power Turbine Tachometer Generator.

a. Position tachometer generator and gasket on studs and install nuts.

b. Connect electrical receptacle and install cowling.

NOTE

Coat tachometer generator shaft and pack mating splines of shaft in accessory drive gearbox 2/3 full with lubricant (C-012).

8-31. ROTOR TACHOMETER GENERATOR.

8-32. Description — Rotor Tachometer Generator. The rotor tachometer generator is located on the lower right side of the transmission. The generator is mounted on the hydraulic pump and tachometer drive quill assembly and is connected to the dual tachometer indicators on the instrument panel.

8-33. Cleaning — Rotor Tachometer Generator. Refer to paragraph 8-24, cleaning procedures are the same.

8-34. Inspection — Rotor Tachometer Generator. Refer to paragraph 8-25; inspection procedures are the same.

8-35. Troubleshooting — Rotor Tachometer Generator. Refer to paragraph 8-19 for troubleshooting procedures.

8-36. Removal — Rotor Tachometer Generator.

a. Remove cowling from right side of transmission.

b. Disconnect electrical receptacle, remove mounting nuts and washers, and lift rotor tachometer generator from helicopter.

8-37. Repair or Replacement — Rotor Tachometer Generator.

a. Replace tachometer generator if case is cracked or damaged.

b. Replace tachometer generator if rotor does not turn freely or if there is visible indication of excessive wear to bearings.

NOTE

Replacement of rotor tachometer generator will require testing the rpm limits warning system. Refer to Chapter 9 for rpm limits warning system test procedure.

8-38. Bench Test — Rotor Tachometer Generator. Refer to paragraph 8-29; procedures are the same.

8-39. Installation — Rotor Tachometer Generator.

a. Apply a thin film of lubricant (C-012) to tachometer generator splines and to mating splines in transmission.

b. Position tachometer generator on mounting studs and install mounting washers and nuts.

c. Connect electrical receptacle and install cowling.

8-40. GAS PRODUCER TACHOMETER INDICATOR.

8-41. Description — Gas Producer Tachometer Indicator. The gas producer tachometer, located on the instrument panel, provides indication in percent rpm of the engine gas producer (first stage on N1 turbine and compressor) by connection to a synchronous generator, mounted on engine accessory drive section. The indicator and generator circuit are independent of helicopter electrical power system.

8-42. Cleaning — Gas Producer Tachometer Indicator. Refer to paragraph 8-3 for cleaning procedure.

8-43. Inspection — Gas Producer Tachometer Indicator. Refer to paragraph 8-4 for inspection procedure.

8-44. Troubleshooting — Gas Producer Tachometer Indicator. Refer to paragraph 8-19; procedures are the same.

8-45. Removal — Gas Producer Tachometer Indicator. Refer to paragraph 8-5 for removal procedure.

8-46. Repair or Replacement — Gas Producer Tachometer Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-47. Bench Test — Gas Producer Tachometer Indicator.

a. Disconnect plug (P87) from gas producer tachometer generator. Connect plug to the MASTER GENERATOR output plug on the TTU-27E tester. Energize the test stand and set controls according to the instructions on the cover of the tester.

b. Check that the gas producer tachometer indicator indicates within tolerance of the various check points in the following chart:

TEST POINTS (RPM)	INDICATOR (%)	TOLERANCE
210	5	±1.00
840	20	±1.25
2940	20	±1.25
4200	100	±1.00

c. Disconnect plug (P87) from TTU-27E tester and reconnect it to gas producer tachometer generator. Check that connector is properly mated and secure.

8-48. Installation — Gas Producer Tachometer Indicator. Refer to paragraph 8-7 for installation procedure.

8-49. GAS PRODUCER TACHOMETER GENERATOR.

8-50. Description — Gas Producer Tachometer Indicator. The gas producer tachometer generator, located on right side of engine on accessory gearbox, monitors the rpm of the gas producer turbine. It transmits voltage signals to drive the gas producer tachometer indicator.

8-51. Cleaning — Gas Producer Tachometer Generator. Refer to paragraph 8-24; procedures are the same.

8-52. Inspection — Gas Producer Tachometer Generator. Refer to paragraph 8-25; procedures are the same.

8-53. Troubleshooting — Gas Producer Tachometer Generator. Refer to paragraph 8-19 for troubleshooting procedure.

8-54. Removal — Gas Producer Tachometer Generator. Refer to paragraph 8-27; procedures are the same.

8-55. Repair or Replacement — Gas Producer Tachometer Generator. Refer to paragraph 8-28; procedures are the same.

8-56. Bench Test — Gas Producer Tachometer Generator. Refer to paragraph 8-29; procedures are the same.

8-57. Installation — Gas Producer Tachometer Generator. Refer to paragraph 8-30; procedures are the same.

8-58. ENGINE OIL PRESSURE AND TEMPERATURE INDICATING SYSTEM.

8-59. Description — Engine Oil Pressure and Temperature Indicating System. The engine oil temperature and pressure indicator (I4A) is a dual type indicator registering temperature (degrees celsius) and pressure (PSIG) for the engine. The temperature portion receives temperature indications from an electrical resistance-type bulb and the pressure portion receives pressure indications from an engine oil pressure transmitter. The system is powered from the 28 Vdc bus and is protected by a 1 ampere ENG OIL PRESS circuit breaker.

8-60. ENGINE OIL PRESSURE AND TEMPERATURE INDICATOR.

8-61. Description — Engine Oil Pressure and Temperature Indicator. The engine oil pressure indicator, located on the instrument panel, indicates engine oil pressure in psi and temperature in degrees (celsius).

8-62. Cleaning — Engine Oil Pressure and Temperature Indicator. Refer to paragraph 8-3 for cleaning procedures.

8-63. Inspection — Engine Oil Pressure and Temperature Indicator. Refer to paragraph 8-4 for inspection procedure.

8-64. Functional Test (Pressure) — Engine Oil Pressure and Temperature Indicator.

a. Disconnect pressure line from the engine oil pressure transmitter.

b. Connect variable pressure 0 — 150 psi tester (MP-1 or equivalent) to input line on engine oil pressure transmitter.

c. Place BATT switch to ON. Close ENG OIL PRESS circuit breaker.

d. Apply pressure to the transmitter input port while monitoring the indicator. Indicated pressure shall be 100 psi when applied pressure is 100 ± 5 psi.

8-65. Functional Test (Temperature) — Engine Oil Pressure and Temperature Indicator.

a. Place BATT switch to ON. Close ENG OIL PRESS circuit breaker.

b. Check that temperature indicators indicate approximately ambient temperature.

8-66. Troubleshooting — Engine Oil Pressure and Temperature Indicator. Use tables 8-2 and 8-3 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-6.

NOTE

Before you use the tables, be sure you have performed all normal operational checks.

Table 8-2. Troubleshooting Engine Oil Pressure and Temperature Indicator — Pressure

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Indicator is reading low.

STEP 1. Check for defective transmitter.

Replace transmitter if defective.

2. Indicator is inaccurate or sticking.

STEP 1. Determine if indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

3. Indicator is inoperative.

STEP 1. Determine if indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

STEP 2. Determine if transmitter is defective.

Replace transmitter if defective.

STEP 3. Perform continuity check of circuit between transmitter and indicator.

Repair or replace electrical leads. (Paragraph 8-1.)

4. Indicator shows fluctuating pressure indication.

STEP 1. Check for loose electrical connections.

Tighten electrical connections.

STEP 2. Determine if transmitter is defective.

Replace transmitter if defective.

Table 8-3. Troubleshooting Engine Oil Pressure and Temperature Indicator — Temperature

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Oil temperature indication off scale at low end, or low reading — constant or intermittent.

STEP 1. Determine if indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

STEP 2. Perform continuity check from thermobulb to indicator.

Repair or replace defective electrical leads. (Paragraph 8-1.)

2. Oil temperature indication off scale at high end, or high reading — either constant or intermittent.

STEP 1. Check for short circuit in thermobulb.

Replace thermobulb if defective. (Paragraphs 8-85 and 8-88.)

STEP 2. Check for open circuit in thermobulb or between thermobulb and indicator.

Replace thermobulb (Paragraphs 8-85 and 8-88) or repair defective electrical wiring.

STEP 3. Check for defective indicator.

Replace indicator if defective. (Paragraphs 8-1.)

3. No indication on temperature indicator.

STEP 1. Ensure voltage is present on 28 Vdc bus and check for defective ENG OIL PRESS circuit breaker.

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Check for open electrical wire from circuit breaker to indicator.

Repair defective electrical wiring.

8-67. Removal — Engine Oil Pressure and Temperature Indicator. Refer to paragraph 8-5 for removal procedure.

8-68. Repair or Replacement — Engine Oil Pressure and Temperature Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-69. Bench Test (Temperature) — Engine Oil Pressure and Temperature Indicator.

NOTE

Bench test procedure shall be supplied later.

8-70. Installation — Engine Oil Pressure and Temperature Indicator. Refer to paragraph 8-7 for installation procedure.

8-71. ENGINE OIL PRESSURE TRANSMITTER.

8-72. Description — Engine Oil Pressure Transmitter. The engine oil pressure transmitter, located on top of the engine inlet section, monitors engine oil pressure and transmits voltage signals to the engine oil pressure indicator.

8-73. Cleaning — Engine Oil Pressure Transmitter.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near flame.

b. Remove oil, grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

8-74. Inspection — Engine Oil Pressure Transmitter.

a. Inspect pressure transmitter for cracks, secure and proper mounting, and proper operation.

b. Inspect electrical connector for damaged or bent pins and cracked inserts.

8-75. Functional Test — Engine Oil Pressure Transmitter. The pressure transmitter is functionally tested during testing of the pressure indicator using variable pressure tester. (Paragraph 8-64.)

8-76. Troubleshooting — Engine Oil Pressure Transmitter. Refer to paragraph 8-66 for troubleshooting.

8-77. Removal — Engine Oil Pressure Transmitter.

a. Remove cowling from engine.

b. Disconnect electrical connector. Disconnect oil line. Place protective covers over connector and oil line.

c. Remove lockwire and mounting screws and lift transmitter from mounting bracket.

8-78. Repair or Replacement — Engine Oil Pressure Transmitter.

a. Repair damaged electrical connectors.

b. Tighten loose transmitter.

c. Replace pressure transmitter if cracked or damaged.

d. Remove improperly mounted pressure transmitter and install correctly.

8-79. Installation — Engine Oil Pressure Transmitter.

a. Position transmitter on bracket and install mounting screws. Install lockwire.

b. Remove protective covers and connect electrical receptacle and oil line. Install cowling.

8-80. ENGINE OIL TEMPERATURE BULB.

8-81. Description — Engine Oil Temperature Bulb. The engine oil temperature bulb, installed in the engine oil pump housing, is a resistance type thermobulb. It monitors the engine oil temperature and transmits varying voltage signals to the engine oil pressure and temperature indicator.

8-82. Cleaning — Engine Oil Temperature Bulb.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove oil, grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

8-83. Inspection — Engine Oil Temperature Bulb.

a. Inspect temperature bulb for cracks, leaks, security and proper mounting.

b. Inspect electrical connector for damaged or bent pins and cracked inserts.

8-84. Troubleshooting — Engine Oil Temperature Bulb. Refer to paragraph 8-66 for troubleshooting procedure.

8-85. Removal — Engine Oil Temperature Bulb.

a. Cut lockwire and disconnect electrical connector.

b. Remove lockwire and unscrew temperature bulb from oil manifold.

c. Remove gasket.

8-86. Repair or Replacement — Engine Oil Temperature Bulb.

a. Repair damaged electrical connectors.

b. Replace damaged or worn gasket.

c. Replace temperature bulb if cracked or damaged.

8-87. Bench Test — Engine Oil Temperature Bulb.

a. Resistance Check.

NOTE

Technical data shall be supplied later.

b. Reinstall temperature bulb.

8-88. Installation — Engine Oil Temperature Bulb.

a. Coat threads and gasket with (C-039) lubricating oil when installing gasket on temperature bulb.

b. Install temperature bulb and gasket in manifold.

c. Lockwire to adjacent bolt head on manifold.

d. Connect and lockwire electrical connector.

8-89. ENGINE GAS TEMPERATURE INDICATING SYSTEM.

8-90. Description — Engine Gas Temperature Indicating System. The engine gas temperature indicating system includes the engine gas temperature indicator and thermocouple wire. The indicator is powered by the 28 Vdc bus and is protected by a 1 ampere EGT IND circuit breaker.

8-91. ENGINE GAS TEMPERATURE INDICATOR.

8-92. Description — Engine Gas Temperature Indicator. The engine gas temperature indicator (I31A), located on the instrument panel, indicates turbine inlet gas temperature in degrees Celsius. The indicator operates on electrical potential from the engine thermocouple harness, mounted in the turbine inlet area.

8-93. Cleaning — Engine Gas Temperature Indicator. Refer to paragraph 8-3 for cleaning procedure.

8-94. Inspection — Engine Gas Temperature Indicator. Refer to paragraph 8-4 for inspection procedure.

8-95. Deleted.

8-96. Troubleshooting — Engine Gas Temperature Indicator. Use table 8-4 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-8.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-97. Removal — Engine Gas Temperature Indicator. Refer to paragraph 8-5 for removal procedure.

8-98. Repair or Replacement — Engine Gas Temperature Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-99. Deleted.

Table 8-4. Troubleshooting Engine Gas Temperature Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. EGT indicator fails to indicate.

STEP 1. Troubleshooting EGT wiring. (Appendix F, figure F-8.)

Replace defective wiring.

STEP 2. Perform functional test of EGT indicator. (Paragraph 8-95.)

Replace indicator if defective (Paragraph 8-1.)

Table 8-5. Deleted

Table 8-6. Deleted

8-100. Installation — Engine Gas Temperature Indicator. Refer to paragraph 8-7 for installation procedure.

8-101. FUEL PRESSURE INDICATING SYSTEM.

8-102. Description — Fuel Pressure Indicating System. The fuel pressure indicating system includes the fuel pressure indicator and the fuel pressure transmitter. The system is powered by the 28 Vac bus, and is protected by a 1 ampere FUEL PRESSURE IND circuit breaker.

8-103. FUEL PRESSURE INDICATOR.

8-104. Description — Fuel Pressure Indicator. The fuel pressure indicator, located on the instrument panel, indicates pressure (psi) in the main fuel supply line by means of an electrical fuel pressure transmitter.

8-105. Cleaning — Fuel Pressure Indicator. Refer to paragraph 8-3 for cleaning procedures.

8-106. Inspection — Fuel Pressure Indicator. Refer to paragraph 8-4 for inspection procedures.

8-107. Functional Test — Fuel Pressure Indicator.

a. Energize main inverter by placing INV switch to MAIN.

b. Close FUEL PRESSURE IND circuit breaker.

c. Disconnect the fuel pressure line from fuel pressure transmitter. Using variable pressure tester (MP-1, or equivalent), apply pressure while monitoring pilots fuel pressure indicator. Indicated pressure shall be 50 psi when applied pressure is 50 ± 7 psi.

d. Open FUEL PRESSURE IND circuit breaker and reconnect the fuel pressure lines.

8-108. Troubleshooting — Fuel Pressure Indicator. Use table 8-7 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-3.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 8-7. Troubleshooting Fuel Pressure Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Pressure indicator is reading low.

STEP 1. Check for kinked or obstructed pressure line.

Replace or clean obstructed line.

Table 8-7. Troubleshooting Fuel Pressure Indicator (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

2. Pressure indicator is inaccurate or sticking

STEP 1. Determine if indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

3. Pressure indicator is inoperative.

STEP 1. Determine if pressure indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

STEP 2. Perform continuity check of circuit between transmitter and indicator.

Repair or replace defective electrical leads.

STEP 3. Perform functional test to determine if pressure transmitter is defective. (Paragraph 8-107.)

Replace defective pressure transmitter. (Paragraph 8-112.)

4. Pressure indicator shows fluctuating pressure indication.

STEP 1. Check for loose electrical connections and determine if instrument is clamped too tight.

Tighten electrical connections or readjust clamp.

STEP 2. Perform functional test to determine if pressure transmitter is defective. (Paragraph 8-107.)

Replace defective pressure transmitter. (Paragraph 8-1.)

8-109. Removal — Fuel Pressure Indicator. Refer to paragraph 8-5 for removal procedures.

8-110. Repair or Replacement — Fuel Pressure Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-111. Installation — Fuel Pressure Indicator. Refer to paragraph 8-7 for installation procedure.

8-112. FUEL PRESSURE TRANSMITTER.

8-113. Description — Fuel Pressure Transmitter. The fuel pressure transmitter, mounted on right engine deck level just ahead of forward firewall, monitors pressure in the main fuel supply line and transmits voltage signals to the fuel pressure indicator. (Paragraph 8-103.)

8-114. Cleaning — Fuel Pressure Transmitter.

a. Remove moisture and loose dirt with clean, soft cloth.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove oil, grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

8-115. Inspection — Fuel Pressure Transmitter.

a. Inspect pressure transmitter for cracks, secure and proper mounting, and proper operation.

b. Inspect fuel line and fitting connection for leaks and proper installation.

c. Inspect electrical connector for damaged or bent pins and cracked inserts.

8-116. Functional Test — Fuel Pressure Transmitter. Refer to paragraph 8-107 for functional test.

8-117. Troubleshooting — Fuel Pressure Transmitter. Refer to paragraph 8-108 for troubleshooting.

8-118. Removal — Fuel Pressure Transmitter.

a. Open right aft pylon access door to gain access to pressure transmitter.

b. Cut lockwire and disconnect electrical connector from transmitter.

c. Disconnect pressure hose from transmitter mount.

d. Remove four screws and washers from transmitter mount.

e. Remove transmitter.

8-119. Repair or Replacement — Fuel Pressure Transmitter.

a. Repair damaged electrical connectors.

b. Tighten loose fuel line or fitting connection.

c. Replace defective or damaged fuel line or fitting.

d. Replace pressure transmitter if cracked or damaged.

e. Remove improperly mounted pressure transmitter and install correctly.

8-120. Installation — Fuel Pressure Transmitter.

a. Install transmitter in mount using four screws and four washers.

b. Connect fuel pressure hose to union and connect electrical connector and lockwire.

c. Close access door.

8-121. TORQUE PRESSURE INDICATING SYSTEM.

8-122. Description — Torque Pressure Indicating System. The torque pressure indicating system includes the torque pressure indicator (Paragraph 8-123) and torque pressure transmitter (Paragraph 8-132.) The system is powered from the 28 Vdc bus, and is protected by a 1 ampere TORQUE PRESS circuit breaker.

8-123. TORQUE PRESSURE INDICATOR.

8-124. Description — Torque Pressure Indicator. The torque pressure indicator (I3A), mounted in the instrument panel, indicates engine output shaft torque pressure in percent by means of the torque pressure transmitter. (Paragraph 8-132.)

8-125. Cleaning — Torque Pressure Indicator. Refer to paragraph 8-3 for cleaning procedure.

8-126. Inspection — Torque Pressure Indicator. Refer to paragraph 8-4 for inspection procedure.

8-127. Functional Test — Torque Pressure Indicator.

a. Disconnect pressure line from the torque pressure transmitter.

b. Connect variable pressure (0 — 150 psi) tester (MP-1 or equivalent) to input line on torque pressure transmitter.

c. Place BATT switch to ON. Close TORQUE PRESS circuit breaker.

d. Apply pressure to the transmitter input port while monitoring the engine torque pressure indicator. Indicated pressure shall be 100% when applied pressure is 56 psi.

8-128. Troubleshooting — Torque Pressure Indicator. Use table 8-8 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-4.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 8-8. Troubleshooting Torque Pressure Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Pressure indicator is inaccurate or sticking.

STEP 1. Determine if indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

2. Pressure indicator has sluggish action.

STEP 1. Check for sludge in pressure line.

Bleed pressure line.

3. Pressure indicator is inoperative or reading low.

STEP 1. Determine if pressure indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

STEP 2. Perform continuity check of circuit between transmitter and indicator.

Repair or replace defective electrical leads.

STEP 3. Check for kinked or obstructed pressure line.

Replace or clean obstructed line.

STEP 4. Perform functional check to determine if pressure transmitter is defective. (Paragraph 8-127.)

Replace defective pressure transmitter. (Paragraph 8-122.)

STEP 5. Determine if pressure metering valve is defective.

Replace defective pressure metering valve (T53-L-703).

Table 8-8. Troubleshooting Torque Pressure Indicator (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. Pressure indicator shows fluctuating pressure indication.

STEP 1. Check for loose electrical connections and determine if instrument is clamped too tight.

Tighten electrical connections or readjust clamp.

STEP 2. Perform functional test to determine if pressure transmitter is defective. (Paragraph 8-127.)

Replace defective pressure transmitter. (Paragraph 8-122.)

8-129. Removal — Torque Pressure Indicator. Refer to paragraph 8-5 for removal procedure.

8-130. Repair or Replacement — Torque Pressure Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-131. Installation — Torque Pressure Indicator. Refer to paragraph 8-7 for installation procedure.

8-132. TORQUE PRESSURE TRANSMITTER.

8-133. Description — Torque Pressure Transmitter. The torque pressure transmitter, mounted on a bracket on the right side of the engine, monitors engine output shaft torque and transmits varying voltage signals to the torque pressure indicator. (Paragraph 8-123.)

8-134. Cleaning — Torque Pressure Transmitter.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove oil, grease, fungus, and ground-in dirt with a clean lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

8-135. Inspection — Torque Pressure Transmitter.

a. Inspect pressure transmitter for cracks, secure and proper mounting, and proper operation.

b. Inspect electrical connector for damaged or bent pins and cracked inserts.

8-136. Functional Test — Torque Pressure Transmitter. Refer to paragraph 8-127 for functional test.

8-137. Troubleshooting — Torque Pressure Transmitter. Refer to paragraph 8-128 for troubleshooting.

8-138. Removal — Torque Pressure Transmitter.

a. Open upper right engine cowling.

b. Disconnect electrical connector and oil line from pressure transmitter.

c. Cap openings if oil line and protect electrical connector with insulation tape (C-491).

d. Cut lockwire, remove mounting screws and washers, and lift pressure transmitter from helicopter.

8-139. Repair or Replacement — Torque Pressure Transmitter.

a. Repair damaged electrical connectors.

b. Tighten loose fuel line or fitting connection.

c. Replace defective or damaged fuel line or fitting.

d. Replace pressure transmitter if cracked or damaged.

e. Reinstall improperly mounted pressure transmitter.

8-140. Installation — Torque Pressure Transmitter.

a. Position pressure transmitter on bracket and install mounting screws. Install lockwire.

b. Remove protective covers and connect oil line and electrical connector to pressure transmitter. Install cowling.

SECTION III — FLIGHT INSTRUMENTS

8-141. FLIGHT INSTRUMENTS.

8-142. Description — Flight Instruments. Flight instruments include the pitot-static system, airspeed indicator, altimeter, attitude indicating system, turn and slip indicator, and vertical velocity indicator.

8-143. PITOT-STATIC SYSTEM.

8-144. Description — Pitot-Static System. The pitot-static system consists of the electrically heated pitot tube, two static ports, pitot and static drains, and pitot and static lines and tubing necessary to connect to airspeed indicators, altimeters, and vertical velocity indicator. The pitot tube, which has a heating element for icing conditions, is located top right hand side of cabin roof. Static air pressure vents are located just forward of each crew door, with piping to altimeters, vertical velocity indicators, and airspeed indicators. A static port is incorporated into the pitot head. (Figure 8-1.)

8-145. Installation — Pitot-Static System.

a. Pitot-Static Lines, Tubing, and Fittings.

(1) Disconnect pitot and static lines from airspeed indicators. Disconnect static lines from altimeters and vertical velocity indicator. Cap openings in indicators to prevent entrance of foreign material.

(2) Remove drain cap(s) and blow all lines clean with filtered, compressed air.

(3) Uncap openings in instruments. Apply silicone compound (C-131) to threads of nuts and fittings and reconnect all lines.

(4) Install drain cap(s).

b. Pitot Tube.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

(1) Clean pitot tube head with a clean, lint-free cloth dampened with solvent (C-304).

(2) Clean mount with a clean, lint-free cloth dampened with solvent (C-304).

8-146. Inspection — Pitot-Static System.

a. Pitot-Static Lines, Tubing, and Fittings.

(1) Inspect lines, tubing, and fittings for leads, chafing, crimping, or other visible damage.

(2) Inspect system for improperly installed fittings and clamps.

b. Pitot Tube.

(1) Inspect pitot tube for clogged or obstructed inlet opening, and clogged drain hole on bottom of tube.

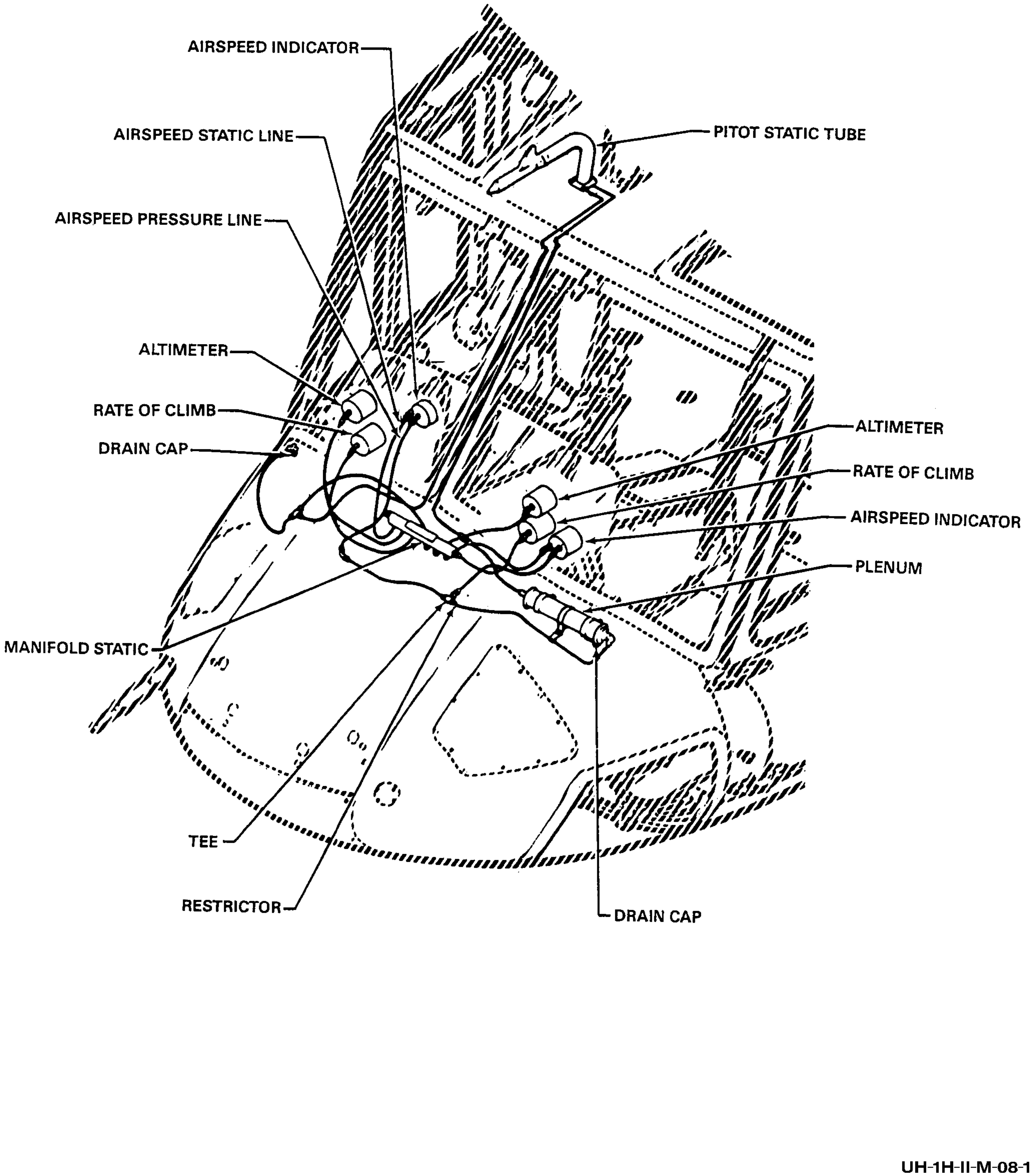


Figure 8-1. Instrument piping

(2) Inspect pitot tube for cracks or damage.

(3) If pitot tube head is removed, inspect electrical receptacle, pins, and sockets for damage

c. Operational Check.

(1) Close PITOT TUBE HEATER circuit breaker.

(2) Position pitot heater switch (S9) to ON and check that pitot tube heating element is energized. Return switch (S9) to OFF.

8-147. Functional Test — Pitot-Static System. (TM 55-1500-204-25/1.)

8-148. Troubleshooting — Pitot-Static System. Refer to applicable portions of tables 8-9, 8-10, 8-13 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-9.

8-149. Removal — Pitot-Static System.

a. Pitot-Static Lines, Tubing, and Fittings.

(1) Disconnect pitot and static lines from indicators. Cap openings in indicators to prevent entrance of foreign material.

(2) Disconnect applicable fittings and clamps.

(3) Remove pitot and static lines.

b. Pitot Tube.

(1) Check that system electrical power is OFF.

(2) Gain access to roof mounted pitot tube through overhead console.

(3) From inside the helicopter, remove the clamps securing the pitot line and pitot heater electrical wires.

(4) Disconnect tube assembly and install protective caps on open ends of fittings.

(5) From outside the helicopter, remove the screws and lockwashers attaching pitot tube head to support.

(6) Carefully pull pitot tube from support to expose electrical connector and pitot line coupling. Disconnect electrical connector. Disconnect coupling from adapter. Cap open adapter and tape electrical connector to prevent entrance of foreign material.

8-150. Repair or Replacement — Pitot-Static System.

a. Pitot-Static Lines, Tubing, and Fittings.

(1) Replace defective or damaged pitot and static lines or tubing.

(2) Tighten or properly install fittings and clamps.

(3) Replace defective or damaged fittings or clamps.

b. Pitot Tube.

(1) Replace Pitot tube if inlet opening is clogged or obstructed, drain hole is clogged, or electrical connector is damaged.

(2) Replace pitot tube if cracked or damaged to the extent it would restrict impact air pressure.

(3) Replace defective or damaged pitot electrical connector.

(4) Tighten or properly install fittings.

8-151. Installation — Pitot-Static System.

a. Pitot-Static Lines, Tubing, and Fittings.

(1) Route pitot and static lines in place through clamps. Apply silicone compound (C-131) to threads of nuts and fittings and connect all lines.

(2) Apply silicone compound (C-131) to threads of tubing nuts and fittings. Position tubing in place and connect. Install clamps.

(3) Conduct functional test of system. (TM 55-1500-204-25/1.)

b. Pitot Tube.

(1) At pitot tube support, remove protective cap from adapter and remove tape from electrical connector.

(2) Apply silicone compound (C-131) to threads of coupling.

(3) Connect pitot line coupling to adapter.

(4) Connect electrical connector to pitot tube connector.

(5) Apply sealant (C-308) and carefully position pitot tube into support and install mounting screws and lockwashers.

(6) From inside helicopter, remove protective caps from fittings. Apply silicone compound (C-131) to threads of nuts and fittings, and connect.

(7) Install pitot line clamp and electrical clamp.

8-152. AIRSPEED INDICATOR.

8-153. Description — Airspeed Indicator. The airspeed indicator, located on the instrument panel, is a standard pitot-static instrument. The single-scale indicator provides airspeed indication in knots by measuring differences between impact air pressure from the pitot tube and atmospheric pressure from the static pressure port.

8-154. Cleaning — Airspeed Indicator. Refer to paragraph 8-3 for cleaning procedure.

8-155. Inspection — Airspeed Indicator. Refer to paragraph 8-4 for inspection procedure.

8-156. Functional Test — Airspeed Indicator. Refer to TM 55-1500-204-25/1 for functional testing of airspeed indicator.

8-157. Troubleshooting — Airspeed Indicator. Use table 8-9 and perform checks as necessary to isolate trouble. (Figure 8-1.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 8-9. Troubleshooting Airspeed Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Pointer fails to respond.

STEP 1. Determine if pitot or static lines are improperly connected or disconnected. (Paragraph 8-146.)

Connect line(s).

2. Pointer indicates incorrectly.

STEP 1. Determine if lines clogged by water or dirt.

Open drain(s), disconnect and blow lines clear. (Paragraph 8-145.)

STEP 2. Perform functional test. (TM 55-1500-204-25/1.)

Replace defective indicator or lines. (Paragraph 8-1.)

8-158. Removal — Airspeed Indicator. Refer to paragraph 8-5 for removal procedure.

8-159. Repair or Replacement — Airspeed Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-160. Installation — Airspeed Indicator. Refer to paragraph 8-7 for installation procedure.

8-161. ALTIMETER.

8-162. Description — Altimeter. The altimeter, located on the instrument panel, furnishes direct readings of helicopter height in feet above sea level. The altimeter is connected through piping to static pressure port to sense atmospheric pressure. An external adjustment knob is provided to make compensation for variations of prevailing barometric pressure.

8-163. Cleaning — Altimeter. Refer to paragraph 8-3 for cleaning procedure.

8-164. Inspection — Altimeter. Refer to paragraph 8-4 for inspection procedure.

8-165. Functional Test — Altimeter. Refer to TM 55-1500-204-25/1 for functional test of altimeter.

8-166. Troubleshooting — Altimeter. Use table 8-10 and perform checks as necessary to isolate trouble. (Figure 8-1.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-167. Removal — Altimeter. Refer to paragraph 8-5 for removal procedure.

8-168. Repair or Replacement — Altimeter. Refer to paragraph 8-6 for repair or replacement criteria.

8-169. Installation — Altimeter. Refer to paragraph 8-7 for installation procedure.

8-170. ATTITUDE INDICATING SYSTEM.

8-171. Description — Attitude Indicating System. The attitude indicating system includes the pilots and copilots attitude indicators, roll and pitch gyro,

Table 8-10. Troubleshooting Altimeter

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Pressure fails to respond.

STEP 1. Determine if static lines are improperly connected or disconnected. (Paragraph 8-146.)

Connect line(s).

2. Pointer indicates incorrectly.

STEP 1. Determine if lines clogged by water or dirt.

Open drain(s), disconnect and blow lines clear. (Paragraph 8-145.)

STEP 2. Perform functional test. (TM 55-1500-204-25/1.)

Replace defective indicator or lines. (Paragraph 8-1.)

and rate switching gyro. The system is powered from the 115 Vac bus and pilots and copilots indicators are each protected by two 1 ampere circuit breakers. Refer to Avionics Maintenance Manual for information and procedures pertaining to the roll and pitch gyro and rate switching gyro.

8-172. ATTITUDE INDICATORS.

8-173. Description — Attitude Indicators. The pilots and copilots attitude indicators, mounted in the instrument panel, display flight attitude of the helicopter relative to the earth. Pitch attitude is indicated by motion of the sphere with respect to the miniature airplane. Roll attitude is indicated by motion of the roll pointer with respect to the fixed roll scale located at the top of the display. The indicator sphere can be adjusted to zero indication by the pitch trim knob and roll trim knob. The copilots attitude indicator contains a PULL TO CAGE knob to cage and release the self-contained gyro. The power OFF flag is energized (out of view) by a tap on the power supply. Any interruption of indicator power will indicate a failure and the flag will be exposed.

8-174. Cleaning — Attitude Indicators. Refer to paragraph 8-3 for cleaning procedure.

8-175. Inspection — Attitude Indicators. Refer to paragraph 8-4 for inspection procedure.

8-176. Functional Test — Attitude Indicators.

a. Pilots Attitude Indicator.

(1) Energize main inverter and close both PILOT ATTD circuit breakers. Check that OFF flag (power warning) disappears within one minute. Check that the display erects properly and remains stable in both pitch and roll.

(2) Rotate roll trim knob (on upper right side of indicator) to its clockwise limit. Check that an 8 to 20 degree right bank is indicated.

(3) Rotate roll trim knob to its counterclockwise limits. Check that an 8 to 20 degree left bank is indicated and return roll trim knob to zero trim.

(4) Rotate pitch trim knob (on lower right side of indicator) to its clockwise limit. Check that deflection of the horizon line is a minimum of 8 degrees upward.

(5) Rotate pitch trim knob to its counterclockwise limit. Check that deflection of the horizon line is a minimum of 16 degrees downward. Return pitch trim knob to zero trim.

(6) Turn main inverter off. After a few seconds delay, turn spare inverter on. Check that display remains properly erected and that pitch and bank axes remain stable. Open PILOT ATTD circuit breakers and turn spare inverter off.

b. Copilots Attitude Indicator.

(1) Turn main inverter on. Close both COPILOT ATTD circuit breakers. Check that OFF flag (power warning) disappears. After 15 seconds, pull out and then release the PULL TO CAGE knob. The gyro should cage and release, settling to a proper display in both pitch and roll.

(2) Rotate pitch trim knob to its clockwise limit. Check that deflection of the miniature airplane is approximately 15 degrees downward.

(3) Rotate pitch trim knob to its counterclockwise limit. Check that deflection of the miniature airplane is approximately 10 degrees upward. Return pitch trim knob to zero trim.

(4) Turn main inverter off and open COPILOT ATTD circuit breakers.

8-177. Troubleshooting — Attitude Indicators. Use table 8-11 and perform checks as necessary to isolate trouble.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-178. Removal — Attitude Indicators. Refer to paragraph 8-5 for removal procedure.

8-179. Repair or Replacement — Attitude Indicators. Refer to paragraph 8-6 for repair or replacement criteria.

8-180. Installation — Attitude Indicators. Refer to paragraph 8-7 for installation procedure.

Table 8-11. Troubleshooting Attitude Indicators

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Indicator does not operate.

STEP 1. Conduct continuity test of circuit to determine if wiring is defective.

Repair or replace defective wiring.

STEP 2. Determine if indicator is defective.

Replace defective indicator. (Paragraph 8-1.)

8-181. TURN AND SLIP INDICATOR.

8-182. Description — Turn and Slip Indicator. The turn and slip indicator, located on the instrument panel, is controlled by an electrically actuated gyro. This instrument has a needle (turn indicator) and a ball (slip indicator). Although the needle and ball are combined in one instrument and are normally read and interpreted together, each has its own specific function, and operates independently of the other. The ball indicates when the helicopter is in directional balance, either in a turn or in straight and level flight. If the helicopter is yawing or slipping, the ball will be off center. The needle indicates in which direction and at what rate the helicopter is turning.

8-183. Cleaning — Turn and Slip Indicator. Refer to paragraph 8-3 for cleaning procedure.

8-184. Inspection — Turn and Slip Indicator. Refer to paragraph 8-3 for inspection procedure.

8-185. Functional Test — Turn and Slip Indicator.

a. Close TURN & SLIP IND circuit breaker.

b. Check that indicator gyro is running.

8-186. Troubleshooting — Turn and Slip Indicator. Use table 8-12 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-7.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-187. Removal — Turn and Slip Indicator. Refer to paragraph 8-5 for removal procedure.

8-188. Repair or Replacement — Turn and Slip Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-189. Installation — Turn and Slip Indicator.

Refer to paragraph 8-7 for installation procedure.

8-190. VERTICAL VELOCITY INDICATOR.

8-191. Description — Vertical Velocity Indicator.

The vertical velocity indicator is connected to the static air system to sense the rate of atmospheric pressure change. The indicator registers ascent or descent in feet.

8-192. Cleaning — Vertical Velocity Indicator.

Refer to paragraph 8-3 for cleaning procedure.

8-193. Inspection — Vertical Velocity Indicator.

Refer to paragraph 8-4 for inspection procedure.

8-194. Functional Test — Vertical Velocity Indicator. Refer to TM 55-1500-204-25/1 for functional testing of vertical velocity indicator.

Table 8-12. Troubleshooting Turn and Slip Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Pointer remains centered, either constantly or intermittently.

STEP 1. Determine if indicator is operative.

Replace defective indicator. (Paragraph 8-1.)

STEP 2. Check input voltage.

Replace defective indicator. (Paragraph 8-1.)

2. Ball too sensitive.

STEP 1. Determine if damping fluid has leaked out of indicator.

Replace defective indicator. (Paragraph 8-1.)

STEP 2. Conduct continuity test of circuit to determine if wiring defective.

Replace defective wiring or connectors.

8-195. Troubleshooting — Vertical Velocity Indicator. Use table 8-13 and perform checks as necessary to isolate trouble. (Figure 8-1.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-196. Removal — Vertical Velocity Indicator. Refer to paragraph 8-5 for removal procedure.

8-197. Repair or Replacement — Vertical Velocity Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-198. Installation — Vertical Velocity Indicator. Refer to paragraph 8-7 for installation procedure.

Table 8-13. Troubleshooting Vertical Velocity Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Inaccurate readings.

STEP 1. Determine if indicator is defective.

Replace defective indicator. (Paragraph 8-1.)

Table 8-13. Troubleshooting Vertical Velocity Indicator (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for loose connections in static line. (Paragraph 8-146.)

Tighten connections.

STEP 3. Determine if indicator case leaks.

Replace indicator if case leaks. (Paragraph 8-1.)

2. Indicator pointer off zero.

STEP 1. Determine if mechanism has shifted.

Tap face of indicator lightly while adjusting and return pointer to zero by turning adjustment knob.

3. Excessive indicator pointer oscillation.

STEP 1. Determine if there is a leak in the static lines. (Paragraph 8-146.)

Tighten connections and/or replace lines.

STEP 2. Determine if indicator is defective.

Replace defective indicator. (Paragraph 8-1.)

SECTION IV — NAVIGATION INSTRUMENTS

8-199. NAVIGATION INSTRUMENTS.

8-200. Description — Navigation Instruments. Navigation instruments include the course indicator, bearing heading indicator, and standby compass.

8-201. COURSE INDICATOR (ID-1347( )/ARN).

8-202. Description — Course Indicator (ID-1347( )/ARN). The course indicator provides visual indication of the position of the helicopter in relation to the station being received. The vertical pointer provides fly right, fly left, and on station indications. The horizontal pointer indicates passage over the station and signal strength. Two power OFF flags (vertical and horizontal) come into view when power is interrupted or weak. The power OFF flags disappear from view under normal operating conditions. Refer to Avionics Maintenance Manual for description, operational check, troubleshooting, and maintenance of system components. Refer to paragraphs 8-3 through 8-7 for instrument maintenance.

8-203. PILOT AND COPILOT COURSE INDICATORS.

8-204. Description — Pilot and Copilot Course Indicators. The pilots course indicator and copilots course indicator are dual pointer, moving dial type indicators. The copilots course indicator is a repeater type indicator driven by the pilots course indicator. The compass dial on each indicator rotates under the fixed index reference mark to indicate compass heading information from the gyromagnetic compass system AN/ASN-43. Pointer number one of each indicator displays radio magnetic bearing information received from the direction finder set AN/ARN-83. Pointer number two is used to indicate VOR bearing. Refer to Avionics Maintenance Manual for description, operational check, troubleshooting, and maintenance of system components. Refer to paragraph 8-3 through 8-7 for instrument maintenance.

8-205. STANDBY COMPASS.

8-206. Description — Standby Compass. The standby compass, located on the pilots instrument panel, is provided for navigational use. This instrument is used with the compass correction card located adjacent to the compass. Refer to paragraphs 8-3 through 8-7 for maintenance procedures.

8-207. Troubleshooting — Standby Compass. Use table 8-14 and perform checks as necessary to isolate trouble.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-208. Compensation — Standby Compass. The standby compass may be calibrated concurrently with the ASN-43 compass system. Refer to Avionics Maintenance Manual. Refer to TM 55-1500-204-25/1 for standby compass compensation procedure.

Table 8-14. Troubleshooting Standby Compass

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Excessive card error.

STEP 1. Check for external magnetic interference.

Locate magnetic interference and eliminate if possible.

STEP 2. Check for air or insufficient liquid in bowl.

Replace standby compass. (Paragraph 8-1.)

STEP 3. Determine if compass is improperly compensated.

Accomplish compass compensation procedure. (Paragraph 8-208.)

2. Card element not level.

STEP 1. Check for leaking float chamber.

Replace standby compass. (Paragraph 8-1.)

3. Card has sluggish rotation.

STEP 1. Determine if pivots or jewels are dirty, restricting rotation or card magnet is weak.

Replace standby compass. (Paragraph 8-1.)

SECTION V — MISCELLANEOUS INSTRUMENTS

8-209. MISCELLANEOUS INSTRUMENTS.

8-210. Description — Miscellaneous Instruments. Miscellaneous instruments and systems include: clock, fuel quantity indicating system, transmission oil pressure and temperature indicating system, ac voltmeter, dc voltmeter, dc loadmeter, free air temperature gage, and radar warning indicating system.

8-211. CLOCK.

8-212. Description — Clock. The clock, located on the pilot instrument panel, is an 8-day clock with an added stopwatch feature for elapsed time. The clock has a sweep-second pointer and a minute totalizer hand to indicate elapsed time. A control knob on the case starts the pointers when pressed, stops both pointers when pressed a second time, and returns pointers to 12 o'clock when pressed a third time. A separate control knob winds and sets the clock.

8-213. Cleaning — Clock. Refer to paragraph 8-3 for cleaning procedure.

8-214. Inspection — Clock. Refer to paragraph 8-4 for inspection procedure.

8-215. Functional Test — Clock. Check that control knob on the case starts the pointers when pressed, stops both pointers when pressed a second time, and returns both pointers when pressed a third time.

8-216. Troubleshooting — Clock. Use table 8-15 and perform checks as necessary to isolate trouble.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 8-15. Troubleshooting Clock

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Clock does not run.

STEP 1. Determine if clock needs winding.

Wind clock if needed.

STEP 2. Determine if clock is defective.

Replace clock if defective. (Paragraph 8-1.)

2. Clock does not keep accurate time.

STEP 1. Determine if clock is out of adjustment.

Adjust clock to run faster or slower as needed. (Paragraph 8-217.)

STEP 2. Determine if clock is defective.

Replace clock if defective. (Paragraph 8-1.)

3. Pointers do not start, stop, or return when control knob is pressed three times.

STEP 1. Determine if control knob, pointer(s), or instrument is defective.

Replace clock if defective. (Paragraph 8-1.)

8-217. Adjustment — Clock. Remove clock from instrument panel. Adjustment on back of clock allows clock to run faster or slower.

8-218. Removal — Clock. Refer to paragraph 8-5 for removal procedure.

8-219. Repair or Replacement — Clock. Refer to paragraph 8-6 for repair or replacement criteria.

8-220. Installation — Clock. Refer to paragraph 8-7 for installation procedure.

8-221. FUEL QUANTITY INDICATING SYSTEM.

8-222. Description — Fuel Quantity Indicating System. The fuel quantity indicating system is a bridge capacitance balance type system. It includes a fuel quantity indicator, located on the instrument panel, and three fuel quantity transmitters, two located in the right side forward fuel cell and the other located in the aft center fuel cell. The system is powered from the 115 Vac bus, and is protected by a 1 ampere FUEL QTY circuit breaker. Pressing the FUEL QUANTITY TEST SWITCH, located on the pilots instrument panel, checks the fuel quantity indicator for zero return.

8-223. FUEL QUANTITY INDICATOR.

8-224. Description — Fuel Quantity Indicator. The fuel quantity indicator provides readings for fuel supply in tank system. The indicator is connected to capacitor-type probes and requires 115 Vac power source.

8-225. Cleaning — Fuel Quantity Indicator. Refer to paragraph 8-3 for cleaning procedures.

8-226. Inspection — Fuel Quantity Indicator. Refer to paragraph 8-4 for inspection procedure.

8-227. Troubleshooting — Fuel Quantity Indicator. Use table 8-16 and perform checks as necessary to isolate trouble. (Figure F-11.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 8-16. Troubleshooting Fuel Quantity Indicator

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Fuel quantity indicator reads low.

STEP 1. Determine if fuel quantity indicating system is out of adjustment.

Perform adjustment procedure. (Paragraph 8-229.)

STEP 2. Determine if compensator capacitance is too high.

Replace tank unit. (Paragraph 8-232.)

STEP 3. Determine if tank unit capacitance is low.

Replace tank unit. (Paragraph 8-232.)

Table 8-16. Troubleshooting Fuel Quantity Indicator (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

2. Fuel quantity indicator reads high.

STEP 1. Determine if fuel quantity indicating system is out of adjustment.

Perform adjustment procedure. (Paragraph 8-229.)

STEP 2. Determine if tank unit capacitance is too high.

Replace tank unit. (Paragraph 8-232.)

STEP 3. Check for open lead on compensator circuit.

Replace defective wiring as necessary.

STEP 4. Check for open circuit in compensator section of tank unit.

Replace tank unit. (Paragraph 8-232.)

3. Fuel quantity indicator remains at one point on scale.

STEP 1. Ensure that 115 Vac, 400 Hz power is available and determine if indicator is defective.

Replace indicator if defective. (Paragraph 8-1.)

STEP 2. Check for grounded coaxial lead.

Repair or replace defective wiring as necessary.

STEP 3. Determine if 400 Hz lead is grounded. (Prolonged existence of this condition will burn out fire hazard resistor in indicator.)

Repair defective wiring and/or replace indicator. (Paragraph 8-1.)

4. Fuel quantity indicator remains at zero or below.

STEP 1. Check for open wiring.

Replace defective wiring.

5. Indicator operation is sluggish.

STEP 1. Check wiring and tank unit for low insulation resistance of the circuit.

Replace or repair defective wiring or replace tank unit. (Paragraph 8-232.)

8-228. Removal — Fuel Quantity Indicator. Refer to paragraph 8-5 for removal procedures.

8-229. Bench Test — Fuel Quantity Indicator. Proceed with the following steps:

a. Capacitance Test.

(1) Using Simmonds 387011 Automatic Capacitance Bridge, or equivalent, measure the capacitance between the coaxial and compensator Lo Z terminals.

(2) When measuring the capacitance between the coaxial and 400 Hz terminal, ground the compensator to Lo Z terminal.

(3) Also, when measuring the capacitance between coaxial and compensator Lo Z terminals, ground the 400 Hz terminal.

(4) The tank unit capacitance should be as shown below. (Figure 8-2.)

Tank Consolidated Airborne	or Simmonds	Capacitance (picofarad)
PAA933	or 39109-001	25.7 ± 0.4
PAA924	or 381057-06008	67.9 ± 0.4
PAA934	or 391020-001	15.9 ± 0.3
(Compensator)		25.0

NOTE

Tolerance of measuring equipment must be taken into consideration in making all capacitance measurements.

b. Insulation Resistance Test. Using the three wire insulation resistance tester, measure the insulation resistance between the points listed below.

(1) Center of coaxial connector to ground — not less than three megohms.

(2) Center of compensator connector to ground — not less than one megohm.

(3) Center of coaxial connector to center of 400 Hz connector — not less than limits in step g. (3).

(4) Center of coaxial connector to center of compensator connector — not less than 800 megohms.

c. Test — Indicator Amplifier Bridge Assembly.

(1) Set up test circuit. (Figure 8-3.)

NOTE

The adjustment controls require 40 complete turns to travel from end to end. Also nut stops are incorporated so that when control runs off end of winding, indicator pointer will jump; continuous rotation in same direction will result in pointer returning to its correct position.

(2) Set capacitance of 109.5 picofarads on tank unit section of tester and 51.9 picofarads on compensator section. Adjust empty control so that pointer reads zero.

(3) Set tank unit section of tester or picofarads and leave compensator section set at 51.9 picofarads. Adjust full control until pointer reads 1575 pounds.

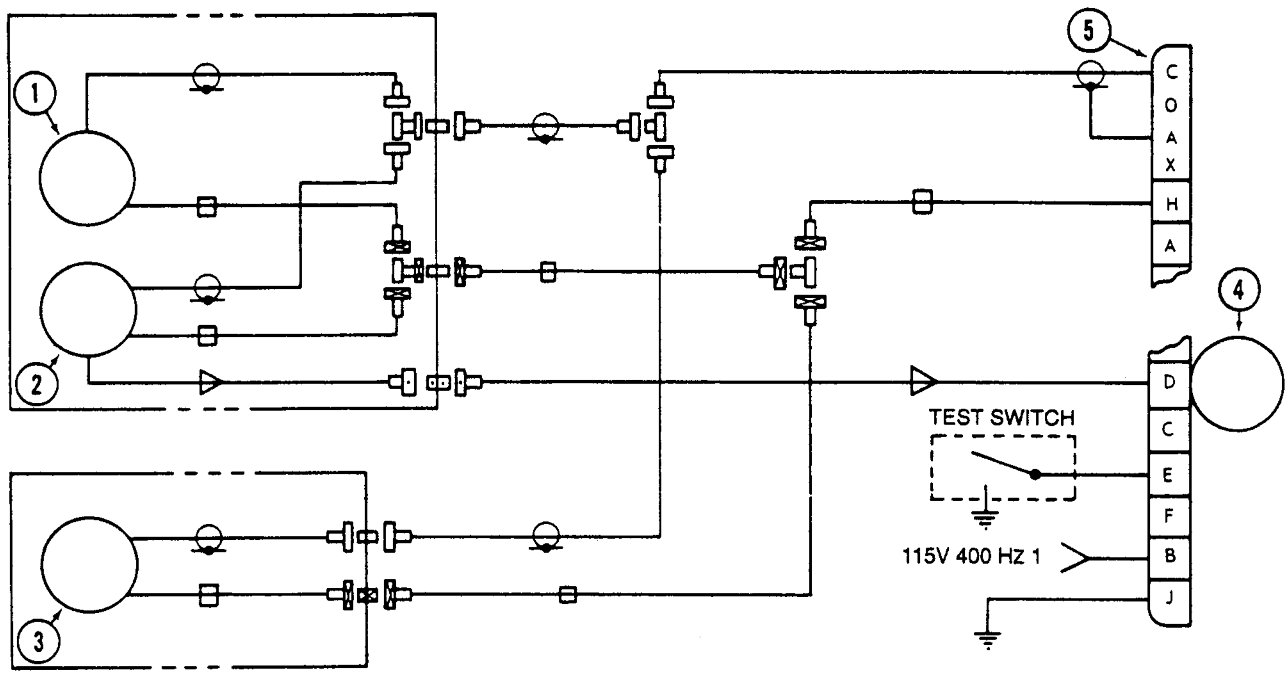
(4) With compensator section set at 51.9 picofarads, vary tank unit section of tester so that pointer reads at graduations shown. Capacitance must be as shown opposite indicator reading.

Indicator Reading (LBS)	Capacitance (picofarad)
0	109.5
400	142.22 ± 1.0
800	174.95 ± 1.0
1200	207.67 ± 1.0
1575	239.7

(5) Cause indicator to travel from 0 to 1575 pounds and from 1575 to 0 pounds. The travel time must not be more than 30 seconds.

(6) Adjust tester so that indicator is upscale. Close test switch. Indicator should go to zero. Release test switch. Pointer should go back to its original position.

d. Insulation Test. After all tank units and wiring have been installed, it is recommended that insulation resistance of the circuits be tested. Using



	PART NAME	PART NUMBER	REQ
1	TANK UNIT (BELL 205-061-633-17)	391019-001	1
2	TANK UNIT (BELL 205-061-633-19)	391020-001	1
3	TANK UNIT (BELL 205-061-633-13)	381057-06008	1
4	INDICATOR (BELL 205-061-633-7	393004-01409	1
5	PLUG (AMPHENOL)	165-61	1
	TEST SWITCH	165-61	1
	COAX ADAPTER TEE	1273-499	1
	400 Hz ADAPTER TEE	1273-199	1
	COMP FEED THRU (NU-LINE)	1244-277	1
	400 Hz FEED THRU (NU-LINE)	1244-177	2
	COAX FEED THRU (NU-LINE)	1244-477	2
	400 Hz TEE (NU-LINE)	1283-199	2
	COAX TEE (NU-LINE)	1283-499	2
	COMP PLUG (NU-LINE)	1231-206	1
	400 Hz PLUG (NU-LINE)	1231-106	5
	COAX PLUG (NU-LINE)	1211-404	5
	COMP LEAD (SUPER TEMP)	20-HE 19/32-40	AS REQD
	400 Hz LEAD (SUPER TEMP)	20-HE 19/32-40	AS REQD
	COAX CABLE (SUPER TEMP)	T-22-1934-30 STC	AS REQD

NOTES

1. ALL WIRING TO BE NO. 20 UNSHIELDED UNLESS OTHERWISE SPECIFIED.
2. TOTAL POWER REQUIREMENTS: 115V 400Hz 1 Ø, 3.5 WATTS, PF = 1.0.

UH-1H-II-M-08-2

Figure 8-2. Schematic diagram, fuel quantity installation

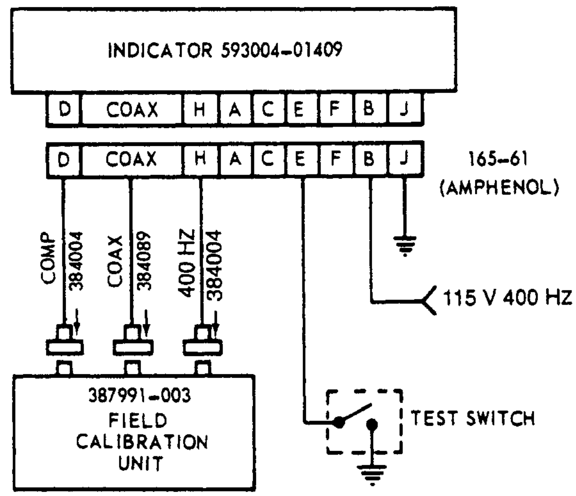


Figure 8-3. Fuel quantity indicator bench test circuit

a three-wire insulation resistance tester, make the following insulation resistance tests at the amphenol connector disconnected from the indicator:

(1) Between compensator (Pin D) and ground (Pin J) — not less than one megohm.

(2) Between coaxial and ground — not less than one megohm.

(3) Between 400 Hz (Pin H) and ground — not less than one megohm.

(4) Between coaxial and 400 Hz (Pin H) — not less than 700 megohms.

(5) Between coaxial and compensator (Pin D) — not less than 800 megohms.

(6) Between 400 Hz (Pin H) and compensator (Pin D) — not less than 10 megohms.

e. Adjustment procedure. (Preferred Method).

(1) Ensure all connecting cables and units have been installed properly, connections are tight and the requirements of step c. are met.

(2) Make sure all tanks are empty and turn on power.

(3) Turn "EMPTY" control unit indicator reads exactly zero.

(4) Connect Simmonds 3876991-003 Tester, or equivalent, in parallel with wiring. (Figure 8-4.)

(5) Set compensator section of Tester to 26.9 picofarads and the tank unit section to 130.2 picofarads.

(6) Adjust "FULL" control on indicator to cause pointer to read at last dial division (1575 pounds).

(7) Disconnect adapter cable and reconnect ships wiring to indicator.

f. Adjustment Procedure (Alternate Method). Fuel in Tanks.

(1) Disconnect the amphenol connector at the indicator and insert the adapter cable. (Figure 8-4.) Connect Simmonds 387991-003 Tester and leave cables marked 1, 2, and 3 disconnected.

(2) Set the compensator section of the Tester to 51.9 picofarads and the tank unit section to 109.5 picofarads. Adjust the "EMPTY" control on the indicator to cause pointer to read zero.

(3) Leave compensator section set at 51.9 picofarads and set tank unit section to 239.7 picofarads. Adjust "FULL" control so that indicator pointer reads at last dial division.

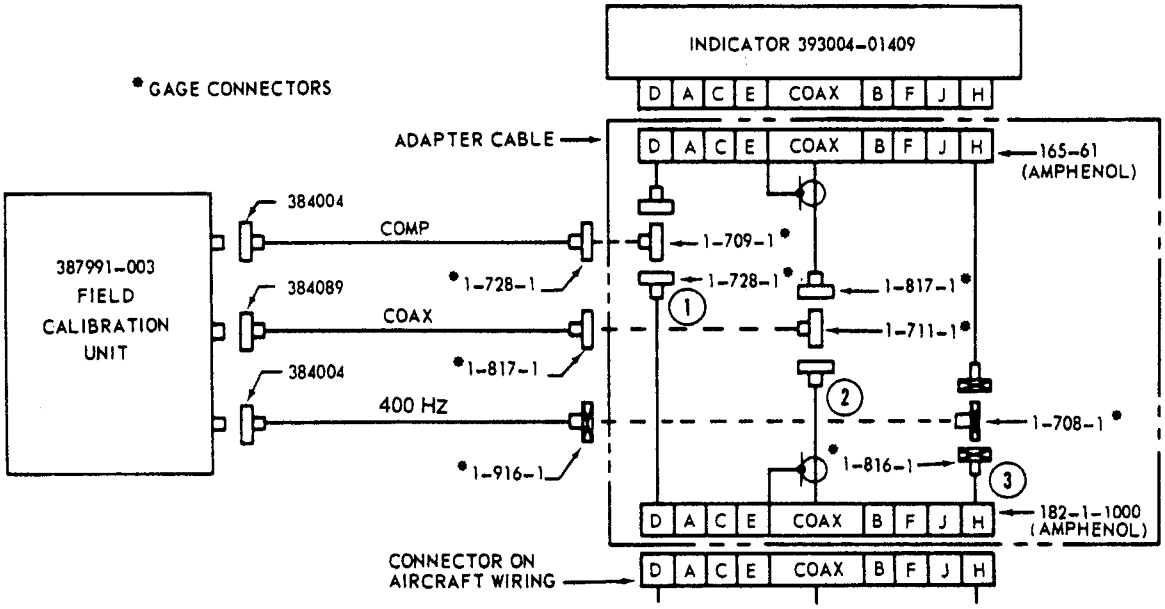


Figure 8-4. Circuit arrangement and adapter cable for adjustment procedures

g. Test Values.

(1) Tank Unit Empty Capacitance Values.

Circuit	Capacitance
Tank Unit (Dry)	109.5 ± 1.1 picofarads
Compensator Section (Dry)	25.0 picofarads

(2) Added and Full Capacitance Values.

Capacitance (picofarqad)		Indicator Readings
Added	Full	(Pounds)
103.2	239.7	1575

(3) Tank Unit Resistance Check Values. Using the three wire insulation tester or equivalent, measure from center of coaxial connector to center of 400 Hz connector. Values should be as given below:

Tank Unit Part No.	Resistance
391019-001	Not less than 3000 megomhs
381057-06003	Not less than 1000 megohms
391020-001	Not less than 4500 megohms

8-230. Repair or Replacement — Fuel Quantity Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-231. Installation — Fuel Quantity Indicator. Refer to paragraph 8-7 for installation procedure.

8-232. FUEL QUANTITY TRANSMITTERS.

8-233. Description — Fuel Quantity Transmitters. Three fuel quantity transmitter probes (tank units) are installed (two) in the forward right side fuel cell and (one) in the aft center fuel cell. The probes act as sensors for the fuel quantity indicator. (Paragraph 8-223.)

8-234. Removal — Fuel Quantity Transmitters.

a. Defuel helicopter. (Chapter 1.)

b. Remove section of cabin floor over right side fuel cell.

c. Remove circular cover plate on top of forward right side fuel cell.

d. Remove fuel cell sump.

e. Detach upper and lower support clamps of each probe from threaded inserts of cell wall by removing bolt, washer, and spacer from each clamp.

f. Remove probes, with attached clamps and electrical leads, from cell. Remove clamps from probes.

g. Disconnect electrical leads and vent line from connectors on aft center fuel cell access door.

h. Detach access door by removing four retainers, eight bolts, washers, sixteen screws, and washers.

i. Remove access door, tilting and turning as necessary to allow attached quantity probe and float switches to pass through access port. Cover open port.

j. Disconnect probe electrical leads from connectors on door. Cut tie straps and remove probe from support clips.

8-235. Inspection — Fuel Quantity Transmitter.

a. Inspect transmitter for security, corrosion, and cracks.

b. Inspect electrical leads for damage.

8-236. Repair or Replacement — Fuel Quantity Transmitter.

a. Remove improperly mounted transmitter and install correctly.

b. Replace transmitter if cracked or damaged.

8-237. Installation — Fuel Quantity Transmitter.

a. Assemble two clamps on each forward fuel cell transmitter probe.

b. Position each probe in forward right side cell, aligning upper and lower clamps to threaded inserts of cell wall. Secure each clamp with bolt, washer, and spacer. On forward probe, also attach support clamp of ejector pump outlet hose on upper clamp bolt of probe.

c. Connect electrical leads of probes to connectors on sump plate while installing sump assembly.

d. Install cover plate on fuel cell using a new packing and screws.

e. Install cabin floor panel.

f. Install aft center fuel transmitter probe with large end up in clips on access door brackets. Secure with teflon locking tie straps.

g. Connect electrical leads to connectors on access door.

h. Place new packing in groove around access port. Tilt and turn access door as necessary to pass quantity probe and float switches through port into cell. Align door and secure with sixteen screws and washers, and four retainers with eight bolts and washers. Torque bolts and screws 40 to 50 inch-pounds.

i. Connect fuel control vent line to check valve on door. Connect electrical leads to terminal block and quantity gage connectors.

8-238. TRANSMISSION OIL PRESSURE AND TEMPERATURE INDICATING SYSTEM.

8-239. Description — Transmission Oil Pressure and Temperature Indicating System. The transmission oil temperature and pressure indicator (I5A) is a dual type indicator registering temperature (degrees celsius) and pressure (PSIG) of oil in the transmission. The temperature portion receives temperature indications from an electrical resistance-type bulb and the pressure portion received pressure indications from the oil pressure transmitter. The system is powered from the 28 Vdc bus and is protected by a 1 ampere XMSN OIL PRESS circuit breaker.

8-240. TRANSMISSION OIL PRESSURE AND TEMPERATURE INDICATOR.

8-241. Description — Transmission Oil Pressure and Temperature Indicator. The transmission oil pressure and temperature indicator provides continuous readings in psi and degrees celsius by means of an electrical transmitter and temperature bulb. (Paragraph 8-249.)

8-242. Cleaning — Transmission Oil Pressure and Temperature Indicator. Refer to paragraph 8-3 for cleaning procedure.

8-243. Inspection — Transmission Oil Pressure and Temperature Indicator. Refer to paragraph 8-4 for inspection procedure.

8-244. Functional and Bench Test — Transmission Oil Pressure and Temperature Indicator. Refer to paragraphs 8-64, 8-65, and 8-69 and close XMSN OIL PRESS circuit breaker.

8-245. Troubleshooting — Transmission Oil Pressure and Temperature Indicator. Refer to paragraph 8-66 for troubleshooting; procedure is the same. Refer to Appendix F, figure F-5.

8-246. Removal — Transmission Oil Pressure and Temperature Indicator. Refer to paragraph 8-5 for removal procedure.

8-247. Repair or Replacement — Transmission Oil Pressure and Temperature Indicator. Refer to paragraph 8-6 for repair or replacement criteria.

8-248. Installation — Transmission Oil Pressure and Temperature Indicator. Refer to paragraph 8-7 for installation procedure.

8-249. TRANSMISSION OIL PRESSURE TRANSMITTER.

8-250. Description — Transmission Oil Pressure Transmitter. The transmission oil pressure transmitter, located on the right side of the transmission, monitors transmission oil pressure and transmits voltage signals to the transmission oil pressure indicator.

8-251. Cleaning — Transmission Oil Pressure Transmitter. Refer to paragraph 8-73 for cleaning; procedure is the same.

8-252. Inspection — Transmission Oil Pressure Transmitter. Refer to paragraph 8-74 for inspection; procedure is the same.

8-253. Functional Test — Transmission Oil Pressure Transmitter. Refer to paragraph 8-75 for functional test; procedure is the same.

8-254. Troubleshooting — Transmission Oil Pressure Transmitter. Refer to paragraph 8-76 for troubleshooting; procedure is the same.

8-255. Removal — Transmission Oil Pressure Transmitter. Refer to paragraph 8-77 for removal; procedure is the same.

8-256. Repair or Replacement — Transmission Oil Pressure Transmitter. Refer to paragraph 8-78 for repair and replacement criteria.

8-257. Installation — Transmission Oil Pressure Transmitter. Refer to paragraph 8-79 for installation; procedure is the same.

8-258. TRANSMISSION OIL TEMPERATURE BULB.

8-259. Description — Transmission Oil Temperature Bulb. The transmission oil temperature bulb, installed in the transmission oil manifold, monitors oil temperature. It sends voltage signals to the transmission oil pressure and temperature indicator.

8-260. Cleaning — Transmission Oil Temperature Bulb. Refer to paragraph 8-82 for cleaning; procedure is the same.

8-261. Inspection — Transmission Oil Temperature Bulb. Refer to paragraph 8-83 for inspection; procedure is the same.

8-262. Troubleshooting — Transmission Oil Temperature Bulb. Refer to paragraph 8-84 for troubleshooting.

8-263. Removal — Transmission Oil Temperature Bulb. Refer to paragraph 8-85 for removal; procedure is the same.

8-264. Repair or Replacement — Transmission Oil Temperature Bulb. Refer to paragraph 8-86 for repair and replacement criteria.

8-265. Bench Test — Transmission Oil Temperature Bulb. Refer to paragraph 8-87 for bench test; procedure is the same.

8-266. Installation — Transmission Oil Temperature Bulb. Refer to paragraph 8-88 for installation; procedure is the same.

8-267. AC VOLTMETER.

8-268. Description — AC Voltmeter. The ac voltmeter indicates voltage of the main or spare inverter for AB, AC, or BC phases, according to position of VM selector switch on ac power panel in overhead console. The ac voltmeter is functionally tested as part of the Alternating Current Power Distribution System. (Chapter 9.) Refer to paragraphs 8-3 through 8-7 for maintenance procedures.

8-269. DC VOLTMETER.

8-270. Description — DC Voltmeter. A dc voltmeter is provided to indicate the voltage of the main generator, standby generator, essential bus, nonessential bus, or battery. These sources are selected by the VM selector switch on the dc power panel in the overhead console. The dc voltmeter is functionally tested as part of the Direct Current Power Distribution System. (Chapter 9.) Refer to paragraphs 8-3 through 8-7 for maintenance procedures.

8-271. Troubleshooting — DC Voltmeter. Use table 8-17 and perform checks as necessary to isolate trouble. (Figure F-12.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

8-272. LOADMETER.

8-273. Description — Loadmeter. Two dc loadmeters are provided for main and standby dc generators to indicate output or load of each generator as a percent of total capacity. The dc loadmeter is functionally tested as a part of dc power distribution system. (Chapter 9.) Refer to paragraphs 8-3 through 8-7 for maintenance procedures.

8-274. FREE AIR TEMPERATURE GAGE.

8-275. Description — Free Air Temperature Gage. The free air temperature gage is a bimetallic, probe type thermometer mounted on the upper left side of the pilots windshield. The probe portion is exposed to outside temperature through a rubber grommet mounted on the skin of the helicopter. The indicator is calibrated in degrees Celsius.

8-276. Cleaning — Free Air Temperature Gage. Refer to paragraph 8-3 for cleaning procedure.

8-277. Inspection — Free Air Temperature Gage.

a. Inspect assembly for corrosion.

b. Inspect for discoloration.

c. Inspect for leaking seal.

d. Check for proper temperature indication.

Table 8-17. Troubleshooting DC Voltmeter

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. No reading or erratic reading on dc voltmeter.

STEP 1. Check for open or short circuit in voltmeter.

Replace voltmeter if defective. (Paragraph 8-1.)

STEP 2. Determine if mechanism in instrument is worn or dirty.

Replace voltmeter if defective. (Paragraph 8-1.)

8-278. Functional Test — Free Air Temperature Gage. Check temperature reading with that of a standard indicator known to be correct. Replace gage if readings do not agree.

8-279. Troubleshooting — Free Air Temperature Gage. Use table 8-18 and perform necessary checks to isolate trouble.

NOTE

efore you use this table, be sure you have performed all normal operational checks.

8-280. Removal — Free Air Temperature Gage.

a. Unscrew and remove sunshield, dished washer, and one case washer from outer end of thermometer.

b. Remove thermometer and other case washer from inside of pilots compartment.

8-281. Repair or Replacement — Free Air Temperature Gage. Replace gage if any of the inspection requirements are not met. (Paragraph 8-6.)

Table 8-18. Troubleshooting Free Air Temperature Gage

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Gage indicating upscale of range.

STEP 1. Check for missing or improperly installed sunshield.

Install missing or reinstall improperly mounted sunshield.

STEP 2. Determine if gage is defective.

Replace gage if defective. (Paragraph 8-1.)

2. Gage indicating downscale of range.

STEP 1. Determine if gage is defective.

Replace gage if defective. (Paragraph 8-1.)

8-282. Installation — Free Air Temperature Gage.

a. washers and thermometer case in position at mounting flange.

b. Insert probe through grommet and mounting flange.

c. Place sunshield over thermometer probe and tighten.

SECTION VI — INSTRUMENT PANEL

8-283. INSTRUMENT PANEL.

8-284. Description — Instrument Panel. The instrument panel is mounted on the top forward section of the pedestal and contains all instruments for the pilot and copilot . Adjustable tube and brace assemblies are used to eliminate or minimize instrument panel vibration. The tube assemblies are attached to the helicopter structure by means of a pin, washer, and cotter pin. They are equipped with a clevis and check nut for adjustment. The brace assemblies are attached to the pedestal and may be adjusted by turnbuckles incorporated in the brace assemblies.

8-285. Cleaning — Instrument Panel.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Dry cleaning solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in-dirt with a clean, lint-free cloth dampened with solvent (C-304).

8-286. Inspection — Instrument Panel.

a. Visually inspect panels for surface scratches, warpage, cracks, and loose mounting screws.

b. Inspect compass correction cards, placards, and decals for legibility.

c. Inspect shock mounts and vibration dampers for sagging, deterioration, cracks, and permanent set.

d. Inspect rheostats and switches for missing and loose knobs.

8-287. Removal — Instrument Panel.

a. Ensure all electrical power is off.

b. Disconnect all electrical receptacles and hoses from instruments.

c. Cover all receptacles and hoses to prevent entrance of foreign particles.

d. Cover openings on instruments.

e. Remove pin, washers, and cotter pin securing each tube assembly.

f. Remove instrument panel from helicopter.

8-288. Repair or Replacement — Instrument Panel.

a. Repair cracks. (Refer to TM 55-1500-204-25/1.)

b. Replace shock mount if warped.

c. Replace loose or worn mounting screws.

8-289. Installation — Instrument Panel.

a. Ensure all electrical power is off.

b. Install shock mounts if removed.

c. Position panel in place on console and install mounting hardware.

d. Connect electrical receptacles to instruments.

e. Apply silicone compound (C-131) to threads of pitot-static fittings.

f. Connect nylon fittings. Torque coupling nuts fingertight.

CHAPTER 9

ELECTRICAL SYSTEMS

SECTION I — DIRECT CURRENT POWER DISTRIBUTION SYSTEM

NOTE

Detail system wiring diagrams are contained in Appendix F.

9-1. DIRECT CURRENT POWER DISTRIBUTION SYSTEM.

9-2. Description — Direct Current Power Distribution System. The direct current power distribution system provides all basic power for operation of electrical components installed in the helicopter. It consists of the main and standby generators, battery, external power, and dc bus systems.

The primary electrical power is supplied by the transmission driven 30 volt, 300 ampere main generator (G2). In the event of main generator failure, emergency dc power is supplied by the engine driven 30 volt, 200 ampere standby starter-generator (G6). If both generators fail, power is supplied by the 24 volt, 34 ampere/hour battery which also furnishes starting power.

Primary power is distributed by a dual-bus arrangement which allows automatic deenergizing of nonessential dc loads in the event of main generator failure. A bus-reset feature provides reactivation of these loads at the pilots discretion.

9-3. COMMON ELECTRICAL COMPONENTS (DC).

9-4. Description — Common Electrical Components (DC). Common electrical components include the miscellaneous electrical components (Paragraph 9-5), circuit breakers (Paragraph 9-12), and control panels (Paragraph 9-19).

9-5. MISCELLANEOUS ELECTRICAL COMPONENTS.

9-6. Description — Miscellaneous Electrical Components. Capacitors, diodes, leads and wiring, panel lights, connectors, relays, rheostats, shock mounts, shunts and bus bars, switches, terminal boards, and transistors are included in this category.

9-7. Cleaning — Miscellaneous Electrical Components (General).

a. Remove moisture, dust, and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt from the equipment cases and mountings. Use a cloth dampened with solvent (C-304).

9-8. Inspection — Miscellaneous Electrical Components.

a. Inspect rheostats for security, corrosion, burned element, damaged wiper, cracks, and correct resistance.

b. Inspect switches for weak detents, security, corrosion, faulty operation, and continuity in ON position and infinity in OFF position.

c. Inspect plugs, connectors, and receptacles for security, contact corrosion, damaged contacts, broken wires, faulty contacts, insert cracks, and faulty insulation.

d. Inspect leads and wiring for loose terminals, chafing, corroded or deteriorated condition, faulty or damaged insulation, excessive mechanical stress, broken strands, damaged shielding, shorted shielding, routing, and mounting conditions.

e. Inspect conduits for security, surface damage, cracks, dents, corrosion, and deterioration.

f. Inspect shunts and bus bars for corrosion, security, deep scratches, physical damage, deformity, and discoloration (indicating excessive overloading).

g. Inspect shockmounts for binding, compression, retention, security, cracks, distortion, and corroded bonding.

h. Inspect relays for loose connections, damaged or broken contact pins or terminals, damage to case or insulation between contact pins, and evidence of corrosion, pits, or discoloration (indicating arcing due to loose connections, external shorting, or excessive overload).

i. Inspect terminal boards for cracks, corrosion, security, and damaged threads.

j. Inspect panel lights for faulty bulbs, security, and corrosion.

k. Visually check capacitors for loose connections, security of mounting, seeping dielectric, and apparent damage.

l. Visually check diodes for loose connections and broken leads. Check suspected faulty diode front to back conductivity ratio with standard ohmmeter.

m. Visually check transistor mount for security. Check suspected faulty transistor with ohmmeter.

9-9. Removal — Miscellaneous Electrical Components.

CAUTION

Before removing or adjusting any electrical component, disconnect battery.

a. Remove attaching hardware, clamps, connectors or conductors; identify connectors and/or conductors.

b. Remove component.

9-10. Repair or Replacement — Miscellaneous Electrical Components.

a. Tighten loose terminal connectors, mounting and attachments of electrical components.

b. Replace miscellaneous electrical components that fail to meet inspection requirements.

9-11. Installation — Miscellaneous Electrical Components.

a. Install component and secure with attaching hardware or clamps.

b. Attach identified terminals and/or connectors.

9-12. DC CIRCUIT BREAKERS.

9-13. Description — DC Circuit Breakers. The dc circuit breakers are mounted on the overhead console. Dc circuits can be opened or closed by operating these trip-free, push-pull circuit breakers.

9-14. Cleaning — DC Circuit Breakers. Refer to paragraph 9-7 for cleaning; procedure is the same.

9-15. Inspection — DC Circuit Breakers. Inspect circuit breakers for reset retention, activation for circuit ON and power OFF, faulty operation, corrosion, and security.

9-16. Removal — DC Circuit Breakers.

a. Ensure all electrical power is OFF. Disconnect battery.

b. Disconnect wiring to appropriate circuit breaker and cover wire ends with electrical tape.

c. Remove mounting hardware and lift circuit breaker from panel assembly.

9-17. Repair or Replacement — DC Circuit Breakers.

a. Repair is limited to tightening or properly installing any loose or improperly installed mounting hardware and connectors.

b. Replace circuit breaker if any other inspection requirements are not met.

9-18. Installation — DC Circuit Breakers.

a. Position circuit breaker in panel assembly and install mounting hardware.

b. Remove cover from wire ends and connect to circuit breaker.

9-19. CONTROL PANELS.

9-20. Description — Control Panels. The control panels on the overhead console are as follows: DOME LT-PITOT, EXT LTS, CABIN HEATING, MISC, DC POWER, INST LTG, and AC POWER. The control panels on the pedestal are as follows: ENGINE, FORCE TRIM-HYD CONTROL, and CAUTION.

9-21. Cleaning — Control Panels. Refer to paragraph 9-7 for cleaning; procedure is the same.

9-22. Inspection — Control Panels. Visually inspect for scratches, chipped edges, faulty edge light panels and bulbs, broken edge light panels, damaged or faulty switches, loose or damaged wiring and connectors, and broken or missing mounting fasteners.

9-23. Removal — Control Panels.

a. Ensure all electrical power is OFF.

b. Disengage fasteners holding panel mounting.

c. Carefully lift panel from mount.

d. Disconnect electrical connector(s).

9-24. Repair or Replacement — Control Panels.

a. Repair any scratches or chipped edge light panels.

b. Replace any burned out or defective bulbs on edge light panels.

c. Replace control panel if any other inspection requirements are not met.

9-25. Installation — Control Panels.

a. Connect electrical connector(s).

b. Position panel in mount, being careful not to damage wiring. Engage fasteners.

c. Apply power and check components for proper operation.

9-26. BATTERY SYSTEM.

9-27. Description — Battery System. The battery system is comprised of two batteries (BT2), battery relay (K9), battery feeder relay (K66), and BAT switch (S40). One battery is located in the nose section; the other in the aft battery compartment. The battery system is associated with the BAT VM circuit breakers (CB6), voltmeter terminal boards (TB60 and TB61), DC VM switch (S2), dc voltmeter (M2), nonessential bus relay (K2) and NON-ESS BUS switch (S62). The batteries also furnish power for the XMSN OIL LEVEL LT (I25). Refer to figure 9-1 for compartment location and figure 9-2 for equipment location.

The battery circuit is activated by placing BAT switch (S40) to ON position. Battery relay (K9) is energized and battery power is transferred through the contacts of battery relay (K9) to battery feeder relay (K66) and through contacts of battery feeder relay to the main and essential dc buses.

The nonessential bus relay (K2) is energized when battery power is applied to the essential bus by placing the NON-ESS BUS switch (S62) to the MANUAL position. Battery power is then applied through the contacts of the nonessential bus relay to the nonessential bus.

The dc voltmeter (M2) monitors battery voltage when DC VM switch (S2) on dc power control panel (A1) is positioned to BAT and BAT VM circuit breaker (CB6) is closed. The battery voltage applied to the essential or nonessential bus may be monitored by placing the DV VM switch (S2) to ESS BUS or NON-ESS BUS position.

9-28. Functional Test — Battery System.

a. Before connecting the battery, check for correct polarity and tightness of the battery leads and terminations.

b. Open all circuit breakers and place all switches in the open position. Place NON-ESS bus switch to normal. Ensure that battery switch is OFF.

c. Close standby loadmeter circuit breaker, main generator voltmeter circuit breaker, battery relay circuit breaker, nonessential bus voltmeter circuit breaker, and the GEN 7 BUS reset circuit breaker. (These circuit breakers are located in electrical compartment and on the overhead console.)

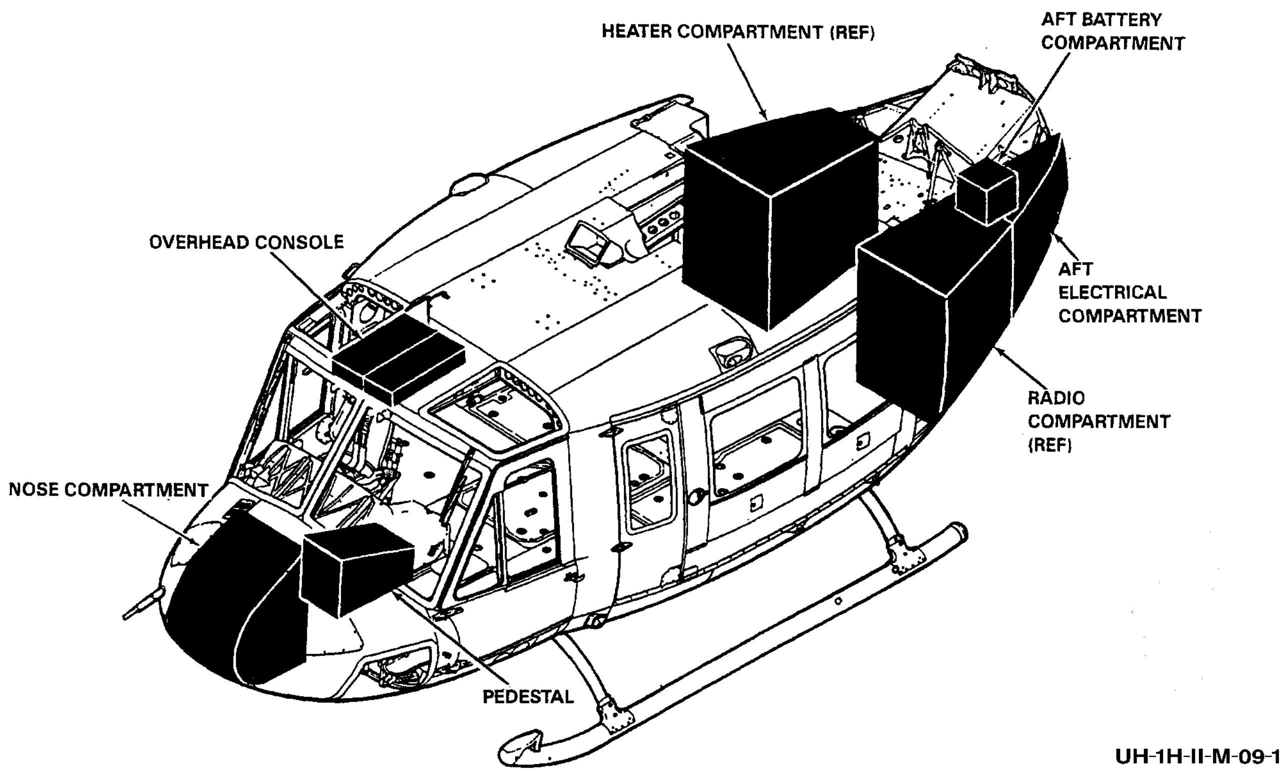


Figure 9-1. Compartment location — electrical

NOTE

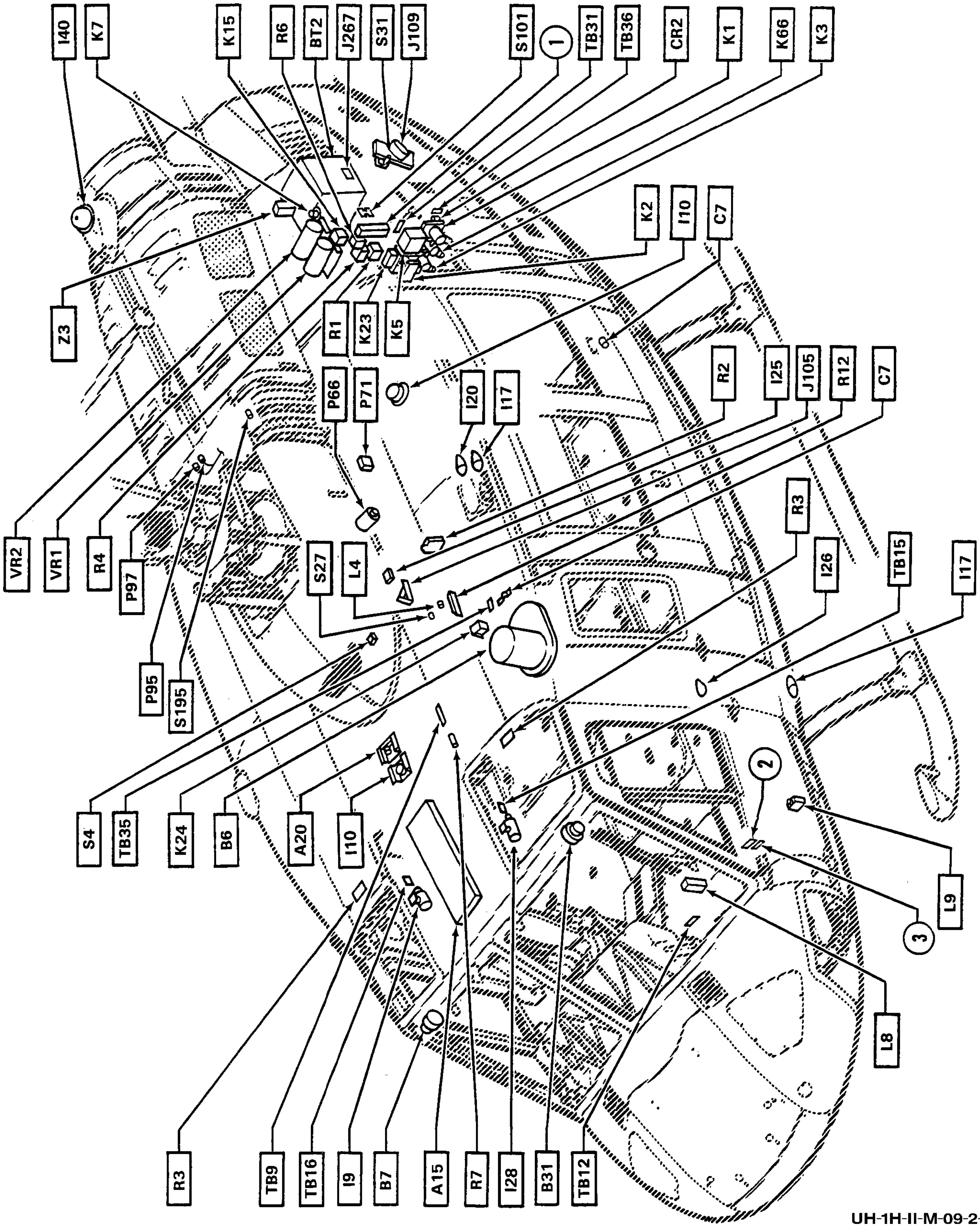
Unless otherwise specified, the voltmeter circuit breakers are to remain closed throughout the test.

d. Position DC VM switch (S2) to BAT and check that voltmeter indicates battery voltage.

e. Position DC VM switch (S2) to each remaining position. Voltmeter should indicate zero voltage.

f. Position DC VM switch (S2) to ESS BUS. Position BAT switch (S40) to ON. Check that voltmeter indicates battery voltage. Other positions, except BAT, should indicate zero.

g. Position nonessential bus switch (S62) to MANUAL ON and check that voltmeter indicates battery voltage for the NON-ESS BUS, ESS BUS and BAT positions of the selector switch. Return switches to normal.



UH-1H-II-M-09-2-1

Figure 9-2. Electrical equipment location (Sheet 1 of 7)

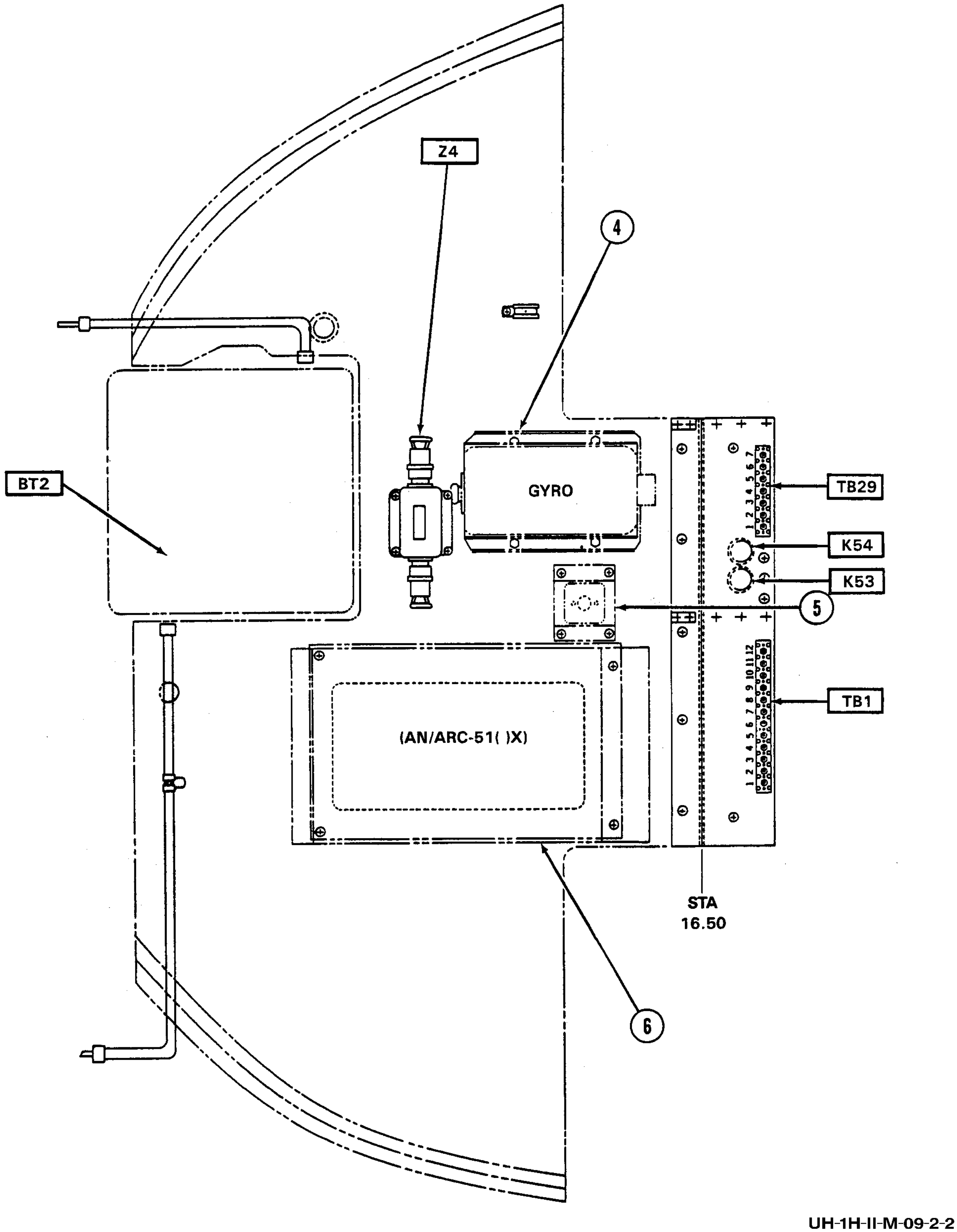
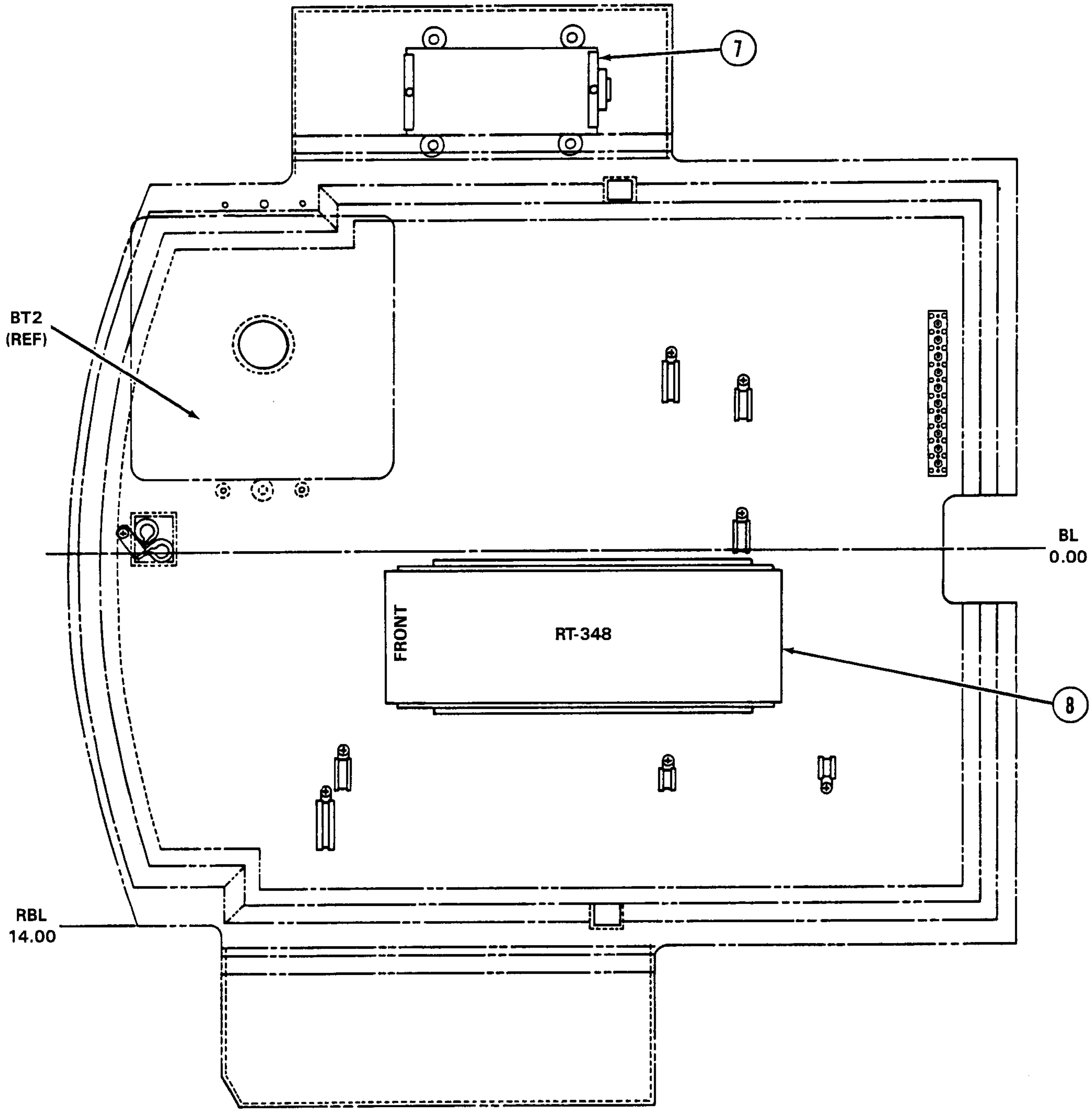


Figure 9-2. Electrical equipment location (Sheet 2 of 7)



LOOKING DOWN AT LOWER NOSE SHELF

UH-1H-II-M-09-2-3

Figure 9-2. Electrical equipment location (Sheet 3 of 7)

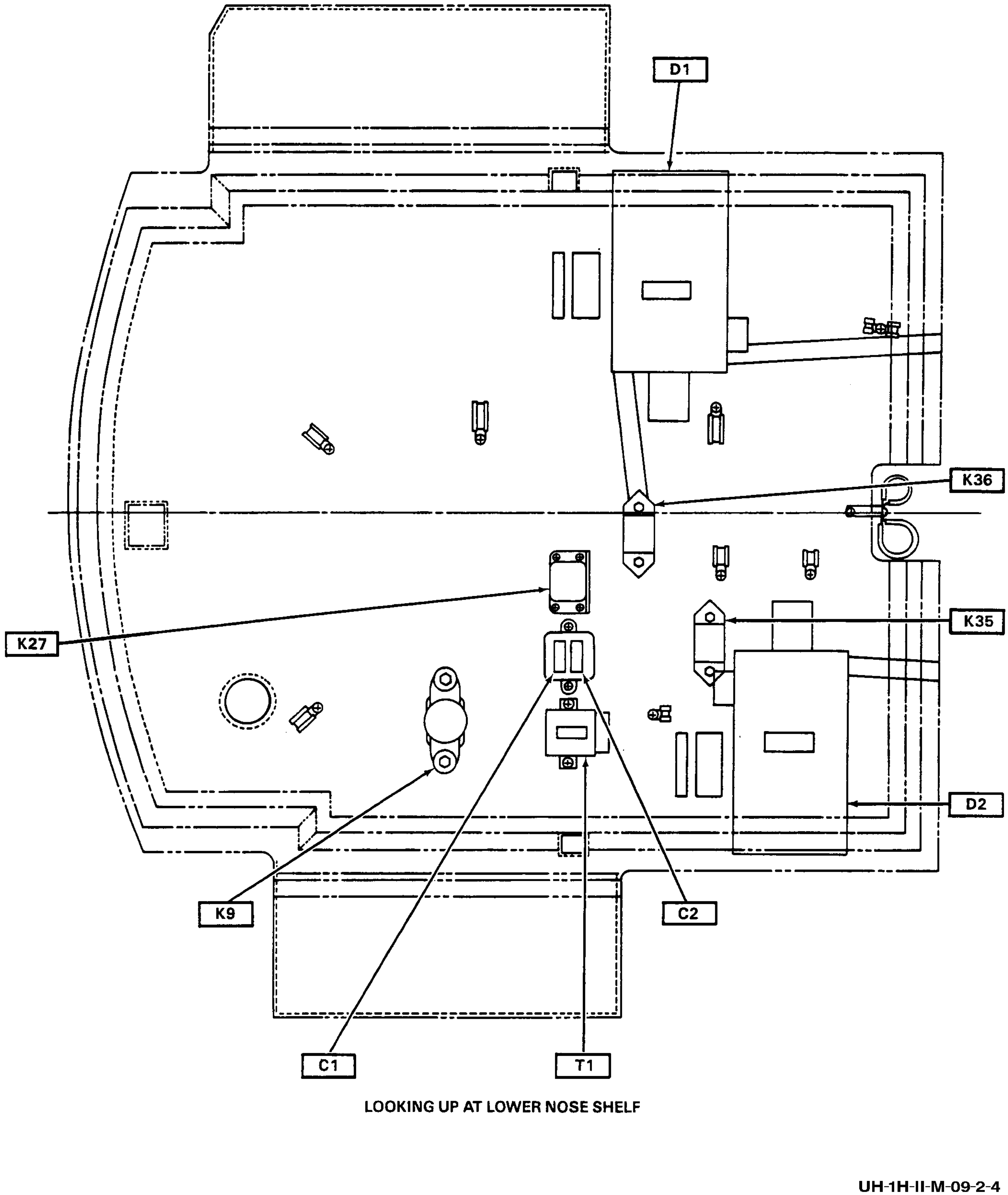
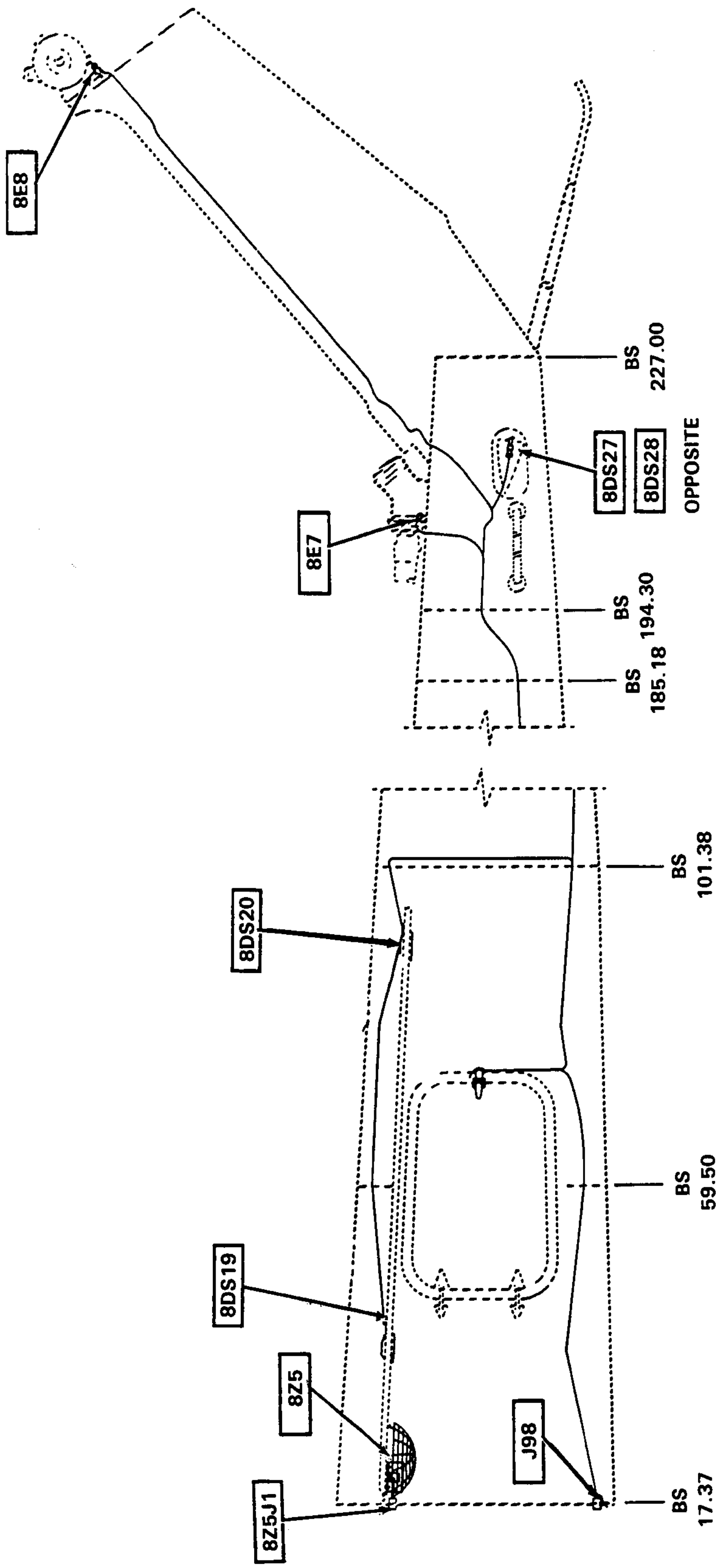


Figure 9-2. Electrical equipment location (Sheet 4 of 7)



UH-1H-II-M-09-2-5

Figure 9-2. Electrical equipment location (Sheet 5 of 7)

CODE ITEM	DESCRIPTION
A15	Overhead Console Panel
A20	Aft Dome Lights Panel
B6	Fuel Boost Pump Motor
B7	Windshield Wiper Motor — Pilot
B31	Windshield Wiper Motor — Copilot
BT2	Battery
C1	Capacitor, Power Factor Correction
C7	Capacitor, Noise Filter
CR2	Diode, External Power Relay
D1	Inverter — Main
D2	Inverter — Spare
E7	Magnetic Chip Detector — 42° Gearbox
E8	Magnetic Chip Detector — 90° Gearbox
I9	Utility Light — Pilot
I10	Dome Light
I17	Navigation Light — Left
I20	Fuselage Light — Top
I25	Transmission Sump Inspection Light
I26	Fuselage Light — Bottom
I28	Utility Light — Copilot
I40	Anti-Collision Light
J74	Receptacle, Battery Disconnect — Forward
J98	Receptacle, Tailboom Disconnect
J105	Receptacle, Heated Blanket — Left-hand
J109	Receptacle, External Power
J267	Receptacle, Battery Disconnect — Aft

CODE ITEM	DESCRIPTION
K1	Relay, External Power
K2	Relay, Non-Essential Bus
K3	Relay, Starter
K4	Relay, Bus Control — Generator Fail
K5	Relay, Reverse Current — Main Generator
K7	Relay, Generator Field
K8	Relay, A.C. Failure
K9	Relay, Battery — Forward
K10	Relay, Fuel Transfer
K15	Relay, Standby Generator Field
K23	Relay, Standby Generator Reverse Current
K24	Relay, Cargo Hook Release
K27	Relay, Inverter
K35	Relay, Main Inverter Power
K36	Relay, Spare Inverter Power
K66	Relay, Battery Feeder
L4	Solenoid, Hydraulic Bypass
L8	Magnetic Brake, Anti-Torque Force Trim
L9	Magnetic Brake, Fore & Aft Force Trim
L10	Magnetic Brake, Lateral Force Trim
P66	Plug, Fuel Pressure Mixture
P71	Plug, Fuel Valve Shut-Off
P95	Plug, Fire Detector Element — Left-hand
P97	Plug, Fire Detector Element — Left-hand
R1	Shunt-Ammeter — Standby Generator
R2	Shunt-Ammeter — Main Generator
R3	Resistor, Windshield Wiper
R7	Resistor, Navigation Lights — Dim
R27	Resistor, A.C. Load Balancing

UH-1H-II-M-09-2-6

Figure 9-2. Electrical equipment location (Sheet 6 of 7)

CODE ITEM	DESCRIPTION
S4	Switch, Transmission Sump Inspection Light
S27	Switch, Hydraulic Pressure
S31	Switch, Limit-External Power Door
S101	Switch, Differential Pressure
T1	Transformer, 115/28 Volt
TB1	Terminal Board, Forward Instrument Panel
TB9	Terminal Board, Top & Dome Lights
TB12	Terminal Board, Pedestal Panel Edge Lights
TB15	Terminal Board, Cockpit Lights — Left-hand
TB16	Terminal Board, Cockpit Lights — Right-hand
TB25	Terminal Board, Thermocouple — Indicator
TB29	Terminal Board, Instrument Ground
TB35	Terminal Board, Right-hand Fuel Cell
TB36	Terminal Board, External Power Diode
TB39	Terminal Board, Electrical Compartment — Aft
TB60	Terminal Board, Battery Voltage — Forward
TB80	Terminal Board, Transmission Chip Detectors

CODE ITEM	DESCRIPTION
VR1	Voltage Regulator — Main Generator
VR2	Voltage Regulator — Standby Generator
Z3	Flasher Unit, Navigation Lights
8DS19	Baggage Compartment Light
8DS20	Baggage Compartment Light
8DS27	Tail Light, Left
8DS28	Tail Light, Right
8Z4	Smoke Detector Amplifier
8Z5	Smoke Detector
8Z5J1	Receptacle, Smoke Detector
1.	Circuit Breakers a. Main Generator Voltmeter b. Standby Generator Loadmeter Voltmeter c. Standby Generator Loadmeter d. Main Generator Field
2.	Junction Box — Upper, BJ-4-F
3.	Junction Box — Lower, BJ-4-A
4.	Vertical Gyro
5.	Servo Amplifier
6.	RT-742( )/ARC-51BX Receiver/Transmitter
7.	RPM Limit Control
8.	RT-348( )/ARC-54 Receiver/Transmitter

UH-1H-II-M-09-2-7

Figure 9-2. Electrical equipment location (Sheet 7 of 7)

9-29. Troubleshooting — Battery System. Use table 9-1 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-12.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-1. Troubleshooting Battery System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Dc voltmeter indicates zero volts with BAT VM circuit breaker closed and DC VM switch in BAT position.

STEP 1. Ensure that battery is installed and power is available. Check that battery voltage is present on both sides of BAT VM circuit breaker with a multimeter.

If voltage is present on battery side but not present on dc voltmeter side of circuit breaker, replace circuit breaker. (Paragraph 9-12.)

STEP 2. Check for battery voltage at diode (CR30).

If voltage is present on battery side but not present on dc voltmeter side of diode, replace diode. (Paragraph 9-5.)

STEP 3. Ensure that battery voltage is present at terminal 17 of DC VM switch (S2) and check for voltage on terminal 11.

If voltage is present on terminal 17 but not present on terminal 11, replace DC VM switch, (Paragraph 9-5.)

STEP 4. Check for battery voltage across dc voltmeter (M2).

If battery voltage is present, replace dc voltmeter. (Paragraph 8-1.)

2. DC voltmeter indicates zero volts with BAT switch (S40) ON, DC VM switch (S2) in ESS BUS, and GEN & BUS RESET circuit breaker closed. (Dc voltmeter indicates correct voltage with DC VM switch in BAT position.)

STEP 1. Check that battery voltage is present on 28 Vdc essential bus with a multimeter. (If voltage is not present on essential bus, continue with step 3.) Using a multimeter, determine if voltage is present across the GEN & BUS RESET circuit breaker.

Replace the GEN & BUS RESET circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Ensure that essential bus voltage is present on terminal 14 of DC VM switch (S2) and check for voltage at terminal 11.

Replace DC VM switch if voltage is not present at terminal 11. (Paragraph 9-5.)

Table 9-1. Troubleshooting Battery System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 3. Check that BAT switch (S40) completes ground circuit in On position.

Replace BAT switch if defective. (Paragraph 9-5.)

STEP 4. When battery voltage is present on terminal A2 of battery relay (K9), determine if battery relay (K9) is actuated by checking for battery voltage at terminal A1. If relay is not actuated, determine that ground potential is present at terminal X2 and check for relay actuating voltage across terminals X1 and X2.

Replace relay if actuating voltage is present across terminals X1 and X2 and relay is not actuated. (Paragraph 9-5.)

STEP 5. With battery relay (K9) actuated and battery voltage present at terminal Z2 of battery feeder relay (K66), determine if battery feeder relay is actuated by checking for battery voltage at terminal A1. If relay is not actuated, determine that ground potential is present at terminal X2 and check for relay actuating voltage across terminals X1 and X2.

Replace relay if actuating voltage is present across terminals X1 and X2 and relay is not actuated. (Paragraph 9-5.)

3. DC voltmeter indicates zero volts with BAT switch (S40) ON, DC VM switch (S2) in NON-ESS BUS, NON-ESS BUS switch (S62) in MANUAL, and NON-ESS BUS VM circuit breaker closed. (DC voltmeter indicates correct voltage at BAT and ESS BUS positions.)

STEP 1. Check for battery voltage at 28 Vdc nonessential bus and NON-ESS BUS VM circuit breaker. (If battery voltage is not present on 28 Vdc and nonessential bus, continue with step 3.)

Replace NON-ESS BUS VM circuit breaker if defective. (Paragraph 9-5.)

STEP 2. Ensure that nonessential bus voltage is present at terminal 13 of DC VM switch (S2) and check for voltage at terminal 11.

Replace DC VM switch if voltage is not present on terminal 11. (Paragraph 9-5.)

STEP 3. Determine if nonessential bus relay is actuated by checking for battery voltage at terminal A2 of nonessential bus relay (K2). If relay is not actuated, determine that ground potential is present at terminal X1 and check for actuating voltage across terminals X1 and X2.

Replace relay if actuating voltage is present across terminals X1 and X2 and relay is not actuated. (Paragraph 9-5.)

STEP 4. Check for battery voltage on center contact of nonessential bus switch (S62).

Replace nonessential bus switch if defective. (Paragraph 9-5.)

Table 9-1. Troubleshooting Battery System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. Battery (BT 2) will not hold charge.

STEP 1. Determine if battery usage is excessive.

Use external power source whenever possible.

STEP 2. Check for too low charging rate.

Adjust voltage regulator. (Paragraph 9-75.)

STEP 3. Perform a visual inspection for broken cell partitions.

Replace battery if cell partition is broken. (Paragraph 9-36.)

STEP 4. Determine if battery cells are unbalanced.

Refer to TM 11-6140-203-15-2 for servicing of battery.

5. Battery life is short.

STEP 1. Determine if electrolyte level is below top of plate.

Refer to TM 11-6140-203-15-2 for servicing of battery.

6. Excessive loss of electrolyte.

STEP 1. Determine if charging rate is too high. (If loss is in individual cells only, cell is faulty.)

Reduce charging rate, or replace battery. (Paragraph 9-36.)

STEP 2. Inspect for cracked battery case.

Replace battery if battery case is defective. (Paragraph 9-36.)

7. Battery terminals corroded.

STEP 1. Check for excessive charging or discharging rate.

Clean terminals and adjust charging rate or load. (Paragraph 9-32.)

8. Polarity is reversed.

STEP 1. Determine if battery connections are reversed.

Reverse wiring connections if necessary.

9-30. BATTERY.

9-31. Description — Battery. The 24 volt, 34 ampere-hour, nickel cadmium type battery is used to start the engine at remote fields where external power is not available. The battery is not to be used to power the inverters because battery will be electrically depleted. After starting the engine, the battery switch should remain ON until the battery is fully recharged by the main generator.

CAUTION

The battery shall be stored in a heated area if the helicopter is to remain at an outside tiedown for a prolonged period at 0°F (-18°C) or below.

9-32. Cleaning — Battery.

CAUTION

Do not use wire brush. Vent plugs shall be closed before cleaning. The battery shall be completely dry before returning to use.

Do not use equipment that has been used on lead acid batteries.

a. Clean battery with a dry, stiff fiber brush or wash with water.

b. Clean up all alkaline deposits in the battery compartment. If corrosion is present, remove with diluted boric acid solution (C-489). Retouch varnished surfaces, if necessary, with alkali-resistant varnish (C-237).

9-33. Inspection — Battery.

WARNING

The electrolyte is a strong alkaline solution that is harmful to the hands or clothing. Use a 3 percent solution of boric acid (C-489) to neutralize spilled electrolyte. Flush thoroughly with water.

CAUTION

Do not use sodium bicarbonate to neutralize the electrolyte spilled in battery compartment from a nickel-cadmium battery.

a. Inspect battery for loose connections at disconnect or between cells.

b. Inspect for proper electrolyte level.

NOTE

Electrolyte will not be visible in partially charged battery. Electrolyte level should be adjusted by battery shop personnel.

c. Inspect for clogged vent plugs or vent tubes.

d. Inspect for damage to individual cell cases (distortion due to overcharge, cracks, or leaks).

9-34. Condition Check — Battery. On the helicopter a charged battery can be determined only by moving the battery switch from ON to OFF and observing the effect on the generator loadmeter. If the change in indications is less than 5 amperes, the battery is considered adequately charged.

9-35. Servicing — Battery. Refer to TM 11-6140-203-15-2 for servicing of battery.

9-36. Removal — Battery.

WARNING

Nickel-cadmium batteries contain an electrolyte mixture of potassium hydroxide and distilled water, a caustic chemical agent. Serious burns will result if the electrolyte contacts the skin. Explosive gases may be released from the battery during charging. Before removing the battery from the helicopter, ensure that BAT switch is OFF. Removal or installation of the battery connector while the battery is under load may result in explosion, electrical arcing and possible severe burns to personnel.

CAUTION

Chemically, this electrolyte is just the opposite of an acid. Take every possible step to keep the nickel-cadmium battery as far away as possible from the lead-acid type of battery. Do not use the same tools and materials (screwdrivers, wrenches, syringes, gloves, apron, etc.) for both types of batteries. Anything associated with the lead-acid battery, even the air, must never come in contact with the nickel-cadmium battery or its electrolyte. Even a trace of sulphuric acid fumes from a lead-acid battery may result in damage to the nickel-cadmium battery. If sulphuric acid has been inadvertently mixed with the electrolyte in the battery, the upper areas of the cells will appear greenish in color. In such cases, the battery must be replaced.

a. Check that BAT switch is OFF, and external power is not applied. Open compartment door.

b. Disconnect battery cable connector by turning knob counterclockwise.

c. Disconnect two vent tubes from battery case.

d. Open tie-down clamps and disengage rods from battery cover. Lift battery from compartment.

e. If battery is to be relocated, detach each tie-down rod from eyebolt at lower end by removing attaching bolt with nut and washers.

f. Stow battery cable connector in dummy receptacle. Close compartment door.

9-37. Repair or Replacement — Battery. Refer to TM 11-6140-203-15-2 for repair or replacement criteria.

9-38. Installation — Battery.

a. Open compartment door. If battery is being relocated, install tie-down rods on eyebolts provided on shelf, using bolts, nuts, and washers removed from old location. Detach battery cable connector from dummy receptacle.

CAUTION

Incorrect installation of the battery cover does not allow the rubber retainer strip to cover two center cell caps. Loosening of these caps and electrolyte-spillage may cause battery overheating and/or explosion.

b. Place battery on shelf, aligned for connections. Engage tie-down rods to strap on cover. Secure and lockwire.

NOTE

Part No. AN3156-3 clamp requires no lockwire; a self-locking device is incorporated.

c. Connect two vent tubes to battery case and tighten clamps.

d. Insert cable connector in battery receptacle and secure by turning knob clockwise.

e. Check that battery voltmeter circuit breaker near left side of battery is closed and that voltmeter will show indication when BAT switch is ON. Return switch to OFF after test. Close compartment door.

9-39. BATTERY RELAY.

9-40. Description — Battery Relay. The battery relay (K9), mounted in the left side of the nose compartment, is an electrically operated switch between the battery and the main bus bar. Controlled switch (S40) opens or closes the circuit to the actuating coil of the relay. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

9-41. BATTERY FEEDER RELAY.

9-42. Description — Battery Feeder Relay. The battery feeder relay (K66), located in the aft electrical compartment, is connected between the main dc bus and battery relay (K9). It is actuated when battery relay (K9) is actuated. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

9-43. EXTERNAL POWER SYSTEM.

9-44. Description — External Power System.

During ground operations, external power may be connected to the systems through an external power receptacle (J109) located on the aft left side of fuselage. No special action or switching is necessary to connect external power. If external power connections are of the correct polarity, the external power relay (K1), located in the aft electrical compartment, closes automatically and connects the ground unit to the main power cables energizing the essential bus. If not, no action occurs. The nonessential bus is energized with NON-ESS BUS switch (S62) in either NORMAL or MANUAL position. All circuits in the helicopter, with exception of the overvoltage protection circuit, function the same on external power as on helicopter power. Helicopter circuits are not protected against overvoltage when operating on external power.

9-45. Functional Test — External Power System.

NOTE

Unless otherwise specified, the voltmeter circuit breaker is to remain closed throughout all operational checks. Except where otherwise specified, all operational checks shall utilize external power. All circuit breakers shall be opened before external power is connected to the helicopter.

a. Before connecting external power for the first time, check for correct polarity, and terminations.

b. Apply 28 Vdc of reverse polarity between the small pin on the external power receptacle and the frame of the helicopter. Check that the external power relay does not close. Remove 28 Vdc reverse polarity.

c. Connect a 28 Vdc external power source to the helicopter external power receptacle (J109). Energize power source. Close GEN & BUS RESET circuit breaker. Dc voltmeter should indicate external power on the essential bus.

d. Place NON-ESS BUS switch (S62) in the NORMAL position. Place DC VM switch (S2) in NON-ESS BUS position. Voltmeter should indicate 28 Vdc on the nonessential bus. Repeat test with NON-ESS switch (S62) in MANUAL position. Voltmeter should indicate 28 Vdc on the nonessential bus.

9-46. Troubleshooting — External Power System. Use table 9-2 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out indicator lamps are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, Figure F-13.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-2. Troubleshooting External Power System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Power not available when external power plug is inserted into connector (J109).

STEP 1. Inspect for loose connection between external power plug and connector (J109).

Reconnect external power plug if loose.

Table 9-2. Troubleshooting External Power System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for reversed polarity in external power plug.

Correct polarity at attachment points on APU if reversed.

STEP 3. Check for low voltage from external power supply.

Increase output of external power.

STEP 4. Determine if external power relay (K1) is actuated. If relay is not actuated, check that ground potential is present at terminal X1 of relay. Check that relay actuating voltage is present across terminals X1 and X2 of relay.

Replace external power relay if relay actuating voltage is present but relay is not actuated. (Paragraph 9-5.)

9-47. EXTERNAL POWER RECEPTACLE.

9-48. Description — External Power Receptacle. The external power receptacle (J109) is mounted just below the aft electrical compartment access door and is covered by an access door. The receptacle provides for connection of an external power source to the helicopter.

NOTE

External power is not required but is recommended for starting the helicopter.

9-49. Cleaning — External Power Receptacle. Refer to paragraph 9-7 for cleaning procedure.

9-50. Inspection — External Power Receptacle. Refer to paragraph 9-8 for inspection procedure.

9-51. Removal — External Power Receptacle.

a. Ensure that all electrical power is OFF.

b. Remove nuts and washers from terminal posts of receptacle and remove wires to receptacle. Cover wire ends with tape.

c. Remove mounting screws and lift receptacle from bracket.

9-52. Repair or Replacement — External Power Receptacle. Refer to paragraph 9-10 for repair or replacement criteria.

9-53. Installation — External Power Receptacle.

a. Position receptacle on bracket and install mounting screws.

b. Remove tape from wire ends and install on terminal posts of receptacle.

9-54. EXTERNAL POWER RELAY.

9-55. Description — External Power Relay. The external power relay (K1), installed in the aft electrical compartment, connects an external source of power through the external power receptacle to the electrical system of the helicopter. A diode (CR2), mounted on terminal board (TB36) near the relay, serves to complete ground return for the holding coil. Also, it prevents reverse polarity to the helicopter electrical system. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

9-56. GENERATOR AND DC BUS SYSTEM.

9-57. Description — Generator and DC Bus System. The dc bus system supplies regulated power for all dc electrical components of the helicopter. This system is fed by batteries (BT2), main dc generator (G2), and standby starter-generator (G6). Refer to Appendix F, figure F-14.

The self-excited main generator (G2) normally supplies electrical power to the main bus when its output voltage is approximately 1/2 volt above that existing at the bus. Mechanical power is not supplied to the main generator until the engine starts driving the main rotor transmission. The voltage of the main generator at which it starts supplying power to bus system will vary according to the voltage applied to the main bus from other sources. (Other sources may be battery of approximately 24 volts, standby generator of approximately 26.5 volts, or external power supply of varying voltages.) If no other voltage source is connected to the bus, the main generator will be connected to the main bus when its output is 22 to 24 volts with main generator switch on. The main generator reverse current relay (K5) automatically closes and opens the circuit between the generator and the main bus. The voltage regulator (VR1) provides for proper generator voltage output during normal operating speeds and loads. A field control relay (K7) operating in conjunction with the overvoltage relay (K6) protects the dc powered components from overvoltage from the main generator. A generator switch (S8) on the dc power control panel provides manual control of the reverse current relay. A warning light on the caution panel indicates when the main generator's reverse current relay is not closed. The warning light receives dc power from the battery or standby generator through the contacts of the bus control relay (K4). The main generator supplies power to the bus control relay coil through the IND terminal on the reverse current relay when it closes and connects the main generator to the main bus.

The standby generator (G6) develops voltage whenever it is being driven by the engine. The voltage regulator (VR2) in the standby system is adjusted so the voltage output of the standby generator is approximately one volt below that of the main generators normal output. A reverse current relay (K23) is also provided for the standby system. Control of the reverse current relay is provided for by the standby position of the starter-generator switch (S70) and the bus control relay (K4). During normal operation the main generator reverse current relay energizes the bus control relay when the main generator is connected to the bus. The bus control relay performs three functions: (1) Opens the circuit between the standby position of the starter-generator switch and the standby reverse current relay preventing the relay from automatically connecting the standby generator to the main bus. (2) Opens the circuit to the DC generator light, turning off the caution light. (3) Completes a circuit from the essential bus through the "normal on" position of the nonessential bus switch (S62) to the nonessential bus relay (K2), energizing the nonessential bus. If the main generator fails or is disconnected from the main bus by its reverse current relay for any reason the bus control relay also becomes deenergized to: (1) illuminate the DC generator caution light, (2) open the circuit to the nonessential bus relay, (3) deenerigize the nonessential bus, (4) close the circuit between the standby position of the starter-generator switch and the standby reverse current relay allowing the standby reverse current relay to connect the standby generator to the main bus. No overvoltage protection is provided for the standby system. A loadmeter (M1) measures the system amperage load on the standby generator.

A standby generator field relay (K15) is provided. The purpose of the standby generator field control relay is to open the standby generator shunt field circuit whenever the coil is energized. Power is applied to the coil whenever the starter relay is energized by pressing the start switch. The shunt field circuit is completed through the relay when the start switch is released.

9-58. Functional Test — Generator and DC Bus System.

a. Perform functional test of main generator circuitry as follows:

(1) Disconnect wires P13A4, P13B4, and P13C4 from positive terminal B. Disconnect wires P14A4, P14B4, and P14C4 from negative terminal E of main generator. Connect these wires to an adjustable 28 volt dc power source (26 to 33 Vdc). Observe the proper polarity.

(2) Energize power source.

(3) Close GEN & BUS RESET, MAIN GEN VM, and CAUTION LIGHTS circuit breakers. There should be no voltage on the main bus in the electrical compartment. Check that dc voltmeter indicates voltage in the MAIN GEN position.

(4) Close MAIN GEN FIELD circuit breaker. Position generator switch (S8) to ON. Reverse current

relay (K5) should close and both essential and nonessential buses should be energized. Check that DC GENERATOR caution light is off.

(5) Momentarily turn on a load, such as the main inverter, and check that main generator loadmeter reads upscale.

(6) Ensure that BAT switch (S40) is OFF. Slowly increase voltage to the power source. At 31 to 33volts, over-voltage relay (K6) should actuate, causing field relay (K7) to trip and reverse current relay (K5) to open and thus remove voltage from all buses. Do not exceed 33 volts.

(7) Reduce voltage to 28 volts. Position battery switch (S40) to ON. Reset main generator system by placing generator switch (S8) in the RESET position and then back to OFF. Return battery switch to OFF. Position generator switch to ON. Field relay (K7) should reset and reverse current relay (K5) should close again energizing all buses.

(8) Return generator switch to OFF, open GEN & BUS RESET circuit breaker, and reconnect wires.

b. Perform functional test of standby starter-generator circuit as follows:

(1) Ensure BATT SW is OFF. Disconnect wire P37A1 from positive terminal B. Disconnect wires K54A and K5C4 from negative terminal E on starter-generator. Connect these wires to an adjustable 28 volt dc power source (26 to 33 Vdc). Observe the proper polarity.

(2) Close both standby generator loadmeter circuit breakers in the electrical compartment. Position starter-generator switch (S70) to START. Energize external power source. There should be no voltage on the main bus in the electrical compartment. Check that dc voltmeter indicates power source voltage in the STBY GEN position.

(3) Close STBY GEN FIELD circuit breaker. Position starter-generator switch (S70) to STBY GEN and check that essential bus is energized.

(4) Close GEN & BUS RESET circuit breaker. Position nonessential bus switch (S62) to MANUAL ON. Both essential and nonessential buses should be energized. Check that dc voltmeter indicates voltage of the power source in the STBY GEN, ESS-BUS, and NON-ESS BUS positions.

(5) Momentarily engage a load, such as the main inverter, and check that the standby generator loadmeter reads up scale. Return all switches and breakers to the open position and reconnect wires to their proper terminals.

9-59. Troubleshooting — Generator and DC Bus System.

a. Perform checks as necessary to isolate trouble using table 9-3. Tripped circuit breakers and burned-out indicator lamps are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a possible cause of circuit malfunction or failure and has not been included. (Figure F-14.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-3. Troubleshooting Generator and DC Bus System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks.

1. DC GENERATOR light on caution panel is not illuminated prior to engine start. Bus is energized from battery or external power and caution light circuit breaker is closed.

STEP 1. Temporarily connect jumper wire between terminals B2 and B3 on bus control relay (K4).

Table 9-3. Troubleshooting Generator and DC Bus System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Replace bus control relay if light illuminates. (Paragraph 9-5.)

STEP 2. Disconnect plug P24 from master caution light panel (A4) and check for dc voltage between terminals W (+) and Z (-) of the plug.

Replace master caution light panel if voltage is present. (Paragraph 9-5.)

2. DC GENERATOR light on caution panel does not extinguish after engine start and generator is placed in operation.

STEP 1. Check for main generator voltage on essential bus.

Replace bus control relay (K4) if generator voltage is present on essential bus. (Paragraph 9-5.)

STEP 2. Check for standby generator voltage on essential bus.

Replace main generator reverse current relay (K5) if standby generator voltage is present on essential bus. (Paragraph 9-5.)

STEP 3. Measure main generator output voltage.

Adjust or replace main generator voltage regulator (VR1) if less than 1.0 volt above standby generator voltage. (Paragraph 9-71.)

3. No voltage output from main generator but starter-generator operates normally.

STEP 1. Determine if main generator voltage regulator (VR1) is improperly adjusted or defective.

Adjust or replace main generator voltage regulator if defective. (Paragraph 9-71.)

STEP 2. Check for defective main dc generator (G2).

Replace main dc generator if defective. (Paragraph 9-60.)

STEP 3. Check for defective or improperly adjusted overvoltage relay.

Replace overvoltage relay if defective. (Paragraph 9-5.)

STEP 4. Check main generator switch (S8) for proper operation.

Replace main generator switch if defective. (Paragraph 9-5.)

STEP 5. Replace main generator switch (S8) to RESET and then to ON. (Bus energized by battery.)

Replace main generator field relay (K7) if voltage does not build up. (Paragraph 9-5.)

Table 9-3. Troubleshooting Generator and DC Bus System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. No voltage output from starter-generator. Main generator operates normally.

STEP 1. Determine if standby generator voltage regulator (VR2) is improperly adjusted or defective.

Adjust or replace standby generator voltage regulator if defective. (Paragraph 9-71.)

STEP 2. Check for defective standby generator (G6).

Replace standby generator if defective. (Chapter 4.)

STEP 3. Check starter-generator switch (S70) for proper operation.

Replace starter-generator switch if defective. (Paragraph 9-5.)

STEP 4. Check for defective standby generator field control relay (K15).

Replace standby generator field control if defective. (Paragraph 9-5.)

STEP 5. Check for defective bus control relay (K4).

Replace bus control relay if defective. (Paragraph 9-5.)

5. Standby generator does not switch onto bus to provide power when main generator is inoperative.

STEP 1. Check for dc voltage on terminal D2 of bus control relay (K4).

Replace starter-generator switch (S70) if voltage is not present. (Paragraph 9-5.)

STEP 2. Jumper terminals D2 and D3 on bus control relay (K4).

Replace bus control relay if standby generator output switches on to bus. Replace reverse current relay (K23) if standby generator does not switch onto bus. (Paragraph 9-5.)

6. No voltage to nonessential bus when NON-ESS BUS switch is in NORMAL position. Main generator voltage is present on essential bus. GEN & BUS RESET circuit breaker is closed.

STEP 1. Ensure that actuating voltage is present across terminals X1 and X2 of bus control relay (K4) and that 28 Vdc essential bus voltage is present at terminal A1. Check for voltage at terminal A2.

Replace bus control relay if voltage is not present at terminal A2.. (Paragraph 9-5.)

STEP 2. Check for actuating voltage at nonessential bus relay (K2).

Replace nonessential bus switch (S62) if voltage is not present. Replace relay if voltage is present. (Paragraph 9-5.)

Table 9-3. Troubleshooting Generator and DC Bus System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

7. No voltage on nonessential bus when NON-ESS BUS switch is in MANUAL position. Main generator voltage present on essential bus. GEN & BUS RESET circuit breaker is closed.

STEP 1. Check for actuating voltage at term X2 of nonessential bus relay (K2).

Replace nonessential bus switch (S62) and/or GEN & BUS RESET circuit breaker if actuating voltage is not present at relay. (Paragraphs 9-5 and 9-12.) Replace relay if actuating voltage is present. (Paragraph 9-5.)

9-60. MAIN DC GENERATOR.

9-61. Description — Main DC Generator. The main dc generator (G2), mounted on an accessory pad on the forward side of the main rotor transmission is rated at 300 amperes. Voltage is controlled by a voltage regulator which is part of the main generator system. The main dc generator is driven at the same speed as the engine output shaft and has to be turned within a specific range of speed to furnish rated current at normal regulated voltage.

9-62. Cleaning — Main DC Generator.

a. Remove moisture with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Do not use near a flame. Provide adequate ventilation.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical terminals with a bristle brush.

9-63. Inspection — Main DC Generator.

a. Visually inspect generator for damage.

b. Check terminals for damage and terminal board to ensure that it is not warped or cracked.

c. Check brush cover for dents and loose or bent pins.

d. Check brushes for wear and freedom of movement in brush holders.

e. Check brush springs for proper tension on brushes.

f. Check all leads for indication of overheating and condition of insulation.

g. Check that proper amount of brush area is making contact with commutator and that commutator is not coated with oil or grease.

h. Check drive splines for excessive wear by rocking armature back and forth.

9-64. Removal — Main DC Generator.

a. Open forward transmission fairing.

b. Tag wires to identify for reinstallation. Disconnect wires from generator.

c. Loosen attaching nuts and position each washer out of recess, turn generator housing counterclockwise, and pull generator free of transmission drive.

9-65. Repair or Replacement — Main DC Generator.

a. Repair brush cover dents (TM 55-1500-204-25/1).

b. Replace brush when no part of diagonal groove is visible on aft end of brush.

c. Replace warped or cracked terminal board.

d. No other repairs are authorized.

9-66. Installation — Main DC Generator.

a. Apply light coat of grease (C-004) on generator shaft. Place gasket into position. Align generator with transmission drive, and slide generator into drive spline.

b. Position generator on studs with terminals on bolt left of helicopter centerline. Tighten retaining nuts to attach generator to drive pad.

c. Connect wires to generator terminals.

d. Position rubber boot to cover generator connections and secure with lacing cord.

9-67. STANDBY GENERATOR (STARTER-GENERATOR).

9-68. Description — Standby Generator. The starter-generator (G6) is mounted on the aft side of the engine accessory drive gearbox. It serves to drive the engine compressor rotor during the start cycle and also serves as a 200 amp, engine driven standby generator at normal engine speeds. Refer to Chapter 4 for maintenance procedures.

9-69. GENERATOR SHUNT.

9-70. Description — Generator Shunt. The standby generator shunt (R1) and main generator shunt (R2) provide a voltage drop, proportional to the current, to operate the standby generator loadmeter (M1) and main generator loadmeter (M4). Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

9-71. VOLTAGE REGULATOR.

9-72. Description — Voltage Regulator. The main generator voltage regulator (VR1) and standby generator voltage regulator (VR2) are located in the aft electrical compartment on the left side of the helicopter. The voltage regulator controls the voltage output of the generator by controlling the magnetic field strength within the generator. Variation of the resistance which is in series with the generator's shunt field coils controls shunt field current to control generator voltage output. the voltage regulator of the standby generator is set at a lower voltage than that of the main generator.

9-73. Cleaning — Voltage Regulator.

a. Remove Moisture And Dirt With A Clean, soft cloth.

WARNING

> Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

d. Clean corroded contact pins and spring tabs with a pencil eraser.

9-74. Inspection — Voltage Regulator.

a. Visually inspect regulator for cracked case, damaged or corroded contact pins, loose terminals, etc.

b. Check for secure mounting of regulator.

c. For regulators with separate base, inspect spring tabs for security and condition.

9-75. Adjustments — Voltage Regulator.

CAUTION

> Adjustment of the voltage regulator is very critical. Overcharging the battery may cause excessive gassing, spewage of electrolyte, and damage to the battery. Use a meter accurate to within 1% when adjusting the voltage regulator. Do not use the voltmeter installed on the instrument panel.

NOTE

Adjust voltage regulator while operating engine at 6000 RPM after allowing sufficient time for voltage regulator to warm up.

a. Gain access to voltage regulator adjustment screw on base of regulator.

b. Turn adjustment screw with insulated screwdriver; clockwise to increase voltage or counterclockwise to decrease voltage.

c. Compensate for temperature changes by checking the generator voltage regulator setting on the helicopter at least every 25 flight-hours. Use the chart below for adjusting the generator voltage regulator setting for seasonal temperatures:

NOTE

The ground level temperature must be considered as a mean (weekly average) value.

Seasonal Temperature	Voltage Setting
Maximum daily ambient temperature does not exceed 58°F (14.4°C)	28.5 ± 0.1 volts dc
Maximum daily ambient temperature exceeds 58°F (14.4°C)	28.0 ± 0.1 volts dc

9-76. Removal — Voltage Regulator.

a. Ensure that all electrical power is OFF.

b. Unlock snap clamps and remove regulator from base. For regulators without base, remove nuts and washers and remove regulator from shelf.

9-77. Repair and Replacement — Voltage Regulator. Other than repositioning spring tabs, no other repairs are authorized.

9-78. Installation — Voltage Regulator.

a. Ensure that all electrical power is OFF.

b. Position regulator on mounting base and lock snap clamps. For regulators without separate base, insert regulator studs through mounting holes and secure with washers and nuts.

9-79. GENERATOR FIELD RELAY.

9-80. Description — Generator Field Relay. Two generator field control relays are located in the aft electrical compartment. The field control relay (K7) in the main generator system opens the shunt field circuit between the voltage regulator and the generator whenever the over-voltage relay closes the circuit to the trip coil of the field control relay. The tripped field control relay opens the circuit to SW terminal of the main generator reverse current relay. Once tripped, the generator field control relay can be reset by placing the generator switch in the RESET position. The standby generator field control relay (K15) is a different type than that in the main generator system. The purpose of the standby generator field control relay is to open the standby generator's shunt field circuit whenever the coil is energized. Power is applied to the coil whenever the starter relay is energized by pressing the start switch. The shunt field circuit is completed through the relay when the start switch is released. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

9-81. REVERSE CURRENT RELAY.

9-82. Description — Reverse Current Relay. Two reverse current relays (K5 and K23) are mounted in the aft electrical compartment. Each is a part of two separate generator systems. It automatically connects and disconnects its own generator to or from the dc bus. Automatic operation of the reverse current relay is possible only when generator voltage is applied to the "SW" terminal of the unit.

Automatic connection of the generator to the dc bus is accomplished only when the following conditions of the generator voltage are satisfied: the polarity is correct, a minimum of 22 to 24 volts dc is attained, and voltage at GEN terminal of reverse current relay exceeds voltage at its BAT terminal by approximately 0.5 volt.

Automatic disconnection of the generator from the dc bus is accomplished by reverse current through the reverse current relay when generator voltage decreases below the voltage of another source connected to the bus. Refer to paragraphs 9-5through 9-11 for maintenance procedures.

9-83. BUS CONTROL RELAY.

9-84. Description — Bus Control Relay. Operation of the bus control relay (K4) is controlled through the IND terminal of the main generator reverse current relay. Closing of the reverse current relay supplies power from the main generator to the coil of the bus control relay. With this coil energized the following events happen: one set of contacts B2 and B3terminals open to remove power from the dcgenerator segment on the caution panel to turn light off, the contacts between A2 and A1 terminals close to allow main generator voltage to energize nonessential bus relay, and the contacts between D2 and D3 terminals open to disconnect standby generator power from the "SW" terminal of the standby generator's reverse current relay. When the main generator's reverse current relay opens, the bus control relay coil is deenergized and returns to its spring loaded position which results in illumination of the dc generator light on caution panel, and removal of power to the nonessential bus relay coil resulting in the nonessential bus disconnecting from the main bus. Power from the external power supply closes the nonessential relay through the deenergized bus control relay. Refer to paragraphs9-5 through 9-11 for maintenance procedures.

9-85. OVERVOLTAGE RELAY.

9-86. Description — Overvoltage Relay. The overvoltage relay (K6) is located in the aft electrical compartment. Voltage from the main generator is applied to the coil of the overvoltage relay only when the main generator switch is ON. The overvoltage relay contacts are normally open, but 31-33 volts across its coil from the main generator will close the relay which connects power from the bus to the trip coil of the main generator field control relay. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

9-87. NONESSENTIAL BUS RELAY.

9-88. Description — Nonessential Bus Relay.

The nonessential bus relay (K2) is mounted in the aft electrical compartment. The nonessential bus relay is an electrically operated switch between the main bus bar and nonessential bus. It is operated by power from external power receptacle when external power is supplied. Power from the main generator will also operate the nonessential bus relay through the bus control relay when the main generator reverse current relay closes. Placing the nonessential bus switch in the manual position will also allow standby generator or battery power to close the relay. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

SECTION II — ALTERNATING CURRENT POWER DISTRIBUTION SYSTEM

NOTE

Power loading charts and detail system wiring diagrams are contained in Appendix F.

9-89. ALTERNATING CURRENT POWER DISTRIBUTION SYSTEM.

9-90. Description — Alternating Current Power Distribution System. The alternating current power distribution system provides all secondary power (115 Vac) for operation of the ac instruments and avionics systems.

9-91. COMMON ELECTRICAL COMPONENTS (AC).

9-92. Description — Common Electrical Components (AC). Common electrical components consist of the miscellaneous electrical components, circuit breakers, and control panels. Refer to paragraphs 9-5 through 9-25 for description and maintenance procedures.

9-93. INVERTER SYSTEM.

9-94. Description — Inverter System. The inverter system is a dual system consisting of a main and spare inverter. The units are interchangeable and are rated at 115 Vac, 400 Hz, 250VA, 3 phase. The system is comprised of the main inverter (D1), spare inverter (D2), main inverter power relay (K35) spare inverter power relay (K36), inverter relay (K27), ac failure relay (K8), ac power panel (A2), inverter switch (S39), ACVM selector switch (S11), ac voltmeter (M3), 115 to 28 Vac autotransformer (T1), and power factor correction network. The inverter system is powered from the 28 Vdc essential bus and is protected by the MAIN INVTR PWR, SPARE INVTR PWR, and INVTR CONTROL circuit breakers.

With the inverter switch (S39) positioned in MAIN, dc power from the 28 Vdc essential bus is routed through the main inverter power relay to the main inverter. The ac output of the main inverter is routed through the inverter relay to the autotransformer and various ac instrument and avionics circuit breakers. With the inverter switch positioned to SPARE, dc power from the 28 Vdc essential bus is routed through the spare inverter power relay to the spare inverter. The ac output of the spare inverter is routed through the inverter relay to the autotransformer and various ac instrument and avionics circuit breakers. The autotransformer reduces 115 Vac to 28 Vac for instrument power.

9-95. Functional Test — Inverter System.

a. Open all circuit breakers and place all switches to their OFF or NORMAL positions.

b. Connect a 28 Vdc power source to the external power receptacle (J109). Energize power source.

c. Close the MAIN INVTR PWR, SPARE INVTR PWR, INVTR CONT, CAUTION LIGHTS, POWER FACTOR CORRECTION, and all ac circuit breakers in the pedestal breaker panel. Check that INST INVERTER caution light illuminates.

d. Position inverter switch (S39) to MAIN ON. Check that main inverter and all ac instruments are on and INST INVERTER light is extinguished.

e. Select each phase on the ac voltmeter and check that voltmeter indicates 1153 Vac, on each phase when dc bus voltage is 28 volts.

f. Position inverter switch (S39) to OFF and check that INST INVERTER light illuminates.

NOTE

When inverter switch (S39) is moved from MAIN ON to OFF, the ac bus voltages decrease gradually because the buses remain connected to the main inverter output through the inverter relay contacts. If the MASTER CAUTION light is reset during the time period in which the main inverter is still decreasing in speed, false MASTER CAUTION and INST INVERTER indications may occur.

g. Position inverter switch (S39) to SPARE ON and check that ac voltmeter indicates 1153 Vac on each phase.

NOTE

When inverter switch (S39) is moved from SPARE ON to OFF, the ac bus voltages will drop off immediately from the spare inverter output by the inverter relay.

9-96. Troubleshooting — Inverter System.

Use table 9-4 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out indicator lamps are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-15.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-4. Troubleshooting Inverter System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Main inverter fails to operate.

STEP 1. With inverter switch (S39) position to MAIN ON, check for 28 Vdc essential bus voltage on terminals 1 and 2 of switch.

Replace switch if voltage is not present on terminal 1. (Paragraph 9-5.)

STEP 2. Ensure that actuating voltage is present across terminals X1 and X2 and that 28 Vdc essential bus voltage is present at terminal A1 of main inverter power relay (K35). Check for voltage at terminal A2.

Replace main inverter power relay if voltage is not present at terminal A2. (Paragraph 9-5.)

STEP 3. Check for 28 Vdc essential bus voltage at pins F and G of main inverter connector (P191). Ensure that ground potential is present at pin E.

Replace main inverter (D1) if voltage is present on pins F and G of connector. (Paragraph 9-97.)

2. Spare inverter fails to operate.

STEP 1. With inverter switch (S39) positioned to SPARE ON, check for 28 Vdc essential bus voltage on terminals 2 and 3 of switch.

Replace switch if voltage is not present on terminal 3. (Paragraph 9-5.)

STEP 2. Ensure that actuating voltage is present across terminals X1 and X2 and that 28Vdc essential bus voltage is present at terminal A1 of spare inverter power relay (K36). Check for voltage at terminal A2.

Replace spare inverter power relay if voltage is not present at terminal A2. (Paragraph 9-5.)

STEP 3. Check for 28 Vdc essential bus voltage at pins F and G of spare inverter connector (P192). Ensure that ground potential is present at pin E.

Replace spare inverter (D2) if voltage is present on pins F and G of connector. (Paragraph 9-5.)

3. Inverter (D1 or D2) operates but no voltage to instruments.

STEP 1. Check continuity of inverter relay (K27) contacts; terminals A2 to A3 and B2 to B3 for main inverter and terminals A1 to A2 and B1 to B2 for sprare inverter (relay actuated for spare inverter operation).

Replace inverter relay if defective. (Paragraph 9-5.)

STEP 2. Check for 115 Vac output from inverter at inverter relay terminals A3 and B3 (for main inverter) and terminals A1 and B1 for spare inverter).

Replace inverter (D1 or D2) if defective. (Paragraph 9-97.)

Table 9-4. Troubleshooting Inverter System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. Improper inverter output voltage or frequency.

STEP 1. Check for proper input voltage to inverter.

Correct primary voltage if low. (Paragraph 9-75.)

STEP 2. Check inverter output voltage and frequency with voltmeter and frequency meters.

Replace inverter if defective. (Paragraph 9-97.)

9-97. INVERTER.

9-98. Description — Inverter. The main and spare 115 Vac, 400 Hz, 250 VA, 3 phase inverters are located in the nose electrical compartment. All three phases of the inverter are loaded equally as far as is practicable. Since loads are primarily inductive, power factor correction capacitors are mounted in the compartment with the inverters to maintain a power factor of .97 (lag) under normal load.

9-99. Cleaning — Inverter.

a. Remove moisture and loose dirt with a clean soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt, with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

9-100. Inspection — Inverter.

a. Inspect case for cracks or damage.

b. Inspect electrical connectors for broken pins or cracked connector inserts.

c. Check for bonding and security of mounting.

9-101. Adjustment — Inverter.

NOTE

To properly conduct the inverter check, apply a regulated 28 Vdc external power source or ground run the helicopter to ensure an adequate source of dc power for inverter operation. Do not use helicopter battery power.

a. Turn on inverter and actuate all ac circuits to produce maximum demand on inverter.

b. Using multimeter (AN/PSM-6A or equivalent) and frequency meter (JTB Model 33FS or equivalent), check output voltage and frequency at the 115 Vac bus (engine vibration receptacle (J115) or other convenient monitoring point).

c. If the output voltage is 1152.5 Vac and the frequency is between 380 and 420 Hz, no adjustment is necessary.

d. If the output voltage is above or below the limits prescribed in the preceding step, turn off dc power to inverter and loosen hexhead jamnut securing adjustment screw.

e. Close all ac circuit breakers to actuate all ac circuits. Turn on inverter power. Connect multimeter and frequency meter at one of the test points described in step b. and note reading. Turn inverter output adjustment screw clockwise to increase or counterclockwise to decrease inverter output. Nominal setting of 111 volts at full output load should produce an output frequency within limits of380 to 420 Hz.

9-102. Removal — Inverter.

a. Ensure that all electrical power is OFF.

b. Disconnect electrical cable and protect connectors with cap or electrical tape.

c. Remove mounting bolts and lift inverter from compartment.

9-103. Repair or Replacement — Inverter. Repair connectors, replace missing mounting bolts, and replace unit if other inspection requirements are not met.

9-104. Installation — Inverter.

a. Ensure all electrical power is OFF.

b. Carefully position and secure inverter in compartment with mounting bolts.

c. Remove caps or electrical tape from plugs and receptacles.

d. Connect electrical connectors to the inverter.

9-105. MAIN INVERTER POWER RELAY.

9-106. Description — Main Inverter Power Relay. The main inverter power relay (K35) is located in the nose compartment. The relay is used as a remote controlled switch. When the relay is energized, 28Vdc is routed from the essential bus through the relay to the main inverter. Refer to paragraphs 9-5 through 9-11 for maintenance procedure.

9-107. SPARE INVERTER POWER RELAY.

9-108. Description — Spare Inverter Power Relay. The spare inverter power relay (K36) is located in the nose compartment. The relay is used as a remote controlled switch. When the relay is energized, 28 Vdc is routed from the essential bus through the relay to the spare inverter. Refer to paragraphs 9-5 through 9-11 for maintenance procedure.

9-109. INVERTER RELAY.

9-110. Description — Inverter Relay. The inverter relay (K27) is used as a double-pole, double-throw remote controlled switch. The relay is energized by28 Vdc when inverter switch (S39) is in SPARE ON position. When energized, 115 Vac from the spare inverter is routed through the relay to the ac systems. When deenergized, 115 Vac from the main inverter is routed through the relay to the ac systems. Refer to paragraphs 9-5 through 9-11 for maintenance procedure.

9-111. INVERTER FAILURE RELAY.

9-112. Description — Inverter Failure Relay. The ac failure relay (K8) monitors the 115 Vac, phase C bus. When no voltage is present at bus, the relay is deenergized, and the INST INVERTER caution panel segment illuminates to warn the pilot of 115Vac power failure. Refer to paragraphs 9-5 through 9-11 for maintenance procedure.

9-113. AC TRANSFORMER.

9-114. Description — AC Transformer. The ac transformer (T1), which is an autotransformer, reduces 115 Vac to 28 Vac for instrument power.

9-115. Cleaning — AC Transformer.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304.)

9-116. Inspection — AC Transformer.

a. Inspect transformer for broken contact pins.

b. Inspect transformer case for damage.

c. Inspect for damaged insulation between pins.

d. Check for discoloration that would indicate internal shorting or excessive overload.

e. Check for security of mounting.

9-117. Removal — AC Transformer.

a. Ensure all electrical power is OFF.

b. Disconnect wiring from transformer and cover wire ends. Tag wires for proper identification.

c. Remove mounting screws and lift transformer from compartment.

9-118. Repair or Replacement — AC Transformer.

a. Replace transformer if case is damaged or discolored.

b. Replace transformer if insulation between pins is damaged or broken, or contact pins are broken.

c. Repair is limited to tightening or properly installing any loose or improperly installed mounting hardware.

9-119. Installation — AC Transformer.

a. Ensure all electrical power is OFF.

b. Position transformer in compartment and secure with mounting screws.

c. Remove cover from wire ends and connect tagged wires to transformer.

9-120. ENGINE VIBRATION METER RECEPTACLE.

9-121. Description — Engine Vibration Meter Receptacle. The engine vibration meter receptacle, powered from the 115 Vac essential bus, is used as source of 115 Vac power for the vibration meter during engine vibration tests. It is also used as a convenient point to monitor ac voltage from the 115Vac essential bus during functional test or troubleshooting. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

SECTION III — STARTING SYSTEM

9-122. STARTING SYSTEM.

9-123. Description — Starting System. The starting system requires 24 Vdc to activate the starter portion of the starter-generator during the starting cycle. The 24 Vdc power may be supplied by the battery or by an external power source. The starting system consists of the starter portion of the starter-generator (G6) and the starter relay (K3).

9-124. Functional Test — Starter System.

a. Disconnect wires K4B4 and K4D4 from terminal C of starter-generator.

b. Position starter-generator switch (S70) to START.

c. Close STARTER RELAY circuit breaker.

d. Actuate starter switch (S6) on pilots collective stick and check that starter relay (K3) closes and that voltage is present at the ends of the disconnected wires.

e. Position starter-generator switch (S70) to STBY GEN.

f. Actuate starter switch (S6) and check that starter relay (K3) does not close.

g. Open STARTER RELAY circuit breaker.

h. Reconnect wires K4B4 and K4D4 to terminal C of starter-generator.

9-125. Troubleshooting — Starter System. Use table 9-5 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out indicator lamps are omitted for indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a possible cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-16.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-5. Troubleshooting Starter System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Starter (G6) fails to operate when starter switch (S6) is depressed with starter-generator switch (S70) in START position.

STEP 1. Ensure that dc essential bus voltage is present and determine if STARTER RELAY circuit breaker is defective.

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Check starter-generator switch (S70) for proper operation.

Replace switch if defective. (Paragraph 9-5.)

STEP 3. With starter switch (S6) depressed, check for relay actuating voltage at terminal X2 or starter relay (K3).

Replace switch (S6) if defective. (Paragraph 9-5.)

STEP 4. With starter switch (S6) depressed, check for main dc bus voltage at terminal A2 of starter relay (K3).

Replace relay if defective. (Paragraph 9-5.)

STEP 5. Check for excessively worn brushes.

Replace brushes as required.

2. Starter fails to produce sufficient rpm during start cycle.

STEP 1. Check for excessive wear to armature bearings.

Replace starter if bearings are worn excessively.

STEP 2. Check for low battery power.

Charge battery or connect external power source.

3. Engine rotates when battery is turned on.

STEP 1. Check for defective starter relay (K3).

Replace relay if defective. (Paragraph 9-5.)

STEP 2. Check for defective starter switch (S6).

Replace starter switch if defective. (Paragraph 9-5.)

9-126. STARTER-GENERATOR.

9-127. Description — Starter-Generator. The starter-generator (G6) is mounted on the aft side of the engine accessory drive gearbox. It serves to drive the engine compressor rotor during the start cycle and also serves as a 200 amp, engine driven standby generator at normal engine speeds.

9-128. STARTER RELAY.

9-129. Description — Starter Relay. The starter relay is located in the aft electrical compartment. This unit is an electrically operated switch between the main bus bar and the starter-generator. It is energized when the starter switch on the pilot collective stick is depressed. Refer to paragraphs 9-5 through 9-11 for maintenance procedures.

SECTION IV — IGNITION SYSTEM

9-130. IGNITION SYSTEM.

9-131. Description — Ignition System. Ignition to the power plant is provided by the ignition unit (Z2), furnished with and attached to the engine. This unit provides a continuous ignition arc during engine start cycle. The igniter solenoid valve (L1), located on the engine, also operates during this cycle to direct fuel to the starting fuel nozzle during engine start. The circuits are energized when fuel switch (S38), located on the engine control panel (A3), is placed to ON and the starter switch (S6) is depressed.

9-132. Functional Test — Ignition System.

NOTE

Ensure that wire K3D20 is disconnected at starter relay (K3) and that terminal is protected to prevent activation of engine.

a. Close IGNITION SYSTEM IGNITER SOL circuit breaker. Position fuel switch (S38) to ON. Actuate starter switch (S6) and check that ignition unit and igniter solenoid valve both operate.

b. Position fuel switch (S38) to OFF. Actuate starter switch (S6) and check that neither the ignition unit nor solenoid valve operates.

c. Reconnect wire K3D20 at starter relay (K3).

9-133. Troubleshooting — Ignition System. Use table 9-6 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-17.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-6. Troubleshooting Ignition System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Ignition unit or igniter solenoid valve fails to operate when starter switch is depressed.

STEP 1. Ensure that proper voltage is present on 28 Vdc bus. Using a voltmeter (AN/PMS-6A or equivalent), check to determine if the IGNITION SYSTEM & IGNITER SOLENOID circuit breaker is defective.

Table 9-6. Troubleshooting Ignition System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Check fuel switch (S38) for proper operation.

Replace switch if defective. (Paragraph 9-5.)

STEP 3. Check starter switch (S6) for proper operation.

Replace switch if defective. (Paragraph 9-5.)

STEP 4. Check ignition unit for proper operation.

Replace ignition unit if defective. (T53-L-703 Maintenance Manual.)

STEP 5. Check igniter solenoid valve for proper operation.

Replace solenoid if defective. (T53-L-703 Maintenance manual.)

9-134. IGNITION UNIT.

9-135. Description — Ignition Unit. The ignition unit is furnished with and attached to the engine. This unit provides a continuous ignition arc during the engine start cycle. Refer to the T53-L-703 Maintenance Manual for maintenance procedures.

9-136. IGNITER SOLENOID VALVE.

9-137. Description — Igniter Solenoid Valve. The igniter solenoid valve (L1) is installed on the engine and operates during the start cycle. It directs fuel to the starting fuel nozzle during engine start. Refer to the T53-L-703 Maintenance Manual for maintenance procedures.

SECTION V — LIGHTING PROVISIONS

9-138. LIGHTING PROVISIONS.

9-139. Description — Lighting Provisions. Lighting provisions include all equipment necessary for the illumination of instruments and switches; also interior and exterior lighting used for night operation of the helicopter and baggage compartment lighting.

9-140. INTERIOR LIGHTS SYSTEM.

9-141. Description — Interior Lights System. Interior light circuits include the instrument lights, instrument secondary lights located on the glare shield, overhead console and pedestal panel lights, dome light, and cockpit lights.

9-142. COCKPIT LIGHTS.

9-143. Description — Cockpit Lights. The cockpit lights (I9 and I28) are multiple-purpose utility lights designed to selectively provide red or white illumination utilizing a narrow spotlight beam or a wide floodlight beam. Controls necessary to obtain operational modes of ON-OFF, dim-bright, spot-flood, and red or white illumination are incorporated into the lamp body.

9-144. Cleaning — Cockpit Lights. Refer to paragraph 9-7 for cleaning procedures.

9-145. Inspection — Cockpit Lights. Inspect light for corroded lamp socket terminals, shorted or broken wires, cracked lens, burned out lamp bulbs, and improper bonding to ground.

9-146. Functional Test — Cockpit Lights.

a. Close COCKPIT LTS circuit breaker. Check that pilot and copilot utility lights are operational in each mode. (ON-OFF, Dim-Bright and Spot-Flood on both red and white.)

b. Open COCKPIT LTS circuit breaker.

9-147. Troubleshooting — Cockpit Lights. Use table 9-7 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out bulbs are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-18.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-7. Troubleshooting Cockpit Lights

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Switch fails to operate lights.

STEP 1. Use a multimeter to determine if switch or rheostat is defective.

Replace switch or rheostat if defective. (Paragraph 9-5.)

2. One light dim or intermittent.

STEP 1. Check for proper circuit ground contact.

Remove light and clean ground. (Paragraph 9-7.)

3. One light does not illuminate.

STEP 1. Check for corroded lamp socket.

Clean terminals or replace light. (Paragraph 9-5.)

9-148. Removal — Cockpit Lights.

a. Open COCKPIT LTS circuit breaker.

b. Remove mounting hardware, lift out light assembly, and disconnect light wire.

9-149. Repair or Replacement — Cockpit Lights. Light assembly may be repaired by replacing damaged or defective component parts. If light case is damaged beyond repair, complete unit must be replaced.

9-150. Installation — Cockpit Lights.

a. Connect light wire and install light assembly with mounting hardware.

b. Close COCKPIT LTS circuit breaker and check light for proper operation.

9-151. DOME LIGHTS.

9-152. Description — Dome Lights. The aft dome lights are designed to provide red or white illumination as selected by switch (S1) on the aft dome lights panel (A20). A rheostat (R21) on the panel controls off-on-dimming of the aft dome lights.

9-153. Cleaning — Dome Lights. Refer to paragraph 9-7 for cleaning procedure.

9-154. Inspection — Dome Lights. Inspect lights for corroded lamp socket terminals, cracked lens, burned out lamp bulbs, improper bonding to ground, and broken or shorted wires.

9-155. Functional Test — Dome Lights.

a. Close DOME LTS circuit breaker. Position switch (S1) to RED. Rotate rheostat (R21) clockwise from OFF. Check that the three aft dome lights are full bright with (R21) in the full clockwise position.

b. Repeat step a. with switch (S1) positioned to WHITE.

c. Open DOME LTS circuit breaker.

9-156. Troubleshooting — Dome Lights. Refer to paragraph 9-147; procedure is the same. Refer to Appendix F, figure F-18.

9-157. Removal — Dome Lights.

a. Open DOME LTS circuit breaker.

b. Remove mounting hardware, lift out light assembly, and disconnect light wires.

9-158. Repair or Replacement — Dome Lights. Light assembly may be repaired by replacing damaged or defective component parts. If case is damaged beyond repair, complete unit must be replaced.

9-159. Installation — Dome Lights.

a. Connect light wires and install light assembly with mounting hardware.

b. Close DOME LTS circuit breaker and check light for proper operation.

9-160. INSTRUMENT, CONSOLE, AND PEDESTAL LIGHTS.

9-161. Description — Instrument, Console, and Pedestal Lights. The instrument, console, and pedestal lights are energized by the 28 Vdc essential bus and protected by INST SEC LTS, INST PANEL LTS, and CONSOLE & PEDESTAL LTS 5 ampere circuit breakers. Six rheostats on the instrument lights panel (A6) control off-on-dimming of pilot instrument, copilot instrument, engine instrument, pedestal, instrument secondary, and console lights.

9-162. Cleaning — Instrument, Console, and Pedestal Lights. Refer to paragraph 9-7 for cleaning procedure.

9-163. Inspection — Instrument, Console, and Pedestal Lights. Refer to paragraph 9-8 for inspection procedure.

9-164. Functional Test — Instrument, Console, and Pedestal Lights.

a. Close INSTR PANEL LIGHTS circuit breaker. Rotate pilots instrument lights rheostat (R4) clockwise from OFF. Check that all instrument lights on the pilots side of the panel, including the standby compass and collective stick light, illuminate and increase in brightness with clockwise rotation of the rheostat.

b. Rotate engine instrument lights rheostat (R9) clockwise from OFF. Check that all engine instrument lights illuminate and increase in brightness with clockwise rotation of the rheostat.

c. Rotate the copilots instrument lights rheostat (R10) clockwise from OFF. Check that all instrument lights on the copilots panel illuminate and increase in brightness with clockwise rotation of the rheostat.

d. Open INST PANEL LIGHTS circuit breaker.

e. Close CONSOLE PED LIGHTS circuit breaker. rotate pedestal lights rheostat (R8) clockwise from OFF. Check that all edge lit panel lights on the pedestal illuminate and increase in brightness with clockwise rotation of the rheostat.

f. Rotate console lights rheostat (R6) clockwise from OFF. Check that all edge lit panel lights in the overhead console plus the aft dome lights panel and crew ICS panel lights illuminate and increase in brightness with clockwise rotation of the rheostat.

g. Open CONSOLE PED LIGHTS circuit breaker.

h. Close INST SEC LIGHTS circuit breaker.

i. Rotate instrument secondary lights rheostat R5 clockwise from OFF. Check that instrument secondary lights illuminate and increase in brightness with clockwise rotation of the rheostat.

j. Open INST SEC LIGHTS circuit breaker.

9-165. Troubleshooting — Instrument, Console, and Pedestal Lights. Refer to paragraph 9-147; procedure is the same. (Figure F-19.)

9-166. Removal — Instrument, Console, and Pedestal Lights. Refer to paragraph 9-9 for removal procedure.

9-167. Repair or Replacement — Instrument, Console, and Pedestal Lights. Refer to paragraphs 9-10 and 9-24 for repair or replacement criteria.

9-168. Installation — Instrument, Console, and Pedestal Lights. Refer to paragraph 9-11 for installation procedure.

9-169. CAUTION LIGHT SYSTEM.

9-170. Description — Caution Light System. The caution light system includes a master caution panel (A4) located in the pedestal and a master caution light (I13) located on instrument panel. The caution panel contains a number of internally lighted capsules that illuminate when associated switches actuate to complete circuits thus indicating malfunctions in respective system. The panel is energized from 28 Vdc essential bus and protected by a 5 ampere circuit breaker located in the dc circuit breaker panel in the overhead console.

9-171. Functional Test — Caution Light System.

NOTE

The following paragraphs cover functional tests of all caution light circuits. All circuit breakers shall be open before making tests. The master caution light should illuminate each time a caution panel segment illuminates and shall be reset each time in readiness for another fault indication.

a. Master Caution Panel.

(1) Close CAUTION LIGHTS AND GOV CONT circuit breakers. Check that MASTER CAUTION light illuminates and that each caution light segment operates as follows:

NOTE

*ENG FUEL PUMP caution light will be illuminated only when a Hydra-Electric Company, (Part No. 40210) or Cook Electric Co. (Part No. 575-1337) fuel pump pressure switch is installed on the engine.

NOTE

**Light will remain OFF when fuel tanks are full.

CAUTION LIGHT	ON/OFF CONDITION
ENGINE OIL PRESS	ON
LEFT FUEL BOOST	ON

CAUTION LIGHT	ON/OFF CONDITION
RIGHT FUEL BOOST	ON
* ENG FUEL PUMP	ON
** 20 MINUTE FUEL	ON
AUX FUEL LOW	OFF
XMSN OIL PRESS	ON
XMSN OIL HOT	OFF
HYD PRESSURE	ON
INST INVERTER	ON
DC GENERATOR	ON
EXTERNAL POWER	ON
FUEL FILTER	OFF
GOV EMER	OFF
CHIP DET	OFF
ENGINE CHIP DET	OFF

(2) Reset master caution light. Test the lights using the test switch on the panel. Push the dim switch to DIM and release. Check that caution lights do not dim.

(3) Rotate pilots instrument lights rheostat (R4) clockwise from OFF. Again actuate the dim switch and check that lights dim and hold.

(4) Rotate rheostat (R4) counterclockwise to OFF and check that lights return to bright.

b. Engine Oil Pressure Light.

(1) Connect a pressure gun to the engine oil pressure switch port and apply pressure. Check that ENGINE OIL PRESSURE indicator extinguishes with increasing pressure at 27 ± 1 psi.

(2) Relieve pressure on engine oil pressure switch. Check that ENGINE OIL PRESSURE indicator illuminates before 25 psi decreasing pressure. (Paragraph 8-60.)

(3) Disconnect pressure gun from port and reconnect pressure line.

c. Left and Right Fuel Boost Lights.

(1) Disconnect wire Q42A20 from terminal board (TB38) terminal No. 2 at left hand fuel cell and check that LEFT FUEL BOOST indicator extinguishes.

(2) Disconnect wire Q40A20 from terminal board (TB35) terminal No. 2 at right hand fuel cell and check that RIGHT FUEL BOOST indicator extinguishes.

(3) Reconnect wires to correct terminals.

d. Engine Fuel Pump Light.

(1) Disconnect both pressure ports at the fuel pressure switch on the engine. Determine the manufacturer and the manufacturer's part number of the fuel pressure switch, then accomplish steps (2) and (3) as applicable.

NOTE

Cook Electric (Part No. 575-584), Hydraulic Research (Part No. 96025) and Gorn Electric (Part No. GP2B-30001) pressure switches are differential types which are activated only when a pressure imbalance exists between the fuel pump elements. Equal pressures, whether low or high, have no effect on the caution indicator.

(2) To test Cook Electric Co., Part No. 575-684; Hydraulic Research and Mfg. Co., Part No. 96025; or Gorn Electric Co., Part No. GP2B-3000-1 proceed as follows:

(a) Apply pressure to a single port at a time and check that ENGINE FUEL PUMP indicator illuminates at 56.5 ± 3.5 psi increasing differential pressure at either port.

(b) Relieve any applied pressure and reconnect the pressure hoses to the switch.

NOTE

Cook Electric (Part No. 575-1337) and Hydra-Electric (Part No. 40210) pressure switches are not of differential type and are normally closed. The caution light remains illuminated until both pumps have reached operating pressure. Low pressure from either or both fuel pumps will deactivate the switch and cause the caution light to illuminate.

(3) To test Cook Electric Co. (Part No. 575-1337) or Hydra-Electric Co., (Part No. 40210), the ENGINE FUEL PUMP indicator shall be illuminated when both pressure ports are exposed to atmosphere pressure.

(a) Apply a steady pressure of 70 psi to the top pressure port of the switch and check that ENGINE FUEL PUMP indicator remains illuminated.

(b) Maintain a pressure of 70 psi at the top pressure port of the switch and apply an increasing pressure to the bottom pressure port. Check that ENGINE FUEL PUMP indicator extinguishes by the time that the pressure on the bottom port is 65 psi.

(c) Reduce pressure applied to the bottom port and check that ENGINE FUEL PUMP indicator illuminates at 56.5 ± 3.5 psi decreasing pressure.

(d) Apply a steady pressure of 70 psi to the bottom port of the switch and allow pressure applied to the top port to decrease to atmospheric pressure. Check that ENGINE FUEL PUMP indicator illuminates.

(e) Maintain pressure applied to the bottom port at 70 psi and increase pressure applied to top port of the switch. Check ENGINE FUEL PUMP indicator extinguishes by the time that the pressure applied to the top port is 65 psi.

(f) Reduce pressure applied to the top port. Check that ENGINE FUEL PUMP indicator illuminates at 56.5 ± 3.5 psi decreasing pressure. Relieve pressure applied to both ports and reconnect the pressure hoses to the switch.

e. text>Twenty Minute Fuel Light.

(1) With 20 MINUTE FUEL indicator illuminated (no fuel in tanks) disconnect wire E12A20 at terminal 1 of terminal board (TB38) under the left fuel cell and check that 20 MINUTE FUEL indicator extinguishes.

(2) When 20 MINUTE FUEL indicator is extinguished (fuel in tanks) connect wire E12A20 to ground and check that 20 MINUTE FUEL indicator illuminates.

(3) Reconnect wire E12A20 to terminal 1 of terminal board (TB38).

f. Auxiliary Fuel Low Light.

(1) Close the FUEL TRANSFER PUMP circuit breaker and test auxiliary fuel low light in accordance with following steps (2), (3), or (4), as applicable.

(2) Test internal auxiliary fuel tank provisions for auxiliary fuel low light indication as follows:

(a) Connect a jumper wire from pin E of the RH internal auxiliary fuel tank receptacle (J148) to ground. (Figure F-25.)

(b) Position right hand fuel transfer pump switch (S46) to ON and check that the AUX FUEL LOW indicator illuminates.

(c) Connect another jumper wire from pin A of receptacle (J148) to ground. Check that AUX FUEL LOW indicator extinguishes. Remove both jumper wires and position switch (S46) to OFF.

(d) Connect a jumper wire from pin E of the LH internal auxiliary fuel tank receptacle (J147) to ground. Position left hand fuel transfer pump switch (S45) to ON. Check that AUX FUEL LOW indicator illuminates.

(e) Connect another jumper wire from pin A of receptacle (J147) to ground. Check that AUX FUEL LOW indicator extinguishes. Remove both jumper wires and position switch (S45) to OFF.

(3) Test for auxiliary fuel low light indication with internal auxiliary fuel tank installed as follows:

(a) Position the right hand fuel pump transfer switch (S46) to ON. Check that AUX FUEL LOW indicator illuminates.

(b) Return switch (S46) to OFF and position left hand fuel transfer pump switch (S45) to ON. Check that AUX FUEL LOW indicator illuminates.

(4) Test external auxiliary fuel tank provisions for auxiliary fuel low light indication as follows:

(a) Connect a jumper wire between pins K and M of the right hand external fuel tank receptacle (J1024). Refer to Appendix F, figure F-33. Check that AUX FUEL LOW indicator illuminates.

(b) Remove jumper wire and place it between pins K and M of the left hand external fuel tank receptacle (J1017). Check that AUX FUEL LOW indicator illuminates.

g. Transmission Oil Pressure Light.

(1) Apply pressure at transmission oil pressure switch (S28) and check that XMSN OIL PRESS indicator extinguishes at 33 to 37 psi increasing pressure.

(2) Relieve pressure on transmission oil pressure switch and check that XMSN OIL PRESSURE indicator illuminates 28 to 32 psi decreasing pressure.

h. Transmission Oil Hot Light.

(1) Connect stud on top of transmission oil temp switch (S26), located on transmission, to ground and check that XMSN OIL HOT indicator illuminates.

(2) Remove ground from transmission oil temp switch and check that XMSN OIL HOT indicator extinguishes.

i. Hydraulic Pressure Lights.

(1) Apply external hydraulic pressure to hydraulic system and check that HYD PRESSURE indicator extinguishes at 800 ± 100 psi increasing pressure.

(2) Relieve pressure applied to hydraulic system and check that HYD PRESSURE indicator illuminates at 500 ± 100 psi decreasing pressure.

j. Instrument Inverter Light. The instrument inverter light is checked as a part of the inverter system. (Paragraph 9-95.)

k. DC Generator Light. The DC generator light is checked as a part of the main generator system. (Paragraph 9-58.)

l. External Power Light.

NOTE

Disconnect external power from the helicopter before performing external power light test.

(1) Turn battery switch ON. Open external power access door and check that EXTERNAL POWER indicator illuminates.

(2) Close external power access door and check that EXTERNAL POWER indicator extinguishes.

m. Fuel Filter Bypass Light.

(1) Disconnect plug (P156) from fuel filter bypass switch. Short pin A to pin B and check that FUEL FILTER indicator illuminates.

(2) Remove short between pins A and B of plug (P156) and check that FUEL FILTER indicator extinguishes. Reconnect plug (P156).

n. Transmission Oil Level Light.

(1) Close both BATTERY VM circuit breakers.

(2) Actuate push button switch (S4) on cabin bulkhead at station 123. Check operation of the indicator through the sight glass in the cabin bulkhead adjacent to the switch.

o. Governor Emergency Caution Light.

(1) Verify that GOV CONT circuit breaker is closed. Position governor switch on the engine control panel to AUTO. Check that GOV EMER indicator light is extinguished. Refer to Appendix F, figure F-26.

(2) Move governor switch to EMER position. Check that GOV EMER indicator is illuminated.

p. Transmission and Tail Rotor Gear Box Chip Detector Light.

(1) Check that CHIP DETECTOR light is extinguished with the CHIP DET selector switch in BOTH position.

(2) Short transmission magnetic chip detector output wire to ground. Position CHIP DET selector switch to each of its three positions and check that CHIP DETECTOR light illuminates with the switch in the BOTH and XMSN positions only. Remove short.

(3) Short tail rotor shaft chip detector (in 42° gearbox) output wire to ground. Position CHIP DET switch to each of its three positions and check that CHIP DETECTOR light illuminates with the switch in the BOTH and TAIL ROTOR position only. Remove short.

(4) Short tail rotor chip detector (in 90° gearbox) output wire to ground. Position CHIP DET selector switch to BOTH and TAIL ROTOR and check that CHIP DETECTOR light illuminates in both positions. Remove short.

q. Engine Chip Detector Light.

(1) Check that ENGINE CHIP DET light is extinguished.

(2) Short engine magnetic chip detector output wire to ground. Check that ENGINE CHIP DET light illuminates.

(3) Remove short and observe that ENGINE CHIP DET light extinguishes.

r. Fire Detection.

(1) Close FIRE DET circuit breaker.

(2) Depress fire detector test switch (S20) on the instrument panel. Check that fire detection control relay actuates and causes the FIRE WARNING light to illuminate.

9-172. Troubleshooting — Caution Light System. Refer to schematic diagram and trace malfunctioning circuit or loop, using standard electronic troubleshooting procedures and standard test equipment. Localize malfunctioning switch components, and repair or replace as required. Refer to Appendix F, figures F-20 and F-34.

9-173. MASTER CAUTION PANEL.

9-174. Description — Master Caution Panel. The master caution panel contains a number of internally lighted segments that illuminate when associated switches actuate to complete circuits, thus indicating malfunctions in respective systems. The panel is energized by the 28 Vdc essential bus and protected by the CAUTION LTS circuit breaker.

9-175. Cleaning — Master Caution Panel. Refer to paragraph 9-7 for cleaning procedure.

9-176. Inspection — Master Caution Panel. Refer to paragraph 9-22 for inspection procedure.

9-177. Troubleshooting — Master Caution Panel. Refer to schematic diagram (Appendix F, figure F-20) and trace malfunctioning circuit or loop, using standard electronic troubleshooting procedures and standard test equipment. Localize malfunctioning components, and repair or replace as required.

9-178. Removal — Master Caution Panel.

a. Loosen fasteners and lift caution panel from panel.

b. Disconnect electrical connector.

9-179. Repair or Replacement — Master Caution Panel.

a. Disassembly.

NOTE

> Disassemble panel in order indexed. Disassemble only to extent necessary to accomplish replacement of damaged parts, as determined by inspection or troubleshooting procedure.

(1) Turn three fasteners (1, figure 9-3) to remove cover (5) from assembly to obtain access to interior of unit.

(2) If malfunction has been traced to a component of one of the printed circuit board assemblies (7, 8, or 9) remove the circuit board involved by removing screws (6) and unplugging board from electrical connector (29, 30, or 31).

(3) Before disconnecting any electrical leads, tag wire leads to aid in replacement of wiring at reassembly.

b. Cleaning.

(1) Remove dust or dirt from exposed surfaces, using dry compressed air at a maximum pressure of 10 psig.

WARNING

> Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

(2) Remove corrosion, dirt or other foreign matter from parts with solvent (C-304), using a clean, lint-free cloth or a soft bristle brush.

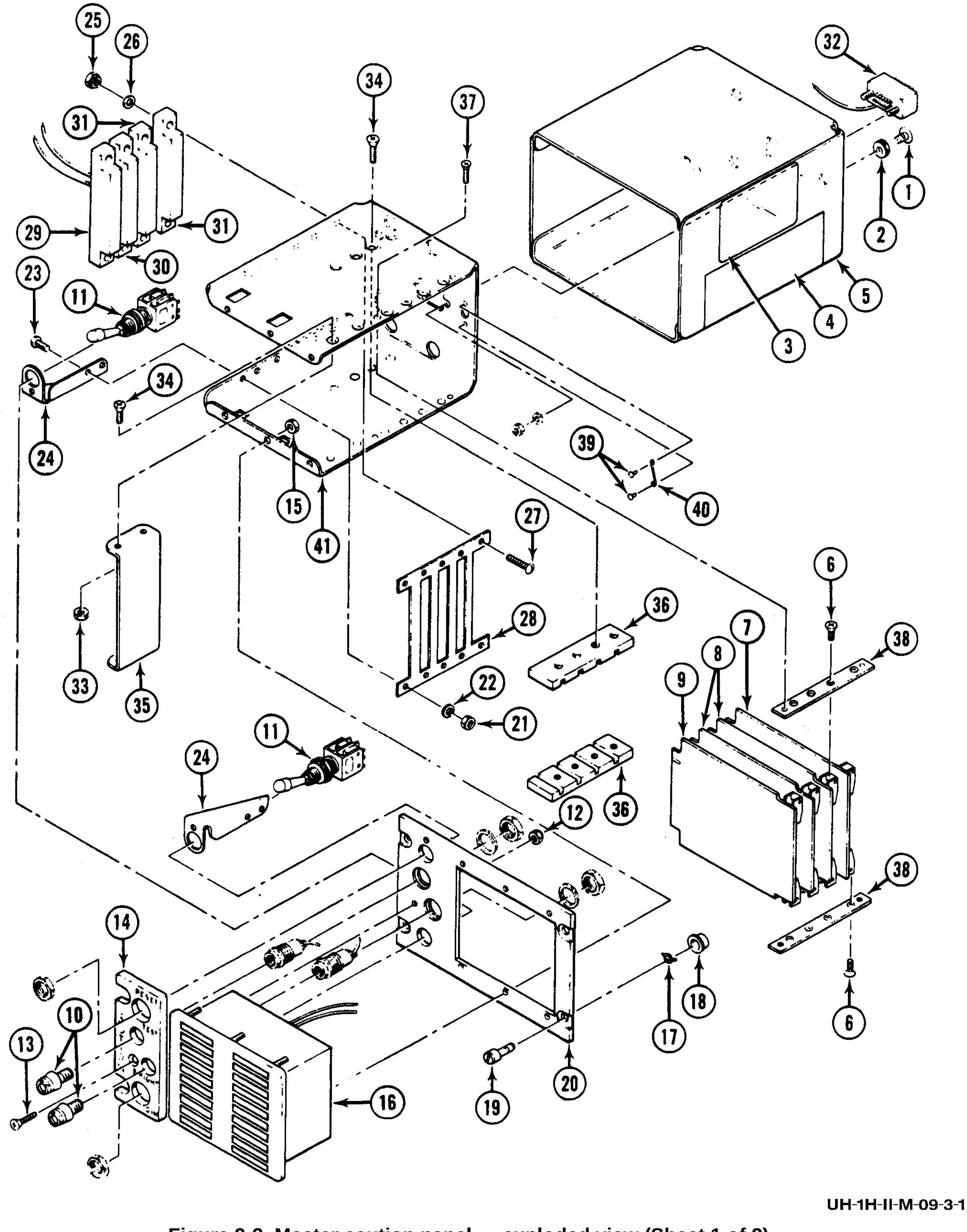


Figure 9-3. Master caution panel — exploded view (Sheet 1 of 2)

1. Fastener
2. Grommet
3. Plate, Identification
4. Plate, Schematic
5. Cover
6. Screw
7. Printed Circuit Board Assy
8. Printed Circuit Board Assy
9. Printed Circuit Board Assy
10. Light, Panel
11. Switch
12. Nut
13. Screw
14. Panel
15. Nut
16. Roto-Tellite
17. Spring
18. Cup
19. Fastener
20. Plate
21. Nut
22. Washer, Lock
23. Screw
24. Bracket
25. Nut
26. Washer, Lock
27. Screw
28. Stiffener
29. Connector, Electrical
30. Connector, Electrical
31. Connector, Electrical
32. Connector, Electrical
33. Nut
34. Screw
35. Stiffener
36. Rail
37. Screw
38. Rail
39. Rivet
40. Spring
41. Bracket
    Clamp, Cable
    Bus Bar, Light Ground

UH-1H-II-M-09-3-2

Figure 9-3. Master caution panel — exploded view (Sheet 2 of 2)

(3) Thoroughly dry all parts after cleaning with a clean, lint-free cloth or with compressed air at 10psig.

c. Inspection.

(1) Inspect all components for security of connections and bent or broken pins, contacts, and terminals.

(2) Inspect wiring and connections to all parts looking for loose connections, burned or broken wires and insulation, and proper grounding.

(3) Inspect resistors for evidence of loose or broken terminals and wire leads, burned or swollen bodies, or other visual signs of damage.

(4) Inspect coils for evidence of damage. If necessary, check continuity of coils with an ohmmeter.

(5) Inspect removed printed circuit boards for broken leads, shorts, or damaged components. Inspect relays, and diodes for broken glass envelopes.

d. Repair or Replacement.

(1) Repair of the master caution panel is limited to minor repairs, such as soldering loose connections and straightening bent connector pins. Damaged or malfunctioning electronic parts shall be replaced with no attempt at repair of such items.

NOTE

In each case, replace components in the exact location from which the replaced part was removed.

(2) Replace lamps in indicators of the rototellite assembly by rotating the indicator to reach the lamps in base of the unit. Lamps are held in place by spring clips.

e. Assembly.

(1) Reassemble master caution panel in reverse order of index numbers assigned in figure 9-3 noting the following.

(2) Refer to schematic plate (4, figure 9-3) when installing new electronic components or wiring.

(3) If new parts are installed, trim excess wire leads after soldering.

(4) Install all attaching hardware in same position and location from which removed.

f. Test Procedure. Inflight testing should be limited to periodically pushing the test/reset switch to TEST. This results in every indicator, including the master caution indicator, lighting either bright or dim, depending on the condition to which the system was last set by the BRIGHT/DIM switch.

9-180. Installation — Master Caution Panel.

a. Connect electrical connector.

b. Position panel in mount, being careful not to damage wiring.

c. Engage fasteners.

9-181. RPM LIMIT WARNING SYSTEM.

9-182. Description — RPM Limit Warning System.

The rpm limit warning system includes the RPM WARNING circuit breaker, located in the overhead console, rpm limit warning detector (DS1), rpm warning light (145), AUDIO RPM switch (S93), and related wiring and connectors. The rpm warning detector, operating on dc power, senses and interprets rotor and engine rpm through connection to tachometer circuits. If the rotor rpm exceeds normal limit, warning light will illuminate. When either rotor or engine rpm reaches low limit, an audio signal is produced in pilot and copilot headsets and the warning light is illuminated. For starting and ground operation, audio tone can be turned off by the AUDIO RPM switch.

NOTE

Before installation, the rpm warning system detector is adjusted. Readjustment may be required whenever a tachometer generator is replaced, due to tolerances on tachometer components. Replacement of an engine tachometer generator will not require a check of rotor high rpm setting.

9-183. Functional Test — RPM Limit Warning System.

NOTE

Test the rpm limit warning system with engine running after replacement of rpm limit warning detector, rotor tachometer generator, or engine tachometer generator.

a. Low Rpm Limit Test.

(1) Position the audio rpm switch (S93) on the pilots engine control panel to ON.

(2) Adjust for an engine speed of approximately 6300 rpm (corresponds to 310 rotor rpm) and check that the red rpm limit warning light on the instrument panel is off and that the audio warning signal is not audible in the pilot and copilot headsets.

(3) Decrease engine speed very slowly to the point where the rpm limit warning light illuminates and a swept-frequency audio warning signal (series of audio bursts) is audible in the pilot and copilot headsets. This point should be at an engine speed of 6200 100 rpm (corresponds to 305 5 rotor rpm).

(4) Position the audio rpm switch (S93) to OFF. The audio signal in the headsets should cease.

(5) Adjust for an engine speed below 6000 rpm (corresponds to 295 rotor rpm). The rpm limit warning light should be illuminated, but the audio warning signal should not be audible in the pilot and copilot headsets.

(6) Increase the engine speed and verify that the rpm limit warning light extinguishes within the limits of 6200 100 engine rpm (corresponds to 305 5 rotor rpm). The audio rpm switch should automatically return to ON position.

b. High Rotor Rpm Warning Test.

(1) Position the audio rpm switch (S93) to the ON position.

CAUTION

Do not exceed 15 psi torque pressure, (L-13) or 85% N1 (L-11).

NOTE

For this test/alignment only, a steady state rpm of up to 6900 output shaft speed is permissible and is not to be considered an engine overspeed as long as 15 psi torque meter pressure (L-13) or 85% N1 (L-11) is not exceeded. The collective pitch must be at the full down position at all times during this check.

(2) With the rotor in flat pitch and the GOV AUTO/EMER governor switch set to EMER, slowly increase throttle until the rpm warning light illuminates. The warning light should illuminate at a rotor speed of 334 ± 5 rpm (corresponds to 6800 ± 100 engine rpm)

and the audio warning signal should not be audible in the pilot and copilot headsets.

9-184. Alignment — RPM Warning System. If the rpm limit warning system does not meet the requirements of the high and low rpm warning test, align the system in accordance with the following paragraphs. Use table 9-8 to properly isolate each circuit for alignment in the different models. Test equipment and cables are shown in figures 9-4 and 9-5.)

WARNING

If alignment of RPM limit warning detector is necessary, the engine should be shut down.

CAUTION

Use caution in making adjustments. Excessive turning of screw or slotted adjustment can damage box.

NOTE

To increase the rpm at which the warning light will illuminate, turn slotted adjustments clockwise. One half turn of the potentiometer shaft will cause a change of 5 rotor rpm or 100 engine rpm. Do not adjust R4 and R5. These are bench check adjustments.

a. Alignment of RPM lower limit.

(1) Disengage the RPM WARNING system circuit breaker.

(2) Disconnect ship's harness from detector. Detach detector from helicopter. Install Extender cable or equivalent between detector and ship's harness. See figure 9-4 for cables to align rpm limit warning detector.

(3) Loosen screws and open cover of the detector.

(4) Engage the RPM WARNING system circuit breaker. Position low RPM Audio switch to the audio position. An audio warning should be present in both pilot and copilot headsets.

Table 9-8. Isolation of Circuits for Alignment

TO ALIGN	DISABLE	DO THIS
R3 ENGINE LOWER LIMIT	ROTOR CIRCUIT	ENGINE Switch — NORMAL
		ROTOR Switch — DISABLE
R1 ROTOR LOWER LIMIT	ENGINE CIRCUIT	ENGINE Switch — DISABLE
		ROTOR Switch — NORMAL

(5) Start the helicopter engine and increase engine speed to approximately 6300 rpm (corresponds to 310 rotor rpm). The audio signal in the headsets should cease.

(6) Set switch to connect jumper to align R3 ENGINE LOWER LIMIT in accordance with table 9-8.

(7) Decrease the engine speed to 6200 rpm (corresponds to 305 rotor rpm).

(8) If the warning light is illuminated, turn R3 slowly counterclockwise until the warning light just extinguishes and then very slowly clockwise until the light again illuminates. If the warning light is extinguished, turn R3 very slowly clockwise until the light just illuminates.

(9) Vary the engine speed slowly above and below 6200 rpm (corresponds to 305 rotor rpm) while observing the warning light. Verify that the warning occurs at an engine speed of 6200 100 rpm (corresponds to 305 5 rotor rpm), if not, repeat steps (7), (8), and (9).

(10) Reset switches or reconnect jumper to align R1 ROTOR LOWER LIMIT in accordance with table 9-8.

(11) Adjust for a rotor speed of 305 rpm (corresponds to 6200 engine rpm).

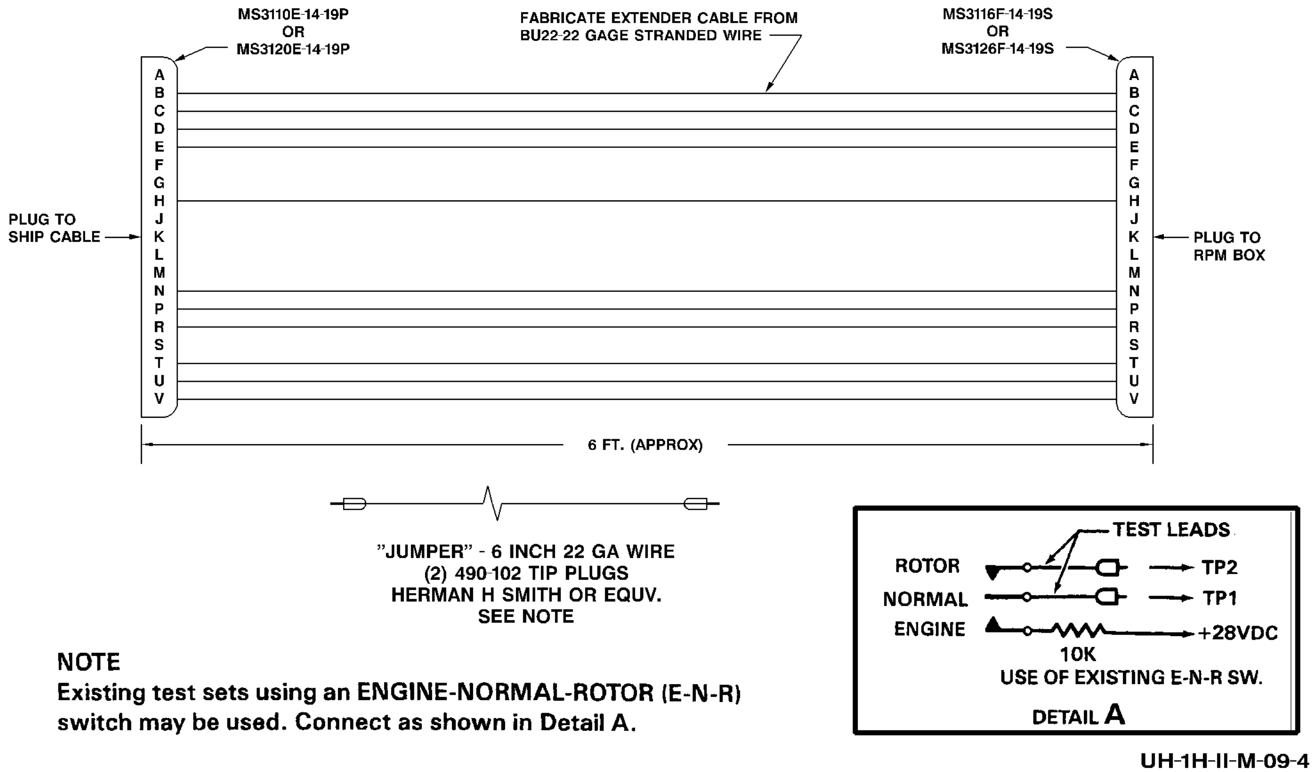


Figure 9-4. Cables for alignment of rpm limit warning detector

(12) If the warning light is illuminated, turn R1 slowly counterclockwise until the light just extinguishes, then very slowly clockwise until the light again illuminates. If the warning light is extinguished, turn R1 very slowly clockwise until the light just illuminates.

(13) Vary the rotor speed above and below 305 rpm (corresponds to 6200 engine rpm) while observing the warning light. Verify that warning occurs at 305 ± 5 rotor rpm (corresponds to 6200 ± 100 engine rpm). If not, repeat steps (11), (12), and (13).

NOTE

Extender cable will remain connected for alignment of RPM High Limit.

(14) Reset switches to NORMAL or remove jumper.

b. Alignment of RPM High Limit.

NOTE

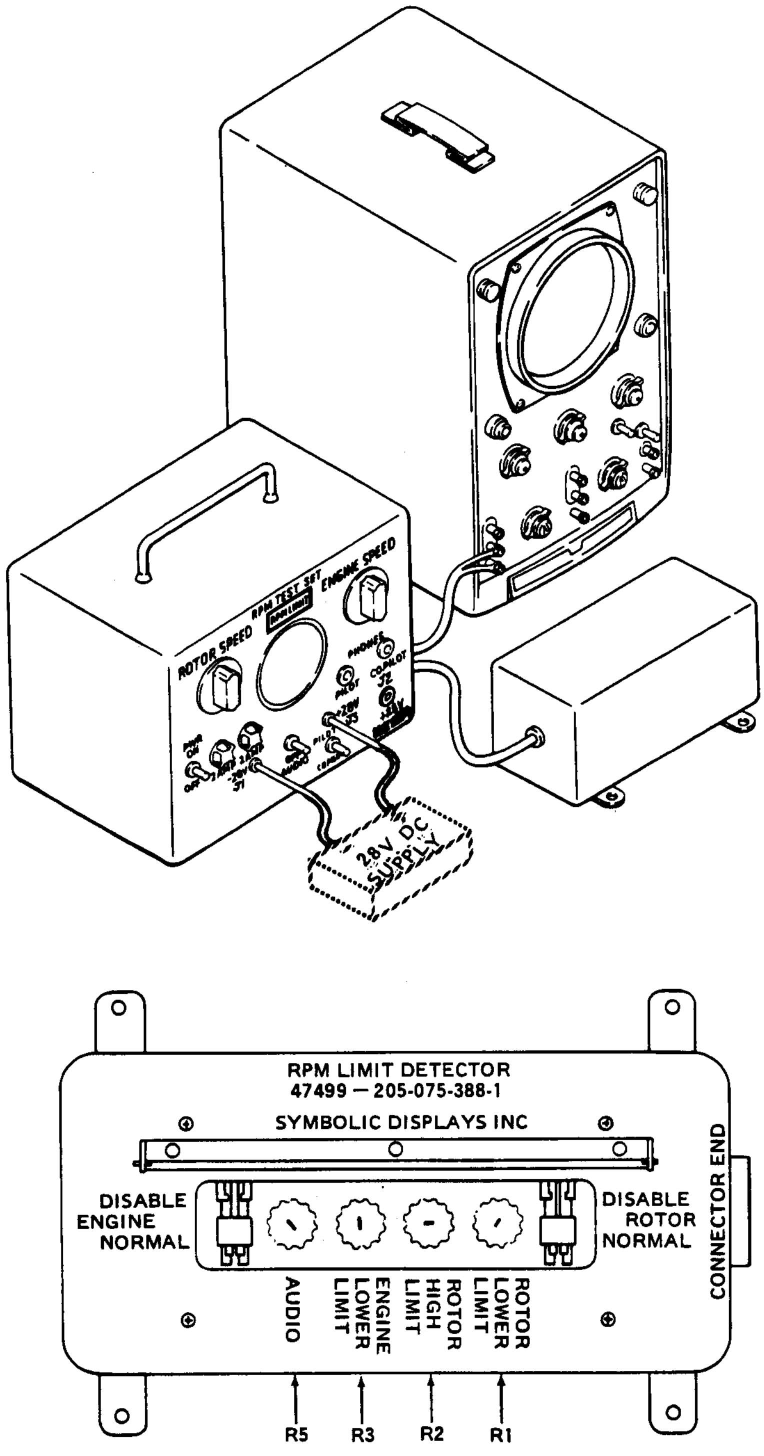
The high limit uses rotor RPM only. Disabling the engine circuit is not necessary to align R2 rotor high limit.

(1) With the rotor in flat pitch and the governor set to EMERGENCY, slowly increase throttle until the rotor speed is 334 ± 5 rpm (corresponds to 6800 ± 100 engine rpm).

NOTE

A rotor rpm of 329-334 (6700-6800 engine rpm) is preferable to increase the margin of overspeed warning.

(2) If the warning light is illuminated, turn R2 clockwise until the light just extinguishes, then very slowly counterclockwise until the light just illuminates. If the warning light is extinguished, turn R2 very slowly counterclockwise until the warning light just illuminates.



VIEW LOOKING DOWN ON TEST SWITCHES

UH-1H-II-M-09-5

Figure 9-5. Bench test setup for rpm limit warning detector

(3) Vary the engine speed to verify that the warning light illuminates and the audio warning does not occur at 334 ± 5 rotor rpm (corresponds to 6800 ± 100 engine rpm). If the warning light does not illuminate, repeat steps (2), (3), and (4).

(4) Disengage the RPM WARN SYSTEM circuit breakers.

(5) Reset switches to normal, remove any test leads, close detector cover and secure.

(6) After engine shutdown, remove extender cable and reinstall the rpm limit warning detector.

(7) Engage the RPM WARN SYSTEM circuit breaker.

9-185. Troubleshooting — RPM Limit Warning System. Use table 9-9 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out indicator lamps are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-21.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-9. Troubleshooting RPM Limit Warning System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. No audio tone is present in pilot or copilot headsets; engine not running and rpm warning light is illuminated.

STEP 1. Check for defective audio rpm switch (S93).

Replace switch if defective. (Paragraph 9-5.)

STEP 2. Check for defective rpm limit warning detector (DS1).

Replace rpm limit warning detector if defective. (Paragraph 9-186.)

2. Placing audio rpm switch (S93) to OFF does not eliminate audio tone in headsets.

STEP 1. Check for defective audio rpm switch (S93).

Replace switch if defective. (Paragraph 9-5.)

3. Rpm warning light (I45) does not illuminate when engine is not running. Audio tone present in headsets.

STEP 1. Check for defective rpm limit warning detector (DS1).

Replace rpm limit warning detector if defective. (Paragraph 9-186.)

Table 9-9. Troubleshooting RPM Limit Warning System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

4. Rpm warning light (I45) does not illuminate, no audio tone present in headsets when engine is not running.

STEP 1. Check for defective RPM WARNING circuit breaker.

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Check for defective rpm limit warning detector (DS1).

Replace rpm limit warning detector if defective. (Paragraph 9-186.)

9-186. RPM LIMIT WARNING DETECTOR.

9-187. Description — RPM Limit Warning Detector. The rpm limit warning detector (DS1), operating on dc power from the 28 Vdc essential bus, senses and interprets rotor and engine rpm through connection to tachometer circuits. If rotor exceeds normal limit, power is furnished through the detector to illuminate the rpm warning light (I45). When either rotor or engine rpm reaches low limit, the detector produces an audio signal in the pilot and copilot headsets and illuminates the rpm warning light.

9-188. Cleaning — RPM Limit Warning Detector.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connector with a bristle brush.

9-189. Inspection — RPM Limit Warning Detector.

a. Inspect detector for cracked or distorted case.

b. Check for bent or broken connector pins.

c. Check for proper operation.

9-190. Bench Test and Adjustment — RPM Limit Warning Detector.

NOTE

The rpm test set may be locally fabricated. Refer to Appendix F, figure F-35 for internal schematic of rpm limit warning test set.

NOTE

The pilot and copilot audio outputs are loaded within the test set so that an oscilloscope may be used to monitor audio signals. The scope input cable is connected to a scope input switch that allows selection of pilot or copilot audio output.

a. Use table 9-8 to isolate circuits in rpm detector.

b. Use equipment shown in figure 9-4 and F-35 and test each rpm limit warning detector as follows:

(1) Loosen detector cover strip screws and move cover strips to expose test points and adjustment potentiometers.

(2) Connect detector to the bench test equipment as shown in figure 9-5. Set initial control positions on the test set as follows:

CONTROL	POSITION
PWR ON/OFF	OFF
ENGINE SPEED	FULLY COUNTER-CLOCKWISE
ROTOR SPEED	FULLY COUNTER-CLOCKWISE
AUDIO ON/OFF	ON
SCOPE INPUT	PILOT

(3) Energize the test equipment and allow a sufficient warmup period.

(4) Apply 27.5 Vdc power to the dc power packs on the front of the test set. Observe that the warning light on the test set is illuminated and that a sweeping audio signal is displayed on the oscilloscope for both the PILOT and COPILOT positions of the scope input switch.

(5) Connect a headset to the COPILOT phone jack and determine that the audio signal is good quality. Disconnect headset.

(6) Repeat step (5) with headset plugged into the PILOT phone jack.

(7) Disable engine circuit to align R1 ROTOR LOWER LIMIT in accordance with table 9-8.

(8) Adjust test for simulated 305 rotor rpm and 6200 engine rpm. If the warning light is illuminated, adjust R1-ROTOR LOWER LIMIT counterclockwise until the light just extinguishes.

(9) Adjust R1-ROTOR LOWER LIMIT clockwise very slowly until the light just illuminates. With the light illuminated an audio signal must be displayed on the oscilloscope for both the PILOT and COPILOT positions of the scope input switch.

(10) Position audio ON/OFF switch to OFF. The sweeping audio signal must cease.

(11) Slowly increase simulated rotor speed through 305 rpm. Observe that the audio switch automatically returns to the ON position when the warning light extinguishes.

(12) Increase simulated rotor speed to 334 rpm. If the warning light is illuminated, adjust R2-ROTOR HIGH LIMIT clockwise until the light just extinguishes.

(13) Adjust R2-ROTOR HIGH LIMIT very slowly counterclockwise until the light just illuminates. Observe that an audio signal is not displayed on the oscilloscope for either PILOT OR COPILOT positions of the scope input switch.

(14) Adjust for simulated 315 rotor rpm. Observe that the warning light is extinguished and that audio signal is not displayed on the oscilloscope for either the PILOT or COPILOT positions of the scope input switch.

(15) Remove jumper or reposition switch used to disable engine circuits in step (7). Disable rotor circuit to align R3 ENGINE LOWER LIMIT in accordance with table 9-8.

(16) With the simulated rotor speed still at 315 rpm, adjust for simulated 6200 engine rpm. If the warning light is illuminated adjust R3-ENGINE LOWER LIMIT counterclockwise until the light just extinguishes.

(17) Adjust R3-ENGINE LOWER LIMIT clockwise until the light just illuminates. While the warning light is illuminated, observe that audio signal is displayed on the oscilloscope for both the PILOT or COPILOT positions of the scope input switch.

(18) Adjust for simulated 6400 engine rpm. Observe that the warning light is extinguished and that the audio signal is not displayed on the oscilloscope for either the PILOT or COPILOT positions of the scope input switch.

NOTE

The engine high limit potentiometer R4 is factory adjusted fully clockwise and is not to be adjusted.

(19) Repeat step (18) at simulated 7000 engine rpm.

(20) Remove jumper or reposition switch used to disable rotor circuit in step (15). Adjust rotor and engine speed controls on test set fully counterclockwise.

(21) Position scope input switch to PILOT and adjust R5-AUDIO for a waveform of 0.5 volt peak-to-peak. Position scope input switch to COPILOT and observe that the indicated waveform is not less than 0.25 volt peak-to-peak and not more than 0.75 volt peak-to-peak.

(22) Disconnect detector from test set and reassemble unit.

9-191. Removal — RPM Limit Warning Detector.

a. Remove attaching hardware and electrical connector.

b. Remove detector.

9-192. Repair or Replacement — RPM Limit Warning Detector.

a. Tighten or repair any loose or defective mounting hardware or electrical connector.

b. Replace detector if any other inspection requirements are not met.

9-193. Installation — RPM Limit Warning Detector.

a. Position detector into place and install mounting hardware.

b. Connect electrical connector.

9-194. EXTERIOR LIGHTS SYSTEM.

9-195. Description — Exterior Lights System. The exterior lights system includes the landing and searchlights, anticollision light, navigation lights, navigation lights flasher, and transmission oil level light.

9-196. LANDING AND SEARCHLIGHT SYSTEM.

9-197. Description — Landing and Searchlight System. One landing light and one searchlight are located on the underside of the cabin. Each has individual control and power circuits which are powered from the 28 Vdc essential bus and protected by circuit breakers. Control switches for both lights are located on the pilots collective stick. They consist of four switches, two that control power to the lamps, and two that control the positions of the lights.

9-198. Functional Test — Landing and Searchlight System.

a. Perform functional test of landing light as follows:

CAUTION

Do not operate landing light in areas of combustible material.

(1) Close LDG LT PWR and LDG & SEARCHLIGHT CONT circuit breakers. Position lamp control switch (S76) on the pilots collective stick to ON and check that landing light illuminates. Return switch (S76) to OFF.

(2) Position extend-retract switch (S25) to EXTEND (fwd position). Check that light extends and is stopped by the extend limit switch at approximately 120 degrees extension.

(3) Position switch (S25) to RETRACT (aft position). Check that light retracts and is stopped in the stowed position by the retract limit switch.

b. Perform functional test of searchlight as follows:

CAUTION

Do not operate searchlight in areas of combustible material.

(1) Close SEARCHLIGHT PWR and LDG & SEARCHLIGHT CONT circuit breakers. Position lamp control switch (S75) to ON and check that searchlight illuminates. Return switch to OFF.

(2) Position four-way switch (S12) to EXT (fwd position). Check that light extends and is stopped by extend limiter switch at approximately 120 degrees extension.

(3) Position switch (S12) to RETR (aft position). Check that light retracts.

(4) With light partially extended, position switch (S12) to "L" and check that light rotates to the left.

(5) Position switch (S12) to "R" and check that light rotates to the right.

(6) With light extended and rotated, position switch (S75) to S L STOW. Check that light retracts and is stopped by the retract limit switch and then rotates to its level stowed position and stops.

9-199. Troubleshooting — Landing and Searchlight System. Use table 9-10 and perform checks as necessary to isolate trouble. Tripped circuit breakers are omitted from indication of trouble since such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-22.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-10. Troubleshooting Landing and Searchlight System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Landing light (I16) inoperative.

STEP 1. Ensure that voltage is present on 28 Vdc bus. Check for defective LDG LT PWR and/or LDG & SEARCHLIGHT CONT circuit breakers.

Replace circuit breaker(s) if defective. (Paragraph 9-12.)

STEP 2. Check for defective landing light switch (S76).

Replace switch if defective. (Paragraph 9-5.)

2. Landing light dim, constant, or intermittent.

STEP 1. Place temporary jumper from bare metal on lamp to metal frame and then turn on. If lamp burns brightly constantly, check mounting of lamp for corrosion and/or paint.

Clean as necessary to provide a good electrical ground. (Paragraph 9-7.)

STEP 2. Check for loose power lead or corroded terminal.

Tighten or clean connection in power circuit. (Paragraphs 9-7, 9-10.)

STEP 3. Check for burned relay contacts.

Replace relay if defective. (Paragraph 9-5.)

3. Searchlight (I11) inoperative.

STEP 1. Ensure that voltage is present on 28 Vdc bus and check for defective SEARCHLIGHT PWR and/or LDG & SEARCHLIGHT CONT circuit breakers.

Table 9-10. Troubleshooting Landing and Searchlight System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Replace circuit breaker(s) if defective. (Paragraph 9-12.)

STEP 2. Check for defective searchlight switch (S75).

Replace switch if defective. (Paragraph 9-5.)

4. Searchlight dim, constantly or intermittently.

STEP 1. Place temporary jumper from bare metal on lamp to metal frame and then turn on. If lamp burns brightly constantly, check mounting of lamp for corrosion and/or paint.

Clean as necessary to provide a good electrical ground. (Paragraph 9-7.)

STEP 2. Check for loose power lead or corroded terminal.

Tighten or clean connection in power circuit. (Paragraphs 9-7 and 9-10.)

STEP 3. Check for burned relay contacts.

Replace relay if defective. (Paragraph 9-5.)

9-200. LANDING AND SEARCHLIGHTS.

9-201. Description — Landing and Searchlights.

The landing light is controllable with extend and retract motion. The searchlight is controllable with extend, retract, rotate left, and rotate right motion.

9-202. Cleaning — Landing and Searchlights.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

9-203. Inspection — Landing and Searchlights.

a. Check light for defective or broken sealed beam unit.

b. Check for loose connections, and damaged or defective component parts (terminal strips, limit switches, drive motors, relays, etc.).

9-204. Removal — Landing and Searchlights.

a. Ensure all electrical power is OFF.

b. Remove attaching screws from light assembly mounting plate; lower light and plate.

c. Remove light mounting screws.

d. Remove terminal cover, disconnect and protect wires.

e. Remove light assembly.

9-205. Repair or Replacement — Landing and Searchlights.

a. Accomplish replacement of sealed beam lamp as follows:

(1) Remove three screws from lamp retainer ring.

(2) Remove ring and gasket.

(3) Lift lamp and disconnect wiring.

NOTE

Observe position of lamp before removal and install new unit in same position using reverse order of removal procedure.

b. Replace complete unit if inspection items in paragraph 9-203, step b, are not met.

9-206. Installation — Landing and Searchlights.

a. Connect wires and install terminal cover and clamp.

b. Position light on mounting plate and secure with mounting screws.

c. Position plate and light assembly on fuselage and secure with mounting screws.

d. Check light for proper operation.

9-207. ANTICOLLISION LIGHT SYSTEM.

9-208. Description — Anticollision Light System. The anticollision light system consists of a circuit breaker, switch, and the anticollision light assembly. The anticollision light is installed on the tailpipe fairing. The circuit breaker and switch are on the overhead console.

9-209. Functional Test — Anticollision Light System.

a. Close ANTI-COLL LT circuit breaker.

b. Position ANTI-COLL LT switch (S59) to ON and check that lamp(s) illuminate and that the light rotates at approximately 45 rpm (90 flashes per minute).

9-210. Troubleshooting — Anticollision Light System. Use table 9-11 and perform checks as necessary to isolate trouble. Tripped circuit breakers are omitted from indication of trouble since such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-23.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-11. Troubleshooting Anticollision Light System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Anticollision light (I40) fails to operate with anticollision light switch (S59) in ON position.

STEP 1. Ensure that voltage is present on 28 Vdc bus and check for defective ANTI-COLL LT circuit breaker.

Replace circuit breaker(s) if defective. (Paragraph 9-12.)

STEP 2. Check for defective anticollision light switch (S59).

Replace switch if defective. (Paragraph 9-5.)

Table 9-11. Troubleshooting Anticollision Light System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

2. Anticollision light fails to rotate with anticollision light switch (S59) in ON position.

STEP 1. Check for proper operating voltage at pin B of connector (P111).

Replace anticollision light if defective. (Paragraph 9-211.)

9-211. ANTICOLLISION LIGHT.

9-212. Description — Anticollision Light. The anticollision light has two bulbs. The internal assembly is motor driven and rotates at approximately 45 rpm (90 flashes per minute).

9-213. Cleaning — Anticollision Light.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

9-214. Inspection — Anticollision Light.

a. Inspect light for broken cover, lens, or open lamp filament.

b. Inspect light for damaged case or broken connector pins.

c. Inspect motor for damage and proper operation.

9-215. Remove — Anticollision Light.

a. Ensure that all electrical power is OFF.

b. Remove mounting screws around base of light, lift light up, and disconnect electrical connector.

9-216. Repair or Replacement — Anticollision Light.

a. Loosen screw securing lens cover retaining ring and lift lens from light base. Install and secure lamp, lens, or cover in reverse order of removal procedure.

b. Replace complete unit if inspection requirements are not met.

c. Replace motor if defective.

9-217. Installation — Anticollision Light.

a. Connect electrical connector to light and secure with lockwire.

b. Place light in recess and install mounting screws.

c. Check light for proper operation.

9-218. NAVIGATION LIGHTS SYSTEM.

9-219. Description — Navigation Lights System. The navigation lights system consists of a circuit breaker, two selector switches, flasher, two red lights on the left side and two green lights on the right side (one each above and below the cabin door), three fuselage white lights (one above each cabin door and one on bottom right side of cabin), and two amber/clear lights in the tailboom. The white lights are protected by a separate circuit breaker.

9-220. Functional Test — Navigation Lights System.

a. Close FUS LIGHTS circuit breaker. Place navigation lights switch (S13) to STEADY. Position DIM/BRIGHT switch (S14) to BRT. Check that the two upper and one lower fuselage lights are on bright.

b. Position switch (S14) to DIM and check that the fuselage lights specified in step a. are on dim.

c. Close NAV LIGHTS circuit breaker. Check that the two red (left side) and the two green (right side) navigation lights and the tail light are illuminated and are on dim.

d. Position switch (S14) to BRT. Check that all lights specified in steps a. and c. are on bright.

e. Position switch (S13) to FLASH. Check that the two red and two green navigation lights and the tail light flash at a rate of approximately 85 15 cycles per minute.

9-221. Troubleshooting — Navigation Lights System. Use table 9-12 and perform checks as necessary to isolate trouble. Tripped circuit breakers are omitted from indication of trouble since such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-23.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-12. Troubleshooting Navigation Lights System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Fuselage lights (white) fail to burn bright with switch (S13) to STEADY and switch (S14) to BRT.

   STEP 1. Check for defective switch (S14).

   Replace switch if defective. (Paragraph 9-5.)

2. Fuselage lights (white) fail to dim with switch (S14) to DIM.

   STEP 1. Check for defective switch (S14).

   Replace switch if defective. (Paragraph 9-5.)

3. One fuselage or navigation light dim or intermittent.

   STEP 1. Check for poor electrical ground at light.

   Remove light and clean ground. (Paragraph 9-5.)

4. Navigation lights (red, green and amber/clear) fail to burn bright with switch (S13) to STEADY and switch (S14) to BRT.

   STEP 1. Check for defective switch (S14).

Table 9-12. Troubleshooting Navigation Lights System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Replace switch if defective. (Paragraph 9-5.)

5. Navigation lights (red, green, and amber/clear) fail to dim with switch (S14) to DIM.

STEP 1. Check for defective switch (S214).

Replace switch if defective.

STEP 2. Check for defective dimming resistor (R7).

Replace resistor if defective. (Paragraph 9-5.)

6. Navigation lights (red, green, and amber/clear) fail to flash when switch (S13) is placed to FLASH.

STEP 1. Check for defective switch (S13).

Replace switch if defective. (Paragraph 9-5.)

STEP 2. Check for defective flasher (Z3).

Replace flasher if defective. (Paragraph 9-229.)

9-222. NAVIGATION LIGHTS.

9-223. Description — Navigation Lights. The navigation lights consist of the upper and lower fuselage lights, upper and lower navigation lights, and right tail light (DS28) and left tail light (DS27).The fuselage light units have two bulbs which furnish dim or bright white light. The navigation lights installed on the right side of the helicopter furnish green light, the lights installed on the left side of the helicopter furnish red light, and the taillights installed on either side of the tailboom furnish amber or clear light.

9-224. Cleaning — Navigation Lights.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

9-225. Inspection — Navigation Lights. Inspect lights for corroded lamp socket terminals, shorted or broken wires, cracked lens, burned out lamp bulbs, or improper bonding of light case to airframe.

9-226. Removal — Navigation Lights.

a. Check that all electrical power is OFF.

b. Remove cover retaining screw. Remove screws attaching light assembly to bracket, pull assembly from helicopter, and disconnect electrical connector. Lift light assembly from helicopter.

9-227. Repair or Replacement — Navigation Lights. Replace faulty or damaged component parts (lens, lamp bulbs, etc.) If light case is damaged beyond repair, unit must be replaced.

9-228. Installation — Navigation Lights.

a. Connect electrical connector. Secure light to adapter bracket with screws. Install cover with screw.

b. Check operation of light.

9-229. NAVIGATION LIGHTS FLASHER.

9-230. Description — Navigation Lights Flasher. The navigation lights flasher is mounted in the aft electrical compartment. When selected, the flasher will cause upper and lower navigation lights and tail lights to flash.

9-231. Cleaning — Navigation Lights Flasher.

a. Remove moisture and loose dirt with a clean, soft cloth.

WARNING

Solvent is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove grease, fungus, and ground-in dirt with a clean, lint-free cloth dampened with solvent (C-304).

c. Remove dirt from electrical connectors with a bristle brush.

9-232. Inspection — Navigation Lights Flashers. Inspect flasher case for dents or damage that would impair normal operation of the unit. Check connector for broken or corroded pins and cracked inserts.

9-233. Removal — Navigation Lights Flasher.

a. Ensure all electrical power is OFF.

b. Disconnect electrical connector. Remove mounting hardware and lift from compartment.

9-234. Repair or Replacement — Navigation Lights Flasher. Replace item if inspection requirements are not met.

9-235. Installation — Navigation Lights Flasher.

a. Position flasher in compartment and install mounting hardware.

b. Connect electrical connector. Check for proper operation.

9-236. TRANSMISSION OIL LEVEL LIGHT.

9-237. Description — Transmission Oil Level Light. The transmission oil level light (I25) is located inside the transmission cowling on the right side of the helicopter. The light is used to illuminate the transmission sump area so that the transmission oil level sight gages will be visible when viewing through the transmission oil level sight glass. The light is powered from the battery system through the BAT VM circuit breaker. Pressing the XMSN OIL LEVEL LT switch (S4), located beside the sight glass, illuminates the light. Refer to paragraphs 9-5 through 9-11 for maintenance procedure.

9-238. Functional Test — Transmission Oil Level Light.

a. Close BAT VM circuit breaker.

b. Press pushbutton switch (S4). Check operation of the light through the sight glass in the right hand transmission cowling.

9-239. Troubleshooting — Transmission Oil Level Light.

Use table 9-13 and perform checks as necessary to isolate trouble. Tripped circuit breakers are omitted from indication of trouble since such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-14.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-13. Troubleshooting Transmission Oil Level Light

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Transmission oil level light (I25) fails to illuminate.

STEP 1. Check for defective transmission oil level light switch (S4).

Replace switch if defective. (Paragraph 9-5.)

STEP 2. Check for defective BAT VM circuit breaker.

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 3. Check for defective transmission oil level light assembly.

Replace lamp assembly if defective. (Paragraph 9-5.)

9-240. BAGGAGE COMPARTMENT LIGHTS SYSTEM.

9-241. Description. Baggage Compartment Lights System. The baggage compartment lights system consists of a two ampere BAG COMP LT circuit breaker (8CB22) on overhead circuit breaker panel, BAGGAGE DOOR OPEN light (8DS2), baggage compartment door switch (8S7) mounted in doorsill, and two baggage compartment lights (8DS19 and 8DS20). Part of the door switch serves to energize BAGGAGE DOOR OPEN light (8DS2) in case baggage compartment door is left open.

9-242. Cleaning — Baggage Compartment Lights System. Refer to paragraph 9-7 for cleaning procedure.

9-243. Inspection — Baggage Compartment Lights System. Refer to paragraph 9-8 for inspection procedure.

9-244. Functional Check — Baggage Compartment Lights System.

a. Close BAG COMPT LT circuit breaker.

b. Open baggage compartment door. Check that baggage compartment lights are illuminated. Check that BAGGAGE DOOR OPEN light is illuminated.

c. Manually depress plunger on baggage compartment door switch. Check that baggage compartment lights extinguish. Close baggage compartment door.

d. Open BAG COMPT LT circuit breaker and place BATTERY switch to OFF.

9-245. Troubleshooting — Baggage Compartment Lights System. Use table 9-14 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out bulbs are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-36.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-14. Troubleshooting Baggage Compartment Lights System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Switch fails to operate lights.

   STEP 1. Use a multimeter to determine if switch is defective.

   Replace switch if defective. (Paragraph 9-5.)

2. One light dim or intermittent.

   STEP 1. Check for proper circuit ground contact.

   Remove light and clean ground. (Paragraph 9-7.)

3. One light does not illuminate.

   STEP 1. Check for corroded lamp socket.

   Clean terminals or replace light. (Paragraph 9-5.)

9-246. Removal — Baggage Compartment Lights System. Refer to paragraph 9-9 for removal procedure.

9-247. Repair or Replacement — Baggage Compartment Lights System. Refer to paragraphs 9-10 and 9-24 for repair or replacement criteria.

9-248. Installation — Baggage Compartment Lights System. Refer to paragraph 9-11 for installation procedure.

SECTION VI — MISCELLANEOUS EQUIPMENT

9-249. MISCELLANEOUS EQUIPMENT.

9-250. Description — Miscellaneous Equipment. Miscellaneous equipment includes engine controls and accessories, flight control systems, bleed air heater, muff heater, heated blanket receptacles, utility outlets, windshield wipers, cargo hook, smoke detector system, transmission chip detector system, and engine oil filter warning light.

9-251. ENGINE CONTROLS AND ACCESSORIES.

9-252. Description — Engine Controls and Accessories. Engine controls and accessories include engine anti-icing, fuel valve, fuel boost pumps, governor control, and idle stop solenoid circuitry.

9-253. ENGINE ANTI-ICE CIRCUITRY.

9-254. Description — Engine Anti-ice Circuitry. The engine anti-ice system is comprised of an engine hot air anti-icing valve (L6) located on the engine, ANTI-ICE switch (S81) located on the engine control panel, and is protected by a 15 ampere ANTI-ICE ENG circuit breaker. Refer to T53-L-703 Maintenance Manual and paragraphs 9-5 through 9-18 for maintenance procedures.

9-255. Functional Test — Engine Anti-ice Circuitry.

a. Open all circuit breakers and return all switches to their normal positions.

b. Check that ANTI-ICE switch (S81) is in OFF position. Then close ANTI-ICE ENG circuit breaker. Check that solenoid valve (L6) has actuated.

c. Place ANTI-ICE switch (S81) in ON position. Check that solenoid valve (L6) is not energized.

d. Return ANTI-ICE switch (S81) to OFF position and check that solenoid valve has actuated again.

9-256. Troubleshooting — Engine Anti-ice Circuitry.

Use table 9-15 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-24.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-15. Troubleshooting Engine Anti-ice Circuitry

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Anti-icing solenoid valve (L6) fails to operate when ANTI-ICE switch (S81) is placed to OFF position.

STEP 1. Ensure that voltage is present on 28 Vdc essential bus and determine if ANTI-ICE ENG circuit breaker is defective.

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Check for loose connections or broken wiring.

Repair wiring and/or tighten connections.

STEP 3. Check for defective ANTI-ICE switch (S81).

Replace switch if defective. (Paragraph 9-5.)

STEP 4. Determine if anti-icing solenoid valve (L6) is defective.

Replace solenoid valve if defective. (T53-L-503 Maintenance Manual.)

9-257. FUEL BOOST AND FUEL VALVE CIRCUITRY.

9-258. Description — Fuel Boost and Fuel Valve Circuitry. The electrical portion of the fuel control system consists of fuel shutoff valve, fuel switch, left and right fuel cell boost pumps, left and right auxiliary fuel pumps, fuel control relay, RH fuel transfer pump switch, LH fuel transfer pump switch, fuel transfer relay, associated interconnecting wiring, terminal boards, and associated switches. The electrical power to the fuel boost and fuel valve system is supplied through and protected by the FUEL VALVE (5 ampere), FUEL TANK SUMP PUMP — RIGHT-HAND (7 ampere), FUEL TANK SUMP PUMP — LEFT-HAND (5 ampere) and FUEL TRANS PUMP (10 ampere) circuit breakers. The entire fuel boost and valve system serves to supply, regulate, and control fuel for operation of the helicopter. Refer to paragraphs 9-5 through 9-18 and Chapter 4 for maintenance procedures.

9-259. Functional Test — Fuel Boost and Fuel Valve Circuitry.

a. Fuel Valve.

(1) Close FUEL VALVE circuit breaker. Position fuel switch (S38) to ON and ensure that fuel valve is open. Repeat procedure with FUEL TANK SUMP PUMP — LEFT-HAND circuit breaker. Check that the fuel pump is running and open circuit breaker.

(2) Position switch (S38) to OFF and check that fuel valve closes.

b. Fuel Pumps.

(1) Close FUEL BOOST RIGHT circuit breaker. Position fuel switch (S38) to ON. Check that fuel pump is running and open circuit breaker. Refer to Appendix F, figure F-25.

(2) Close FUEL TRANSFER PUMP circuit breaker. Position the right fuel transfer switch (S46) to ON. Check that auxiliary fuel pump is running. When internal auxiliary tank is not installed, check that voltage is present at pin D on the tank receptacle (J148) and pin A of external fuel control panel plugs (P57). Refer to Appendix F, figure F-33.

(3) Connect a jumper wire between terminals 2 and 3 of terminal board (TB4) on the access door of the center aft fuel cell or ground terminal B1 of the fuel control relay (K10) in the electrical compartment. Check that voltage is present at pin D of receptacle (J148) and pin A of plug (P57).

(4) Connect another jumper wire between terminals 1 and 3 of terminal board (TB4) or ground terminal X1 of relay (K10). Ensure that pump shuts off and voltage is not present at pin D of receptacle (J148) and pin A of plug (P57).

(5) Remove jumper from terminals 1 and 3 terminal board (TB4) or remove ground from X1 of relay (K10). Check that relay (K10) remains energized and voltage is not present at pin D of receptacle (J148) and pin A of plug (P57).

(6) Remove jumper from terminals 2 and 3 of terminal board (TB4) or remove ground from B1 of relay (K10). Check that relay deenergizes and that voltage is present at pin D of receptacle (J148) and pin A of plug (P57). Return switch (S46) to OFF.

(7) Repeat steps (1) through (6) using left side fuel transfer switch (S45) and left side internal auxiliary fuel tank receptacle (J147).

9-260. Troubleshooting — Fuel Boost and Fuel Valve Circuitry.

Use system wiring diagram Appendix F, figure F-25 and standard troubleshooting techniques to isolate and correct trouble.

9-261. GOVERNOR CONTROL SYSTEM CIRCUITRY.

9-262. Description — Governor Control System Circuitry. The governor control system consists of an engine control solenoid valve and a motor driven rpm actuator located on engine. Power is supplied by the 28 Vdc essential bus and protected by a 5 ampere GOV CONT circuit breaker located in the overhead console. The governor control actuator is energized either by GOV-RPM switch (pilot) or by GOV-RPM switch (copilot). With the switch placed to increased position, the circuit to the actuator motor is completed allowing the motor to move the actuator arm in one direction. With the switch in DECR position polarity to the actuator motor is reversed, allowing the actuator arm to move in the opposite direction. The fuel control solenoid valve is energized by the governor AUTO EMER switch located on the engine control panel. Refer to paragraph 9-5 through 9-18 and Chapter 4 for maintenance procedures.

9-263. Functional Test — Governor Control System Circuitry.

a. Close GOV CONT circuit breaker. Position governor switch (S33) to AUTO. Check that fuel control solenoid valve L3 on the engine is energized in the normal or automatic position (voltage at pin C of P90 on valve).

b. Position switch (S33) to EMER and check that valve is energized in the bypass or emergency position (voltage at pin A of P90). Check that GOV EMER indicator on caution panel is illuminated.

c. Return switch (S33) to AUTO and check that GOV EMER indicator is extinguished.

d. Position governor rpm switch (S37) on pilot collective stick to INCR. Check that governor rpm actuator on the engine retracts.

e. Position switch (S37) to DECR and check that actuator extends.

f. Repeat steps d. and e. using switch (S51) on copilot collective stick.

9-264. Troubleshooting — Governor Control System Circuitry. Use table 9-16 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-26.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-16. Troubleshooting Governor Control System Circuitry

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Governor actuator (B12) fails to respond when either RPM switch (S37) or (S51) is placed to INCR or DECR position.

STEP 1. Check for faulty wiring or loose connections.

Repair wiring or tighten connections.

STEP 2. Check for defective switch.

Replace switch if defective. (Paragraph 9-5.)

STEP 3. Check for defective governor actuator.

Replace actuator if defective. (Chapter 4.)

2. Governor actuator (B12) operates in reverse.

STEP 1. Check for reversed wiring at switch (S37 or S51) and actuator (B12).

Reconnect wiring if reversed. (Figure F-26.)

3. Fuel control solenoid valve (L2) fails to operate when GOV SW (S33) is actuated.

STEP 1. Check for defective switch (S33).

Table 9-16. Troubleshooting Governor Control System Circuitry

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Replace switch if defective. (Paragraph 9-5.)

STEP 2. Check for faulty wiring or loose connections.

Repair wiring and tighten connections.

STEP 3. Check for defective fuel control solenoid valve (L2).

Replace valve if defective. (T53-L-703 Maintenance Manual.)

4. Solenoid valve operates in reverse.

STEP 1. Check for reversed wiring at switch (S33) or solenoid valve (L2).

Reconnect wiring if reversed. (Appendix F, figure F-33.)

9-265. IDLE STOP SYSTEM CIRCUITRY.

9-266. Description — Idle Stop System Circuitry. The idle stop system consists of an idle stop release solenoid, an idle stop release switch, located on pilot collective stick, and a 7 ampere IDLE STOP RELEASE circuit breaker which protects the system against overload. Refer to paragraphs 9-5 through 9-18 and 4-99 for maintenance procedures.

9-267. Functional Test — Idle Stop System Circuitry.

a. Close IDLE STOP REL circuit breaker.

b. Actuate the idle stop release switch (S50) on the pilot collective stick and check that solenoid retracts when power is applied.

9-268. Troubleshooting — Idle Stop System Circuitry. Refer to system wiring diagram (Figure F-26) and use standard troubleshooting procedures to isolate and correct malfunctions.

9-269. FLIGHT CONTROL SYSTEMS (ELECTRICAL).

9-270. Description. - Flight Control System (Electrical). The flight control systems include the force trim and hydraulic control systems.

9-271. FORCE TRIM SYSTEM CIRCUITRY.

9-272. Description — Force Trim System Circuitry. The force trim system consists of an anti-torque force trim magnetic brake, a fore and aft force trim magnetic brake, a lateral force trim magnetic brake, pilot and copilot force trim switches, and a master force trim switch located on the hydraulic control panel. The magnetic brakes are wired in parallel. The force trim switches are all series wired. The system is protected by a 5 ampere FORCE TRIM circuit breaker located in overhead console. The entire system serves to return pilots and copilots cyclic sticks to desired initial position when master force trim switch is set to on. Pilot and copilot force trim switches may be triggered to deenergize magnetic brakes and eliminate centering force. Refer to paragraphs 9-5 through 9-18, and 11-56 for maintenance procedures.

9-273. Functional Test — Force Trim System Circuitry.

a. Close FORCE TRIM circuit breaker. Position force trim switch (S68) to ON. Check the cyclic stick and pedals for centering force.

b. Depress force trim switch (S18) on the pilots cyclic stick. Check that the three magnetic brakes deenergize and that there is no centering force in the cyclic stick and pedals.

c. Repeat step b. using switch (S10) on the copilots cyclic stick.

9-274. Troubleshooting — Force Trim System Circuitry. Use table 9-17 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-27.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-17. Troubleshooting Force Trim System Circuitry

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. All magnetic brakes fail to energize with FORCE TRIM switch in ON position.

STEP 1. Check for faulty wiring or loose connections.

Repair wiring or tighten connections.

STEP 2. Check for defective FORCE TRIM switch.

Replace switch if defective. (Paragraph 9-5.)

2. Any magnetic brake fails to energize with FORCE TRIM switch in ON position.

STEP 1. Check for defective magnetic brake.

Replace magnetic brake if defective. (Paragraph 11-73.)

3. Magnetic brakes fail to deenergize when pilot or copilot FORCE TRIM switch is depressed.

STEP 1. Check for defective FORCE TRIM switch.

Replace switch if defective. (Paragraph 9-5.)

STEP 2. Check for shorted wiring.

Repair wiring.

9-275. HYDRAULIC CONTROL SYSTEM CIRCUITRY.

9-276. Description — Hydraulic Control System Circuitry. The hydraulic system consists of a hydraulic solenoid valve mounted on the left beam of the transmission. The valve is controlled by the HYD CONT switch on the hydraulic control panel and protected by a 5 ampere hydraulic control circuit breaker located on the overhead console. The valve is deenergized when the switch is in the ON position. This valve closes off hydraulic pump pressure to the flight control servos and allows unrestricted fluid flow to and from the servos when the control switch is in the closed (OFF) position. Manual operation of flight controls is then possible.

9-277. Functional Test — Hydraulic Control System Circuitry.

a. Close HYD CONT circuit breaker. With external hydraulic pressure applied, position hydraulic control switch (S7) to OFF. Close CAUTION LIGHTS circuit breaker and check that HYD PRESSURE caution light illuminates.

b. Operate the cyclic, collective, and directional controls with switch (S7) in the ON and OFF positions. Check that controls require more force to operate with switch (S7) in the OFF position than in the ON position.

9-278. Troubleshooting — Hydraulic Control System Circuitry. Use table 9-18 and perform checks as necessary to isolate trouble. Refer to Appendix F, figure F-27.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-18. Troubleshooting Hydraulic Control System Circuitry

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Hydraulic solenoid fails to actuate when hydraulic control switch is placed to OFF position.

STEP 1. Check for defective HYD CONT circuit breaker.

Replace circuit breaker if defective. (Paragraph 9-12.)

STEP 2. Check for faulty wiring or loose connections.

Repair wiring or tighten connections.

STEP 3. Check for defective hydraulic control switch (S7).

Replace switch if defective. (Paragraph 9-5.)

STEP 4. Check for defective hydraulic bypass solenoid valve (L4).

Replace solenoid valve if defective. (Chapter 7.)

9-279. BLEED AIR HEATING SYSTEM CIRCUITRY.

9-280. Description — Bleed Air Heating System Circuitry. The bleed air heating circuitry includes bleed air switch (S83), overheat switch (S73), bleed air valve (B34), overheat relay (K46), aft outlet valve (L15), door post outlet valve actuator (L14), aft outlet switch (S85), aft outlet limit switch (S87), and variable mixture solenoid valve (L21). The circuitry is protected by the CABIN HEATER CONT and CABIN HEATER OUTLET VALVE circuit breakers. Refer to paragraphs 9-5 through 9-18 and Chapter 13 for maintenance and troubleshooting procedures. Refer to Appendix F, figure F-28.

9-281. Functional Test — Bleed Air Heating System Circuitry.

a. Accomplish the following:

(1) Close CABIN HEATER AIR VALVE and CABIN HEATER OUTLET VALVE circuit breakers.

(2) Actuate bleed air switch (S83) to the ON position and then to OFF. Check that variable mixture solenoid valve (L21) makes an audible click when switch (S83) is switched to both ON and OFF positions.

(3) Actuate aft outlet switch (S85) from OFF to positions 1, 2, and 3. Check that the door post outlet valve opens to a maximum at position 3.

(4) With switch (S85) in position 3, move the aft outlet limit lever to the full ON position. Check that the door post outlet valve returns to its closed position.

(5) Move the aft outlet limit lever slightly toward the OFF position. Check that the door post outlet valve switch returns to position 3.

(6) Position bleed air switch (S83) on ON. Obtain access to relay (K46) behind heater panel in overhead console. Find wire H110A20 attached to a terminal of relay (K46). Temporarily jump this relay terminal to ground to simulate an overheat condition. Check that the variable mixture solenoid (L21) makes an audible click signifying the off or closed position.

(7) Remove the temporary jumper. Check that the variable mixture solenoid valve makes an audible click signifying its return to the on or open position.

9-282. MUFF HEATER SYSTEM CIRCUITRY.

9-283. Description — Muff Heater System Circuitry. The muff heater circuitry utilizes same components as bleed air heater circuitry. Refer to paragraph9-280 for description. Refer to paragraphs 9-5 through 9-18 and Chapter 13 for maintenance and troubleshooting procedures. Refer to Appendix F, figure F-28.

9-284. Functional Test — Muff Heater System Circuitry.

a. Accomplish the following:

(1) Check that wire H86A20 is connected to terminal 16 (position 3) instead of terminal 13 of switch (S85). Close CABIN HEATER OUTLET VALVE circuit breaker.

(2) Move switch (S85) to OFF and then in turn to positions 1, 2, and 3. Check that the door post outlet valve and the aft outlet are closed when switch (S85) is in the OFF position and full-on when switch (S85) is in position 3.

(3) With switch (S85) in position 1 of 2, move the aft outlet lever to the full-on position. This actuates switch (S87). Check that the door post outlet valve and the aft outlet valve are closed when switch (S85) is in the OFF position.

(4) Move aft outlet limit lever slightly toward the OFF position so that the door post outlet valve and the aft outlet valve return to their present positions.

(5) Position switch (S83) on ON. Obtain access to relay (K46) behind heater panel in overhead console. Find wire H110A20 attached to a terminal of relay (K46). Temporarily jump this relay terminal to ground to simulate an overheat condition. Check that the variable mixture solenoid valve (L21) makes an audible click signifying the off or closed position. Check that the bleed air valve motor (B34) is functioning.

(6) Remove the temporary jumper. Check that variable mixture solenoid valve (L21) makes an audible click signifying its return to the on or open position.

(7) Position switch (S83) to ON and then OFF, while listening to determine that the bleed air valve motor and the solenoid valve (L21) is functioning.

9-285. HEATED BLANKET RECEPTACLES.

9-286. Description — Heated Blanket Receptacles. Heated blanket receptacles are provided in the cabin interior, right and left side cabin roof. These utility receptacles are supplied by the 28 Vdc nonessential bus and protected by 35 ampere HEATED BLANKETS R/H and HEATED BLANKETS L/H circuit breakers. Refer to paragraphs 9-5 through 9-18 for maintenance procedures.

9-287. Functional Test — Heated Blanket Receptacles.

a. Close both HEATED BLANKET circuit breakers.

b. Check for 28 Vdc at each of two receptacles mounted in the cabin roof.

9-288. Troubleshooting — Heated Blanket Receptacles. Refer to system wiring diagram (Appendix F, figure F-29) and use standard troubleshooting procedures to isolate and correct malfunction.

9-289. WINDSHIELD WIPER SYSTEM CIRCUITRY.

9-290. Description — Windshield Wiper System Circuitry. The windshield wiper system includes windshield wiper switch (S23), selector switch (S124), right and left resistor panels (A-13), pilots windshield wiper motor (B7), and copilots windshield wiper motor (B8). Power for the system is furnished by the28 Vdc essential bus and protected by 10 ampere WINDSHIELD WIPER PILOT and WINDSHIELD WIPER COPILOT circuit breakers. Refer to paragraphs 9-5 through 9-18 and Chapter 12 for maintenance and troubleshooting procedures. Refer to Appendix F, figure F-30.

9-291. Functional Test — Windshield Wiper System Circuitry.

a. Protect windshield against scratching by wiper blades.

b. Close WINDSHIELD WIPER PILOT and WINDSHIELD WIPER COPILOT circuit breakers. Position wiper selector switch (S124) to BOTH. Position windshield wiper switch (S23) to LOW. Check that pilots and copilots wipers operate at low speed.

c. Position switch (S23) to MED position. Check that both wipers operate at medium speed.

d. Position switch (S23) to HIGH. Check that both wipers operate at high speed.

e. Position switch (S23) to PARK. Check that both wipers move at high speed to their park positions and stop.

f. Open WINDSHIELD WIPER COPILOT circuit breaker. Position selector switch (S124) to PILOT. Check that pilots wiper operates with wiper switch (S23) in the LOW, MED, HIGH, and PARK positions.

g. Open WINDSHIELD WIPER PILOT circuit breaker. Close WINDSHIELD WIPER COPILOT circuit breaker. Position selector switch (S124) to COPILOT. Check that copilots wiper operates with wiper switch (S23) in the LOW, MED, HIGH, and PARK positions. Position wiper switch (S23) to OFF and open the WINDSHIELD WIPER COPILOT circuit breaker.

9-292. CARGO HOOK SYSTEM CIRCUITRY.

9-293. Description -9 Cargo Hook System Circuitry. The cargo hook system circuitry includes cargo release switch (S36), cargo release armed light (I44), copilots cyclic stick release switch (S78), pilots cyclic stick release switch (S32), and cargo hook release relay (K24). Power for the system is supplied by the28 Vdc essential bus and protected by the 10 ampere CARGO HOOK REL circuit breaker. Refer to paragraphs 9-5 through 9-18 and Chapter 14 for maintenance and troubleshooting procedures. Refer to Appendix F, figure F-31.

9-294. Functional Test — Cargo Hook System Circuitry.

a. Close CARGO HOOK REL circuit breaker. Close and latch the hook. Position the cargo release switch to ARM. Check that cargo release armed light on the instrument panel is illuminated.

b. Depress cargo release switch (S32) on the pilots cyclic stick. Check that solenoid in the hook actuates and causes the hook to fall open.

c. Repeat step b. for switch (S78) on the copilots cyclic stick.

9-295. RESCUE HOIST SYSTEM CIRCUITRY (PROVISIONS).

9-296. Description — Rescue Hoist System Circuitry. The rescue hoist system circuitry includes HOIST PWR, HOIST CONT, and HOIST CUT circuit breakers, hoist switch (S112), cable cutter switch (S96), hoist power relay (K32), and overload sense control (S101). Refer to paragraphs 9-5 through 9-18 and Chapter 14 for maintenance and troubleshooting procedures. Refer to Appendix F, Figure F-32.

9-297. Functional Test — Rescue Hoist System Circuitry.

a. Check that wire M20A20 is connected to HOIST PWR circuit breaker (1 ampere).

b. Check that wires M21A20 and M22A20 are connected to HOIST CONT circuit breaker (10 ampere).

c. Check that wire M25A20 is connected to HOIST CABLE CUT circuit breaker (5 ampere).

NOTE

The following checks are made between the designated pin of connector (J119) and ground (pin X of J119).

d. Close HOIST CONT circuit breaker and measure for 28 Vdc on pin G of connector (J119).

e. Open HOIST CONT circuit breaker and measure for zero Vdc on pin G of connector (J119).

f. Close HOIST CONT circuit breaker. Position HOIST switch (S112) (located on pilots cyclic stick) to DN. Measure for 28 Vdc on pin C of connector (J119).

g. Release HOIST switch (S112) and measure for zero Vdc on pin C of connector (J119).

h. Position HOIST switch (S112) to RH/OUT, and measure for 28 Vdc on pin D of connector (J119).

i. Release HOIST switch (S112) and measure for zero Vdc on pin D of connector (J119).

j. Position HOIST switch (S112) to UP, and measure for 28 Vdc on pin E of connector (J119).

k. Release HOIST switch (S112) and measure for zero Vdc on pin E of connector (J119).

l. Position HOIST switch (S112) to LH/IN and measure for 28 Vdc on pin F of connector (J119).

m. Release HOIST switch (S112) and measure for zero Vdc on pin F of connector (J119).

n. Close HOIST CUT circuit breaker. Close CABLE CUT switch (S96) (located on pedestal). Measure for 28 Vdc on pin H of connector (J119).

o. Open CABLE CUT switch (S96) and measure for zero Vdc on pin H of connector (J119).

p. Close NON-ESS BUS switch (S62). Close HOIST PWR circuit breaker and measure for 28 Vdc on pin W of connector (J119).

q. Open HOIST PWR circuit breaker and measure for zero Vdc on pin W of connector (J119).

r. Position all circuit breakers and switches to OFF.

s. Position crew HOT MIC switch (S66) to OFF and measure resistance between Pins J and K of (J119). The resistance should be 500 ohms or greater if ICS units are installed or infinite if ICS units are not installed.

t. Position crew HOT MIC switch (S66) to ON and measure resistance between pins J and K of connector (J119). The resistance should be zero ohms.

u. Hold crew HOT MIC switch in MOM position and measure resistance between pins J and K of connector (J119). The resistance should be zero ohms.

v. Position crew HOT MIC switch (S66) to OFF. Disconnect ohmmeter.

9-298. ROTOR BRAKE SYSTEM CIRCUITRY.

9-299. Description — Rotor Brake System Circuitry. The rotor brake system circuitry includes warning lights (DS4) actuator-operated micro switches (S179 and S180) and a light test switch (S200). Power for the system is supplied by the 24 Vdc essential bus and is protected by a 5 ampere ROTOR BRAKE circuit breaker. Refer to paragraphs 9-5 through 9-18 and Service Instruction No. 205-9 for maintenance and troubleshooting procedures.

9-300. Functional Test — Rotor Brake System Circuitry.

a. Close ROTOR BRAKE circuit breaker. Pull down on actuator handle, moving handle toward vertical position (do not pass center). Check that rotor Brake Indicator on instrument panel illuminates.

b. Return handle to OFF (horizontal position). Check that rotor Brake Indicator light extinguishes.

c. Pull handle down and aft to full limit of travel (parking position). Check that rotor Brake Indicator illuminates.

d. Return handle to OFF (horizontal position). Check that Brake Indicator light extinguishes.

e. Depress ROTOR BRAKE LIGHT TEST SWITCH (S200). Check that warning lights illuminate when switch is depressed and extinguish when switch is released.

9-301. SMOKE DETECTOR SYSTEM.

9-302. Description — Smoke Detector System. The smoke detector system consists of BAGGAGE FIRE warning light (8DS1) and BAGGAGE FIRE/DOOR TEST switch (8S1) located on the instrument panel, 5 ampere SMOKE DET circuit breaker (8CB21) located on the overhead circuit breaker panel, smoke detector amplifier (8Z4), and smoke detector. The smoke detector is a closed assembly, solid-state, electronic component and a light sensitive detector. The smoke detector, located in forward end of baggage compartment roof, is protected from baggage damage by a protective guard. When smoke reduces light transmission in baggage compartment 30 to 35 percent below that of clear air, the smoke detector will send a signal to fire detector control amplifier. This will cause BAGGAGE FIRE warning light on instrument panel to illuminate.

9-303. Cleaning — Smoke Detector System. Refer to paragraph 9-7 for cleaning procedure.

9-304. Inspection — Smoke Detector System. Refer to paragraph 9-8 for inspection procedure.

9-305. Functional Check — Smoke Detector System.

a. Apply electrical power to helicopter electrical system.

b. Depress BAGGAGE FIRE/DOOR TEST switch. Check that BAGGAGE FIRE warning light is illuminated. Check that BAGGAGE DOOR OPEN and ENG OIL FILTER lights are illuminated.

c. Release test switch. Check that BAGGAGE FIRE warning light is extinguished.

d. Introduce smoke into baggage compartment near the smoke detector. Check that BAGGAGE FIRE warning light illuminates.

e. Remove smoke or allow it to dissipate into the surrounding air. Check that BAGGAGE FIRE warning light extinguishes.

f. Turn electrical power off.

9-306. Troubleshooting — Smoke Detector System. The following is a list of indications of trouble probable causes and corrective action. (Table 9-19and Appendix F, figure F-36.)

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-19. Troubleshooting Smoke Detector System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Indicator light inoperative.

STEP 1. Check for burned out bulb.

Replace bulb. (Paragraph 9-5.)

STEP 2. Check for defective test switch.

Replace switch if defective. (Paragraph 9-5.)

STEP 3. Check for loose electrical connections.

Repair faulty connections. (Paragraph 9-10.)

STEP 4. Check for broken or disconnected detector wire.

Replace or connect detector wire. (Paragraph 9-10.)

2. Indicator light stays on.

STEP 1. Check for defective switch.

Replace switch if defective. (Paragraph 9-5.)

9-307. Removal — Smoke Detector System. Refer to paragraph 9-9 for removal procedure.

9-308. Repair or Replacement — Smoke Detector System. Refer to paragraph 9-10 for repair or replacement criteria.

9-309. Installation — Smoke Detector System. Refer to paragraph 9-11 for installation procedure.

9-310. TRANSMISSION CHIP DETECTOR SYSTEM.

9-311. Description — Transmission Chip Detector System. The transmission chip detector system consists of: UPPER MAST chip detector (E17) and indicator (DS52), PLNTY (planetary) chip detector (E16) and indicator (DS51), SUMP/OIL MONITOR chip detector (E1), debris monitor, and indicator (DS50). The chip detectors and the debris monitor are located on the transmission. All indicators are located on the pedestal at the pilots feet. The system is powered by the 28 Vdc bus and protected by 5 ampere XMSN CHIP DET circuit breakers (8CB26).

9-312. Cleaning — Transmission Chip Detector System. Refer to paragraph 9-7 for cleaning procedures.

9-313. Inspection — Transmission Chip Detector System. Inspect light for corroded lamp socket terminals, shorted or broken wires, cracked lens, burned out lamp bulb, and improper bonding to ground.

9-314. Functional Test — Transmission Chip Detector System. Refer to Appendix F, Figure F-20.

a. Ensure XMSN CHIP DET circuit breaker is pushed in.

b. Apply power to helicopter electrical system.

c. Connect a temporary short between terminal on E1 sump chip detector and male probe.

d. Position CHIP DET switch to XMSN.

e. Verify CHIP DET caution light on MASTER CAUTION PANEL illuminates and DS50 SUMP indicator shows three white sections.

f. Repeat procedure on E16 planetary chip detector and E17 upper mast detectors showing the three white sections on DS51 planetary and DS52 upper mast indicators are operating. If CHIP DET caution light does not illuminate, or the indicators fail toshow three white sections, inspect applicable wiring circuit and chip detector male probe for grounding on chip detector female housing. Make continuity and voltage checks as necessary to isolate wiring and/or component problems.

g. Remove temporary short(s).

h. Turn off and remove electrical power.

9-315. Removal — Transmission Chip Detector System. Refer to paragraph 9-9 for removal procedure.

9-316. Repair or Replacement — Transmission Chip Detector System. Refer to paragraphs 9-10 and 9-24 for repair or replacement criteria.

9-317. Installation — Transmission Chip Detector System. Refer to paragraphs 9-11 and 9-25 for installation procedure.

9-318. ENGINE OIL FILTER WARNING LIGHT CIRCUITRY.

9-319. Description — Engine Oil Filter Warning Light Circuitry. The engine oil filter warning light circuitry includes the ENG OIL FILTER indicator (8DS3) and the engine oil filter. Two ampere BAG COMP LT circuit breaker (8CB22) protects the system powered by the 28 Vdc bus. BAGGAGE FIRE/DOOR TEST switch (8S1) allows testing of the circuitry. Both the switch and indicator are located on the instrument panel. Refer to paragraphs 9-7 through 9-18 for cleaning inspection, removal, repair or replacement, and installation procedures.

9-320. Functional Test — Engine Oil Filter Warning Light Circuitry.

a. Close BAG COMPT LT circuit breaker.

b. Press BAGGAGE FIRE/DOOR TEST switch (8S1) and check that ENGINE OIL FILTER indicator illuminates.

9-321. Troubleshooting — Engine Oil Filter Warning Light Circuitry. Use table 9-20 and perform checks as necessary to isolate trouble. In the following table, tripped circuit breakers and burned-out bulbs are omitted from indications of trouble. Such trouble is usually easily detected and corrected. Broken wiring is always a probable cause of circuit malfunction or failure and has not been included. Refer to Appendix F, figure F-36.

NOTE

Before you use this table, be sure you have performed all normal operational checks.

Table 9-20. Troubleshooting Engine Oil Filter Warning Light Circuitry

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Switch fails to operate light.

STEP 1. Use a multimeter to determine if switch is defective.

Replace switch if defective. (Paragraph 9-5.)

2. Light dim or intermittent.

STEP 1. Check for proper circuit ground contact.

Remove light and clean ground. (Paragraph 9-7.)

3. Light does not illuminate.

STEP 1. Check for corroded lamp socket.

Clean terminals or replace light. (Paragraph 9-5.)

9-322. Removal — Engine Oil Filter Warning Light Circuitry. Refer to paragraph 9-9 for removal procedures.

9-323. Repair or Replacement — Engine Oil Filter Warning Light Circuitry. Refer to paragraph 9-10 for repair or replacement criteria.

9-324. Installation — Engine Oil Filter Warning Light Circuitry. Refer to paragraph 9-11 for installation procedure.

CHAPTER 10

FUEL SYSTEM

SECTION I — FUEL CELLS

10-1. FUEL CELLS — CRASHWORTHY.

10-2. Description — Fuel Cell. The fuel supply system is contained in five fuel cell assemblies, which are interconnected to act as a single tank. Two forward cells are located under cabin floor and are gravity fed from aft cells. The three aft fuel cells are located in series across the fuselage below engine deck. The crashworthy cells are self-sealing and are fitted with self-sealing breakaway valves at fuel and ventline locations.

10-3. Removal Fuel Cell.

a. *Forward Fuel Cell.*

NOTE

Removal procedures given are for the left side cell. Procedures for the right side cell are identical unless noted.

(1) Defuel system.

(2) Remove access panel over fuel cell.

(3) Remove sump assembly. (Paragraph 10-120.)

(4) Remove two bolts (17, figure 10-1) and washers from fuel cell fitting (13).

(5) From inboard side of bulkhead, remove nut (12) and washer (11) from vent valve (8).

(6) From inboard side of bulkhead, remove bolt (1) and washer (2). For right side cell remove bolt (80) and washer (81).

(7) Remove screws (3) and remove access cover (4) and packing (5) from fuel cell.

(8) From inside fuel cell remove bolt securing hose clamp to bulkhead. (Left side cell only).

(9) For right side cell, remove two bolts (75), washers (76) and spacers (79). Remove aft fuel quantity transmitter (77).

(10) For right side cell, remove bolts (85), washers (84) and spacers (82). Remove forward fuel quantity transmitter (86).

(11) Working through access port, remove two bolts (18), washers (19) and nuts (32), attaching ejector pump (20) to support (23). Allow ejector pump and attached hoses to lay in fuel cell.

(12) Remove two bolts (21) and washers (22) securing support (23) to fuel cell, remove support.

(13) Remove nut (31) from hose assembly (24).

(14) From forward end (outside cell) remove clamp (26), washer (27) and seal (28). Remove packing (25) from hose assembly (24).

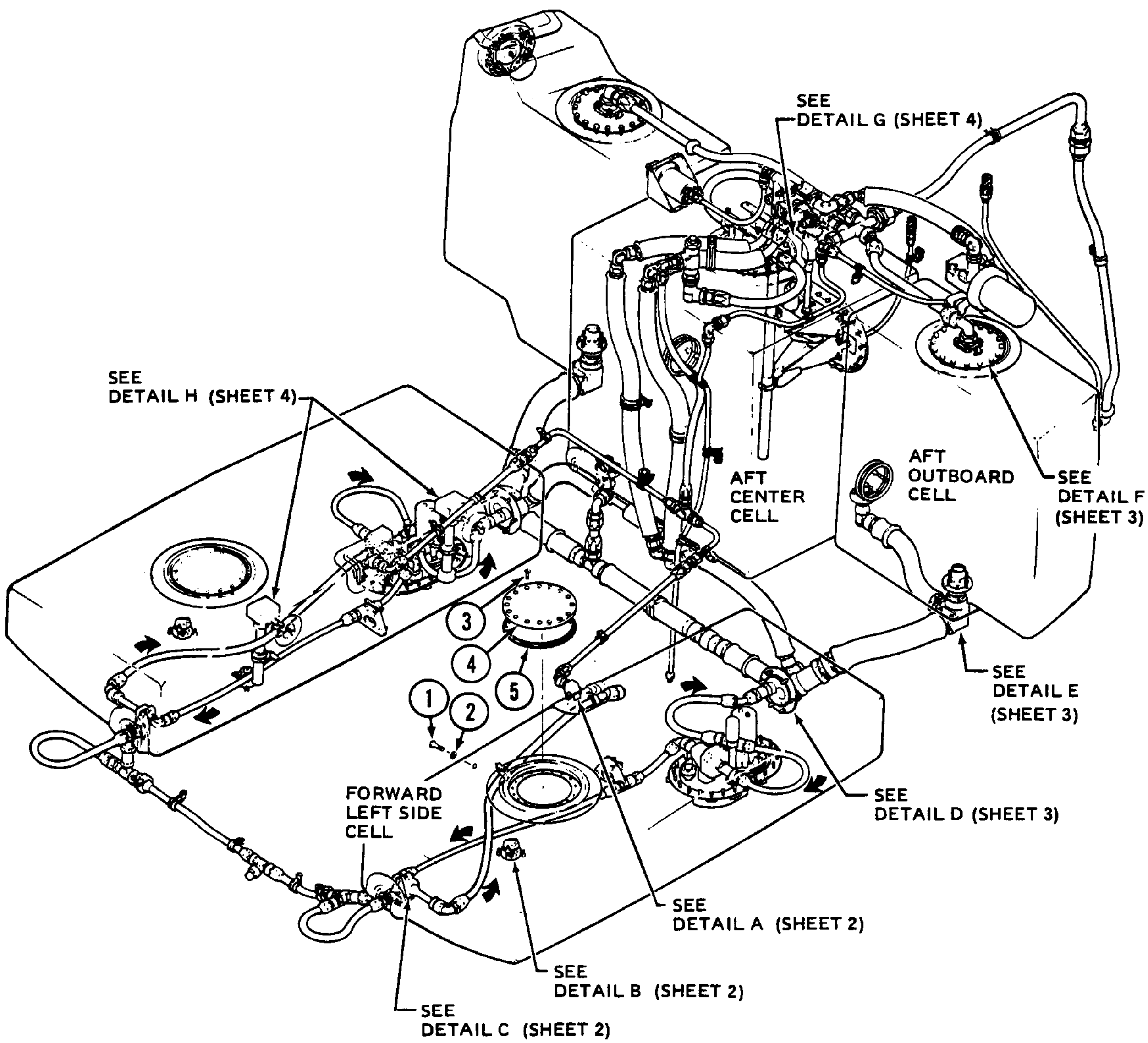
(15) On aft end of cell (outside), remove bolts (36), washers (35) and retainers (34) securing outlet fitting (37) to fuel cell. Remove packing (38) from fuel cell (33).

(16) Remove nylon lacing from top perimeter of fuel cell. Remove fuel cell from helicopter.

b. *Aft Outboard Fuel Cell.*

NOTE

Removal procedures given are for left side cell; procedures are identical for right side cell unless noted. If right side cell is to be removed, engine oil tank must be removed. (Chapter 4.)



1. Bolt
2. Washer
3. Screw
4. Access cover
5. Preformed packing

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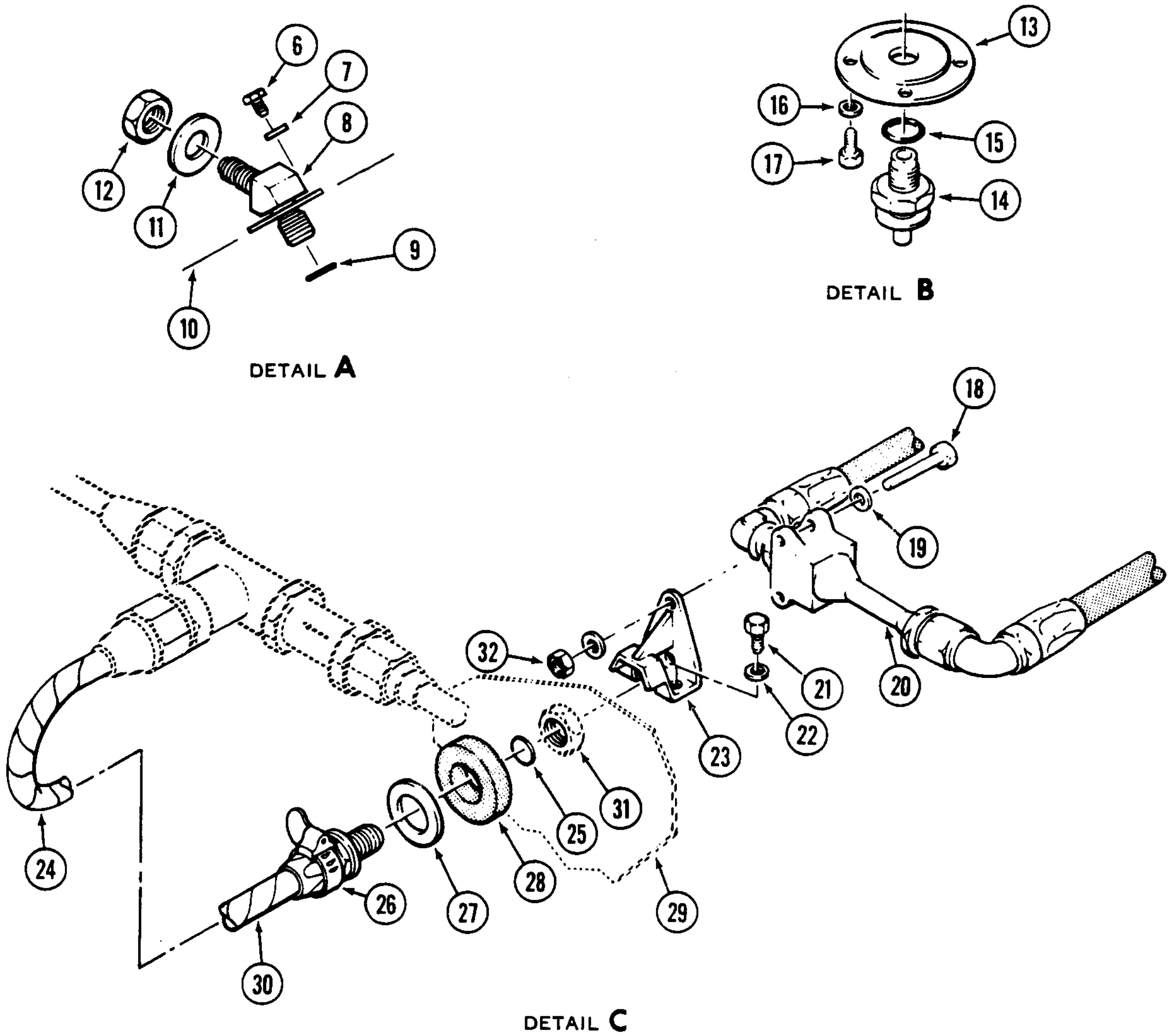
Figure 10-1. Fuel cell installation (Sheet 1 of 4)



6.	Bolt	20.	Ejector pump
7.	Washer	21.	Bolt
8.	Vent valve	22.	Washer
9.	Preformed packing	23.	Support
10.	Airframe bulkhead	24.	Hose assembly
11.	Washer	25.	Preformed packing
12.	Nut	26.	Clamp
13.	Fuel cell fitting	27.	Washer
14.	Drain valve	28.	Seal
15.	Preformed packing	29.	Airframe bulkhead
16.	Washer	30.	Nylon sleeve
17.	Bolt	31.	Nut
18.	Bolt	32.	Nut
19.	Washer		

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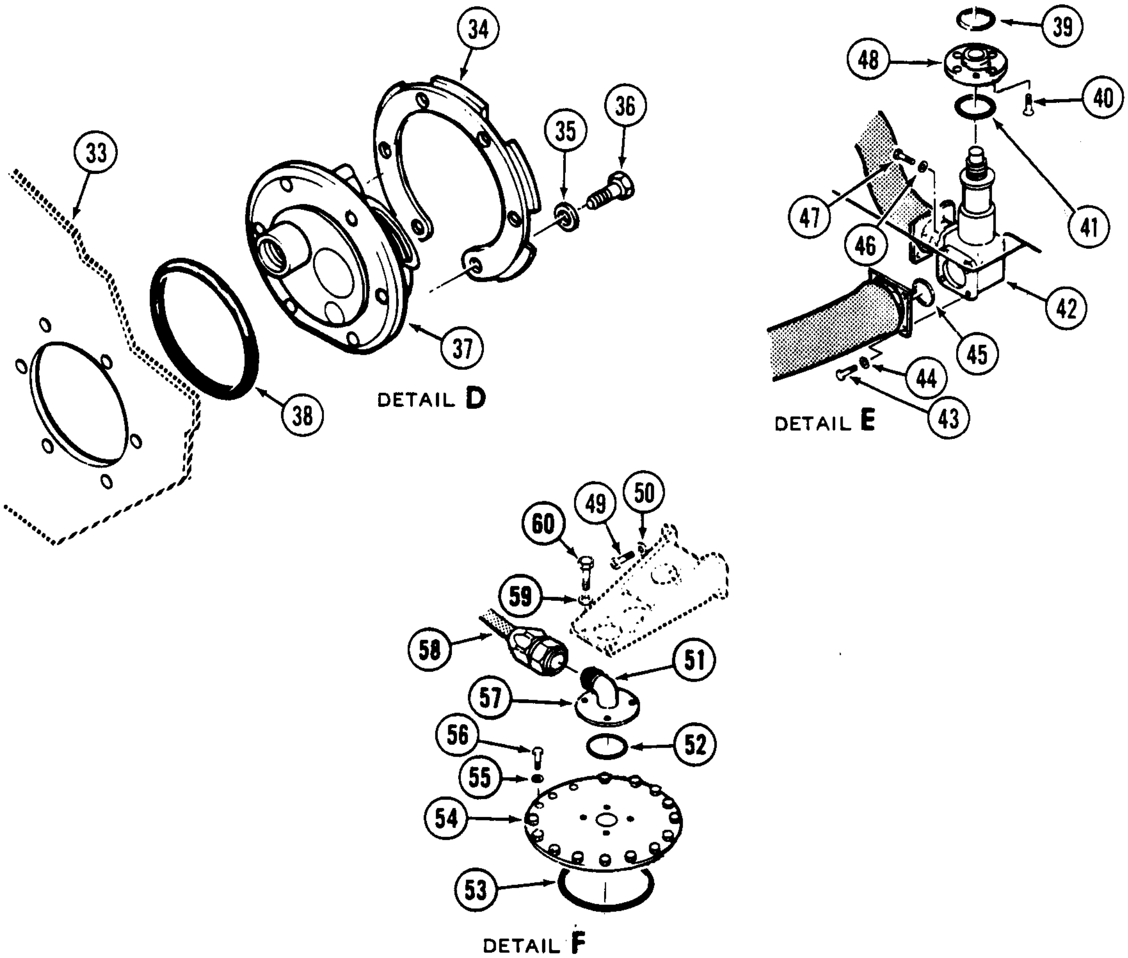
Figure 10-1. Fuel cell installation (Sheet 2 of 4)



33. Fuel cell
34. Retainer
35. Washer
36. Bolt
37. Outlet fitting
38. Preformed packing
39. Preformed packing
40. Screw
41. Preformed packing
42. Breakaway valve
43. Bolt
44. Washer
45. Preformed packing
46. Washer
47. Bolt
48. Fitting
49. Screw
50. Washer
51. Elbow
52. Preformed packing
53. Preformed packing
54. Cover plate
55. Washer
56. Screw
57. Fitting
58. Hose assembly
59. Washer
60. Bolt

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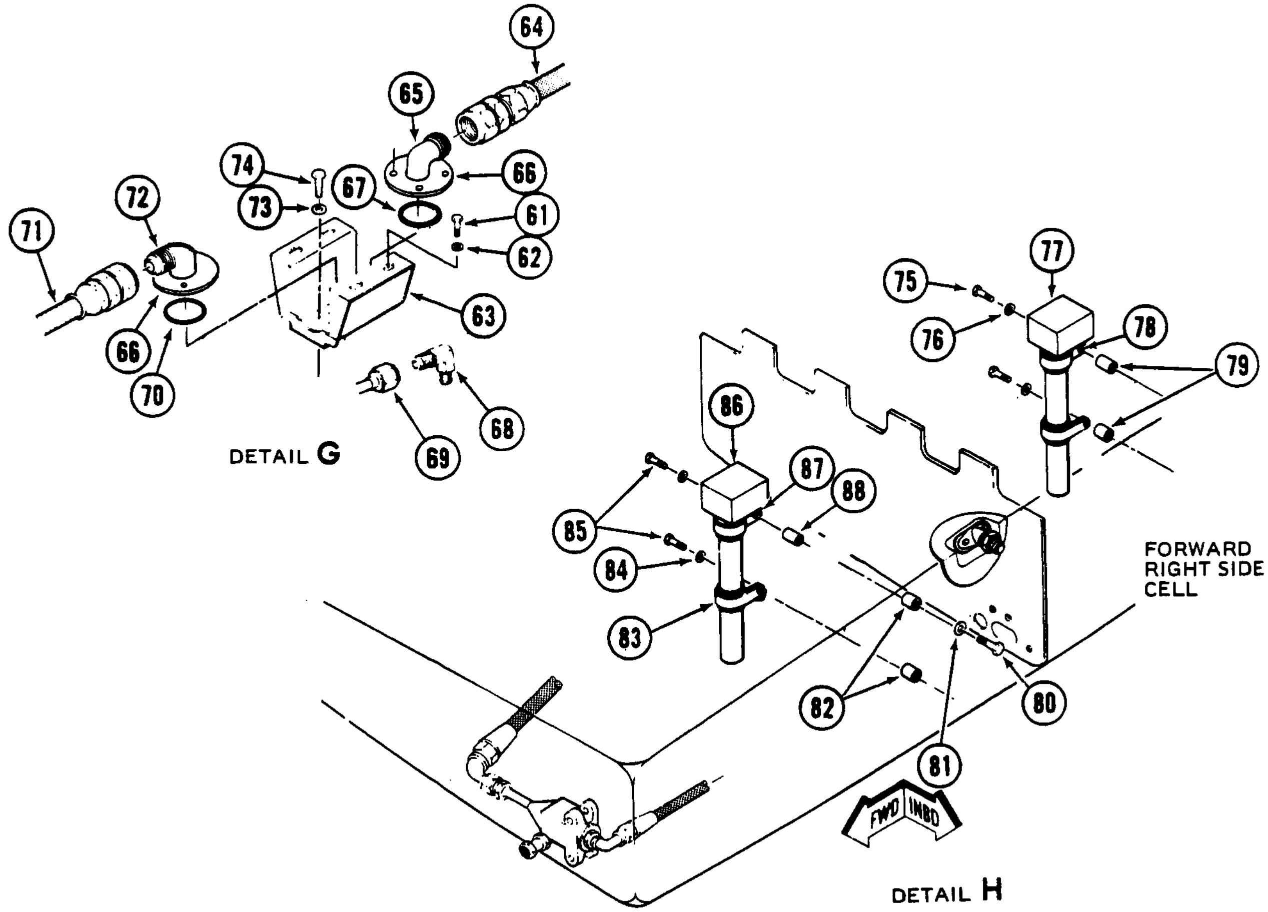
Figure 10-1. Fuel cell installation (Sheet 3 of 4)



61. Bolt
62. Washer
63. Bracket
64. Hose assembly
65. Elbow
66. Fitting
67. Preformed packing
68. Elbow
69. Hose assembly
70. Preformed packing
71. Hose assembly
72. Elbow
73. Washer
74. Bolt
75. Bolt
76. Washer
77. Fuel quantity transmitter
78. Clamp
79. Spacer
80. Bolt
81. Washer
82. Spacer
83. Clamp
84. Washer
85. Bolt
86. Fuel quantity transmitter
87. Clamp
88. Spacer

UH-1H-II-M-10-1-4

Figure 10-1. Fuel cell installation (Sheet 4 of 4)

NOTE

If right side cell is to be removed, remove cap and adapter or closed circuit refueling receiver in accordance with paragraph 10-71. If left side cell is to be removed, fuel filter assembly must be removed. (Paragraph 10-15.)

(1) Defuel system.

(2) Remove left or right side fuel cell access cover on engine work deck.

(3) If bracket is installed, remove screws (49, figure 10-1) and washers (50).

(4) Disconnect hose (58) from elbow (51).

(5) Remove center fuel cell cover plate.

(6) Working through center fuel cell opening, remove bolts and washers securing cell interconnect.

(7) Unscrew breakaway valve (42) from fitting (48). Remove packing (39) from breakaway valve (42).

(8) Remove nylon lacing around top perimeter of fuel cell and airframe.

(9) Remove fuel cell. Cap all open lines and fittings.

c. *Aft Center Fuel Cell.*

(1) Defuel system.

(2) Remove engine work deck access plate over center fuel cell.

(3) Remove center fuel cell cover plate.

(4) Remove bolts and washers at left and right side cell interconnects.

(5) Remove bolts (61) and washers (62) securing bracket (63) to structure.

(6) Remove bolts (74) and washers (73) securing bracket to fittings (66).

(7) Disconnect hose tube assemblies (64), (71) and (69).

(8) Remove nylon lacing around top perimeter of cell and airframe.

(9) Collapse cell and fold. Remove through aft center cover plate opening. Cap all open lines and fittings.

10-4. Inspection — Fuel Cell — Crashworthy.

a. Remove exterior surface dirt and grime by scrubbing the fuel cell with warm, soapy water. Air dry surface.

b. Purge fuel cell thoroughly with fresh air; scrub with warm, soapy water; and rinse in clean, clear water. Air dry.

c. Inspect all interior and exterior surfaces for loose seams, cuts, abrasions, scuffed surfaces, tears, blisters, and for any area that appears to have become soaked with fuel.

d. Inspect metal fittings to make certain protective finishes are intact and the coil-type inserts are installed and in good condition.

e. The following damages are prohibited for field repair and can be repaired only by an authorized fuel cell overhaul depot.

(1) Pass-through holes (holes made by a projectile that enters through one surface of the fuel cell and exits through the opposite surface).

(2) Damage that extends into a corner or stepped-off area or that involves a cut longer than 4.0 inches, or that is caused by seepage or diffusion of fuel between the fabric plies.

10-5. Repair — Fuel Cell.

CAUTION

Only those cements, accelerators, solvents, fabrics, and lacquers specified for use in the following procedures shall be used to repair the fuel cells. Substitution of materials shall not be made.

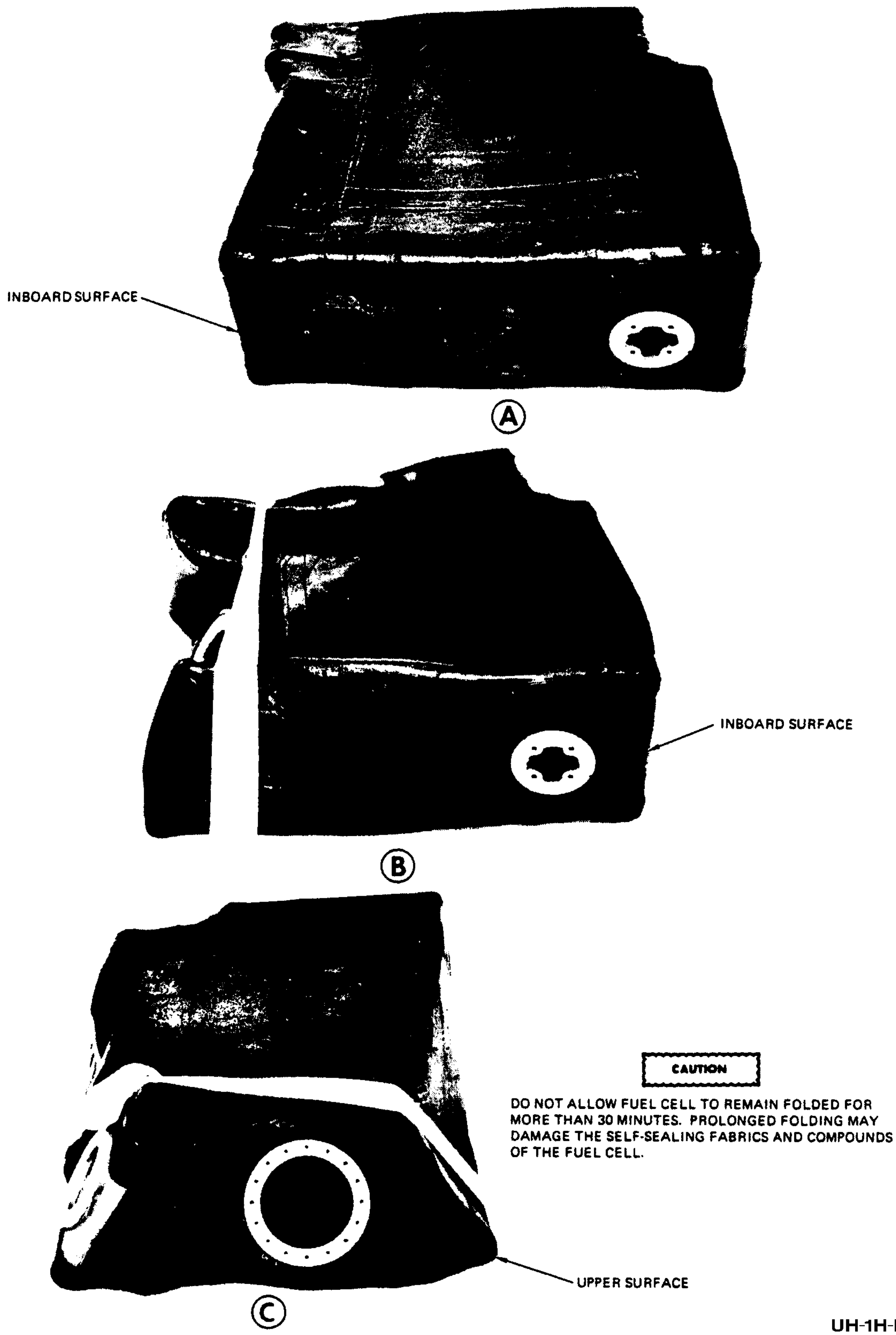


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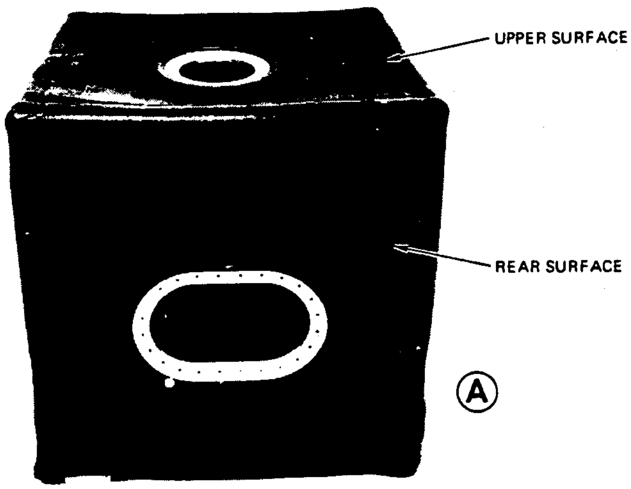
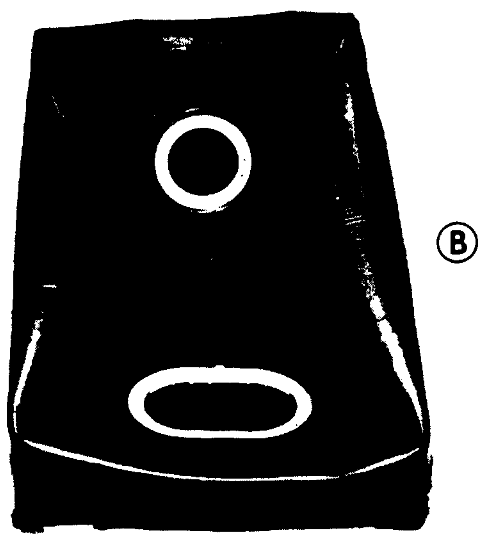
Figure 10-2. Aft outboard fuel cells





CAUTION

DO NOT ALLOW FUEL CELL TO REMAIN FOLDED FOR MORE THAN 30 MINUTES. PROLONGED FOLDING MAY DAMAGE THE SELF-SEALING FABRICS AND COMPOUNDS OF THE FUEL CELL.

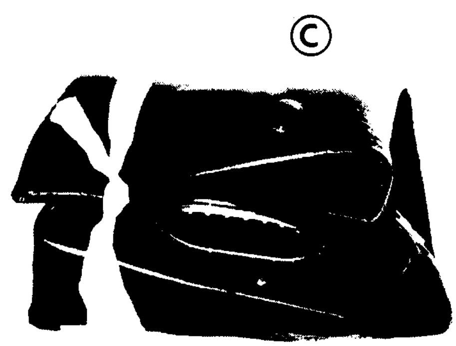


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Figure 10-3. Aft center fuel cell (Sheet 1 of 2)

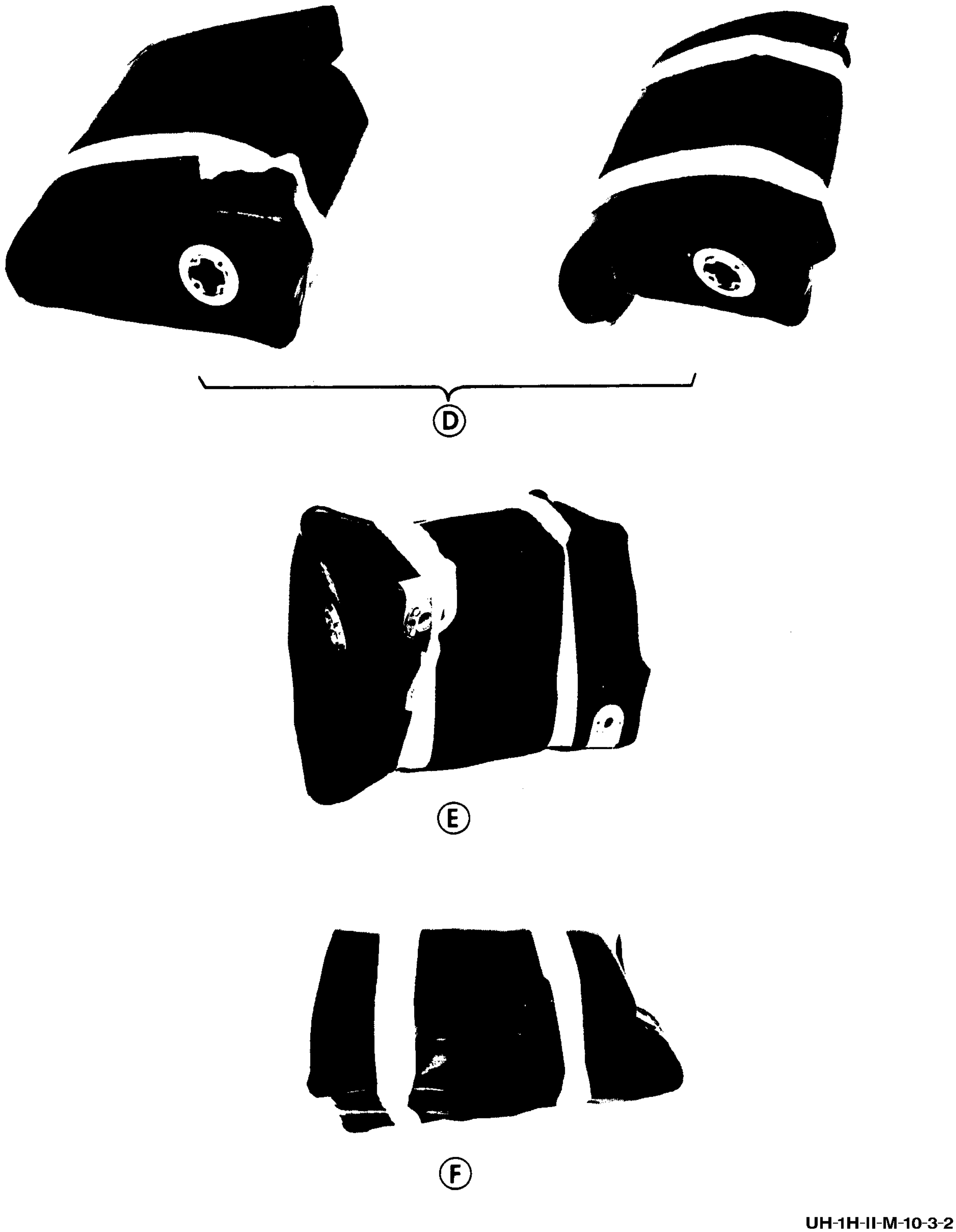


Figure 10-3. Aft center fuel cell (Sheet 2 of 2)

NOTE

All materials required to accomplish repairs are included in fuel cell repair kit Part No. ACA 8000388. Kits are available from the Goodyear Tire and Rubber Co., Aviation Products Operation, Goodyear, Arizona. (Table10-1.)

a. Observe the following precautions during repair and stowage of fuel cells.

(1) Protect the fuel cell from the careless use of sharp tools and hot lights during all repair procedures.

(2) Install protective covers or tape over all undamaged fitting surfaces immediately after inspecting the fuel cells.

Table 10-1. Contents of Fuel Cell Repair Kit, Part No. ACA 8000388

NOMENCLATURE	QUANTITY	USE
Group One:	2 sq yd	Repair interior surfaces of fuel cell
Fabric, type FT-136, reinforced nylon	1 sq yd	Repair exterior surfaces of fuel cell
Fabric, type FT-79	2 sq yd	Assemble curing plates
Airfoam, fabric-backed, 1/4 inch	1 qt	Bond fuel cell repair surfaces
Cement, repair, type 1492-C	25 cc	Activate type 1492-C cement
Accelerator, type 1465-C	1 qt	Refinish and seal fuel cell repairs
Lacquer, type 5053-C	1 qt	Cleaning fuel cells during repair
Methyl-Ethyl-Ketone, Federal Specification TT-M-261	2 lb	Prevent adhesion of rubber coatings
Soapstone, powdered or mica		

Group Two:

NOMENCLATURE	QUANTITY
Curing iron, 290×F Temperature setting (The Goodyear Tire & Rubber Company, Aviation Products Division, Arizona Operation, Goodyear, Arizona)	1
Electric timer, Rhodes Mark Time Model 78105, or equivalent	1
Abrasive arbor, ¼-inch drive, 1-inch diameter, 1-inch long, Dumore Model R421003, or equivalent	1
Motor, electric 2250 rpm, 1.9 amp, 115 vac, Black and Decker Model 725, or equivalent	1
Light, vapor proof, 25-ft cord	1
Roller, ¼-inch wide, ¾-inch diameter, flat gooseneck, Hoggson Pettis Company, New Haven, Conn., or equivalent	1
Stitcher, 1/32-inch wide, ¾-inch diameter, gooseneck, Hoggson Pettis Company, or equivalent	1
Shears, 10-inch, snubnose	1

Table 10-1. Contents of Fuel Cell Repair Kit, Part No. ACA 8000388 (Cont)

Group Two:

NOMENCLATURE	QUANTITY
Scissors, 4-inch, curved, nail	1
Scale, 12-inch, straight-edge	1
C-clamps, 6-inch	6
Brush, paint, 1-inch	1
Sanding sleeve, 1-inch x 1-inch,. 80 to 100 grit, Three-M-Ite, 3M Company, or equivalent	6
Abrasive cloth, 120-grit, aluminum oxide, Three-M-Ite, Eleck-tro-cut, 3M Company, or equivalent	1 sheet
Abrasive cloth, 320-grit, aluminum oxide, Three-M-Ite, Eleck-tro-cut, 3M Company, or equivalent	1 sheet
Metal plate 6-inch x 6-inch, ¼-inch thick, soft aluminum	6

(3) Carry the fuel cells without using the fitting openings as handgrips.

(4) Make all fuel cell repairs on a clean, well-padded work table. Use adequate, vapor proof lighting when inspecting and repairing the interior surfaces of the fuel cell.

(5) Maintain the natural contour of the fuel cell throughout all repair procedures.

WARNING

Make all repairs in a well-ventilated area. Do not allow smoking or open flame in or near the repair area, or in an area where the cements and solvents used to repair the fuel cell are mixed and stored. The cements and solvents used to repair a fuel cell are highly flammable.

(6) Do not stack uncrated fuel cells. Whenever possible, place the fuel cells in suitable containers and use packing material to prevent the fuel cell from shifting position in the storage containers.

(7) Stack crated fuel cells to provide first access to the oldest fuel cell. Do not allow stacked fuel cells to crush those in the lower part of the stack. Leave the fuel cell in its storage container until it is required for installation in the helicopter.

(8) Protect the fuel cell from direct exposure to sunlight, ozone, dirt and moisture.

b. *Repairing Blistered Areas.* Blistered areas of the fuel cell that are less than 1.0 inch in diameter do not require repair. If any blister exceeds 1.0 inch in diameter, the fuel cell must be repaired by the installation of a cover patch (Step f. or g.).

c. *Repairing Loose Interior Seams.*

(1) Carefully inspect the loosened interior seam area to determine the exact extent of the seam operation.

(2) Carefully trim away loosened seam strips and recheck the seam. If the remaining bond is at least 1.0 inch wide, no further repair of the seam is required.

(3) If a 1.0 inch effective bond does not remain after the loosened strip has been trimmed, install a cover patch over the interior surface of the fuel cell (Step f. or g.).

d. *Repair Loose Exterior Seams*. The procedure for repairing loosened seams on the exterior of a fuel cell is essentially the same as that for repairing loosened interior seams, except that the bond width must be at least 1-1/2 inches. If, after being trimmed, the effective width of any exterior seam is less than 1-1/2 inches, a cover patch must be installed (Step f. or g.).

e. *Repair Loosened Fitting Flanges*. Fitting flanges that have loosened from the exterior surfaces of the fuel cell can be recemented into place using the following procedure.

(1) Using clean pads dampened in MEK (C-309), clean the exposed, contacting areas of the fuel cell and the fitting flange. Allow the cleaned area to air dry.

(2) Carefully buff the cleaned surfaces until they have the feel of soft velvet.

(3) Again clean the buffed areas with pads dampened in MEK (C-309) and allow the cleaned surfaces to air dry.

NOTE

Type 1492-C cement has a shelf life of 6 months. Discard and do not use any type 1492-C cement if shelf life has expired.

(4) Obtain a one quart container of type 1492-C cement and a 25-cc container of type 1465-C accelerator from fuel cell repair kit, Part No. ACA 8000388. Check the expiration date stamped on the cement container.

(5) Add 25 cc of accelerator to the one-quart container of cement; mix the cement compound slowly and thoroughly. The resulting compound is also known as type 1895-C cement.

NOTE

Smaller quantities of the final 1895-C cement can be prepared by accurate reduction of the cement and accelerator.

CAUTION

Type 1895-C cement will have a pot life of 16 hours. When the pot life has expired, discard and do not attempt to use the cement compound.

(6) When type 1895-C cement has been thoroughly mixed, apply four brushed-on coats of the compound to each cleaned surface of the fuel cell and fitting flange. Allow each coat to dry to its maximum tack condition before applying the succeeding coat.

NOTE

Maximum tack can be tested by touching the cemented surface lightly with the knuckles. If the surface feels tacky, but no cement is transferred to the knuckles, the cemented surface is at maximum tack.

(7) When the fourth coat of cement is at maximum tack, press the cemented surfaces together carefully and roll the bond thoroughly to remove any entrapped air.

NOTE

Roll the cemented bond from the edge of the fitting outwards toward the edge of the flange. Any large blisters (bubbles) of trapped air can be removed by inserting a thin piece of looped wire that has been dipped in MEK (C-309) between the surfaces until the blister is contacted and its trapped air withdrawn.

(8) Dust the cemented bond lightly with soapstone provided in the fuel cell repair kit.

(9) Obtain two 1/8-inch thick pieces of aluminum plate that are at least 1.0 inch wider and longer than the cemented bond.

(10)From the fuel cell repair kit obtain sufficient 1/4-inch thick, fabri-backed Airfoam material to cover the aluminum plates and to allow a 1/2-inch protective overlap around each edge of the plates. Use tape to hold the Airfoam to the plates.

(11) Place one prepared plate over the exterior cement-bond surface of the fuel cell and the other plate inside the fuel cell directly below the cemented bond. Fabric-covered surface should be placed against the fuel cell.

CAUTION

Excessive pressure may damage the self-sealing compounds of the fuel cell.

(12) Secure the curing iron, Part No. 2F1-3-25721, on the aluminum plate adjoining the cement-bond surface. Using a clamp, secure the curing iron and both plates in place. Tighten the clamp to apply approximately 40 pounds of pressure to the repair area.

(13) Connect curing iron to 110VAC, 60 cycle, outlet. Cure the cement-bond surface for 60 minutes.

(14) When 60-minute cure cycle has been completed, disconnect the curing iron and allow the repair area to cool while the pressure remains applied. Remove curing iron, clamp, and aluminum plates.

(15) Paint the exterior surfaces of the cement-bond with one coat of type 5053-C lacquer supplied in the fuel cell repair kit.

f. *Repairing Cuts, Tears, Snags, and Holes (Hot-Patch Method).* Cuts, tears, snags, and holes that do not extend through more than one exterior fabric ply or through the gummed inner liner on the interior of the fuel cell, can be repaired by the installation of a cover patch over the exterior or interior damaged surfaces as applicable. Cover patches can be installed using the hot-patch method described in the following step (1) through step (7), or by using the cold-patch method described in step g. If the damaged area exceeds the limitations, the fuel cell can be repaired only by the manufacturer.

NOTE

A fuel cell repaired with hot patches is fuel worthy immediately after there paired area has cooled after being cured. Cold patches must remain undisturbed for 24 hours and are not fuel worthy for at least 72 hours.

NOTE

If the damaged area is located at, or extends into, a corner of the fuel cell, or into one of its stepped-off areas, do not attempt to repair it. If the damage extends through more than one exterior ply or through more than the gummed inner liner, do not attempt further repair. Such fuel cells must be condemned and removed from service.

(1) Using clean pads dampened with MEK (C-309), clean the exterior and interior surfaces of the fuel cell across an area that extends at least four inches beyond damage area of fuel cell. When the cleaning is complete, carefully trim away, for a distance of at least 2.0 inches beyond the edge of the damaged area, any threads, ragged edges, or fuel-soaked surfaces of the cell.

CAUTION

Type FT-136 fabric must be used to make a cover patch for interior surfaces of the fuel cell. Type FT-79 fabric must be used to make a cover patch for exterior surfaces of the fuel cell. The incorrect use of the fabric types will produce an unacceptable repair.

NOTE

When cutting fabric, hold the shears at an angle to produce a beveled cut along the edge of the patches. When installing the patches, the beveled edge should be positioned so that it is away (not set against) from the fuel cell. The fabric surface of the patch must be out.

(2) From the fuel cell repair kit, Part No. ACA 8000388, obtain a section of type FT-136 fabric and a section of type FT-79 fabric. The fabric is marked to identify its type number.

(3) Carefully cut a cover patch from the type FT-136 fabric. The cover patch must be large enough to extend at least 1-1/2-inches beyond the damaged area of the fuel cell.

(4) Carefully cut a cover patch from the type FT-79 fabric. The cover patch must be large enough to extend at least 2.0 inches beyond the damaged area of the fuel cell.

CAUTION

In the following-step, do not buff the fuel cell for more than 1/4 inch beyond the marked area. To do so will damage the fuel cell.

(5) Position the cover patches over the damaged surfaces of the fuel cell. Using chalk, mark the mating areas of the fuel cell. Carefully buff the shiny surface from the mating areas that were marked; buff the shiny surface from one side of the patch.

NOTE

On the type FT-136 fabric cover patch, buff the gummed surface.

(6) Clean the buffed area of the patches and fuel cell with pads dampened with MEK (C-309). Allow the dampened surfaces to air dry.

(7) Apply the exterior patch over the cleaned area using the procedure given in step e. sub-step (1) through (15). When the exterior patch has cured, apply the interior patch using the same procedure.

CAUTION

Do not exceed the repair restrictions defined in step f.

g. *Repair Cuts, Tears, Snags, and Holes (Cold-Patch Method).* The procedure for repairing cuts, tears, snags, and holes using the cold-patch method is the same as that for applying a patch using the hot-patch method (step f.) except as follows:

(1) When the cover patches have been cemented into place, but not heat-cured, apply two successive coats of type 1895-C cement (prepared in accordance with the procedure given in step e. sub-step (4) and (5) over all surfaces of the interior and exterior cover patches.

(2) Allow cover patches to remain undisturbed for 24 hours before handling or inspecting the fuel cell. Pressure need not be applied to the cover patch during this 24-hour interval.

(3) Apply one brushed-on coat of Type 5053-C lacquer supplied in the fuel cell repair kit to exterior cover patch. Do not apply lacquer to the interior cover patch.

(4) Allow an additional 72-hour period before attempting to add fuel to a fuel cell repaired using the cold-patch method.

h. *Replace Fitting Inserts.* Standard maintenance procedures are adequate to replace the coil-type inserts in each fuel cell fitting.

i. *Restoring Protective Fitting Finishes.*

(1) Using a fine file or fine emery paper, carefully remove any roughness from the fitting to be refinished.

(2) Clean metal surfaces of fitting using pads dampened with MEK (C-309).

(3) Obtain a small container of chemical film material (C-100) solution from stock.

WARNING

In the following steps, do not allow the chemical film material (C-100) to come into contact with the hands, body, or clothing. The solution is corrosive and can injure personnel.

(4) Moisten fitting surface with clean pad dampened in water.

(5) Using a narrow nylon brush, apply an undiluted coat of chemical film material (C-100) solution to the moistened area.

(6) Allow solution to dry until a light, golden coating appears on the fitting. When coating has formed, remove excess solution by wiping the surface with clean pads dampened in water. Dry the restored area with dry pads.

10-6. Installation — Fuel Cell.

a. *Forward Fuel Cell.*

(1) Vacuum or remove any foreign material from fuel cell opening.

(2) Place fuel cell in opening.

(3) Position vent valve (8, figure 10-1) through bulkhead opening. Install washer (11) and nut (12) to vent valve.

(4) Install two bolts (17) and washers (16) at cell drain valve location.

(5) Install bolts (1) and washer (2) from inboard side of bulkhead. For left side cell install bolt (80) and washer (81).

(6) Install bolt and washer through hose clamp (inside fuel cell) to bulkhead. (Left side cell only.)

(7) For right side cell install aft fuel quantity transmitter (77), using two bolts (75) washers and spacers (79) clamps (78). (Figure 10-1, Detail H.)

(8) For right side cell install forward fuel quantity transmitter (86) using bolts (85), washers (84), spacers (82 and 88) and clamps (83 and 87).

(9) From forward end of cell install hose assembly with packing (25), seal (28), washer (27) and clamp (26). Install nut (31) from inside cell. Tighten nut (31). Seat seal (28) against bulkhead and tighten clamp (26).

(10) Install support (23) using two washers (22) and two bolts (21).

(11) Attach ejector pump (20) to support (23) using washers (19) and bolts (18).

(12) Install aft outlet fitting (37) to fuel cell with packing (38). Install retainer (34), washers (35) and bolts (36).

(13) Install sump assembly. Refer to paragraph 10-120.

(14) Lace fuel cell around perimeter of airframe using nylon lacing cord.

(15) Install access cover (4, figure 11) with packing (5) and screws (3).

(16) Install access panel over cell.

(17) Pressure test cell for leaks. Refer to paragraph 10-12.

b. *Aft Outboard Fuel Cell.*

(1) Vacuum or remove any foreign material from fuel cell opening.

(2) Position fuel cell in airframe.

(3) Install packing (39) to breakaway valve (42). Install valve to fitting of fuel cell.

(4) Install packing and bolts at center fuel cell interconnect fitting.

(5) Install bracket (if used) using screws (49) and washers (50).

(6) Connect hose assembly (58) to elbow (51).

(7) Install nylon lacing around top perimeter of fuel cell.

(8) Install fuel cell access cover (engine deck).

(9) Pressure test fuel cell. (Paragraph 10-12.)

c. *Aft Center Fuel Cell.*

(1) Vacuum or remove any foreign material from fuel cell opening.

(2) Fold and tie fuel cell and install through aft access port.

(3) Install packing and bolts at each interconnect location to aft outboard cells.

(4) Install aft center access cover.

(5) Connect hose assemblies (71 and 64) to elbows (65 and 72).

(6) Connect tube assembly (69) to elbow (68).

(7) Install bracket (63) using bolts (74) and washers (73).

(8) Install bolts (61) and washers (62) through bulkhead and bracket.

(9) Install access cover plate (engine deck).

(10) Pressure test fuel cell. (Paragraph 10-12.)

SECTION II — FUEL SYSTEMS

10-7. FUEL SYSTEM.

10-8. Description — Fuel System. The helicopter is equipped with a crashworthy fuel system which incorporates self-sealing tanks and self-sealing breakaway valves in the fuel supply and fuel vent lines. Both forward fuel cell sump assemblies incorporate electrically driven fuel boost pumps. (Figure 10-4). Fuel under pressure is delivered from pumps through separate lines to a check valve manifold on front of engine forward firewall. Passing through two check valves and single outlet of manifold, fuel flows through an electrically controlled shutoff valve to main fuel filter near engine compartment for delivery to engine through fuel control inlet hose. Fuel shutoff valve and each check valve of manifold have internal bypass valves to relieve thermal expansion of trapped fuel when system is inoperative. Transmitter for fuel pressure gage is connected to a tap on check valve manifold.

10-9. General Maintenance — Fuel System.

a. Organizational maintenance will consist of visual inspections, ground operational checks, cleaning of filter and strainers, specified adjustment of control linkage system, and replacements of piping, fittings, and seals. Observe general notes and precautions below, and procedures for replacement or adjustment of principal components in subsequent paragraphs. Fuel lines and components on the engine constitute the fuel control system and will be found in T53-L-703 Maintenance Manual. A fuel system schematic diagram is shown in figure 10-5.

b. Intermediate maintenance will include more detailed procedures as indicated by (AVIM) throughout the chapters.

c. Before removing any line or hose, be sure it is properly identified and its route understood for replacement in same manner.

d. Cap or cover any open lines, fittings, or exposed opening in units (other than normal vents and drains) to protect fuel system from contaminations. Be sure vent lines are not obstructed.

e. For electrical circuits of boost pump, shutoff valve, fuel quantity gage system, pressure transmitter, pressure or flow switches, and float switches, see applicable wiring diagrams. (Appendix F.)

f. Conduct any defueling or drainage of fuel in accordance with applicable directives, and with extreme care to avoid fire hazards.

10-10. Troubleshooting — Fuel System.

NOTE

Before using Table 10-2 be sure to perform all normal operational checks.

Table 10-2. Troubleshooting — Fuel System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Right or left side boost pump warning light illuminated, no pressure indicated on fuel pressure gage.

STEP 1. Ensure electrical boost pump is operative.

Replace boost pump if defective. (Paragraph 10-87.)

STEP 2. Check for faulty wiring.

Correct wiring if defective.

2. Right or left side boost pump warning light illuminated, pressure indicated on fuel pressure gage.

STEP 1. Ensure ejector pump is operating correctly.

Replace ejector pump if defective. (Paragraph 10-101.)

STEP 2. Check for foreign material in ejector pump and/or hoses.

Clean foreign material from ejector pump and/or hoses. (Paragraph 10-102.)

STEP 3. Check for defective check valve.

Replace check valve if defective. (Paragraph 10-132.)

STEP 4. Check for defective flow switch.

Replace flow switch if defective. (Paragraph 10-127.)

3. Engine fuel pump warning light illuminated.

STEP 1. Check pressure switch mounted on engine adjacent to fuel pump.

Check switch and replace if defective.

STEP 2. Check for faulty engine driven fuel pump (two).

Replace engine driven fuel pump if defective.

4. Fuel filter warning light illuminated.

STEP 1. Check for dirty fuel filter.

Replace filter. If frequent filter changes are required, investigate fuel source. (Paragraph 10-18.)

5. Shut-off valve inoperative.

Table 10-2. Troubleshooting — Fuel System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 1. Check for defective shutoff valve or lack of electrical power.

Check for electrical power at valve; if power available, valve is defective. (Paragraph 10-35.)

Replace shutoff valve if defective.

6. Fuel low level light fails to illuminate.

STEP 1. Check for faulty low level switch or wiring.

Replace defective switch or wiring. (Paragraph 9-5.)

7. Fuel low level light illuminates above normal low level fuel quantity.

STEP 1. Check forward fuel valves for leakage faster than ejector pumps can pump fuel to rear of cell.

Check flapper valves for proper seating, replace or shim as necessary. (Paragraph 10-105.)

STEP 2. Check for faulty fuel quantity system.

Adjust, repair fuel quantity system as required.

8. Fuel pressure fluctuating, low, or zero with boost pump warning light not illuminated.

STEP 1. Check for faulty fuel pressure transmitter or indicator.

Replace defective transmitter or indicator.

STEP 2. Check for faulty wiring.

Replace defective wiring.

10-11. Operational Check — Fuel System. Test installation for leaks. Perform air pressure-type test or add small, measured amount of fuel and check for leaks. Check for proper operation of low level fuel warning system (paragraph 10-82), fuel quantity indicating system (Chapter 8) and boost pumps (paragraph 10-89).

10-12. Pressure Test — Fuel System.

a. Defuel system.

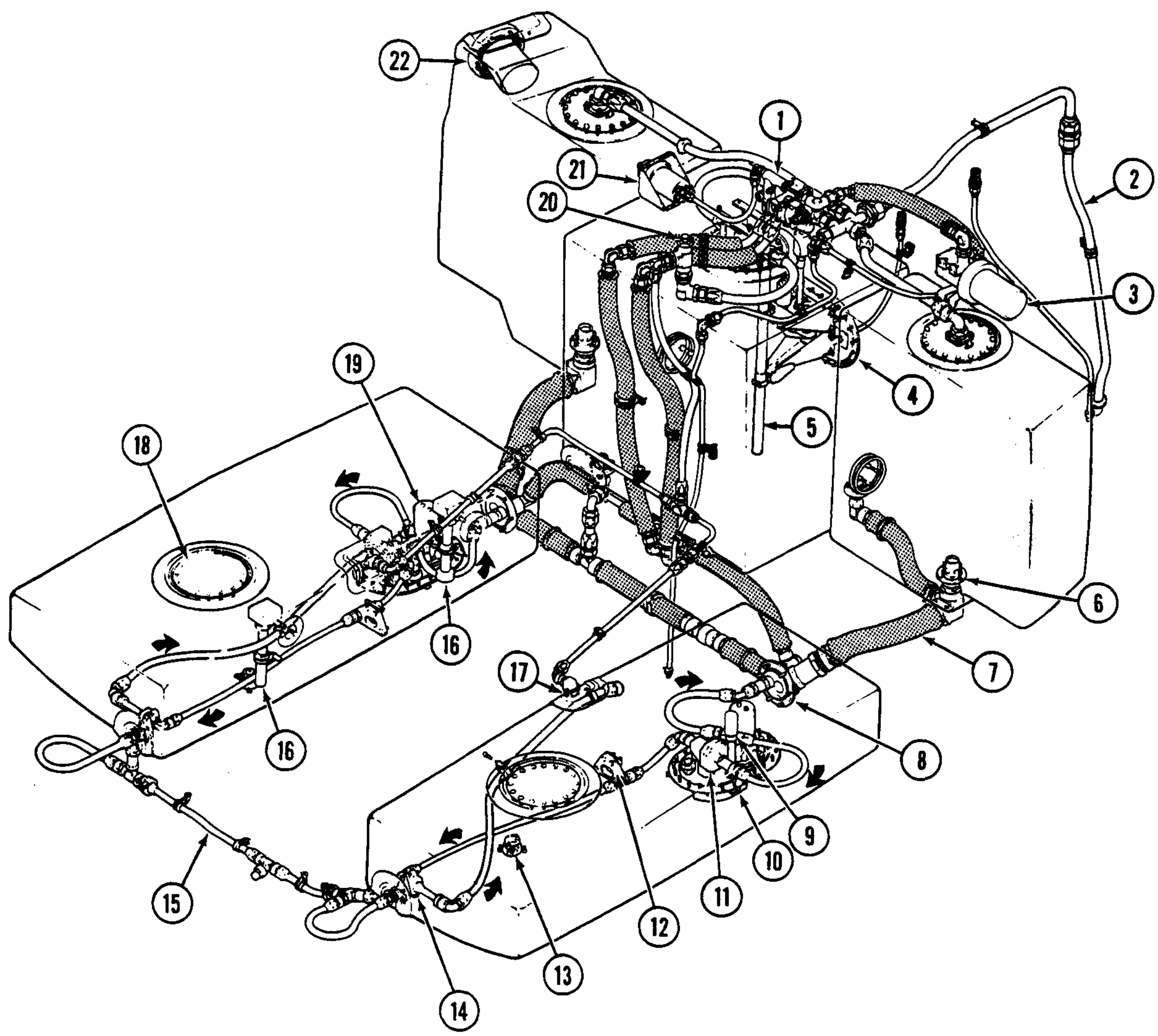
b. Cap main fuel line and vent connections.

c. Use regulated low pressure, filtered compressed air source with a manometer or accurate pressure gage and a shutoff valve.

CAUTION

Do not apply excessive pressure, as severe damage to cell and structure may result.

d. Apply pressure until gage indicates 2.5 psig in cells and crossover tubes. Shut off air source. Cells should hold this pressure for 15 minutes.



1. Fuel shutoff valve and check valve manifold
2. Vent line
3. Fuel filter
4. Cover plate — aft center fuel cell
5. Fuel quantity transmitter
6. Breakaway valve
7. Crossover hose
8. Outlet fitting
9. Low level float switch
10. Sump assembly
11. Flow switch
12. Flapper valve
13. Cell drain valve
14. Ejector pump
15. Crossfeed line
16. Fuel quantity transmitters
17. Vent valve
18. Fuel cell access
19. Electric boost pump
20. Siphon breaker valve
21. Fuel pressure transmitter
22. Closed circuit refueling receiver

UH-1H-II-M-10-4

Figure 10-4. Fuel supply system

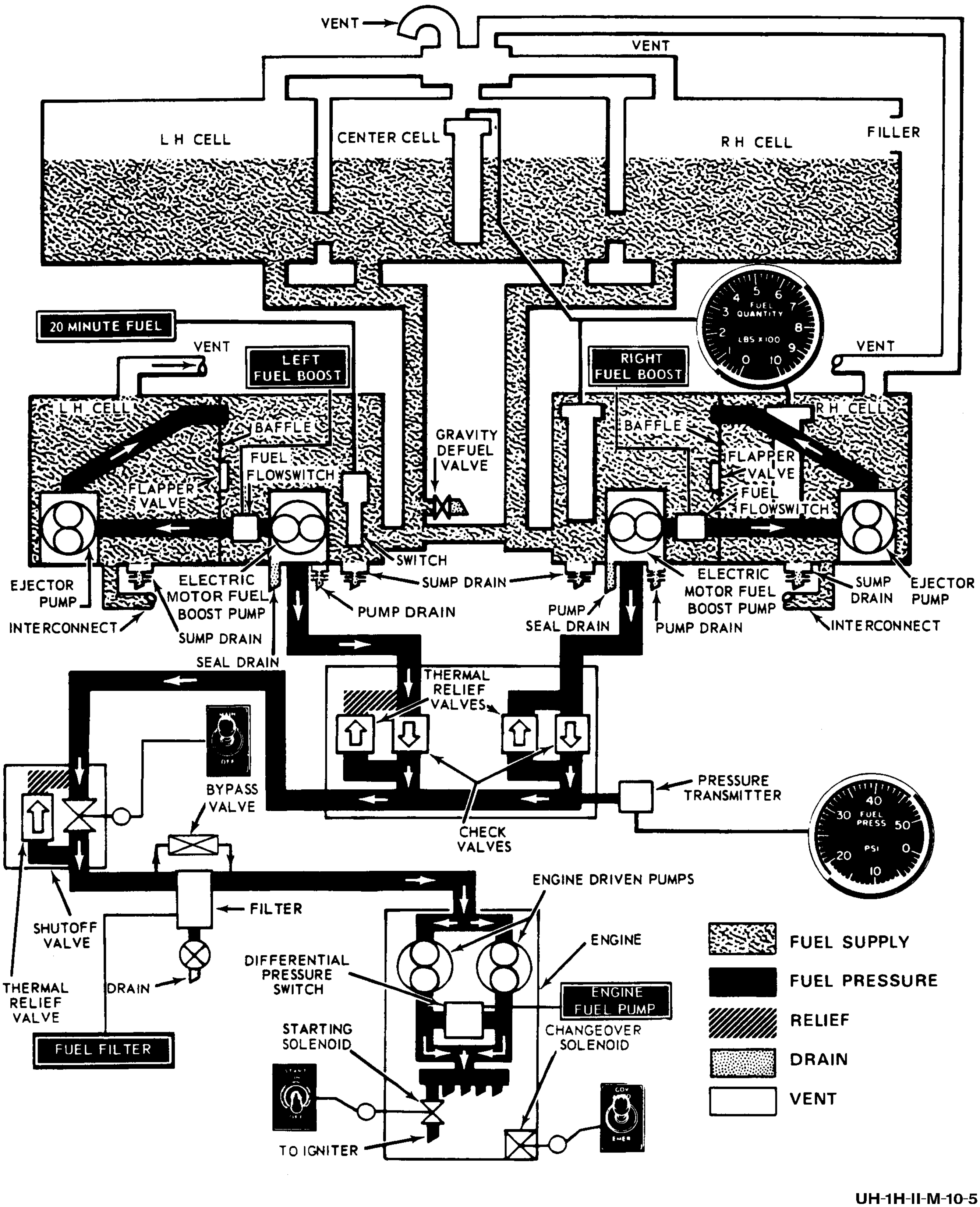


Figure 10-5. Fuel system schematic

e. Locate and correct any leakage indicated by loss of pressure, and repeat tests until results are satisfactory.

f. Refuel system, if required.

10-13. FUEL FILTER ASSEMBLY.

10-14. Description — Fuel Filter Assembly. The main fuel filter has a micronic type element and electrical means of indicating any impending bypass condition which may occur. Filter is a cylindrical unit, horizontally mounted on forward firewall in left side of engine compartment. Piping connections to filter head are an inlet line from shutoff valve of supply system, a drain line with manual valve, and an outlet coupling for engine fuel control hose. Filter element and other parts, except head assembly, are interchangeable with those used in external filter of transmission oil system. If a clogging condition should develop in filter element, a normally-open switch is closed by differential pressure, lighting FUEL FILTER caution panel as warning that further clogging may cause fuel to flow through bypass valve without filtration. (Figure 10-6.)

10-15. Removal — Fuel Filter Assembly.

a. Open engine compartment cowling at left side.

NOTE

Use suitable tool to depress self-closing valve in filter outlet coupling, to admit some air and allow drainage.

b. Disconnect fuel hose from outlet coupling (7, figure 10-6) on filter (8). Drain fuel from filter by opening valve (11) located under head (8).

c. Remove filter element (3) for inspection and replacement as follows:

(1) Open V-band clamp (5).

(2) Remove filter body (1) with packing (6) and element (3) from head assembly (8).

(3) Separate element (3) and packing (2 and 4) from filter body.

(4) Filter head (8) will normally remain in place but can be removed when necessary by disconnecting electrical cable plug (9), fuel inlet hose (10) and drain line, and removing four bolts with washers which secure head to firewall.

10-16. Inspection — Fuel Filter Assembly. Inspect filter element (3) for contamination to determine if any corrective action is needed beyond replacement of element and packing.

10-17. Cleaning — Fuel Filter Assembly. Clean filter body and head as necessary with solvent (C-304). Protect electrical connections when cleaning head.

10-18. Replacement — Fuel Filter Assembly.

a. Replace element (3) if unserviceable or damaged.

b. Replace entire filter assembly if corrosion or damage exists.

10-19. Installation — Fuel Filter Assembly.

a. If removed, reinstall filter head (8, figure 10-6). Secure to firewall with four bolts and washers. Lockwire bolt heads. Connect fuel line tube to filter inlet hose (10), and drain line to valve (11) at bottom of filter head. Connect and lockwire electrical cable plug.

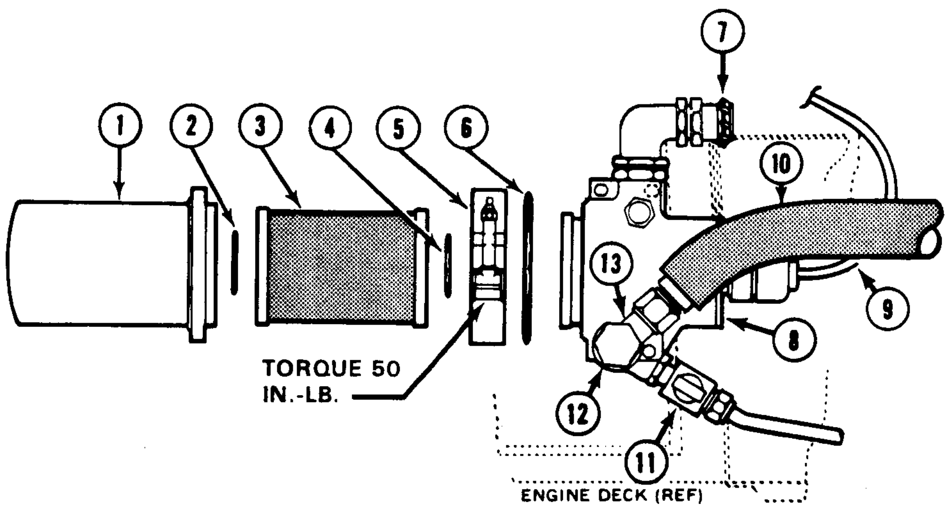
b. Install filter element (3) and body (1) as follows:

(1) Place new packing (2) on boss in bottom of filter body (1).

(2) Place clean filter element (3) in body (1), seated firmly on boss.

(3) Place new packing (4) around center boss in filter head.

(4) Install packing (6) around upper lip of filter body (1), next to flange.



1. Filter body
2. Preformed packing (MS29513-24)
3. Filter element (204-040-760-13)
4. Preformed packing (MS29513-24)
5. Clamp
6. Prefomed packing (MS29513-237)
7. Fuel outlet to engine
8. Filter head
9. Electrical wiring to caution panel
10. Fuel inlet hose
11. Filter drain valve
12. Bolt
13. Elbow

UH-1H-II-M-10-6

Figure 10-6. Fuel filter assembly

(5) Install body assembly (1) into filter head (8), pressing firmly to seat.

(6) Install V-bank clamp (5) around mating flanges of filter head and body. Torque clamp to 50 inch-pounds.

CAUTION

Do not over torque clamp to prevent leakage; use new packing or filter if leakage persists.

c. Connect hose from engine fuel control inlet to outlet coupling on filter.

d. During next ground runup, check fuel filter and connections for leaks. Also ensure FUEL FILTER caution panel does not light.

NOTE

Engine inlet system quick disconnect couplings must be torqued.

10-20. CELL DRAIN VALVE.

10-21. Description — Cell Drain Valve. A cell drain valve (13, figure 10-4) is located in bottom of front section in each forward fuel cell assembly. The valve is used to drain residual fuel and water (moisture) from the system.

10-22. Removal — Cell Drain Valve.

a. Defuel system.

b. Remove valve (13) and packing.

10-23. Inspection — Cell Drain Valve. Inspect valve for nicks, scratches, corrosion and leakage.

10-24. Replacement — Cell Drain Valve. If valve fails inspection requirements, replace valve.

10-25. Installation — Cell Drain Valve.

a. Install drain valve (13, figure 10-4) with packing to fuel cell opening.

b. Service fuel system and inspect valve for leakage.

10-26. PRESSURE TRANSMITTER.

10-27. Description — Pressure Transmitter. A pressure transmitter (4, figure 10-7) is located on engine work deck above aft center fuel cell. The pressure transmitter relays fuel pressure to fuel pressure gage on instrument panel.

10-28. Removal — Pressure Transmitter.

a. Remove access panel on pylon bulkhead.

b. Disconnect hose assembly (7, figure 10-7) from transmitter.

c. Remove four screws (1) and four washers (2).

d. Disconnect electrical plug and remove transmitter.

10-29. Inspection — Pressure Transmitter.

a. Inspect transmitter for leaks, corrosion or damage.

b. Replace fuel pressure transmitter if defective.

c. Inspect transmitter for proper operation in accordance with troubleshooting procedure. Refer to paragraph 10-10.

10-30. Replacement — Pressure Transmitter.

a. Remove existing union (6) and packing (5) from defective transmitter.

b. Install new packing (5) on union (6). Install union in replacement transmitter.

10-31. Installation — Pressure Transmitter.

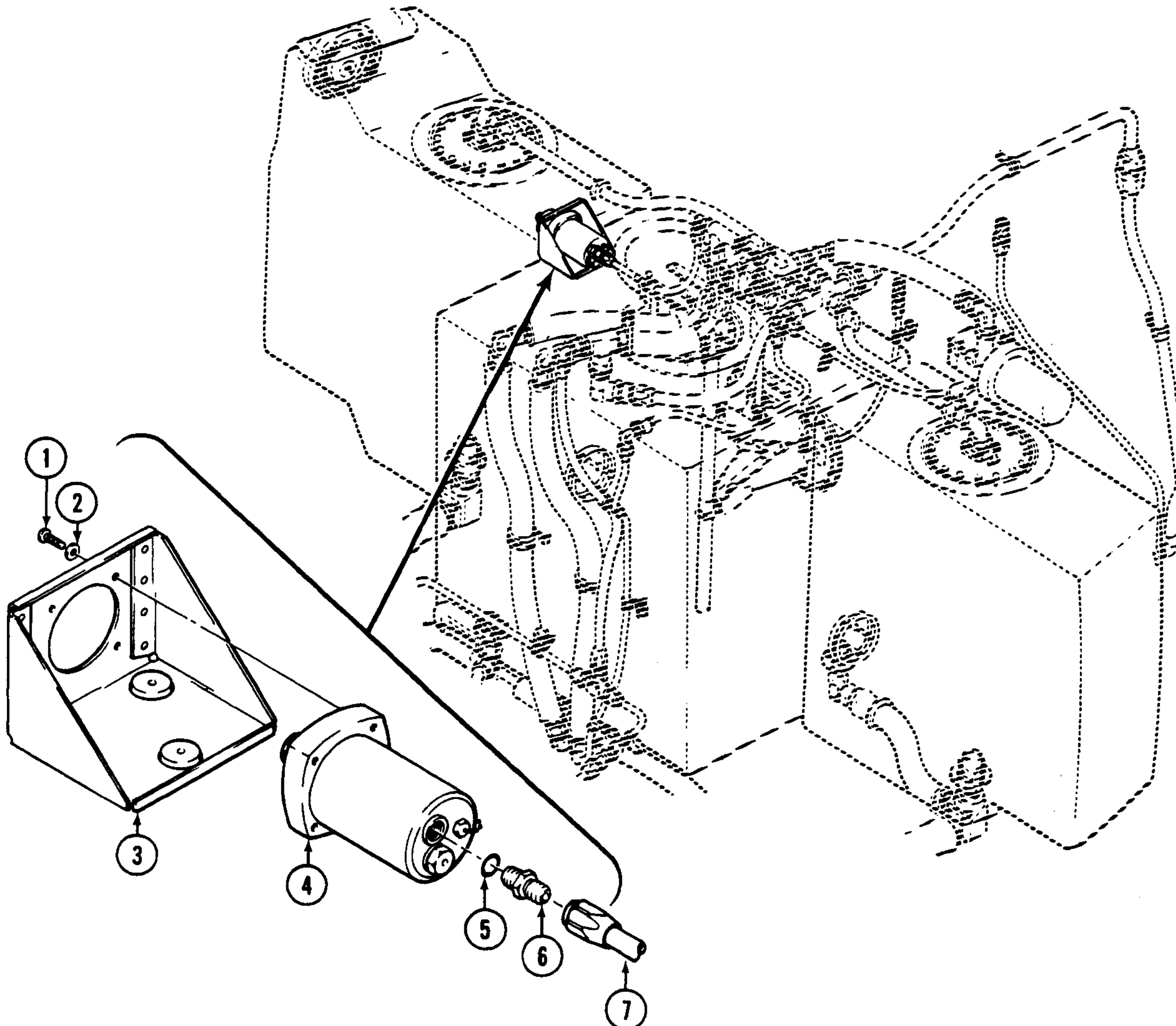
a. Install transmitter (4) to mounting bracket (3). Secure using four washers (2) and four screws (1).

b. Install hose assembly (7) to transmitter.

c. Connect electrical plug to transmitter.

d. Install access panel on pylon bulkhead.

10-32. Test Procedures — Pressure Transmitter. Ground run helicopter and check fuel pressure gage for proper fuel pressure indication.



1. Screw
2. Washer
3. Mounting bracket
4. Fuel pressure transmitter
5. Preformed packing
6. Union
7. Hose assembly

UH-1H-II-M-10-7

Figure 10-7. Fuel pressure transmitter installation

10-33. SHUTOFF VALVE.

10-34. Description — Shutoff Valve. A motor-operated pullout type gate valve (figure 10-8), in main fuel line before filter, is mounted on front of engine forward firewall and is accessible through a door on left side of pylon structural island. Valve is controlled by MAIN FUEL switch, and has a manual override handle which also serves as a visual position indicator. A thermal relief valve allows internal bypass of fuel trapped on outlet side of shutoff valve, being set to crack at 90 to 120 psig and to reseat at 80 psig minimum.

10-35. Removal — Shutoff Valve.

a. Open left engine cowling and remove left lower access panel from pylon island.

b. Provide suitable container to catch fuel, and disconnect fuel hose from union (16, figure 10-8). Remove nut (14) and washers (15) from union.

c. Disconnect electrical connector from shutoff valve (10).

d. Disconnect fuel inlet hoses from bottom of check valve manifold (28) and transmitter hose from restrictor (1).

e. Remove bolts (19), nuts (25) and washers (22) securing shutoff valve to bracket (21).

f. Remove nuts (29) and washers from bolts (5).

g. Remove shutoff valve (10) and check valve manifold (28). Reinstall washers and nuts (29) temporarily to retain spacers (4) and bolts (5) in place.

h. Disassemble shutoff valve and check valve manifold as follows:

(1) Remove bolts (13), washers and nuts (6) and separate shutoff valve from manifold (28).

(2) Remove elbow (18) from fitting (12) and remove flange (23) from fitting. Do not remove union (16) from elbow (18) unless required for parts replacement.

(3) Remove fitting (8) and flange (7) from check valve manifold (28).

(4) Discard packings (9, 11 and 20).

10-36. Inspection — Shutoff Valve.

a. Inspect shutoff valve for leaks, damage and corrosion.

b. Repair or replace if found defective.

c. Inspect shutoff valve for proper operation. (Paragraph 10-39.)

10-37. Replacement — Shutoff Valve. Assemble shutoff valve (10) and check valve manifold (28) as follows:

a. Position flange (7) and packing (24) on fitting (8) and install fitting in port of check valve manifold (28).

b. Assemble fitting (12), packing (20) and elbow (18). Install packing (17) and union (16) on elbow if removed.

c. Using packing (9 and 11) position fittings (8 and 12) on shutoff valve (10). Install two bolts (13) with washers and nuts (6). Do not tighten nuts at this time.

10-38. Installation — Shutoff Valve.

a. Remove nuts (29) and washers from bolts (5). Hold bolts (5) in place through firewall with spacers (4) installed. Position shutoff valve and check valve manifold assembly to firewall with bolts (5) through mounting holes of check valve assembly and union (16) through hole in firewall.

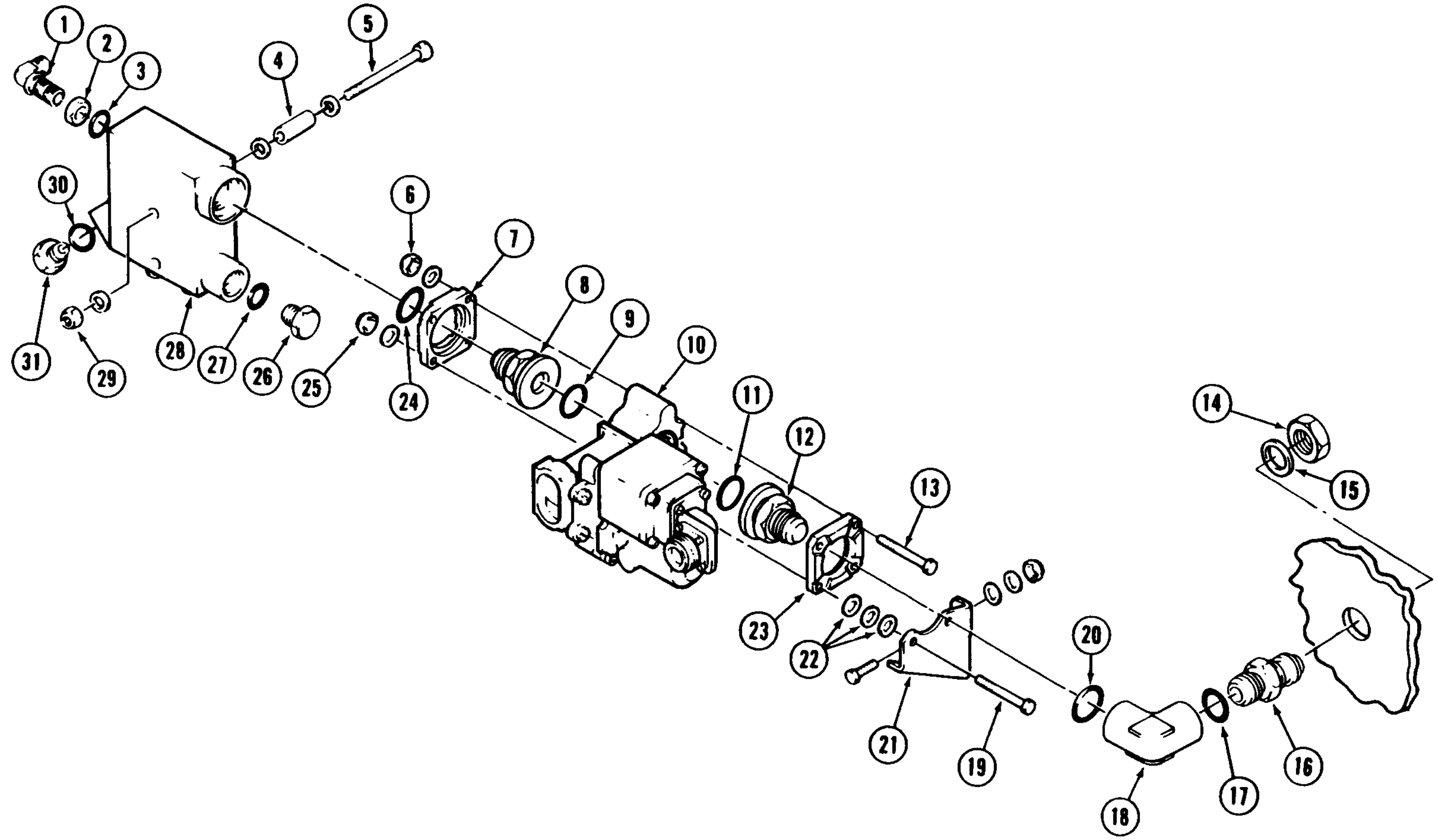
b. Position three washers (22) between mounting holes of bracket (21) and each lower mounting hole of flange (23). Install bolts (19) with washers and nuts (25). Tighten nuts (25) and (6) evenly.

c. Install washers and nuts (29) on bolts (5).

d. Install washer (15) and nut (14) on union (16).

e. Connect fuel inlet hoses to fittings on bottom of valve manifold and hose from transmitter to restrictor (1).

f. Connect electrical connector to fuel shutoff valve and safety with lockwire (C-405).



1. Restricor
2. Nut
3. Packing
4. Spacer
5. Bolt
6. Nut
7. Flange
8. Fitting
9. Packing
10. Valve, fuel shutoff
11. Packing
12. Fitting
13. Bolt
14. Nut
15. Washer
16. Union
17. Packing
18. Elbow
19. Bolt
20. Packing
21. Bracket
22. Washers
23. Flange
24. Packing
25. Nut
26. Plug
27. Packing
28. Manifold, check valve
29. Nut
30. Packing
31. Plug

UH-1H-II-M-10-8

Figure 10-8. Shutoff valve and check valve manifold

g. Connect fuel hose to union (16).

10-39. Test Procedures — Shutoff Valve.

a. Place BAT switch ON, move FUEL switch to ON. Check all disturbed points for fuel leaks. Observe that manual override handle on fuel shutoff valve moves to open position. Move FUEL switch to OFF. Observe that manual override handle moves to closed position. Place BAT switch OFF.

b. Close engine cowling and install access panel on pylon island.

10-40. GOVERNOR BLEED CHECK VALVE.

10-41. Description — Governor Bleed Check Valve. A governor bleed check valve is located in the governor bleed return line connected to center fuel cell assembly. The governor bleed check valve allows separated air and fuel vapor to return to fuel tank and prevents reverse flow of fuel.

10-42. Removal — Governor Bleed Check Valve.

a. Defuel system.

b. Working through access door (53, figure 2-20), disconnect hose or tube assembly from check valve.

c. Remove nut, check valve and packing.

10-43. Inspection — Governor Bleed Check Valve. Inspect check valve for corrosion, leaks and security.

10-44. Replacement — Governor Bleed Check Valve. Replace check valve if corroded, damaged or if leakage exists.

10-45. Installation — Governor Bleed Check Valve.

a. Install packing and nut to check valve and install in fuel cell. Tighten nut.

b. Connect hose or tube assembly to check valve.

10-46. Test Procedures — Governor Bleed Check Valve. Perform fuel system operational check. (Paragraph 10-11.)

10-47. MANIFOLD ASSEMBLY.

10-48. Description — Manifold Assembly. A check valve manifold (28, figure 10-8), is located at left front of engine forward firewall and is connected into fuel pressure lines ahead of shutoff valve. Manifold contains two separate valve elements at inlet ports, each consisting of a check valve which prevents reverse flow except through its thermal relief bypass of trapped fuel. Manifold also has an outlet port and a tap for fuel pressure gage transmitter at outlet side of check valves.

10-49. Removal — Manifold Assembly.

a. Remove fuel shutoff valve (10, figure 10-8) and manifold (28) as an assembly. (Paragraph 10-35.)

b. Separate manifold (28) from fuel shutoff valve. (Paragraph 10-35.)

c. Remove restrictor (1), nut (2), packing (3), plugs (26 and 31) and packings (27 and 30). Discard packings.

10-50. Inspection — Manifold Assembly.

a. Inspect manifold assembly for damage, corrosion and leaks.

b. Inspect check valves in manifold for proper operation. (Paragraphs 10-11 and 10-12.)

10-51. Replacement — Manifold Assembly.

a. Assemble packing (3, figure 10-8), restrictor (1) and nut (2) to manifold.

b. Assemble plugs (26 and 31) and packings (27 and 30) to manifold.

10-52. Installation — Manifold Assembly.

a. Assemble manifold (28) to fuel shut-off valve. (Paragraph 10-37.)

b. Install manifold to firewall. (Paragraph 10-38.)

10-53. CROSSOVER ASSEMBLIES.

10-54. Description — Crossover Assemblies. Six crossover assemblies (7, figure 10-4) interconnect forward and aft fuel cells. Each crossover has a flange type fitting for connection to fuel cell or crossover.

10-55. Removal — Crossover Assemblies.

NOTE

Removal procedures are identical for either side.

a. Lower Forward Crossover.

(1) Defuel system.

(2) Remove access panels (48 and 57, figure 2-20).

(3) Remove six bolts, six washers and packing from forward connection.

(4) Remove four bolts, four washers, four nuts and packing connecting lower forward crossover to upper crossovers.

(5) Remove lower forward crossover assembly.

b. Upper Crossover Assemblies.

(1) Defuel system.

(2) Remove four bolts, four washers and packing securing inboard crossboard to center fuel cell.

(3) Remove four bolts, four washers and packing securing outboard crossover to outboard fuel cell.

(4) Remove four bolts, four washers and four nuts connecting upper crossovers to lower forward crossover.

(5) Remove upper crossovers.

10-56. Inspection — Crossover Assemblies. Inspect crossover assemblies for nicks, scratches and damage.

10-57. Repair or Replacement — Crossover Assemblies.

a. Burnish out scratches, nicks or burrs less than 0.005 inch deep on the mating surfaces and in sealing groove of fitting using crocus cloth. Treat repaired area using chemical film material (C-100).

b. Repair damage exceeding 0.005 inch but not more than 0.020 inch in depth as follows:

(1) Isolate the damaged areas and sand, using 180 grit abrasive cloth or paper (C-423).

(2) Clean with trichloreothane (C-334).

(3) Air dry and apply MMM-A-132 adhesive. Allow to dry at room temperature for a minimum of 24 hours.

(4) Rework to original surface and finish.

c. Replace any crossover assembly if damage is extensive or if nicks, scratches, or burrs exceed 0.020 inch depth.

10-58. Installation — Crossover Assemblies.

a. Lower Forward Crossover.

(1) Connect lower forward crossover to forward fuel cell using packing, six washers and six bolts.

(2) Connect opposite end to upper outboard crossover using packing, four bolts, four washers and four nuts.

b. Upper Crossover Assemblies.

(1) Connect upper outboard crossover to outboard fuel cell using packing, four washers and four bolts.

(2) Connect upper inboard crossover to center fuel cell using packing, four washers and four bolts.

(3) Connect upper outboard crossover to lower forward crossover using packings, four bolts, four washers and four nuts.

(4) Refuel fuel system and check for leaks.

10-59. SIPHON BREAKER VALVE.

10-60. Description — Siphon Breaker Valve. A siphon breaker (check) valve (1, figure 10-9) in the vent system allows air to vent into the forward tanks through overboard vent and prevents fuel from siphoning out cells through overboard drain.

10-61. Removal — Siphon Breaker Valve.

a. Remove access cover (38, figure 2-20).

b. Remove siphon breaker valve (1, figure 10-9), and packing (2).

10-62. Inspection — Siphon Breaker Valve.

a. Inspect valve for corrosion, leakage and damage.

b. Replace siphon breaker valve if defective.

10-63. Replacement — Siphon Breaker Valve. Replace valve.

10-64. Installation — Siphon Breaker Valve.

a. Install replacement valve (1) with packing (2) into fitting (3).

b. Install access cover (38, figure 2-20).

10-65. COVERPLATE — AFT CENTER FUEL CELL.

10-66. Description — Coverplate — Aft Center Fuel Cell. The aft center fuel cell incorporates a coverplate (access) (3, figure 10-10), which allows internal access to fuel cell and is used for removal/ installation of fuel cell. A fuel quantity transmitter (probe) and a float switch are mounted on coverplate.

10-67. Removal — Coverplate — Aft Center Fuel Cell.

a. Disconnect tube assembly at governor bleed valve location.

b. Disconnect fuel quantity transmitter and float switch electrical connections.

c. Remove bolts (5) and washers (4) securing coverplate (3) to structure.

d. Remove clips and tie wrap securing transmitter (1) to coverplate (3).

e. Carefully remove transmitter (1) and coverplate (3). Remove packing (2) from fuel cell.

10-68. Inspection — Coverplate — Aft Center Fuel Cell. Inspect coverplate (3) for nicks, corrosion and damage.

10-69. Replacement — Coverplate — Aft Center Fuel Cell. Replace coverplate (3) if damage exceeds inspection requirements.

10-70. Installation — Coverplate — Aft Center Fuel Cell.

a. Partially position coverplate (3) in fuel cell, secure transmitter to coverplate using clips and tie wrap.

b. Install packing (2) to fuel cell.

c. Install coverplate using bolts (5), washers (4) and torque bolts (5) 40 to 50 inch-pounds.

d. Install tube assembly at governor bleed valve location.

e. Connect transmitter and float switch connections.

f. Pressure test fuel cell. (Paragraph 10-12.)

10-71. CAP AND ADAPTER ASSEMBLY.

10-72. Description — Cap and Adapter Assembly. A cap and adapter assembly (figure 10-11) is located on structure and connected to the aft right side fuel cell. The cap and adapter provides a single point fueling location for the fuel system.

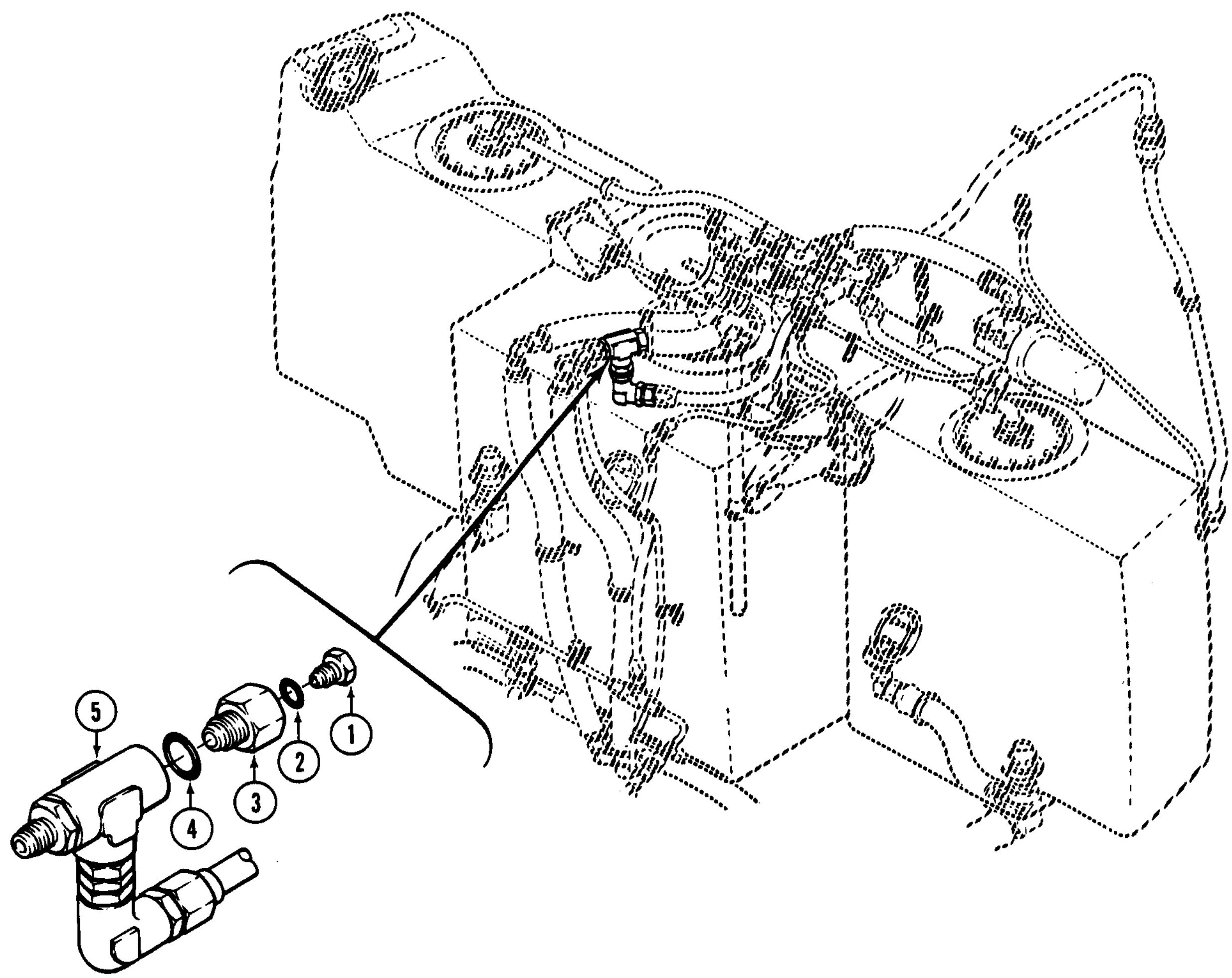
10-73. Removal — Cap and Adapter Assembly.

a. Remove bolts (1, figure 10-11) and washer (2).

b. Remove cap and adapter assembly from structure. Remove packing (4).

c. Remove cap (8) from adapter (5).

d. Remove packing (6) from cap (8).



1. Siphon breaker valve
2. Preformed packing
3. Fitting
4. Preformed packing
5. Tee

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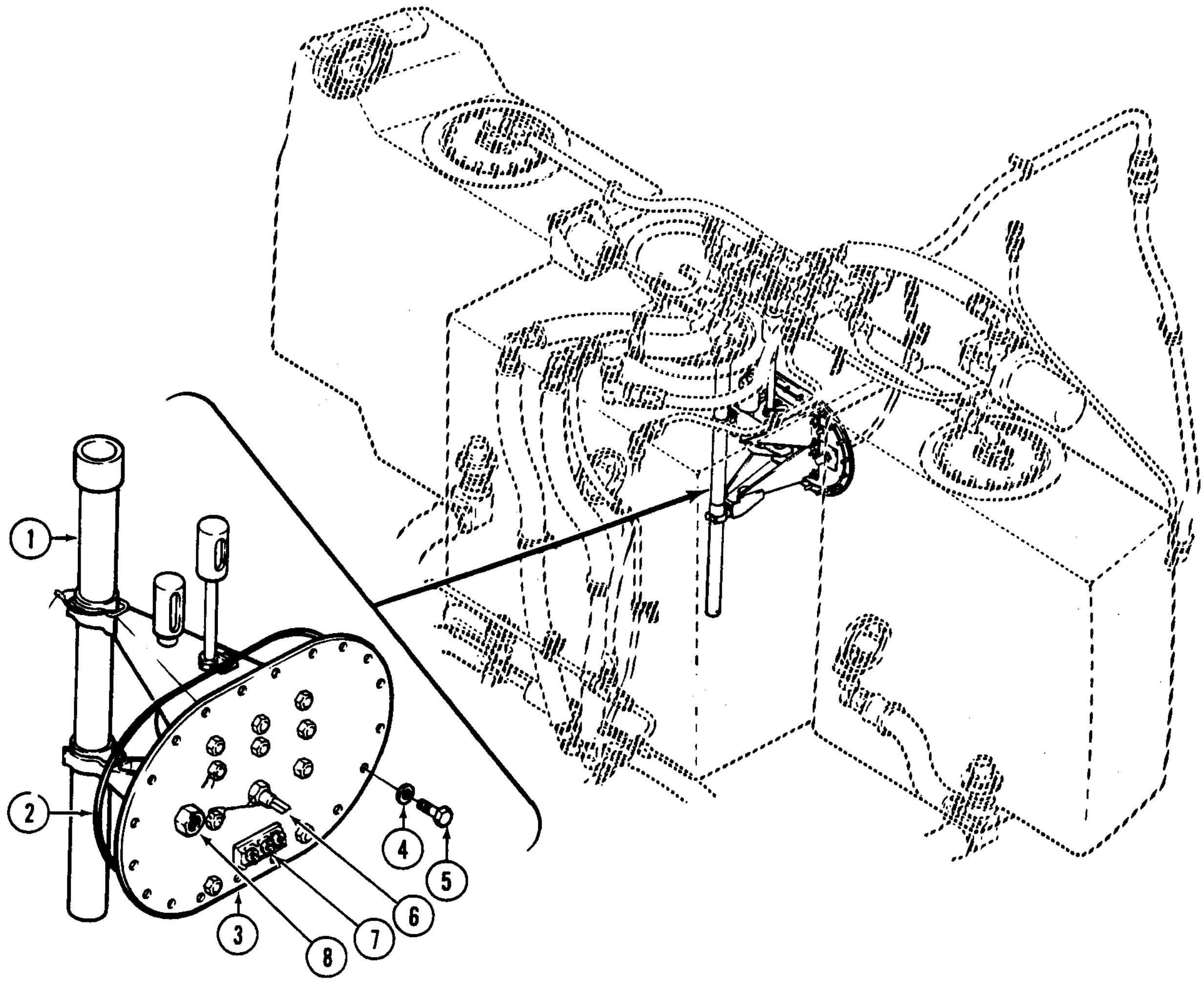
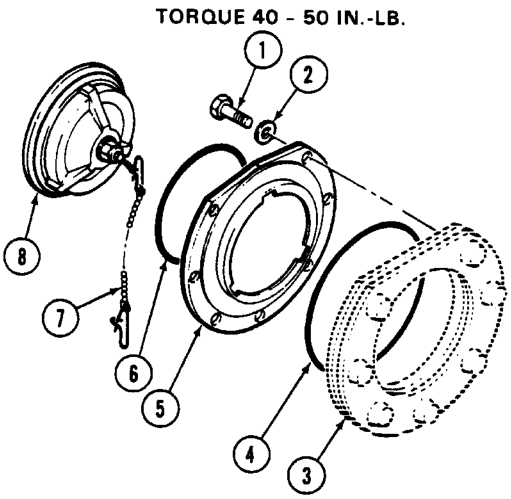
Figure 10-9. Siphon breaker valve installation



1. Fuel quantity transmitter (probe)
2. Preformed packing
3. Cover plate (aft center fuel cell)
4. Washer
5. Bolt
6. Float switch electrical connection
7. Fuel quantity transmitter electrical connection
8. Governor bleed valve tube connection

UH-1H-II-M-10-10

Figure 10-10. Coverplate installation — aft center center fuel cell



1. Bolt
2. Washer
3. Fuel cell and structure
4. Preformed packing
5. Adapter
6. Preformed packing
7. Chain assembly
8. Cap assembly

UH-1H-II-M-10-11

Figure 10-11. Cap and adapter assembly

10-74. Inspection — Cap and Adapter Assembly.

a. Inspect cap assembly (8) for proper locking and sealing.

b. Inspect chain (7) for security.

c. Inspect adapter (5) for damage and corrosion.

10-75. Installation — Cap and Adapter Assembly.

a. Install packing (4) to adapter (5).

b. Secure adapter (5) to structure and fuel cell using washers (2) and bolts (1). Torque bolts 40 to 50 inch-pounds.

c. Install packing (6) to cap assembly (8). If disconnected, connect chain to adapter (5). Install cap assembly to adapter (5).

10-76. FLOAT SWITCH — 20 MINUTE FUEL WARNING SYSTEM.

10-77. Description — 20 Minute Fuel Warning System. A float switch is located on the left fuel cell sump assembly. The float switch illuminates the 20 MINUTE FUEL caution light located in the pedestal caution panel. Illumination occurs when fuel quantity decreases to 170 (±30) pounds.

10-78. Removal — Float Switch — 20 Minute Fuel Warning System.

a. Defuel system.

b. Disconnect battery.

c. Remove left fuel cell sump assembly. (Paragraph 10-120.)

d. Unscrew float switch from standpipe, pull switch and wires through standpipe.

10-79. Inspection — Float Switch — 20 Minute Fuel Warning System. Inspect float switch for cracks, damage and security.

10-80. Replacement — Float Switch — 20 Minute Fuel Warning System. Replace float switch if inoperative or if damage exceeds inspection requirements.

10-81. Installation — Float Switch — 20 Minute Fuel Warning System.

a. Install packing to float switch, thread float switch wiring through standpipe and screw switch to standpipe.

b. Reinstall fuel cell sump assembly. (Paragraph 10-123.)

c. Refuel system and connect battery.

10-82. Test Procedures — Float Switch — 20 Minute Fuel Warning System.

a. Place battery switch on.

b. Check 20 MINUTE FUEL caution light located on pedestal caution panel. Light should be illuminated when fuel quantity is below 170 (±30) pounds of fuel.

c. Refuel helicopter (Chapter 1).

d. Observe 20 MINUTE FUEL caution light and fuel quantity indicator. Light should go out when fuel quantity reaches 170 (±30) pounds.

10-83. FUEL BOOST PUMPS.

10-84. Description — Fuel Boost Pumps. An impeller type fuel boost pump is located in each forward fuel cell sump assembly. The boost pumps are 28 Volt DC electrically operated and deliver fuel under pressure to engine fuel control, passing through fuel manifold and fuel shutoff valve. The fuel boost pump is rated at 990 pounds per hour at 8 to 25 PSIG.

10-85. Troubleshooting — Fuel Boost Pumps. Refer to paragraph 10-10 and table 10-2 for troubleshooting procedures.

10-86. Removal — Fuel Boost Pumps.

NOTE

Removal procedures are identical for right or left side fuel boost pump.

a. Defuel system and disconnect battery.

b. Remove sump assembly. (Paragraph 10-120.)

c. Remove pump drain plug (16, figure 10-12) and drain fuel from pump.

d. Remove attaching hardware and separate boost pump (11) from sump assembly. Remove gasket (10).

10-87. Replacement — Fuel Boost Pumps.

NOTE

If cross fitting contains a conical screen, remove screen and discard. Reinstall cross fitting without screen.

a. Remove bolt (15), washer (17), packing (18), plug (19), packing (20), and cross fitting (26) from defective pump.

b. Replace all packings when reassembling pump.

c. Attach cross fitting (26) to replacement pump using bolt (15), washer (17), packing (18), plug (19) and packing (20). Position cross fitting as shown, tighten bolt (15) and safety with lockwire (C-405).

d. Install packing (14) on pump drain plug (16). Install plug in drain port of pump and safety with lockwire (C-405).

10-88. Installation — Fuel Boost Pumps.

a. Position boost pump (11) in mounting port of sump plate with gasket (10) in place, secure boost pump to sump plate with attaching hardware.

b. Connect flow switch hose to pump cross fitting (26).

c. If boost pump is not being replaced, remove cross fitting (26) and inspect. If cross fitting contains a screen, remove screen and discard, reinstall cross fitting without screen.

d. Install sump assembly. (Paragraph 10-123.)

10-89. Functional Test — Fuel Boost Pumps and Ejector Pumps.

a. Turn electrical power ON.

b. Turn main fuel switch ON.

c. Activate fuel boost circuit breaker.

d. If right and/or left fuel boost light is on, check fuel pressure gage for correct pressure.

e. If pressure is not indicated, electric boost pump is inoperative.

f. If pressure is indicated, check for malfunction of ejector pump or check valve flow switch.

10-90. CROSS FITTING.

10-91. Description — Cross Fitting. A cross fitting (26, figure 10-12) is installed in each boost pump.

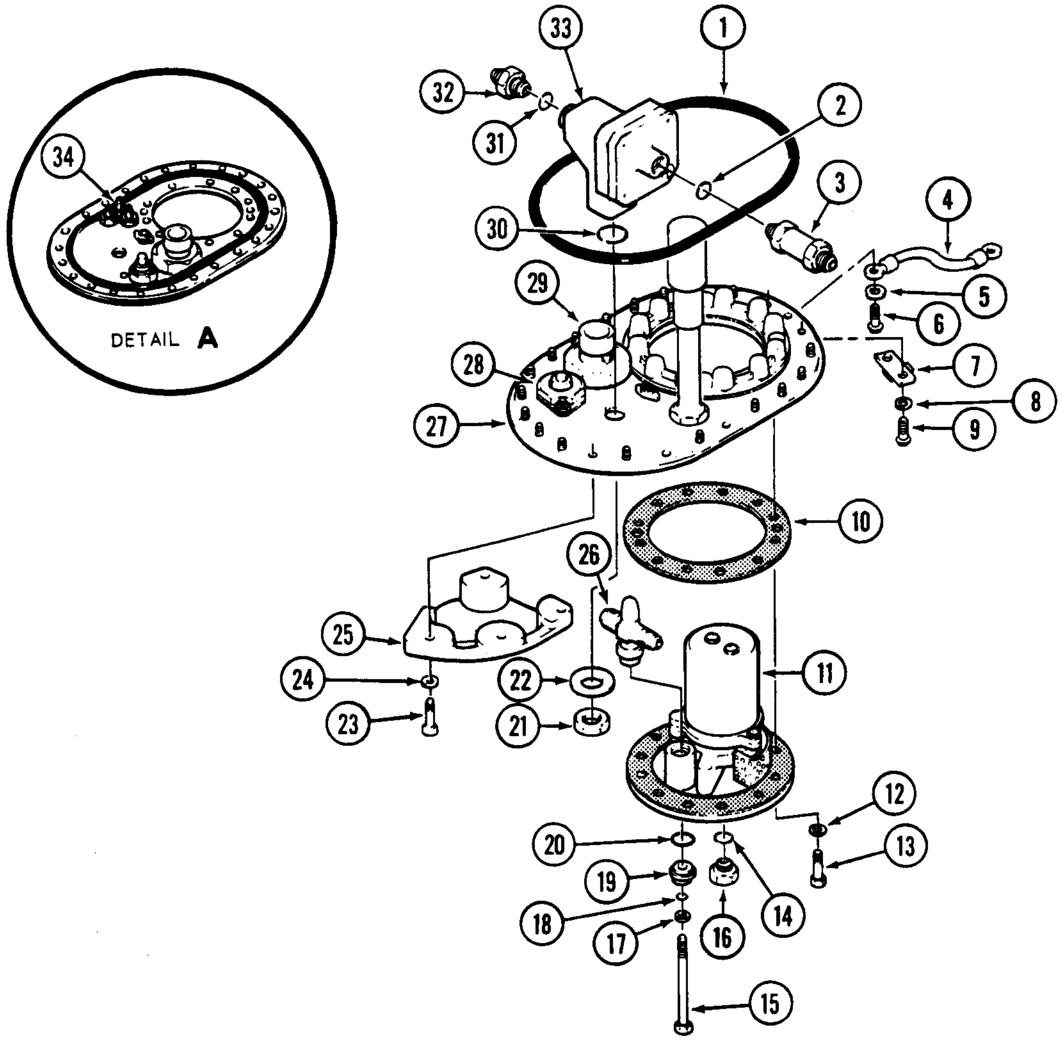
10-92. Removal — Cross Fitting.

a. Turn the fuel cell sump assembly. (Paragraph 10-120.)

b. Disconnect the fuel lines from inlet and outlet ports of cross fitting (26, figure 10-12).

c. Cut lockwire and remove bolt securing cross fitting to boost pump flange.

d. Remove rubber plugs from lower end of cross fitting.



1. Preformed packing
2. Preformed packing
3. Check valve
4. Ground wire
5. Washer
6. Screw
7. Retainer (4 places)
8. Washer
9. Screw
10. Gasket
11. Electric boost pump
12. Washer
13. Bolt
14. Preformed packing
15. Bolt
16. Pump drain plug
17. Washer
18. Preformed packing
19. Retaining plug
20. Preformed packing
21. Nut
22. Washer
23. Bolt
24. Washer
25. Screen cover
26. Cross fitting
27. Sump
28. Sump drain valve
29. Defuel valve
30. Preformed packing
31. Preformed packing
32. Union
33. Flow switch
34. Fuel quantity connections (right side sump only)

UH-1H-II-M-10-12

Figure 10-12. Fuel tank sump assembly removal (installation)

10-93. Replacement — Cross Fitting. Install new rubber plug and two packings in bottom of cross fitting at reassembly.

NOTE

If cross fitting has a conical screen, remove screen and install cross fitting without screen.

10-94. Installation — Cross Fitting.

a. Install bolt previously removed through boost pump (11, figure 10-12) flange into cross (26) and secure fitting to boost pump. Lockwire bolt.

b. Connect fuel lines to each side of cross fitting.

c. Install forward fuel cell sump assembly. (Paragraph 10-123.)

10-95. FUEL QUANTITY TRANSMITTERS.

10-96. Description — Fuel Quantity Transmitter. The fuel system incorporates three fuel quantity transmitters (probes). One transmitter is located in aft center fuel cell and two are located in right forward fuel cell.

10-97. Removal — Fuel Quantity Transmitter. Refer to paragraphs 10-3 and 10-65 for removal of applicable transmitter.

10-98. Installation — Fuel Quantity Transmitter. Refer to paragraphs 10-6 and 10-70 for installation of applicable transmitter.

10-99. EJECTOR PUMP.

10-100. Description — Ejector Pump. An ejector pump (2, figure 10-13) is located in forward end of each forward fuel cell. The ejector pump continually pumps fuel over fuel cell baffle into rear section of fuel cell, ensuring an adequate fuel level for the fuel boost pump in all flight attitudes.

10-101. Removal — Ejector Pump.

a. Disconnect battery and all external power sources. Defuel system.

b. Remove floor section directly above forward fuel tank.

c. Loosen 16 bolts in access cover (1).

d. Gradually work cover (1) out of cell.

e. Disconnect hoses (5 and 6, figure 10-13) from ejector pump (2).

f. Remove bolts (3) that secure pump.

g. Remove ejector pump through access port in cell.

10-102. Cleaning — Ejector Pump. Remove any obstructions from openings in ejector pump using compressed air. If necessary, clean nozzle opening using safety wire. Do not enlarge nozzle hole during cleaning process.

10-103. Inspection — Ejector Pump. Inspect ejector pump for corrosion, damage and general condition.

10-104. Installation — Ejector Pump.

a. Install ejector pump through access port in forward fuel cell.

b. Install bolts (3, figure 10-13) and washers (4) that secure pump.

c. Connect hoses (5 and 6) to ejector pump (2).

d. Install access cover (1) in fuel cell access port and tighten bolts.

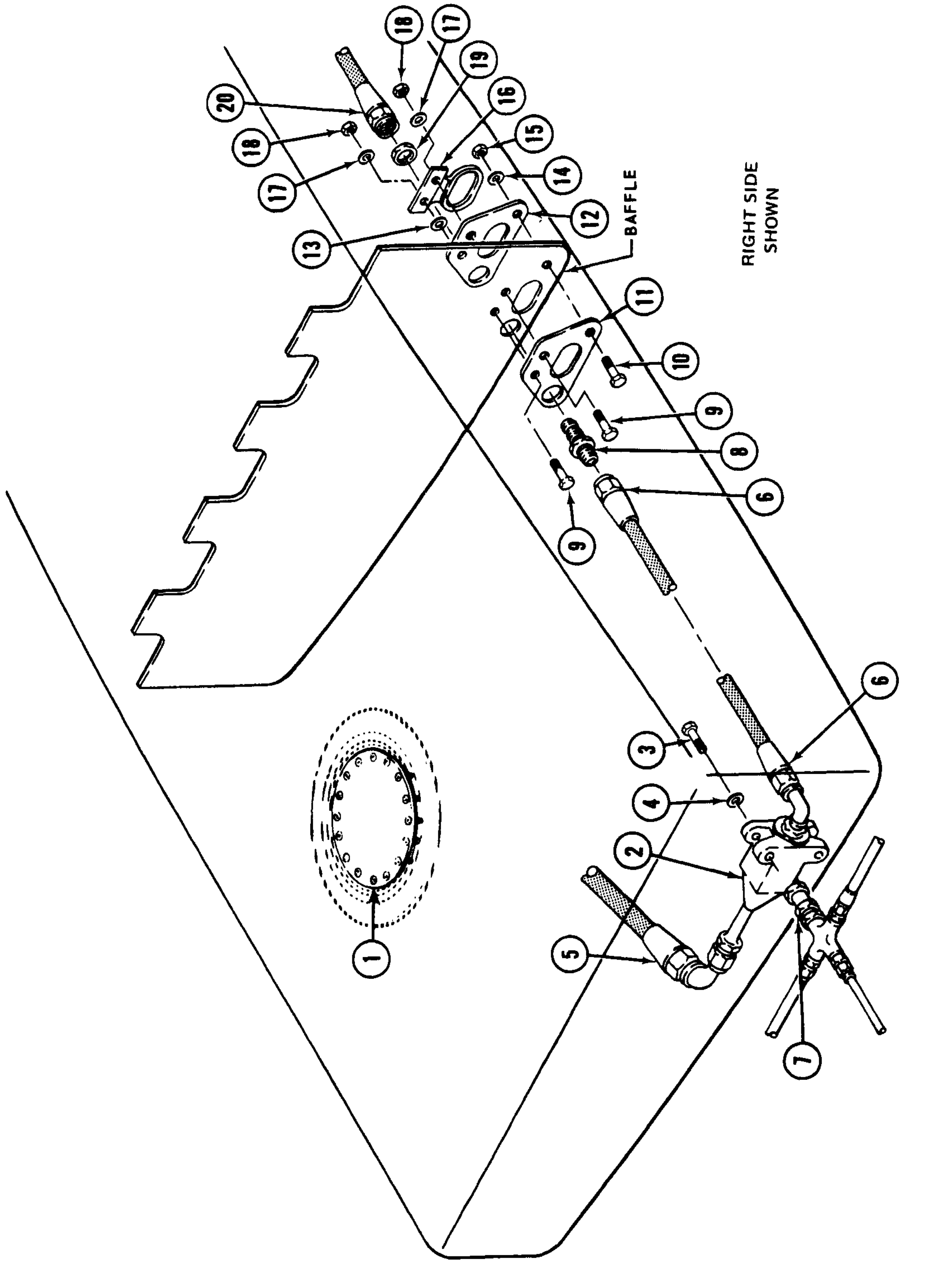
e. Replace floor panel.

10-105. FLAPPER VALVE.

10-106. Description — Flapper Valve. A flapper valve (16, figure 10-13) is located in forward fuel cell. The flapper valve is located on the baffle and prevents flow of fuel out of sump area when helicopter is in a nose down flight attitude.

10-107. Removal — Flapper Valve.

a. Disconnect battery and all external power sources. Defuel system.



1. Access cover
2. Ejector pump
3. Bolt
4. Washer
5. Hose
6. Hose
7. Fitting
8. Nipple
9. Bolt
10. Bolt
11. Plate
12. Plate
13. Shim washers
14. Washer
15. Nut
16. Flapper valve
17. Washer
18. Nut
19. Nut
20. Hose

UH-1H-II-M-10-13

Figure 10-13. Fuel system components

b. Remove floor section directly above forward fuel cell.

c. Remove access cover to fuel cell sump assembly.

d. Disconnect lines on sump assembly.

e. Remove bolts from sump assembly.

f. Remove sump assembly through access opening.

g. Loosen bolts holding access port cover.

h. Gradually work cover out of opening.

NOTE

Flapper valve (16, figure 10-13) is located on the aft side of fuel cell baffle.

i. Remove two bolts (9), nuts (18), and washers (17) from flapper valve (16).

j. Remove flapper valve.

10-108. Inspection — Flapper Valve. Inspect flapper valve (16) for cracks, warpage and damage.

10-109. Replacement — Flapper Valve. Replace flapper valve if damage exceeds inspection requirements.

10-110. Installation — Flapper Valve.

a. Insert bolts (9, figure 10-13) through plates (11 and 12) and shim washers (13) on bolts (9), then install flapper valve (16) on bolts.

b. Check flapper valve to make sure it is flush with opening. Proper clearance is obtained by shimming with shim washers (13) on each bolt (9) between plate (12) and flapper valve (16).

c. Install nuts (18) on bolts (9) and check flapper valve (16) to be sure it is flush with opening. If not, reshim as indicated in step b.

d. Install access port cover.

e. Tighten bolts in cover (1).

f. Install sump assembly through access cover opening.

g. Install and tighten bolts in sump assembly.

h. Connect hoses to sump assembly.

i. Install access cover to fuel cell sump assembly.

j. Install floor section.

10-111.FLAPPER VALVE PLATES.

10-112. Description — Flapper Valve Plates. Two plates installed on the baffle provide for mounting of the flapper valve and fuel fittings. (Figure 10-13.)

10-113. Removal — Flapper Valve Plate. Refer to items 11 and 12, figure 10-13.

a. For access procedure. (Paragraph 10-107.)

b. Disconnect hoses (6) and (20) from nipple (8).

c. Remove bolt (10), nut (15) and washer (14).

d. Remove flapper valve. (Paragraph 10-107.)

10-114. Cleaning — Flapper Valve Plates. If corroded, clean corrosion from plates.

10-115. Inspection — Flapper Valve Plates. Inspect plates (11 and 12) for cracks and warpage.

10-116. Repair or Replacement — Flapper Valve Plates. Replace plates if cracked or warped.

10-117. Installation — Flapper Valve Plates.

a. Insert bolt (10) through plates (11 and 12).

b. Place washer (14) on bolt (10) and thread nut (15) on bolt. Tighten nut.

c. Connect hoses (6 and 20, figure 10-13).

d. Install flapper valve. (Paragraph 10-110.)

e. Install remaining components. (Paragraph 10-110.)

10-118.FUEL CELL SUMP ASSEMBLY.

10-119. Description — Fuel Cell Sump Assembly. The fuel cell sump assemblies are mounted in openings on the underside of each forward fuel tank. Removal of the sump assemblies from the tanks permits access for maintenance and replacement of the boost pump, slow switch, check valve, cross fittings, and sump drain valve. (Figure 10-12.)

10-120. Removal — Fuel Cell Sump Assembly.

a. Disconnect battery and any external power source. Defuel system.

b. Remove sump access panel from underside of cabin by removing screws. Mark access panel so it can be installed in same position.

c. Open sump drain valve (28, figure 10-12) to drain trapped fuel into suitable container. On right cell only, drain sump through valve provided.

d. Disconnect tubes and electrical leads of units attached to sump (27).

e. Remove 12 bolts and 12 washers around sump plate. Lower sump assembly (27) and support it below mounting port. Reach through opening to disconnect hoses from boost pump (11) outlet, flow switch (33) outlet, and disconnect fuel quantity gage tank unit electrical leads as necessary.

f. Remove sump assembly (27). Remove packing seal from groove around cell opening. Cover opening immediately to prevent entry of foreign matter.

10-121. Inspection — Fuel Cell Sump Assembly.

a. Inspect drain valve for leaking packing or seal washers. (Figure 10-12.)

b. Inspect flow switch, flow switch gaskets, and packings for evidence of leakage.

c. Inspect fuel quantity indicating system electrical connectors on right sump for damage.

10-122. Repair or Replacement — Fuel Cell Sump Assembly. Replace components which show evidence of damage or have been found to be faulty during troubleshooting procedures.

10-123. Installation — Fuel Cell Sump Assembly.

a. Locate free ends of hoses which attach to boost pump and to flow switch inside fuel cell. Locate fuel quantity probe leads if a right fuel cell sump is being installed.

b. Install packing in groove around cell opening. Use a small amount of adhesive (C-312) to hold packing in place.

c. Position clean, properly assembled sump assembly, with boost pump (11, figure 10-12), flow switch (33), check valve (3), cross fitting (26), and sump drain valve (28) properly installed, slightly below opening. Reach inside and connect outlet hose to pump fitting. Connect outlet hose to flow switch (33) and cross fitting (26) and attach fuel quantity tank unit leads to connectors.

d. Raise sump plate to normal position and secure with bolts and washers. Tighten bolts evenly. Torque 40 to 50 inch-pounds.

e. Connect external lines and electrical leads of pump and other units of sump assembly.

f. Check for leaks and for proper functioning of indicators when system is being refilled.

g. Reinstall access panel.

10-124.FLOW SWITCH.

10-125. Description — Flow Switch. The flow switch (33, figure 10-12) is attached to the sump plate on the underside of each forward fuel tank.

10-126. Removal — Flow Switch.

a. Remove sump assembly. (Paragraph 10-120.)

b. Disconnect fuel line from check valve (3) and fuel line from outlet of flow switch (33).

c. Disconnect electrical terminals and cover ends with tape.

d. Cut lockwire and remove nut and washer securing flow switch (33) to sump plate; remove flow switch (33), and check valve (3) from sump plate.

e. Remove check valve (3) from flow switch (33).

f. Remove packing from flow switch electrical unit.

10-127. Replacement — Flow Switch.

a. Replace flow switch (33) if malfunctioning.

b. Replace packing with like serviceable item.

10-128. Installation — Flow Switch.

a. Install check valve (3, figure 10-12) in inlet port of the flow switch (33).

b. Install new packing (30) on electrical outlet.

c. Position flow switch (33) and check valve (3) on sump plate with electrical inlet projecting through plate.

d. Install washer (22) on electrical outlet and secure flow switch to sump plate with nut (21) previously removed. Lockwire nut.

e. Connect electrical terminals.

f. Replace sump assembly (27). (Paragraph 10-123.)

10-129.CHECK VALVE.

10-130. Description — Check Valve. The check valve (3, figure 10-12) is installed in the inlet port of the flow switch (33).

10-131. Removal — Check Valve.

a. Remove sump assembly. (Paragraph 10-120.)

b. Disconnect hose from inlet port of check valve (3).

c. Unscrew check valve (3) from inlet port of flow switch (33).

d. Remove packing (2) between flow switch (33) and check valve (3). Discard packing.

10-132. Replacement — Check Valve.

a. Replace check valve (3) if malfunctioning.

b. Replace packing (2) between flow switch (33) and check valve (3) with like serviceable item.

10-133. Installation — Check Valve.

a. Install new gasket between check valve (3, figure 10-12) and flow switch (33).

b. Install check valve (3) in inlet port of flow switch with direction of flow toward flow switch (33).

c. Connect hose to inlet port of check valve (3).

d. Replace sump assembly. (Paragraph 10-123.)

10-134.AUXILIARY FUEL PROVISIONS.

Permanently installed provisions for use of auxiliary fuel tanks include drain, vent, and fuel transfer connections and a stowed transfer pump relay circuit, with two float switches in center aft fuel cell, to limit fuel level during transfer. (Figure 10-14.)

10-135.FUEL SYSTEM — 300 GALLON AUXILIARY — CRASHWORTHY.

10-136. Description — Fuel System — 300 Gallon Auxiliary. Two 150 U.S. gallon capacity crashworthy auxiliary fuel cells (figure 10-15) may be installed in the passenger-cargo compartment for extended distance and ferry missions. The cells are located at the intersection of the aft cabin bulkhead and the transmission support structure, one on each side of cabin. Each cell is equipped with an electrically operated fuel transfer pump, a fuel low-level switch for controlling CAUTION panel indicator AUX FUEL LOW circuit, fittings and flexible hoses with quick-disconnect couplings, a float type fuel gage, and a closed circuit refueling receiver. The fuel cell hoses connect to lines under the cabin floor which are a permanent part of the main fuel system. The auxiliary transfer pump circuit relay is controlled by float switches in the main fuel cells. (Refer to BHT PUB-92-004-10 for operating instructions and general information.)

Table 10-3. Troubleshooting — Auxiliary Fuel System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. No fuel transfer from one auxiliary fuel cell.

STEP 1. Check fuel discharge hose coupling for proper seating.

Connect coupling properly or replace coupling.

STEP 2. Ensure check valve (fuel discharge line) is operating correctly.

If check valve is defective, replace check valve. Do not attempt to clean and reuse check valve exception emergency conditions.

STEP 3. Check for defective fuel pump or fuel pump electrical circuit.

If electrical power is available at fuel pump, replace defective pump, otherwise check and repair defective wiring.

2. No fuel transfer from either auxiliary fuel cell.

STEP 1. Check for faulty transfer relay.

Repair or replace transfer relay.

STEP 2. Check for faulty float switch or electrical circuit.

Replace float switch or repair faulty circuit.

3. Fuel overflows main cell vents during fuel transfer.

STEP 1. Check upper float switch (aft center fuel cell) to ensure it is actuating transfer relay.

Replace upper float switch or transfer relay, as required.

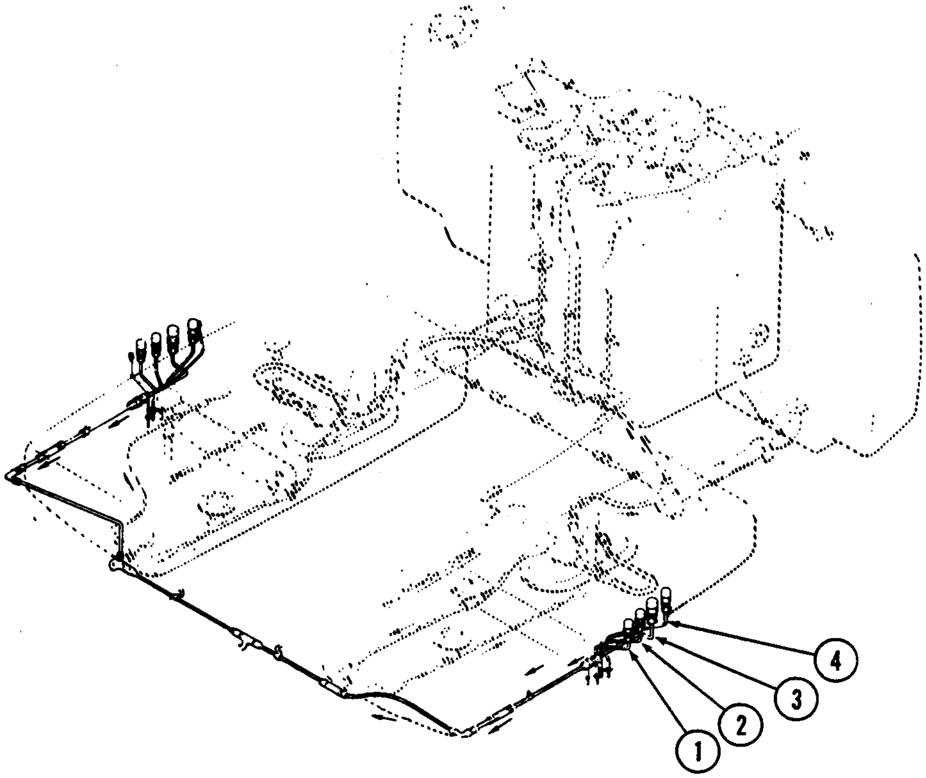
4. Auxiliary cell collapsing during fuel transfer.

STEP 1. Check for clogged vent line.

Replace or clean vent line.

STEP 2. Check for defective low level float switch or electrical circuit.

Replace defective switch or faulty wiring.



AUXILIARY INTERNAL FUEL TANK CONNECTIONS:

1. Electrical connector
2. Tank vent line
3. Fuel line
4. Tank drain line

UH-1H-II-M-10-14

Figure 10-14. Auxiliary fuel provisions

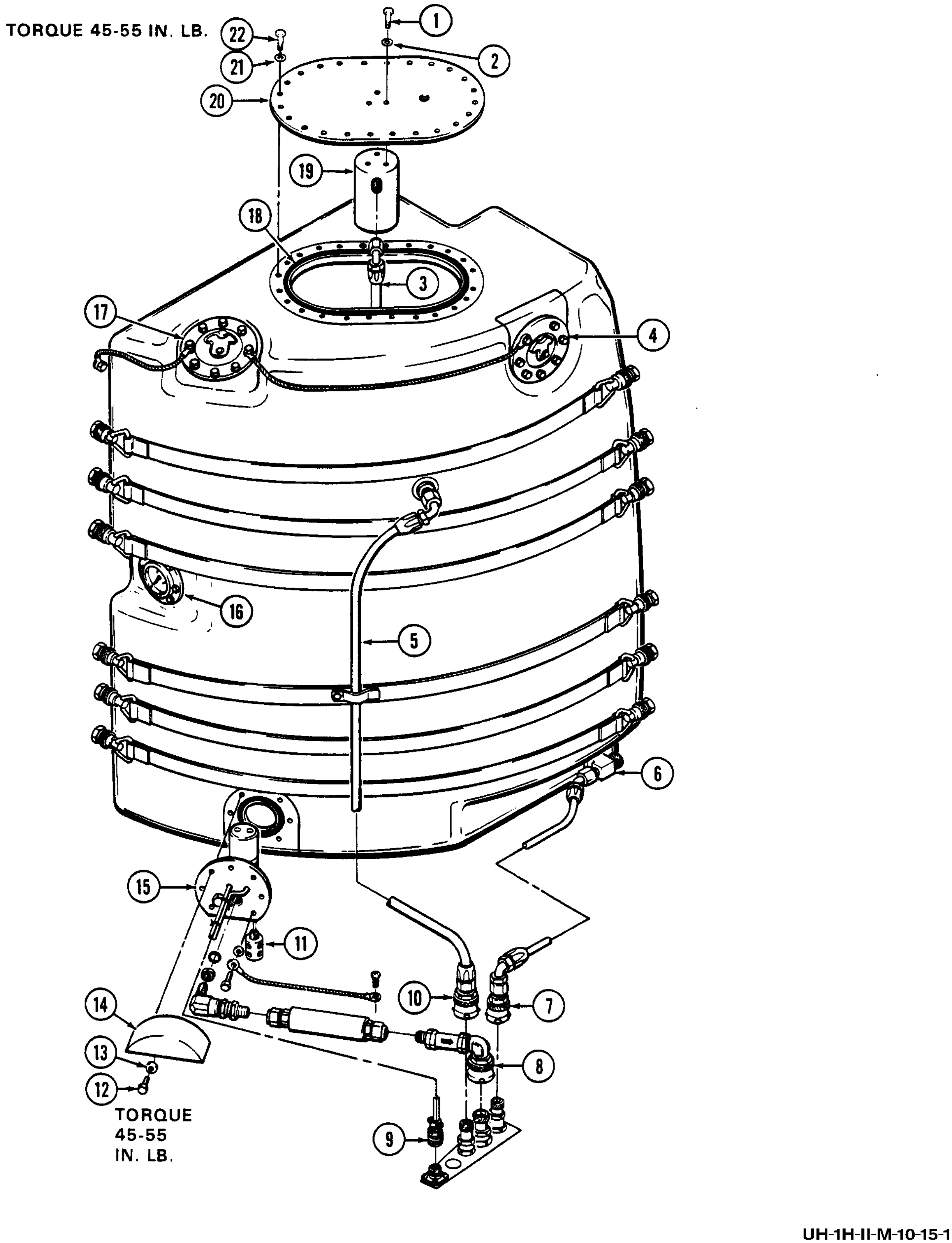


Figure 10-15. Auxiliary fuel cell — typical (Sheet 1 of 2)

1. Bolt
2. Washer
3. Hose assembly
4. Receiver assembly
5. Hose assembly
6. Drain valve
7. Drain quick disconnect
8. Discharge quick disconnect
9. Electrical quick disconnect
10. Vent quick disconnect
11. Low level float switch
12. Bolt
13. Washer
14. Cover
15. Pump assembly
16. Fuel gage
17. Filler cap
18. Packing
19. Fuel shutoff valve
20. Cover plate
21. Washer
22. Bolt

UH-1H-II-M-10-15-2

Figure 10-15. Auxiliary fuel cell — typical (Sheet 2 of 2)

10-138. Pressure Testing — Fuel System — 300 Gallon Auxiliary.

a. Drain all fuel from auxiliary cell.

b. Disconnect fuel discharge line (8, figure 10-15).

c. Check that valve (6) is in off position.

d. Check that filler cap is secured.

e. Connect pressurizing connector (figure 10-16) to end of tank vent line (5, figure 10-15) on underside of helicopter. Make an adapter to fit between 0.5 inch OD tube on helicopter and 1.0 inch ID of work aid. Secure to vent tube with a hose clamp.

CAUTION

Monitor pressurization closely to prevent damage to fuel cell from over-pressurization.

f. Using a controllable low pressure air source, slowly pressurize entire fuel cell to 2.500 (±0.25) psi.

g. Shut off air source. System should hold initial pressure for 15 minutes.

h. If pressure drops off, repressurize and check for air leaks. Take corrective action as required to repair and repressure cell.

i. After test, reduce pressure slowly and remove pressurizing connector.

j. Connect fuel discharge line (8, figure 10-15).

10-139. Operational Check — Fuel System — 300 Gallon Auxiliary.

a. Open AUX FUEL TRANS and MASTER CAUTION LTS circuit breakers. Place BATTERY switch and both INT AUX FUEL TRANS PUMP switches OFF.

b. Before servicing auxiliary fuel tanks, check operation of float switch and caution panel circuit:

(1) Place BATTERY switch ON. Close MASTER CAUTION LTS circuit breaker. AUX FUEL LOW caution panel should be unlighted.

(2) Place RH INT AUX FUEL TRANS PUMP switch to ON. AUX FUEL LOW caution panel should be illuminated. Return switch to OFF and check that caution panel extinguishes.

(3) Repeat step (2) using LH INT AUX FUEL TRANS PUMP switch.

(4) Place BATTERY switch to OFF.

c. After servicing auxiliary fuel tanks, check operation of fuel transfer to main fuel system.

NOTE

Main fuel system must be less than full to allow operation of fuel transfer pumps.

(1) Place BATTERY switch ON. Check that MASTER CAUTION LTS circuit breaker is closed and that AUX FUEL LOW caution panel is unlighted. Place RH AUX FUEL TRANS PUMP switch to ON, then OFF; then operate LH switch in same manner. Observe that caution panel segment remains unlighted.

(2) Place NON ESS BUS switch to MANUAL. Close AUX FUEL circuit breaker.

(3) Place RH AUX FUEL TRANS PUMP switch ON. Check that pump is running in right-hand auxiliary tank. Return switch to OFF.

(4) Place LH AUX FUEL TRANS PUMP switch ON. Check that pump is running in left-hand auxiliary tank.

(5) Place RH AUX FUEL TRANS PUMP switch ON, and allow both pumps to run.

(6) Place INVERTER switch to MAIN. Close FUEL QTY circuit breaker. Monitor fuel quantity gage. When main fuel system is filled, fuel transfer relay should be actuated by upper float switch in aft center fuel cell and both pumps in auxiliary tanks should stop operating.

NOTE

If fuel level in main tank should now be lowered, without any interruption of electrical power or change of switch settings in auxiliary fuel system circuits, both pumps should automatically resume operation when dropping fuel level opens lower float switch, deenergizing fuel transfer relay to restore power to pump circuits. This portion of the operating cycle will normally be checked during ground run-up or test flight.

(7) Position switches to OFF or NORMAL.

(8) Fill auxiliary tanks as required.

10-140. FUEL CELL — 300 GALLON AUXILIARY — CRASHWORTHY.

10-141. Description — Fuel Cell — 300 Gallon Auxiliary. A molded rubber type fuel cell with a capacity of 150 gallons (each cell) may be located adjacent to the aft cabin bulkhead and transmission pylon.

10-142. Removal — Fuel Cell — 300 Gallon Auxiliary.

NOTE

Drain fuel from auxiliary cells before removing the fuel cells.

a. Disconnect three fuel lines (fuel discharge, cell vent, and cell drain) and electrical connector at cabin floor.

b. Install protective devices, over ends of all lines and plugs, under deck and on cell.

c. Install cover plate over fuel line access hole on cabin floor.

d. Disconnect auxiliary cell holding straps from studs (12 points) at aft cabin bulkhead and transmission support structure.

e. Unhook two nylon cord loops on top of cell.

f. Carefully remove cell from helicopter.

NOTE

For handling, and storage instructions of fuel cell, refer to TM 55-1500-204-25/1.

g. If auxiliary cell is to remain out of the helicopter, remove all fuel cell equipment kit items from aft cabin bulkhead and transmission support structure and place in storage compartment in door post. Reinstall all troop seats and litter fittings along sides of aft cabin bulkhead and transmission support structure.

10-143. Inspection — Fuel Cell — 300 Gallon Auxiliary.

a. fuel cell for cuts, tears and damage.

b. Test fuel cell in accordance with paragraph 10-138.

10-144. Repair — Fuel Cell — 300 Gallon Auxiliary. Refer to paragraph 10-5 for fuel cell repair procedures.

10-145. Installation — Fuel Cell — 300 Gallon Auxiliary.

a. If installed, remove troop seats and litter fittings from aft cabin bulkhead and sides of transmission support structure.

b. Remove auxiliary fuel cell equipment kit items from stowage in doorpost. Install 12 studs and washers into cap plates nuts on aft cabin bulkhead and transmission support structure. Torque studs 50 to 70 inch-pounds.

NOTE

The long stud is used in third plate nut from bottom of transmission support structure.

c. Install spacer, hook, washer, and bolt into plate nut at top of transmission support structure. Install like items in plate nut at top of aft cabin bulkhead. Torque bolts 50 to 70 inch-pounds.

d. Carefully lift cell into helicopter.

e. Thread (0.187 inch) nylon cord through two aft cell hangers and through hook on upper transmission support structure. Tighten and tie cord in such a manner as to retain fuel cell to support structure. Repeat process to secure forward end of fuel cell to aft cabin bulkhead, using cord through delta ring hanger and hook on cabin bulkhead.

f. Snap cell-holding straps to studs on aft cabin bulkhead and transmission support structure. (Figure 10-15.)

g. Remove cover over fuel lines access on top of cabin floor; remove caps from all lines and plugs.

h. Connect electrical connector and three lines from cell.

i. It will be necessary to check transmission oil level by use of mirror when auxiliary fuel cell is installed.

10-146.FUEL PUMP — AUXILIARYFUEL CELL.

10-147. Description — Fuel Pump — Auxiliary Fuel Cell. The electrically operated fuel pump is capable of pumping approximately 600 pounds of fuel per hour at sea level. The auxiliary fuel cell incorporates a float switch to give CAUTION panel (AUX FUEL LOW) indication to the pilot when fuel level is low.

10-148. Removal — Fuel Pump — Auxiliary Fuel Cell.

NOTE

Turn battery switch to OFF. Drain all fuel from cell.

a. Disconnect electrical connector and fuel line. (Fuel discharge) at access port in cabin floor.

b. Remove seven bolts and washers holding fuel pump to fuel cell.

c. Carefully withdraw pump and packing from fuel cell by pulling outward and upward on fuel pump base. Upward movement is required in order to clear pump body through opening in cell.

10-149. Installation — Fuel Pump — Auxiliary Fuel Cell.

a. Install fuel pump and packing into cell with flat section of mounting flange down, using reverse procedure to that noted in step c. above.

b. Install seven bolts and washers.

c. Torque bolts 50 to 70 inch-pounds.

d. Connect electrical connector and fuel line in access port in cabin floor.

e. Check installation for leaks.

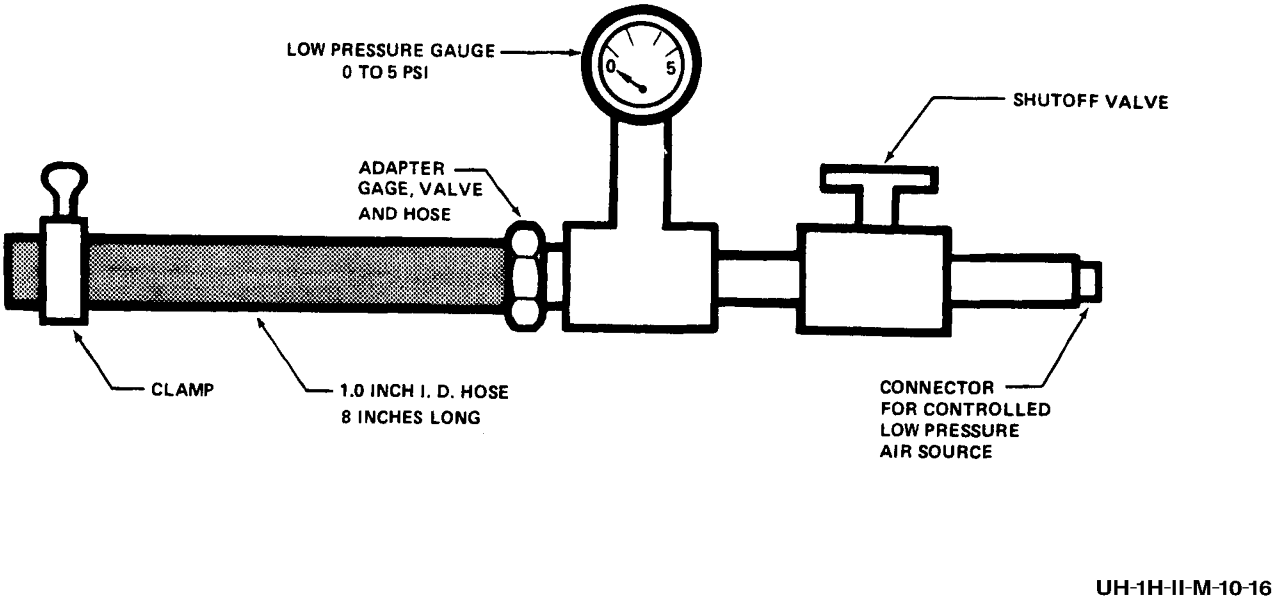


Figure 10-16. Pressurizing connector — auxiliary fuel cell

CHAPTER 11

FLIGHT CONTROLS

SECTION I — CONTROL SURFACES

(Not Applicable)

SECTION II — FLIGHT CONTROL COMPONENTS

11-1. FLIGHT CONTROL SYSTEM.

11-2. Description — Flight Control System. The flight control system consists of the collective pitch control system, cyclic control system (fore and aft and lateral), elevator control system, and tail rotor (anti-torque) control system. The flight control systems are mechanical linkages, actuated by conventional controls, and are used to control flight attitude and direction.

The flight control systems are a straight through system with hydraulic boost. A synchronized elevator is linked into the fore and aft control system at the swashplate. Electrically operated force trims connected to cyclic and tail rotor controls induce artificial feel and stabilize control stick and tail rotor control pedals.

11-3. Troubleshooting — Flight Control System. Perform troubleshooting of the flight control system. (Table 11-1.)

NOTE

Before using table 11-1, ensure all normal operational checks have been performed.

Isolate potential problem areas by disconnecting pilot stick or pedals and the hydraulic actuators from the interconnecting linkage prior to troubleshooting.

Table 11-1. Troubleshooting Flight Control System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

a. CYCLIC SYSTEM

1. Cyclic stick rough or binding.

STEP 1. Check for dirt or foreign material at base of stick.

Remove boot, inspect and clean as required. (Paragraph 11-60 and 11-62.)

Step 2. Check for interference in control linkage.

Inspect linkage and adjust or repair as necessary. (Paragraph 11-68.)

Step 3. Check for bent control tubes.

Inspect and replace rods as necessary. (Paragraph 11-68.)

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 4. Check for dry or seized bearings.

Inspect and replace bearings as necessary. (Paragraph 11-171.)

Step 5. Check pilot cyclic stick friction material for wear and damage.

Replace friction material.. (Paragraph 11-63.)

Step 6. Check force gradient assemblies and magnetic brakes for binding.

Inspect and adjust or repair magnetic brakes. (Paragraph 11-83 and 11-86.)

Inspect and adjust or repair magnetic brakes. (Paragraph 11-77 and 11-79.)

2. Uneven cyclic application force (boost off).

STEP 1. Check for missing or out of adjustment swashplate balance spring (right forward arm).

Adjust or replace and adjust spring. (Paragraph 11-56.)

3. Insufficient stick travel.

STEP 1. Check for interference in stick base or control linkage.

Inspect linkage and repair as necessary. (Paragraph 11-68.)

STEP 2. Check for proper rigging.

Rig as required. (Paragraph 11-56.)

4. Pilot and copilot sticks out of synchronization.

STEP 1. Check for correct rigging of interconnecting linkage.

Rig adjustable tubes as necessary. (Paragraph 11-56.)

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

b. COLLECTIVE SYSTEM

1. Collective stick light or heavy.

STEP 1. Check minimum friction adjustment of collective stick.

Adjust friction as necessary. (Paragraph 11-27.)

STEP 2. Check for dirt, oil, or grease on friction surface.

Remove boot and inspect friction surfaces. Clean and adjust as necessary. (Paragraph 11-27, 11-11, and11-13.)

Step 3. Check control linkage and supports for looseness and damage.

Inspect and replace linkage as necessary. (Paragraph 11-10 and 11-11.)

STEP 4. Check for out of adjustment or missing balance spring on hydraulic actuator servo.

Adjust spring as required. (Paragraph 11-6.)

2. High vertical vibration level.

STEP 1. Check minimum friction nut adjustment (causes pilot induced vibration).

Adjust friction as necessary. (Paragraph 11-27.)

STEP 2. Check control linkage and supports for looseness and damage.

Inspect and replace linkage as necessary. (Paragraph 11-10 and 11-11.)

3. Insufficient collective travel.

STEP 1. Check for interference in control linkage.

Inspect and replace linkage as necessary. (Paragraph 11-10 and 11-11.)

STEP 2. Check linkage for correct rigging.

Rig as necessary. (Paragraph 11-6.)

4. Binding or rough operation.

STEP 1. Check for interference in control linkage.

Inspect and replace linkage as necessary. (Paragraph 11-10 and 11-11.)

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for bent control rods.

Inspect and replace rods as necessary. (Paragraph 11-10 and 11-11.)

STEP 3. Check for dry or seized bearings.

Inspect and replace bearings as necessary. (Paragraph 11-171 and 11-172.)

STEP 4. Check for binding, torn, or loose boot.

Inspect, align or replace boots. (Paragraph 11-10 and 11-11.)

STEP 5. Check for dirt or foreign matter at base of stick.

Remove boot, inspect and clean as necessary. (Paragraph 11-10 and 11-11.)

5. Monitoring collective stick (stick is driven from position by feedback from main rotor.)

STEP 1. Check hydraulic actuator irreversible valve. (Chapter 7.)

STEP 2. Check minimum friction adjustment.

Adjust friction as necessary. (Paragraph 11-27.)

STEP 3. Check for out of adjustment or missing balance spring on hydraulic actuator servo.

Replace or adjust spring as required. (Paragraph 11-6.)

Check minimum friction. Adjust as necessary. (Paragraph 11-27.)

c. SYNCHRONIZED ELEVATOR CONTROL SYSTEM

1. Elevator loose when cyclic stick is in position.

STEP 1. Check for broken or disconnected linkage, and loose, worn, or damaged linkage supports.

Repair or replace linkage and supports as necessary. (Paragraphs 11-16.1 and 11-162)

Adjust linkage as necessary. (Paragraph 11-156.)

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for worn bearings.

Inspect and replace bearings as necessary. (Paragraphs 11-171 and 11-172.)

2. Elevator position does not correspond to cyclic stick position.

STEP 1. Check rigging. (Paragraph 11-156.)

STEP 2. Check for bent control rods.

d. TAIL ROTOR CONTROLS

1. Tail rotor pedal adjustment rough or binding.

STEP 1. Check for dirt or foreign material in pedal adjustment linkage.

Inspect control rods and replace as necessary. (Paragraphs 11-161 and 11-162.)

Adjust linkage as necessary. (Paragraph 11-156.)

2. Elevator binds or operate rough.

Step 1. Check for dry or seized bearings.

Inspect bearings and replace as necessary. (Paragraphs 11-171 and 11-172.)

Inspect linkage and repair as necessary. (Paragraphs 11-116 and 11-117.)

Adjust as required. (Paragraph 11-110.)

3. Tail rotor controls rough or binding.

STEP 1. Check for interference in control linkage.

Inspect linkage between pedals and power cylinder. (Figure 11-23.) For any interference over the full travel range.

Adjust as required. (Paragraph 11-110.)

STEP 2. Check for bent control rods.

Replace damaged tubes as required. (Paragraph 11-143.)

STEP 3. Check for dry or seized bearings.

Inspect and replace bearings as required. (Paragraphs 11-171 and 11-172.)

STEP 4. Check force gradient and magnetic brake for binding, dry or seized bearings.

Inspect and adjust as required. (Paragraphs 11-123 and 11-127.)

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

3. Pilot and copilot pedals out of synchronization.

STEP 1. Check interconnect tube (adjustable) for correcting rigging.

Rig as required. (Paragraph 11-110.)

4. Insufficient pedal travel.

Step 1. Check for any interference in control linkage.

Rig control linkage as required. (Paragraph 11-110.)

11-4. COLLECTIVE CONTROL SYSTEM.

11-5. Description — Collective Control System.

The collective control system (figure 11-1) consists of a jackshaft assembly with dual control sticks, push-pull tubes and bellcranks, and a hydraulic actuator connected to a collective lever on mast assembly.

Movement of either control stick is transmitted through linkage and hydraulic actuator to maintain rotor pitch control mechanism, causing helicopter to ascend or descend or to remain at constant altitude.

The collective hydraulic actuator has an irreversible valve to reduce feedback forces and to provide for minimum use of controls in event of hydraulic boost failure.

11-6. Rigging — Collective Control System.

a. Disconnect collective controls at all rigging points. (Figure 11-1).

b. Place pilot collective stick (1) against its up stop and secure with friction adjustment knob.

c. Adjust control tube (14) to fit cylinder valve with cylinder bottomed in up position and valve arm at top of travel (View B).

NOTE

The bolt securing control tube to cylinder valve must be free to rotate after installation.

d. Shorten control tube (14) 1-1/2 to 5 turns of the rod end, tighten jam nut and install. Torque attaching bolt to 24 inch pounds maximum and secure.

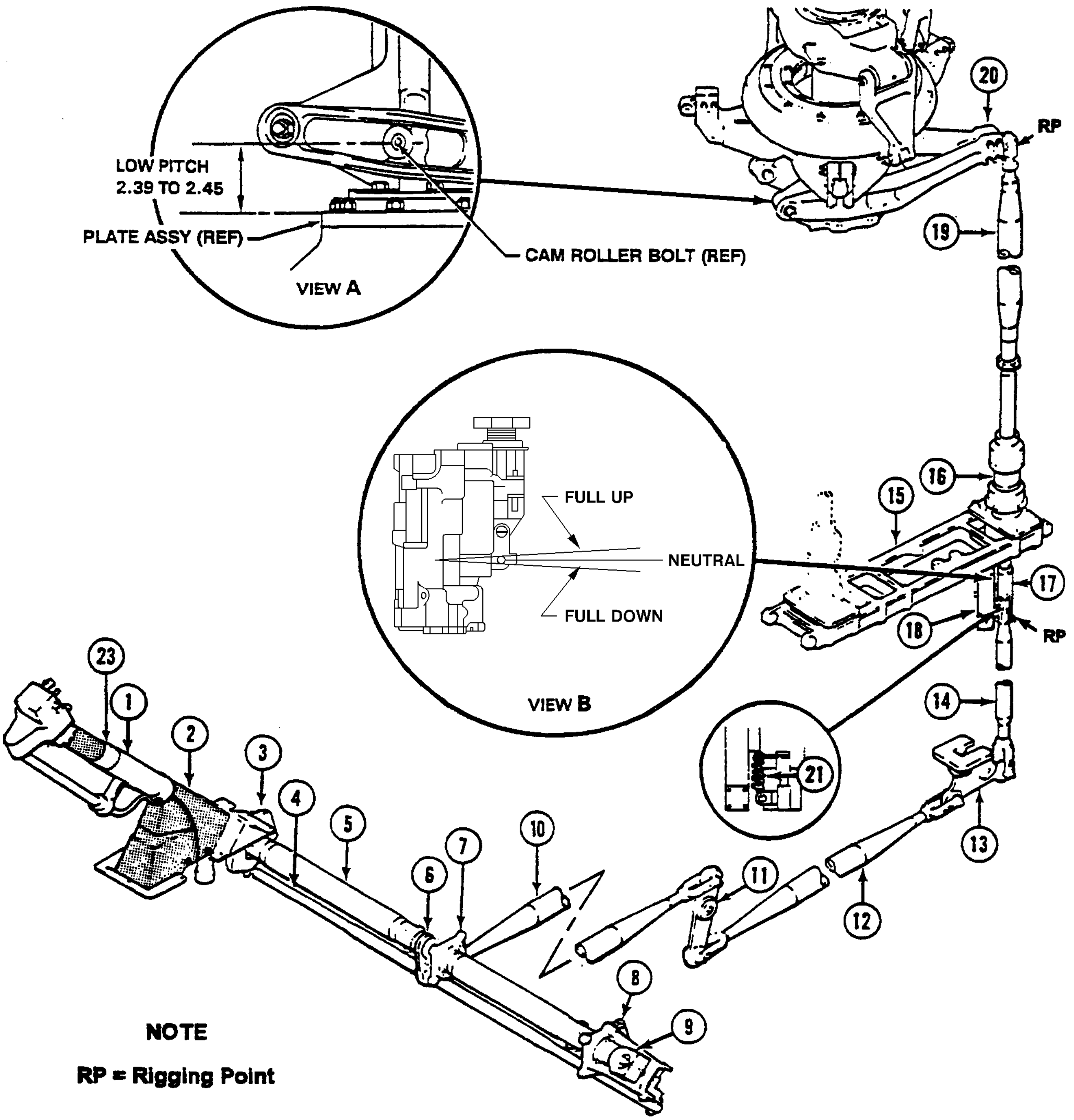
e. Place the collective stick against low stop. Locate collective lever by measuring up from 204-040-349 plate assembly 2.39 to 2.45 inches to center of cam roller bolt (view A, figure 11-1).

CAUTION

Collective controls below cylinder must not move while bottoming valve.

f. Exert sufficient downward force on collective cylinder valve (17) to hold lever at top of travel. (View B.) Adjust clevis end of cylinder to fit to collective lever (20), then shorten cylinder one full turn of clevis end, torque jam nut and install.

g. Check for free travel of collective controls with hydraulic boost pressure off.



1. Pilot collective stick
2. Boot
3. Control assembly
4. Power control (throttle) interconnect tube
5. Jackshaft assembly
6. Control arm
7. Bearing and housing
8. Control assembly
9. Elbow
10. Control tube
11. Lever
12. Control tube
13. Bellcrank
14. Control tube
15. Support
16. Hydraulic actuator
17. Cylinder valve
18. Irreversible valve
19. Actuator tube
20. Collective lever
21. Spring
22. Stop
23. Friction adjustment knob

UH-1H-II-M-11-1

Figure 11-1. Collective control system — rigging

h. Check minimum pitch angle of main rotor (Chapter 5).

i. Inspect complete collective control system for security of parts.

11-7. COLLECTIVE JACKSHAFT.

11-8. Description — Collective Jackshaft. A collective jackshaft mounted laterally under cabin floor provides mounting for the collective stick assemblies and attachment of collective control tube. The jackshaft is mounted on structural members by two housing assemblies and a support. (Figure 11-2.)

11-9. Adjustment — Collective Jackshaft (Installed).

NOTE

Adjustment procedure for collective minimum friction is contained in paragraph 11-27.

11-10. Inspection — Collective Jackshaft (Installed).

a. Inspect jackshaft for free travel and excessive lateral looseness.

b. Inspect jackshaft for loose, missing, or improperly installed hardware.

c. Inspect bolt and bushing installations for enlarged holes and looseness of bolt and bushing.

d. Inspect jackshaft for surface corrosion.

11-11. Removal — Collective Jackshaft.

CAUTION

Accidental movement of flight controls while disconnected may result in damage to controls and surrounding structures.

a. Remove pilot and copilot seats. (Chapter 2).

b. Remove screws (30, figure 11-2) and boot (29) from pilot collective control stick (5).

c. Disconnect electrical connector (32) from pilot collective control stick (5).

d. Remove cotter pin (33), nut (34), washers (35), bolt (27), and control tube (28) from gear lever on lower end of pilot collective control stick (5).

e. Remove cotter pins (33), nuts (34), washers (35), bolts (36), and control tube (23) through access opening in side of cabin.

f. Remove two screws (37), two bolts (6), washers (35), and nuts (34) attaching housing assembly (7) to structural intercostal. Remove pilot collective control stick (5) and housing assembly (7).

g. Remove copilot collective control stick (25) as follows:

(1) Remove access panel from floor.

(2) Remove screws (26, figure 11-2) and boot (24) from copilot collective control stick (25).

(3) Remove bolts (22), washers (35), and nuts (38) from control assembly (21).

(4) Disconnect electrical connector (32) from copilot collective control stick (25).

(5) Remove copilot collective control stick (25).

h. Remove collective jackshaft tube (17) as follows.

(1) Remove cotter pin (33), nut (34), washers (35), bolt (13), control tube (14) from arm (11).

(2) Remove four nuts (18), washers (35), and bolt (20) attaching housing (19) to intercostal structural member.

(3) Remove bolts (8 and 16), washers (35), tapered bushings (9), and nuts (34) attaching jackshaft tubes (10 and 17). Identify bolts and bushings for reinstallation in same location. Remove jackshaft tube (17) from left side access opening with control assembly (21); then, remove jackshaft tube (10).

(4) Remove nuts (34), washers (35), bolts (12), and support assembly (15).

11-12. Disassembly — Collective Jackshaft.

a. Remove control assembly (1, figure 11-3) if not previously removed, by removing bolts (2), bushings (4), washers (3), and nuts (5) attaching control assembly (1) to jackshaft tube (6).

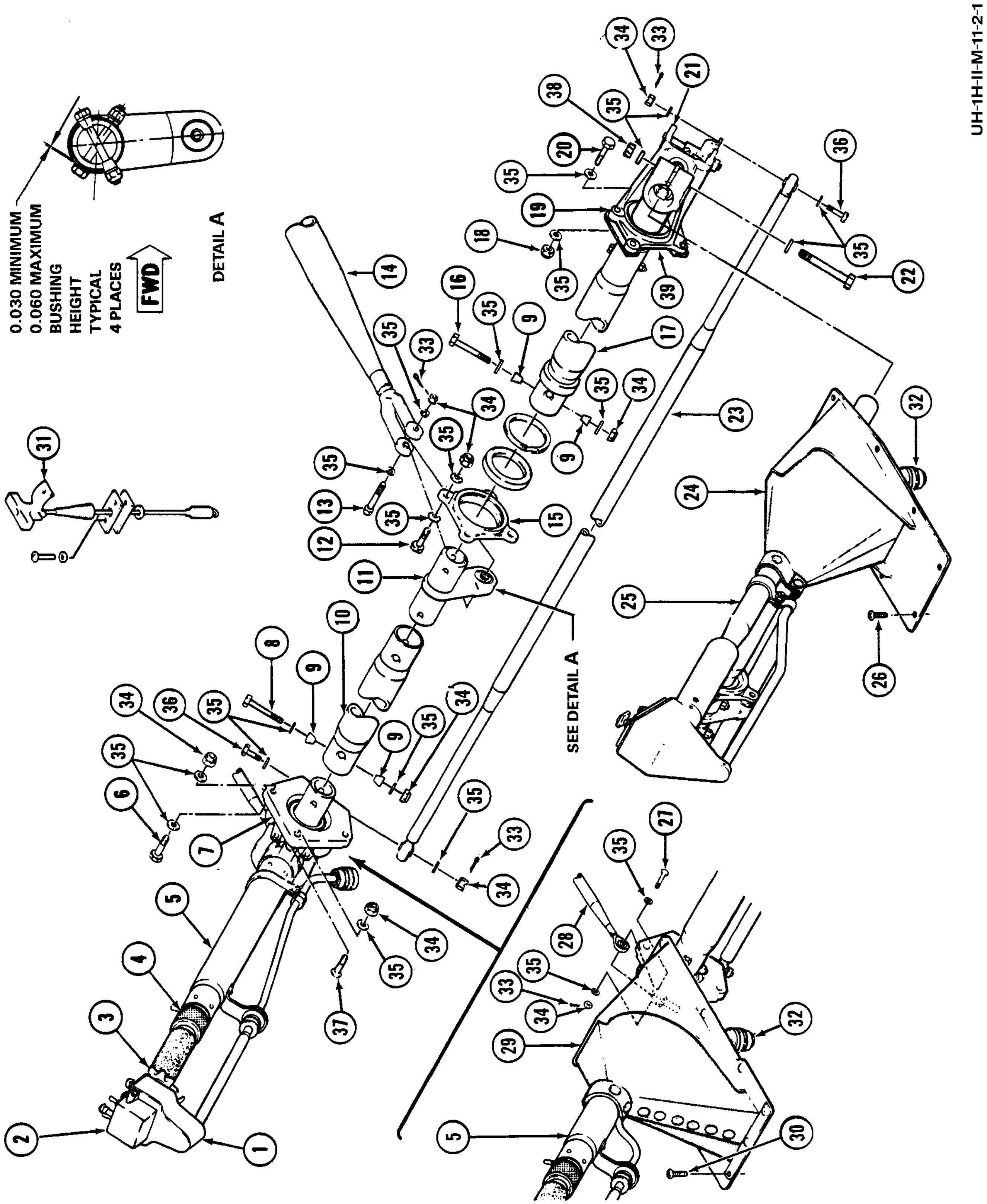


Figure 11-2. Collective jackshaft — pilots collective control stick — removal and installation (Sheet 1 of 2)

1. Switch box	15. Support assembly	28. Control tube
2. Cover	16. Bolt	29. Boot
3. Throttle friction knob	17. Jackshaft tube	30. Screw
4. Collective friction knob	18. Nut	31. Downlock assembly
5. Pilot collective control stick	19. Housing assembly	32. Connector
6. Bolt	20. Bolt	33. Cotter pin
7. Housing assembly	21. Control assembly	34. Nut
8. Bolt	22. Bolt (2 reqd)	35. Washer
9. Bushing	23. Tube assembly	36. Bolt
10. Jackshaft tube	24. Boot	37. Screw
11. Arm	25. Copilot collective control stick	38. Nut
12. Bolt	26. Screw	39. Shim
13. Bolt	27. Bolt	
14. Control tube		

UH-1H-II-M-11-2-2

Figure 11-2. Collective jackshaft — pilots collective control stick — removal and installation (Sheet 2 of 2)

b. Remove lever arm (8) (if not previously removed) from jackshaft tube (7) by removing bolts (2), washers (3), bushings (4), and nuts (5) attaching lever arm (8) to jackshaft tube (7).

11-13. Inspection — Collective Jackshaft.

a. Inspect jackshaft details for enlarged bushing holes.

b. Inspect jackshaft details for corrosion and mechanical damage.

11-14. Repair or Replacement — Collective Jackshaft.

a. Repair components of jackshaft as follows:

(1) Polish out scratches (maximum 0.010 inch depth) using 600 grit abrasive cloth or paper (C-423). Obtain a smooth scratch free surface.

(2) Treat repaired areas using chemical film material (C-100).

(3) Apply two coats epoxy polyamide primer (C-204) to repaired area.

11-15. Assembly — Collective Jackshaft.

a. Assemble detail parts as shown in figure 11-4.

b. Clamp in a suitable fixture, holding dimension shown.

c. Drill through tube and detail being replaced using a No. F (0.257) inch drill.

d. Insert reamer (T84) so that end of pilot projects through parts to be reamed.

e. Ream one side to a RHR 125 finish.

f. Install tapered bushing in reamed hole.

g. Ream opposite hole using the tapered bushing to support reamer pilot.

h. Install tapered bushing and secure with bolt, washers, and nut.

i. Repeat steps c. through h. for remaining holes.

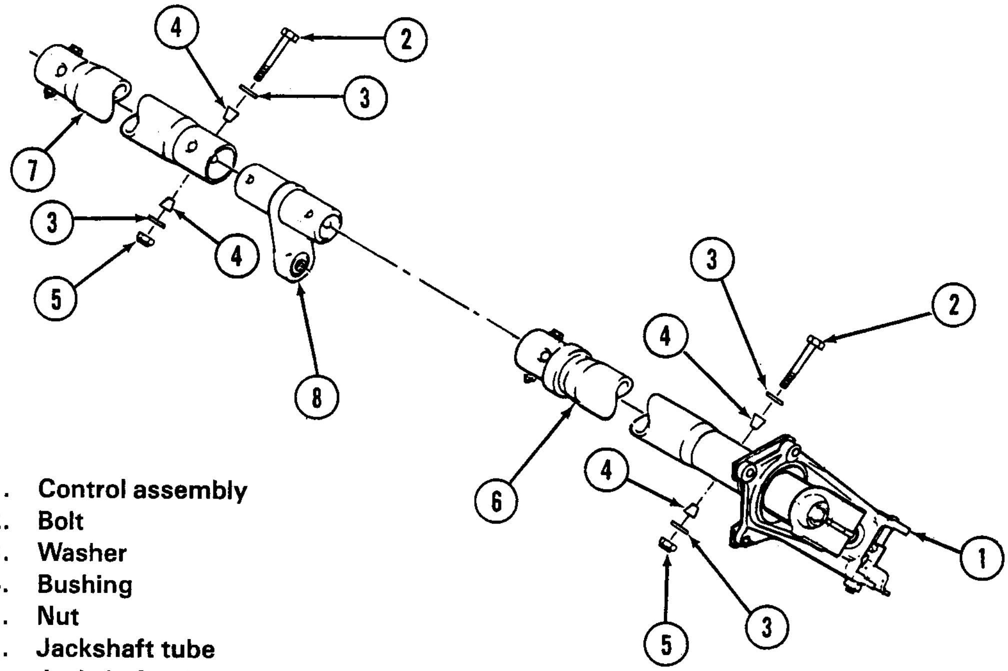
j. Disassemble, remove burrs and metal particles.

k. Apply epoxy polyamide primer (C-204) to all bare metal.

11-16. Installation — Collective Jackshaft.

NOTE

If collective sticks and jackshaft are in one assembly; remove bolts, nuts, washers,



1. Control assembly
2. Bolt
3. Washer
4. Bushing
5. Nut
6. Jackshaft tube
7. Jackshaft tube
8. Lever arm

UH-1H-II-M-11-3

Figure 11-3. Collective jackshaft — collective control system — disassembly and assembly

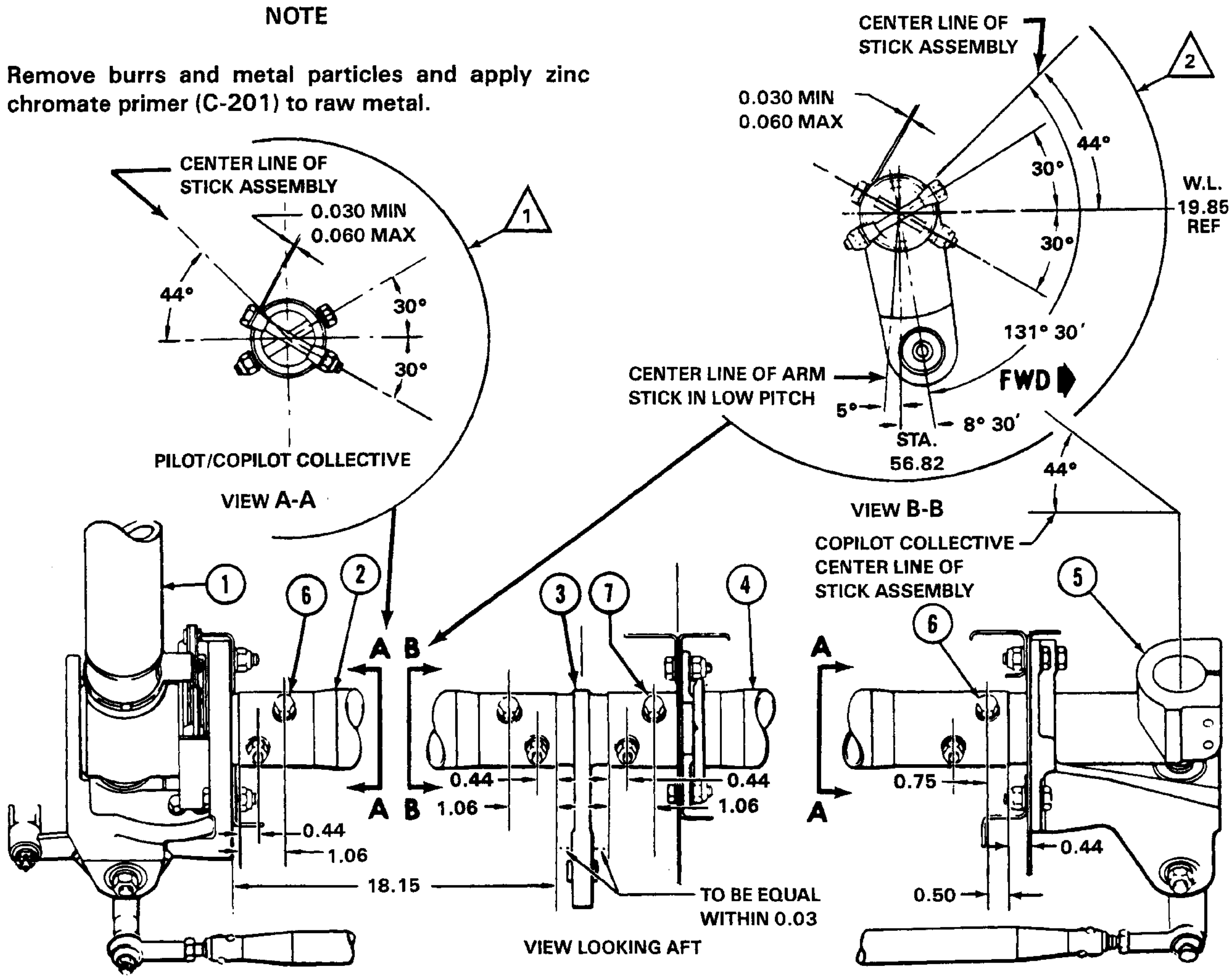
△ WORK STATEMENT

△1 Drill four No. F (0.257 inch) holes in line. Taper ream (T84) holes, 125 finish. Install tapered bushing (79B1-4-7 or 20-037-4-7) (4 reqd), bolt (2 reqd), washer (4 reqd), and nut (2 reqd).

△2 Drill eight No. F (0.257 inch) holes in line. Taper ream (T84) holes, 125 finish. Install tapered bushing (79B1-4-5 or 20-037-4-5) (8 reqd), bolt (4 reqd), washer (8 reqd), and nut (4 reqd).

NOTE

Remove burrs and metal particles and apply zinc chromate primer (C-201) to raw metal.



1. Pilot collective control assembly
2. Tube
3. Arm assembly
4. Tube
5. Copilot collective control assembly
6. Bolt
   Nut
   Washer
   Tapered bushing
7. Bolt
   Nut
   Washer
   Tapered bushing

UH-1H-II-M-11-4

Figure 11-4. Collective jackshaft — collective control system — repair and bushings from jackshaft tubes (10 and 17, figure 11-2).

a. Apply a coat of epoxy polyamide primer (C-204) to mounting faces of housing assembly (7 and 19, figure 11-2) and support assembly (15).

b. Lower pilot collective control stick (5) through floor opening and insert elbow through mounting hole of structural intercostal. Attach housing assembly (7) to intercostal with two screws (37), two bolts (6), washers (35), and nuts (34). Torque nuts 50 to 70 inch-pounds.

c. Install jackshaft tube (10) to housing assembly (7). Secure with tapered bushings (9), nuts (34), washers (35), and bolts (8). Torque nuts 50 to 70 inch-pounds. See detail A for tapered bushing installation.

d. Install arm (11) to jackshaft tube (10) with bolts (8), tapered bushing (9), washers (35), and nuts (34). Torque nuts 50 to 70 inch-pounds.

e. Position support assembly (15) on left side of beam at BL 14.00. Secure with bolts (12), washers (35), and nuts (34). Torque nuts 50 to 70 inch-pounds.

f. Install jackshaft tube (17) and housing assembly (19) from left side. Place shim (39) between housing assembly (19) and support structure. Install bolts (20), washers (35), and nuts (18) to secure housing assembly (19). Torque nuts 50 to 70 inch-pounds.

g. Install bolts (16), tapered bushings (9), washers (35), and nuts (34) in jackshaft tube (17) and arm (11). Torque nuts 50 to 70 inch-pounds. See detail A for tapered bushing installation.

h. Check lateral alignment of universal in housing assembly (19) and remove or add shims to provide minimum lateral deflection.

i. Align levers on axis of each housing assembly. Install control tube (23). Install bolt, washers (35), and nut (34) on left end with head down. Install bolt, washers (35), and nut (34) on right side with head up. Place one washer under bolt heads and one washer under nuts. Torque nuts 20 to 25 inch-pounds. Install cotter pin (33).

j. Connect control tube (28) to pilot collective control stick with bolt (27), two washers (35), and nut (34). Torque nut 12 to 15 inch-pounds. Install cotter pin (33).

k. Connect electrical connector (32) to receptacle. Install boot (24) and secure with screws (26).

l. Install copilot collective control stick (25) in control assembly elbow (21).

m. Install bolts (22), washers (35), and nuts (38).

n. Adjust collective friction. (Paragraph 11-27.)

o. Attach control tube (14) to arm (11). Install one washer (35) under bolt head (13) and one washer under nut (34). Torque nut 30 to 40 inch-pounds. Install cotter pin (33).

p. Check collective rigging. (Paragraph 11-6.)

11-17. CONTROL ASSEMBLY — COLLECTIVE JACKSHAFT.

11-18. Description — Control Assembly — Collective Jackshaft. A control assembly (21, figure 11-2) is mounted on left side of the collective jackshaft. The control assembly provides for mounting of the copilot collective stick and transmits copilot throttle motion to control tube (23) which is interconnected to pilot throttle control.

11-19. Removal — Control Assembly — Collective Jackshaft. (Paragraph 11-11.)

11-20. Disassembly — Control Assembly — Collective Jackshaft.

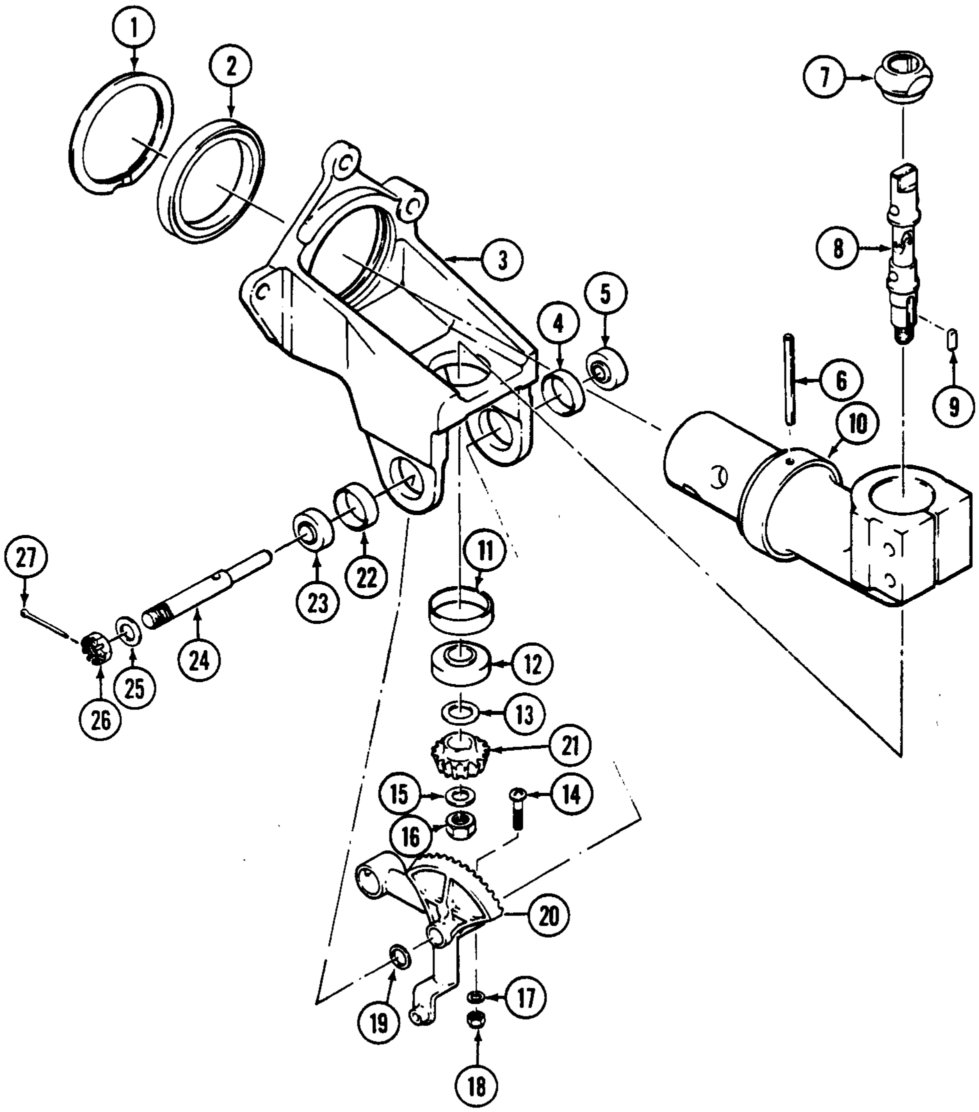
a. Remove cotter pin (27, figure 11-5), nut (26), and washer (25).

b. Remove nut (18), washer (17), and screw (14). Slide shaft (24) from support assembly (3) and lever (20).

c. Remove lever (20) and shim (19) from support assembly (3).

d. Remove nut (16) and washer (15) attaching pinion (21) to drive assembly (8).

e. Remove pinion (21) from drive assembly (8).



1.	Spirolox	10.	Elbow assembly	19.	Shim
2.	Bearing	11.	Sleeve	20.	Lever
3.	Support assembly	12.	Bearing	21.	Pinion
4.	Bushing	13.	Shim	22.	Bushing
5.	Bearing	14.	Screw	23.	Bearing
6.	Pin	15.	Washer	24.	Shaft
7.	Guide	16.	Nut	25.	Washer
8.	Drive assembly	17.	Washer	26.	Nut
9.	Key	18.	Nut	27.	Cotter pin

UH-1H-II-M-11-5

Figure 11-5. Control assembly — collective jackshaft — disassembly and assembly

f. Remove shim (13), guide (7), and drive assembly (8) from elbow assembly (10).

g. Remove key (9) from slot in drive assembly (8).

h. Slide elbow assembly (10) out of support assembly (3).

i. Remove spirolox (1) securing bearing (2) to support assembly (3). Remove bearing (2).

11-21. Inspection — Control Assembly — Collective Jackshaft.

a. Inspect all parts of control assembly for wear, damage, and corrosion.

b. Inspect bearings for binding and damage. (Paragraphs 11-171 and 11-172.)

11-22. Repair and Replacement — Control Assembly — Collective Jackshaft.

a. Replace all defective bearings, sleeves, and bushings. (BHT-ALL-SPM.)

b. Replace all parts that show evidence of wear, damage, and corrosion.

11-23. Assembly — Control Assembly — Collective Jackshaft.

a. Place bearing (2, figure 11-5) in support assembly (3) and secure with spirolox (1).

b. Install sleeve (11), bushings (4 and 22), and bearings (5, 12, and 23) in support assembly (3).

c. Slide elbow assembly (10) into support assembly (3).

d. Install key (9) in slot at bottom of drive assembly (8).

e. Install shim (13), guide (7), and drive assembly (8) in elbow assembly (10).

f. Slide pinion (21) on drive assembly (8). Secure with washer (15) and nut (16).

g. Position lever (20) and shim (19) between bearings (5 and 23). Insert shaft (24) through bearings (5 and 23), shim (19), and lever (20). Align hole in lever and shaft and install screw (14), washer (17), and nut (18). Install washer (25) and nut (26) on shaft. Secure nut with cotter pin.

11-24. Installation — Control Assembly — Collective Jackshaft. Refer to paragraph 11-16 for installation on control assembly.

11-25. PILOT COLLECTIVE CONTROL STICK.

11-26. Description — Pilot Collective Control Stick. The pilot collective control stick (right side) controls pitch of the main rotor blade. When collective control stick is in up position, main rotor blades are at a maximum pitch; when collective control stick is down, blades are at minimum pitch. A knurled nut on the pilot collective control stick allows the pilot to adjust collective friction to his own requirements. A minimum friction adjustment is provided so that the collective control stick will always have a preset minimum feel. A switch box mounted on top of pilot collective control stick contains the following switches; landing light switches, searchlight switches, engine governor switch, engine idle stop release switch, and engine start trigger switch.

11-27. Adjustment — Pilot Collective Stick (Minimum Friction).

a. Adjust for proper amount of minimum friction as follows:

CAUTION

Do not adjust setscrews (4) to bear heavily against the washers. Over torquing setscrews will bend the washers, requiring disassembly of collective control stick to replace the damaged part.

(1) Disconnect tube (14, figure 11-2) from collective jackshaft (10).

(2) Loosen friction nut (2, figure 11-6) so that no friction is being applied by nut (2).

(3) Tighten set screws (4) until a spring scale applied at center of throttle grip indicates a breakaway force of 14 to 16 pounds up with the collective stick positioned approximately 1/3 of full travel from bottom stop.

(4) Reconnect tube (14, figure 11-6) to collective jackshaft (10).

CAUTION

Deleted.

(1) Deleted.

(2) Deleted.

11-28. Adjustment — Pilot Collective Stick (Throttle Control Gears). If throttle control does not operate smoothly, perform following checks and adjustments. (Figure 11-7.)

a. Remove boot (29, figure 11-2) from pilot collective control stick (5).

b. Remove boot (24) from copilot collective control stick (25).

c. Disconnect control tube (28) from throttle lever.

d. Disconnect interconnect power control tube (23) at both ends.

e. Adjust throttle control gears as follows:

NOTE

Gear teeth may be hand lapped or shaved to obtain indicated pull friction limits.

(1) Check for 0.50 to 1.50 pounds friction pull at end of lever (5, figure 11-7).

(2) Add or remove shims (4) at gear lever (5) shaft to adjust friction.

(3) Measure pinion (3) and lever (4) gear teeth surfaces to within 0.020 inch in mating surfaces.

(4) Add or remove shims (1) at drive assembly (2) shaft to adjust gear teeth mating surfaces.

f. Repeat steps 1. through 4. to adjust copilot gears.

g. Connect interconnect power control tube (23, figure 11-2).

h. Connect control tube (28) to throttle lever.

i. Check throttle controls for full travel and smooth operation.

j. Check engine power controls rigging. (Chapter 4.)

k. Install boot (24) on copilot collective control stick (25).

l. Install boot (29) on pilot collective control stick (5).

11-29. Removal — Pilot Collective Control Stick.

a. Remove two bolts (6, figure 11-2), two screws (37), nuts (34), and washers (35) attaching housing (7) to structure.

b. Remove bolt (36), washers (35), nut (34), and cotter pin (33) attaching tube assembly (23) to pilot collective control stick (5).

c. Disconnect throttle linkage control tube (28) on aft side of control assembly by removing cotter pin and nut (34), washers (35), and bolt (27).

d. Remove screws (30) and boot (29).

e. Disconnect electrical plug (32) and pilot collective control stick (5).

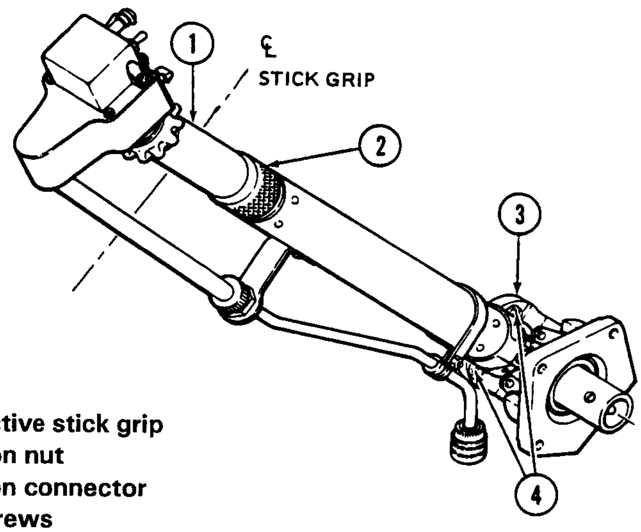
11-30. Disassembly — Pilot Collective Control Stick.

a. Release clamps at bottom of tube (4, figure 11-8) and unscrew nut to release cable (5) from bracket on tube (4).

b. Remove screws (25) attaching cover on switch box (26). Push cable (5) upward to allow cover to be moved without disconnecting electrical wiring.

c. From inside switch box (26), drive out pin (24) and lift switch box from lever tube (4).

d. Remove washers (29, 28, and 27).



1. Collective stick grip
2. Friction nut
3. Friction connector
4. Setscrews

UH-1H-II-M-11-6

Figure 11-6. Pilot collective control stick — friction adjustment

e. Drive pin (34) from throttle grip (33) and slide grip off tube.

f. Remove cotter pin (7) and release drag link (10) from pin (6).

g. Remove retainer ring (1) and unscrew friction nut (3) with bearing (2) installed.

h. Slide lever tube (4) off inner tube.

i. Remove roll pin (16) and pin (15) from elbow (20).

j. Remove nuts (12), washers (13), washers (18), and bolts (17) attaching housing (14) to support (19).

k. Detach housing (14) from support (19).

11-31. Inspection — Pilot Collective Control Stick.

a. Inspect all parts of pilot collective control stick for nicks, scratches, dents, broken or damaged tubing, or frayed or broken cabling.

b. Inspect friction mechanism on pilot collective control stick for general condition. Inspect friction shoes (11) for condition. Secure bonding to housing (14).

c. Inspect bearings for wear or roughness.

11-32. Repair or Replacement — Pilot Collective Control Stick.

a. Replace all parts that are worn, damaged, broken, bent, or corroded.

b. Replace electrical wires if frayed or broken.

c. Replace bearings if worn, rough, or damaged. (Paragraphs 11-171 and 11-172.)

11-33. Assembly — Pilot Collective Control Stick.

a. Position friction shoes (11) between lugs of elbow (20) and install pin (15) through elbow and friction shoes.

b. Install roll pin (16) through elbow (20) and hole in pin (15).

c. Align drag link (10) over friction shoes (11) and install pins (9). Secure with cotter pins (7).

d. Align housing (14), with elbow (20) and install on support (19).

1. Shim
2. Drive assembly
3. Pinion
4. Shim
5. Lever

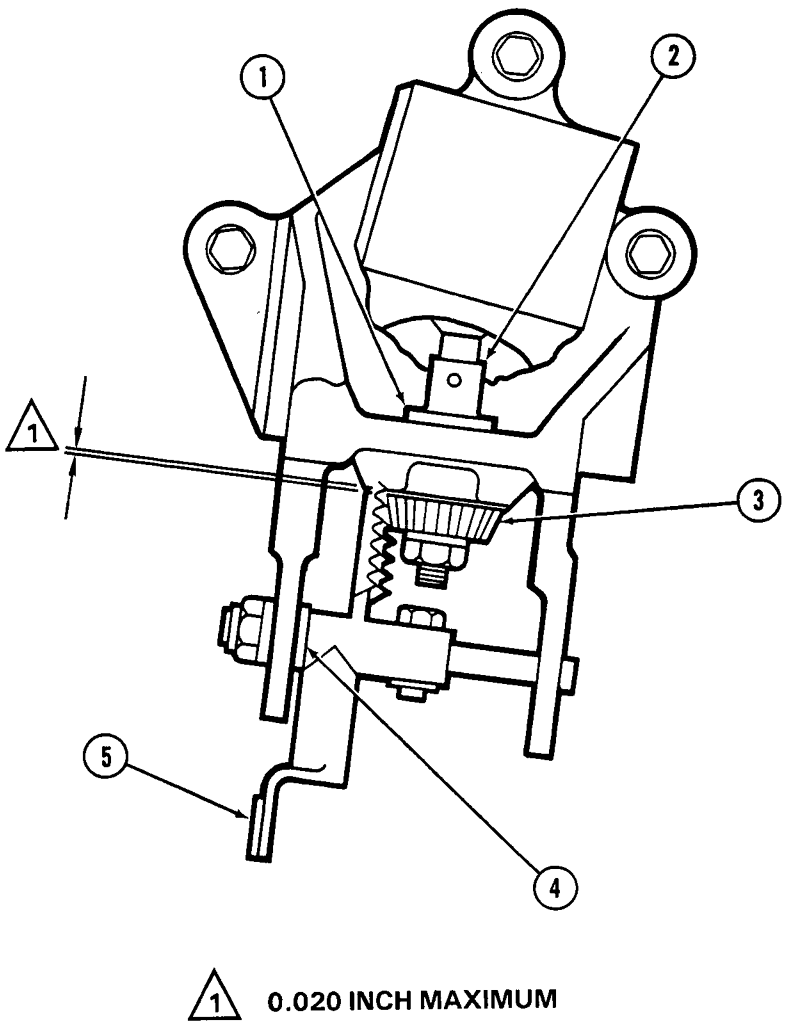
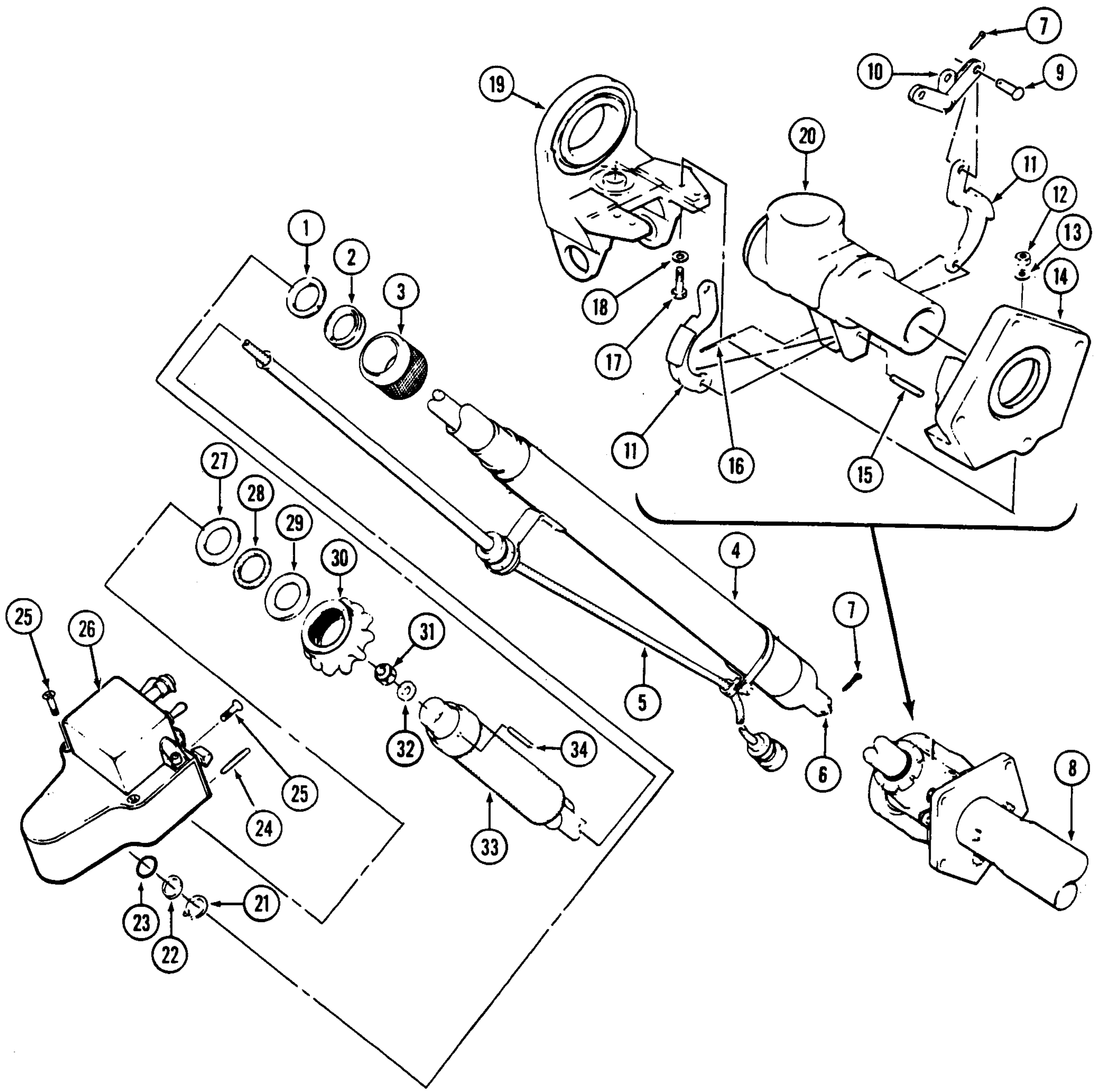


Figure 11-7. Pilot collective control stick — throttle control gears — adjustment



1. Retaining ring
2. Bearing
3. Collective friction nut
4. Tube
5. Cable assembly
6. Pin
7. Cotter pin
8. Jackshaft tube
9. Pin
10. Drag link
11. Friction shoes
12. Nut
13. Washer
14. Housing
15. Pin
16. Pin
17. Bolt
18. Washer
19. Support
20. Elbow
21. Retaining ring
22. Washer
23. Packing
24. Pin
25. Screw
26. Switch box
27. Washer
28. Nonmetallic washer
29. Washer
30. Throttle friction nut
31. Nut
32. Washer
33. Throttle grip
34. Pin

UH-1H-II-M-11-8

Figure 11-8. Pilots collective control stick — disassembly and assembly

e. Install bolts (17), washers (18), washers (13), nuts (12) to attaching housing (14) and support (19). Torque nuts to 25 inch-pounds.

f. Slide lever tube (4, figure 11-8) on inner tube against connector. Install friction nut (3) and bearing (2) on tube assembly. Secure with retaining ring (1).

g. Slide throttle grip (33) onto tube assembly; align holes in grip with hole in throttle shaft and install pin (34).

h. Install throttle friction nut (30), steel washer (29), rubber washer (28), and steel washer (27) in that order.

i. Position switch box (26) on lever tube (4). Align holes and install pin (24).

j. Install switch box cover and secure with screws (25).

k. Connect drag link (10) to pin (6). Secure with cotter pin (7).

l. cable (5) to tube (4) bracket and install clamp at bottom of tube (4).

11-34. Installation — Pilot Collective Control Stick.

a. Position pilot collective control stick (5, figure 11-2) housing assembly (7) and attach to intercostal with two screws (37), two bolts (6), washers (35), and nuts (34). Torque nuts 50 to 70 inch-pounds.

b. Position jackshaft tube (10) and housing assembly (7) tube and install bushings (9), washers (35), bolts (8), and nuts (34). Torque nuts 50 to 70 inch-pounds. See detail A for tapered bushing installation.

c. Position tube assembly (23) to housing assembly (7 and 19) levers and install left bolt (36) head down, and right bolt (36) head up, with washers (35), and nuts (34). Torque nuts 20 to 25 inch-pounds. Install cotter pins (38).

d. Connect control tube (28) to collective control stick (5) with bolt (27), washers (35), and nut (34). Torque nut 12 to 15 inch-pounds. Install cotter pin (33).

e. Connect electrical plug (32) to receptacle.

f. Adjust collective control friction. (Paragraph 11-27.)

g. Install boot (29) using screws (30).

h. Check collective control system rigging. (Paragraph 11-6.)

11-35. COPILOT COLLECTIVE CONTROL STICK.

11-36. Description — Copilot Collective Control Stick. The copilot collective control stick (left side) provides same collective and throttle control as pilot collective control stick. The copilot collective stick is mounted to an elbow on control assembly attached to left side of collective jackshaft.

11-37. Removal — Copilot Collective Control Stick.

a. Remove screws (26, figure 11-2) and remove boot (24).

b. Remove bolt (22), washers (35), and nuts (38) attaching copilot collective control stick (25) to elbow.

c. Disconnect electrical connector (32) from receptacle

d. Disengage stick assembly (25) from elbow assembly. Remove stick assembly.

11-38. Disassembly — Copilot Collective Control Stick.

a. Release clamps (17 and 21, figure 11-9) at bottom of stick assembly.

b. Remove screws (1) and washers (2) securing switch box cover (3) to switch box (15).

c. Remove connector (20) and switch (4) from switch box (15). Disconnect connector (24).

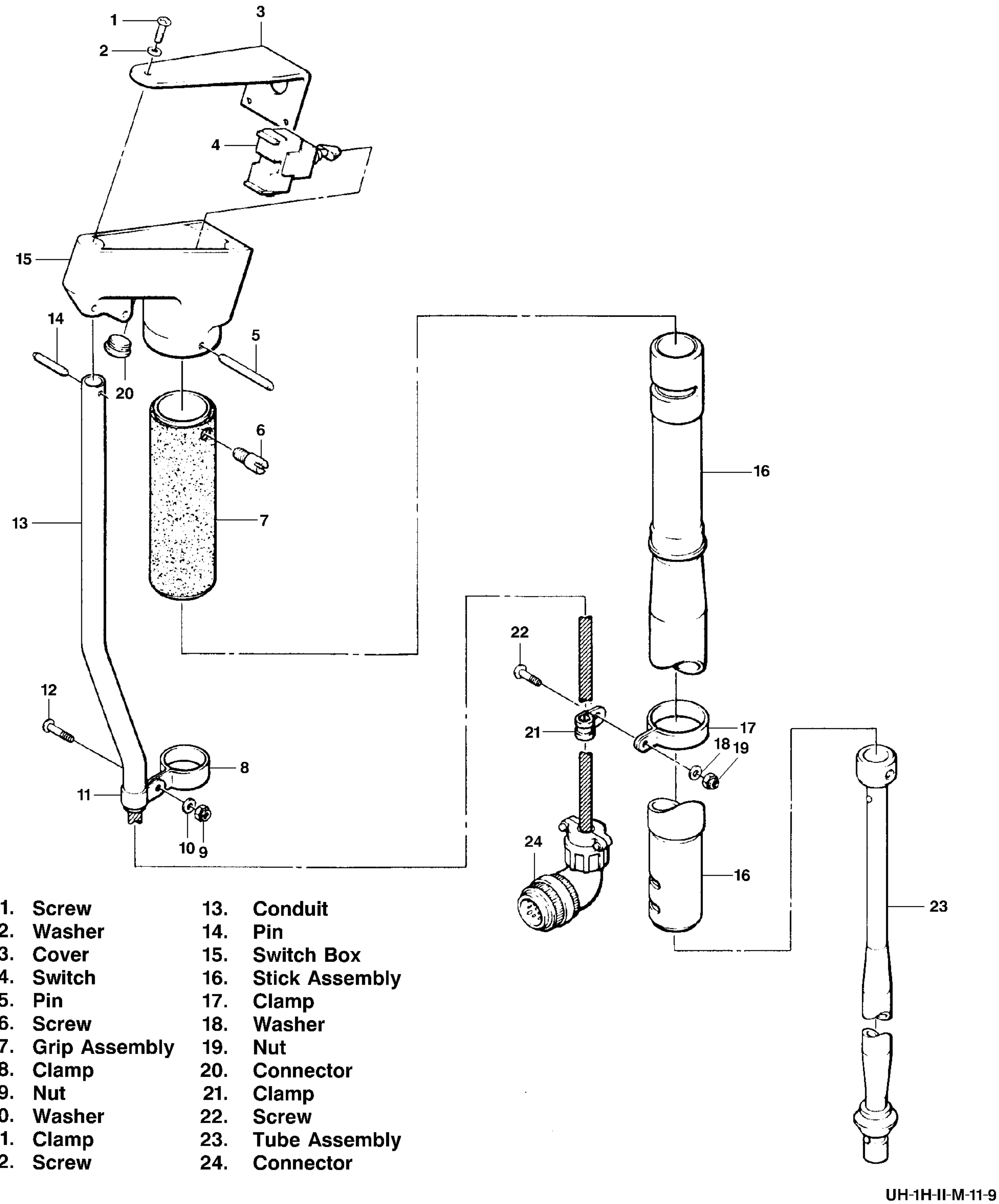
d. Remove pins (5 and 14) and remove switch box (15) from grip (7).

e. Remove nut (9), washer (10), and bolt (12). Remove clamps (8 and 11). Remove nut (19), washer (18) and bolt (22). Remove clamps (17 and 21).

f. Remove conduit (13) from stick assembly (16).

g. Remove screw (6) and grip assembly (7).

h. Slide tube assembly (23) from stick assembly (16).



1. Screw
2. Washer
3. Cover
4. Switch
5. Pin
6. Screw
7. Grip Assembly
8. Clamp
9. Nut
10. Washer
11. Clamp
12. Screw
13. Conduit
14. Pin
15. Switch Box
16. Stick Assembly
17. Clamp
18. Washer
19. Nut
20. Connector
21. Clamp
22. Screw
23. Tube Assembly
24. Connector

Figure 11-9. Copilot collective control stick — disassembly and assembly

11-39. Inspection — Copilot Collective Control Stick.

a. Inspect parts for nicks, scratches, and wear. Replace damaged parts.

b. Inspect all detail parts for corrosion. Replace parts that have corrosion.

c. Inspect all parts for thread damage.

d. Inspect bearings for looseness and binding. Replace defective bearings. (Paragraphs 11-171 and 11-172.)

11-40. Assembly — Copilot Collective Control Stick.

a. Insert tube assembly (23, figure 11-9) into stick assembly (16). Install grip assembly (7) onto stick assembly.

b. Align holes in grip assembly (7) and stick assembly (16). Install screw (6).

c. Install switch box (15) to grip (7). Install conduit (13) to switch box. Align holes in grip (7) and switch box and install pin (5). Align holes in switch box and conduit (13) and install pin (14).

d. Attach conduit (13) to stick assembly with clamps (8, 11, 17 and 21). Install bolt (12), washers (10) and nut (9) to clamp (8). Install bolt (22), washer (18), and nut (1) to clamp (17).

e. Connect connectors (20 and 24).

11-41. Installation — Copilot Collective Control Stick.

a. Install copilot collective control stick (25, figure 11-2) to elbow and control assembly (21), engaging copilot collective control stick to control guide.

b. Install two bolts (22), washers (35), and nuts (38).

c. Connect electrical connector (32). Secure boot to cabin floor with screws (26).

d. Install boot assembly (24). Secure boot to cabin floor with screws (26).

11-42. CONTROL TUBES — COLLECTIVE CONTROL SYSTEM.

11-43. Description — Control Tubes — Collective Control System. Varied length control tubes (adjustable and nonadjustable) are used in the collective control system. The nonadjustable type are fitted with bonded and riveted clevis ends. The adjustable type has a threaded clevis end and locknut which secures clevis end.

11-44. Removal — Control Tubes — Collective Control System.

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove flight controls access doors.

c. Detach forward end of control tube (6, figure 11-10) from lever (1) by removing cotter pin (5), nut (4), washers (3), and bolt (2). (Detail A.)

d. Detach aft end of control tube (6) from lever (13) by removing cotter pin and nut (8), washer (3), and bolt (7). (Detail B.)

e. Detach forward end of control tube (10) from lever (13) by removing cotter pin and nut (11), washers (3), and bolt (9). (Detail B.)

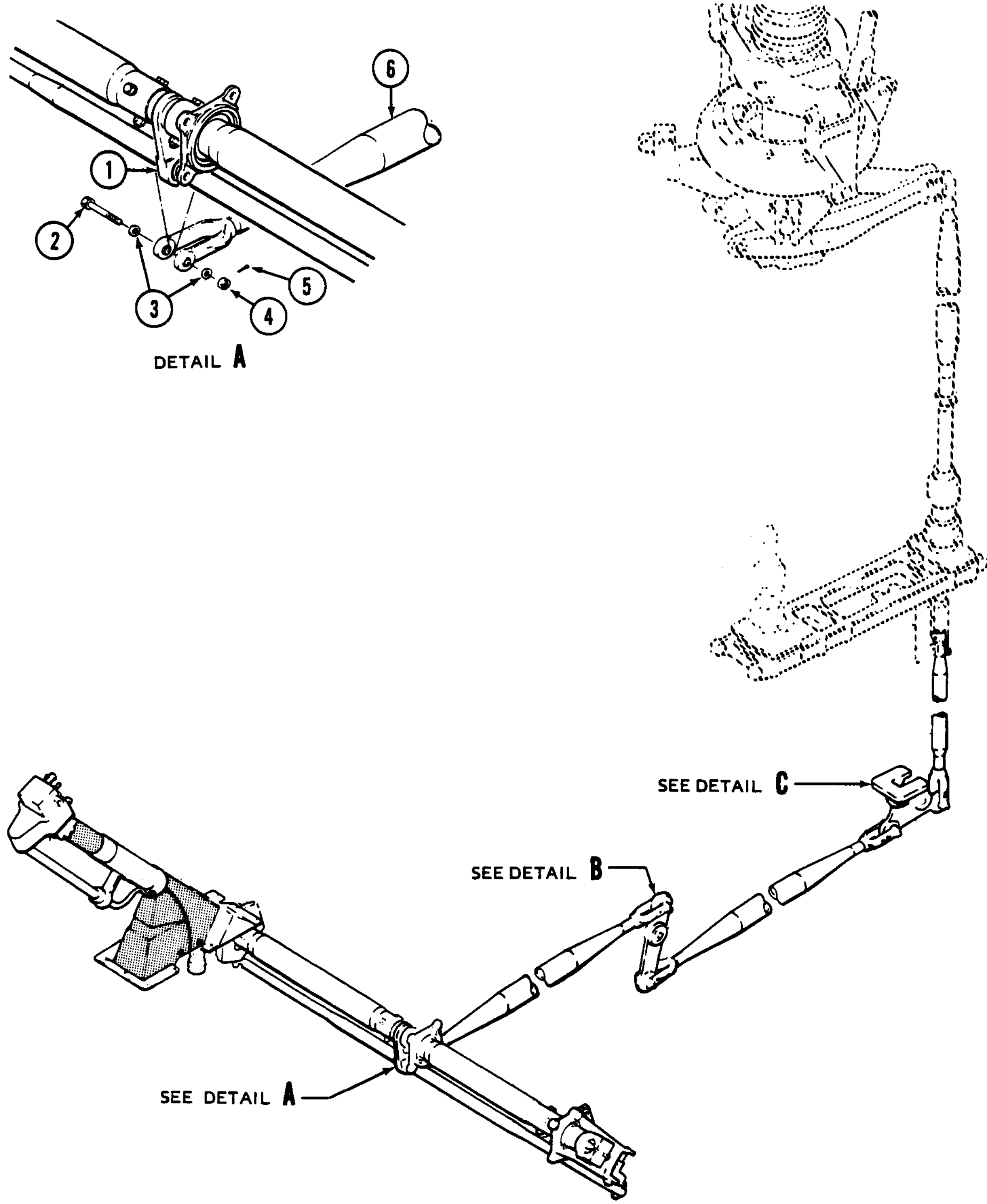
f. Detach aft end of control tube (10) from bellcrank (23) by removing cotter pin and nut (24), washers (3), and bolt (25). (Detail C.)

g. Detach lower end of control tube (19) from bellcrank (23) by removing cotter pin and nut (18), washers (3), and bolt (20). Detail C.)

h. Detach upper end of control tube (19) from collective hydraulic actuator by removing cotter pin, nut, washers, and bolt.

11-45. Inspection — Control Tubes — Collective Control System.

a. Inspect control tubes (6, 10, and 19, figure 11-10) for corrosion, wear, and mechanical damage. (Figure 11-11.)



1. Lever
2. Bolt
3. Washers
4. Nut
5. Cotter pin
6. Control tube

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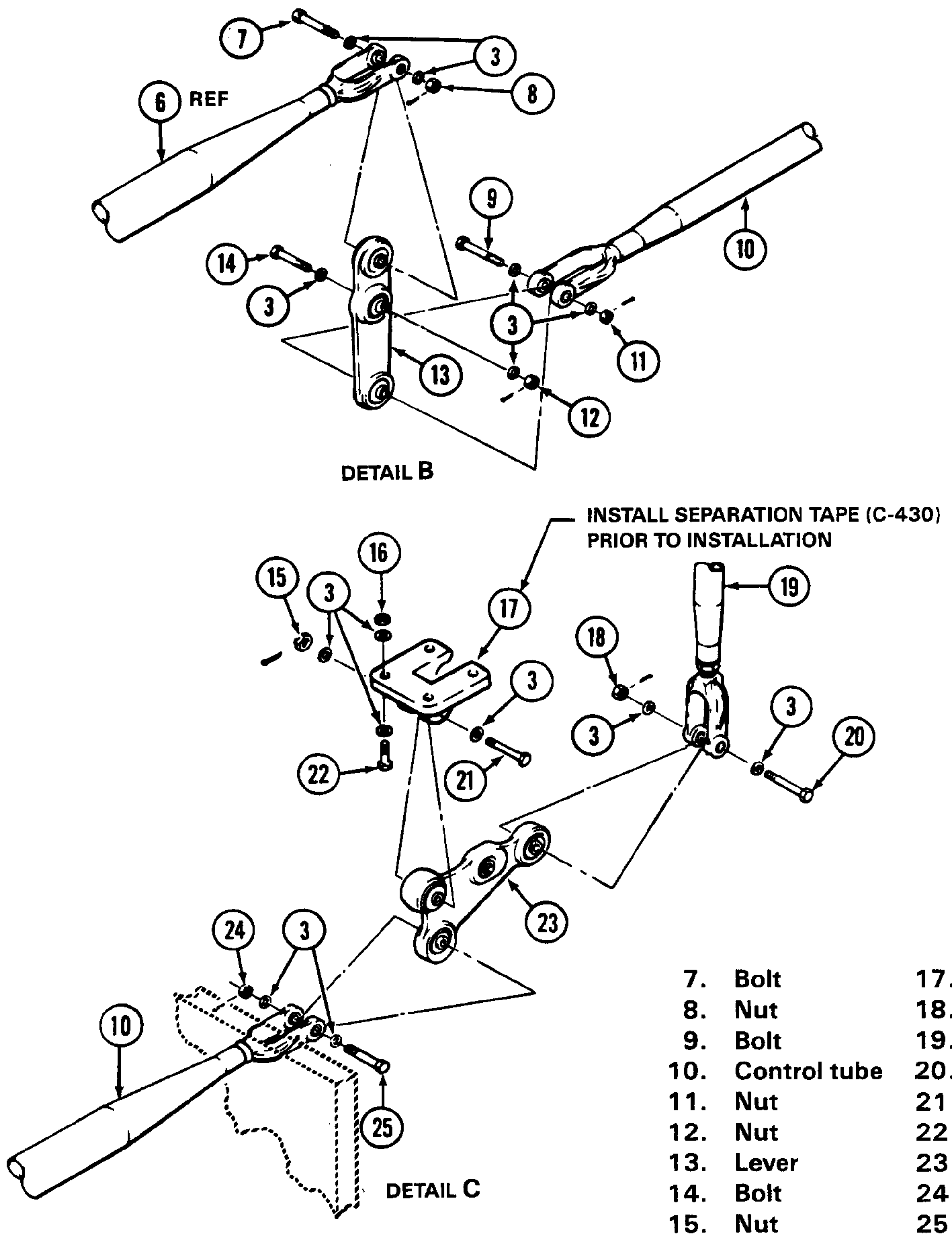
Figure 11-10. Bellcranks, levers, supports, and control tubes — collective control system — removal and installation (Sheet 1 of 2)



7.	Bolt	17.	Support
8.	Nut	18.	Nut
9.	Bolt	19.	Control tube
10.	Control tube	20.	Bolt
11.	Nut	21.	Bolt
12.	Nut	22.	Bolt
13.	Lever	23.	Bellcrank
14.	Bolt	24.	Nut
15.	Nut	25.	Bolt
16.	Nut		

UH-1H-II-M-11-10-2

Figure 11-10. Bellcranks, levers, supports, and control tubes — collective control system — removal and installation (Sheet 2 of 2)

b. Inspect clevis end holes for wear and clevis end for looseness in tube.

11-46. Repair or Replacement — Control Tubes — Collective Control System.

a. Polish out corrosion or mechanical damage to control tubes (repair area only). (Figure 11-11.)

b. Any damage to swage transition area or damage in repair areas that is in excess of limits is cause for replacement of tube assembly.

11-47. Installation — Control Tubes — Collective Control System.

a. Position forward end of control tube (6, figure 11-10) on lever (1) and install bolt (2), washers (3), nut (4), and cotter pin (5). (Detail A.)

b. Position aft end of control tube (6) to lever (13) and install bolt (7), washers (3), nut (8), and cotter pin. (Detail B.)

c. Install aft end of control tube (10) through boot. (Detail C.) Position forward end of control tube (10) to lever (13). Install bolt (9), washers (3), nut (11), and cotter pin. (Detail B.)

d. Position aft end of control tube (10) to bellcrank (23). Install bolt (25), washers (3), nut (24), and cotter pin. (Detail C.)

e. With collective stick full down, position boot on control tube (10) so that end of boot is 7.90 inches from bulkhead. Install clamp (26) on boot and tighten. (Detail C.)

f. Position bottom end of control tube (19) to bellcrank (23). Install bolt (20), washers (3), nut (18), and cotter pin. (Detail C.)

g. Attach control tube (19) to hydraulic actuator during rigging of collective control system. (Paragraph 11-6.)

11-48. BELLCRANKS, LEVERS, AND SUPPORTS — COLLECTIVE CONTROL SYSTEM.

11-49. Description — Bellcranks, Levers, and Supports — Collective Control System. Various

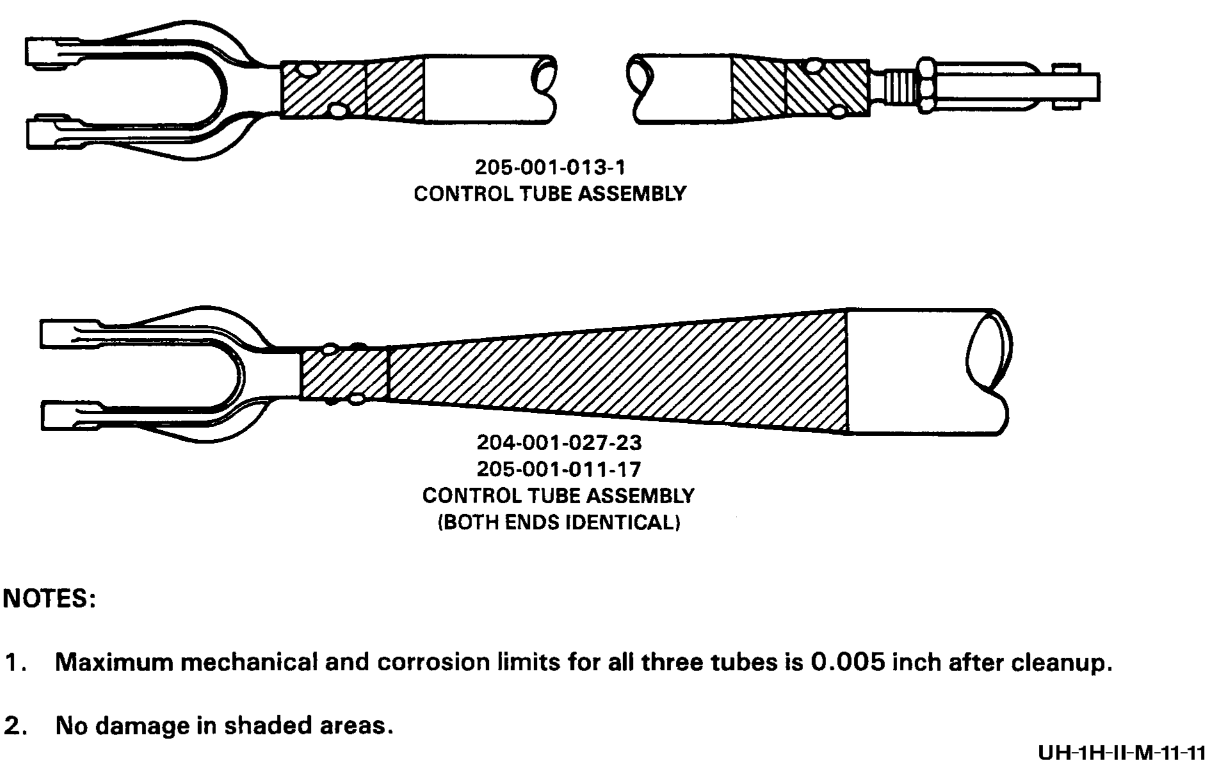


Figure 11-11. Control tubes — collective control system — wear and damage limits

bellcranks, levers, and supports are incorporated in the collective control system. The supports are airframe mounted and provide a pivot mount for levers and bellcranks.

11-50. Removal — Bellcranks, Levers, and Supports — Collective Control System.

a. Remove lever (13, figure 11-10) from brackets as follows:

(1) Remove flight controls access doors.

(2) Disconnect control tubes (6 and 10) from lever (13). (Detail B.)

(3) Remove cotter pin and nut (12), two washers (3), and bolt (4) from bracket and lever (13). Remove lever.

b. Remove bellcrank (23) and support (17) as follows: (Detail C.)

(1) Remove cargo hook. (Chapter 14.)

(2) Disconnect control tubes (10 and 19) from bellcrank (23). (Detail C.)

(3) Remove cotter pin and nut (15), two washers (3), and bolt (21) from support (17). Remove bellcrank (23).

(4) Remove four nuts (16), eight washers (3), and four bolts (22) from support (17). Remove support.

11-51. Inspection — Bellcranks, Levers, and Supports — Collective Control System.

a. Inspect bellcranks, levers, and supports for loose bearings. (BHT-ALL-SPM.)

b. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. (Figure 11-12.)

11-52. Repair — Bellcranks, Levers, and Supports — Collective Control System.

a. Replace loose or damaged bearings in bellcranks, levers, and support. (BHT-ALL-SPM.)

b. Remove minor surface corrosion or repair damage areas using fine grit abrasive cloth or paper (C-423). Observe limits shown. (Figure 11-12.)

(1) Treat repaired areas with chemical film material (C-100).

(2) Coat repaired area with epoxy polyamide primer (C-204).

11-53. Installation — Bellcranks, Levers, and Supports — Collective Control System.

a. Install lever (13, figure 11-10) as follows:

(1) Position lever (13) into bracket of cabin structure and install bolt (14), washers (3), and nut (12). Install cotter pin.

b. Install bellcrank (23) and support (17) as follows:

CAUTION

Ensure that bellcrank (23) and support (17) are positioned properly prior to installation. (Detail C.)

(1) Install barrier tape (C-430) (overlapping edges 1/4 inch) to support (17).

WARNING

Zinc chromate primer is flammable with a flash point of 50ºF (10ºC). Use in a well ventilated area and avoid breathing spray mist.

(2) Install eight washers (3) on four bolts (22).

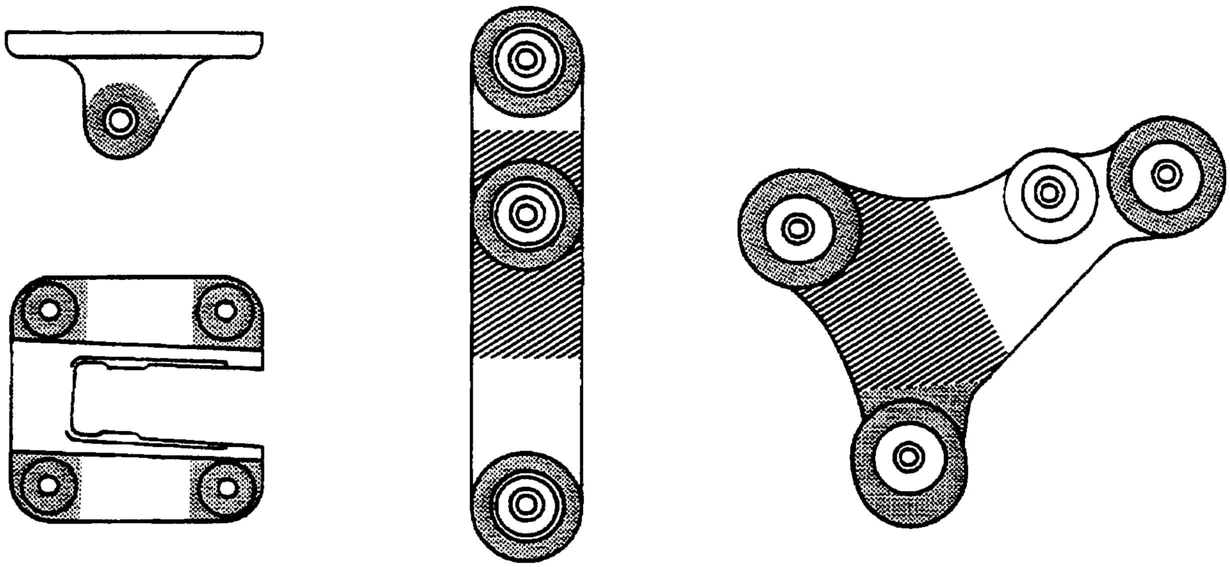
(3) Apply zinc chromate primer (C-201) to four bolts (22). Install bolts (22), support (17), eight washers (3), and four nuts (16) through support to cabin structure. (Detail C.)

(4) Position bellcrank (23), as shown in detail C, to support (17). Install bolt (21), two washers (3), and nut (15). Secure nut (15) with cotter pin.

(5) Connect and secure control tube assemblies (10 and 19) to bellcrank (23).

(6) Install cargo hook. (Chapter 14.)

(7) Install flight control access doors.



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
CORROSION DAMAGE			
(BEFORE CLEANUP)	0.0075 In.	0.005 In.	0.0025 In.
(AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 In. Sq.	0.10 In. Sq.	0.10 In. Sq.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER	0.05 By 0.05	0.04 By 0.04	
BORE DAMAGE	0.002 In. for one-fourth circumference		

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Figure 11-12. Bellcranks, levers, and supports — collective control system — wear and damage limits

11-54. CYCLIC CONTROL SYSTEM.

11-55. Description — Cyclic Controls. A system of linkage (figure 11-13) transmits movement from cyclic control sticks to swashplate which actuates rotating controls to main rotor, controlling direction of helicopter. Fore-aft and lateral controls are independent linkages from control stick to an intermixing bellcrank. From this point on the swashplate horns and the linkage cannot be considered separately as to effect. Two hydraulic power cylinders are incorporated to reduce effort required for control and to reduce feedback forces from main rotor. Two force gradient units, with magnetic brakes, are incorporated for artificial control feel and stabilization of controls.

11-56. Rigging — Cyclic Controls.

Premaintenance Requirements for Rigging Cyclic Controls

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Fixture	(T101330), (T84)
Test Equipment	None
Support Equipment	Maintenance Work Stands
Minimum Personnel Required	Two
Consumable Materials	(Pro-Seal 584), (C-201), (C-309), (C-405), (C-423), (C-430), (C-445)
Special Environmental Conditions	None

a. Disconnect cyclic controls at all rigging points shown in figure 11-13.

b. Disconnect spring from right swashplate horn. (View D, figure 11-13.)

c. Place and hold both cyclic control sticks in extreme left lateral position against stops. Adjust tube (6) to fit and connect.

d. Place and hold both cyclic control sticks in extreme forward or extreme aft position against stops. Adjust tube (7) to fit and connect.

NOTE

Bolt securing tube assembly to cylinder valve must be free to rotate after installation.

e. Place and hold pilots cyclic stick in extreme aft-left corner position, so that upper arm of bellcrank (20) is in its upper most position. Bottom out piston up-travel at top of cylinder (24) and set arm of cylinder valve in up position. (View B.) Adjust tube (21) to fit, then shorten three full turns, torque jam nut, and attach cylinder to valve arm with bolt, nut, and washers. Install washer next to bolt head and also next to nut. Torque nut 25 inch-pounds maximum. (Bolt must turn freely.) Install cotter pin.

f. Place and hold pilot cyclic stick in extreme aft-right corner position, so that upper arm of bellcrank (19) is in the upper most position. Bottom out piston up-travel at top of cylinder (29) and set arm of cylinder valve in up-position. (View B). Adjust tube (26) to fit, then shorten three full turns, torque jamnut, and attach to cylinder valve arm with bolt, nut, and washers, install washer next to bolthead and also next to nut. Torque nut 25 inch-pounds maximum. (Bolt must turn freely.) Install cotter pin.

g. Install cyclic stick fixture (T101330) on copilots control stick.

NOTE

Swashplate lateral pretilt limits are between 1 and 2 degrees for satisfactory flight.

h. Set swashplate to dimensions shown in figure 11-14.

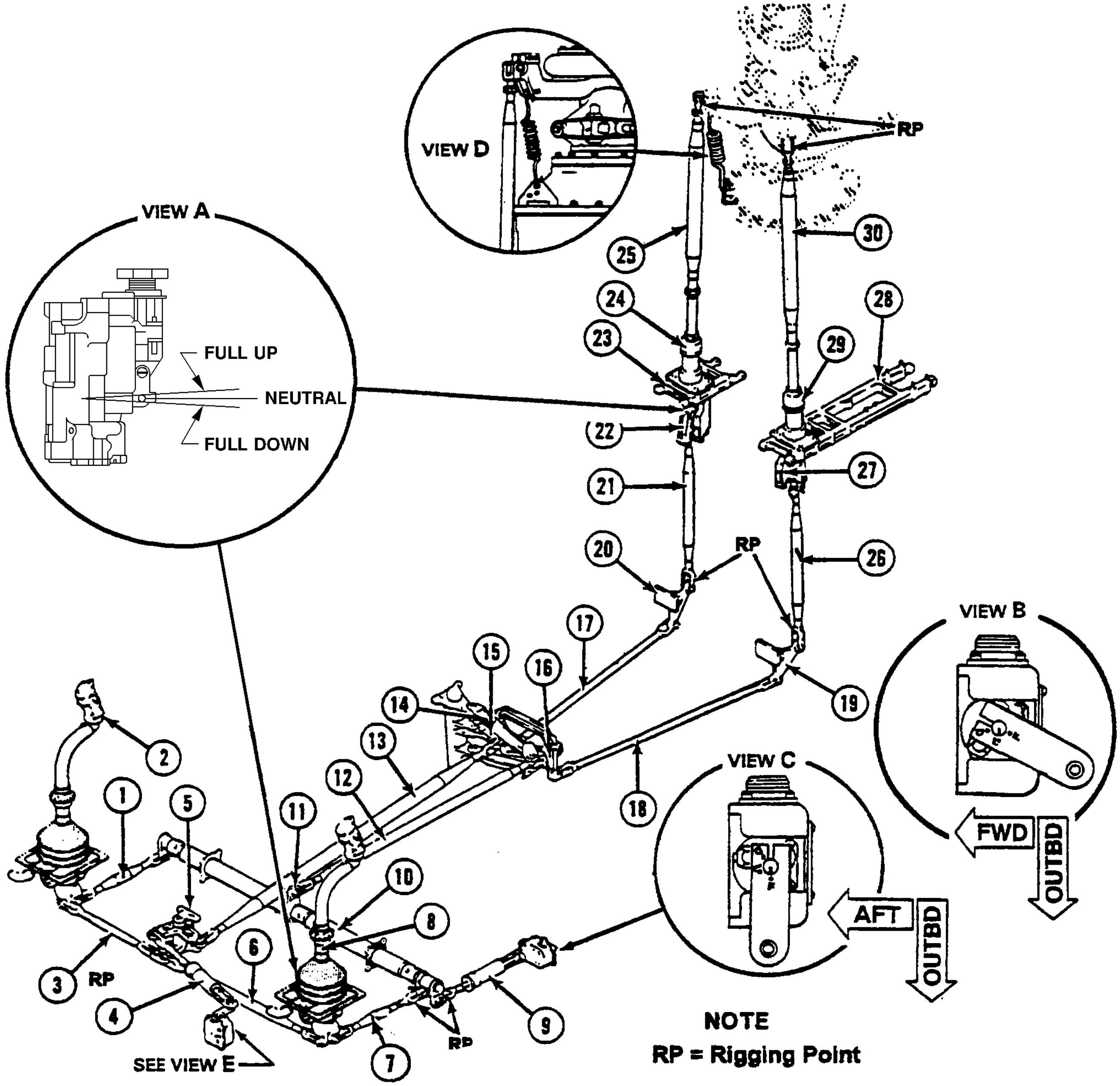
CAUTION

Cyclic controls shall not move while bottoming servo valves.

i. Set servo valves (22 and 27, figure 11-13) in up position. (View B.) Adjust control tubes (25 and 30) to fit swashplate, then shorten one complete turn each and connect.

j. Connect spring to right swashplate horn. (View D.)

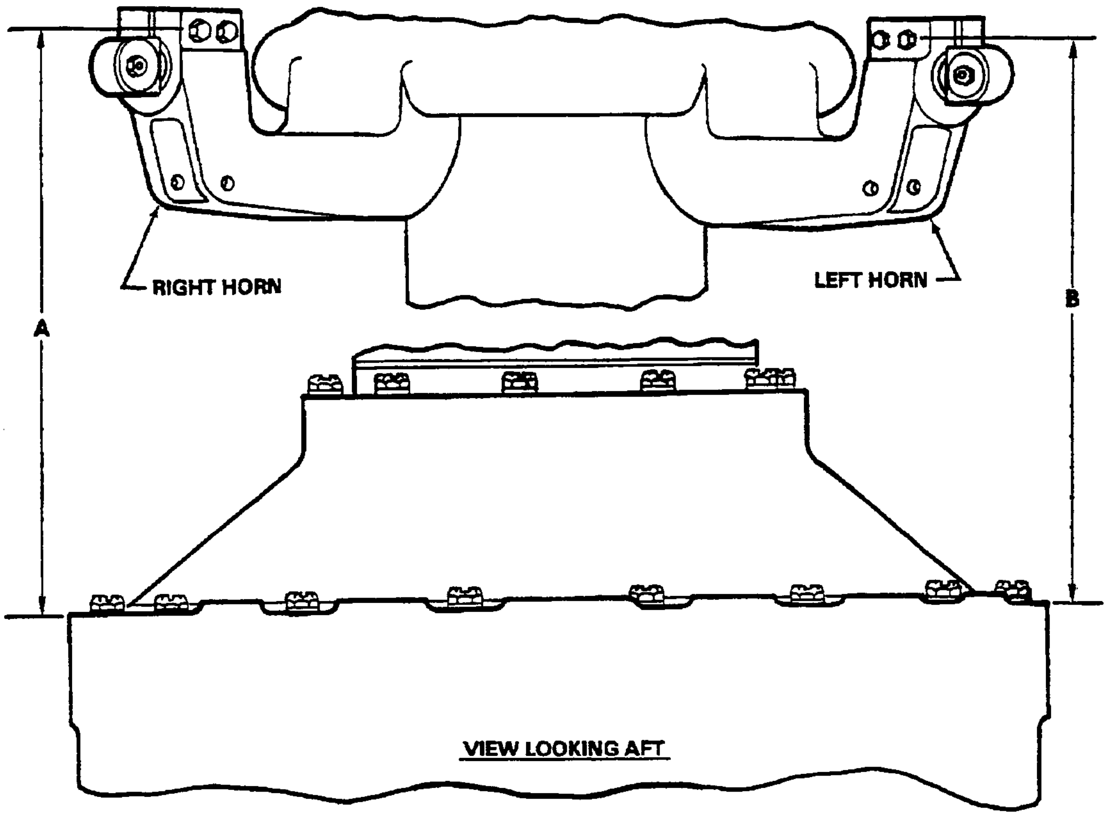
k. Remove cyclic stick fixture (T101330) from copilot control stick.



1. Control tube - fore and aft
2. Cyclic control stick (pilot)
3. Control tube - lateral
4. Force gradient - lateral
5. Bellcrank and support
6. Control tube - lateral
7. Control tube - fore and aft
8. Cyclic control stick (copilot)
9. Force gradient - fore and aft
10. Cyclic jackshaft - fore and aft
11. Lever
12. Control tube
13. Control tube - fore and aft
14. Matched link set - lateral
15. Bellcrank
16. Bellcrank
17. Control tube
18. Control tube
19. Bellcrank
20. Bellcrank
21. Control tube
22. Cylinder valve
23. Support
24. Cylinder assembly
25. Control tube
26. Control tube
27. Cylinder valve
28. Support
29. Cylinder assembly
30. Control tube

UH-1H-II-M-11-13

Figure 11-13. Cyclic control system — rigging



SWASHPLATE SETTING WITH RESPECT TO MAST		DIMENSION (INCHES) A RIGHT HORN	DIMENSION (INCHES) B LEFT HORN
FORE AND AFT	LATERAL		
NORMAL	1° DOWN LEFT	14.19 14.13	13.97 13.91
NORMAL	1 1/2° DOWN LEFT	14.24 14.18	13.92 13.86
NORMAL	2° DOWN LEFT	14.30 14.24	13.86 13.80

NOTE

Measurement for dimensions A and B shall be taken from top of transmission to center line of outboard bolt head.

UH-1H-II-M-11-14

Figure 11-14. Cyclic control system — swashplate adjustment

l. Position arms on longitudinal (view C), align index mark "F" on arm with index mark on the shaft, see figure 11-17 and lateral (view E), align index mark "L" on arm with index mark on the shaft, cyclic magnetic brakes. (Figure 11-13).

m. Place and hold pilot cyclic control stick against forward stop and longitudinal magnetic brake against aft stop.

n. Adjust force gradient (9) to fit, then extend 2 turns and connect. Check for 3 to 4 inch cushion at stick grip when positioned against forward cyclic control stick stop.

NOTE

Lateral magnetic brake arm may be reindexed by one serration as required for clearance.

o. Check clearance between force gradient (4) and structure at extreme left position of lateral magnetic brake.

p. Place and hold pilot cyclic control stick against right lateral stick stop and lateral magnetic brake arm (view E) to extreme left position against stop.

q. Adjust force gradient (4) link attached to bellcrank (5) and temporarily install. Using a 6-inch scale, measure from end cap of force gradient to center of clevis hole, mark the clevis and record the dimension. Place and hold pilot cyclic control stick against left lateral stick stop, measure and record travel distance of the clevis. Extend clevis one-half the travel distance recorded and connect force gradient to bellcrank.

r. Inspect cyclic control system for secure installation, binding, and unobstructed full travel.

s. Check synchronized elevator controls for proper rigging. (Paragraph 11-156.)

11-57. CYCLIC CONTROL STICK.

11-58. Description — Cyclic Control Stick. Two cyclic control sticks are installed. The grips are equipped with a trigger type communications switch, a cargo hook release switch, and a force trim switch. The control sticks are identical except for an adjustable friction on the pilot stick. Linkage between cyclic control sticks and swashplate control horns includes push-pull tubes, bellcranks, control tubes, two force gradients with magnetic brakes, and two hydraulic actuators.

11-59. Inspection — Cyclic Control Stick (Installed).

a. Inspect for binding, full travel, and synchronization of pilot and copilot cyclic stick assemblies.

b. Inspect friction lock for restriction of cyclic stick movement and proper release.

c. Check boot for cuts, tears, deterioration, and missing, loose, or improperly installed hardware.

11-60. Removal — Cyclic Control Stick (Pilot or Copilot).

NOTE

Use this procedure to remove a complete stick assembly, including support and lever.

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove screws (33, figure 11-15) and washers (12) to detach boot assembly (32) from floor.

c. Remove boot assembly (32) from cyclic control stick (2).

d. Remove flight controls access doors.

e. Remove lockwire and disconnect cyclic control stick electrical cable (31, figure 11-15) from receptacle on structure.

f. Remove cotter pins and nuts (30 and 34), washers (12), and bolts (27 and 29) attaching control tube (fore and aft) (35) and control tube (lateral) (28) to lever assembly (26).

g. Remove four bolts (6) and washers (7) from support assembly (9).

h. Remove cyclic control stick (2) and support assembly (9).

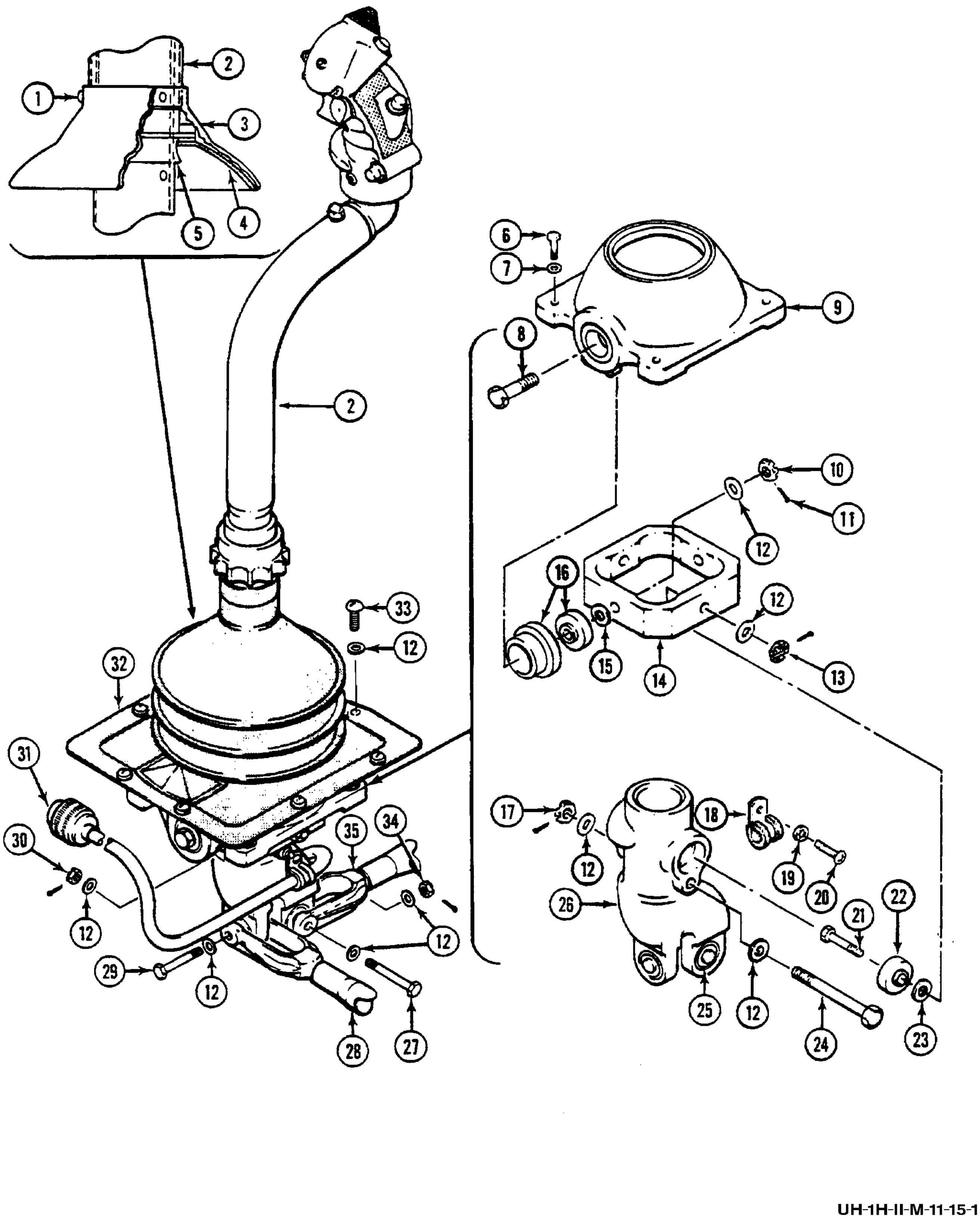


Figure 11-15. Cyclic control system — removal and installation (Sheet 1 of 2)

1. Rivet
2. Stick assembly
3. Bell
4. Friction material
5. Collar
6. Bolt
7. Washer
8. Bolt
9. Support assembly
10. Nut
11. Cotter pin
12. Washer
13. Nut
14. Gimbal
15. Shim
16. Bearing and sleeve
17. Nut
18. Clamp
19. Lockwasher
20. Screw
21. Bolt
22. Bearing
23. Shim
24. Bolt
25. Bearing and sleeve
26. Lever assembly
27. Bolt
28. Control tube(lateral)
29. Bolt
30. Nut
31. Electrical cable
32. Boot assembly
33. Screw
34. Nut
35. Control tube (fore and aft)

UH-1H-II-M-11-15-2

Figure 11-15. Cyclic control system — removal and installation (Sheet 2 of 2)

11-61. Disassembly — Cyclic Control Stick.

a. Remove screw (20, figure 11-15), lockwasher (19), and clamp (18) attaching electric cable (31) to lever assembly (26).

b. Remove cotter pin (11), nut (17), washers (12), and bolt (24) attaching stick assembly (2) and lever assembly (26). Separate the parts.

c. Remove two cotter pins and nuts (10), washers (12), shims (15), and bolts (8) attaching support assembly (9) to gimbal (14). Separate parts.

d. Remove two cotter pins and nuts (13), washers (12), and bolts (21) attaching gimbal (14) to lever assembly (26). Separate parts.

e. Remove two bearings (22), two bearings and sleeves (16), and shims (23).

11-62. Inspection — Cyclic Control Stick. (Removed).

NOTE

For bearing tolerances, refer to paragraph 11-170.

a. Inspect bearings (figure 11-15) for wear and damage.

b. Inspect bolts for thread damage.

c. Inspect cyclic control stick for loose, missing, or improperly installed hardware.

d. Check boots for cuts, tears, and deterioration.

e. Inspect all components of cyclic control sticks for nicks, scratches, dents, broken, or damaged tubing and frayed or broken cabling.

f. Elongation of bolt holes shall not exceed 0.001 inch on the diameter. Score marks on inside surface of holes may be polished out for one fourth of the circumference of hole, if the depth of score is 0.002 inch or less.

11-63. Repair or Replacement — Cyclic Control Stick. (Removed).

NOTE

Do not attempt to repair any damaged components.

a. Replace bearings if worn, rough, or damaged. (Paragraphs 11-171 and 11-172.)

b. Replace electrical wires if frayed or broken.

c. Replace hard sheet friction material (C-445) (4, figure 11-15) in bell (3) if worn or damaged, as follows:

(1) Scrape old hard sheet friction material (C-445) out of bell and clean with methyl-ethyl-ketone (C-309).

(2) Apply cement (Pro-Seal 584) to new hard sheet friction material (C-445) and install in bell (3).

d. Replace all parts that do not appear suitable for continued use.

11-64. Assembly — Cyclic Control Stick.

NOTE

Bolt heads (21, figure 11-15) to be inboard for step a.

a. Attach gimbal (14) to lever assembly (26) by installing two bearings (22), shims (23), and inserting bolts (21), securing with washers (12), nuts (13), and cotter pins.

NOTE

Bolt heads to be outboard for step b.

b. Attach gimbal (14) to support assembly (9) by installing two bearings and sleeves (16), shims (15), inserting bolts (8) and securing with washers (12), nuts (10), and cotter pins.

NOTE

Insert stick assembly (2) so the fore and aft control tube attachment point is aft when the assembly is installed in helicopter.

c. stick assembly (2) through support assembly (9) into lever assembly (26). Install bolt (24), washers (12), and nut (17). Insert cotter pin.

d. Position electrical cable (32) and secure with clamp (18) by installing screw (20) with lockwasher (19).

11-65. Installation — Cyclic Control Stick (Pilot or Copilot).

NOTE

Use this procedure to install a stick assembly complete with support and lever.

a. Position cyclic control stick assembly (2, figure 11-15) in place. Secure support assembly (9) to structure with four bolts (6) and four washers (7).

b. Attach fore and aft control tubes (35) and lateral control tubes (28) to control stick lever (26) with bolts (27 and 29), washers (12) and nuts (30 and 34). Secure with cotter pins.

c. Connect cyclic control stick electrical cable (31) to receptacle on structure and install lockwire (C-405). Check that cable support clamp allows enough slack in cable for full stick travel.

d. Install boot assembly (32) and secure to floor with eight screws (33) and washers (12).

e. Install flight control access doors.

f. Install pilot and copilot seats. (Chapter 2.)

11-66. TUBE AND LEVER ASSEMBLY — CYCLIC CONTROLS.

11-67. Description — Tube and Lever Assembly — Cyclic Controls. Two control tube and lever assemblies are mounted under the floor and forward of the pilot seat. These are segments of linkage between cyclic control stick and swashplate control horns.

11-68. Inspection — Tube and Lever Assembly — Cyclic Controls (Installed).

a. Inspect tube and lever assemblies (13 and 14, figure 11-16) for binding).

b. Inspect bearing in arm assembly (19) for 0.012 inch radial and 0.030 inch axial maximum allowable wear.

c. Maximum allowable lateral play on tube and lever assemblies (13 and 14) is 0.020 inch.

d. Inspect tube and lever assemblies (13 and 14) for corrosion, cracks, nicks, and scratches.

11-69. Removal — Tube and lever Assembly — Cyclic Controls.

CAUTION

Accidental movement of flight controls while disconnected may result in damage to controls and surrounding structure.

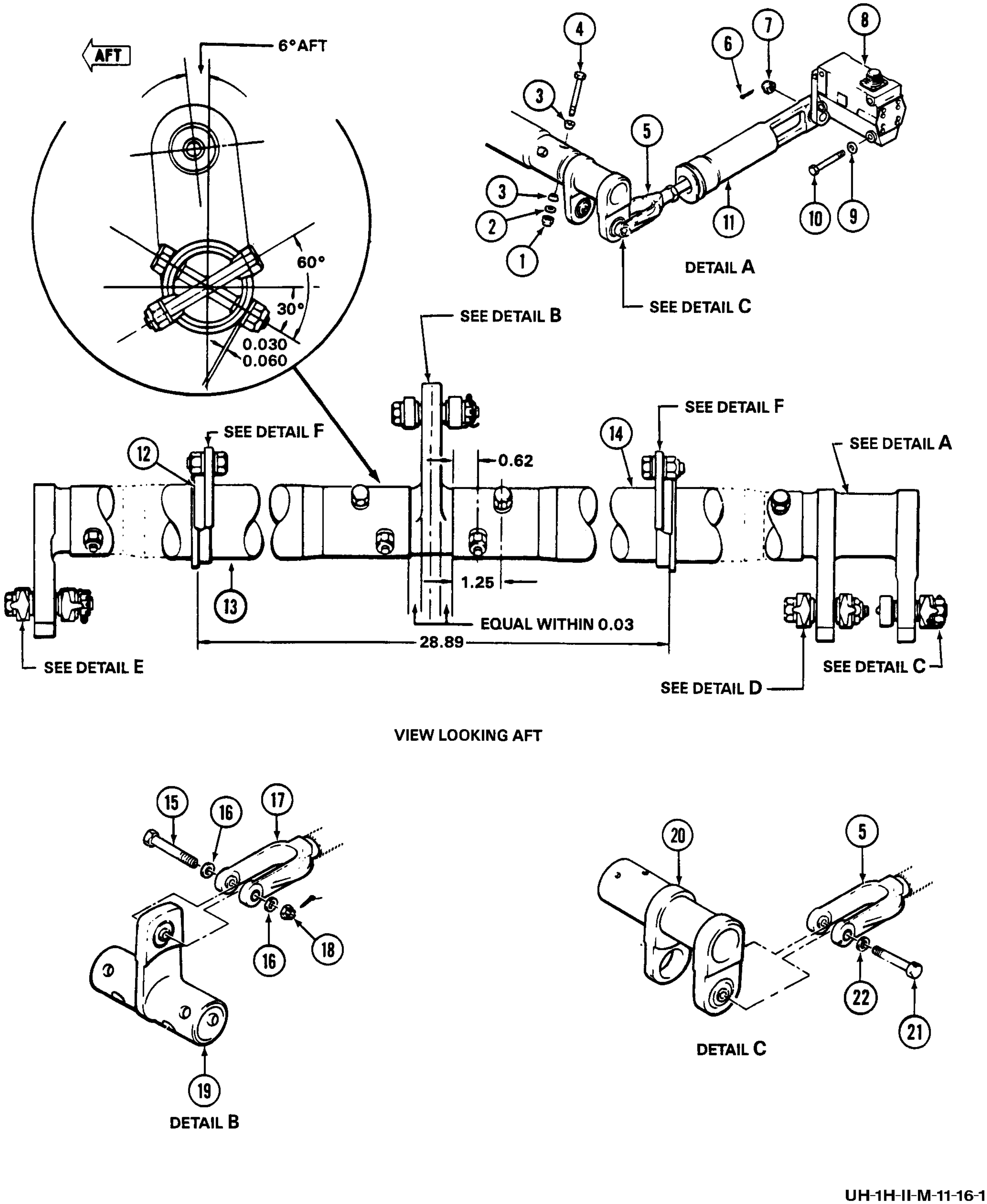
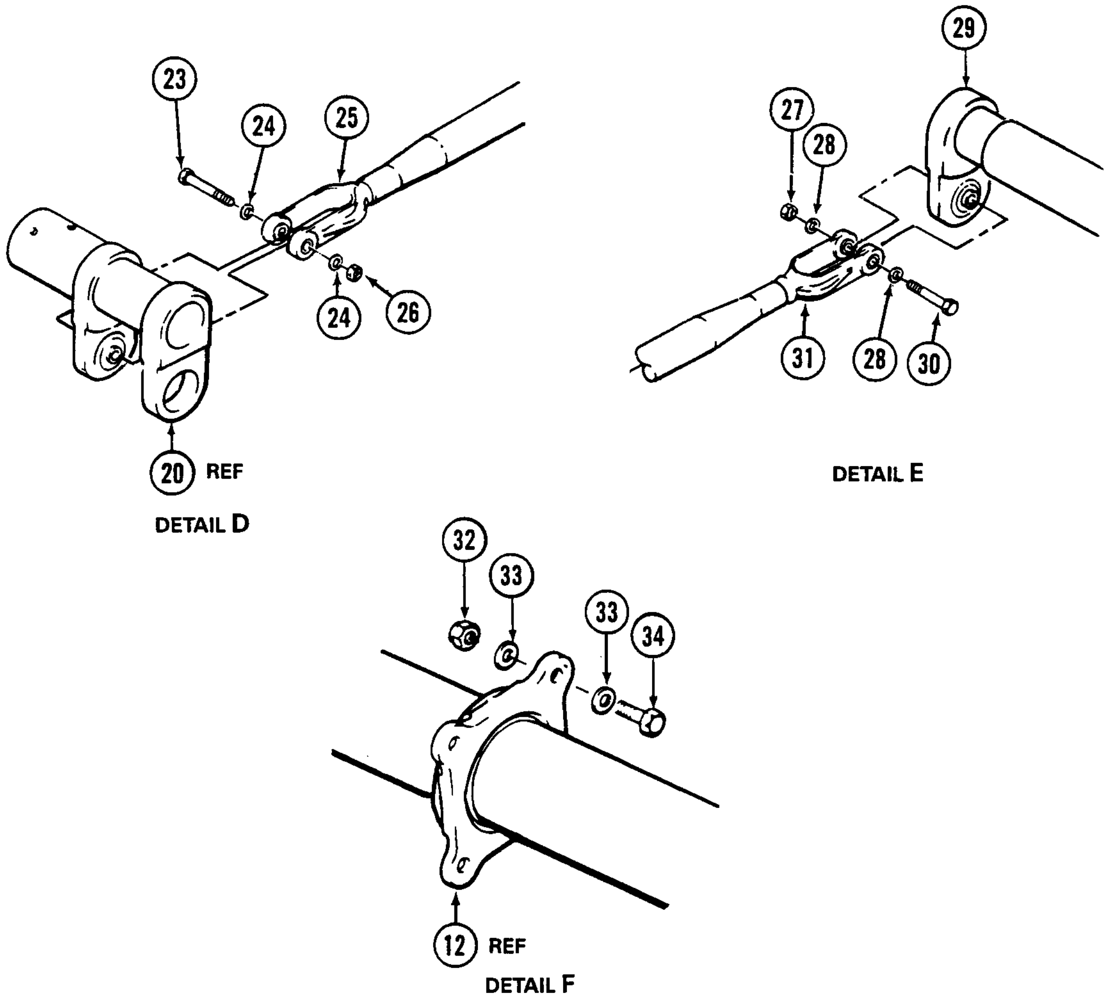


Figure 11-16. Tube and lever assemblies — cyclic control system — disassembly and assembly (Sheet 1 of 2)



1. Nut
2. Washer
3. Tapered bushing
4. Bolt
5. Clevis assembly
6. Cotter pin
7. Nut
8. Magnetic brake
9. Washer
10. Bolt
11. Force gradient — fore and aft
12. Support assembly
13. Tube and lever assembly
14. Tube and lever assembly
15. Bolt
16. Washer
17. Tube assembly
18. Nut
19. Arm assembly
20. Tube and lever assembly
21. Bolt
22. Washer
23. Bolt
24. Washer
25. Tube assembly
26. Nut
27. Nut
28. Washer
29. Tube and lever assembly
30. Bolt
31. Tube assembly
32. Nut
33. Washer
34. Bolt

UH-1H-II-M-11-16-2

Figure 11-16. Tube and lever assemblies — cyclic control system — disassembly and assembly (Sheet 2 of 2)

NOTE

Parts of control system can be removed separately as need occurs, or completely in practical sequence.

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove flight control access doors.

c. Remove cotter pin and nut (27, figure 11-16), washers (28), and bolt (30) attaching tube assembly (31) to tube and lever assembly (29). (Detail E.)

d. Remove cotter pin and nut (18), washer (16), and bolt (15) attaching tube assembly (17) to arm assembly (19). (Detail B.)

e. Remove cotter pin and nut (26), washer (24), and bolt (23) attaching tube assembly (25) to tube and lever assembly (20). (Detail D.)

f. Remove lockwire bolt (21), and washer (22) attaching clevis assembly (5) to tube and lever assembly (20). (Detail C.)

g. Remove bolts (4), washers (2), tapered bushings (3) and nuts (1) from each side of tube and lever assembly (20). Identify bolts and tapered bushings for installation in same location. (Detail A.)

h. Remove bolts (34), washers (33), and nuts (32) attaching support assemblies (12) to beam. Withdraw tube and lever assemblies (13 and 14) through access openings. (Detail F.)

11-70. Disassembly — Tube and Lever Assembly — Cyclic Controls.

a. Remove bolts (4, figure 11-16), washers (2), and tapered bushings (3) attaching components of tube and lever assembly (13 and 14) from arm assembly (19).

b. Remove tubes from assembly.

11-71. Inspection — Tube and Lever Assembly — Cyclic Controls.

a. Maximum allowable elongation of bushing hole is 0.003 inch.

b. Maximum allowable lateral play is 0.020 inch.

c. Maximum allowable wear on tube and lever assembly bearing is 0.010 inch radial.

d. Inspect tube and lever assembly for corrosion, cracks, nicks, and scratches.

e. Inspect bearing in arm assembly (19, figure 11-16) for 0.012 inch radial and 0.030 inch axial maximum allowable wear.

11-72. Repair or Replacement — Tube and Lever Assembly — Cyclic Controls.

a. Replace worn or rough bearings and damaged or unserviceable parts. (BHT-ALL-SPM.)

b. Replace all parts that do not meet inspection requirements.

11-73. Installation — Tube and Lever Assembly — Cyclic Controls.

a. Inspect structural intercostal mounting surfaces of support assembly (12, figure 11-16) to determine if barrier tape (C-430) is torn or missing. Install new tape if torn and missing.

NOTE

Barrier tape (C-430) shall cover the entire mating surface area of one of the parts and extend at least 1/4 inch beyond the joint edges.

b. Insert tube and lever assemblies (13 and 14, figure 11-16) with support assemblies (12) in place through access openings of cabin.

c. Slip ends of tube and lever assemblies (13 and 14) on shafts of arm assembly (19).

d. Align bolt holes with center arm pointing up and end down. If new tube and lever assemblies (13 and 14) are being installed, line ream holes for bolts (4) using taper reamer (T84).

e. Apply zinc chromate primer (C-201) on tapered bushings (3) and mounting surfaces of tube and lever assemblies (13 and 14).

CAUTION

Do not intermix parts.

f. Install bolts (4), tapered bushings (3), washers (2), and nuts (1) attaching tubes to arm assembly (19) and both ends of tube and lever assemblies (13 and 14). Torque nuts 50 to 70 inch-pounds.

g. Secure support assemblies (12) to each beam by installing bolts (34) washers (33) and nuts (32). Check for free operation.

h. Install bolt (21) and washers (22) to attach clevis assembly (5) to tube and lever assembly (20). Secure with lockwire (C-405).

NOTE

If adjustable control tubes are not correct length to be attached, leave one end free until controls are rigged.

i. Install bolt (23), washers (24), and nut (26) to attach tube assembly (25) to tube and lever assembly (20). Secure with cotter pin.

j. Install bolt (15) from right side, washers (16), and nut (18) to secure tube assembly (17) to arm assembly (19). Secure with cotter pin.

k. Install bolt (30), washers (28), and nut (27) to install tube assembly (31) to tube and lever assembly (29). Secure with cotter pin.

l. Install flight control access doors.

m. Install pilot and copilot seats. (Chapter 2.)

11-74. MAGNETIC BRAKE — CYCLIC CONTROLS.

11-75. Description — Magnetic Brake — Cyclic Controls. A magnetic brake used in conjunction with a force gradient assembly is mounted in each control system; the fore and aft cyclic, the lateral cyclic, and the tail rotor pitch control. All three assemblies are identical except for the position of the arm on the brake. By position one of the letters "D", "L", or "F" relative to the brake shaft, the brake may be used in either the Directional (D), Lateral (L), or Fore and aft (control assembly. (Figure 11-17.))

11-76. (DELETED)

11-77. Inspection — Magnetic Brake — Cyclic Controls.

a. Check flight controls for unobstructed full travel.

b. Check assembly for corrosion, unobstructed travel, and cannon plug safetying.

c. Check for loose, missing, or improperly installed hardware.

11-78. Removal — Magnetic Brake — Cyclic Controls.

a. Remove lockwire and disconnect electrical plug from brake (8, figure 11-16) body.

b. Remove cotter pin and nut (7) attaching force gradient (11) to brake (8) arm.

c. Remove four bolts (10) and four washers (9) attaching magnetic brake (8) to structure.

11-79. Repair or Replacement — Magnetic Brake — Cyclic Controls. Replace magnetic brake assemblies having malfunction that will not allow unobstructed full travel for cyclic controls.

11-80. Installation —Magnetic Brake — Cyclic Controls.

a. Mount brake arm on brake. (Paragraph 11-74.) Secure arm with retaining bolts.

b. Position brake in place on structure and install mounting bolts (10, figure 11-16) and washers (9).

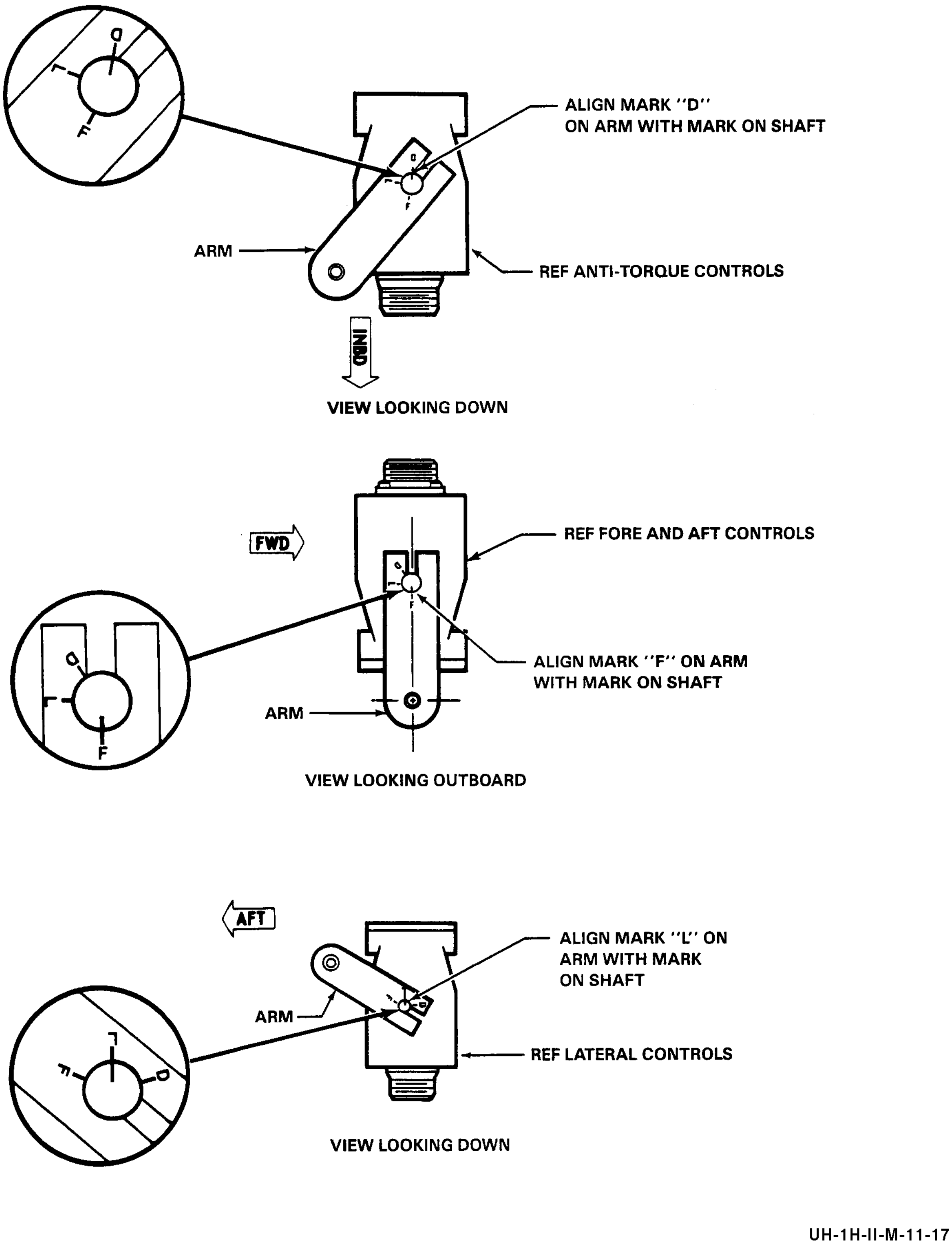


Figure 11-17. Magnetic brake — adjustment

c. Connect force gradient (11) to brake (8) arm. Secure with nut (7) and cotter pin (6).

d. Connect electrical plug and secure with lockwire (C-405).

11-81. FORCE GRADIENT — CYCLIC CONTROLS.

11-82. Description — Force Gradient Cyclic Controls. Two force gradient assemblies are used in the cyclic control system in conjunction with magnetic brake assemblies. The force gradient and magnetic brake assemblies serve to give artificial "feel" to the flight controls and enable the pilot to "trim" the helicopter.

11-83. Adjustment — Force Gradient — Cyclic Controls.

NOTE

Ensure that parts are not intermixed when two or more force gradient assemblies are disassembled at one time.

a. Remove force gradient assembly. (Paragraph 11-84.)

b. Preload spring in force gradient assemblies (lateral, fore and aft, and directional) as follows:

(1) Remove spring assembly (6, figure 11-18) from housing (2) by removing lockwire and cap (1).

(2) Place spring assembly in a vise. (Figure 11-18.)

NOTE

Do not tighten vise rod. Allow spring retainer to pull evenly against both jaws of vise.

(3) Attach spring scale to clevis (10). Compress spring (6) with a steady 2.5 to 3.0 pounds pull.

(4) While maintaining this tension, tighten adjustment nut (7) until it makes contact with spring retainer (5).

(5) Hold adjustment nut (7) while tightening jam nut (8).

c. Assemble force gradient assembly as follows:

(1) Insert spring assembly (6, figure 11-18) in housing (2).

(2) Install cap (1) and tighten sufficiently to eliminate end play.

NOTE

A cap too tight or too loose will cause end play.

(3) Install lockwire (C-405) on cap (1), as shown in figure 11-18, to prevent rotation in either direction.

11-84. Removal — Force Gradient — Cyclic Controls.

a. Remove cotter pin and nut (7, figure 11-16) attaching force gradient (11) to magnetic brake (8). (Detail A.)

b. Remove lockwire, bolt (21), and washer (22) attaching clevis (5) to tube and lever assembly (20). (Detail C.)

11-85. Inspection — Force Gradient — Cyclic Controls.

a. Inspect for preloading, and freedom of operation.

b. Inspect for loose, missing, or improperly installed hardware.

c. Inspect for bottoming at all control positions.

d. Inspect shaft lock nuts for security and cap for correct safetying.

e. Inspect bearing for wear and damage.

f. Inspect for wear and damage in excess of limits. (Figure 11-19.)

g. Inspect for corrosion on inside of barrel.

11-86. Repair or Replacement — Force Gradient — Cyclic Controls.

a. Repair or replace force gradients with wear and damage exceeding limits. (Figure 11-19.)

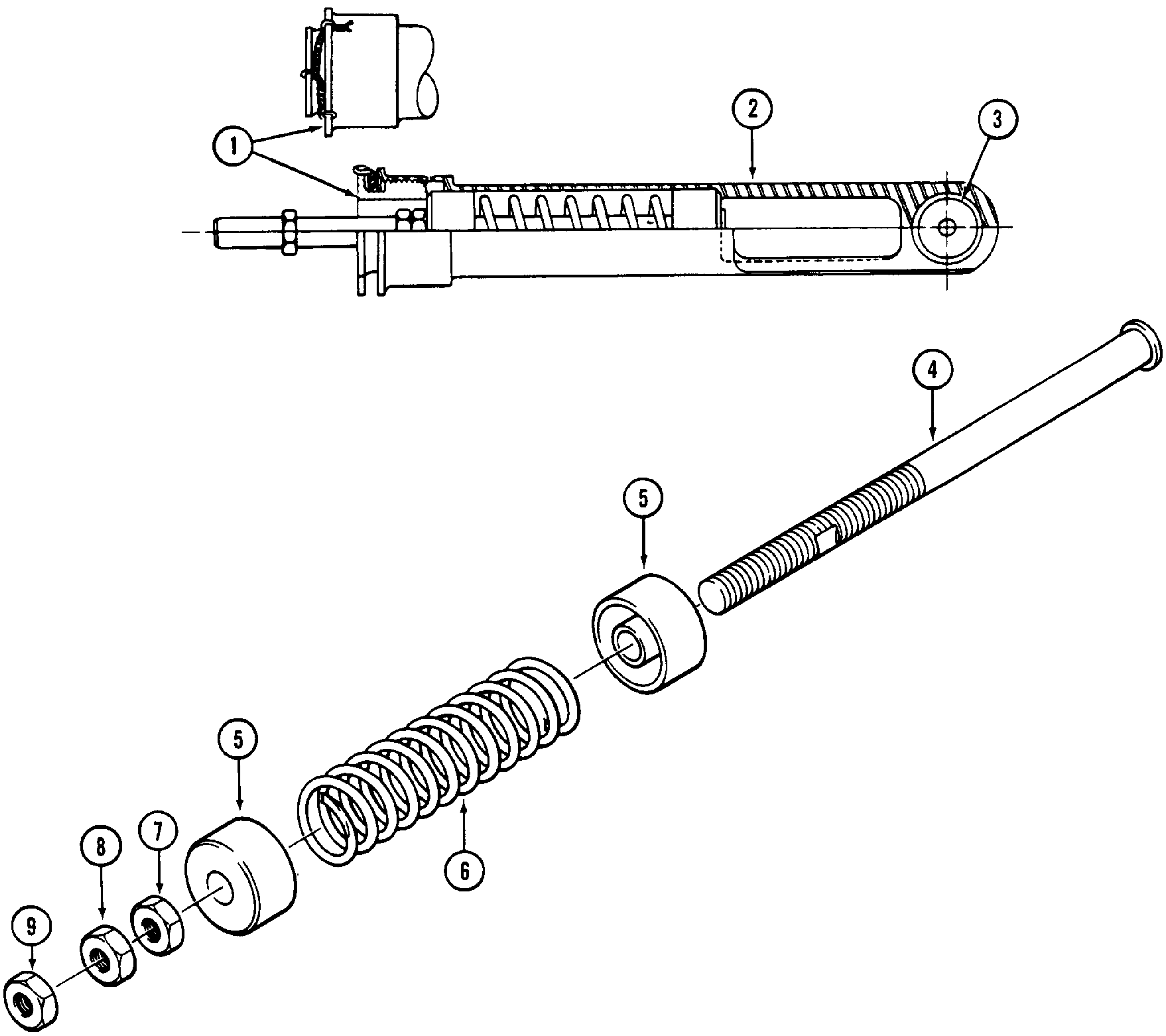
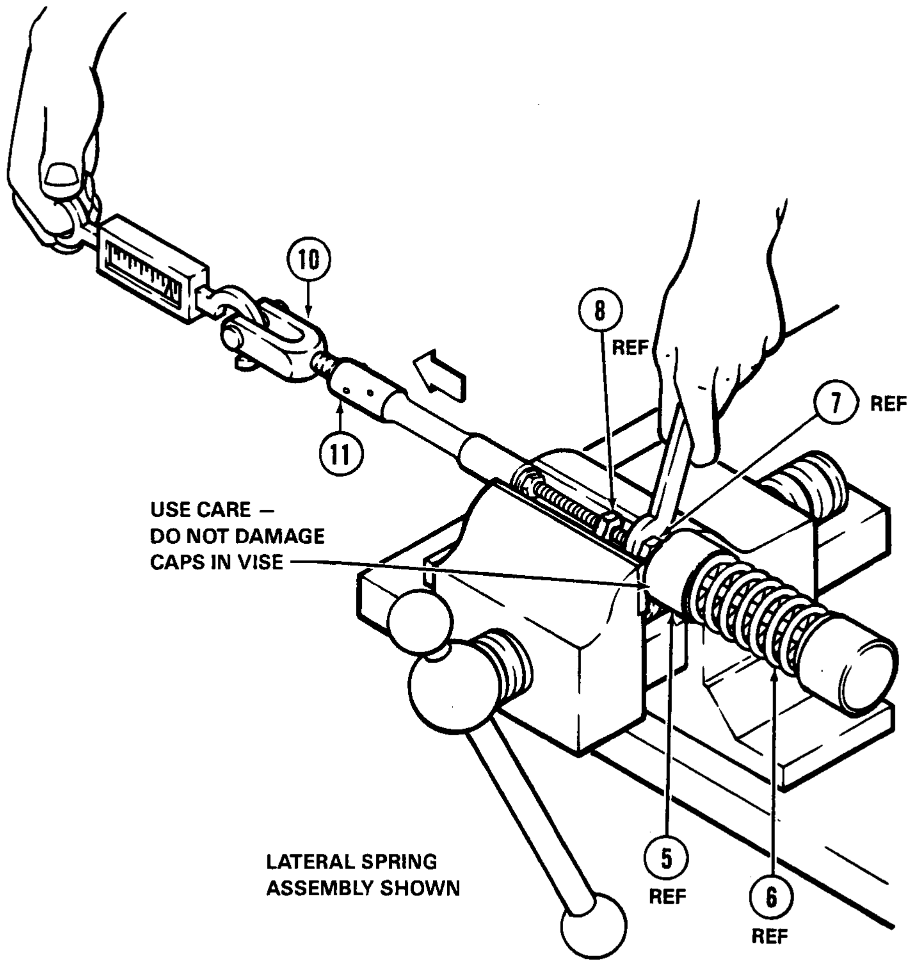


Figure 11-18. Force gradient assembly — adjustment (Sheet 1 of 2)



1. Cap
2. Housing
3. Bearing
4. Shaft
5. Spring retainer
6. Spring assembly
7. Adjustment nut
8. Jam nut
9. Nut
10. Clevis
11. Link assembly

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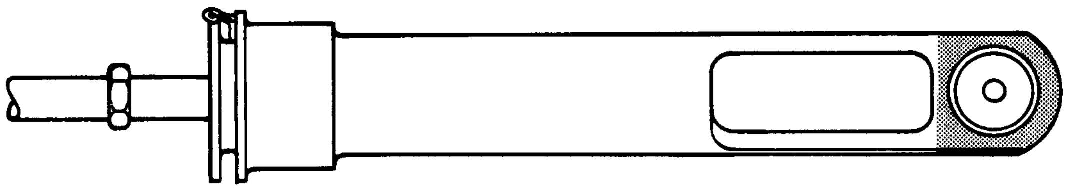
Figure 11-18. Force gradient assembly — adjustment (Sheet 2 of 2)



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FORCE GRADIENT ASSEMBLY

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE		
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 In.	0.010 In.
CORROSION DAMAGE		
(BEFORE CLEANUP)	0.0075 In.	0.005 In.
(AFTER CLEANUP)	0.015 In.	0.010 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 In. Sq.	0.10 In. Sq.
NUMBER OF REPAIRS	One per area	One per area
EDGE CHAMFER	0.05 By 0.05 In.	0.04 By 0.04 In.
BORE DAMAGE	0.002 In. for one-fourth circumference	

REPLACE PARTS WITH DAMAGED THREADS.

UH-1H-II-M-11-19

Figure 11-19. Force gradient — wear and damage limits

b. Replace worn or damaged bearings. (BHT-ALL-SPM.)

11-87. Installation — Force Gradient — Cyclic Controls.

a. Connect clevis assembly (5, figure 11-16) to tube and lever assembly (20). Secure with bolt (21), washer (22), and lockwire (C-405).

b. Connect force gradient (11) to magnetic brake (8) and attach with nut (7). Secure with cotter pin.

11-88. MIXING LEVER ASSEMBLY — CYCLIC CONTROLS.

11-89. Description — Mixing Lever Assembly — Cyclic Controls The mixing lever assembly consists of bellcranks, matched links, and support. It is mounted on the right main beam below the cabin floor area.

11-90. Removal — Mixing Lever Assembly — Cyclic Controls.

a. Remove flight control access doors.

b. Remove cotter pin and nut (14, figure 11-20), washers (2), and bolt (4) connecting end of tube (16).

c. Remove cotter pin and nut (12), washers (2), and bolt (60) connecting end of tube (15).

d. Remove cotter pin and nut (13), washers (2), and bolt (5) connecting end of tube (7).

e. Remove cotter pin (11), nut (13), washers (2), and bolt (8) connecting end of tube (9).

f. Remove bolts (3) and washers (2) attaching support (1) to right main beam.

11-91. Disassembly — Mixing Lever Assembly — Cyclic Controls.

a. Remove cotter pin and nut (20, figure 11-21), washers (2), and bolts (1) attaching upper link (3).

b. Remove cotter pins and nuts (9 and 11), aluminum washers (5), and bolts (4 and 7) attaching upper and lower matched links (6). Remove bellcrank (8).

c. Remove cotter pin and nut (10), washers (12), and bolt (13) attaching lower link (3).

d. Remove cotter pin and nut (15), aluminum washers (18), and bolt (19) attaching bellcrank (17) to support (14).

11-92. Inspection — Mixing Lever Assembly — Cyclic Controls.

a. Inspect bearings for wear and roughness. (Paragraph 11-170.)

b. Inspect parts for wear, elongated bolt holes, cracks, nicks, and surface damage.

c. Inspect parts for corrosion.

d. Inspect for loose, missing, or improperly installed hardware.

11-93. Repair or Replacement — Mixing Lever Assembly — Cyclic Controls.

a. Repair or replace mixing lever assembly with wear and damage exceeding limits. (Figure 11-22.)

b. Replace any parts that do not meet inspection requirements.

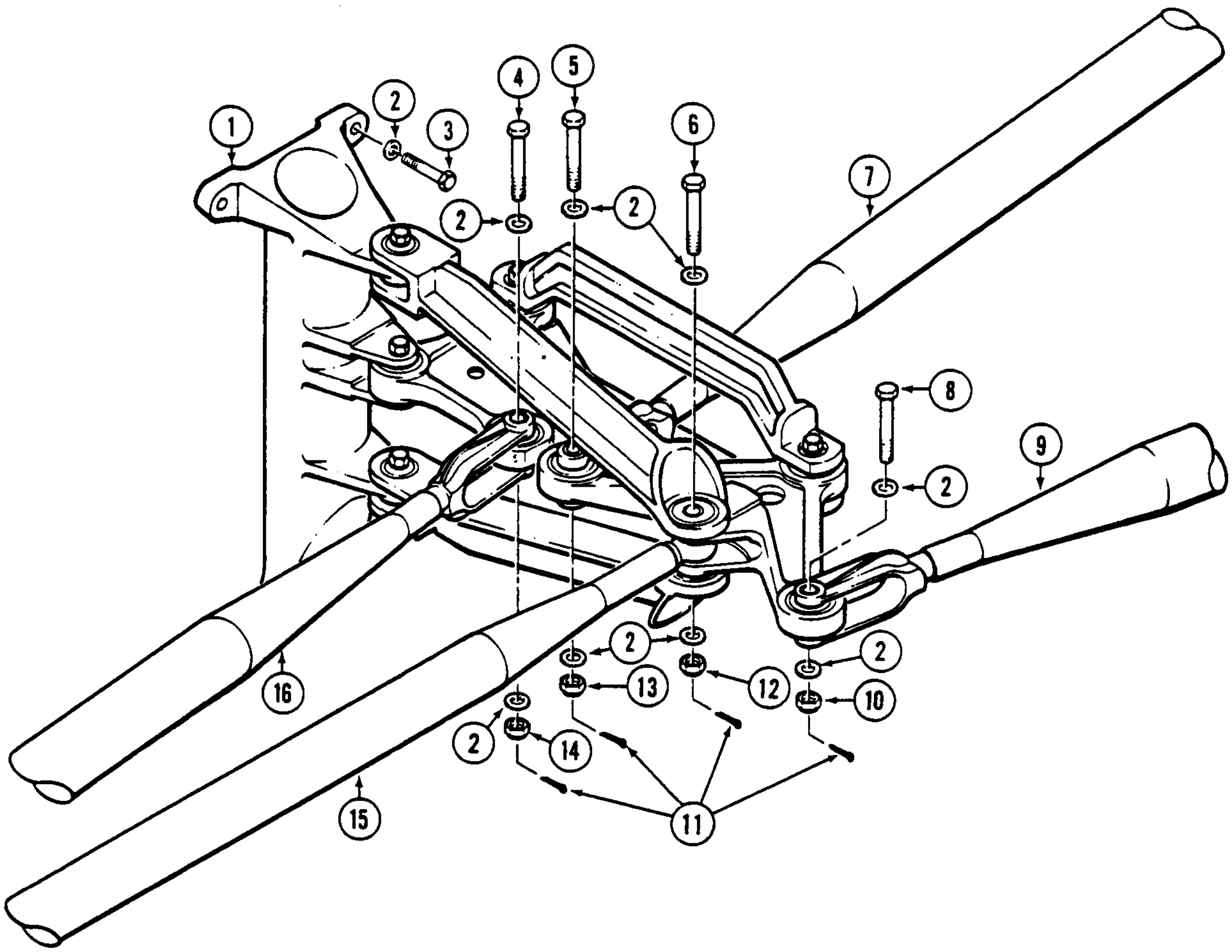
c. Refer to paragraphs 11-171 and 11-172 for bearing replacement.

11-94. Assembly — Mixing Lever Assembly — Cyclic Controls.

a. Place bellcrank (17, figure 11-21) in center attachment point of support (14). Install bolt (19), aluminum washers (18), and nut (15). Torque nut 50 to 70 inch-pounds. Secure with cotter pin.

b. Place lower half of matched link (3) on lower attachment point of support (14). Install bolt (13), washers (12), and nut (10). Torque nut 50 to 70 inch-pounds. Secure with cotter pin.

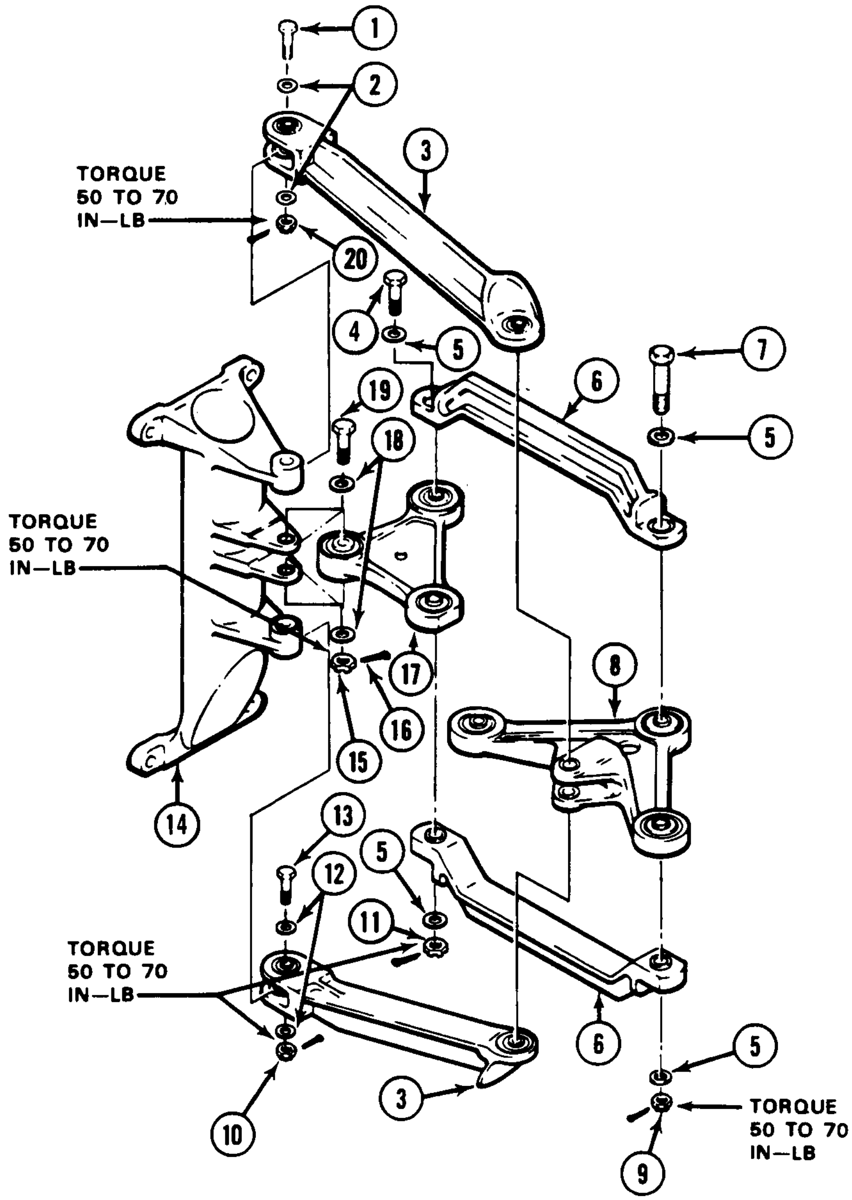
c. Place bellcrank (8) between both upper and lower links (6). Install bolt (7) with aluminum washers (5) through upper matched link (6) and aft attachment point of bellcrank (8), and through lower matched link (6). Install aluminum washers (5) and tighten nut (9) slightly. Install bolt (4) with aluminum washers (5) through upper matched link



1. Support	9. Tube
2. Washer	10. Nut
3. Bolt	11. Cotter pin
4. Bolt	12. Nut
5. Bolt	13. Nut
6. Bolt	14. Nut
7. Tube	15. Tube
8. Bolt	16. Tube

UH-1H-II-M-11-20

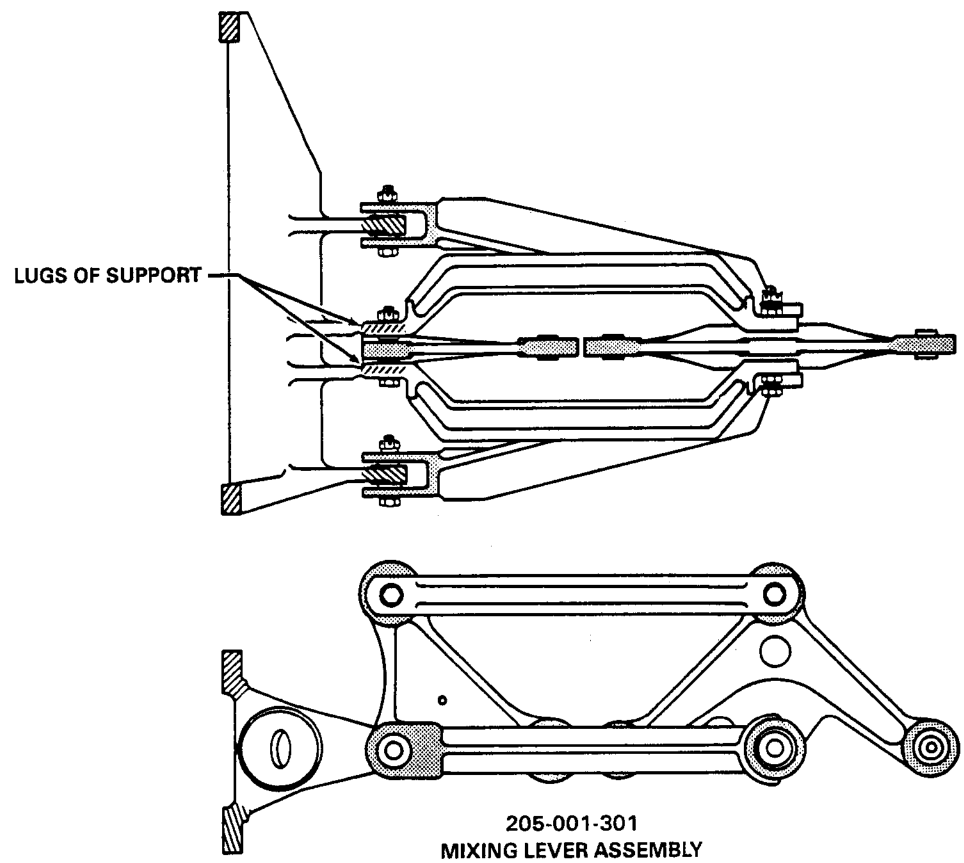
Figure 11-20. Mixing lever assembly — cyclic control system — removal and installation



1.	Bolt	11.	Nut
2.	Washer	12.	Washer
3.	Matched links	13.	Bolt
4.	Bolt	14.	Support
5.	Aluminum washer	15.	Nut
6.	Matched links	16.	Cotter pin
7.	Bolt	17.	Bellcrank
8.	Bellcrank	18.	Aluminum washer
9.	Nut	19.	Bolt
10.	Nut	20.	Nut

UH-1H-II-M-11-21

Figure 11-21. Mixing lever assembly — cyclic control system — disassembly and assembly



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	(open box)	(shaded box)	(hatched box)
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
CORROSION DAMAGE			
(BEFORE CLEANUP)	0.0075 In.	0.005 In.	0.0025 In.
(AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 In. Sq.	0.10 In. Sq.	0.10 In. Sq.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER	0.05 By 0.05	0.04 By 0.04	
BORE DAMAGE	0.002 In. for one-fourth circumference		
NO CRACKS ALLOWED			

UH-1H-II-M-11-22

Figure 11-22. Mixing lever assembly — cyclic control system — wear and damage limits

(6) and through aft attachment point of bellcrank (17), and through lower matched link (6). Install aluminum washer (5) and nut (11). Torque nuts 50 to 70 inch-pounds. Secure with cotter pins.

d. Place upper matched link (3) on upper attachment point of support (14). Install bolt (1) with washers (2) and nut (20). Torque nut 50 to 70 inch-pounds. Secure with cotter pin.

11-95. Installation — Mixing Lever Assembly — Cyclic Controls.

NOTE

Barrier tape (C-430) shall cover entire mating surface area of one of the parts and extend at least 1/4 inch beyond joint edges.

a. Inspect mounting surface on right main beam of support (1, figure 11-20) to determine if barrier tape (C-430) is torn or missing. Install new barrier tape if torn or missing.

b. Install bolts (3) and washers (2) to attach support (1) to right main beam.

c. Place tube (9) on bellcrank and attach with bolt (8), washers (2), and nut (10). Secure with cotter pin (11).

d. Place tube (7) on bellcrank and attach with bolt (5), washers (2), and nut (13). Secure with cotter pin (11).

e. Place tube (15) and attach with bolt (6), washers (2), and nut (12). Secure with cotter pin (11).

f. Place tube (16) on bellcrank and attach with bolt (4), washers (2), and nut (14). Secure with cotter pin (11).

g. Install flight control access doors.

11-96. CONTROL TUBES — CYCLIC CONTROL SYSTEM.

11-97. Description — Control Tubes — Cyclic Control System. Control tubes (adjustable and nonadjustable) are used throughout the cyclic control system. The tubes are connected to bellcranks, levers, and supports with standard hardware.

11-98. Removal — Control Tubes — Cyclic Control System.

a. Remove flight control access doors.

b. Detach forward end of control tube (8, figure 11-23) from pilot cyclic stick by removing cotter pin (1), nut (2), two washers (3), and bolt (9). (Detail A.)

c. Detach aft end of control tube (8) from arm of tube and lever assembly by removing cotter pin (4), nut (5), two washers (6), and bolt (7). (Detail A.)

d. Detach outboard end of control tube (13) from pilot cyclic stick by removing cotter pin (11), nut (10), two washers (12), and bolt (14). (Detail A.)

e. Detach inboard end of control tube (13) from bellcrank (15) by removing cotter pin (11) and nut (22), two washers (17), and bolt (24). (Detail B.)

f. Detach outboard end of control tube (20) from copilot cyclic stick by removing cotter pin (40), nut (41), two washers (42), and bolt (52). (Detail D.)

g. Detach inboard end of control tube (20) from bellcrank (15) by removing cotter pin (11) and nut (21), two washers (17), and bolt (23). (Detail B.)

h. Detach control tube (18) from bellcrank (15) by removing cotter (11) pin and nut (19), two washers (17), and bolt (16). (Detail B.)

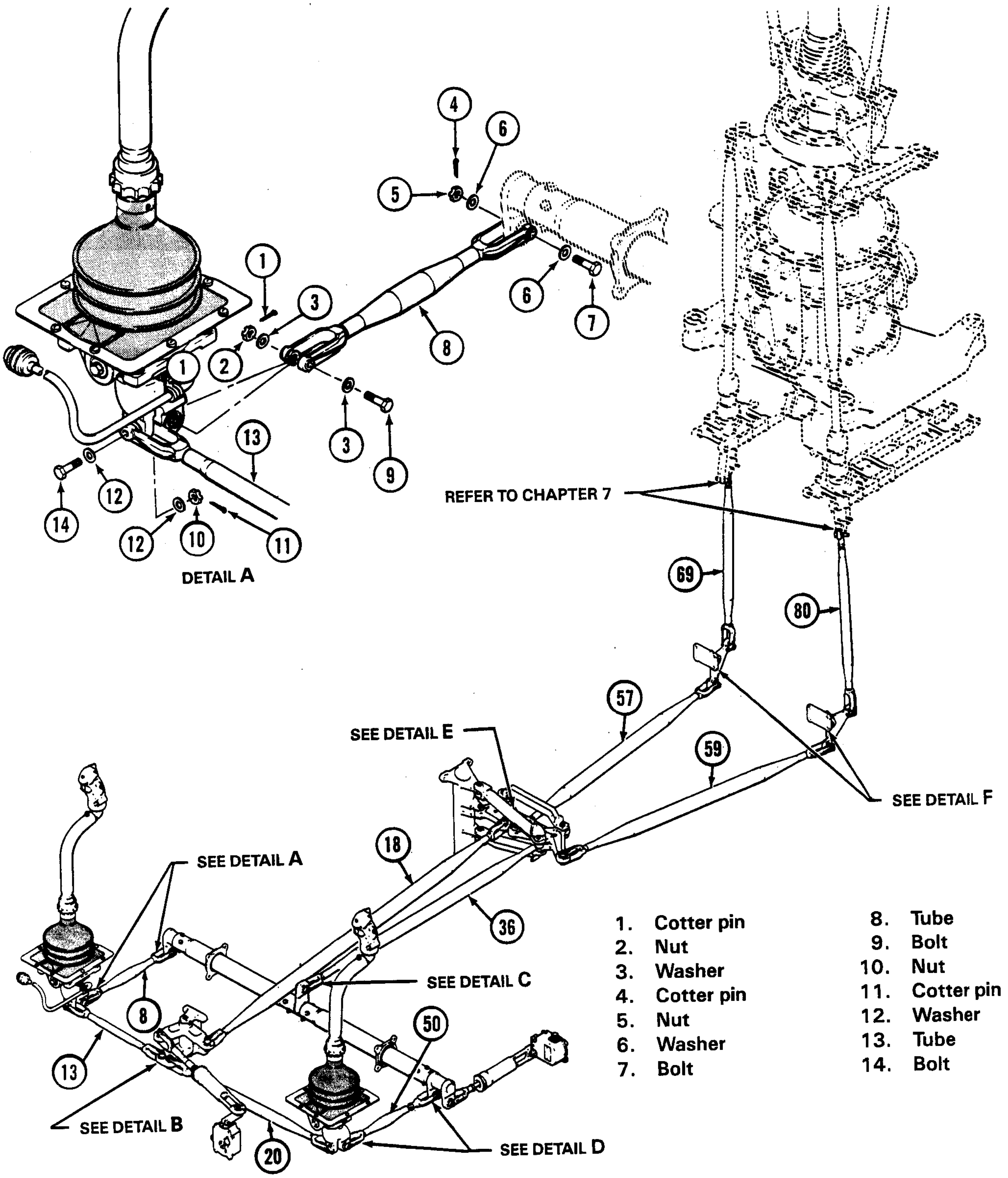
i. Detach aft end of control tube (18) from mixing levers and support (53) by removing cotter pin (60) and nut (64), two washers (55), and bolt (54). (Detail E.)

j. Detach control tube (36) from lever (39) by removing cotter pin (37), nut (38), two washers (35), and bolt (34). (Detail C.)

k. Detach aft end of control tube (36) from mixing levers and support (53) by removing cotter pin (60) and nut (62), two washers (55), and bolt (63). (Detail E.)

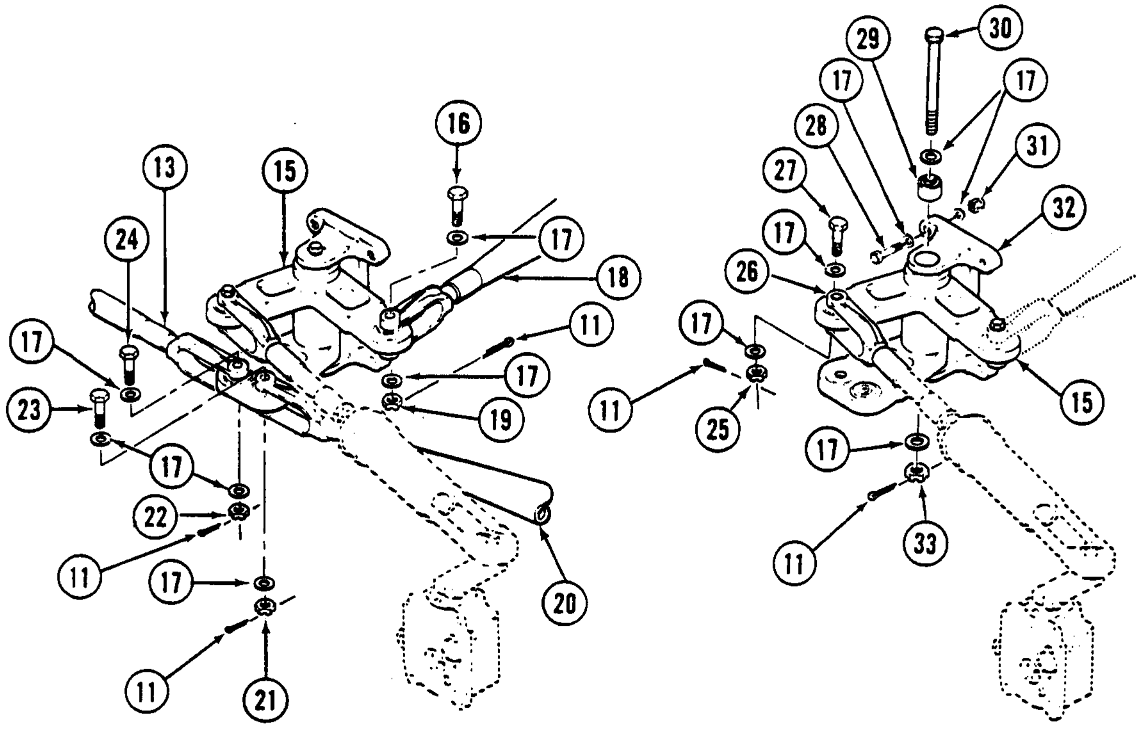
l. Detach forward end of control tube (57) from mixing levers and support (53) by removing cotter pin (60) and nut (62), two washers (55), and bolt (56). (Detail E.)

m. Detach aft end of control tube (57) from bellcrank (71) by removing cotter pin (67) and nut (72), two washers (65), and bolt (73). (Detail F.)



1.	Cotter pin	8.	Tube
2.	Nut	9.	Bolt
3.	Washer	10.	Nut
4.	Cotter pin	11.	Cotter pin
5.	Nut	12.	Washer
6.	Washer	13.	Tube
7.	Bolt	14.	Bolt

Figure 11-23. Bellcranks, levers, supports, and control tubes — cyclic cyclic control system — removal and installation (Sheet 1 of 5)

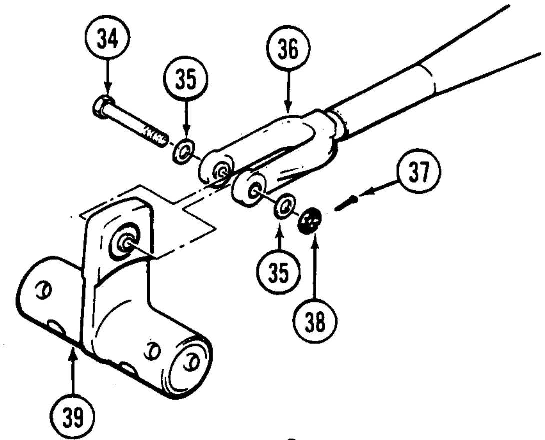


DETAIL B

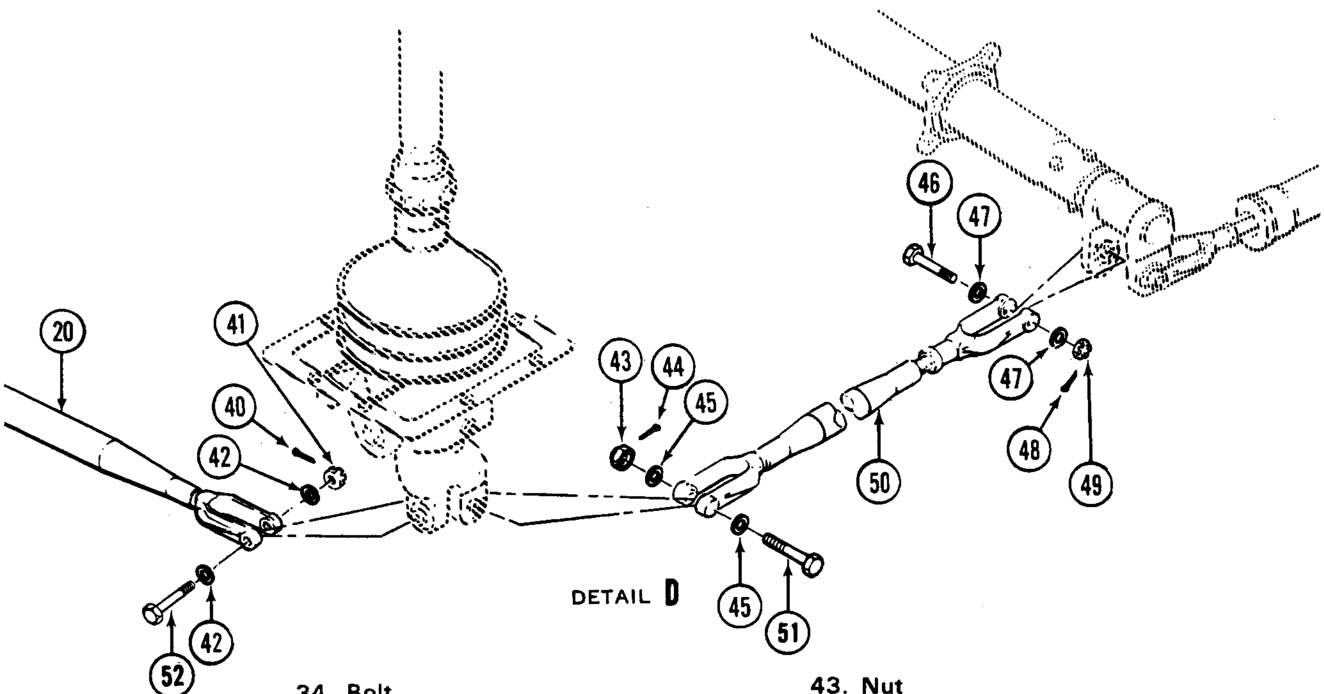
15. Bellcrank
16. Bolt
17. Washer (aluminum)
18. Control tube
19. Nut
20. Control tube
21. Nut
22. Nut
23. Bolt
24. Bolt
25. Nut
26. Clevis
27. Bolt
28. Bolt
29. Bearing
30. Bolt
31. Nut
32. Support
33. Nut

UH-1H-II-M-11-23-2

Figure 11-23. Bellcranks, levers, supports, and control tubes — cyclic cyclic control system — removal and installation (Sheet 2 of 5)



DETAIL C

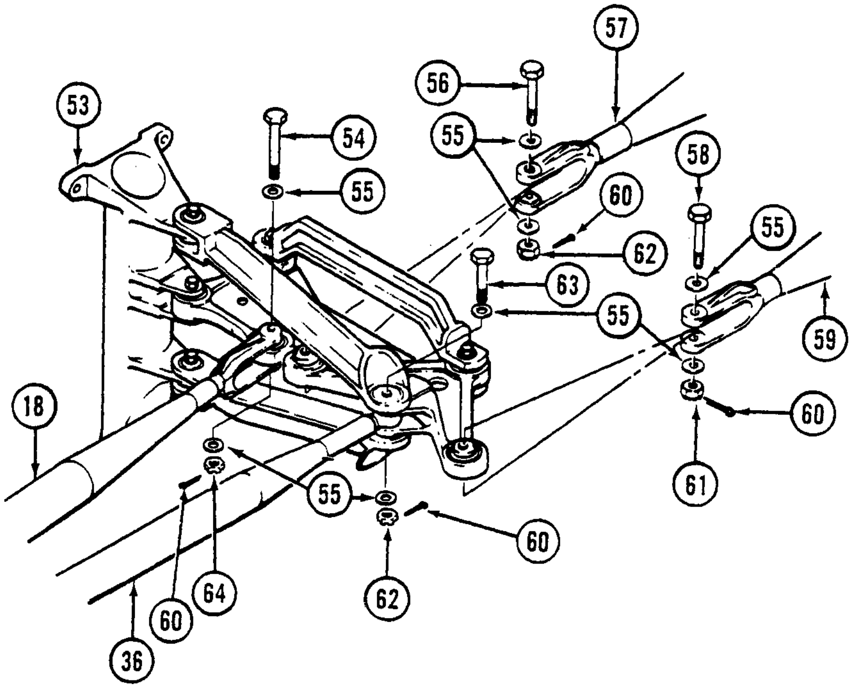


DETAIL D

34. Bolt
35. Washer
36. Control tube
37. Cotter pin
38. Nut
39. Lever
40. Cotter pin
41. Nut
42. Washer
43. Nut
44. Cotter pin
45. Washer
46. Bolt
47. Washer
48. Cotter pin
49. Nut
50. Tube
51. Bolt
52. Bolt

UH-1H-II-M-11-23-3

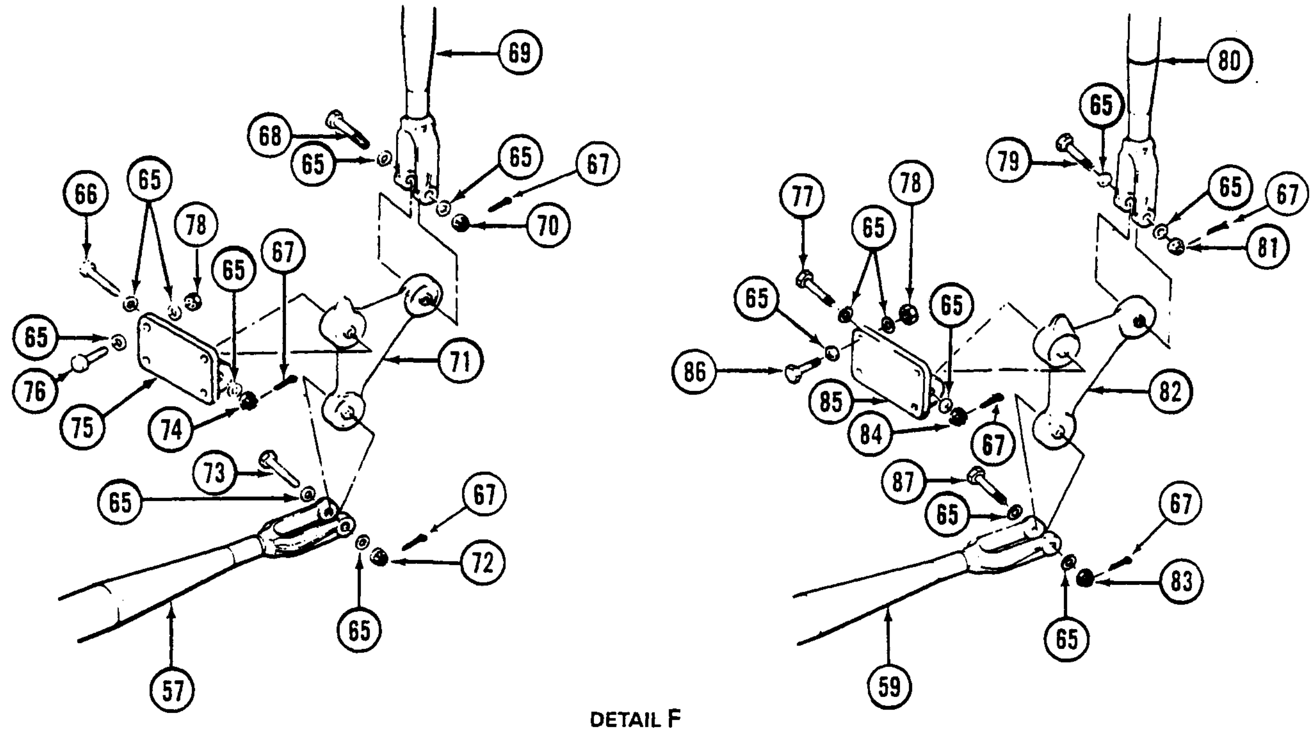
Figure 11-23. Bellcranks, levers, supports, and control tubes — cyclic cyclic control system — removal and installation (Sheet 3 of 5)



53. Mixing levers and support
54. Bolt
55. Washer
56. Bolt
57. Control tube
58. Bolt
59. Control tube
60. Cotter pin
61. Nut
62. Nut
63. Bolt
64. Nut

UH-1H-II-M-11-23-4

Figure 11-23. Bellcranks, levers, supports, and control tubes — cyclic cyclic control system — removal and installation (Sheet 4 of 5)



65. Washer (aluminum)
66. Bolt
67. Cotter pin
68. Bolt
69. Control tube
70. Nut
71. Bellcrank
72. Nut
73. Bolt
74. Nut
75. Support
76. Bolt
77. Bolt
78. Nut
79. Bolt
80. Control tube
81. Nut
82. Bellcrank
83. Nut
84. Nut
85. Support
86. Bolt
87. Bolt

UH-1H-II-M-11-23-5

Figure 11-23. Bellcranks, levers, supports, and control tubes — cyclic cyclic control system — removal and installation (Sheet 5 of 5)

n. Detach forward end of control tube (59) from mixing levers and support (53) by removing cotter pin (60), nut (61), two washers (55), and bolt (58). (Detail E.)

o. Detach aft end of control tube (59) from bellcrank (82) by removing cotter pin (67) and nut (83), two washers (65), and bolt (87). (Detail F.)

p. Detach lower end of control tube (69) from bellcrank (71) by removing cotter pin (67) and nut (70), two washers (65), and bolt (68). (Detail F.)

q. Detach upper end of control tube (69) from hydraulic cylinder assembly. (Chapter 7.)

r. Detach lower end of control tube (80) from bellcrank (82) by removing cotter pin (67) and nut (81), two washers (65), and bolt (79). (Detail F.)

s. Detach upper end of control tube (80) from hydraulic cylinder assembly. (Chapter 7.)

t. Detach forward end of control tube (50) from copilot cyclic stick by removing cotter pin (44), nut (43), two washers (45), and bolt (51). (Detail D.)

u. Detach aft end of control tube (50) from arm of tube and lever assembly by removing cotter pin (48) and nut (49), two washers (47), and bolt (46). (Detail D.)

11-99. Inspection — Control Tubes — Cyclic Control System.

a. Inspect control tubes for corrosion, wear, and mechanical damage. Refer to figure 11-24 for wear and damage limits.

b. Inspect clevis end holes for wear and clevis end for looseness in tube.

11-100. Repair or Replacement — Control Tubes — Cyclic Control System.

a. Polish out corrosion or mechanical damage to control tubes to limits. (Figure 11-24.)

b. Any damage to control tubes in excess of limits requires replacement of control tube.

11-101. Installation — Control Tubes — Cyclic Control System.

a. Install control tubes (20, 50, 69, and 80, figure 11-23) by the rigging procedures. (Paragraph 11-56.)

b. Align aft end of control tube (8) on arm of tube and lever assembly. Install bolt (7) with washer (6) through clevis. Install washer (6), nut (5), and cotter pin (4). (Detail A.)

c. Align forward end of control tube (8) to lever on bottom of pilot cyclic stick. Install bolt (9), two washers (3), and nut (2). Secure with cotter pin (1). (Detail A.)

d. Align outboard end of control tube (13) on lever on bottom of pilot cyclic stick. Install bolt (14), two washers (12), and nut (10). Secure with cotter pin (11). (Detail A.)

e. Align inboard end of control tube (13) on bellcrank (15). Install bolt (24) with two washers (17) and nut (22). Secure with cotter pin (11). (Detail B.)

f. Align forward end of control tube (18) to bellcrank (15). Install bolt (16), two washers (17), and nut (19). Secure with cotter pin (11). (Detail B.)

g. Align aft end of control tube (18) to mixing levers and support (53). Install bolt (54), two washers (55), and nut (64). Secure with cotter pin (60). (Detail E.)

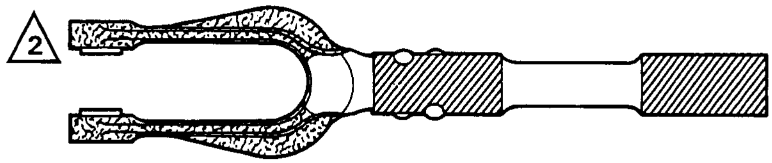
h. Align forward end of control tube (36) to lever (39). Install bolt (34), two washers (35), and nut (38). Secure with cotter pin (37). (Detail C.)

i. Align rod end bearing on aft end of control tube (36) to mixing levers and support (53). Install bolt (63), two washers (55), and nut (62). Secure with cotter pin (60). (Detail E.)

j. Align forward end of control tube (57) to mixing levers and support (53). Install bolt (56), two washers (55), and nut (62). Secure with cotter pin (60). (Detail E.)

k. Align aft end of control tube (57) to bellcrank (71). Install bolt (73), two washers (65), and nut (72). Secure with cotter pin (67). (Detail F.)

l. Align forward end of control tube (59) to arm of mixing levers and support (53) bellcrank. Install bolt (58), two washers (55), and nut (61). Secure with cotter pin (60). (Detail E.)



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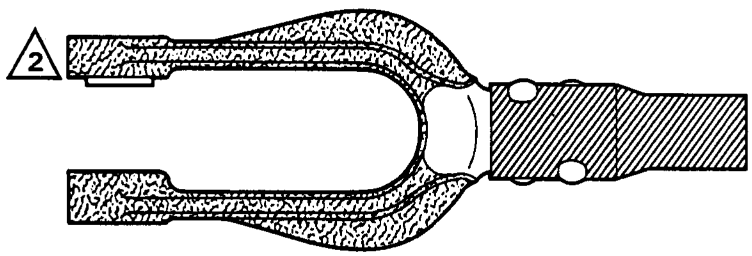
LINK ASSEMBLY



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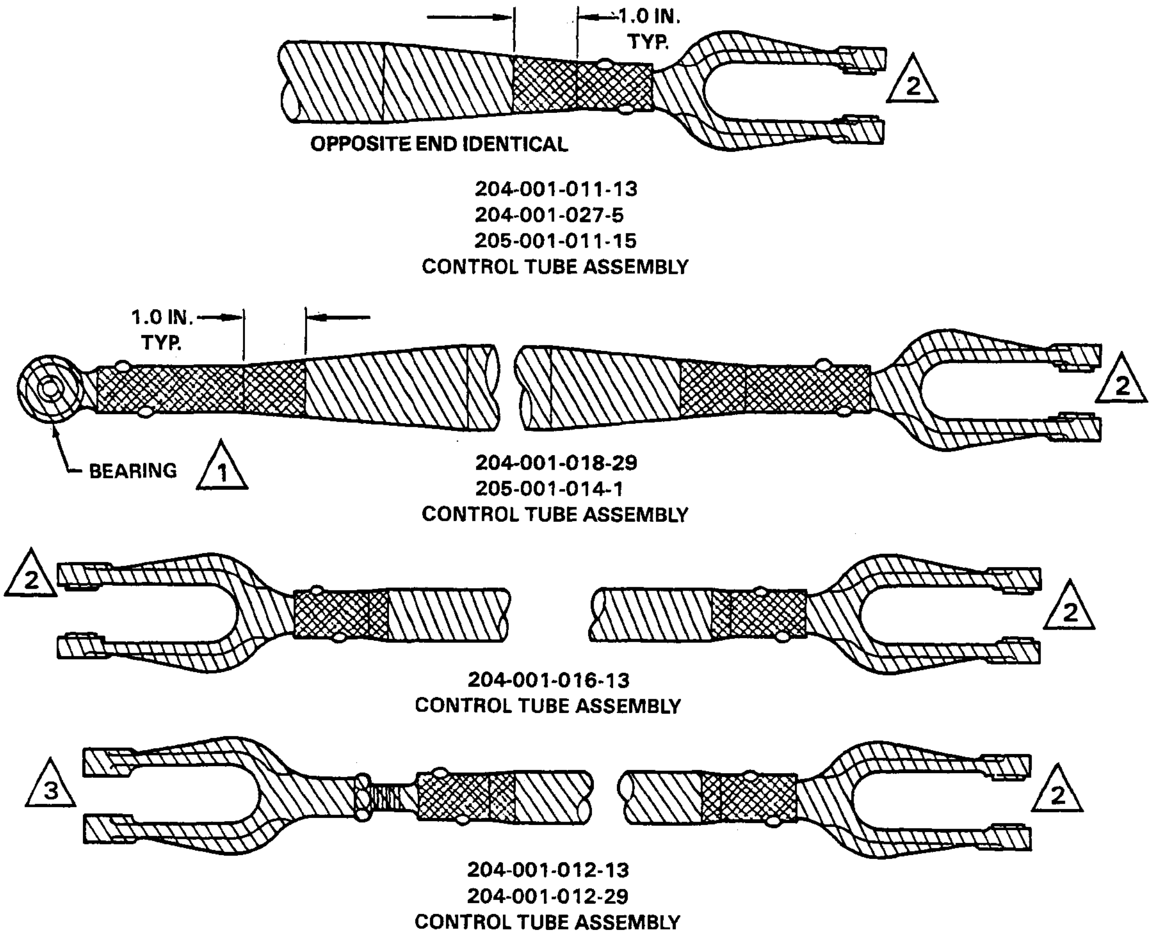
CLEVIS ASSEMBLY

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE			
	MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL AND △3 CORROSION	0.015 In. after repair	0.010 In. after repair	0.005 In. after repair
MECHANICAL △2	0.015 In. after repair	0.010 In. after repair	0.005 In. after repair
CORROSION △2	0.0075 In. before repair 0.015 In. after repair	0.005 In. before repair 0.010 In. after repair	0.0025 In. before repair 0.005 In. after repair
MAXIMUM AREA PER FULL DEPTH REPAIR	1 Sq. In.	0.10 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER	0.05 By 0.05	0.04 By 0.04	
BORE DAMAGE	0.002 In. for one-fourth circumference		

UH-1H-II-M-11-24-1

Figure 11-24. Control tubes, links, and clevises — wear and damage limits — cyclic control system — (Sheet 1 of 2)



	DAMAGE LOCATION SYMBOLS	
TYPE OF DAMAGE		
	MAXIMUM DAMAGE AND REPAIR DEPTH	
MECHANICAL DAMAGE	No damage allowed	Maximum damage after cleanup 0.005 In.

NOTES:

1. Maximum play allowed bearing — 0.010 inch axial or 0.005 inch radial.
2. Aluminum clevis — corrosion damage limits before and after repair — mechanical damage limits after repair.
3. Steel clevis — mechanical/corrosion damage limits after cleanup.

UH-1H-II-M-11-24-2

Figure 11-24. Control tubes, links, and clevises — wear and damage limits — cyclic control system — (Sheet 2 of 2)

m. Align aft end of control tube (59) to bellcrank (82). Install bolt (87), two washers (65), and nut (83). Secure with cotter pin (67). (Detail F.)

11-102. BELLCRANKS, LEVERS, AND SUPPORT — CYCLIC CONTROL SYSTEM.

11-103. Description — Bellcranks, Levers, and Supports — Cyclic Control System. Various bellcranks, levers, and supports are incorporated in the cyclic system. The supports are mounted to the airframe for attachment of levers and bellcranks.

11-104. Removal — Bellcranks, Levers, and Supports — Cyclic Control System.

a. Remove bellcrank (15, figure 11-23, Detail B) and support (32) as follows:

(1) Remove flight control access doors.

(2) Disconnect cyclic control tubes (13, 18 and 20) and lateral cyclic clevis (26) from bellcrank (15).

(3) Remove cotter pin (11) and nut (33), washers (17) and bolt (30) from support (32). Remove bellcrank (15) and bearing (29) from support.

(4) Remove four nuts (31), washers (17), and four bolts (28) from support (32). Remove support.

b. Remove bellcrank (82) and support (85) as follows:

(1) Disconnect control tubes (59 and 80, figure 11-23, Detail F) from bellcrank (82). (Paragraph 11-98.)

(2) Remove cotter pin (67) and nut (84), two washers (65), and bolt (77) from support (85). Remove bellcrank (82).

(3) Remove four nuts (78), washers (65), and four bolts (86) from support (85). Remove support.

c. Remove bellcrank (71) and support (75) as follows:

(1) Remove cargo hook. (Chapter 14.)

(2) Remove troop seat, soundproofing blanket, and access door (Chapter 2) from pylon island in cabin area.

(3) Disconnect control tubes (57 and 69, figure 11-23) from bellcrank (71). (Paragraph 11-98.)

(4) Remove cotter pin (67), nut (74), two washers (65), and bolt (66) from support (75). Remove bellcrank (71) from support.

(5) Remove four nuts (78), washers (65), and four bolts (76) from support (75). Remove support.

11-105. Inspection — Bellcranks, Levers, and Supports — Cyclic Control System.

a. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. (Figure 11-25.)

b. Inspect bellcranks and supports for loose bearings. (Paragraph 11-170.)

11-106. Repair or Replacement — Bellcranks, Levers, and Supports — Cyclic Control System.

a. Replace loose or damaged bearings. (Paragraph 11-170.)

b. Remove minor surface corrosion or repair allowable damage using fine grit abrasive cloth or paper (C-423). Observe limits shown in figure 11-25.

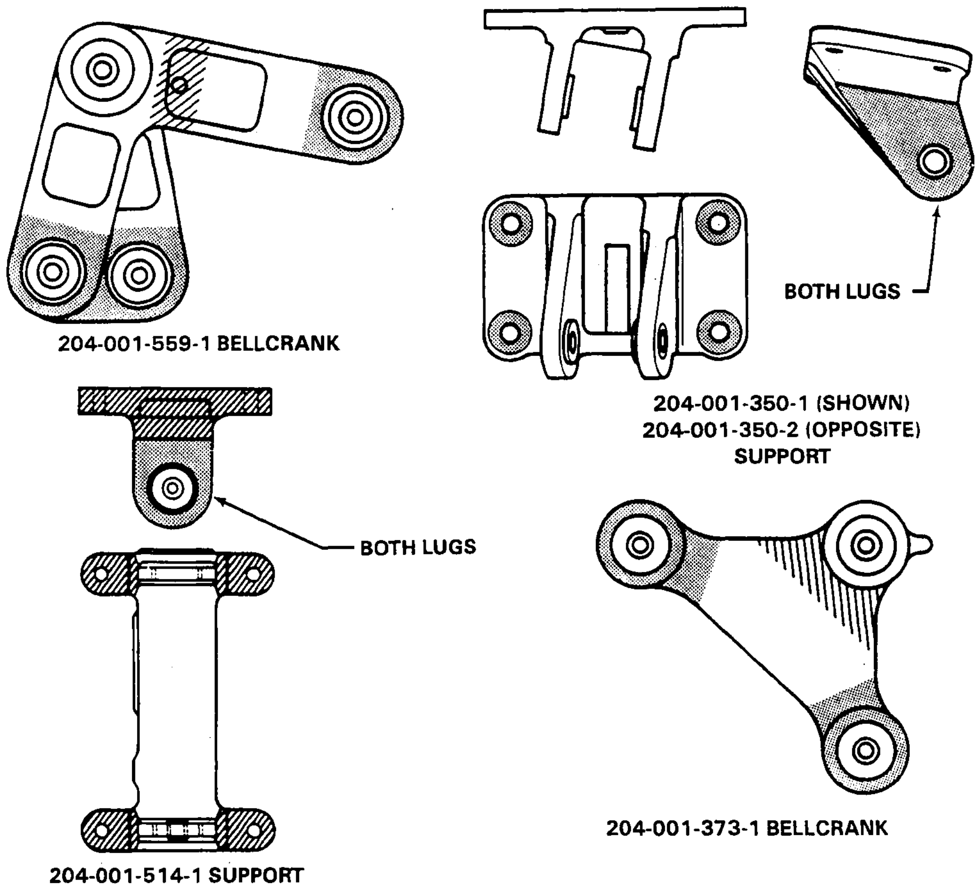
11-107. Installation — Bellcranks, Levers, and Supports — Cyclic Control System.

WARNING

Zinc chromate is flammable with a flash point of 50°F (10°C). Use in a well ventilated area and avoid breathing spray mist.

a. Install barrier tape (C-430) on support (32, figure 11-23, Detail B). Apply unreduced zinc chromate primer (C-201) to bolts (28). Position support and install four bolts (28) with aluminum washers (17). Install four washers (17) with nuts (31).

b. Position bellcrank (15) between ears of support (32). Apply unreduced zinc chromate primer (C-201) to outer race of bearing (29) and install bearing in top arm of support (32). Install bolt (30) with washers (17) through support and bellcrank pivot. Install washer (17) with nut (33) and cotter pin (11).



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
CORROSION DAMAGE			
(BEFORE CLEANUP)	0.0075 In.	0.005 In.	0.0025 In.
(AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 In. Sq.	0.10 In. Sq.	0.10 In. Sq.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER	0.05 By 0.05	0.04 By 0.04	
BORE DAMAGE	0.002 In. for one-fourth circumference		

NO CRACKS ALLOWED

NOTE:

All Dimensions in inches unless otherwise specified.

UH-1H-II-M-11-25

Figure 11-25. Bellcranks, levers, and supports — cyclic control system — wear and damage limits

c. Install barrier tape (C-430) on support (75 or 85). Apply unreduced zinc chromate primer (C-201) to bolts (76 or 86). From inside transmission pylon support area, position support (75 or 85) and install four bolts (76 or 86) with washers (65) through bulkhead and support. Install aluminum washers (65) and nut (78). (Detail F.)

d. Position bellcrank (71 or 82) with projection pivot point facing up to support (75 or 85). Install bolt (66 or 77), aluminum washers (65), with nuts (74 or 84), and cotter pins (67).

e. Attach control tubes (57, 59, 69, and 80) as required. (Paragraph 11-101.)

f. Install cargo hook. (Chapter 14.)

g. Install flight control access doors, soundproofing blanket, and troop seat. (Chapter 2.)

SECTION III — TAIL ROTOR HUB AND BLADE SYSTEM

11-108.ANTI-TORQUE CONTROL — TAIL ROTOR — HUB AND BLADE SYSTEM.

11-109. Description — Anti-Torque Controls — Tail Rotor — Hub and Blade System. The anti-torque control system includes control pedals, pedal adjusters, a force gradient (centering spring) assembly with an electrically operated magnetic brake, a hydraulic power cylinder, and connecting linkage. Actuation of the pedals causes a power-assisted pitch change of the tail rotor blades to offset main rotor torque and control the directional heading of the helicopter.

11-110. Rigging — Anti-Torque Controls — Tail Rotor — Hub and Blade System.

NOTE

Tolerance on rigging fixed controls dimensions is plus or minus 0.03 inch, unless otherwise noted. Accomplish rigging without hydraulic power.

a. Check that linkage is complete, except for the following adjustable links and control tubes disconnected:

NOTE

Some early version helicopters may have adjustable pitch change links.

(1) Link (6) from lever on left side of tail rotor gearbox.

(2) Control tube (12) from bellcrank (13) above hydraulic cylinder.

(3) Force gradient (31) from pedal adjuster (28).

(4) Interconnect tube (34) at pedal adjuster (28), pilot controls.

b. Verify 1.8 inch dimension between the directional cylinder piston rod and center control tube (14) adapter (Detail B).

c. Position both pilot and co-pilot pedals forward against left pedal stops. Adjust the interconnect tube (34) to fit, torque jam nut and install.

d. Remove bolt retaining the fixed pitch link (6) to the crosshead (2).

e. Install T103206 tail rotor rigging tool to crosshead (2) with bolt (figure 11-27, detail C). Install T103206 tool to trunnion. Hold in position by pushing inboard on the tail rotor crosshead, between crosshead (2, figure 11-26) and trunnion of tail rotor hub assembly.

NOTE

DELETED.

f. With T103206 rigging tool positioned between tail rotor trunnion and crosshead check for 0.58 inch clearance with the bellcrank as shown in figure 11-27, detail B.

g. Position and hold pilots left pedal against left pedal stop.

1. Tail rotor
2. Crosshead
3. Pitch change link
4. Pitch control tube
5. Lever
6. Link
7. Bellcrank
8. Control tube
9. Bellcrank
10. Control tube
11. Walking beam
12. Control tube
13. Bellcrank
14. Control tube
15. Hydraulic cylinder
16. Control tube
17. Lever
18. Shim washer
19. Support
20. Bolt
21. Washer
22. Washer
23. Nut
24. Cotter pin
25. Control tube
26. Lever
27. Control tube
28. Pedal adjuster
29. Adjuster knob
30. Pilots pedal
31. Force gradient
32. Magnetic brake
33. Control tubes
34. Interconnect tube

NOTE

RP = Rigging Point

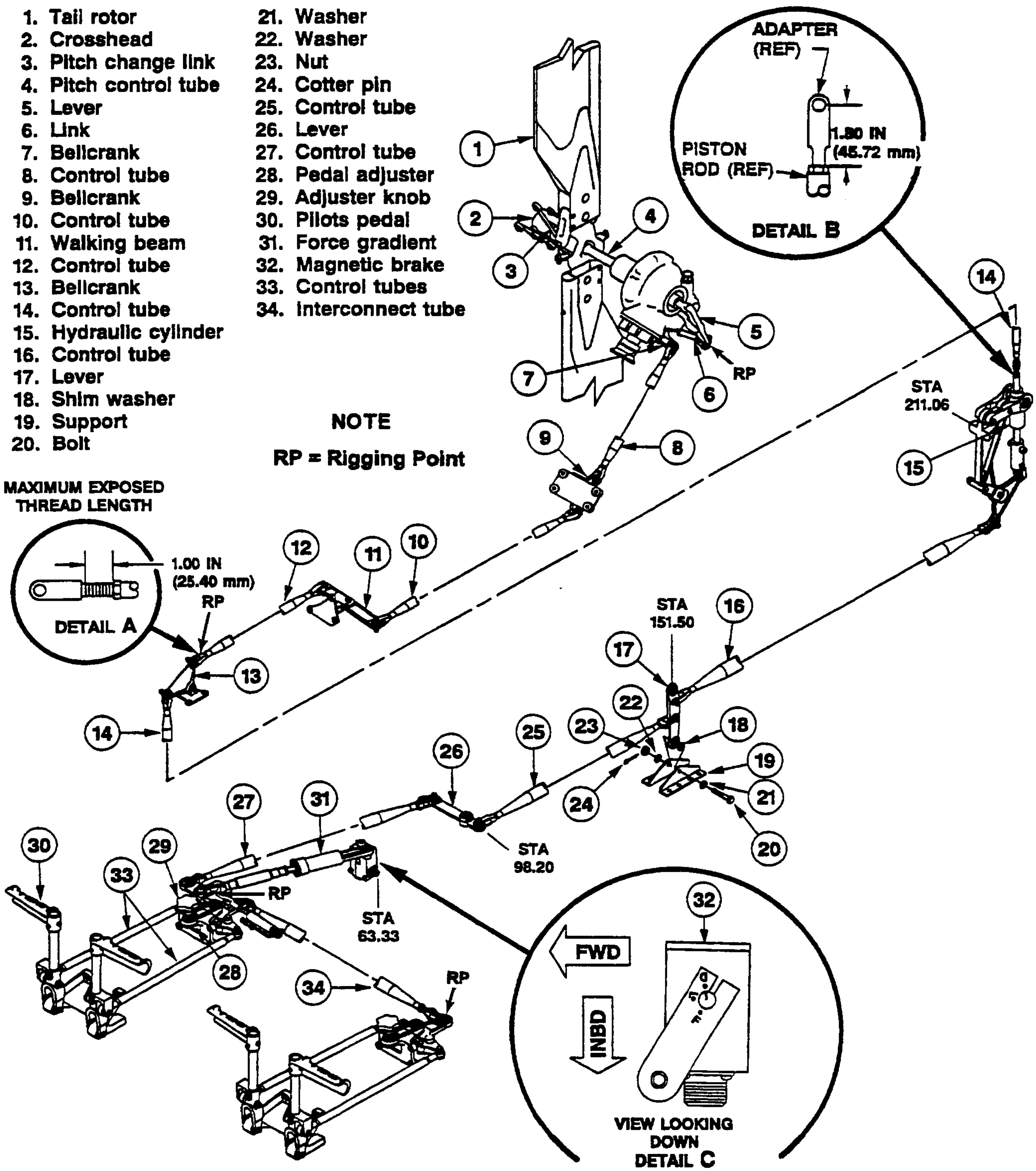


Figure 11-26. Tail rotor—hub and blade system—anti-torque controls—rigging

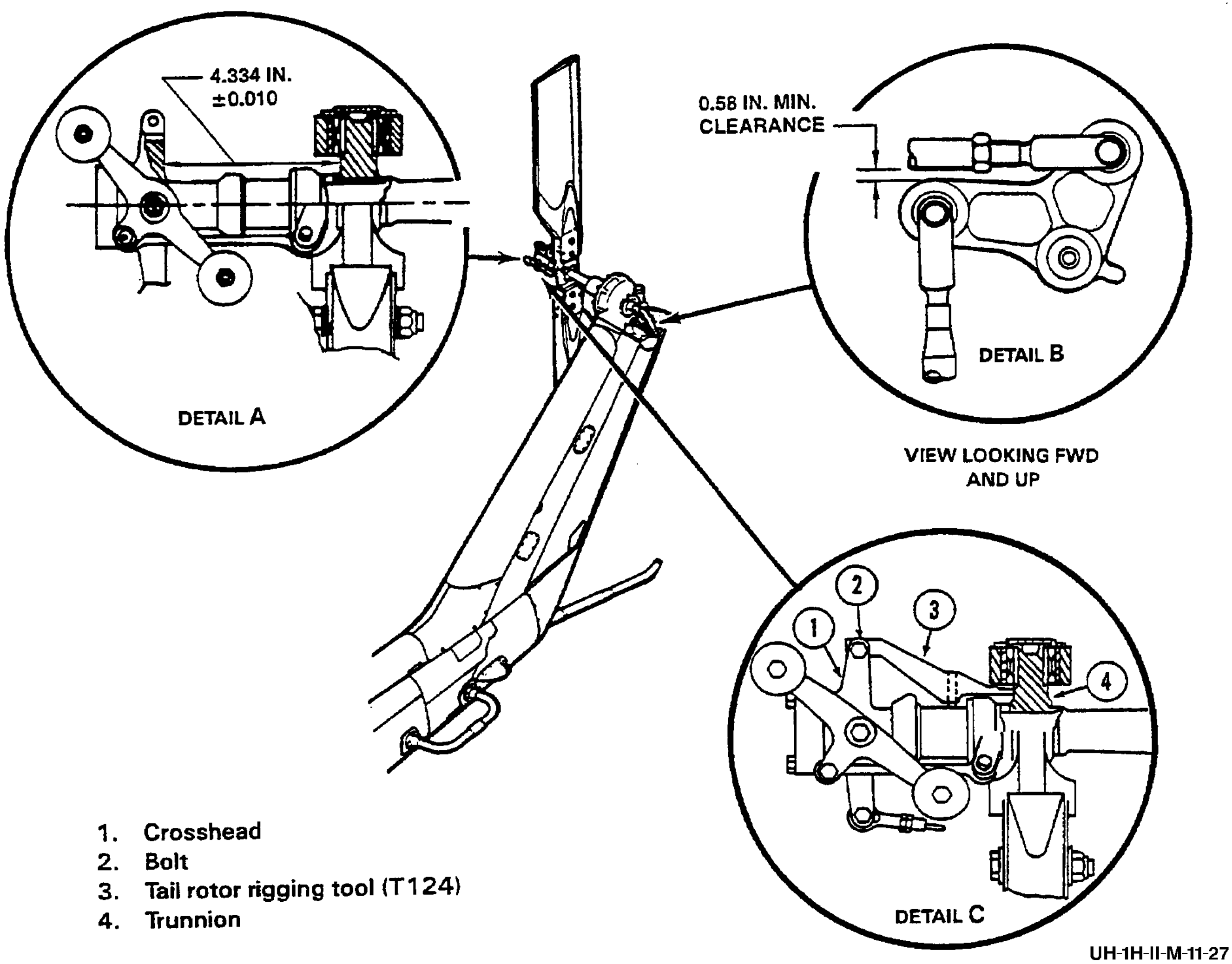


Figure 11-27. Tail rotor — hub and blade system — anti-torque controls — adjustments

h. With pilots left pedal positioned per step g., bottom the cylinder valve by pushing down on the piston.

i. With the pilots pedal positioned per step g., cylinder valve position, per step h. and the bellcrank position per step f., adjust the tube (25, figure 11-26) to fit then shorten by one half turn of tube clevis, torque jam nut and install.

NOTE

With the hydraulic system pressurized the cylinder valve will be centered and there is no need to re-adjust the tube clevis.

j. Remove T103205 rigging tool and connect the pitch link (3) to the crosshead (2).

k. Position output arm of on directional magnetic brake (32) so that index mark "D" is aligned with index mark on shaft. (Figure 11-26, view C.)

l. Place pilot's pedals in line and arm of magnetic brake (32) in center of travel. Adjust the tube assembly of force gradient to fit to the pedal adjuster (28), torque jam nut and install.

NOTE

Check clearance between force gradient and structure at extreme position of brake arm. Re-index arm by one serration if required for clearance then repeat step l. to verify clearance.

Figure 11-28. Deleted

m. Operate system through full travel to check for any binding or interference.

n. Check track of tail rotor in operation. (Chapter 5.) If required, track. (Chapter 5.)

o. Check complete system for security and safetying of parts. Check control system for clearance and freedom of operation.

p. Install flight control access panels.

q. Install pilot and copilot seats. (Chapter 2.)

11-111.PEDALS AND ADJUSTER — ANTI-TORQUE CONTROL.

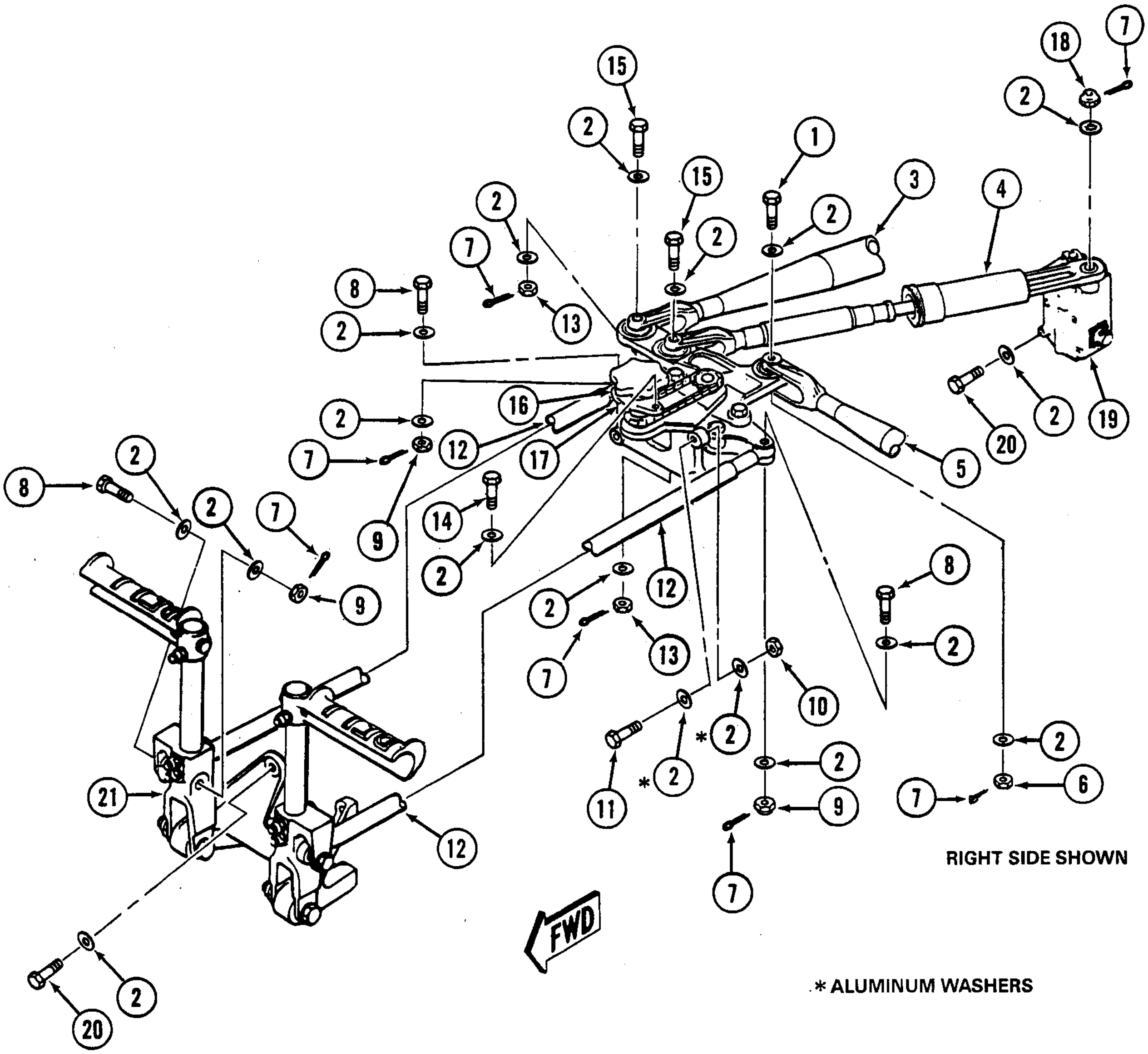
11-112. Description — Pedals and Adjuster — Anti-torque Control. A set of control pedals supported on forward bulkhead is connected under cabin floor to adjuster assembly. Adjuster is a bellcrank assembly with a knob on the floor for manual adjustment of pedal position according to pilot needs. Force gradient and control linkage to power cylinder are connected to a bellcrank on pilot adjuster.

11-113. Inspection — Pedals and Adjuster — Anti-torque Control Installed.

a. Inspect pedal adjuster (17, figure 11-29) for nicks, scratches, cracks, loose or missing hardware, and corrosion.

b. Inspect parts for bolt and bushing hole elongation.

c. Inspect for proper operation (movement of pedals) and binding.



1. Bolt
2. Washer
3. Control tube (right side only)
4. Force gradient (right side only)
5. Control tube
6. Nut
7. Cotter pin
8. Bolt
9. Nut
10. Nut
11. Bolt
12. Control tube
13. Nut
14. Bolt
15. Bolt
16. Adjuster knob
17. Pedal adjuster
18. Nut
19. Magnetic brake
20. Bolt
21. Pedals and support

UH-1H-II-M-11-29

Figure 11-29. Pedals and adjuster — tail rotor controls — removal and installation

11-114. Removal — Pedals and Adjuster — Anti-torque Control.

Premaintenance Requirements for Removal and Installation of Tail Rotor — Anti-torque Control System — Pedals and Adjuster

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Maintenance and Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C-200), (C-201), (C-405)
Special Environmental Conditions	None

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove flight control access doors.

c. Remove control tubes (12, figure 11-29) by removing cotter pins (7) and four nuts (9), washers (2), and four bolts (8) from pedal adjuster (17).

d. Remove pedals and support (21) by removing four bolts (20) and washers (2) from bulkhead.

e. Disconnect forward end of control tube (3) and force gradient (4) by removing cotter pins (7) and nuts (13), washers (2), and bolts (15).

f. Disconnect control tube (5) from pedal adjuster (17) by removing cotter pin (7) and nut (6), washers (2), and bolt (1).

g. Remove adjuster knob assembly (16) by removing two bolts (14) and washers (2).

h. Remove pedal adjuster (17) by removing four nuts (10), washers (2), and four bolts (11).

11-115. Disassembly — Pedals and Adjuster — Anti-torque Control.

a. Remove cotter pin (38, figure 11-30) and nut (39), washer (40), and bolt (43) attaching sprocket (41).

b. Remove key (42) from bolt (43).

c. Remove cotter pin (37), nut (36), washer (35), pin (28), and bolt (30) attaching sprocket (33).

d. Remove key (31) from bolt (30).

e. Remove chain (32), sprockets (41 and 33), and gear (29).

f. Remove cotter pin (13), nut (12), washers (10 and 25), and bolt (5).

g. Remove cotter pin (26), nut (27), washers (3 and 4), and bolt (2) attaching plates (6 and 8).

h. Remove pin (22) and pin (24) attaching screw (23).

i. Remove link (9) and spacer (7).

j. Remove screw (16).

k. Remove pin (21) attaching shaft (20) and nut (11).

l. Remove nut (11), shaft (20), retainers (17 and 19), gear (18), and support (14).

11-116. Inspection — Pedals and Adjuster — Anti-torque Control.

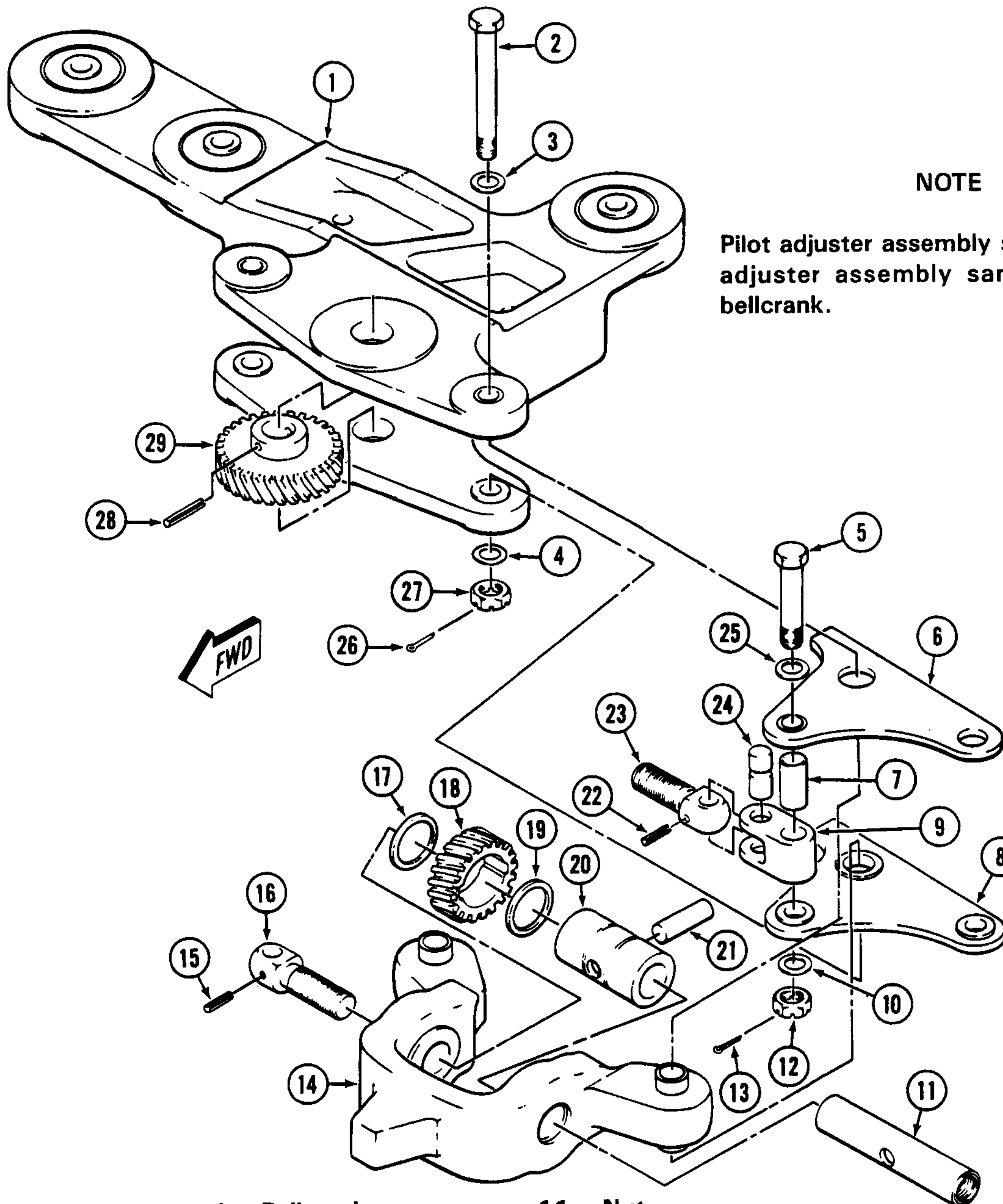
a. Inspect chain (32, figure 11-30) for wear, damaged links, and corrosion.

b. Inspect sprockets (33 and 41) for wear and chipped or missing teeth.

c. Inspect keys (31 and 42) for wear.

d. Inspect bellcrank (1) and support (34) for corrosion and damage.

e. Inspect bushings in bellcrank (11), upper plate (6), lower plate (8), and support assembly (34) for wear, elongation, and looseness. Maximum allowable bushing wear is 0.002 inch over 1/4 of circumference of bore.



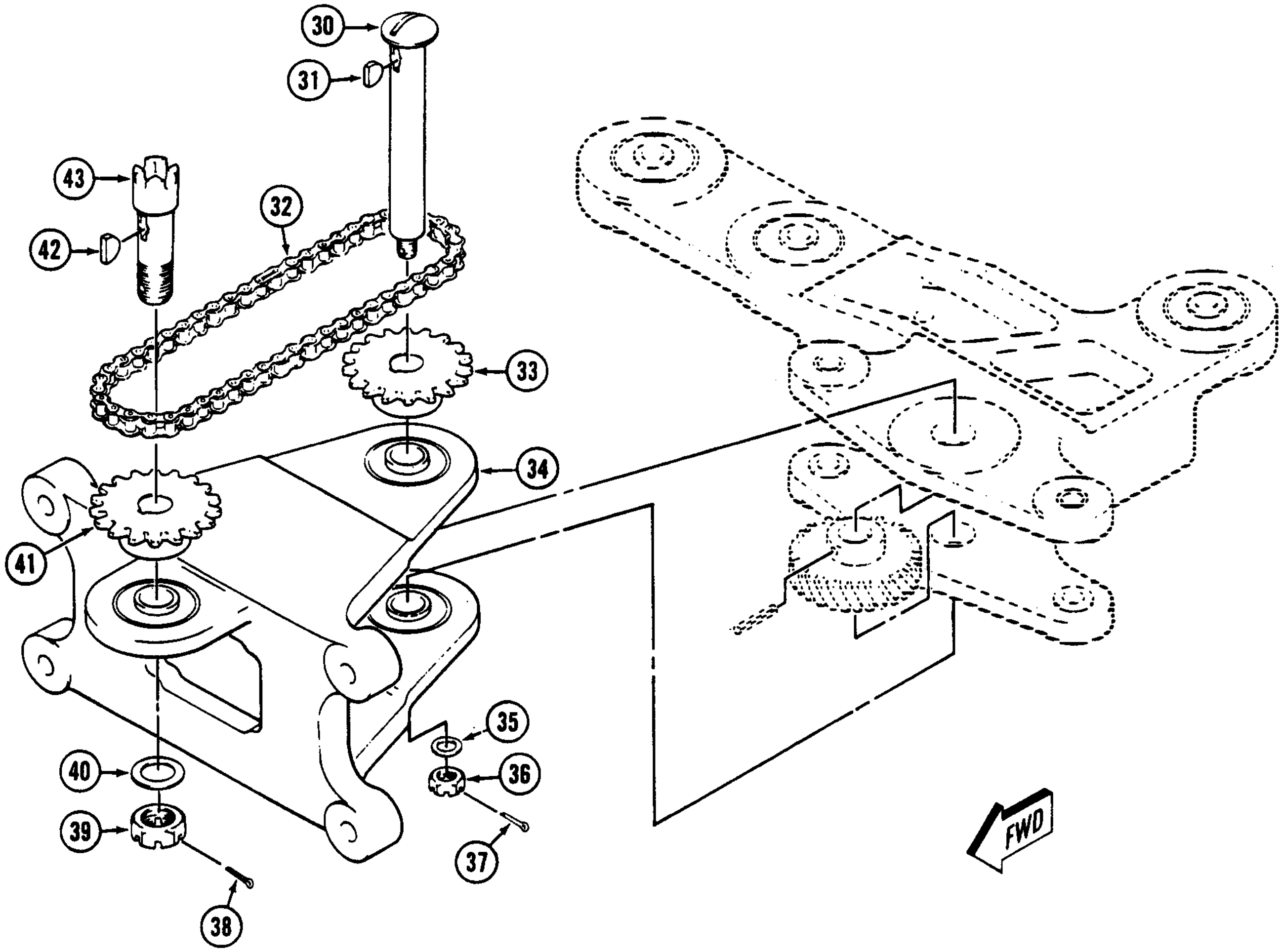
NOTE

Pilot adjuster assembly shown. Copilot adjuster assembly same except for bellcrank.

1. Bellcrank
2. Bolt
3. Washer
4. Washer
5. Bolt
6. Plate
7. Spacer
8. Plate
9. Link
10. Washer
11. Nut
12. Nut
13. Cotter pin
14. Support
15. Pin
16. Screw
17. Retainer
18. Gear
19. Retainer
20. Shaft
21. Pin
22. Pin
23. Screw
24. Pin
25. Washer
26. Cotter pin
27. Nut
28. Pin
29. Gear

UH-1H-II-M-11-30-1

Figure 11-30. Pedals and adjuster assembly — tail rotor controls — disassembly and assembly (Sheet 1 of 2)



30. Bolt
31. Key
32. Chain
33. Sprocket
34. Support
35. Washer
36. Nut
37. Cotter pin
38. Cotter pin
39. Nut
40. Washer
41. Sprocket
42. Key
43. Bolt

UH-1H-II-M-11-30-2

Figure 11-30. Pedals and adjuster assembly — tail rotor controls — disassembly and assembly (Sheet 2 of 2)

11-117. Repair or Replacement — Pedals and Adjuster — Anti-torque Control.

a. Replace components that do not meet inspection requirements.

b. Repair adjuster assembly within limits specified. (Figure 11-31.)

11-118. Assembly — Pedals and Adjuster — Anti-torque Control.

a. Place retainers (17 and 19, figure 11-30) and gear (18) on shaft (20) and place inside support (14).

b. Slide nut (11) into support (14) and inside shaft (20) with the 45 degree chamfer on the opposite side of arm of bellcrank assembly (1).

c. Place pin (21) to attach shaft (20) and nut (11).

d. Install screw (16).

e. Install spacer (7) and link (9).

f. Install pin (24) and pin (22) to attach screw (23).

g. Install nut (27), washers (3 and 4), and bolt (2) to attach plates (6 and 8). Tighten nut and install cotter pin (26).

h. Install nut (12), washers (10 and 25), and bolt (5). Tighten nut and install cotter pin (13).

i. Position bellcrank (1) with inner gear (29) in bellcrank (1) to support assembly (34).

j. Install bolt (30) with key (31) and sprocket (33) through support (34), bellcrank (1), and inner gear (29).

k. Install new pin (28) through inner gear (29) and bolt (30). Stake pin on both sides.

l. Position chain (32) on aft sprocket (33).

m. Assemble bolt (43), key (42), and forward sprocket (41). Position forward sprocket inside chain and install bolt through support (34).

n. Install washer (40) and nut (39). Tighten nut and install cotter pin (38).

o. Install washer (35) and nut (36). Tighten nut and install cotter pin (37).

11-119. Installation — Pedals and Adjuster — Anti-torque Control.

a. Apply a coat of zinc chromate putty (C-200) to mounting surface of pedal adjuster (17, figure 11-29), position on bulkhead, install four bolts (11), washers (2), and four nuts (10). Torque nuts 50 to 70 inch-pounds.

b. Position adjuster knob (16) in slots of pedal adjuster (17), install washers (2), and two bolts (14). Torque 20 to 25 inch-pounds.

c. Position forward end of control tubes (5) on pedal adjuster (17) and install bolt (1), washers (2), and nut (6). Torque nut 30 to 40 inch-pounds. Secure with cotter pin (7).

d. Position forward end of control tube (3) and force gradient (4) on pedal adjuster (17). Install bolts (15), washers (2), and nuts (13). Torque nuts 30 to 40 inch-pounds. Secure with cotter pins (7).

e. Apply a coat of zinc chromate primer (C-201) to mounting surface of pedals and support (21) and position on bulkhead with the word TOP up. Install four bolts (20) and washers (2). Torque 30 to 40 inch-pounds.

f. Position control tubes (12) on pedals (21) and pedal adjuster (17). Install bolts (8), washers (2), and nuts (9). Torque nuts 30 to 40 inch-pounds. Secure with cotter pins (7).

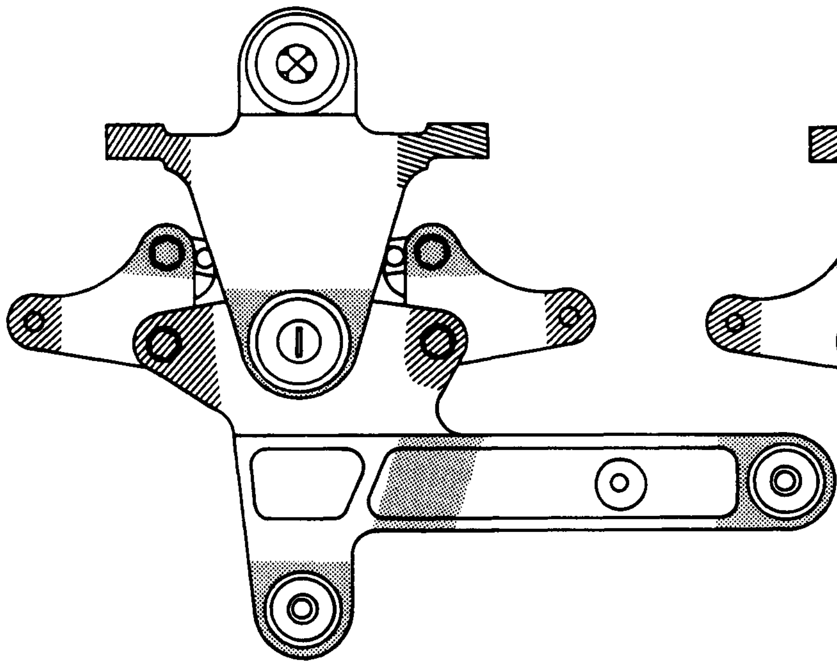
g. Install flight control access doors.

h. Install pilot and copilot seats. (Chapter 2.)

i. Perform rigging and operational check. (Paragraph 11-110.)

11-120. TAIL ROTOR — HUB AND BLADE SYSTEM — ANTI-TORQUE CONTROL — FORCE TRIM.

11-121. Description — Tail Rotor — Hub and Blade System — Anti-torque Control — Force Trim. A magnetic brake and force gradient installation is used for control centering and force trim. The brake is secured to airframe structure, and has an arm on its rotary shaft. The arm can be braked and held at any point in its travel by use of a switch on cyclic stick. The force gradient is a link equipped with an



204-001-762-13
ADJUSTER ASSEMBLY

204-001-762-15
ADJUSTER ASSEMBLY

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
CORROSION DAMAGE			
(BEFORE CLEANUP)	0.0075 In.	0.005 In.	0.0025 In.
(AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 In. Sq.	0.10 In. Sq.	0.10 In. Sq.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER	0.05 By 0.05	0.04 By 0.04	
BORE DAMAGE	0.002 In. for one-fourth circumference		

UH-1H-II-M-11-31

Figure 11-31. Wear and damage limits — pedals and adjuster assemblies — tail rotor controls internal spring, and connects the brake arm to center hole in aft bellcrank on pilots pedal adjuster. Brake and force gradient are like units used in cyclic system, but are different in position of installation. Brake is mounted on forward side of Station 63.33 bulkhead at approximately right Buttock Line 20 and force gradient extends forward.

11-122.FORCE GRADIENT — ANTI-TORQUE.

11-123. Removal — Force Gradient — Anti-torque.

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove flight control access panels.

c. Disconnect forward end of force gradient (4, figure 11-29) from pedal adjuster (17) by removing cotter pin and nut (13), washers (2), and bolt (15).

d. Disconnect aft end of force gradient (4) from magnetic brake (19) arm by removing cotter pin (7), nut (18), and washer (2). Remove force gradient (4).

e. Refer to paragraph 11-82 for force gradient adjustment.

11-124. Installation — Force Gradient — Anti-torque.

CAUTION

All force gradients are similar in appearance, but each installation requires a different part number because of different spring assembly.

a. Position aft end of force gradient (4, figure 11-29) on magnetic brake (19) arm. Install washer (2) and nut (18). Secure with cotter pin (7).

b. Rig force gradient (4). (Paragraph 11-110.) Connect to pedal adjuster (17, figure 11-29) and install bolt (15), washers (2), and nut (13). Secure with cotter pin (7).

c. Install flight control access panels.

d. Install pilot and copilot seats. (Chapter 2.)

11-125.MAGNETIC BRAKE — ANTI-TORQUE.

11-126. Removal — Magnetic Brake — Anti-torque.

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove flight control access panels.

c. Disconnect aft end of force gradient (4, figure 11-29) from arm of magnetic brake (19) by removing cotter pin (7), nut (18), and washer (2).

d. Remove lockwire and disconnect electrical plug from magnetic brake.

e. Remove four bolts (20), washers (2), and magnetic brake (19).

f. Remove arm from magnetic brake.

11-127. Installation — Magnetic Brake — Anti-torque.

a. Align arm on magnetic brake shaft so that the D is next to mark on shaft (figure 11-16). Tighten arm attaching bolt.

b. Position magnetic brake (19, figure 11-29) and secure to bulkhead with four bolts (20) and washers (2).

c. Connect electrical plug to magnetic brake and lockwire (C-405).

d. Check rigging of magnetic brake and force gradient. (Figures 11-17 and 11-18).

e. Position aft end of force gradient (4) on magnetic brake (19) arm and install washer (2) and nut (18). Secure with cotter pin (7).

f. Install flight control access panels.

g. Install pilot and copilot seats. (Chapter 2.)

11-128.ANTI-TORQUE CONTROL — PITCH CHANGE MECHANISM.

11-129. Description — Anti-torque Control — Pitch Change Mechanism. The pitch change mechanism consists of a link, lever, and idler. Mounted on left side of tail rotor gearbox and attached to a control tube extending through hollow output shaft of gearbox connecting to pitch control crosshead and linked to tail rotor. Movement of pedals is transmitted through linkage to lever moving control tube to change pitch of blades.

11-130. Removal — Anti-torque Control — Pitch Change Mechanism.

Premaintenance Requirements for Removal, Inspect and Repair, and Installation of Tail Rotor — Anti-torque Control System — Pitch Change Mechanism

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Maintenance and Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C-005), (C-007), (C-021), (C-100), (C-201), (C-304), (C-309), (C-407)
Special Environmental Conditions	None

NOTE

Solid film lubricant (C-005) shall be heat cured. Solid film lubricant (aerosol) (C-021) may be cured at room temperature.

a. Disconnect and remove link (13, figure 11-32) from bellcrank (11) and lever (9) by removing bolts (10 and 12), cotter pins (19), nuts (20, and washers (21).

b. Disconnect lever (9) from pitch change tube (7) and idler (15) by removing bolts (14 and 17), cotter pins (19), nuts (20), and washers (21). Remove race (8) from lever.

c. Remove idler (15) from mounting boss on gearbox housing by removing cotter pin (19), nut (20), washers (21), and bolt (16).

d. Remove tail rotor crosshead. (Paragraph 11-135).

e. Pull pitch change tube (7, figure 11-32) from housing (2).

f. Remove three nuts (22) and washers (23) attaching housing (2) to gearbox housing. Use suitable jackscrews in housing holes and remove housing.

g. Disassemble housing (2) as follows:

(1) Remove retainer (6), excluder housing (5), seal (18), and excluder (4).

(2) Push bearing (3) out from inside housing.

(3) Remove and discard packing (1).

11-131. Inspection and Repair — Anti-torque Control — Pitch Change Mechanism.

a. Inspect and repair lever (9, figure 11-32), idler (15), and tube (7). (Refer to BHT-212-CR&O.)

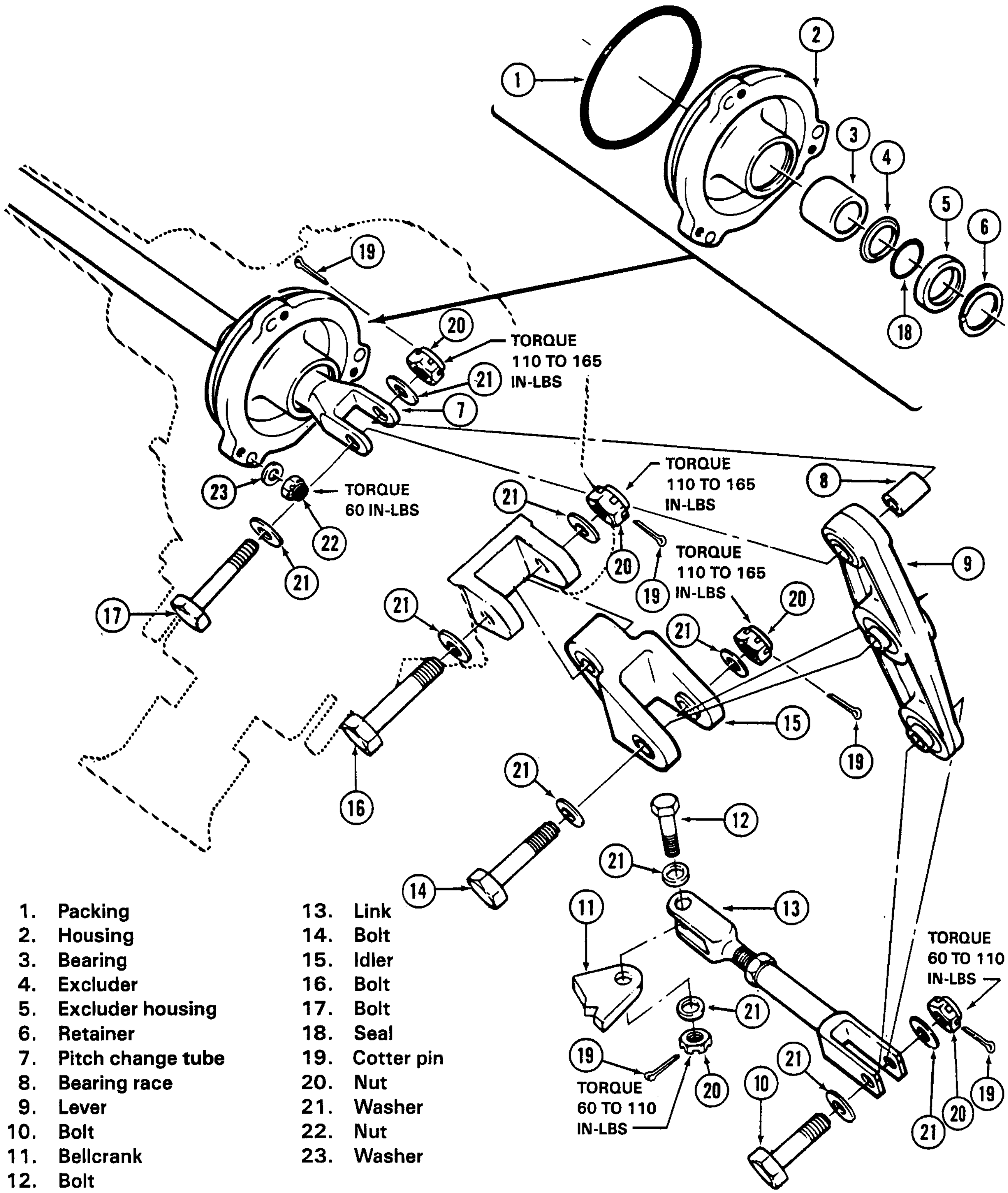
b. Inspect for accumulation of foreign material on the pitch change tube (7).

CAUTION

Do not rotate link past normal travel. Damage to seal retainer may result if excessive rotation occurs.

c. Inspect lower bearing in lever (9) for binding or excessive tightness. Grasp link (13) with slight hand pressure and check for rotational movement of lower bearing. If tightness of lower bearing in lever (9) is found, rotate lower bearing in lever (9) upward. Attach a spring scale to clevis control bolt nut. Pull slowly and evenly down on scale. The force required to rotate bearing should not exceed 10 pounds. If a force greater than 10 pounds is required to rotate bearing, replace lever (9).

d. Inspect link assembly (13), housing (2), and other components for nicks, scratches, and other mechanical and corrosion damage. (Refer to BHT-212-CR&O.)



1. Packing
2. Housing
3. Bearing
4. Excluder
5. Excluder housing
6. Retainer
7. Pitch change tube
8. Bearing race
9. Lever
10. Bolt
11. Bellcrank
12. Bolt
13. Link
14. Bolt
15. Idler
16. Bolt
17. Bolt
18. Seal
19. Cotter pin
20. Nut
21. Washer
22. Nut
23. Washer

Figure 11-32. Anti-torque control — pitch change mechanism — removal and installation

e. Visually inspect excluder housing (5).

f. Inspect bearing (3) for maximum inside diameter of 0.765 inch.

g. Apply chemical film material (C-100) to repaired area.

h. Replace any part that exceeds specified limits.

i. Coat repaired area with zinc chromate primer (C-201).

j. Inspect anti-torque control tubes for nicks, dents, scratches, and corrosion. (Refer to BHT-212-CR&O.)

11-132. Installation — Anti-torque Control — Pitch Change Mechanism.

a. Assemble housing (2, figure 11-32) as follows:

(1) Push bearing (3) in from outside of cap until seated.

(2) Place excluder (4), seal (18), and excluder housing (5) into housing (2). Press firmly against bearing (3).

CAUTION

Install housing (2) with flange outboard, next to retainer.

(3) Install retainer (6) in groove of housing (2).

(4) Position new packing (1) in outer flange of housing (2).

b. Apply wet, unreduced zinc chromate primer (C-201) to mating flange of housing (2). Install on gearbox. Install three washers (23) and nuts (22) on case studs. Torque 60 inch-pounds.

c. Lubricate pitch change tube (7) with grease (C-007) in area of bearing.

NOTE

If pitch change tube (7) binds inside bearing (3), clean inside diameter of bearing using a fine grade nylon abrasive pad (C-407). Clean bearing and pitch change tube with MEK (C-309).

d. Insert pitch change tube (7) through housing (2) and gearbox shaft.

e. Position idler (15) on mounting boss of gearbox. Install bolt (16) with washers (21) under bolt head and nut (20). Torque nut 110 to 165 inch-pounds. Install cotter pin (19).

f. Clean bearing in upper end of lever (9) with solvent (C-304). Allow to air-dry. Hand-pack bearing with grease (C-007). Insert race (8) into lever (9).

g. Attach lever (9) to pitch change tube (7). Install bolt (17) with washers (21) under bolt head and nut (20). Torque nut 110 to 165 inch-pounds. Install cotter pin (19).

h. Align holes in idler (15) with center hole in lever (9). Install bolt (14) with washers (21) under bolt head and nut (20). Torque nut 110 to 165 inch-pounds. Install cotter pin (19).

i. Attach link (13) to lower end of lever (9). Install bolt (10) with washers (21) under bolt head and nut (20). Torque nut 60 to 100 inch-pounds and install cotter pin (19).

j. Attach opposite end of link (13) to bellcrank (11) of tail rotor controls. Install bolt (12) with washers (21) under bolt head and nut (20). Torque nut 60 to 110 inch-pounds. Install cotter pin (19).

k. Install tail rotor crosshead. (Paragraph 11-139.)

l. Check rigging of tail rotor controls. (Paragraph 11-110.)

11-133.TAIL ROTOR CROSSHEAD.

11-134. Description — Tail Rotor Crosshead. The tail rotor crosshead is located on outboard side of tail rotor and is splined to the tail rotor shaft. It is actuated by movement of pitch change tube and changes blade pitch through two pitch links attached to clevises on opposite sides of crosshead. Two counterweight assemblies, consisting of a bellcrank with weights attached to each end is mounted on spindles extending from crosshead perpendicular to pitch link clevises. A fixed link connects mid-point of each bellcrank to a common support mounted next to hub.

11-135. Removal — Tail Rotor Crosshead.

a. Remove lockwire and bolt (20, figure 11-33), bushing (21), and disconnect each pitch link (9) attached to each tail rotor blade pitch horn (15). Reinstall bushings and bolts fingertight in pitch horns.

b. Remove cotter pin (14), nut (13), washers (12), bolt (16), and disconnect each counterweight link (11) attached to each counterweight support (18).

c. Remove lockwire and screws (1), washers (2), lock (3), and retainer (4) from crosshead (10).

d. Remove cotter pin (14) and nut (5) with washer (6) from end of pitch change tube (17).

e. Remove crosshead assembly (10) from pitch change tube (17). Remove bearing (7) and nylon washer (8) from crosshead.

11-136. Disassembly — Tail Rotor Crosshead.

a. Disconnect pitch link (17, figure 11-34) from crosshead (4) by removing cotter pin (1), nut (2), washers (3), and bolt (5).

b. Remove cotter pin (12), nut (11), washers (10), bolt (20), and counterweight link (16) from bellcrank (18).

c. Remove bellcrank (18) from crosshead (4) by removing cotter pin (15), nut (14), washer (13), and washer (19).

d. Remove attaching bolt (6), washer (8), and nut (9) to separate weights (7) from bellcrank (18).

11-137. Inspection and Repair — Tail Rotor Crosshead.

a. Inspect and repair crosshead (10, figure 11-33), bellcrank (18, figure 11-34), pitch links (17), counterweight links (16), and counterweight support (18, figure 11-33). (Refer to BHT-212-CR&O.)

b. Replace any part that exceeds specified limits.

c. Coat repaired areas with zinc chromate primer (C-201).

11-138. Assembly — Tail Rotor Crosshead.

NOTE

Color coded units shall be matched during assembly.

NOTE

There must be two weights at each of the four locations on bellcrank for a total of eight weights.

a. Install weights (7, figure 11-34), two at each of four locations, on bellcrank (18) with bolts (6) (bolt head in opposite direction of rotation), washer (8), and nut (9). Torque nut 50 to 70 inch-pounds.

b. Position washer (19) and bellcrank (18) on crosshead (4), install washer (13) and nut (14). Torque nut 100 to 170 inch-pounds. Install cotter pin (15).

CAUTION

Do not mix 212-010-711-001 and -003 counterweight links. 212-010-711-001 counterweight links are made from aluminum alloy, 212-010-711-003 counterweight links are made from steel.

c. Connect counterweight link (16) to bellcrank (18) with bolt (20) (bolt head in opposite direction of rotation), washers (10), and nut (11). Torque nut 60 to 110 inch-pounds. Install cotter pin (12).

NOTE

If new pitch links or new tail rotor assembly is being installed, adjust pitch links to equal length 6.115 plus or minus 0.010 inch between centerline of bolt holes. If same pitch links and tail rotor assembly is being installed do not adjust pitch links, install links in original position.

d. Connect riveted end of pitch link (17) to crosshead (4) and install bolt (5), washers (3), and nut (2). Torque nut 110 to 165 inch-pounds. Install cotter pin (1).

e. Repeat steps a., b., c., and d. for opposite side of crosshead.

1. Screw
2. Washer
3. Lock
4. Retainer
5. Nut
6. Washer
7. Bearing
8. Nylon washer
9. Pitch link
10. Crosshead assembly
11. Counterweight link
12. Washer
13. Nut
14. Cotter pin
15. Pitch horn
16. Bolt
17. Pitch change tube
18. Counterweight support
19. Sleeve
20. Bolt
21. Bushing

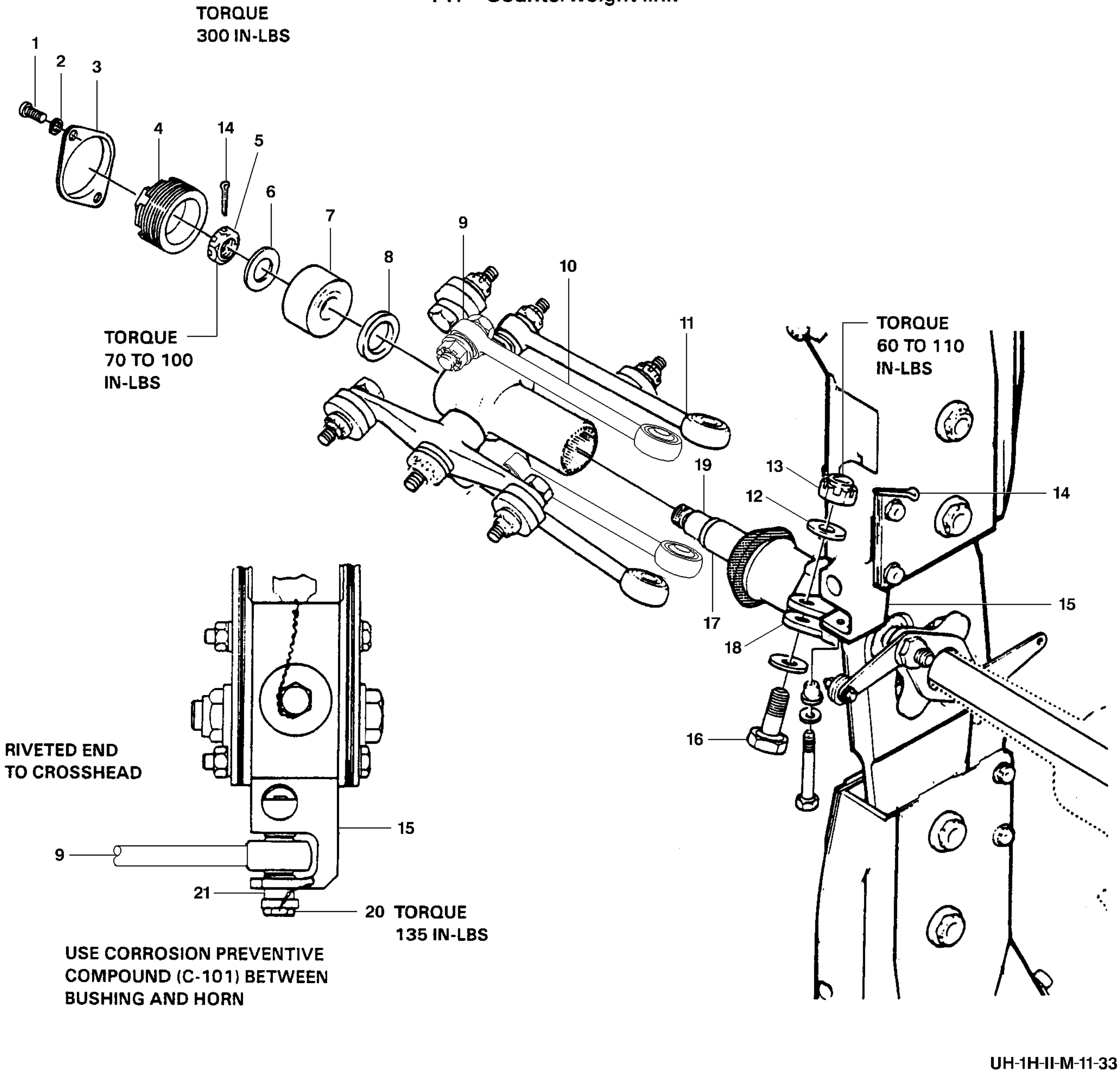
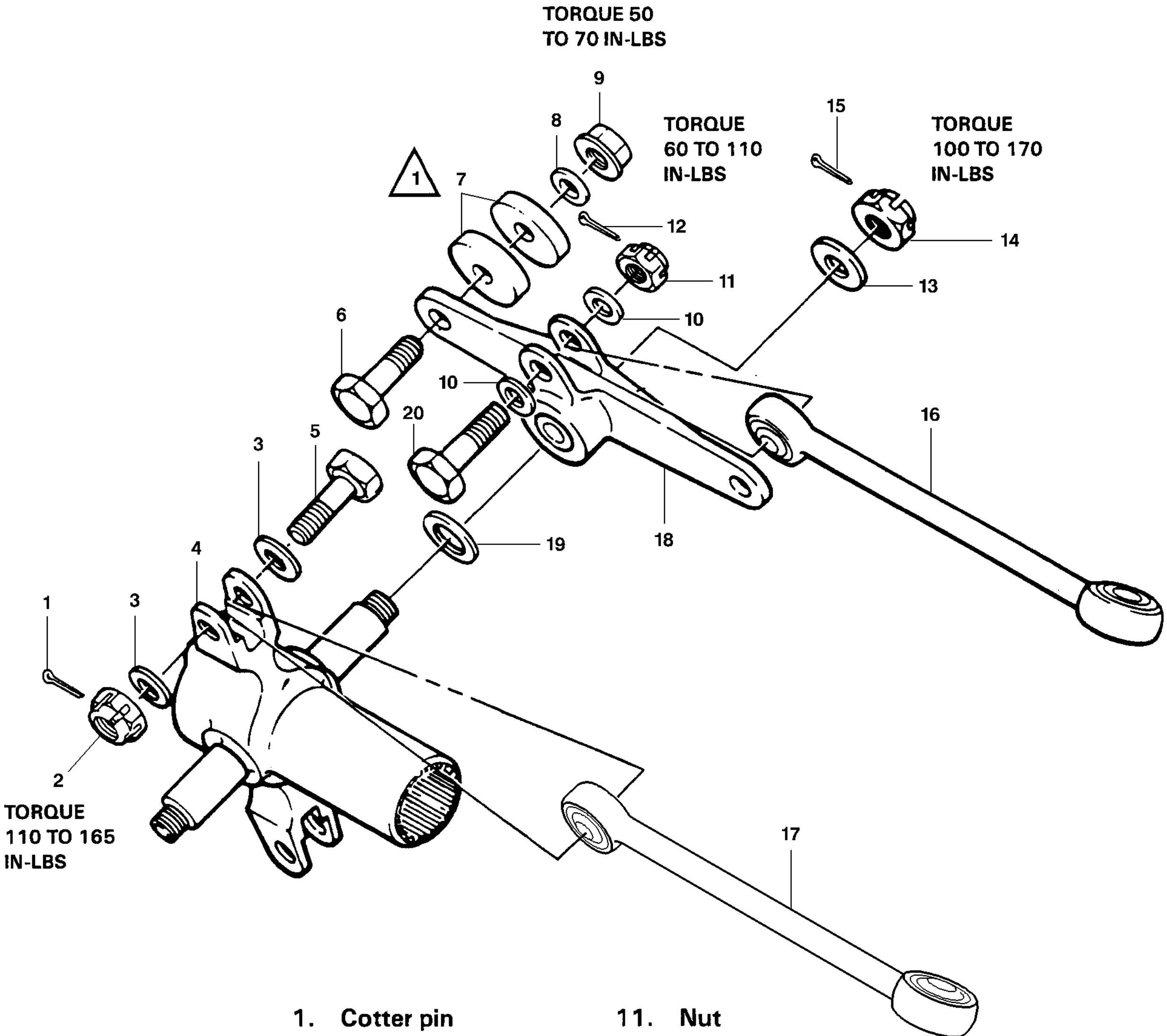


Figure 11-33. Tail rotor crosshead controls — removal and installation



1.	Cotter pin	11.	Nut
2.	Nut	12.	Cotter pin
3.	Washer	13.	Washer
4.	Crosshead	14.	Nut
5.	Bolt	15.	Cotter pin
6.	Bolt	16.	Counterweight link
1 7.	Weight	17.	Pitch link
8.	Washer	18.	Bellcrank
9.	Nut	19.	Washer
10.	Washer	20.	Bolt

*NOTE

There must be two weights at each of the four locations for a total of eight weights.

UH-1H-II-M-11-34

Figure 11-34. Tail rotor crosshead — disassembly and assembly

f. Install tail rotor crosshead. (Paragraph 11-139.)

11-139. Installation — Tail Rotor Crosshead.

a. Check that sleeve (19, figure 11-33), is installed on end of pitch change tube (17).

b. Wash bearing (7) and cavity of retainer (4) with solvent (C-304) and air dry.

c. Hand pack bearing (7), fill cavity of retainer (4), and lubricate splined surfaces of crosshead (10) with grease (C-001 or C-007).

NOTE

When placing black nylon washer (8) in crosshead (10), ensure it is properly seated in recess.

NOTE

Ensure cotter pin for nut (5) is properly installed to preclude possible contacts with base of retainer (4) (zerk fitting area).

d. Install washer (8) and bearing (7) in outboard end of crosshead (10). Install crosshead assembly on gearbox output shaft engaging master splines. Install washer (6) and nut (5) on end of pitch change tube (17). Torque nut 70 to 100 inch-pounds. Install cotter pin.

e. Position counterweight link (11) on counterweight support (18) and install bolt (16) (with bolt head in opposite direction of rotation), washers (12) and nut (13). Torque nut 60 to 110 inch-pounds and install cotter pin (14).

f. Coat mating surfaces of bushing (21) and pitch horn (15) with corrosion preventive compound (C-101).

NOTE

Ensure that flange of bushing (21) does not seat against pitch horn (15) to prevent bending stress on pitch horn.

g. Assemble bolt (20) and bushing (21) with flange of bushing next to bolt head. Check that barrel nut and retainer are in hole in pitch horn (15). Align pitch horn (15). Align pitch link (9) with pitch horn (15) and install bolt (20) and bushing (21). Do not use washers on bolt (20). Torque bolt 135 to 160 inch-pounds. Lockwire (C-405) bolt to pitch horn.

h. Repeat steps e., f., and g. for opposite counterweight link and pitch link.

i. Install retainer (4) and torque 300 inch-pounds. Position lock (3) over retainer and install screws (1) and washers (2). Lockwire (C-405) screws. Deform lock (3) into notches of retainer (4), two places, near screws (1).

j. Using hand grease gun, lubricate bearing (7) with two shots of grease (C-001) through grease fitting in center of retainer (4).

k. Perform rigging check. (Paragraph 11-110.)

l. Perform operational check. (Chapter 5.)

11-140.LINKAGE — TAIL ROTOR — ANTI-TORQUE CONTROL — HUB AND BLADE SYSTEM.

11-141. Description — Linkage — Tail Rotor — Anti-Torque Control — Hub and Blade System.

Linkage between tail rotor control pedals and pitch change mechanism mounted on tail rotor gearbox include control tubes, bellcranks, levers, walking beam, force gradient with magnetic brake, and hydraulic power cylinder.

11-142. Removal — Linkage — Tail Rotor — Anti-Torque Control — Hub and Blade System.

CAUTION

Accidental movement of flight controls while disconnected may result in damage to controls and surrounding structures.

NOTE

Parts of control system may be removed separately, as need arises, or completely in practical sequence.

a. Remove pilot and copilot seats. (Chapter 2.)

b. Remove flight control access panels.

c. Remove tail rotor gearbox. (Chapter 6.)

d. Detach control tube (10, figure 11-35) from bellcrank (3) by removing cotter pin (4), nut (8), washers (9), and bolt (1). (Detail A.)

e. Remove screws (12) and washers (13) from two guides (14) on control tube (10). (Detail A.)

f. Detach lower end of control tube (10) from bellcrank (15) by removing cotter pin (4) and nut (16), washers (9), and bolt (17). Remove control tube. (Detail B.)

g. Detach control tube (18) from bellcrank (15) by removing cotter pin (4) and nut (16), washers (9), and bolt (19). (Detail B.)

h. Detach control tube (18) from walking beam (32) by removing cotter pin (30), nut (29), washers (27), and bolt (28). Remove control tube. (Detail C.)

i. Remove screws (25) and washers (26) from four guides (24) on control tube (18). (Detail C.)

j. Detach control tube (36) from walking beam (32) by removing cotter pin (30) and nut (29), washers (27), and bolt (37). Remove screws (25) and washers (26) from four guides (24) on control tube (36). (Detail C.)

k. Detach control tube (36) from bellcrank (49) by removing cotter pin (38), nut (39), washers (40), and bolt (41). Remove control tube. (Detail D.)

l. Detach control tube (48) from bellcrank (49) by removing cotter pin (38) and nut (42), washers (40), and bolt (41). (Detail D.)

m. Detach control tube (48) from hydraulic cylinder (51) by removing cotter pin (38) and nut (39), washers (40), and bolt (41). Remove control tube. (Detail E.)

n. Detach hydraulic cylinder (51) from bellcrank (56) by removing cotter pin (38) and nut (39), washers (40), and bolt (41). (Detail E.)

NOTE

Protective devices shall be installed on all open ports and hoses.

o. Disconnect hydraulic hoses (52 and 55) from cylinder (51). Remove two nuts (60), washers (57), bolts (58), trunnion assembly (61), and cylinder from support (59). (Detail E.)

p. Detach control tube (68) from bellcrank (65) and lever (72) by removing cotter pins (64) and nuts (69), washers (67), and bolts (66). Remove control tube. (Detail F.)

q. Detach control tube (75) from lever (72) by removing cotter pin (64) and nut (69), washers (67), and bolt (76). (Detail F.)

r. Detach control tube (75) from walking beam (85) by removing cotter pin (82), nut (83), washers (81), and bolt (80). Remove control tube. (Detail H.)

s. Detach control tube (86) from walking beam (85) and pedal adjuster (87) by removing cotter pins (82) and nuts (83), washers (78), and bolts (79). Remove control tube. (Detail H.)

11-143. Inspection and Repair — Linkage — Tail Rotor — Anti-Torque Control — Hub and Blade System.

a. Inspect and repair control tubes (linkage) (figure 11-35) for mechanical and corrosion damage. (Paragraphs 11-151 and 11-152.)

b. Repair or replace anti-torque control tube wear strips. (Paragraph 11-153.)

c. Inspect anti-torque control tube guides (24, figure 11-35) for wear damage.

11-144. Installation — Linkage — Tail Rotor — Anti-Torque Control — Hub and Blade System.

a. Apply corrosion preventive compound (C-101) to bolts shown in figure 11-36 prior to installing.

b. Position control tube (86, figure 11-35) ends on walking beam (85) and pedals adjuster (87). Install bolts (79), washers (78), and nuts (83). Secure with cotter pins (82). (Detail H.)

c. Position control tube (75) end on walking beam (85) and install bolt (80), washers (81), and nut (83). Secure with cotter pin (82). (Detail H.)

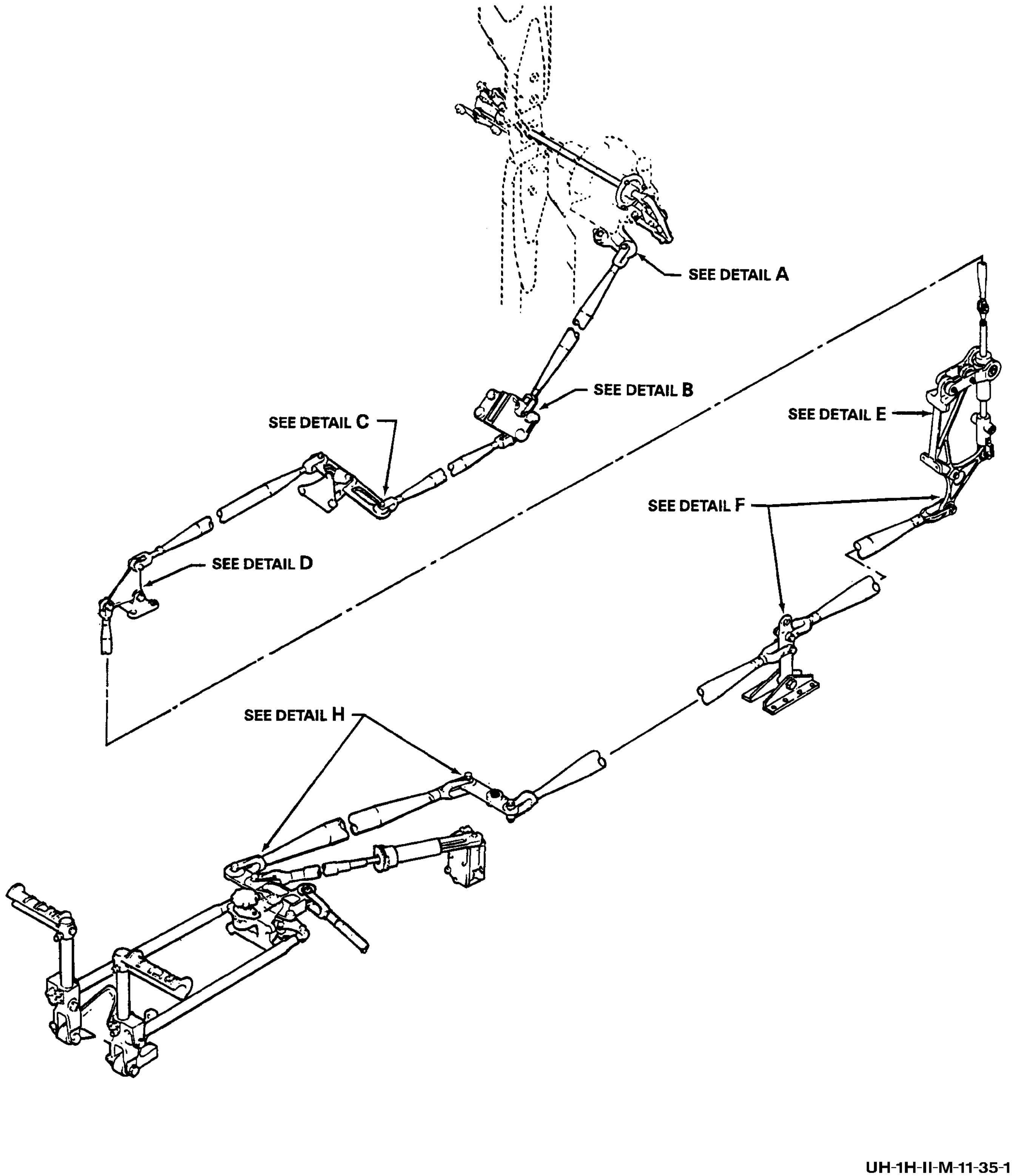
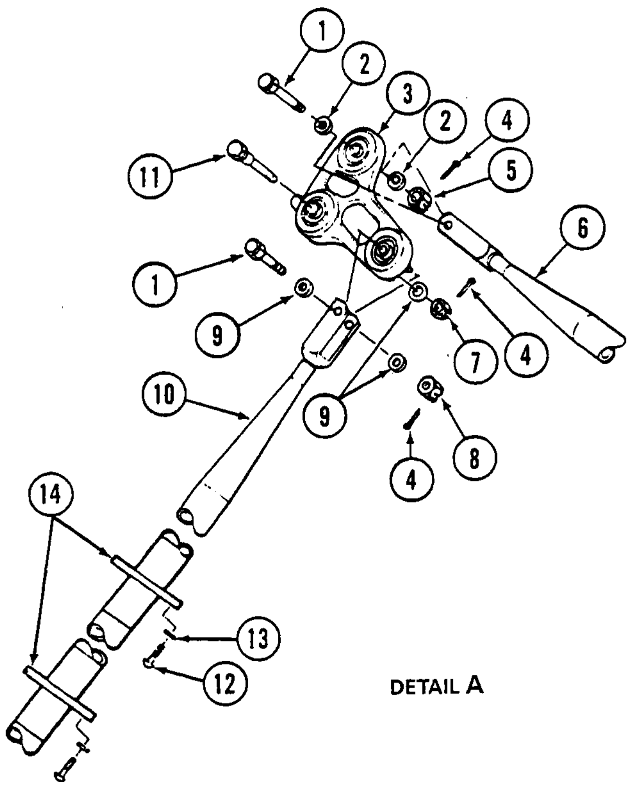
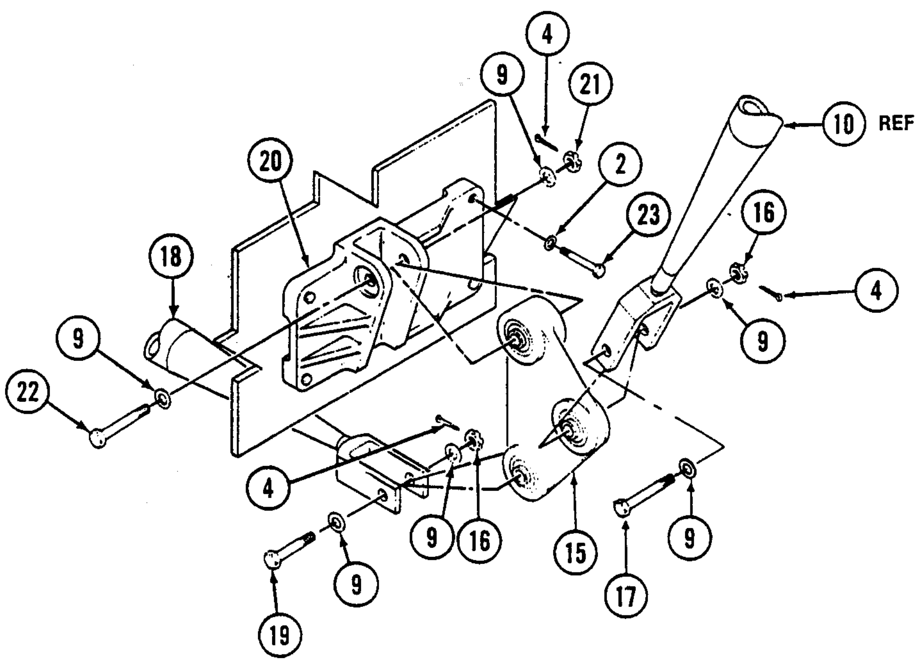


Figure 11-35. Tail rotor — hub and blade system — linkage and components — removal and installation (Sheet 1 of 6)



DETAIL A

1. Bolt
2. Washer
3. Bellcrank
4. Cotter pin
5. Nut
6. Link
7. Nut
8. Nut
9. Washer
10. Control tube
11. Bolt
12. Screw
13. Washer
14. Guide
15. Bellcrank
16. Nut
17. Bolt
18. Control tube
19. Bolt
20. Support
21. Nut
22. Bolt
23. Bolt



DETAIL B

UH-1H-II-M-11-35-2

Figure 11-35. Tail rotor — hub and blade system — linkage and components — removal and installation (Sheet 2 of 6)

24. Guide
25. Screw
26. Washer
27. Washer
28. Bolt
29. Nut
30. Cotter pin
31. Bolt
32. Walking beam
33. Bolt
34. Washer
35. Support
36. Control tube
37. Bolt

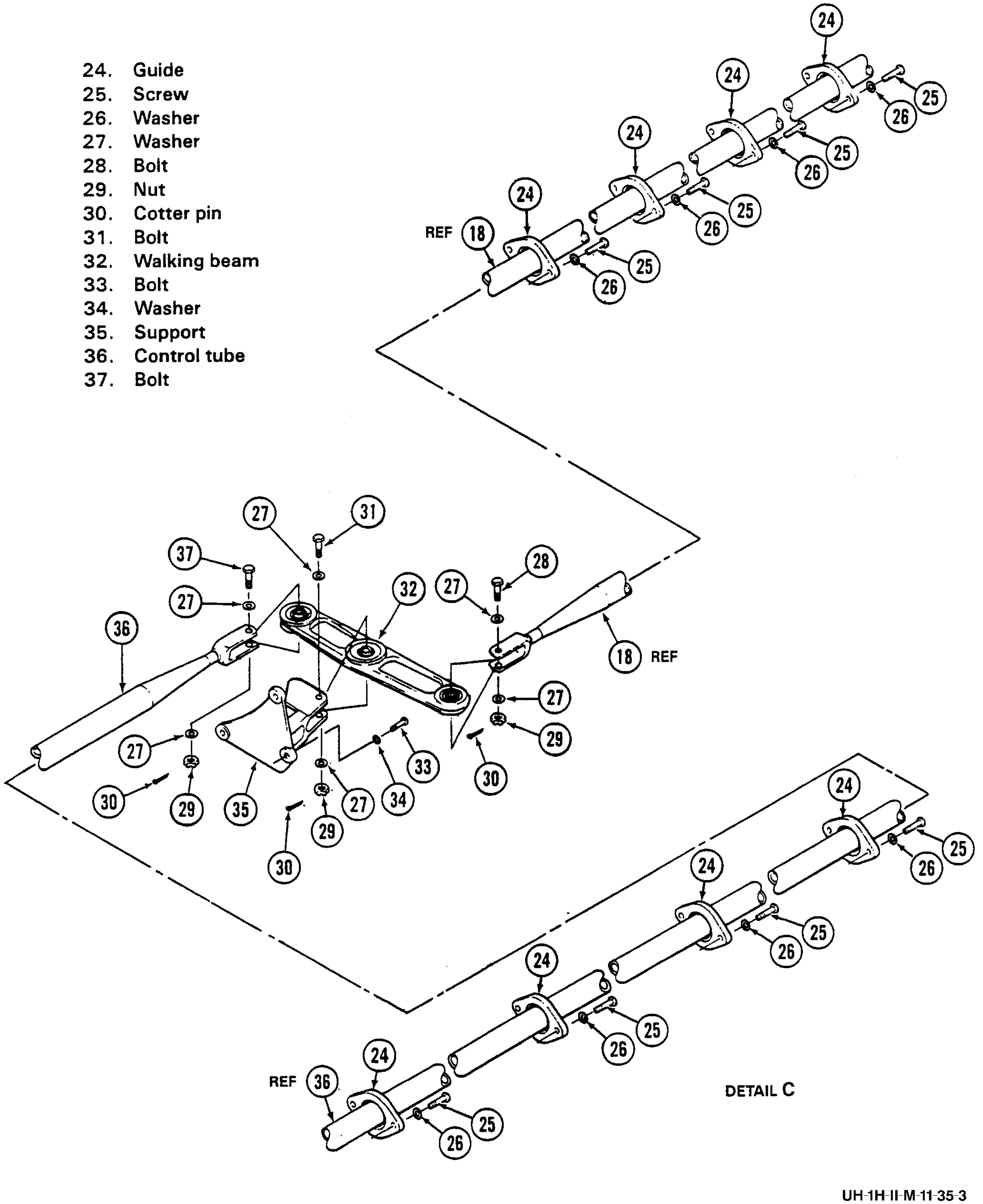
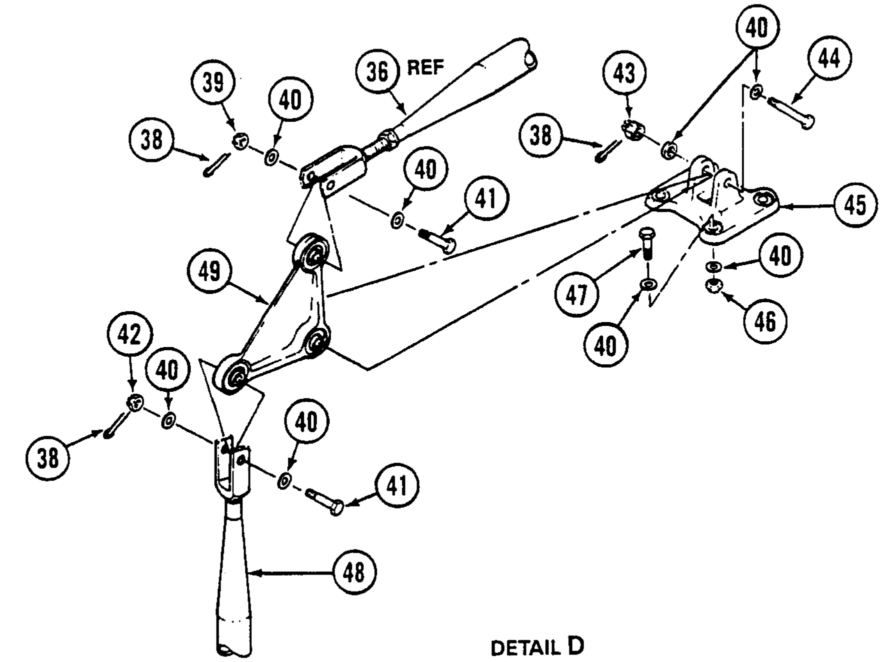
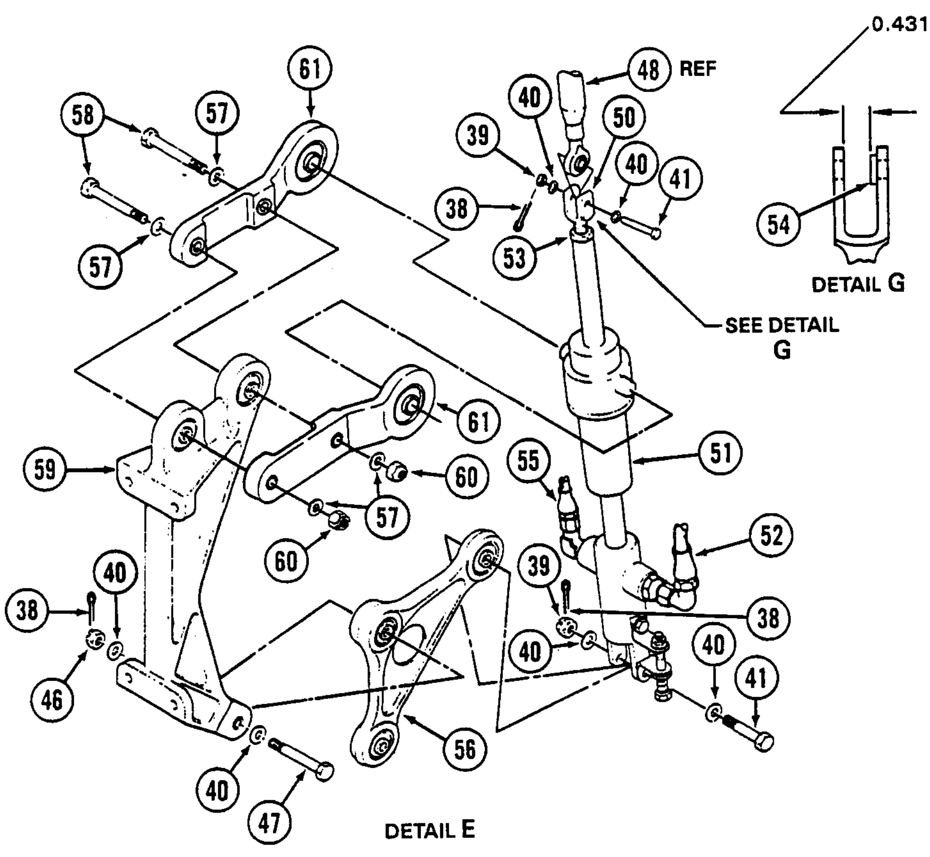


Figure 11-35. Tail rotor — hub and blade system — linkage and components — removal and installation (Sheet 3 of 6)

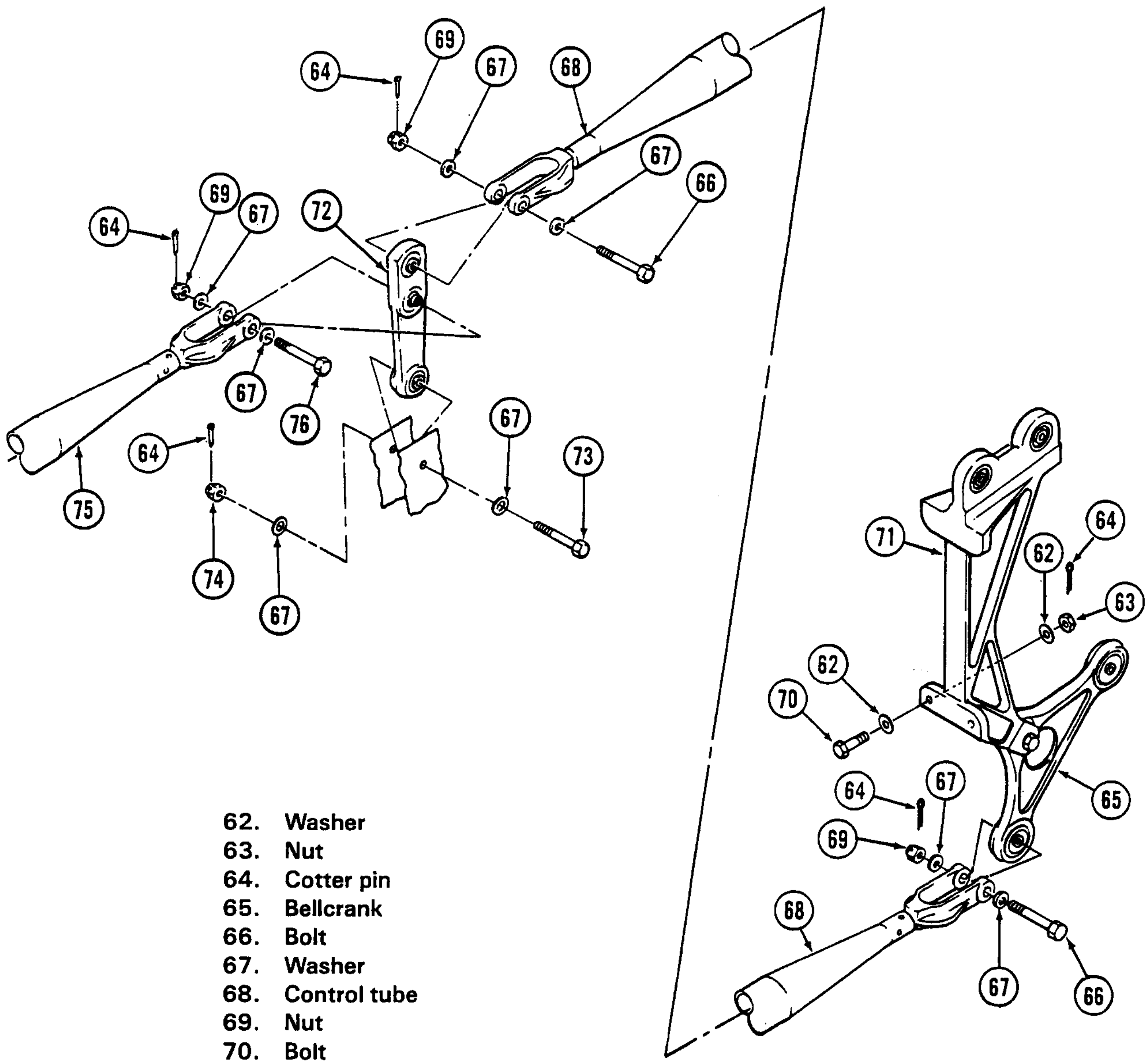




38. Cotter pin
39. Nut
40. Washer
41. Bolt
42. Nut
43. Nut
44. Bolt
45. Support
46. Nut
47. Bolt
48. Cotter tube
49. Bellcrank
50. Clevis
51. Hydraulic cylinder
52. Hose
53. Nut
54. Shim
55. Hose
56. Bellcrank
57. Aluminum washer
58. Bolt
59. Support
60. Nut
61. Trunnion assembly

UH-1H-II-M-11-35-4

Figure 11-35. Tail rotor — hub and blade system — linkage and components — removal and installation (Sheet 4 of 6)

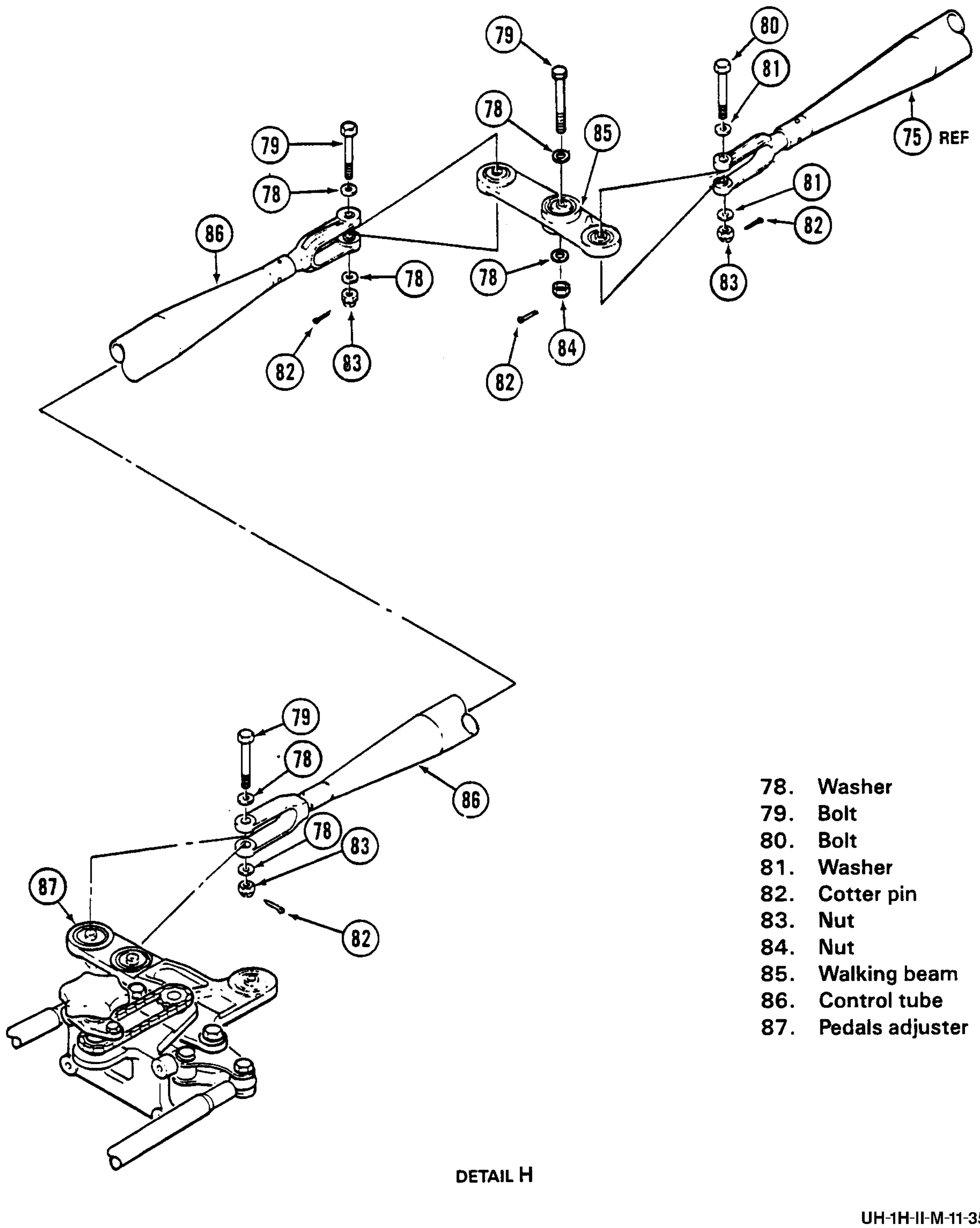


62. Washer
63. Nut
64. Cotter pin
65. Bellcrank
66. Bolt
67. Washer
68. Control tube
69. Nut
70. Bolt
71. Support
72. Lever
73. Bolt
74. Nut
75. Control tube
76. Bolt

DETAIL F

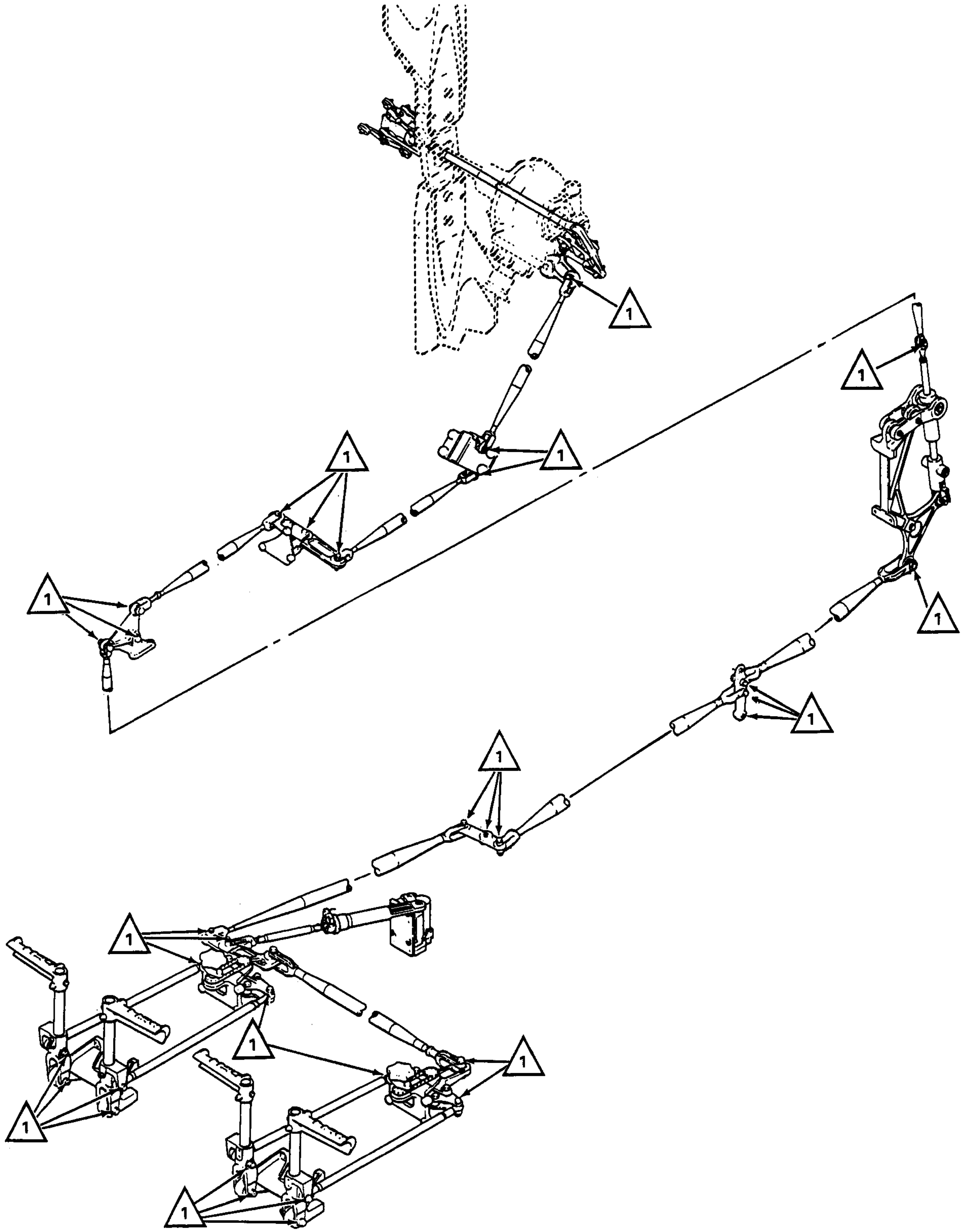
UH-1H-II-M-11-35-5

Figure 11-35. Tail rotor — hub and blade system — linkage and components — removal and installation (Sheet 5 of 6)



78. Washer
79. Bolt
80. Bolt
81. Washer
82. Cotter pin
83. Nut
84. Nut
85. Walking beam
86. Control tube
87. Pedals adjuster

Figure 11-35. Tail rotor — hub and blade system — linkage and components — removal and installation (Sheet 6 of 6)



1 Bolts to be installed with corrosion preventive compound (C-101).

UH-1H-II-M-11-36

Figure 11-36. Anti-torque control pivot bolts

d. Position control tube (75) end on lever (72) and install bolt (76), washers (67), and nut (69). Secure with cotter pin (64). (Detail F.)

e. Position control tube (68) ends on lever (72) and bellcrank (65). Install bolts (66), washers (67), and nuts (69). Secure with cotter pins (64). (Detail F.)

f. Inspect shim (54) on clevis (50) for wear and damage. Install shim on clevis to obtain a dimension of 0.431 to 0.442 inch between shim and clevis. Bond with adhesive (C-317). (Detail G.)

g. Install clevis (50) on hydraulic cylinder (51) to obtain measurement of 1.80 inches from bolt hole centerline to top of piston. Secure with nut (53). (Detail E.)

h. Install trunnion assembly (61) on cylinder (51) and position onto support (59). Install two bolts (58), washers (57), and nuts (60). (Detail E.)

i. Position bellcrank (56) on lever (54) and install spacer (55), bolt (41), washers (40), and nut (39). Secure with cotter pin (38). (Detail E.)

j. Position control tube (48) end on clevis (50) and install bolt (41), washers (40), and nut (39). Secure with cotter pin (38). (Detail E.)

NOTE

Protective devices shall be removed from ports and hoses.

k. Connect hoses (52 and 55) to hydraulic cylinder (51). (Detail E.)

l. Position control tube (48) end on bellcrank (49) and install bolt (41), washers (40), and nut (42). Secure with cotter pin (38). (Detail D.)

m. Position four guides (24) and install screws (25) and washers (26). (Detail C.)

n. Slide control tube (36) through guides (24) adjustable end forward. (Detail C.)

o. Position control tube (36) end on bellcrank (49) and install bolt (41), washers (40), and nut (39). Secure with cotter pin (38). (Detail D.)

p. Position control tube (36) end on walking beam (32) and install bolt (37), washers (27), and nut (29). Secure with cotter pin (30). (Detail C.)

q. Position guides (24) and install screws (25) with washers (26). (Detail C.)

r. Slide control tube (18) through guides (24) and position control tube (18) end on walking beam (32). Install bolt (28), washers (27), and nut (29). Secure with cotter pin (30). (Detail C.)

s. Position control tube (18) end on bellcrank (15) and install bolt (19), washers (9), and nut (16). Secure with cotter pin (4). (Detail B.)

t. Position two guides (14) and install screws (12) with washers (13). (Detail A.)

u. Slide control tube (10) through guides (14) and position tube end on bellcrank (15). Install bolt (17), washers (9), and nut (16). Secure with cotter pin (4). (Detail B.)

v. Position control tube (10) end on bellcrank (3) and install bolt (1), washers (9), and nut (8). Secure with cotter pin (4). (Detail A.)

w. Install tail rotor gearbox. (Chapter 6.)

x. Perform anti-torque tail rotor controls rigging. (Paragraph 11-110.)

11-145. BELLCRANKS, LEVERS, AND SUPPORTS — TAIL ROTOR — ANTI-TORQUE CONTROL — HUB AND BLADE SYSTEM.

11-146. Description — Bellcrank, Levers, and Supports — Tail Rotor — Anti-torque Control — Hub and Blade System. Various bellcranks, levers, and supports are incorporated in the anti-torque tail rotor control system. The supports are airframe mounted and provide a pivot mount for levers (walking beams) and bellcranks.

11-147. Removal — Bellcrank, Levers, and Supports — Tail Rotor — Anti-torque Control — Hub and Blade System.

a. Remove tail rotor control linkage. (Paragraph 11-142.)

b. Remove bellcrank (3, figure 11-35) by removing cotter pin (4), nut (7), washer (9), and bolt (11).

c. Remove bellcrank (15, figure 11-35) cotter pin (4) and nut (21), washers (9), and bolt (22). (Detail B.)

d. Remove support (20) by removing four bolts (23) and washers (2). (Detail B.)

e. Remove walking beam (32) by removing cotter pin (30), nut (29), washers (27), and bolt (31). (Detail C.)

f. Remove support (35) by removing three bolts (33) and washers (34). (Detail C.)

g. Remove bellcrank (49) by removing cotter pin (38), nut (43), washers (40), and bolt (44). (Detail D.)

h. Remove support (45) by removing four nuts (46), washers (40), and bolts (47). (Detail D.)

i. Remove bellcrank (56) by removing cotter pin (38), nut (46), washers (40), and bolt (47). (Detail E.)

j. Remove support (71) by removing cotter pins (64), four nuts (63), washers (62), and bolts (70). (Detail F.)

k. Remove lever (72) by removing cotter pin (77) and nut (74), washers (67), and bolt (73). (Detail F.)

l. Remove walking beam (85) by removing cotter pin (82), nut (84), washers (78), and bolt (79). (Detail H.)

11-148. Inspection — Bellcrank, Levers, and Supports — Tail Rotor — Anti-torque Control — Hub and Blade System.

a. Inspect bellcranks, levers, and supports of the anti-torque system for mechanical and corrosion damage and for excessive wear. (Figure 11-37.)

b. Repair superficial damage. (Paragraph 11-149.)

11-149. Repair — Bellcrank, Levers, and Supports — Tail Rotor — Anti-torque Control — Hub and Blade System.

Premaintenance Requirements for Anti-torque Control Components Repair

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Maintenance and Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C-100), (C-204), (C-423)
Special Environmental Conditions	None

a. Remove all mechanical or corrosion damage (within limits) using 400 to 600 grit abrasive cloth or paper (C-423) to obtain a smooth, scratch free surface. On aluminum, cleanup corrosion to twice the visible corrosion depth.

b. Apply chemical film material (C-100) to repaired areas on aluminum parts.

c. Apply two coats of epoxy polyamide primer (C-204) to repaired area.

d. Replace any components that are cracked.

e. Replace any components that fail to meet inspection requirements.

f. Replace any components that exceed mechanical and corrosion limits.

g. Replace any bearings which are excessively rough or worn. (Refer to BHT-ALL-SPM.)

11-150. Installation — Bellcrank, Levers, and Supports — Tail Rotor — Anti-torque Control — Hub and Blade System.

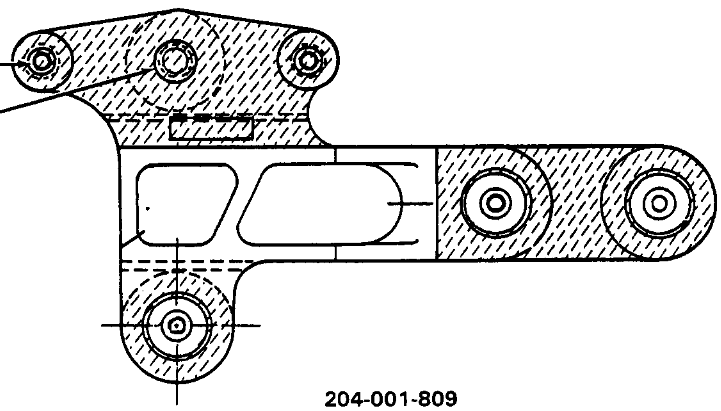
a. Position walking beam (85, figure 11-35) and install bolt (79), washers (78), and nut (84). Secure with cotter pin (82). (Detail H.)

b. Position lever (72) and install bolt (73), washers (67), and nut (74). Secure with cotter pin (77). (Detail F.)

NOTE

Barrier tape (C-430) shall cover entire mating surface and extend 1/4 inch beyond joint edges.

c. Install barrier tape (C-430) and position support (71). Install four bolts (70), washers (62) and nuts (63). Secure with cotter pins (64). (Detail F.)



204-001-809
BELLCRANK

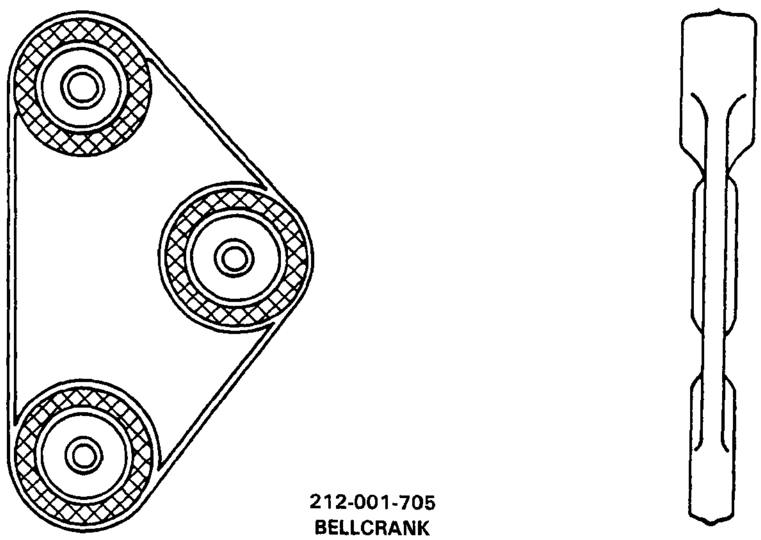
	DAMAGE AREA REPAIR SYMBOLS	
	(hatched)	(clear)
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL DAMAGE	0.010	0.015
CORROSION DAMAGE		
BEFORE CLEANUP	0.005	0.0075
AFTER CLEANUP	0.010	0.015
MAXIMUM AREA PER FULL DEPTH REPAIR	0.100 Sq. In.	1.00 Sq. In.
NUMBER OF REPAIRS	Not critical 1.0 In. minimum spacing	Four 1.0 In. minimum spacing
EDGE CHAMFER	0.040 x 0.040	0.050 x 0.050
BORE DAMAGE (BUSHING)		0.002 In. for 1/4 circumference
BORE DAMAGE (BEARING)		0.001 In. for 1/4 circumference
BORE A (BUSHING REMOVED)		0.500 In. maximum diameter-2 holes in line
BORE B (BUSHING REMOVED)		0.3755 In. maximum diameter-2 holes in line

NOTES:

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-1

Figure 11-37. Components — anti-torque control — damage limits (Sheet 1 of 18)



DAMAGE AREA REPAIR SYMBOLS

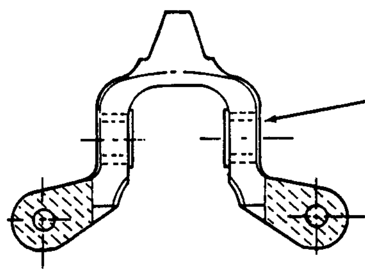
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (cross-hatched area)	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (open area)
MECHANICAL DAMAGE	0.010 In.	0.020 In.
CORROSION DAMAGE	(2)	
BEFORE CLEANUP	0.005 In.	0.010 In.
AFTER CLEANUP	0.010 In.	0.020 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.20 Sq. In.
NUMBER OF REPAIRS	One per lug	(1) Two per surface
EDGE CHAMFER	0.020 In.	0.030 In.
BORE DAMAGE	0.002 In. for 1/4 circumference	

NOTES:

1. No repairs allowed within 1.0 inch of a previous repair.
2. Corrosion damage on aluminum parts must be cleaned up to twice the depth of damage, not to exceed the limits given above.
3. No cracks allowed.

UH-1H-II-M-11-37-2

Figure 11-37. Components — anti-torque control — damage limits (Sheet 2 of 18)



204-001-810
SUPPORT

DAMAGE AREA REPAIR SYMBOLS

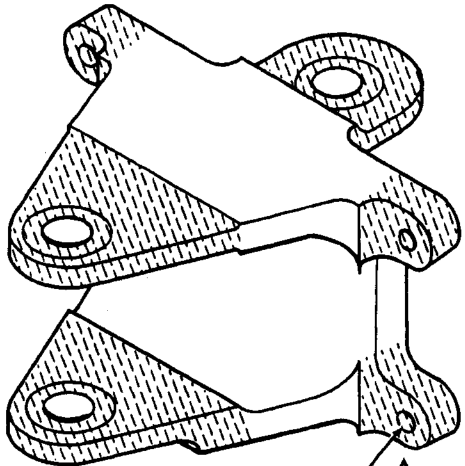
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL DAMAGE	0.010	0.015
CORROSION DAMAGE		
BEFORE CLEANUP	0.005	0.0075
AFTER CLEANUP	0.010	0.0015
MAXIMUM AREA PER FULL DEPTH REPAIR	0.100 Sq. In.	1.00 Sq. In.
NUMBER OF REPAIRS	One per area	One per area
EDGE CHAMFER	0.040 x 0.040	0.050 x 0.050
BORE DAMAGE (BUSHING)		0.002 In. for 1/4 circumference

NOTES:

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-3

Figure 11-37. Components — anti-torque control — damage limits (Sheet 3 of 18)



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (hatched)	(clear)
MECHANICAL DAMAGE	0.010	0.015
CORROSION DAMAGE		
BEFORE CLEANUP	0.005	0.0075
AFTER CLEANUP	0.010	0.0015
MAXIMUM AREA PER FULL DEPTH REPAIR	0.100 Sq. In. ⚠3	1.00 Sq. In.
NUMBER OF REPAIRS	One per area	One per surface — five total
EDGE CHAMFER	0.040 x 45°	0.050 x 45°
BORE DAMAGE (MOUNT HOLE)		0.002 In. for 1/4 circumference
BORE DAMAGE (BEARING)		0.001 In. for 1/4 circumference

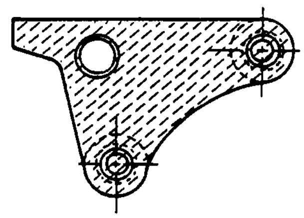
NOTES:

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

3 Surface damage under fasteners within 0.62 inch diameter of mounting bores is limited to 0.07 square inch area after repair.

UH-1H-II-M-11-37-4

Figure 11-37. Components — anti-torque control — damage limits (Sheet 4 of 18)



204-001-710
PLATE

DAMAGE AREA REPAIR SYMBOLS

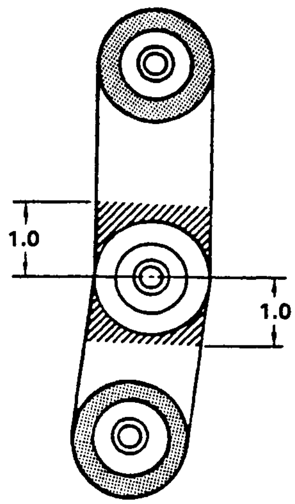
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED
MECHANICAL DAMAGE	0.010
CORROSION DAMAGE	
BEFORE CLEANUP	0.005
AFTER CLEANUP	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.100 Sq. In.
NUMBER OF REPAIRS	One per area
EDGE CHAMFER	0.040 x 0.040
BORE DAMAGE (BUSHING)	0.002 In. for 1/4 circumference

NOTES:

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-5

Figure 11-37. Components — anti-torque control — damage limits (Sheet 5 of 18)



205-001-704-1
LEVER

DAMAGE LOCATION SYMBOLS

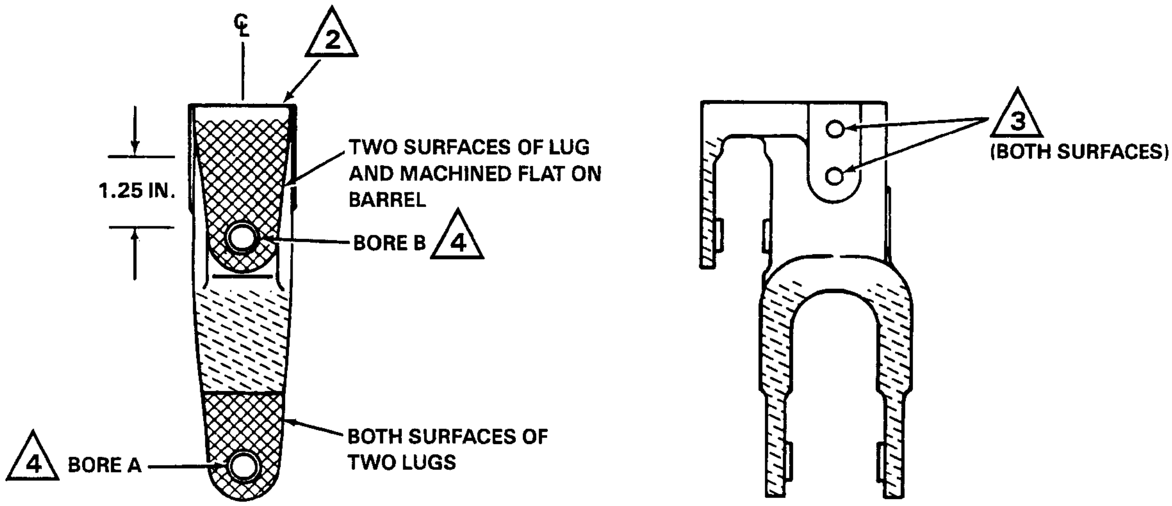
TYPE OF DAMAGE	MAXIMUM DAMAGE AND REPAIR DEPTH		
	(hatched)	(shaded)	(clear)
MECHANICAL	0.005 In. after repair	0.010 In. after repair	0.005 In. after repair
CORROSION DAMAGE	0.0025 In. before repair 0.005 In. after repair	0.005 In. before repair 0.010 In. after repair	0.0075 In. before repair 0.015 In. after repair
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In.	1 Sq. In.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER		0.04 By 0.04	0.05 By 0.05
BORE DAMAGE	0.002 In. for 1/4 circumference		

NOTES:

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-6

Figure 11-37. Components — anti-torque control — damage limits (Sheet 6 of 18)



204-001-757
LEVER

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
MECHANICAL DAMAGE BEFORE AND AFTER CLEANUP	0.010 In.	0.016 In.	0.040 In.
CORROSION DAMAGE			
BEFORE CLEANUP	0.005 In.	0.008 In.	0.020 In.
AFTER CLEANUP	0.010 In.	0.016 In.	0.040 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In.	0.25 Sq. In.
NUMBER OF REPAIRS	One per lug	One per area	Not critical
EDGE CHAMFER	0.015 In. by 45°	0.025 In. by 45°	0.060 In. by 45°

NOTES:

1. Bushing bore damage shall not exceed 0.002 inch for one-fourth circumference. Limit one repair per bore.

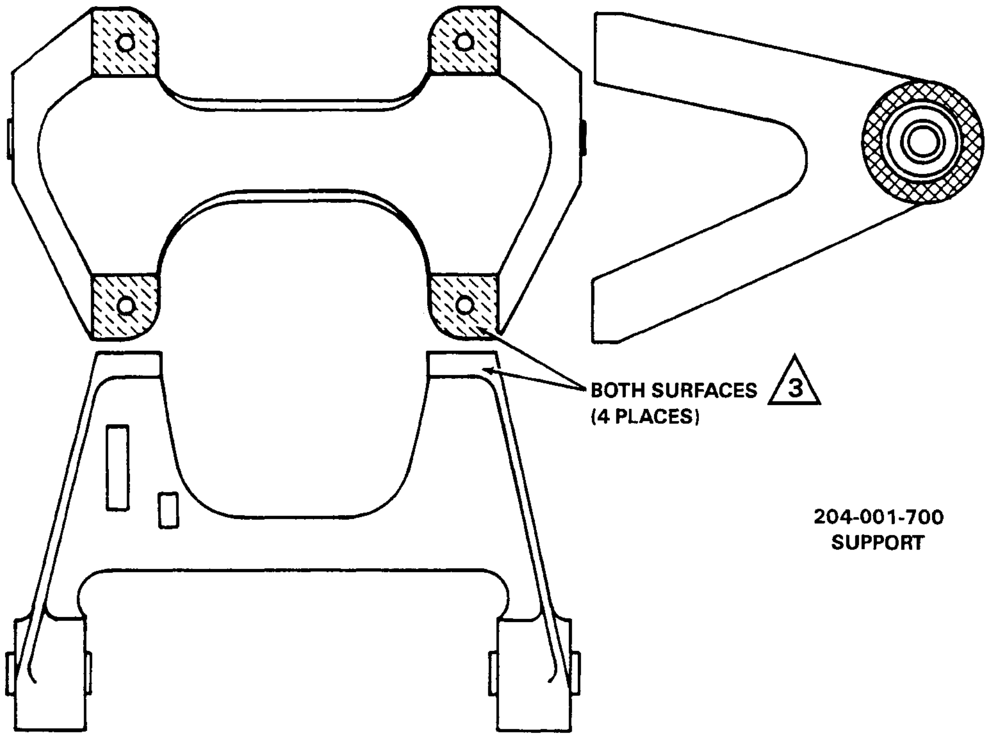
2. Bolt bores and pedal arm bore damage shall not exceed 0.002 inch for one-fourth circumference. Limit one repair per bore.

3. Surface under fastener heads shall remain flat and in plain after repair.

4. Bore A (bushing removed), two holes in line, 0.5005 maximum diameter. (Check prior to bushing replacement.)
BORE B (bushing removed), two holes in line, 0.3755 maximum diameter. (Check prior to bushing replacement.)

UH-1H-II-M-11-37-7

Figure 11-37. Components — anti-torque control — damage limits (Sheet 7 of 18)



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
MECHANICAL DAMAGE BEFORE AND AFTER CLEANUP	0.010 In.	0.016 In.	0.020 In.
CORROSION DAMAGE			
BEFORE CLEANUP	0.005 In.	0.008 In.	0.010 In.
AFTER CLEANUP	0.010 In.	0.016 In.	0.020 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In. △3	0.25 Sq. In.
NUMBER OF REPAIRS	One per area	One per area	Not critical, 1.0 In. minimum spacing
EDGE CHAMFER	0.015 In. by 45°	0.025 In. by 45°	0.040 In. by 45°

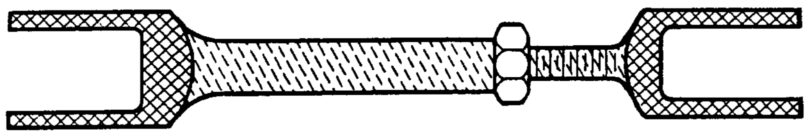
NOTES:

1. Bearing bore damage shall not exceed 0.001 inch for one-fourth circumference. Limit one repair per bore.
2. Bolt bore damage shall not exceed 0.002 inch for one-fourth circumference. Limit one repair per bore.

△3 Surface damage to spotface limited to one-fourth after repair.

UH-1H-II-M-11-37-8

Figure 11-37. Components — anti-torque control — damage limits (Sheet 8 of 18)



209-011-713
LINK ASSEMBLY

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS / MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
MECHANICAL AND CORROSION BEFORE AND AFTER CLEANUP	0.005	0.010	0.030
AREA OF FULL DEPTH REPAIR	0.05 Sq. In.	0.25 Sq. In.	Not Critical
NUMBER OF REPAIRS	One per tang	One per segment	One
EDGE CHAMFER	0.020	0.040	0.040

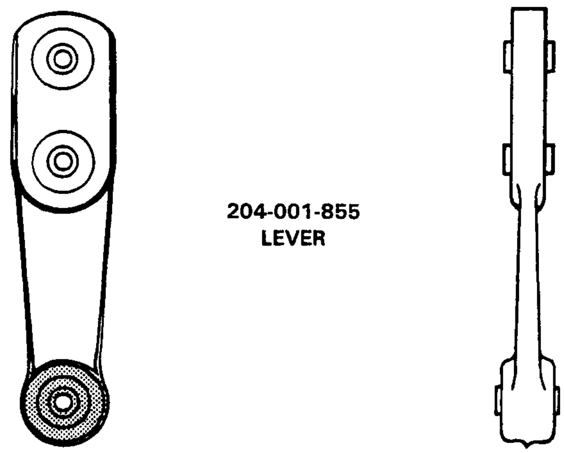
THREAD DAMAGE:
- DEPTH: One third of thread
- LENGTH: One quarter inch
- NUMBER: Two

NOTES:

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-9

Figure 11-37. Components — anti-torque control — damage limits (Sheet 9 of 18)



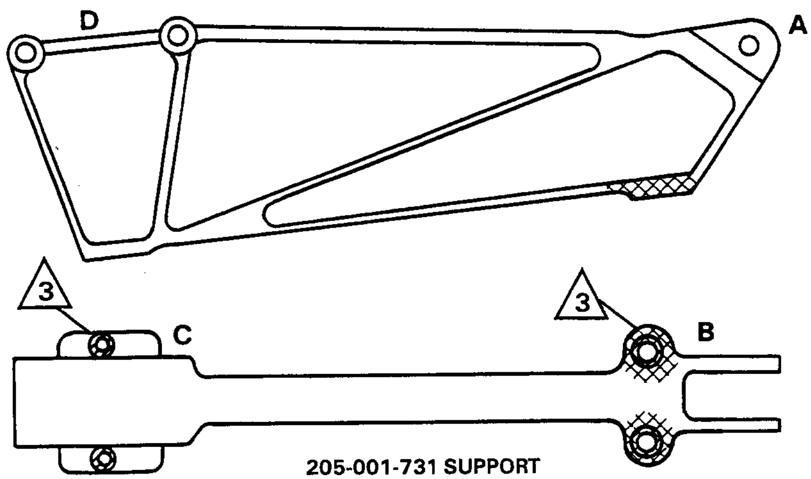
TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS: MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (plain area)	(shaded area)
MECHANICAL DAMAGE AFTER CLEANUP	0.015	0.010
CORROSION DAMAGE		
BEFORE CLEANUP	0.0075	0.005
AFTER CLEANUP	0.015	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	1.00 Sq. In.	0.100 Sq. In.
NUMBER OF REPAIRS	One per surface four total	One per area
EDGE CHAMFER	0.050 by 0.050	0.040 by 0.040
BORE DAMAGE	0.001 In. for 1/4 circumference	

NOTES:

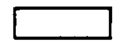
1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-10

Figure 11-37. Components — anti-torque control — damage limits (Sheet 10 of 18)



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
MECHANICAL DAMAGE MAXIMUM DEPTH AFTER BLEND	None	0.020	0.030
CORROSION DAMAGE			
BEFORE CLEANUP	None	0.010	0.020
AFTER CLEANUP	None	0.020	0.030
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.060	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	One/area	Three
EDGE CHAMFER	None	NA	0.040

BORE DAMAGE

A Lug bore (clevis) — 0.002 inch on full circumference to 0.252 maximum diameter

B Lower attach lug bore — No damage permitted.

C Attach lug bores — 0.005 inch on full circumference to 0.258 maximum

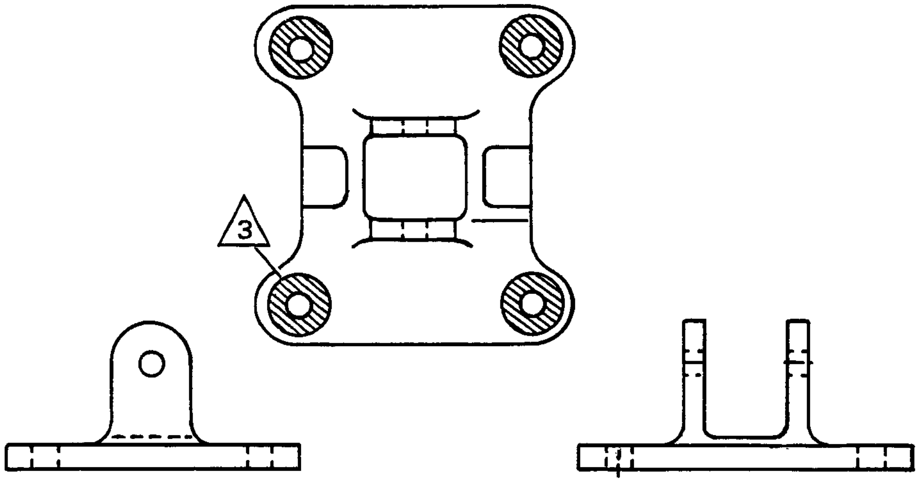
D Remove and replace bushing if damage exists or fit is loose (0.3745/0.3755 diameter)

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.
3. Spot face 0.687 inch diameter (ref). Critical areas (4 places) upper surface only.

UH-1H-II-M-11-37-11

Figure 11-37. Components — anti-torque control — damage limits (Sheet 11 of 18)



205-001-733 SUPPORT

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS (hatched)	DAMAGE AREA REPAIR SYMBOLS (open)
	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL DAMAGE MAXIMUM DEPTH AFTER BLEND	0.020	0.040
CORROSION DAMAGE		
BEFORE CLEANUP	0.010	0.030
AFTER CLEANUP	0.020	0.040
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	0.060	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	One/area	Three/surface
EDGE CHAMFER	NA	0.040

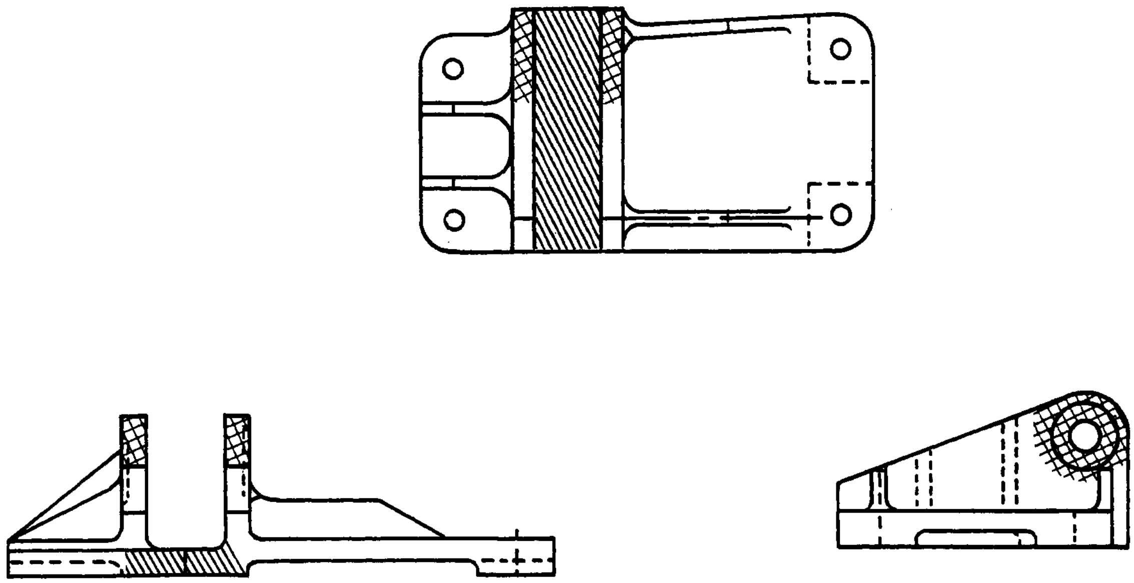
BORE DAMAGE
Lug bore — 0.003 inch on full circumference to 0.2535 maximum diameter
Mounting bores — 0.005 inch on full circumference to 0.269 maximum diameter

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.
3. Spot face 0.68 inch diameter (ref). Critical area (4 places) upper surface only. (Bolt seat area to be smooth and flat)

UH-1H-II-M-11-37-12

Figure 11-37. Components — anti-torque control — damage limits (Sheet 12 of 18)



212-001-706 SUPPORT

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
MECHANICAL MAXIMUM DEPTH AFTER BLEND	None	0.020	0.040
CORROSION			
BEFORE CLEANUP	None	0.010	0.030
AFTER CLEANUP	None	0.020	0.040
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.060	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	One per area	Three/surface

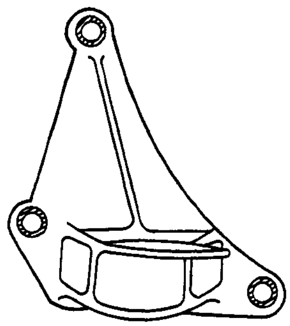
BORE DAMAGE
Lug bore — No damage permitted
Mounting bores — +0.002 inch on full circumference to 0.266 inch maximum diameter

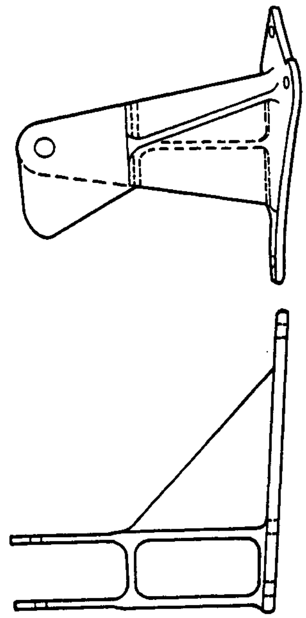
NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-13

Figure 11-37. Components — anti-torque control — damage limits (Sheet 13 of 18)





TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS — MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (hatched)	(open)
MECHANICAL DAMAGE MAXIMUM DEPTH AFTER BLEND	0.020	0.030
CORROSION DAMAGE		
BEFORE CLEANUP	0.010	0.020
AFTER CLEANUP	0.020	0.030
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	0.060	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	One/area	Three/surface
EDGE CHAMFER	NA	0.040

BORE DAMAGE

Lug Bores — 0.003 inch on full circumference to 0.316 inch maximum diameter

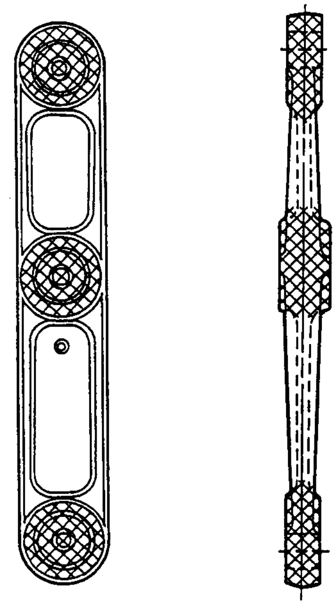
Mounting bores — 0.005 inch on full circumference to 0.269 inch maximum diameter

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-14

Figure 11-37. Components — anti-torque control — damage limits (Sheet 14 of 18)



212-001-708
WALKING BEAM

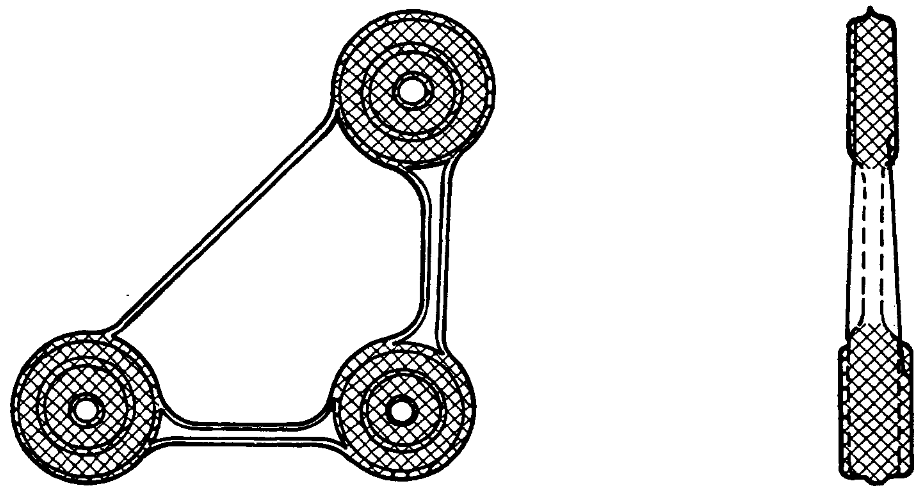
TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS: MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (crosshatched)	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (open)
MECHANICAL MAXIMUM DEPTH AFTER BLEND	None	0.030
CORROSION BEFORE CLEANUP	None	0.020
AFTER CLEANUP	None	0.030
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	Three
BEARING WEAR AXIAL LIMIT	0.016	NA
RADIAL LIMIT	0.008	NA
EDGE CHAMFER	None	0.003

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-15

Figure 11-37. Components — anti-torque control — damage limits (Sheet 15 of 18)



212-001-710 BELLCRANK

DAMAGE AREA REPAIR SYMBOLS

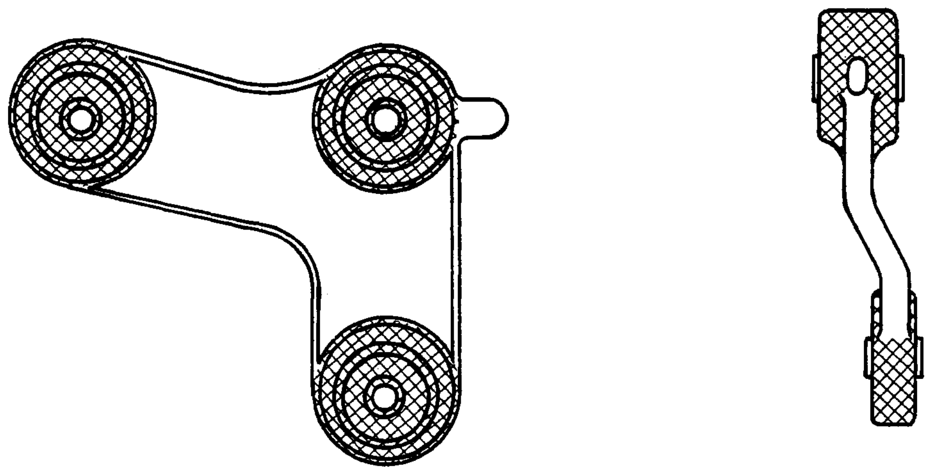
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL		
MAXIMUM DEPTH AFTER BLEND	None	0.030
CORROSION		
BEFORE CLEANUP	None	0.020
AFTER CLEANUP	None	0.030
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	Three/part
BEARING WEAR		
AXIAL LIMIT	0.016	NA
RADIAL LIMIT	0.008	NA

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-16

Figure 11-37. Components — anti-torque control — damage limits (Sheet 16 of 18)



212-001-759 BELLCRANK

DAMAGE AREA REPAIR SYMBOLS

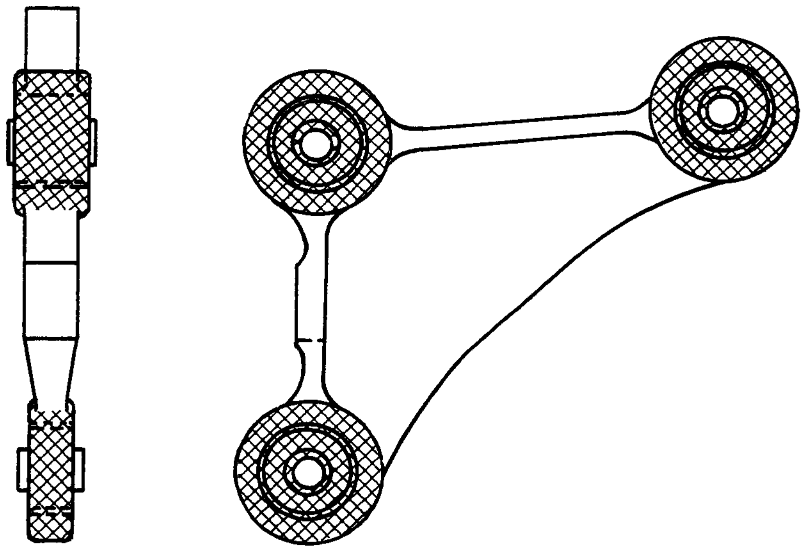
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL DAMAGE		
MAXIMUM DEPTH AFTER BLEND	None	0.040
CORROSION DAMAGE		
BEFORE CLEANUP	None	0.030
AFTER CLEANUP	None	0.040
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.500 Sq. In.
NUMBER OF NON-OVERLAPPING REPAIRS	None	Three/part
BEARING WEAR		
AXIAL LIMIT	0.016	NA
RADIAL LIMIT	0.008	NA

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-17

Figure 11-37. Components — anti-torque control — damage limits (Sheet 17 of 18)



212-001-900 BELLCRANK

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS: crosshatched MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	DAMAGE AREA REPAIR SYMBOLS: open MAXIMUM DEPTH AND REPAIR AREAS ALLOWED
MECHANICAL MAXIMUM DEPTH AFTER BLEND	None	0.030
CORROSION BEFORE CLEANUP	None	0.020
AFTER CLEANUP	None	0.030
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	Three/part
EDGE CHAMFER	None	0.030
BEARING WEAR AXIAL LIMIT	0.016	NA
RADIAL LIMIT	0.008	NA

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-37-18

Figure 11-37. Components — anti-torque control — damage limits (Sheet 18 of 18)

d. Position bellcrank (56) on support (59), and install bolt (47), washers (40), and nut (46). Secure with cotter pin (38). (Detail E.)

e. Position support (45) and install four bolts (47), washers (40), and nuts (46). (Detail D.)

f. Position bellcrank (49) on support (45) and install bolt (44), washers (40), and nut (43). Secure with cotter pin (38). (Detail D.)

g. Position support (35) an install three bolts (33) and washers (34). (Detail C.)

h. Position walking beam (32) on support (35) and install bolt (31), washers (27), and nut (29). Secure with cotter pin (30). (Detail C.)

i. Position support (20) and install four bolts (23) and washers (2). (Detail B.)

j. Position bellcrank (15) on support (20) and install bolt (22), washers (9), and nut (21). Secure with cotter pin (4). (Detail B.)

k. Position bellcrank (3) on fin and install bolt (11), washer (9) and nut (7). Secure with cotter pin (4). (Detail A.)

l. Install anti-torque control system linkage. (Paragraph 11-144.)

11-151. Inspection — Control Tubes — Tail Rotor — Anti-torque Control — Hub and Blade System. Inspect control tubes. (Figure 11-38.)

11-152. Repair — Control Tubes — Tail Rotor — Anti-torque Control — Hub and Blade System.

Premaintenance Requirements for Repair of Tail Rotor Anti-torque Control Tubes

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Maintenance and Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C-100), (C-204), (C-423)
Special Environmental Conditions	None

a. Polish out mechanical and corrosion damage with fine grit abrasive cloth or paper (C-423) to a finish of 63 RHR or better. Polish out corrosion damage to twice the depth of the visible corrosion. Refer to figure 11-38 for maximum depth and repair area allowed.

b. Apply chemical film material (C-100) to repaired areas of aluminum alloy tubes.

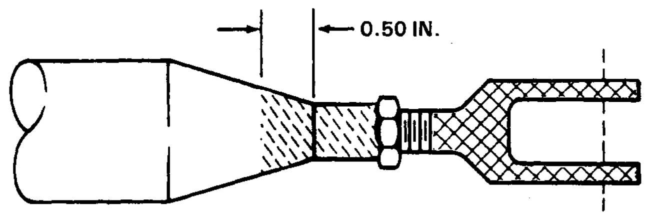
c. Apply epoxy polyamide primer (C-204) to repaired areas of tubes.

d. Replace adjustable rod end bearings in control tubes if rod end bearings are damaged or worn in excess of limits. (Refer to BHT-212-CR&O.)

11-153. Repair or Replacement — Wear Strip- Tail Rotor — Anti-torque Control — Hub and Blade System.

Premaintenance Requirements for Repair or Replacement of Control Tube Wear Strip

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	Heat Gun
Test Equipment	None
Support Equipment	Maintenance and Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C-100), (C-204), (C-305), (C-331), (C-423), (C-426), (C-496)
Special Environmental Conditions	None



TYPICAL CONTROL LINK ASSEMBLY

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL DAMAGE	0.005 In. before and after repair	△3	△2
CORROSION DAMAGE ALUMINUM	0.0025 In. before repair △4	△3	△2
STEEL	0.005 In. before repair △6 0.005 In. after repair		△2
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In. △5	△3	△1
NUMBER OF NONOVERLAPPING REPAIRS	One per lug	△3	Not critical
EDGE CHAMFER	0.010 In.		0.040 In.
BORE DAMAGE (LUG)	0.002 In. for 1/4 circumference		
BORE DAMAGE (BEARING)	0.001 In. for 1/4 circumference		
THREAD DAMAGE:			
DEPTH:	One-third of thread		
LENGTH:	One quarter inch		
NUMBER:	Two per rod end/clevis		
CRACKS:	None allowed		

UH-1H-II-M-11-38-1

Figure 11-38. Control tubes anti-torque controls — wear and damage limits (Sheet 1 of 2)

NOTES:

1. Scratches are limited to 3.00 inches length and 1/3 tube circumference width. Maximum area for full depth repair is 1.00 square inch.

2. The maximum acceptable mechanical damage to the surface of the control tube is 10% of the tube wall thickness after cleanup. The maximum acceptable corrosion damage on aluminum is 5% of the tube wall thickness before cleanup and 10% after cleanup; on steel the acceptable damage is 10% of tube wall thickness before and after cleanup. Listed below are the control tubes used in the anti-torque system with the control tube wall thickness.

3. Critical area. No damage or repair permitted.

4. Corrosion damage on aluminum parts must be cleaned up to twice the depth of damage, not to exceed the ''after cleanup'' limits of 10% tube wall thickness.

5. Surface damage within 0.62 inch diameter of all bores, excluding bearing bores, is limited to 0.05 inch after repair. Inspect bearings. (Refer to BHT-212-CR&O.)

6. Corrosion damage on steel parts not to exceed limit of 0.005 inch or same limits as mechanical damage.

TUBE PART NUMBER	TUBE WALL THICKNESS		TUBE PART NUMBER	TUBE WALL THICKNESS
204-001-014-007	0.049 In.		212-001-056-001	0.035 In.
205-001-011-005	0.049 In.		212-001-052-101	0.035 In.
205-001-011-009	0.049 In.		212-001-053-101	0.035 In.
205-001-033-001	0.049 In.		212-001-055-101	0.035 In.

UH-1H-II-M-11-38-2

Figure 11-38. Control tubes anti-torque controls — wear and damage limits (Sheet 2 of 2)

CAUTION

Do not exceed specified heat range. Excessive heat may damage control tube.

a. Remove worn plastic strip by applying a maximum of 220°F (104°C) heat to strip. Use plastic scraper to assist removal of strip and old adhesive.

b. If prime finish has been damaged, touch up with chemical film material (C-100).

c. Clean bonding area with clean cloth moistened with aliphatic naphtha (C-305). Do not remove prime. Lightly abrade area with 400 grit abrasive cloth or paper (C-423). Remove sanding residue with clean cloth moistened with aliphatic naphtha (C-305).

d. Prepare new sleeve inside diameter bonding surface as follows:

(1) Blast with slurry of 30 to 50 percent wet blasting abrasive 3/0 inspected grade flint quartz (C-496) in water. Blast uniformly at 30 to 80 psi.

NOTE

Do not allow abrasive slurry of quartz to dry on sleeves.

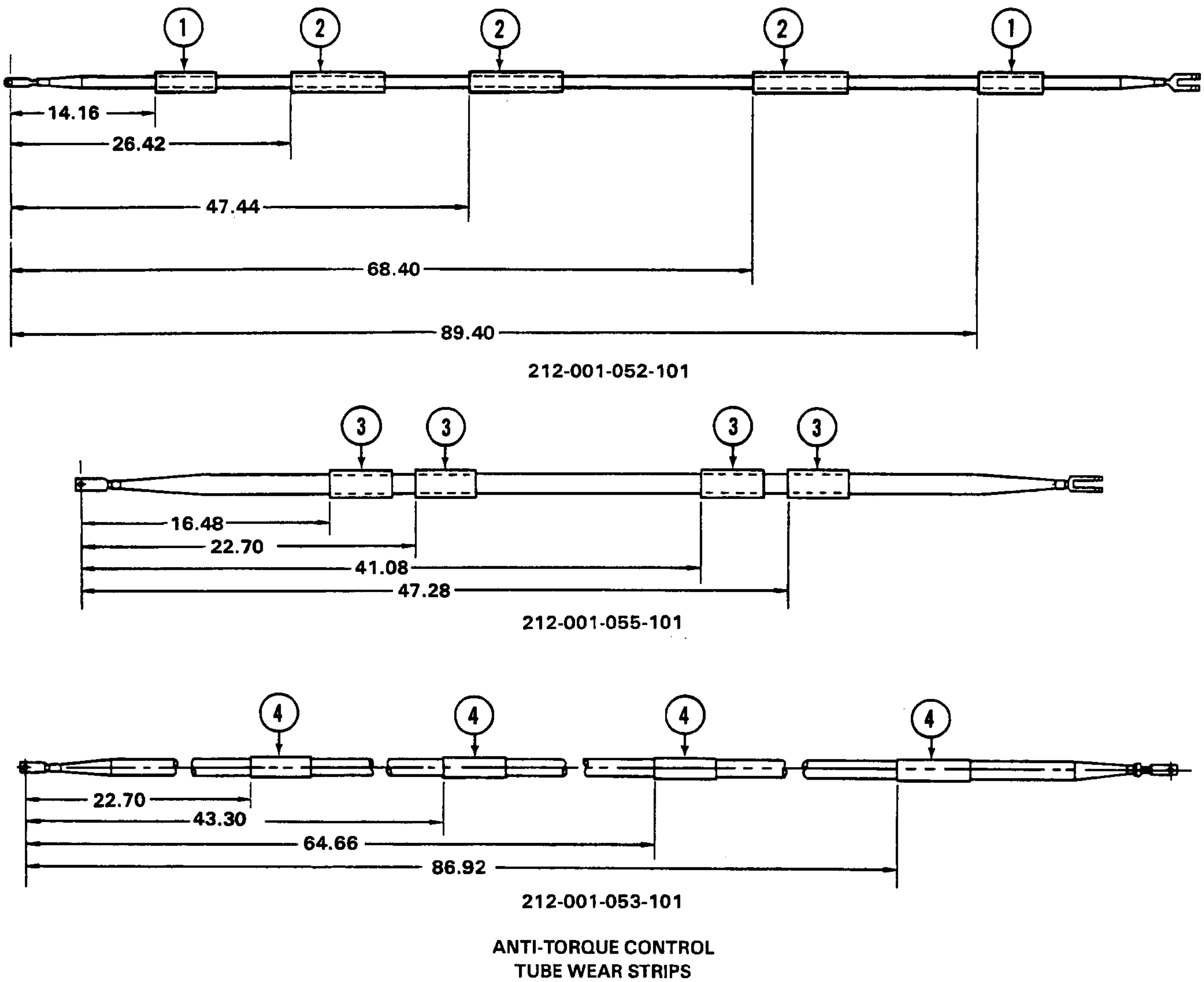
(2) Rinse with clean water.

e. Perform strip and install on an aluminum tube approximately 5 inches long and 1.25 inches inside diameter. Apply 275°F (135°C) heat to tube for 15 minutes. An oven is preferred method.

f. Apply adhesive (C-331) to tube (figure 11-39) and inside diameter of strip.

g. Install sleeves and secure in place with Hi-shrink tape (use masking tape (C-426) on ends). Apply heat to Hi-shrink tape with heat gun evenly to insure uniform shrinkage.

h. Apply one coat of epoxy polyamide primer (C-204) to tube adjacent to areas of strip and overlapping 0.030 inch to all edges of strip.



ALL DIMENSIONS ARE IN INCHES

1. Plastic (nylatron) strip (120-110-4A11W) (3.511x5.5x0.015)
2. Plastic (nylatron) strip (120-110-4A29) (3.511x14.5x0.015)
3. Plastic (nylatron) strip (120-110-5A08W) (3.903x4.0x0.015)
4. Plastic (nylatron) strip (120-110-4A10W) (3.511x5.0x0.015)

UH-1H-II-M-11-39

Figure 11-39. Wear strips — anti-torque control tube — repair or replacement

SECTION IV — SYNCHRONIZED ELEVATOR CONTROL SYSTEM

11-154. SYNCHRONIZED ELEVATOR CONTROL SYSTEM.

11-155. Description — Synchronized Elevator Control System.. The synchronized elevator control system consists of two elevator assemblies, a horn assembly, and a control linkage of push-pull tubes and bellcranks. Movement of the cyclic control stick in the fore and aft direction actuates the swashplate. This movement is transmitted through a series of push-pull tubes and bellcranks to the horn assembly, to which the elevator assemblies are attached. The elevator assists in longitudinal control of helicopter.

11-156. Rigging — Synchronized Elevator Control System.

NOTE

Cyclic controls must be rigged prior to adjusting the elevators.

Premaintenance Requirements for Rigging the Elevator Control System

CONDITIONS	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T34)
Test Equipment	None
Support Equipment	Maintenance and Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C-405)
Special Environmental Conditions	None

NOTE

The following shall be accomplished after the installation of all bellcranks and nonadjustable control tubes (20, 13, 7, and 10. (Figure 11-40.)

a. Rig synchronized elevator control system with hydraulic system off as follows:

(1) Disconnect the elevator controls at all rigging points. Retract elevator stops. (Figure 11-40).

NOTE

If dual control kit is installed, install rigging fixture (T101330) on copilot cyclic stick.

(2) Position pilots cyclic control stick perpendicular to deck within 0° ± 0.5°

.

CAUTION

Ensure that bolts attaching control tubes (16 and 19) to lever (17) are installed with bolt heads inboard. (Figure 11-40, View B). Bolts in wrong direction could interfere with engine power control linkage.

CAUTION

Cyclic controls below hydraulic cylinder shall not move while bottoming servo actuator valves.

(3) Position both cyclic hydraulic cylinder control valves to top of travel (view B, figure 11-13). Adjust and connect tube (19, figure 11-40) to obtain dimension of 2.20 ± 0.06) inches from top surface of lever (17) to centerline of lower bolts in lever support. (View B.)

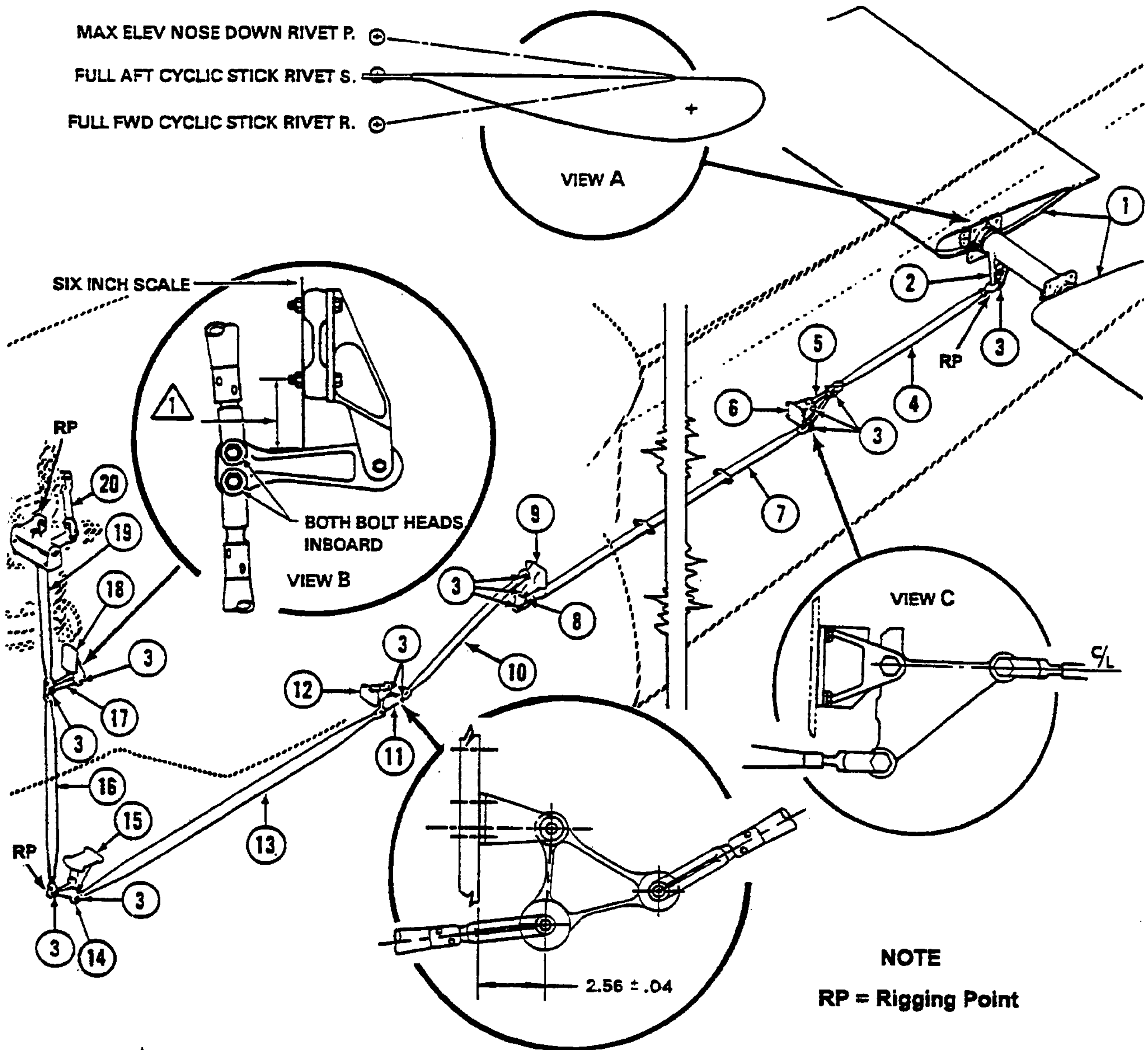
(4) Locate bellcrank (11) per figure 11-40. Adjust tube (16) to fit.

(5) Set right elevator (1) so upper surface is 0.11 ± 0.06 inches above rigging rivet P. (View A.) Adjust control tube (4) to minimum length required to reach bellcrank (5) and install. Centerline of tube should form a straight line from joint of control tube and horn assembly arm to pivot at bellcrank (5). (View C.)

(6) Loosen cyclic stick friction (or remove rigging fixture (T101330) from copilot cyclic control stick, if installed). Hold pilot control stick full forward.

(7) Set right elevator upper surface 0.27 ± 0.12 inch above rivet R for full forward cyclic control stick position. (View A.) Aft arm of bellcrank (5) must be above horizontal. With valves in both cyclic control hydraulic cylinders positioned at top of travel, adjust control tube (16) to fit and connect.

(8) Hold pilot cyclic control stick full aft. Check right elevator upper surface for alignment to rigging



⚠1 2.20 inches, measurement taken between center of bolt and lever, hydraulic boost off.

1. Elevators
2. Elevator horn
3. Bolt
   Washer
   Nut
   Cotter pin
4. Control tube
5. Bellcrank
6. Bulkhead support
7. Control tube
8. Walking beam
9. Bulkhead support
10. Control tube
11. Bellcrank
12. Bulkhead fitting
13. Control tube
14. Bellcrank
15. Bulkhead support
16. Control tube
17. Lever
18. Bulkhead support
19. Control tube
20. Control tube

UH-1H-II-M-11-40-1

Figure 11-40. Synchronized elevator control system—rigging (Sheet 1 of 2)

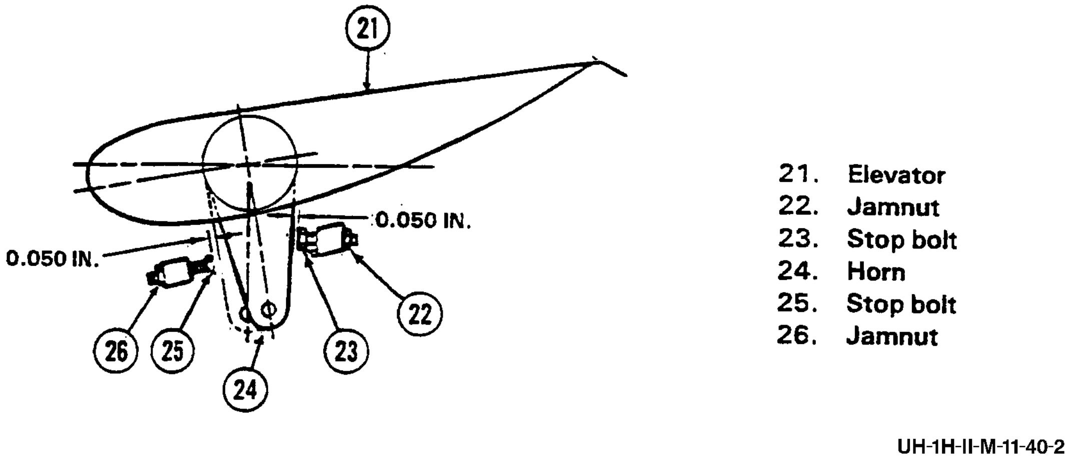


Figure 11-40. Synchronized elevator control system—rigging (Sheet 2 of 2)

rivet S within ± 0.50 inch (figure 11-40, view A). If dimensions are exceeded, repeat steps (1) through (8).

(9) Check system for freedom of operation and full travel.

(10)Turn hydraulic boots ON and cycle controls. Place pilot cyclic stick in full forward position against stop. Check alignment of right elevator upper surface to rigging rivet R. If necessary, readjust tube (16) only to align upper surface of right elevator 0.27 ± 0.12 inch.

11-157. Adjustment — Stop Bolts — Synchronized Elevator Control System.

NOTE

Cyclic control and synchronized elevator control systems shall be rigged prior to adjusting elevator stop bolts.

a. Apply hydraulic boost cart pressure.

b. Adjust aft stop bolt (23, figure 11-40) as follows:

(1) Place cyclic control stick near mid stick to full nose down position on synchronized elevator (21) control.

(2) Remove lockwire from jamnut (22). Loosen stop bolt (23) and adjust to obtain 0.050 inch gap between stop bolt (23) and elevator horn (24).

(3) Secure bolt (23) with jamnut (22). Lockwire (C-405) bolt to jamnut to support.

c. Adjust forward stop bolt as follows:

(1) Place cyclic control stick against extreme forward stop, the elevator will be at full nose up position on elevator (21) control.

(2) Remove lockwire from jamnut (26). Loosen stop bolt (25) and adjust to obtain 0.050 inch gap between stop bolt (25) and elevator horn (24).

(3) Secure stop bolt (25) with jamnut (26). Lockwire (C-405) bolt to jamnut to support.

d. Slowly move cyclic stick through full range of forward and aft cyclic stick motions. Verify that 0.050 inch gap is maintained at maximum nose up and nose down elevator positions. Readjust if required.

11-158.CONTROL TUBES — SYNCHRONIZED ELEVATOR CONTROL SYSTEM.

11-159. Description — Control Tubes — Synchronized Elevator Control System.. Control tubes (adjustable and nonadjustable) are used throughout the synchronized elevator control system. The tubes are connected to bellcranks, levers, supports, and a horn assembly with standard hardware.

11-160. Removal — Control Tubes — Synchronized Elevator Control System.

a. Remove transmission cowling and flight controls access doors. (Chapter 2.)

b. Detach control tube (20, figure 11-41) from swashplate horn and bellcrank (18) by removing cotter pin (2), nuts (1 and 19), washers (3), and bolts (4 and 9). (Detail A.)

c. Detach upper end of control tube (8) from bellcrank (18) by removing cotter pin (2), nut (5), washers (3), and bolt (7). (Detail A.)

d. Detach lower end of control tube (8) from lever (25) by removing cotter pin (23), nut (22), washers (24), and bolt (31). (Detail B.)

e. Detach upper end of control tube (33) from lever (25) by removing cotter pin (2), nut (21), washers (24), and bolt (32). (Detail B.)

f. Detach lower end of control tube (33) from bellcrank (40) by removing cotter pin (23), nut (42), washers (24), and bolt (41). (Detail C.)

g. Detach forward end of control tube (37) from bellcrank (40) by removing cotter pin (23), nut (39), washers (24), and bolt (38). (Detail C.)

h. Detach aft end of control tube (37) from bellcrank (54) by removing cotter pin (48), nut (56), washers (46), and bolt (55). (Detail D.)

i. Detach forward end of control tube (51) from bellcrank (54) by removing cotter pin (48), nut (52), washers (46), and bolt (53). (Detail D.)

j. Detach aft end of control tube (51) from lever (64) by removing cotter pin (48), nut (58), washers (59), and bolt (60). (Detail E.)

NOTE

Tailboom assembly removal is required when control tube (62) is being removed. Refer to Chapter 2 for tailboom assembly removal.

k. Detach forward end of control tube (62) from lever (64) by removing cotter pin (48), nut (61), washers (59), and bolt (63). (Detail E.)

l. Detach aft end of control tube (62) from bellcrank (74) by removing cotter pin (68), nut (69), washers (70), and bolt (75). Remove control tube (62). (Detail F.)

m. Detach three guides (82) from structure by removing six screws (81) and six washers (70). (Detail F.)

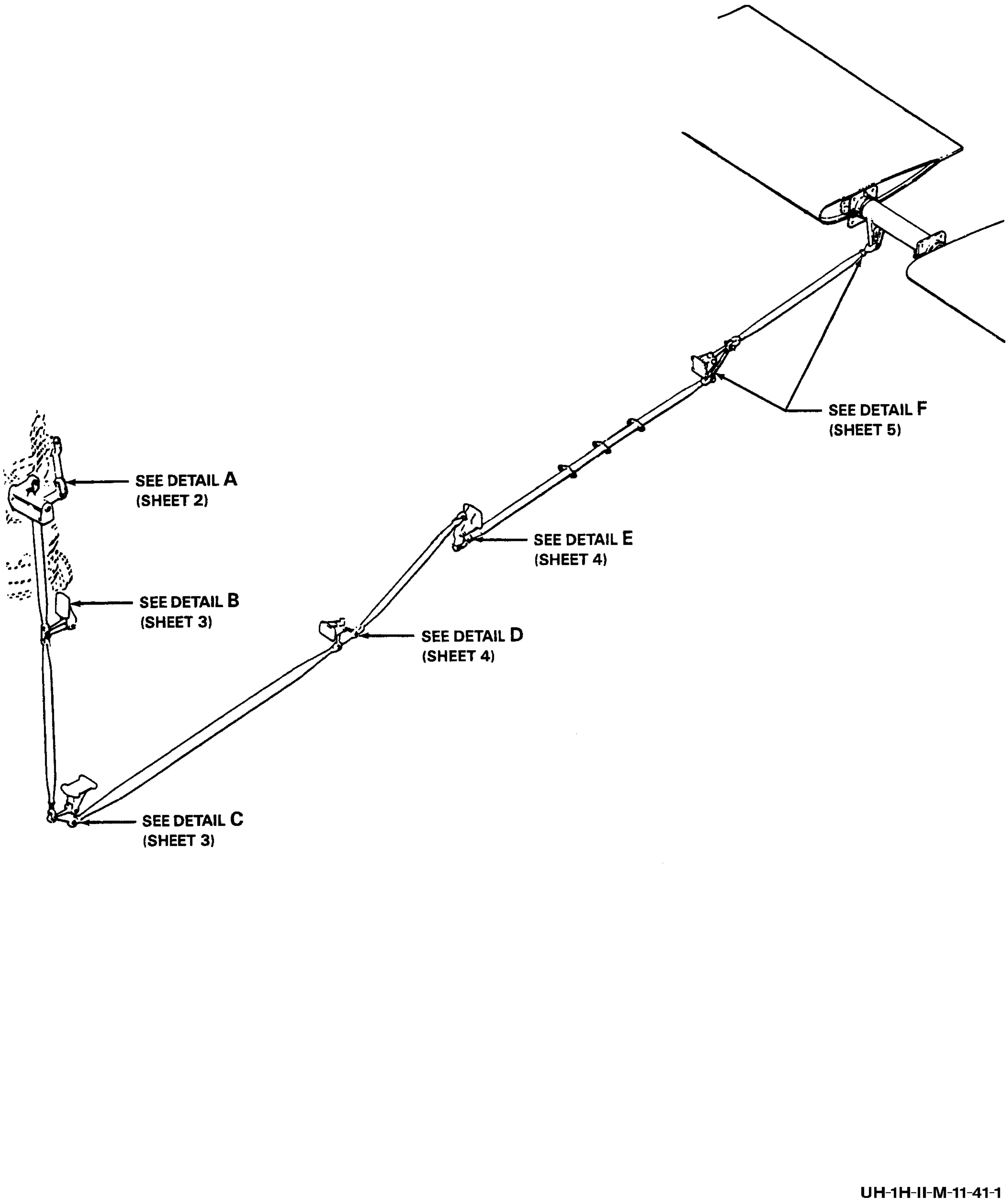
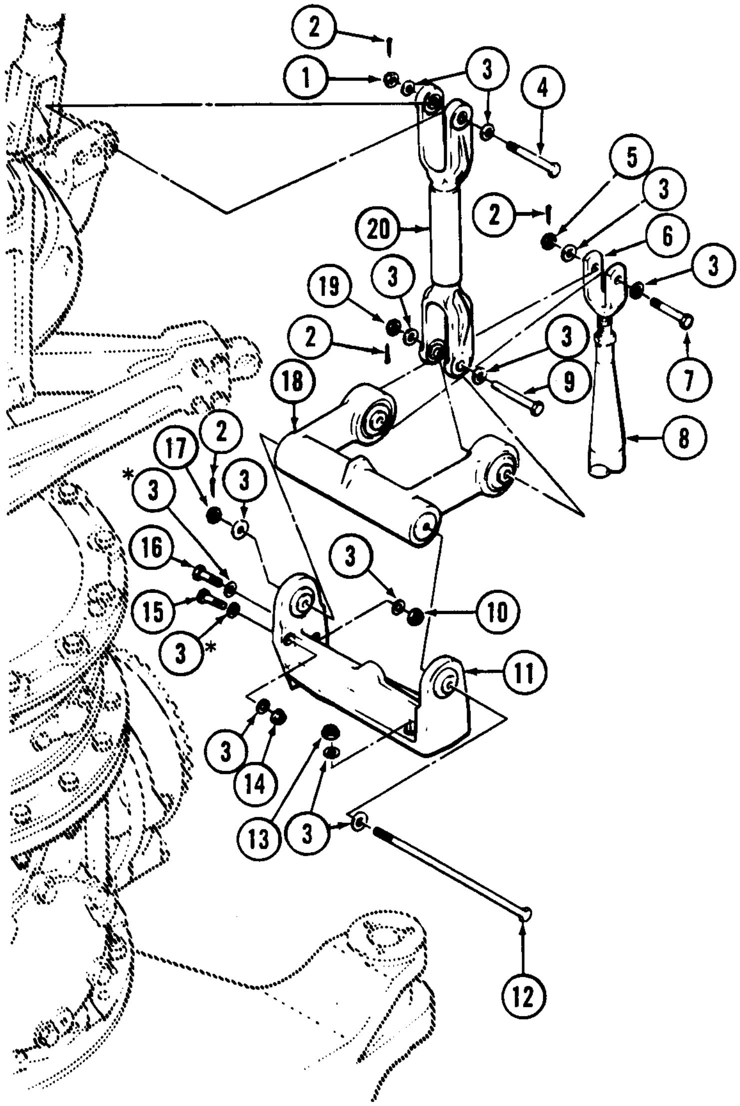


Figure 11-41. Bellcranks, levers, supports, and control tubes — synchronized elevator control system — removal and installation (Sheet 1 of 5)



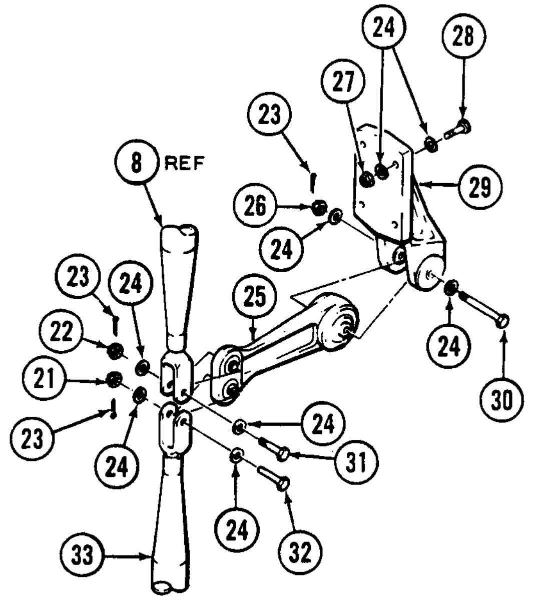
DETAIL A

* Install only aluminum washers adjacent to magnesium.

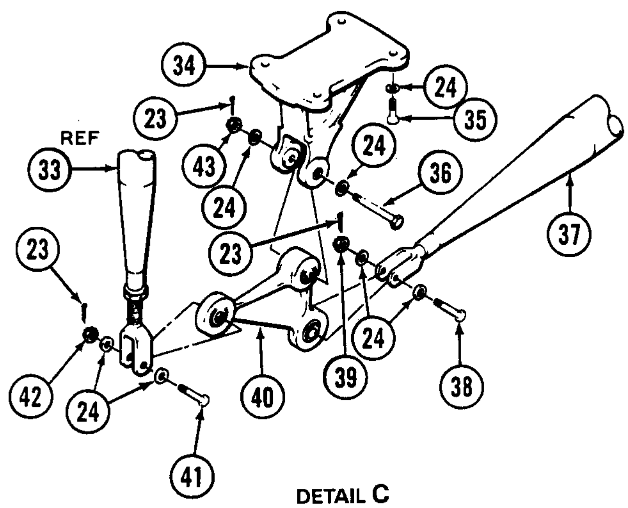
1. Nut
2. Cotter pin
3. Washer
4. Bolt
5. Nut
6. Clevis
7. Bolt
8. Control tube
9. Bolt
10. Nut
11. Support
12. Bolt
13. Nut
14. Nut
15. Bolt
16. Bolt
17. Nut
18. Bellcrank
19. Nut
20. Control tube

UH-1H-II-M-11-41-2

Figure 11-41. Bellcranks, levers, supports, and control tubes — synchronized elevator control system — removal and installation (Sheet 2 of 5)



DETAIL B

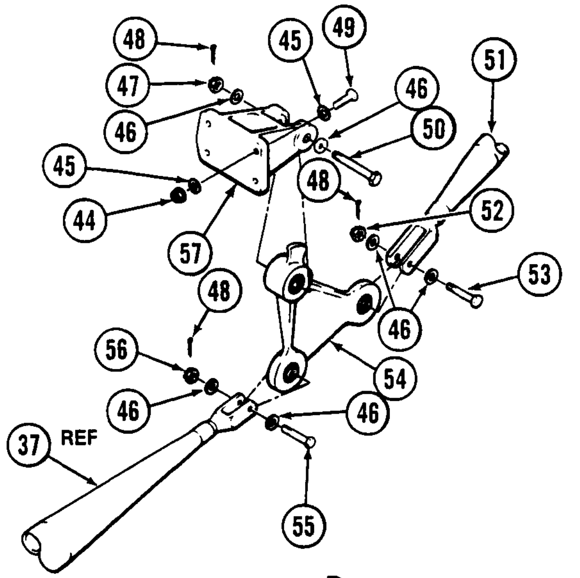


DETAIL C

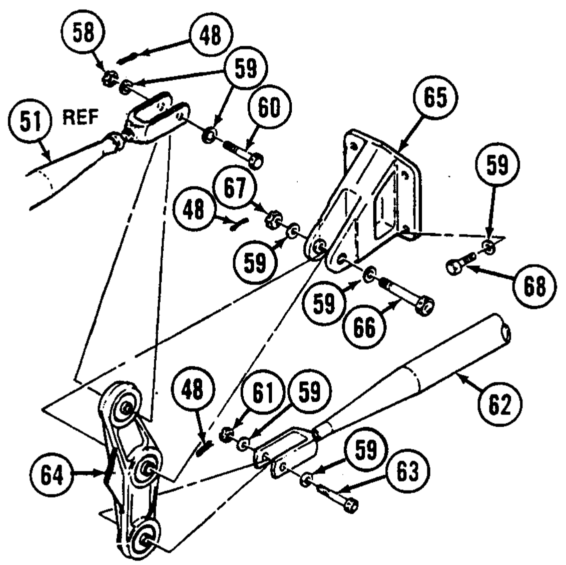
21.	Nut	29.	Support	37.	Control tube
22.	Nut	30.	Bolt	38.	Bolt
23.	Cotter pin	31.	Bolt	39.	Nut
24.	Washer	32.	Bolt	40.	Bellcrank
25.	Lever	33.	Control tube	41.	Bolt
26.	Nut	34.	Support	42.	Bolt
27.	Nut	35.	Bolt	43.	Bolt
28.	Bolt	36.	Bolt		

UH-1H-II-M-11-41-3

Figure 11-41. Bellcranks, levers, supports, and control tubes — synchronized elevator control system — removal and installation (Sheet 3 of 5)



DETAIL D

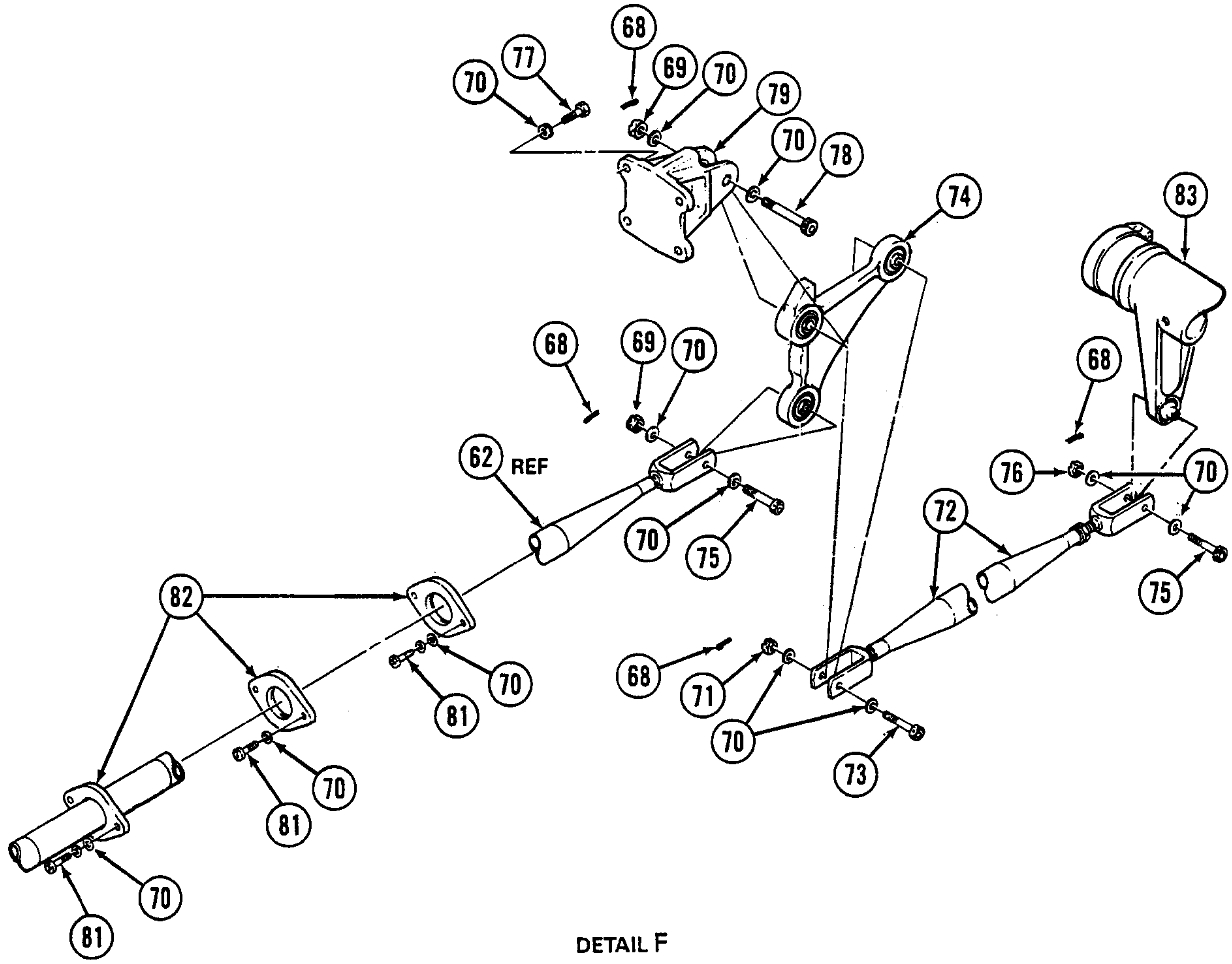


DETAIL E

44.	Nut	53.	Bolt	61.	Nut
45.	Washer	54.	Bellcrank	62.	Control tube
46.	Washer	55.	Bolt	63.	Bolt
47.	Nut	56.	Nut	64.	Lever
48.	Cotter pin	57.	Support	65.	Support
49.	Bolt	58.	Nut	66.	Bolt
50.	Bolt	59.	Washer	67.	Nut
51.	Control tube	60.	Bolt	68.	Bolt
52.	Nut				

UH-1H-II-M-11-41-4

Figure 11-41. Bellcranks, levers, supports, and control tubes — synchronized elevator control system — removal and installation (Sheet 4 of 5)



68. Cotter pin
69. Nut
70. Washer
71. Nut
72. tube
73. Bolt
74. Bellcrank
75. Bolt
76. Nut
77. Bolt
78. Bolt
79. Support
80. Nut
81. Screw
82. Guide
83. Horn assembly

UH-1H-II-M-11-41-5

Figure 11-41. Bellcranks, levers, supports, and control tubes — synchronized elevator control system — removal and installation (Sheet 5 of 5)

n. Detach forward end of control tube (72) from bellcrank (74) by removing cotter pin (68), nut (71), washers (70), and bolt (73). (Detail F.)

o. Detach aft end of control tube (72) from elevator horn assembly (83) by removing cotter pin (68), nut (76), washers (70), and bolt (75). (Detail F.)

11-161. Inspection — Control Tubes — Synchronized Elevator Control System.

a. Inspect control tubes for corrosion and mechanical damage. (Figure 11-42.)

b. Inspect clevis end holes for wear and clevis end for looseness in tube.

11-162. Repair and Replacement — Control Tubes — Synchronized Elevator Control System.

a. Polish out corrosion or mechanical damage to control tubes (repair areas only). (Figure 11-42.)

b. Any damage in repair areas that is in excess of limits is cause for replacement.

11-163. Installation — Control Tubes — Synchronized Elevator Control System.

a. Position control tube (72, figure 11-41) end to horn assembly (83) and install bolt (75), washers (70), nut (76), and cotter pin (68). (Detail F, sheet 5.)

b. Position control tube (72) end to bellcrank (74) and install bolt (73), washers (70), nut (71), and cotter pin (68). (Detail F, sheet 5.)

c. Position three guides (82) on structures and install six screws (81) with six washers (70) each. (Detail F, sheet 5.)

d. Position control tube (62) end to bellcrank (74) and install bolt (75), washers (70), nut (69), and cotter pin (68). (Detail F, sheet 5.)

e. Position control tube (62) end to lever (64) and install bolt (63), washers (59), nut (61), and cotter pin (48). (Detail E, sheet 4.)

f. Position aft end of control tube (51) to lever (64) and install bolt (60), washers (59), nut (58), and cotter pin (48). (Detail E, sheet 4.)

g. Position forward end of control tube (51) to bellcrank (54) and install bolt (53), washers (46), nut (52), and cotter pin (48). (Detail D, sheet 4.)

h. Position aft end of control tube (37) to bellcrank (54) and install bolt (55), washers (46), nut (56), and cotter pin (48). (Detail D, sheet 4.)

i. Position forward end of control tube (37) to bellcrank (40) and install bolt (38), washers (24), nut (39), and cotter pin (23). (Detail C, sheet 3.)

j. Position lower (adjustable) end of control tube (33) to bellcrank (40) and install bolt (41), washers (24), nut (42), and cotter pin (23). (Detail C, sheet 3.)

k. Position upper (nonadjustable) end of control tube (33) to lever (25) and install bolt (32), washers (24), nut (21), and cotter pin (23). (Detail B, sheet 3.)

l. Position lower end of control tube (8) to lever (25) and install bolt (31), washers (24), nut (22), and cotter pin (23). (Detail B, sheet 3.)

m. Position upper (adjustable) end of control tube (8) with clevis (6) to bellcrank (18) and install bolt (7), washers (3), nut (5), and cotter pin (2). (Detail A, sheet 2.)

n. Position control tube (20) to swashplate horn and install bolt (4), washers (3), nut (1), and cotter pin (2). Position opposite clevis end to bellcrank (18) and install bolt (9), washers (3), nut (19), and cotter pin (2). (Detail A, sheet 2.)

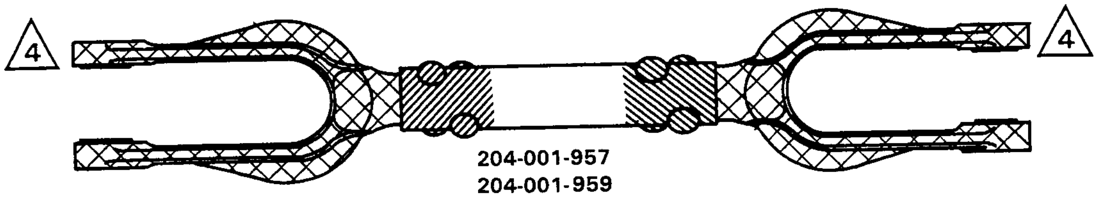
o. Install tailboom assembly. (Chapter 2.)

p. Rig synchronized elevator control. (Paragraph 11-156.)

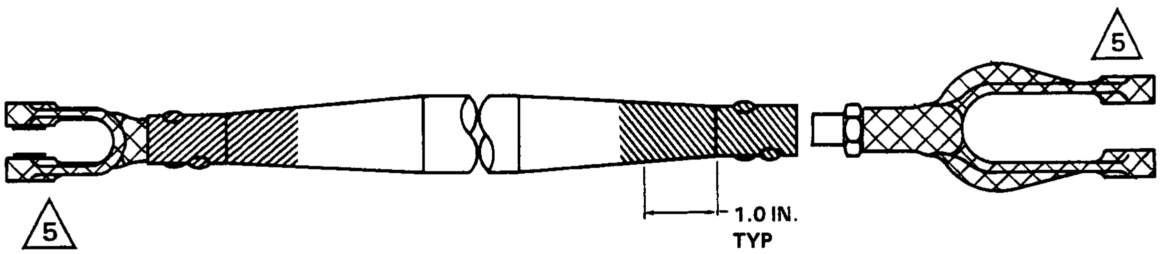
q. Install transmission cowling and flight controls access doors. (Chapter 2.)

11-164. BELLCRANKS, LEVERS, AND SUPPORTS — SYNCHRONIZED ELEVATOR CONTROL SYSTEM.

11-165. Description — Bellcranks, Levers, and Supports — Synchronized Elevator Control System. Various bellcranks, levers, and supports are incorporated



204-001-957
204-001-959
204-001-053
CONTROL TUBE ASSEMBLY



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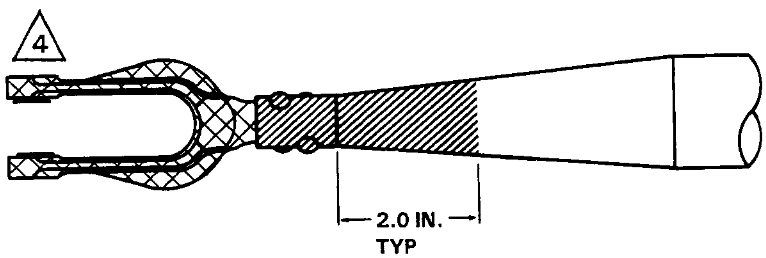


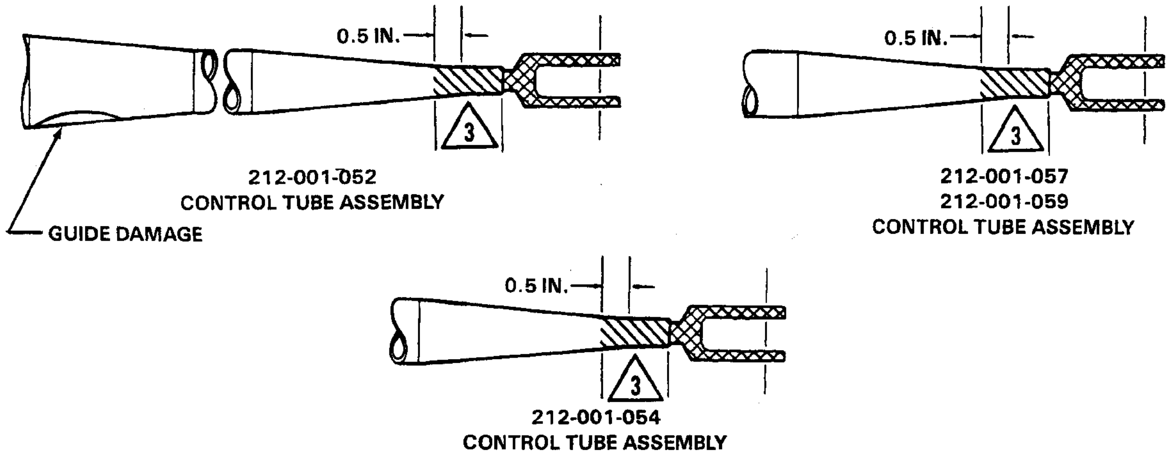
205-001-018
204-001-053
CONTROL TUBE ASSEMBLY

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	(cross-hatched)	(diagonal hatched)	(blank)
	MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL AND 5 CORROSION	0.005 in. before and after repair	No damage allowed	1 2
MECHANICAL 4	0.005 In. after repair		1 2
CORROSION 4	0.0025 In. before repair 0.005 In. after repair		1 2

UH-1H-II-M-11-42-1

Figure 11-42. Control tubes — synchronized elevator control system — wear and damage limits (Sheet 1 of 2)



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE			
	△5 MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL AND CORROSION	0.005 In. after repair	△3	△2
MECHANICAL △4	0.005 In. after repair		
CORROSION DAMAGE △4	0.0025 In. before repair 0.05 In. after repair	△3	△2 △2
MAXIMUM AREA PER FULL DEPTH REPAIR	0.010 Sq. In.	△3	0.10 Sq. In. △1
NUMBER OF NONOVERLAPPING REPAIRS	One per lug	△3	4
EDGE CHAMFER	0.010 In.	△3	0.040 In.
BORE DAMAGE	0.002 In. for one-fourth circumference		
THREAD DAMAGE:			
Depth	One-third of thread		
Length	0.25 In.		
Number	Two per segment		
GUIDE DAMAGE	0.008 In. maximum wear depth		

NOTES

△1 Width of repair at any section shall not exceed one-third of tube circumference.

△2 Mechanical damage to surface of control tube shall not exceed 10% of tube wall thickness. Corrosion damage shall not exceed 5% of tube wall thickness before cleanup and 10% after cleanup. Listed below are the control tubes used in the elevator controls system with control tube wall thickness.

204-001-059	0.065 in.	212-001-052	0.035 in.
205-001-017	0.049 in.	212-001-054	0.035 in.
205-001-018	0.049 in.	212-001-057	0.035 in.

△3 The smaller diameter of tube and approximately 0.5 in. of swaged section are critical and no damage or repair is permitted.

△4 Aluminum clevis — corrosion damage limits before and after repair — mechanical damage limits after repair.

△5 Steel clevis — mechanical and corrosion damage limits after repair.

UH-1H-II-M-11-42-2

Figure 11-42. Control tubes — synchronized elevator control system — wear and damage limits (Sheet 2 of 2) in the synchronized elevator control system. The supports are airframe mounted and provide a pivot mount for levers and bellcranks.

11-166. Removal — Bellcranks, Levers, and Supports — Synchronized Elevator Control System.

a. Disconnect control tubes (8, 20, 33, 37, 51, 62, or 72) from bellcranks or levers as necessary. (Paragraph 11-160.)

b. Detach bellcrank (18, figure 11-41) from support (11) by removing cotter pin (2), nut (17), washers (3), and bolt (12). Remove support (11) from transmission top case by removing two nuts (13) and washers (3) from two studs and removing nuts (10 and 14), washers (3), and bolts (15 and 16) from mounting bracket. (Detail A.)

c. Through access door on right side of pylon support, detach lever (25) from support (29) by removing cotter pin (23), nut (26), washers (24), and bolt (30). Remove support (29) from transmission fifth-mount fitting by removing four nuts (27), washers (24), and four bolts (28). (Detail B.)

d. Detach bellcrank (40) from support (34) by removing cotter pin (23), nut (43), washers (24), and bolt (36). Remove support (34) from structure by removing four bolts (35) and washers (24). (Detail C.)

e. Detach bellcrank (54) from support (57) by removing cotter pin (48), nut (47), washers (46), and bolt (50). Remove support (57) from structure by removing four nuts (44), washers (45), and bolts (49). (Detail D.)

f. Detach lever (64) from support (65) by removing cotter pin (48), nut (67), washers (59), and bolt (66). Remove support by removing bolts (68) and washers (59). (Detail E.)

g. Detach bellcrank (74) from support (79) by removing cotter pin (68), nut (69), washers (70), and bolt (78). Remove support (79) by removing four bolts (77) and washers (70). (Detail F.)

11-167. Inspection — Bellcranks, Levers, and Supports — Synchronized Elevator Control System.

a. Inspect bellcranks, levers, and supports for loose bearings. (Paragraph 11-171.)

b. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. (Figure 11-43.)

11-168. Repair or Replacement — Bellcranks, Levers, and Supports — Synchronized Elevator Control System.

a. Replace loose or damaged bearings in bellcranks, levers, and supports. (Paragraph 11-172.)

b. Remove minor surface corrosion or repair damage areas with fine grit abrasive cloth or paper (C-423). (Figure 11-43.)

11-169. Installation — Bellcranks, Levers, and Supports — Synchronized Elevator Control System.

a. Position support (79, figure 11-41) to mounting holes on bulkhead. Install bolts (77) and washers (70). (Detail F.)

b. Position bellcrank (74) on support (79) by bolt (78), washers (70), and nut (69). Tighten nut and install cotter pin (68). (Detail F.)

c. Position support (65) on bulkhead and install bolts (68) and washers (59). Tighten bolts. (Detail E.)

d. Position lever (64) on support (65) and install bolt (66), washers (59), and nut (67). Tighten nut and install cotter pin (48). (Detail E.)

e. Position support (57) and install four bolts (49), washers (45), and nuts (44). (Detail D.)

f. Position bellcrank (54) with tab on pivot pointing up and aft in support (57). Install bolt (50), washers (46), and nut (47). Tighten nut and install cotter pin (48). (Detail D.)

g. Position support (34) and install four bolts (35) with washers (24). Tighten bolts. (Detail C.)

h. Position bellcrank (40) in support (34) and install bolt (36), washers (24), and nut (43). Tighten nut and install cotter pin (23). (Detail C.)

i. Position support (29) and install four bolts (28), washers (24), and nuts (27). Tighten nuts. (Detail B.)

j. Position lever (25) in support (29) and install bolt (30), washers (24), and nuts (26). Tighten nuts and install cotter pin (23). (Detail B.)

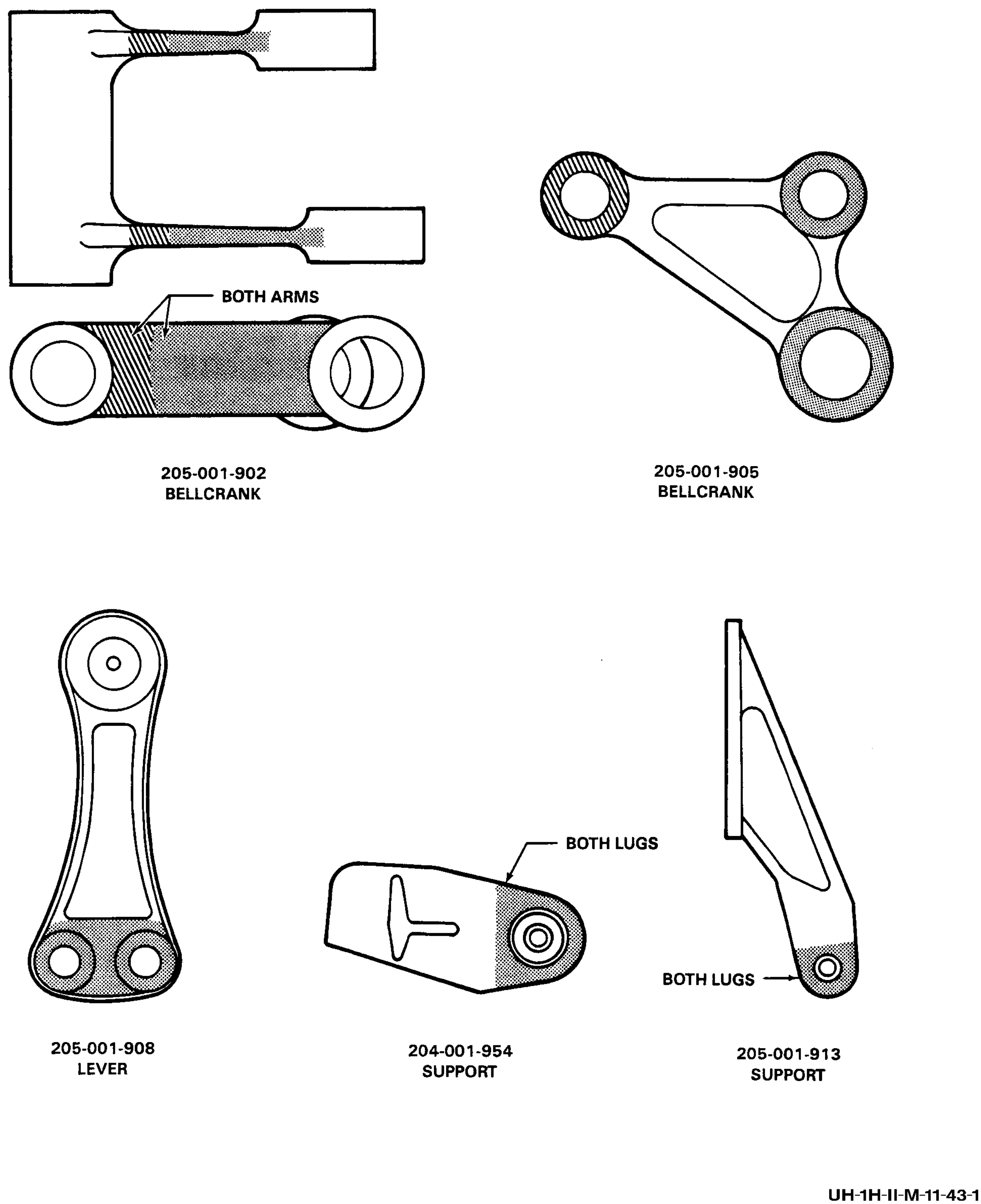
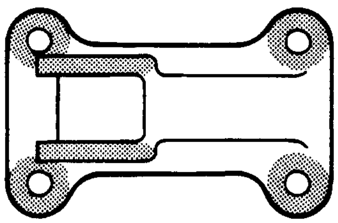


Figure 11-43. Bellcranks, levers, and supports — synchronized elevator control system — wear and damage limits (Sheet 1 of 4)



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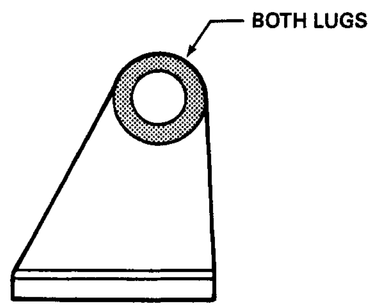
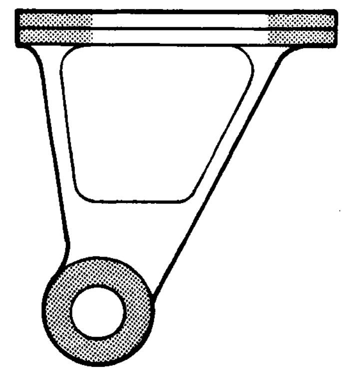
SUPPORT



205-001-909
SUPPORT



DAMAGE AREA REPAIR SYMBOLS

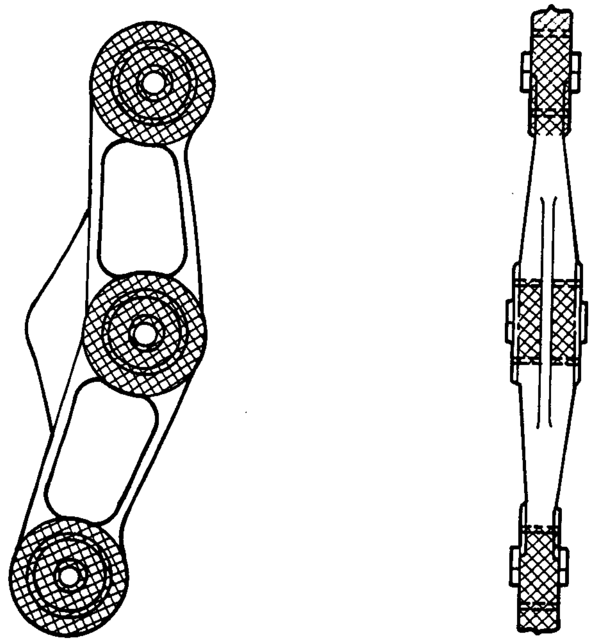
TYPE OF DAMAGE			
	MAXIMUM DAMAGE AND REPAIR DEPTH		
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
CORROSION DAMAGE			
(BEFORE CLEANUP)	0.0075 In.	0.005 In.	0.0025 In.
(AFTER CLEANUP)	0.015 In.	0.010 In.	0.005 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 In. Sq.	0.10 In. Sq.	0.10 In. Sq.
NUMBER OF REPAIRS	One per area	One per area	One per area
EDGE CHAMFER	0.05 By 0.05	0.04 By 0.04	
BORE DAMAGE	0.002 In. for one-fourth circumference		

NOTE:

No cracks allowed.

UH-1H-II-M-11-43-2

Figure 11-43. Bellcranks, levers, and supports — synchronized elevator control system — wear and damage limits (Sheet 2 of 4)



212-001-901 WALKING BEAM

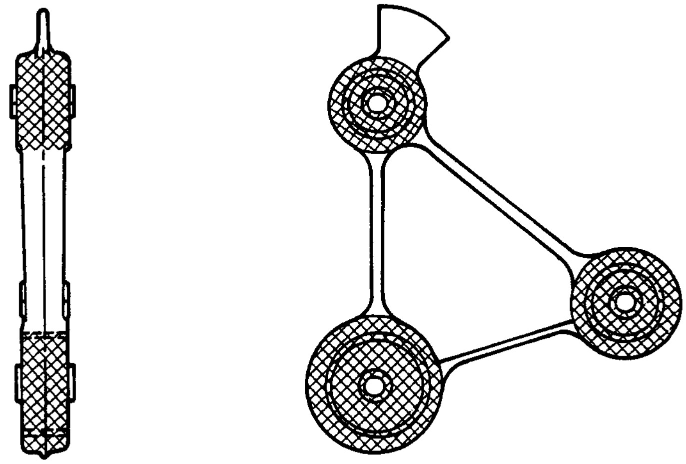
TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS: Cross-hatched	DAMAGE AREA REPAIR SYMBOLS: Open
	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL		
MAXIMUM DEPTH AFTER BLEND	None	0.020
CORROSION		
BEFORE CLEANUP	None	0.010
AFTER CLEANUP	None	0.020
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	Three
BEARING WEAR		
AXIAL LIMIT	0.016	NA
RADIAL LIMIT	0.008	NA

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-43-3

Figure 11-43. Bellcranks, levers, and supports — synchronized elevator control system — wear and damage limits (Sheet 3 of 4)



212-001-902 BELLCRANK

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
MECHANICAL MAXIMUM DEPTH AFTER BLEND	None	0.030
CORROSION		
BEFORE CLEANUP	None	0.020
AFTER CLEANUP	None	0.030
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIR	None	0.500
NUMBER OF NON-OVERLAPPING REPAIRS	None	Three/part
BEARING WEAR		
AXIAL LIMIT	0.016	NA
RADIAL LIMIT	0.008	NA

NOTES

1. No cracks allowed.
2. All dimensions are in inches unless otherwise specified.

UH-1H-II-M-11-43-4

Figure 11-43. Bellcranks, levers, and supports — synchronized elevator control system — wear and damage limits (Sheet 4 of 4)

k. Position support (11) with barrier tape (C-430) between faying surfaces on two studs on top case of transmission. Install two nuts (13) with washers (3). Tighten nuts. Apply unreduced zinc chromate primer (C-201) to bolts (15 and 16) and install two bolts (15) and one bolt (16) with washers (3) and nuts (10 and 14). Tighten nuts.

l. Position bellcrank (18) in support (11) and install bolt (12) from inboard with washers (3) and nut (17). Tighten nut and install cotter pin.

m. Attach control tubes (8, 20, 33, 37, 51, 62, and 72) to bellcranks or levers as required. (Paragraph 11-163.)

n. Rig synchronized elevator control system. (Paragraph 11-156.)

11-170.BEARINGS.

11-171. Inspection — Bearings.

a. Inspect bearings of bellcrank-to-servo-valve tube assembly (14, figure 11-1) for 0.005 inch radial and 0.030 inch axial maximum allowable wear. Any wear in excess of these limits is cause for replacement.

b. Maximum allowable elongation to a bushing or clevis hole in control system is 0.003 inch.

c. Maximum allowable lateral chuck or play for collective pitch jackshaft is 0.060 inch.

d. Check pilot collective stick friction after installation. (Paragraph 11-27.)

e. Inspect cyclic jackshaft-to-mixing-lever tube assembly (12, figure 11-13) bearing for 0.005 inch radial and 0.030 inch axial maximum allowable wear.

f. Inspect bellcrank to servo valve tube assembly (21 and 26) bearings for 0.005 inch radial and 0.030 inch maximum allowable wear.

g. Maximum allowable elongation of bushing or clevis hole in control system is 0.003 inch.

h. Maximum allowable lateral play on jackshaft (10) is 0.20 inch.

i. Maximum allowable wear on jackshaft bearings is 0.010 inch radial.

j. Mechanical damage limits for exposed surfaces of aluminum clevis and rod end bearings is 0.010 inch in depth before and after repair. Corrosion damage limits is 0.005 inch before repair and 0.010 inch after repair.

k. Mechanical and corrosion damage limits for exposed surfaces of steel clevis and rod end bearings is 0.005 inch in depth before and after repair.

11-172. Repair or Replacement — Bearings. Repair and replacement instructions for bearings on bellcranks, levers, and supports of flight control system. (Refer to BHT-ALL-SPM.)

11-173.SYNCHRONIZED ELEVATOR.

11-174. Description — Synchronized Elevator. The synchronized elevator consists of two elevators, one installed on each side of the tailboom. Each elevator is a horizontal airfoil section built up on a spar tube, which is inserted into a projecting end of horn assembly and secured by two bolts. The horn assembly is mounted horizontally through the sides of tailboom and secured to the structure by supports which serve as bearings for rotational movement. A control arm on the horn provides attachment for linkage from the fore and aft cyclic control system at the swashplate.

11-175. Removal — Synchronized Elevator.

a. Remove either synchronized elevator assembly as follows:

(1) Remove access door from bottom of tailboom below elevator.

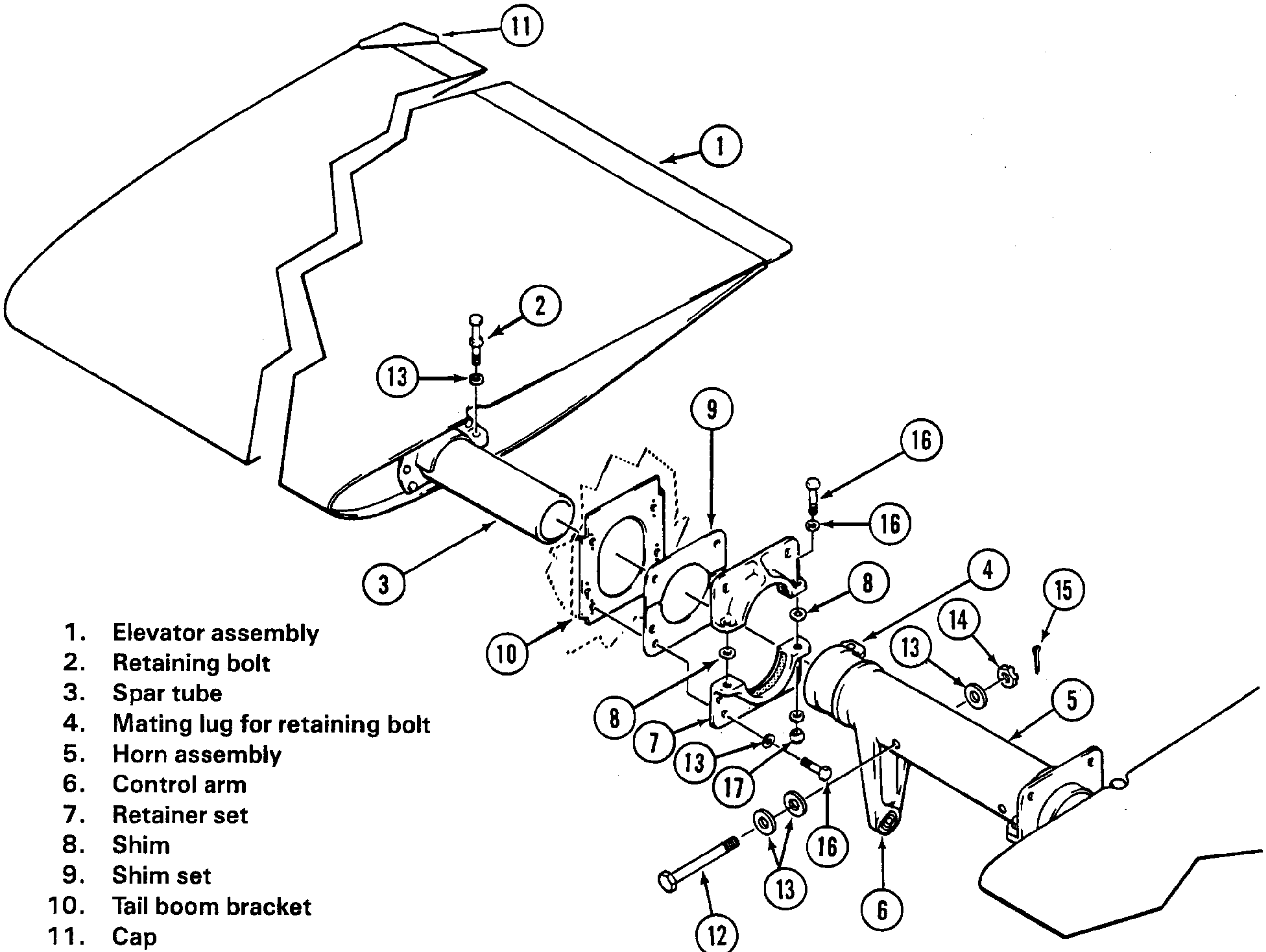
(2) Remove cotter pin (15, figure 11-44), nut (14), washers (13), and bolt (12).

(3) Remove retaining bolt (2) with washers (13) to detach elevator fitting from lug (4) on horn assembly (5).

(4) Withdraw elevator straight outboard until spar tube (3) is pulled free from horn assembly (5).

b. If horn assembly (5) is to be removed, proceed as follows:

(1) Disconnect control tube assembly from arm (6) on horn assembly (5).



1. Elevator assembly
2. Retaining bolt
3. Spar tube
4. Mating lug for retaining bolt
5. Horn assembly
6. Control arm
7. Retainer set
8. Shim
9. Shim set
10. Tail boom bracket
11. Cap
12. Bolt
13. Washer
14. Nut
15. Cotter pin
16. Bolt
17. Nut

UH-1H-II-M-11-44

Figure 11-44. Synchronized elevator — removal and installation

(2) At each end of horn assembly inside tailboom, remove two bolts (16), nut (17), washers (13), and shims (8) from upper and lower retainers (7).

CAUTION

Handle retainers with care to avoid damaging inner surfaces of bushings. Keep removed parts in sets.

(3) Remove bolts (16) and washers (13) attaching retainers (7) and shim sets (9) to tailboom support brackets (10). Remove retainers and shim sets.

(4) Remove horn assembly (5) through access opening in bottom of tailboom.

11-176. Inspection and Repair — Synchronized Elevator.

a. Inspect synchronized elevator for damage, dents, and cracks.

b. Check synchronized elevator radial movement as follows:

(1) With elevators installed, mount dial indicator on tailboom with stylus in contact with upper surface of elevator at spar station.

(2) Lightly move elevator up and down and observe total reading on dial indicator. A maximum reading of 0.010 inch is permissible.

(3) If reading is not within tolerance, complete following:

(a) Check elevator for proper installation. (Paragraph 11-177.)

(b) Check drag on support assembly. (Paragraph 11-177, step e.)

(c) Inspect elevator and support. (Step c. and d.)

c. Inspect elevator for loose rivets, damage, dents, cracks, and worn spar tube. (Figures 11-40 and 11-45.)

d. Inspect support retainer set (7, figure 11-44) for damage, wear, and looseness. (Refer to BHT-212-CR&O.)

e. Inspect horn (5, figure 11-44) for damage, dents, cracks, and wear. (Refer to BHT-212-CR&O.)

NOTE

Inboard rib may be modified to reduce the probability of cracking per T.B. 212-83-76 during inboard rib replacement.

f. Inspect inboard rib for cracks. Small crack in rib web may be stop drilled if it does not extend into the radius of the rib flange. If crack extends into rib flange, replace rib.

g. Replace tip cap (11, figure 11-44) if loose or missing, as follows:

(1) Clean elevator tip area with solvent (C-305).

(2) Inspect new cap (11) to ensure it is free of oil, grease, dirt, etc. Cap may be cleaned with toluene (C-306).

(3) Brush a thin coat of adhesive (C-300) (approximately 0.010 inch thick) on elevator tip (cleaned area) and inside of cap.

(4) Allow approximately 1 hour drying time until adhesive attains an aggressive tack; then, install cap on elevator tip.

(5) Hold cap in place for a minimum of 15 seconds.

(6) Allow a minimum of 24 hours drying time before releasing helicopter for flight.

h. For repair of elevator, refer to AC 43.13-1A.

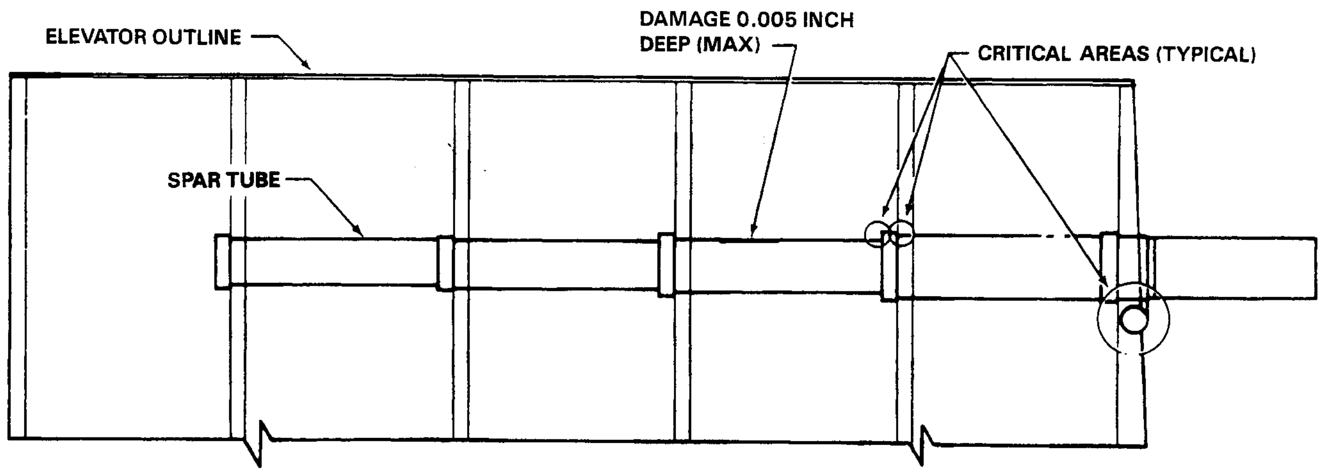
11-177. Installation — Synchronized Elevator.

a. Coat horn assembly (5, figure 11-44) with corrosion preventive compound (C-101).

b. Insert horn assembly (5) into tailboom through access door on bottom of tailboom below elevator installation. Position assembly with ends through tailboom brackets (10) and with control arm (6) at right of center pointing down.

CAUTION

Handle retainers with care to avoid damaging inner surfaces of bushings.



NOTE

The entire elevator spar tube is a critical fatigue area. The area where the elevator attaches to the horn and the radii adjacent to the rib lands are especially critical because these are the points where loads are transferred to the spar. If an elevator sustains damage, the elevator skin must be removed for inspection of the spar prior to repair of the internal damage.

LIMITS — REPAIRABLE DAMAGE

Scratch and scoring damage is limited to 0.005 inch depth after cleanup with 400 grit or smoother abrasive paper to a polished smooth surface. Scratch and scoring damage is further limited as follows:

0.050 inch Radially
1.00 inch Longitudinally

No dents which result is visible tube wall depressions are permitted. The allowable limit on pit corrosion is 10% of wall thickness. No corrosion is permitted after clean-up.

NOTE

Apply two coats of epoxy polyamide primer (C-204) to spar in cleanup areas. Do not apply primer to portion of spar which fits inside horn.

UH-1H-II-M-11-45

Figure 11-45. Elevator spar damage limits

c. Position shim sets (9) and retainers (7) to tailboom brackets (10) and install attaching washers (13) and bolts (16). Peel shim sets (9) as necessary to obtain 0.005 to 0.030 inch lateral play of horn assembly (5).

d. Secure upper and lower retainers (17) together with two bolts (16), thin aluminum alloy washers (13) next to bolt heads, and nuts and shims (8) between retainers.

e. Adjust preload on bearings as follows:

NOTE

Preload shall be measured using a standard spring scale applied to control arm of horn assembly. Spring scale tension shall be applied 90 degrees to the control arm to obtain a correct reading.

(1) With one retainer set (7) loosely installed, peel or add to shims (8) on opposite set to obtain 13 to 16 pounds preload with bolts torqued 50 to 70 inch-pounds.

(2) Adjust opposite support retainer set in the same manner until an overall reading of 26 to 32 pounds of drag is measured on horn assembly control arm (6).

f. Connect control tube assembly (4, figure 11-40) to horn assembly (2).

g. Coat surface of elevator spar tube (3, figure 11-44) with corrosion preventive compound (C-101). Install each elevator assembly (1) by inserting spar tube (3) into end of horn assembly (5) and installing retaining bolt (2) with washer (13). Torque bolt 100 to 140 inch-pounds.

h. Install bolt (12), washers (13), and nut (14). Torque nut not to exceed 10 inch-pounds and install cotter pin (15).

i. Install access door on bottom of tailboom below elevator installation.

j. Check elevator system rigging. (Paragraph 11-156.)

11-178. LINKAGE — SYNCHRONIZED ELEVATOR CONTROL.

11-179. Description — Linkage — Synchronized Elevator Control. Linkage from trunnion on rear control arm of swashplate inner ring to control arm on elevator horn assembly consists of control tubes, bellcranks, and an idler.

11-180. Removal — Linkage — Synchronized Elevator Control.

a. Remove access doors on bottom of fuselage and tailboom and sides of pylon island as necessary for access to controls.

CAUTION

Take precautions against damage which may be caused by accidental movement of linkage while disconnected.

b. Part of control system can be removed separately as the need arises, or completely in practical sequence. (Figure 11-40.)

11-181. Inspection and Repair — Linkage — Synchronized Elevator Control.

a. Inspect linkage parts for wear, elongated bolt holes, cracks, nicks, or damage. Inspect bearings for wear or roughness. (Refer to BHT-212-CR&O.)

b. Inspect bushings and clevis holes in the control linkage for wear. (Refer to BHT-212-CR&O.)

c. Inspect control tubes for damage. (Refer to BHT-212-CR&O.)

d. Remove all mechanical and corrosion damage that is within limits with wet or dry abrasive cloth or paper (C-423) to obtain a smooth scratch free surface. Apply two coats of zinc chromate primer (C-201) to repaired area.

e. Replace any control linkage parts that fail to meet inspection requirements.

f. Replace any control linkage that exceeds mechanical or corrosion limits.

g. Replace linkage if bearings are rough or excessively worn.

h. Replace components in control linkage if elongation to bushing or clevis hole exceeds 0.003 inch.

11-182. Installation — Linkage — Synchronized Elevator Control.

CAUTION

The precautions against damage which may be caused by accidental movement of linkage while disconnected.

a. Install components of the elevator control linkage. (Figure 11-40.)

b. Check rigging of controls after replacement of any linkage. (Paragraph 11-156.)

c. Install access doors and panels.

CHAPTER 12

UTILITY SYSTEMS

This chapter contains supplements covering customer-selected optional equipment. Each supplement should be inserted in the chapter in alphabetical order.

HEAT SUPPRESSOR

1. HEAT SUPPRESSOR.

2. Description — Heat Suppressor. Provisions may be installed to accept infrared suppression equipment contained in Auxiliary Suppressor Kit, Exhaust (Heat) Suppressor (205-706-082-001). This kit includes an upturned insulated exhaust duct assembly, oil cooler exit shield, two engine side shields, forward duct assembly, and attaching hardware.

3. Removal — Heat Suppressor.

a. Prepare helicopter for safe ground maintenance. Disconnect rotating beacon light and remove cover assembly (1, figure 1) from insulated exhaust duct assembly (2).

b. Disconnect duct assembly drain line (29) from reducer (30).

c. Remove tailpipe fairing (7) with forward duct assembly (10) and position tailpipe fairing on suitable workbench.

d. Disconnect tailpipe drain line (26) from adapter (27) and tailpipe.

e. Remove adapter (27) and packing (28) from tee (37). Discard packing (28).

f. Remove coupling (34) with tee (37) attached from coupling half (32). Install adapter (27) in coupling half (32) using new packing (28).

g. Remove heat suppressor tailpipe and install standard tailpipe. (Chapter 4.)

h. Connect tailpipe drain line (26) to adapter (27) and tailpipe.

i. Remove nuts (14) with washers (15) and remove forward duct assembly (10) from fairing assembly (7).

j. Remove lock pins (17) and remove jog bolts (18).

k. Remove fairing assembly (6) by removing screws (5) with washers (4). Retain insulator (3) with fairing assembly (6).

l. Remove screws (9) with washers (8) and remove insulated exhaust duct assembly (2).

m. Remove screws (20) with washers (21) and remove left and right shield assemblies (19).

n. Remove aft panel (Chapter 2) and remove nuts (22, figure 1) with washers (23). Remove bolts (25) and oil cooler shield (24).

o. Install tailpipe fairing (Chapter 2) and connect rotating beacon light.

p. Cap or cover all open ports. Retain Auxiliary Equipment Kit, Exhaust Suppressor (205-706-082-001) in local stock for future reinstallation.

4. Cleaning — Heat Suppressor. Wipe components of heat suppressor with cloth dampened with solvent (C-304).

5. Inspection — Heat Suppressor.

a. Scratches and small shallow dents are considered negligible and do not require repair.

b. Inspect exhaust tailpipe (12, figure 1) for cracks, dents and burned out or buckled areas.

c. Inspect duct assemblies (2 and 10) for cracks, dents, and burned out or buckled areas.

d. Inspect lockpin (17) for cracks and security.

e. Inspect bolts (18) for cracks and damaged threads.

f. Inspect insulation (13) for holes and tears.

g. Inspect cowling and fairings (6 and 7) for cracks, dents, corrosion, security, and loose or missing fasteners.

6. Repair or Replacement — Heat Suppressor.

a. General repair limits for forward duct assembly (10, figure 1) are as follows:

(1) Cracks and holes in surface of duct should not exceed 3.0 inches in diameter after cleanup. Adjacent repair areas must allow a minimum of 2.0 inches between patches.

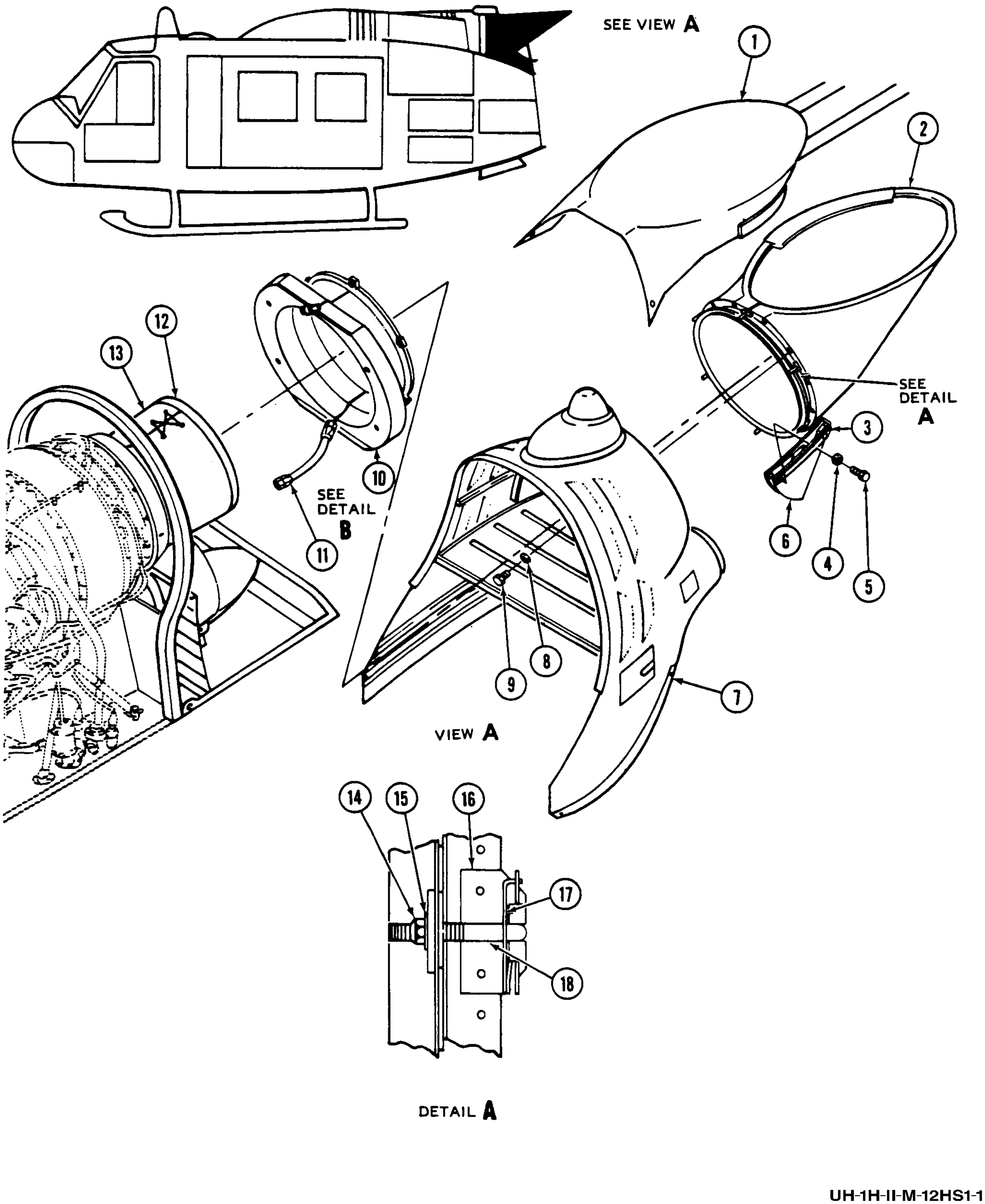
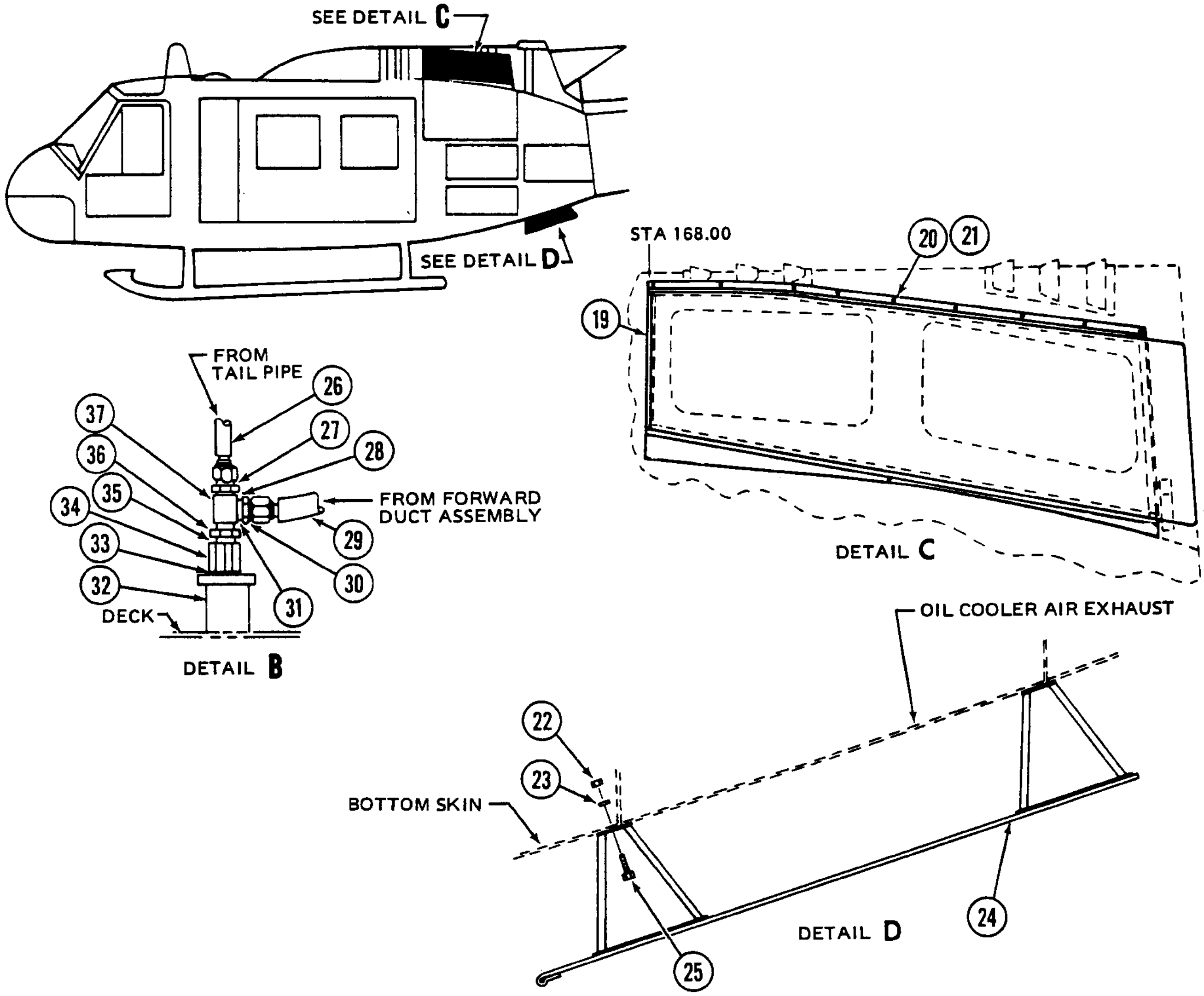


Figure 1. Heat suppression components (Sheet 1 of 2)



1. Cover assembly
2. Insulated exhaust duct assembly
3. Insulator
4. Washers
5. Screws
6. Fairing assembly
7. Tailpipe fairing
8. Washers
9. Screws
10. Forward duct assembly
11. Drain fitting
12. Exhaust tail pipe
13. Insulation blanket
14. Nut
15. Washer
16. Mount bracket
17. Lockpins
18. Jog bolts
19. Shield assembly
20. Screws
21. Washers
22. Nut
23. Washer
24. Oil cooler shield
25. Bolt
26. Tail pipe drain line
27. Adapter
28. Preformed packing
29. Duct assembly drain line
30. Reducer
31. Preformed packing
32. Coupling half
33. Preformed packing
34. Coupling
35. Preformed packing
36. Nut
37. Tee

UH-1H-II-M-12HS1-2

Figure 1. Heat suppression components (Sheet 2 of 2)

(2) Heating, as evidenced merely by discoloration of the metal, permissible. However, if the condition becomes progressive, indicating a possible burn-through, the part should be replaced.

(3) Dents in the surface of duct are permissible provided the surface is not broken and there are no sharp creases or projections into exhaust stream.

(4) Damage to circumferential mounting frames shall be evaluated locally as to feasibility of repair or need for replacement. It is not feasible to replace the frame on the duct.

b. General repair limits for insulated exhaust duct assembly (2, figure 1) are as follows:

(1) Cracks and holes in the interior surface of duct should not exceed 3.0 inches in diameter after cleanup. Adjacent repair areas must allow minimum of 2.0 inches between patches.

(2) Cracks and holes in exterior surface of duct should not exceed 4.0 inches in diameter after cleanup. Adjacent repair areas must allow a minimum of 2.0 inches between patches.

(3) Damage which penetrates the temp-mat insulation between the interior and exterior surfaces of the duct should not exceed 4.0 inches in diameter after cleanup.

(4) Dents in the interior or exterior surfaces are permissible, providing the surfaces are not broken and there are no sharp projections into the exhaust stream.

(5) Damage to the mounting flange and outlet rim of the duct will be evaluated locally as to feasibility of repair or need for replacement.

c. General repair procedures. Repair to the exhaust infra-red suppression system components will employ standard sheet metal repair practices in conjunction with procedures described herein.

(1) Minor dents in exterior surface require no rework if the surface is not broken, or if not sharp crease or projection exists in the interior surface.

(2) Work out minor dents, having sharp projections into the interior of the duct, by restoring to original contour and smoothing any sharp projections with fine abrasive paper.

(3) Large dents (surface impressions) will be worked out by restoring the surface to original contour.

(4) All cracks will be stop-drilled to prevent continuation.

d. Repair cracks or holes in forward duct assembly (10, figure 1) as follows:

(1) Stop drill crack at both ends.

(2) If two or more cracks converge, cut out area encompassed by cracks and smooth out edges to form a hole but do not exceed 3.0 inches (figure 2, Detail A)

(3) Trim 205-706-083-3 patch from 205-706-083-001 repair kit as necessary to provide a minimum of 0.25 inch edge distance between rivets and hole in parent metal and between rivets and edge of patch.

(4) Position patch and lay out rivet hole locations.

(5) Drill rivet holes and install MS20615-3M4 rivets with heads on interior of duct.

e. Repair cracks or holes in interior surface of insulated exhaust duct assembly (2, figure 1) as follows:

(1) Cut hole through outer surface of duct to encompass damaged area, not to exceed 4.0 inches in diameter (figure 2, Detail B).

(2) Cut out and remove insulation material (temp-mat) not to exceed 4.0 inches.

(3) Cut out damaged area of interior surface of duct but do not exceed 3.0 inches in diameter.

(4) Trim 205-706-083-003 patch from 205-706-083-001 repair kit as necessary to provide a minimum of 0.25 inch edge distance between rivets and hole and between rivets and edge of patch.

(5) Position patch on outside of interior surface, and lay our rivet hole locations.

(6) Drill rivet holes and install MS20615-3M4 rivets with heads on interior of duct.

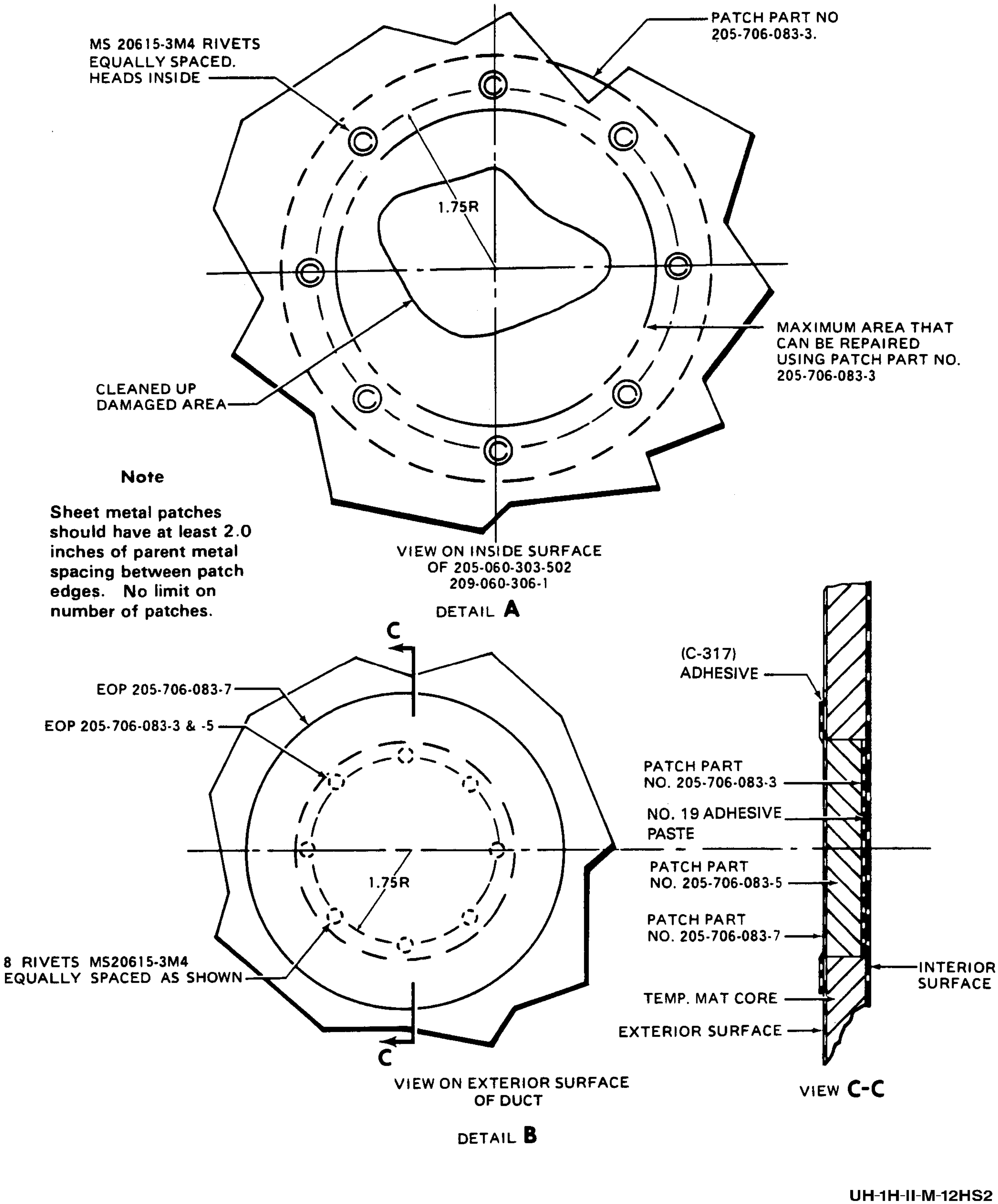


Figure 2. Heat suppressor repair procedures

(7) Cut 205-706-083-005 patch from 205-706-083-001 repair kit to fit insulating core area.

(8) Apply No. 19 adhesive paste and install patch.

(9) Trim 205-706-083-007 patch from 205-706-083-001 repair kit to provide a minimum of 0.50 inch overlap on outer surface of duct.

(10)Lightly abrade area 0.60 inch wide around hole in outer surface. Clean area with MEK (C-309).

(11)Apply adhesive (C-317) to area around hole.

(12)Remove backing from patch and apply patch over hole. Press smoothly into place.

(13) Allow adhesive to cure for 24 hours at room temperature. Alternate cure time is 1 hour at 175°F (79°C).

f. Repair cracks or holes in exterior surface of insulated exhaust duct assembly (2, figure 1) as follows:

(1) Cut out damaged area of outer skin, not to exceed 4.0 inches in diameter.

(2) Trim 205-706-083-007 patch from 205-706-083-001 repair kit to provide a minimum of 0.50 inch overlap on outer surface of duct.

(3) Lightly abrade area 0.60 inch wide around hole. Clean area with MEK (C-309).

(4) Apply adhesive (C-317) to area around hole.

(5) Remove backing from patch and apply patch over hole. Press smoothly into place.

(6) Allow adhesive to cure for 24 hours at room temperature. Alternate cure time is 1 hour at 175°F (79°C).

g. Repair holes which penetrate completely through exterior and interior surfaces of exhaust duct (2, figure 1) as described in step e.

h. Repair holes or tears in insulation blanket (13, figure 1) as follows:

(1) Clean up the hole, either make round or rectangular, with 0.25 inch minimum corner radius.

(2) Select nearest edge of the area to be repaired, unfold edge and separate the two skins.

(3) Select 0.002 inch stainless steel of the proper skin texture with diamond pattern on interior and corrugation on exterior.

(4) Cut skin doubler. Allow 0.50 inch minimum overlap.

(5) Place doubler on inside, line up skin pattern and apply "Class C" spot weld. Spot weld doublers to interior and exterior skins.

(6) Cut to 1/16 inch oversize insulation material plug (0.25 inch fiber asbestos) to fit hole.

(7) Spot weld edges together. Assure insulation material is 0.50 inch minimum inboard of spot weld area.

(8) Fold edge to existing square corner.

i. Repair damaged exhaust cowling or fairing as follows:

(1) Repair cracks, dent, and corrosion.

(2) Replace loose or missing fasteners.

7. Installation — Heat Suppressor.

a. Disconnect rotating beacon light and remove tailpipe fairing. (Chapter 2.) Position tailpipe fairing on suitable workbench.

b. Position insulated exhaust duct assembly (2, figure 1) on rear flange of tailpipe fairing (7) with lower external supports extending over the external supports mounted on the tailpipe fairing transition section.

NOTE

Insulator (3) does not extend the full length forward.

c. Secure insulated exhaust duct assembly (2) with screws (9) and washers (8).

d. Position fairing assembly (6) between external supports. Insert insulator (3) (one on each side) between upper supports and fairing assembly side skins extending from the fairing aft surface forward and secure with screws (5) and washers (4).

e. Install jog bolts (18) in mount bracket (16) on forward flange of insulated exhaust duct assembly (2) (inside engine fairing) and secure in place with lockpins (17).

f. Position forward duct assembly (10) against forward flange of insulated exhaust duct assembly (2) with drain fitting (11) at the lower 6 o'clock position and jog bolts (18) extending through the mount tabs.

g. Install nuts (14) and washers (15) on jog bolts (18) and secure forward duct assembly (10) in position.

h. Position left side shield assembly (19) on engine left side cowl and secure in position with screws (20) and washers (21). Repeat step and install right side shield assembly on engine right side cowl and secure in place.

i. Remove aft panel (Chapter 2). Position oil cooler shield (24, figure 1) over oil cooler outlet with rolled edge of shield forward and mounting holes in legs centered over mount holes. Install one bolt (25) through each of the leg mount holes and secure in position with nuts (22) and washers (23). Install aft panel. (Chapter 2.)

j. Disconnect drain line and remove exhaust tailpipe (Chapter 4). Remove exhaust tailpipe drain line.

k. Remove coupling half (32, figure 1) adapter (27), and packing (28). Dispose of packing and retain remaining parts for reuse.

l. Install coupling half (32) in deck fitting. Install packing (33) on coupling (34). Install coupling (34) in coupling half (32).

m. Thread nut (36) on extended end of tee (37). Install packing (35) on extended end of tee (37). Install tee (37) in coupling (34) with center port facing aft and tighten nut (36).

n. Install packing (31) on reducer (30). Install reducer (30) in tee (37).

o. Install packing (28) on adapter (27) and install adapter (27) in tee (37).

p. Install replacement tailpipe assembly (12), (Chapter 4) with insulation blankets (13) secured around tailpipe with lockwire (C-405). Attach tailpipe. Connect tailpipe drain line to tailpipe and adapter (27).

q. Connect duct assembly drain line (29) to forward duct assembly drain fitting (11). Install tailpipe fairing and duct assembly. Connect duct assembly drain line (29) on reducer (30) and secure fairing assembly with Dzus fasteners and screws and washers. Connect rotating beacon light.

r. Install cover assembly (1) over insulated exhaust duct assembly (2) and secure to fasteners on fairing assembly sides.

NOTE

Tailpipe removed during installation of the Auxiliary Equipment Kit, Exhaust Suppressor (205-706-082-001), must be retained in stock for future reinstallation.

FIRE DETECTOR SYSTEM

1. FIRE DETECTION SYSTEM — ENGINE.

2. Description — Fire Detection System — Engine. The engine fire detection system (figure 1) consists of a fire detector unit, FIRE WARNING caution light, and FIRE DETECTOR test pushbutton switch. The fire detector unit consists of two heat sensitive wires (2) one on inside of each engine cowl in the engine compartment. The wires are mounted in spring support brackets (3). The caution light and test switch are located on the instrument panel.

3. Troubleshooting — Fire Detection System — Engine.

a. *Troubleshooting - Fire Detector.* The following is a list of indications of trouble, probable causes and corrective action. (Table 1.)

NOTE

Before using this table, be sure all normal operation checks have been performed.

Table 1. Troubleshooting Fire Detector

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Indicator light inoperative.

STEP 1. Check for burned out bulb.

Replace bulb. (Chapter 9.)

STEP 2. Check for defective test switch.

Replace switch if defective. (Chapter 9.)

STEP 3. Check for loose electrical connections.

Repair faulty connections. (Paragraph 7.)

STEP 4. Check for broken or disconnected detector wire.

Replace or connect detector wire. (Paragraph 7.)

STEP 5. Perform test in accordance with paragraph 4.

Replace fire detector control box if test and control circuit does not work. (Paragraph 5.)

Replace fire detector wire if test or alarm circuit shows malfunction. (Paragraph 5.)

2. Indicator light stays on.

STEP 1. Check for defective switch.

Replace switch if defective. (Chapter 5.)

Table 1. Troubleshooting Fire Detector (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Perform test in accordance with paragraph 4.

Replace fire detector wire if alarm circuit does not work. (Paragraph 5.)

Replace control box if test of control circuit indicates malfunction. (Paragraph 5.)

4. Test — Fire Detection System — Engine.

a. Disconnect electrical plug located in work deck directly under power plant on left side of helicopter at station 184.41.

b. Short receptacle pins "C" and "F" together, depress the "Push-to-Test" switch. Fire warning light should come on.

NOTE

This test assures that the test and control circuit is operable.

c. Remove the jumper wire from pins "C" and "F" and use it to short either receptacle pin "C" or "F" to ground.

d. Fire warning light should come on.

NOTE

This test assures that the alarm circuit is operable.

e. Use an ohmmeter to check conductivity between pins "C" and "F" at plug side of harness.

NOTE

Maximum resistance should not exceed 20 ohms. If higher value registers, check all connectors for tightness.

f. Use an ohmmeter to check either pin "C" or "F" to ground at plug side of harness.

NOTE

Value register should always be a minimum of 200,000 ohms at an ambient temperature of 72°F (22°C). As the ambient temperature rises the resistance value of pin "C" or "F" to ground will decrease. At 100°F (38°C) this resistance should be a minimum of 100,000 ohms.

g. If the above values are not obtained, it will be necessary to check each cable for resistance from center pin of cable to ground. At 72°F (22°C), the minimum value of each cable is one megohm. Resistance below this value will indicate a faulty cable which should be replaced.

h. Reconnect main firewall cannon plug.

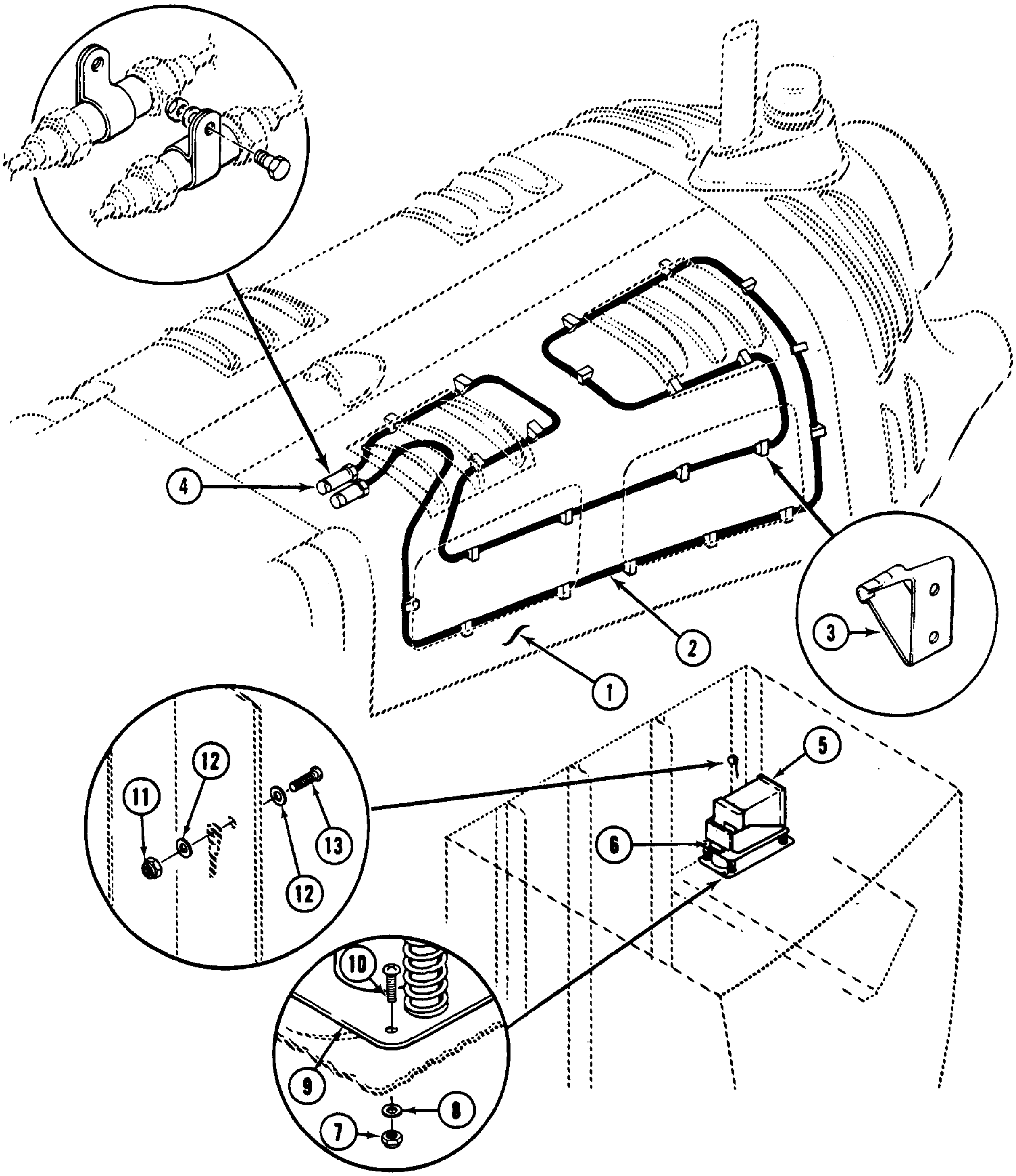
i. Depress "Push-to-Test" switch to assure that system is properly assembled.

j. Install a Jet-Cal Tester Unit to area of cable that assures a good fit for the temperature probe.

NOTE

Make sure that temperature probe is contacting nothing but the cable. It is easy to "heat-singe" the probe if contact is made with helicopter structure.

k. When alarm light comes on, check indicator on Jet-Cal Tester Unit. Value should be 806°F (430°C) plus or minus 230°F (128°C).



1. Engine Cowl (LH)
2. Fire Detector Wire
3. Support Bracket
4. Receptacle
5. Fire Detector Control Box
6. Resistor
7. Nut
8. Washer
9. Mount
10. Screw
11. Nut
12. Washer
13. Screw

UH-1H-II-M-12FDS1

Figure 1. Engine Fire Detector

NOTE

The Jet-Cal Tester Unit is only a system check under heated condition. the temperature at which the warning light comes on is not a good indication of system operation temperature.

l. Remove test equipment and safety wire all electrical connectors and cannon plugs.

5. Removal — Fire Detection System — Engine.

a. Make sure battery switch is in "OFF" position.

b. Disconnect electrical wiring from detector wire receptacles and cover wire ends with insulating tape.

c. Remove bolts, washers, and nuts attaching detector wire receptacles to engine cowl.

d. Apply pressure on each side of detector wire retaining clips and remove detector wire from cowl.

e. Remove safety wire from retaining nuts on each end of detector wire receptacles. Remove top nut on each receptacle and remove detector wire ends.

f. Remove fire detector control unit (5, figure 1) located in electrical and radio compartment, station 178.00 on left hand side of helicopter, as follows:

(1) Disconnect cable connector from the fire detector control box (5).

(2) Remove screw (13), two washers (12), and nut (11) securing ground cable to bulkhead.

(3) Remove four screws (10), four washers (8), and four nuts (7) securing fire detector control box (5) to shelf of electrical and radio compartment.

(4) Remove fire detector control box (5).

6. Inspection — Fire Detection System — Engine.

a. Inspect wires for damage and wear.

b. Inspect wire retention clips for cracks and serviceability.

c. Inspect fire detector control box for security of mounting.

7. Repair or Replacement — Fire Detection System — Engine.

a. Replace wires if damaged and worn.

b. Replace clips if broken, cracked, or unserviceable.

c. Replace fire detector control box if unserviceable.

8. Installation — Fire Detection System — Engine.

a. Insert detector wire end into receptacle and tighten retaining nuts. Lockwire top and bottom retaining nuts together, on each receptacle.

b. Position detector wire receptacles on engine cowl and install attaching nuts, washers, and bolts.

c. Position and route detector wire through spring retention clips.

d. Remove insulating tape from wire ends and connect electrical wiring to detector wire receptacles.

e. Install fire detector control box (5, figure 1) in electrical and radio compartment, station 178.00 on left side of helicopter as follows:

NOTE

Before installation, check resistor (6) for electrical and radio compartment using four screws (10), four washers (8), and four nuts (7).

(1) Secure fire detector control box (5) to shelf of electrical and radio compartment using four screws (10), four washers (8), and four nuts (7).

(2) Attach ground cable to bulkhead with screw (13), two washers (12), and nut (11).

WINDSHIELD WIPER SYSTEM

1. WINDSHIELD WIPER

2. Description — Windshield Wiper. The helicopter is equipped with a windshield wiper for both pilot and copilot. Circuit breakers in the overhead console panel protect these installations in case of malfunction. A five position rotary switch on the miscellaneous panel of the overhead console permits operation of the wipers at low, medium or high speed. A selector switch permits operation of pilot and copilot windshield wipers separately or simultaneously.

3. Removal — Windshield Wiper.

a. Turn battery to OFF position.

CAUTION

Install 3/32 inch cotter key in stand-off holes prior to removal of windshield wipers.

b. Remove windshield wiper blade and universal arm from motor shaft. Disconnect electrical receptacle.

c. Remove bolts which attach head guard bracket and windshield wiper support to cabin. Lift brackets, and motor-converter from cabin.

d. Remove four nuts, washers, and bolts which attach motor-converter to bracket support.

4. Inspection — Windshield Wiper. Inspect blade for deterioration and serviceability. Check continuity of electrical circuits. (Figure 1.)

5. Replacement — Windshield Wiper. Replace wiper blade if unserviceable.

6. Installation — Windshield Wiper.

Premaintenance Requirements for Adjusting Pressure on Windshield Wiper Blade

CONDITION	REQUIREMENTS
Part No. or Serial No.	All
Special Tools	(T70)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	None
Special Environmental Conditions	None

a. Position motor-converter in support and install mounting bolts, washers, and nuts.

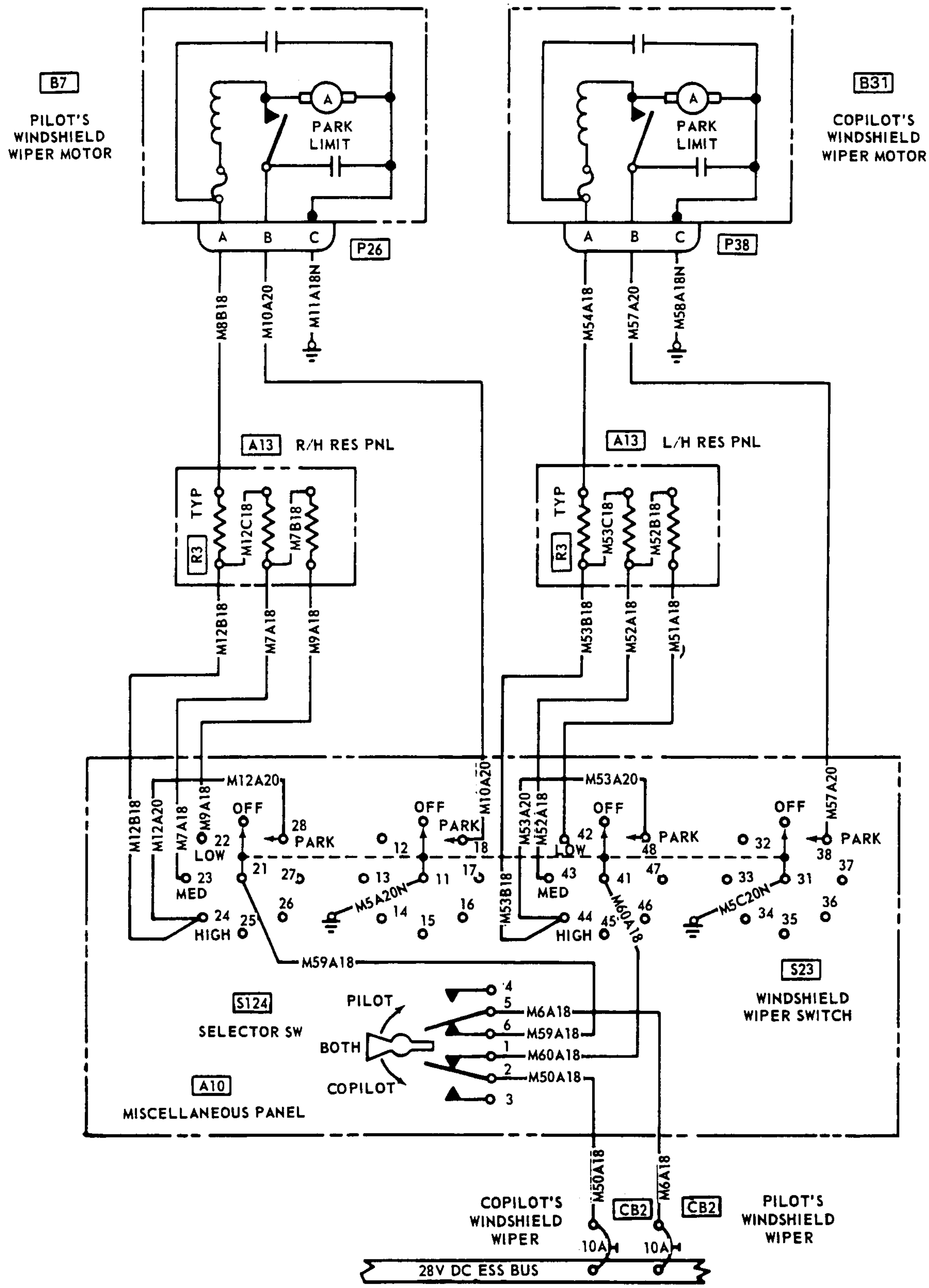
b. Place converter shaft through hole in cabin and position head guard assembly over motor-converter. Align holes in head assembly and windshield wiper support with holes in cabin, and install mounting screws and connect electrical receptacle.

c. Operate the motor-converter so that wiper shaft is stopped in the PARK position.

d. Install wiper arm and blade assembly on serrated shaft. Blade will be parallel to and 5.0 to 5.5 inches below the windshield wiper stop, with a slight upward pressure being applied to arm.

e. Tighten Allen head screw clamping wiper arm to shaft, install washer and mounting bolt. Safety the Allen screw to mounting bolt.

f. Using wrench (T70) adjust pressure of blade on windshield to 4.5 to 5 pounds measured at intersection of wiper blade and wiper arm.



UH-1H-II-M-12WWS1

Figure 1. Windshield wiper system

CAUTION

Do not operate wiper on dry windshields. Install 3/32 inch cotter key in standoff holes before operating.

g. With battery switch ON and wiper circuit breaker in, using wiper control switch, operate the wiper through all speeds, and return to the PARK position.

CAUTION

Testing of the windshield wiper with blade raised clear of windshield should be done in small increments. Do not allow blade to operate fast enough to cause whipping, this can bend wiper arm.

h. Remove 3/32 inch cotter key from standoff holes and carefully lower blade onto windshield.

REAR VIEW MIRROR

1. REAR VIEW MIRROR.

2. Description — Rear View Mirror. The helicopter is equipped with an adjustable rear view mirror located outside the forward cabin below the pilots lower window. This mirror, when properly adjusted, enables the pilot to visually check the operation of the external cargo suspension hook. When the helicopter is employed on missions which do not require use of the external cargo suspension, the rear view mirror may be covered or removed and stowed.

3. Removal — Rear View Mirror.

a. Remove bolts, washers, nuts and/or quick-release pins, which attach braces and supports to structure and remove mirror assembly from helicopter.

b. To remove mirror from brace assembly, remove mirror cover and spring pins from adjustment handles.

4. Inspection — Rear View Mirror.

a. Inspect mirror for cracks, crazing or hazy (clouded) areas on mirror glass.

b. Inspect mirror frame for security and damage.

c. Inspect braces for damage, dents, cracks, and loose or missing hardware.

d. Inspect all pip pins for positive locking.

5. Replacement — Rear View Mirror. If mirror exceeds inspection requirements, replace mirror assembly.

6. Installation — Rear View Mirror.

a. Install braces and supports to structure, using previously removed bolts, washers, nuts, and/or quick-release pins.

b. Position rear view mirror and align mounting holes.

c. Screw adjustment handles through mounting holes. Adjust mirror to desired angle, tighten adjustment handles, and insert spring pins in threaded ends of handles.

d. Slide protective cover over mirror and fasten holding snap.

7. Adjustment — Rear View Mirror.

a. Remove spring pin and loosen adjustment handles.

b. Manually adjust mirror to desired angle.

c. Tighten adjustment handles and insert spring pins.

CHAPTER 13

ENVIRONMENTAL CONTROL SYSTEM

This chapter contains supplements covering customer — selected optional equipment. Each supplement should be inserted in the chapter in alphabetical order.

HEATING SYSTEM

1. BLEED AIR HEATER AND DEFROSTER INSTALLATION.

2. Description — Heater and Defroster Installation. The helicopter is equipped with a heater- defroster system which uses engine bleed air mixed with ambient air routed through a distribution system to cabin outlets. Temperature of the heated air is controlled by means of a thermostat type valve, located in the distribution duct, which pneumatically governs the ratio of the quantity of bleed air to ambient air. The thermostat control is located on the right hand doorpost and linked to the thermostat by a flexible cable. The distribution system carries heated air from the mixing valve, under the cabin floor on the right side, to a heat/defog selector valve, which enables the pilot to direct air to either the heat outlets at the pedestal or to the windshield defog nozzles. Two additional outlet positions are provided at the right and left doorposts. Air for these outlets is diverted from the main duct by a pilot controlled selector valve which provides control over the quantity of air diverted.

An exhaust muff heater may be installed, replacing the existing bleed air heater.

3. Troubleshooting — Bleed Air Heater and Defroster Installation.

NOTE

Troubleshoot The Applicable Bleed Air Heat System In Accordance With The Following Charts.

Before Using This Table, Be Sure All Normal Operational Checks Have Been Performed.

Table 1. Troubleshooting — Bleed Air Heater Defroster Installation

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. No voltage with circuit breakers closed.

STEP 1. Check for faulty circuit breaker.

Replace circuit breaker if defective. (Chapter 9.)

2. Circuit breaker trips.

STEP 1. Check for faulty electrical circuits.

Replace electrical circuit if defective.

STEP 2. Check for faulty circuit breaker.

Replace circuit breaker if defective. (Chapter 9.)

3. Heater will not turn on.

STEP 1. Check for faulty electrical circuits.

Repair electrical circuit if defective.

Table 1. Troubleshooting — Bleed Air Heater Defroster Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for bleed air switch.

Replace switch if defective.

STEP 3. Check for faulty overheat relay.

Replace overheat relay if defective. (Chapter 9.)

STEP 4. Check for faulty overheat switch.

Replace overheat switch if defective.(Chapter 9.)

STEP 5. Check for faulty bleed air valve.

Replace bleed air valve if defective. (Paragraph 5.)

4. Bleed air opens when switch is in OFF position and closes when switch is in ON position.

STEP 1. Check for faulty circuit.

Repair circuit if defective.

5. No air flow.

STEP 1. Check for faulty bleed air valve motor.

Replace bleed air valve motor if defective.

STEP 2. Check for faulty bleed air switch.

Replace bleed air switch if defective.

STEP 3. Check for faulty bleed air switch.

Replace bleed air switch if defective. (Chapter 9.)

STEP 4. Check for faulty overheat relay.

Replace overheat relay if defective.(Chapter 9.)

6. Bleed air valve will not close.

STEP 1. Check for faulty circuit.

Repair circuit if defective.

Table 1. Troubleshooting — Bleed Air Heater Defroster Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for faulty bleed air valve motor.

Replace bleed air valve if defective. (Paragraph 5.)

STEP 3. Check for faulty Bleed air switch.

Replace bleed air switch if defective. (Chapter 9.)

STEP 4. Check for faulty overheat relay.

Replace overheat relay if defective.(Chapter 9.)

STEP 5. Check for jammed bleed air valve.

Replace valve if defective. (Paragraph 5.)

7. Cannot control air flow at door post outlet.

STEP 1. Check for faulty electrical circuit.

Repair circuit if defective.

STEP 2. Check for faulty doorpost outlet switch.

Replace doorpost outlet switch if defective. (Chapter 9.)

STEP 3. Check for faulty doorpost outlet switch.

Replace doorpost outlet valve if defective. (Paragraph 5.)

STEP 4. Check for jammed or broken flapper valve.

Repair or replace flapper valve if defective. (Paragraph 5.)

STEP 5. Check for faulty actuator valve.

Replace actuator valve if defective. (Paragraph 5.)

8. Doorpost outlets do not turn OFF when HEAT DEFOG selector is in DEFOG position.

STEP 1. Check for faulty actuator.

Replace actuator if defective. (Chapter 9.)

Table 1. Troubleshooting — Bleed Air Heater Defroster Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for faulty microswitch.

Replace microswitch if defective. (Paragraph 5.)

9. HEAT/DEFOG selector does not operate.

STEP 1. Check for faulty linkage.

Repair or replace faulty linkage as necessary. (Paragraph 5.)

STEP 2. Check for faulty flapper valve.

Replace flapper valve if defective. (Paragraph 5.)

10. No air flow with heater turned ON.

STEP 1. Check for obstructed bleed air line.

Clean or replace bleed air line. (Paragraph 5.)

STEP 2. Check for faulty electrical circuits.

Repair defective circuits.

STEP 3. Check for faulty mixing valve.

Replace mixing valve if defective. (Paragraph 5.)

STEP 4. Check for loose or obstructed thermostat pneumatic tube.

Repair or replace tube as required. (Paragraph 5.)

STEP 5. Check for faulty thermostat.

Replace thermostat if defective. (Chapter 9.)

11. Air to outlets too hot.

STEP 1. Check for faulty mixing valve.

Replace mixing valve if defective. (Paragraph 5.)

STEP 2. Check for faulty thermostat.

Replace thermostat if defective. (Chapter 9.)

Table 1. Troubleshooting — Bleed Air Heater Defroster Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

12. Air to outlets too cool.

STEP 1. Check for restricted bleed air line.

Repair or replace bleed air line. (Paragraph 5.)

STEP 2. Check for faulty mixing valve.

Replace mixing valve if defective. (Paragraph 5.)

13. No air from outlets.

STEP 1. Check for obstructed bleed air line.

Repair or replace line as necessary. (Paragraph 5.)

STEP 2. Check for faulty mixing valve.

Replace mixing valve if defective. (Paragraph 5.)

14. No heated air at outlets.

STEP 1. Check for disconnected or broken pneumatic line between mixing valve and thermostat.

Repair or replace line as required. (Paragraph 5.)

15. Air at outlets not hot with thermostat set at above midpoint.

STEP 1. Check for faulty thermostat.

Replace thermostat if defective. (Chapter 9.)

STEP 2. Check for loose thermostat knob.

Tighten thermostat knob if loose.

STEP 3. Check for faulty thermostat element.

Replace thermostat if element defective. (Chapter 9.)

STEP 4. Check for faulty limit switch.

Replace limit switch if defective. (Chapter 9.)

Table 1. Troubleshooting — Bleed Air Heater Defroster Installation (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

16. Air at outlets full hot with thermostat set below midpoint.

STEP 1. Check for loose thermostat knob.

Tighten knob as required.

STEP 2. Check for faulty thermostat element.

Replace thermostat if element defective. (Chapter 9.)

STEP 3. Check for crimpled or obstructed line from mixing valve.

Repair or replace line as necessary. (Paragraph 5.)

17. Heater shuts off after a short period.

STEP 1. Check for faulty temperature limit switch.

Replace temperature limit switch if defective. (Chapter 9.)

18. Heater oscillates on and off.

STEP 1. Check for faulty temperature limit switch.

Replace temperature limit switch if defective. (Chapter 9.)

19. Heater will not shut off in overheated condition.

STEP 1. Check for faulty temperature limit switch.

Replace temperature limit switch if defective. (Chapter 9.)

4. DUCTS, NOZZLES, REGISTERS, GASKETS AND MISCELLANEOUS VALVES.

5. Removal — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. Remove attaching hardware and/or clamps and remove component.

6. Inspection — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves.

a. Inspect hoses for cracks, corrosion, wear and deterioration.

b. Inspect nozzles, registers and valves for damage and serviceability.

c. Inspect gaskets for damage.

d. Inspect duct screens for obstructions, cuts and cleanliness.

e. Inspect flexible air ducts for damage and/or deterioration exceeding the following:

(1) Silicone damage in excess of 3.00 inches in length and 1.50 inches wide.

(2) Maximum of two repairs per foot of duct.

NOTE

No more than 3 percent of surface area may be repaired.

7. Repair or Replacement — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves.

a. Replace damaged or unserviceable hoses.

b. Replace nozzles, registers, valves, gaskets which do not meet inspection requirements.

c. If necessary, clean and remove obstructions from dust screens. Replace screens if cut or damaged.

d. Repair flexible air ducts as follows:

(1) Clean damaged with Xylene (C-347) or Toluene (C-306). Allow cleaned area to dry a minimum of 30 minutes.

(2) Apply a brush coat of sealing compound (C-308) on damaged area with a 0.5 inch overlap from edge of damaged area.

(3) Smooth and cure by air drying a minimum of two hours at room temperature or until adhesive is dry to the touch.

NOTE

For repair of damage to the fiber glass cloth, the limitation is no more than 10 percent of surface area after completion of repair.

(4) Clean the complete circumference of the air duct in the vicinity of damaged area with Xylene (C-347) or Toluene (C-306). Allow cleaned area to air dry a minimum of 30 minutes.

(5) Use brush to apply a thin coat of sealing compound (C-308) to the complete circumference of the duct in the damaged area and smooth out adhesive.

(6) Cut a piece of 0.010 thick fiber glass cloth (C-404) if sufficient size to cover the complete circumference of the duct, with a one inch overlap of the damaged area.

(7) Wrap fiber glass cloth around duct and smooth out.

(8) Allow to air dry a minimum of two hours or until dry to touch before handling.

8. Installation — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. Install component and secure with attaching hardware and/or clamps.

AIR COOLING SYSTEM

1. AIRSCOOP ASSEMBLIES — VENTILATION

2. Description — Air Scoop Assemblies — Ventilation. Volume and directional flow of air into cabin is controlled by one valve in each of two forward scoops and two valves in each of two aft scoops. The air scoops are located in cabin roof. Each scoop pan is vented by a tube to an opening in roof skin to prevent excessive moisture in the scoop.

NOTE

With the combustion (auxiliary) heater installed, cabin air may be changed by turning on the blowers without lighting the heater.

3. Removal — Air Scoop Assemblies — Ventilation.

a. Remove screws from scoop assemblies on top of cabin roof and remove scoop.

b. Use a sharp, non-metallic instrument for separating scoop of either forward assembly from top cabin skin.

NOTE

Pan sections of air scoop assemblies are riveted to roof section and are not removable.

c. Pull drain tube assembly from pan assembly nipple inside cabin roof.

d. Remove the screws attaching air control valve to the pan and remove the valve from the assembly.

NOTE

The air control valve may be removed as a unit from inside the cabin without removing either the pan or air scoop.

4. Inspection — Air Scoop Assemblies — Ventilation.

a. Check air scoops and valves for security of mounting and condition.

b. Check air valves for freedom of operation.

c. Inspect ventilation system and drain tubes for obstructions.

5. Installation — Air Scoop Assemblies — Ventilation.

a. Position control fitting on pan assembly, align holes and install attaching screws.

b. Place a bead of zinc chromate putty (C-200) on mating sections of roof skin (forward scoops only), position pan and align screw holes.

c. Position scoop assembly on pan assembly, align holes and install screws.

WINTERIZATION EQUIPMENT

1. CABIN THERMOSTAT.

2. Description — Cabin Thermostat. A thermostat which controls output of combustion heater when TEMP. CONT. switch is at THERMO position, is mounted on outboard side of distribution valve below cabin floor near right door post. A control dial on door post changes setting of thermostat through a flexible cable.

3. Removal — Cabin Thermostat.

a. Remove floor panel at right side of cabin behind door post for access to distribution valve and thermostat.

b. Be sure electrical power is off. Disconnect electrical connector from thermostat.

c. Disconnect flexible control cable from thermostat.

d. Remove mounting screws to detach thermostat from mounting pad on valve assembly.

4. Inspection — Cabin Thermostat.

a. Check thermostat for operation.

b. Check thermostat and thermostat dial for security of mounting.

c. Check electrical leads on thermostat for security.

5. Installation — Cabin Thermostat.

a. Position replacement thermostat on side of valve and secure with mounting screws.

b. Connect control cable and electrical connector to thermostat.

c. Make operational check before reinstalling floor plate.

6. HEATER AIR PRESSURE SWITCHES.

7. Description — Heater Air Pressure Switches. Two air pressure actuated switches are mounted in brackets on front wall of heater compartment and connected by air hoses to combustion air blower and to heater plenum. Electrical circuits to heater lockout relay are such that power to heater ignition and fuel train will be shut off if either blower fails.

8. Inspection — Heater Air Pressure Switches.

a. Check switches for operation and security of mounting..

b. Check security of electrical connections and security and condition of air hoses.

9. Removal — Heater Air Pressure Switch.

a. Open heater compartment doors.

b. Be sure electrical power is off. Disconnect electrical connector from pressure switch being removed.

c. Disconnect air hose from fitting at bottom of switch assembly.

d. Remove mounting nuts to detach switch from bracket.

10. Installation — Heater Air Pressure Switch.

a. Assemble fittings from removed switch on replacement switch assembly, using new gasket.

b. Install switch assembly, with ports down for self draining, on mounting bracket.

c. Connect air hose to switch fitting.

d. Connect and lockwire electrical connector.

e. Close compartment after operational check.

11. HOT AIR MIXING VALVE.

12. Description — Hot Air Mixing Valve. The hot air mixing valve controls the air to maintain the desired temperature of air routed to the cabin. The valve assumes its position as a result of increasing or decreasing pressures, as dictated by the remote sensor, using bleed air through the actuator to drive the butterfly to the correct position.

13. Removal — Hot Air Mixing Valve.

a. Disconnect electrical plug from sensor on mixing valve. Stow electrical plug.

b. Remove clamp, screw, washer, and nut and detach duct from capped outlet port.

c. Remove hardware attaching duct to support bracket.

d. Remove clamp, screw, washer, and nut and detach duct from mixing valve. Remove duct from helicopter.

e. Remove clamp, screw, washer, and nut from flexible coupling and detach flexible coupling from mixing valve.

f. Remove clamp, screw, washer, and nut from aft post of mixing valve. Detach duct from mixing valve.

g. Remove "V" clamp, screw, washer, and nut from forward port of mixing valve.

h. Remove upper clamp, screw, washer, and nut from vertical flexible coupling and detach elbow and horizontal flexible coupling. Remove elbow and coupling from helicopter.

14. Inspection — Hot Air Mixing Valve. Inspect hot air mixing valve for damage, corrosion, and general condition.

15. Replacement — Hot Air Mixing Valve. Replace hot air mixing valve if inspection reveals damage or corrosion.

16. Installation — Hot Air Mixing Valve.

a. Position mixing valve to plenum with sensor aft. Secure mixing valve to plenum with existing "V" clamp.

b. Remove plug from flexible coupling in plenum and insert elbow into coupling. Secure with clamp, screw, washer, and nut.

c. Secure other end of elbow to flexible coupling with clamp, screw, washer, and nut.

d. Secure flexible coupling to mixing valve with clamp, screw, washer, and nut.

e. Position duct on aft flange of mixing valve and secure duct to valve with clamp, screw, washer, and nut.

f. Route duct to lower flange of temperature control valve and secure duct to valve with clamp, screw, washer, and nut.

g. Secure duct to fuselage bulkhead with clamps, screws, brackets, spacers, washers, and nuts in two places approximately 18 inches apart.

h. Attach duct to outboard port of mixing valve. Secure duct with clamp, washer, and nut.

i. Route duct forward to capped air outlet and secure to outlet with clamp, screw, washer, and nut.

CAUTION

Install rubber channel in two places where duct exerts pressure on stringers to prevent chafing of ducts.

j. Unstow electrical plug near mixing valve and attach to sensor on aft side of mixing valve.

17. TEMPERATURE CONTROL VALVE.

18. Description — Temperature Control Valve. The temperature control valve senses the air temperature in the distribution ducts and controls the hot air mixing valve by increasing or decreasing bleed air pressure by positioning the flapper valve to maintain the selected temperature.

19. Removal — Temperature Control Valve.

a. Disconnect tube from distribution valve and tube.

b. Remove brackets that attach tubing to lower end of bulkhead fitting. Disconnect tubing from reducing adapter in bleed air line and remove.

c. Disconnect tubing from temperature control valve.

d. Remove tubing from bulkhead fitting and disconnect from temperature control valve.

e. Remove clamp that secures duct to elbow.

f. Remove elbow and gasket from temperature control valve.

g. Remove clamp that secures duct to temperature control valve.

h. Remove clamp that secures duct to temperature control valve.

i. Remove bolts that secure temperature control valve to cabin deck and remove temperature control valve.

20. Inspection — Temperature Control Valve. Inspect temperature control valve for corrosion, damage, and general condition.

21. Replacement — Temperature Control Valve. Replace temperature control valve if damage exceeds inspection requirements.

22. Installation — Temperature Control Valve.

a. Remove cover on right side of deck.

b. Position temperature control valve through hole in cabin deck and secure with bolts.

c. Position duct on aft port of temperature control valve and secure duct to temperature control valve with clamp, screw, washer, and nut.

d. Position gasket on top flange of temperature control valve. Position elbow on temperature control valve and secure with screws.

e. Position duct on elbow and secure with clamp, screw, washer, and nut.

f. Position temperature control valve on duct and secure with clamp.

g. Remove cap from existing bulkhead fitting at right hand forward side of deck. Install tubing from bulkhead fitting to inboard connection of temperature control valve.

h. Remove plug from deck and install bulkhead fitting and jamnut.

i. Install tubing from bulkhead fitting to fitting on temperature control valve.

j. Attach tubing to lower end of bulkhead fitting, previously installed and route and attach to reducing adapter in hot air bleed line on left side of fuselage. Secure tubing to bulkhead with brackets, screws, washers, and nuts.

k. Remove cap from tube and attach flexible tube. Route tube beneath distribution valve and connect to sensor switch.

l. Unstow electrical plug near hot air mixing valve and attach sensor on aft side of hot air mixing valve.

23. OVERHEAT SWITCH.

24. Description — Overheat Switch. The overheat switch is temperature sensitive and serves to actuate the overheat relay, thus turning heater off should an overheat condition occur.

25. Removal — Overheat Switch.

a. Disconnect electrical connector.

b. Remove attaching hardware and remove switch.

26. Inspection — Overheat Switch.

a. Visually inspect switch for loose connector pins, corrosion and any damage to case that should impair normal operation.

b. Inspect for proper switch actuation points as follows:

(1) Apply a controlled source of heated air to switch and verify that switch contacts close at 260° ± 6°F, (127° ± 3°C).

(2) Allow switch to cool and verify that switch contacts open at 225° ± 8°F (107° ± 5°C).

27. Replacement — Overheat Switch. Replace switch if it fails to meet inspection requirements.

28. Installation — Overheat Switch.

a. Position switch on mounting and secure attaching hardware.

b. Connect and tighten electrical connector.

CHAPTER 14

HOIST AND WINCHES

This chapter contains supplements covering customer-selected optional equipment. Each supplement should be inserted in the chapter in alphabetical order.

CARGO SUSPENSION ASSEMBLY

1. CARGO SUSPENSION ASSEMBLY P/N 205-070-900 OR 212-706-103.

2. Description — Cargo Suspension Assembly.

The cargo suspension assembly consists of the cargo hook, mechanical and electrical release for the cargo hook, rear view mirror and a warning light. The cargo suspension hook hangs at approximately the center of gravity, attached to a lateral beam of pylon structure, and extends through an opening in bottom of lower fuselage. Refer to figure 1. Protective covers shall be installed on all open ports and lines.

3. Removal — Cargo Suspension Assembly.

a. Remove access door from front of pylon island in cabin.

b. Ensure electrical power is OFF, then disconnect electrical cable (1, figure 2) of suspension assembly at connector located on right under side of structural lift beam.

c. Detach upper control cable (7) from clamp (8). Remove cotter pin and detach ball terminal of cable connector (6), inboard of pulley bracket (4).

d. Remove cotter pin, nut (9), washers (10), and suspension bolt (11), securing upper ends of cargo suspension assembly to bracket (12), and remove suspension assembly.

4. Inspection — Cargo Suspension Assembly.

a. Inspect electrical cable (1, figure 2) for security and general condition.

b. Inspect cable assemblies (2 and 7) for frayed or broken strands.

c. Inspect wiring and cable assemblies for sufficient slack to allow full swing of cargo hook.

d. Visually inspect cargo hook for nicks, scratches, corrosion, and general condition.

5. Installation — Cargo Suspension Assembly.

a. Place cargo suspension assembly in install position (beneath structural lift beam), with free end of cargo suspension assembly aligned with hole in bracket (12, figure 2) and install bolt (11), washers (10), nut (9), and cotter pin.

b. Engage ball terminal of upper control cable (7) in connector (6) and secure with cotter pin.

c. Attach conduit of upper control cable (7), with support clamp (8) and secure with screw to bracket of beam. Adjust so that ball terminal on lower end of cable, (on hook assembly), has 0.10 inch clearance below bottom side of lever (17), with no other slack in cable. (Refer to figure 2, View A).

6. Lubrication — Cargo Suspension Assembly.

When cargo hook is used daily, apply a small amount of corrosion preventive compound (C-110) each day to end of load beam where it engages latch. Lubricate link at bracket (12, figure 2). Wipe off excess grease.

7. Rigging and Operations Check — Cargo Suspension Assembly.

a. Perform rigging check as follows:

(1) With pedal (20, figure 2) full aft, and with cable of suspension assembly loose in support clamp (8), adjust actuating cable (2), at turnbuckle (24), to provide 20 to 24 pounds tension. Secure turnbuckle with lockwire (C-405).

(2) Check at hook (18) for correct position of parts with load beam of hook (18) latched. Stopbolt (16) of lever (17) should be in contact with top of cargo hook case, with lever positioned parallel to plane of yoke attachment bolts. Lower cable ball terminal shall extend 0.12 to 0.18 inch beyond (below) seat of latch lever to provide proper slack.

1. External cargo mechanical release
2. External cargo electrical release switch
3. Cargo release - OFF - ARM switch - misc. panel
4. External cargo suspension unit
5. Mechanical release cable assembly

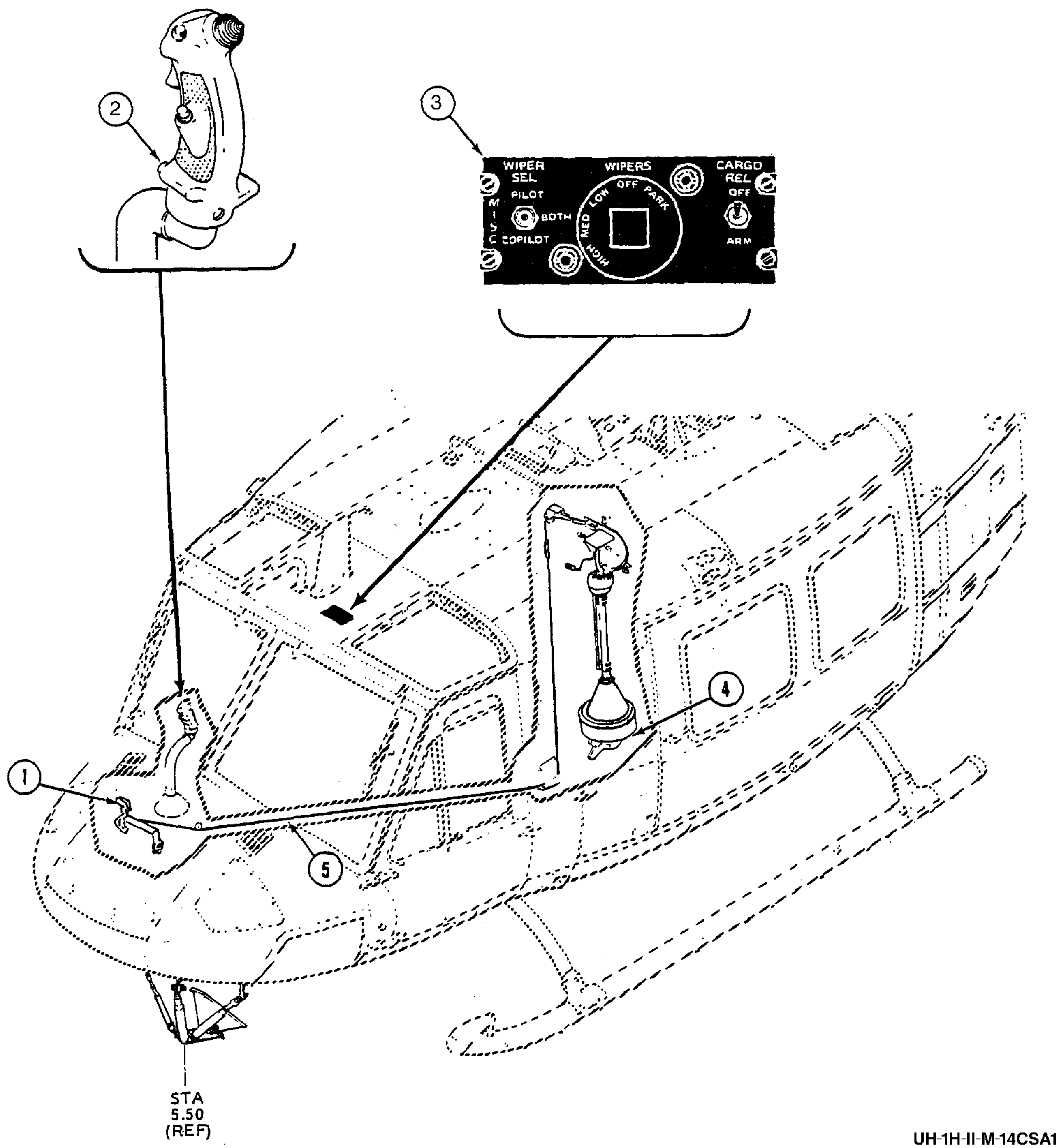


Figure 1. External cargo suspension

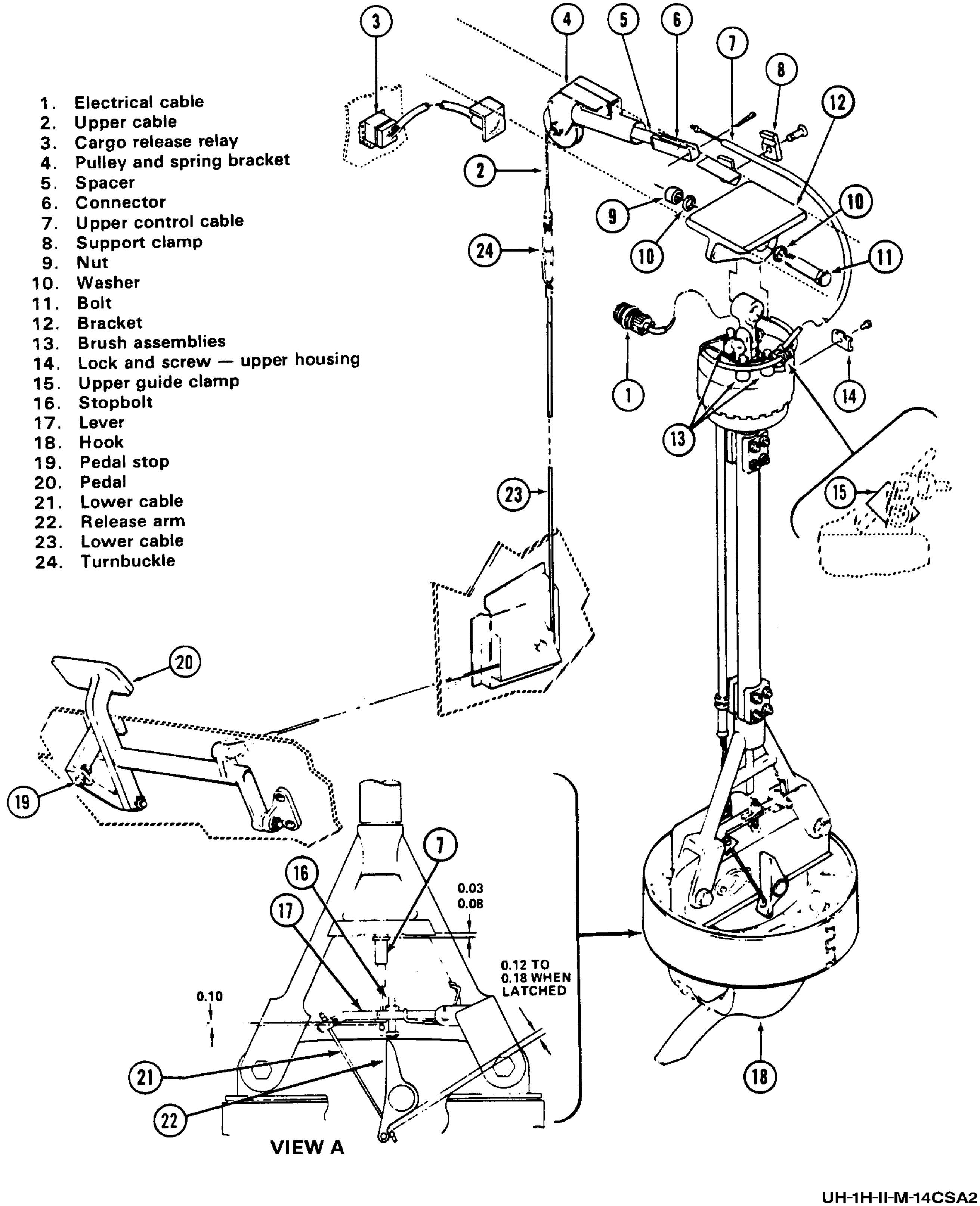


Figure 2. Cargo suspension

(3) Adjust slack of upper control cable (7) conduit (cable) housing between upper guide clamps (15) and yoke with proper dimension of 0.030 to 0.080 inch. Refer to figure 2, View A. Place cable terminal in connector (6) and slide conduit until gap of 0.10 inch is maintained at lever (17), then clamp cable in place with support clamp (8).

(4) Check that electrical and mechanical cables have enough slack to allow full swing of suspension assembly.

b. Perform operational check as follows:

(1) With at least a 20 pound load on cargo hook, push pedal forward. Cargo hook should release, but cable spring in upper pulley bracket (4) should not bottom out. Adjust pedal if necessary.

(2) With pedal forward, lever (17) at top of cargo hook should be full up, but not bottom against end of cable conduit or clamp.

(3) When pedal is released, cable should return to locking position.

(4) Direct assistant to observe cargo hook and reset to closed position, as required.

(5) Check cargo release circuit breaker in, turn battery ON. Position NON-ESS BUS switch to MANUAL.

(6) Check that cargo release armed light illuminates when light is pressed and extinguishes, when released.

(7) Position cargo release switch to ARM. The cargo release armed light should illuminate. Depress cargo release button on cyclic stick and hold for two or three seconds. The cargo hook releases.

(8) Position cargo release switch to OFF. The cargo release armed light should be extinguished. Depress cargo release button on cyclic stick and hold for two or three seconds. The cargo hook should NOT release.

(9) Turn battery OFF.

8. Troubleshooting — Cargo Suspension Assembly. Troubleshoot the cargo suspension assembly in accordance with Table 1.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 1. Troubleshooting — Cargo Suspension Assembly

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Electrical cargo release inoperative.

STEP 1. Ensure that 28 Vdc is present at receptacle when CARGO RELEASE switch is depressed.

If 28 Vdc is present, replace faulty solenoid. (Chapter 9.)

STEP 2. Depress CARGO RELEASE switch on pilot cyclic stick and check for 28 Vdc at receptacle.

If 28 Vdc is not present at receptacle with switch depressed, replace faulty switch. (Chapter 9.)

STEP 3. Depress CARGO RELEASE switch on copilot cyclic stick and check for 28 Vdc at receptacle.

If 28 Vdc is not present at receptacle with switch depressed, replace faulty switch. (Chapter 9.)

Table 1. Troubleshooting — Cargo Suspension Assembly (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 4. Depress CARGO RELEASE switch (pilot or copilot) and check for 28 Vdc at receptacle.

If 28 Vdc is not present, replace circuit breaker. (Chapter 9.)

STEP 5. Check wiring and electrical continuity.

Repair or replace defective wiring. (Chapter 9.)

2. Mechanical cargo release malfunctioning.

STEP 1. Depress mechanical CARGO RELEASE pedal and check that cargo hook releases.

If cargo hook does not open, replace broken cable, damaged pulley, or secure cable connections.(Paragraph 9.)

STEP 2. Depress mechanical CARGO RELEASE pedal and check that cargo hook releases.

If cargo hook does not release, adjust cable(s). (Paragraph 7.)

3. Cargo suspension assembly power failure.

STEP 1. Ensure that circuit breaker does not open when cargo suspension assembly is energized.

If circuit breaker opens, correct short in system, repair/replace defective wiring, or replace faulty circuibreaker. (Chapter 9.)

9. RELEASE CABLES.

10. Description — Release Cables. The mechanical release system of the cargo suspension assembly is connected by four cable assemblies: lower cable (23, figure 2), upper cable (2), upper control cable (7), and lower control cable (21). The actuating cables are routed through pulleys and fair leads down inside right wall of pylon support structure and forward under cabin floor to the MANUAL CARGO RELEASE pedal (20) and pilots station. The actuating cables are spring loaded by a coil spring in the pulley and spring bracket (4).

CAUTION

Wearing of bolts, screws or pins in the cargo suspension assembly can change the rigging of the mechanical release; and, if they are sufficiently worn, an inadvertent release of external cargo can result. Wear of the hardware attaching the cargo suspension yoke to the cargo suspension shaft can be determined by removing two of the machine screws or the pin.

11. Removal — Release Cables.

a. Remove floor access door and pylon access door in cabin.

b. Disconnect upper control cable (7, figure 2) from connector (6), by removing cotter pin and lifting out ball terminal.

c. Cut lockwire and disconnect turnbuckles (24) from lower and upper actuating cables (2 and 23).

d. To remove upper actuating cable (2) proceed as follows:

(1) Upper pulley and spring bracket (4) may be left in place, or may be removed, by removing two attaching screws, washers, and nuts. Lift bracket from lift beam.

(2) Detach ball terminal of upper actuating cable (2) from connector (6) by removing cotter pin.

(3) Remove connector (6), spacer (5), split guide, and spring from end of upper actuating cable (2).

(4) Remove fairlead from pulley at bracket (4) and pull upper actuating cable (2) out of bracket. Remove bolts, nut, and washers to remove pulley from bracket.

e. To remove lower actuating cable (23) proceed as follows:

(1) Disconnect clevis on forward end of lower actuating cable (23) from arm on pedal (20) by removing cotter pin, washer, and pin.

(2) Remove fairleads from lower pulley and bracket in pylon compartment and from three pulleys under cabin floor. One pulley is located just aft of fuselage Station 52 bulkhead; two pulleys are just forward of Station 102.

(3) Carefully pull lower cable (23) forward through bulkhead grommets.

(4) Remove and replace pulleys, with attaching bolts, nuts, and washers, as necessary.

12. Inspection — Release Cables.

a. Inspect pulleys for wear and freedom of rotation.

b. Inspect lower and upper actuating cables (2 and 23, figure 2) for broken strands, frayed wires, or wear.

c. Inspect pulley brackets and grommets for cracks, wear, and proper installation.

13. Repair or Replacement — Release Cables.

a. Replace worn and unserviceable lower or upper cables (2 and 23, figure 2).

b. Replace pulleys showing wear, rough bearings or deterioration.

c. Replace pulley brackets, grommets and fairleads that show cracks, wear or deterioration.

14. Installation — Release Cables.

a. Install lower cable (23, figure 2) as follows:

(1) Insert threaded terminal of lower cable (23) through hole in Station 23 bulkhead into area under cabin floor.

(2) Route cable through bulkhead grommets and three pulleys below floor, and through lower pulley bracket in pylon compartments. Install fairleads with cotter pins, at pulleys.

(3) Attach clevis terminal of lower cable (23) to arm on pedal (20) with clevis pin, washer, and cotter pin.

b. Install upper actuating cable (2) as follows:

(1) Insert ball terminal end of upper cable (2) from outboard side of upper pulley bracket (4). Pull cable through tube of bracket.

(2) spring, split guide, spacer (5), and connector (6) on end of upper cable (2) inboard of bracket (4). Secure cable ball terminal to connector with cotter pin. Pull parts into tube of bracket.(3).

(3) Install fairlead through outboard side of bracket (4) and install cotter pin to secure upper cable(2).

(4) If removed, place pulley and spring bracket (4) on aft side of support bracket at right lower side of lift beam. Secure with two screws, washers and nuts.

a. Connect lower and upper actuating cables (2 and 23) with turnbuckle (24).

b. Insert ball terminal of upper control cable (7) in connector (6) and secure with cotter pin.

c. Adjust release cables and check mechanical and electrical operation. (Paragraph 6.)

d. Install floor and pylon access doors.

15. Adjustment — Release Cables. (Paragraph 7.)

16. PEDAL ASSEMBLY.

17. Description — Pedal Assembly. A foot pedal (20, figure 2) is provided for manual release of the cargo. The pedal is mounted on the floor at Station 23.00 and is connected to the cargo hook release mechanism by a cable assembly.

18. Removal — Pedal Assembly.

a. Disconnect clevis terminal of lower cable (23, figure 2) from arm of pedal (20) by removing cotter pin and pin.

b. Remove pedal (20) as an assembly by removing five bolts and nuts and washers, to detach stop assembly and eye bracket from Station 23 bulkhead.

19. Inspection — Pedal Assembly.

a. Inspect for wear of bushings in pedal or mounting fittings.

b. Inspect pedal for cracks and deterioration.

20. Repair or Replacement — Pedal Assembly.

a. Replace bushings if unserviceable.

b. Replace pedal assembly having cracks or other damage. No repair permitted.

21. Installation — Pedal Assembly.

a. Align pedal (20, figure 2) as an assembly on front of Station 23 Bulkhead in cabin ahead of pilot seat.

b. Attach eye bracket to structure with two bolts, washers, and nuts.

c. Attach stop assembly with three bolts, washers, and nuts.

d. Check for snug fit of pedal (20) in bracket and stop assembly. Adjust shims on pivot bolts as necessary to eliminate end play and to align pedal with stop (19).

e. Connect clevis terminal of lower cable (23) to arm on pedal (20) with pin and cotter pin.

f. Adjust suspension assembly and perform mechanical and electrical operational check. (Paragraph 7.)

22. MIRROR — CARGO SLING.

23. Description — Cargo Sling Mirror. The cargo sling mirror is located below the nose of the helicopter and attached to the right underside. When adjusted properly the pilot will see a rear view image of external load and ground personnel aiding with the external load hookup. (Refer to figure 3.)

24. Removal — Cargo Sling Mirror. Remove nuts (3, figure 3), washers (2), and bolts (1), or remove three quick release pins (8) and remove mirror as an assembly.

25. Inspection — Cargo Sling Mirror.

a. Inspect brackets and eyebolts (9, figure 3) for cracks, corrosion, and general conditions.

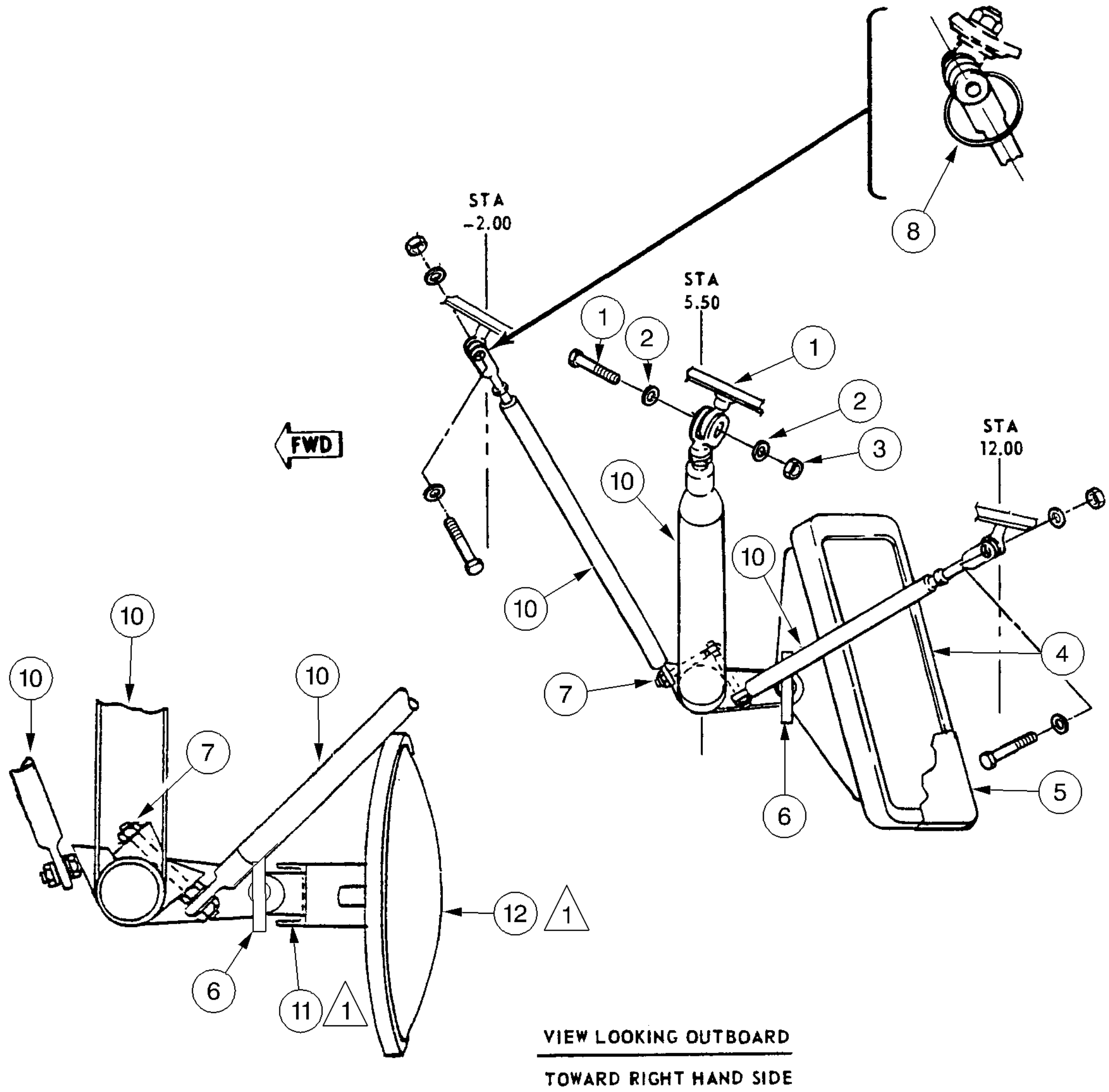
b. Inspect brace supports (10) for nicks, cracks, and corrosion.

c. Inspect mirror (4) or mirror (12) for cracks and clarity.

d. Inspect handles (6) and bolts (7) for security and corrosion.

e. Inspect, if installed, bracket support (11) for security and corrosion.

26. Installation — Cargo Sling Mirror. Install mirror assembly with bolts (1, figure 3), washers (2) and nuts (3) or install the three quick release pins (8).



1. Bolt (3)
2. Washer (6)
3. Nut (3)
4. Mirror (PN 204-070-347-001)
5. Cover
6. Handle
7. Bolt (2)
8. Quick release pin (3)
9. Bracket and eyebolt (3)
10. Brace support (3)
11. Bracket support
12. Mirror (PN 28041)

NOTE

1 Mirror (12) and bracket support (11) are replacements for mirror (4).

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Figure 3. Mirror installation

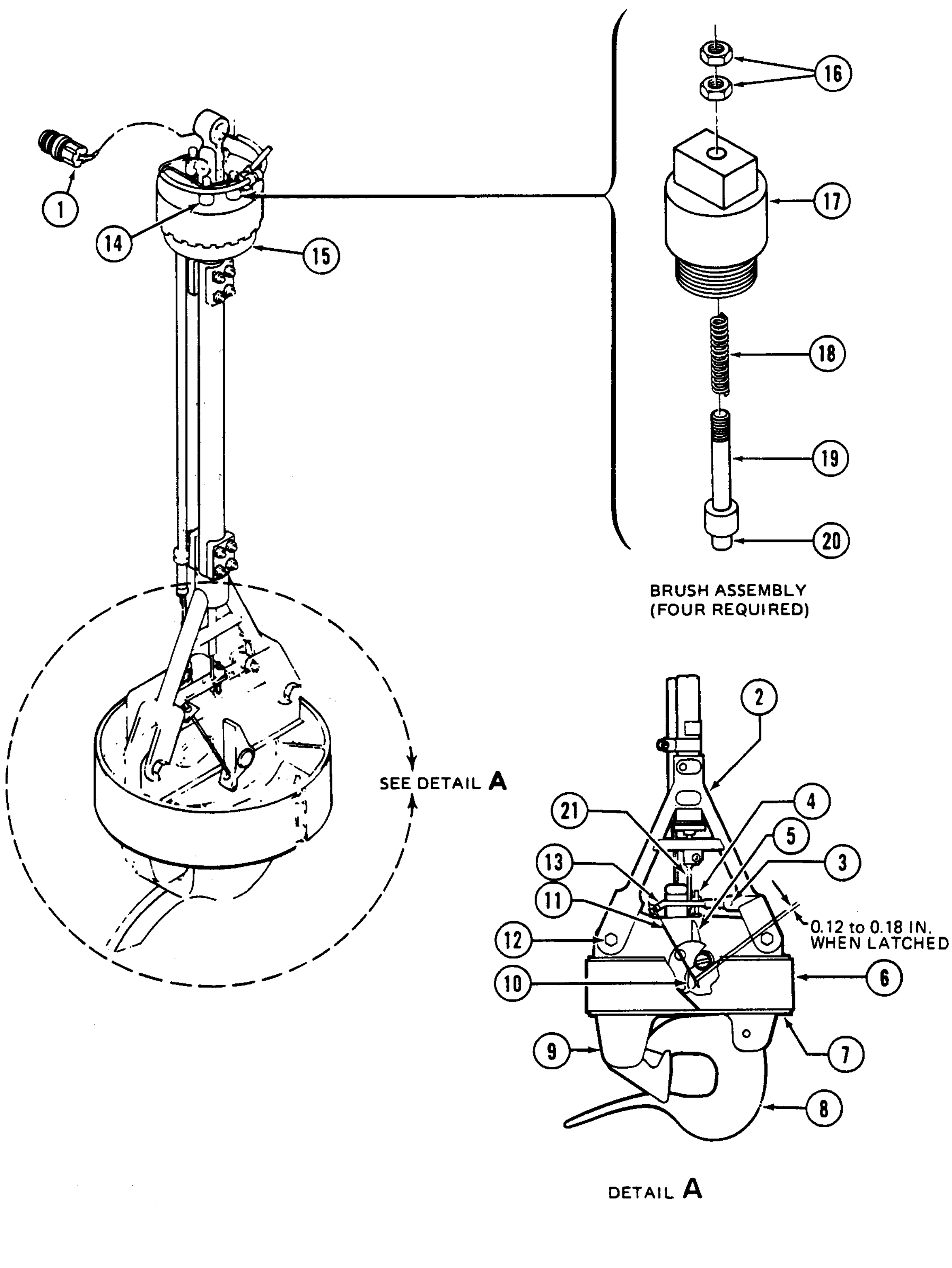


Figure 4. Cargo suspension assembly (Sheet 1 of 2)

1. Electrical cable
2. Yoke
3. Pin
4. Stop screw
5. Release arm
6. Nylon ring
7. Bumper
8. Load beam
9. Cargo hook assembly
10. Internal lever
11. Lower control cable
12. Bolt
13. Cable lever
14. Brush assembly
15. Housing
16. Nuts
17. Case
18. Spring
19. Guide
20. Brush
21. Upper control cable

UH-1H-II-M-14CSA4-2

Figure 4. Cargo suspension assembly (Sheet 2 of 2)

27. CARGO HOOK.

28. Description — Cargo Hook. The cargo hook is a horizontal loading type with an automatic pickup latch and has both electrical and mechanical load release provisions. Cargo quick release can be actuated electrically from a switch located on the pilot cyclic control stick or manually through cables by depressing a foot release pedal that is located between the tail rotor control cables.

29. Removal — Cargo Hook.

a. Disconnect lower connector of electrical cable (1, figure 4) at cargo hook (18).

b. Remove cotter pins securing ball terminals of upper and lower control cables (11 and 21) to cable lever (13). Remove cables from lever.

c. Remove cable lever (13) and spring from yoke (2) by removing pin (3), two spacers and cotter pin.

d. Remove cargo hook assembly (9) from yoke (2) by removing two bolts (12), washers, nuts, and cotter pins.

30. Inspection — Cargo Hook.

a. Inspect cargo hook assembly (9, figure 4) for cracks and damage that would impair serviceability.

b. Inspect hardware for security.

c. Inspect moving parts of cargo hook assembly (9) for wear, deterioration and corrosion.

31. Repair or Replacement — Cargo Hook.

a. Replace cargo hook assembly (9, figure 4) if cracks are evident.

b. Repair surfaces that display corrosion damage.

c. Repair small nicks and scratches by honing method.

32. Lubrication — Cargo Hook. (Paragraph 6.)

33. Installation — Cargo Hook.

a. Align cargo hook assembly (9, figure 4) to yoke (2) with open side of load beam (8) forward. Install two bolts (12), washers and nuts. Use one washer under bolt head and one washer under nut, maximum twelve washers may be used as spacers. Torque nuts 50 to 70 inch-pounds, secure with cotter pins.

b. Align cable lever (13) to yoke (2) with spring and two spacers, secure with pin (3) and cotter pin.

c. If required, install lower control cable (11) to internal lever (10) and cable guide.

d. Connect ball terminal of upper and lower control cable to cable lever (13) and secure with cotter pins.

e. Attach connector of electrical cable (1) to receptacle on cargo hook assembly (9).

f. Adjust cargo suspension assembly and perform mechanical and electrical operational checks. (Paragraphs 4 and 8.)

34. Adjustment — Cargo Hook. (Paragraph 7.)

CHAPTER 15

AUXILIARY POWER PLANT

This chapter contains supplements covering customer-selected optional equipment. Each supplement should be inserted in the chapter in alphabetical order.

CHAPTER 16

MISSION EQUIPMENT.

This chapter contains supplements covering customer-selected optional equipment. Each supplement should be inserted in the chapter in alphabetical order.

EXTERNAL STORES SUPPORT

1. EXTERNAL STORES SUPPORT

2. Description — External Stores Support. Four external stores supports can be installed on the helicopter. Each support assembly consists of a forward and aft support beam attached to the fuselage, a cross beam installed between the two support beams, and two sway braces attached diagonally between the support beams and the center of the cross beam.

3. Removal — External Stores Support.

a. Remove nuts, washers, and bolts attaching sway braces (1, figure 1) to support beams and cross beam. Remove sway braces.

b. Remove nuts, washers, and bolts attaching cross beam (2) to support beams and remove cross beam.

c. Remove nuts, washers, and clevis bolts attaching forward and aft support beams (3 and 4) to fuselage and remove support beams.

4. Cleaning — External Stores Support. Clean parts by washing with a bristle brush and solvent (C-304).

5. Inspection — External Stores Support.

a. Inspect bushings in support beams (3 and 4, figure 1) and in tangs of cross beam (2) for excessive wear and damage.

b. Inspect support beams (3 and 4) and cross beam (2) for corrosion and cracks. Pay particular attention to attaching points of support beams. Perform a dye penetrant inspection, inspecting for fatigue cracks in an area approximately six inches adjacent to the upper attachment point and any other area where indications of cracks are found.

c. Inspect for loose, missing, or improperly installed hardware.

d. Inspect sway braces (1) for damage and excessive wear in clevis mounting holes.

6. Repair or Replacement — External Stores Support.

a. Replace support beams (3 and 4, figure 1) if cracked or if bushings in attachment point are worn sufficiently to allow movement when parts are assembled.

b. Repair small nicks and scratches by polishing out with fine abrasive cloth or paper (C-423). Coat repaired areas with epoxy polyamide primer (C-204).

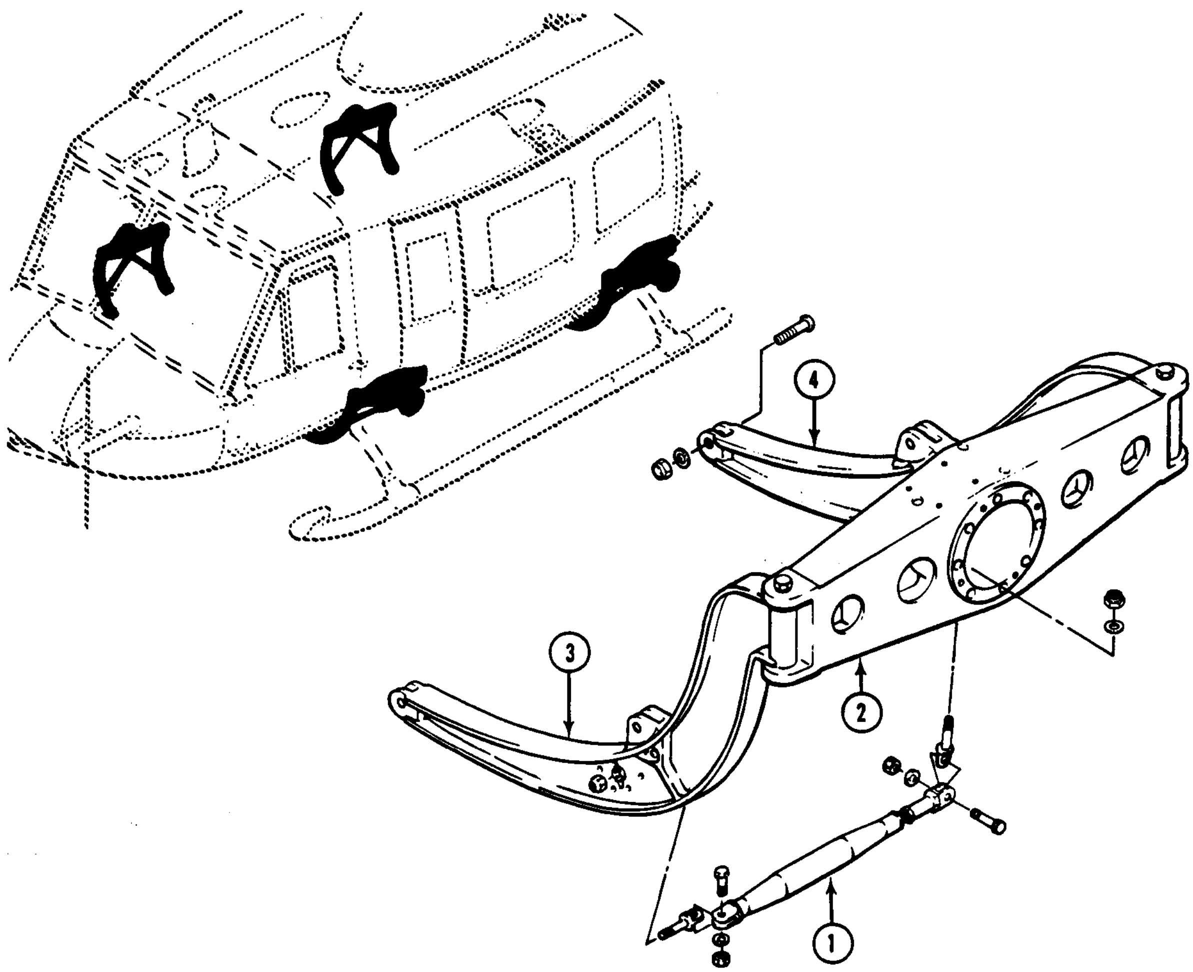
c. Replace sway braces (1) if bent, dented or if riveted clevis end is excessively worn. Adjustable clevis end can be replaced separately.

7. Installation — External Stores Support.

a. Position each support beam (3 and 4, figure 1) on helicopter and secure to structure with clevis bolts, washers, and nuts. Install cotter pins.

b. Position cross beam (2) between outer ends of forward and aft support beams and install attaching bolts, washers, and nuts.

c. Attach sway braces (1) to eyebolts in forward and aft support beams using bolt, washer, and nut. Adjust clevis on sway brace, if necessary, to align with eyebolt in cross beam. Install attaching bolt, washer, and nut.



1. Sway brace assemblies
2. Cross beam
3. Forward support beam
4. Aft support beam

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Figure 1. External stores support assembly

EMERGENCY JETTISON RELEASE MECHANISM

1. EMERGENCY JETTISON RELEASE MECHANISM

2. Description — Emergency Jettison Release Mechanism. A series of cables, actuated by a manually operated jettison lever located by the pilots seat, enables the pilot to mechanically jettison externally carried stores or equipment. These cables are equipped with adjustable fittings which facilitate final rigging and adjustment during installation of stores or equipment on the external stores support.

3. Removal — Emergency Jettison Release Mechanism.

a. Remove access plate from lower fuselage skin below external stores forward support beam.

b. If external stores are installed, disconnect stores release cables from lateral release cables (10, figure 1).

c. Remove three cotter pins, washers, and flat head pins attaching cable assemblies to bellcrank (9). Remove two lateral release cable assemblies (10) from grommet and pulleys.

d. Remove cotter pin, nut, washer, and bolt attaching bellcrank (9) and remove bellcrank.

e. Remove nuts, washers, spacers, screws, and clamps attaching cable guard (11) to pedestal. Remove cotter pin and pin attaching longitudinal release cable (12) to emergency release lever assembly (13). Remove cable guard and grommet (14).

f. Remove cotter pins, pins, nuts, washers, and bolts holding longitudinal release cable pulleys (15) to pulley brackets and remove pulleys.

g. Remove grommets (17) which guide longitudinal release cable (12) and remove release cable.

h. Remove cotter pin, nut, washer, and clevis bolt attaching lever assembly (13) to support assembly (18).

i. Remove nuts, washers, bolts, and spacers attaching support assembly (18) to pedestal and remove support assembly.

4. Cleaning — Emergency Jettison Release Mechanism.

a. Clean lever (13, figure 1), support (18), and bellcrank (9) by washing with a bristle brush and solvent (C-304).

b. Wipe cables with a clean cloth moistened with solvent (C-304).

5. Inspection — Emergency Jettison Release Mechanism.

a. Inspect pulleys for wear, damage, and freedom or rotation.

b. Inspect cables for broken or frayed wires.

c. Inspect grommets for wear.

d. Inspect lever assembly for serviceability and damage.

e. Inspect support assembly bushing for wear.

f. Inspect bellcrank for damage or wear at cable attachment holes and center pivot hole.

6. Repair or Replacement — Emergency Jettison Release Mechanism.

a. Replace worn and unserviceable pulleys and grommets (figure 1).

b. Replace frayed or unserviceable cables.

c. Replace damaged or unserviceable lever assembly.

d. if bushing is worn or unserviceable.

e. Replace bellcrank if cable attachment holes or center pivot hole is worn.

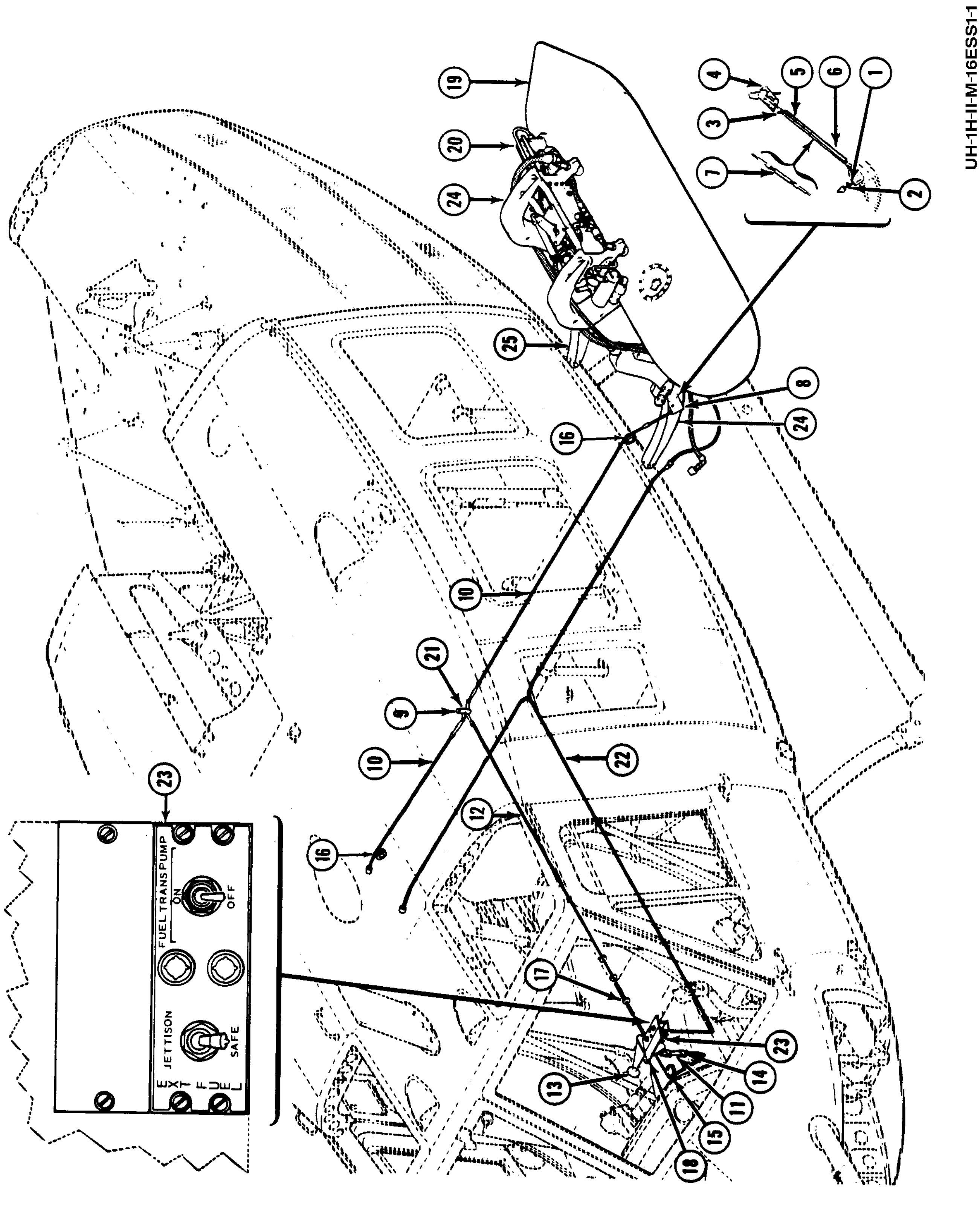

Figure 1. Manual release mechanism (Sheet 1 of 2)

1. Lower cable assembly
2. Grommet
3. Cable assembly
4. Pulley brackets
5. Upper guard tube
6. Lower guard tube
7. Barrel
8. Lateral release cable pulleys
9. Bellcrank
10. Lateral release cable assemblies
11. Cable guard
12. Longitudinal release cable assembly
13. Emergency release lever assembly
14. Grommet
15. Longitudinal release cable pulleys
16. Pulley
17. Grommets
18. Support assembly
19. Auxiliary fuel tank
20. Pylon assembly
21. Manual release mechanism
22. Electrical release controls
23. Control panel
24. Pylon support
25. External stores support assembly

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Figure 1. Manual release mechanism (Sheet 2)

7. Installation — Emergency Jettison Release Mechanism.

a. Position support assembly (18, figure 1) on pedestal and install attaching bolts, spacers, washers, and nuts.

b. Position emergency release lever assembly (13) on support assembly (18) and install attaching clevis bolt, washer, nut, and cotter pin.

c. Thread longitudinal release cable (12) through bulkhead openings and install grommets (17).

d. Position longitudinal release cable pulleys (15) and cable (12) in pulley brackets and install attaching bolts, washers, nuts, pins, and cotter pins.

e. Thread forward end of longitudinal release cable (12) through cable guard (11) and attach to emergency release lever assembly (13) by installing pin and cotter pin.

f. Position cable guard (11) and install grommet (14) and attaching clamps, screws, spacers, washers, and nuts.

g. Position bellcrank (9) and install attaching screw, washer, nut, and cotter pin.

h. Position aft end of longitudinal release cable (12) and inboard end of lateral release cable assemblies (10) on bellcrank (9), and attach with flat head pins, washers, and cotter pins.

i. Position lateral release cables (10) through grommet and pulleys (16).

j. When external stores are installed, connect stores release cables to lateral release cables (10). Adjust and rig release mechanism in accordance with each external store.

k. Reinstall removed access panels.

LITTER RACK SAFETY HARNESS

1. LITTER RACK SAFETY HARNESS.

2. Description — Litter Rack Safety Harness. The litter rack installation accommodates three litters (one above the other) parallel to, and just forward of, the aft cabin passenger compartment aft bulkhead. (Figures 1 and 2). Litters can be quickly installed for transporting patients, or rapidly removed for carrying cargo or personnel. Provisions are also included for the installation of two attendant's seats.

3. Removal — Litter Rack Assembly.

a. Remove attendant's seats (figure 2) as follows:

(1) Disconnect the two leg braces at lower eyebolts by removing the pip pins.

(2) Disconnect the seat back support arms by removing the pip pins from the lower eyebolts and remove seat.

(3) Remove passenger seats, if installed, by pulling back collar on bottom of seat legs.

b. Remove litter cot (figure 1) as follows:

(1) Remove and store two safety belts (21) from each litter (22).

(2) Loosen straps (2) to allow sufficient slack.

(3) Release brackets (3) and remove litter.

c. Remove strap assembly (figure 1) as follows:

(1) Disconnect lower end of strap (2) from tie-down fitting (8) in cabin deck.

(2) Disconnect upper end of strap (2) from suspension fitting (6) in cabin roof and remove strap.

d. Remove the two stanchion assemblies (figure 1) as follows:

(1) Loosen nut (15) on slip-joint of stanchion (9).

(2) Pull back collar on lower end of stanchion to open locking lug and remove stanchion end from floor.

(3) Pull back collar on upper end of stanchion to open locking lugs and remove stanchion end from cabin roof. Remove stanchion.

4. Inspection — Litters/Litter Rack.

a. Check visually for abrasion, tears, and/or worn spots on litter fabric. Remove and replace that material which cannot be restored to its original weight load capacity by repair techniques.

b. Cleaning — Follow instructions sewn to fabric.

c. Fire Retardant Treatment — Follow instructions sewn to fabric.

d. Repairing — Make prompt repairs to seat fabric to prolong service life. Inspect for damage immediately after use and make repairs as follows:

(1) Repair punctured, snagged, or torn areas by sewing in place a patch of material equal to basic material in weight, quality, and color.

(2) Reinforce and darn punctures and small holes (1/2 inch or less).

(3) Trim and turn under frayed edges to make a neat and durable repair.

(4) Use circular patches on small holes and rectangular patches on larger holes, irregular snags, or tears.

(5) Mend a cluster of holes with one suitable patch, after first removing damaged area and turning under all edges.

(6) Do not extend patches over more than one section of cover (seam to seam).

(7) Restitch all open seams. Stitch pattern and type thread will follow as near as possible the type stitch and thread used in original construction of item being repaired.

(8) Repair damaged areas along edge of covers where attaching points are located, by folding a piece

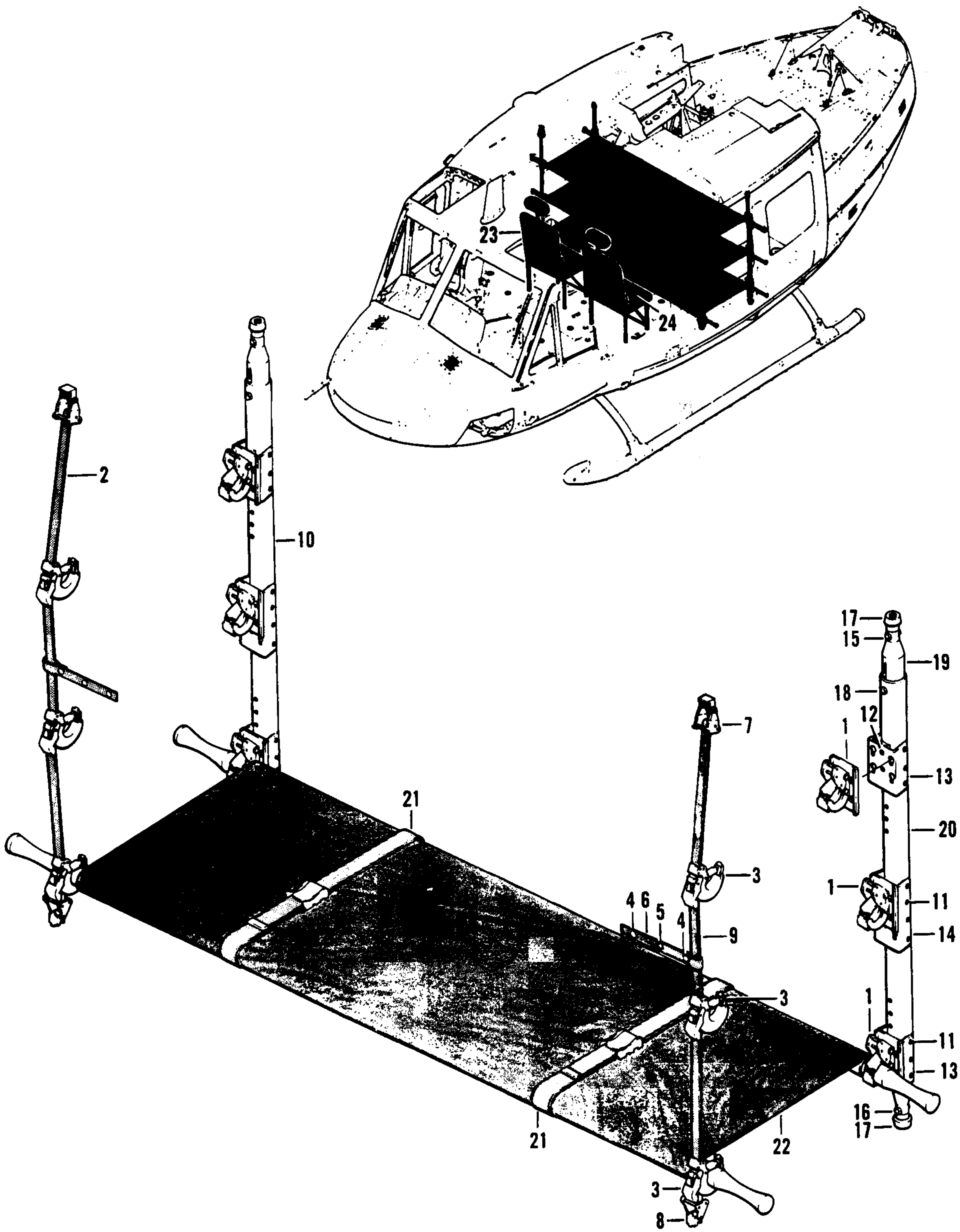

Figure 1. Litter kit installation (Sheet 1 of 2)

1. Bracket, support
2. Strap assy
3. Bracket
4. Button
5. Stud
6. Strap
7. Fitting
8. Fitting
9. Strap
10. Stanchion assy, litter
11. Screw
12. Screw
13. Support
14. Support
15. Nut
16. Nut
17. Stud Attachment
18. Nut
19. Adapter
20. Tube
21. Belt, safety
22. Litter cot
23. Seat assy, one man
24. Seat belt

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Figure 1. Litter kit installation (Sheet 2)

of material equal to the basic material over damaged area and sewing in place.

5. Inspection — Safety Belts and Support Straps.

Inspect belts and straps carefully for abrasions, tears, and overall serviceability. Check for condition of adjustable buckles, security rings, and fittings of each belt or strap. Remove and replace any defective part wherever necessary.

6. Inspection — Stanchions, Tubes and Brackets.

a. Visually inspect stanchions, brackets, and tube assemblies for cracks and bending. Remove and replace those parts which cannot be repaired adequately to ensure continued normal usage.

b. Check stanchions and tubes for proper fitting at end attachment points. Assure that attachments on studs are rigid.

c. Repeat instructions outlined in steps a. and b. above with regard to attendant seat legs.

7. Installation — Litter Rack Assembly.

a. Disconnect battery.

b. If installed, remove passenger seats located immediately forward of transmission pylon.

8. Installation — Stachion Assembly. (Figure 1).

a. Install two stanchion assemblies (10) as follows:

(1) Loosen nut (16) on slip joint end of stanchion assembly enough to allow fitting to slide in tube.

(2) Locate studs (one each side) in cabin roof 25.50 inches outboard and approximately 2 inches aft of forward corners of transmission pylon.

(3) Position slip-joint end of stanchion assembly (10) toward cabin roof, open locking lugs by pulling down on collar, position stanchion on ceiling stud, and push collar upward to lock lugs on stud.

(4) Pull back collar on lower end of stanchion to open locking lugs. Position stanchion on stud in floor and push collar downward to lock lugs on stud.

(5) Tighten nut loosened in step (1) to secure slip joint.

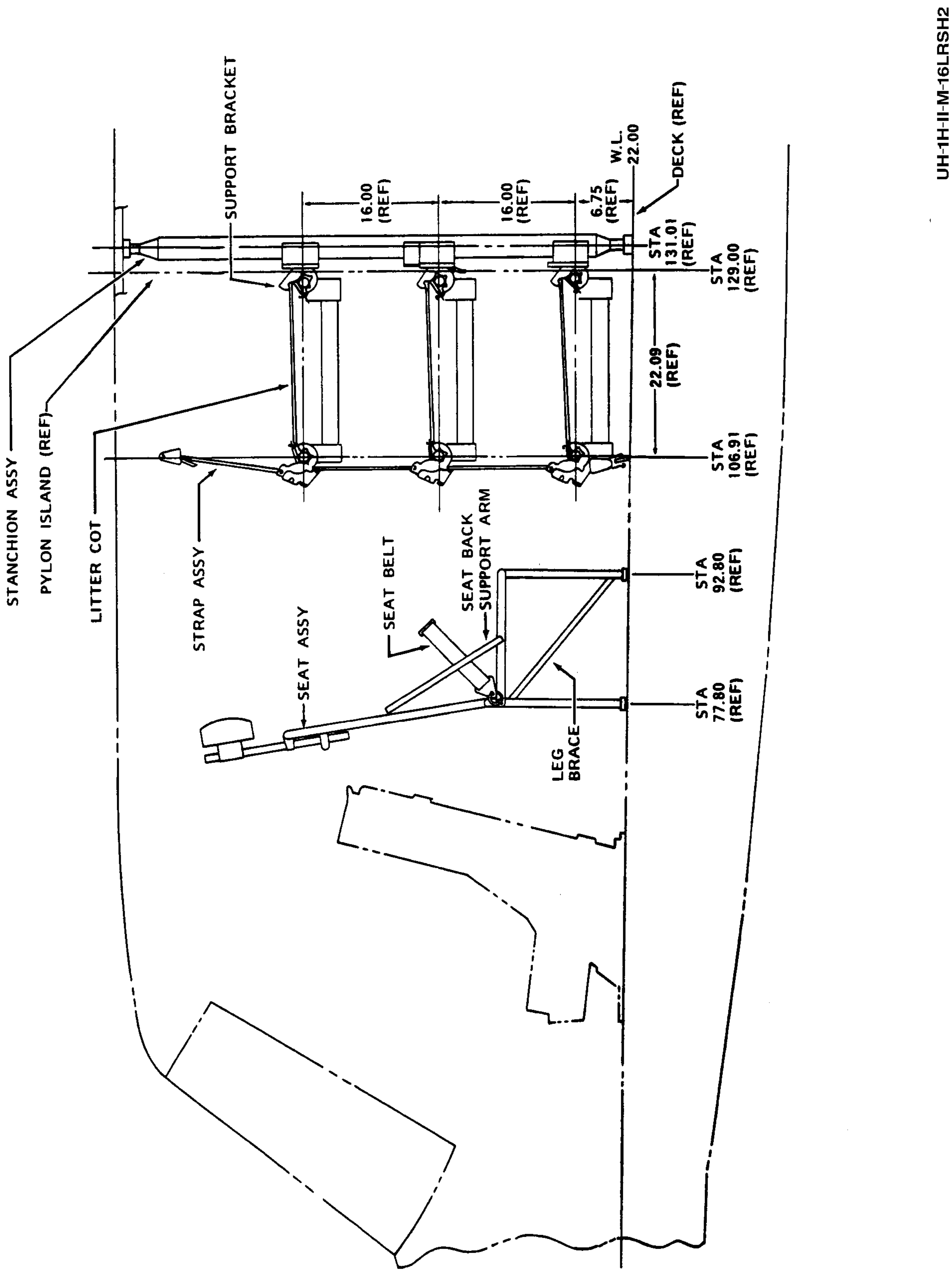


Figure 2. Three litter configuration

b. Attach three bracket assemblies (1) on each stanchion (10) with litter support forward.

9. Installation — Strap Assembly.

a. Locate two suspension fittings (one each side) in cabin roof, located approximately 22.00 inches forward of transmission pylon and 39.50 inches to left and right side of centerline.

b. Attach one strap (2) to each suspension fitting.

c. Attach lower ends of straps to corresponding tiedown fittings (8) in cabin deck.

10. Installation — Litter Cot. (Figure 1)

a. Loosen straps (2) at cabin deck fitting (8) as necessary to allow litter installation.

b. Install litter (21) in upper position. Secure aft rail of litter in upper stanchion brackets (1) and forward rail in upper brackets on straps.

c. Install litters in center and lower positions in similar manner as described in step b.

d. Adjust brackets (3) on straps as necessary to level litters.

e. After leveling litters tighten straps (2) at deck to remove all slack.

f. Install two safety belts (20) on each litter.

11. Installation — Attendant's Seat. (Figure 2)

a. Position seat back support arms to side eyebolts and secure with pip pins. Connect two leg braces at lower eyebolts with pip pins. Install headrests on seat back.

b. Install two seat assemblies as follows:

(1) Locate eight studs (four each side of centerline) on cabin deck. Refer to figure 2 for specific locations.

(2) Pull back collar on bottom of seat legs to unlock locking lugs, position seat legs on studs in cabin deck, push collars down to lock locking lugs.

(3) Install two seat belts (FDC-2700-169-2) inside of support arms. (Figure 1)

WARNING

The litter kit weighs approximately 103.3 pounds and has a moment of 11,250 inch-pounds. Parts removed must be subtracted to find the weight and moment difference for the addition of the kit.

BLOOD BOTTLE HOOKS

1. BLOOD BOTTLE HOOKS.

2. Description — Blood Bottle Hooks. Six blood bottle hooks (three on each side of the island) are mounted in the cabin above the litters.

CHAPTER 17

EMERGENCY EQUIPMENT

This chapter contains supplements covering customer-selected optional equipment. Each supplement should be inserted in the chapter in alphabetical order.

FIRE EXTINGUISHER AND BRACKET

1. FIRE EXTINGUISHER AND BRACKET

2. Description — Fire Extinguisher and Bracket. The fire extinguisher is a portable, hand operated monobromotrifluoromethane (CF3Br) type. The fire extinguisher is located on the floor to the right of the pilots seat. The fire extinguisher may also be located between seats aft of console.

3. Removal — Fire Extinguisher and Bracket.

a. Loosen retaining clamp from around upper section of the extinguisher by pulling the hinged lever aft. Tension on the extinguisher will be released so that the catch on the hinged lever will be disengaged from the attaching ring.

b. Grasp the fire extinguisher by the handle and remove from the hanger bracket.

c. Remove screws, washers, and nuts attaching hanger bracket to aircraft and remove hanger bracket.

4. Inspection — Fire Extinguisher and Bracket.

a. Pressure gage reading should be within the green arc.

b. CF_3Br type fire extinguishers should be weighed every six months to determine that they are fully charged. The fully charged weight of fire extinguisher should not be less than four ounces below the gross weight stamped on the nameplate.

c. Inspect fire extinguishers for broken or missing seals.

d. Inspect hanger bracket for damaged retaining clamp and loose or missing hardware.

5. Repair — Fire Extinguisher and Bracket.

a. If fire extinguisher fails to meet inspection requirements, it should be recharged by authorized personnel.

b. Replace hanger bracket if retaining clamp is damaged. Replace missing or damaged hardware.

6. Installation — Fire Extinguisher and Bracket.

a. Position hanger bracket and install attaching nuts, washers, and screws.

b. Position fire extinguisher in hanger bracket with extinguisher handle opposite bracket.

c. Hook the latch of the retaining clamp handle through ring on inboard section of the retaining clamp. Force free end of clamp handle to the left and forward. This will close the clamp and secure the fire extinguisher in the hanger bracket.

FIRST AID KITS

1. FIRST AID KITS.

2. Description — First Aid Kits. Four first aid kits are installed on right and left door posts.

3. Inspection — First Aid Kits.

a. Inspect first aid kit for broken or missing seal, and a legible, serviceable material condition tag.

b. Inspect first aid kits on door posts or loose or missing fasteners.

4. Removal — First Aid Kits. Pull outward on kit to release from snap fasteners.

5. Repair — First Aid Kits.

a. If seal is broken or missing or material condition tag is missing, kit should be inspected, sealed and new material condition tag attached by station medical supply office.

b. Tighten or replace loose or missing fasteners on door post.

6. Installation — First Aid Kits. Position kit over snap fasteners and push to engage fasteners.

APPENDIX A

REFERENCES

REFERENCE NUMBER	REFERENCE TITLE
AR 700-52	Licensing and Control of Sources of Ionizing Radiation
AR 750-5	Organization, Policies, and Responsibility of Maintenance Operation
AR 750-55	Inspection and Preparation of Army Aircraft for Transfer to Foreign Government as Grant Aid or Military Sales
AR 95-13	Weight and Balance — Army Aircraft
BHT-ALL-SPM	Standard Practices Manual
BHT PUB-92-004-PMS	Preventive Maintenance Services
BHT PUB-92-004-23P	Illustrated Parts Breakdown
BHT PUB-92-004-10	Flight Operators Manual
BHT-212-CR&O	Component Repair & Overhaul Manual
CSSD-PSE-87-001	Corrosion Control Guide
DA Form 2408-13	Aircraft Inspection and Maintenance Record
DA Form 2408-14	Uncorrected Fault Record
DA Form 2408-16	Component Installation and Removal Record
DA Form 2408-17	Aircraft Inventory Record
DA PAM 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, Lubrication Orders
DA PAM 310-7	U.S. Army Equipment Index of Modification Work Orders
DA PAM 738-751	Functional Users Manual for the Army Maintenance Management System — Aviation (TAMMS-A)
FM 55-450	Army Helicopter Load Operations
TB MED 232	Protective Measures Radioactive Material Used in Self Luminous Light Sources
TB 43-0002-3	Maintenance Expenditure Limits for Army Aircraft

TB 55-1500-204-25-1	Test Flights and Maintenance Operational Checks for Army Aircraft
TB 55 -1500-300-25	Aircraft Component Replacement and Re-Use Procedures
TB 55-1500-301-25	Army Aircraft Maintenance Inspection Procedures
TB 55-1500-311-25	Test Flights and Maintenance Operational Checks for Army Aircraft
TB 55-1500-314-25	Handling, Storage, and Disposal of Army Aircraft Components Containing Radioactive Material
TB 55-6650-300-15	Spectrometric Oil Analysis
TB 55-9150-200-24	Engine and Transmission Oils, Fuels, and Additives for Army Aircraft
TB 746-93-2	Painting and Marking of Army Aircraft
TM 1-7R-1-33	Handbook Overhaul Inspections Oil Coolers and Control Valves
TM 1-8D1-18-5-3	Overhaul Instructions: Electric Windshield Wiper Systems (Alco)
TM 1-8D3-8-17-13	Overhaul Instructions with Parts Breakdown: Aircraft Navigational Rotating Warning Lights, Part Number G8400-8-24, G8400-24-24, and G84-23-24 (Grimes)
TM 1-8D10-6-4-3	Overhaul Instructions with Parts Breakdown: Position Light Flasher, Type C-2, Part Number 810-00 (Gaudette)
TM 1-8D16-15-13	Overhaul Instructions and Test Procedures: Aircraft DC Generator Voltage Regulator Assembly, Part Number CR2795B105 A1 (General Electric)
TM 1-8R1-3-2-93	Overhaul Instructions: Cutout Relay Type AN3025-300, AN3025-100, Part Numbers A-700AP and A-718AP (Hartman)
TM 1-8R1–3-5-3	Handbook Overhaul Instructions: Generator Field Control Relay, Type M2: Part Numbers PR9502, PR95502A and PR9502AC (Phaostron prepared by Northrop)
TM 1-15H1-2-10-3	Overhaul Instructions Aircraft Heaters and Accessories (Janitrol Aircraft, Automotive Division) (Surface Combustion Corporation)
TM 1-1500-328-23	Aeronautical Equipment Maintenance Management Policies and Procedures.
TM 3-220	Chemical, Biological and Radiological (CBR) Decontamination
TM 3-261	Handling and Disposal of Unwanted Radioactive Materials
TM 11-6140-203-14-1	Operations Organizational Direct Support and General Support Maintenance Manual for Aircraft Nickel Cadmium Batteries
TM 38-230	Packaging of Material: Preservation
TM 38-230-1 and -2	Preservation, Packaging and Packing of Military Supplies and Equipment
TM 38-750	Army Equipment Maintenance Records Procedures

TM 55-403	Fundamentals of Army Helicopter Maintenance
TM 55-405-9	Army Aviation Maintenance Engineering Manual: Weight and Balance
TM 55-405-10	Army Aviation Maintenance Engineering Manual: Ground Handling and Service Equipment
TM 55-412	Fundamentals of Aircraft Instruments
TM 55-416	Aircraft Maintenance Management and Production Control
TM 55-450-3	Air Transport of Supplies and Equipment
TM 55-1500-200-42/2	Engine Quick Change Bulletin
TM 55-1500-204-25/1	General Aircraft Maintenance Manual
TM 55-1500-219-MTF	Aircraft Maintenance Test Flight Manual for UH-1B, C, D, H, M Aircraft
TM 55-1500-322-25	Maintenance of Aeronautical Antifriction Bearings
TM 55-1500-326-23	Standards of Serviceability for Transfer of Aircraft
TM 55-1500-328-25	Aeronautical Equipment Maintenance Management Policies and Procedures
TM 55-1615-221-40	GS Maintenance Manual: Swashplate and Support Assembly
TM 55-1615-223-40	GS Maintenance Manual: Main Rotor Mast Assembly
TM 55-1615-226-40	GS Maintenance Manual: Scissors and Sleeve Assembly
TM 55-1650-294-40	General Support Maintenance Manual: Hydraulic Flight Control Servo Cylinder Assembly
TM 55-1650-312-40	Overhaul Instructions Hydraulic Servo-Cylinder Part Number 1660 and CS546
TM 55-1650-334-40	GS Maintenance Manual Including Repair Parts and Special Tools Lists: Hydraulic Servo Cylinder
TM 55-1680-271-40	Internal Rescue Hoist Assembly
TM 55-2925-211-50	DC Voltage Regulator, Type ANR-89, Part Number A24A9170
TM 55-2925-218-50	Depot Maintenance Manual: Starter-Generator, Type STU-6/A and Model 23031-004
TM 55-2995-212-40	Overhaul Instructions Starter General Cooling Fan, Part Number 144801-1 and A20087-1
TM 55-2995-213-40	Overhaul Instructions Electromechanical Linear Actuator Part Number SYLC9190-10 and 540264–2-1
TM 55-4920-201-15	Operator, Organizational, Field, and Depot Maintenance Manual: Balancing Kit, Propeller and Rotor Blade for all Aircraft

TM 55-4920-2-44-15	Org. Ds. GS and Depot Maintenance Manual: Tester Exhaust Temp. Model BH112JA36
TM 55-6220-200-50	Depot Maintenance Manual: Controllable Search and Landing Light Assembly, Part Number G6250-1
TM 55-6340--202-40	GS Maintenance Manual: Including Repair Parts and Special Tool List
TM 55-6610-217-50	Depot Maintenance Manual: Rate of Climb Indicator, Part Number RC-60 and RC-60MS
TM 55-6610-224-50	Depot Maintenance Manual: Airspeed Indicator, Type MS28045-W1, Part Number S-15KA and S-15K
TM 55-6610-226-50	Pressure Sensitive Altimeter, Type MA-1, Part Number D22061-04-010
TM 55-6620-211-40	GS Maintenance Manual: Tachometer Indicator Model 8DJ81CAA1
TM 55-6645-200-50	Depot Maintenance Manual: Type A13A Aircraft Clock, Model 22322-S-ET-12
TM 55-6680-201-50	Depot Maintenance Manual: Tachometer Indicator, Part Number 8DJ67FAB1
TM 55-6685-208-50	Depot Maintenance Manual: Electrical Resistance Temperature Indicator, Part Number 132875 (etc.)
TM 750-126	Use of Material Condition Tags and Labels on Army Aeronautical and Air Delivery Equipment
TM 750-134	Procedures for Rapid Deployment, Redeployment and Retrogradation, U.S. Army Rotary Wing Aircraft.
TM 750-199	Procedures for Rapid Deployment, Redeployment and Retrogradation, U.S. Army Aircraft, Components, Spare Parts and Support Equipment. (Class II (A) and Class IV (A) Supplies)
T53-L-703	Illustrated Parts Catalog
T53-L-703	Maintenance Manual

APPENDIX B

MAINTENANCE ALLOCATION

(Not Applicable)

APPENDIX C

AIRCRAFT INVENTORY MASTER GUIDE

C-1. INTRODUCTION.

C-2. Scope. Appendix C lists those items of installed or loose equipment required by and authorized for using organizations to accomplish their primary or alternate mission. This list will serve to standardize present inventory procedures, using the inventory master guide to determine the inventoriable items of installed and loose equipment. Insofar as possible, items of equipment are listed in the sequence of their physical location within the aircraft area.

C-3. Changes to Inventory. Aircraft inventory is subject to change as a result of authorized changes (MWO's), addition or deletions of property for special missions requirements; therefore, the selection of items of inventory from the inventory master guide may or may not provide a complete inventory list. When it is known that the master guide does not provide a complete inventory list, it will be necessary to research authorized changes (MWO's) and local command directives in order to compile an accurate and exact inventory list.

C-4. Inventory Forms and Records. Refer to TM 38-750 for applicable forms and records.

C-5. REQUIREMENTS.

C-6. Security. It is desired that inventory records be unclassified. Therefore when equipment bearing a security classification or the installation of unclassified equipment is of a confidential or secret nature accomplishment of the classification will be in accordance with security regulations.

C-7. Inventoriable Items. The selection of inventoriable items is without regard to the agency, governmental or contractual, furnishing the items.

a. Items to be listed are:

(1) Items essential to the execution of the designated mission of the aircraft, such as electronic, photographic, armament, special mission instruments, and safety and comfort equipment.

(2) Loose equipment delivered with the aircraft and items subject to pilferage or readily converted to personal use.

(3) Modification kits which are issued or distributed to using organizations for installation and which are not immediately placed in work will be recorded on the affected aircraft DA Form 2408 17 (Aircraft Inventory Record) and identified as loose equipment until modification is completed.

(4) Equipment required for operation in special environment.

b. Items to be excluded:

(1) Nonaccountable items coded as expendable in the applicable stock lists.

(2) Personal issue or furnished on unit allowance or other authority.

(3) Items or components considered as basic or integral parts of the aircraft or basic aircraft such as engines, rotors, wheels and standard instruments.

(4) Equipment publications, check lists, and aircraft forms.

C-8. Periods of Inventory. Inventoriable items will be checked against the Aircraft Inventory Record (DA Form 2408 17) at the following periods:

a. Upon receipt of the aircraft.

b. Prior to transfer of the aircraft to another organization.

c. Upon placing aircraft in storage and upon removing from storage. Aircraft need not be inventoried while in storage.

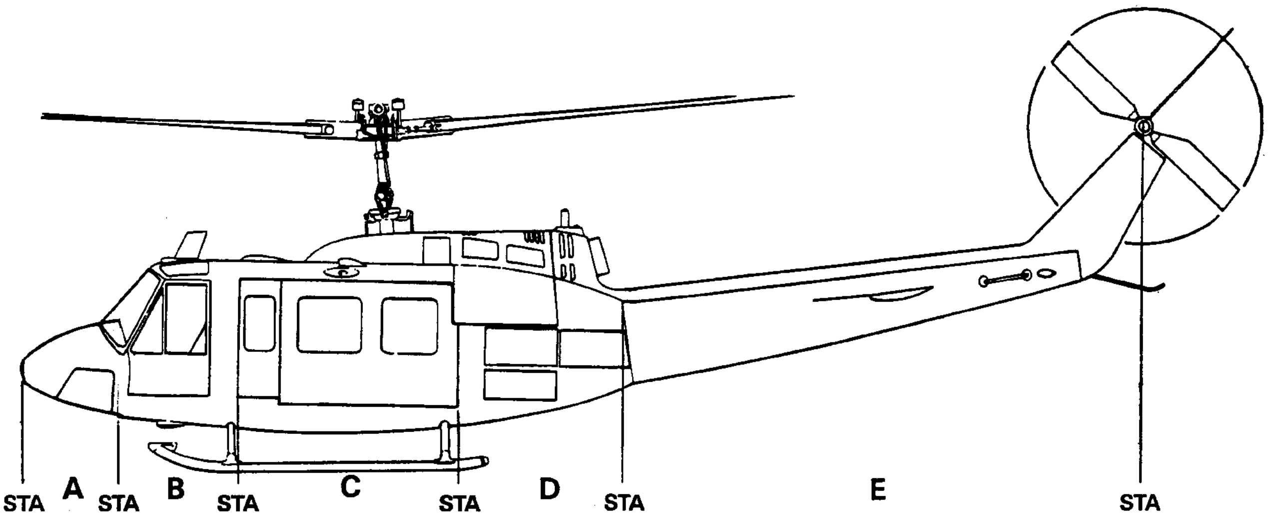
d. Twelve months elapsed time since last inventory.

e. Loose equipment shipped under separate cover is inventoried upon transfer by the sending activity and immediately upon receipt by the receiving activity.

C-9. Inventory Items List. (Figure C-1).

NOTE

Only those items listed which are installed or assigned to a particular aircraft are to be listed on a DA Form 2408-17 (Aircraft Inventory Record) for aircraft.



A — Nose Compartment Sta –20 to STA 23.0
B — Pilots Compartment Sta 23.0 to Sta 74.0
C — Cargo Compartment Sta 74.0 to Sta 166.0
D — Aft Fuselage Compartment Sta 166.0 to Sta 241.0
E — Tailboom Sta 241.0 to 488.73

Nomenclature		Number of Items Normally Installed	Remarks
SECTION A – NOSE COMPARTMENT			
AN/ARC-73	VHF Radio Set	1	
SECTION B – PILOTS COMPARTMENT			
AN/ARC-114A	VHF/FM Radio	1	
C-6533/ARC	Intercom	2	
Clock	400202	1	
Compass Magnetic:	Pilot Standby	1	
Aircraft Manufacturers Data Plate (100-030-1)		1	
Pilot Seat (Armored)		1	
Copilot Seat (Armored)		1	
Pilot Seat Belt and Shoulder Harness		1	
Copilot Seat Belt and Shoulder Harness		1	
Fire Extinguisher		1	
Blackout Curtains		3	

UH-1H-II-M-C-1-1

Figure C-1. Inventory items list component diagram (Sheet 1 of 2)

Nomenclature		Number of Items Normally Installed	Remarks
SECTION C — CARGO COMPARTMENT			
H-101/U	Mic-Headset	4	
Medical Attendant Seat		1	
Passenger Seats Against Firewall		3	
Passenger Seat Belts Against Firewall		5	
Passenger Seats:	Forward Arrangement	2	
Passenger Seat Belts:	Forward Arrangement	2	Includes Medical Attendants Seat Belt
Passenger Seats:	Aft	2	
Passenger Seat Belts:	Aft	4	
Litter Rack	(Number of Patients)	3	
Litter Rack Safety Belts		6	
Blood Bottle Hangers		3	
Aft Bulkhead Tiedown Fittings		16	
Cargo Restraint Device		1	
C-6533/ARC	Intercom	2	
SECTION D — AFT FUSELAGE COMPARTMENT			
Luggage Compartment Net		1	
100,000 BTU Heater Kit		1	
Auxiliary Fuel Tank Kit (300 Gallon) (Two 150 Gallon Tanks)		1	
Blade Anti-Icing Kit		1	
SECTION E — TAILBOOM			
Pitot Tube All Weather Cover		1	
Rear View Mirror		1	
Engine Air Inlet All Weather Cover		1	
Hard Point Fittings		4	
Engine Exhaust All Weather Cover		1	
Main Rotor Blade Tiedown Rig		1	
Tail Rotor Blade Tiedown Rig		1	
MS27212-1-3 Fabricate from NSN 5940-00-950-1610			FMC 96906
NAS1455B00-5 Fabricate from NSN 4010-00-554-8661			FMC 80205

205070-1006-2B

Figure C-1. Inventory items list component diagram (Sheet 2 of 2)

APPENDIX D

ILLUSTRATED FIELD MANUFACTURE ITEM LIST

This appendix includes complete instructions, including bills of material, for field manufacture of all items listed in BHT PUB-92-004-23P, Illustrated Parts Breakdown. The part number index lists all items in part number order with a cross reference to the figure in which the item appears. All materials necessary for manufacture of all items are listed by National stock number in the bill of material for the item.

PART NUMBER	FIGURE NO.
AN257-2-650	D-15
AN6544	D-6
AN6545	D-7
AN6546	D-9
AN6910	D-10
AN6915	D-14
AN743-7	D-4
AN743-12	D-4
AN743-13	D-4
AN8031-8-183	D-5
AN9116-2	D-16
BL6150	D-29
BL8359	D-30
BL8379	D-229
BL8453	D-228
BL8456	D-227
BL8485	D-35
BL8515	D-230
BYRF572	D-52
B56C21	D-56
B79C65	D-55
CSC 536-3	D-18
E1112-32-14	D-225
MS18029-1S1	D-242
MS18029-1S10	D-242
MS18029-1S14	D-242
MS18029-1S15	D-242
MS20253P2-538	D-22
MS20253-2-225	D-46
MS20253-2-275	D-46
MS20253-2-600	D-46
MS20253-2-2450	D-46
MS20253P2-275	D-46
MS20253P2-387	D-46
MS20253P2-2372	D-46
MS25083-2BB5	D-299
MS25083-2BB6	D-299
MS27212-1-3	D-37
MS27212-1-9	D-37
MS27212-1-10	D-37
MS27212-1-12	D-37
MS27212-1-14	D-37
MS27212-1-15	D-37
MS28741	D-41
MS8000	D-41
MS87028 Thru MS87032	D-41
NAS42DD4-16	D-2
NAS42DD6-8	D-2
NAS43-3-8	D-2
NAS43-3-24	D-2
NAS43-3-42	D-2

PART NUMBER	FIGURE NO.
NAS43-3-48	D-2
NAS43-4-12	D-2
NAS43-4-14	D-2
NAS43-4-44	D-2
NAS43-4-108	D-2
NAS43-5-36	D-2
NAS43-5-48	D-2
NAS43-6-12	D-2
NAS43-6-30	D-2
NAS43DD1-16	D-2
NAS43DD1-7	D-2
NAS43DD3-9	D-2
NAS43DD3-10	D-2
NAS43DD3-12	D-2
NAS43DD3-19	D-2
NAS43DD3-21	D-2
NAS43DD3-22	D-2
NAS43DD3-23	D-2
NAS43DD3-28	D-2
NAS43DD3-30	D-2
NAS43DD3-31	D-2
NAS43DD3-36	D-2
NAS43DD3-38	D-2
NAS43DD3-44	D-2
NAS43DD3-45	D-2
NAS43DD3-48	D-2
NAS43DD3-50	D-2
NAS43DD3-53	D-2
NAS43DD3-54	D-2
NAS43DD3-64	D-2
NAS43DD3-65	D-2
NAS43DD3-67	D-2
NAS43DD3-70	D-2
NAS43DD3-74	D-2
NAS43DD3-76	D-2
NAS43DD3-80	D-2
NAS43DD3-88	D-2
NAS43DD3-92	D-2
NAS43DD3-96	D-2
NAS43DD3-98	D-2
NAS43DD3-112	D-2
NAS43DD4-10	D-2
NAS43DD4-16	D-2
NAS43DD4-23	D-2
NAS43DD4-28	D-2
NAS43DD4-38	D-2
NAS43DD4-60	D-2
NAS43DD4-61	D-2
NAS43DD4-71	D-2
NAS43DD5-36	D-2
NAS43DD6-8	D-2

PART NUMBER	FIGURE NO.
NAS43DD10-14	D-2
NAS43HT1-7	D-2
NAS43HT3-12	D-2
NAS43HT3-82	D-2
NAS43HT4-7	D-2
NAS43HT4-28	D-2
NAS521-16-12	D-2
NAS1455B00-5	D-19
NAS1455-00-3C	D-19
NAS1455-00-5	D-19
NAS1455-1A2-5	D-19
NYLC3	D-57
RB8515-18-3	D-2
SP401-1	D-54
SP401-2	D-54
SP469-1	D-58
SP469-2	D-58
SP516	D-59
SP1152-2	D-60
SP1699-1	D-61
SP1705-1	D-62
SP1706-1	D-63
SP1707-1	D-64
SP1707-2	D-64
SP1709-2	D-65
SP1710-1	D-66
SP1715-1	D-67
SP3184-4	D-68
SP3184-5	D-68
SP3184-6	D-68
S8168-44A0170	D-2
W20396	D-20
Y1152-1-6	D-225
Y1152-1-11	D-225
Y1159-2-3	D-226
20-032-1	D-21
20-032-2	D-21
20-032-3	D-21
20-036-8-24	D-69
28D00	D-43
49C16	D-44
50H1	D-45
59H21	D-47
67SPL1275-0114	D-335
70-001B8F18Z3	D-48
70-001B8F59Z3	D-48
70-001B10F66Z2	D-48
70-001B12F13Z3	D-48
70-001B12F22Z2	D-48
70-001B12F27Z2	D-48
70-001B12F52Z3	D-48

PART NUMBER	FIGURE NO.
70-001B20F12Z3	D-48
70-004A10F23Z2	D-48
70-004A10F24Z2	D-48
70-004A10F25Z3	D-48
70-004A12F27Z2	D-48
85T4-0-2	D-2
85T4-1-2	D-2
85T4-1-27	D-2
85T4-1-106	D-2
85T4-2-2	D-2
85T4-2-4	D-2
85T4-2-10	D-2
85T4-2-27	D-2
85T4-2-60	D-2
85T4-2-108	D-2
85T4-2-116	D-2
85T4-3-1	D-2
85T4-3-2	D-2
85T4-3-6	D-2
85T4-3-56	D-2
85T4-4-4	D-2
85T4-4-8	D-2
85T4-4-24	D-2
85T4-4-34	D-2
85T4-4-48	D-2
85T4-4-50	D-2
85T4-5-2	D-2
85T4-5-15	D-2
85T4-6-2	D-2
85T4-6-4	D-2
85T4-6-16	D-2
85T4-7-2	D-2
85T4-7-4	D-2
85T4-8-1	D-2
85T4-8-2	D-2
85T4-8-6	D-2
85T4-9-3	D-2
85T4-10-1	D-2
85T4-10-2	D-2
85T4-10-12	D-2
85T4-11-3	D-2
85T4-11-4	D-2
85T4-12-1	D-2
85T4-12-2	D-2
85T4-14-1	D-2
85T4-16-6	D-2
85T4-375-2	D-2
85T4-375-3	D-2
85T4-375-8	D-2
85T4-375-12	D-2
85T4-375-46	D-2

PART NUMBER	FIGURE NO.
85T4-375-52	D-2
85T4-500-2	D-2
85T4-500-4	D-2
85T4-500-6	D-2
85T4-625-2	D-2
85T4-875-56	D-2
85T4-1000-8	D-2
85T4-1250-48	D-2
90-045-5	D-243
90-047-1	D-244
99C29	D-70
99C30	D-42
110-033-1	D-71
120-067B020	D-234
120-069-1	D-233
130-005-5-2	D-232
130-005-6-58	D-232
130-005-7-4	D-232
130-005-7-10	D-232
130-005-7-50	D-232
130-005-7C4	D-232
130-005-8-4	D-232
130-005-9-6	D-232
204-001-222-1	D-11
204-001-790-1	D-81
204-001-849-1	D-81
204-001-849-2	D-81
204-010-780-1	D-8
204-010-793-3	D-8
204-010-794-1	D-91
204-011-059-1	D-235
204-011-149-1	D-72
204-011-458-1	D-73
204-011-458-3	D-73
204-011-458-5	D-73
204-011-458-7	D-73
204-011-461-1	D-128
204-011-708-1	D-8
204-011-708-3	D-8
204-012-022-3	D-236
204-012-110-1	D-74
204-030-007-139	D-24
204-030-010-1	D-12
204-030-337-3	D-13
204-030-458-4	D-237
204-030-665-11	D-241
204-030-800-443	D-75
204-030-813-5	D-76
204-030-813-21	D-15
204-030-813-23	D-15
204-030-813-25	D-15

PART NUMBER	FIGURE NO.
204-030-813-27	D-15
204-030-829-15	D-238
204-030-829-27	D-238
204-030-840-1	D-15
204-030-840-3	D-15
204-030-840-5	D-15
204-030-853-73	D-27
204-030-853-83	D-27
204-030-853-85	D-27
204-030-853-97	D-337
204-030-853-98	D-337
204-030-853-99	D-337
204-030-853-100	D-337
204-030-853-111	D-27
204-030-853-113	D-27
204-030-853-115	D-27
204-030-853-117	D-27
204-030-853-133	D-40
204-031-003-13	D-77
204-031-003-14	D-78
204-031-003-23	D-78
204-031-136-17	D-152
204-031-139-3	D-79
204-031-251-1	D-80
204-040-153-13	D-3
204-040-153-15	D-3
204-040-153-25	D-3
204-040-155-11	D-3
204-040-155-13	D-3
204-040-155-15	D-3
204-040-156-5	D-3
204-040-215-27	D-42
204-040-299-1	D-17
204-040-306-9	D-3
204-040-314-5	D-3
204-040-353-11	D-3
204-040-353-13	D-3
204-040-353-15	D-3
204-040-353-17	D-3
204-040-355-11	D-3
204-040-355-13	D-3
204-040-355-15	D-3
204-040-356-5	D-3
204-040-419-7	D-3
204-040-425-5	D-3
204-040-513-11	D-3
204-040-513-13	D-3
204-040-722-1	D-42
204-040-723-1	D-42
204-040-732-1	D-82

PART NUMBER	FIGURE NO.
204-040-749-1	D-25
204-040-787-1	D-83
204-040-848-1	D-239
204-060-020-207	D-25
204-060-031-15	D-84
204-060-045-1	D-1
204-060-056-1	D-85
204-060-082-1	D-42
204-060-098-1	D-42
204-060-224-9	D-240
204-060-816-33	D-300
204-070-048-7	D-245
204-070-048-13	D-246
204-070-110-3	D-42
204-070-110-7	D-42
204-070-110-65	D-42
204-070-110-67	D-42
204-070-110-71	D-42
204-070-110-153	D-42
204-070-110-155	D-42
204-070-143-3	D-23
204-070-134-11	D-42
204-070-175-1	D-86
204-070-185-1	D-87
204-070-230-1	D-88
204-070-255-1	D-89
204-070-255-2	D-89
204-070-255-13	D-90
204-070-255-14	D-90
204-070-274-1	D-92
204-070-275-1	D-93
204-070-343-1	D-26
204-070-476-1	D-31
204-070-528-1	D-94
204-070-583-1	D-95
204-070-585-1	D-96
204-070-749-1	D-97
204-070-812-1	D-26
204-070-848-3	D-247
204-070-855-7	D-33
204-070-904-1	D-34
204-071-523-1	D-2
204-071-539-3	D-98
204-071-542-3	D-2
204-071-577-1	D-99
204-072-054-1	D-100
204-072-083-1	D-101
204-072-258-1	D-248
204-072-258-3	D-249
204-072-259-1	D-250
204-072-265-1	D-42
204-072-267-1	D-42
204-072-268-1	D-42
204-072-355-1	D-42
204-072-364-1	D-42
204-075-143-5	D-36
204-075-143-7	D-36
204-075-152-3	D-257
204-075-160-1	D-102
204-075-163-1	D-38
204-075-173-35	D-28
204-075-177-13	D-301
204-075-181-9	D-2
204-075-207-3	D-32
204-075-230-3	D-255
204-075-230-5	D-256
204-075-243-1	D-39
204-075-264-1	D-251
204-075-264-3	D-252
204-075-264-5	D-253
204-075-264-9	D-254
204-075-520-1	D-103
204-076-032-3	D-104
205-001-104-1	D-105
205-030-007-77	D-106
205-030-007-97	D-107
205-030-007-98	D-107
205-030-007-99	D-108
205-030-007-107	D-109
205-030-007-109	D-110
205-030-007-111	D-111
205-030-007-113	D-112
205-030-007-131	D-113
205-030-007-132	D-113
205-030-007-133	D-114
205-030-007-134	D-114
205-030-007-155	D-115
205-030-007-157	D-116
205-030-007-159	D-117
205-030-007-179	D-118
205-030-007-180	D-118
205-030-007-231	D-119
205-030-007-233	D-120
205-030-007-245	D-121
205-030-007-246	D-121
205-030-007-271	D-122
205-030-007-272	D-122
205-030-007-337	D-123
205-030-007-341	D-124
205-030-007-347	D-302
205-030-007-351	D-125
205-030-028-5	D-126

PART NUMBER	FIGURE NO.
205-030-028-6	D-126
205-030-028-25	D-126
205-030-028-27	D-126
205-030-029-5	D-133
205-030-029-25	D-258
205-030-031-7	D-127
205-030-137-4	D-259
205-030-148-3	D-260
205-030-163-25	D-303
205-030-163-125	D-304
205-030-163-129	D-305
205-030-164-215	D-261
205-030-163-231	D-306
205-030-163-329	D-307
205-030-213-4	D-308
205-030-239-3	D-262
205-030-239-5	D-263
205-030-245-13	D-15
205-030-245-15	D-15
205-030-245-43	D-15
205-030-245-45	D-15
205-030-245-61	D-157
205-030-245-67	D-157
205-030-247-25	D-129
205-030-257-15	D-264
205-030-302-5	D-130
205-030-302-6	D-130
205-030-309-13	D-131
205-030-385-17	D-309
205-030-385-18	D-309
205-030-385-21	D-310
205-030-407-121	D-311
205-030-407-317	D-312
205-030-431-1	D-132
205-030-432-1	D-132
205-030-484-15	D-15
205-030-484-17	D-15
205-030-539-7	D-313
205-030-539-11	D-15
205-030-543-15	D-135
205-030-543-17	D-136
205-030-611-15	D-314
205-030-614-13	D-137
205-030-615-93	D-315
205-030-615-94	D-315
205-030-671-7	D-138
205-030-671-9	D-138
205-030-711-27	D-317
205-030-711-28	D-317
205-030-729-49	D-318
205-030-737-3	D-139

PART NUMBER	FIGURE NO.
205-030-737-5	D-140
205-030-814-17	D-141
205-030-819-21	D-319
205-030-828-1	D-142
205-030-828-5	D-143
205-030-846-33S	D-320
205-030-849-7	D-144
205-030-850-21	D-321
205-030-919-37	D-223
205-030-919-38	D-223
205-031-137-1	D-145
205-031-250-3	D-198
205-031-250-5	D-198
205-031-250-7	D-198
205-031-250-9	D-198
205-031-250-10	D-198
205-031-250-11	D-198
205-031-250-12	D-198
205-031-250-13	D-146
205-031-423-31	D-265
205-031-423-32	D-265
205-031-423-33	D-265
205-031-423-34	D-265
205-031-481-15	D-266
205-031-481-23	D-267
205-031-481-29	D-267
205-031-668-43	D-147
205-031-668-51	D-15
205-031-668-53	D-148
205-031-668-65	D-268
205-031-669-137	D-316
205-031-669-151	D-49
205-031-669-152	D-49
205-031-801-153	D-149
205-031-837-19	D-150
205-031-837-20	D-150
205-031-837-21	D-150
205-031-862-17S	D-269
205-031-862-19S	D-270
205-031-862-21S	D-269
205-031-862-47S	D-271
205-031-898-1	D-151
205-040-125-1	D-3
205-040-125-15	D-3
205-040-130-1	D-132
205-040-131-1	D-153
205-040-152-1	D-154
205-040-154-3	D-155
205-040-156-3	D-156

PART NUMBER	FIGURE NO.
205-040-169-1	D-158
205-040-170-1	D-159
205-040-202-1	D-160
205-040-202-3	D-161
205-060-020-7	D-162
205-060-110-1	D-272
205-060-204-1	D-163
205-060-205-19	D-273
205-060-205-20	D-273
205-060-280-23	D-134
205-060-424-1	D-42
205-060-440-1	D-42
205-060-509-1	D-165
205-060-536-1	D-166
205-060-540-19	D-167
205-060-580-1	D-42
205-060-581-1	D-42
205-060-582-1	D-42
205-060-583-1	D-42
205-060-584-1	D-42
205-060-585-1	D-42
205-060-586-1	D-42
205-060-587-1	D-42
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205-060-593-1	D-42
205-060-594-1	D-42
205-060-648-1	D-42
205-060-649-1	D-42
205-060-690-1	D-42
205-060-691-1	D-42
205-060-692-1	D-42
205-060-693-1	D-42
205-060-694-1	D-42
205-060-695-1	D-42
205-060-696-1	D-42
205-060-697-1	D-42
205-060-770-1	D-168
205-060-802-11	D-169
205-060-802-13	D-169
205-060-810-15	D-170
205-060-810-16	D-170
205-060-826-79	D-322
205-060-826-81	D-171
205-060-826-83	D-172
205-060-826-85	D-172
205-060-838-1	D-173
205-060-860-3	D-174
205-060-860-4	D-174

PART NUMBER	FIGURE NO.
205-060-862-1	D-175
205-060-907-35	D-50
205-060-907-37	D-51
205-060-908-79	D-177
205-060-908-85	D-177
205-060-907-7	D-323
205-060-907-17	D-324
205-060-919-3	D-178
205-061-213-1	D-42
205-061-214-1	D-42
205-061-232-1	D-325
205-061-234-1	D-326
205-061-412-1	D-327
205-061-520-13	D-172
205-061-521-1	D-328
205-061-600-1	D-42
205-061-601-1	D-42
205-061-604-1	D-42
205-061-606-1	D-42
205-061-607-1	D-42
205-061-608-1	D-42
205-061-609-1	D-42
205-061-610-1	D-42
205-061-611-1	D-42
205-061-612-1	D-42
205-061-614-1	D-42
205-061-615-1	D-42
205-061-616-1	D-42
205-061-617-1	D-42
205-061-618-1	D-42
205-061-619-1	D-42
205-061-624-1	D-42
205-061-643-1	D-179
205-061-643-3	D-329
205-061-645-1	D-42
205-061-647-1	D-42
205-061-649-1	D-42
205-061-650-1	D-42
205-061-651-1	D-42
205-061-652-1	D-42
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205-061-655-1	D-42
205-061-659-1	D-42
205-061-661-1	D-42
205-061-662-1	D-42
205-061-663-1	D-42
205-061-664-1	D-42
205-061-665-1	D-180
205-061-666-1	D-181
205-061-668-1	D-42

PART NUMBER	FIGURE NO.
205-061-669-1	D-42
205-061-670-1	D-42
205-061-671-1	D-42
205-061-672-1	D-182
205-061-674-1	D-42
205-061-675-1	D-42
205-061-677-1	D-183
205-061-684-1	D-184
205-061-685-1	D-42
205-062-614-1	D-42
205-062-662-1	D-42
205-062-663-1	D-42
205-062-680-1	D-42
205-062-681-1	D-42
205-062-696-1	D-274
205-070-054-1	D-330
205-070-226-1	D-26
205-070-365-1	D-42
205-070-366-1	D-42
205-070-404-1	D-186
205-070-404-3	D-187
205-070-416-5	D-188
205-070-416-7	D-188
205-070-416-13	D-188
205-070-430-1	D-189
205-070-430-3	D-189
205-070-436-1	D-42
205-070-439-1	D-42
205-070-440-1	D-42
205-070-441-1	D-42
205-070-448-1	D-42
205-070-450-3	D-190
205-070-452-1	D-191
205-070-452-3	D-191
205-070-475-1	D-42
205-070-476-1	D-42
205-070-483-1	D-192
205-070-484-1	D-42
205-070-485-1	D-42
205-070-486-1	D-42
205-070-487-1	D-42
205-070-488-1	D-42
205-070-490-1	D-42
205-070-491-1	D-42
205-070-493-1	D-193
205-070-493-3	D-193
205-070-494-1	D-194
205-070-609-1	D-195
205-070-656-1	D-196
205-070-769-1	D-197
205-070-772-1	D-276

PART NUMBER	FIGURE NO.
205-070-795-1	D-277
205-070-853-1	D-26
205-070-853-3	D-26
205-070-882-1	D-278
205-070-942-1	D-199
205-072-028-5	D-331
205-072-038-1	D-331
205-072-038-3	D-331
205-072-038-7	D-331
205-072-038-9	D-331
205-072-038-13	D-331
205-072-039-1	D-279
205-072-083-9	D-331
205-072-083-11	D-331
205-072-208-1	D-412
205-072-221-3	D-275
205-072-222-1	D-99
205-072-224-1	D-280
205-072-225-1	D-281
205-072-226-1	D-282
205-072-227-1	D-283
205-072-227-3	D-284
205-072-264-1	D-164
205-072-269-1	D-200
205-072-274-1	D-201
205-072-278-1	D-42
205-072-304-1	D-42
205-072-305-1	D-42
205-072-317-1	D-285
205-072-403-1	D-202
205-072-410-1	D-42
205-072-424-1	D-42
205-075-126-1	D-203
205-075-126-9	D-204
205-075-126-13	D-205
205-075-133-1	D-206
205-075-134-1	D-42
205-075-134-1	D-207
205-075-135-15	D-208
205-075-135-19	D-288
205-075-137-3	D-332
205-075-142-3	D-209
205-075-142-5	D-289
205-075-142-9	D-290
205-075-142-11	D-185
205-075-144-3	D-210
205-075-151-1	D-291

PART NUMBER	FIGURE NO.
205-075-210-3	D-292
205-075-210-5	D-293
205-075-229-1	D-211
205-075-237-5	D-294
205-076-025-11	D-218
205-076-025-15	D-218
205-076-033-1	D-42
205-076-101-1	D-212
205-076-101-3	D-213
205-076-102-1	D-214
205-076-118-1	D-215
205-076-136-1	D-42
205-076-138-1	D-42
205-076-140-1	D-42
205-076-141-1	D-42
205-076-156-1	D-42
205-076-157-1	D-42
205-076-159-1	D-42
205-076-160-1	D-42
205-076-161-1	D-42
205-076-201-1	D-42
205-076-202-1	D-42
205-076-203-1	D-42
205-076-204-1	D-42
205-706-206-1	D-42
205-076-207-1	D-42
205-076-209-1	D-42
205-076-210-1	D-42
205-076-212-1	D-42
205-076-214-1	D-42
205-076-216-1	D-42
205-076-217-1	D-42
205-076-223-1	D-42
205-076-230-1	D-216
205-076-233-1	D-42
205-076-234-1	D-217
205-076-255-1	D-42
205-076-257-1	D-42
205-076-258-1	D-42
205-076-259-1	D-42
205-706-025-11	D-218
205-706-025-15	D-218
205-706-025-17	D-333
205-706-025-19	D-334
205-706-029-11	D-286
205-706-029-15	D-287
205-961-102-17	D-295
205-961-102-25	D-296
205-961-102-33	D-297
205-961-155-3	D-298
206-010-324-1	D-231

PART NUMBER	FIGURE NO.
397-1	D-336
100337	D-224
11021-1	D-219
178036-3	D-176
178038-3	D-176
178040-3	D-176
178042-3	D-176
178044-3	D-176
178050-3	D-176
178050-5	D-176
178050-7	D-176
178052-3	D-176
178052-5	D-176
178052-7	D-176
178065-1	D-220
528307	D-221
9524491	D-222

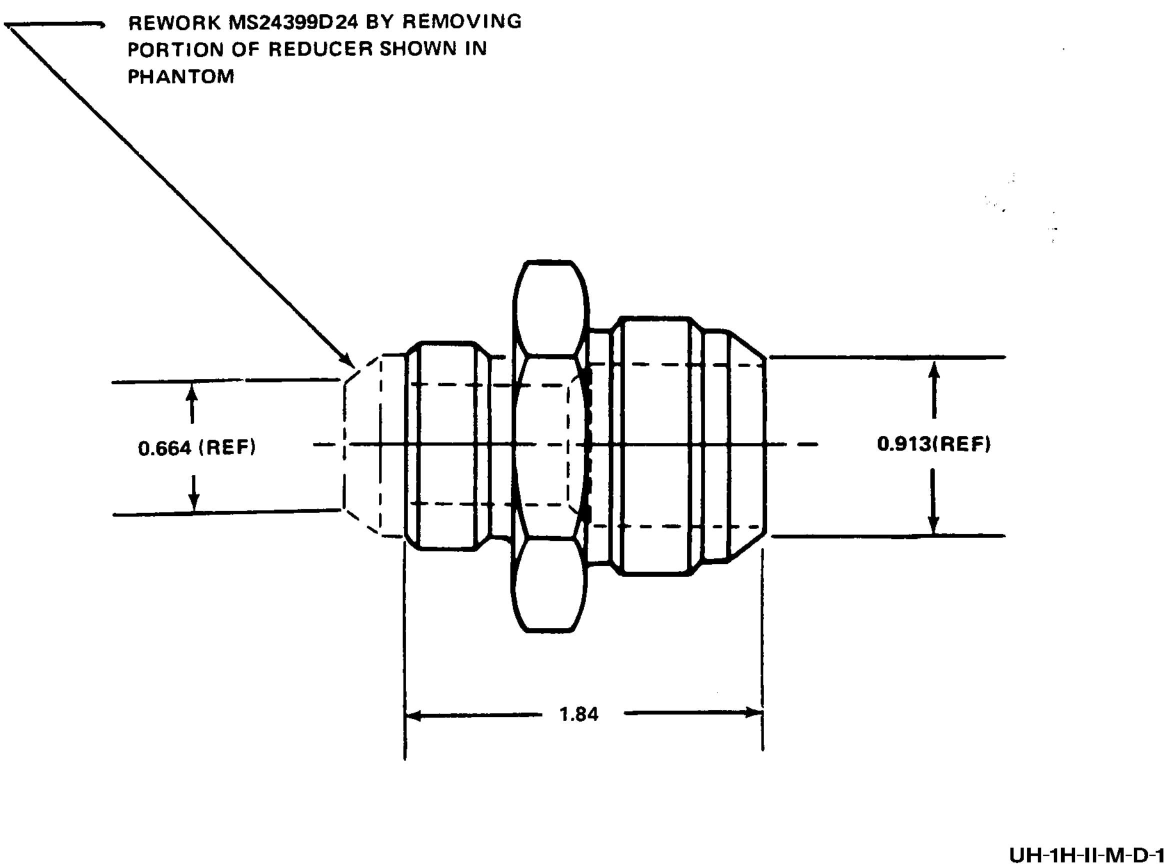
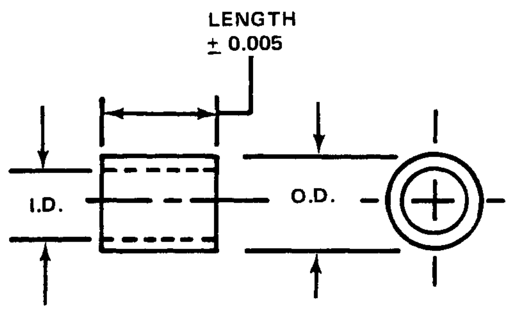


Figure D-1. Part Number 204-060-045-1, FITTING, Reducer Engine Oil Inlet
Fabricate from: NSN 4730-00-684-7446



PART NUMBER	NOMENCLATURE	FABRICATE FROM NSN	ID	OD	LG
NAS42DD4-16	SPACER, RIVET	5340-00-631-3905	0.127	0.260	0.250
NAS42DD6-8	SPACER, SLEEVE	5340-00-631-3904	0.190	0.385	0.125
NAS43-3-8	SPACER, SCREW AND BOLT	5340-00-826-6257	0.194	0.322	0.125
NAS43-3-24	SPACER, SCREW AND BOLT	5340-00-826-6257	0.194	0.322	0.375
NAS43-3-42	SPACER, SCREW AND BOLT	5340-00-826-6257	0.194	0.322	0.656
NAS43-3-48	SPACER, SCREW AND BOLT	5340-00-826-6257	0.194	0.322	0.750
NAS43-4-12	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.365	0.187
NAS43-4-14	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.365	0.218
NAS43-4-44	SPACER, SCREW AND BOLT	9535-00-167-2151	0.256	0.365	0.687
NAD43-4-108	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.365	1.687
NAS43-5-36	SPACER, SCREW AND BOLT	5340-00-632-1252	0.320	0.448	0.582
NAS43-5-48	SPACER, SCREW AND BOLT	5340-00-632-1252	0.320	0.448	0.750
NAS43-6-12	SPACER, SCREW AND BOLT	5340-00-540-3668	0.377	0.515	0.187
NAS43-6-30	SPACER, SCREW AND BOLT	5340-00-540-3668	0.377	0.515	0.468
NAS43DD1-16	SPACER, SLEEVE	5340-00-841-8565	0.143	0.260	0.250
NAS43DD1-7	SPACER, SLEEVE	5340-00-632-3562	0.143	0.260	0.114
NAS43DD3-9	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.140
NAS43DD3-10	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.186
NAS43DD3-12	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.187
NAS43DD3-19	SPACER, SLEEVE	5340-00-727-1891	0.194	0.322	0.206
NAS43DD3-21	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.328
NAS43DD3-22	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.343
NAS43DD3-23	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.359
NAS43DD3-28	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.437
NAS43DD3-30	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.468
NAS43DD3-31	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.484

UH-1H-II-M-D-2-1

Figure D-2. (Sheet 1 of 4)

PART NUMBER	NOMENCLATURE	FABRICATE FROM NSN	ID	OD	LG
NAS43DD3-36	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.562
NAS43DD3-38	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.593
NAS43DD3-44	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.687
NAS43DD3-45	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.703
NAS43DD3-48	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.750
NAS43DD3-50	SPACER, SLEEVE	5340-00-727-1891	0.194	0.322	0.781
NAS43DD3-53	SPACER, SLEEVE	5340-00-727-1891	0.194	0.322	0.828
NAS43DD3-54	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	0.843
NAS43DD3-64	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.000
NAS43DD3-65	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.015
NAS43DD3-67	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.046
NAS43DD3-70	SPACER, SCREW AND BOLT	5340-00-727-1981	01.94	0.322	1.093
NAS43DD3-74	SPACER, SLEEVE	5340-00-727-1891	0.194	0.322	1.156
NAS43DD3-76	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.187
NAS43DD3-80	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.250
NAS43DD3-88	SPACER, SLEEVE	5340-00-727-1891	0.194	0.322	1.375
NAS43DD3-92	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.437
NAS43DD3-96	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.500
NAS43DD3-98	SPACER, SLEEVE	5340-00-727-1891	0.194	0.322	1.531
NAS43DD3-112	SPACER, SCREW AND BOLT	5340-00-727-1891	0.194	0.322	1.750
NAS43DD4-10	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.385	0.156
NAS43DD4-16	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.385	0.250
NAS43DD4-23	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.385	0.359
NAS43DD4-28	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.385	0.437
NAS43DD4-38	SPACER, SLEEVE	5340-00-632-1254	0.256	0.385	0.594
NAS43DD4-60	SPACER, SLEEVE	5340-00-632-1254	0.256	0.385	0.937
NAS43DD4-61	SPACER, SLEEVE	5340-00-632-1254	0.256	0.385	0.953
NAS43DD4-71	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.385	1.109
NAS43DD5-36	SPACER, SLEEVE	5340-00-632-1255	0.320	0.448	0.567
NAS43DD10-14	SPACER, SLEEVE	5340-00-841-8565	0.627	0.765	0.218
NAS43HT1-7	SPACER, SCREW AND BOLT	5340-00-952-2955	0.143	0.260	0.109
NAS43HT3-12	SPACER, SLEEVE	5340-00-826-6257	0.194	0.322	0.187
NAS43HT3-82	SPACER, SLEEVE	5340-00-826-6257	0.194	0.322	1.281
NAS43HT4-7	SPACER, SLEEVE	5340-00-541-9565	0.256	0.385	0.109
NAS43HT4-28	SPACER, SCREW AND BOLT	5340-00-632-1254	0.256	0.365	0.437
NAS521-16-12	COUPLING, HOSE	4720-00-843-1731	2.000	2.126	3.000
RB8515-18-3	TUBE, INSULATING	5970-00-263-1327	0.234	0.274	3.000
S8168-44A0170	SPACER, SLEEVE	5340-00-632-1254	0.028	0.360	0.170
85T4-0-2	INSULATING TUBING	5970-00-623-8526	0.325	0.371	1.000
85T4-1-2	TUBE, INSULATING	5970-00-243-5878	0.294	0.334	1.000
85T4-1-27	TUBE, INSULATING	5970-00-811-9461	0.289	0.335	13.500
85T4-1-106	TUBE, INSULATING	5970-00-243-5878	0.294	0.334	53.00
85T4-2-2	INSULATION TUBING	5970-00-235-2725	0.258	0.304	1.000
85T4-2-4	TUBE, INSULATING	5970-00-235-2725	0.263	0.303	2.000

UH-1H-II-M-D-2-2

Figure D-2. (Sheet 2 of 4)

PART NUMBER	NOMENCLATURE	FABRICATE FROM NSN	ID	OD	LG
85T4-2-10	TUBE INSULATING	5970-00-235-2725	0.263	0.303	5.000
85T4-2-27	TUBE INSULATING	5970-00-235-2725	0.258	0.304	13.500
85T4-2-60	TUBE INSULATING	5970-00-235-2725	0.258	0.304	30.00
85T4-2-108	INSULATING TUBING	5970-00-235-2725	0.263	0.304	54.00
85T4-2-116	INSULATING TUBING	5970-00-235-2725	0.263	0.304	58.00
85T4-3-1	INSULATION TUBING	5970-00-235-2725	0.229	0.275	.500
85T4-3-2	TUBE INSULATION	5970-00-235-2725	0.229	0.275	1.000
85T4-3-6	TUBE INSULATING	5970-00-263-1327	0.234	0.275	3.00
85T4-3-56	TUBE INSULATING	5970-00-235-2725	0.229	0.275	28.00
85T4-4-4	TUBE INSULATING	5970-00-235-2728	0.208	0.248	2.00
85T4-4-24	TUBE INSULATING	5970-00-284-9696	0.208	0.248	12.00
85T4-4-34	TUBE INSULATING	5970-00-284-9696	0.208	0.248	17.00
85T4-4-48	TUBE INSULATING	5970-00-284-9689	0.208	0.248	24.00
85T4-4-50	TUBE INSULATING	5970-00-284-9689	0.208	0.248	25.00
85T4-5-2	TUBE INSULATING	5970-00-263-1325	0.186	0.226	1.000
85T4-5-15	TUBE INSULATING	5970-00-263-1325	0.186	0.226	7.500
85T4-6-2	TUBE INSULATING	5970-00-235-2719	0.166	0.206	1.000
85T4-6-4	INSULATION TUBING	5970-00-235-2719	0.162	0.208	2.000
85T4-6-16	INSULATION TUBING	5970-00-235-2719	0.166	0.206	8.000
85T4-7-2	TUBE, INSULATING	5970-00-557-6245	0.148	0.188	1.000
85T4-7-4	INSULATION TUBING	5970-00-557-6245	0.144	0.186	2.000
85T4-8-1	TUBE, INSULATING	5970-00-284-8468	0.133	0.173	0.500
85T4-8-2	TUBE, INSULATING	5970-00-284-8468	0.133	0.173	1.000
85T4-8-6	TUBE, INSULATING	5970-00-284-8468	0.133	0.173	3.000
85T4-9-3	INSULATION TUBING	5970-00-284-8468	0.114	0.160	1.500
85T4-10-1	TUBE, INSULATING	5970-00-826-9827	0.106	0.138	0.500
85T4-4-8	TUBE, INSULATING	5970-00-284-9696	0.208	0.248	4.00
85T4-10-2	TUBE, INSULATING	5970-00-826-9827	0.102	0.138	1.000
85T4-10-12	INSULATION TUBING	5970-00-826-9870	0.106	0.140	6.000
85T4-11-3	INSULATION TUBING	5970-00-826-9827	0.106	0.138	1.500
85T4-11-4	INSULATION TUBING	5970-00-826-9827	0.081	0.138	2.000
85T4-12-1	INSULATION TUBING	5970-00-826-9827	0.106	0.119	.500
85T4-12-2	TUBE, INSULATING	5970-00-826-9827	0.106	0.138	1.000
85T4-14-1	TUBE, INSULATING	5970-00-235-2721	0.066	0.088	0.500
85T4-16-6	TUBE, INSULATING	5970-00-809-9163	0.053	0.085	3.000
85T4-375-2	INSULATION TUBING	5970-00-235-2728	0.375	0.431	1.000
85T4-375-3	INSULATION TUBING	5970-00-235-2728	0.375	0.431	1.500
85T4-375-8	INSULATION TUBING	5970-00-235-2728	0.375	0.431	4.000
85T4-375-12	TUBE INSULATING	5970-00-235-2728	0.375	0.431	6.000
85T4-375-46	INSULATION TUBING	5970-00-235-2728	0.375	0.431	23.000
85T4-375-52	INSULATION TUBING	5970-00-235-2728	0.375	0.419	26.00
85T4-500-2	TUBE, INSULATING	5970-00-284-9698	0.208	0.248	1.000

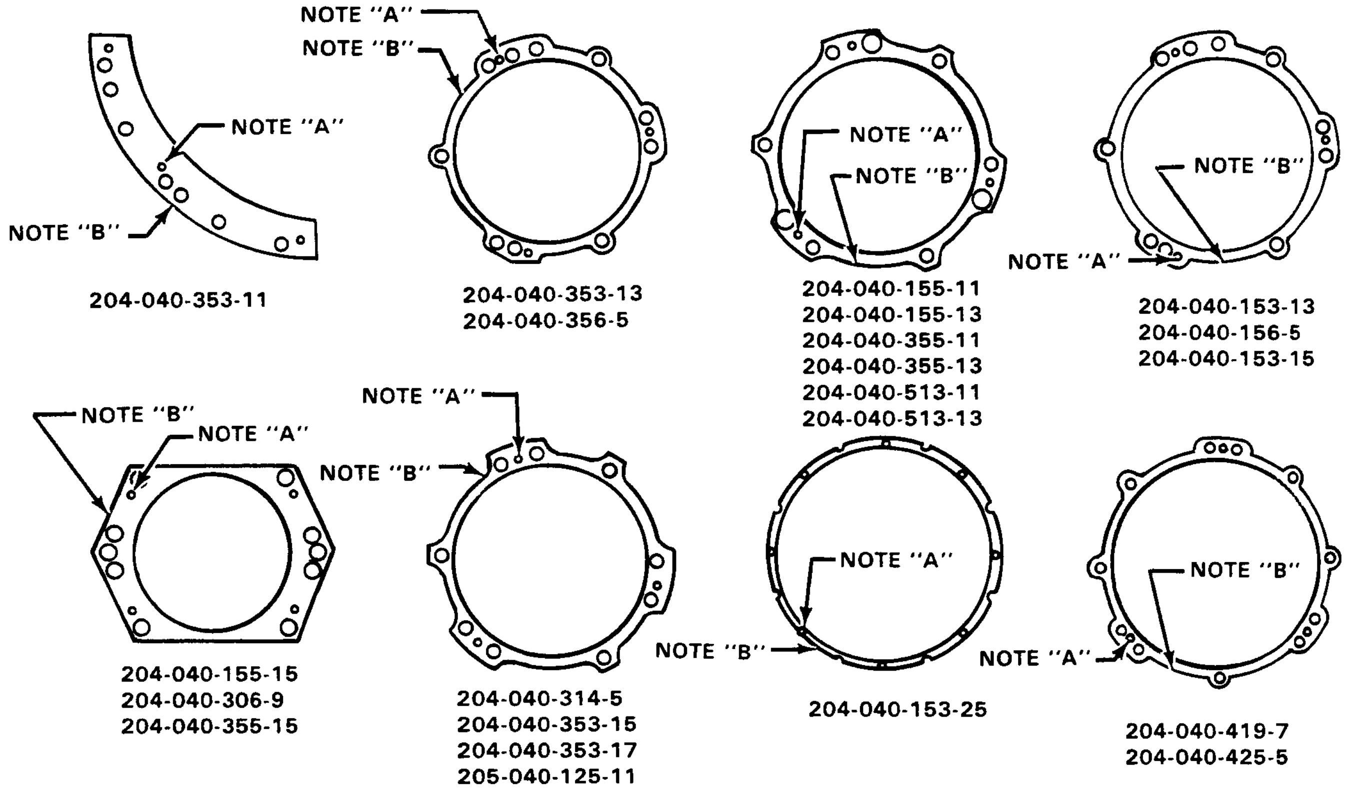
UH-1H-II-M-D-2-3

Figure D-2. (Sheet 3 of 4)

PART NUMBER	NOMENCLATURE	FABRICATE FROM NSN	ID	OD	LG
85T4-500-4	TUBE INSULATING	5970-00-557-6254	0.500	0.556	2.000
85T4-500-6	INSULATION TUBING	5970-00-284-9698	0.500	0.556	3.000
85T4-625-2	INSULATING TUBING	5970-00-615-9853	0.625	0.695	1.000
85T4-875-56	TUBE INSULATING	5970-00-615-4946	0.875	0.955	28.00
85T4-1000-8	TUBE INSULATING	5970-00-882-5007	1.000	1.060	4.000
85T4-1250-48	INSULATION TUBING	5970-00-284-8480	1.250	1.340	24.00
204-071-523-1	TUBE, GUARD	4710-00-277-3627	0.652	0.750	9.000
204-071-542-3	TUBE, GUARD	4710-00-279-0917	0.180	0.250	8.500
204-075-181-9	SPACER	9330-00-260-3806	0.250	1.000	0.250

UH-1H-II-M-D-2-4

Figure D-2. (Sheet 4 of 4)



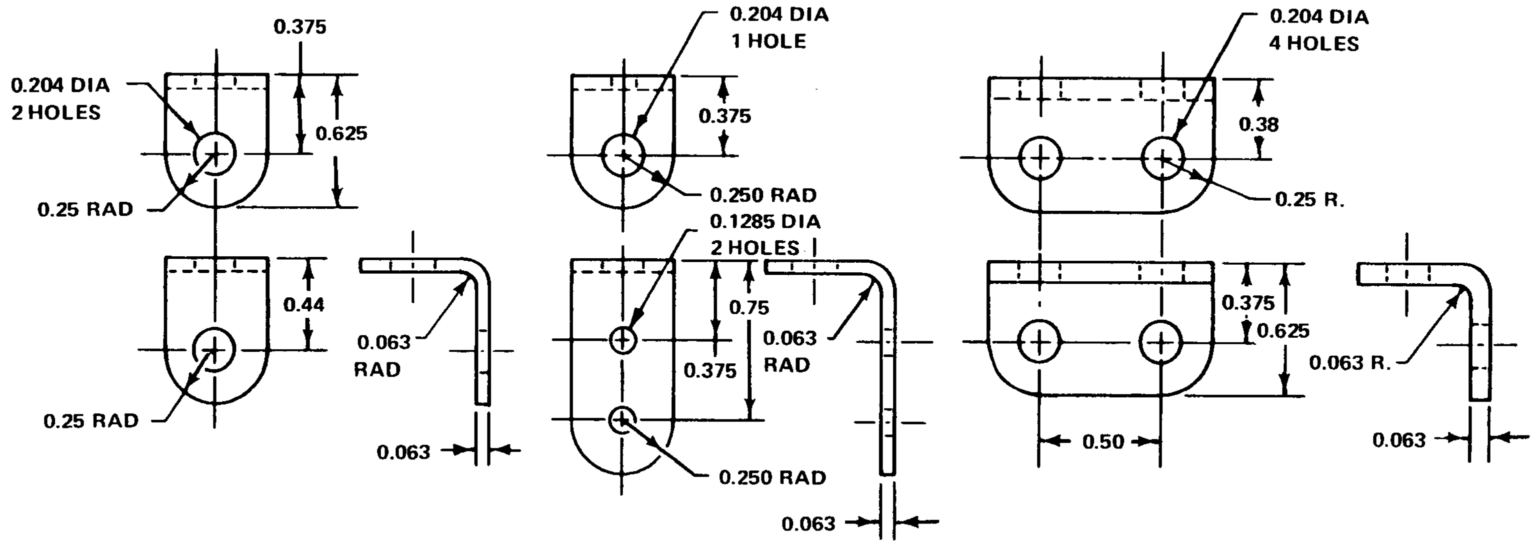
PART NUMBER	FABRICATE FROM NSN	NOTES	PART NUMBER	FABRICATE FROM NSN	NOTES
204-040-153-13	1560-00-898-1615	A,B	204-040-353-17	1560-00-894-6539	A,B
204-040-153-15	1560-00-894-6539	A,B	204-040-355-11	1560-00-491-0880	A,B
204-040-153-25	1560-00-898-1614	A,B	204-040-355-13	1560-00-491-0880	A,B
204-040-155-11	1560-00-491-0880	A,B	204-040-355-15	1560-00-893-4551	A,B
204-040-155-13	1560-00-491-0880	A,B	204-040-356-5	1560-00-893-4598	A,B
204-040-155-15	1560-00-893-4551	A,B	204-040-419-7	1560-00-898-1576	A,B
204-040-156-5	1560-00-898-1615	A,B	204-040-425-5	1560-00-898-1576	A,B
204-040-306-9	1560-00-893-4551	A,B	204-040-513-11	1560-00-491-0880	A,B
204-040-314-5	1560-00-894-6539	A,B	204-040-513-13	1560-00-491-0880	A,B
204-040-353-11	1560-00-893-4552	A,B	205 040-125-11	1560-00-894-6539	A,B
204-040-353-13	1560-00-893-4598	A,B	205-040-125-15	1560-00-894-6539	A,B
204-040-353-15	1560-00-894-6539	A,B			

NOTES

A. COUNTERSINK 100° BEFORE PLATING
B. SIDES OF PLATES TO BE PARALLEL WITHIN 0.0002 T.I.R. AFTER PLATING

UH-1H-II-M-D-3

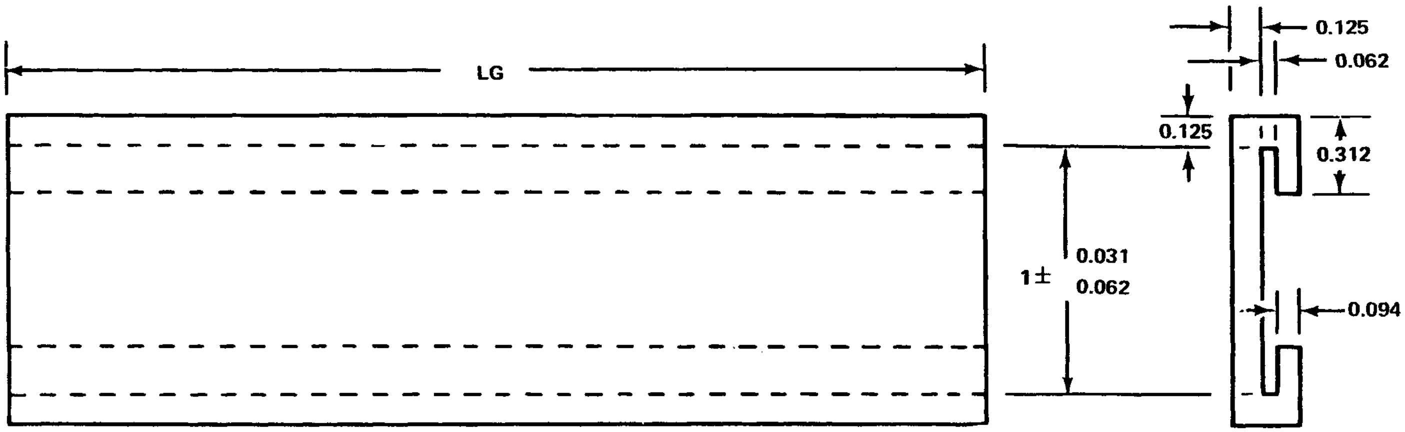
Figure D-3. Shims



AN743-12 AN743-13 AN743-7

UH-1H-II-M-D-4

Figure D-4.	Part Number	AN 743-7, BRACKET, Support Clamp
		AN 743-12
		AN 743-13
	Fabricate From:	NSN 9535-00-232-0378
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-362
		0.063 inch thick



NOTES
1. + 0.125
Tolerance on Lg

PARTS NUMBER	FABRICATE FROM NSN	LG
AN8031-8-183	9390-00-263-0061	18.75

UH-1H-II-M-D-5

Figure D-5. Part Number AN 8031-8-183, PAD, Strap
Fabricate From: 9390-00-263-0061
Material: Synthetic Rubber and Cork Channel, MIL-G-6183
Synthetic Rubber, Nonmetallic, Soft, Fuel and
Oil Grade MIL-G-6183

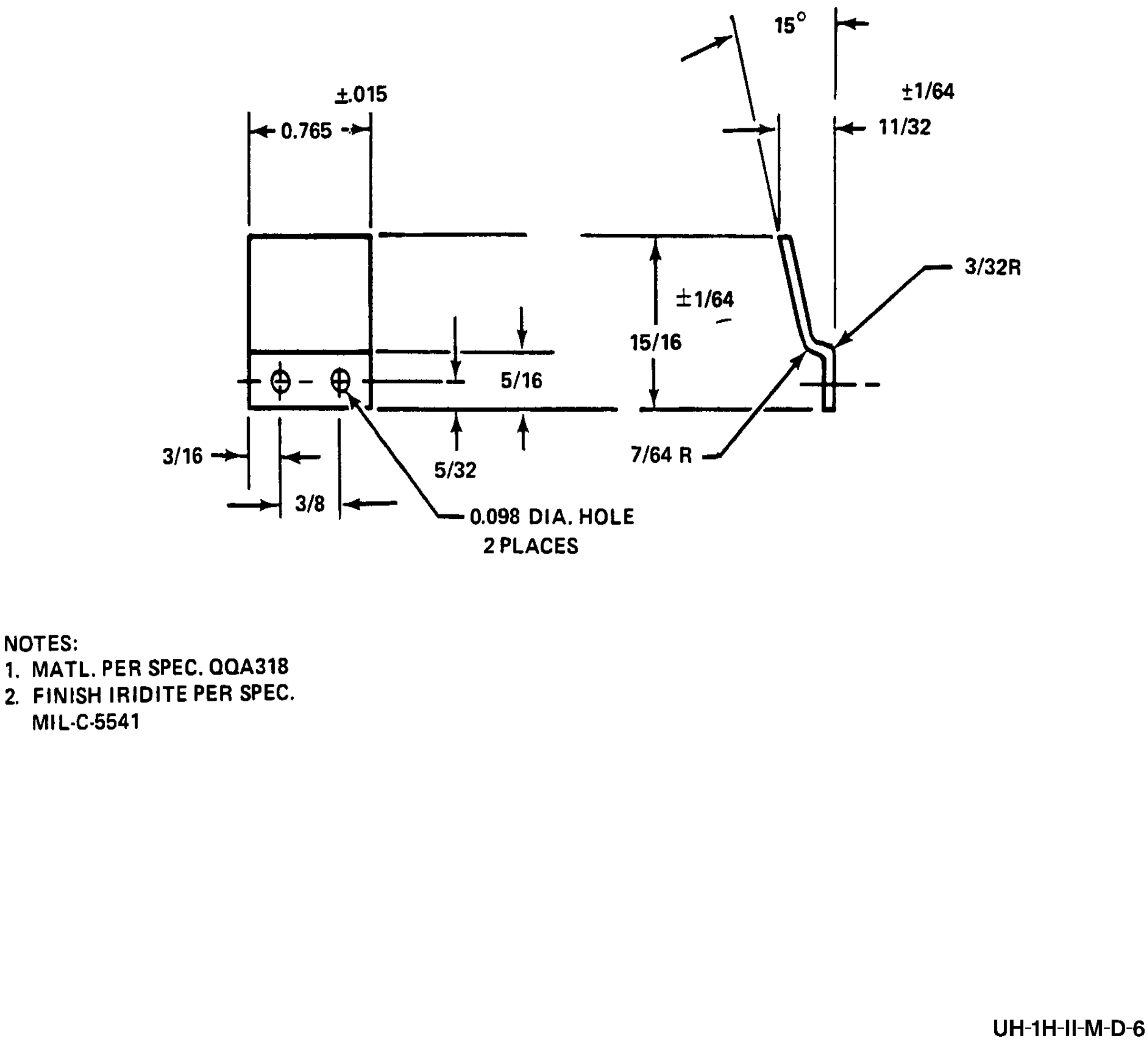


Figure D-6.	Part Number	A6544, CLIP, Wire Light
	Fabricate From:	NSN 9535-00-232-0378
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

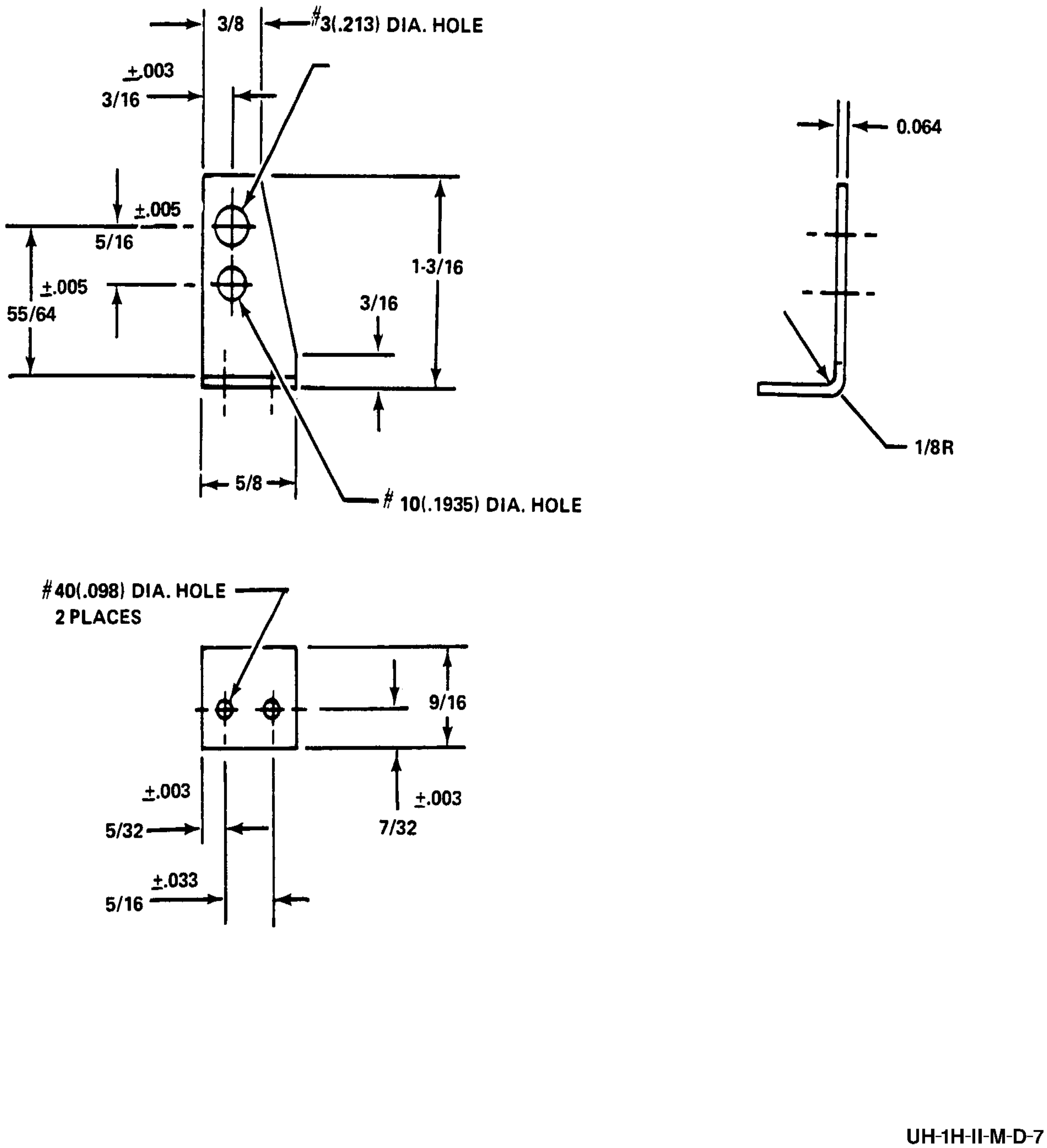
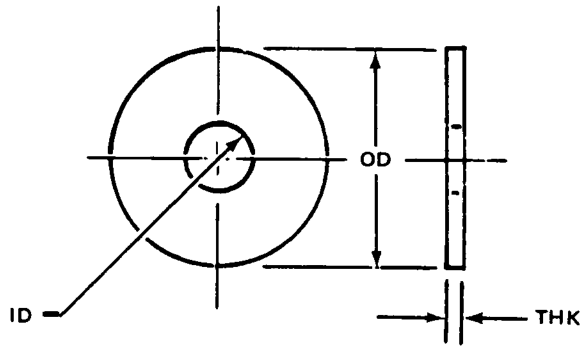


Figure D-7.	Part Number	A6545, BRACKET, LH
	Fabricate From:	NSN 9535-00-232-0378
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



BREAK SHARP EDGES 0.025x45° or 0.025 R
DIAMETERS TO BE CONCENTRIC
TO 0.010 T.I.R.

	PART NUMBER	NAME	FABRICATE FROM	ID	OD	THK
1	204-010-780-1	WASHER	5310-00-167-0766	0.390 0.397	1.125	0.063
1	204-010-793-3	WASHER	5310-00-167-0766	0.265	0.700	0.063
1	204-011-708-1	WASHER	5310-00-167-0766	0.452	1.125	0.063
2	204-011-708-3	WASHER	5310-00-167-0768	0.452	1.620	0.063

1 Make from AN970-4

2 Make from AN970-6

UH-1H-II-M-D-8

Figure D-8. WASHER, FLAT

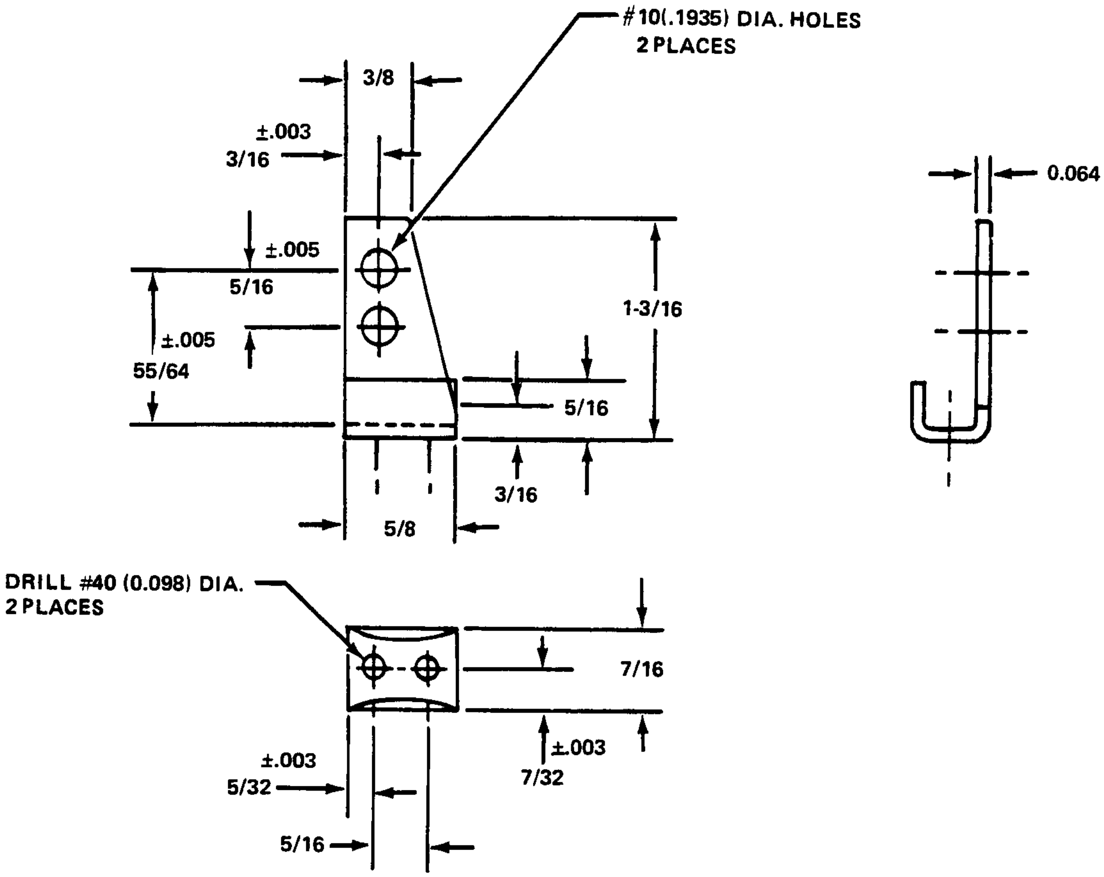


Figure D-9. Part Number A6546, BRACKET
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

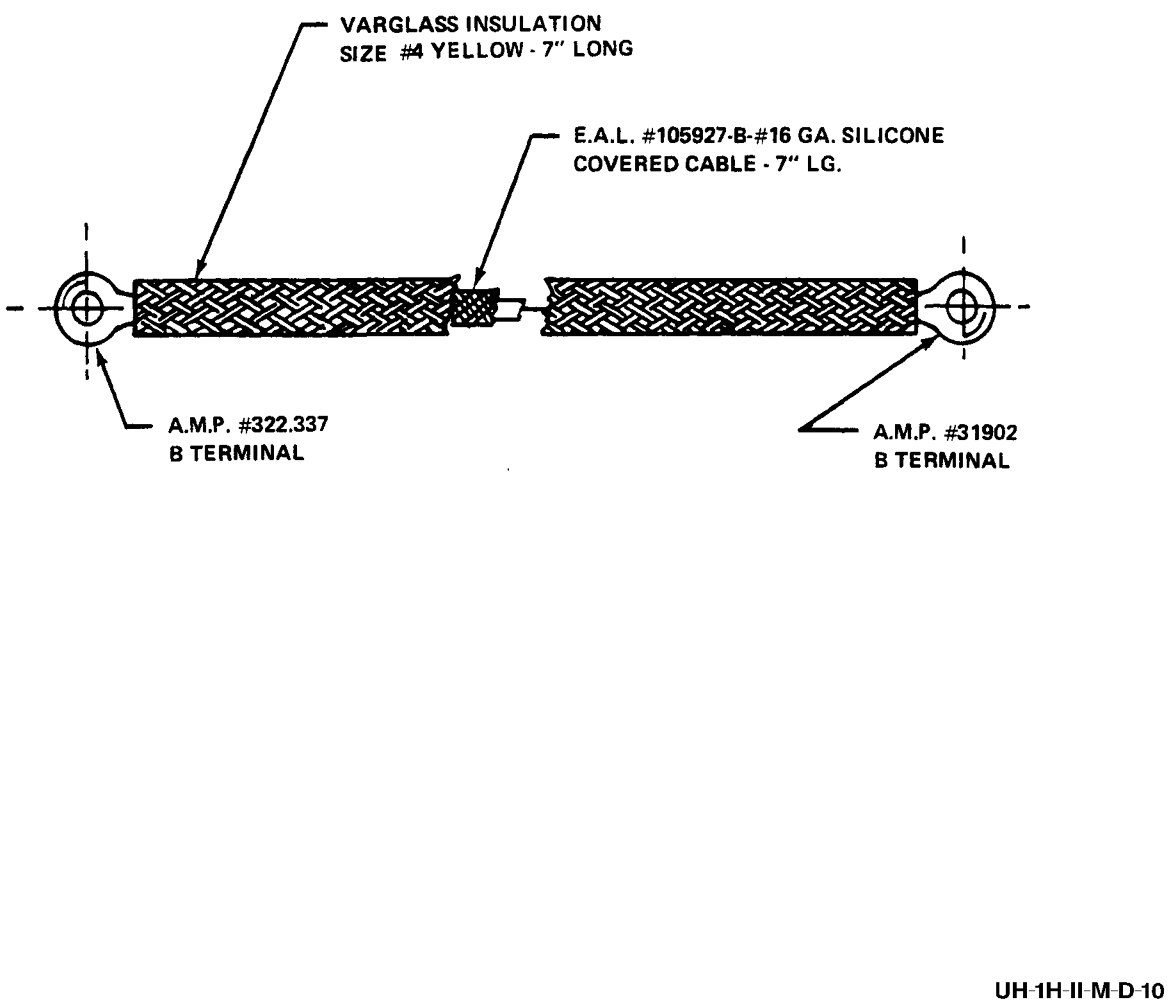


Figure D-10.	**Part Number**	**A6910, WIRE ASSEMBLY, Lamp**
	Fabricate From:	**NSN 9535-00-557-1627**
		NSN 6145-00-998-7609

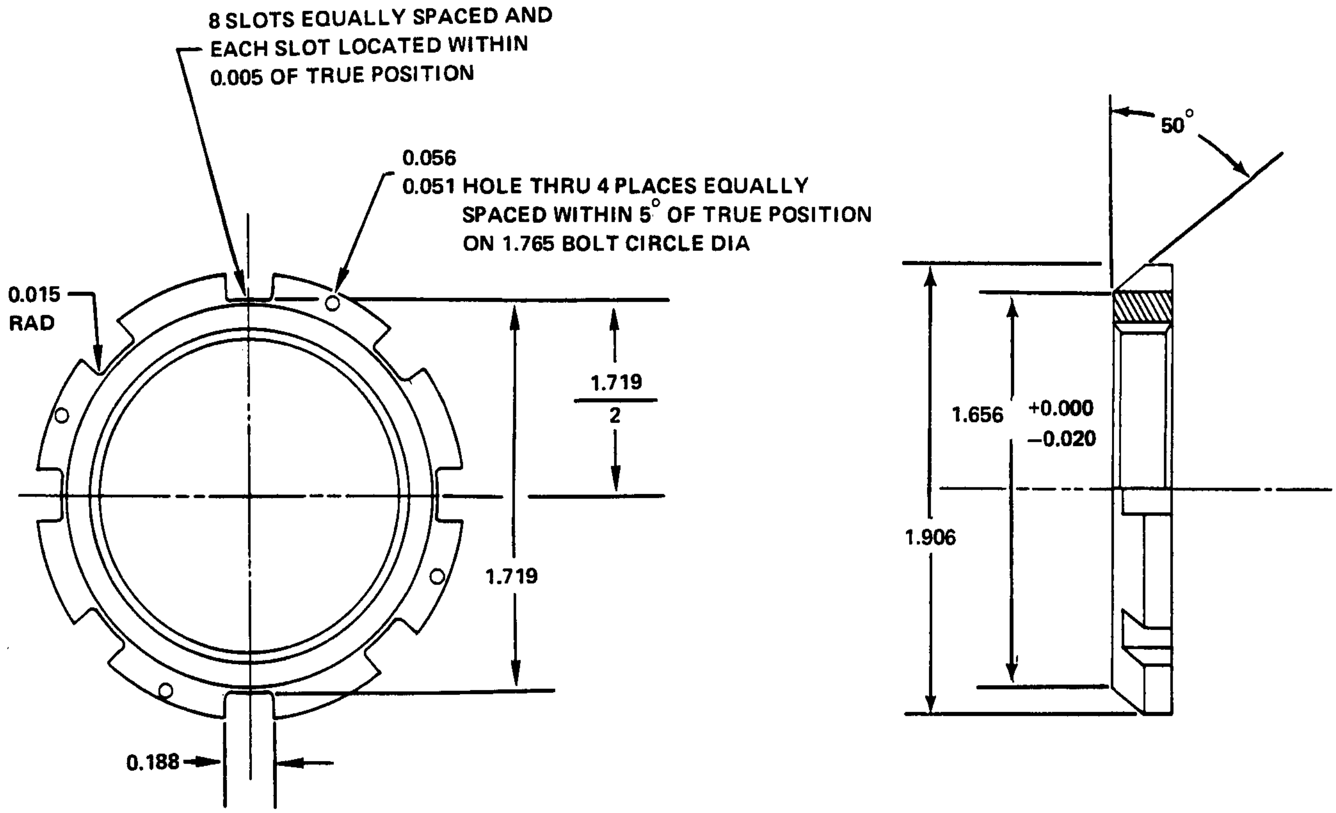


Figure D-11. Part Number 204-001-222-1, NUT, Collective Stick Lock
Fabricate From: NSN 3110-00-566-8864
Material: Steel, AMS 6381 or AMS 6382

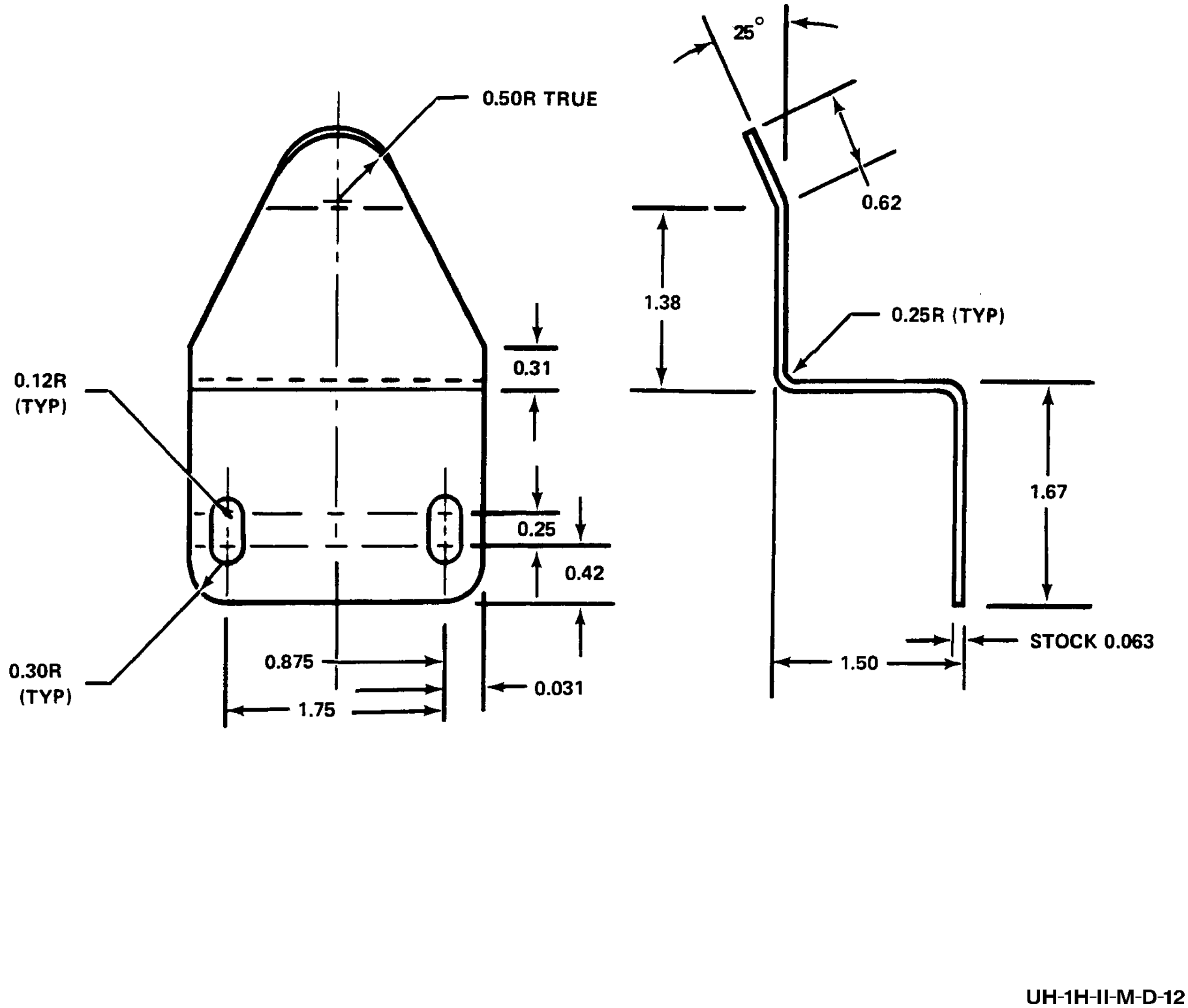
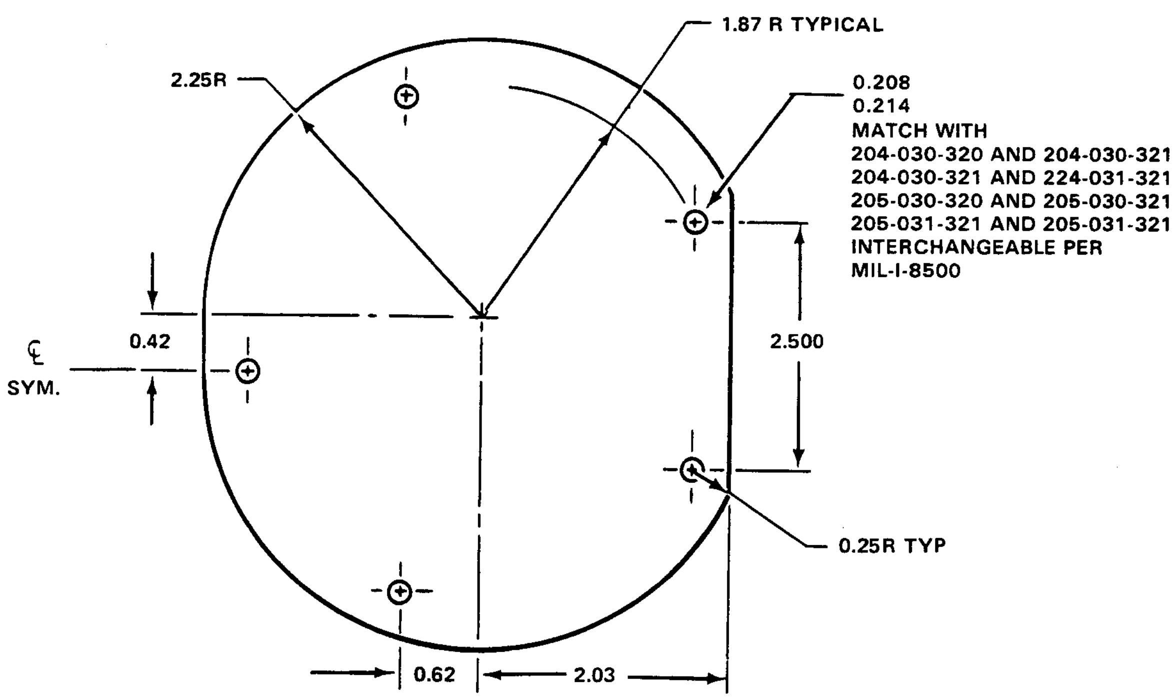
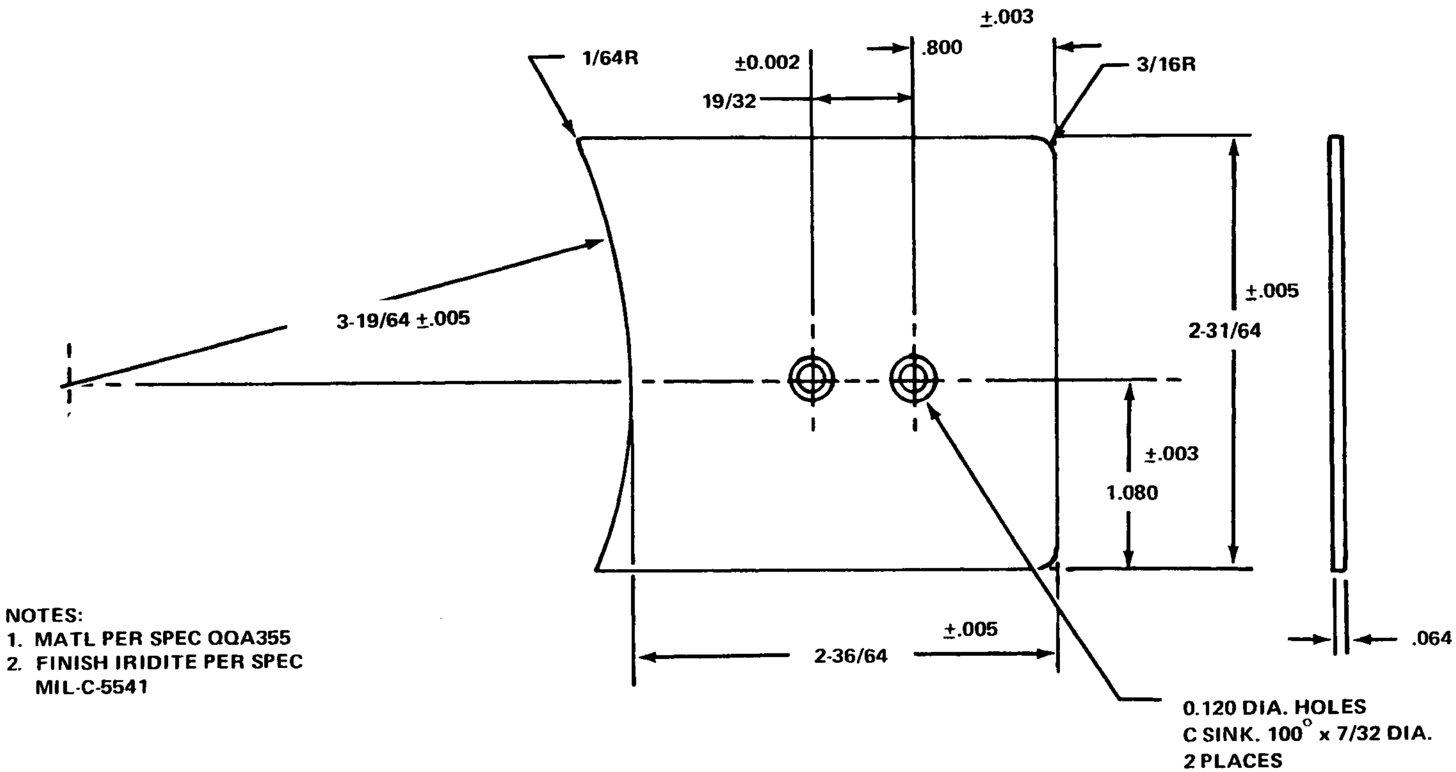


Figure D-12. Part Number 204-030-010-1, STOP, Windshield Wiper
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.063 Inch Thick



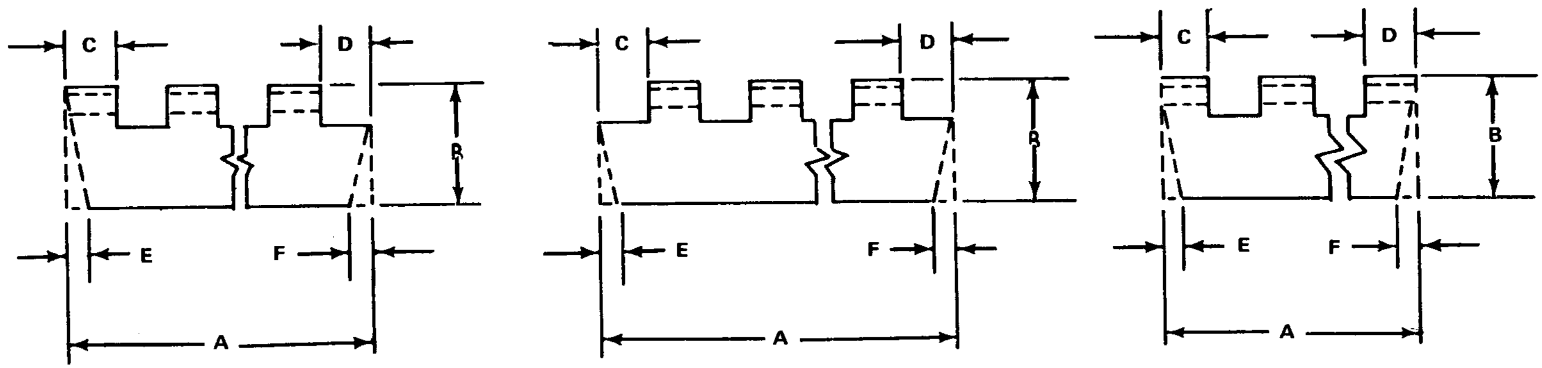
UH-1H-II-M-D-13

Figure D-13. Part Number 204-030-337-3, DOOR, Cyclic
Fabricate From: NSN 9535-00-086-9870
Material: 7075 AL ALY, T6, Federal Specification QQ-A-250/13, 0.025 Inch Thick



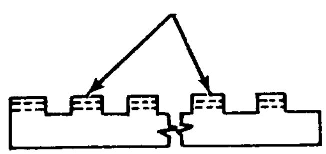
UH-1H-II-M-D-14

Figure D-14. Part Number A6915, PLATE, Cover
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



TYPE 1 TYPE 2 TYPE 3

REMOVE TANG TWO PLACES



DETAIL A-A

GENERAL NOTES:
1. CRIMP BOTH ENDS OF HINGE TO RETAIN HINGE PIN.
2. HOLES TO BE DRILLED AT TIME OF INSTALLATION AND TO BE EQUALLY SPACED ALONG HINGE HALF.

SPECIAL NOTES:
A. FOR INSTALLATION OF SPRING REMOVE CENTER TANG.
B. FOR INSTALLATION OF SPRINGS REMOVE TWO TANGS. SEE DETAIL A-A.
C. HINGE HALF WITH TANGS REMOVED MAY BE MISMATCHED AT BOTTOM OF TANG.
D. BOTH ENDS OF HINGE HALF MUST BE EQUAL WITHIN 0.020 INCHES.

UH-1H-II-M-D-15-1

Figure D-15. (Sheet 1 of 2)

PART NUMBER	FABRICATE FROM NSN	TYPE	A	B	C	D	E	F	NO. OF HOLES TO BE DRILLED	SPECIAL NOTES
AN257-2-650	5340-00-664-8121	1	6.50	STOCK			N/A	N/A	AR	D
204-030-813-21	5340-00-993-1461	1	AR	STOCK			N/A	N/A	AR	D
204-030-813-23	5340-00-993-1461	1	AR	STOCK			N/A	N/A	AR	D
204-030-813-25	5340-00-993-1461	1	AR	STOCK			N/A	N/A	AR	D
204-030-813-27	5340-00-993-1461	1	AR	STOCK			N/A	N/A	AR	D
204-030-840-1	5340-00-993-1461	1	14.50	STOCK			N/A	N/A	AR	D
204-030-840-3	5340-00-993-1461	2	7.16	STOCK			N/A	N/A	AR	D
204-030-840-5	5340-00-993-1461	2	7.16	STOCK			N/A	N/A	AR	D
205-030-245-13	5340-00-664-8140	1	6.30	STOCK			N/A	N/A	6	D
205-030-245-15	5340-00-664-8140	1	6.30	STOCK			N/A	N/A	6	B,D
205-030-245-43	5340-00-664-8140	1	6.30	STOCK			N/A	N/A	6	B,D
205-030-245-45	5340-00-664-8140	1	6.30	STOCK			N/A	N/A	6	D
205-030-484-15	5340-00-664-8140	3	3.10	STOCK			N/A	N/A	5	D
205-030-484-17	5340-00-664-8140	2	3.10	STOCK			N/A	N/A	5	D
205-030-539-11	5340-00-664-8140	1	2.50	STOCK			N/A	N/A	4	D
205-031-668-51	5340-00-993-1461	1	6.00	STOCK			N/A	N/A	6	D

UH-1H-II-M-D-15-2

Figure D-15. (Sheet 2 of 2)

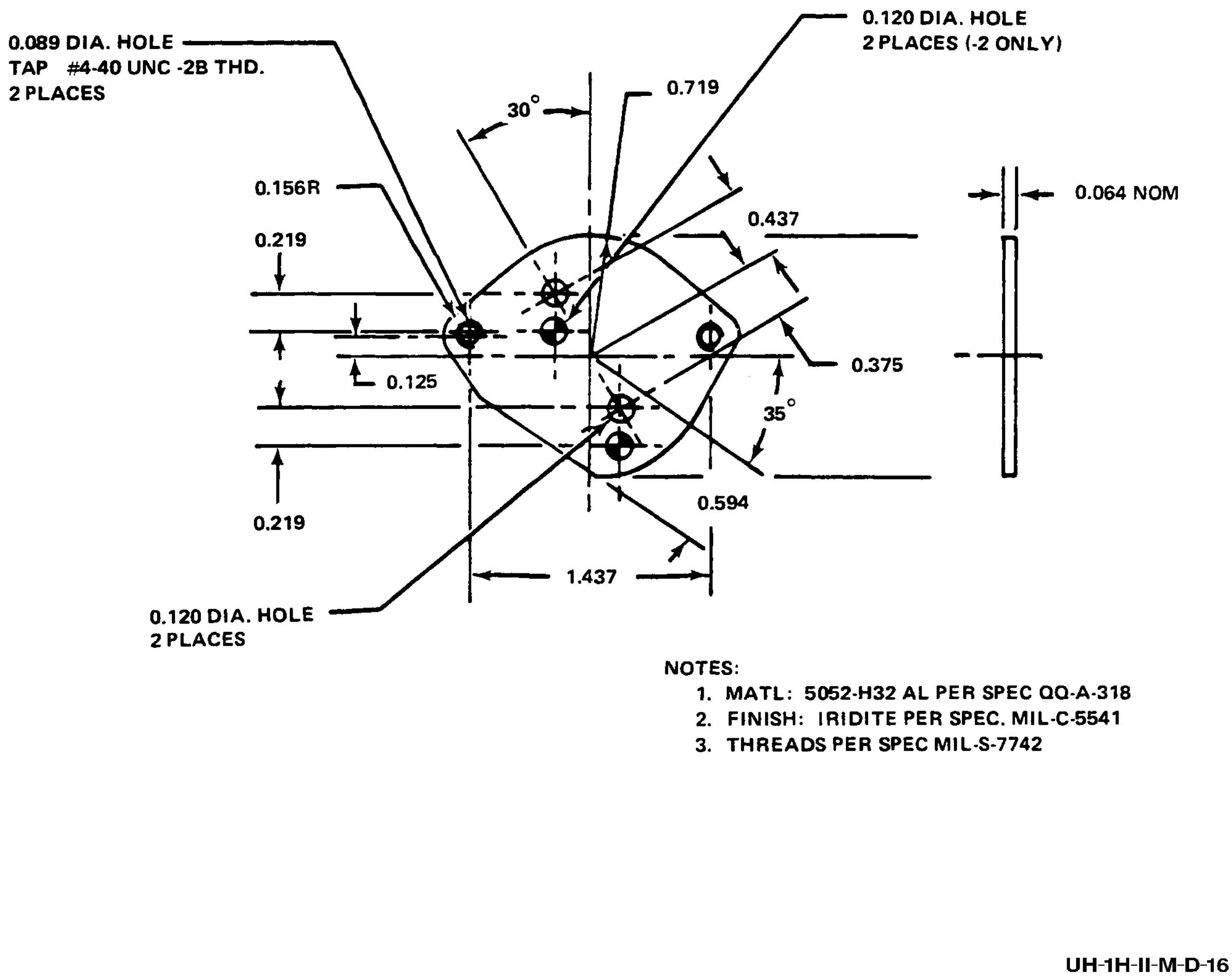


Figure D-16. Part Number A9116-2 PLATE
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

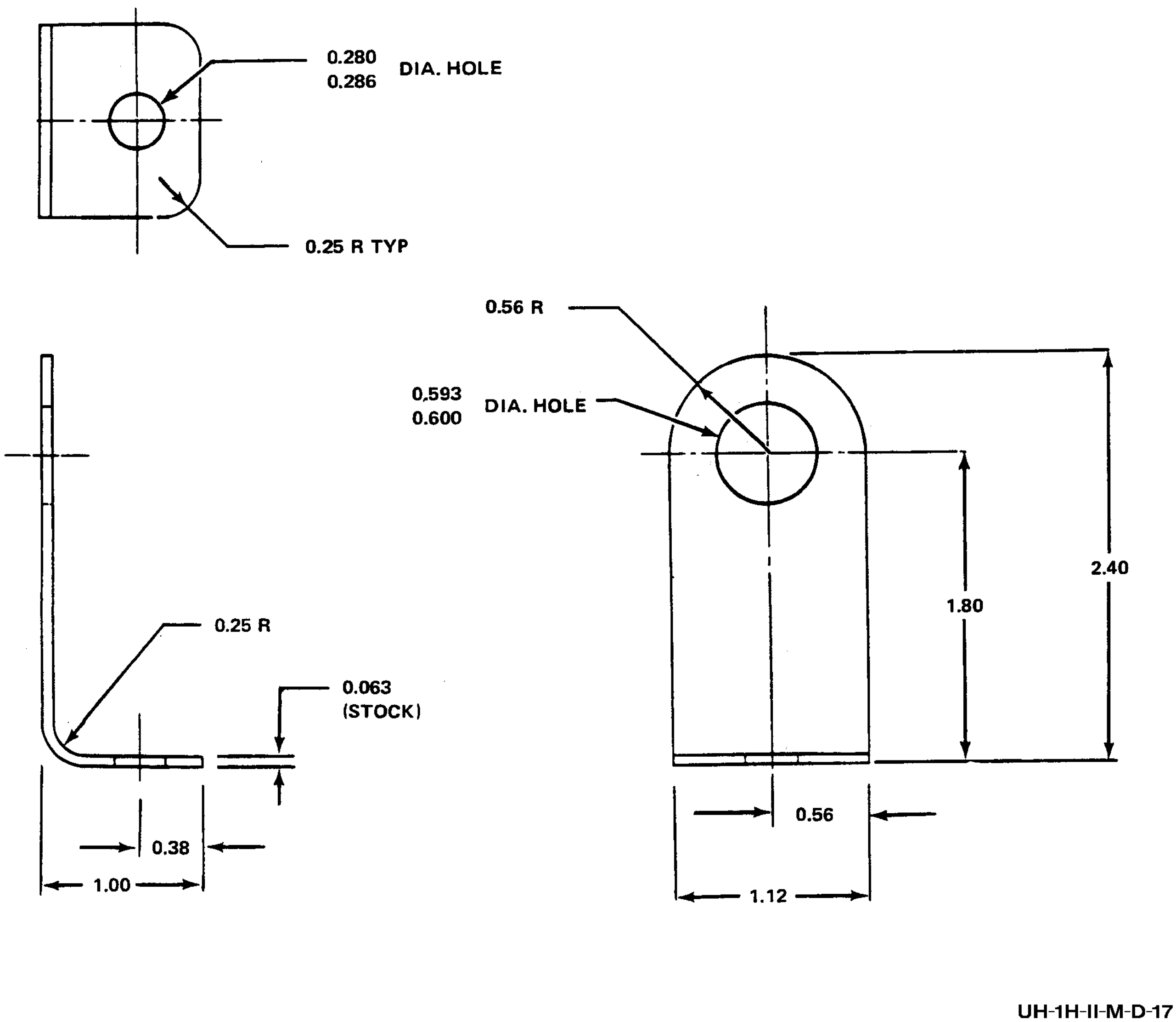
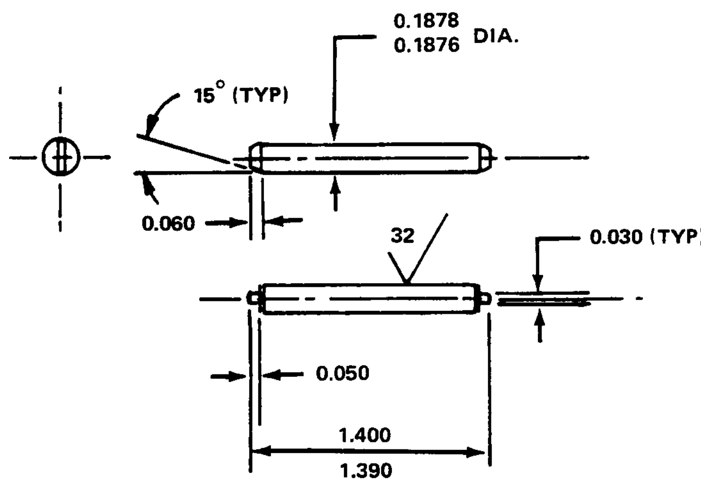


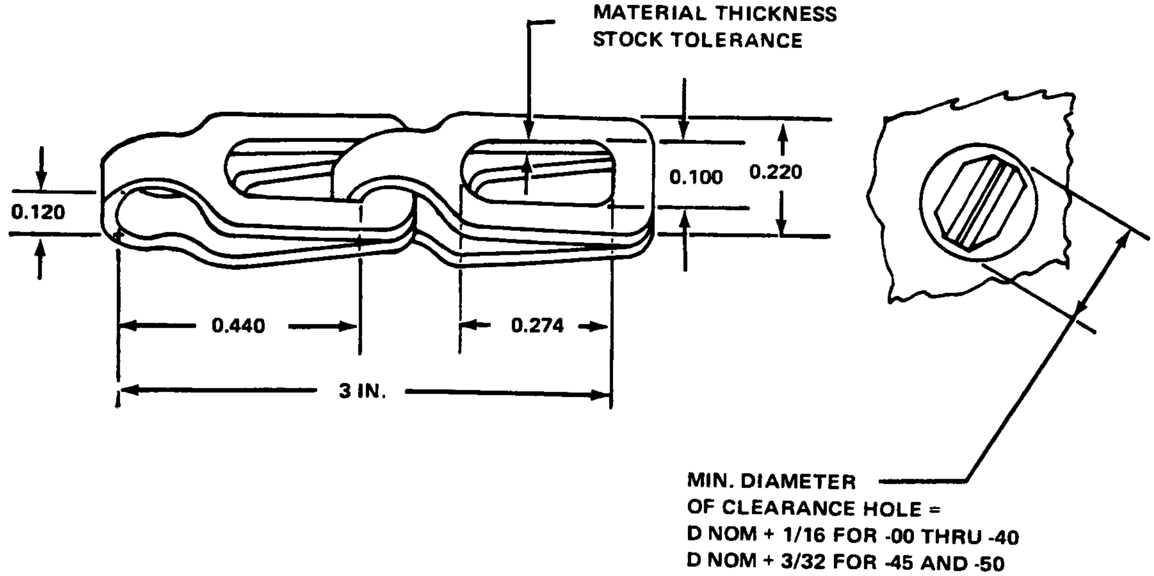
Figure D-17. Part Number 204-040-299-1 BRACKET, Oil Drain Line
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



NOTE:
1. COAT WITH PRESERVATIVE OIL AND WRAP IN MOISTURE-PROOF PAPER (OR EQ.)

UH-1H-II-M-D-18

Figure D-18. Part Number CSC536-3, PIN, Cam
Fabricate From: NSN 9510-00-234-7620



PART NUMBER	FABRICATE FROM NSN	A	B	C	D	E	LG
NAS 1455-00-3C	4010-00-889-2210	0.440	0.274	0.100	0.220	0.120	3 IN.
NAS 1455-00-5	4010-00-228-9948	0.440	0.274	0.100	0.220	0.120	5 IN.
NAS 1455-1A2-5	4010-00-554-8661	0.576	0.350	0.109	0.178	0.295	5 IN.
NAS 1455-B00-5	4010-00	0.440	0.274	0.100	0.220	0.120	5 IN.

UH-1H-II-M-D-19

Figure D-19. CHAIN, WELDLESS

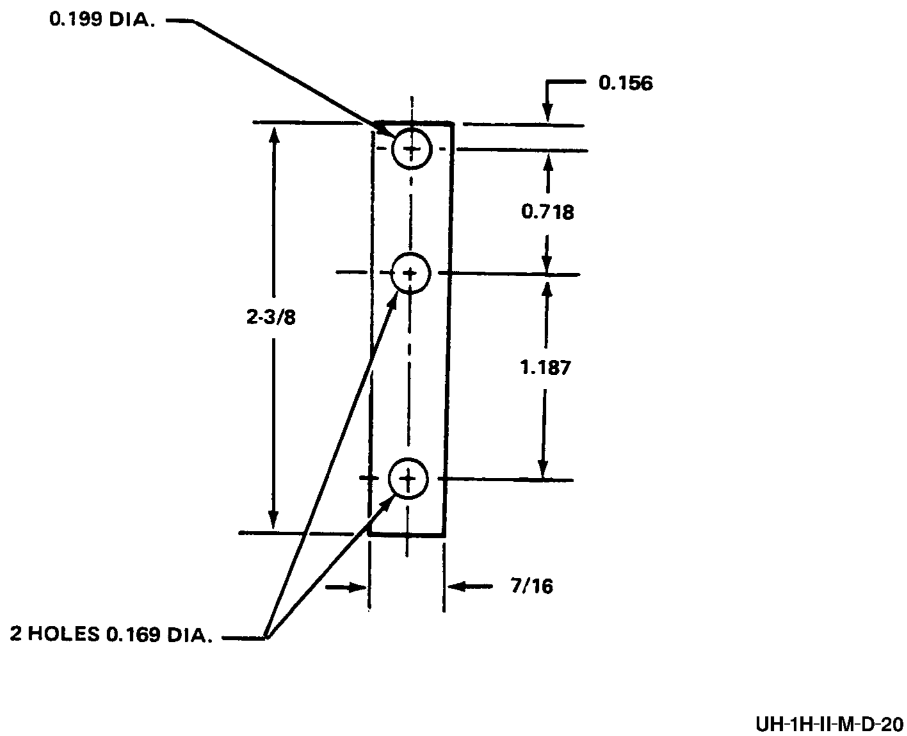
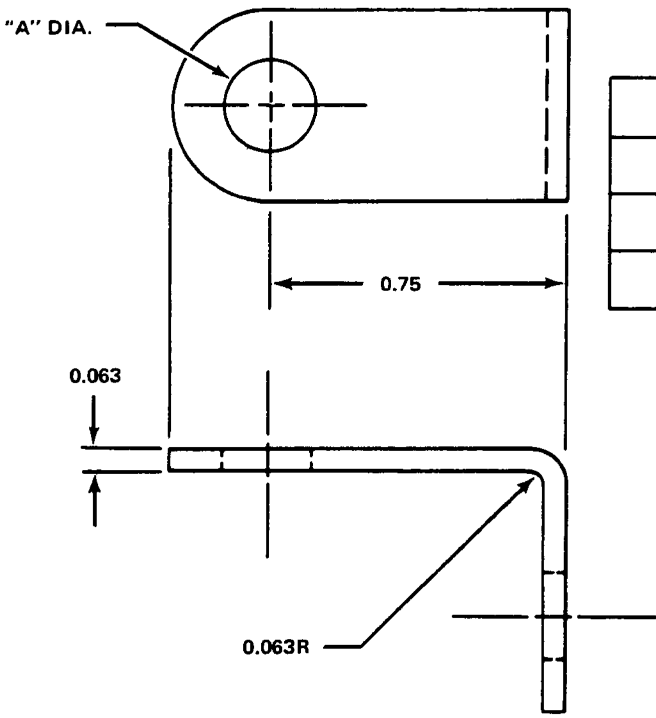
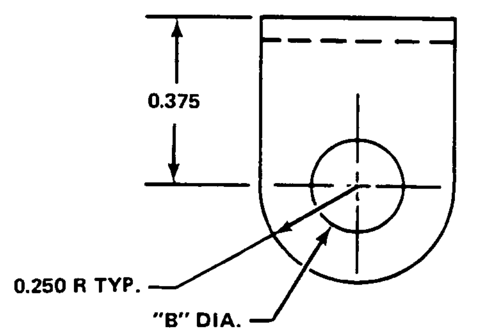


Figure D-20.	**Part Number**	**W20396, BRACKET**
	Fabricate From:	**NSN 9535-00-640-2311**
	Material:	**2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.050 Inch Thick**



DASH NO.	DIA. "A"	DIA. "B"
-1	0.204	0.204
-2	0.204	0.264
-3	0.264	0.204



UH-1H-II-M-D-21

Figure D-21. Part Number 20-032-1, BRACKET SUPPORT
20-032-2
20-032-3
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

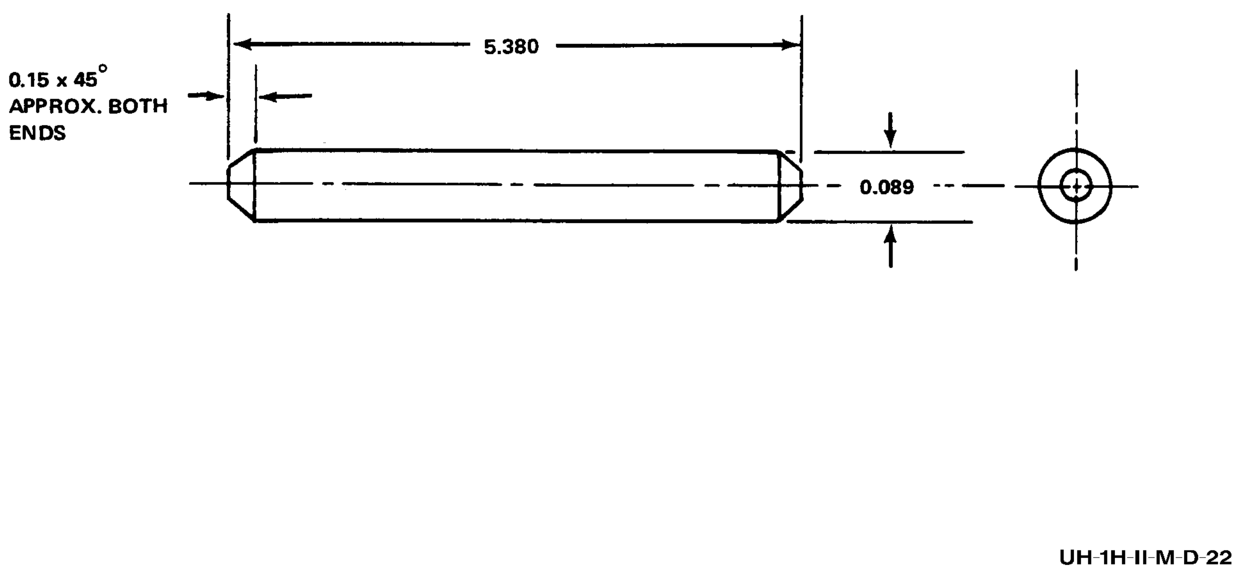


Figure D-22. **Part Number** **MS20253P2-538 PIN, HINGE**
Fabricate From: **NSN 5340-00-043-3723**
Material: **Rod, Straight, Headless, Cres. Cadimum Plated, 0.089 Inch Thick Diameter**

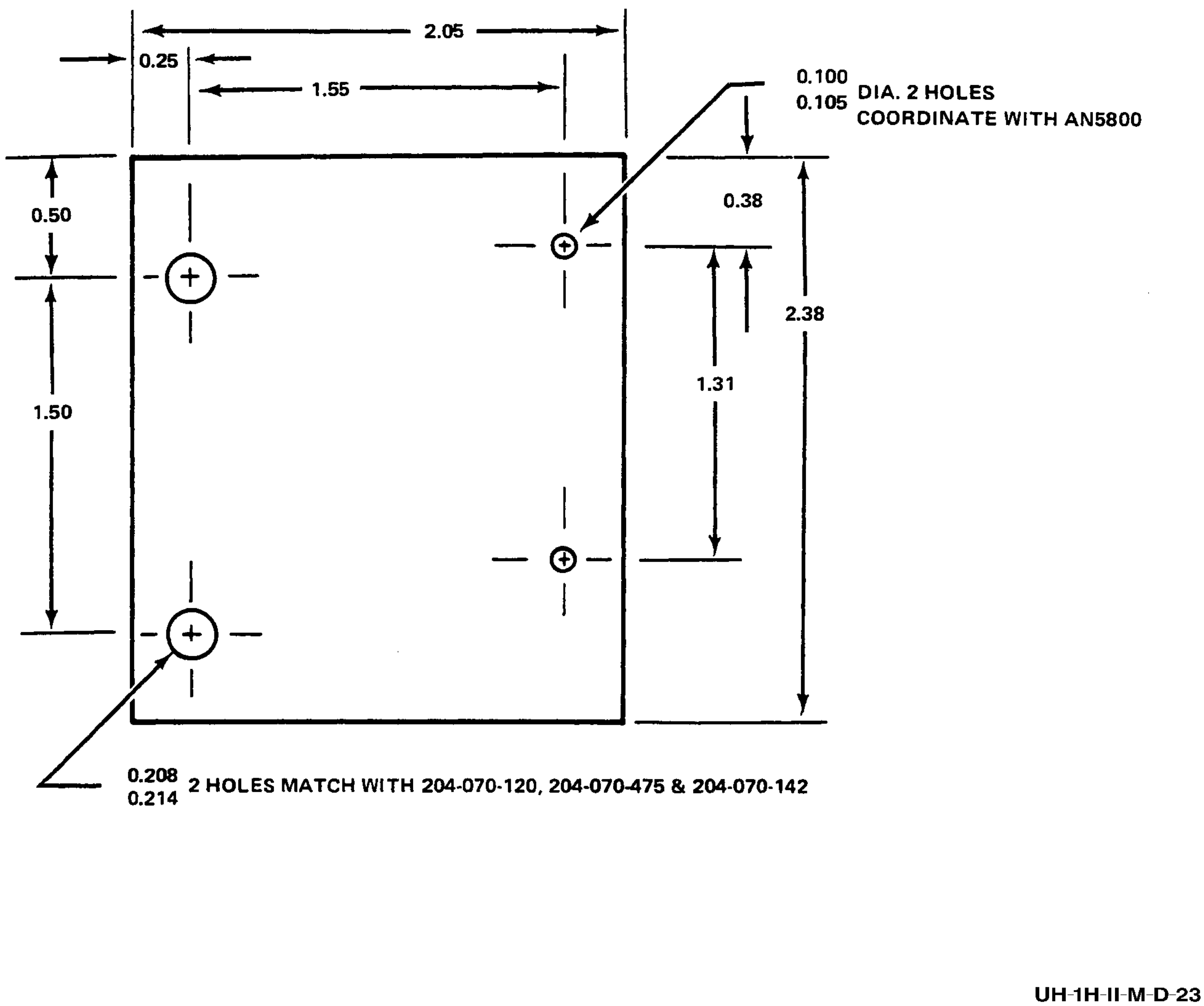
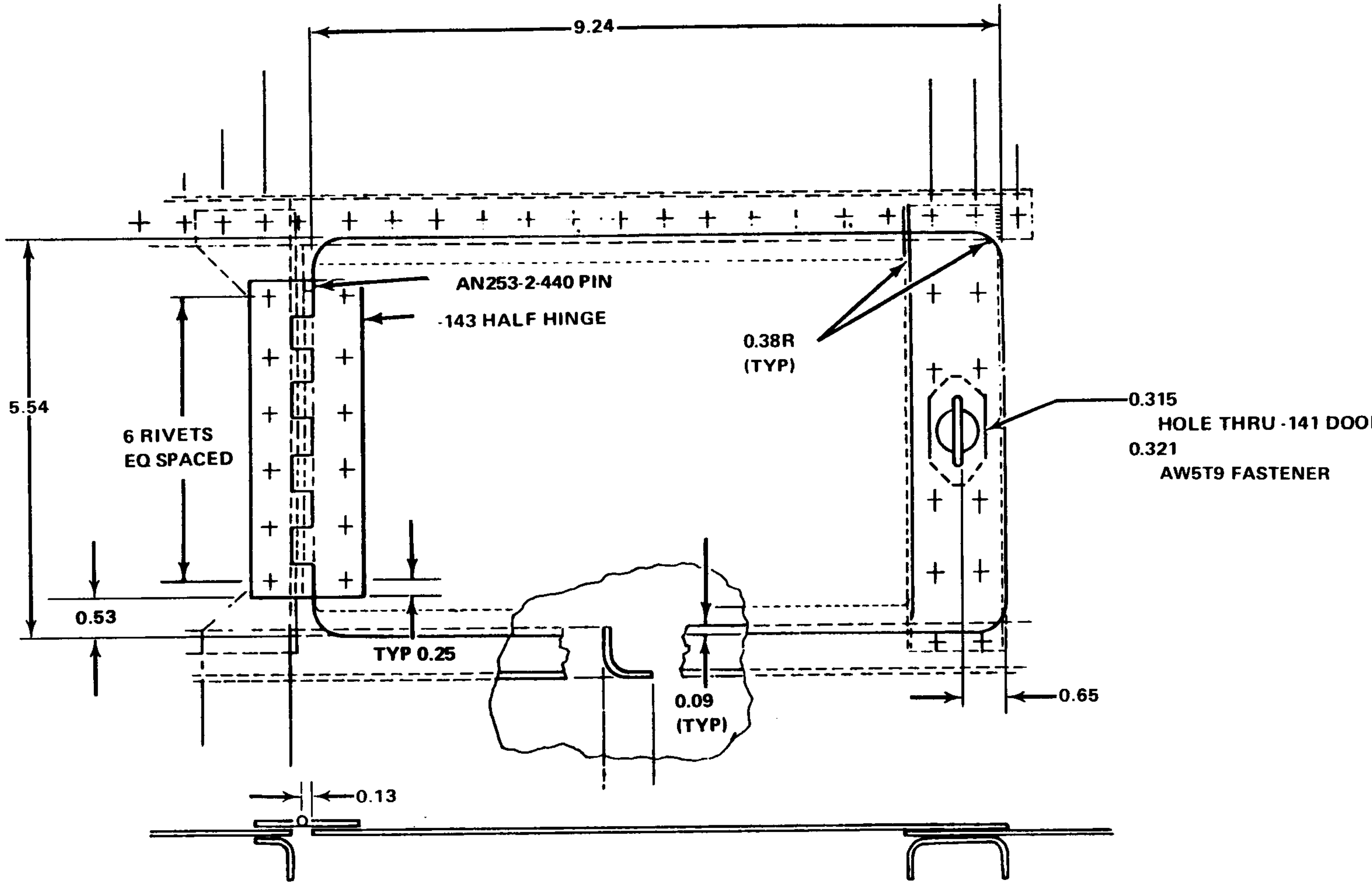


Figure D-23. Part Number 204-070-143-3, PLATE, Correction Card Holder
Fabricate From: NSN 9535-00-167-2277
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.020 Inch Thick



UH-1H-II-M-D-24

Figure D-24.	**Part Number**	**204-030-007-139 DOOR ASSEMBLY**
	Fabricate From:	**NSN 9535-00-167-2279**
		NSN 5340-00-209-7519
		NSN 5325-00-838-8804
		NSN 5325-00-141-4002
	Material:	**2024 AL ALY, Federal Specification QQ-A-25, 0.020 Inch Thick**

TUBE ASSY PART NUMBER	FABRICATE FROM NSN	STOCK DIM.	END FITTING NUT NSN	NO. REQ.	SLEEVE NSN	NO. REQ.
204-040-749-1	4710-00-279-0955	3/8 x 0.035 x 30.00	4730-00-142-2167	1	4730-00-278-6070	1

1ST BEND FROM "Y"				2ND BEND FROM "Y"				3RD BEND FROM "Y"				4TH BEND FROM "Y"			
DIST FROM "Y" END	RAD.	BEND DEG.	DIAL ROT CW	DIST FROM "Y" END	RAD.	BEND DEG.	DIAL ROT CW	DIST FROM "Y" END	RAD.	BEND DEG.	DIAL RTN CW	DIAL FROM "Y" END	RAD.	BEND DEG.	DIAL RTN CW
1.00	0.094	90	0	3.50	0.094	19	270	4.87	0.094	90	270	7.75	0.094	135	135
5TH BEND FROM "Y"				6TH BEND FROM "Y"											
12.50	0.094	90	180	22.00	0.094	35	0								

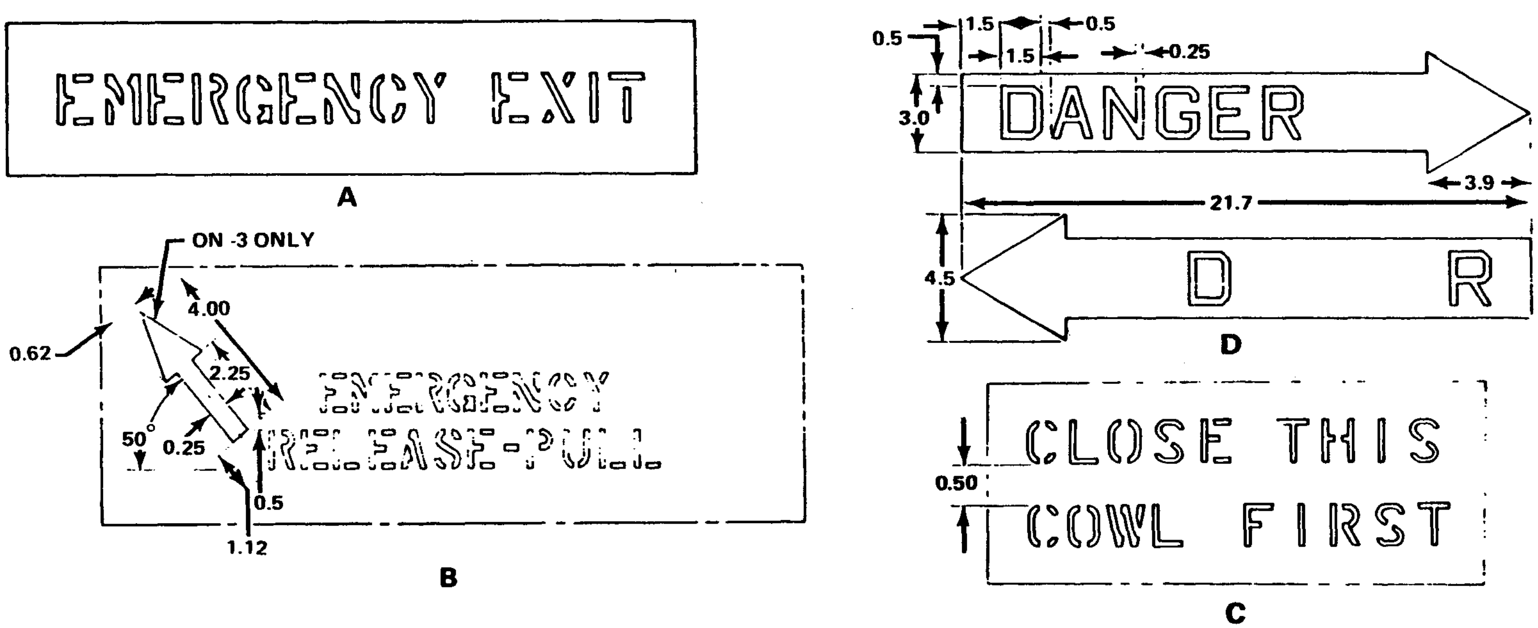
TUBE ASSY PART NUMBER	FABRICATE FROM NSN	STOCK DIM.	END FITTING NUT NSN	NO. REQ.	SLEEVE NSN	NO. REQ.
204-060-020-207	4710-00-278-6398	1/4 x 0.028 x 46.00	4730-00-278-0289	1	4730-00-302-8641	1

1 ST BEND			2ND BEND				3RD BEND				4TH BEND			
DIST A	RAD.	BEND DEG.	DIST A	RAD.	TURN ANG.	BEND DEG.	DIST A	RAD.	TURN ANG.	BEND DEG.	DIST A	RAD.	TURN ANG	BEND DEG.
44.75	0.56	82	40.25	0.56	175R	58	30.00	0.56	5R	25	20.75	0.56	0	22
5TH BEND			6TH BEND											
11	0.56	5R	35	2.62	0.56	180	55							

UH-1H-II-M-D-25

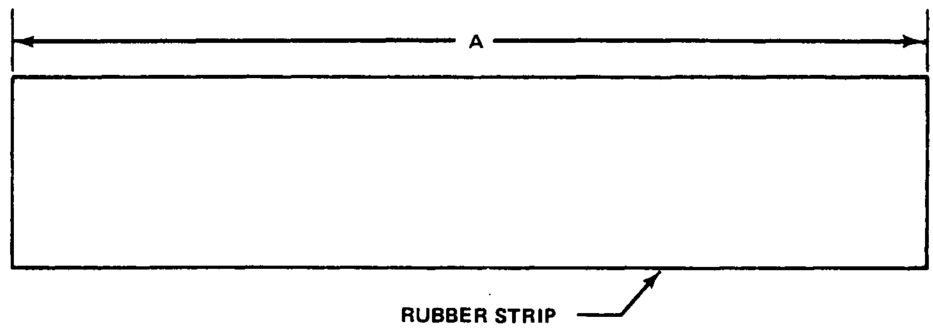
Figure D-25.

PART NUMBER	FABRICATE FROM NSN	REF LETTER	NOTES:
204-070-343-1	9310-00-265-6797	A	LETTERS TO BE 1.00 IN. HIGH, SPACED APPROX AS SHN ;
204-070-812-1	9310-00-265-6797	B	LETTERS TO BE 1.00 IN. HIGH, SPACED APPROX AS SHN SHN
205-070-226-1	9310-00-265-6797	C	LETTERS TO BE 0.50 IN. HIGH, SPACED APPROX AS SHN
205-070-853-1	9310-00-265-6797	D	
205-070-853-3	9310-00-265-6797	E	



UH-1H-II-M-D-26

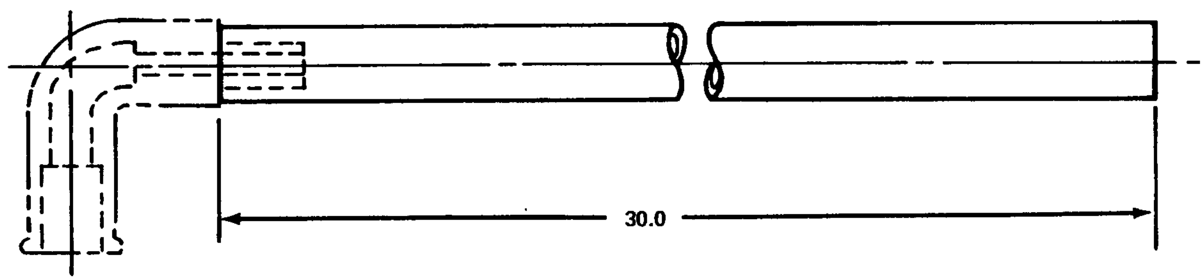
Figure D-26.



PART NUMBER	NOMENCLATURE	FABRICATE FROM NSN	A
204-030-853-73	RUBBER STRIP	9320-00-880-4520	50.000
204-030-853-83	RUBBER STRIP	9320-00-880-4520	53.500
204-030-853-85	RUBBER STRIP	9320-00-880-4520	22.000
204-030-853-111	RUBBER STRIP	9320-00-880-4520	3.000
204-030-853-113	RUBBER STRIP	9320-00-880-4520	8.300
204-030-853-115	RUBBER STRIP	9320-00-880-4520	7.700
204-030-853-117	RUBBER STRIP	9320-00-880-4520	18.500

UH-1H-II-M-D-27

Figure D-27.



NOTES:
1. MARK PART PER BPSFW 4050
2. RUBBER, MIL-R-6855, CLASS II, GRADE 60,
BLACK. - MAY BE USED AS AN ALTERNATE
3. CLEAN SURFACES TO BE BONDED WITH
ACETONE, CHEM PURE, OR METHYL ETHYL KETONE.
CHEM PURE

UH-1H-II-M-D-28

Figure D-28.	**Part Number**	**204-075-173-35, TUBING, Rubber**
	Fabricate From:	**NSN 4720-00-231-2483**
	Material:	**Tubing, Rubber, Natural, Federal Specification 28-T-831 Grade A, 0.125 Inch Wall Thickness**

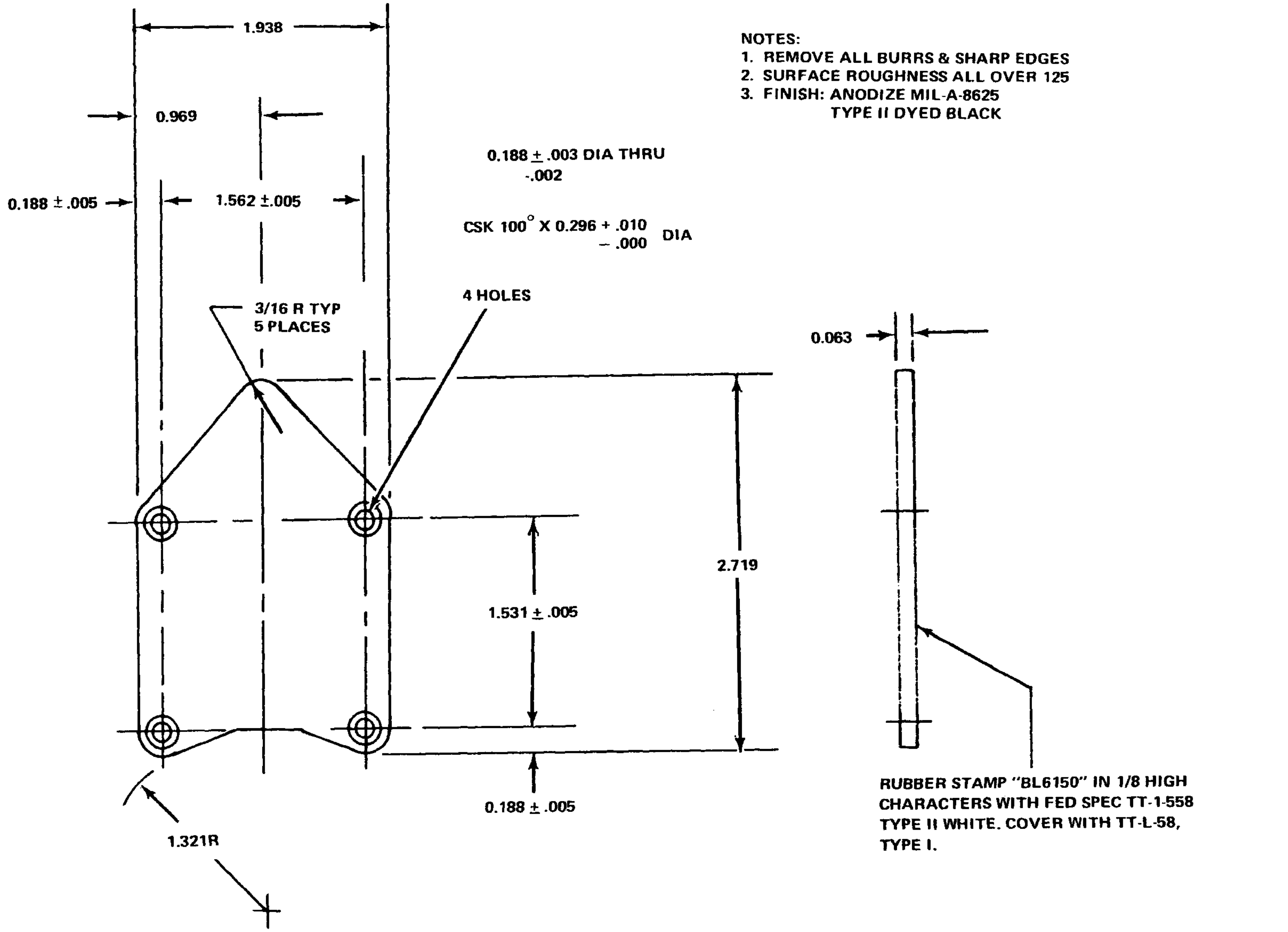


Figure D-29. Part Number BL6150 COVER, IDLE GEAR
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

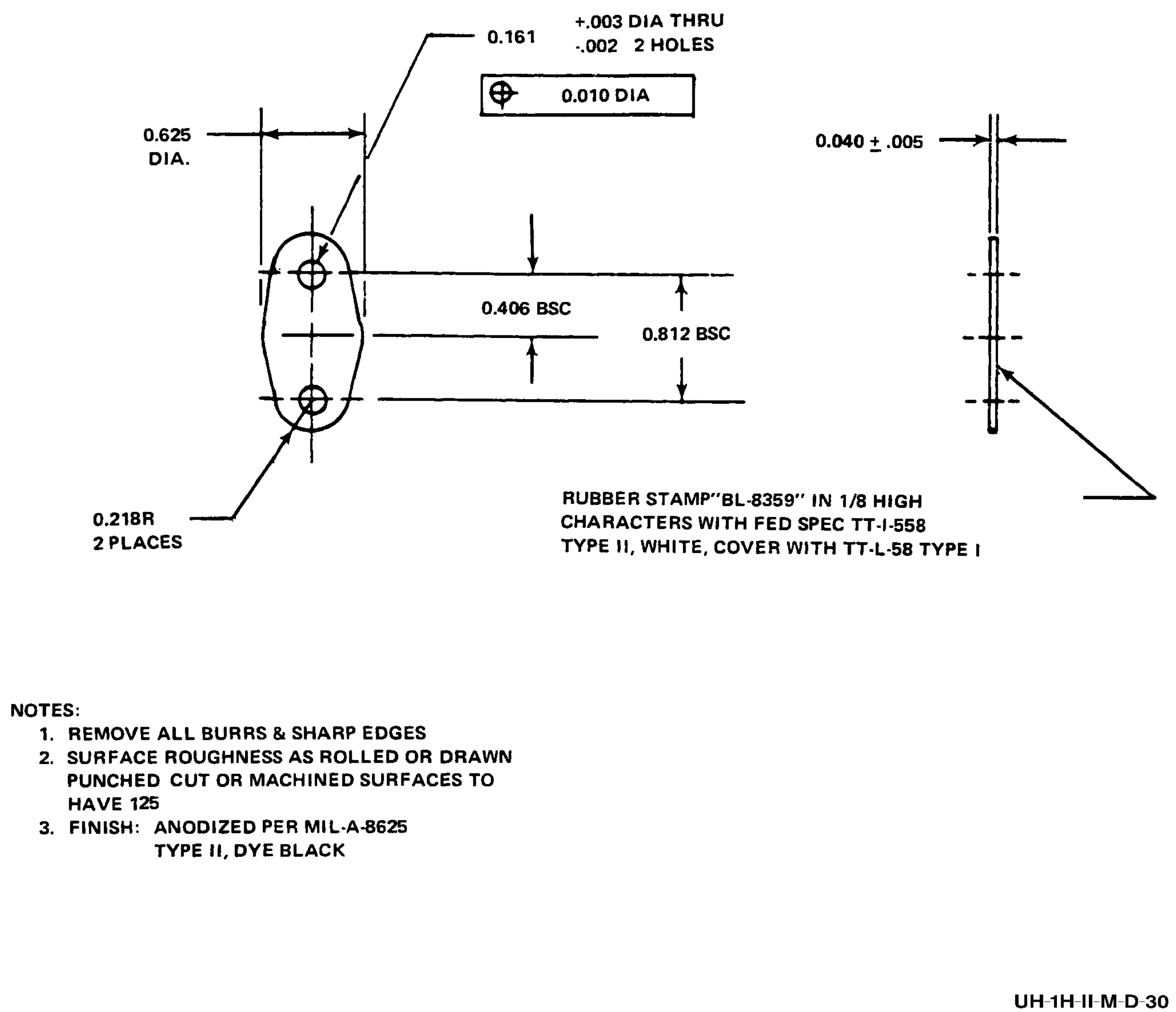


Figure D-30. Part Number BL8359 COVER, TENSION ROLL
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick

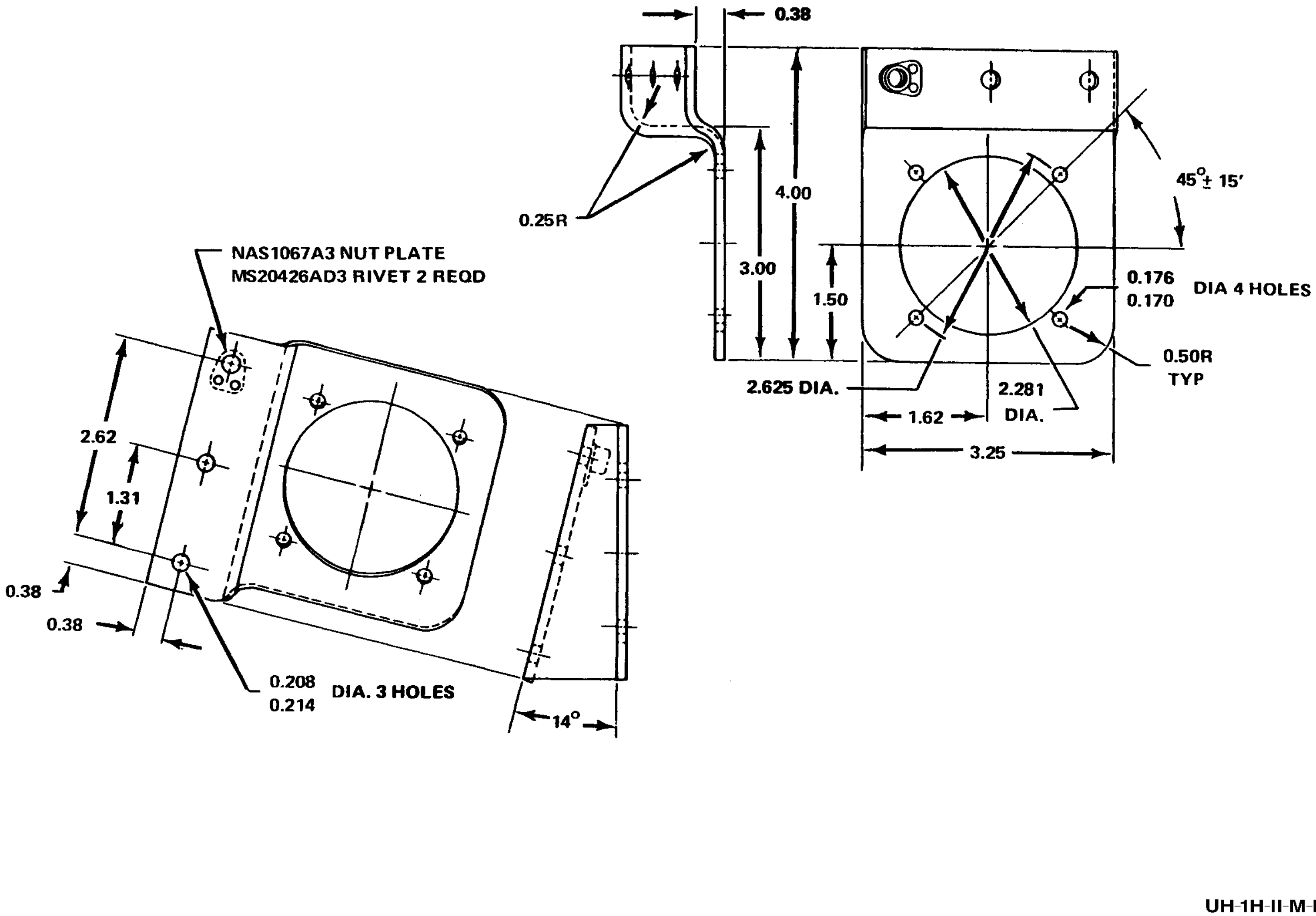
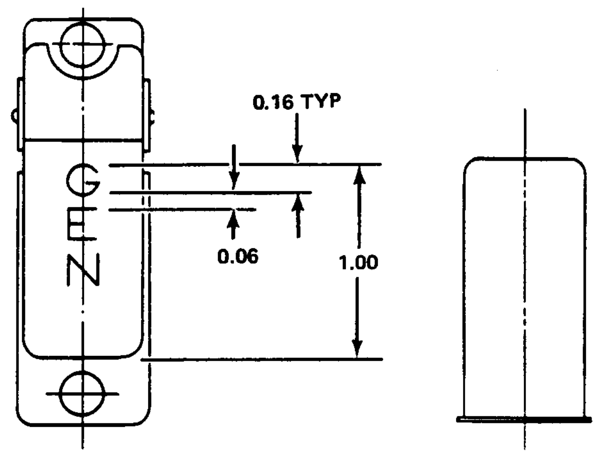
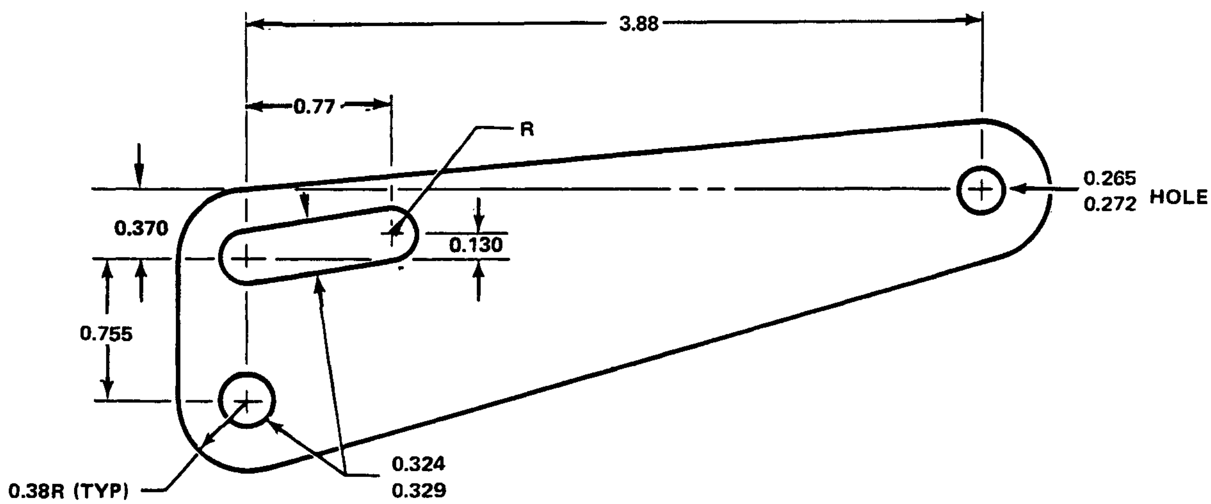


Figure D-31.	Part Number	204-070-476-1, BRACKET ASSEMBLY, Standby Compass
	Fabricate From:	NSN 9535-00-232-0418
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.125 Inch Thick



UH-1H-II-M-D-32

Figure D-32. Part Number 204-075-207-3 SWITCH GUARD
Fabricate From: NSN 5930-00-681-4897
Material: Switch Guard — Make From P/N 8497K2, Switch Guard, Cutler Hammer Milwaukee, Wis., Code Ident No. 15605



UH-1H-II-M-D-33

Figure D-33. Part Number 204-070-855-7 PLATE — Cable Guide
Fabricate From: NSN 9535-00-232-0405
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.090 Inch Thick

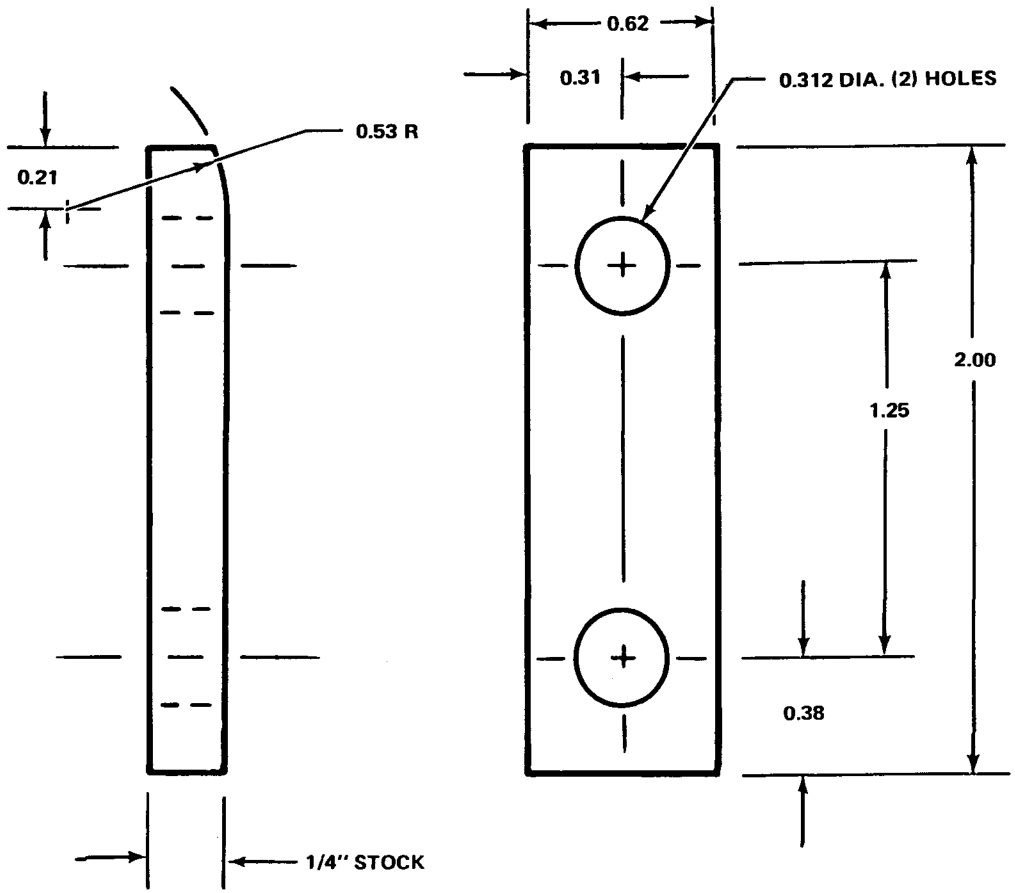
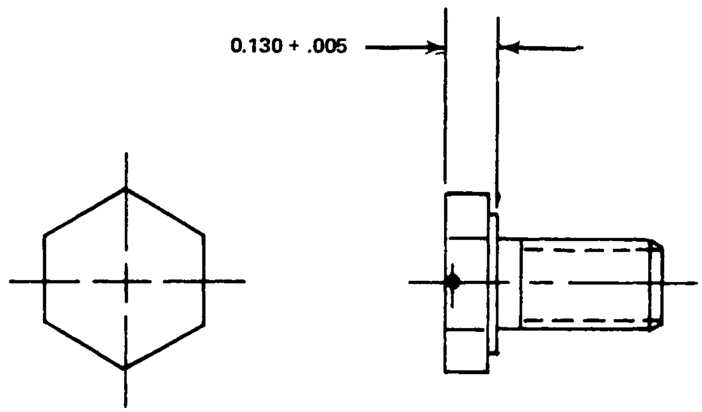


Figure D-34. Part Number 204-070-904-1 SPACER, Block-head Guard
Fabricate From: NSN 9330-00-260-3806
Material: Plastic Sheet Phenolic, Federal Specification MIL-P-15035, TYPE FBG, 0.1875 Inch Thick



NOTES:
1. REMOVE ALL BURRS & SHARP EDGES
2. GRIND OR CUT HEAD OF BOLT TO DIM SHOWN

UH-1H-II-M-D-35

Figure D-35.	**Part Number**	**BL8485 BOLT, MACHINE**
	Fabricate From:	**NSN 5306-00-180-2777**
	Material:	**Bolt, Machine, Cres., Passivated Finish, Make from AN4CN3A Bolt**

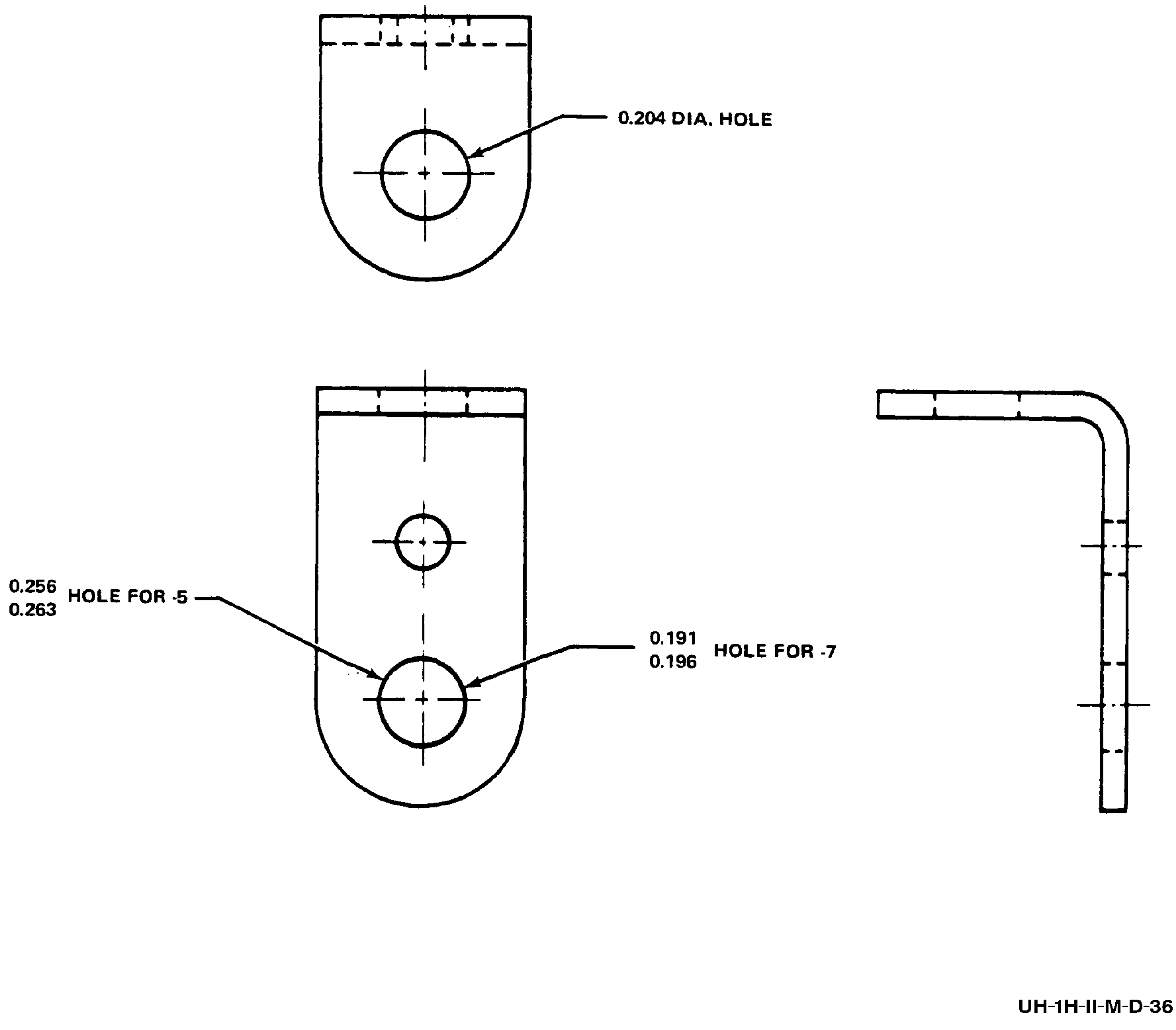
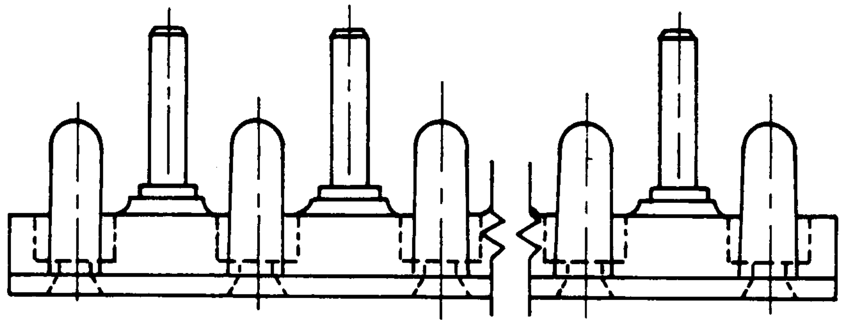


Figure D-36.	Part Number	204-075-143-5 & 7 BRACKET, Plug Mounting
	Fabricate From:	NSN 9535-00-232-0378
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



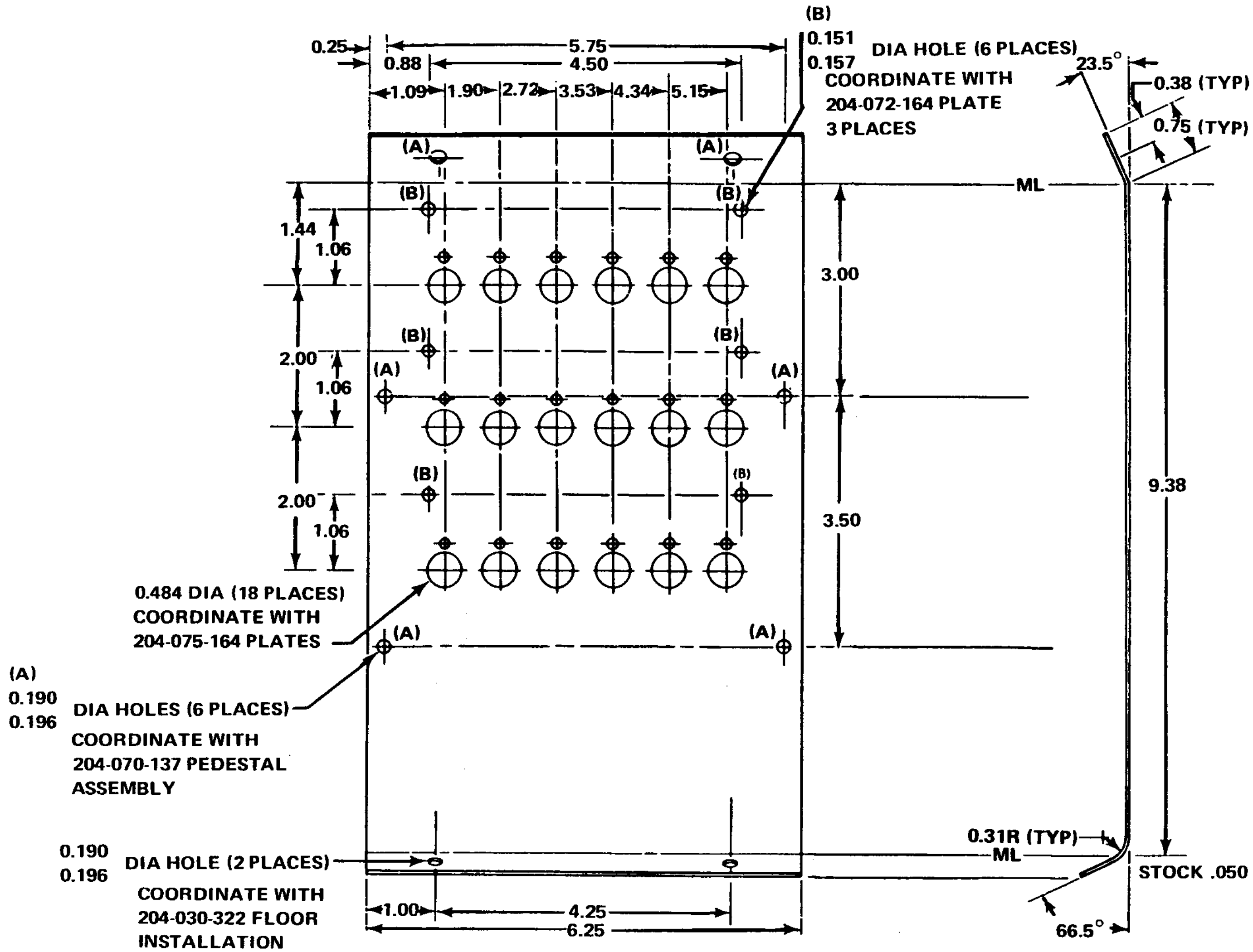
PART NUMBER	FABRICATE FROM NSN
MS27212-1-3	5940-00-950-1610
MS27212-1-9	5940-00-950-1610
MS27212-1-10	5940-00-950-1610
MS27212-1-12	5940-00-950-1610
MS27212-1-14	5940-00-950-1610
MS27212-1-15	5940-00-950-1610

NOTES:

1. LAST DASH NUMBER INDICATES NUMBER OF STUDS.
2. ALLOWANCE MUST BE MADE FOR THE LOSS OF ONE STUD FOR EACH CUT.

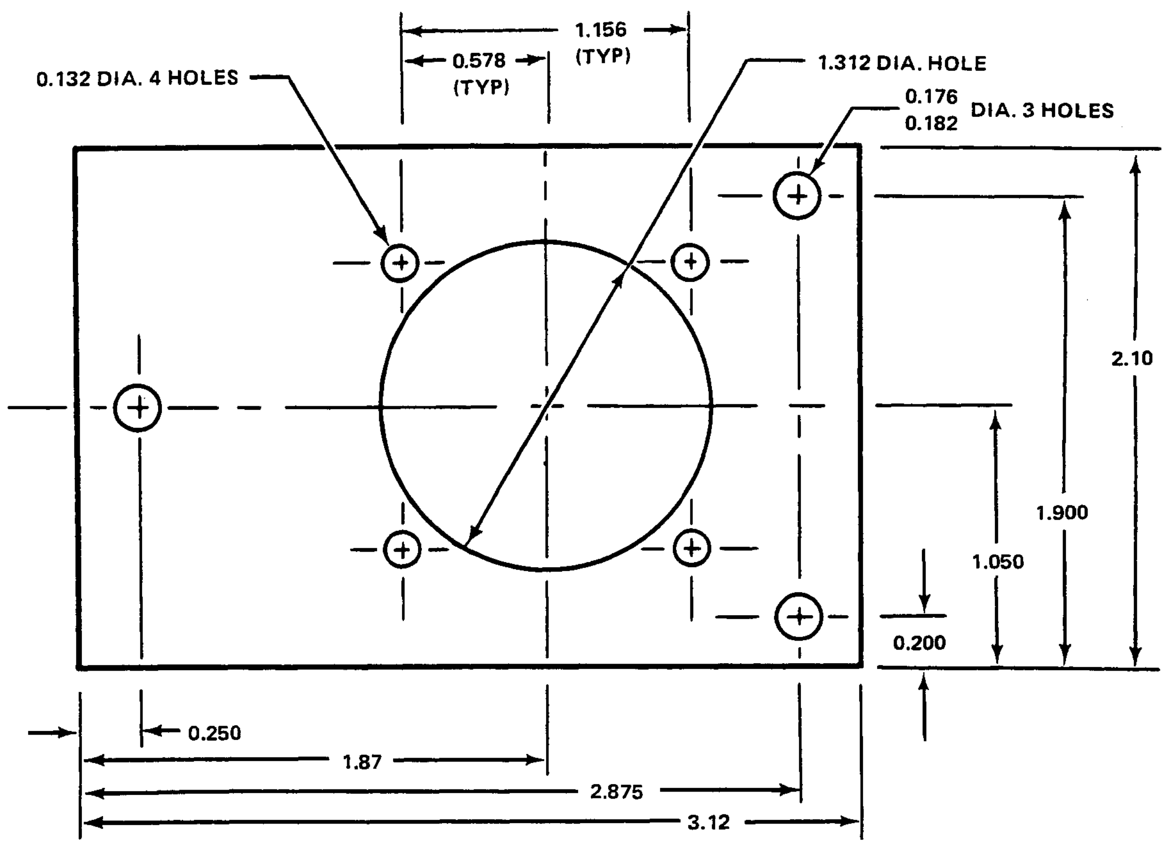
UH-1H-II-M-D-37

Figure D-37. TERMINAL BLOCK



UH-1H-II-M-D-38

Figure D-38.	Part Number	204-075-163-1 PANEL, A.C. Circuit Breakers Pedestal
	Fabricate From:	NSN 9535-00-554-1412
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick



UH-1H-II-M-D-39

Figure D-39. **Part Number** 204-075-243-1 PLATE RECEPTACLE, Control Panel
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

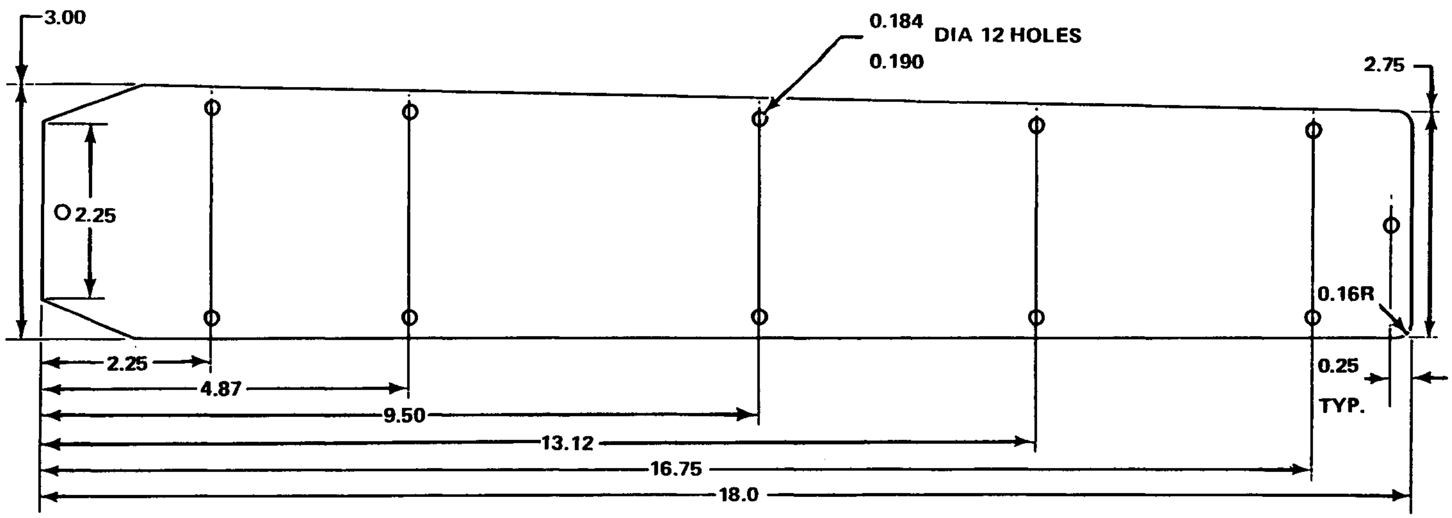
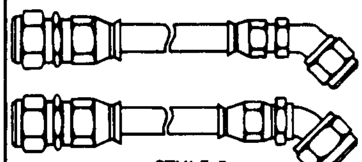
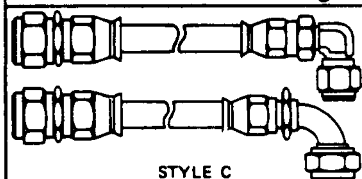
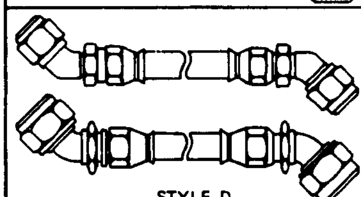
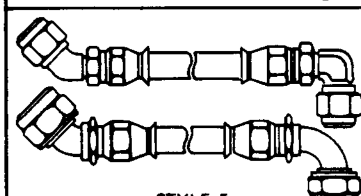
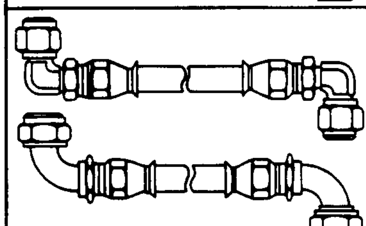


Figure D-40. Part Number 204-030-853-133, DOOR
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

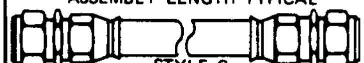
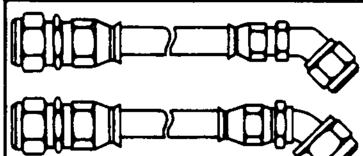
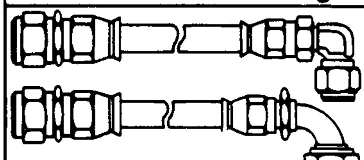
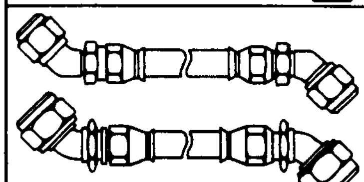
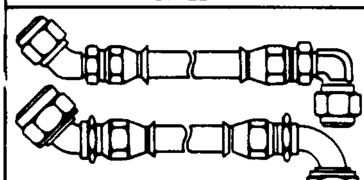
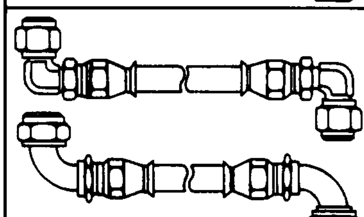
CONFIGURATION AND MATERIAL CORROSION RESISTANT STEEL (450º)		FITTING ENDS (MIL-F-27272)		(MIL-H-27267) HOSE CUT OFF FACTOR (HCOF) INCHES VS HOSE DASH SIZE NO.									
1	2	1	2	-¾C	-4C	-5C	-6C	-8C	-10C	-12C	-16C	-20C	-24C
ASSEMBLY LENGTH TYPICAL  STYLE A		MS27053	MS27053	1.40	1.48	1.54	1.62	1.86	2.10	2.26	2.60	2.88	3.32
 STYLE B		MS27053	MS27059	1.78	1.92	1.99	2.10	2.72					
		MS27053	MS27055						2.63	3.18	3.44	3.86	4.41
 STYLE C		MS27053	MS27060	1.56	1.65	1.74	1.84	2.24					
		MS27053	MS27057						2.46	3.05	3.35	3.78	4.34
 STYLE D		MS27059	MS27059	2.16	2.36	2.44	2.58	3.58					
		MS27055	MS27055						3.16	4.10	4.28	4.84	5.50
 STYLE E		MS27059	MS27060	1.94	2.09	2.19	2.32	3.10					
		MS27055	MS27057						2.99	3.97	4.19	4.76	5.43
 STYLE F		MS27060	MS27060	1.72	1.82	1.94	2.06	2.62					
		MS27057	MS27057						2.82	3.84	4.10	4.68	5.36

EXAMPLE OF HOSE CUTOFF FACTOR:
FOR A -4, ¼ TUBE OD, 18½ ASSEMBLY LENGTH, STYLE D THE BULK HOSE LENGTH 18.50 MINUS THE HCOF, = 18.50 -2.36 = 16.14
BULK HOSE LENGTH NEEDED IS 16.14 INCHES.

FITTINGS TO MATE WITH PARTS DESIGNED TO MS33656

UH-1H-II-M-D-41-1

Figure D-41. Hose Assembly MS8000 Series (Sheet 1 of 9)

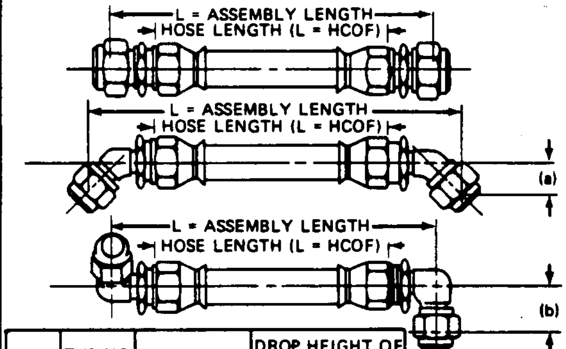
CONFIGURATION AND MATERIAL COMBINATION ALUMINUM AND CORROSION RESISTANT STEEL (275°F)		FITTING ENDS (MIL-F-27272)		(MIL-H-27267) HOSE CUT OFF FACTOR (HCOF) INCHES VS HOSE DASH SIZE NO.									
1	2	1	2					-8C	-10C	-12C	-16C	-20C	-24C
ASSEMBLY LENGTH TYPICAL  STYLE G		MS27053	MS27053					1.86	2.10	2.26	2.60	2.88	3.32
		MS27053	MS27059					2.72					
STYLE H		MS27053	MS27055						2.63	3.16	3.44	3.86	4.41
		MS27053	MS27060					2.24					
STYLE J		MS27053	MS27057						2.46	3.05	3.35	3.78	4.34
		MS27059	MS27059					3.58					
STYLE K		MS27055	MS27055						3.16	4.10	4.28	4.84	5.50
		MS27059	MS27060					3.10					
STYLE M		MS27055	MS27057						2.99	3.97	4.19	4.76	5.43
		MS27060	MS27060					2.62					
STYLE N		MS27057	MS27057						2.82	3.84	4.10	4.68	5.36

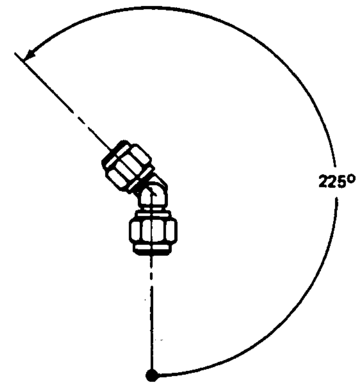
EXAMPLE OF HOSE CUTOFF FACTOR:
FOR A –8, 1/2 TUBE OD, 18 1/2 ASSEMBLY LENGTH, STYLE K THE BULK HOSE LENGTH = 18.50 MINUS THE HCOF, = 18.50 –3.58 = 14.92
BULK HOSE LENGTH NEEDED IS 14.92 INCHES.

FITTINGS TO MATE WITH PARTS DESIGNED TO MS33656

UH-1H-II-M-D-41-2

Figure D-41. Hose Assembly MS8000 Series (Sheet 2 of 9)





DASH NO.	TUBING OD REF.	SIZE	DROP HEIGHT OF ELBOW FITTING (a)	(b)
-3/4	NOTE 2	B	.283	.530
-4	1/4	E	.322	.580
-5	5/16	F	.340	.655
-6	3/8	G	.389	.720
-8	1/2	H	.465	.830
-10	5/8	J	.536	1.126
-12	3/4	K	.623	1.376
-16	1	M	.660	1.500
-20	1 - 1/4	N	.768	1.782
-24	1 - 1/2	P	.867	2.032

EXAMPLE OF ANGULAR ALIGNMENT OF END FITTING.

(ANGLE BETWEEN ELBOW FITTINGS, WHEN PROJECTED ON A PLANE PERPENDICULAR TO THE HOSE AXIS SHALL BE SPECIFIED. SIGHTING ALONG THE AXIS OF THE HOSE, THE ANGLE SPECIFIED WILL BE THE ANGLE THAT THE FURTHEST FITTING SHOULD BE ROTATED COUNTERCLOCKWISE.) TOLERANCE ON ANGULAR ALIGNMENT ± 2°.

LENGTH L TO BE MEASURED BETWEEN CENTERS OF NIPPLE ENDS ALONG A STRAIGHT LINE PARALLEL TO HOSE LENGTH WITH HOSE LAID OUT HORIZONTALLY AND STRAIGHT
HOSE IN ACCORDANCE WITH MIL-H-27267

HOSE ASSEMBLY TO BE SPECIFIED IN INCHES AND IN THE FOLLOWING LENGTH INCREMENTS ONLY:
UNDER 12 INCHES LONG, NOT LESS THAT 1/8 INCH (TOLERANCE ± 1/8)
12 TO 18 INCHES LONG, NOT LESS THAN 1/4 INCH (TOLERANCE ± 1/8)
OVER 18 INCHES LONG, NOT LESS THAN 1/2 INCH (TOLERANCE FOR LENGTHS FROM 18 TO 36 INCHES ± 1/4) (TOLERANCE FOR LENGTHS FROM 36 TO 50 INCHES ± 1/2) (TOLERANCE FOR LENGTHS OVER 50 INCHES ± 1%)

THE PART NO. SHALL BE FORMULATED TO REFLECT THE HOSE ASSEMBLY TUBE OD, LENGTH, STYLE AND ANGLE BETWEEN ELBOWS (AS APPLICABLE)

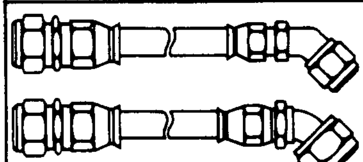
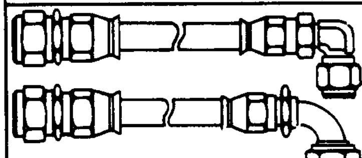
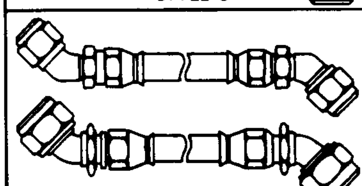
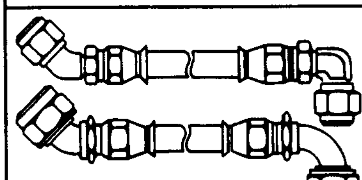
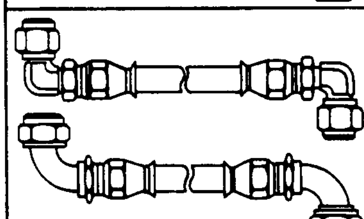
EXAMPLES OF PART NO.

MS8000H180FL030 HOSE ASSEMBLY FOR 1/2 INCH TUBE OD 18 INCHES IN LENGTH 30° BETWEEN ELBOWS.
- ANGLE BETWEEN ELBOWS IN DEGREES (NOT REQUIRED FOR STYLES A,B,C,G,H,J)
- LOCKWIRE HOLE (IF REQD)
- STYLE AND MATL OF FITTING ASSY (SEE SH 1 AND 2)
- LENGTH IN EIGHTS (1/8) OF AN INCH.
- LENGTH IN INCHES (FOR LENGTHS UNDER 10 INCHES USE 09,08,07, ETC.)
- SIZE H = -8 OR 1/2 INCH TUBE OD

MS8000J002GL HOSE ASSEMBLY FOR 5/8 INCH TUBE OD 9 1/4 INCHES IN LENGTH
- LOCKWIRE HOLE (IF REQD)
- STYLE AND MATL OF FITTING ASSY (SEE SH 1 AND 2)
- LENGTH IN EIGHTS (1/8) OF AN INCH
- LENGTH IN INCHES
- SIZE J = -10 OR 5/8 INCH TUBE OD

UH-1H-II-M-D-41-3

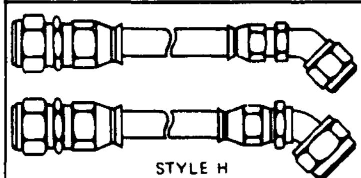
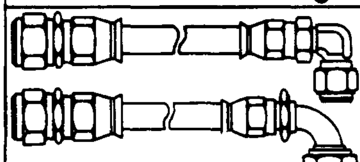
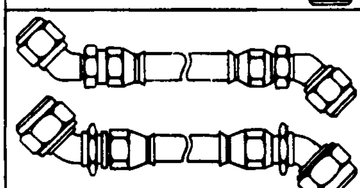
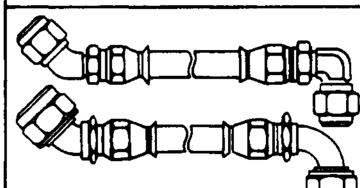
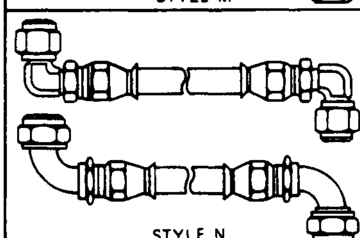
Figure D-41. Hose Assembly MS8000 Series (Sheet 3 of 9)

CONFIGURATION AND MATERIAL CORROSION RESISTANT STEEL (450°F)	FITTING ENDS (MIL-F-27272)		(MIL-H-27267) HOSE CUT OFF FACTOR (HCOF) INCHES VS HOSE DASH SIZE NO.									
1 2	1	2	-¾C	-4C	-5C	-6C	-8C	-10C	-12C	-16C	-20C	-24C
ASSEMBLY LENGTH TYPICAL  STYLE A	MS27381	MS27381	1.84	1.78	1.86	2.04	2.32	2.64	2.80	3.16	3.44	4.14
 STYLE B	MS27381	MS27384	2.15	2.18	2.25	2.45	3.11					
	MS27381	MS27382						3.09	3.63	3.91	4.33	5.10
 STYLE C	MS27381	MS27385	1.78	1.80	1.90	2.05	2.47					
	MS27381	MS27383						2.73	3.32	3.63	4.06	4.75
 STYLE D	MS27384	MS27384	2.46	2.58	2.64	2.86	3.90					
	MS27382	MS27382						3.54	4.46	4.66	5.22	6.06
 STYLE E	MS27384	MS27385	2.09	2.20	2.29	2.46	3.26					
	MS27382	MS27383						3.18	4.15	4.38	4.95	5.71
 STYLE F	MS27385	MS27385	1.72	1.82	1.94	2.06	2.62					
	MS27383	MS27383						2.82	3.84	4.10	4.68	5.36

EXAMPLE OF HOSE CUTOFF FACTOR:
FOR A –6, 3/8 TUBE OD, 20 1/2 ASSEMBLY LENGTH, STYLE A THE BULK HOSE LENGTH = 20.50 MINUS THE HCOF, = 20.50 = 2.04, = 18.46.
BULK HOSE LENGTH NEEDED IS 18.46 INCHES.

UH-1H-II-M-D-41-4

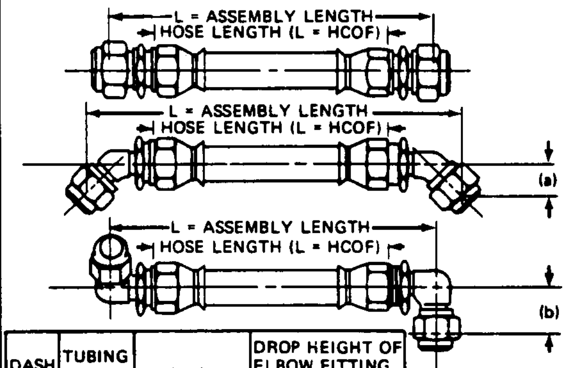
Figure D-41. Hose Assembly MS8000 Series (Sheet 4 of 9)

CONFIGURATION AND MATERIAL COMBINATION ALUMINUM AND CORROSION RESISTANT STEEL (275°)	FITTING ENDS (MIL-F-27272)		(MIL-H-27267) HOSE CUT OFF FACTOR (HCOF) INCHES VS HOSE DASH SIZE NO.									
1 2	1	2					-8C	-10C	-12C	-16C	-20C	-24C
ASSEMBLY LENGTH TYPICAL  STYLE G	MS27381	MS27381					2.32	2.64	2.80	3.16	3.44	4.14
 STYLE H	MS27381	MS27384					3.11					
	MS27381	MS27382						3.09	3.63	3.81	4.33	5.10
 STYLE J	MS27381	MS27383					2.47					
	MS27381	MS27383						2.73	3.32	3.63	4.06	4.75
 STYLE K	MS27384	MS27384					3.90					
	MS27382	MS27382						3.54	4.46	4.66	5.22	6.06
 STYLE M	MS27384	MS27385					3.26					
	MS27382	MS27383						3.18	4.15	4.38	4.95	5.71
 STYLE N	MS27385	MS27385					2.62					
	MS27383	MS27383						2.82	3.84	4.10	4.68	5.36

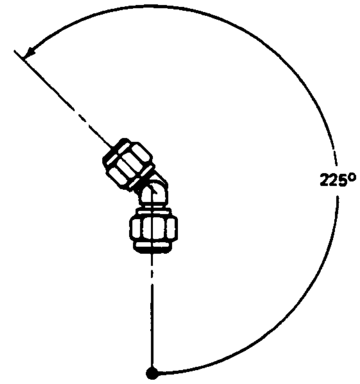
EXAMPLE OF HOSE CUTOFF FACTOR:
FOR A –8, 1/2 TUBE OD, 20 1/2 ASSEMBLY LENGTH, STYLE G THE BULK HOSE LENGTH = 20.50 MINUS THE HCOF, = 20.50 –2.32 = 18.18
BULK HOSE LENGTH NEEDED IS 18.18 INCHES.

UH-1H-II-M-D-41-5

Figure D-41. Hose Assembly MS8000 Series (Sheet 5 of 9)



DASH NO.	TUBING OD REF.	SIZE	DROP HEIGHT OF ELBOW FITTING (a)	(b)
-3/4	NOTE 2	B	.432	.741
-4	1/4	E	.424	.725
-5	5/16	F	.448	.808
-6	3/8	G	.526	.915
-8	1/2	H	.622	1.052
-10	5/8	J	.725	1.392
-12	3/4	K	.800	1.626
-16	1	M	.854	1.776
-20	1 - 1/4	N	.962	2.050
-24	1 - 1/2	P	1.155	2.438



EXAMPLE OF ANGULAR ALIGNMENT OF END FITTING.

ANGLE BETWEEN ELBOW FITTINGS, WHEN PROJECTED ON A PLANE PERPENDICULAR TO THE HOSE AXIS SHALL BE SPECIFIED. SIGHTING ALONG THE AXIS OF THE HOSE, THE ANGLE SPECIFIED WILL BE ROTATED COUNTERCLOCKWISE. TOLERANCE ON ANGULAR ALIGNMENT ±2°

LENGTH L TO BE MEASURED BETWEEN CENTERS OF NIPPLE ENDS ALONG A STRAIGHT LINE PARALLEL TO HOSE LENGTH WITH HOSE LAID OUT HORIZONTALLY AND STRAIGHT
HOSE IN ACCORDANCE WITH MIL-H-27267

HOSE ASSEMBLY TO BE SPECIFIED IN INCHES AND IN THE FOLLOWING LENGTH INCREMENTS ONLY:
UNDER 12 INCHES LONG, NOT LESS THAT 1/8 INCH (TOLERANCE ± 1/8)
12 TO 18 INCHES LONG, NOT LESS THAN 1/4 INCH (TOLERANCE ± 1/8)
OVER 18 INCHES LONG, NOT LESS THAN 1/2 INCH (TOLERANCE FOR LENGTHS FROM 18 TO 36 INCHES ± 1/4) (TOLERANCE FOR LENGTHS FROM 36 TO 50 INCHES ± 1/2) (TOLERANCE FOR LENGTHS OVER 50 INCHES ± 1%)

THE PART NO. SHALL BE FORMULATED TO REFLECT THE HOSE ASSEMBLY TUBE OD, LENGTH, STYLE AND ANGLE BETWEEN ELBOWS (AS APPLICABLE)

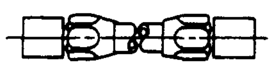
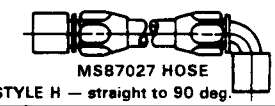
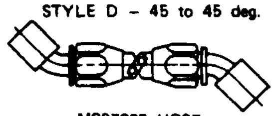
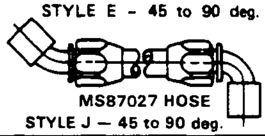
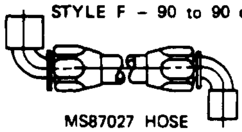
EXAMPLES OF PART NO.

MS8001K370EL030 HOSE ASSEMBLY FOR 3/4 INCH TUBE OD 37 INCHES IN LENGTH 30° BETWEEN ELBOWS.
- ANGLE BETWEEN ELBOWS IN DEGREES (NOT REQUIRED FOR STYLES A, B, C, G, H, J)
- LOCKWIRE HOLE (IF REQD)
- STYLE AND MATL OF FITTING ASSY (SEE SH 1 AND 2)
- LENGTH IN EIGHTS (1/8) OF AN INCH.
- LENGTH IN INCHES (FOR LENGTHS UNDER 10 INCHES USE 09, 08, 07 ETC.
- SIZE K = -12 OR 3/4 INCH TUBE OD

MS8001K204HL HOSE ASSEMBLY FOR 3/4 INCH TUBE OD 20 1/2 INCHES IN LENGTH
- LOCKWIRE HOLE (IF REQD)
- STYLE AND MATL OF FITTING ASSY (SEE SH 1 AND 2)
- LENGTH IN EIGHTS (1/8) OF AN INCH
- LENGTH IN INCHES (FOR LENGTHS UNDER 10 INCHES USE 09, 08, ETC).
- SIZE K = -12 OR 3/4 INCH TUBE OD

UH-1H-II-M-D-41-6

Figure D-41. Hose Assembly MS8000 Series (Sheet 6 of 9)

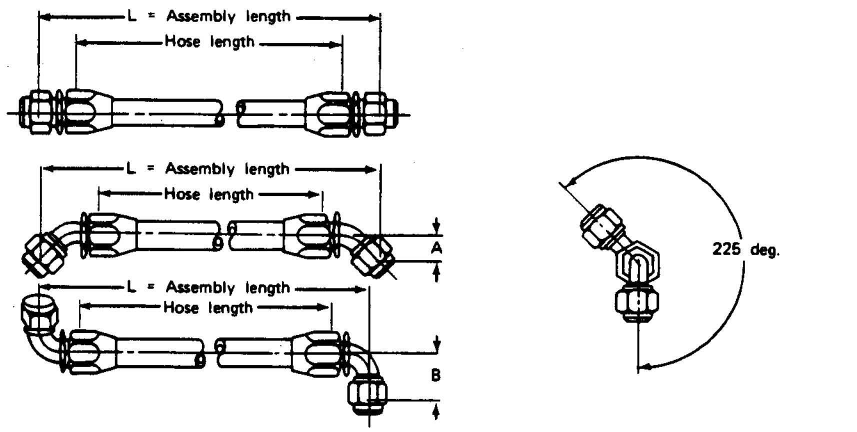
HOSE ASSEMBLY		MS87028	MS87029	MS87030	MS87031	MS87032
CONFIGURATION		PART NUMBERS OF FITTINGS				
FIG NO. 1 FIG NO. 2	FIG NOS.	FLARE TO FLARE	FLARELESS TO FLARELESS	FLARE TO FLANGE	FLARELESS TO FLANGE	FLANGE TO FLANGE
STYLE A – straight to straight  MS87027 HOSE	1	MS87018	MS87021	MS87018	MS87021	MS87024
	2	MS87018	MS87021	MS87024	MS87024	MS87024
STYLE B – straight to 45 deg.  MS87027 HOSE	1	MS87018	MS87021	MS87018	MS87021	MS87024
	2	MS87019	MS87022	MS87025	MS87025	MS87025
STYLE G — straight to 45 deg.	1			MS87024	MS87024	
	2			MS87019	MS87022	
STYLE C – straight to 90 deg.  MS87027 HOSE	1	MS87018	MS87021	MS87018	MS87021	MS87024
	2	MS87020	MS87022	MS87026	MS87026	MS87026
STYLE H — straight to 90 deg.	1			MS87024	MS87024	
	2			MS87020	MS87023	
STYLE D – 45 to 45 deg.  MS87027 HOSE	1	MS87019	MS87022	MS87019	MS87022	MS87025
	2	MS87019	MS87022	MS87025	MS87025	MS87025
STYLE E – 45 to 90 deg.  MS87027 HOSE	1	MS87019	MS87022	MS87019	MS87022	MS87025
	2	MS87020	MS87023	MS87024	MS87026	MS87026
STYLE J — 45 to 90 deg.	1			MS87025	MS87025	
	2			MS87020	MS87023	
STYLE F – 90 to 90 deg.  MS87027 HOSE	1	MS87020	MS87023	MS87020	MS87023	MS87026
	2	MS87020	MS87023	MS87026	MS87026	MS87026

NOTES

1. Fittings shall mate with MS33514, MS33656, or MS33786 end fittings, as applicable.
2. For design and size of fittings, see corresponding dash number on applicable MS standard.
3. Identification: See procurement specification.
4. Dimensions in inches.
5. Referenced documents shall be of the issue in effect on date of invitation for bids.
6. For design feature purposes, this standard takes precedence over procurement documents referenced herein.

UH-1H-II-M-D-41-7

Figure D-41. Hose Assembly MS87028 Thru MS87032 Series (Sheet 7 of 9)



For drop height A and B, see applicable fitting MS. The hose length to produce a desired assembly length is determined by measuring distance from socket groove to point shown in sketches.

Angle between elbow fittings, when projected on a plane perpendicular to the hose axis, shall be specified. Sighting along the axis of the hose, the angle specified will be the angle that the furtherest fitting should be rotated counterclockwise. Tolerance on angular alignment, ±5 deg. on hose lengths up to 36 inches and ±10 deg. on hose lengths over 36 inches.

Length L to be measured between centers of nipple ends along a straight line parallel to hose.
Length with hose laid out horizontally and straight.
Hose Assembly to be specified in inches and in the following length increments only: Under 12 inches not less that 1/8-inch (Tolerance ±1/8-inch).
12 to 18 inches, not less than 1/4-inch (Tolerance ±1/8-inch).
Over 18 inches, not less than 1/2-inch (Tolerance for lengths from 18 to 36 inches, ±1/4-inch). (Tolerances for lengths from 36 to 50 inches, ±1/2-inch; for lengths over 50 inches, ±1 percent.)

THE PART NO. SHALL BE FORMULATED TO REFLECT THE HOSE ASSEMBLY TUBE OD, LENGTH, STYLE AND ANGLE BETWEEN ELBOWS (AS APPLICABLE). ADD "F" AT END OF PART NO. TO DESIGNATE FORGED ELBOW FITTINGS (SEE MS87019, MS87020, MS87022, AND MS87023).

EXAMPLES OF PART NO.

HOSE ASSEMBLY FLARE TO FLARE, FOR 1/2-INCH TUBE OD 18 INCHES LONG, 30 DEG. BETWEEN ELBOWS

MS87028 H 018 O F L 030

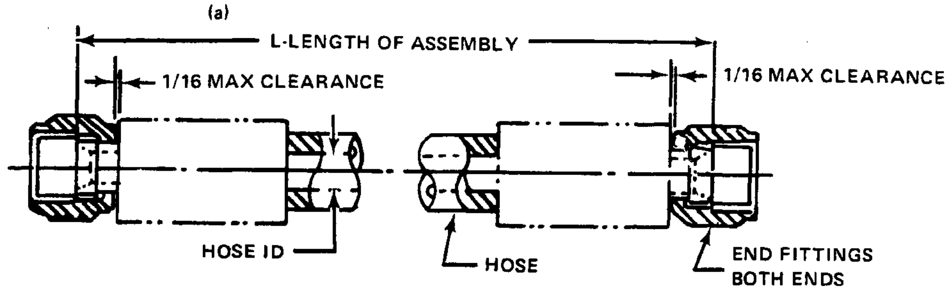
- 030 — ANGLE BETWEEN ELBOWS IN DEGREES.
- L — LOCKWIRE HOLE (IF REQUIRED).
- F — STYLE OF FITTING (SEE SHEET 1).
- O — LENGHTHS (1/8- OF AN INCH).
- 018 — LENGTH IN INCHES, FOR LENGTHS UNDER 10 INCHES USE 09, 08, 07, etc.

DASH NO.	-3	-4	-5	-6	-8	-10	-12	-16	-20	-24	-32
TUBING OD REF.	3/16	1/4	5/16	3/8	1/2	5/8	3/4	1	1-1/4	1-1/2	2
SIZE CODE	B	E	F	G	H	J	K	M	N	P	R

FLARE TO FLARE	FLARELESS TO FLARELESS	FLARE TO FLANGE	FLARELESS TO FLANGE	FLANGE TO FLANGE
MS87028	MS87029	MS87030	MS87031	MS87032

UH-1H-II-M-D-41-8

Figure D-41. Hose Assembly MS87028 Thru MS87032 Series (Sheet 8 of 9)



MS ASSEMBLY NO.	TUBING OD REF	HOSE ID REF	END FITTING
(b) MS28741-3	3/16	1/8	MS24587-3
MS28741-4	1/4	3/16	MS24587-4
MS28741-3	3/16	1/4	MS24587-5
MS28741-6	3/8	5/16	MS24587-6
MS28741-8	1/2	13/32	MS24587-8
MS28741-10	3/8	1/2	MS24587-10
MS28741-12	3/4	5/8	MS24587-12
MS28741-16	1	7/8	MS24587-14
MS28741-20	1-1/4	1-1/8	MS24587-20
MS28741-24	1-1/2	1-3/8	MS24587-24
MS28741-32	2	1-13/16	MS24587-32

NOTES:

(a) HOSE ASSEMBLIES TO BE SPECIFIED IN THE FOLLOWING LENGTH INCREMENTS ONLY
12 INCHES LONG AND UNDER - NOT LESS THAN 1/8
12 TO 18 INCHES LONG - NOT LESS THAN 1/4
OVER 18 INCHES LONG - NOT LESS THAN 1/2

(b) ASSEMBLY NUMBER MS28741-3 INACTIVE FOR DESIGN FOR HYDRAULIC USE.
MS224587 END FITTINGS ARE DIMENSIONALLY AND FUNCTIONALLY INTERCHANGEABLE WITH MS28740. END FITTINGS SHALL CONFORM TO MIL-A-5070
ASSEMBLIES SHALL BE PROOF PRESSURE TESTED IN ACCORDANCE WITH SPECIFICATION MIL-M-8795.

SEE MIL-M-8796 FOR USE, OPERATING PRESSURE AND AGE CONTROL OF HOSE ASSEMBLY

MS ASSEMBLY NUMBERS FOR USE OF AIRCRAFT CONTRACTORS AND HOSE ASSEMBLIES ONLY PROVISIONING PARTS BREAKDOWN MUST LIST COMPONENT PARTS SPARE AND MAINTENANCE PARTS ARE NOT TO BE ORDERED BY SERVICES UNDER THE ASSEMBLY NUMBER SERVICES TO ORDER END FITTINGS BY THEIR INDIVIDUAL PART NUMBER AND HOSE CONFORMING TO MIL-M-8794.

(c) EACH HOSE ASSEMBLY SHALL BE IDENTIFIED WITH A DURABLE PERMENENTLY ATTACHED TAG PLAINLY MARKED WITH THE MILITARY STANDARD (MS) HOSE ASSEMBLY NUMBER, DATE OF ASSEMBLY, CURE DATE OF THE HOSE, AND THE MANUFACTURER'S NAME AND PART NUMBER. THE NAME, TRADEMARK OR SYMBOL OF THE HOSE ASSEMBLER SHALL BE IMPRESSION STAMPED OR VERATOR ETCHED ON A BLANK SURFACE OF BOTH END ADAPTERS.

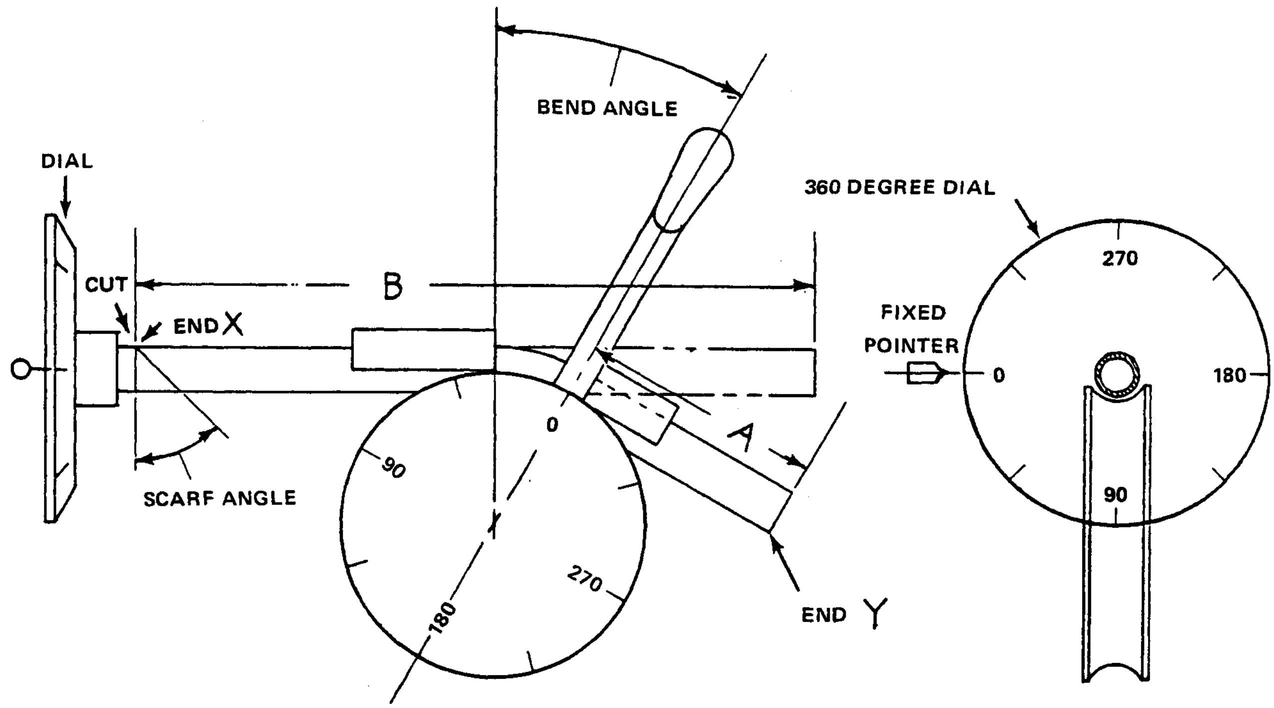
EXAMPLE OF PART NUMBER: MS28741-4-0164 - HOSE ASSEMBLY FOR 1/2 OD TUBING - LENGTH - 18-1/2 INCHES
FRACTIONS IN EIGHTS OF AN INCH
INCHES
SIZE

LENGTH L SHALL ALWAYS BE SPECIFIED BY FOUR DIGITS, THE LAST DIGIT SHALL ALWAYS INDICATE FRACTIONS BY EIGHTS OF AN INCH

DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED, TOLERANCE LENGTH L
1/8 (L UNDER 18)
1/4 (L FROM 18 TO 36)
1/2 (L OVER 36 TO 50)
1 PERCENT (L OVER 50)

UH-1H-II-M-D-41-9

Figure D-41. Hose Assembly MS87028 Thru MS87032 Series (Sheet 9 of 9)



NOTES:

1. SELECT MATERIAL AND END FITTINGS FROM TABLE D-4.
2. REFER TO TUBE BENDING DATA, TABLE D-5, FOR ALL DIMENSIONS, ANGLES, AND DIAL SETTINGS.
3. MARK DIMENSION "A" FOR EACH BEND, AND DIMENSION "B" PRIOR TO BENDING.
4. MAKE FIRST BEND WITH DIAL SET AT 0 DEG AND ROTATE DIAL TO "RIGHT" (CLOCKWISE) AND MAKE REMAINING BENDS AT SPECIFIED DIAL SETTINGS.
5. CUT "X" END AFTER BENDING. IF SCARF IS REQUIRED SET DIAL AND CUT TO SPECIFIED ANGLE.
6. TRIM AND BURR ENDS "X" AND "Y" AS NECESSARY.
7. BEND RADI SHALL CONFIRM TO MS33611.
8. NUTS AND SLEEVES INSTALLED PER MS33566.
9. PRESSURE TEST TO PSI CALLED OUT IN TUBE BENDING DATA, TABLE D-5, IF APPLICABLE.
10. IDENTIFY TUBE ASSEMBLY BY MARKING PART NUMBER WITH RUBBER INK STAMP OR FELT PEN.

TYPE OF ENDS

I SINGLE FLARE - MS33584
II BEAD - MS33660 TYPE "A" UNLESS NOTED.
III DOUBLE FLARE - MS33583
IV PLAIN SQUARE
V ANGLE - 45° SCARF UNLESS NOTED.
VI OTHER - AS DESIGNATED

UH-1H-II-M-D-42

Figure D-42.

D-3. TUBE BENDING DATA. The information contained in this section discloses, as applicable, quantities of material and fittings, bend radii, angles, dimensions, and all other data required for fabrication of tube assemblies.

a. Table D-4 gives the material, FSN's, and quantities of the stock required to fabricate each tube assembly. The stock dimension column will indicate a length of 2 to 3 inches longer than is actually required for the finished tube. The last column includes the applicable system for each tube assembly, such as Fuel, Lubrication, etc.

b. Figure 42 illustrate the type of dial marking, end references ("X" and "Y"), and dimensional references ("A" and "B"), to coincide with the data on Table D-5. The Type of Ends (I thru IV) are defined, and the "Notes" are provided for additional information.

c. Table D-5 includes all the dimensions (inches), angles (degrees), and other information required to fabricate the tube assemblies. The use of Table D-5 is described in the following example. The columns are numbered for reference only.

EXAMPLE

1	2	3	4	5	6	7
PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	AND NOTES
205-061-619-1	1	1-1/16	9/16	0	45	Y - AN818-4D MS20819-4D X - Scarf Dial Setting 320
	2	9 1/8	9/16	185	68	
		11 3/8	III	V	N/A	

Column 1. PART NUMBER – Tube Part Number in alpha numerical order.

Column 2. BEND NO. – Bend Number 1, 2, etc., numbering from "Y" end of tube. The last block in Column 2 will be blank.

Column 3. DIMENSION "A" FROM "Y" END – Refer to Figure 42. Dimension "A" is the distance from "Y" End before bending to the beginning point of each bend to be performed. (See Example.) "A" Dimension for No. 1 bend is 1-1/6 inch. "A" Dimension for No. 2 bend is 9 1/8 inch.

DIMENSION "B" – Dimension "B" is the exact tube length before tube is bent, including allowances for flaring or beading ends. (See Example.) "B" Dimension is 11-3/8 inches.

Column 4. BEND RADIUS – Specifies the radius of each bend. (See Example.) Bend Radius for Nos. 1 and 2 bends is 9/16 inch.

TYPE END "Y" – Refers to type of end (I thru VI). See Figure 42, "Type of Ends", for definition. (See Example.) Type of End "Y" is III, indicated a Double Flare.

Column 5. DIAL SETTING – This dial setting is the degree of tube rotation from plane of first bend. The dial setting (degree of tube rotation) will depend on the type of dial marking used. The dial settings referenced in Table D-5 correspond to the type of dial marking illustrated in Figure 42.

TYPE OF END "X" – Refer to type of End (I thru VI). See Figure 42 "Type of Ends", for definition. (See Example.) Type of End "X" is V, indicated "Angle 45 degrees, scarf."

Column 6. BEND ANGLE – Specifies the degree of bend through which the tube is bent, as shown if Figure 42. (See Example.) The bend angle (degree of bend) for 1st bend is 45 degrees, 2nd bend is 68 degrees.

NOTE

This is the actual number of degrees required in the bend. When pressure is released from the tube bender, a small amount of "spring back" varying in proportion to harness and elongation characteristics of the tubing will necessitate a certain amount of over-run to accomplish the exact bend angle.

PRESSURE TEST – The pressure test, if applicable, is indicated in psi (pounds per square inch). (See Example.) Pressure test is indicated as N/A, meaning "Not Applicable"

Column 7. END FITTINGS AND NOTES – The Part Number of End Fitting, if required, and their identity to the correct End ("X" and "Y") are referenced. Additional notes will be included in this column, as required. (See Example.) The End Fittings for "Y" End are AN818-4D and MS20819-4D. For "X" End, no fittings are required. A scarf is cut on End "X", with dial setting at 320 degrees.

ITEM NUMBER	PART NUMBER	NSN	NOMENCLATURE
1.	MIL-H-27267-10	4720-00-857-1730	Hose
2.	MIL-H-27267-12	4720-00-857-1734	Hose
3.	MIL-H-27267-16Z	4720-00-857-1729	Hose
4.	MIL-H-27267-4	4720-00-857-1732	Hose
5.	MIL-H-27267-5	4720-00-857-1736	Hose
6.	MIL-H-27267-6	4720-00-857-1731	Hose
7.	MIL-H-27267-8	4720-00-815-6354	Hose
8.	MIL-H-8794-4	4720-00-639-9907	Hose
9.	601-10	4720-00-541-8328	Hose
10.	MS87027-12R	4720-00-555-3499	Hose
11.	MS87027-16R	4720-00-540-6434	Hose
12.	MS87027-4	4720-00-541-9281	Hose
13.	MS87027-6	4720-00-611-2548	Hose
14.	MS87027-8	4720-00-580-6618	Hose
15.	MS24587-4	4730-00-842-2200	Fitting Assembly
16.	MS27053-10	4730-00-125-2640	Fitting Assembly
17.	MS27053-10C	4730-00-889-2477	Fitting Assembly
18.	MS27053-12	4730-00-935-9382	Fitting Assembly
19.	MS27053-12C	4730-00-889-2478	Fitting Assembly
20.	MS27053-16	4730-00-889-2473	Fitting Assembly
21.	MS27053-4C	4730-00-889-2474	Fitting Assembly
22.	MS27053-6C	4730-00-982-9736	Fitting Assembly
23.	MS27053-8C	4730-00-889-2476	Fitting Assembly
24.	MS27055-10C	4730-00-884-1232	Fitting Assembly
25.	MS27055-12	4730-00-935-9383	Fitting Assembly
26.	MS27055-12C	4730-00-884-1234	Fitting Assembly
27.	MS27055-16	4730-00-884-1231	Fitting Assembly
28.	MS27057-10C	4730-00-132-3162	Fitting Assembly
29.	MS27057-12	4730-00-130-4269	Fitting Assembly
30.	MS27057-12C	4730-00-132-3163	Fitting Assembly
31.	MS27057-16	4730-00-135-8851	Fitting Assembly
32.	MS27059-4C	4730-00-889-2465	Fitting Assembly
33.	MS27059-6C	4730-00-889-2468	Fitting Assembly
34.	MS27060-4C	4730-00-013-6970	Fitting Assembly
35.	MS27060-6C	4730-00-013-6969	Fitting Assembly
36.	MS27060-8C	4730-00-228-1106	Fitting Assembly
37.	MS27381-12	4730-00-054-7661	Fitting Assembly
38.	MS27381-4C	4730-00-054-7650	Fitting Assembly
39.	MS27381-5C	4730-00-877-9876	Fitting Assembly
40.	MS27381-6C	4730-00-053-0379	Fitting Assembly
41.	MS27381-8	4730-00-053-0389	Fitting Assembly
42.	MS27381-8C	4730-00-929-5705	Fitting Assembly
43.	MS27382-12	4730-00-053-0411	Fitting Assembly
44.	MS27384-4C	4730-00-057-0665	Fitting Assembly
45.	MS27384-5C	4730-00-007-2197	Fitting Assembly
46.	MS27384-6C	4730-00-128-9819	Fitting Assembly
47.	MS27384-8	4730-00-054-7635	Fitting Assembly
48.	MS27385-4C	4730-00-057-0664	Fitting Assembly
49.	MS27385-6C	4730-00-053-0380	Fitting Assembly

ITEM NUMBER	PART NUMBER	NSN	NOMENCLATURE
50.	MS27385-8C	4730-00-119-9854	Fitting Assembly
51.	MS87018-10	4730-00-541-9105	Fitting Assembly
52.	MS87018-12	4730-00-541-1957	Fitting Assembly
53.	MS87018-16	4730-00-585-6212	Fitting Assembly
54.	MS87018-4	4730-00-618-7378	Fitting Assembly
55.	MS87018-6	4730-00-613-1859	Fitting Assembly
56.	MS87018-8	4730-00-632-2002	Fitting Assembly
57.	MS87019-12	4730-00-618-7382	Fitting Assembly
58.	MS87019-4	4730-00-709-3887	Fitting Assembly
59.	MS87019-8	4730-00-684-6394	Fitting Assembly
60.	MS87020-10	4730-00-919-6785	Fitting Assembly
61.	MS87020-12	4730-00-238-5338	Fitting Assembly
62.	MS87020-4	4730-00-618-8862	Fitting Assembly
63.	MS87020-6	4730-00-720-1166	Fitting Assembly
64.	MS87020-8	4730-00-795-0945	Fitting Assembly
65.	MS87021-16	4730-00-936-2364	Fitting Assembly
66.	MS87022-16	4730-00-087-1016	Fitting Assembly
67.	MS87023-16	4730-00-403-0886	Fitting Assembly
68.	624-7	5640-00-684-4153	Fire Sleeving
69.	624-8	5640-00-684-4152	Fire Sleeving
70.	900902-4	4730-00-675-2450	Clamp
71.	AE10187-001	8030-00-907-0879	Adhesive
72.	QQ-V-423	9505-00-804-3814	Safety Wire .042 Dia.
73.	MS87021-12	4730-00-936-2365	Fitting Assembly
74.	MS87023-12	4730-00-087-1008	Fitting Assembly

Hose Assembly Part Number	Items Required for Fabrication (Refer to Table D-1 for Items Listed)
MS8000E072A	4, 21
MS8000E150B	4, 21, 32
MS8000E160A	4, 21
MS8000E160B	4, 21, 32
MS8000E165A	4, 21
MS8000E180B	4, 21, 32
MS8000E210A	4, 21
MS8000E210C	4, 21, 34
MS8000E250C	4, 21, 34
MS8000E300A	4, 21
MS8000E324C	4, 21, 34
MS8000E340C	4, 21, 34
MS8000G070C	6, 22, 35
MS8000G090C	6, 22, 35
MS8000G110B	6, 22, 33
MS8000G130A	6, 22
MS8000G130B	6, 22, 35
MS8000G180C	6, 22, 35
MS8000G520F	6, 35
MS8000H210A	7, 23
MS8000J190F	1, 28
MS8000J220C	1, 17, 28
MS8000J260F	1, 28
MS8000K130B	2, 19, 26
MS8000K150E180	2, 26, 30
MS8000K160F180	2, 30
MS8000K700C	2, 19, 30
MS8000M210G	3, 20
MS8001E140B	4, 38, 44
MS8001E150B	4, 38, 44
MS8001E440A	4, 38
MS80001F150B	5, 39, 45

MS8001F210A	5, 39
MS8001G130B	6, 40, 46
MS8001G146A	6, 40
MS8001G400A	6, 40
MS8001G440A	6, 40
MS8001H094C	7, 42, 50
MS8001H136H	7, 41, 47
MS87028E123A	12, 54
MS87028E216A	12, 54
MS87028E220C	12, 54, 62
MS87028G082C000	13, 55, 63
MS87028G210A	13, 55
MS87028H090A	14, 56
MS87028H106A00	14, 56
MS87028H110C	14, 56, 64
MS87028H150A	14, 56
MS87028H175A	14, 56
MS87028H280C	14, 56, 64
MS87028H283C000	14, 56, 64
MS87028H700C	14, 56, 64
MS87028J136A	9, 51
MS87028J166F	9, 60
MS87028J185F000	9, 60
MS87028J336C	9, 51, 60
MS87028K116C	10, 73, 74
MS87028K146A	10, 52
MS87028K171B	10, 52, 57
MS87028K214A	10, 52
MS87028K292A	10, 52
MS87028K213E140	10, 57, 61
MS87028K360C	10, 52, 61
MS87029M284E220	11, 66, 67
70-009F245Z347	12, 58, 62, 69, 70, 71

TUBE ASSY PART NO.	FABRICATE FROM NSN	STOCK DIM.			END FITTING				SYSTEM
		O.D.	W.T.	L.	NUT NSN	QTY	SLEEVE NSN	QTY	
204-040-215-27	4710-00-278-8726	3/8	.035	13	4730-00-142-2167	2	4730-00-278-6070	2	Lub.
204-040-722-1	4710-00-278-3291	1/4	.035	16	4730-00-222-1912	2	4730-00-278-0678	2	Lub.
204-040-723-1	4710-00-278-3291	1/4	.035	16	4730-00-222-1912	2	4730-00-278-0678	2	Lub.
204-060-082-1	4710-00-278-3291	1/4	.035	13	4730-00-222-1912	2	4730-00-278-0678	2	Lub.
204-060-098-1	4710-00-278-3291	1/4	.035	7	4730-00-222-1912	2	4730-00-278-0678	2	Lub.
204-070-110-153	4710-00-278-6398	1/4	.035	6	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-110-155	4710-00-278-6398	1/4	.035	7	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-110-3	4710-00-278-6398	1/4	.035	18	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-110-65	4710-00-278-6398	1/4	.035	38	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-110-67	4710-00-278-6398	1/4	.035	38	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-110-7	4710-00-278-6398	1/4	.035	24	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-110-71	4710-00-278-6398	1/4	.035	12	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-070-134-11	4710-00-278-6398	1/4	.035	30	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-072-265-1	4710-00-278-6398	1/4	.035	60	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-072-267-1	4710-00-278-6398	1/4	.035	33	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-072-268-1	4710-00-278-6398	1/4	.035	49	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-072-355-1	4710-00-278-6398	1/4	.035	14	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
204-072-364-1	4710-00-278-6398	1/4	.035	20	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
205-060-424-1	4710-00-278-2890	3/4	.035	6	4730-00-287-0296	2	4730-00-433-3377	2	Pneu.
205-060-440-1	4710-00-541-8624	1/2	.035	14	4730-00-287-0297	2	4730-00-433-3376	2	Pneu.
205-060-580-1	4710-00-278-8726	3/8	.035	38	4730-00-142-2167	1	4730-00-278-6070	1	Drain
205-060-581-1	4710-00-278-8726	3/8	.035	69	4730-00-142-2167	1	4730-00-278-6070	1	Drain
205-060-582-1	4710-00-278-8745	3/4	.035	73	4730-00-287-0285	1	4730-00-287-0067	1	Drain
205-060-583-1	4710-00-278-6398	1/4	.035	49	4730-00-287-0289	1	4730-00-302-8641	1	Drain

TUBE ASSY PART NO.	FABRICATE FROM NSN	STOCK DIM.			END FITTING				SYSTEM
		O.D.	W.T.	L.	NUT NSN	QTY	SLEEVE NSN	QTY	
205-060-584-1	4710-00-278-8745	3/4	.035	43	4730-00-287-0285	2	4730-00-287-0067	2	Lub.
205-060-585-1	4710-00-278-8745	3/4	.035	16	4730-00-287-0285	2	4730-00-287-0067	2	Lub.
205-060-586-1	4710-00-278-8742	5/8	.035	46	4730-00-287-0295	2	4730-00-277-5358	2	Lub.
205-060-587-1	4710-00-278-8742	5/8	.035	40	4730-00-287-0295	2	4730-00-277-5358	2	Lub.
205-060-589-1	4710-00-278-8726	3/8	.035	14	4730-00-142-2167	1	4730-00-278-6070	1	Drain
205-060-590-1	4710-00-278-8726	3/8	.035	50	4730-00-142-2167	1	4730-00-278-6070	1	Drain
205-060-591-1	4710-00-278-3282	3/8	.035	9	4730-00-203-3831	2	4730-00-278-0682	2	Lub.
205-060-592-1	4710-00-278-3282	3/8	.035	17	4730-00-203-3831	2	4730-00-278-0682	2	Lub.
205-060-593-1	4710-00-278-3282	3/8	.035	33	4730-00-203-3831	2	4730-00-278-0682	2	Lub.
205-060-594-1	4710-00-278-3314	3/4	.035	39	4730-00-287-0296	2	4730-00-433-3377	2	Lub.
205-060-648-1	4710-00-278-8742	5/8	.035	36	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-060-649-1	4710-00-278-8742	5/8	.035	36	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-060-690-1	4710-00-278-8726	3/8	.035	46	4730-00-142-2167	1	4730-00-278-6070	1	Drain
205-060-691-1	4710-00-278-8745	3/4	.035	21	4730-00-287-0285	2	4730-00-287-0067	2	Fuel
205-060-692-1	4710-00-278-8745	3/4	.035	11	4730-00-287-0285	2	4730-00-287-0067	2	Fuel
205-060-693-1	4710-00-278-8745	3/4	.035	33	4730-00-287-0285	2	4730-00-287-0067	2	Fuel
205-060-694-1	4710-00-278-8745	3/4	.035	17	4730-00-287-0285	2	4730-00-287-0067	2	Fuel
205-060-695-1	4710-00-278-8723	1	.035	36	4730-00-222-1915	2	4730-00-287-0065	2	Fuel
205-060-696-1	4710-00-278-8723	1	.035	33	4730-00-222-1915	1	4730-00-287-0065	1	Drain
205-060-697-1	4710-00-278-8726	3/8	.035	49	4730-00-142-2167	1	4730-00-278-6070	1	Fuel
205-061-213-1	4710-00-278-8723	1	.035	19	4730-00-222-1915	2	4730-00-287-0065	2	Drain
205-061-214-1	4710-00-278-8723	1	.035	51	4730-00-222-1915	1	4730-00-287-0065	1	Drain
205-061-600-1	4710-00-278-8742	5/8	.035	20	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-061-601-1	4710-00-278-8742	5/8	.035	19	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-061-604-1	4710-00-278-6398	1/4	.035	9	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-061-606-1	4710-00-279-0950	1/2	.035	20	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-607-1	4710-00-279-0950	1/2	.035	20	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-608-1	4710-00-279-0950	1/2	.035	6	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-609-1	4710-00-279-0950	1/2	.035	5	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-610-1	4710-00-278-8726	3/8	.035	33	4730-00-142-2167	2	4730-00-278-6070	2	Fuel

TUBE ASSY PART NO.	FABRICATE FROM NSN	STOCK DIM. O.D.	W.T.	L.	END FITTING NUT NSN	QTY	SLEEVE NSN	QTY	SYSTEM
205-061-611-1	4710-00-278-8726	3/8	.035	33	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-061-612-1	4710-00-278-8726	3/8	.035	26	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-061-614-1	4710-00-279-0950	1/2	.035	18	4730-00-287-0288	1	4730-00-277-5373	1	Fuel
205-061-615-1	4710-00-279-0950	1/2	.035	17	4730-00-287-0288	1	4730-00-277-5373	1	Drain
205-061-616-1	4710-00-279-0950	1/2	.035	18	4730-00-287-0288	1	4730-00-277-5373	1	Drain
205-061-617-1	4710-00-279-0950	1/2	.035	17	4730-00-287-0288	1	4730-00-277-5373	1	Drain
205-061-618-1	4710-00-278-6398	1/4	.035	13	4730-00-287-0289	1	4730-00-302-8641	1	Drain
205-061-619-1	4710-00-278-6398	1/4	.035	14	4730-00-287-0289	1	4730-00-302-8641	1	Drain
205-061-624-1	4710-00-278-8726	3/8	.035	20	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-061-645-1	4710-00-279-0950	1/2	.035	11	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-647-1	4710-00-278-8742	5/8	.035	21	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-061-649-1	4710-00-278-8742	5/8	.035	22	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-061-650-1	4710-00-278-8742	5/8	.035	21	4730-00-287-0290	2	4730-00-277-5358	2	Fuel
205-061-651-1	4710-00-279-0950	1/2	.035	23	4730-00-287-0288	1	4730-00-277-5373	1	Drain
205-061-652-1	4710-00-279-0950	1/2	.035	23	4730-00-287-0288	1	4730-00-277-5373	1	Drain
205-061-653-1	4710-00-278-6398	1/4	.035	24	4730-00-287-0289	1	4730-00-302-8641	1	Drain
205-061-654-1	4710-00-278-6398	1/4	.035	23	4730-00-287-0289	1	4730-00-302-8641	1	Drain
205-061-655-1	4710-00-278-8726	3/8	.035	28	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-061-659-1	4710-00-279-0950	1/2	.035	14	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-661-1	4710-00-278-8726	3/8	.035	25	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-061-662-1	4710-00-278-8726	3/8	.035	13	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-061-663-1	4710-00-279-0950	1/2	.035	30	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-664-1	4710-00-279-0950	1/2	.035	16	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-061-668-1	4710-00-279-0950	1/2	.035	13	4730-00-287-0288	2	4730-00-277-5373	2	Pneu.
205-061-669-1	4710-00-279-0950	1/2	.035	16	4730-00-287-0288	2	4730-00-277-5373	2	Pneu.
205-061-670-1	4710-00-279-0950	1/2	.035	36	4730-00-287-0288	2	4730-00-277-5373	2	Pneu.
205-061-671-1	4710-00-279-0950	1/2	.035	32	4730-00-287-0288	2	4730-00-277-5373	2	Pneu.
205-061-674-1	4710-00-278-3305	5/8	.035	12	4730-00-287-0295	2	4730-00-277-5357	2	Fuel
205-061-675-1	4710-00-278-3282	3/8	.035	12	4730-00-203-3831	2	4730-00-278-0682	2	Fuel
205-061-685-1	4710-00-278-6398	1/2	.035	42	4730-00-287-0289	2	4730-00-302-8641	2	Fuel

TUBE ASSY PART NO.	FABRICATE FROM NSN	STOCK DIM.			END FITTING				SYSTEM
		O.D.	W.T.	L.	NUT NSN	QTY	SLEEVE NSN	QTY	
205-062-614-1	4710-00-279-0950	1/2	.035	26	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-062-662-1	4730-00-278-8726	3/8	.035	9	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-062-663-1	4730-00-278-8726	3/8	.035	30	4730-00-142-2167	2	4730-00-278-6070	2	Fuel
205-062-680-1	4710-00-279-0950	1/2	.035	20	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-062-681-1	4710-00-279-0950	1/2	.035	25	4730-00-287-0288	2	4730-00-277-5373	2	Fuel
205-070-365-1	4730-00-278-6398	1/4	.035	33	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-366-1	4730-00-278-6398	1/4	.035	13	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-436-1	4710-00-278-6398	1/4	.035	24	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-439-1	4710-00-278-6398	1/4	.035	14	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-070-440-1	4710-00-278-6398	1/4	.035	33	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-070-441-1	4710-00-278-6398	1/4	.035	12	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-070-448-1	4710-00-278-6398	1/4	.035	10	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-070-475-1	4710-00-278-6398	1/4	.035	36	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-070-476-1	4710-00-278-6398	1/4	.035	12	4730-00-287-0289	2	4730-00-302-8641	2	Fuel
205-070-484-1	4710-00-278-6398	1/4	.035	18	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-485-1	4710-00-278-6398	1/4	.035	10	4730-00-287-0289	2	4730-00-302-8641	2	Inst. Air
205-070-486-1	4710-00-278-6398	1/4	.035	23	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-487-1	4710-00-278-6398	1/4	.035	36	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-488-1	4710-00-278-6398	1/4	.035	12	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-490-1	4710-00-278-6398	1/4	.035	34	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-070-491-1	4710-00-278-6398	1/4	.035	39	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-072-208-1	4730-00-278-6398	1/4	.035	46	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-072-278-1	4710-00-278-6398	1/4	.035	32	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-072-304-1	4730-00-278-6398	1/4	.035	13	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
205-072-305-1	4730-00-278-6398	1/4	.035	15	4730-00-278-0289	2	4730-00-302-8641	2	Pneu.
205-072-410-1	4710-00-278-8723	1	.035	28	4730-00-222-1915	2	4730-00-287-0065	2	Pneu.
205-072-424-1	4710-00-278-8723	1	.035	66	4730-00-222-1915	2	4730-00-287-0065	2	Pneu.
205-075-134-1	4710-00-278-8726	3/8	.035	7	N/A	N/A	N/A	N/A	Drain
205-076-033-1	4710-00-278-6398	1/4	.035	16	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.

TUBE ASSY PART NO.	FABRICATE FROM NSN	STOCK DIM.			END FITTING				SYSTEM
		O.D.	W.T.	L.	NUT NSN	QTY	SLEEVE NSN	QTY	
205-076-136-1	4710-00-278-6398	1/4	.035	30	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-138-1	4710-00-278-0950	1/2	.035	16	4730-00-555-0595	2	4730-00-580-2120	2	Hyd.
205-076-140-1	4710-00-278-8726	3/8	.035	33	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-141-1	4710-00-278-3282	3/8	.035	26	4730-00-810-449	2	4730-00-554-7398	2	Hyd.
205-076-156-1	4710-00-278-6398	1/4	.035	33	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-157-1	4710-00-278-8726	3/8	.035	17	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-159-1	4710-00-278-0950	1/2	.035	28	4730-00-555-0595	2	4730-00-580-2120	2	Hyd.
205-076-160-1	4710-00-278-6398	1/4	.035	29	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-161-1	4710-00-278-6398	1/4	.035	13	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-201-1	4710-00-278-8726	3/8	.035	15	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-202-1	4710-00-278-8726	3/8	.035	15	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-203-1	4710-00-278-8726	3/8	.035	12	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-204-1	4710-00-278-8726	3/8	.035	24	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-206-1	4710-00-298-6398	1/4	.035	19	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-207-1	4710-00-278-3291	1/4	.035	16	4730-00-554-8015	2	4730-00-289-8619	2	Hyd.
205-076-209-1	4710-00-278-6398	1/4	.035	35	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-210-1	4710-00-278-3291	1/4	.035	14	4730-00-554-8015	2	4730-00-289-8619	2	Hyd.
205-076-212-1	4710-00-278-3282	3/8	.035	26	4730-00-810-4499	2	4730-00-554-7398	2	Hyd.
205-076-214-1	4710-00-278-8726	3/8	.035	18	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-216-1	4710-00-278-8726	3/8	.035	20	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-217-1	4710-00-278-8726	3/8	.035	24	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-223-1	4710-00-278-6398	1/4	.035	12	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-233-1	4710-00-278-6398	1/4	.035	43	4730-00-555-8203	1	4730-00-289-8619	1	Hyd.

TUBE ASSY PART NO.	FABRICATE FROM NSN	STOCK DIM. O.D.	W.T.	L.	END FITTING NUT NSN	QTY	SLEEVE NSN	QTY	SYSTEM
205-076-255-1	4710-00-278-6398	1/4	.035	8	4730-00-555-8203	2	4730-00-289-8619	2	Hyd.
205-076-257-1	4710-00-287-8726	3/8	.035	17	4730-00-554-7397	2	4730-00-554-7398	2	Hyd.
205-076-258-1	4710-00-684-7029	1/2	.035	22	4730-00-554-8018	2	4730-00-580-2120	2	Hyd.
205-076-259-1	4710-00-279-0950	1/2	.035	36	4730-00-555-0595	2	4730-00-580-2120	2	Hyd.
99C29	4710-00-278-6398	1/4	.035	11	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.
99C30	4710-00-278-6398	1/4	.035	17	4730-00-287-0289	2	4730-00-302-8641	2	Pneu.

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
204-040-215-27	1	2 7/8	15/16	0	90	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	7 10 3/8	15/16 III	90 III	22 N/A	
204-040-722-1	1	1	9/16	0	21	Y – AN818-4 MS20819-4 X – AN818-4 MS20819-4
	2	2 3/8	9/16	190	22	
	3	6 3/4	9/16	210	30	
	4	11 1/2	9/16	210	27	
		14	I	I	125 psi	
204-040-723-1	1	2 1/4	9/16	0	34	Y – AN818-4 MS20819-4 X – AN818-4 MS20819-4
	2	5	9/16	348	22	
	3	8 7/8	9/16	340	16	
		14	I	I	125 psi	
204-060-082-1	1	1 1/8	9/16	90	0	Y – AN818-4 MS20819-4 X – AN818-4 MS20819-4
	2	6 13/16	9/16	60	90	
		13	I	I	N/A	
204-060-098-1	1	1	9/16	90	0	Y – AN818-4 MS20819-4 X – AN818-4 MS20819-4
	2	3	9/16	45	270	
		7	I	I	I	
					N/A	
204-070-110-153	1	1	9/16	0	110	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
		3 3/4	III	III	35 psi	
204-070-110-155	1	1 5/8	9/16	0	45	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
		4 13/16	III	III	N/A	
204-070-110-3	1	2 3/16	9/16	0	79	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	3 7/8	9/16	180	79	
	3	13 1/16	9/16	280	90	
		15 3/8	III	III	N/A	
204-070-110-7	1	1 5/8	9/16	0	55	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	4 1/4	9/16	180	60	
	3	16 3/4	9/16	180	60	
	4	19 1/2	9/16	0	55	
		21 1/2	III	III	N/A	
204-070-110-65	1	1 9/16	9/16	0	70	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	3 3/8	9/16	180	70	
	3	6 1/8	9/16	0	45	
	4	7 1/2	9/16	180	45	
	5	30 3/8	9/16	0	45	
	6	33 3/4	9/16	165	60	
		35 5/8	III	III	N/A	
204-070-110-67	1	1 9/16	9/16	0	70	Y – AN818-4D MS20819-4D X – AN818-4D
	2	3 3/8	9/16	180	70	
	3	6 1/8	9/16	0	45	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
	4	7 1/2	9/16	180	45	MS20819-4D
	5	30 3/8	9/16	0	45	
	6	33 3/4	9/16	95	60	
		35 5/8	III	III	N/A	
204-070-110-71	1	1 11/16	9/16	0	125	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	3 15/16	9/16	160	35	
		9 11/16	III	III	N/A	
204-070-134-11	1	1 11/16	9/16	0	86	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	4 5/16	9/16	102	79	
	3	19 1/16	9/16	235	79	
	4	22 13/16	9/16	55	72	
		27 5/16	III	III	N/A	
204-072-265-1	1	1 1/4	9/16	0	90	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	3 13/16	9/16	185	90	
	3	11 3/4	9/16	295	70	
	4	14 1/8	9/16	25	55	
	5	46 1/2	9/16	70	58	
	6	48 3/16	9/16	310	30	
	7	54 1/4	9/16	130	25	
	8	55 5/16	9/16	310	20	
		57 3/8	III	III	35 psi	
204-072-267-1	1	2 3/16	9/16	0	102	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	13 1/4	9/16	270	25	
	3	28 3/4	9/16	24	33	
		30 15/16	III	III	N/A	
204-072-268-1	1	2 9/16	9/16	0	90	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	5 1/4	9/16	270	38	
	3	37 1/8	9/16	270	41	
		46 5/8	III	III	35 psi	
204-072-355-1	1	11 3/4	9/16	0	77	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	10 1/4	9/16	180	74	
	3	8 3/16	9/16	270	56	
	4	5 5/8	9/16	200	67	
		14	II		N/A	
204-072-364-1	1	16 1/16	9/16	0	140	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	13 7/16	9/16	0	35	
	3	1 5/16	9/16	260	24	
		20	I	I	N/A	
205-060-424-1	N/A	(STRAIGHT TUBE)				Y – AN818-12 MS20819-12 X – AN818-12 MS20819-12
		3 7/8	I	I	100 psi	
205-060-440-1	1	1 5/16	1 1/4	0	97	Y – AN818-8 MS20819-8 X – AN818-8 MS20819-8
	2	9 5/16	1 1/4	125	11	
		11 29/32	I	I	100 psi	
205-060-580-1	1	1 3/8	1	0	83	Y – AN818-6D MS20819-6D X – Scarf Dial
	2	4 5/8	1	90	5	
	3	18 3/16	1	20	46	

PART NUMBER	BEND NO.	DIMENSION “A” FROM “Y” END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION “B”	TYPE END “Y”	TYPE END “X”	PRESSURE TEST	
	4	21 1/8	1	205	46	Setting 220
		35 7/8	V	III	N/A	
205-060-581-1	1	2	1	0	6	Y – AN818-6D MS20819-6D X – Scarf Dial Setting 320
	2	5	1	300	80	
	3	10 3/8	1	40	55	
	4	17 5/8	1	62	40	
	5	20 5/8	1	255	27	
	6	26 1/6	1	100	81	
	7	53	1	350	52	
	8	61 11/16	1	140	74	
		66 11/16	V	III	N/A	
205-060-582-1	1	3 7/8	1	0	83	Y – AN818-12D MS20819-12D X – Scarf Dial Setting 60
	2	11 3/4	1	90	56	
	3	21 3/8	1	90	39	
	4	29	1	165	73	
	5	55 5/8	1	60	54	
	6	65 1/8	1	240	76	
		71	V	I	N/A	
205-060-583-1	1	1 1/2	9/16	0	55	Y – AN818-4D MS20819-4D X – Scarf Dial Setting 110
	2	4	9/16	180	55	
	3	9 5/8	9/16	90	50	
	4	13 1/4	9/16	90	34	
	5	15 1/8	9/16	270	54	
	6	34 7/8	9/16	110	26	
	7	42 1/4	9/16	290	47	
		46 1/2	V	III	N/A	
205-060-584-1	1	2 3/4	1	0	87	Y – AN818-12D MS20819-12D X – AN818-12D MS20819-12D
	2	12	1	265	34	
	3	26 15/16	1	262	94	
	4	36 1/4	1	345	8	
		40	I	I	100 psi	
205-060-585-1	1	2 5/16	1	0	90	Y – AN818-12D MS20819-12D X – AN818-12D MS20819-12D
	2	9 3/16	1	270	15	
		13 3/16	I	I	100 psi	
205-060-586-1	1	3 1/4	1	0	90	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	18 1/8	1	90	90	
	3	25 5/8	1	180	88	
	4	36 5/8	1	0	61	
	5	40 7/8	1	0	26	
		43 3/4	I	I	100 psi	
205-060-587-1	1	2 3/8	1	0	88	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	14 1/4	1	180	87	
	3	23 3/8	1	270	88	
	4	33 13/16	1	0	90	
		37 9/16	I	I	N/A	
205-060-589-1	1	2 7/16	1	0	83	Y – AN818-6D MS20819-6D X – Scarf Dial Setting 81
	2	5 15/16	1	90	67	
	3	8 3/8	1	171	90	
		11 5/8	V	III	N/A	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
205-060-590-1	1	1 1/2	1	0	83	Y – AN818-6D MS20819-6D X – Scarf Dial Setting 235
	2	9 5/8	1	165	85	
	3	14 5/16	1	50	85	
	4	17 1/4	1	230	90	
	5	21 1/4	1	230	25	
	6	24 5/8	1	50	22	
	7	31 1/4	1	155	15	
	8	40 1/2	1	50	37	
	9	42 3/4	1	235	45	
		47 3/8	V	III	N/A	
205-060-591-1	1	1	1	0	80	Y – AN818-6 MS20819-6 X – AN818-6 MS20819-6
		6 5/16	I	I	N/A	
205-060-592-1	1	1 5/16	1	0	70	Y – AN818-6 MS20819-6 X – AN818-6 MS20819-6
	2	12 7/16	1	75	50	
		14 3/4	I	I	N/A	
205-060-593-1	1	11 1/4	1	0	15	Y – AN818-6 MS20819-6 X – AN818-6 MS20819-6
	2	13 1/4	1	180	15	
	3	15 1/4	1	270	76	
		30 9/16	I	I	N/A	
205-060-594-1	1	2 3/4	1 3/4	0	82	Y – AN818-12 MS20819-12 X – AN818-12 MS20819-12
	2	16 3/8	1 3/4	210	78	
	3	22 1/2	1 3/4	290	67	
	4	31 3/4	1 3/4	357	52	
		36 1/4	I	I	100 psi	
205-060-648-1	1	8 7/16	1 1/2	0	28	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	11 7/16	1 1/2	180	28	
	3	20 1/16	1 1/2	270	8	
	4	28 1/16	1 1/2	180	8	
	5	30 5/16	1 1/2	0	8	
		33 1/16	I	I	35 psi	
205-060-649-1	1	8 1/8	1 1/2	0	28	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	11 1/8	1 1/2	180	28	
	3	19 5/8	1 1/2	290	12	
	4	28 1/8	1 1/2	200	8	
	5	30 5/16	1 1/2	20	8	
		33 7/16	I	I	35 psi	
205-060-690-1	1	2 11/16	1	0	25	Y – AN818-6D MS20819-6D X – Scarf Dial Setting 210
	2	4 3/16	1	180	62	
	3	4 7/16	1	0	32	
	4	26 11/16	1	30	46	
	5	29 7/16	1	210	46	
		43 13/16	III	V	N/A	
205-060-691-1	1	2	1 3/4	0	61	Y – AN818-12D MS20819-12D X – AN818-12D MS20819-12D
	2	6	1 3/4	180	60	
	3	13 5/8	1 3/4	270	12	
	4	16 3/16	1 3/4	90	12	
		18 3/8	I	I	N/A	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END / DIMENSION "B"	BEND RADIUS / TYPE END "Y"	DIAL SETTING / TYPE END "X"	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
205-060-692-1	1	2 7/16	1 3/4	0	35	Y – AN818-12D MS20819-12D X – AN818-12D MS20819-12D
	2	5 5/8	1 3/4	335	55	
		8 7/8	I	I	N/A	
205-060-693-1	1	7	1 3/4	0	54	Y – AN818-12D MS20819-12D X – AN818-12D MS20819-12D
	2	12 9/16	1 3/4	180	54	
	3	25 7/16	1 3/4	90	12	
	4	27 15/16	1 3/4	270	12	
		30 11/16	I	I	N/A	
205-060-694-1	1	1 3/4	1 3/4	0	30	Y – AN818-12D MS20819-12D X – AN818-12D MS20819-12D
	2	9	1 3/4	90	5	
	3	11 13/16	1 3/4	270	5	
		14	I	I	35 psi	
205-060-695-1	1	1 3/8	3	0	90	Y – AN818-16D MS20819-16D X – AN818-16D MS20819-16D
	2	24 1/8	3	270	41	
	3	29 3/8	3	90	41	
		33 3/4	I	I	35 psi	
205-060-696-1	1	2 3/4	3	0	27	Y – AN818-16D MS20819-16D X – Scarf Dial Setting 96
	2	8 3/16	3	180	24	
	3	18 7/16	3	343	36	
	4	25	3	151	46	
		31	I	V	N/A	
205-060-697-1	1	1 9/16	1	0	50	Y – AN818-6D MS20819-6D X – Scarf Dial Setting 85
	2	4 3/8	1	180	50	
	3	9 1/8	1	90	55	
	4	11 7/16	1	90	26	
	5	13 1/16	1	270	53	
	6	33 9/16	1	100	28	
	7	40 9/16	1	10	9	
	8	44 1/8	1	265	52	
		46 9/16	III	V	N/A	
205-061-213-1	1	1 9/16	3	0	85	Y – AN818-16D MS20819-16D X – AN818-16D MS20819-16D
	2	11 1/8	3	90	82	
		16 7/8	I	I	N/A	
205-061-214-1	1	21	3	0	40	Y – AN818-16D MS20819-16D X – Scarf Dial Setting 140
	2	25 1/4	3	180	40	
		49	I	V	N/A	
205-061-600-1	1	2 1/2	1 1/2	0	90	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	10	1 1/2	90	36	
		17 1/2	I	I	35 psi	
205-061-601-1	1	2 1/4	1 1/2	0	90	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	9 7/8	1 1/2	90	18	
		16 5/16	I	I	35 psi	
205-061-604	1	7/8	9/16	0	135	Y – AN818-4D MS20819-4D
	2	3	9/16	180	45	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
	3	4 1/4	9/16	270	25	X – AN818-4D MS20819-4D
	4	5 1/2	9/16	90	36	
		6 13/16	III	III	35 psi	
205-061-606-1	1	2 7/16	1 1/4	0	24	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	5 11/16	1 1/4	180	24	
		17 1/2	I	I	35 psi	
205-061-607-1	1	3 11/16	1 1/2	0	15	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	11 7/16	1 1/2	180	15	
		17 1/16	I	I	35 psi	
205-061-608-1	N/A	(STRAIGHT TUBE)				Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
		3 7/16	I	I	35 psi	
205-061-609-1	N/A	(STRAIGHT TUBE)				Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
		2 7/32	I	I	35 psi	
205-061-610-1	1	1 9/16	15/16	0	77	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	8 1/16	15/16	180	77	
		30 3/4	III	III	35 psi	
205-061-611-1	1	3 1/4	1	0	14	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	4 7/8	1	180	105	
	3	14 7/8	1	270	35	
	4	26 11/16	1	90	27	
		30 1/8	III	III	35 psi	
205-061-612-1	1	3 5/8	1	0	8	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	6 11/16	1	90	25	
	3	20 1/8	1	254	23	
		23 9/16	III	III	30 psi	
205-061-614-1	1	1 3/16	1 1/4	0	66	Y – AN818-8D MS20819-8D X – Scarf Dial Setting 210
	2	12	1 1/4	165	81	
		15 1/4	I	V	N/A	
205-061-615-1	1	1 1/16	1 1/4	0	63	Y – AN818-8D MS20819-8D X – Scarf Dial Setting 225
	2	11 3/16	1 1/4	165	78	
		14 1/16	I	V	N/A	
205-061-616-1	1	1 3/16	1 1/4	0	70	Y – AN818-8D MS20819-8D X – Scarf Dial Setting 151
	2	12 3/16	1 1/4	192	85	
		15 1/4	I	V	N/A	
205-061-617-1	1	1 3/8	1 1/4	0	55	Y – AN818-8D MS20819-8D X – Scarf Dial Setting 150
	2	11 3/16	1 1/4	195	76	
		14 1/16	I	V	N/A	

PART NUMBER	BEND NO.	DIMENSION “A” FROM “Y” END / DIMENSION “B”	BEND RADIUS / TYPE END “Y”	DIAL SETTING / TYPE END “X”	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
205-061-618-1	1	1 1/16	9/16	0	38	Y – AN818-4D MS20819-4D X – Scarf Dial Setting 220
	2	9 11/32	9/16	180	51	
		10 15/16	III	V	N/A	
205-061-619-1	1	1 1/16	9/16	0	45	Y – AN818-4D MS20819-4D X – Scarf Dial Setting 220
	2	9 1/8	9/16	185	68	
		11 3/8	III	V	N/A	
205-061-624-1	1	1 9/16	1	0	61	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	6 1/8	1	180	18	
		17 1/8	III	III	35 psi	
205-061-645-1	1	1 1/4	1 1/4	0	102	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	5 3/4	1 1/4	180	61	
		8 1/4	I	I	35 psi	
205-061-647-1	1	1 5/16	1 1/2	0	25	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	3 7/8	1 1/2	180	25	
	3	10 1/4	1 1/2	180	23	
	4	14 1/4	1 1/2	0	21	
		18 3/16	I	I	35 psi	
205-061-649-1	1	1 1/4	1 1/2	0	64	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	7 1/8	1 1/2	92	90	
		19 5/16	I	I	35 psi	
205-061-650-1	1	1 3/16	1 1/2	0	63	Y – AN818-10D MS20819-10D X – AN818-10D MS20819-10D
	2	6 7/16	1 1/2	268	90	
		18 9/16	I	I	35 psi	
205-061-651-1	1	1 1/2	1 1/4	0	55	Y – AN818-8D MS20819-8D X – Scarf Dial Setting 198
	2	7	1 1/4	95	92	
	3	17 1/16	1 1/4	198	94	
		20 5/16	I	V	N/A	
205-061-652-1	1	1 3/4	1 1/4	0	54	Y – AN818-8D MS20819-8D X – Scarf Dial Setting 178
	2	7	1 1/4	268	88	
	3	17	1 1/4	178	88	
		20 1/8	I	V	N/A	
205-061-653-1	1	2 5/8	9/16	0	28	Y – AN818-4D MS20819-4D X – Scarf Dial Setting 185
	2	8 7/8	9/16	90	84	
	3	18 5/8	9/16	185	87	
		21 1/4	III	V	N/A	
205-061-654-1	1	2 1/2	9/16	0	45	Y – AN818-4D MS20819-4D X – Scarf Dial Setting 180
	2	8 7/8	9/16	270	90	
	3	18 1/2	9/16	180	90	
		21	III	V	N/A	
205-061-655-1	1	2 1/16	1	0	71	Y – AN818-6D MS20819-6D
	2	7 1/16	I	178	70	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END / DIMENSION "B"	BEND RADIUS / TYPE END "Y"	DIAL SETTING / TYPE END "X"	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
		14 13/16	1	178	91	X – AN818-6D MS20819-6D
	4	23 1/4	1	90	92	
		26	III	III	N/A	
205-061-659-1	1	3 5/8	1 1/4	0	26	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	6 9/16	1 1/4	180	26	
		11 13/16	I	I	60 psi	
205-061-661-1	1	5 1/2	1	0	33	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	7 3/8	1	180	33	
	3	15 1/8	1	197	89	
		22 1/8	III	III	60 psi	
205-061-662-1	1	4 3/8	1	0	90	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
		10 5/8	III	III	60 psi	
205-061-663-1	1	1	1 1/4	0	90	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	11 1/16	1 1/4	0	37	
	3	14 3/4	1 1/4	180	37	
	4	22 3/4	1 1/4	230	62	
	5	25 1/8	1 1/4	50	67	
		27 3/4	I	I	35 psi	
205-061-664-1	N/A	(STRAIGHT TUBE)				Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
		13 1/2	I	I	60 psi	
205-061-668-1	1	2 3/4	1 1/4	0	90	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	8 1/4	1 1/4	265	10	
		10 5/8	I	I	80 psi	
205-061-669-1	1	1 7/16	1 1/4	0	83	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	7 11/16	1 1/4	164	79	
	3	11 3/4	1 1/4	254	15	
		13 15/16	I	I	100 psi	
205-061-670-1	1	1 3/4	1 1/4	0	36	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	3 1/2	1 1/4	175	38	
	3	9 1/2	1 1/4	265	19	
	4	13 11/16	1 1/4	175	26	
	5	16 1/8	1 1/4	352	26	
	6	24 9/16	1 1/4	10	30	
	7	27	1 1/4	155	26	
	8	31 7/16	1 1/4	340	12	
	9	32 3/4	1 1/4	160	14	
		33 15/16	I	I	100 psi	
205-061-671-1	1	2	1 1/4	0	135	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	8 11/16	1 1/4	185	88	
	3	13 1/8	1 1/4	275	35	
	4	15 3/8	1 1/4	25	48	
		29 15/16	I	I	100 psi	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
205-061-674-1	1	3 1/4	1 1/2	0	90	Y – AN818-10 MS20819-10 X – AN818-10 MS20819-10
		9 3/4	I	I	60 psi	
205-061-675-1	1	2	1	0	27	Y – AN818-6 MS20819-6 X – AN818-6 MS20819-6
	2	8	1	79	22	
		9 11/16	I	I	60 psi	
205-061-685-1	1	1 1/16	9/16	0	114	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	9 1/6	9/16	117	34	
	3	16 15/16	9/16	156	56	
	4	19 1/8	9/16	343	56	
		21 1/8	III	III	N/A	
205-062-614-1	1	1	1 1/4	0	3	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
		23 7/8	I	I	35 psi	
205-062-662-1	1	5 9/16	15/16	0	95	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
		7 3/4	I	I	35 psi	
205-062-663-1	1	24 7/8	15/16	0	14	Y – AN818-6D MS20819-6D X – AN818-6D MS20819-6D
	2	22 1/16	15/16	180	99	
	3	12 3/8	15/16	159	56	
	4	8 3/4	15/16	339	59	
	5	4 11/16	15/16	0	20	
	6	1 5/8	15/16	170	30	
		26 5/16	I	I	35 psi	
205-062-680-1	1	18	1 1/4	0	32	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	14 15/16	1 1/4	296	18	
	3	4 3/4	1 1/4	259	8	
	4	2 1/4	1 1/4	79	7	
		19 3/4	I	I	35 psi	
205-062-681-1	1	21 3/8	1 1/4	0	96	Y – AN818-8D MS20819-8D X – AN818-8D MS20819-8D
	2	17 3/16	1 1/4	90	9	
	3	5 13/16	1 1/4	90	6	
	4	2 11/16	1 1/4	270	6	
		22 9/16	I	I	35 psi	
205-070-365-1	1	27 3/8	9/16	0	39.5	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	25 13/16	9/16	188.5	39	
	3	17 3/4	9/16	108	93.5	
	4	5 5/16	9/16	281	90	
	5	1 1/4	9/16	190	20	
		30 13/16	I	I		
205-070-366-1	1	8 3/4	9/16	0	41	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	6 13/16	9/16	172	38	
	3	2 13/16	9/16	21.5	85	
	4	1 3/4	9/16	108.5	20	
		10 5/16	I	I		

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END / DIMENSION "B"	BEND RADIUS / TYPE END "Y"	DIAL SETTING / TYPE END "X"	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
205-070-436-1	1	2 5/16	9/16	0	49	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	4 7/16	9/16	180	49	
	3	15 7/16	9/16	180	90	
	4	18	9/16	330	90	
	5	19 5/8	9/16	60	25	
		21 3/4	III	III	N/A	
205-070-439-1	1	3 1/2	9/16	0	45	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	7 3/16	9/16	180	43	
		11 1/14	III	III	35 psi	
205-070-440-1	1	2 9/16	9/16	0	9	Y – AN818-4D MS20819-4D X - AN818-4D MS20819-4D
	2	17 11/16	9/16	180	8	
		30 15/16	III	III	N/A	
205-070-441-1	1	1 1/16	9/16	0	90	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	3	9/16	0	40	
	3	5 5/16	9/16	180	40	
	4	8	9/16	90	45	
		9 7/8	III	III	35 psi	
205-070-448-1	1	2 3/8	9/16	0	180	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	5 1/8	9/16	180	90	
		7 1/2	III	III	35 psi	
205-070-475-1	1	3 1/2	9/16	0	20	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	7 5/8	9/16	105	63	
	3	9 1/8	9/16	260	62	
	4	11 5/16	9/16	240	88	
	5	13 7/8	9/16	55	86	
	6	17	9/16	328	14	
	7	20 1/8	9/16	148	15	
	8	26 13/16	9/16	53	13	
	9	28 3/8	9/16	233	13	
		33 5/8	III	III	35 psi	
205-070-476-1	1	1 1/8	9/16	0	20	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	2 9/16	9/16	180	25	
		9 3/8	III	III	35 psi	
205-070-484-1	1	1 1/4	9/16	0	52	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	2 3/4	9/16	180	78	
	3	14 1/4	9/16	315	24	
		15 7/8	III	III	150 psi	
205-070-485-1	1	2 3/8	9/16	0	180	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	4 15/16	9/16	180	90	
		7 7/16	III	III	N/A	
205-070-486-1	1	1 3/4	9/16	0	50	Y – AN818-4D MS20819-4D X – AN818-4D
	2	4 1/2	9/16	180	50	
	3	16 3/16	9/16	180	38	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
	4	17 1/2	9/16	0	38	MS20819-4D
		20 1/4	III	III	150 psi	
205-070-487-1	1	3 1/2	9/16	0	20	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	7 5/8	9/16	105	63	
	3	9 1/8	9/16	260	62	
	4	11 5/16	9/16	258	85	
	5	14	9/16	74	81	
	6	17 1/8	9/16	347	14	
	7	19 3/16	9/16	167	15	
	8	26 15/16	9/16	62	13	
	9	28 1/2	9/16	242	13	
		33 11/16	III	III	35 psi	
205-070-488-1	1	1 1/8	9/16	0	20	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	2 9/16	9/16	180	25	
		9 3/8	III	III	150 psi	
205-070-490-1	1	2 7/8	9/16	0	9	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	18 5/8	9/16	180	7	
		31 1/8	III	III	150 psi	
205-070-491-1	1	1 5/16	9/16	0	115	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	4 7/16	9/16	90	56	
	3	10 3/4	9/16	252	40	
	4	32 1/16	9/16	85	35	
	5	33 1/2	9/16	250	35	
		36 7/16	III	III	N/A	
205-072-208-1	1	42 11/16	9/16	0	39	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	41	9/16	169	39	
	3	33	9/16	90	90	
	4	20 3/4	9/16	180	90	
	5	12 3/16	9/16	90	37	
	6	9 15/16	9/16	176	35	
	7	8 11/16	9/16	275	90	
	8	4 3/16	9/16	144	48	
	9	2 1/4	9/16	182	47	
		44 3/16	I	I		
205-072-278-1	1	1 1/4	9/16	0	150	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	6 3/8	9/16	70	21	
	3	13 3/8	9/16	167	82	
	4	21	9/16	254	23	
	5	22 1/16	9/16	76	23	
	6	23 9/16	9/16	355	51	
	7	25 3/4	9/16	172	52	
	8	28 7/16	9/16	180	24	
		29 7/8	III	III	150 psi	
205-072-304-1	1	9 7/16	9/16	0	163	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	2	6 9/16	9/16	0	12	
		10 1/2	I	I		

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END / DIMENSION "B"	BEND RADIUS / TYPE END "Y"	DIAL SETTING / TYPE END "X"	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
205-072-305-1			9/16	0	43	Y – AN818-4D MS20819-4D X – AN818-4D MS20819-4D
	1	11 7/8	9/16	0	93	
	2	8 3/16	9/16	0	90	
		12.9	I	I		
205-072-410-1	1	2 5/8	3	0	116	Y – AN818-16D MS20819-16D X – AN818-16D MS20819-16D
	2	16 3/4	3	180	25	
		25 3/8	I	I	150 psi	
205-072-424-1	1	1 7/8	3	0	13	Y – AN818-16D MS20819-16D X – AN818-16D MS20819-16D
	2	11 9/16	3	97	23	
	3	17 1/8	3	235	19	
	4	23 3/8	3	212	97	
	5	31 1/2	3	116	71	
	6	46 3/4	3	125	73	
	7	53 1/4	3	245	160	
	8	61 1/2	3	155	5	
		63 1/4	I	I	150 psi	
250-075-134-1	1	2 3/4	3/4	0	120	Y – N/A X – Scarf Dial Setting 90
		5	V	IV	N/A	
205-076-033-1	1	2 3/16	9/16	0	28	Y – MS21921-4D MS21922-4 X – MS21921-4D MS21922-4
	2	5 9/16	9/16	190	47	
		13 5/16	IV	IV	1500 psi	
205-076-136-1	1	3 1/8	9/16	0	86	Y – MS21921-4D MS21922-4 X – MS21921-4D MS21922-4
	2	7	9/16	96	43	
	3	14	9/16	186	83	
	4	20 3/4	9/16	226	12	
	5	25 1/4	9/16	321	85	
		27 7/8	IV	IV	N/A	
205-076-138-1	1	1 3/8	1 1/4	0	86	Y – MS21921-8D MS21922-8 X – MS21921-8D MS21922-8
	2	5 1/8	1 1/4	180	86	
		13 15/16	IV	IV	1500 psi	
205-076-140-1	1	1	15/16	0	96	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	4 9/16	15/16	183	94	
	3	17 5/8	15/16	290	87	
	4	21	15/16	20	13	
	5	24 3/4	15/16	290	21	
	6	27 1/2	15/16	200	90	
		30 1/2	IV	IV	1500 psi	
205-076-141-1	1	3 13/16	1	0	33	Y – MS21921-6 MS21922-6
	2	6 3/16	1	180	33	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END / DIMENSION "B"	BEND RADIUS / TYPE END "Y"	DIAL SETTING / TYPE END "X"	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
	3	18	1	180	17	X – MS21921-6 MS21922-6
	4	19 5/8	1	0	17	
		23 3/8	IV	IV	3000 psi	
205-076-156-1	1	1	9/16	0	63	Y – MS21921-4D MS21922-4 X – MS21921-4D MS21922-4
	2	8	9/16	172	67	
	3	13 1/4	9/16	352	13	
	4	21 15/16	9/16	172	19	
		30 7/16	IV	IV	N/A	
205-076-157-1	1	1 1/4	1	0	180	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	7 3/8	1	340	27	
	3	11 5/8	1	240	92	
		14 3/16	IV	IV	1500 psi	
205-076-159-1	1	6 15/16	1 1/4	0	41	Y – MS21921-8D MS21922-8 X – MS21921-8D MS21922-8
	2	14 3/8	1 1/4	192	36	
	3	17 3/8	1 1/4	144	33	
	4	21 5/16	1 1/4	219	86	
		25 3/16	IV	IV	1500 psi	
206-076-160-1	1	6 3/4	9/16	0	37	Y – MS21921-4D MS21922-4 X – MS21921-4D
	2	20 1/4	9/16	265	55	
	3	23 1/4	9/16	175	77	
		26 3/4	IV	IV	1500 psi	
205-076-161-1	1	1 7/16	9/16	0	86	Y – MS21921-4D MS21922-4 X – MS21921-4D MS21922-4
	2	6 1/8	9/16	140	91	
		10 1/4	IV	IV	1500 psi	
205-076-201-1	1	1 5/16	1	0	20	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	2 3/4	1	270	90	
	3	8 1/2	1	200	20	
	4	9 3/4	1	100	90	
		12 7/8	IV	IV	1500 psi	
205-076-202-1	1	2 7/8	15/16	0	92	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	8	15/16	251	120	
		11 7/16	IV	IV	1500 psi	
205-076-203-1	1	2 3/8	1	0	10	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	8	1	180	10	
		9 3/4	IV	IV	1500 psi	
205-076-204-1	1	2 13/16	1	0	75	Y – MS21921-4D MS21922-4
	2	8 9/16	1	180	75	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
	3	16	1	180	90	X – MS21921-6D MS21922-6
	4	18 13/16	1	270	23	
		21 2/8	IV	IV	1500 psi	
205-076-206-1	1	2 1/4	9/16	0	89	Y – MS21921-4D MS21922-4 X – MS21921-4D MS21922-4
	2	5	9/16	150	89	
	3	11 3/4	9/16	140	89	
	4	14 1/16	9/16	300	89	
		16 3/16	IV	IV	1500 psi	
205-076-207-1	1	2 7/16	9/16	0	50	Y – MS21921-4 MS21922-4 X – MS21921-4 MS21922-4
	2	4 9/16	9/16	180	50	
	3	11 1/2	9/16	95	12	
		13 5/8	IV	IV	3000 psi	
205-076-209-1	1	1 5/16	9/16	0	45	Y – MS21921-4D MS21922-4 X – MS21921-4D MS21922-4
	2	13 5/8	9/16	180	48	
	3	27 5/16	9/16	96	22	
	4	30 5/16	9/16	4	87	
		32 3/4	IV	IV	1500 psi	
205-076-210-1	1	1	9/16	0	41	Y – MS21921-4 MS21922-4 X – MS21921-4 MS21922-4
	2	3 7/16	9/16	180	41	
	3	9 1/8	9/16	180	20	
	4	9 15/16	9/16	0	25	
		11 13/16	IV	IV	3000 psi	
205-076-212-1	1	2 1/16	1	0	35	Y – MS21921-6 MS21922-6 X – MS21921-6 MS21922-6
	2	4 7/8	1	180	35	
	3	17 3/16	1	175	48	
	4	20 13/16	1	355	44	
		23 13/16	IV	IV	3000 psi	
205-076-214-1	1	1 5/8	15/16	0	91	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	4 1/4	15/16	150	89	
	3	10 13/16	15/16	150	93	
	4	13 5/16	15/16	310	90	
		15 13/16	15/16	IV	1500 psi	
205-076-216-1	1	2	1	0	29	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	11 5/8	1	320	45	
	3	13 5/8	1	245	95	
		17 3/8	IV	IV	1500 psi	
205-076-217-1	1	2 7/16	1	0	8	Y – MS21921-6D MS21922-6 X – MS21921-6D MS21922-6
	2	7 13/16	1	200	95	
	3	13 3/8	1	208	90	
		22	IV	IV	1500 psi	
205-076-223-1	1	2 3/8	9/16	0	90	Y – MS21921-4D MS21922-4
	2	7	9/16	0	90	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END	BEND RADIUS	DIAL SETTING	BEND ANGLE	END FITTING AND NOTES
		DIMENSION "B"	TYPE END "Y"	TYPE END "X"	PRESSURE TEST	
		9	IV	IV	1500 psi	X – MS21921-4D MS21922-4
205-076-233-1	1	2 3/16	9/16	0	43	Y – MS21921-4D MS21922-4 X – Scarf Dial Setting 151
	2	5 11/16	9/16	180	43	
	3	9 5/8	9/16	183	37	
	4	15 1/8	9/16	3	36	
	5	24 3/4	9/16	241	12	
	6	27 1/4	9/16	61	13	
	7	36 13/16	9/16	61	61	
	8	38 1/2	9/16	241	63	
		40 5/8	IV	V	N/A	

PART NUMBER	BEND NO.	DIMENSION "A" FROM "Y" END / DIMENSION "B"	BEND RADIUS / TYPE END "Y"	DIAL SETTING / TYPE END "X"	BEND ANGLE / PRESSURE TEST	END FITTING AND NOTES
205-076-258-1	1	1 7/8	1 1/4	0	90	Y – MS21921-8 MS21922-8 X – MS21921-8 MS21922-8
	2	13 1/2	1 1/4	255	23	
		19 15/16	IV	IV	3000 psi	
205-076-259-1	1	1 1/2	1 1/4	0	93	Y – MS21921-8D MS21922-8 X – MS21921-8D MS21922-8
	2	14 5/16	1 1/4	272	19	
	3	22 3/4	1 1/4	92	10	
	4	26	1 1/4	206	58	
	5	31	1 1/4	116	10	
		33 1/2	IV	IV	1500 psi	
99C29	1	2 7/16	9/16	0	60	Y – AN818-4D MS20819-4 X – AN818-4D MS20819-4
	2	4 7/8	9/16	188	63	
		8 3/8	III	III	150 psi	
99C30	1	15/16	1	0	90	Y – AN818-4D MS20819-4 X – AN818-4D MS20819-4
	2	3 1/2	1	270	26	
	3	6 13/16	1	225	16	
	4	13 1/16	1	45	16	
		15	III	III	150 psi	

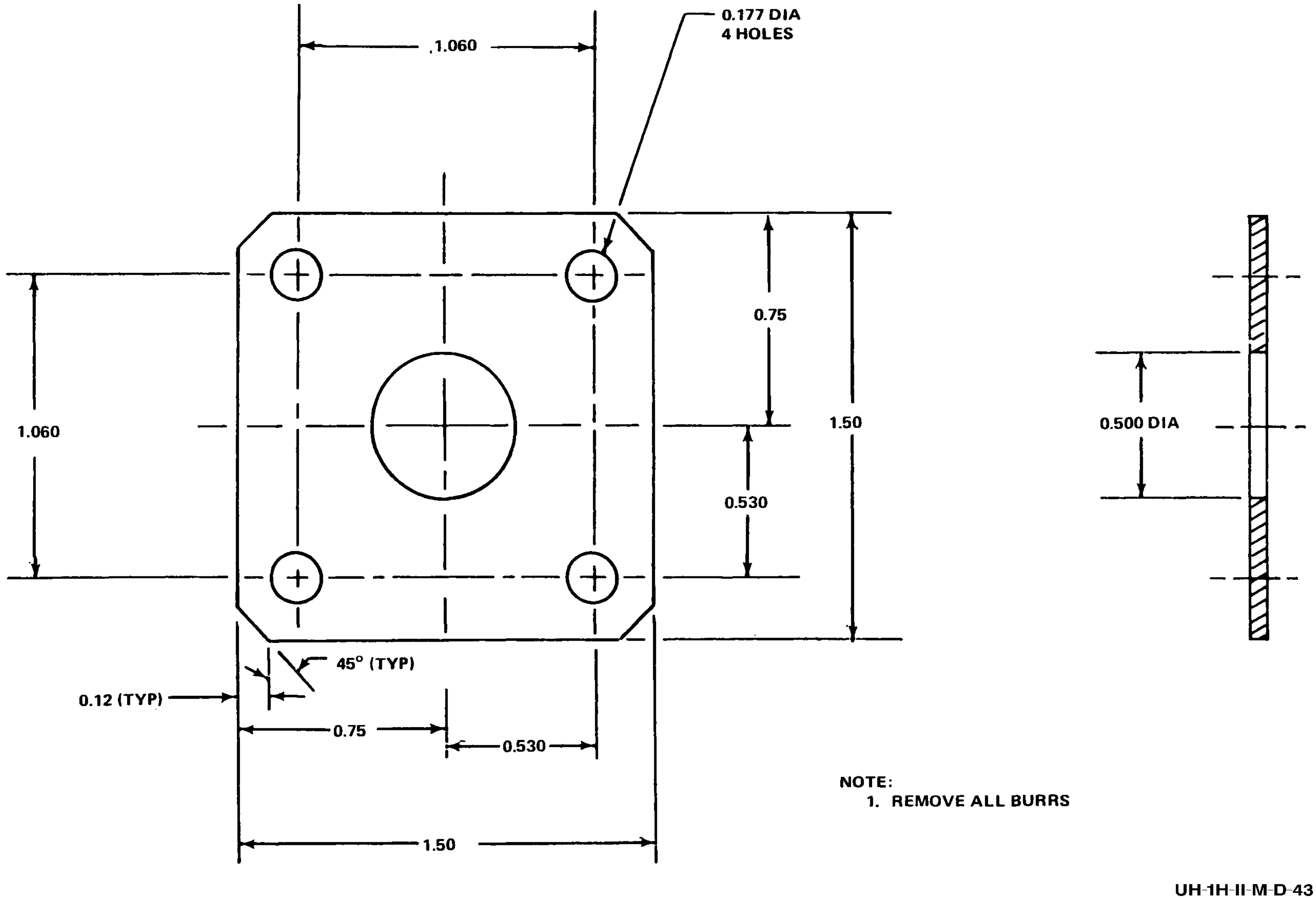


Figure D-43.	Part Number	28D00 PLATE, RETAINER
	Fabricate From:	NSN 9535-00-640-2311
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

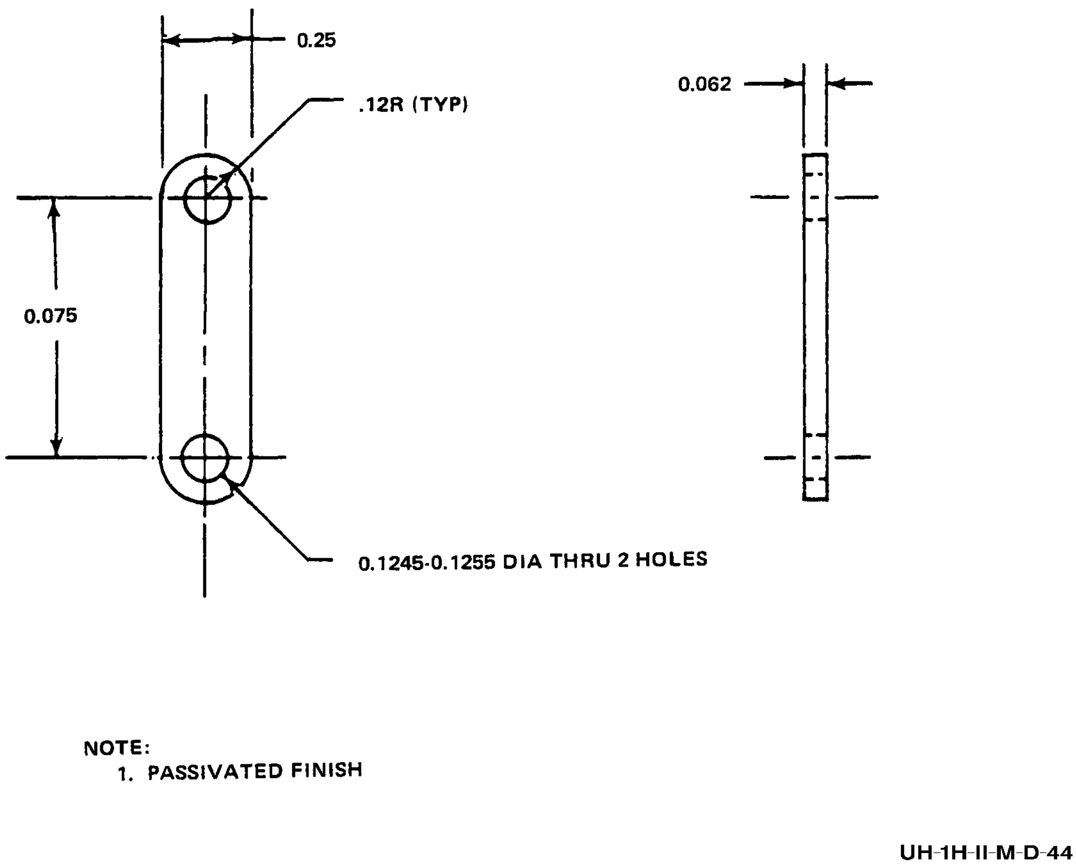
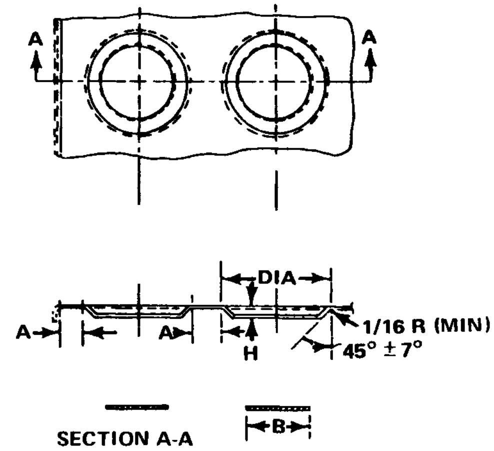


Figure D-44.	**Part Number**	**49C16 LINK, VALVE ASSEMBLY**
	Fabricate From:	**NSN 9515-00-234-7953**
	Material:	**Metal Sheet - Steel, Corrosion Resistant, Cold Roll Federal Specification MIL-S-5059A, 0.063 Inch Thick**

DASH NO.	DIA. OF HOLE D	BLANK DIA. B	AREA OF BLANK SQ. IN.	H ±1/32	A MIN
4	1	.6895	.37	1/8	5/16
5	1-1/4	.9375	.69	1/8	5/16
6	1-1/2	1.000	.78	3/16	11/32
7	1-3/4	1.250	1.23	3/16	11/32
8	2	1.500	1.77	3/16	11/32
9	2-1/4	1.750	2.41	3/16	11/32
10	2-1/2	2.000	3.14	3/16	11/32
11	2-3/4	2.250	3.98	3/16	11/32
12	3	2.500	4.91	3/16	11/32
13	3-1/4	2.625	5.41	1/4	3/8
14	3-1/2	2.875	6.49	1/4	3/8
15	3-3/4	3.125	7.67	1/4	3/8
16	4	3.375	8.94	1/4	3/8
17	4-1/4	3.625	10.32	1/4	3/8
18	4-1/2	3.875	11.79	1/4	3/8
19	4-3/4	4.125	13.36	1/4	3/8
20	5	4.375	15.00	1/4	3/8
CONTINUE IN 1/4 INCH INCREMENTS					

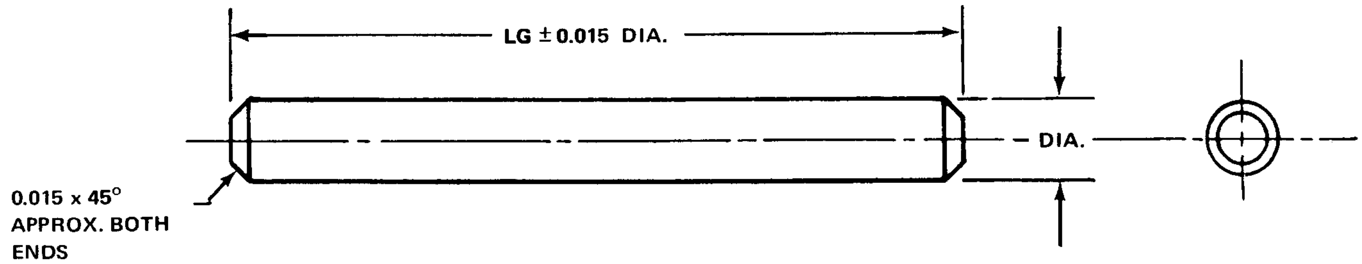


NOTES:

1. THE MINIMUM HOLE SHALL BE 1" IN DIAMETER (D).
   COVE: DASH NUMBER INDICATED DIAMETER OF HOLE (D) IN 1/4 INCH INCREMENTS
   EXAMPLE: 50H1-8 = HOLE - CIRCLAR LIGHTENING -45° FLANGE, 2" DIAMETER

UH-1H-II-M-D-45

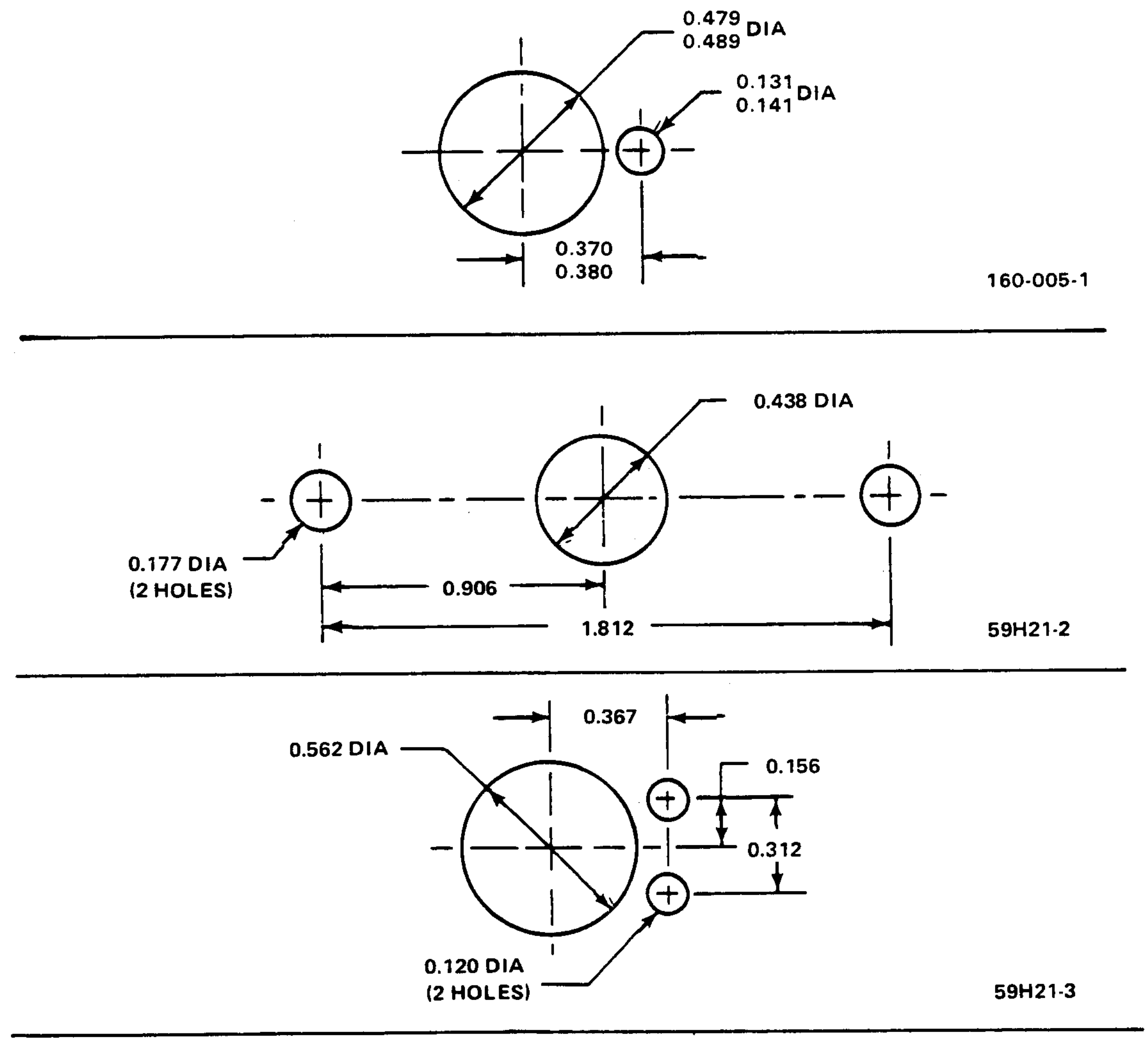
Figure D-45. Part Number 50H1 LIGHTENING HOLE PATTERN



PART NUMBER	FABRICATE FROM NSN	DIA.	LENGTH
MS20253-2-225	5340-00-068-4378	0.089	2.250
MS20253-2-275	5340-00-573-0780	0.089	2.750
MS20253-2-600	5340-00-573-0780	0.089	6.000
MS20253-2-2450	5340-00-068-4378	0.089	24.50
MS20253P2-275	5340-00-043-3723	0.089	2.750
MS20253P2-387	5340-00-043-3723	0.089	3.870
MS20253P2-2372	5340-00-043-3723	0.089	23.720

UH-1H-II-M-D-46

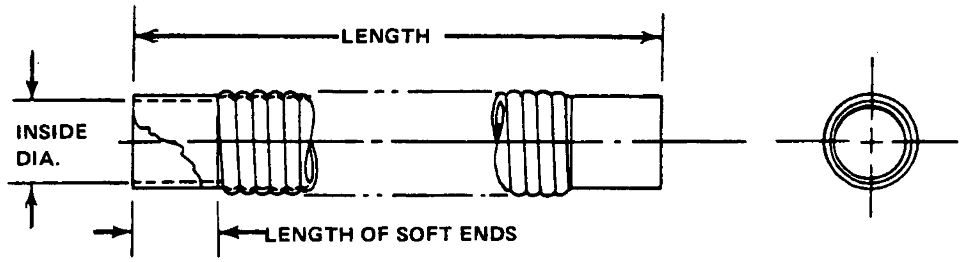
Figure D-46. PIN, Straight Headless



DIMENSIONS IN INCHES: UNLESS OTHERWISE SPECIFIED
TOLERANCES: THREE
PLACE DECIMALS ± .005

UH-1H-II-M-D-47

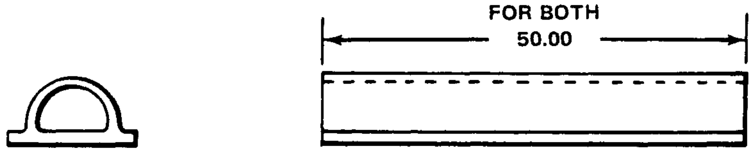
Figure D-47. Part Number 59H21 HOLE PATTERNS



HOSE PART NUMBER	FABRICATE FROM NSN	ID.	LG.	SOFT END LG.
70-001B8F18Z3	4720-00-707-6900	2.000 IN.	9.000 IN.	1.500 IN.
70-001B8F59Z3	4720-00-707-6900	2.000 IN.	29.500 IN.	1.500 IN.
70-001B10F66Z2	4720-00-736-0985	2.500 IN.	2.900 IN.	1.000 IN.
70-001B12F13Z3	4720-00-736-0986	3.000 IN.	6.500 IN.	1.500 IN.
70-001B12F22Z2	4720-00-736-0986	3.000 IN.	11.99 IN.	1.000 IN.
70-001B12F27Z2	4720-00-736-0986	3.000 IN.	13.500 IN.	1.000 IN.
70-001B12F52Z3	4720-00-736-0986	3.000 IN.	26.000 IN.	1.500 IN.
70-001B20F12Z3	4720-00-736-0986	5.000 IN.	6.000 IN.	1.500 IN.
70-004A10F23Z2	4720-00-736-0985	2.500 IN.	11.500 IN.	1.000 IN.
70-004A10F24Z2	4720-00-736-0985	2.500 IN.	12.00 IN.	1.000 IN.
70-004A10F25Z3	4720-00-736-0985	2.500 IN.	12.500 IN.	1.500 IN.
70-004A12F27Z2	4720-00-736-0986	3.000 IN.	13.500 IN.	1.000 IN.

UH-1H-II-M-D-48

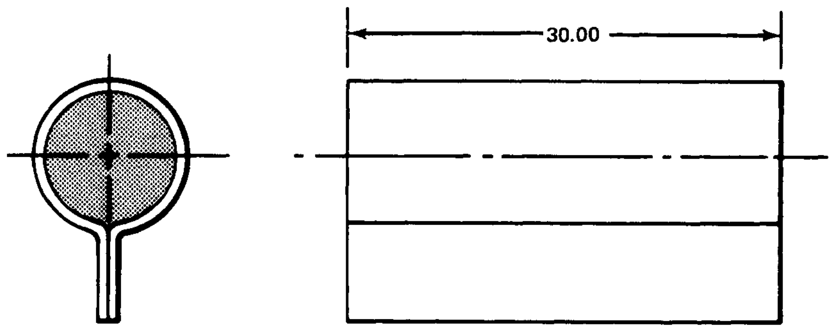
Figure D-48. HOSE, Air Duct



SEAL, PART NUMBERS 205-031-669-151
205-031-669-152
FABRICATE FROM NSN 9390-00-456-2095

UH-1H-II-M-D-49

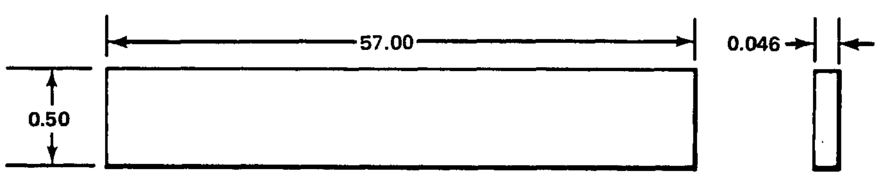
Figure D-49.



SEAL, PART NUMBER 205-060-907-35
FABRICATE FROM NSN 5330-00-851-9178

UH-1H-II-M-D-50

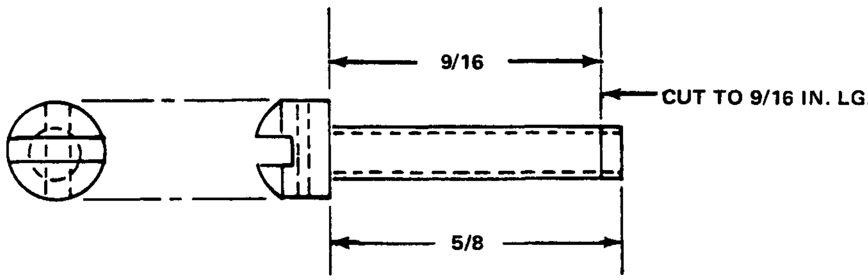
Figure D-50.



GASKET, PART NUMBER 205-060-907-37
FABRICATE FROM NSN 5330-00-938-1719

UH-1H-II-M-D-51

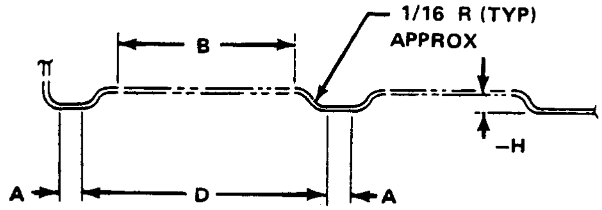
Figure D-51.



NO. 4-40 x 9/16" DRILLED FILLISTER HEAD
MACHINE SCREW WITH SLOTTED HEAD.

UH-1H-II-M-D-52

Figure D-52. Part Number BYRF572 SCREW, MACHINE
Fabricate From: NSN 5305-00-579-4554

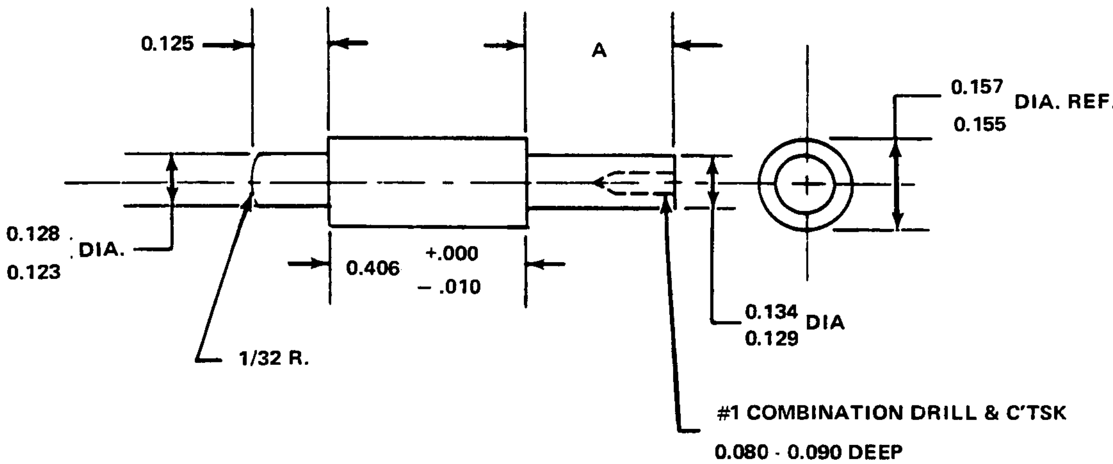


DASH NO.	D	H	A	B APPROX.
-4	1	1/8	5/16	11/16
-5	1-1/4	1/8	5/16	15/16
-6	1-1/2	3/16	11/32	1
-7	1-3/4	3/16	11/32	1-1/4
-8	2	3/16	11/32	1-1/2
-9	2-1/4	3/16	11/32	1-3/4
-10	2-1/2	3/16	11/32	2
-11	2-3/4	3/16	11/32	2-1/4
-12	3	3/16	11/32	2-1/2
-13	3-1/4	1/4	3/8	2-5/8
-14	3-1/2	1/4	3/8	2-7/8
-15	3-3/4	1/4	3/8	3-1/8
-16	4	1/4	3/8	3-3/8
-17	4-1/2	1/4	3/8	3-7/8
-18	4-1/2	1/4	3/8	3-7/8
-19	4-3/4	1/4	3/8	4-1/8
-20	5	1/4	3/8	4-3/8
CONTINUE IN 1/4 INCH INCREMENTS				

NOTE:
MATERIAL SHOULD BE IN "0" INITIAL CONDITION.

UH-1H-II-M-D-53

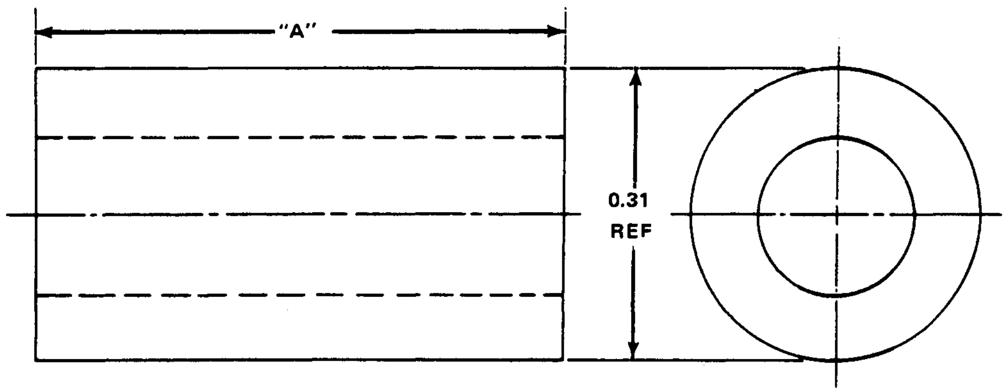
Figure D-53. Part Number 50 HI HOLE PATTERNS



PART NO.	A
-1	0.344
-2	0.218

UH-1H-II-M-D-54

Figure D-54.	Part Number	SP 401-1 PIN, Shoulder
		SP 401-2
	Fabricate From:	NSN 9530-00-167-1817
	Material:	Wire, Non-Electric Nickel Annealed Cold,
		Federal Specification MIL-N-6710, Cond A, 0.250 Inch Dia.



PART NUMBER	"A"	NEXT ASSY	APPLICATION QTY. REQ'D		
			USED ON	NEXT ASSY	USED ON
B79C65	0.61	A71C09	A71C09	1	1

MATERIAL: 5/16 O.D. x .058 WALL
THICKNESS TYPE
6061 AL. ALY. TUBING
PER WW-T-789

NOTE:
1. REMOVE ALL BURRS

UH-1H-II-M-D-55

Figure D-55. Part Number B79C65 SPACER
Fabricate From: NSN 5340-00-727-1891
Material: Spacer, Sleeve Aluminum Alloy, 0.194 inch ID, 0.322 Inch OD, 20 inches long.

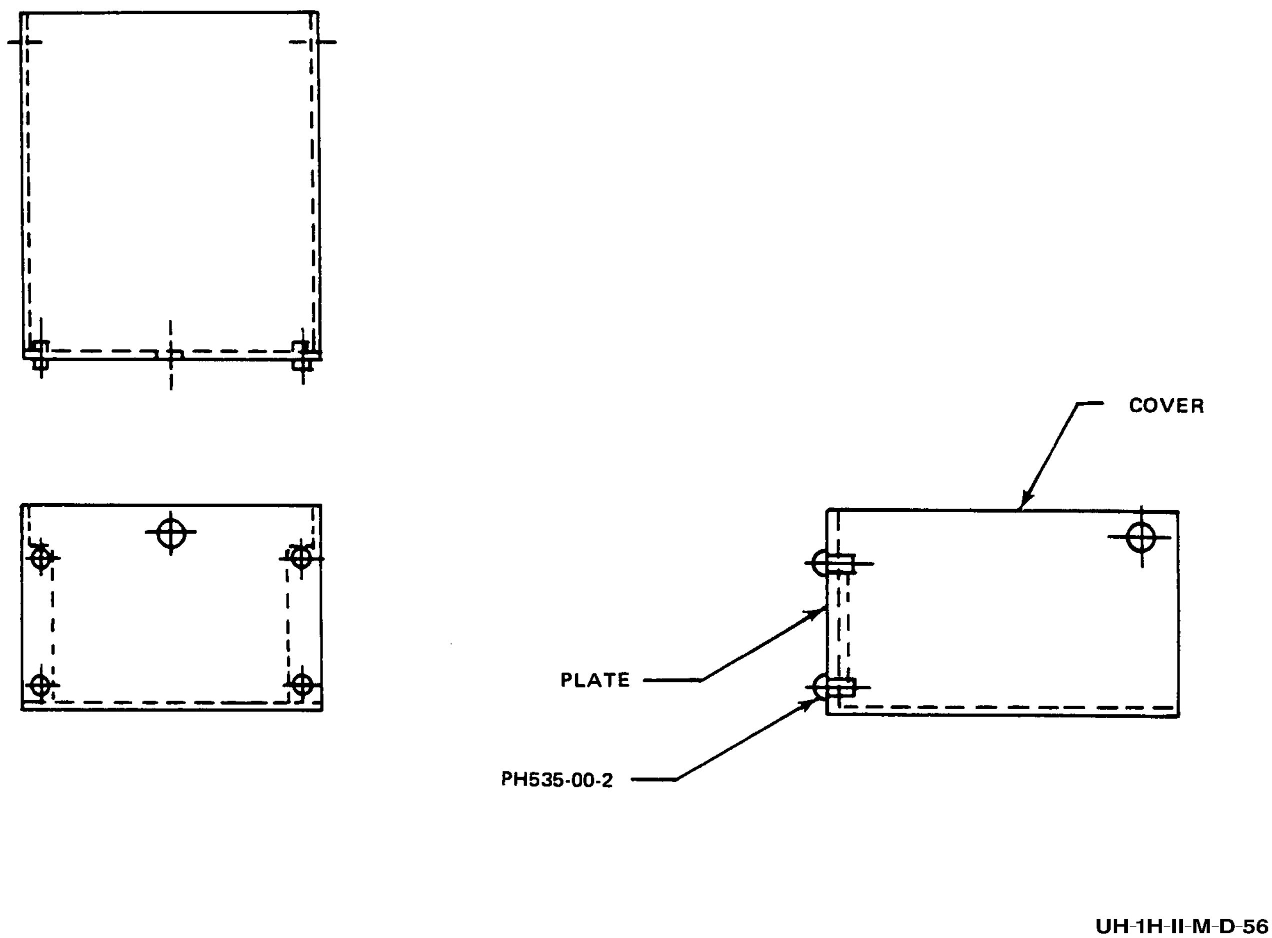
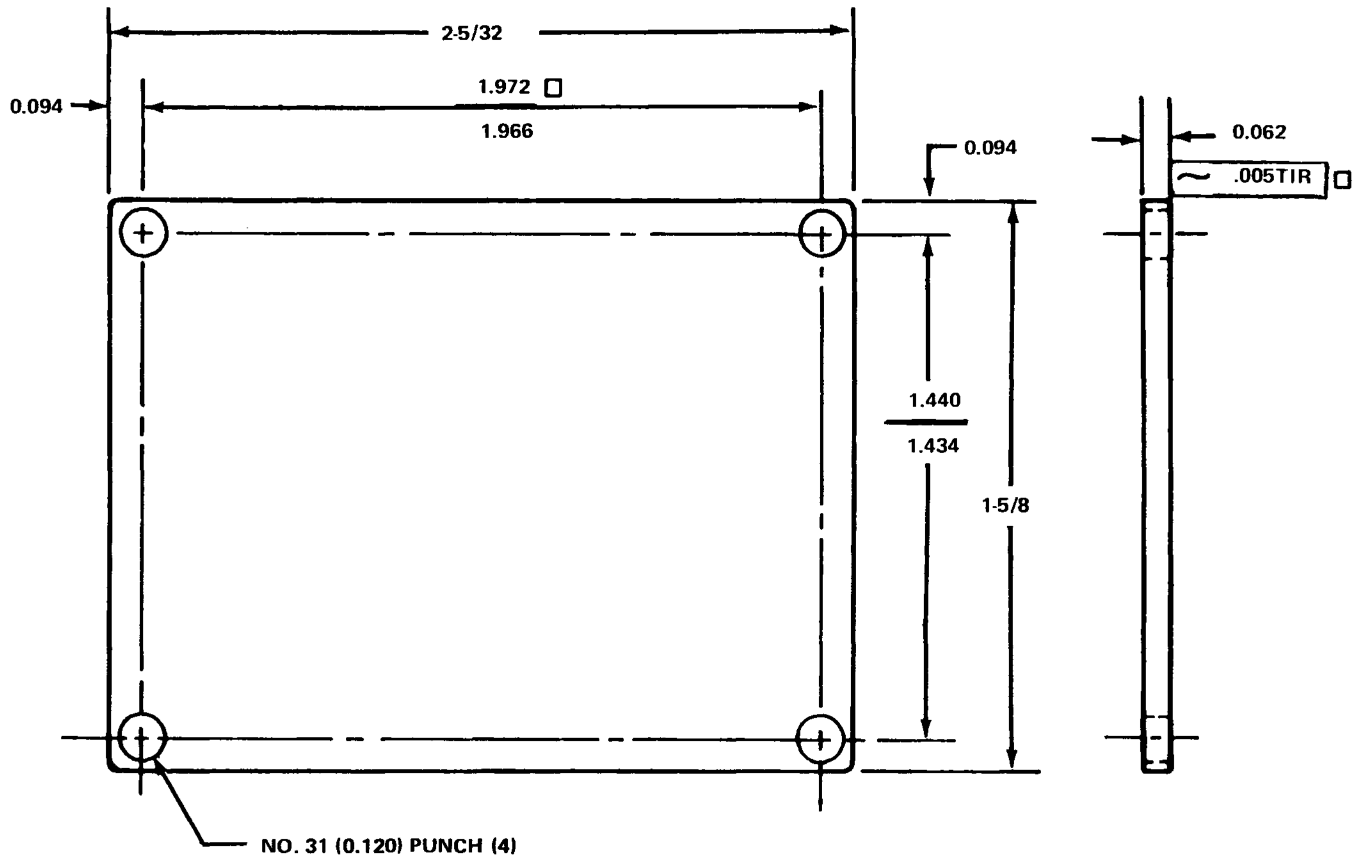


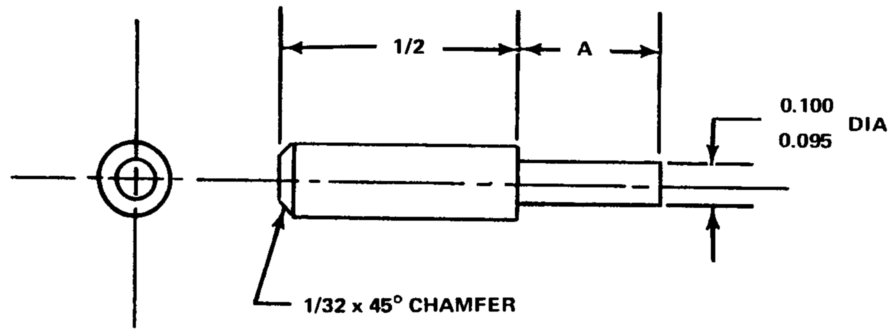
Figure D-56. Part Number B56C21 COVER ASSEMBLY
Fabricate From: NSN 9535-00-167-2280
NSN 5305-00-253-5604
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, 0.040 Inch Thick



NOTES:
1. MUST BE FREE OF BURRS
2. ALODIZE MIL-C-5541 (1)

UH-1H-II-M-D-57

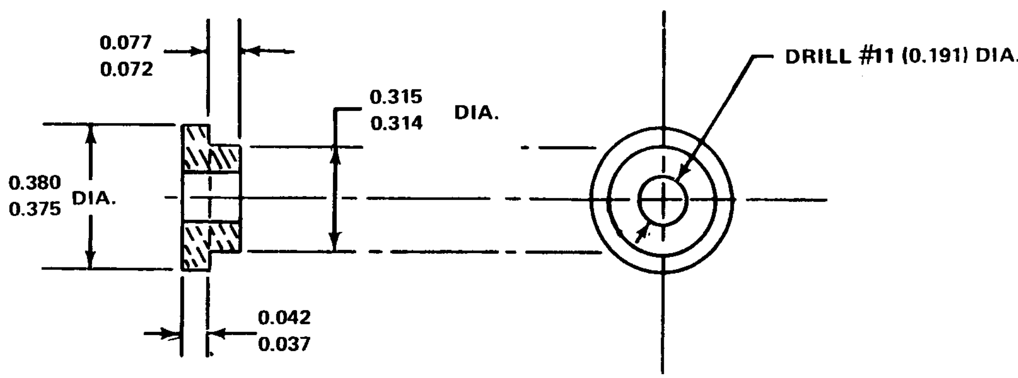
Figure D-57. Part Number NYLC3, COVER PLATE Access
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



PART NO.	A
SP 469-1	5/16
SP 469-2	5/8

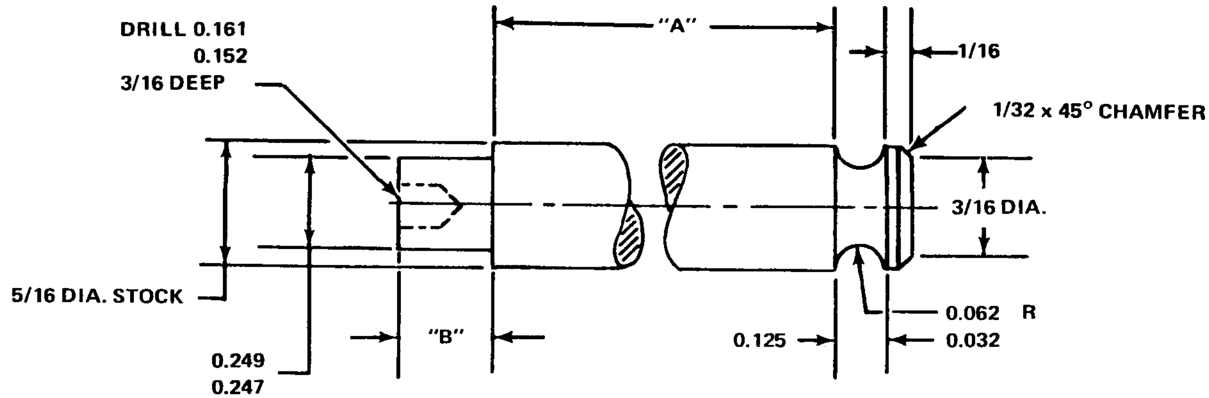
UH-1H-II-M-D-58

Figure D-58. Part Number SP 469-1 POST, Micro Switch
Fabricate From: NSN 9530-00-167-1817
Material: Wire, Nonelectric Nickel Annealed, Federal Specification MIL-N-6710, Cond A, 0.250 Inch Dia.



UH-1H-II-M-D-59

Figure D-59. Part Number SP 516 BUSHING, Solenoid
Fabricate From: NSN 9530-00-167-1818
Material: Metal Rod-Nickel, Cold Finish Annealed, Federal Specification MIL-N-6710, 0.375 Inch Dia.

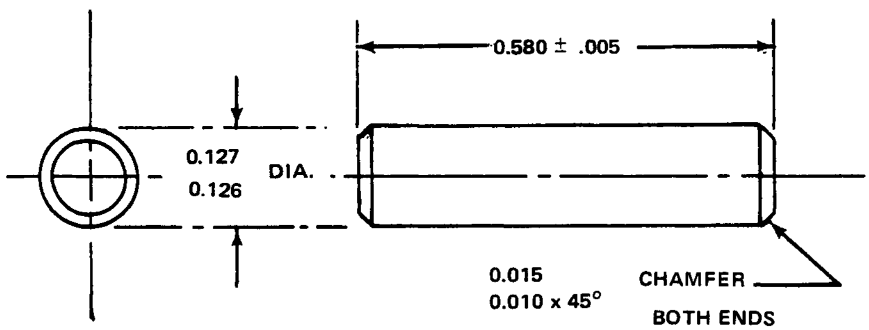


DASH. NO.	DIM "A"	DIM "B"
-2	1-1/32	0.250

NOTES:
1. BREAK ALL SHARP EDGES .005 TO 0.10
2. CAD. PLATE QQ-P-416 TYPE 1 CLASS A

UH-1H-II-M-D-60

Figure D-60. Part Number SP 1152-2 SUPPORT, Spring
Fabricate From: NSN 9510-00-294-9660
Material:



NOTES:
1. HEAT TREAT TO ROCKWELL C-34 TO C-38

UH-1H-II-M-D-61

Figure D-61.	**Part Number**	**SP 1699-1 PIN, Solenoid Shaft**
	Fabricate From:	**NSN 9510-00-294-9666**
	Material:	**Metal Bar, Steel, Cold Finish, Federal Specification MIL-S-6758, 4130 Comp, 0.375 Inch Dia.**

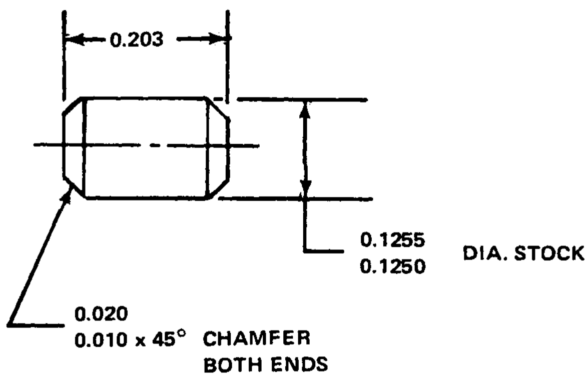
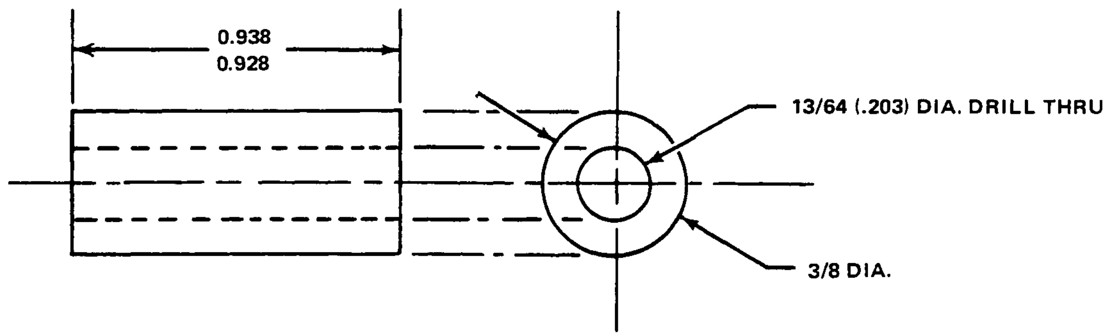


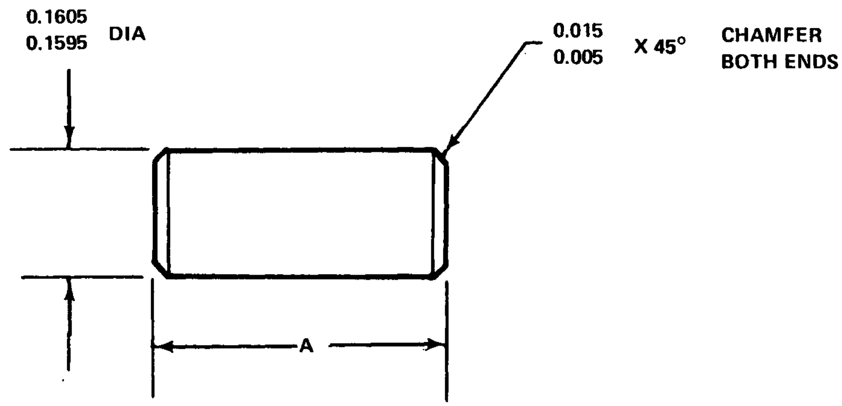
Figure D-62. Part Number SP 1705-1 PIN, Solenoid
Fabricate From: NSN 9510-00-224-1675
Material:



NOTE:
1. BREAK SHARP EDGES

UH-1H-II-M-D-63

Figure D-63. Part Number SP 1706-1 SPACER
Fabricate From: NSN 9530-00-167-2026
Material:

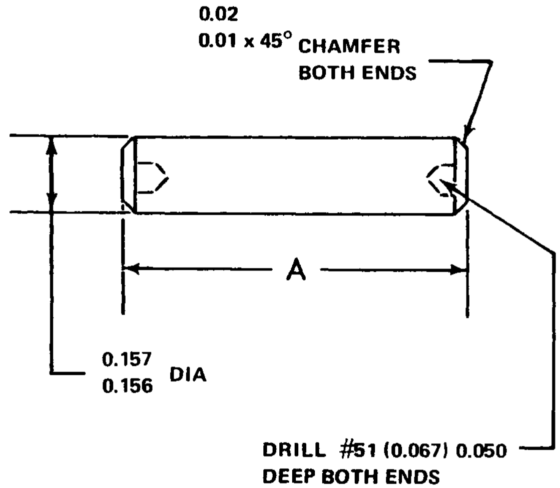


DASH NO.	A DIM
-1	0.359
-2	0.390

PART NO.	NAME	STOCK SIZE	MATT.	SPEC.
SP-1707-1	PIN	3/16 DIA X 3/8	4130	COMM.
SP1707-2	PIN	3/16 DIA X 13/32	4130	COMM.

UH-1H-II-M-D-64

Figure D-64. **Part Number** **SP 1707 AND 2, PIN, Solenoid Linkage**
Fabricate From: **NSN 9510-00-294-9666**
Material: **Metal Bar, Steel, Cold Finish, Federal Specification MIL-S-6758, Comp 4130, 0.375 Inch Dia.**

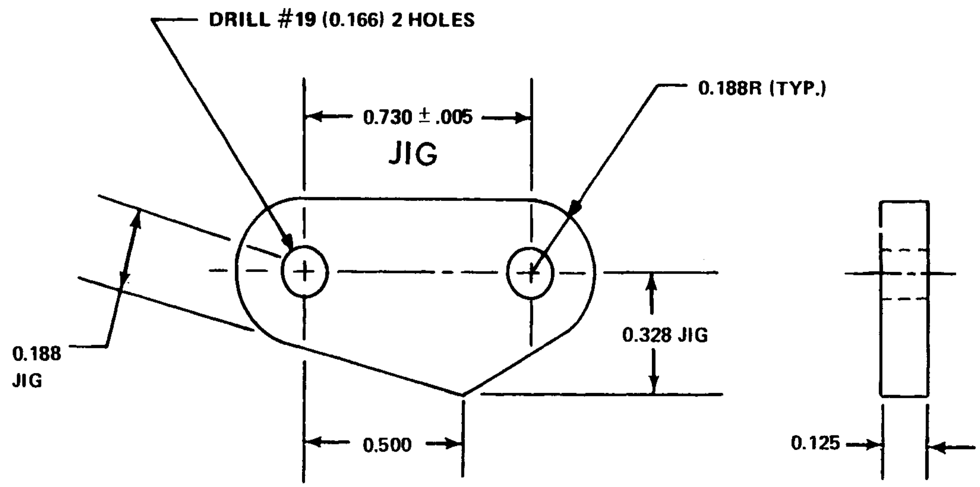


DASH NO.	A DIM.
-2	1.125 1.100

NOTES:
1. DIM'S ARE BEFORE PLATE
2. HEAT TREAT TO ROCKWELL C-25-29
3. CAD. PLATE QQ-P-416 CC. 2 TYPE II

UH-1H-II-M-D-65

Figure D-65. Part Number SP 1709-2 PIN, Shaft & Arm
Fabricate From: NSN 9510-00-294-9666
Material: Metal Bar, Steel, Cold Finish, Federal Specification MIL-S-6758, Comp 4130, 0.375 Inch Dia.

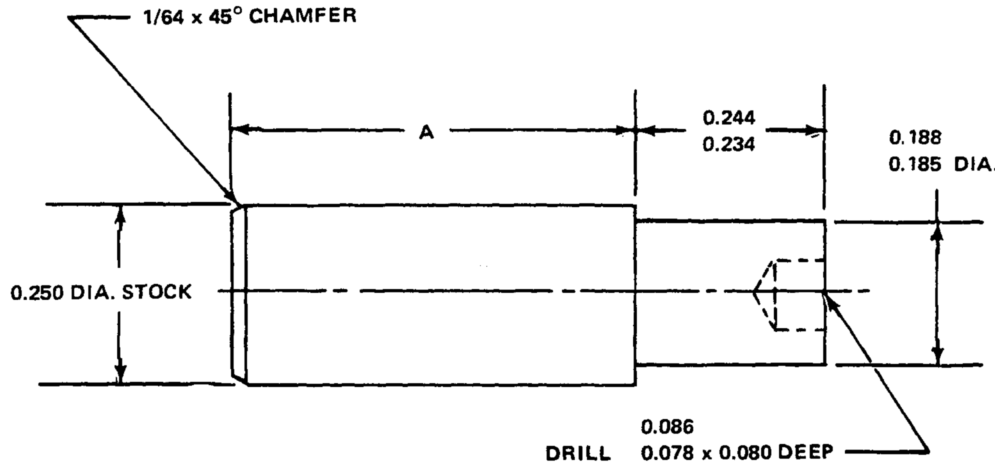


NOTES:

1. BREAK ALL SHARP EDGES 0.005 TO 0.010
2. HEAT TREAT MATERIAL TO ROCKWELL C-25 TO 29
3. CAD. PLATE QQ-P-416 CLASS 2 TYPE II

UH-1H-II-M-D-66

Figure D-66. **Part Number** **SP 1710-1 LINK SOLENOID**
Fabricate From: **NSN 9510-00-184-8811**
Material: **Metal Strip Steel, Hot Rolled, Federal Specification MIL-S-18729, Comp 4130, 0.125 Inch Thick**

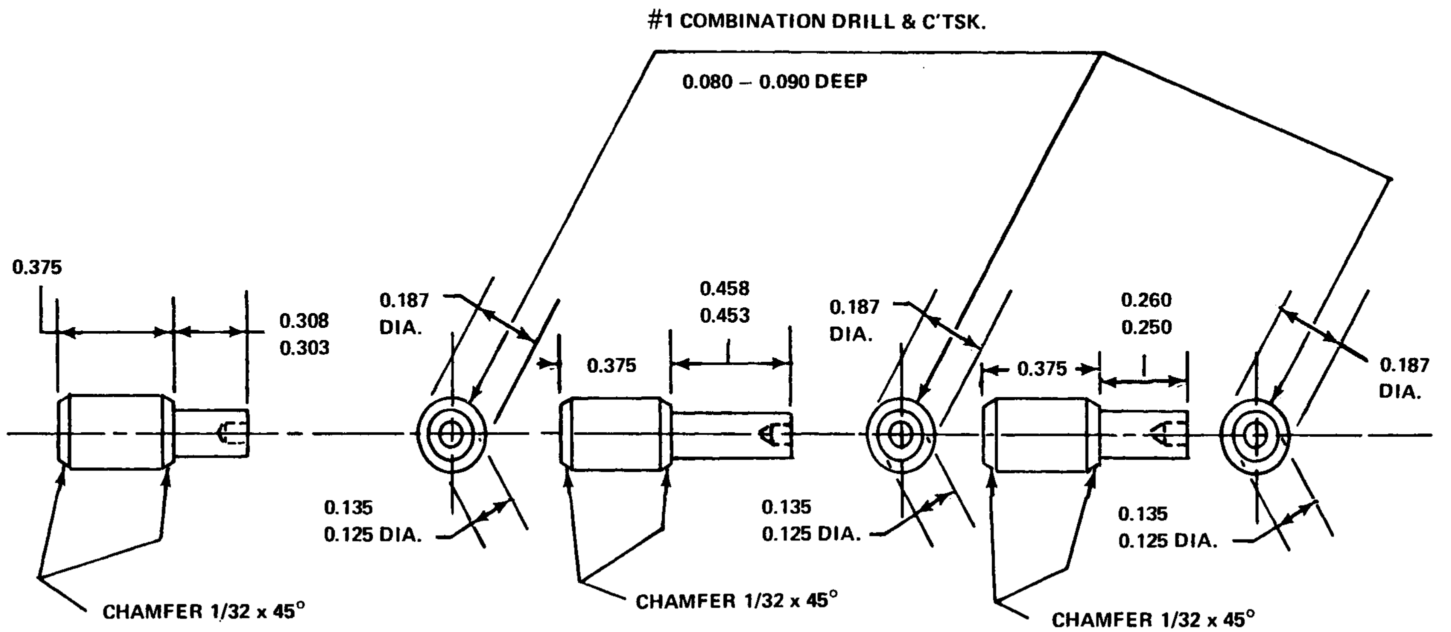


DASH NO.	A DIM.
-1	0.469

NOTE:
1. BREAK SHARP EDGES 0.005 TO 0.010

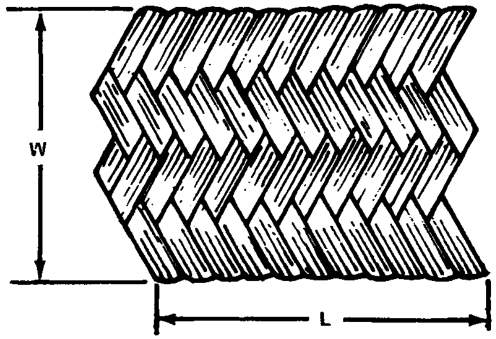
UH-1H-II-M-D-67

Figure D-67. Part Number SP 1715-1 PIN, Stop
Fabricate From: NSN 9510-00-618-8926
Material:



UH-1H-II-M-D-68

Figure D-68.	**Part Number**	**SP 3184-4 DOWEL PIN**
		SP 3184-5
		SP 3184-6
	Fabricate From: Material:	**NSN 9510-00-596-2016**



ENGINEERING INFORMATION								
DASH NO.	4	7	8	11	13	24	32	50
SIZE DESIGNATION APPROX. INSIDE DIA.	1/16	7/64	1/8	11/64	13/64	3/8	1/2	25/32
NUMBER OF ENDS	48	96	120	168	312	384	528	864
SIZE OF INDIVIDUAL WIRES (A.W.G.)	36	36	36	36	36	36	36	36

NOTES: 1. BRAID MUST CONFORM TO SPEC. QQ-B-575

CODE: FIRST DASH NUMBER INDICATES NOMINAL I.D. OF BRAID IN 1/64 IN. INCREMENTS
SECOND DASH NUMBER INDICATES LENGTH IN 1/2 IN. INCREMENTS

EXAMPLE: 20-036-11-10= FLAT, NOMINAL SIZE 11/64 I.D. 5 INCHES LONG

MATERIAL: COPPER WIRE

FINISH: TIN PLATE

UH-1H-II-M-D-69

Figure D-69. Part Number 20-036-8-24, BRAID, Wire
Fabricate From: NSN 6145-00-628-7753
Material:

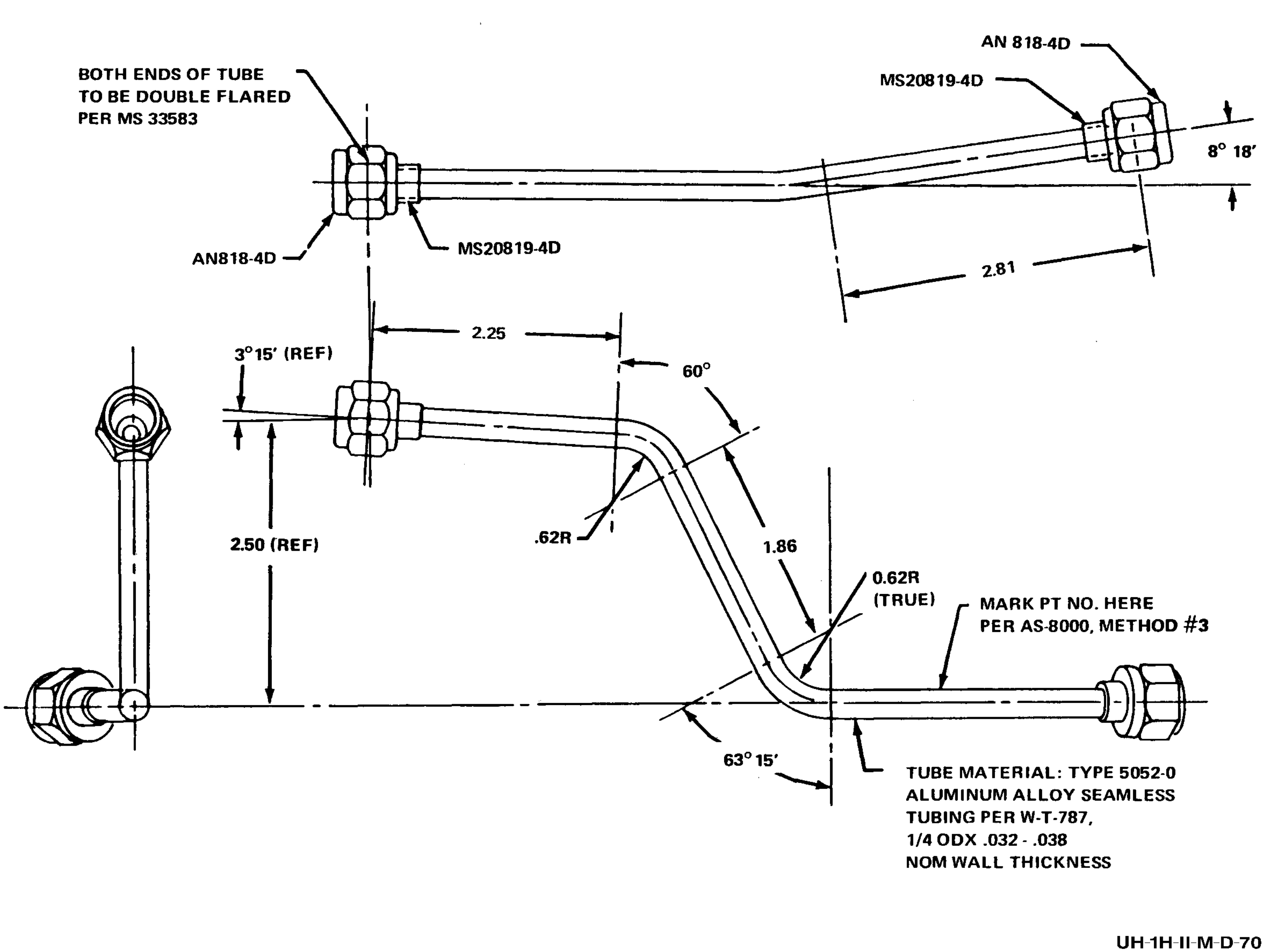
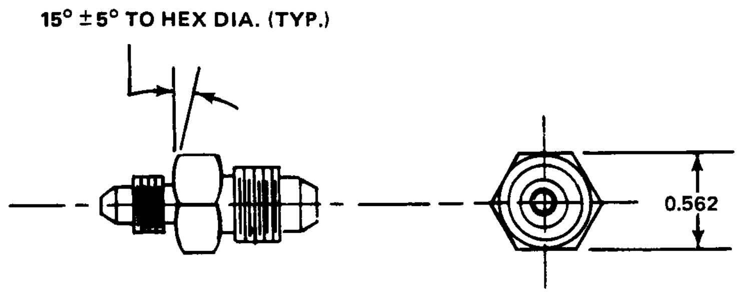


Figure D-70.	Part Number	99C29, TUBE, Valve to Valve
	Fabricate From:	NSN 4710-00-278-6398
		NSN 4730-00-287-0289
		NSN 4730-00-302-8641
	Material:	Tube Aluminum Alloy, Federal Specification WW-T-700/4, 1/4 Inch Diameter OD, 0.035 Inch Wall Thickness



BREAK ALL SHARP EDGES AND REMOVE ALL BURRS AND SLIVERS WHICH MIGHT BECOME DISLOGED UNDER USAGE

UH-1H-II-M-D-71

Figure D-71.	Part Number	110-033-1 REDUCER TUBE
	Fabricate From:	NSN 4730-00-838-9974
	Finish:	Hex Surface 25
		Anodize per MIL-A-8625 Or
		Chem Film Per MIL-C-55541
		(Light Blue Dye)
	Material:	

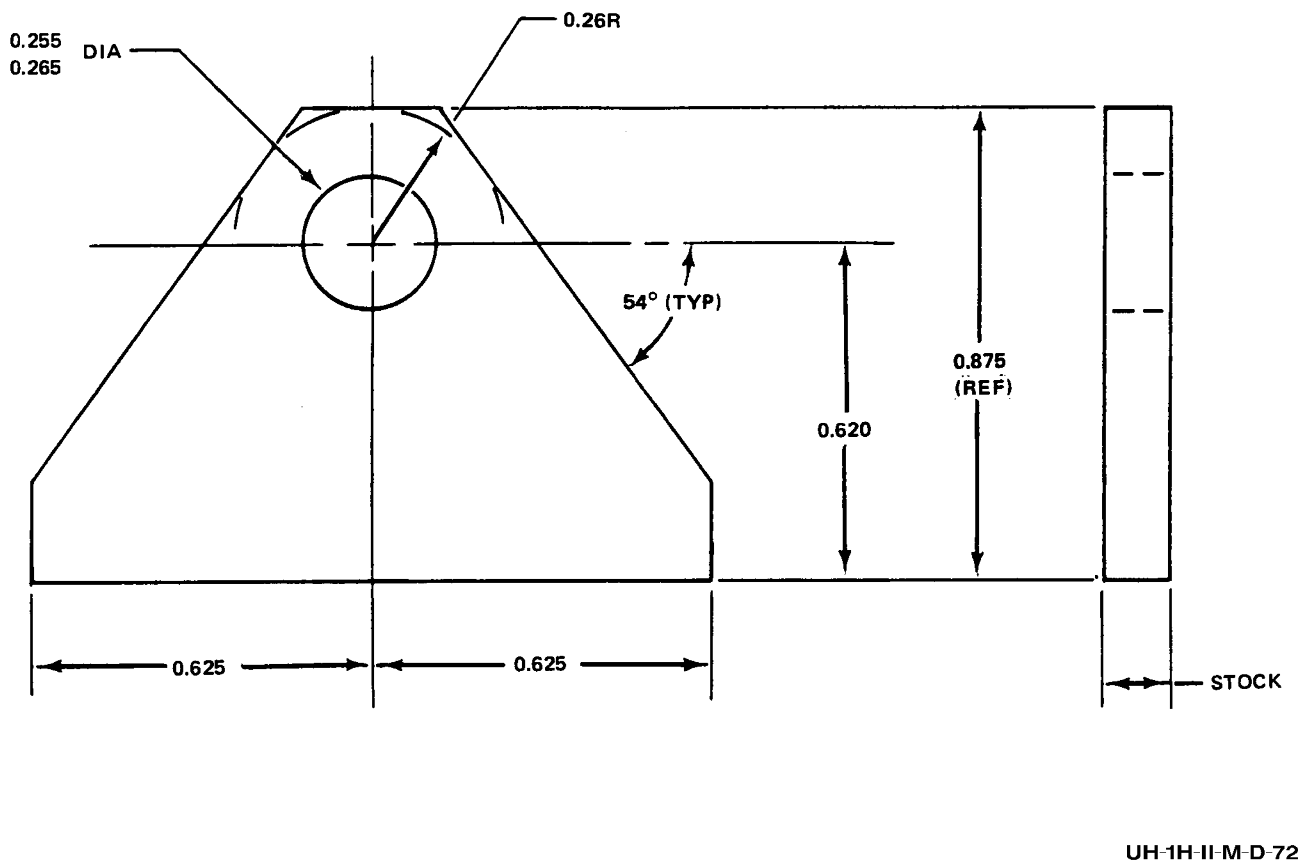


Figure D-72. Part Number 204-011-149-1 CLAMP, Strap Retention Nut Main Rotor
Fabricate From: NSN 9515-00-204-0220
Material: Steel Sheet, Federal Specification MIL-S-18729, 0.125 Inch Thick

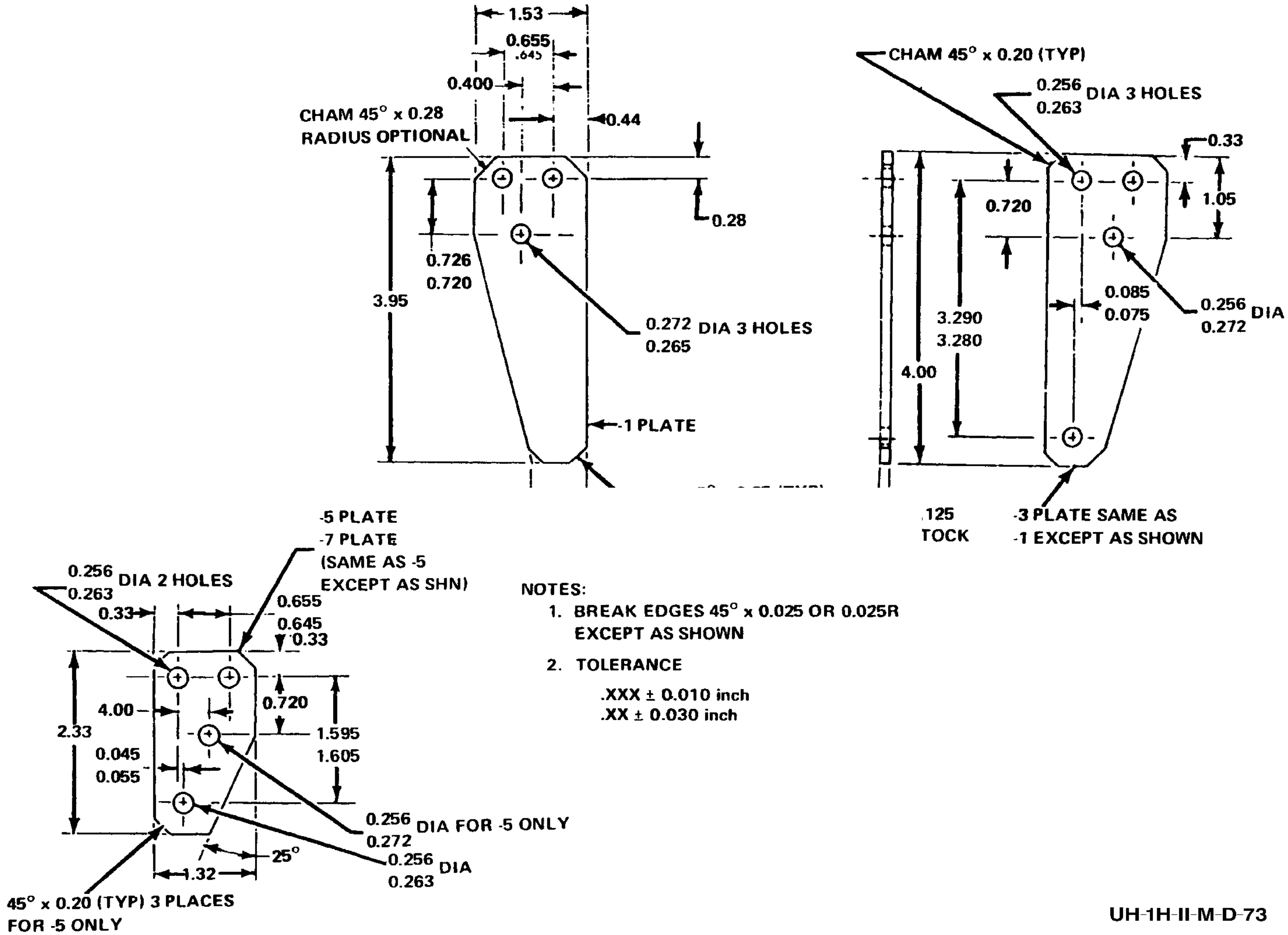
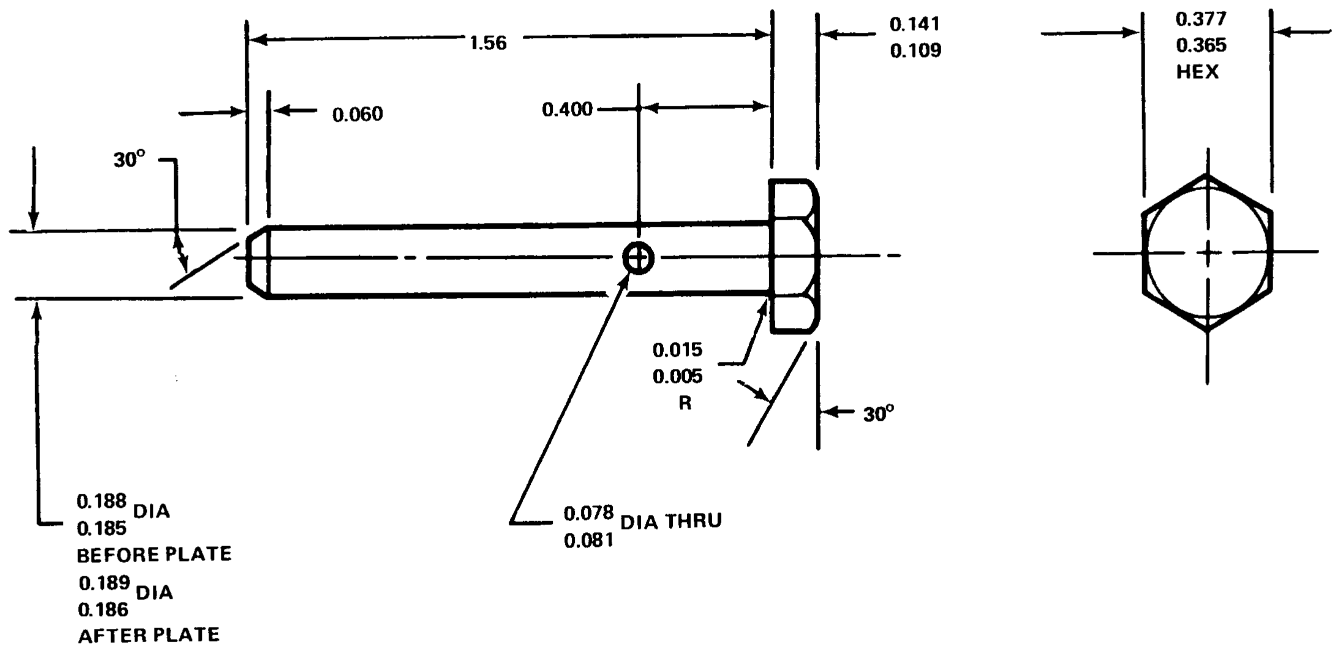


Figure D-73.	**Part Number**	**204-011-458-1 SWASH PLATE**
		204-011-458-3
		204-011-458-5
		204-011-458-7
	Fabricate From:	**NSN 9535-00-232-0418**
	Material:	**2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.125 Inch Thick**



NOTES:

1. MARK PER BPS FW B 4050
2. BREAK EDGES 0.015 X 45° OR 0.015R UNLESS OTHERWISE NOTED
3. ALT. MATL: MAY BE MADE FROM AN3-21A (OR LONGER) BOLT. MARKINGS ON BOLT HEAD TO BE REMOVED

uh-1h-ii-m-D-74

Figure D-74. Part Number 204-012-110-1 BOLT
Fabricate From: NSN 5306-00-182-2010
Material:

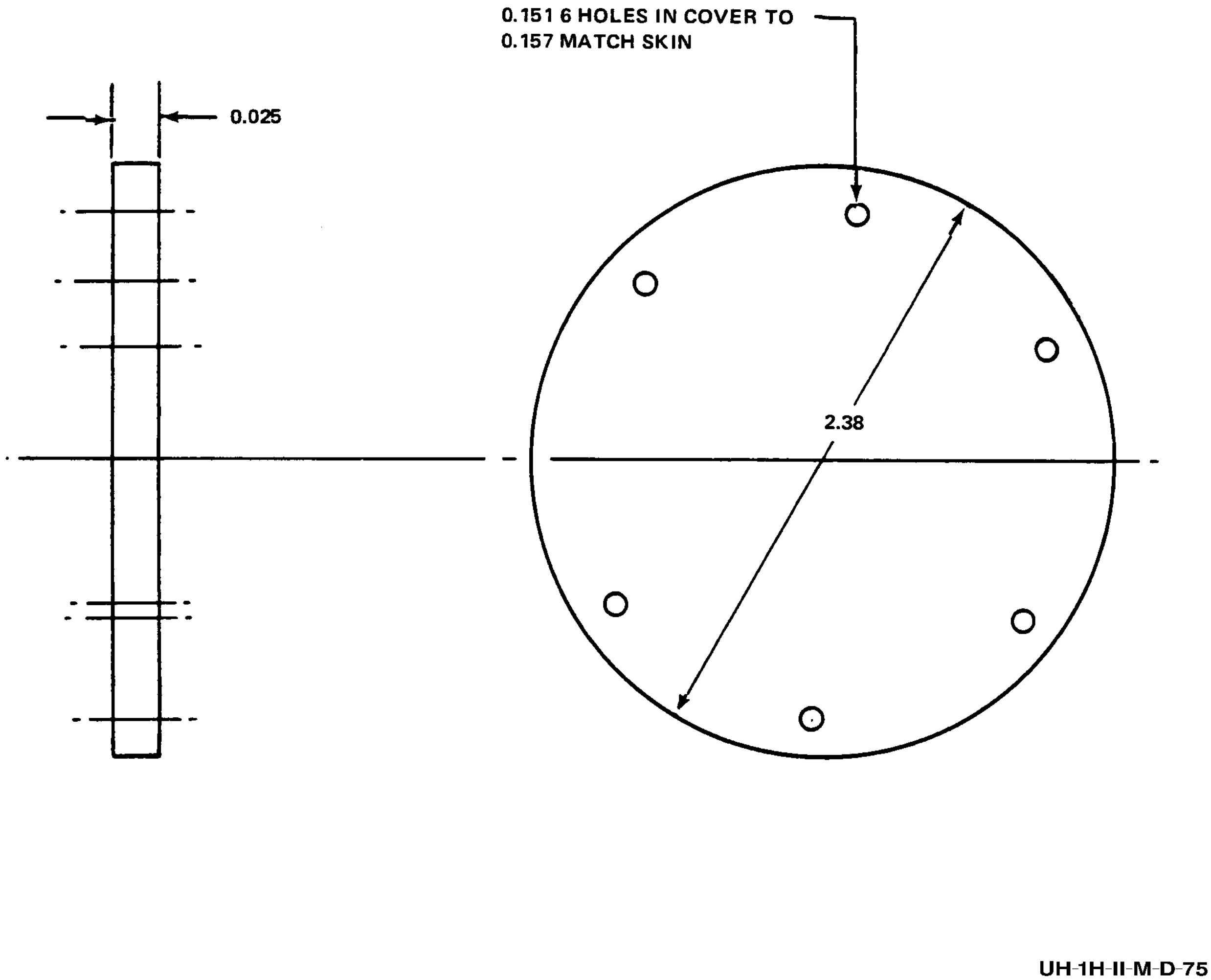
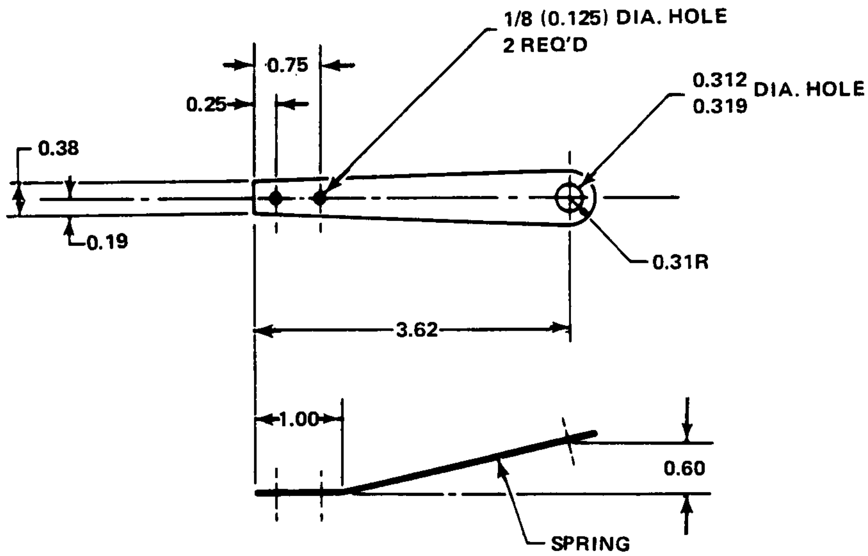


Figure D-75.	**Part Number**	**204-030-800-443 Cover Tail Boom Assembly**
	Fabricate From:	**NSN 9535-00-167-2278**
	Material:	**2024 AL ALY, Federal Specification QQ-A-250/5 0.0250 Inch Thick**



UH-1H-II-M-D-76

Figure D-76.	**Part Number**	**204-030-813-5 SPRING ASSEMBLY**
	Fabricate From:	**NSN 9515-00-684-6944** **NSN 5325-00-141-4002** **NSN 5325-00-721-5503**
	Material:	**Metal Strip Steel, Hot Rolled, Federal Specification MIL-S-7947, 0.020 Inch Thick**

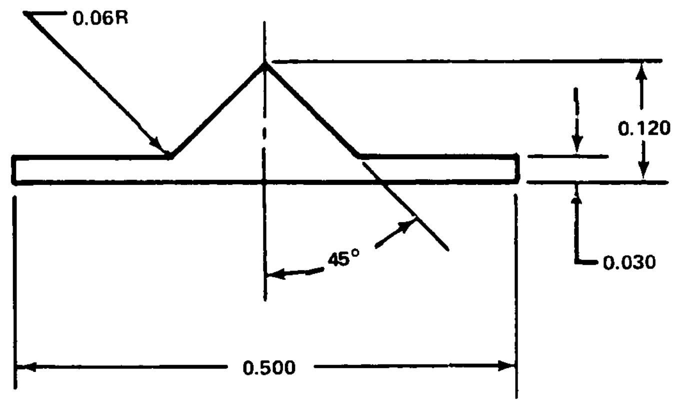
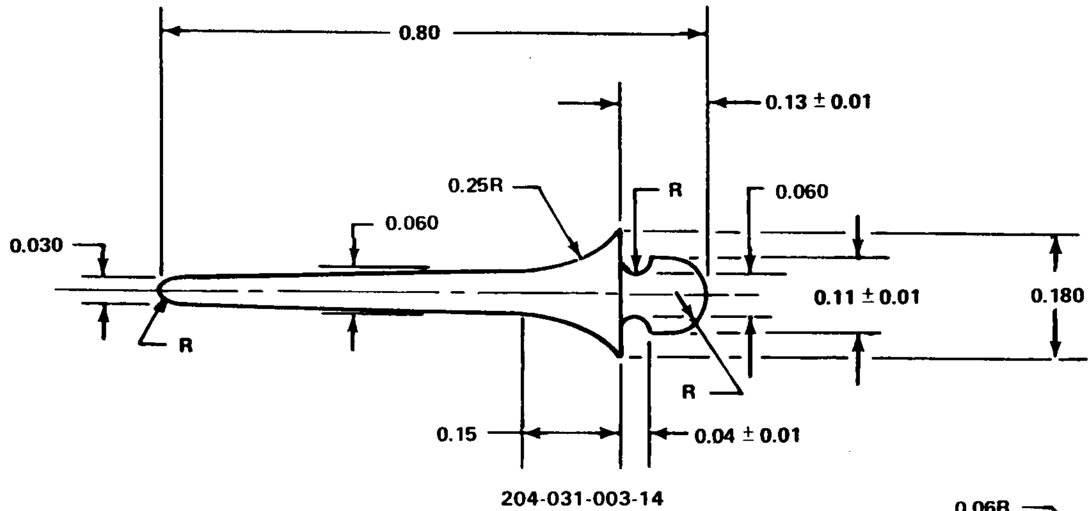
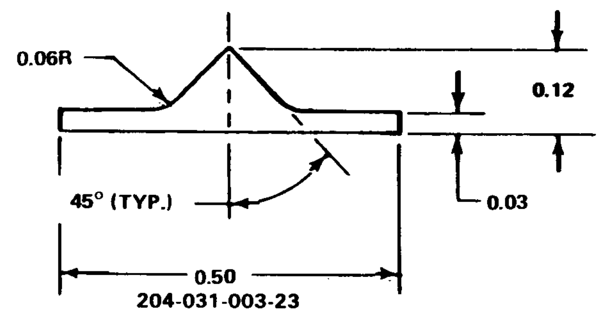


Figure D-77. Part Number 204-031-003-13 Rubber Seal
Fabricate From: BELL STD 110-010-2
Material: LG. Rubber, 105.0 Inches Length

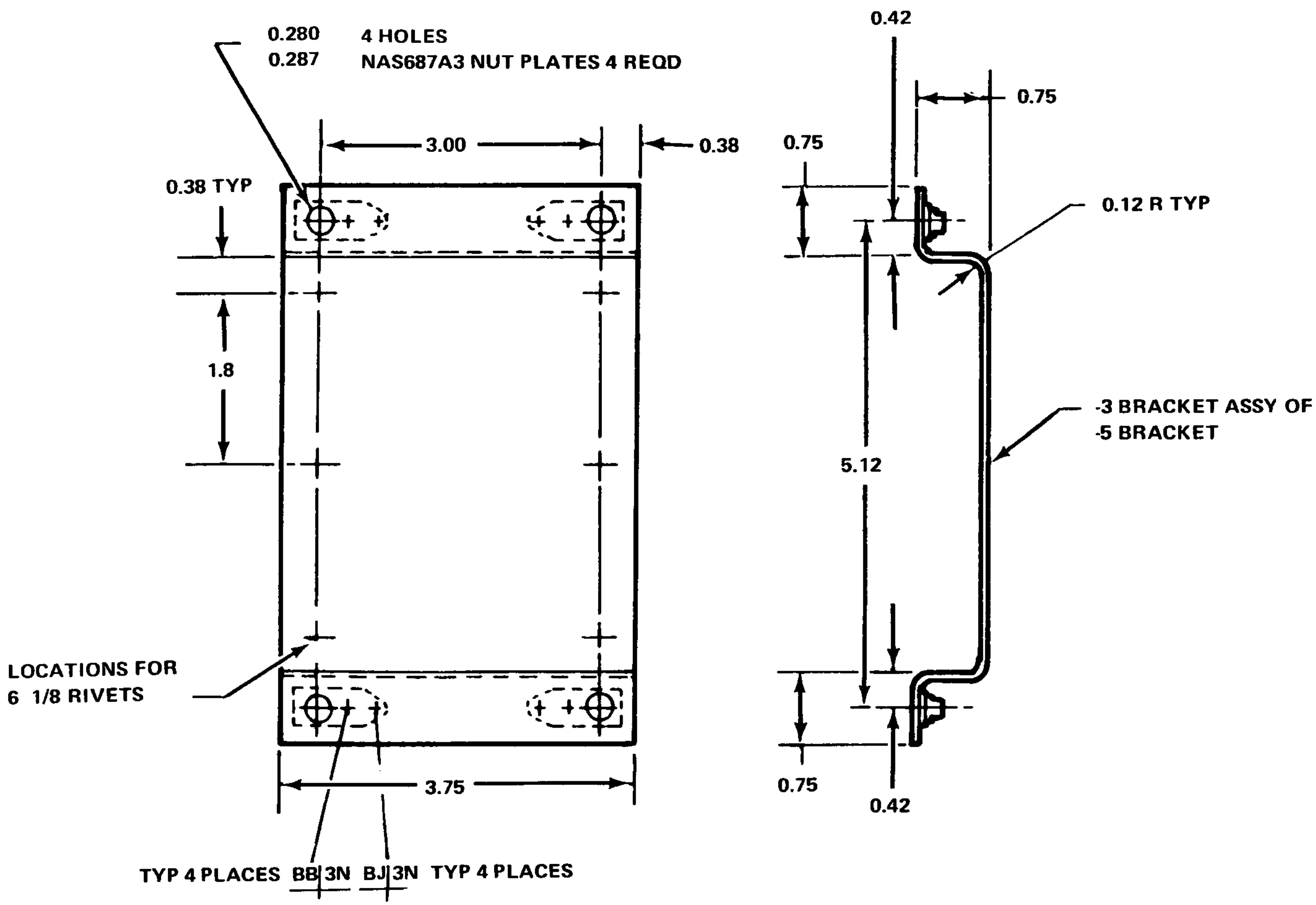




PART NUMBER	NOMENCLATURE	FABRICATE FROM	LENGTH
204-031-003-14	SEAL	BELL STD 110-010-2	105 IN.
204-031-003-23	SEAL	BELL STD 110-032-1	49 IN.

UH-1H-II-M-D-78

Figure D-78.



NOTE:
1. ZINC CHROMATE FINISH

UH-1H-II-M-D-79

Figure D-79. Part Number 204-031-139-3 BRACKET ASSY
Fabricate From: NSN 9530-00-167-2279
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, 0.032 Inch Thick

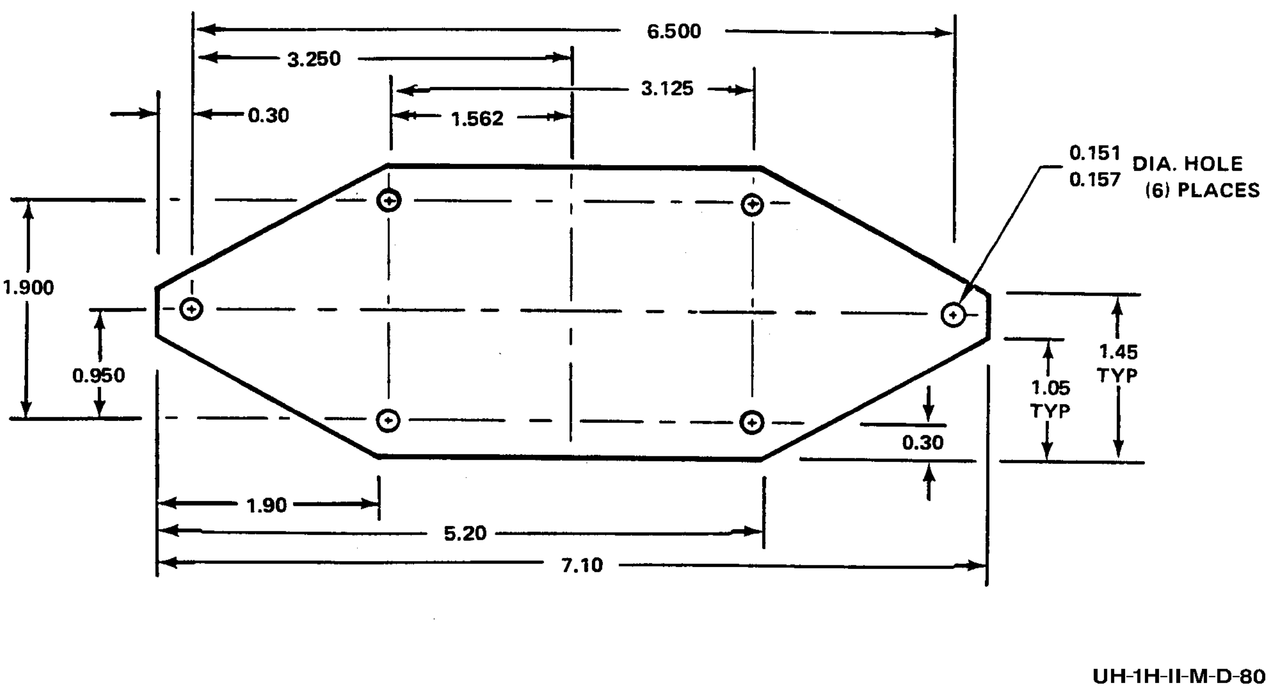
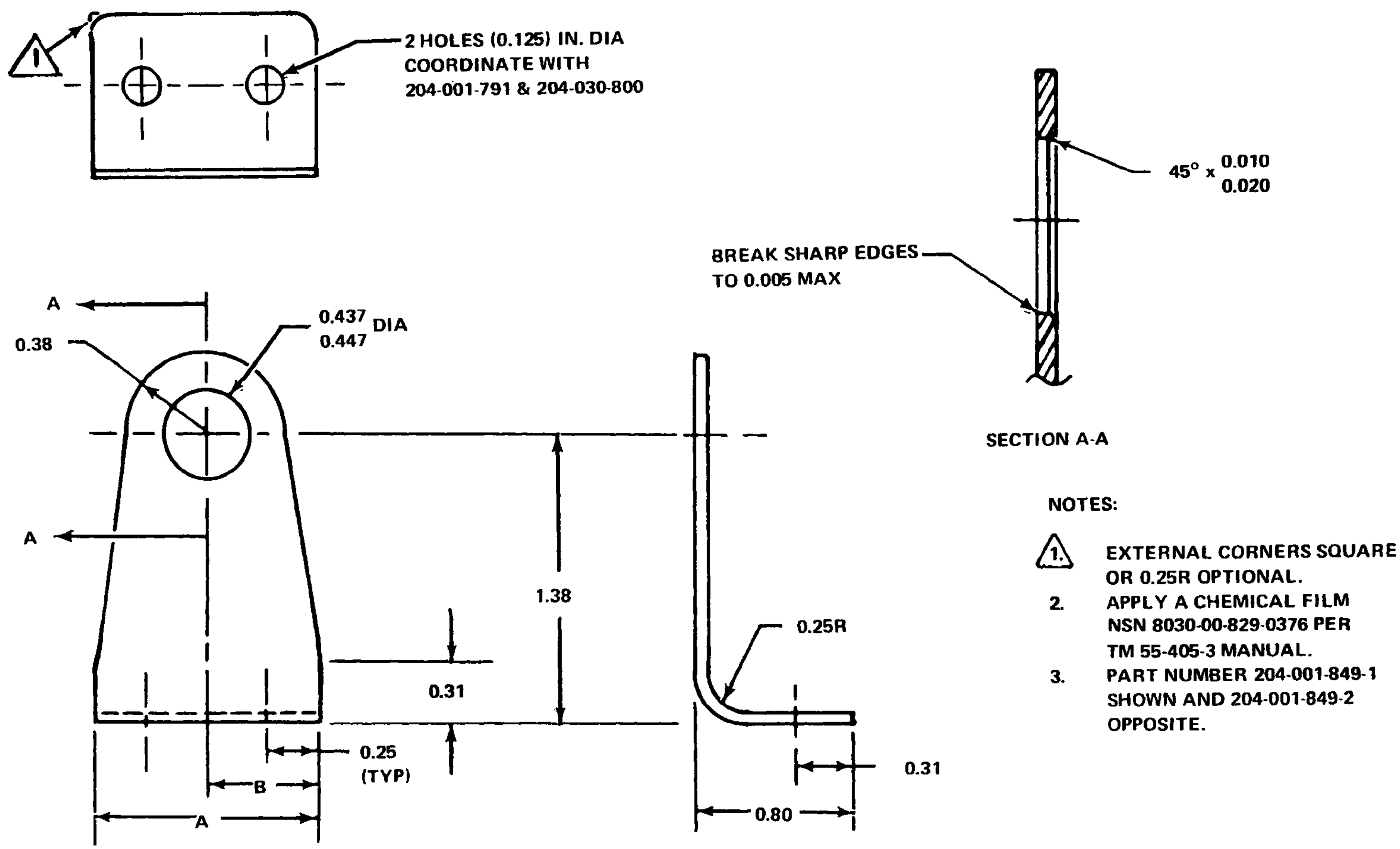


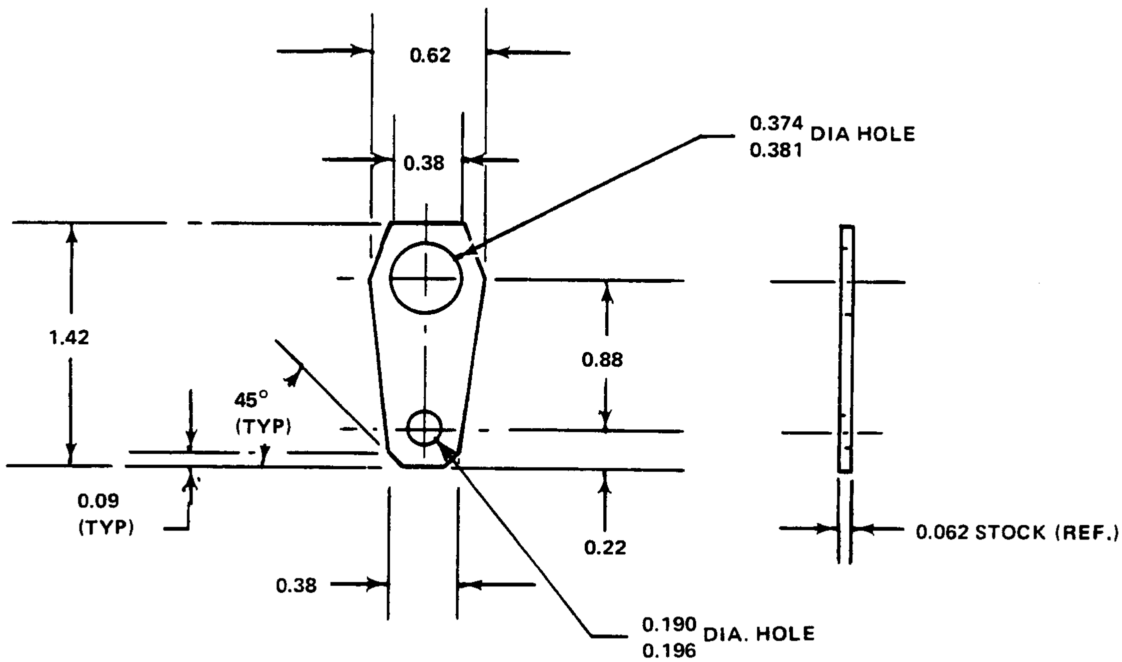
Figure D-80.	**Part Number**	**204-031-251-1 COVER PLATE, Antenna Cutout**
	Fabricate From:	**NSN 9535-00-167-2279**
	Material:	**2024 AL ALY, Federal Specification QQ-A-250/5, 0.032 Inch Thick**



PART NUMBER	DIM A	DIM B
204-001-790-1	1.12	0.56
204-001-849-1	1.31	0.80
204-001-849-2	1.31	0.80

UH-1H-II-M-D-81

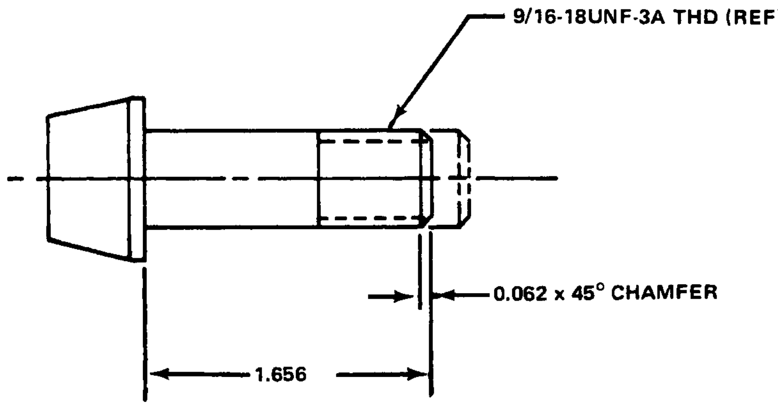
Figure D-81. Part Number 204-001-790-1 SUPPORT
204-001-849-1
204-001-849-2
Fabricate From: NSN 9535-00-232-0376
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, 0.063 Inch Thick



NOTES:
1. BREAK SHARP EDGES 0.015 x 45° CHAMFER
2. CADMIUM PLATE, CLASS III, TYPE II

UH-1H-II-M-D-82

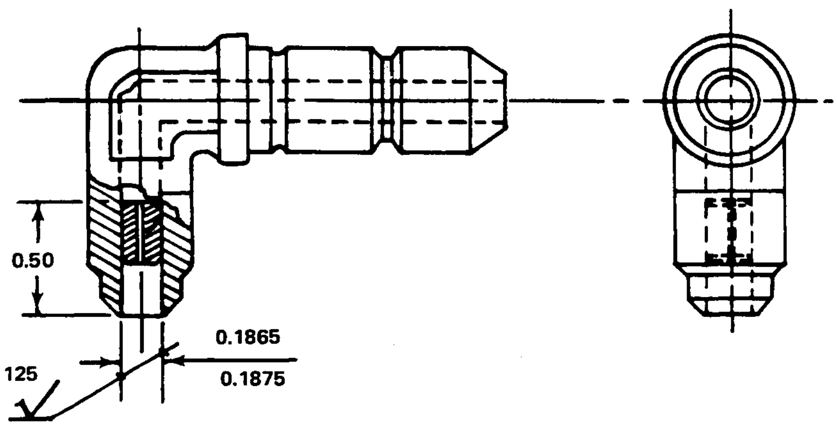
Figure D-82.	**Part Number**	**204-040-732-1 Strap, Support**
	Fabricate From:	**NSN 9515-00-683-9294 on P/N 204-040-732-1 Clip**
	Material:	**Metal Strip Steel, Federal Specification MIL-S-7947, 0.062 Inch Thick**



NOTE:
1. MARK PER BPS FW 4050

UH-1H-II-M-D-83

Figure D-83.	Part Number	204-040-787-1 BOLT, Internal Wrenching
	Fabricate From:	NSN 5306-00-584-5075
	Material:	Bolt, Internal Wrenching, Steel, Make from MS20009H16 Bolt



NOTE: 1. MARK PER BPS-FW-4050

UH-1H-II-M-D-84

Figure D-84. Part Number 204-060-031-15 RESTRICTOR, Fitting
Fabricate From: NSN 9510-00-243-7626 and 4730-00-231-3026
Material:

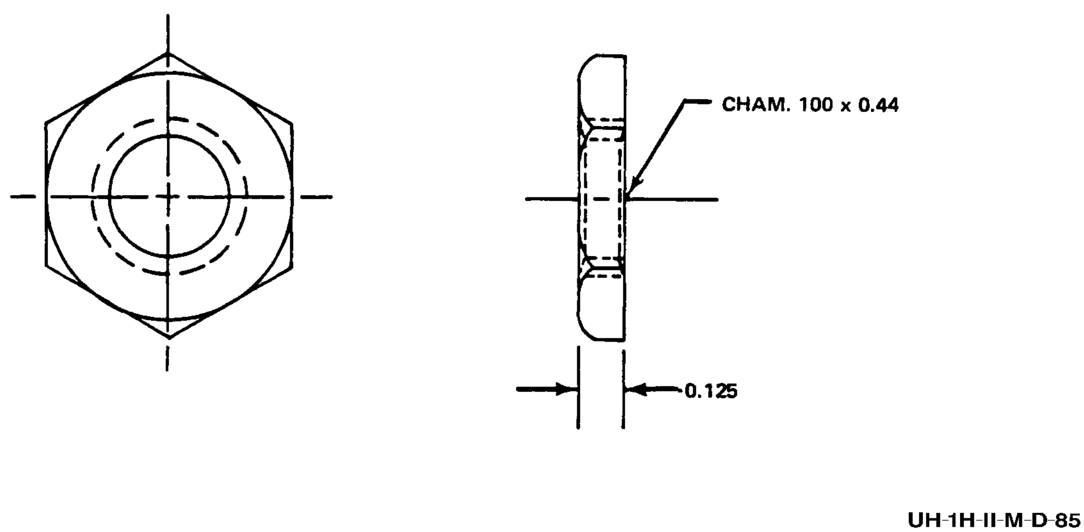


Figure D-85. Part Number 204-060-056-1 NUT, Pressure Switch Support
Fabricate From: NSN 5310-00-656-0094
Material: Steel, Cadmium Plated

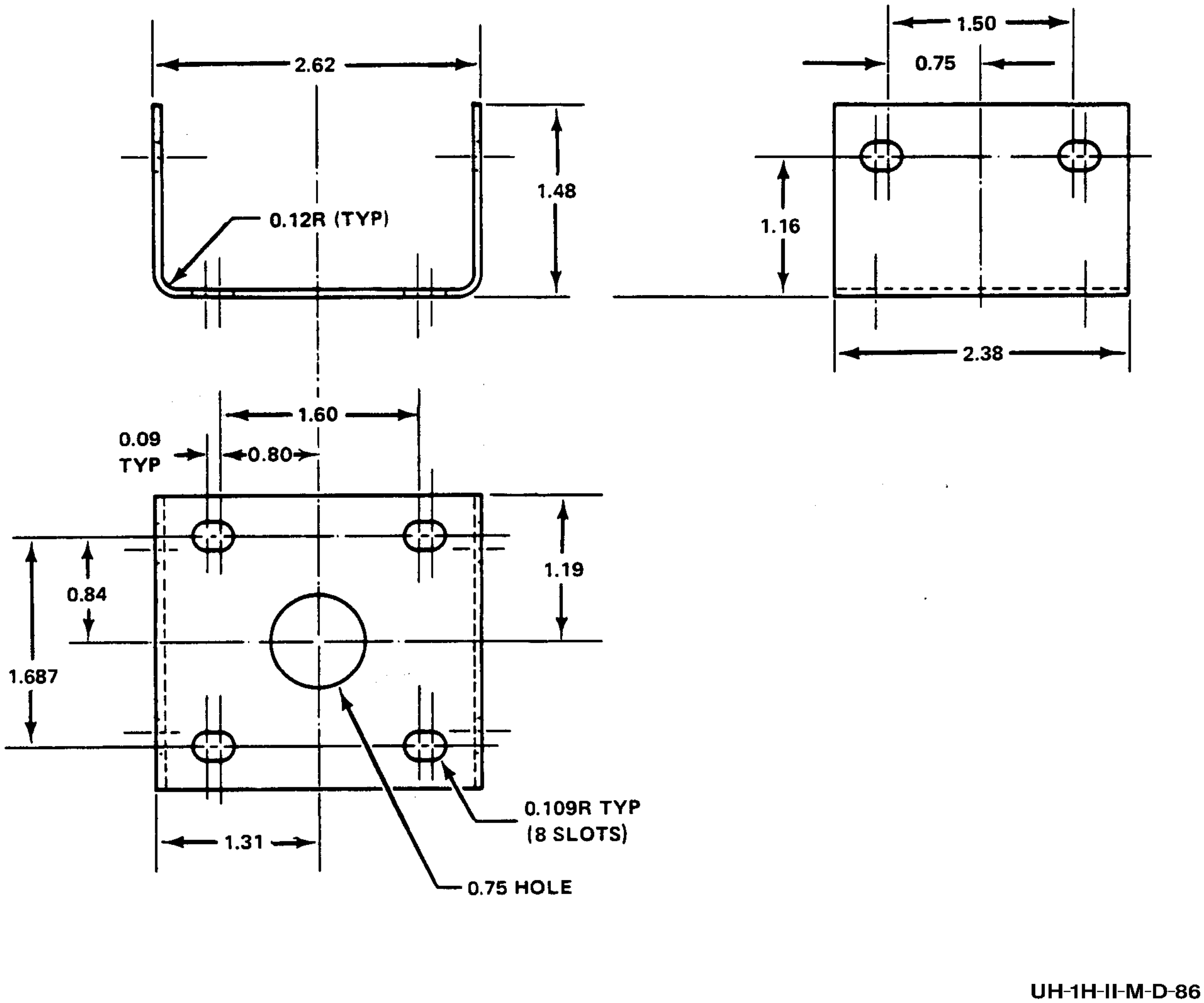
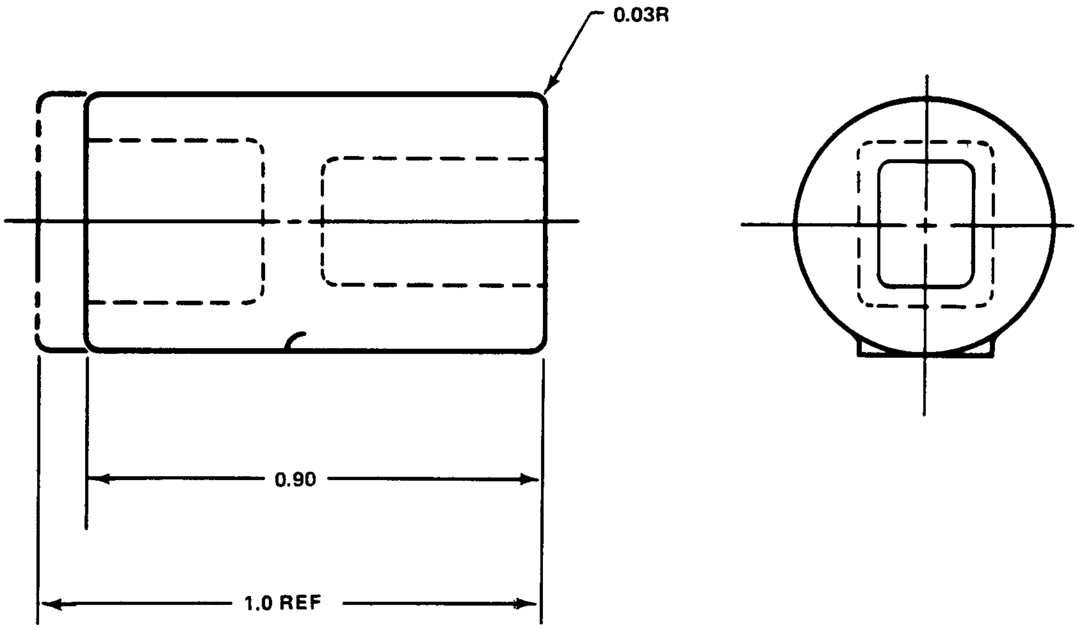


Figure D-86.	Part Number	204-070-175-1 MOUNT, Valve Control, Heating
	Fabricate From:	NSN 9535-00-232-0378
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



UH-1H-II-M-D-87

Figure D-87. Part Number 204-070-185-1 CONNECTOR, Valve Selector, Bleed Air
Fabricate From: NSN 1660-00-736-1007
Material: Adapter, Aluminum Alloy Casting

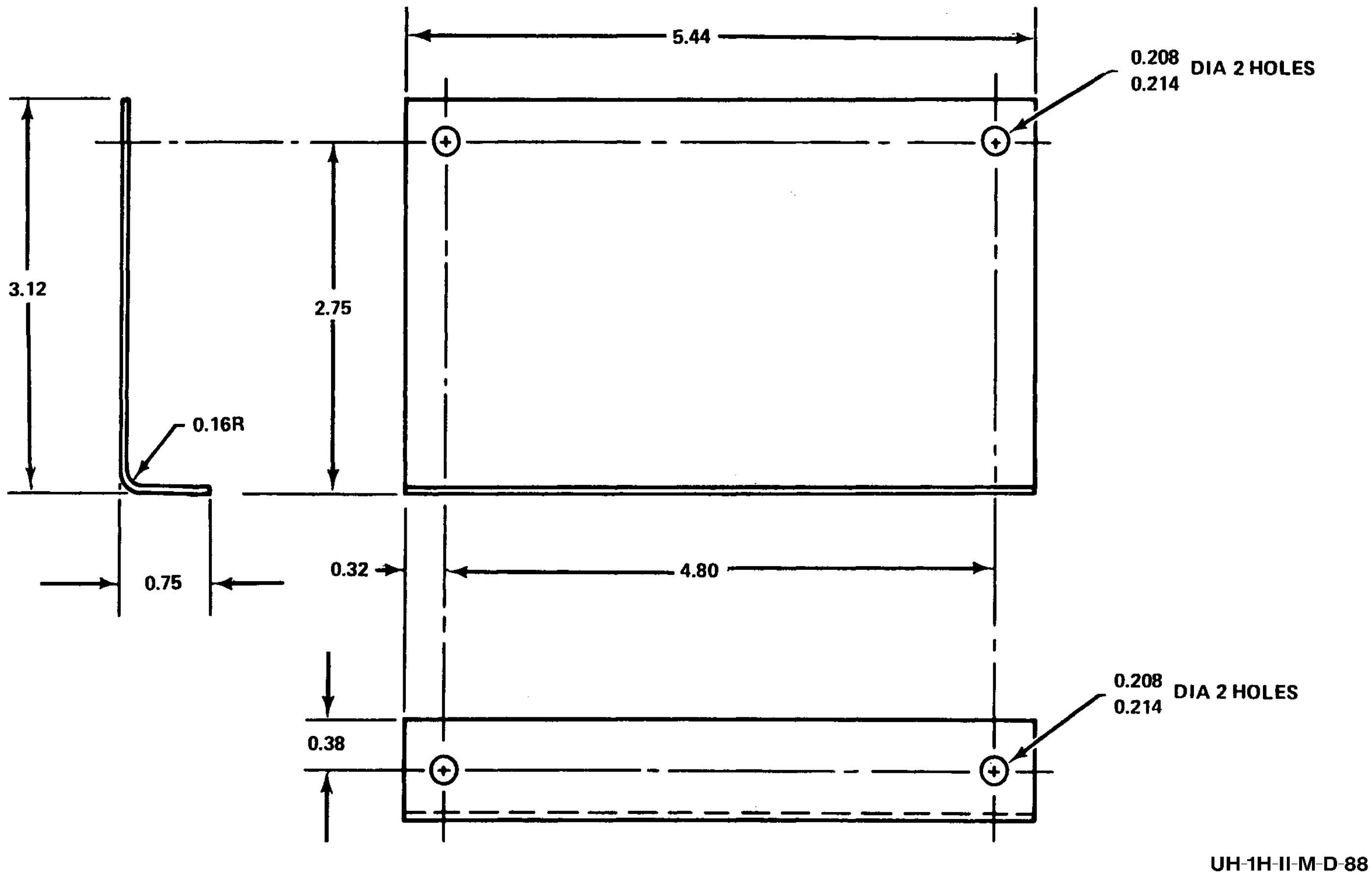
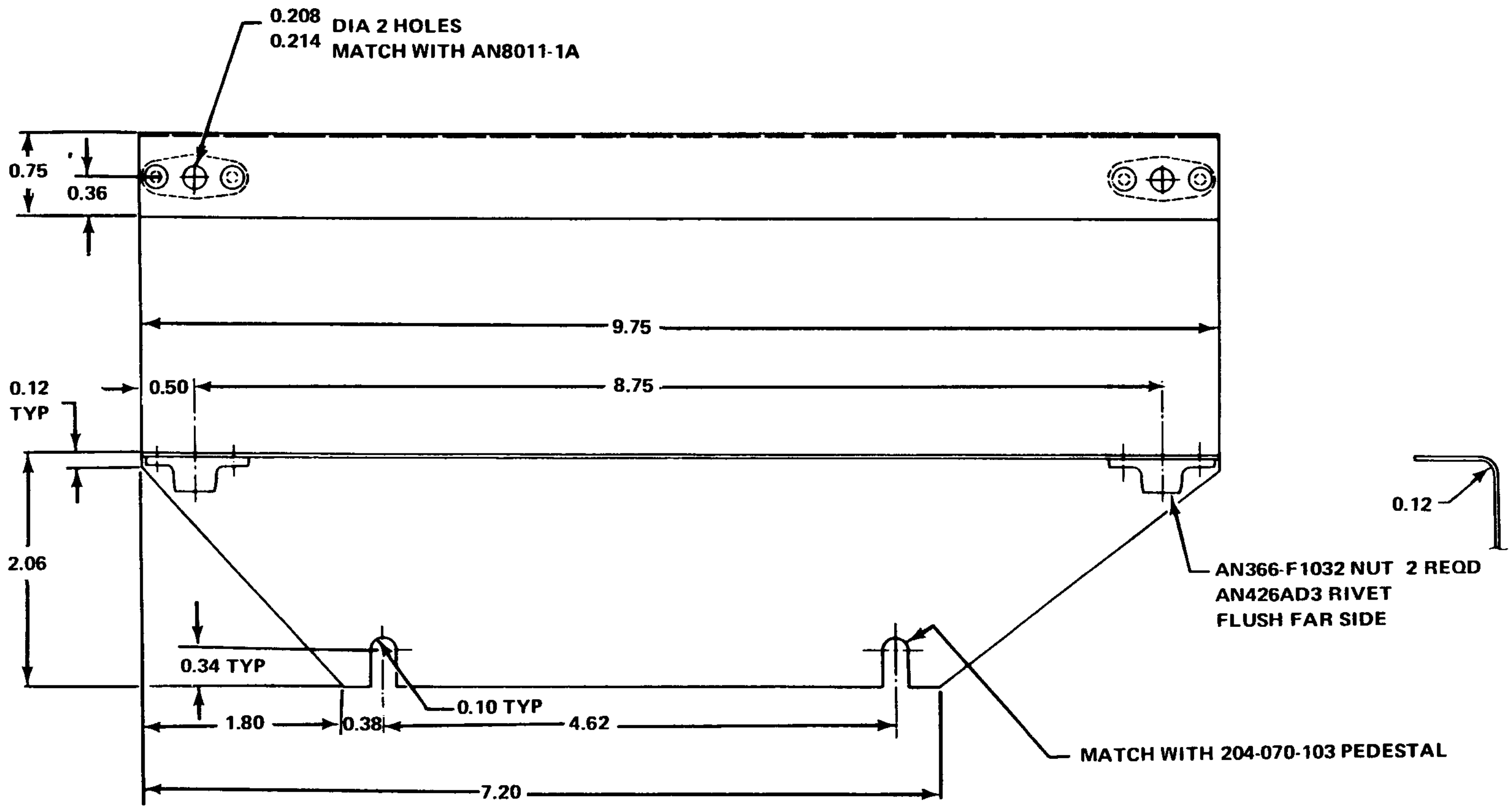


Figure D-88. Part Number 204-070-230-1 BRACKET, Valve, Heating and Bleed Air
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick



PART NUMBER	NAME	FABRICATE FROM:
204-070-255-3	BRACKET	NSN 9535-00-167-2279
NAS697A3	NUT	NSN 5310-00-275-4364
MS20426AD3	RIVET	NSN 5320-00-117-6938

UH-1H-II-M-D-89

Figure D-89. Part Number 204-070-255-1 & 2 BRACKET, Map & Data Case

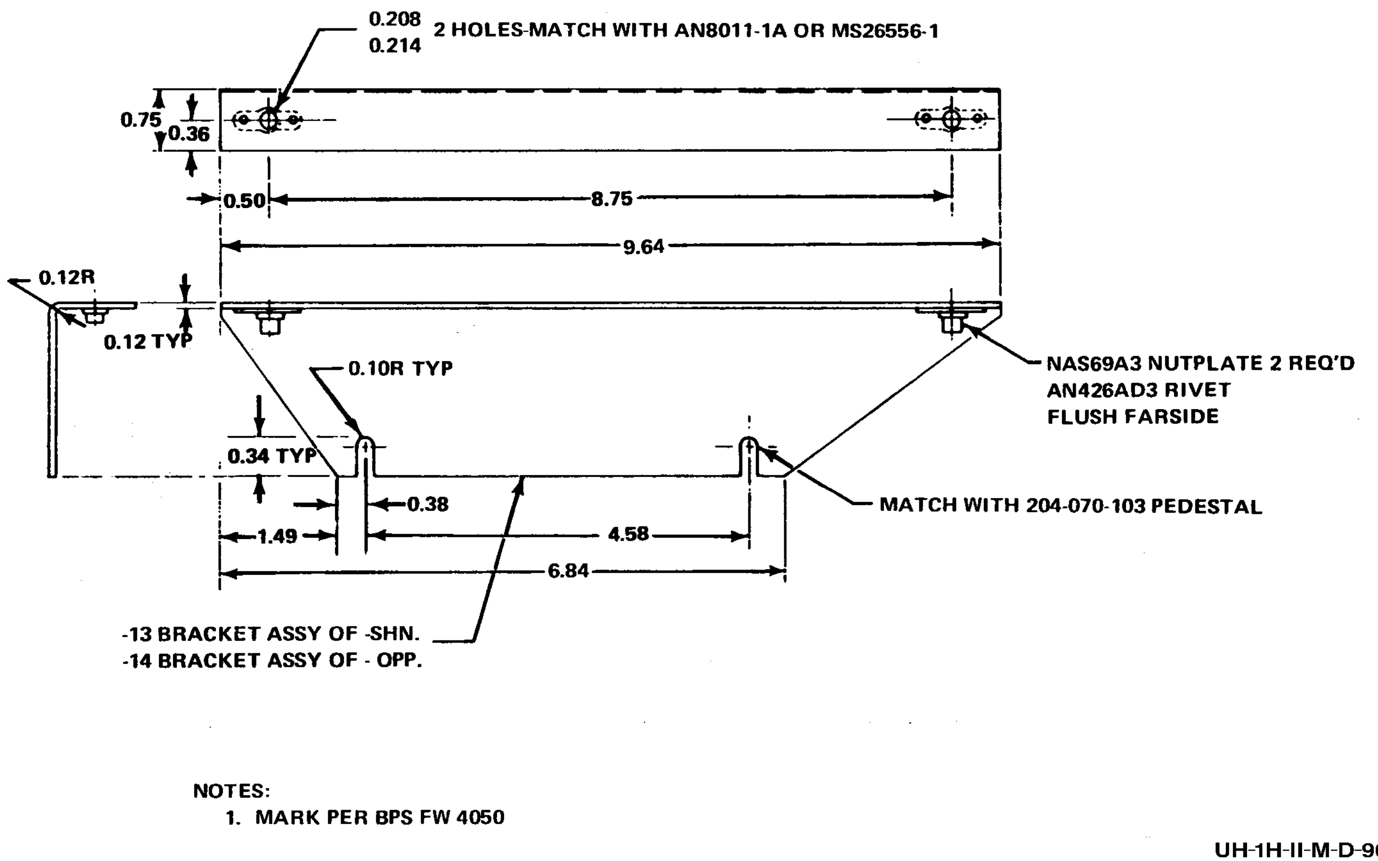
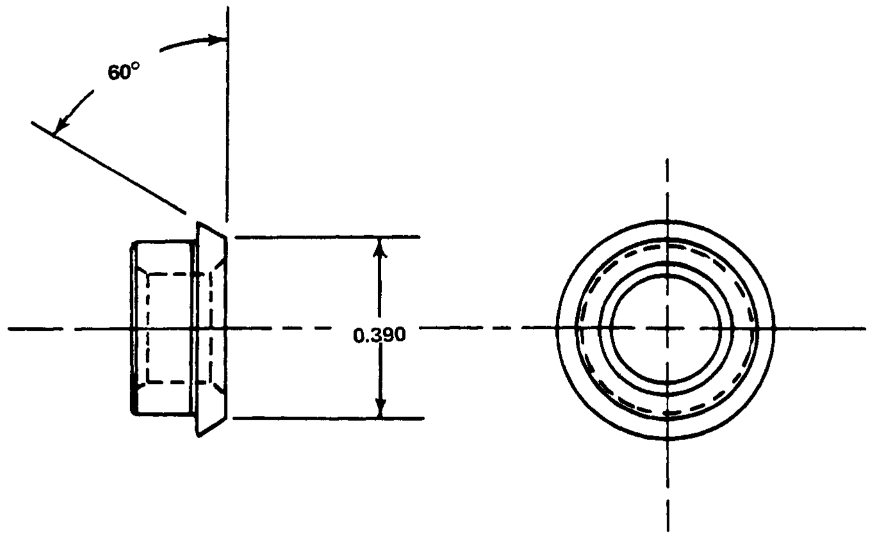


Figure D-90.	**Part Number**	**204-070-255-13 BRACKET ASSEMBLY**
		204-070-255-14
	Fabricate From:	**NSN 9535-00-167-2279**
		NSN 5310-00-728-7716
	Material:	**2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.32 Inch Thick Nut-Self Locking (MS2106923)**



NOTES:
1. MODIFY NSN 3120-00-625-0056 AS SHOWN
2. BREAK EDGES 0.015 x 45° OR 0.025R

UH-1H-II-M-D-91

Figure D-91. Part Number 204-010-794-1 BUSHING
Fabricate From: NSN 3120-00-625-0056
Material:

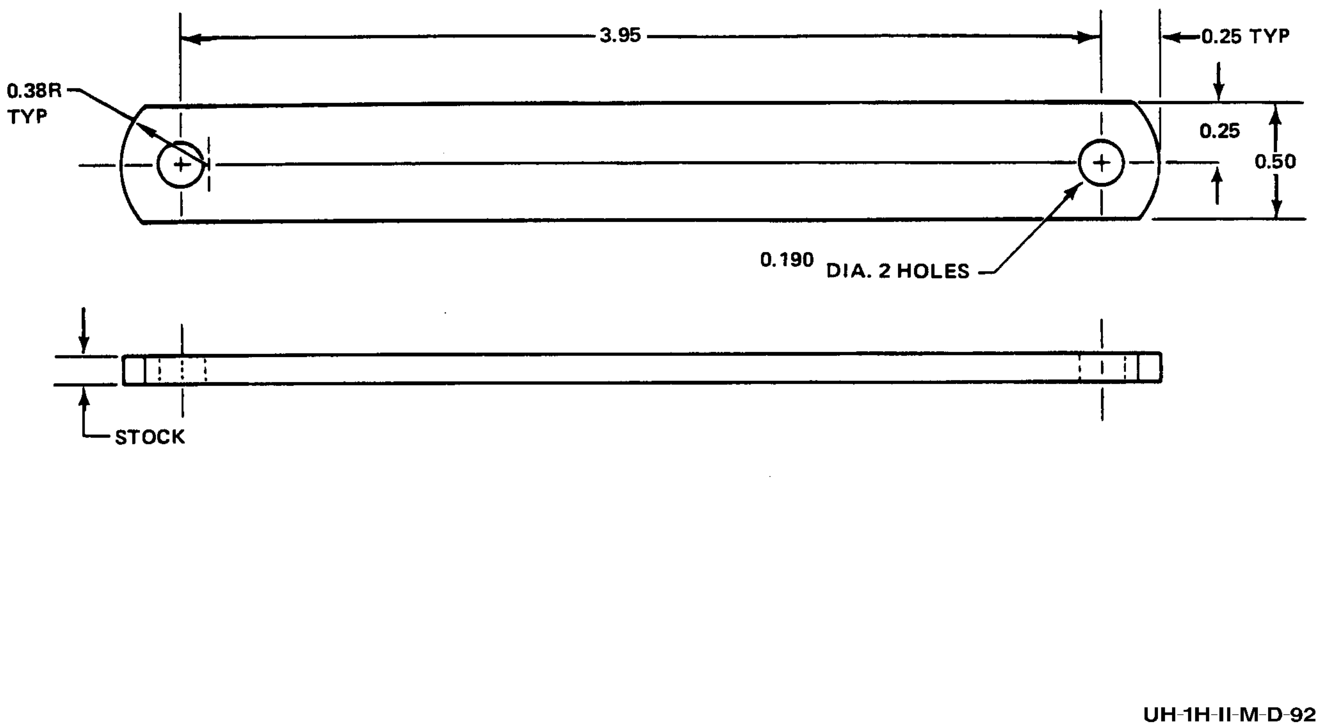
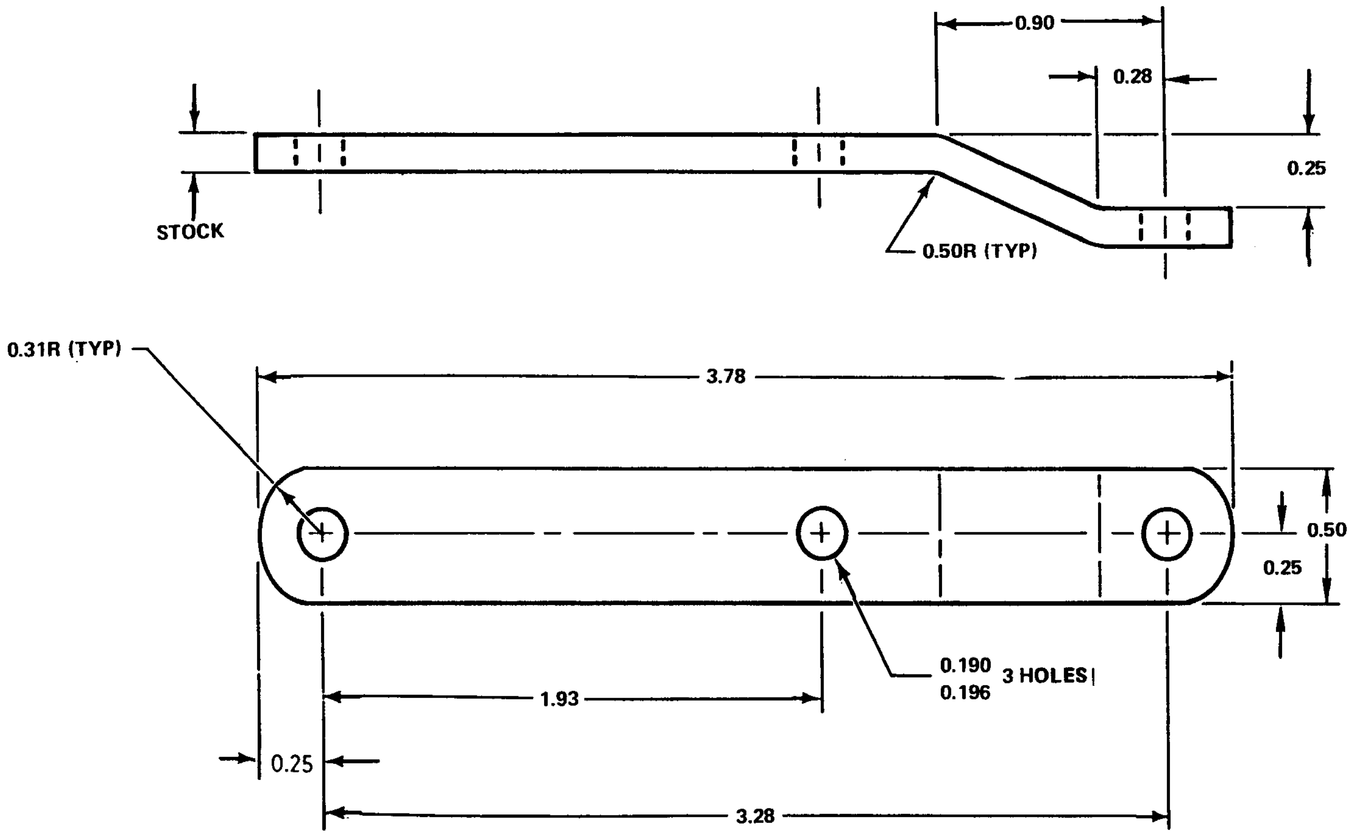
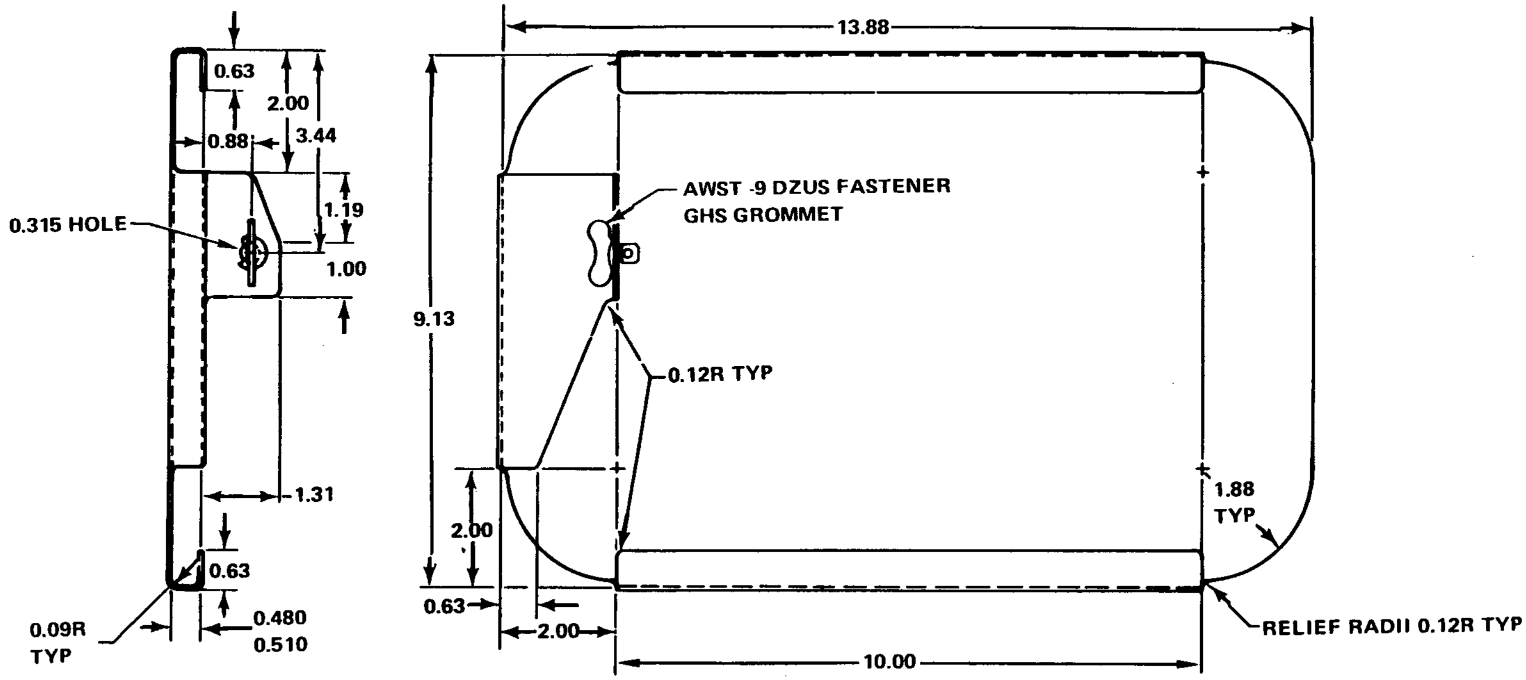


Figure D-92. Part Number 204-070-274-1 LINK Control to Bellcrank, Defrost
Fabricate From: NSN 9535-00-232-0418
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.125 Inch Thick



UH-1H-II-M-D-93

Figure D-93. **Part Number** **204-070-275-1 BELLCRANK, Heating and Defrost Control**
Fabricate From: **NSN 9535-00-232-0418**
Material: **2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.125 Inch Thick**



PART NUMBER	NAME	FABRICATE FROM:
204-070-528-3	PLATE	NSN 9535-00-167-2278
AW5T9	FASTENER	NSN 5325-00-838-8804
GH5	GROMMET	NSN 5325-00-141-4002

UH-1H-II-M-D-94

Figure D-94. Part Number 204-070-528-1, COVER ASSEMBLY, Cargo Hook Mirror

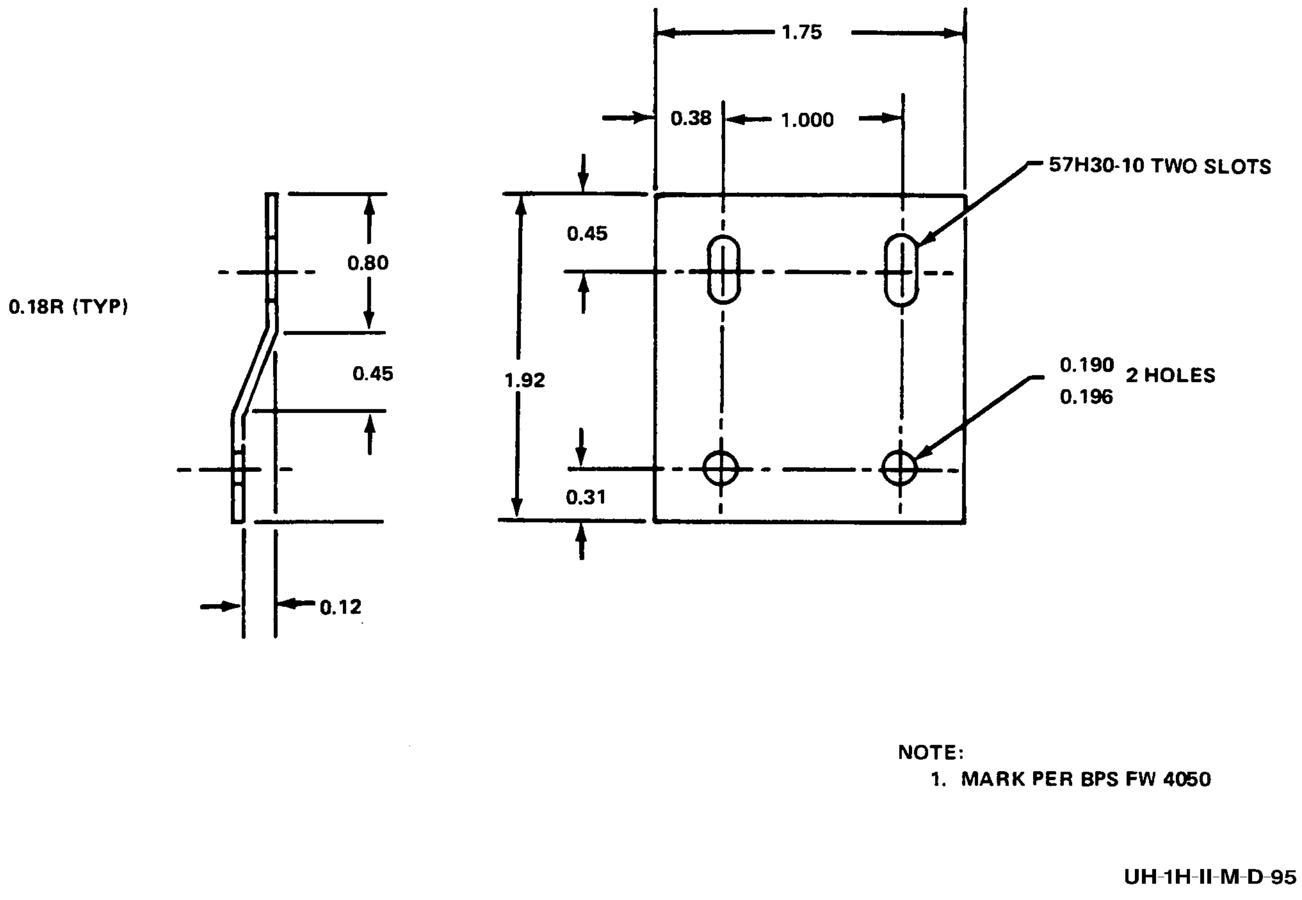


Figure D-95. Part Number 204-070-583-1 BRACKET, Upper Switch
Fabricate From: NSN 9535-00-554-1412
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick

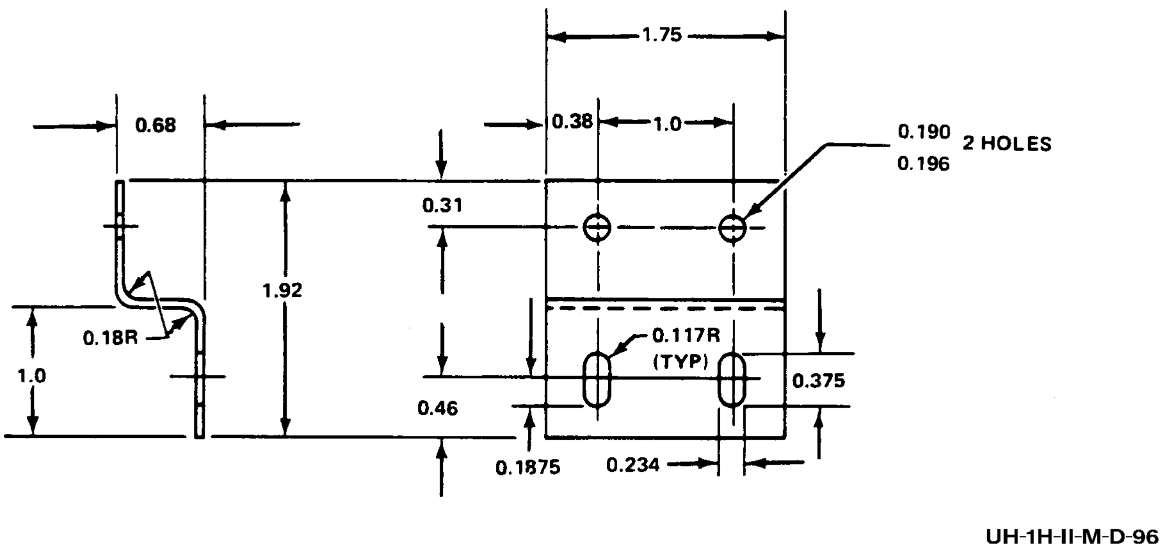
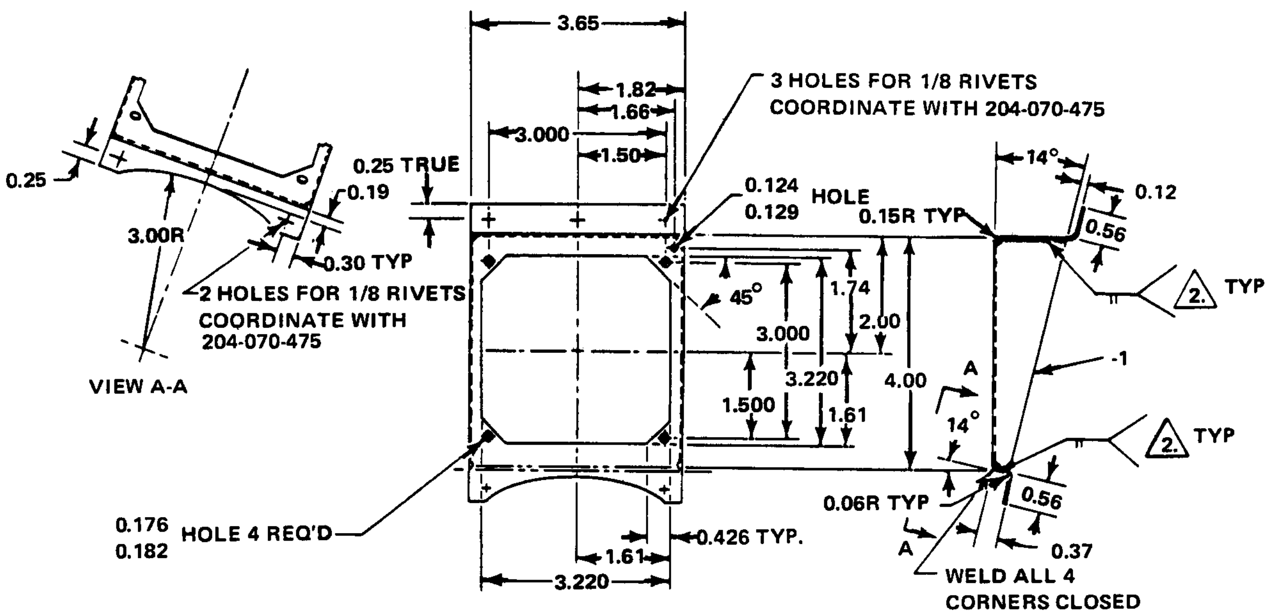


Figure D-96. Part Number 204-070-585-1 BRACKET, Lower Switch Bleed Air & Heating
Fabricate From: NSN 9535-00-534-1412
Material: 2024 AL ALY Sheet, Federal Specification, QQ-A-362, 0.050 Inch Thick



NOTES:
1. MARK PER BPS 4050
2. WELD PER MIL-W-8604

UH-1H-II-M-D-97

Figure D-97. Part Number 204-070-749-1 BRACKET INSTRUMENT
Fabricate From: NSN 9535-00-232-0501
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.050 Inch Thick

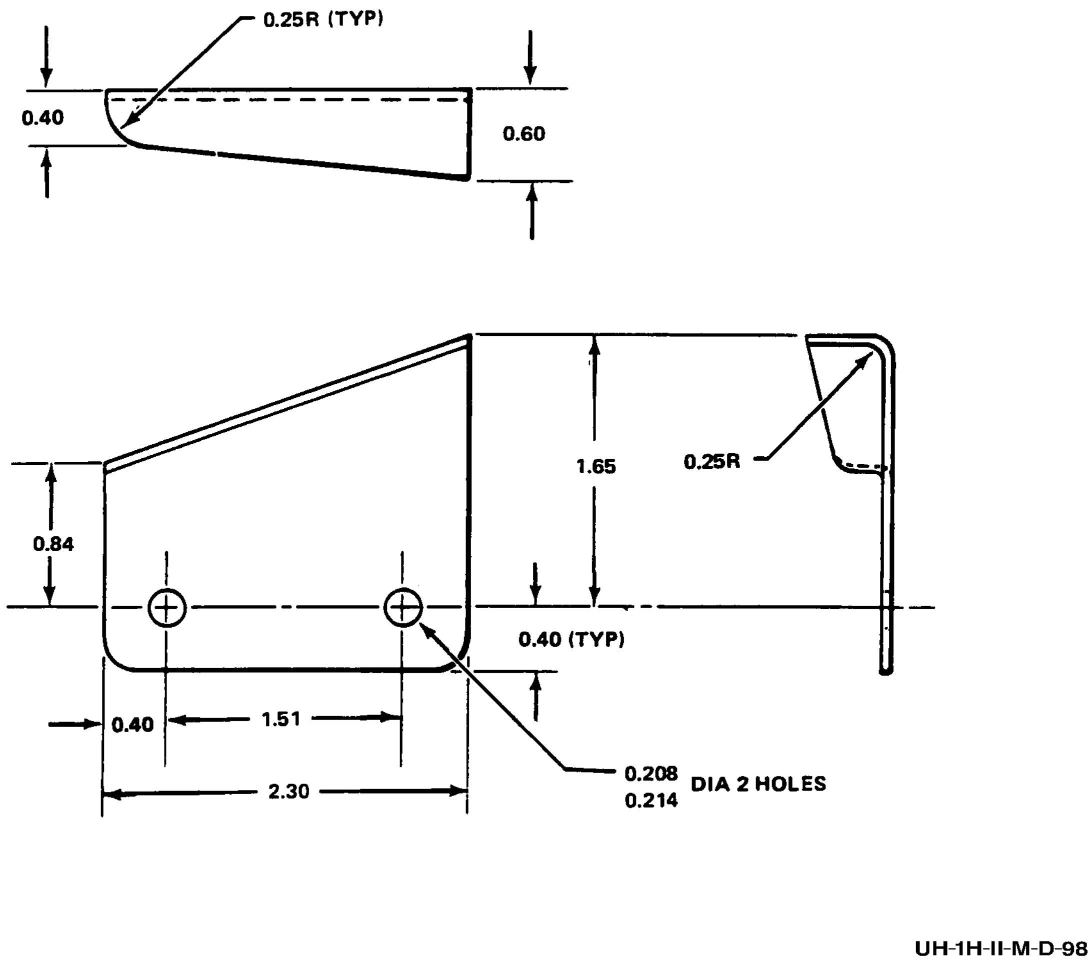
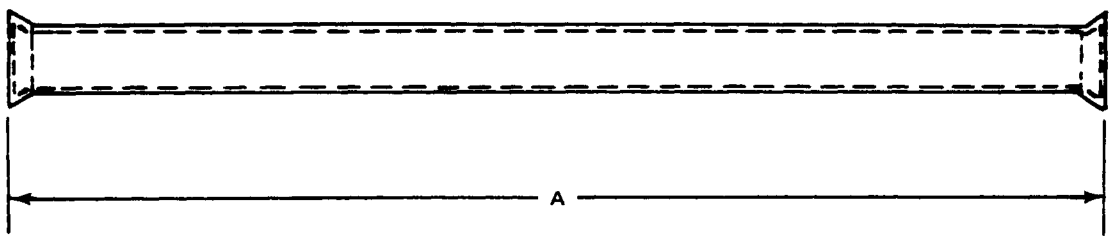


Figure D-98. Part Number 204-071-539-3 STOP, Emergency Jettison
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification, QQ-A-250/5, 0.063 Inch Thick

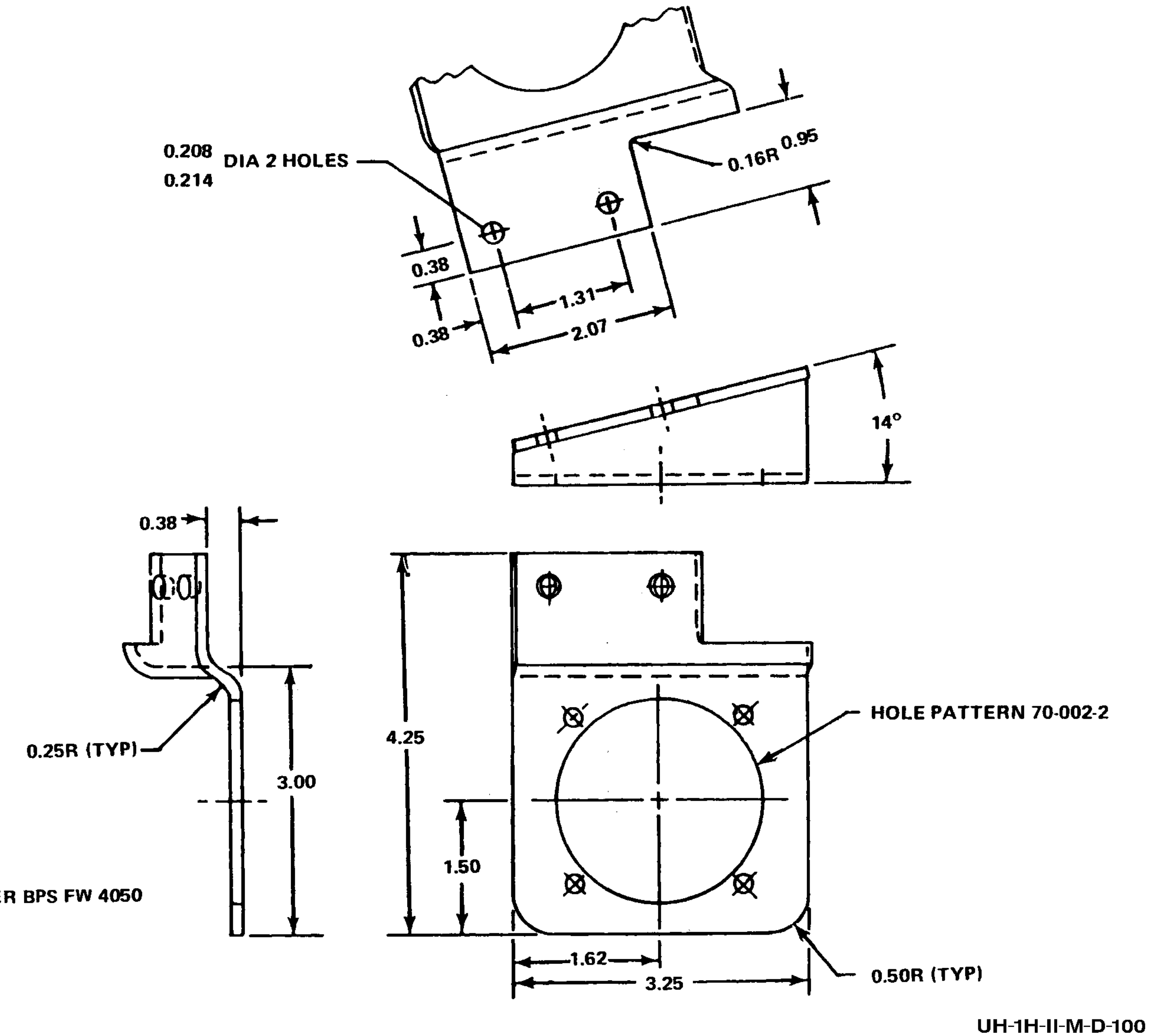


PART NUMBER	FABRICATE FROM NSN	DIM A	OD	NOTES
204-071-577-1	4710-00-278-8727	8.50	5/16	2, 3, 4
205-072-222-1	4710-00-279-0910	15.25	5/8	2, 3, 4

NOTES:
1. DOUBLE FLARE ENDS OF TUBE PER TM 55-405-7 MANUAL.
2. SINGLE FLARE ENDS OF TUBE PER TM 55-405-7 MANUAL.
3. APPLY A CHEMICAL FILM NSN 8030-00-829-0376 PER TM 55-405-3 MANUAL.
4. APPLY ONE COAT ZINC CHROMATE PRIMER NSN 8010-00-899-8825 IMMEDIATELY FOLLOWING APPLICATION OF CHEMICAL FILM ALLOWING TIME FOR DRYING BETWEEN COATS.

UH-1H-II-M-D-99

Figure D-99.



NOTES:
1. MARK PER BPS FW 4050

Figure D-100.	Part Number	204-072-054-1 BRACKET, Compass
	Fabricate From:	NSN 9535-00-232-0418
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.125 Inch Thick

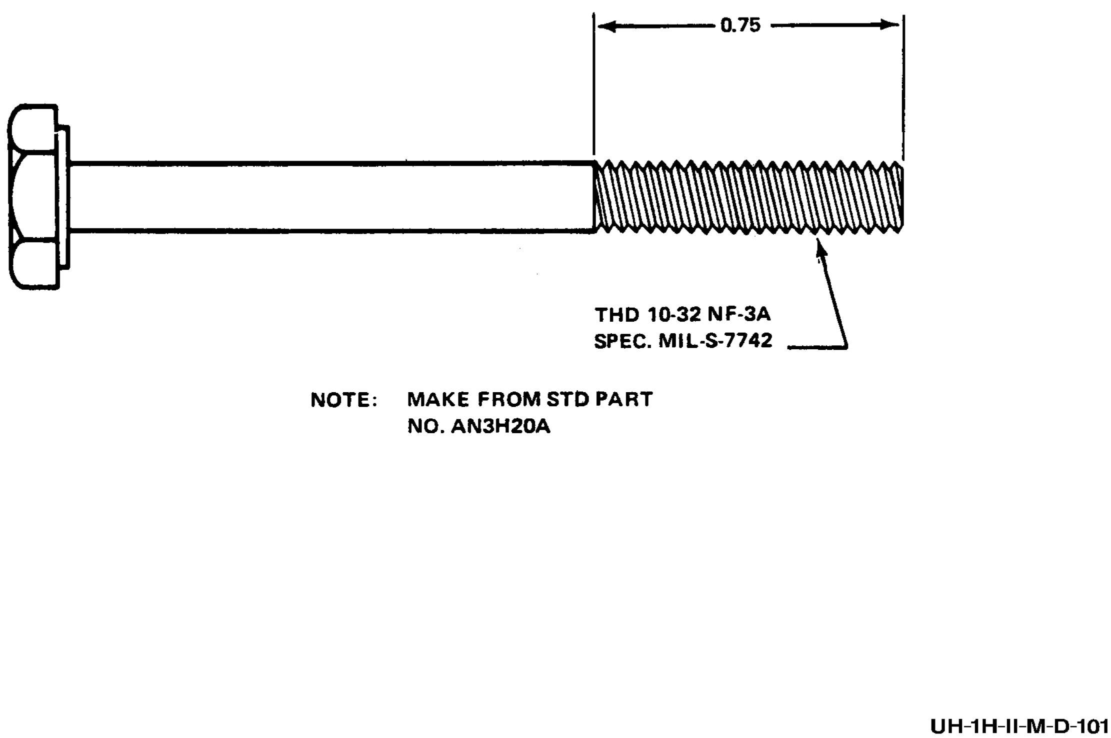
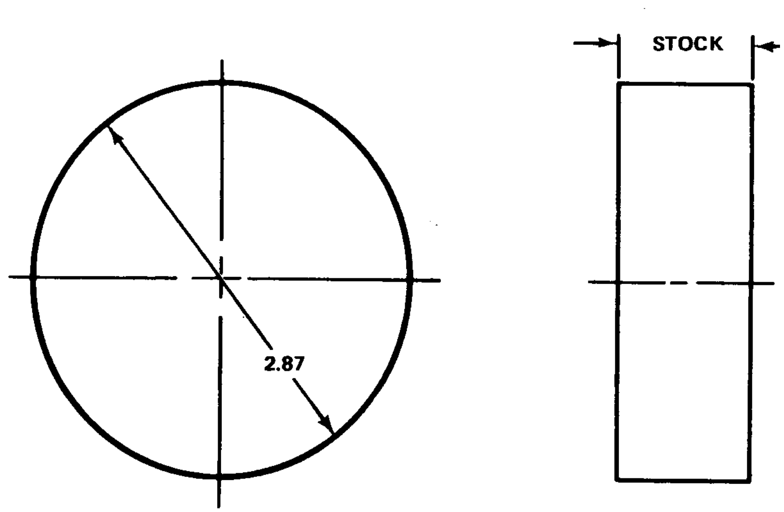
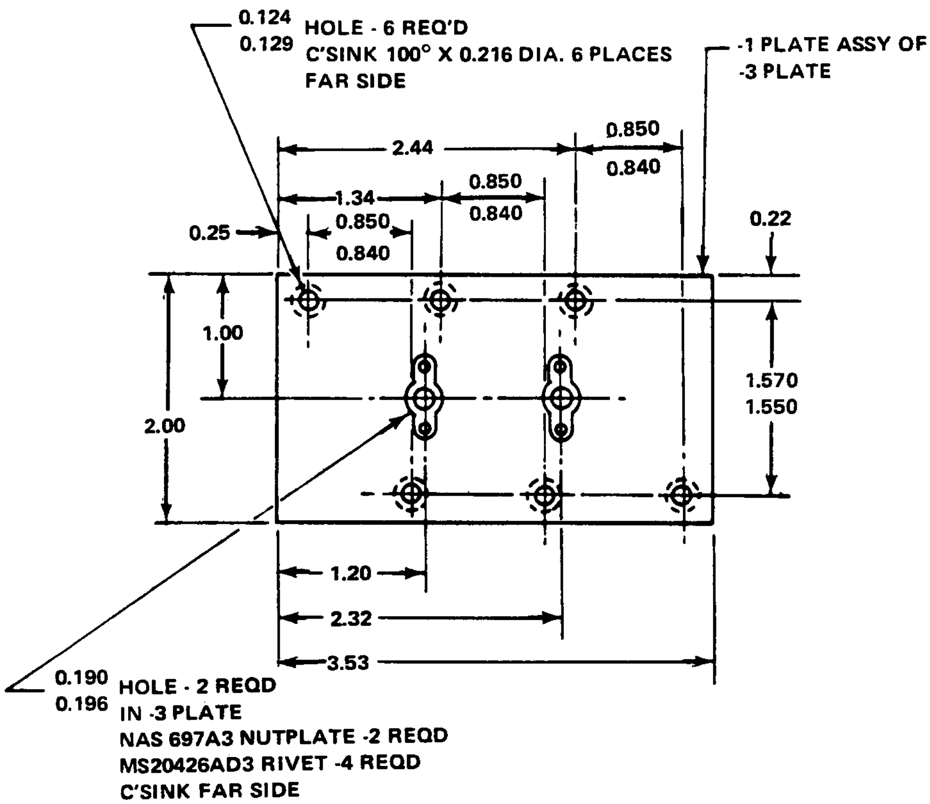


Figure D-101. Part Number 204-072-083-1 BOLT, Cargo Mirror
Fabricate From: NSN 5305-00-182-2009
Material:



UH-1H-II-M-D-102

Figure D-102. **Part Number** **204-075-160-1 PAD, Battery Sump Jar**
Fabricate From: **NSN 8305-00-191-1101**
Material: **Felt Sheet, Grey Non-woven, Federal Specification C-F-2026, Type I, 0.50 Inch Thick, 1.0 Inch Wide**



NOTES:
1. MARK PART NO. PER BPS FWB 4050
2. INSTALL RIVETS PER BPS 4019
3. ZINC CHROMATE FINISH

UH-1H-II-M-D-103

Figure D-103.	Part Number	204-075-520-1 PLATE, Assy Mounting
	Fabricate From:	NSN 9535-00-167-2280
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick

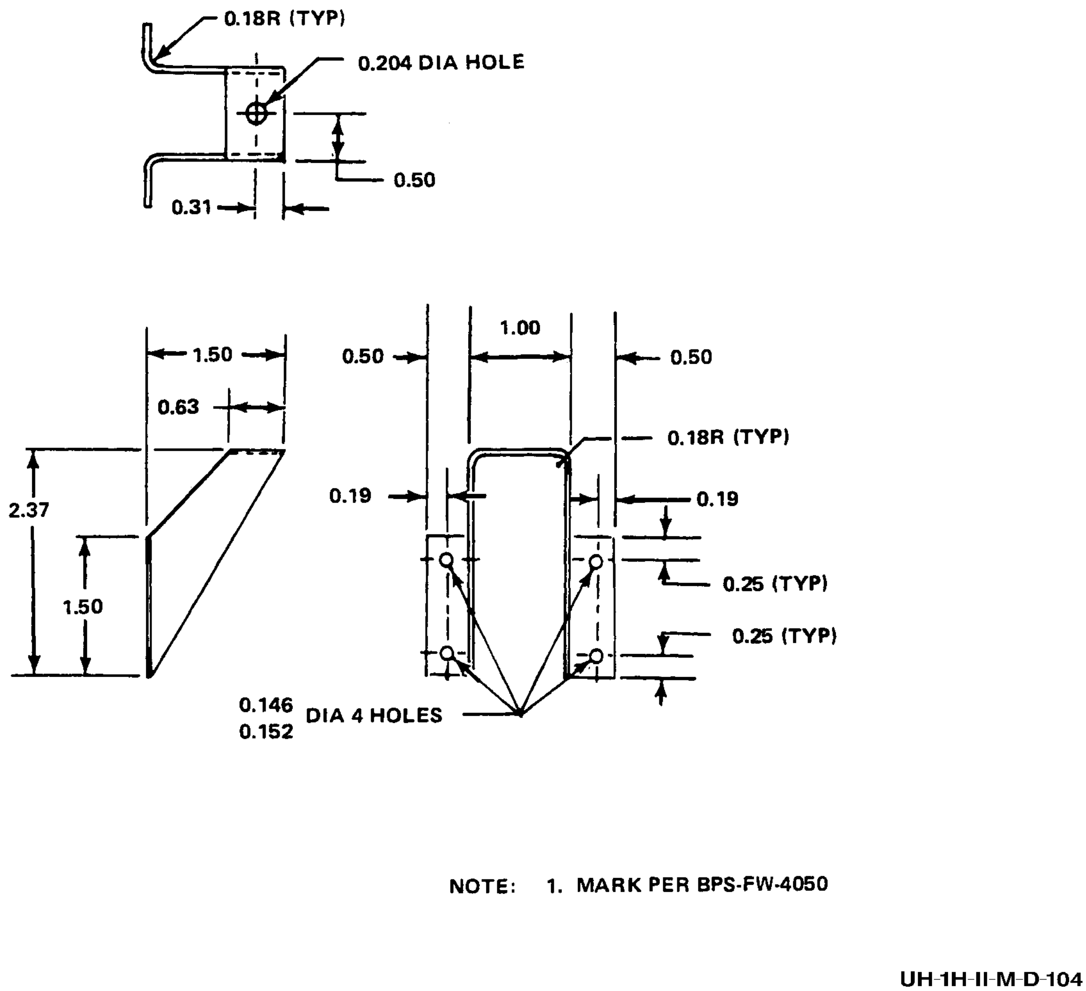
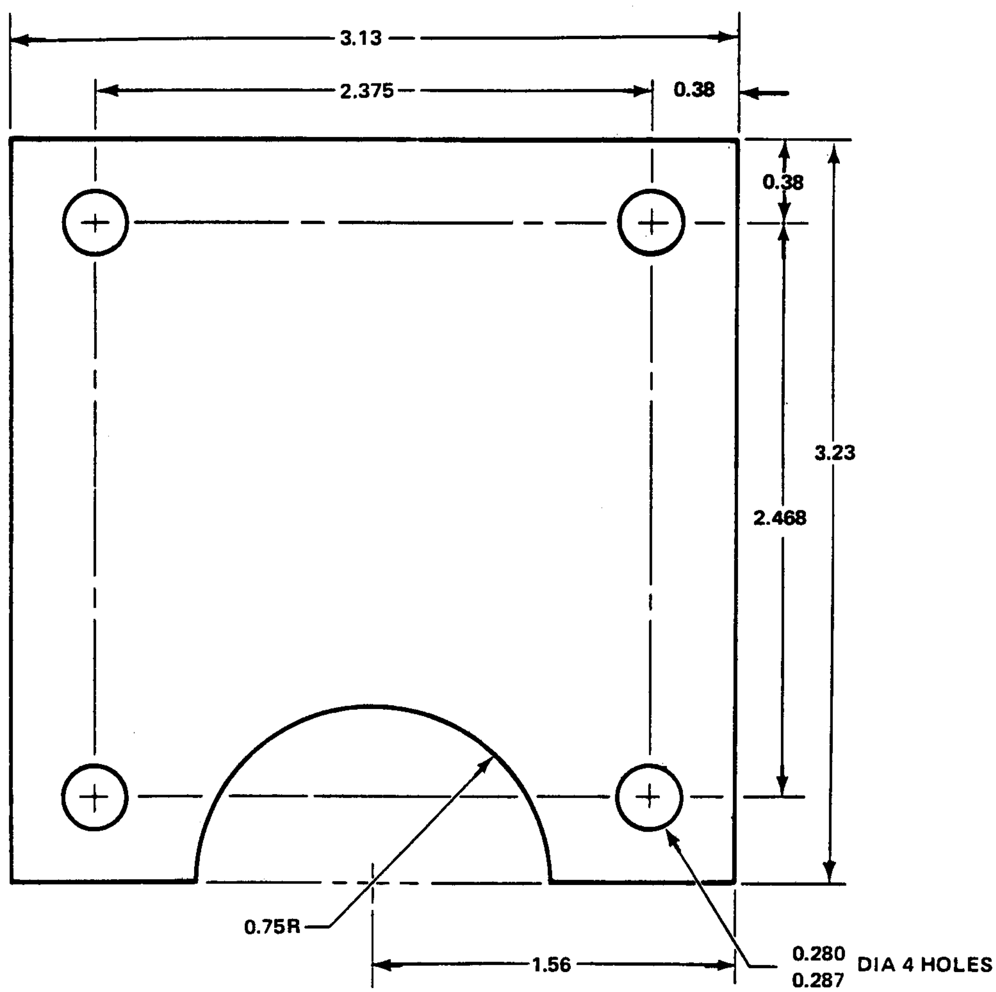
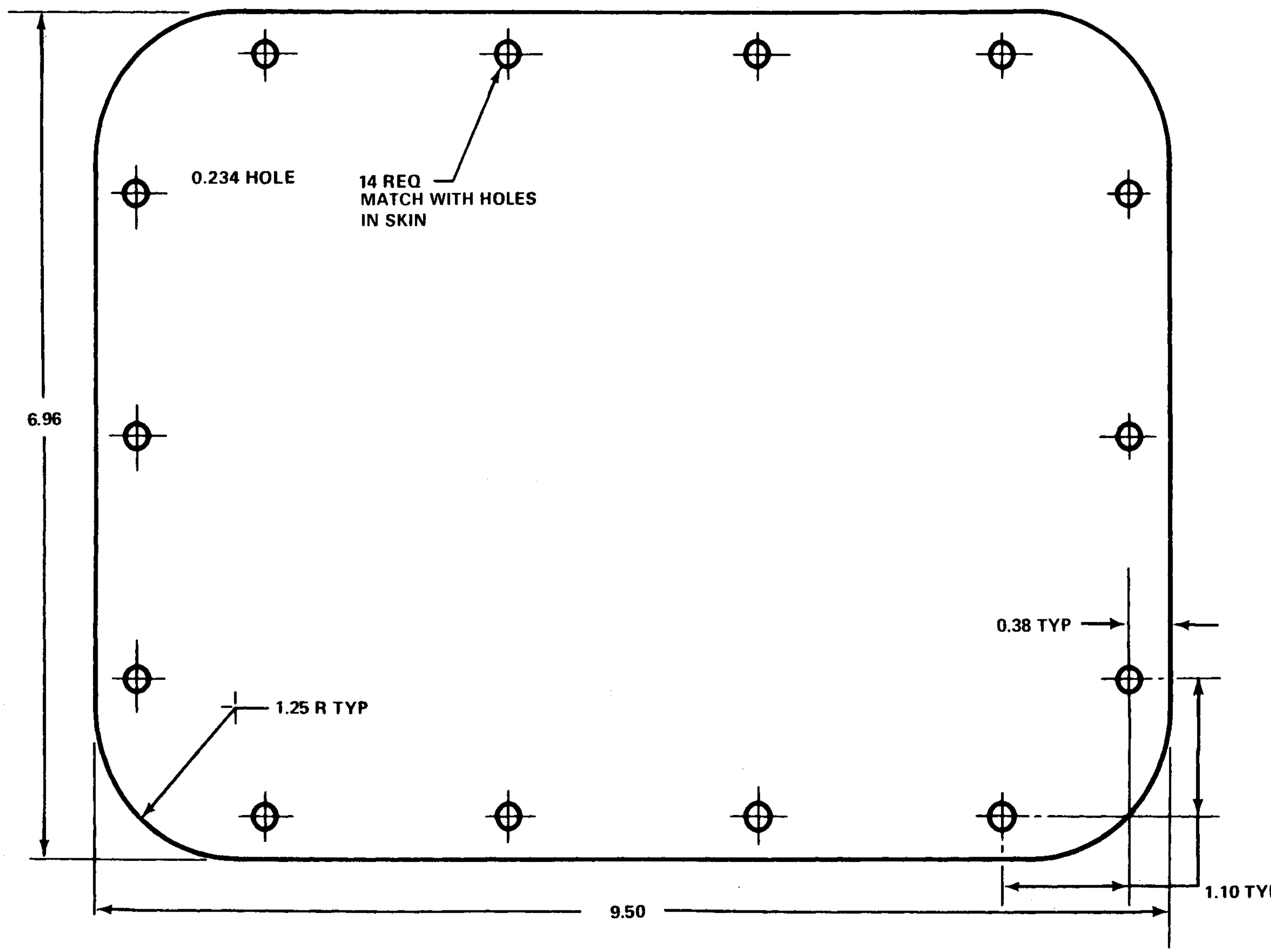


Figure D-104. Part Number 204-076-032-3 BRACKET
Fabricate From: NSN 9535-00-554-1412
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick



UH-1H-II-M-D-105

Figure D-105.	Part Number	205-001-104-1, SHIM, Bellcrank Support Collective Controls
	Fabricate From:	NSN 9535-00-167-2280
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick



UH-1H-II-M-D-106

Figure D-106.	Part Number	205-030-007-77 DOOR
	Fabricate From:	NSN 9535-00-167-2279
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

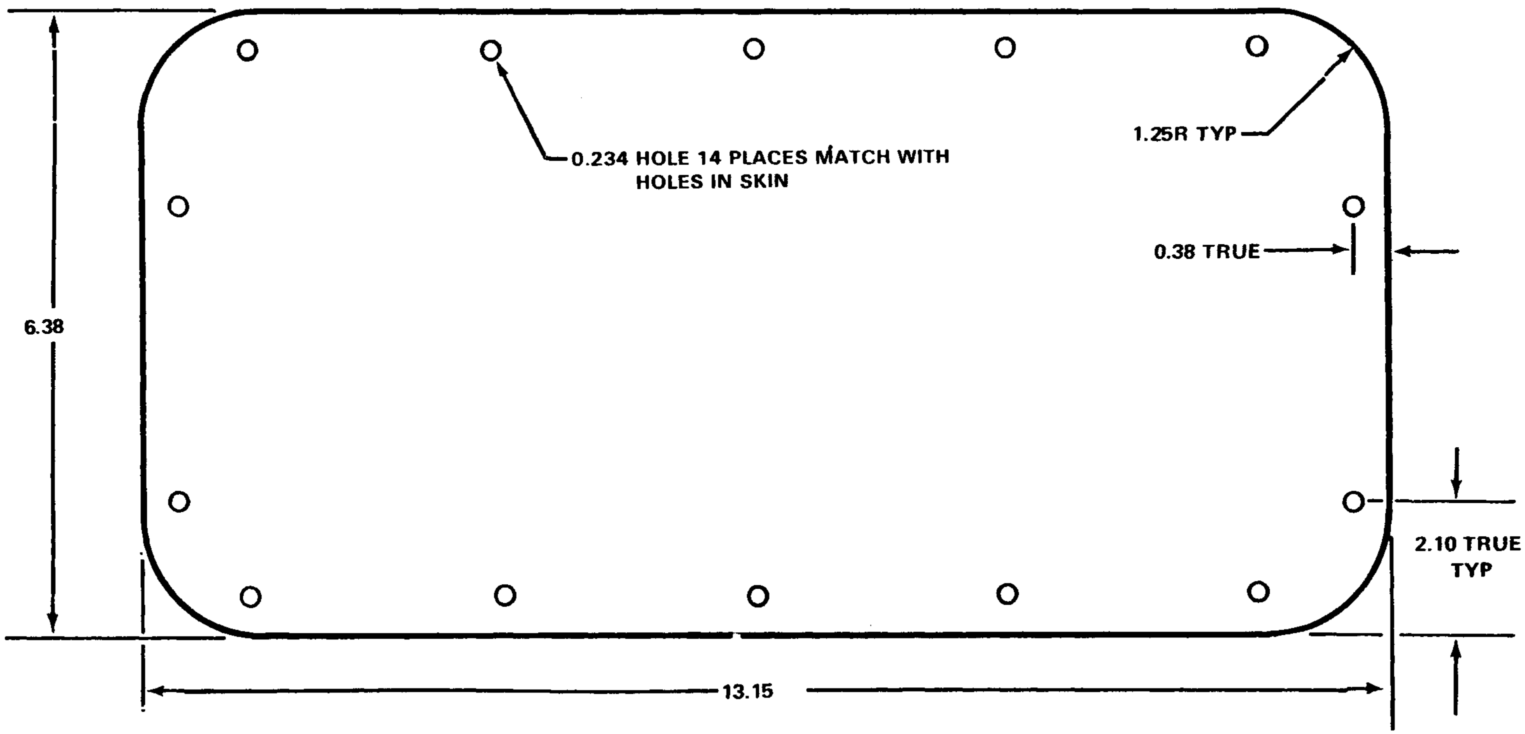


Figure D-107. Part Number 205-030-007-97 Left Hand (Shown)
205-030-007-98 Right Hand, (Opp)
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

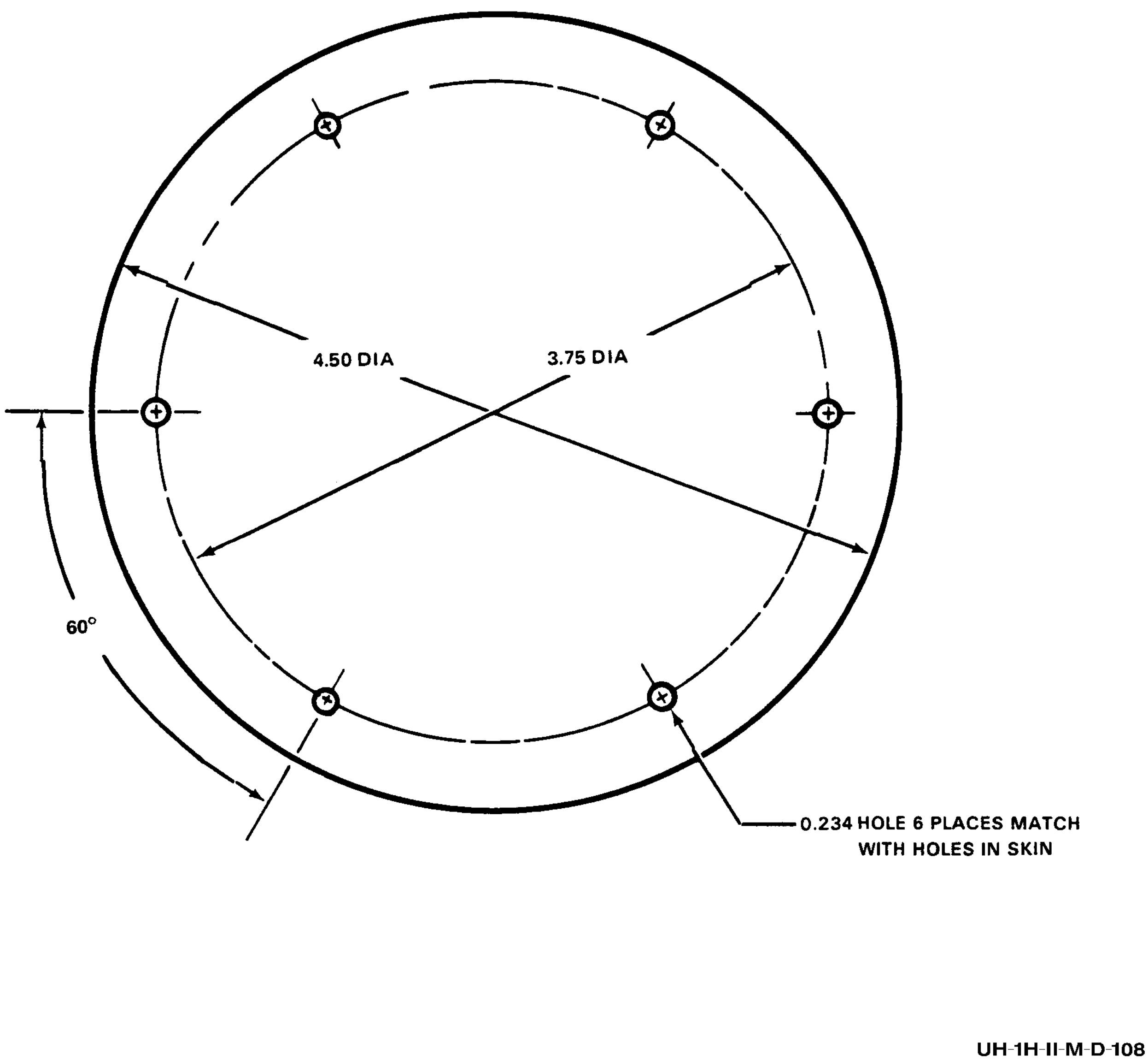


Figure D-108. Part Number 205-030-007-99 DOOR
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

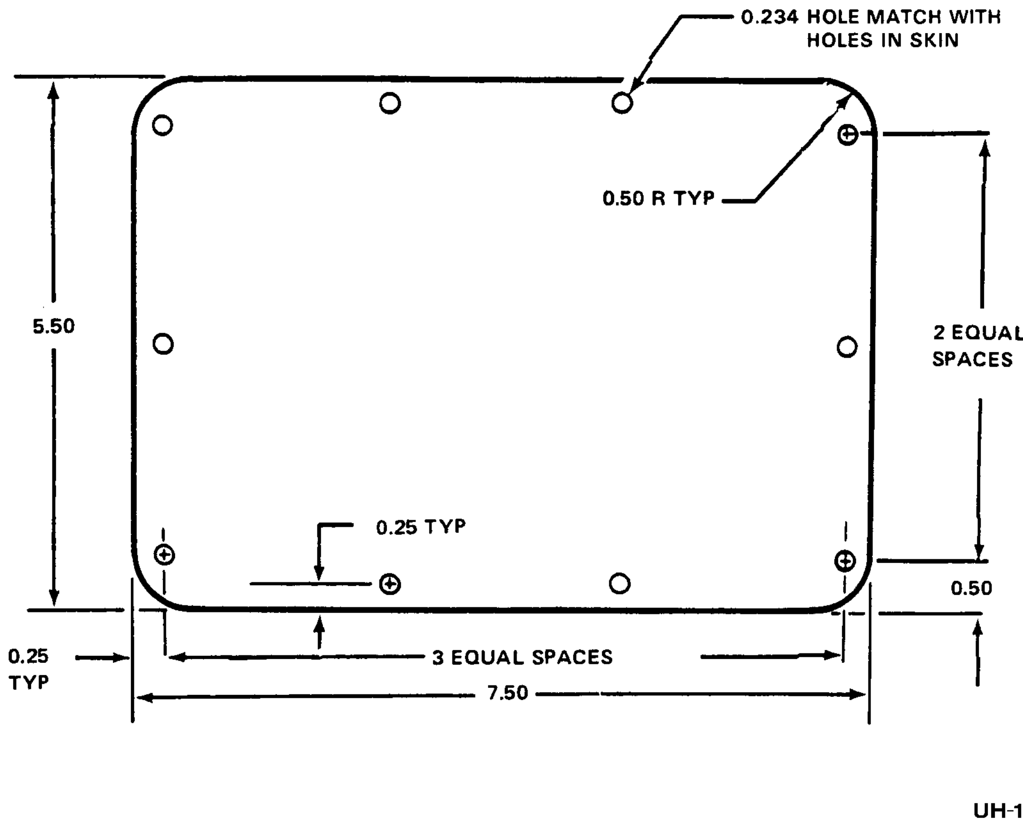
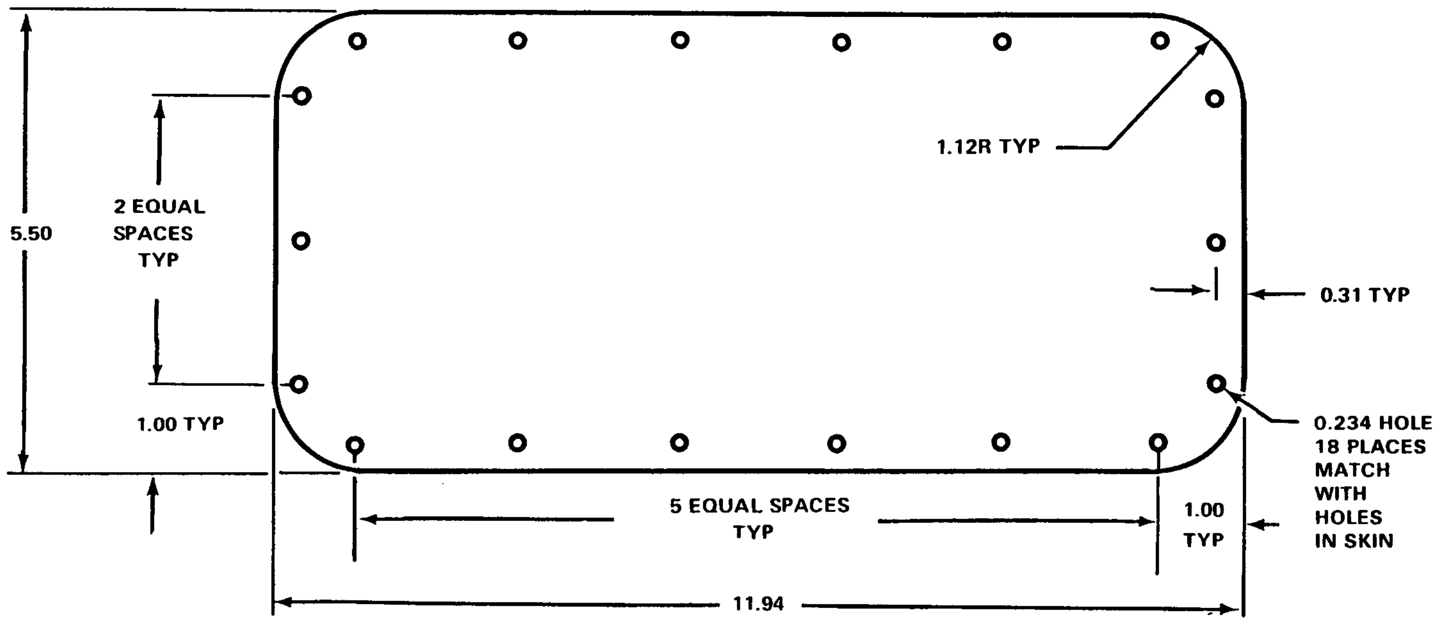


Figure D-109. Part Number 205-030-007-107, DOOR
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick



UH-1H-II-M-D-110

Figure D-110. Part Number 205-030-007-109 DOOR
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

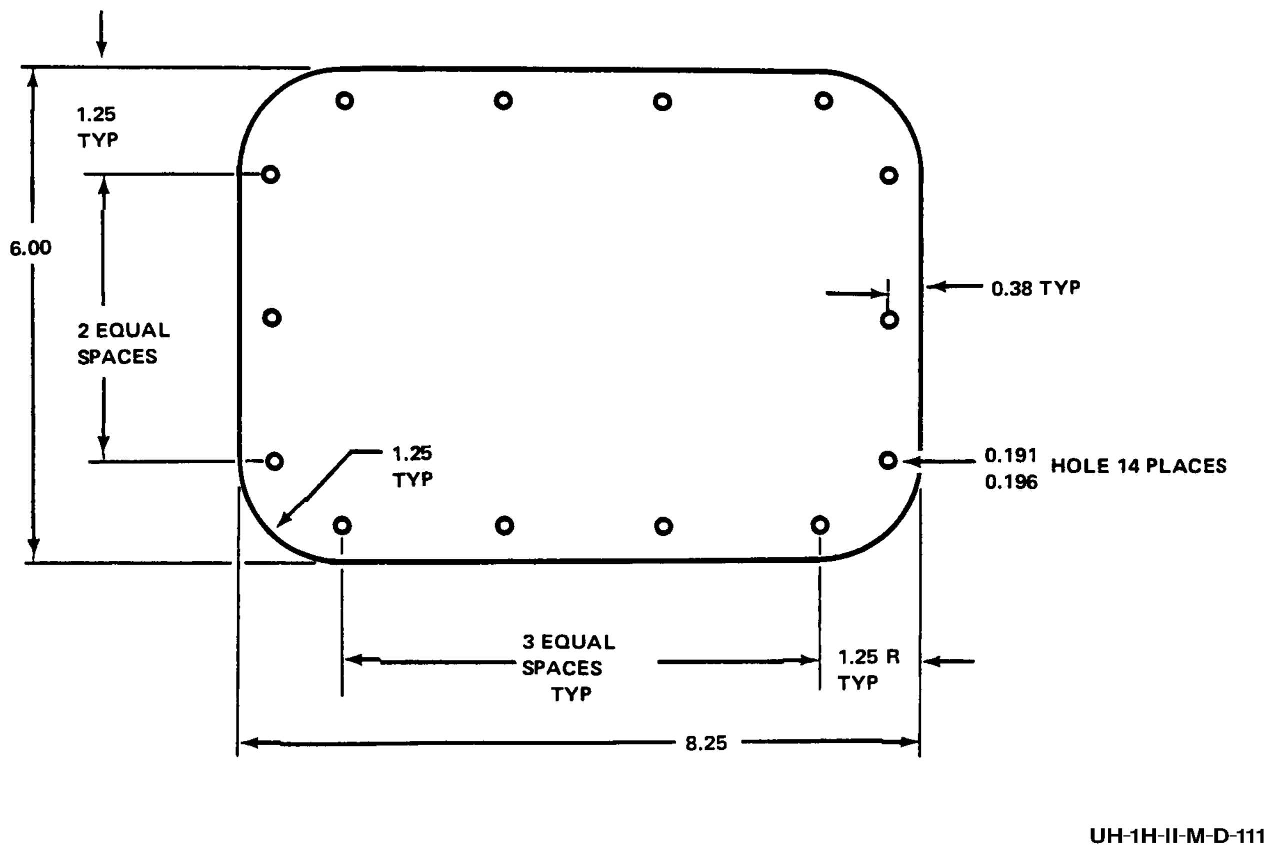


Figure D-111. Part Number 205-030-007-111, DOOR
Fabricate From: NSN 9535-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

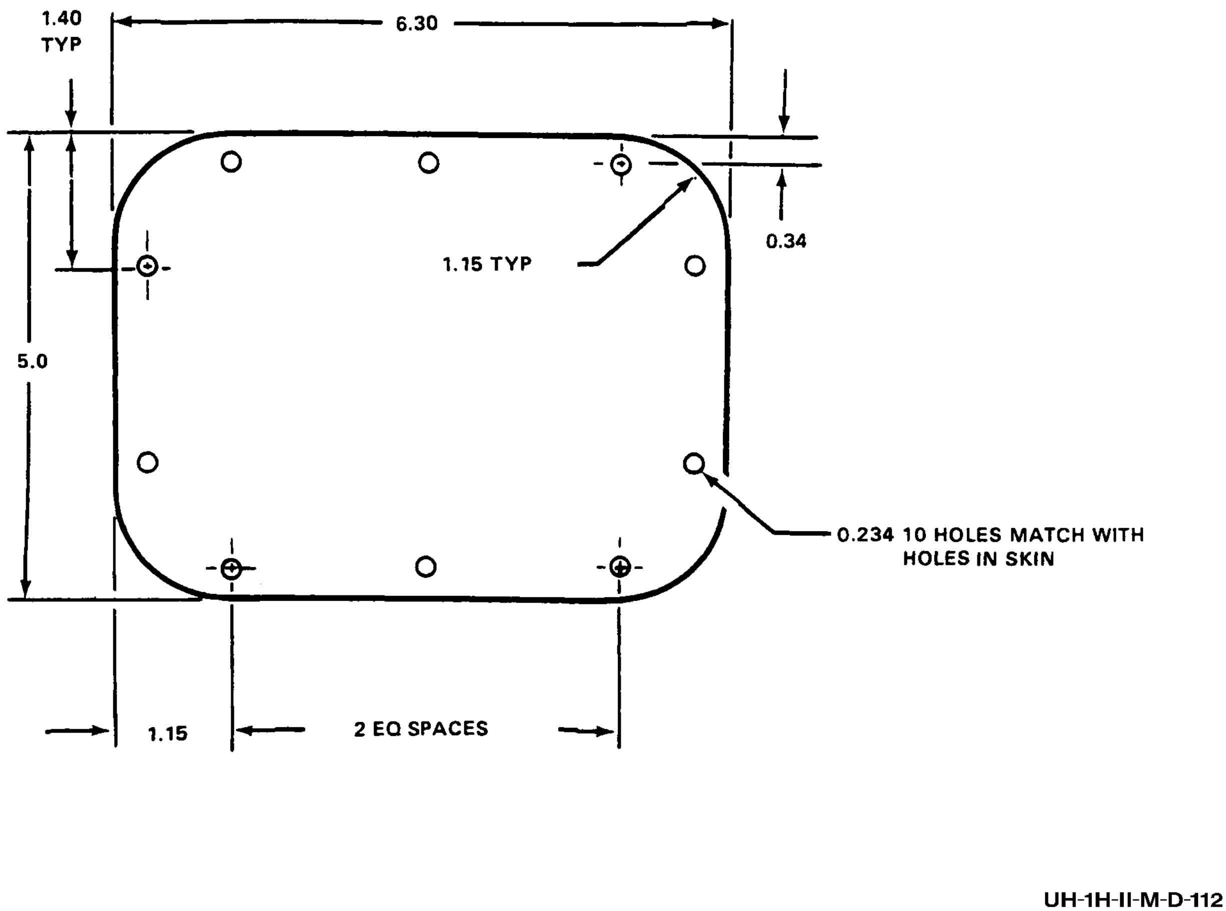


Figure D-112.	Part Number	205-030-007-113, DOOR
	Fabricate From:	NSN 9535-00-167-2279
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

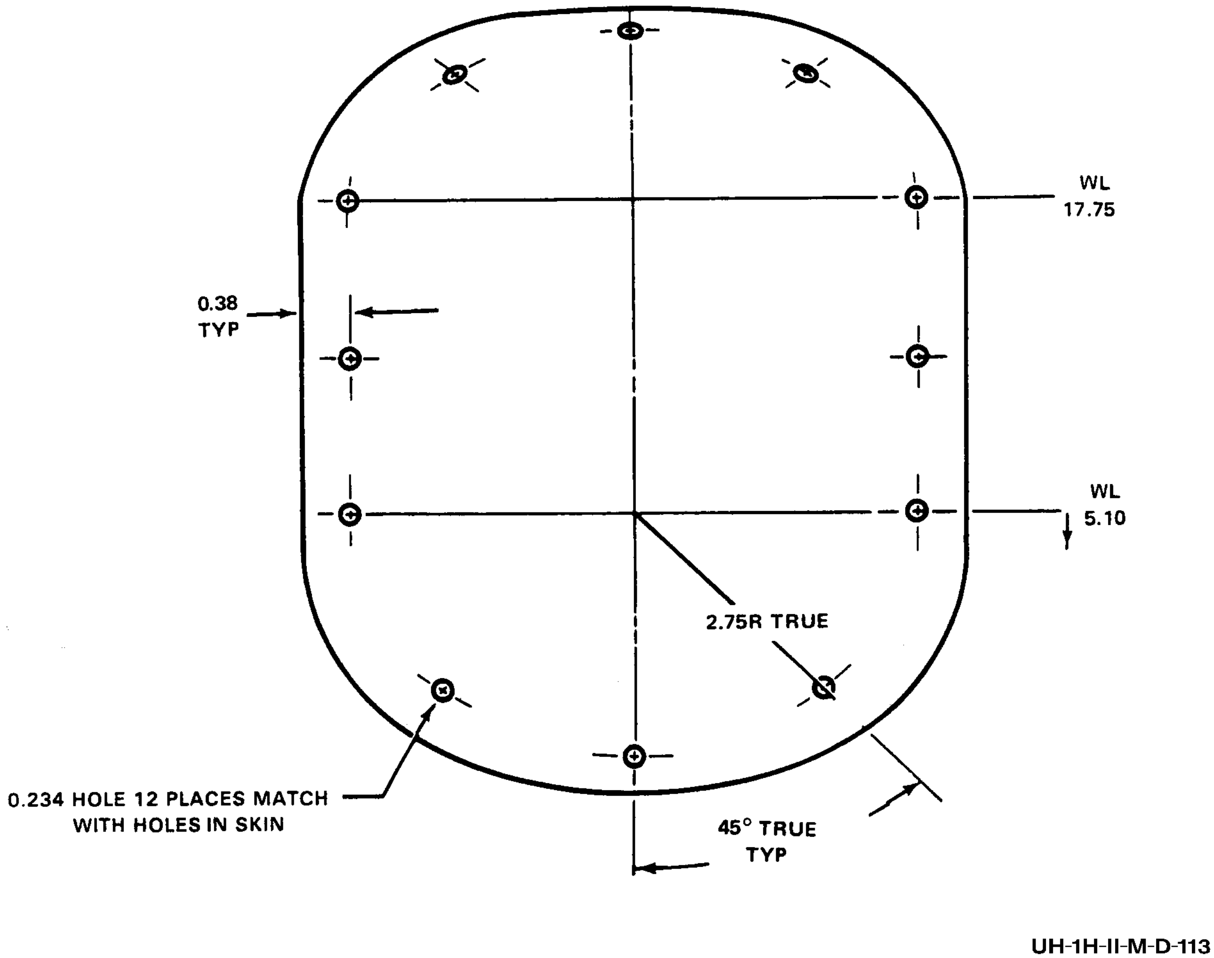


Figure D-113.	Part Number	205-030-007-131, DOOR, Left Hand (Shown)
		205-030-007-132, DOOR, Right Hand (Opp)
	Fabricate From:	NSN 9535-00-167-2278
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

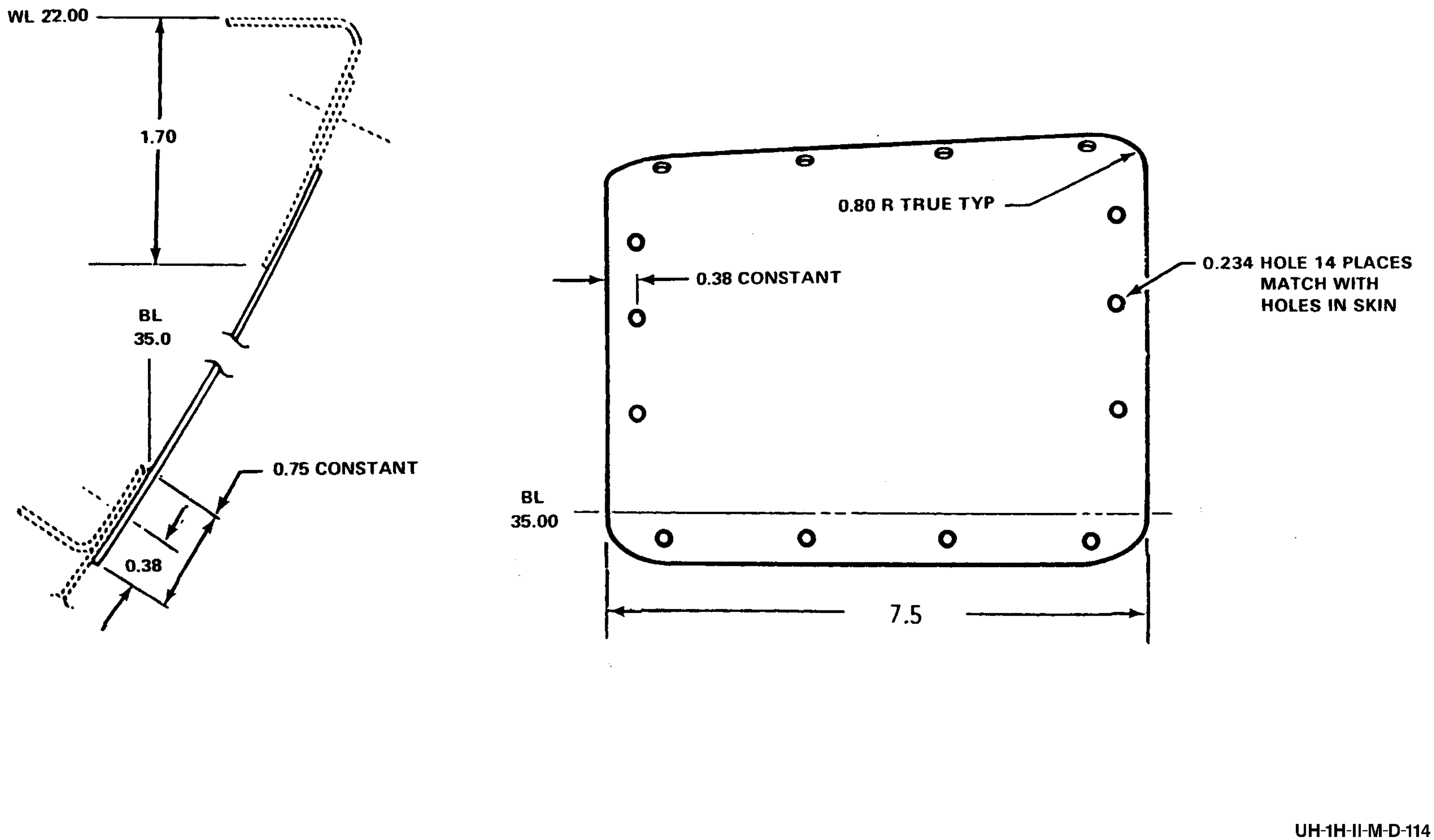
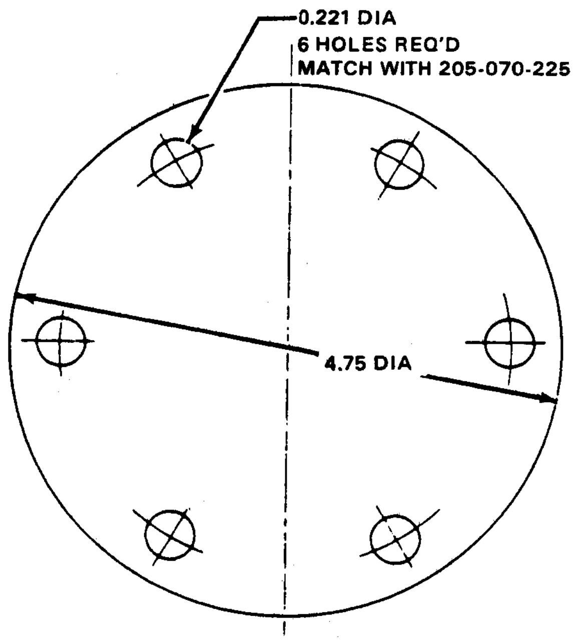


Figure D-114.	Part Number	205-030-007-133 DOOR, Left Hand (Shown)
		205-030-007-134 DOOR, Right Hand (Opp)
	Fabricate From:	NSN 9535-00-167-2278
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick



UH-1H-II-M-D-115

Figure D-115.	Part Number	205-030-007-155 COVER
	Fabricate From:	NSN 9535-00-167-2278
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

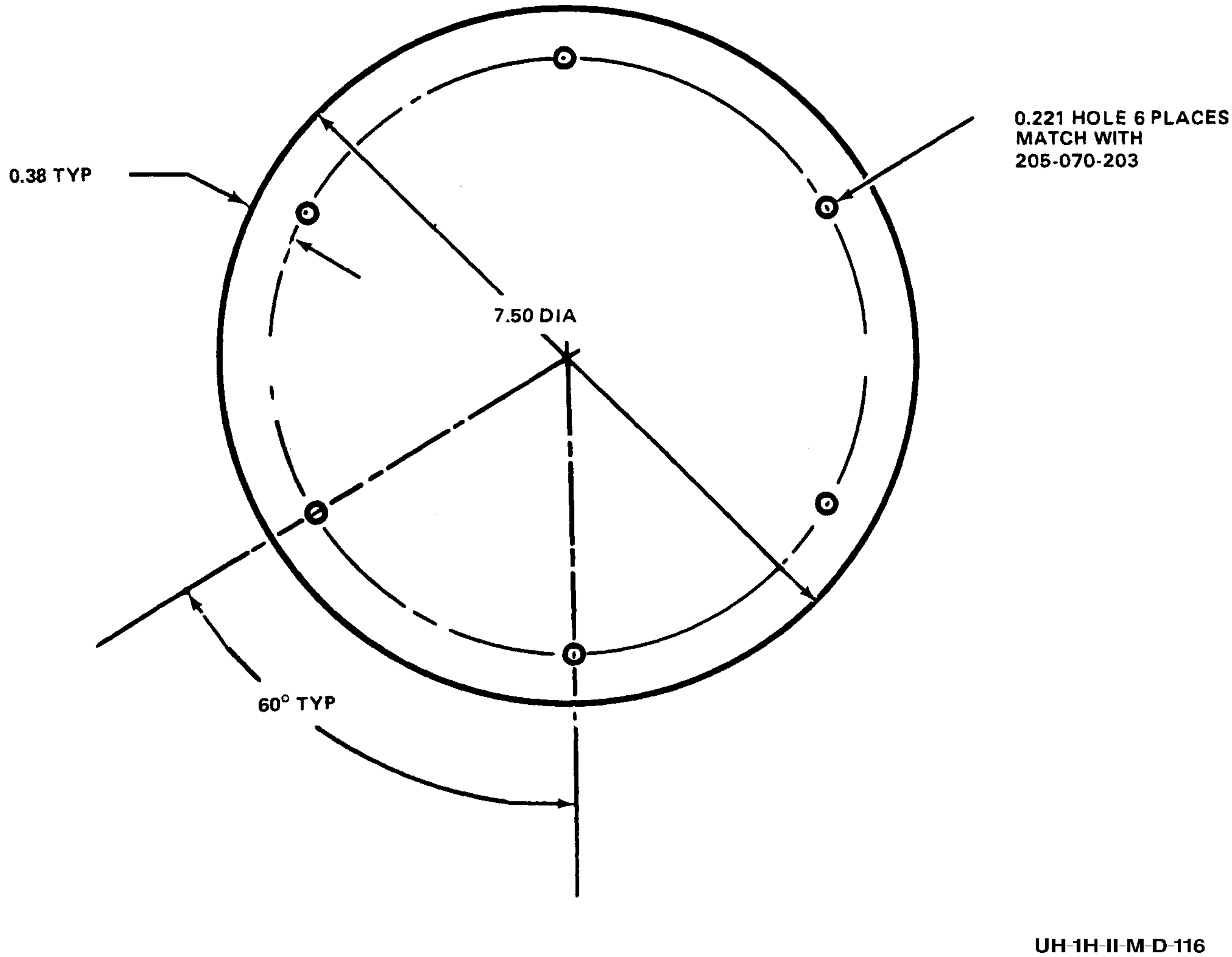


Figure D-116. Part Number 205-030-007-157, COVER
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

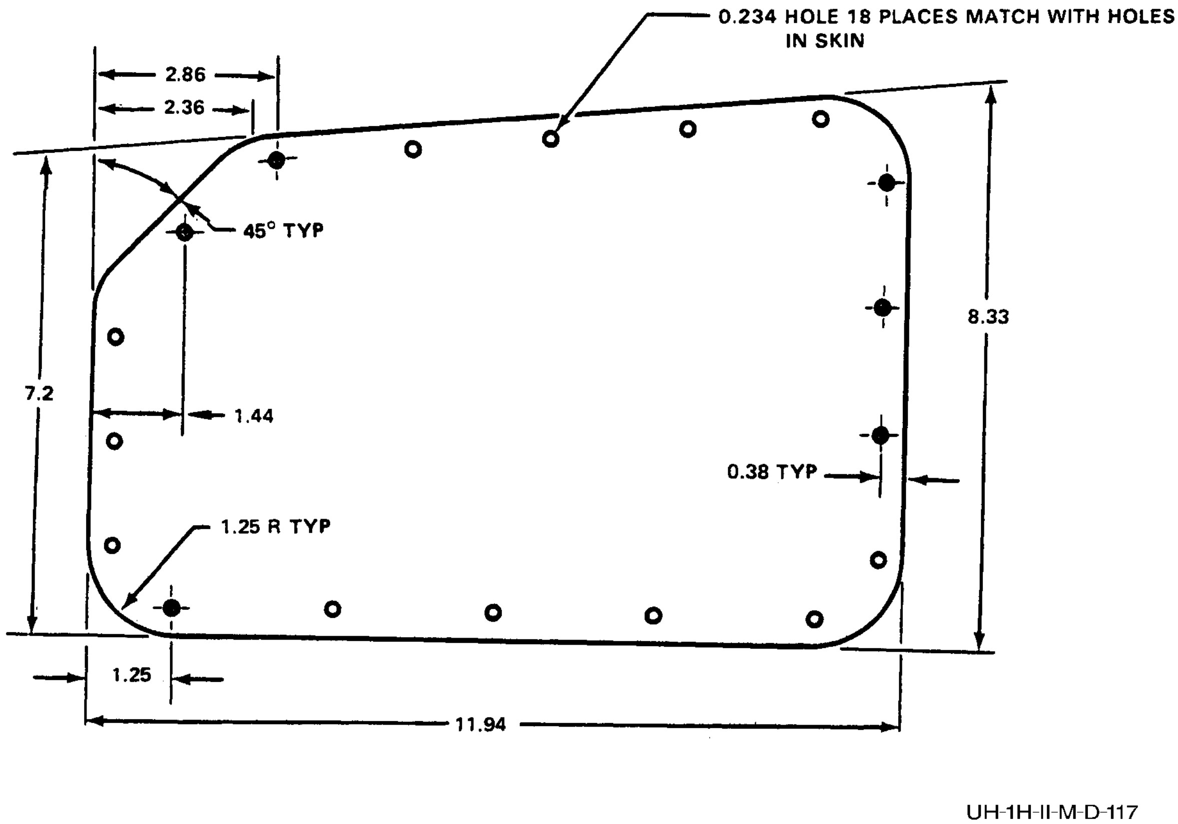
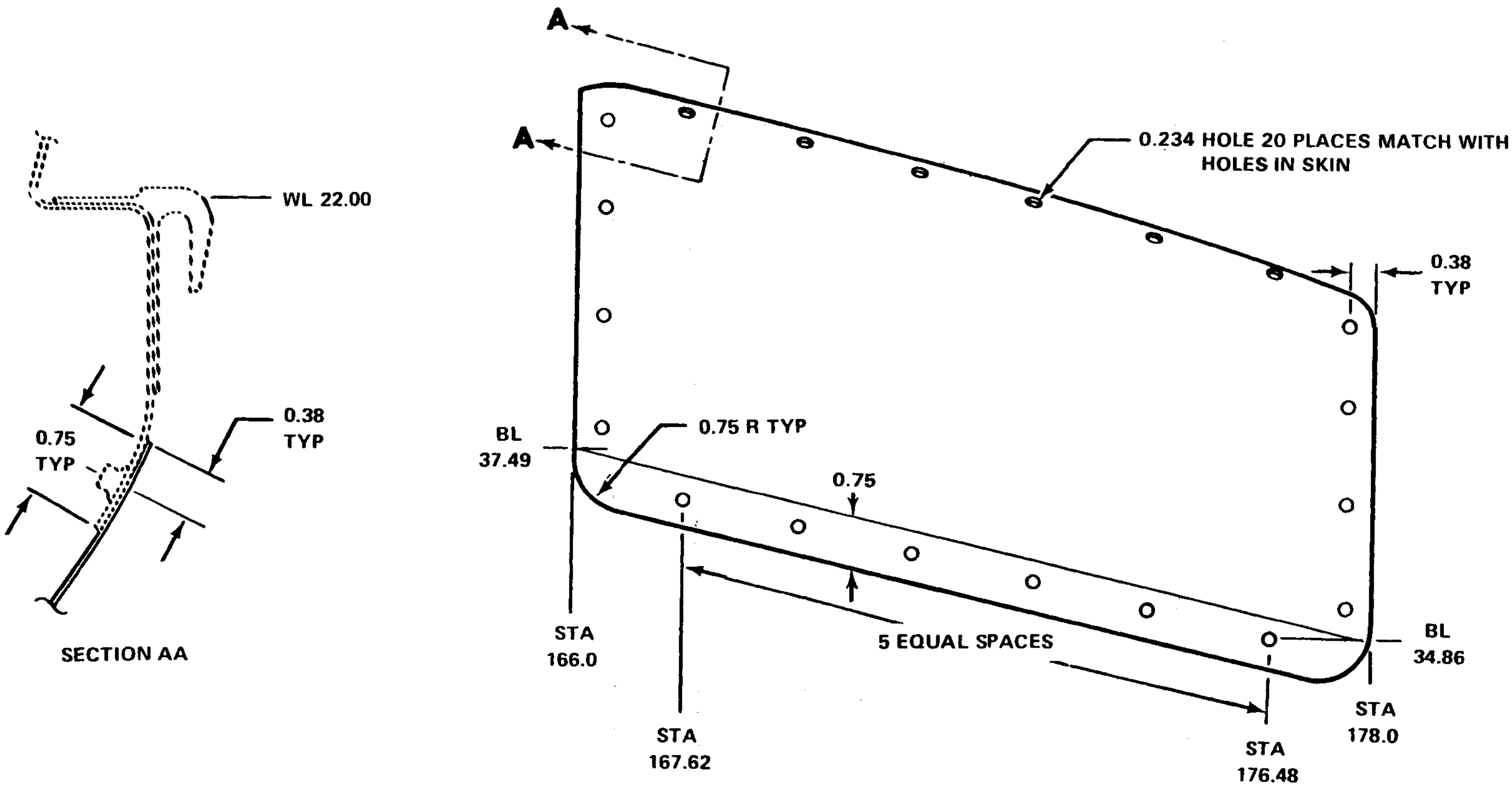


Figure D-117. Part Number 205-030-007-159, DOOR
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick



UH-1H-II-M-D-118

Figure D-118.	Part Number	205-030-007-179 DOOR, Left Hand (Shown)
		205-030-007-180 DOOR, Right Hand (Opp)
	Fabricate From:	NSN 9535-00-167-2278
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

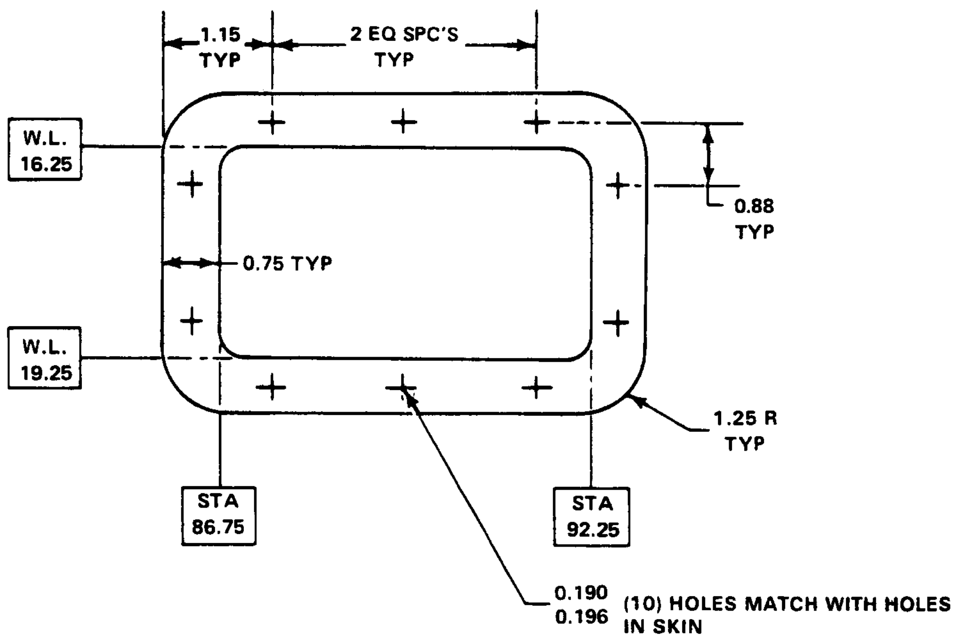


Figure D-119. Part Number 205-030-007-231 DOOR
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.023 Inch Thick

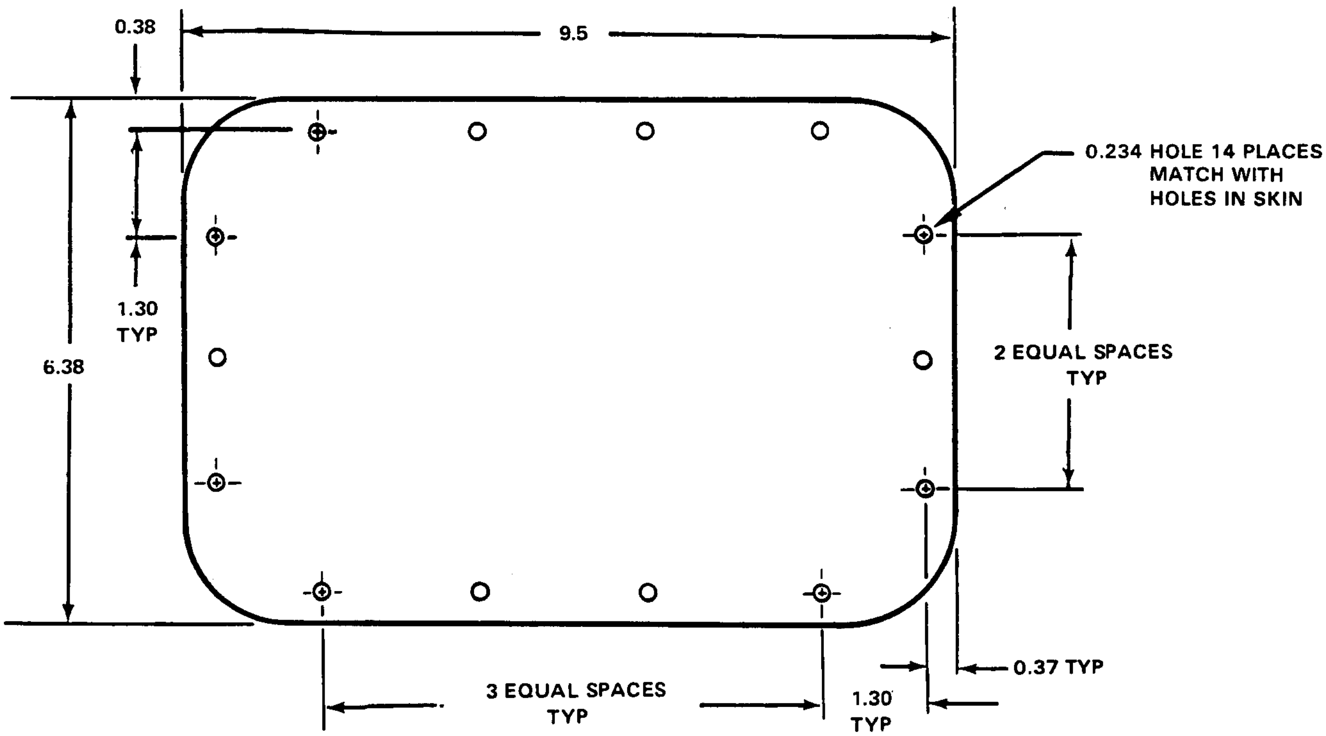


Figure D-120. Part Number 205-030-007-233, DOOR
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

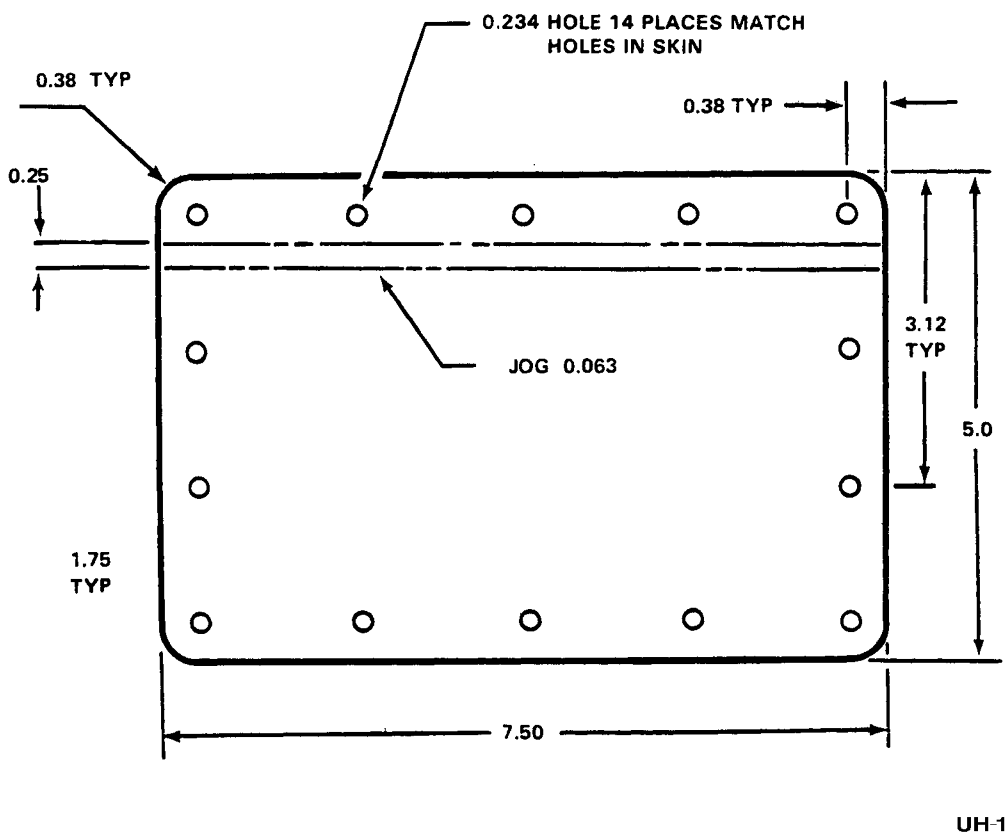


Figure D-121. Part Number 205-030-007-245, DOOR, Left Hand (Shown)
205-030-007-246, DOOR, Right Hand (Opp)
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

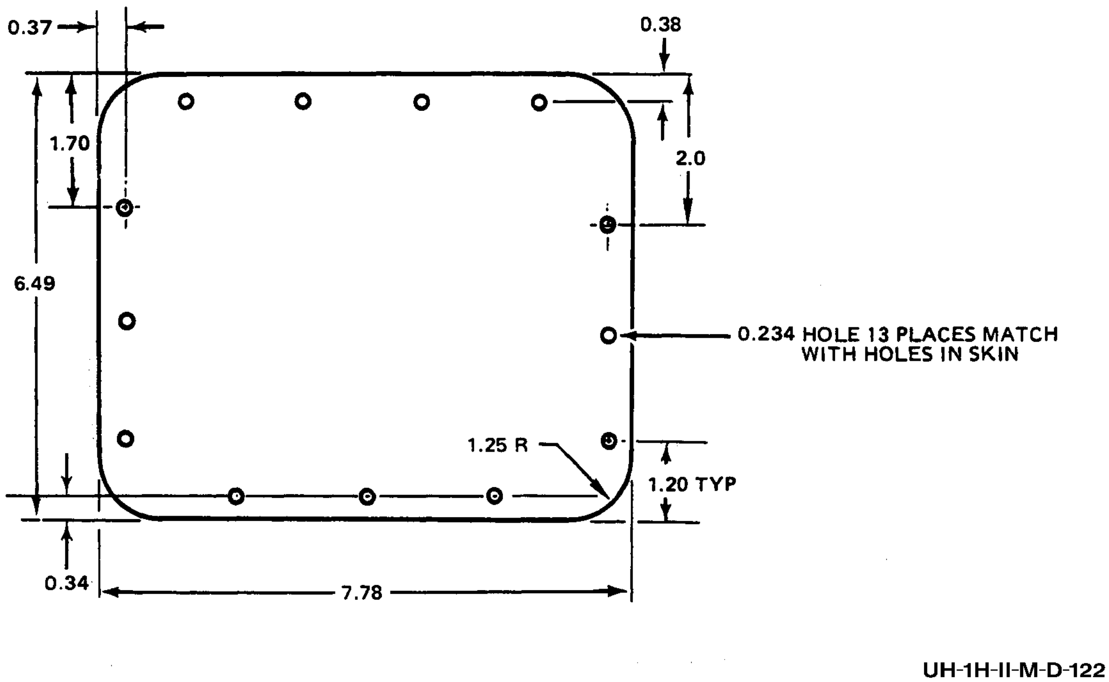


Figure D-122.	Part Number	205-030-007-271, DOOR, Left Hand (Shown)
		205-030-007-272, DOOR, Right Hand (Opp)
	Fabricate From:	NSN 9535-00-167-2279
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

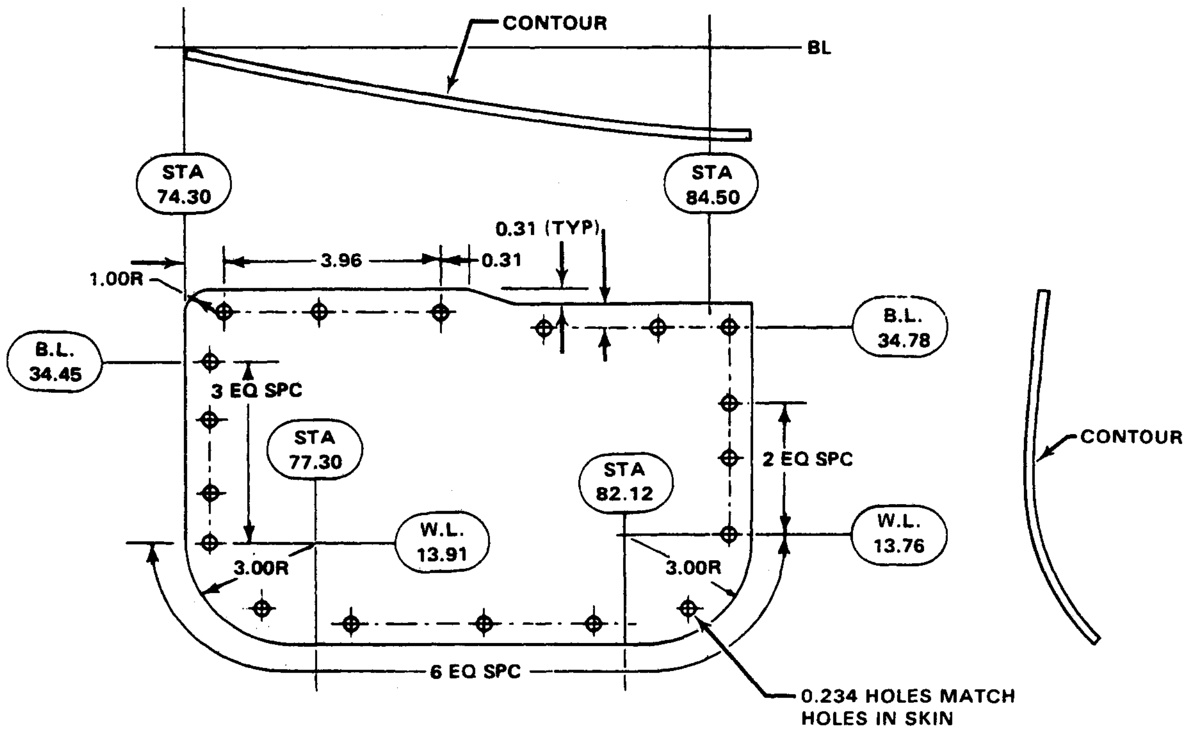


Figure D-123. Part Number 205-030-007-337, DOOR
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

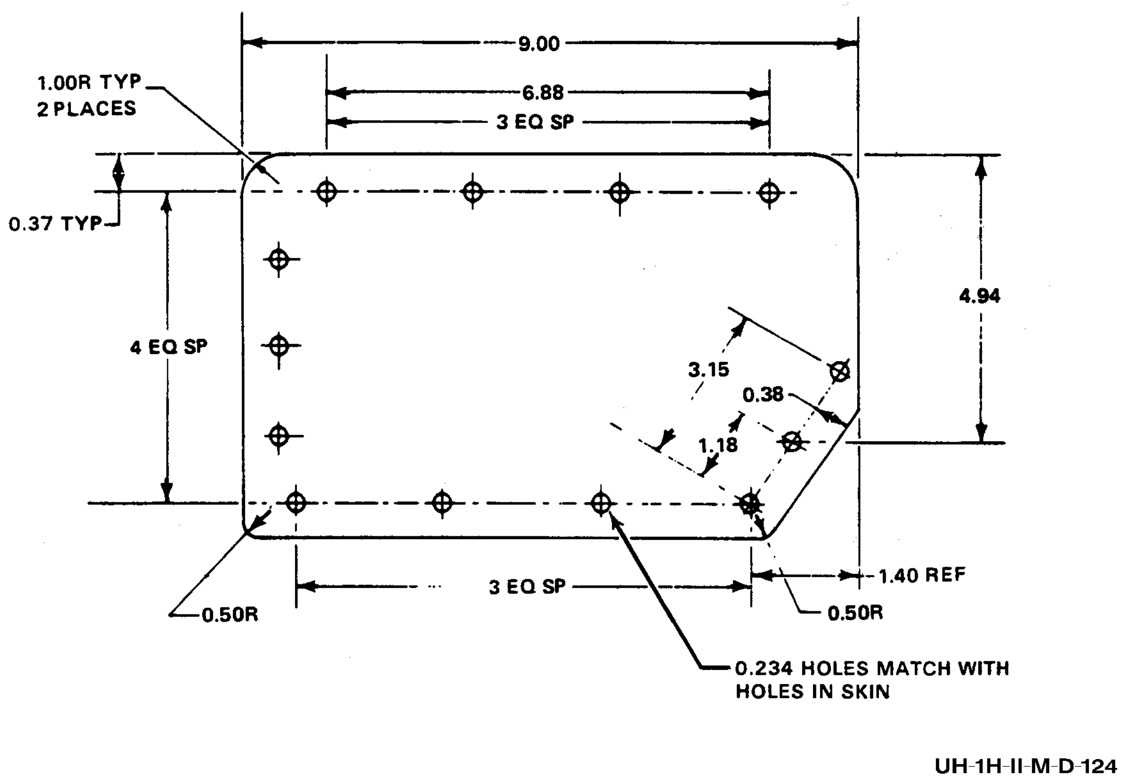


Figure D-124. **Part Number** **205-030-007-341, DOOR**
Fabricate From: **NSN 9535-00-167-2279**
Material: **2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick**

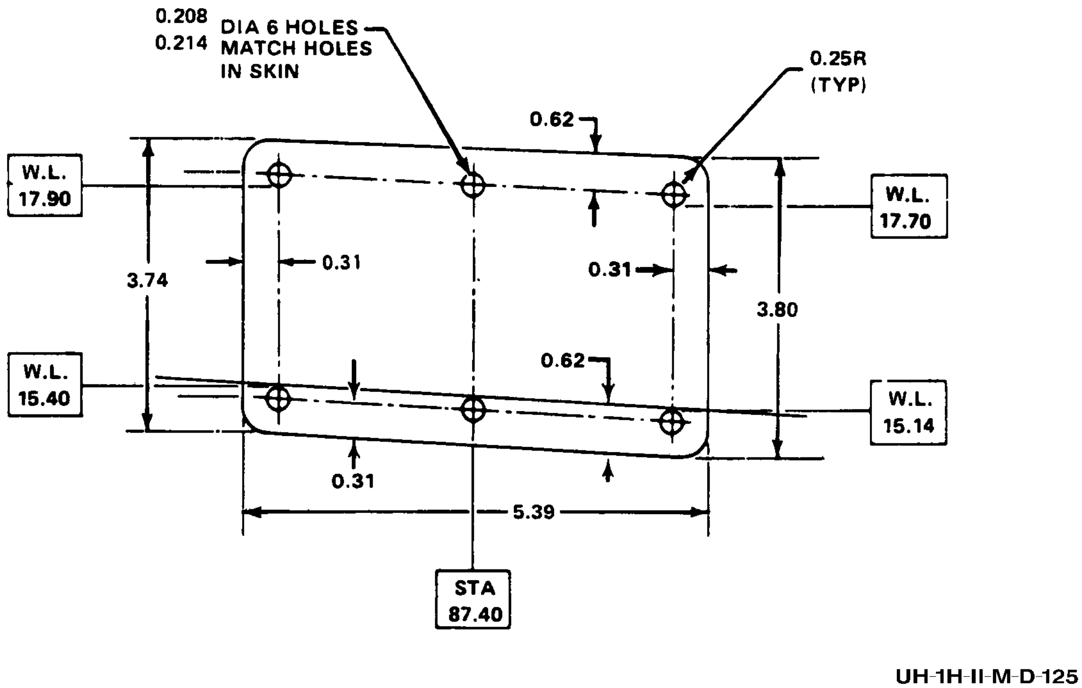


Figure D-125. Part Number 205-030-007-351, DOOR
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

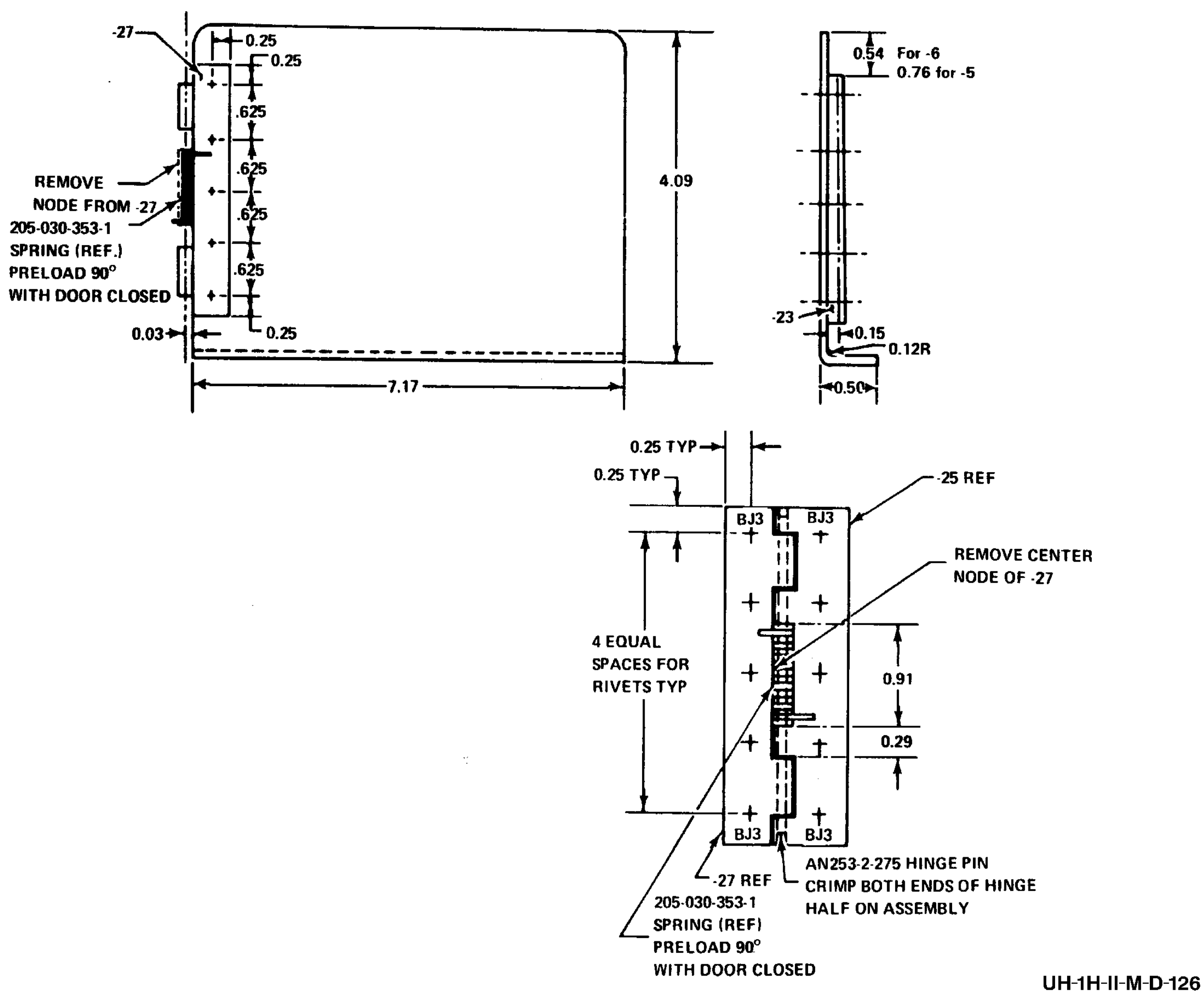
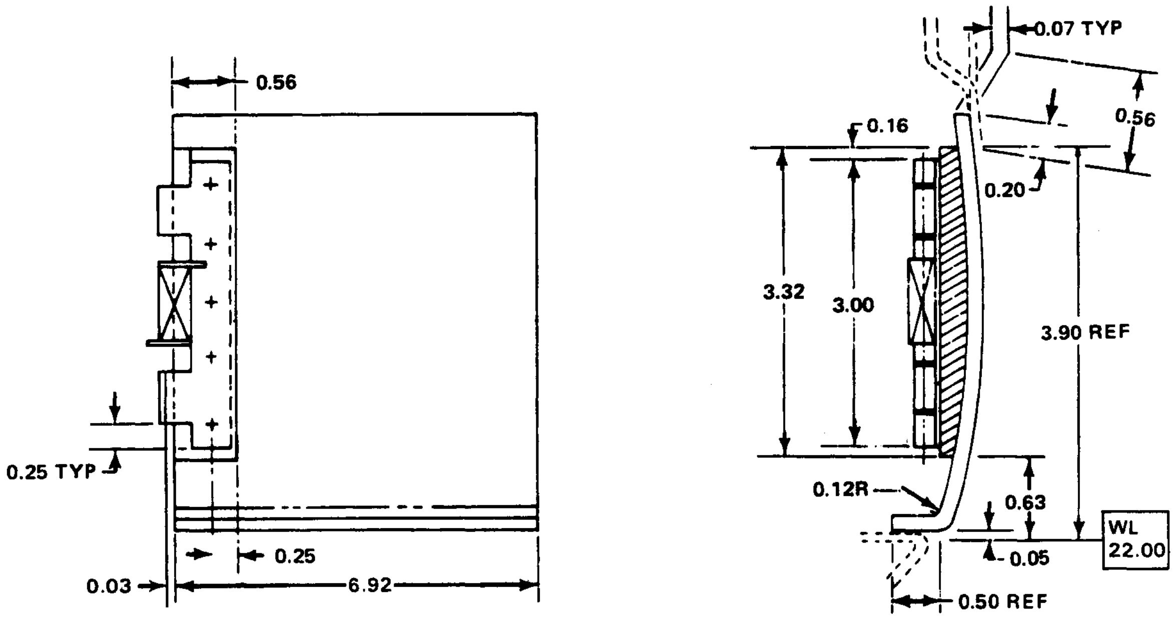


Figure D-126.	**Part Number**	**205-030-028-5, DOOR ASSEMBLY**
		205-030-028-6
		205-030-028-25
		205-030-028-27
	Fabricate From:	**NSN 9535-00-167-2279**
		NSN 9330-00-576-3984
		NSN 5340-00-661-8140
	Material:	**2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick, Hinge Butt, Aluminum Alloy, Make From MS200001P3-7200 Material**



UH-1H-II-M-D-127

Figure D-127. Part Number 205-030-031-7, DOOR ASSEMBLY
Fabricate From: NSN 9535-00-167-2279
NSN 9330-00-579-6453
NSN 5340-00-664-8140
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick,
Plastic Sheet Phenolic, Federal Specification MIL-D-1503S, 0.25 Inch Thick

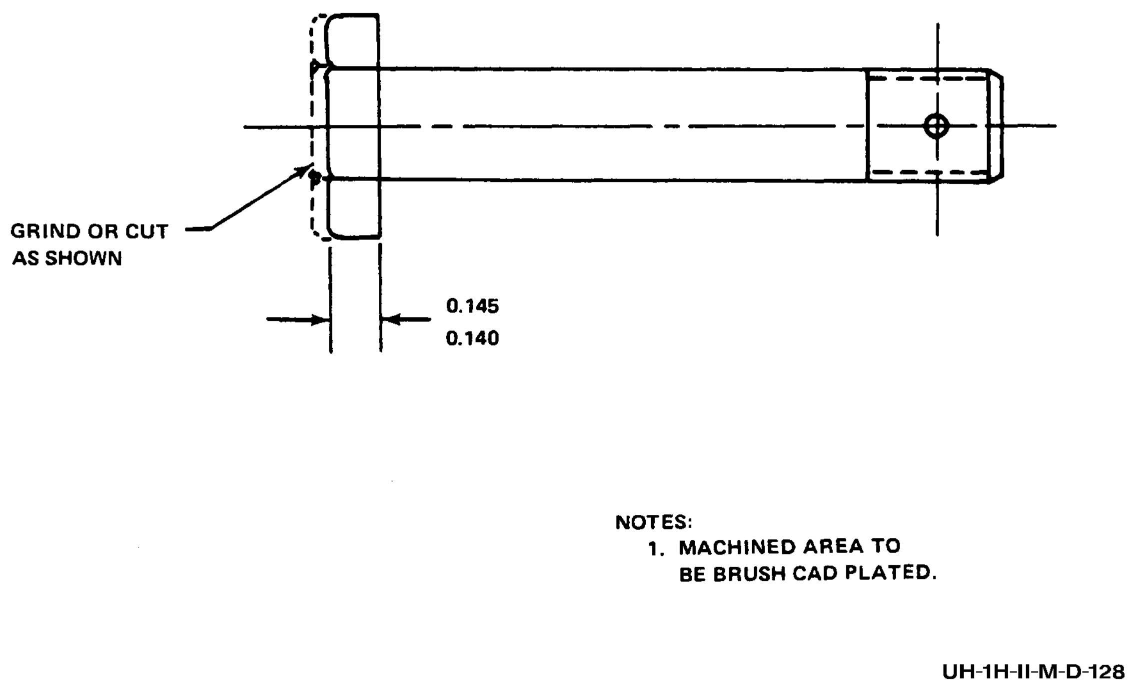
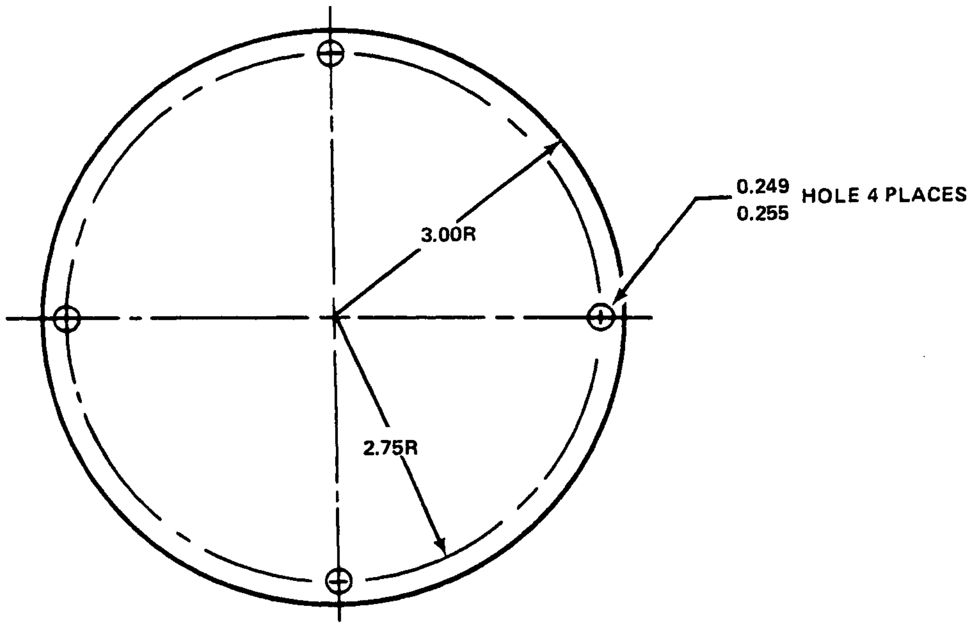


Figure D-128.	Part Number	204-011-461-1, BOLT, SWASHPLATE
	Fabricate From:	NSN 5360-00-639-2277
	Material:	Bolt, Shear, Steel, Make from



UH-1H-II-M-D-129

Figure D-129. Part Number 205-030-247-25 COVER PLATE
Fabricate From: NSN 9533-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

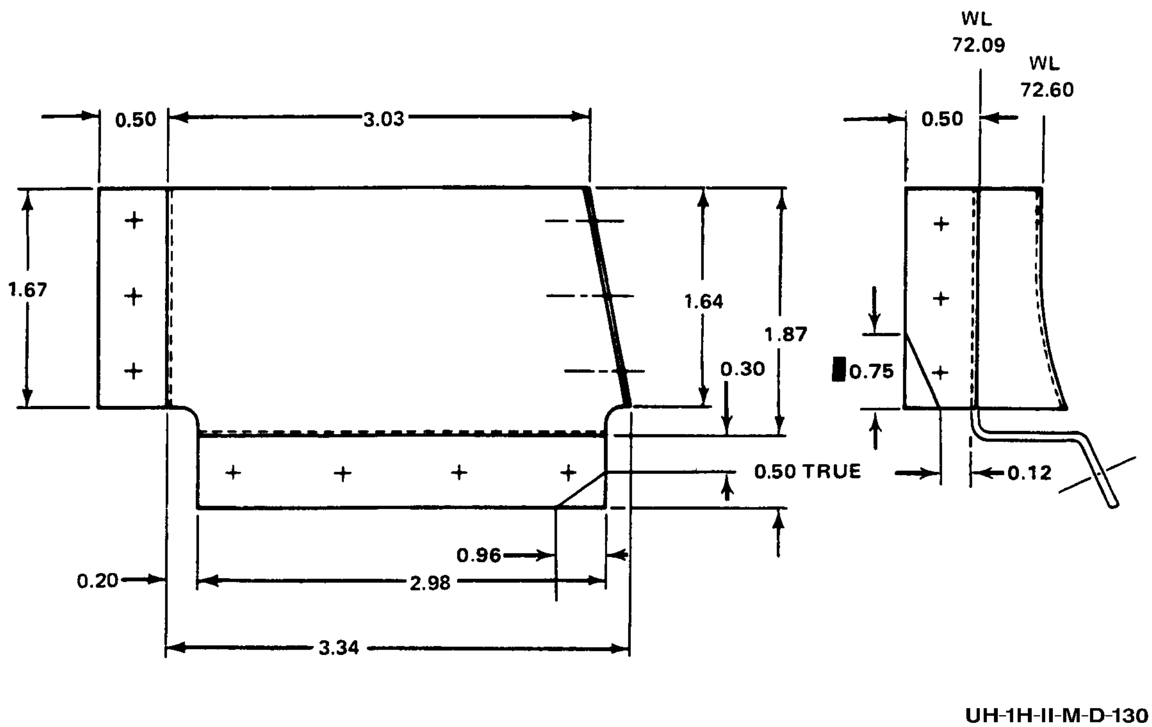
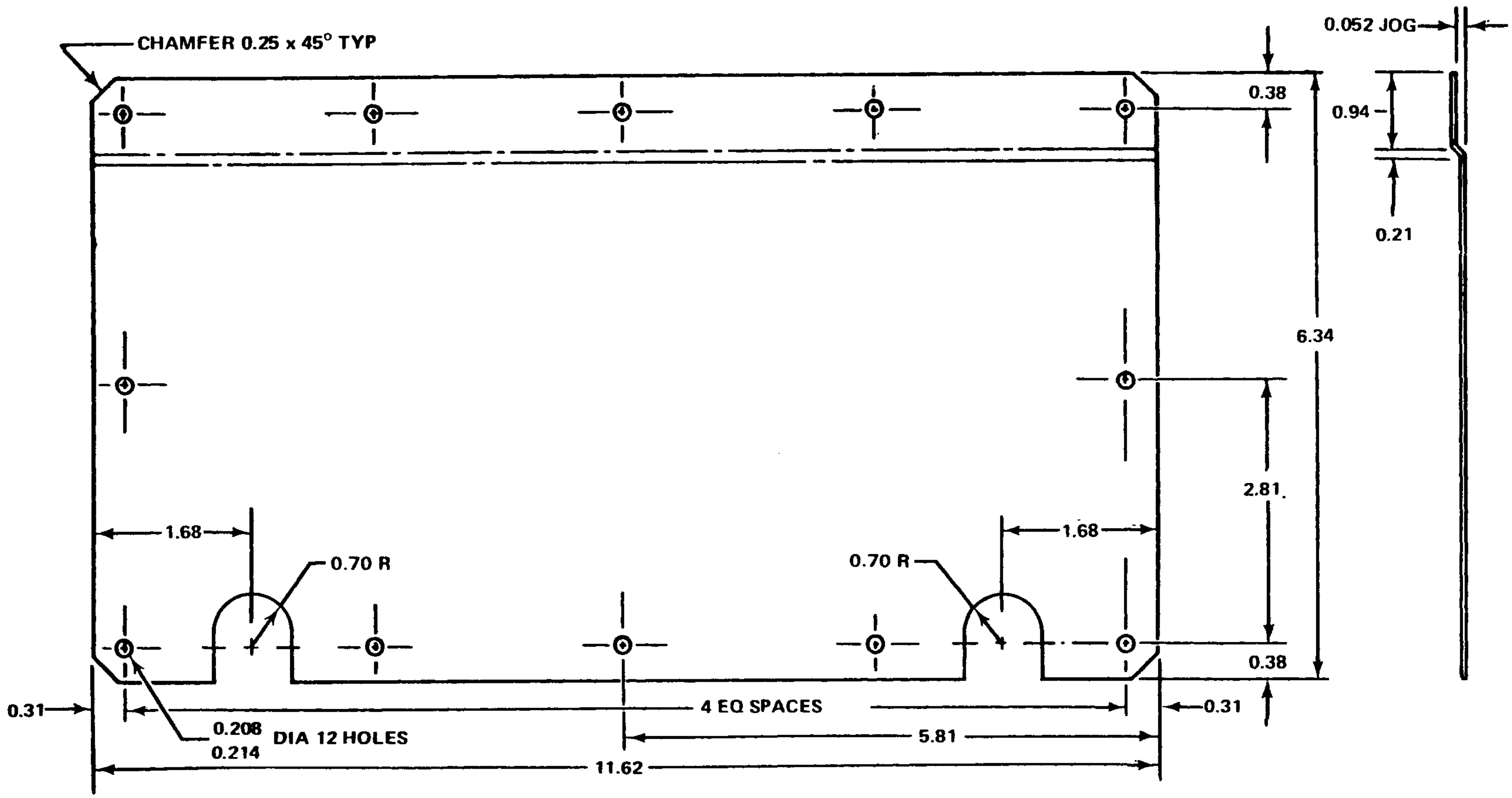
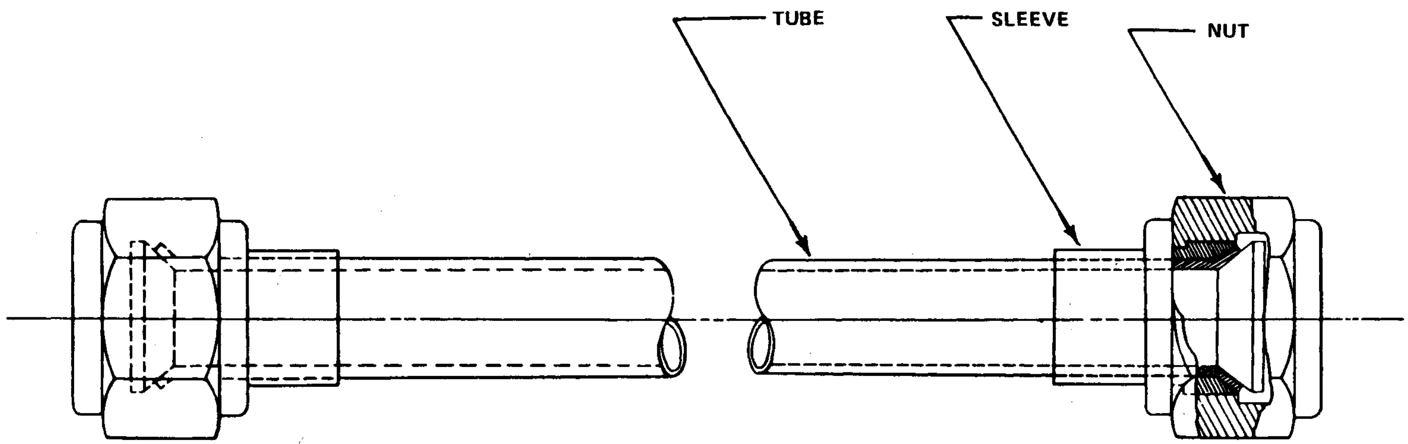


Figure D-130. Part Number 205-030-302-5 & -6, SUPPORT, Stop Cargo Door
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick



UH-1H-II-M-D-131

Figure D-131. Part Number 205-030-309-13, COVER
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

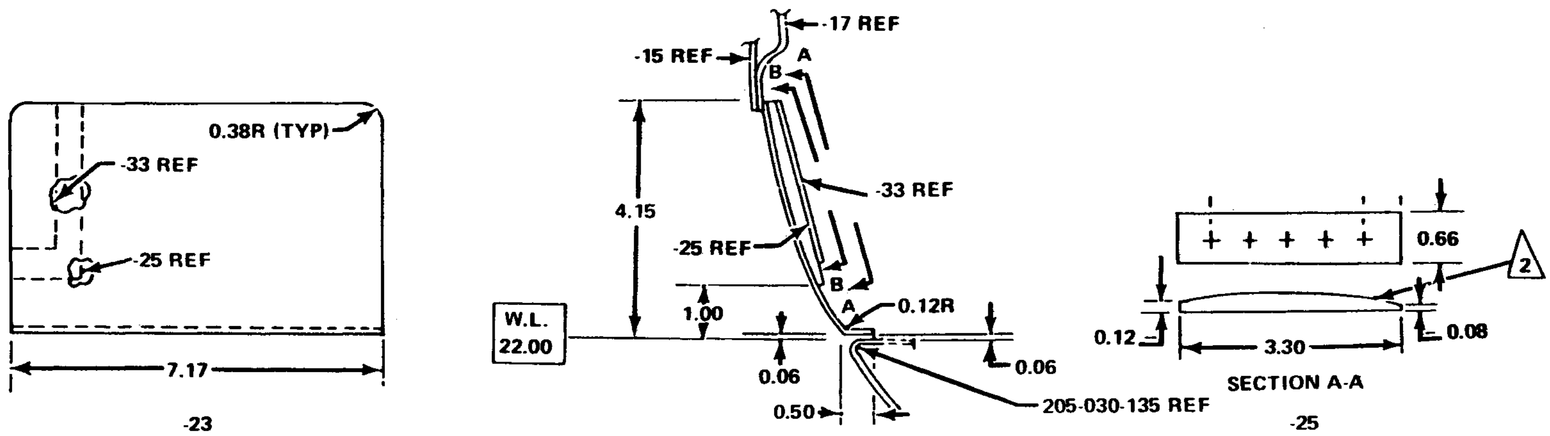


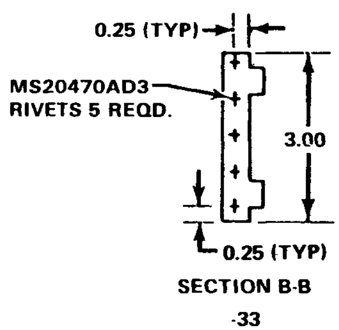
UH-1H-II-M-D-132

Figure D-132. TUBE ASSEMBLY

Fabricate From:

Part Number	Tube NSN	Nut NSN	Sleeve NSN
205-030-431-1	4710-00-279-0955	4730-00-142-2167	4730-00-278-6070
205-030-432-1	4710-00-279-0955	4730-00-142-2167	4730-00-278-6070
205-040-130-1	4710-00-279-0955	4730-00-142-2167	4730-00-278-6070





NOTES:

1. APPLY ONE COAT ZINC CHROMATE PRIMER NSN 8010-00-899-8825 PER TB 746-93-2 FOLLOWING APPLICATION OF CHEMICAL FILM.

2. CONTOUR TO MATCH -23 DOOR.

1	-33	HINGE HALF	2
1	-25	SPACER	3
1	-23	DOOR	1,2
QTY REQ'D		NOMENCLATURE OR DESCRIPTION	NOTES

UH-1H-II-M-D-133

Figure D-133. Part Number 205-030-029-5, DOOR ASSEMBLY

Fabricate From: NSN 9535-00-167-2174
NSN 5340-00-664-8140
NSN 9330-00-260-3807

Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/4, TEMP T3, 0.025 Inch Thick
Hinge, Butt, Aluminum Alloy, Make from MS2000 1P3-7200 Material — MS20257-XP3-400
Plastic Sheet Phenolic, Federal Specification MIL-P-15035, 0.1875 Inch Thick

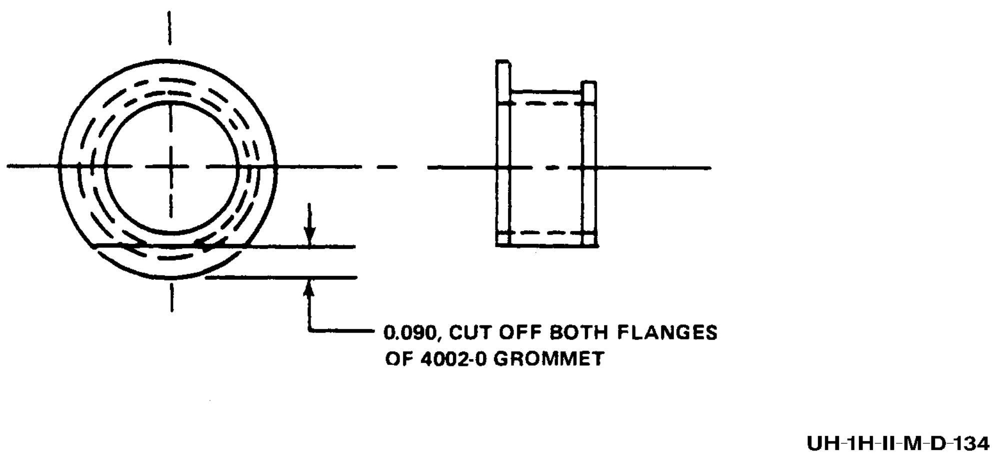
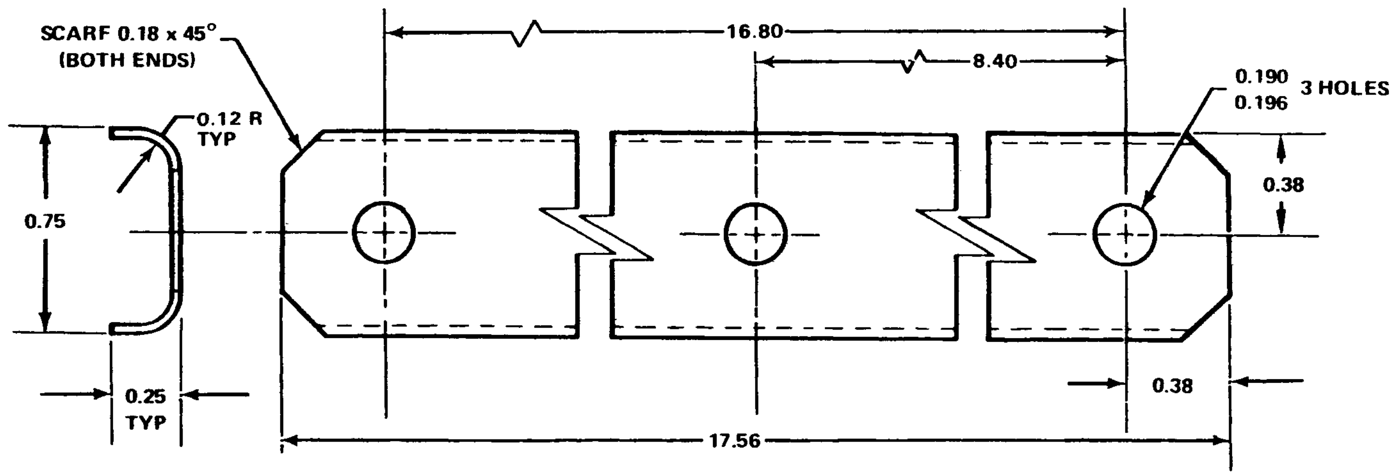


Figure D-134. Part Number 205-060-280-23, GROMMET
Fabricate From: NSN 5325-00-282-7464
Material:



UH-1H-II-M-D-135

Figure D-135. Part Number 205-030-543-15, CHANNEL
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Heat Treat Temp 0 to T42, 0.040 Inch Thick

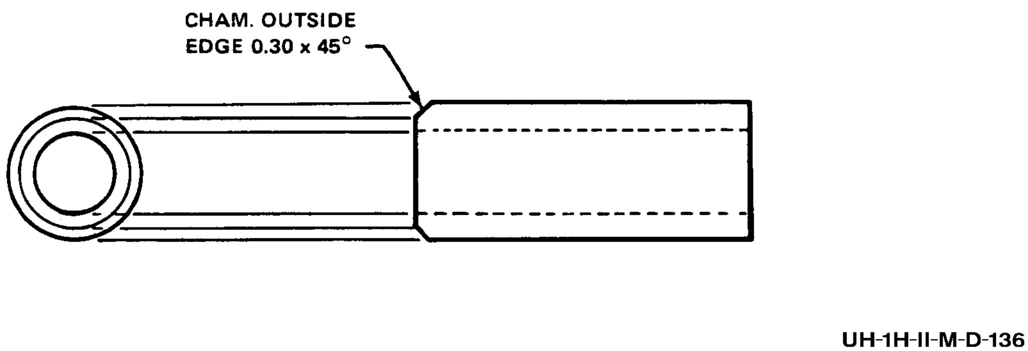
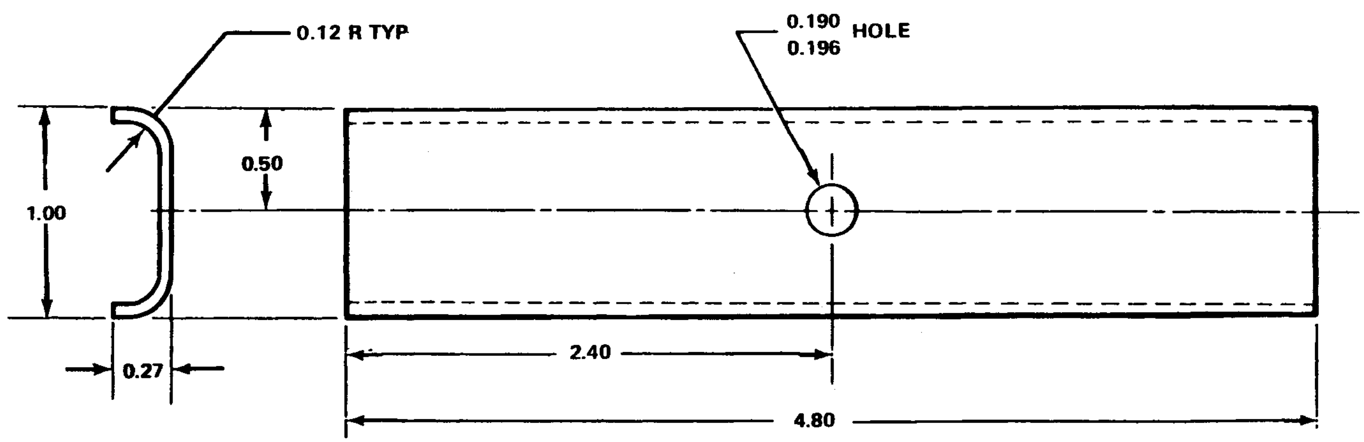


Figure D-136.	**Part Number**	**205-030-543-17, SPACER**
	Fabricate From:	**NSN 5340-00-727-1891**
	Material:	**Spacer, Sleeve, Aluminum Alloy, Make from NAS 43DD3-51 Spacer**



UH-1H-II-M-D-137

Figure D-137. Part Number 205-030-614-13, CHANNEL
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp T3, 0.032 Inch Thick

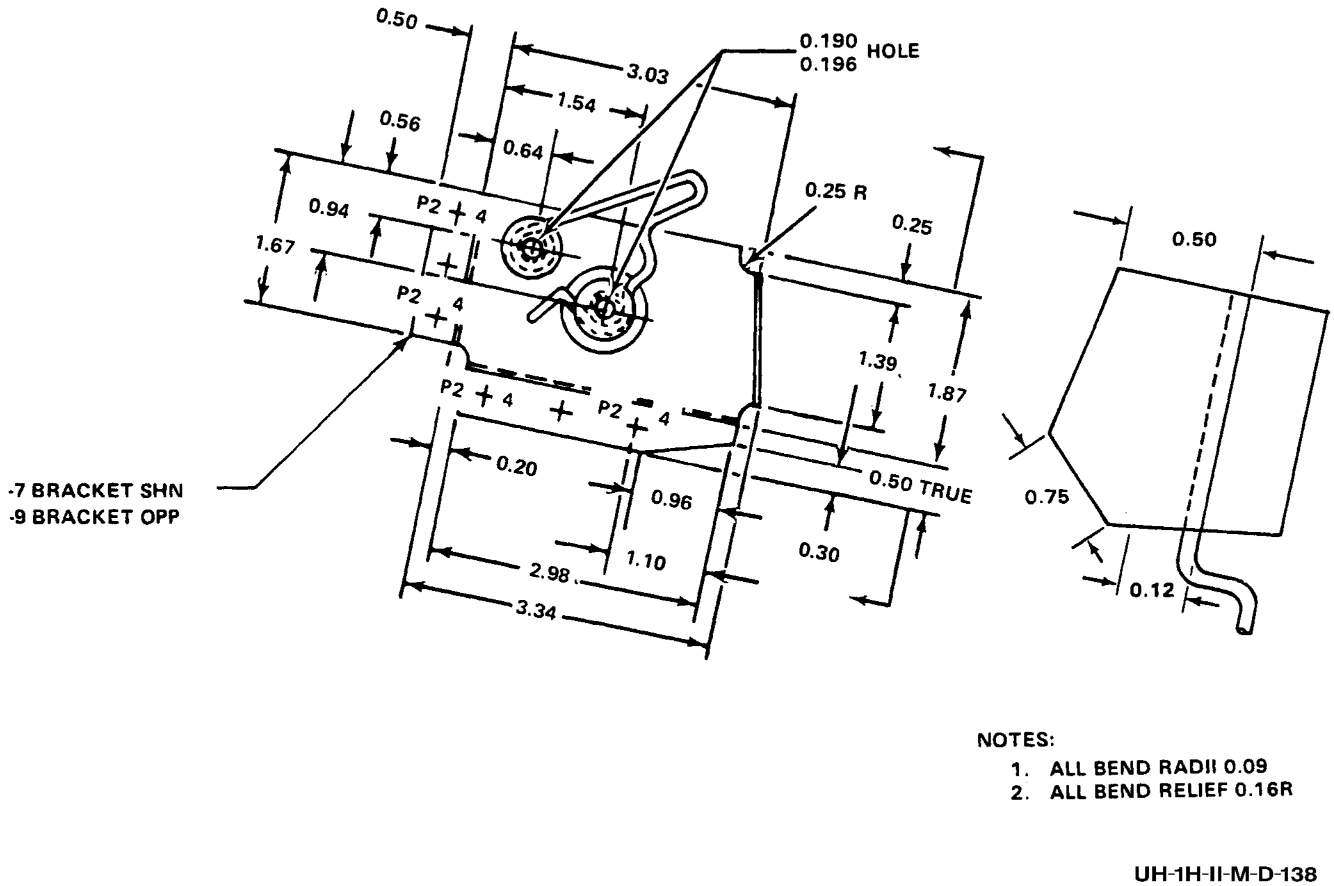
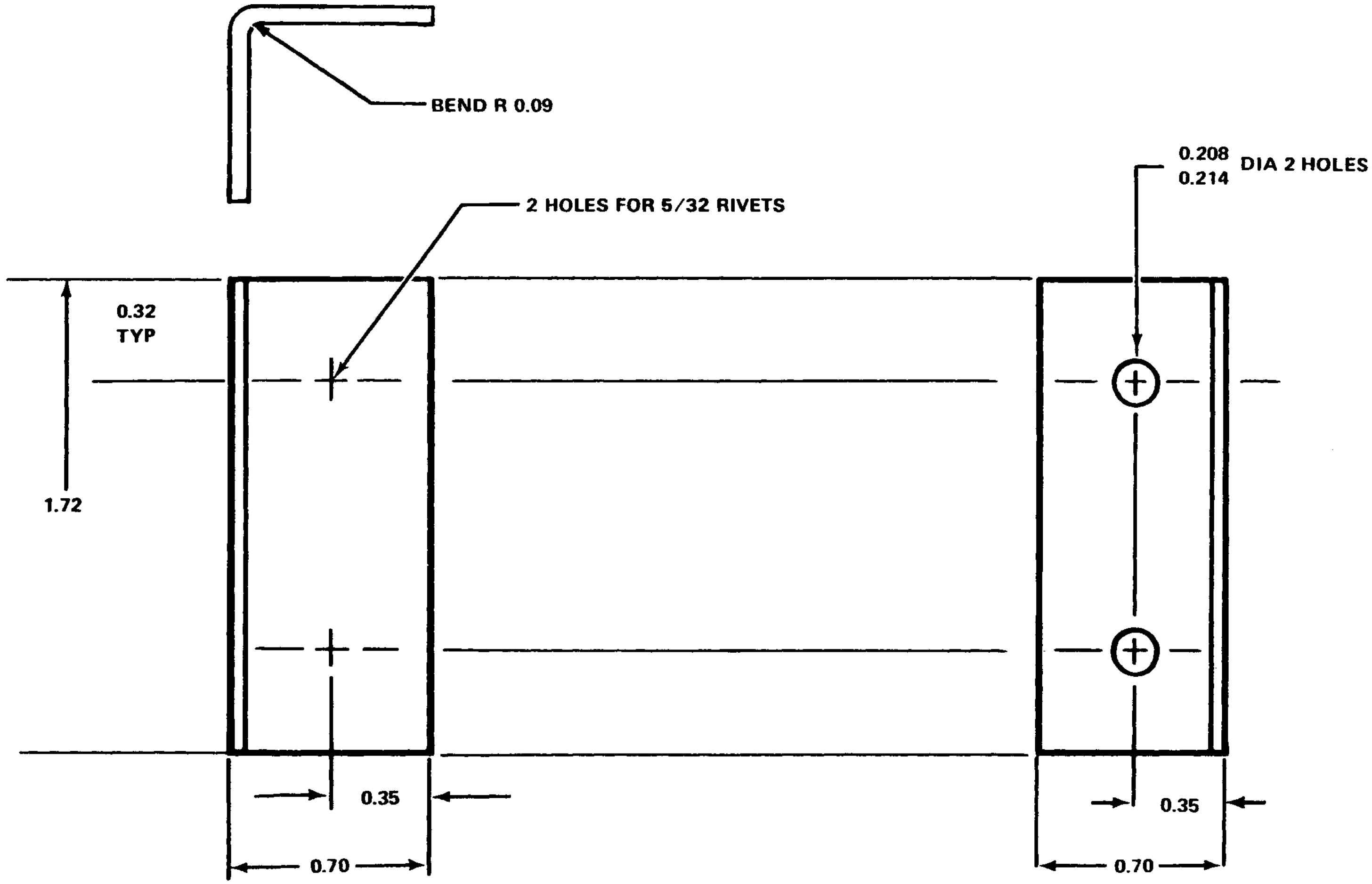


Figure D-138. Part Number 205-030-671-7, BRACKET
205-030-671-9
Fabricate From: NSN 9530-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Heat Treat Temp 0 to T42, 0.040 Inch Thick



UH-1H-II-M-D-139

Figure D-139. Part Number 205-030-737-3, BRACKET
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Heat Treat Temp 0 to T42, 0.040 Inch Thick

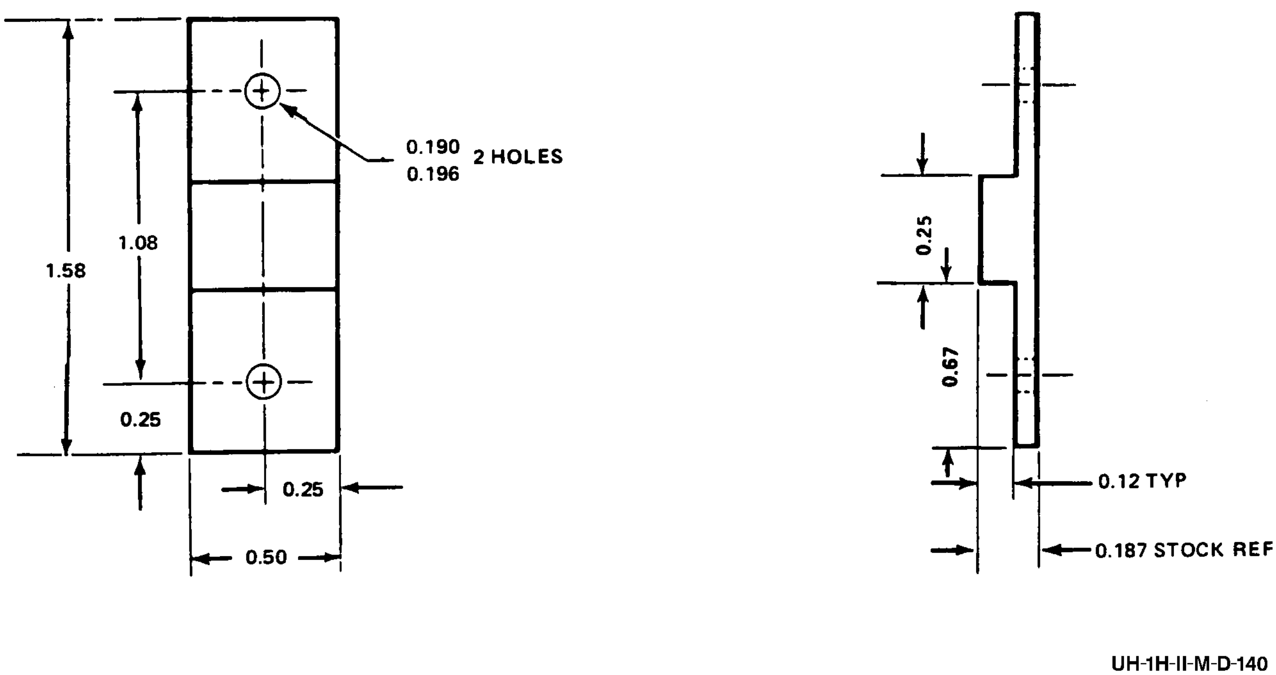


Figure D-140. Part Number 205-030-737-5, SPACER
Fabricate From: NSN 9330-00-576-3984
Material: Phenolic Cotton Fabric, MIL-P-15035, Type FBM, 0.1875 Inch x 0.70 inch x 1.8 inch

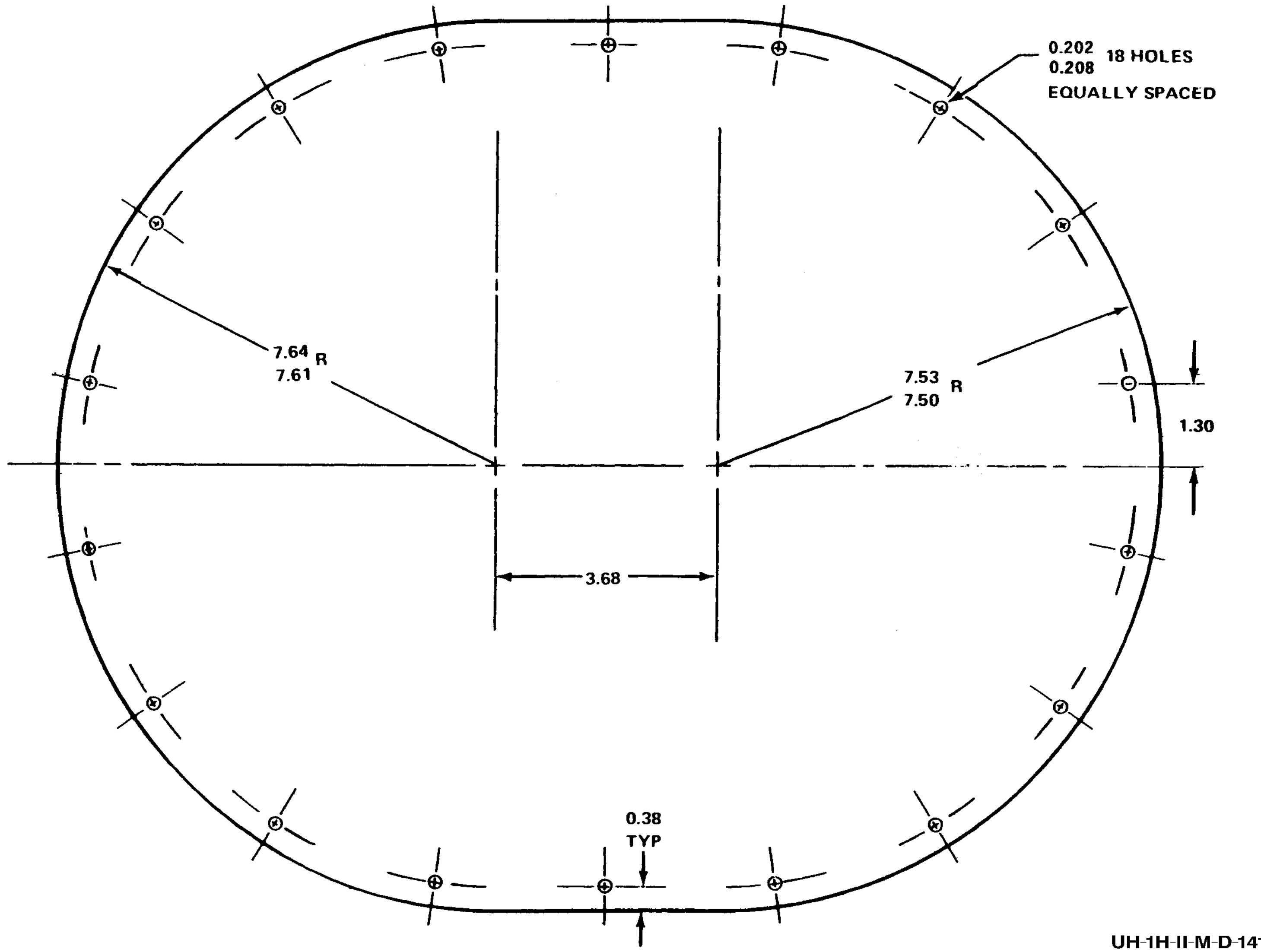


Figure D-141. Part Number 205-030-841-17, DOOR, Boom Access
Fabricate From: NSN 9535-00-167-2279
Material: 7075 AL ALY Sheet, Federal Specification QQ-A-250/13, Temp Heat Treat to T6, 0.032 Inch Thick

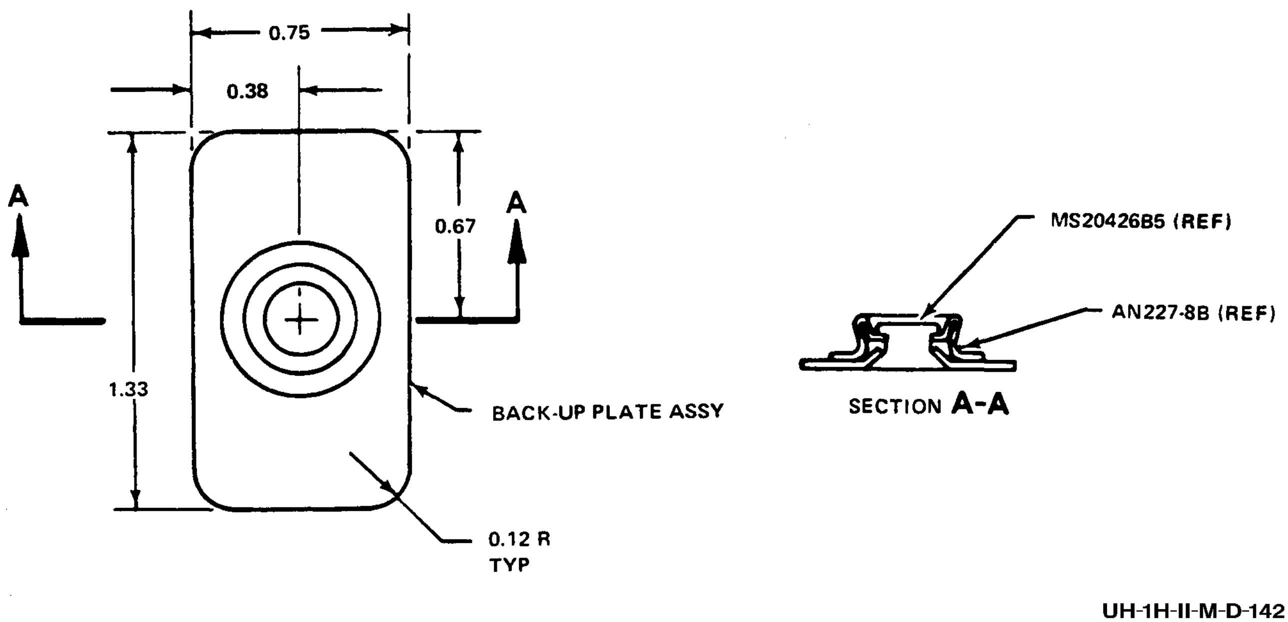


Figure D-142. Part Number 205-030-828-1, BACKUP PLATE ASSY

Fabricate From: NSN 9535-00-167-2279
NSN 5325-00-174-2923

Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick STUD-SNAP FASTENERS, METAL (AN227-80 COLOR BLACK)

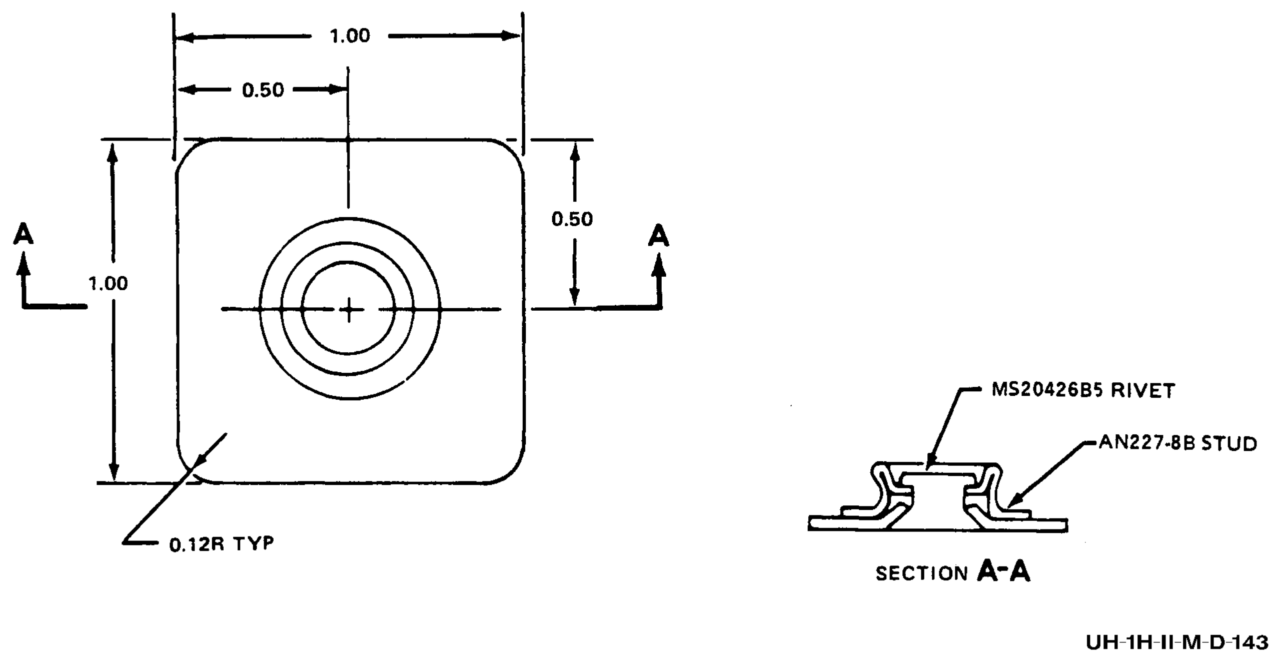


Figure D-143.	**Part Number**	**205-030-828-5, BACKUP PLATE ASSY**
	Fabricate From:	**NSN 9535-00-167-2279** **NSN 5325-00-174-2923**
	Material:	**2024 AL ALY Sheet, Federal Specification QQ-A-250/5, T3, 0.032 Inch Thick STUD-SNAP FASTENERS, METAL (AN227-80 COLOR BLACK)**

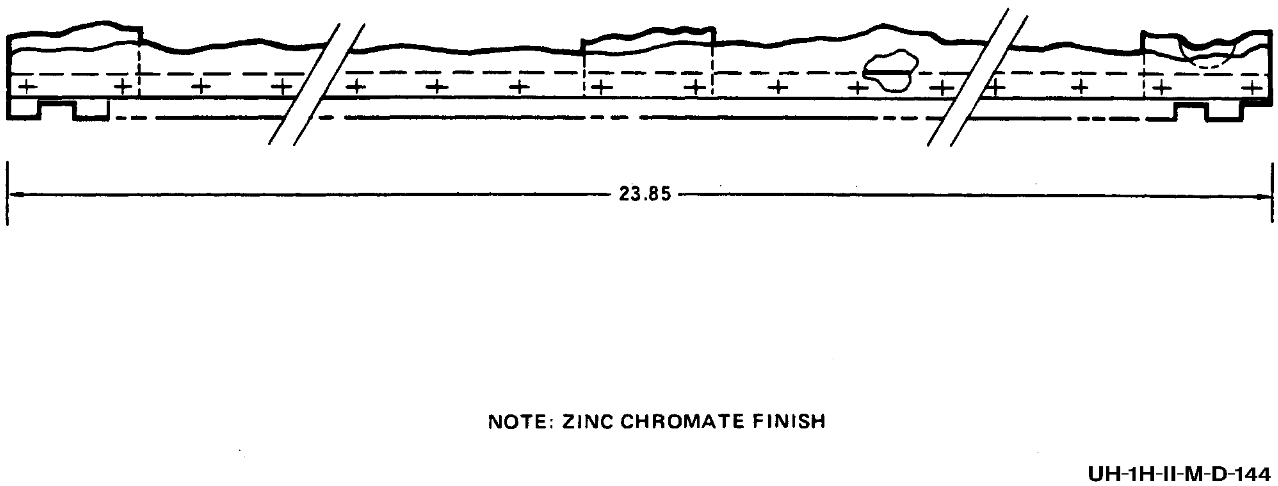


Figure D-144. Part Number 205-030-849-7, HINGE Half
Fabricate From: NSN 5340-00-993-1461
Material: Leaf Butt Hinge, Aluminum, 0.040 Inch Thick, Make from MS20257HP2-2400 Material

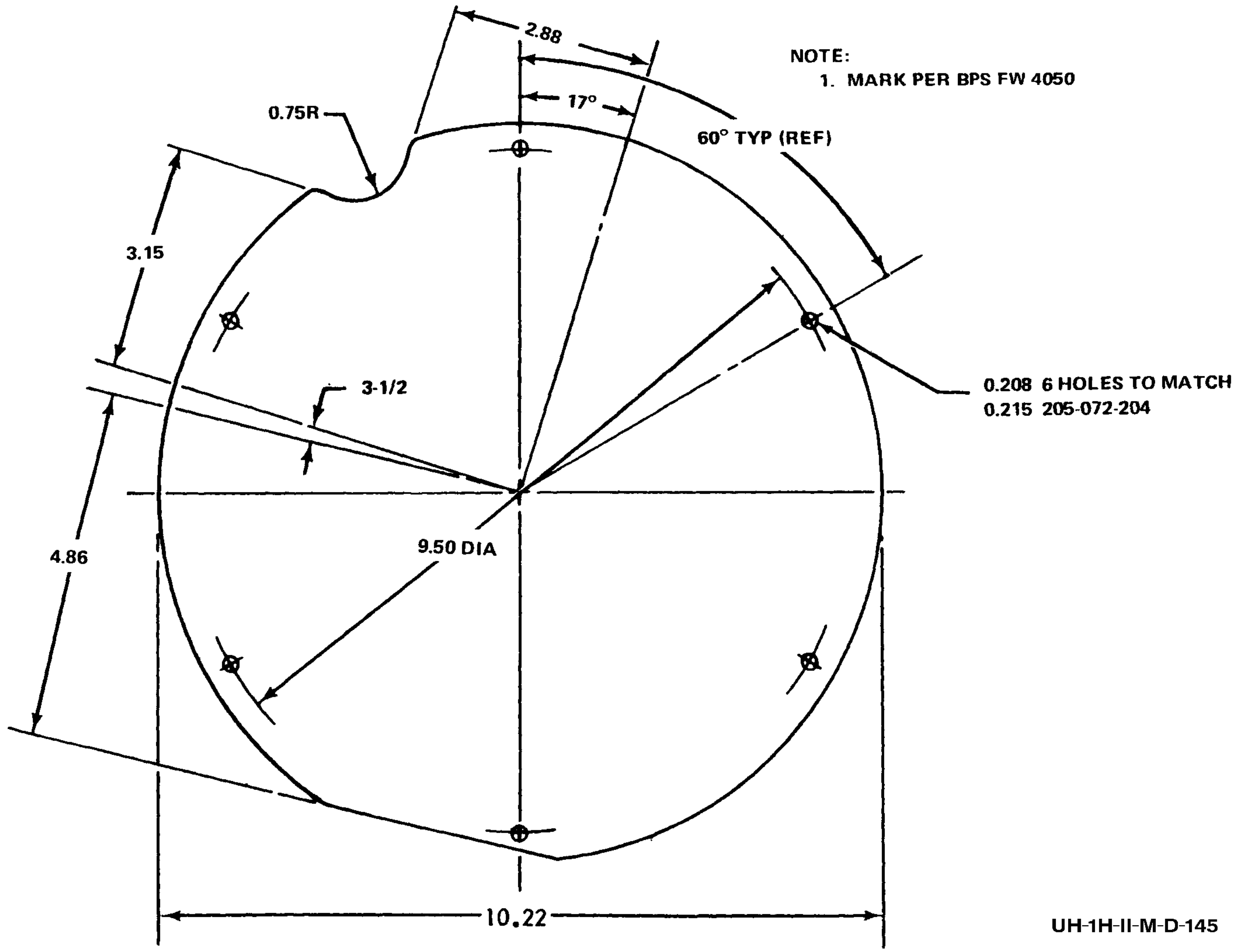


Figure D-145. Part Number 205-031-137-1, COVER, Access Aircraft Components
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

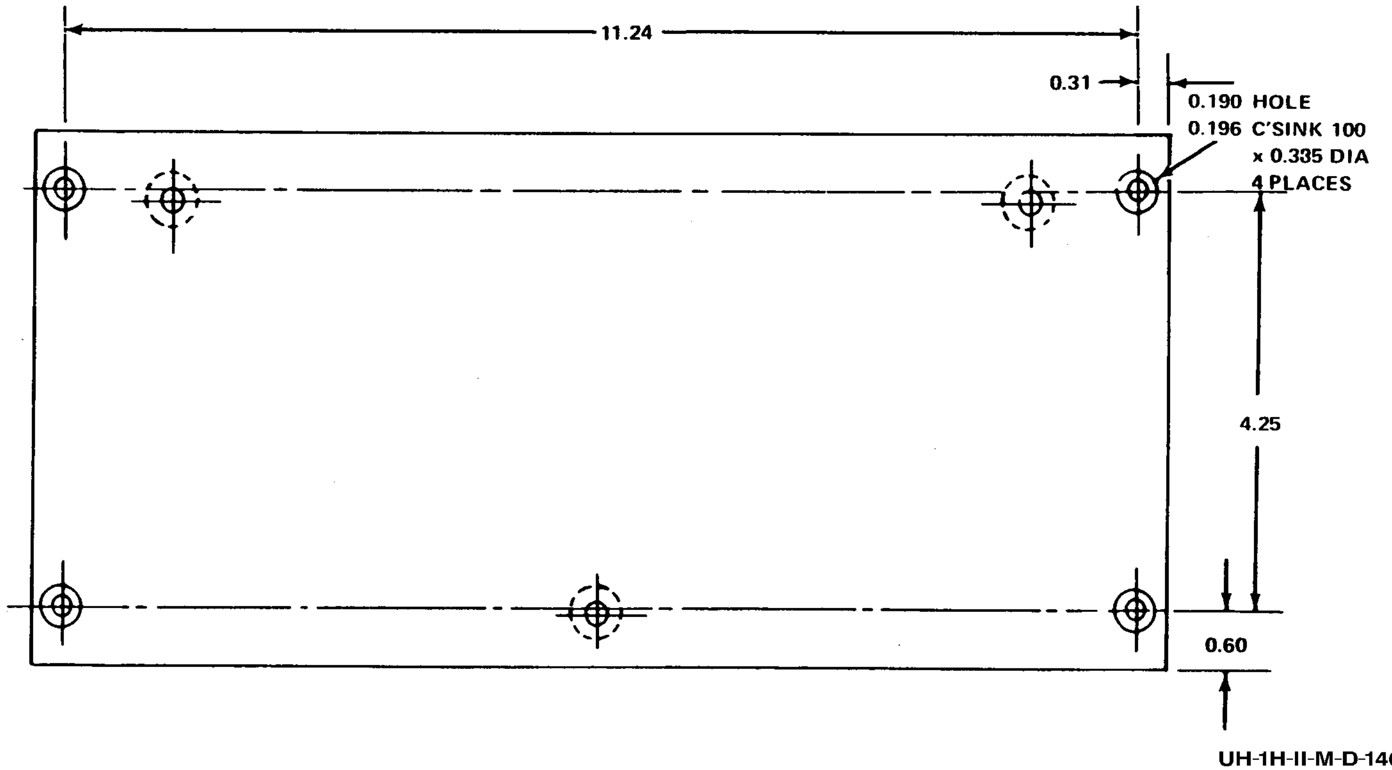


Figure D-146. Part Number 205-031-250-13, BASE PLATE
Fabricate From: NSN 1560-00-903-0798
Material: E9161-BP from Laboratory for Electronics Inc, Boston, Mass., Manufacturing Code 82598

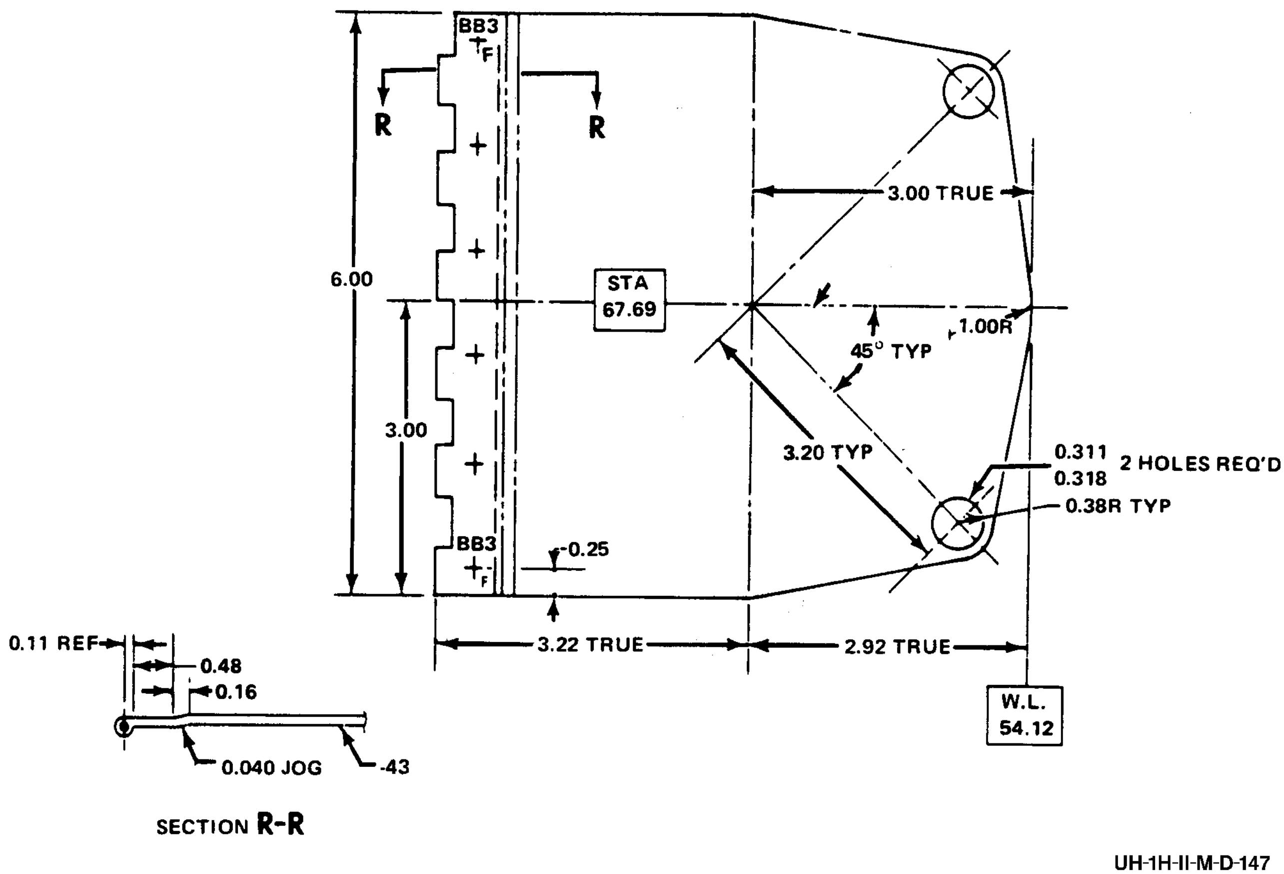
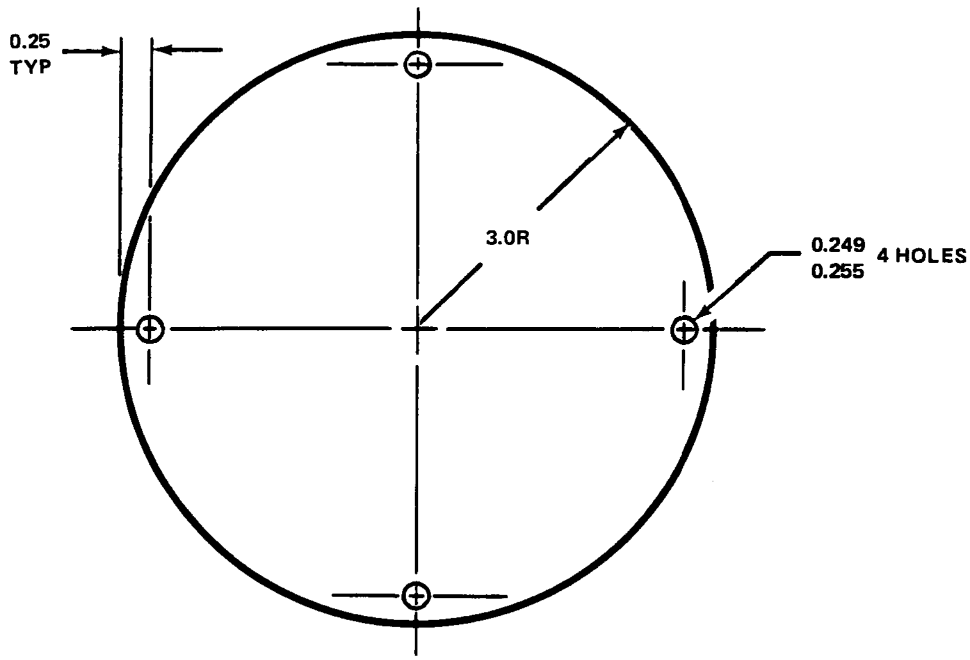


Figure D-147. Part Number 205-031-668-43, DOOR ASSEMBLY
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp T3, 0.025 Inch Thick



UH-1H-II-M-D-148

Figure D-148. Part Number 205-031-668-53, COVER PLATE
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

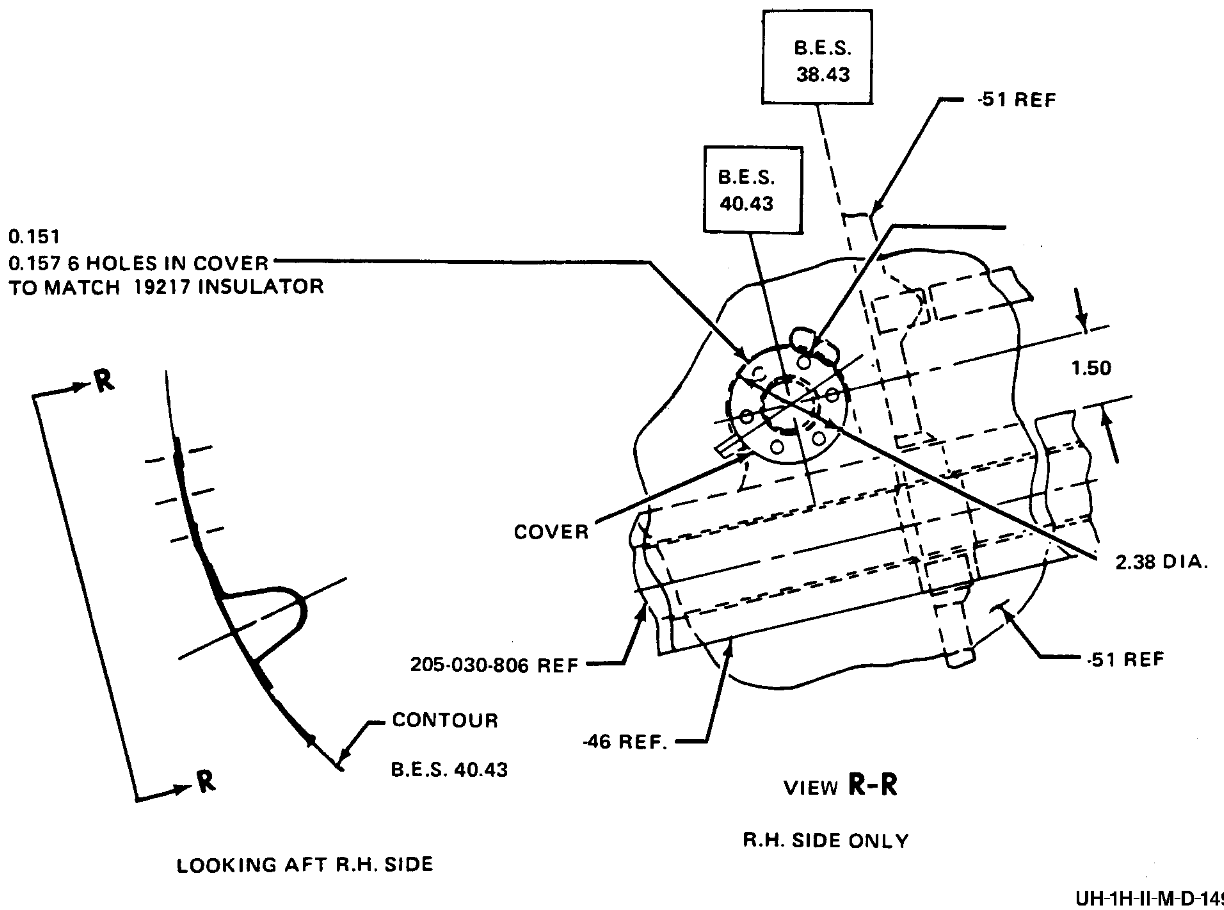


Figure D-149. Part Number 205-031-801-53, COVER, Tail Boom
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp T3, 0.025 Inch Thick

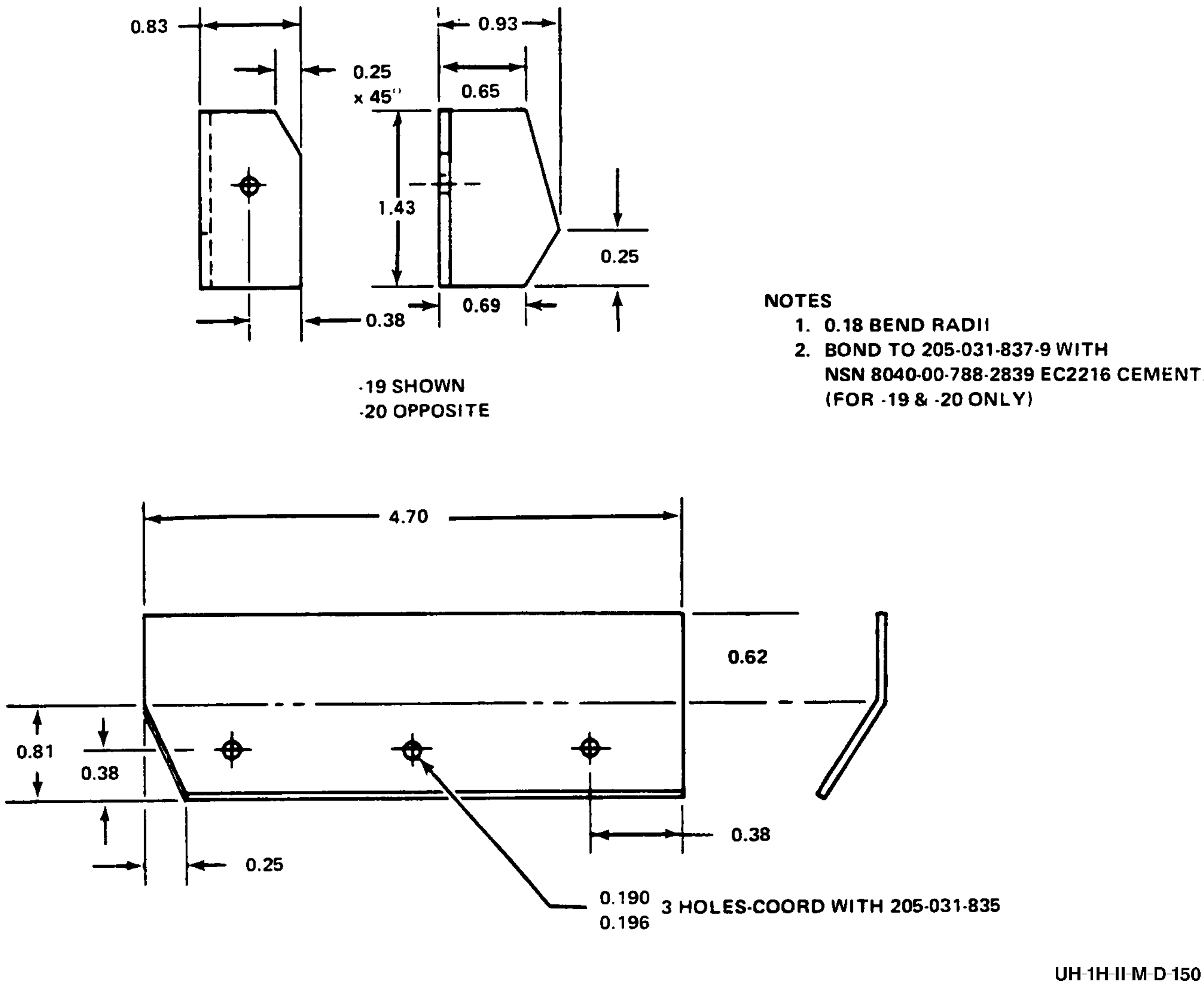
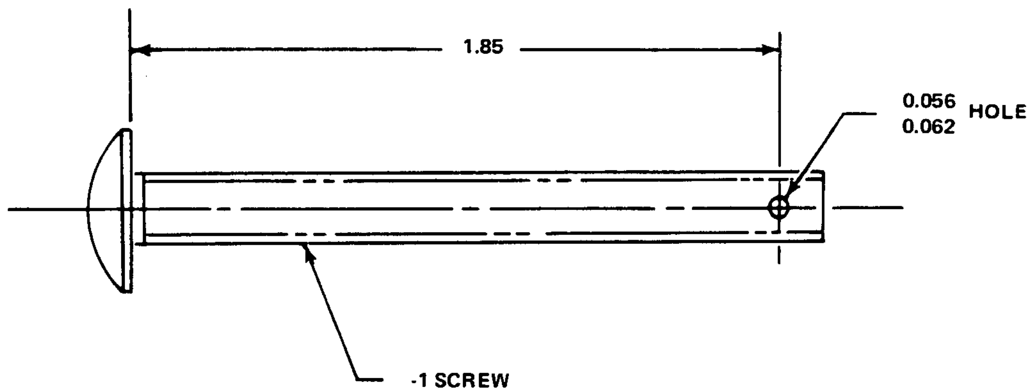


Figure D-150.	Part Number	205-031-837-19, -20, -21, CLIP
	Fabricate From:	NSN 9535-00-554-1412
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp T3, 0.050 Inch Thick



NOTES:
1. MARK PER BPS-FW-4050
2. BRUSH CADMIUM PLATE AFTER DRILLING

UH-1H-II-M-D-151

Figure D-151. Part Number 205-031-898-1, SCREW
Fabricate From: NSN 5305-00-150-9404
Material:

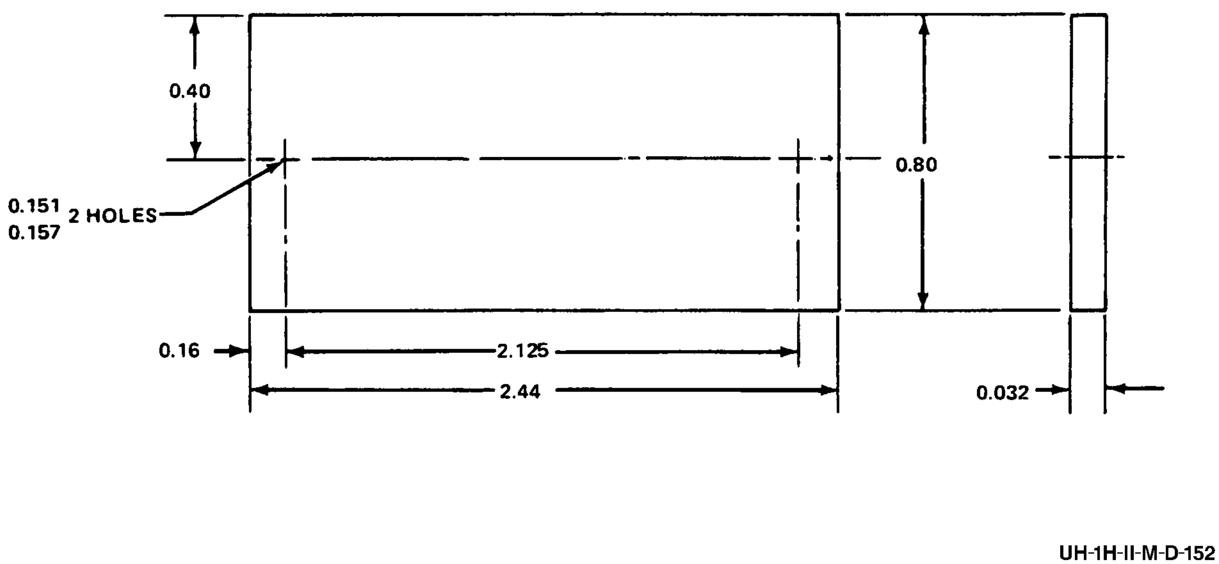


Figure D-152. Part Number 205-031-136-17, COVER
Fabricate From: NSN 9535-00-167-2279
Material: AL ALY Sheet, Federal Specification QQ-A-250/5, Temp T3, 0.032 Inch Thick

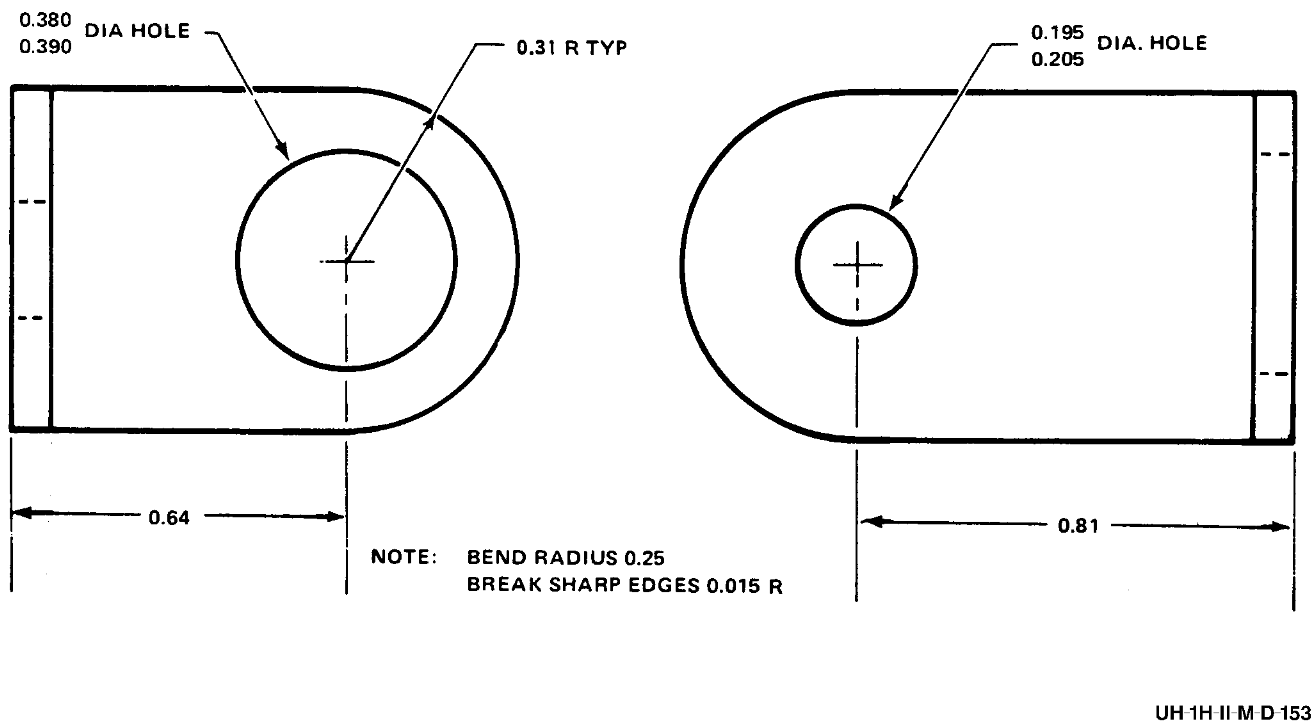
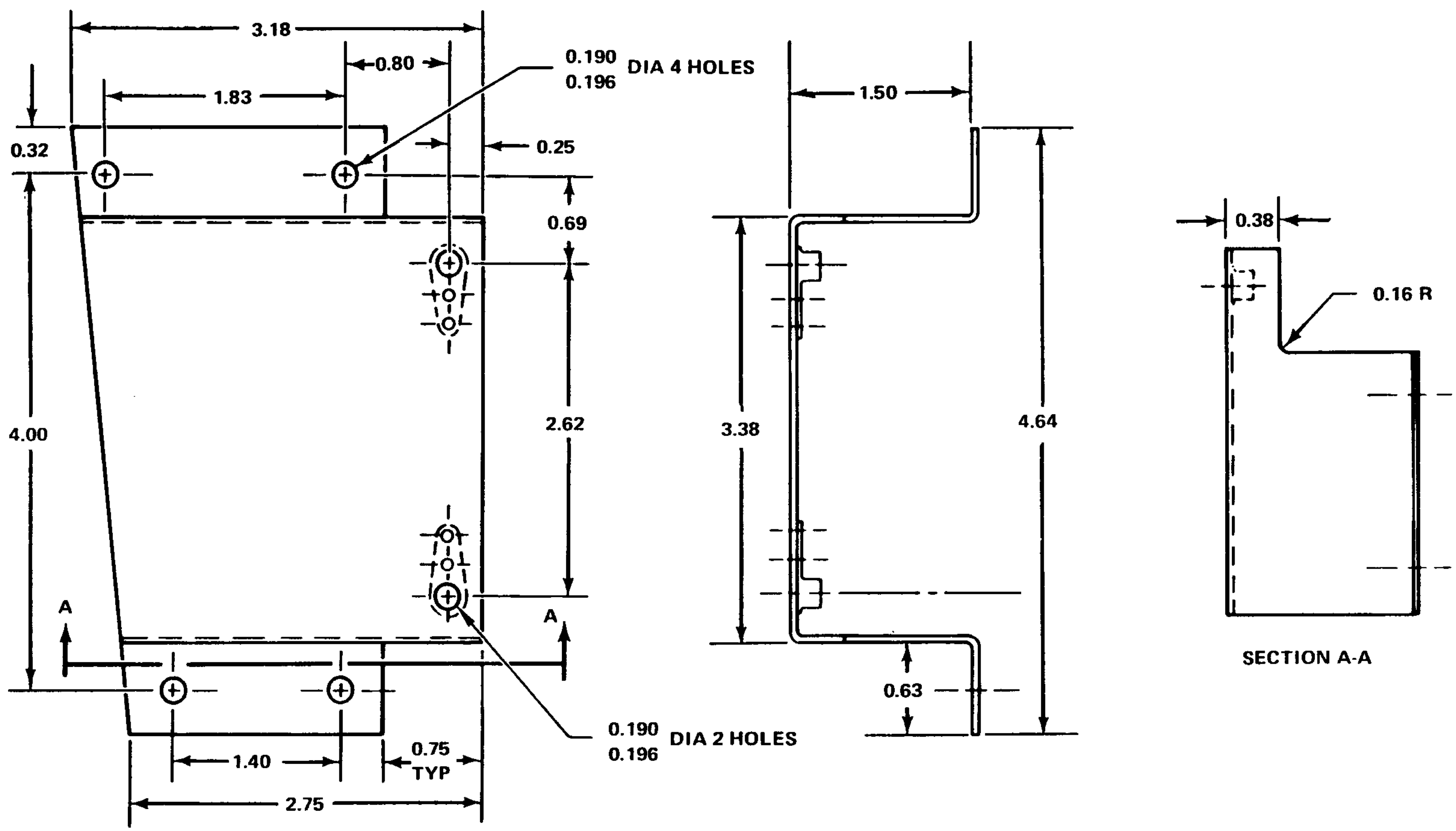


Figure D-153. Part Number 205-040-131-1, BRACKET, Support, Oil Line, Transmission
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



UH-1H-II-M-D-154

Figure D-154. Part Number 205-040-152-1, BRACKET ASSY, Transmission Oil
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

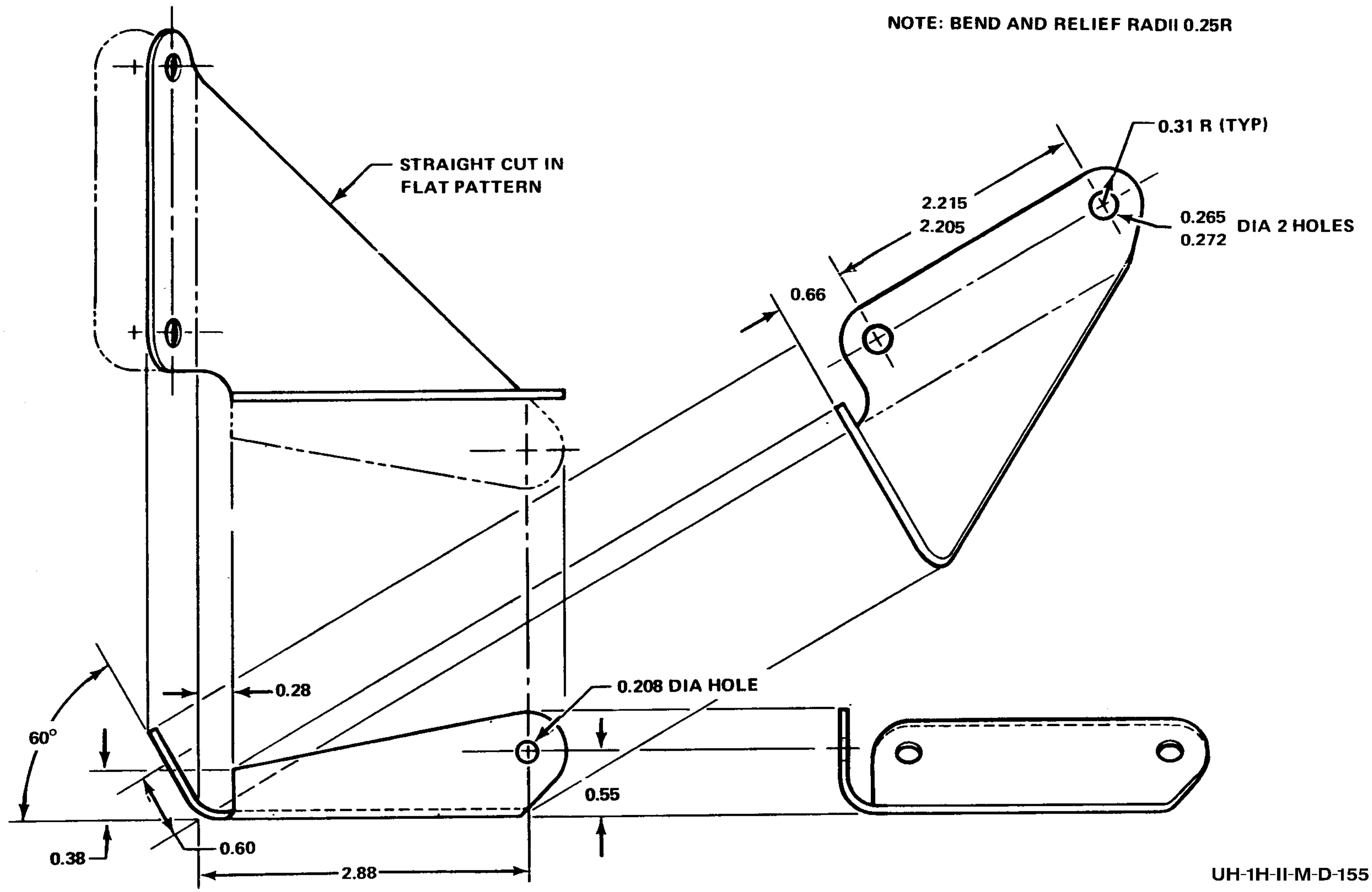


Figure D-155. Part Number 205-040-154-3, BRACKET, Flex Hose Support
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

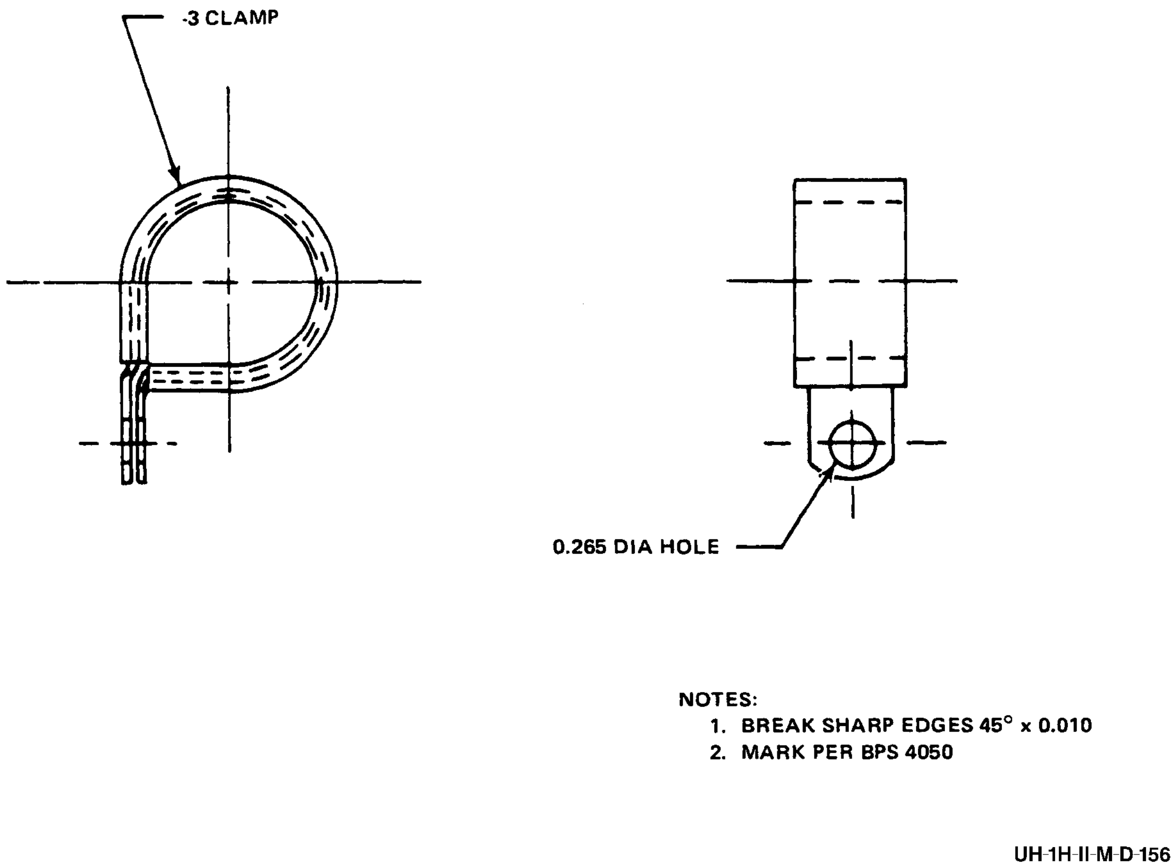
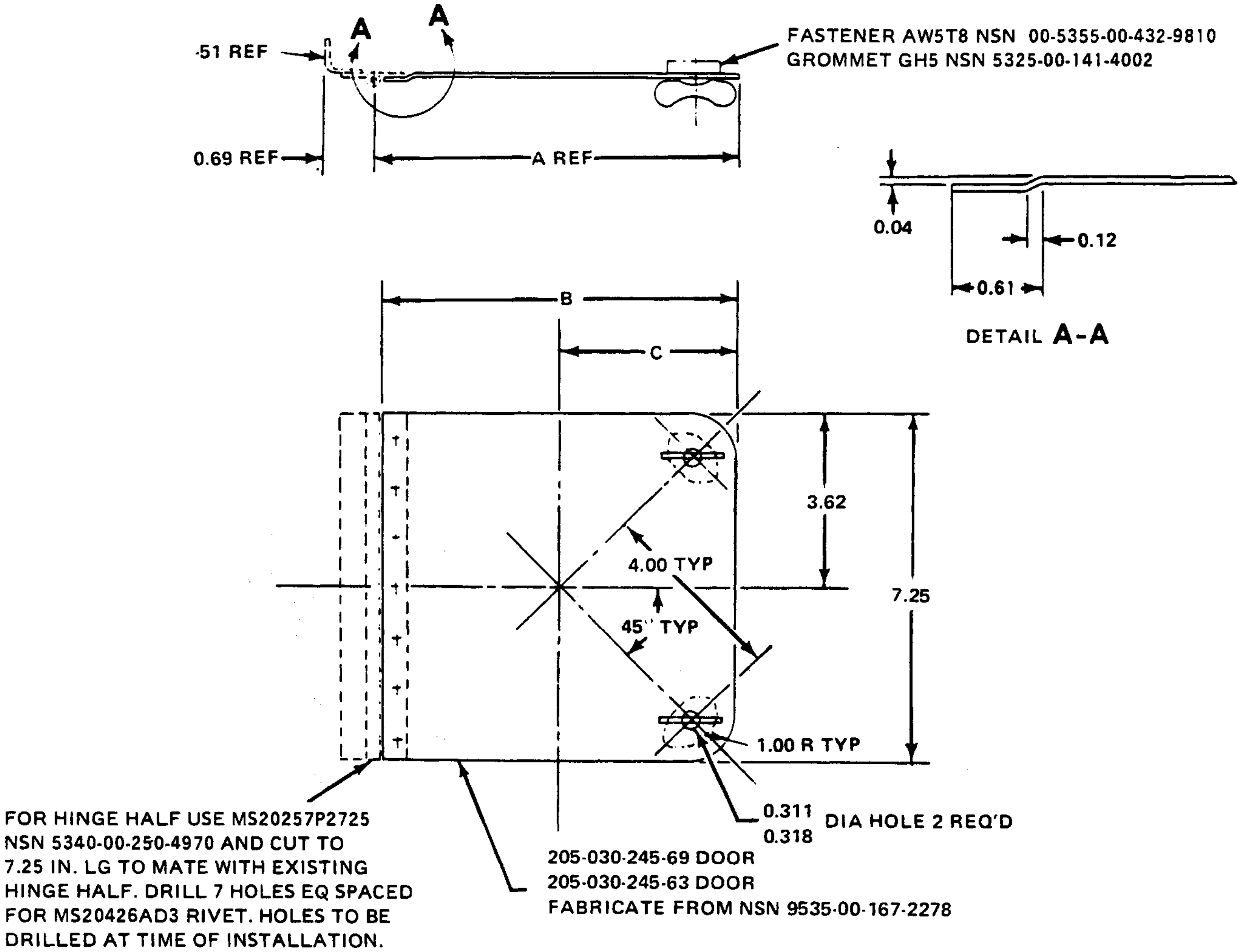


Figure D-156. Part Number 205-040-156-3, CLAMP, Hose
Fabricate From: NSN 5340-00-989-4571
Material:



NOTES:
1. APPLY A CHEMICAL FILM NSN 8030-00-829-0376 TM 55-405-3 MANUAL
2. APPLY 1 COAT ZINC CHROMATE PRIMER NSN 8010-00-899-8825 PER TB 746-93-2, FOLLOWING APPLICATION OF CHEMICAL FILM

PART NUMBER	A	B	C
205-030-245-67	6.97	6.83	3.56
205-030-245-61	7.35	7.24	3.74

UH-1H-II-M-D-157

Figure D-157. DOOR ASSEMBLY

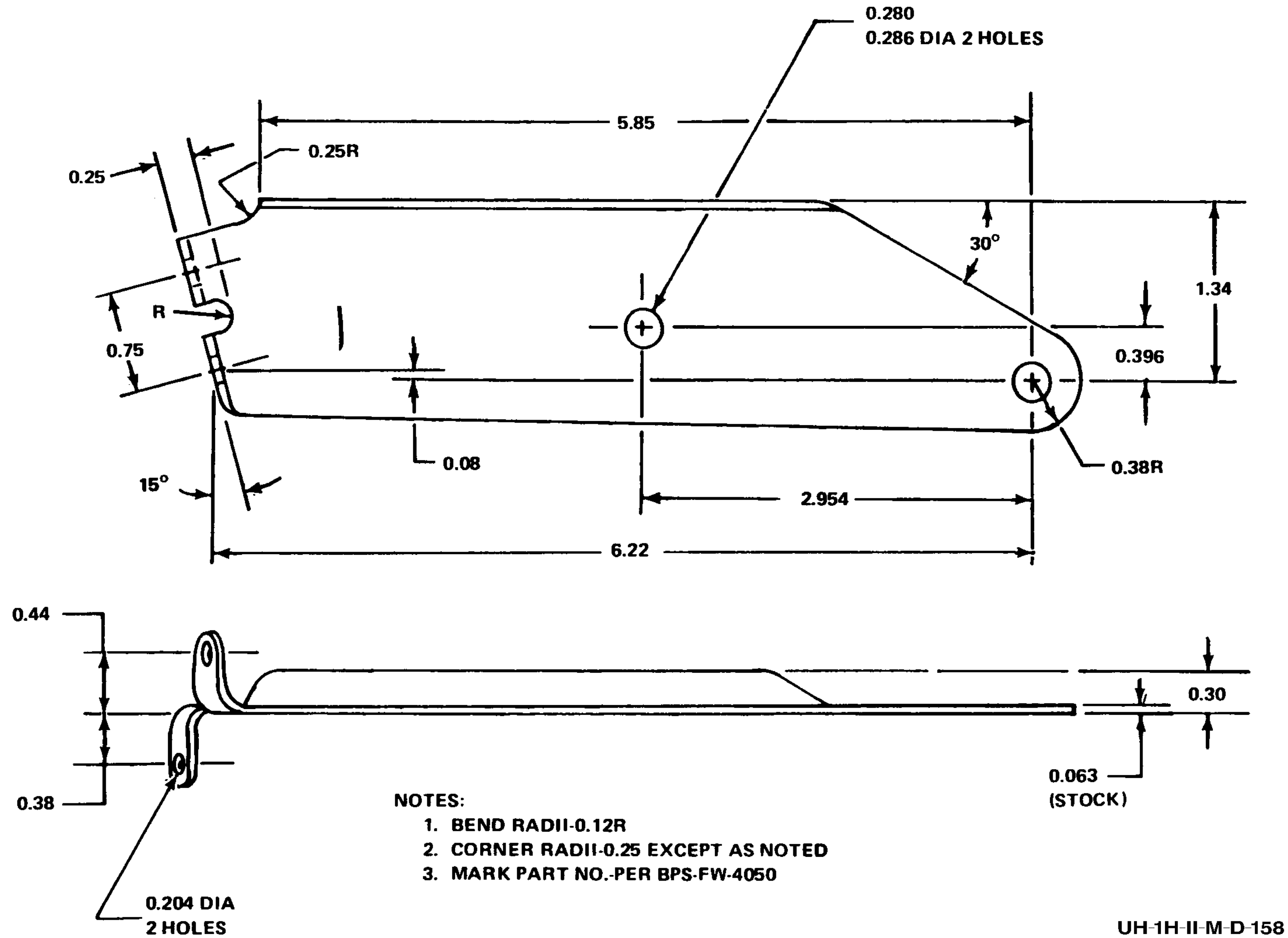


Figure D-158. Part Number 205-040-169-1, BRACKET, Hose Support
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

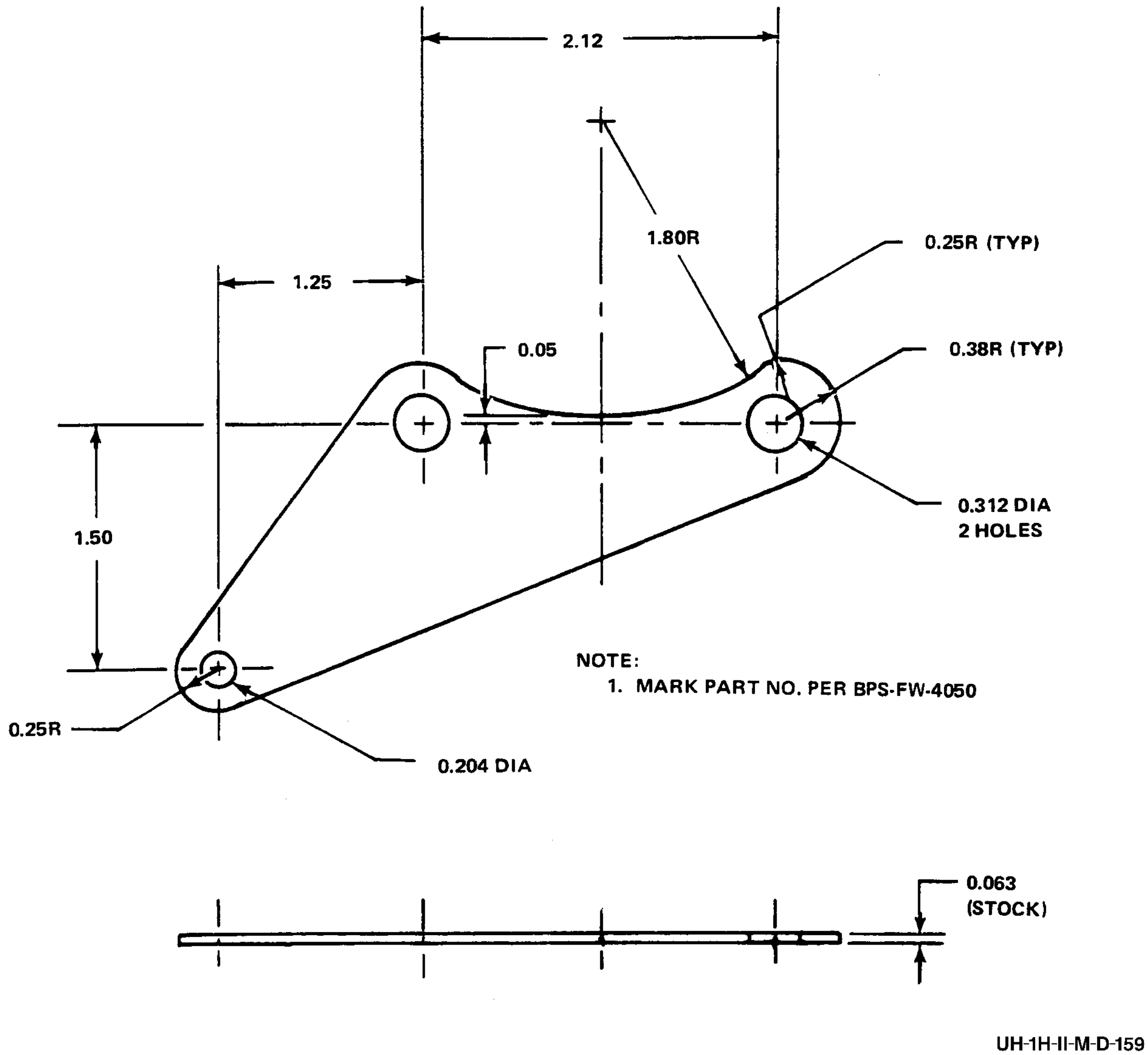
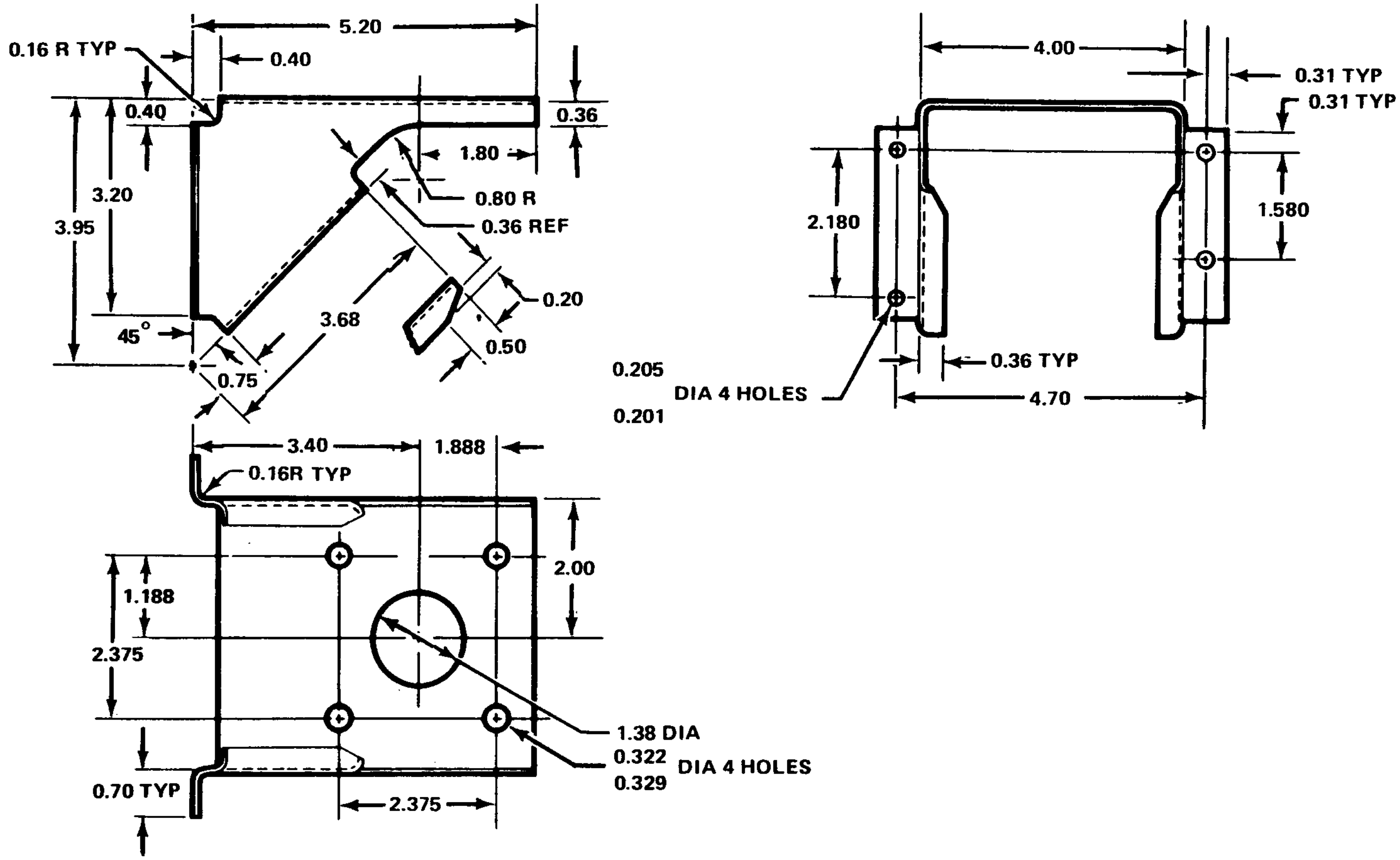


Figure D-159. Part Number 205-040-170-1, BRACKET, Hose Support
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



UH-1H-II-M-D-160

Figure D-160. Part Number 205-040-202-1, BRACKET, Transmission Oil Filter
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick

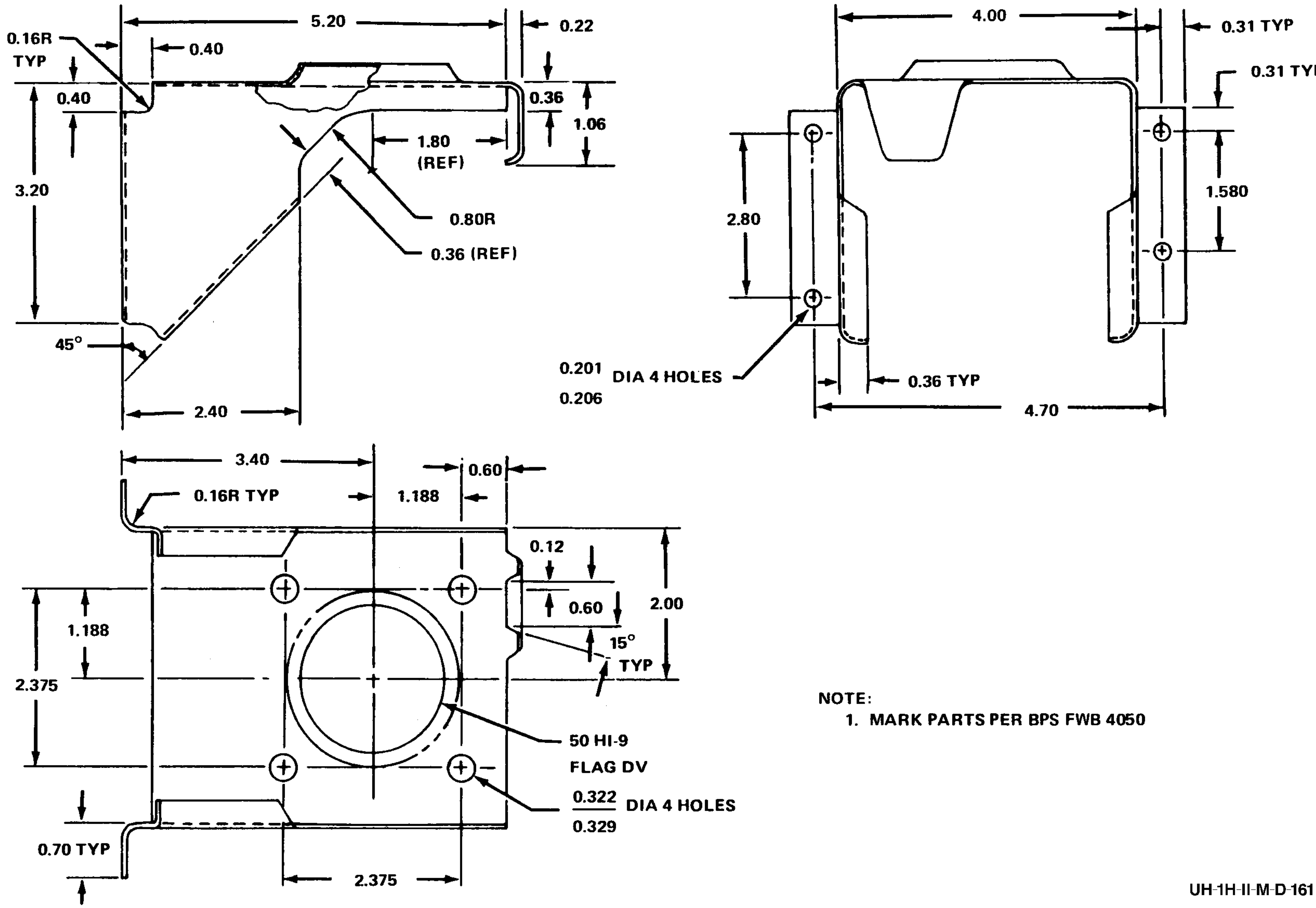


Figure D-161. Part Number 205-040-202-3, BRACKET, Transmission Oil Filter
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick

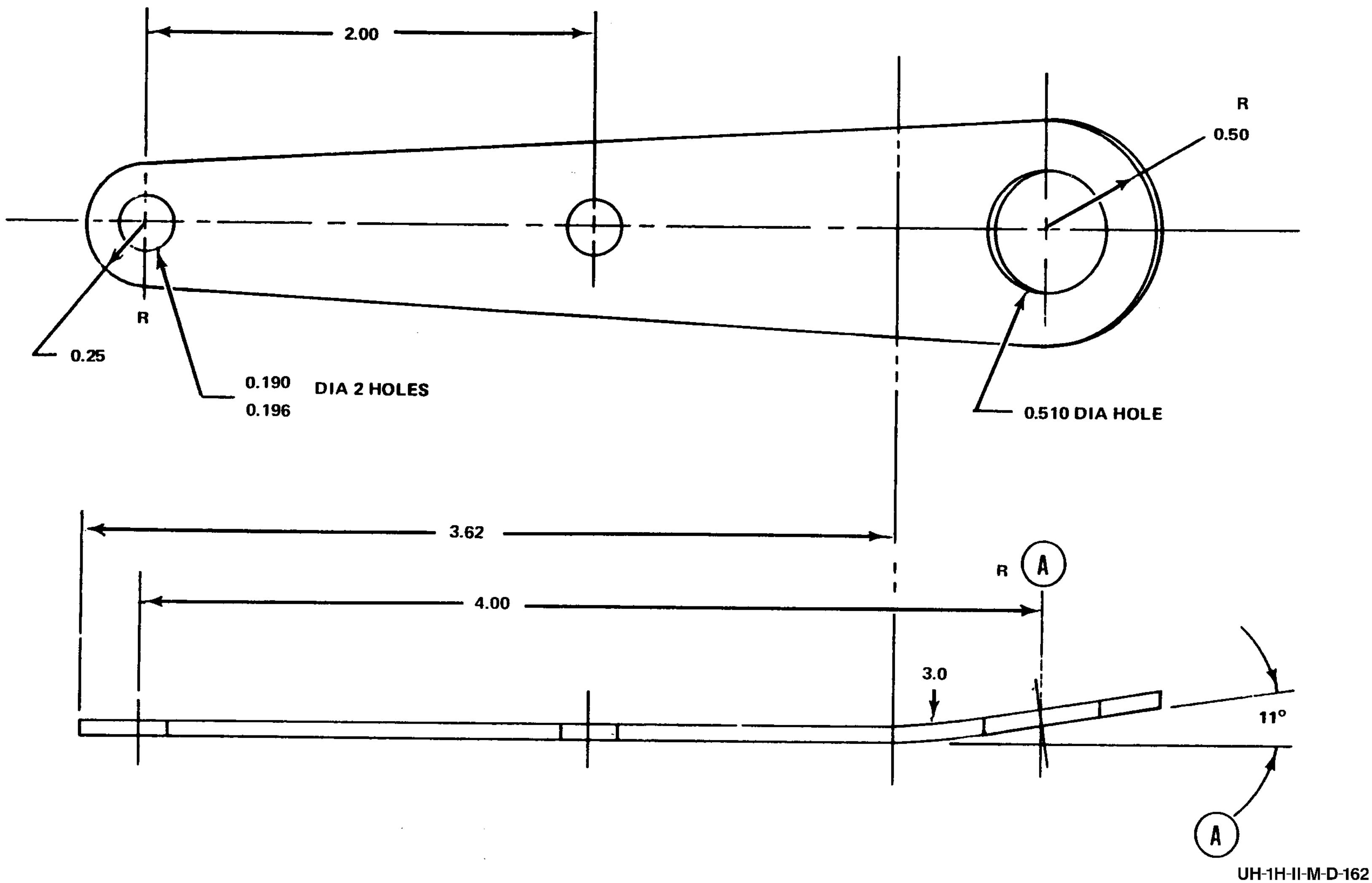


Figure D-162. Part Number 205-060-020-7, BRACKET
Fabricate From: NSN 9535-00-232-0405
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.090 Inch Thick

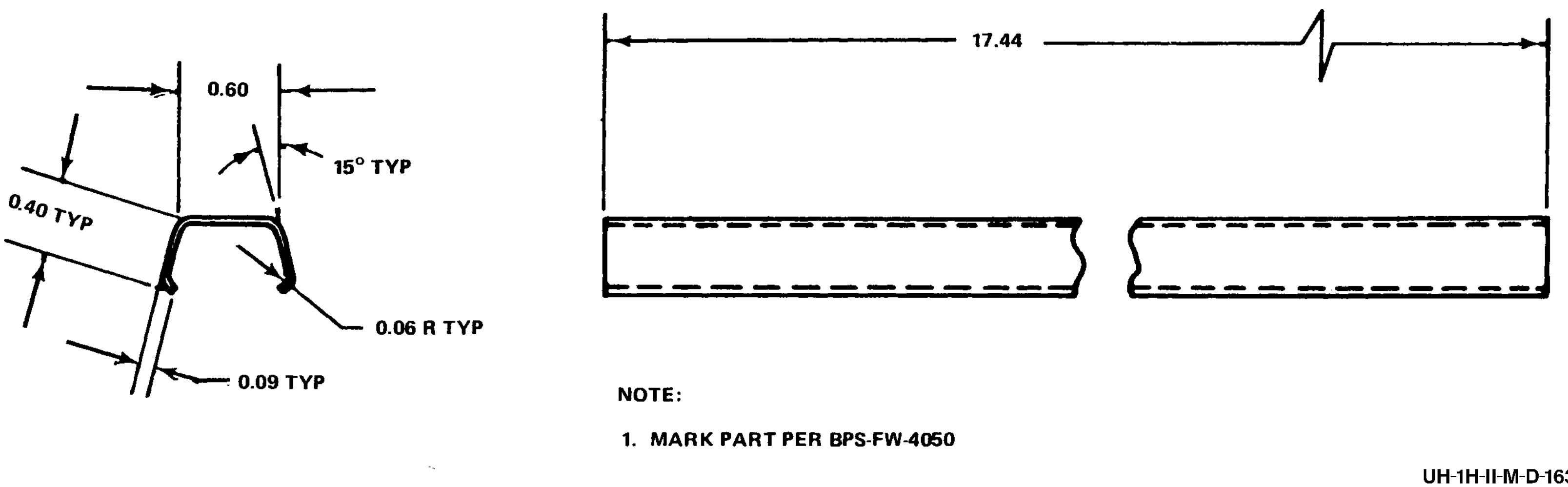
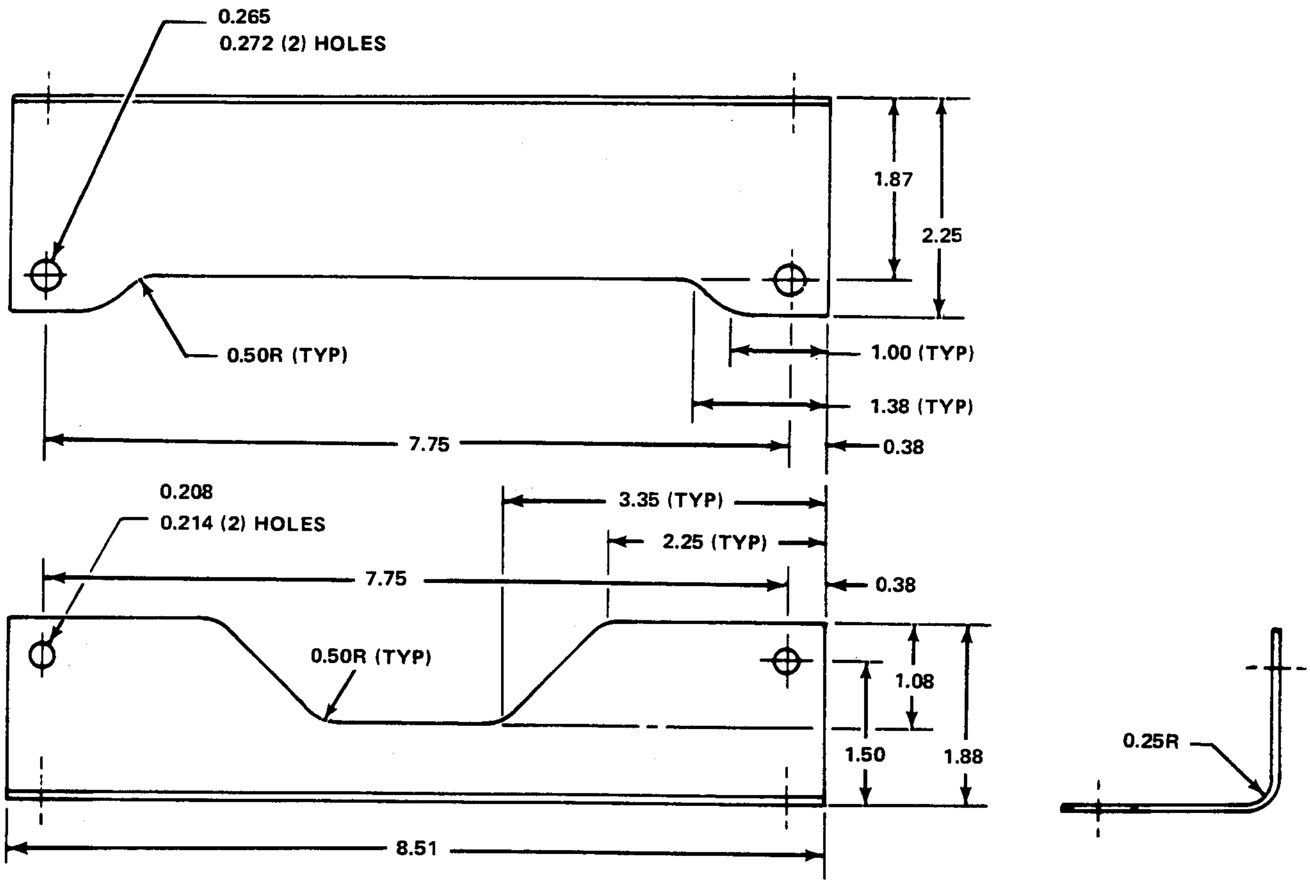


Figure D-163. Part Number 205-040-204-1, CHANNEL RETAINER
Fabricate From: NSN 9535-00-232-0543 Zinc Chromate Finish
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.016 Inch Thick



NOTES:
1. APPLY A CHEMICAL FILM NSN 8030-00-820-0376 PER TM 55-405-3 MANUAL.
2. APPLY TWO COATS OF ZINC CHROMATE PRIMER NSN 8010-00-899-8825 IMMEDIATELY FOLLOWING APPLICATION OF CHEMICAL FILM ALLOWING TIME FOR DRYING BETWEEN COATS.

UH-1H-II-M-D-164

Figure D-164. Part Number 205-072-264-1, BRACKET, Angle
Fabricate From: NSN 9543-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/4, 0.063 Inch Thick

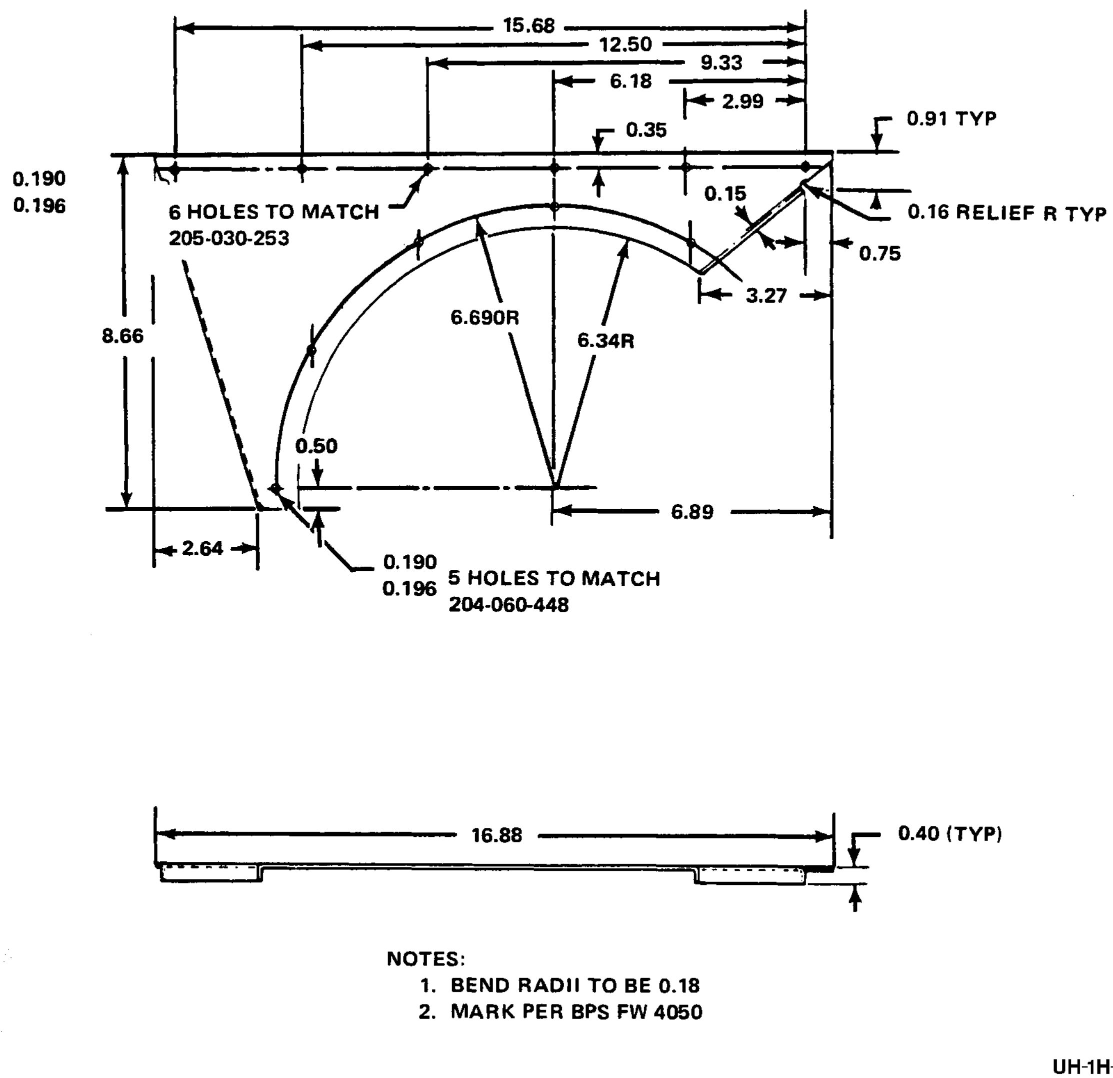


Figure D-165. Part Number 205-060-509-1, BRACKET, Oil Cooler Fan
Fabricate From: NSN 9535-00-232-0569
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.050 Inch Thick

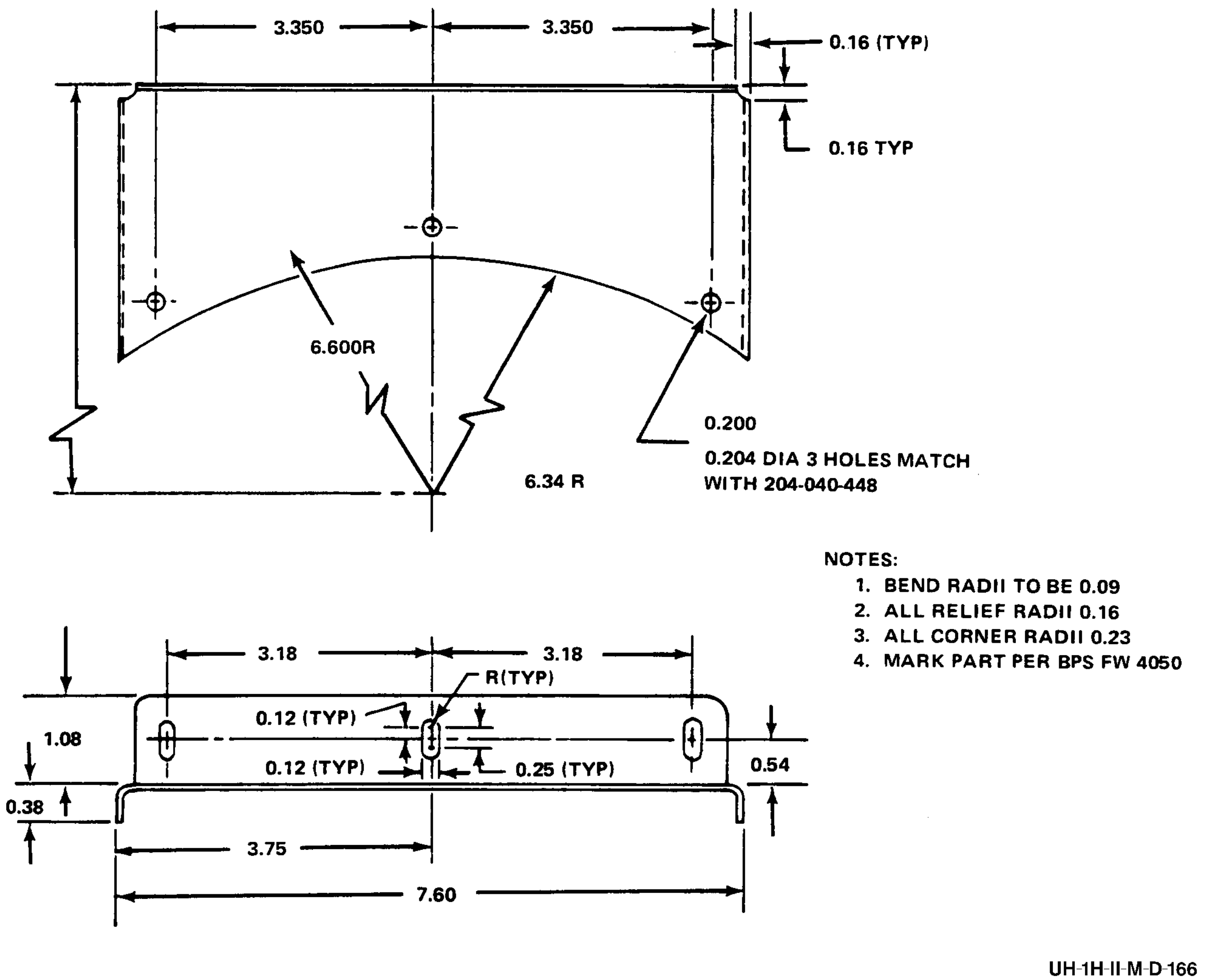


Figure D-166. Part Number 205-060-536-1, BRACKET, Transmission Oil Cooler
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

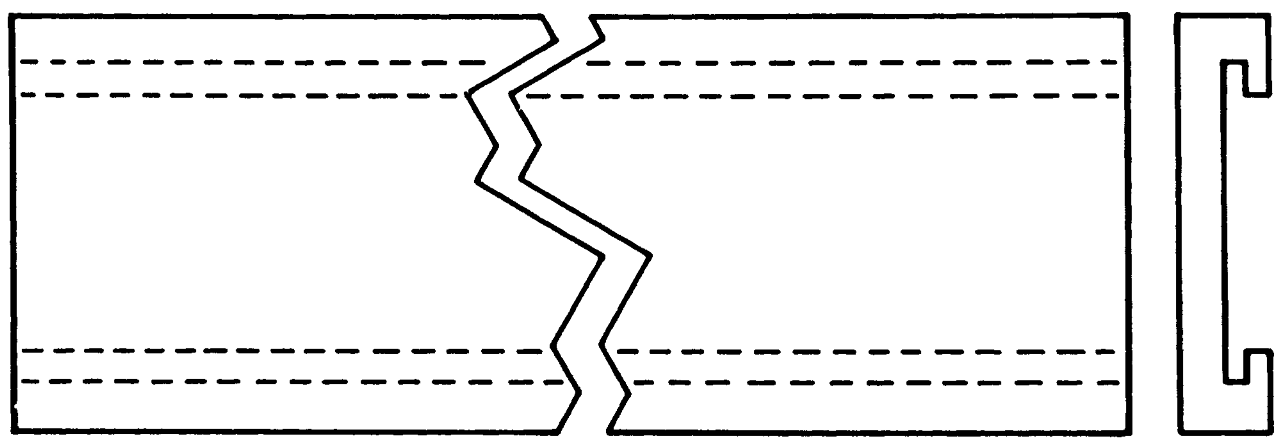


Figure D-167. Part Number 205-060-540-19, PAD, Oil Tank Support Assembly
Fabricate From: NSN 9390-00-263-0061
Material: Nonmetallic Channel Synthetic Rubber, Fuel and Oil Resistant, 1-1/4 Inches Wide, 2.81 Inches High, 60 Inches Long

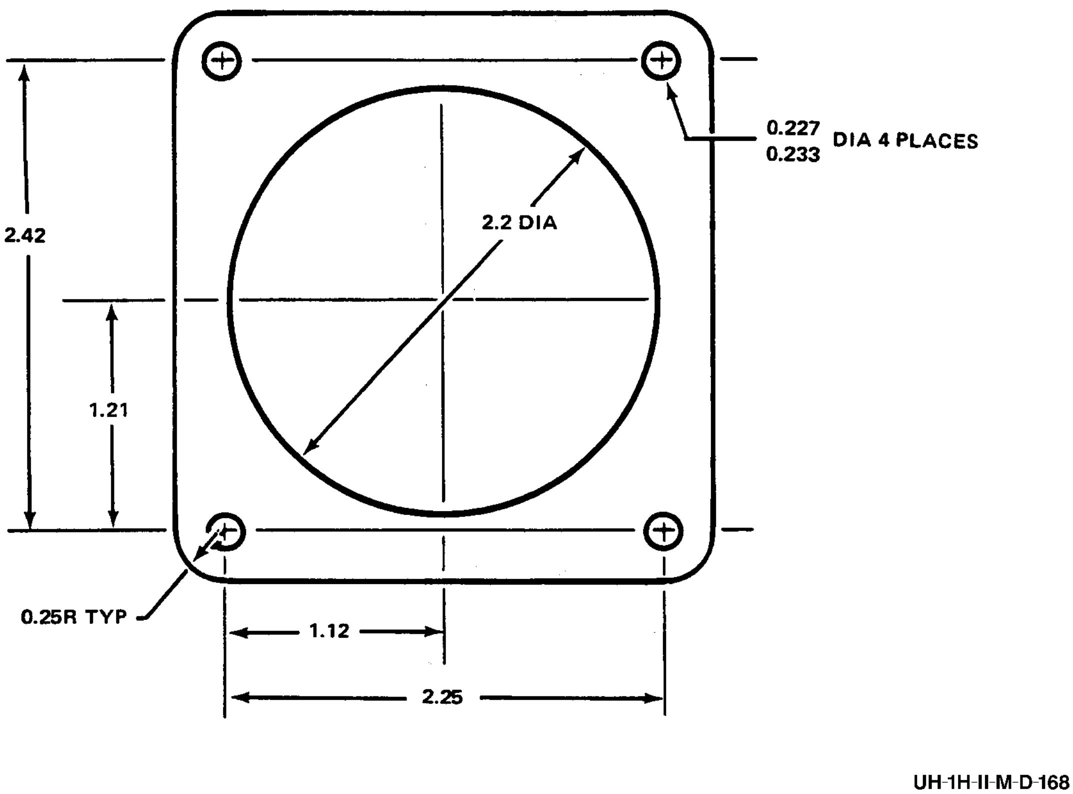
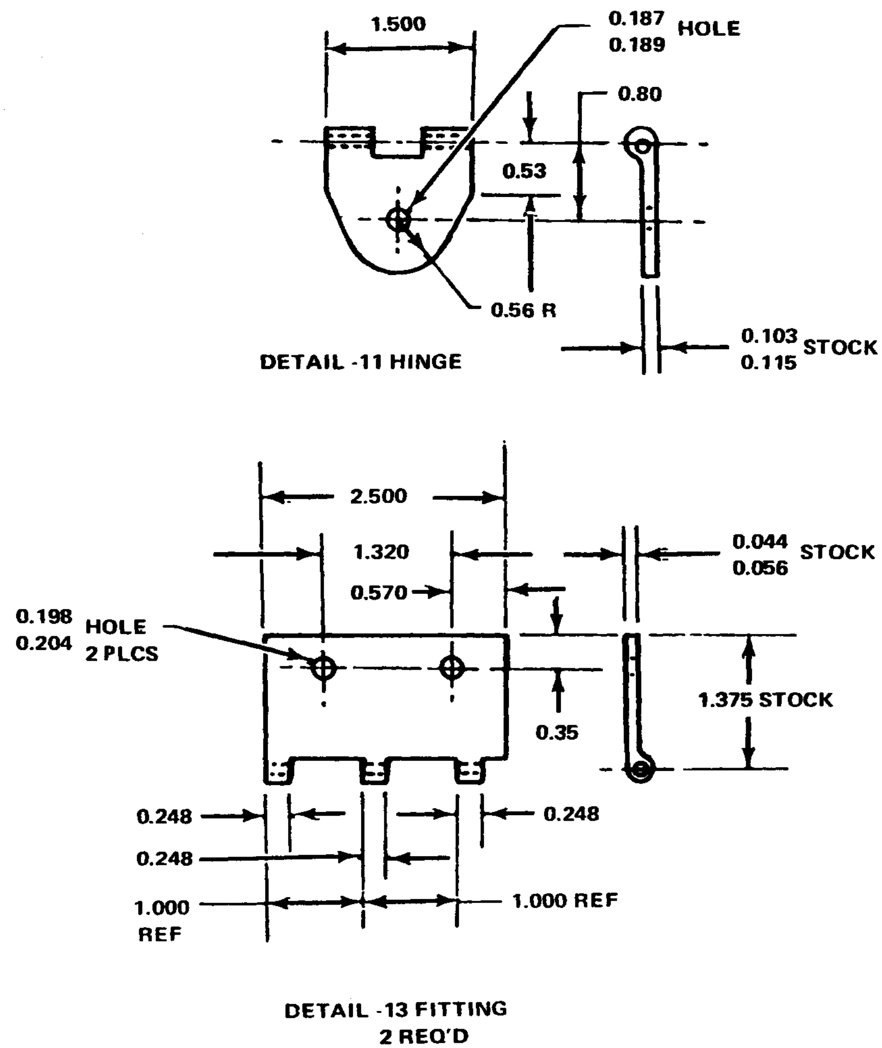


Figure D-168. Part Number 205-060-770-1, SHIM, Jackshaft Support
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick



NOTE:
1. MARK PART NUMBER PER BPS-FW-4050

UH-1H-II-M-D-169

Figure D-169. Part Number 205-060-802-11, HINGE
Fabricate From: NSN 5340-00-947-9891
Part Number 205-060-802-13, FITTING
Fabricate From: NSN 5340-00-947-9874

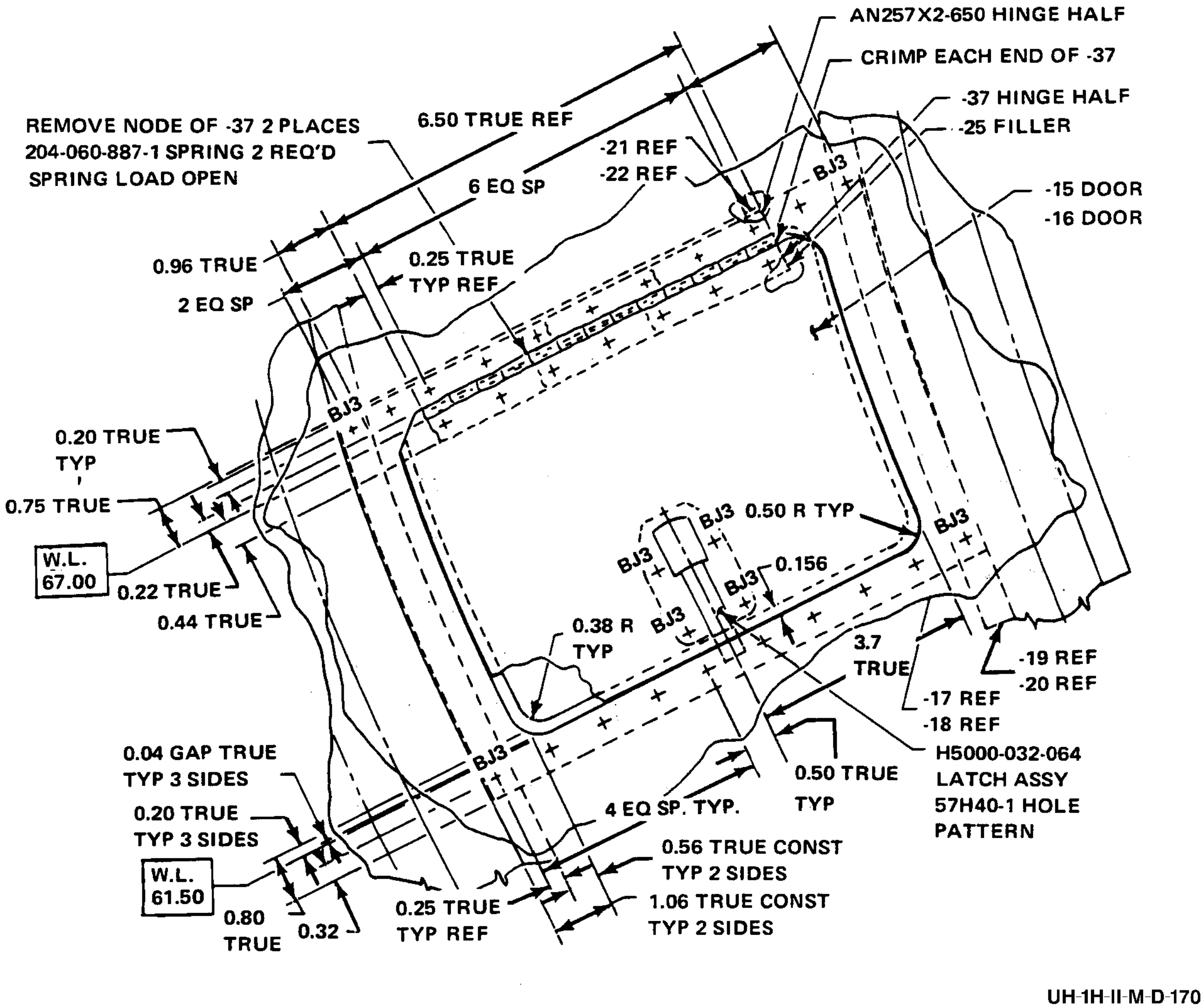


Figure D-170.	Part Number	205-060-810-15
		205-060-810-16, DOOR ASSEMBLY
	Fabricate From:	NSN 5340-00-701-9897
		NSN 5340-00-993-1461
		NSN 9535-00-232-0378
	Material:	Leaf, Butt, Hinge, Aluminum - Make from MS20257HP2-7200 Material
		2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.064 Inch Thick

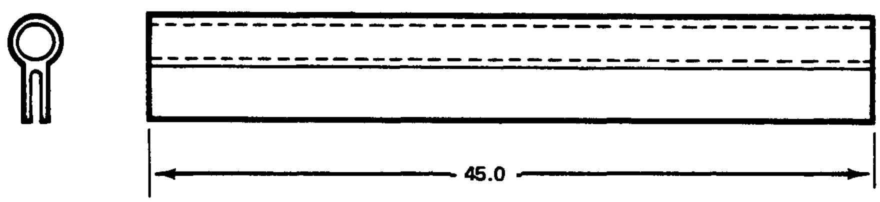
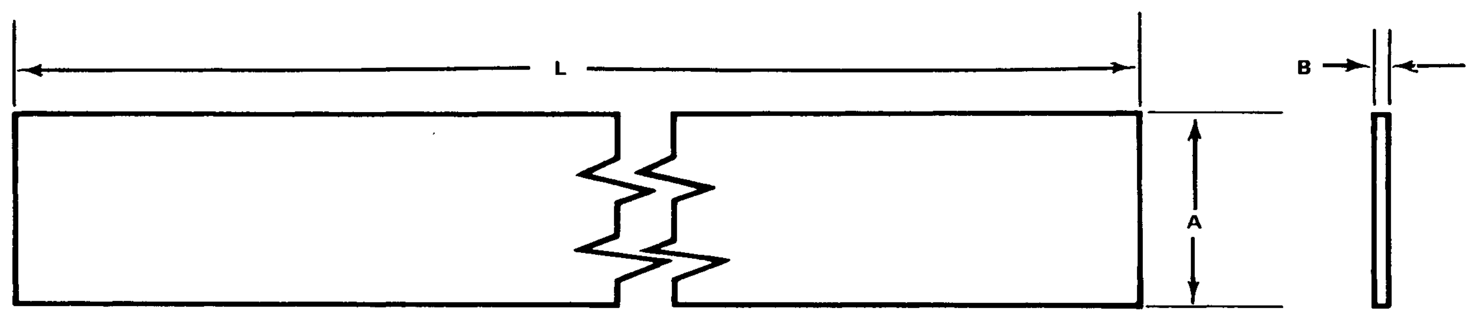


Figure D-171. Part Number 205-060-826-81, SEAL
Fabricate From: NSN 5330-00-754-7443
Material: Extrusion, Rubber, Federal Specification MIL-R-5847, Class I



PART NUMBER	ITEM NAME	FABRICATE FROM NSN	A	B	L
205-060-826-83	GASKET	9320-00-241-9754	0.500	0.032	46.00
205-060-826-85	GASKET	5330-00-754-4164	0.700	0.046	47.00
205-061-520-13	PAD	5330-00-530-1858	1.250	0.120	AR

UH-1H-II-M-D-172

Figure D-172. Part Number 205-060-826-83, GASKET
205-060-826-85

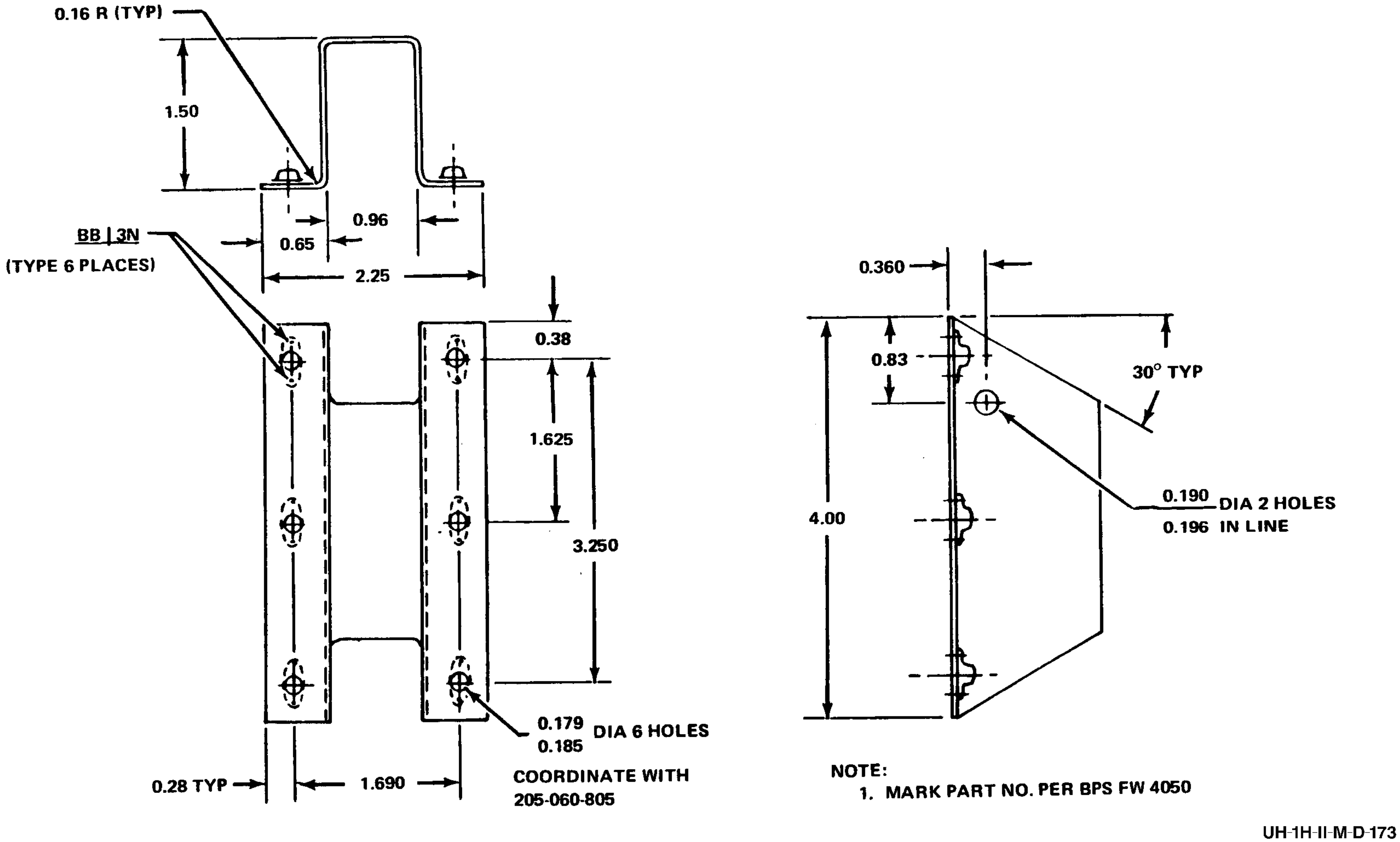
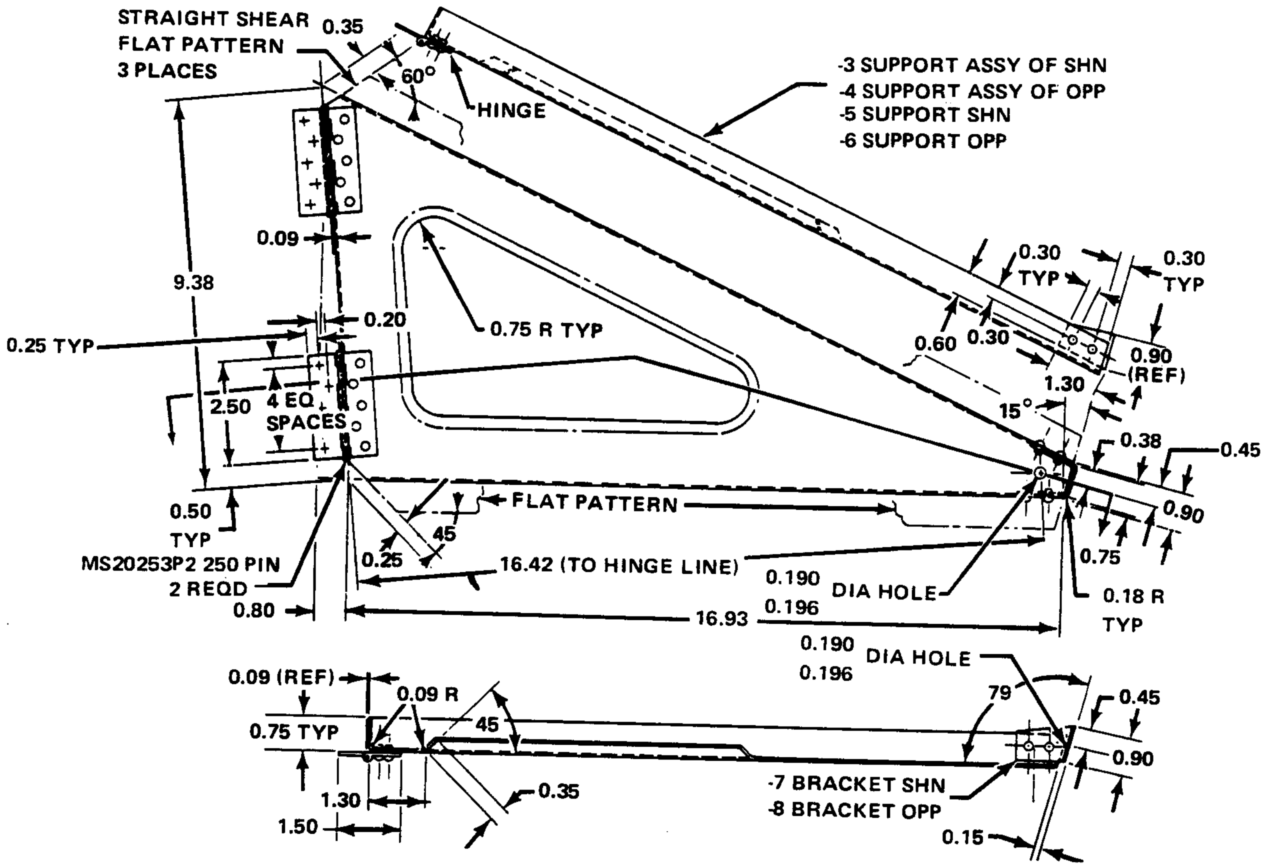


Figure D-173. Part Number		205-060-838-1, SUPPORT ASSEMBLY
	Fabricate From:	NSN 9535-00-167-2280
		NSN 5310-00-584-7339
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick



UH-1H-II-M-D-174

Figure D-174. Part Number 205-060-860-3, SUPPORT ASSEMBLY, Shown
SUPPORT, Shown, NSH 9535-00-167-2279
BRACKET, Shown, NSN 9535-00-554-1412
HINGE HALF, NSN 5340-00-543-3723
HINGE PIN, NSN 5340-00-838-2787

Part Number 205-060-860-4, SUPPORT ASSEMBLY, Opposite
SUPPORT, Opposite, NSN 9535-00-167-2279
BRACKET, Opposite NSN 9535-00-554-1412
HINGE HALF, NSN 5340-00-543-3723
HINGE PIN, NSN 5340-00-838-2787

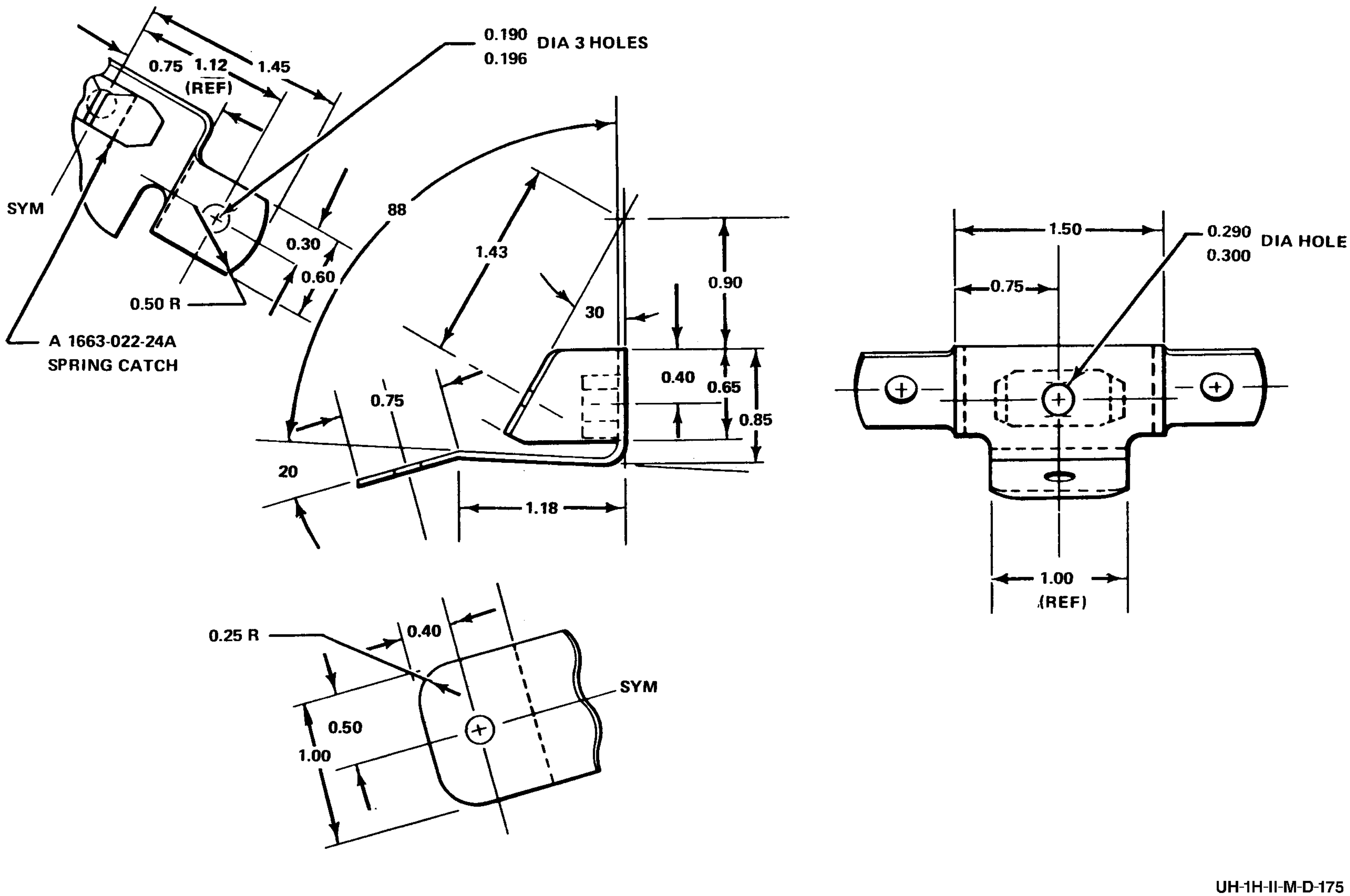
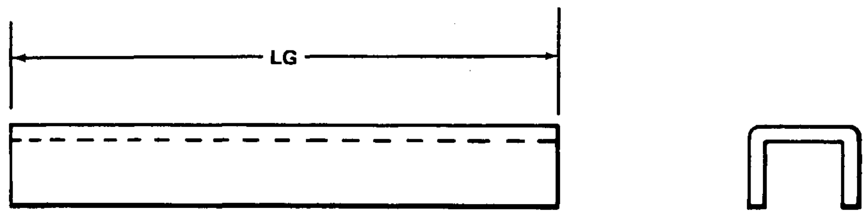


Figure D-175. Part Number 205-060-862-1, BRACKET ASSEMBLY
Fabricate From: BRACKET, NSN 9535-00-554-1412
SPRING CATCH, NSN 5340-00-634-7350
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick, Receptacle, Friction Catch, A1663-022-24A



PART NUMBER	LENGTH
178036-3	AR
178038-3	AR
178040-3	AR
178042-3	AR
178044-3	AR
178050-3	AR
178050-5	AR
178050-7	AR
178052-3	AR
178052-5	AR
178052-7	AR
ITEM NAME CHANNEL	

UH-1H-II-M-D-176

Figure D-176. Fabricate From: NSN 9320-00-107-4517
Material: Channel, Etrusion

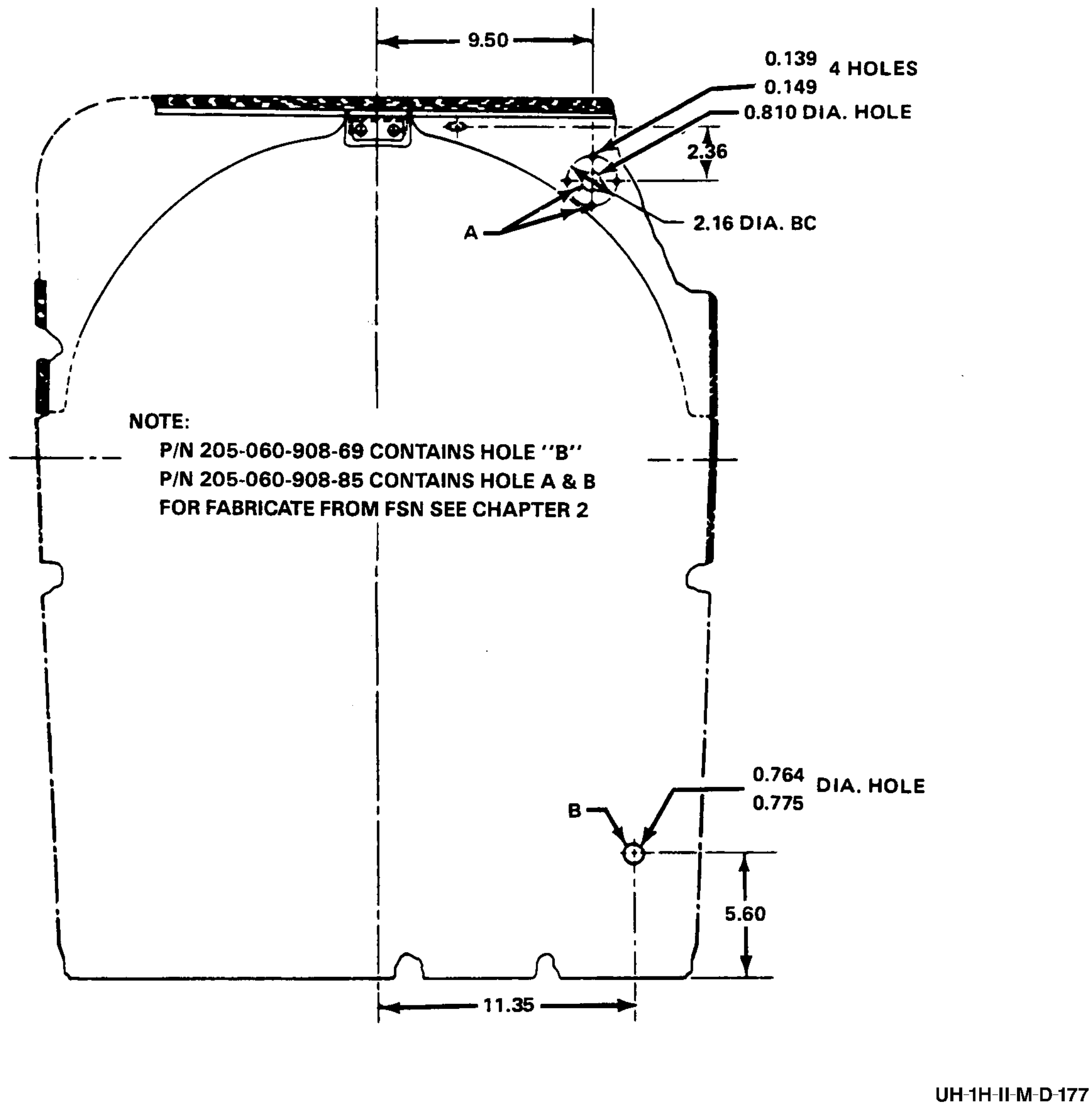


Figure D-177. Part Number 205-060-908-79 & -85, FIRE WALLS ASSY'S
Fabricate From: NSN 1560-00-758-0299
P/N 205-060-908-73

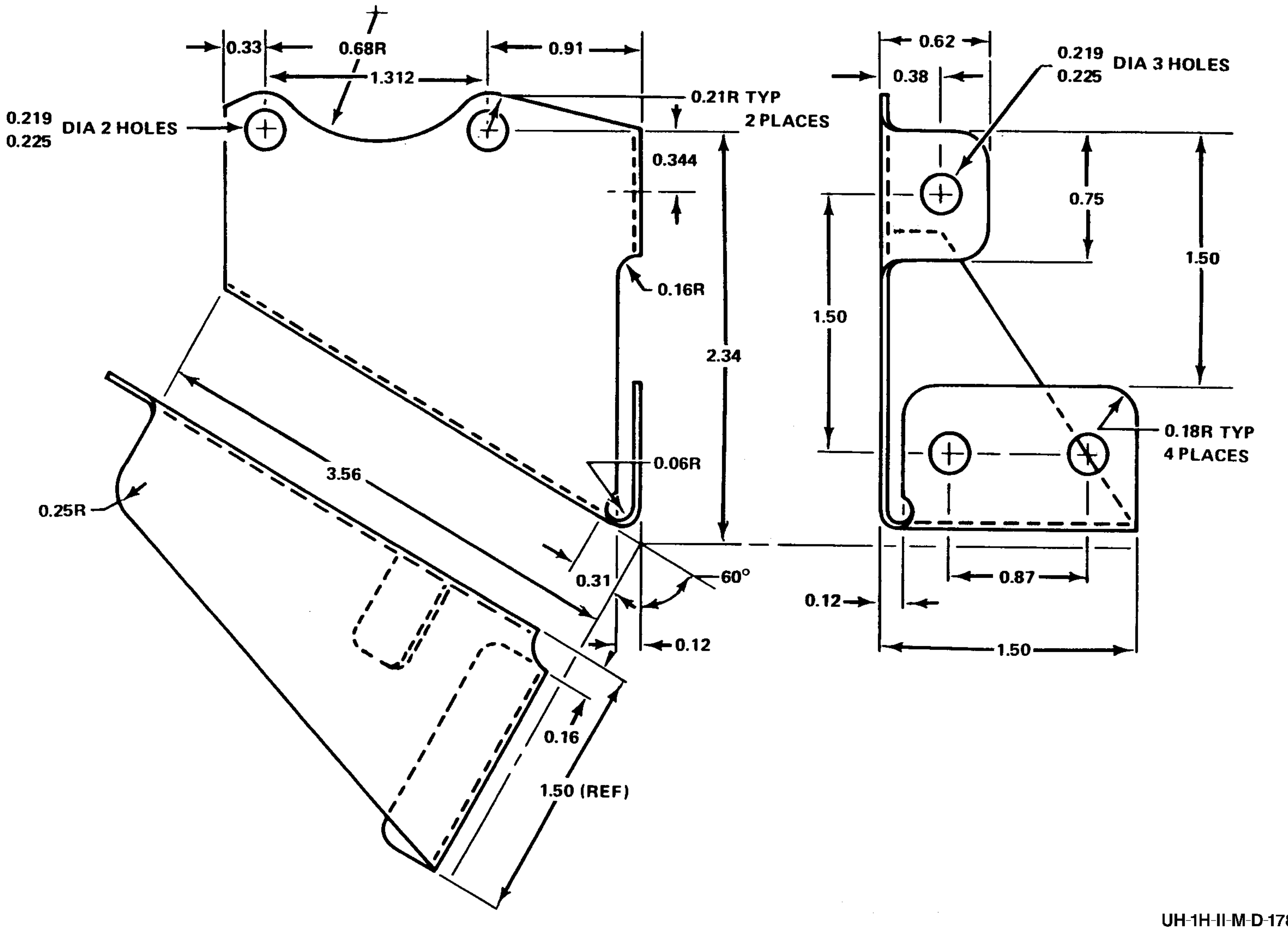


Figure D-178. Part Number 205-060-919-3, BRACKET, Fuel System Valve
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.025 Inch Thick

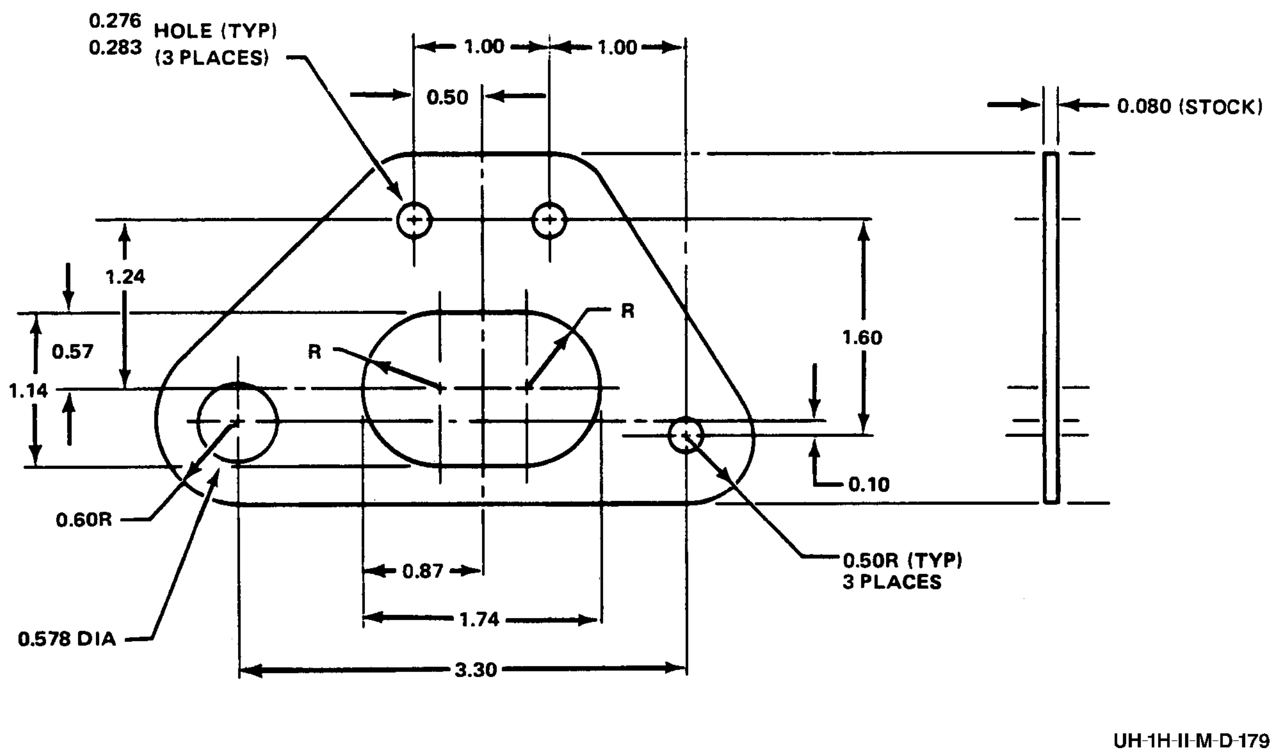
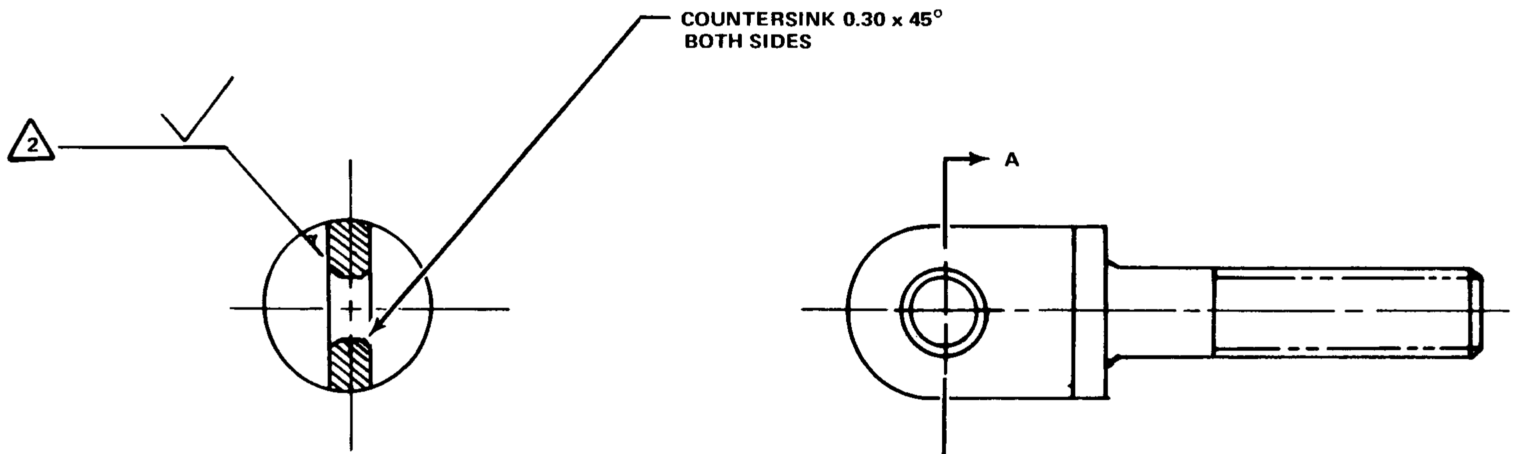


Figure D-179. Part Number 205-061-643-1, PLATE, Baffle, Fuel Cell
Fabricate From: NSN 9535-00-167-2247
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/4, 0.250 Inch Thick



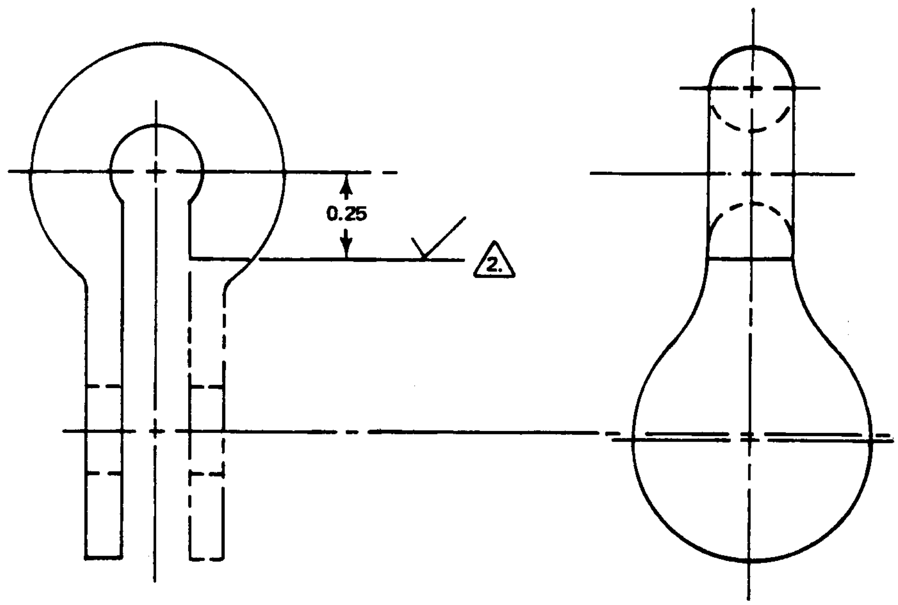
SECTION A-A

NOTES:

1. MARK PART NO. PER BPS-FWB-4050
2. BREAK SHARP EDGES IN MACHINED AREA 0.10R OR CHAMFER
3. ALTERED FROM GOVERNMENT STANDARD PART NUMBER AN43B-5A.

UH-1H-II-M-D-180

Figure D-180. Part Number 205-061-665-1, BOLT, Eye
Fabricate From: NSN 5306-00-260-7578
Material: Cadmium Plate Finish Class II Type I



NOTES:
1. MARK PART PER BPS FWD-4050
2. BREAK SHARP EDGES IN MACHINED AREA 0.010 R OR CHAMFER
3. AN 115-32 MAY BE USED AS AN ALTERNATE FOR MS 20115 F5

UH-1H-II-M-D-181

Figure D-181. Part Number 205-061-666-1, HOOK
Fabricate From: NSN 4030-00-132-9155
Material:

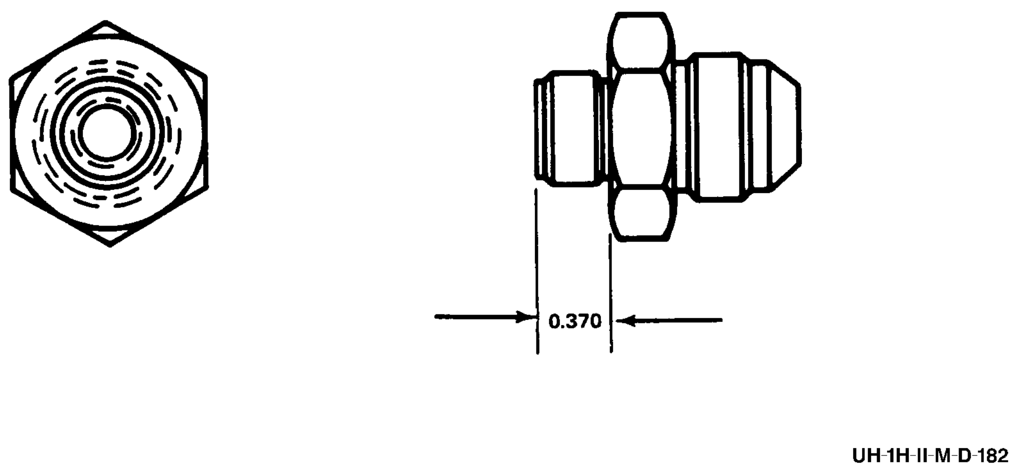


Figure D-182. Part Number 205-061-672-1, REDUCER, Fuel Pump Air Inlet
Fabricate From: NSN 4730-00-803-7981
Material:

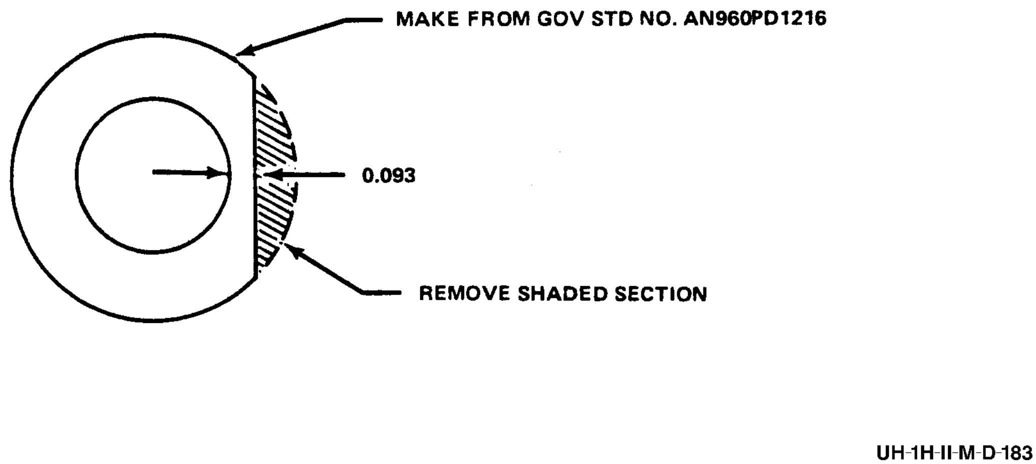
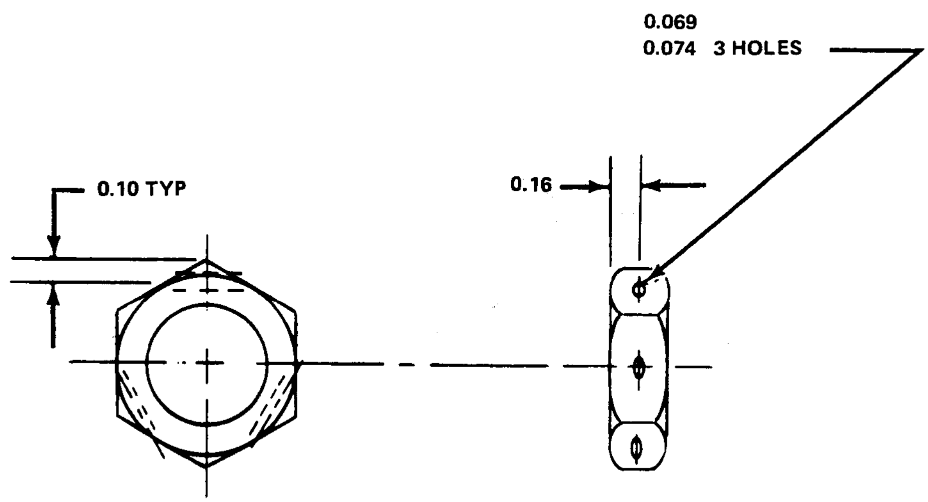


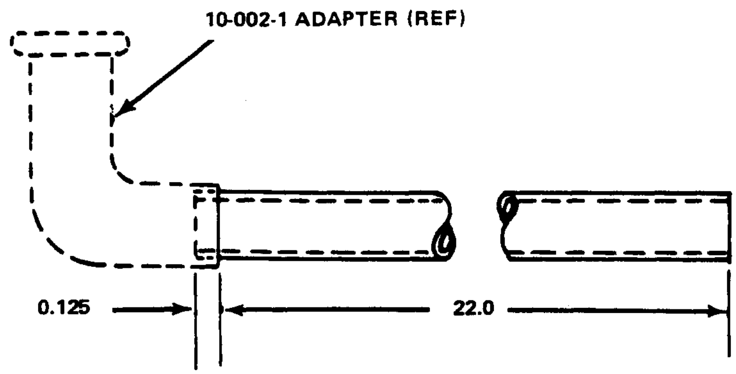
Figure D-183. Part Number 205-061-677-1, WASHER, Bleed Air
Fabricate From: NSN 53100-00-187-2404
Material:



NOTES:
1. MARK PART NO. PER BPS-FW-4050
2. ALTERED FROM GOVERNMENT STANDARD PART NO. AN924-8D

UH-1H-II-M-D-184

Figure D-184. Part Number 205-061-684-1, NUT
Fabricate From: NSN 53100-00-282-7835
Material:



NOTE:
1. BOND WITH ADHESIVE

UH-1H-II-M-D-185

Figure D-185. Part Number 205-075-142-11, TUBE, BATTERY VENT
Fabricate From: NSN 4720-00-246-4355
Material:

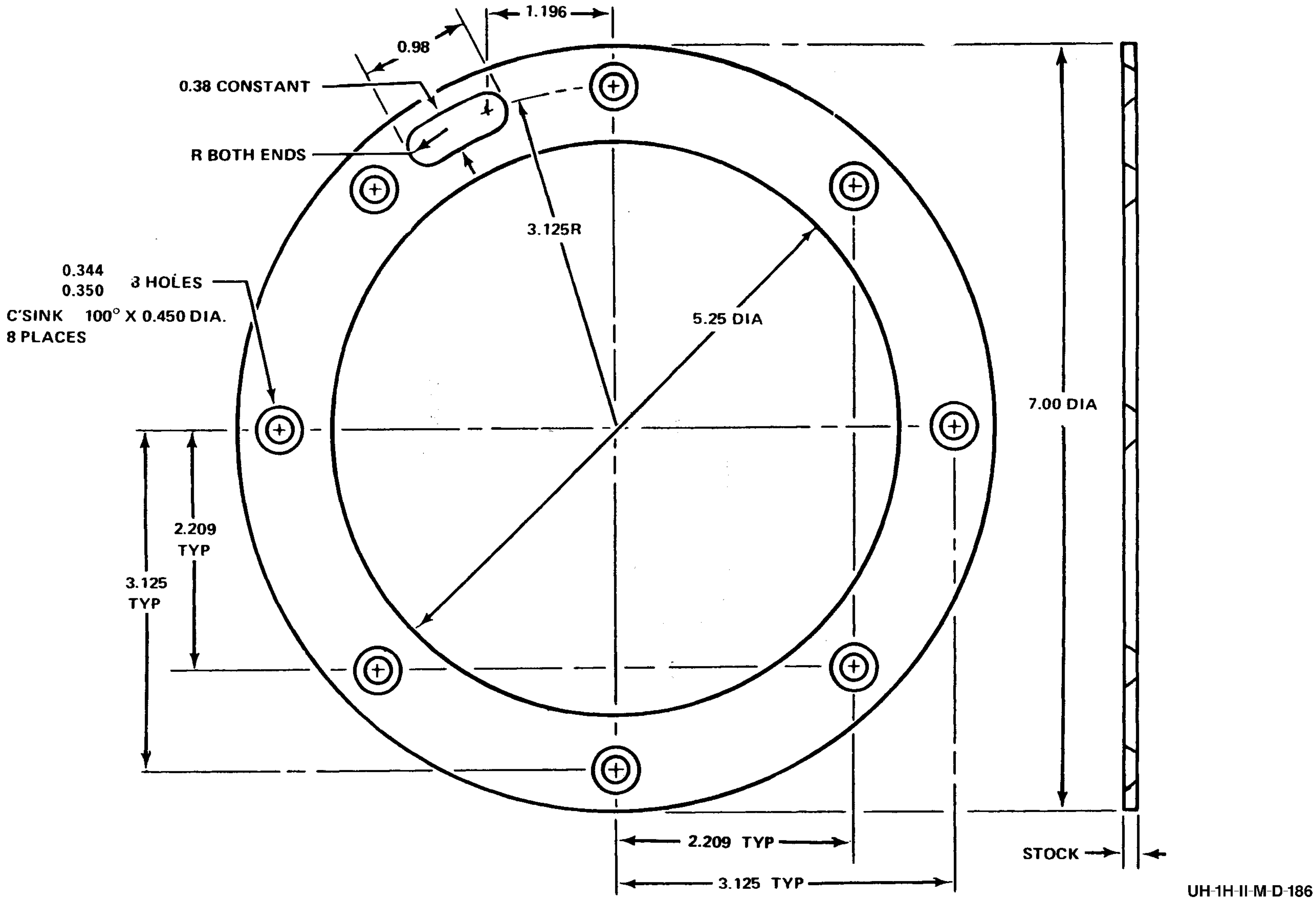


Figure D-186. Part Number 205-070-404-1, SPACER, Spot Heating Connector
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

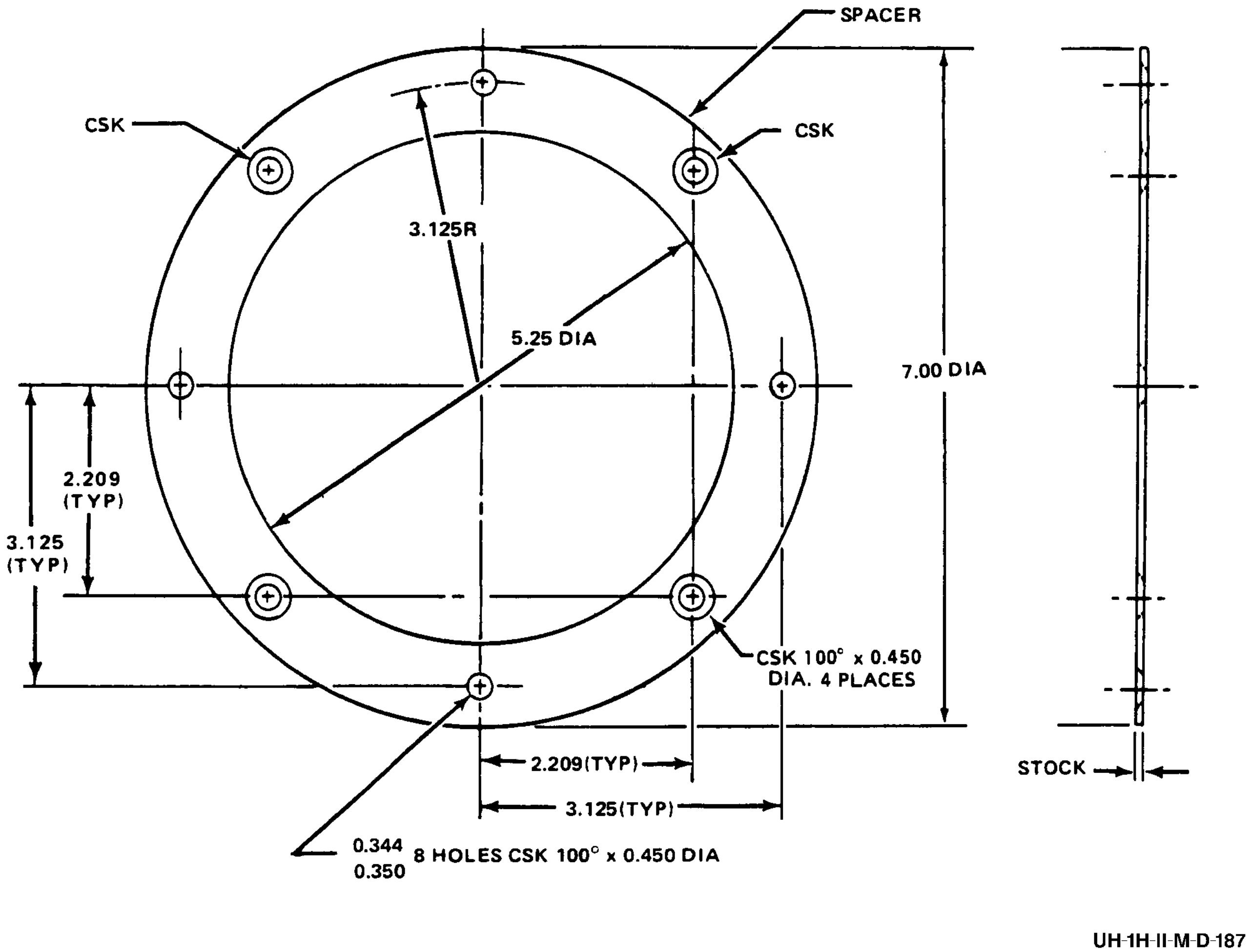


Figure D-187. Part Number 205-070-404-3, SPACER
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

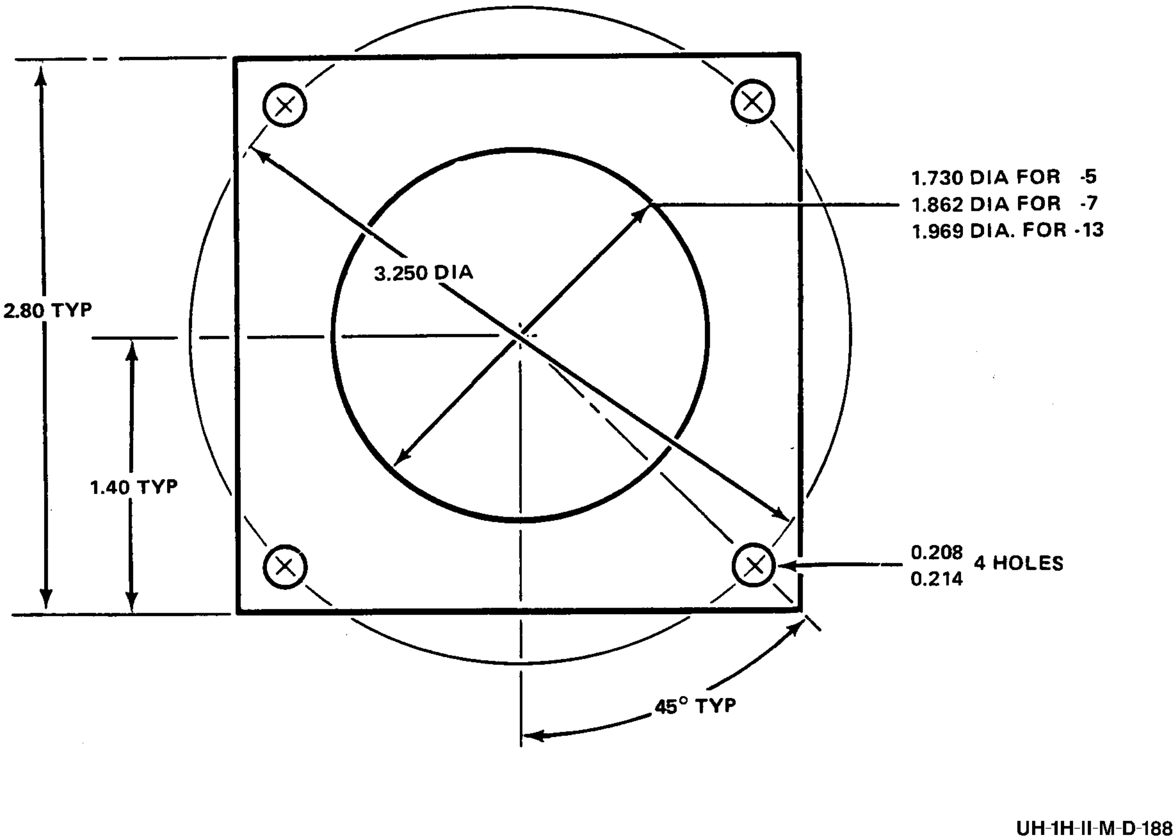


Figure D-188. Part Number 205-070-416-5, -7, -13, ORIFICE PLATE, Air Distribution Outlet
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

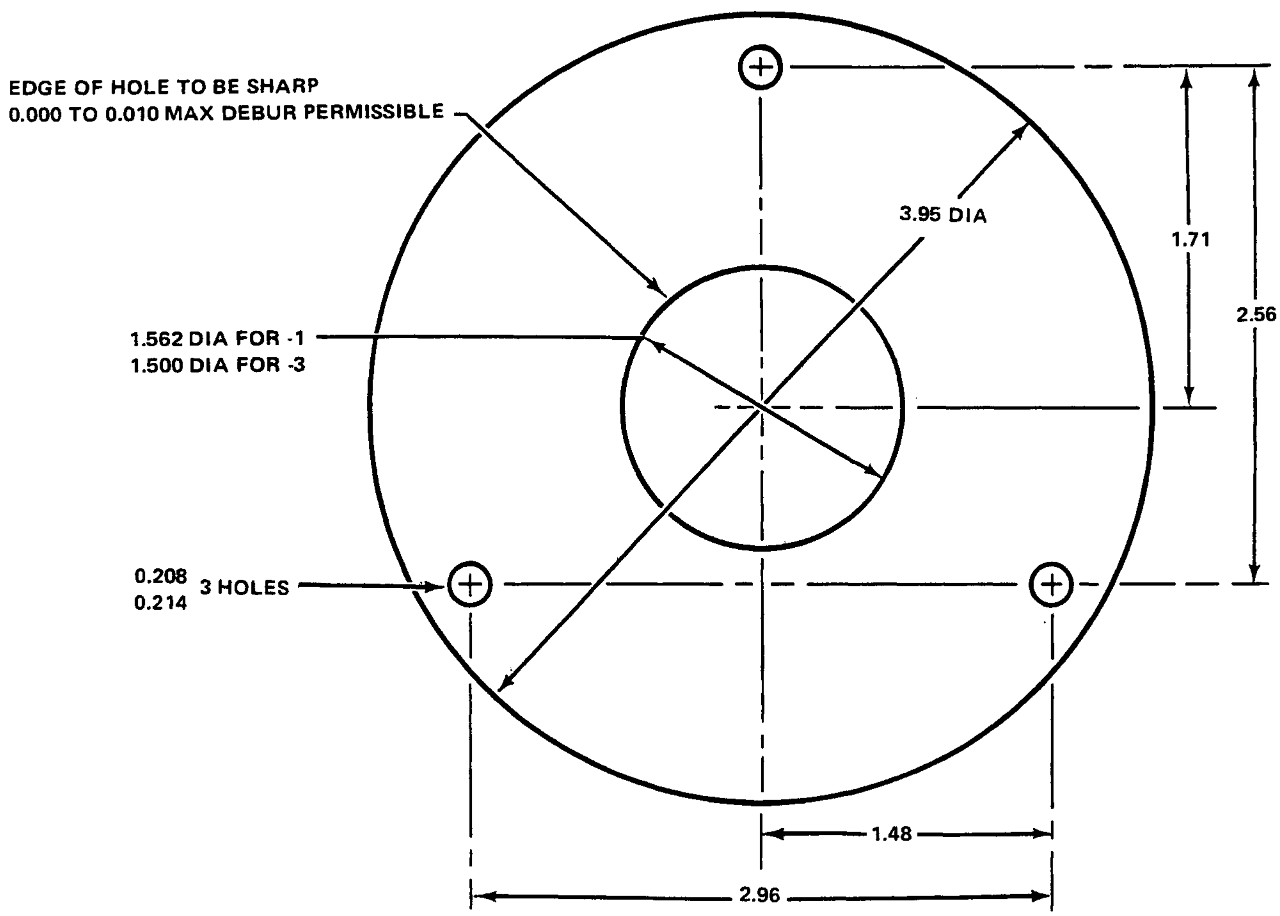
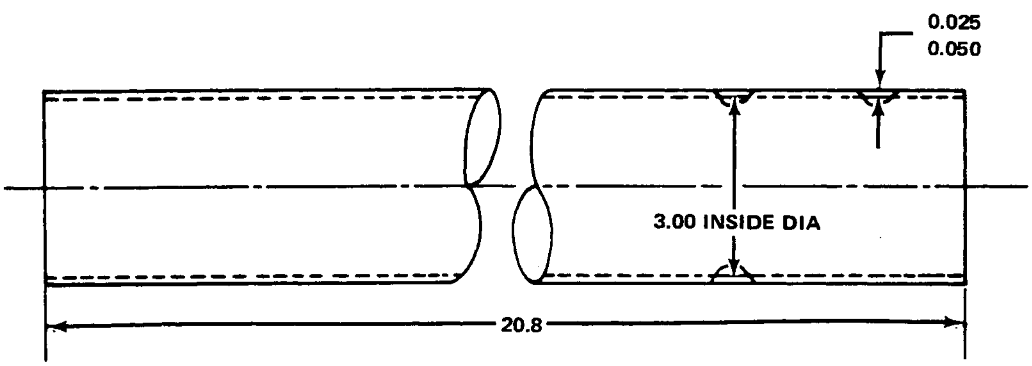


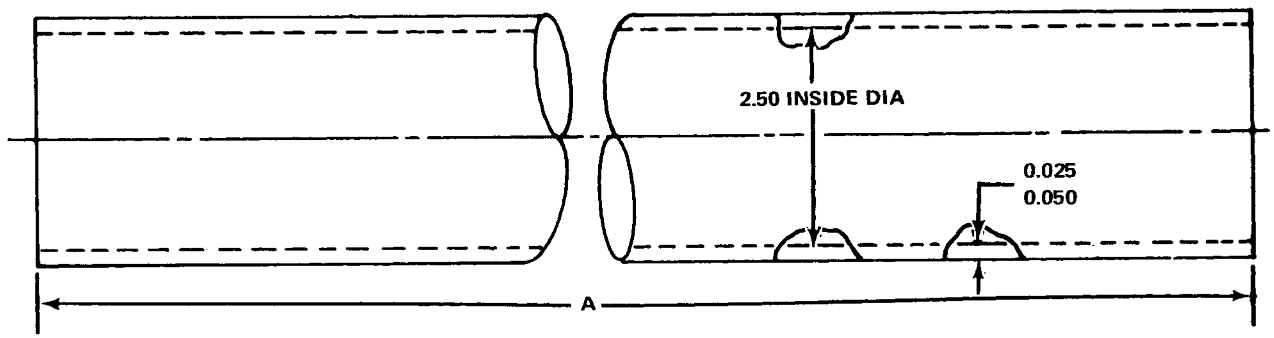
Figure D-189. Part Number 205-070-430-1, -3, ORIFICE, Air Distribution Defrost Nozzle
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick



NOTES:
1. MARK PER BPS FN 4060
2. DUCT MAY BE MADE FROM MAT'L THICKNESS BEST SUITED TO MFG. METHOD
3. COLOR MAY BE MADE:
   A. OF TWO OR MORE PARTS JOINED TOGETHER WITH ETHYLENE DICHLORIDE OR AIR WELDED
   B. WITH JOINT PROJECTIONS (BEAD OR FLANGE) NOT TO EXCEED 0.12 HIGH OR WIDE ON THE EXTERNAL SURFACE AND TO BE FLUSH 1.20 FROM ENDS
5. DUCT TO BE AN AIRTIGHT ENCLOSURE AT 15 IN. H_2O GAGE AND ROOM CONDITIONS.

UH-1H-II-M-D-190

Figure D-190. Part Number 205-070-450-3, HOSE, Air Duct
Fabricate From: NSN 4720-00-736-0985
Material: Hose Air Duct, Fiberglass Cloth, 2.5 Inches ID



DASH NO.	DIM. A
-1	7.06
-3	18.75

NOTES:

1. MARK PER BPS FWB 4050
2. DUCT MAY BE MADE FROM MAT'L THICKNESS BEST SUITED TO MFR. METHOD
3. COLOR OF DUCT TO BE GRAY PER MATERIAL BULLETIN FW 1270
4. DUCT MAY BE MADE:
   A. OF TWO OR MORE PARTS JOINED TOGETHER WITH ETHYLENE DICHLORIDE OR AIR WELDED
   B. WITH JOINT PROJECTIONS (BEAD OR FLANGE) NOT TO EXCEED 0.12 HIGH OR WIDE ON THE EXTERNAL SURFACE AND TO BE FLUSH 1.20 FROM ENDS
5. DUCT TO BE AN AIR TIGHT ENCLOSURE AT 15 IN. H_2O GAGE AND ROOM CONDITIONS

UH-1H-II-M-D-191

Figure D-191. Part Number 205-070-452-1, HOSE AIR DUCT
205-070-452-3
Fabricate From: NSN 4720-00-736-0985
Material: Hose Air Duct, Fiberglass Cloth, 2.5 Inches ID

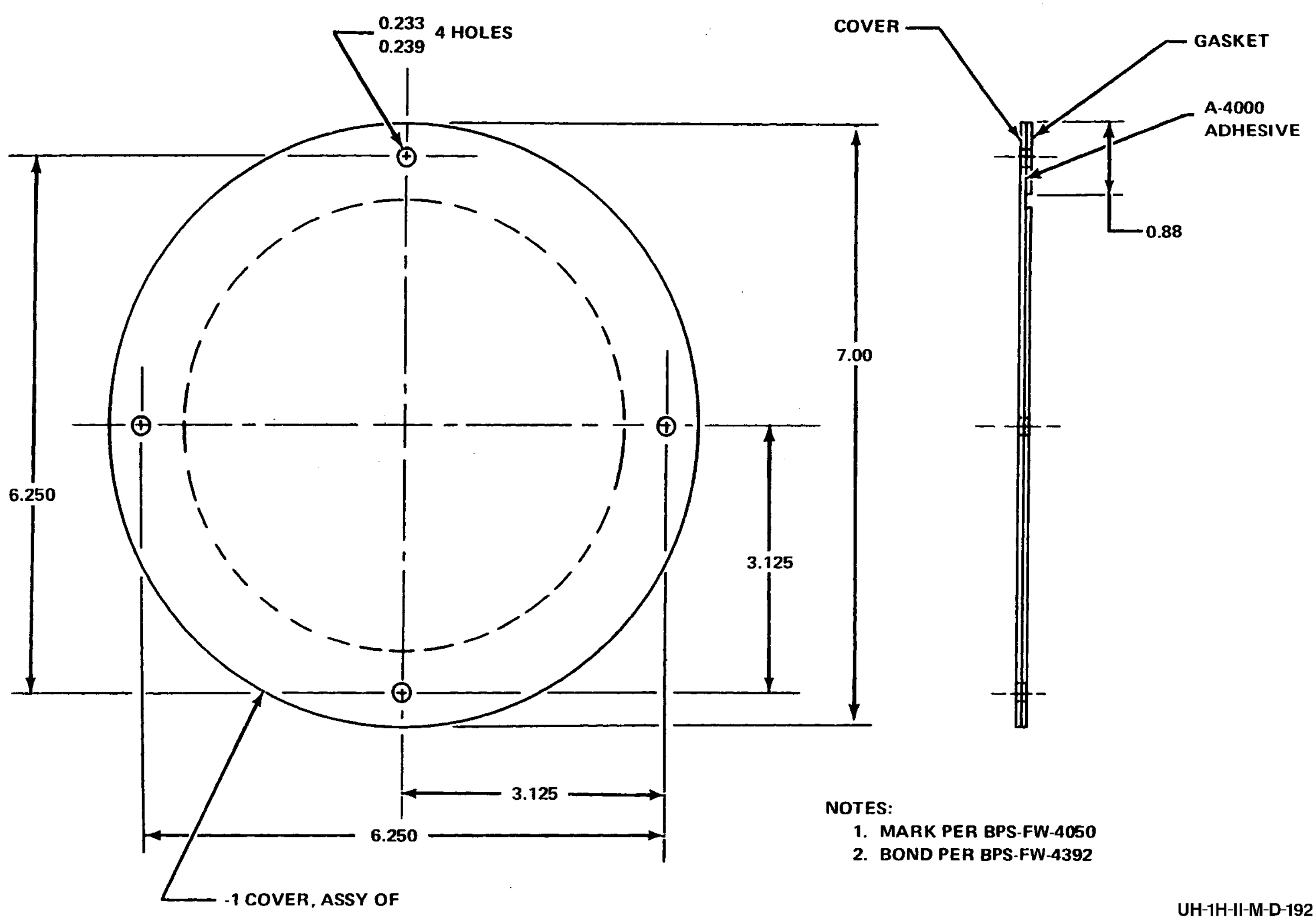
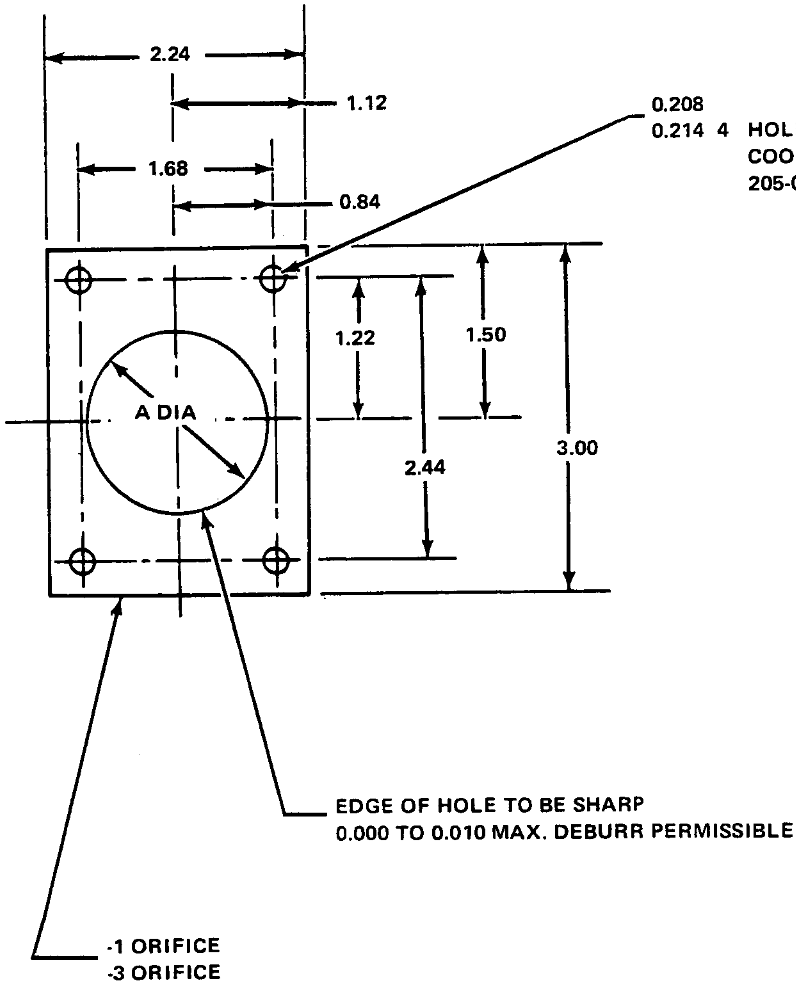


Figure D-192.	Part Number	205-070-483-1, COVER ASSEMBLY, Inlet
	Fabricate From:	NSN 9535-00-232-0522
		NSN 9320-00-061-1975
	Material:	Zinc Chromate Finish



DASH NO.	A DIA
-1	1.562
-3	1.387

NOTES:
1. MARK PER BPS-FW-4050

UH-1H-II-M-D-193

Figure D-193.	Part Number	205-070-493-1, ORIFICE, Foot Warmer
		205-070-493-2
	Fabricate From:	NSN 9535-00-167-2279
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

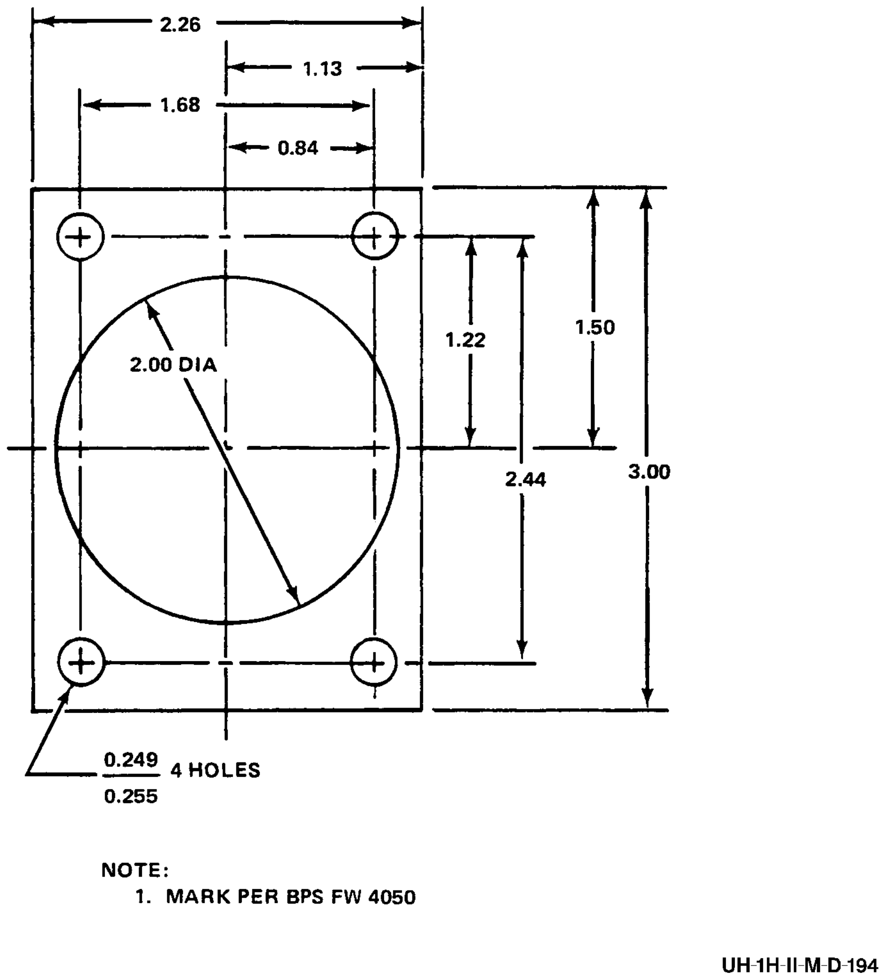


Figure D-194. **Part Number** **205-070-494-1, GASKET**
Fabricate From: **NSN 5330-00-182-1288**
Material: **Cork and Rubber Sheet, Synthetic, Federal Specification MIL-G-6183, 1/16 Inch Thick**

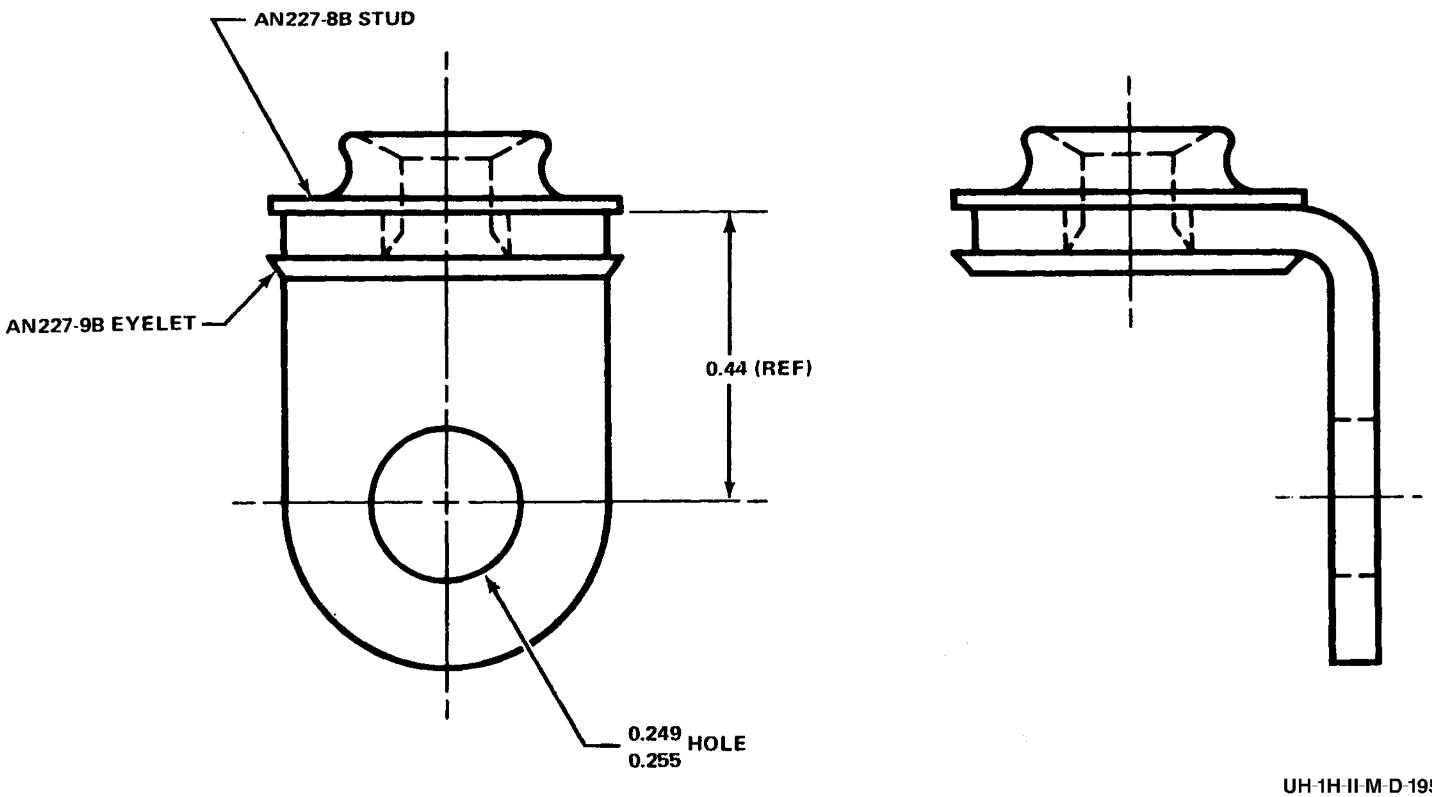
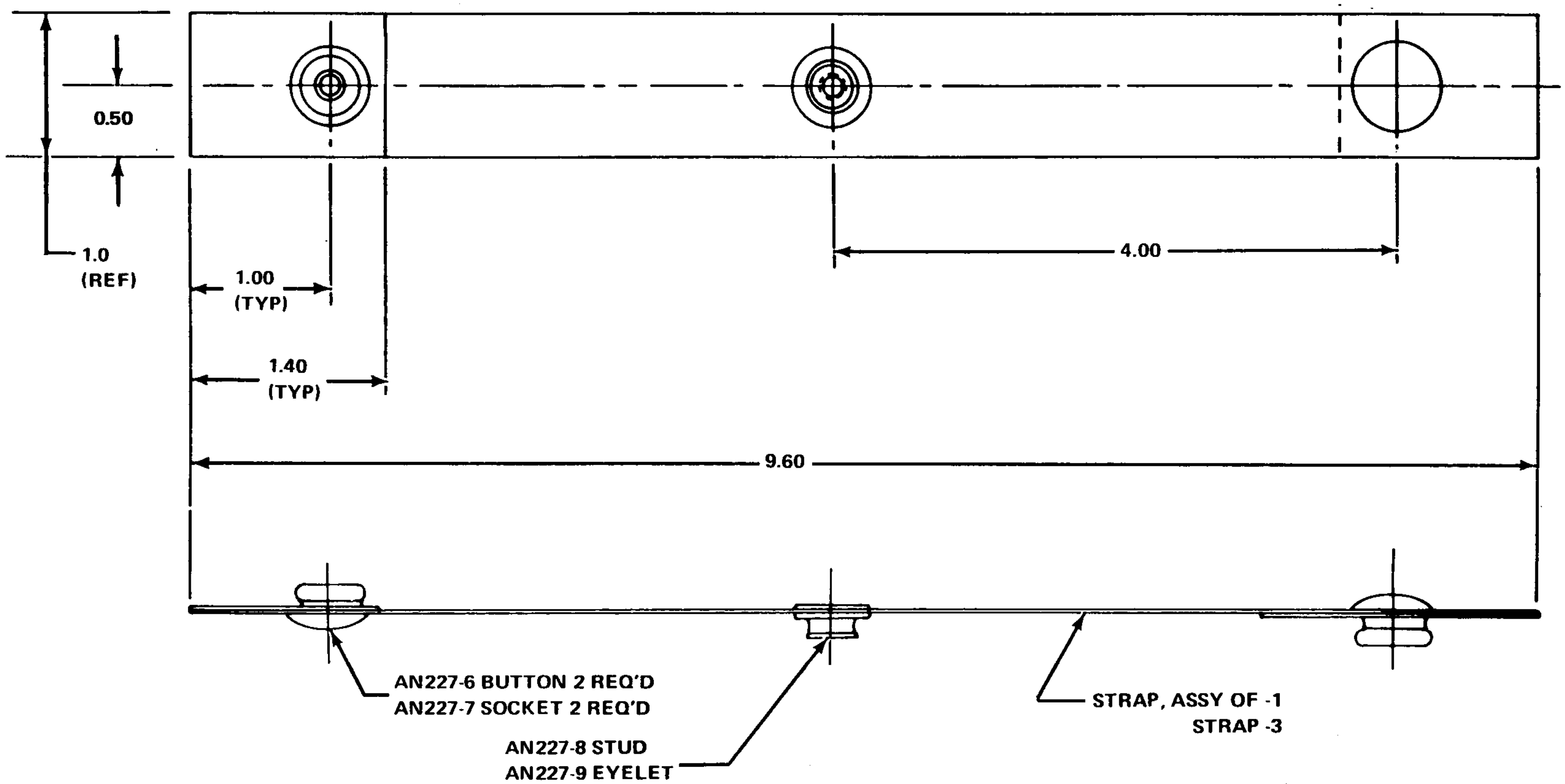


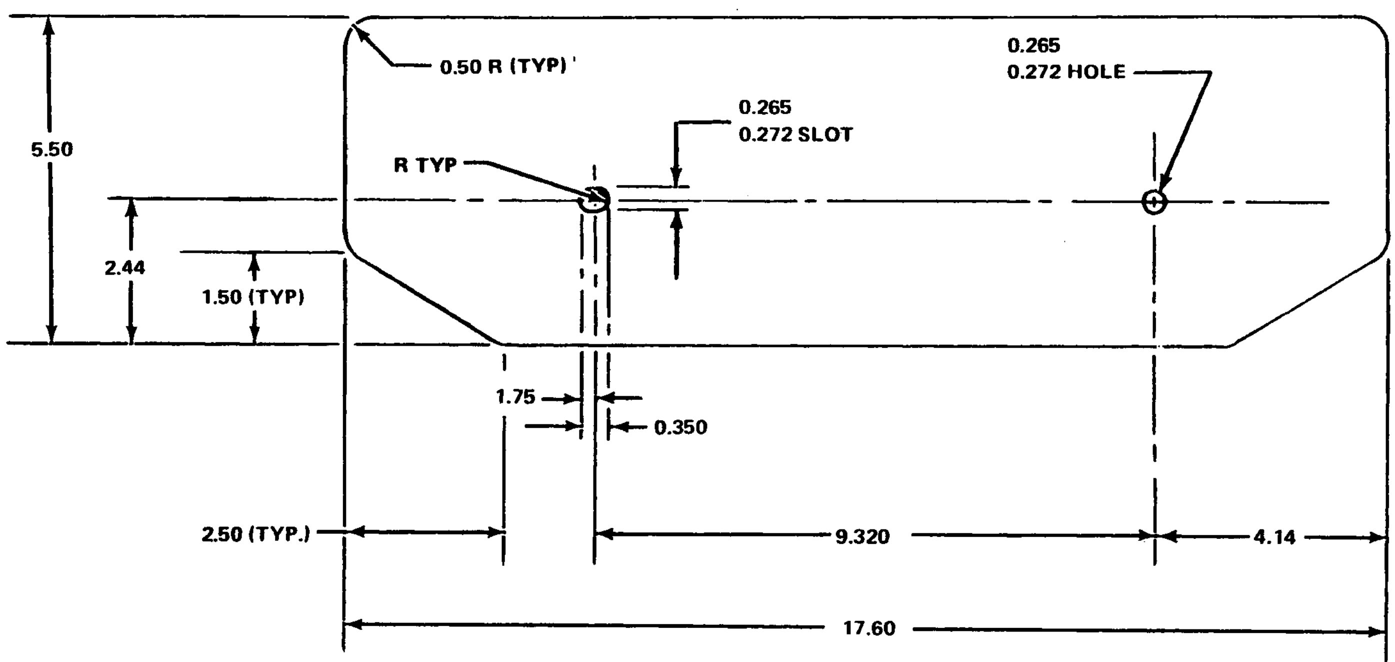
Figure D-195. Part Number 205-070-609-1, SUPPORT ASSEMBLY, Blackout Curtain
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



NOTES:
1. MARK PER BPS-FWB-4050
2. HEAT TREAT ENDS OF ALL WEBBING
3. COLOR LIGHT GULL GREY #36440
   PER FED STD 595

UH-1H-II-M-D-196

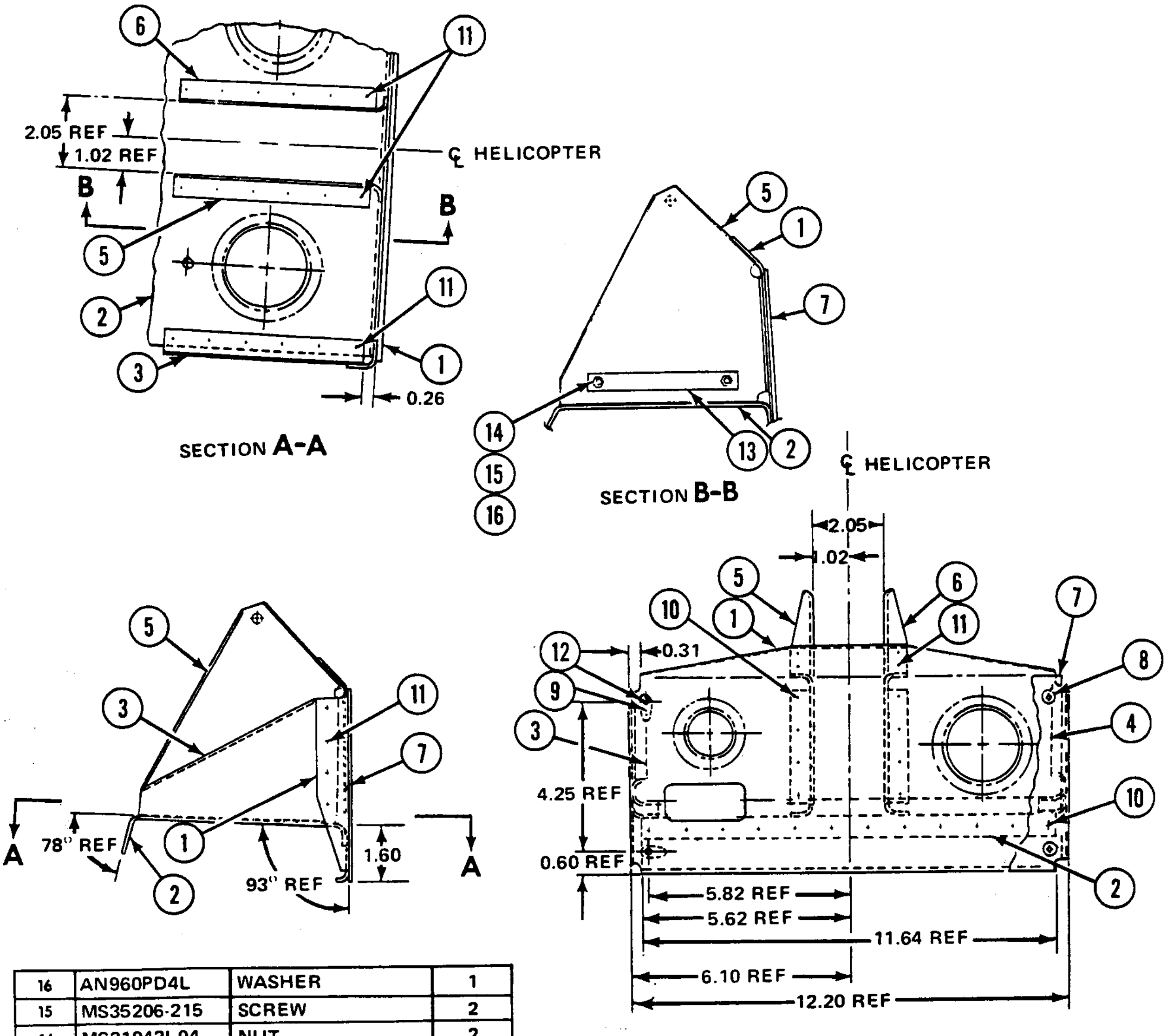
Figure D-196. Part Number 205-070-656-1, STRAP ASSEMBLY
Fabricate From: NSN 5325-00-291-2393
NSN 5325-00-276-4946
NSN 5325-00-174-2923
NSN 5325-00-276-4969
NSN 1680-00-225-5084



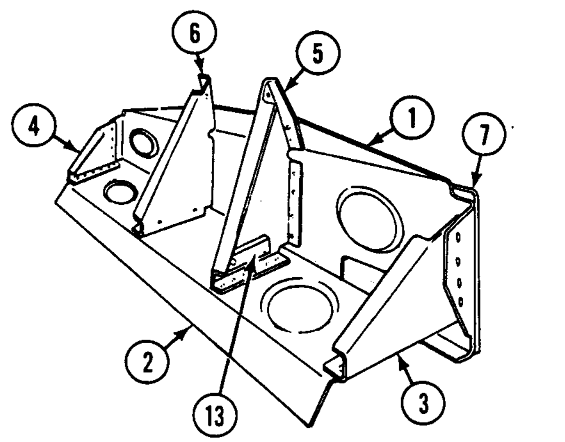
NOTES:
1. MARK PER FWB 4050

IH-1H-II-M-D-197

Figure D-197. Part Number 205-070-769-1, PLATE
Fabricate From: NSN 9535-00-167-2277
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.020 Inch Thick



16	AN960PD4L	WASHER	1
15	MS35206-215	SCREW	2
14	MS21042L04	NUT	2
13	MS27212-1-6	TERMINAL BOARD	1
12	NAS683A3	NUT PLATE	4
11	MS20470AD4	RIVET	AR
10	MS20426AD4	RIVET	AR
9	MS20426AD3	RIVET	AR
8	AN509-10F7	SCREW	4
7	205-031-250-13	BASE PLATE	1
6	205-031-260-12	GUSSET	1
5	205-031-260-11	GUSSET	1
4	205-031-250-10	GUSSET	1
3	205-031-250-9	GUSSET	1
2	205-031-250-7	SUPPORT	1
1	205-031-250-6	SUPPORT	1
ITEM NO.	PART NUMBER	NOMENCLATURE	NO. REQ'D



UH-1H-II-M-D-198-1

Figure D-198. Part Number 205-031-250-3, SUPPORT BRACKET ASSEMBLY (Sheet 1 of 6)

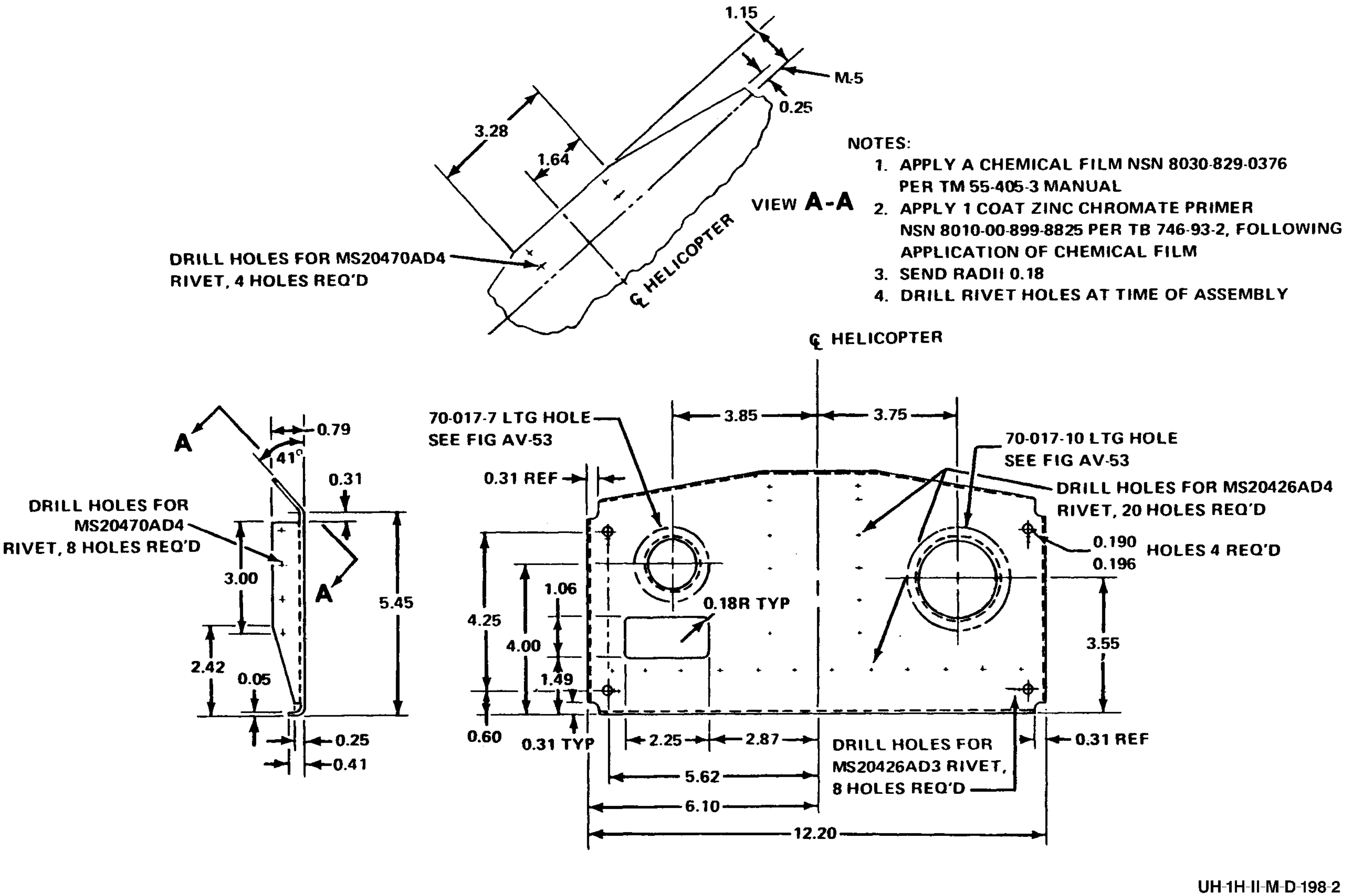


Figure D-198. Part Number 203-031-250-5, SUPPORT (Sheet 2 of 6)
Fabricate From: NSN 9535-00-640-2311
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp 3, 0.050 Inch Thick

NOTES:
1. APPLY A CHEMICAL FILM NSN 8030-00-829-0376 PER TM 55-405-3 MANUAL
2. APPLY 1 COAT ZINC CHROMATE PRIMER NSN 8010-00-899-8825 PER TB 746-93-2 FOLLOWING APPLICATION OF CHEMICAL FILM
3. BEND RADII 0.18
4. DRILL RIVET HOLE AT TIME OF ASSEMBLY

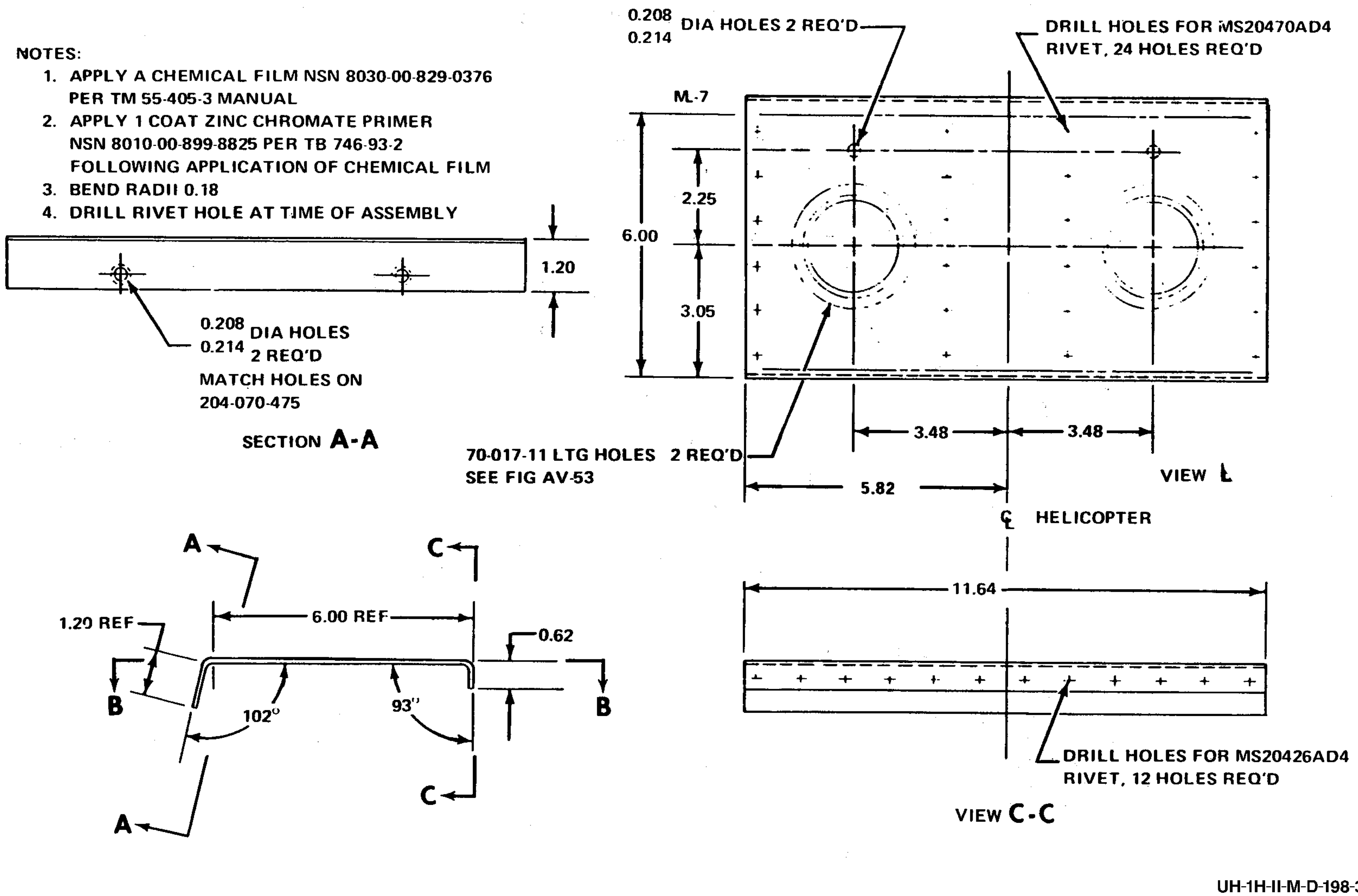


Figure D-198. Part Number 205-031-250-7, SUPPORT (Sheet 3 of 6)
Fabricate From: NSN 9535-00-640-2311
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp 3, 0.050 Inch Thick

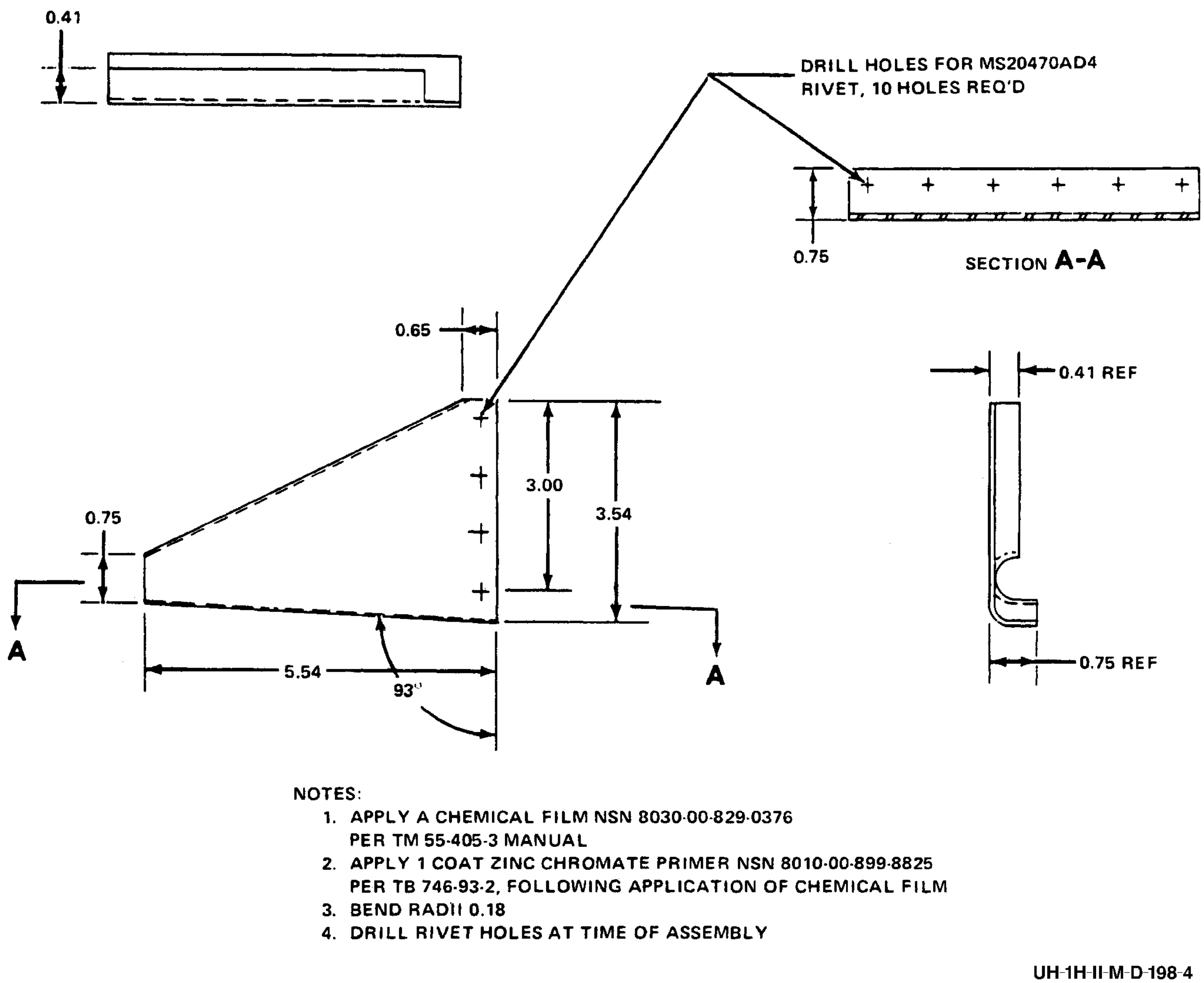


Figure D-198. Part Number 205-031-250-9, SHOWN-GUSSET (Sheet 4 of 6)
205-031-250-10, OPPOSITE-GUSSET
Fabricate From: NSN 9535-00-640-2311
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp 3, 0.050 Inch Thick

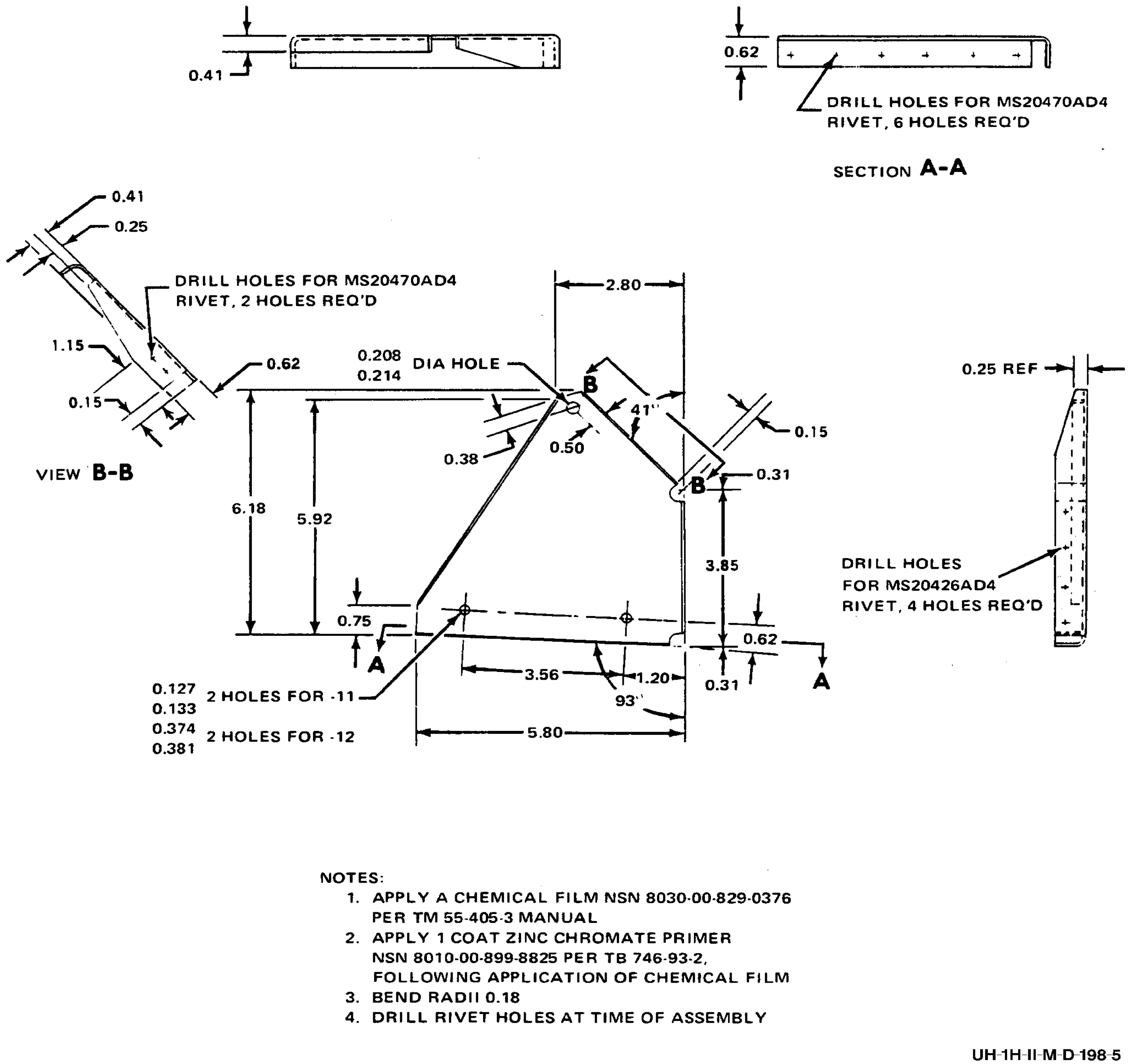
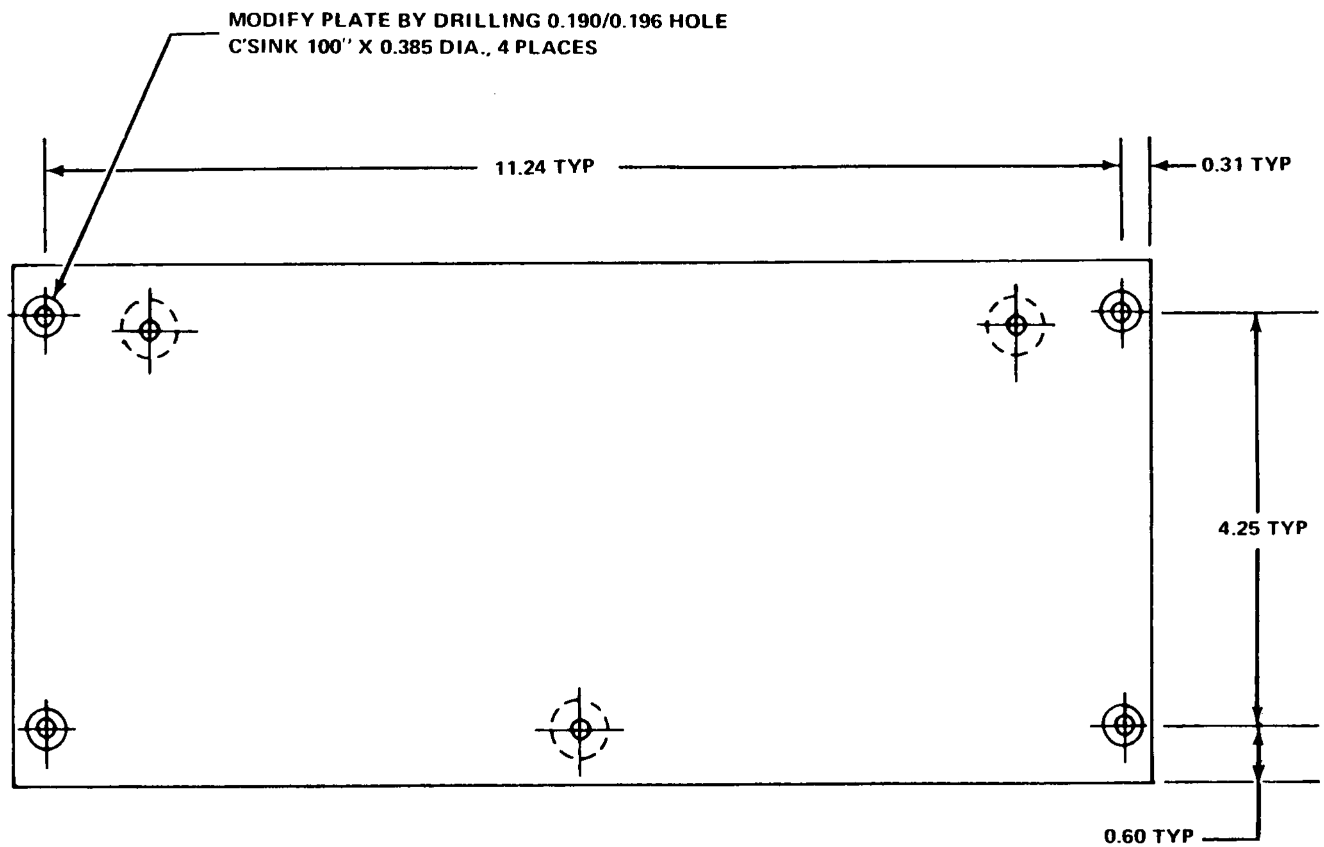
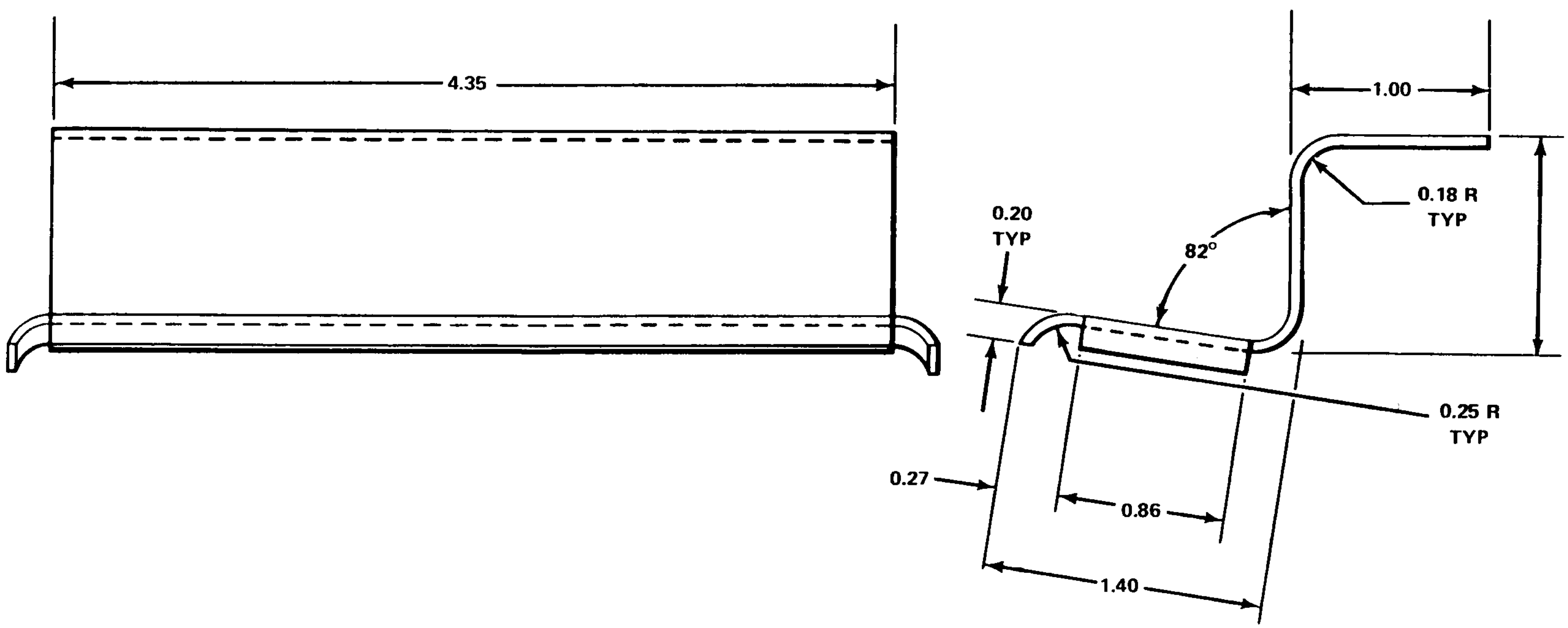


Figure D-198. Part Number 205-031-250-11, SHOWN-GUSSET (Sheet 5 of 6)
205-031-250-12, OPPOSITE-GUSSET
Fabricate From: NSN 9535-00-640-2311
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, Temp 3, 0.050 Inch Thick



UH-1H-II-M-D-198-6

Figure D-198. Part Number 205-031-250-13, BASE PLATE (Sheet 6 of 6)
Fabricate From: NSN 1560-00-903-0798
Material:



UH-1H-II-M-D-199

Figure D-199. Part Number 205-070-942-1, BRACKET
Fabricate From: NSN 9535-00-554-1412
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick

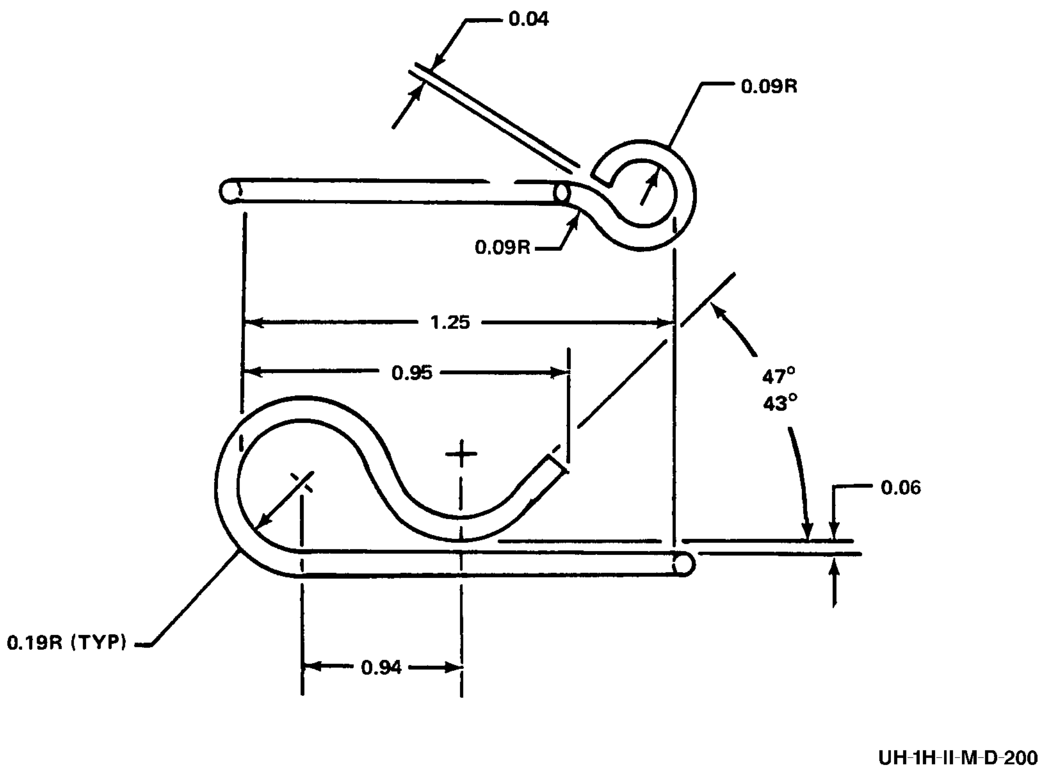


Figure D-200. Part Number 205-070-269-1, CLIP, Spring Tension
Fabricate From: NSN 9505-00-221-2682
Material: Wire, Steel Carbon, Spring, Federal Specification MIL-W-6101-2, 0.067 Inch Dia.

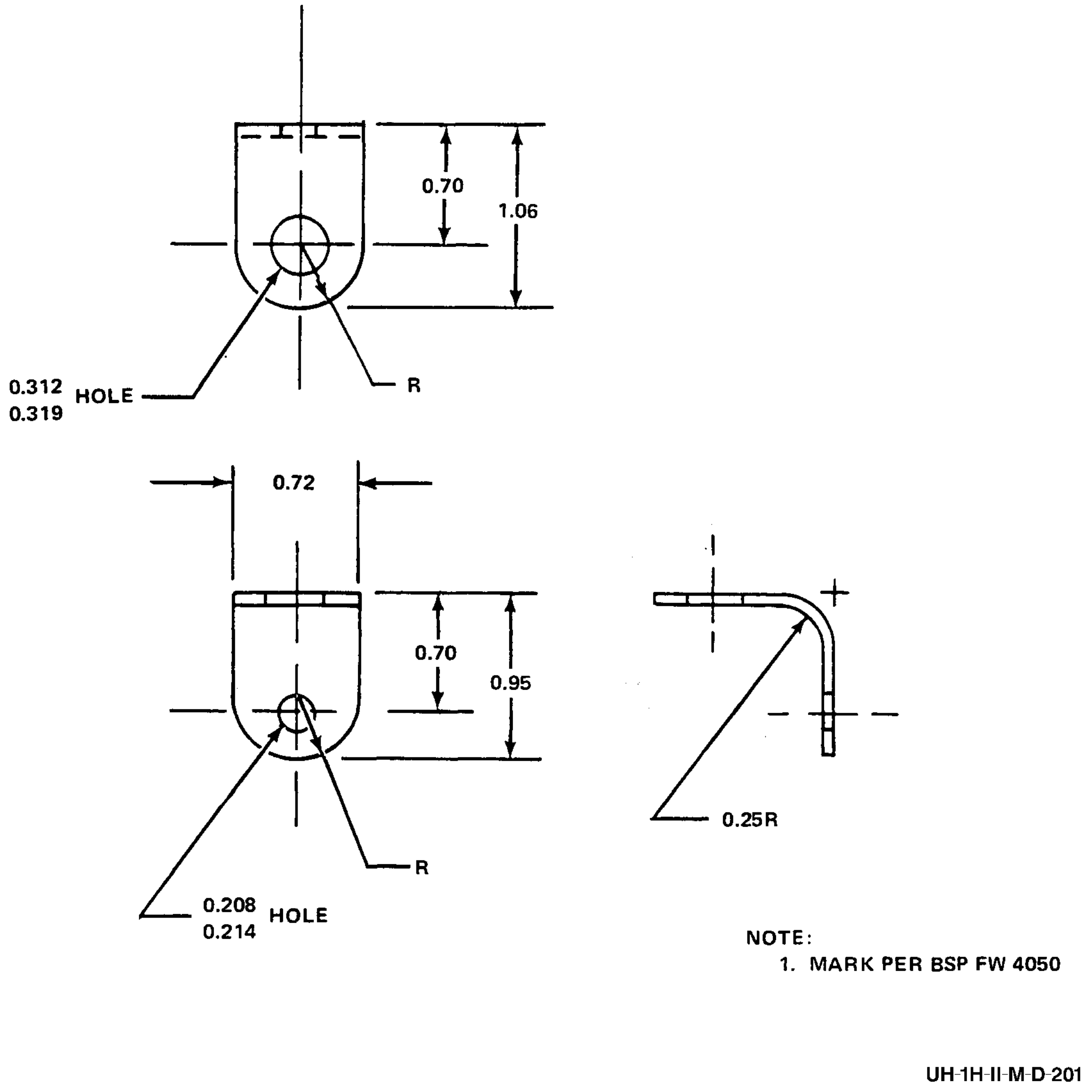
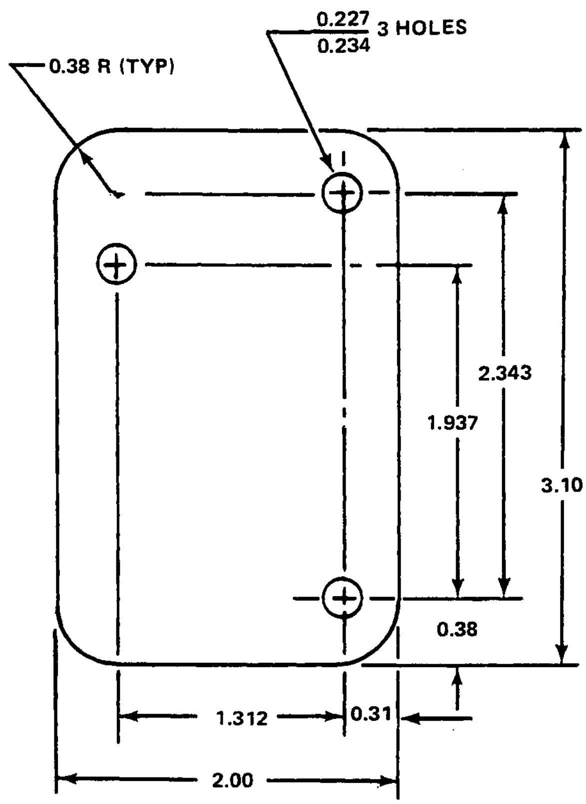


Figure D-201. Part Number 205-072-274-1, BRACKET, ANGLE
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



NOTE:
1. MARK PER BPS FW 4050

UH-1H-II-M-D-202

Figure D-202. Part Number 205-072-403-1 PLATE, Cover, Heating Valve
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

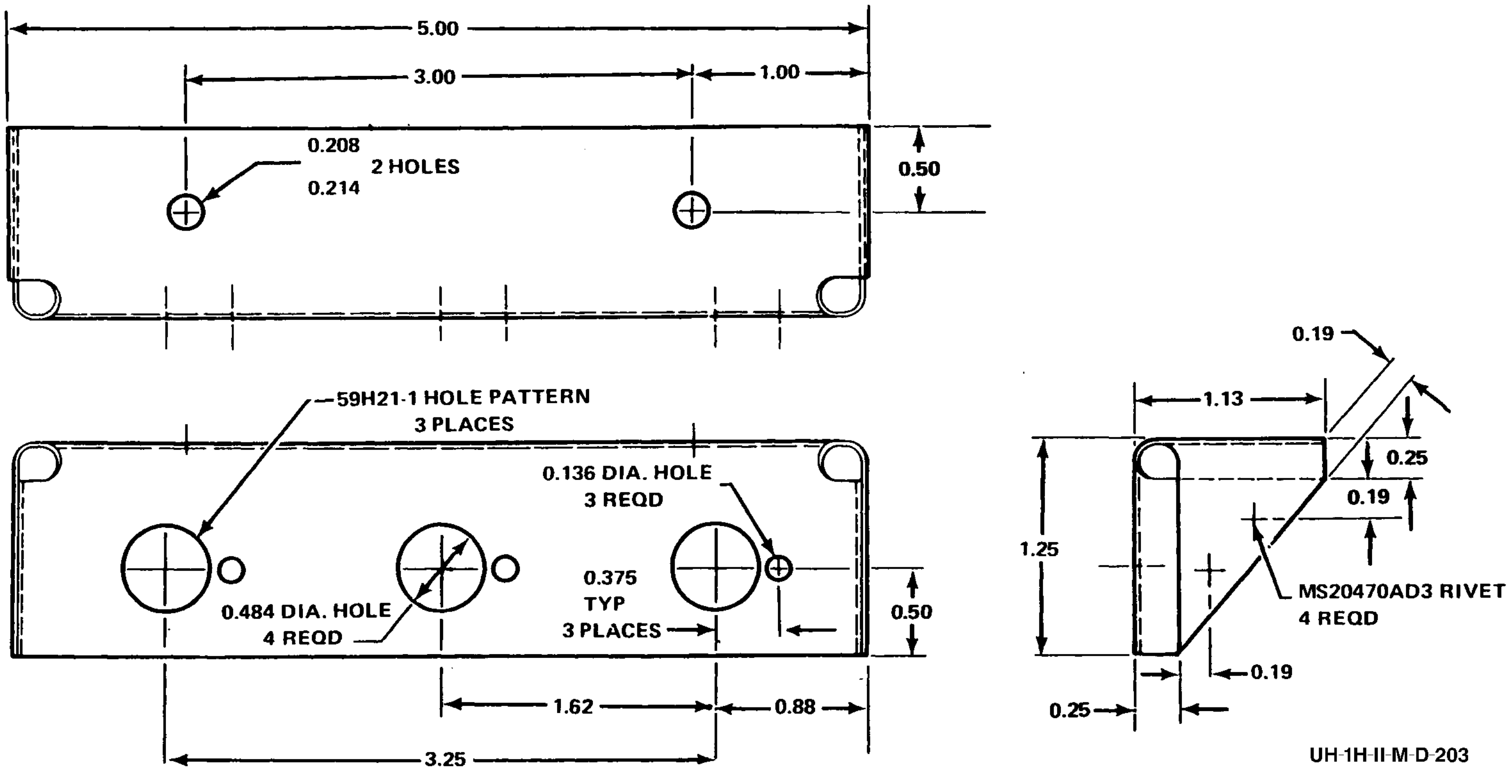
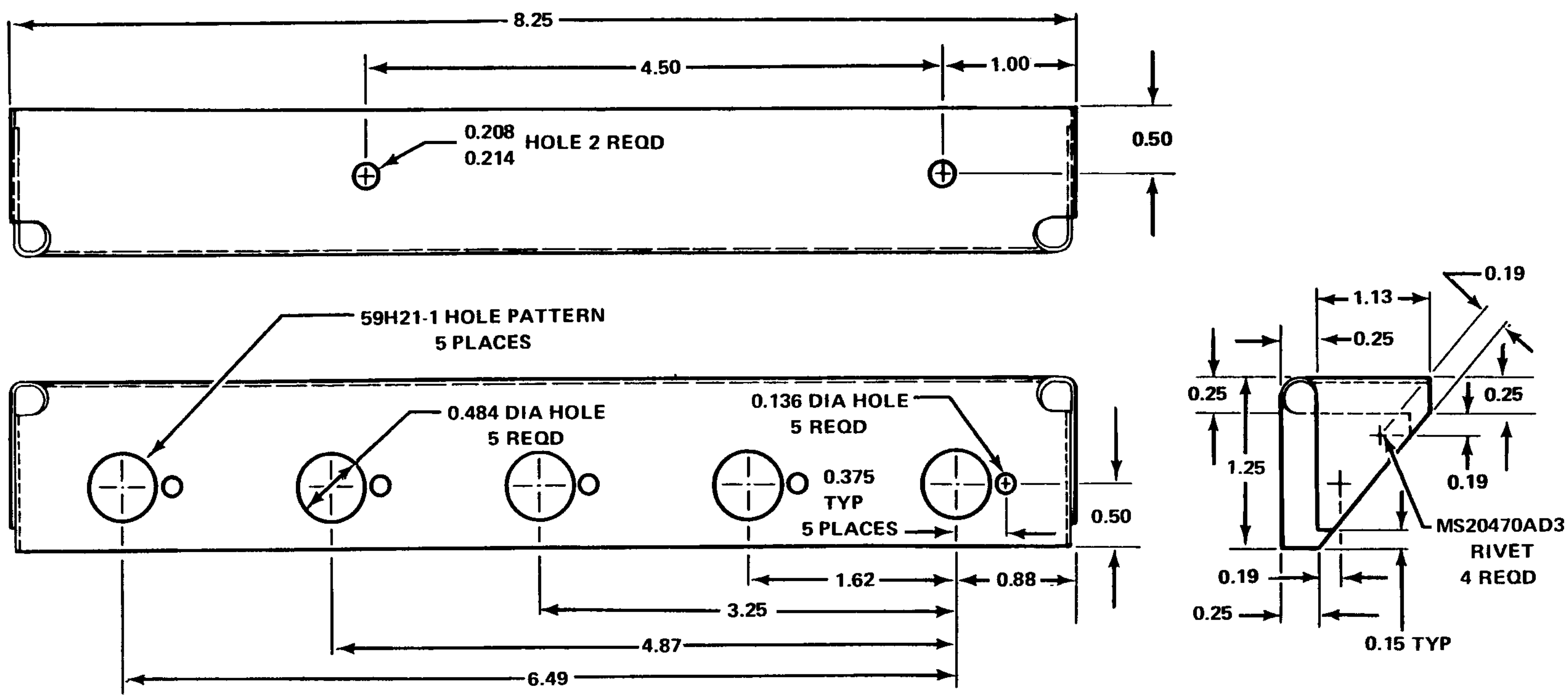
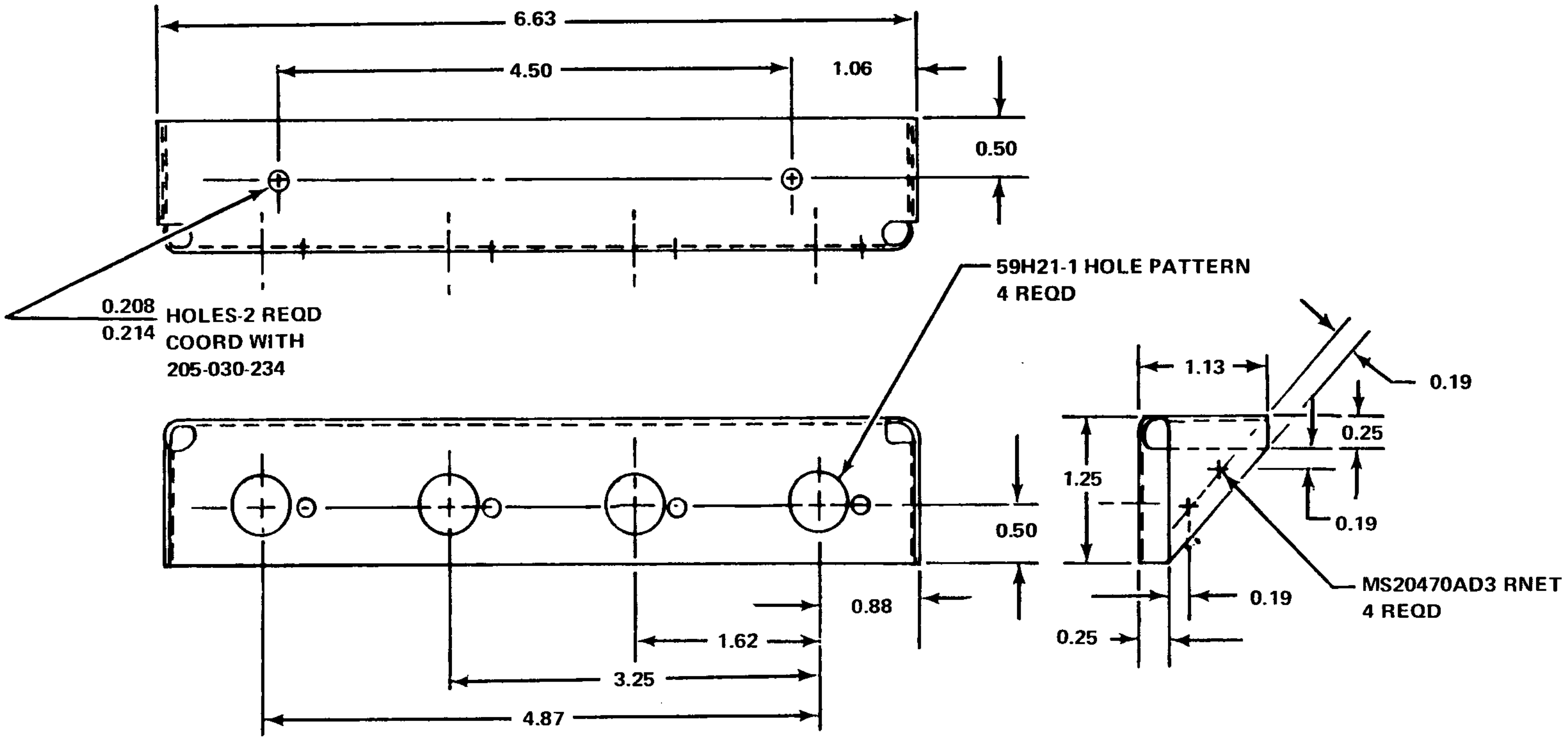


Figure D-203. Part Number 205-075-126-1, SUPPORT ASSEMBLY, Circuit Breaker
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick



UH-1H-II-M-D-204

Figure D-204. Part Number 205-075-126-9, SUPPORT ASSEMBLY, Circuit Breaker
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

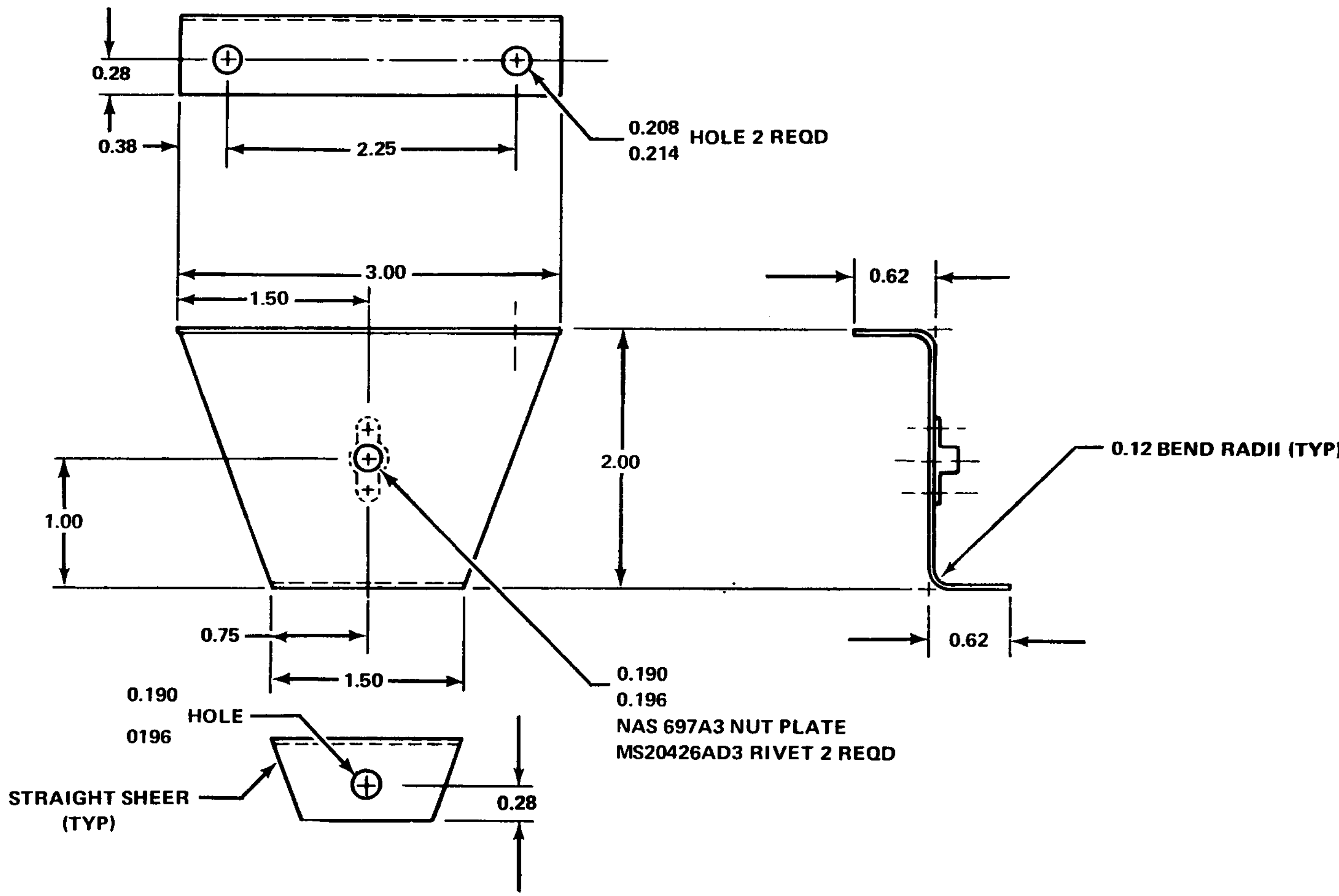


NOTES:

1. MARK PART PER BPS FW 4050
2. ALL BEND RADII TO BE 0.12 UNLESS OTHERWISE NOTED
3. BEND RELIEF RADII 0.16

UH-1H-II-M-D-205

Figure D-205. Part Number 205-075-126-13, SUPPORT ASSEMBLY
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick



UH-1H-II-M-D-206

Figure D-206. Part Number 205-075-133-1, BRACKET ASSEMBLY, Cable Support
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

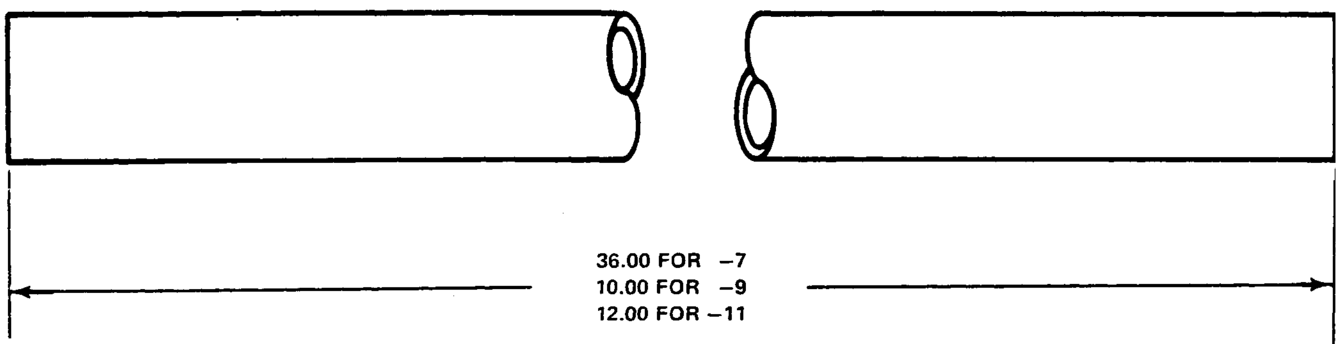
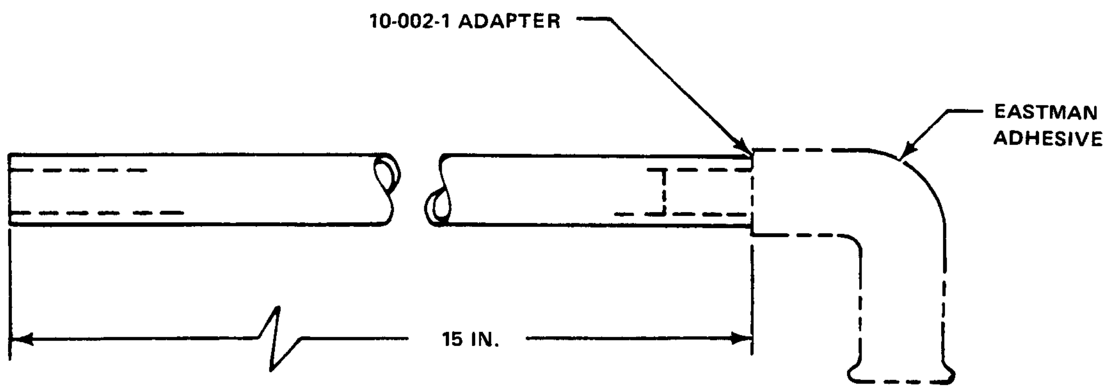


Figure D-207. Part Number 205-075-134-1, TUBE, Battery Vent
Fabricate From: NSN 4710-00-279-0955
Material: 5052 AL ALY Tube, Federal Specification WW-T-700/4, Type 1, 3/8 Inch Dia, 0.049 Inch Wall Thickness



NOTES:
1. MARK PART PER BPS FW 4050
2. PRIOR TO BOND CLEAN SURFACES WITH ACETONE CHEM PURE OR METHYL ETHYL KETONE CHEM PURE
3. ALTERNATE MAT'L: RUBBER - BLACK, MIL-R-6855, CLASS II - GRADE 60

UH-1H-II-M-D-208

Figure D-208. **Part Number** **205-075-135-15, TUBE**
Fabricate From: **NSN 4720-00-540-3644**
Material: **Tubing, Black Synthetic, Federal Specification MIL-R-6855, Class II, Grade 40, 3/8 Inch ID, 1/8 Inch Wall Thickness**

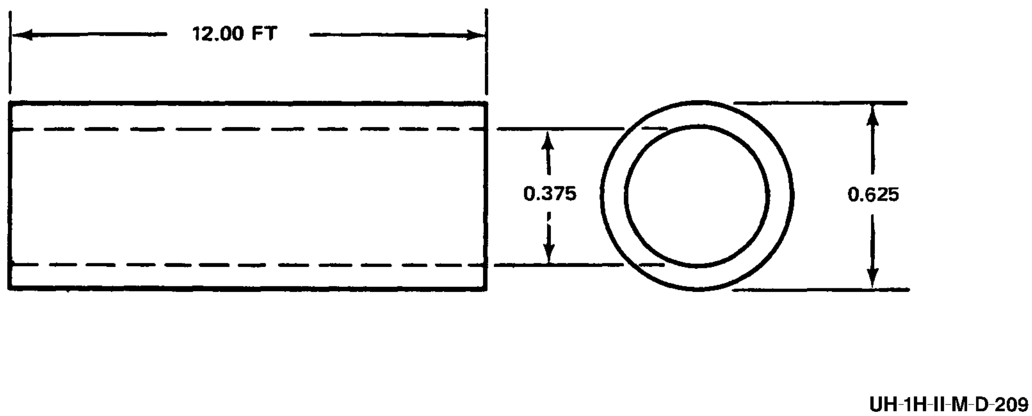


Figure D-209. Part Number 205-075-142-3, TUBE
Fabricate From: NSN 4720-00-231-2483
Material: Tubing, Rubber, Natural, Federal Specification ZZ-T-831, Grade A, 3/8 Inch ID, 1/8 Inch Wall Thickness

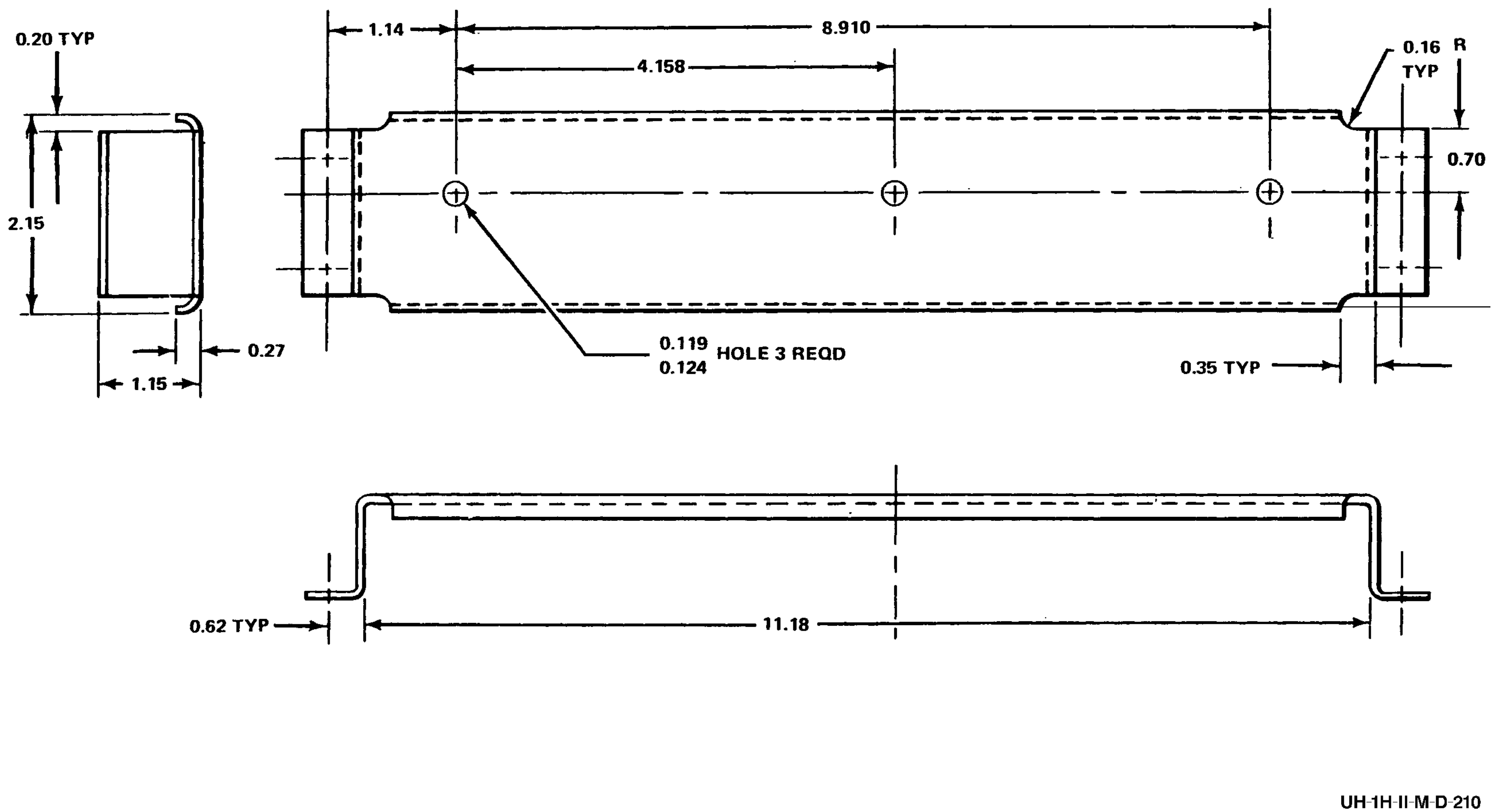


Figure D-210. Part Number 205-075-144-3, BRACKET
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

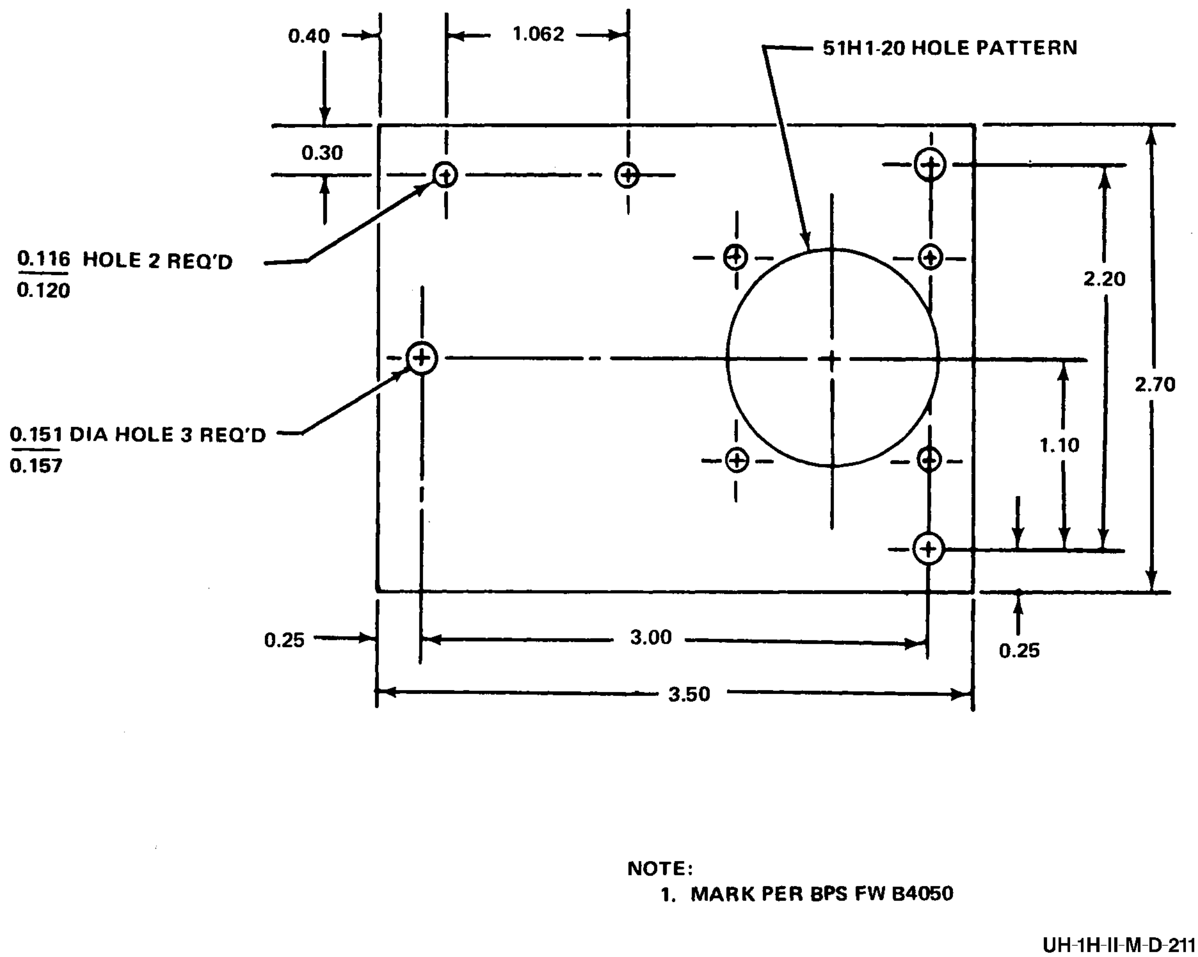


Figure D-211. Part Number 205-075-229-1, MOUNTING PLATE
Fabricate From: NSN 9535-00-554-1412
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick

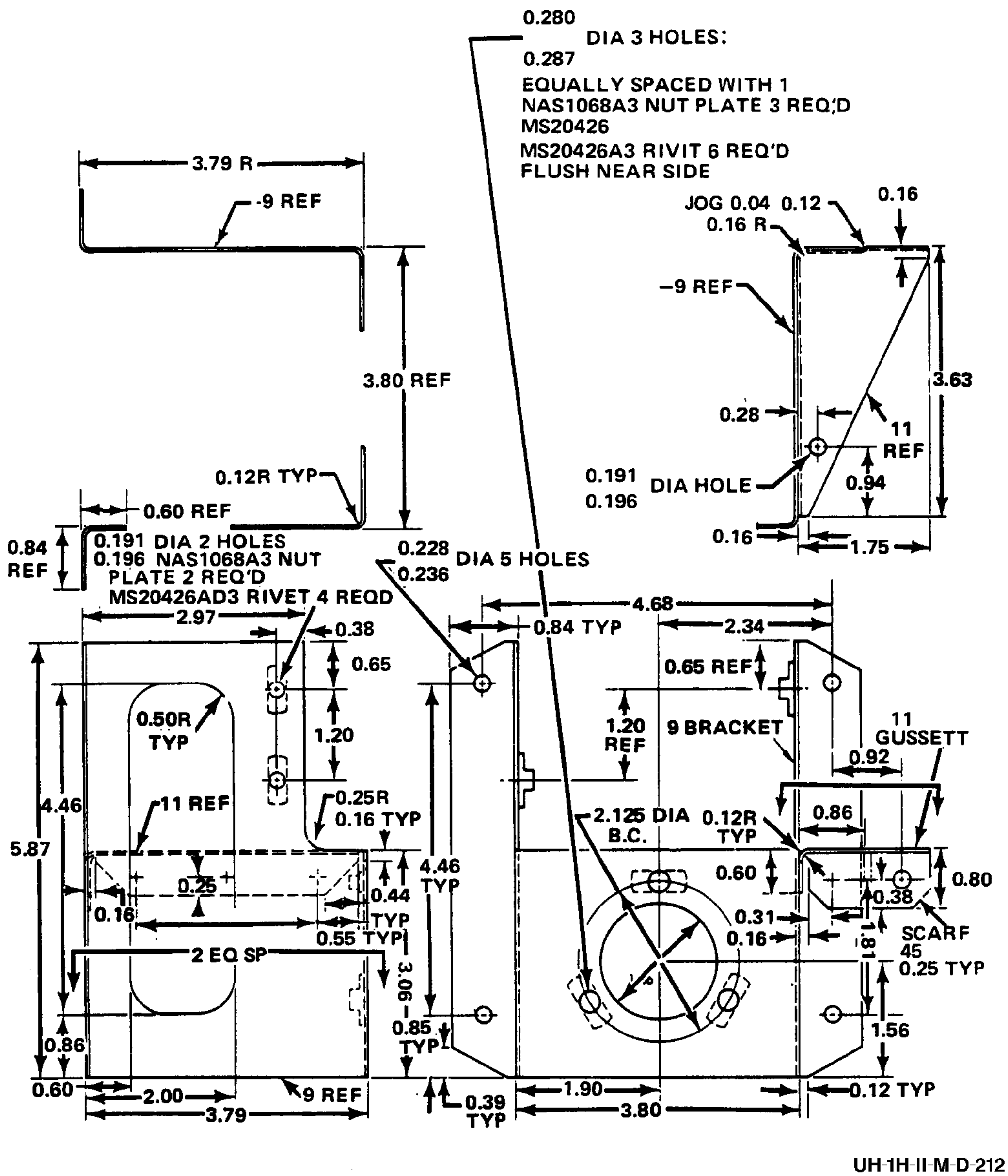


Figure D-212. Part Number 205-076-101-1, BRACKET ASSEMBLY
205-076-101-3
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick

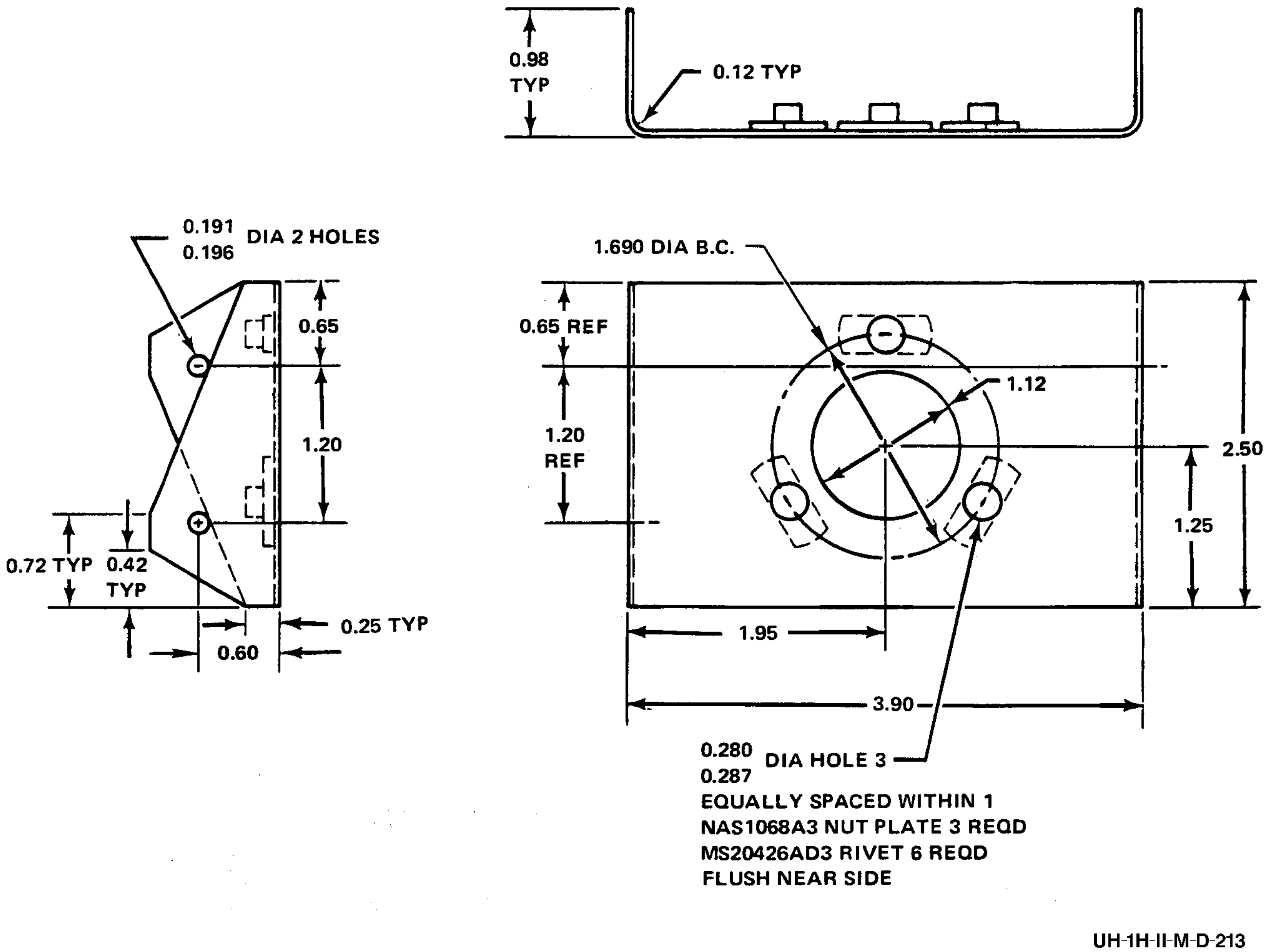


Figure D-213.	Part Number	205-076-101-1, BRACKET ASSEMBLY
		205-076-101-3
	Fabricate From:	NSN 9535-00-167-2280
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick

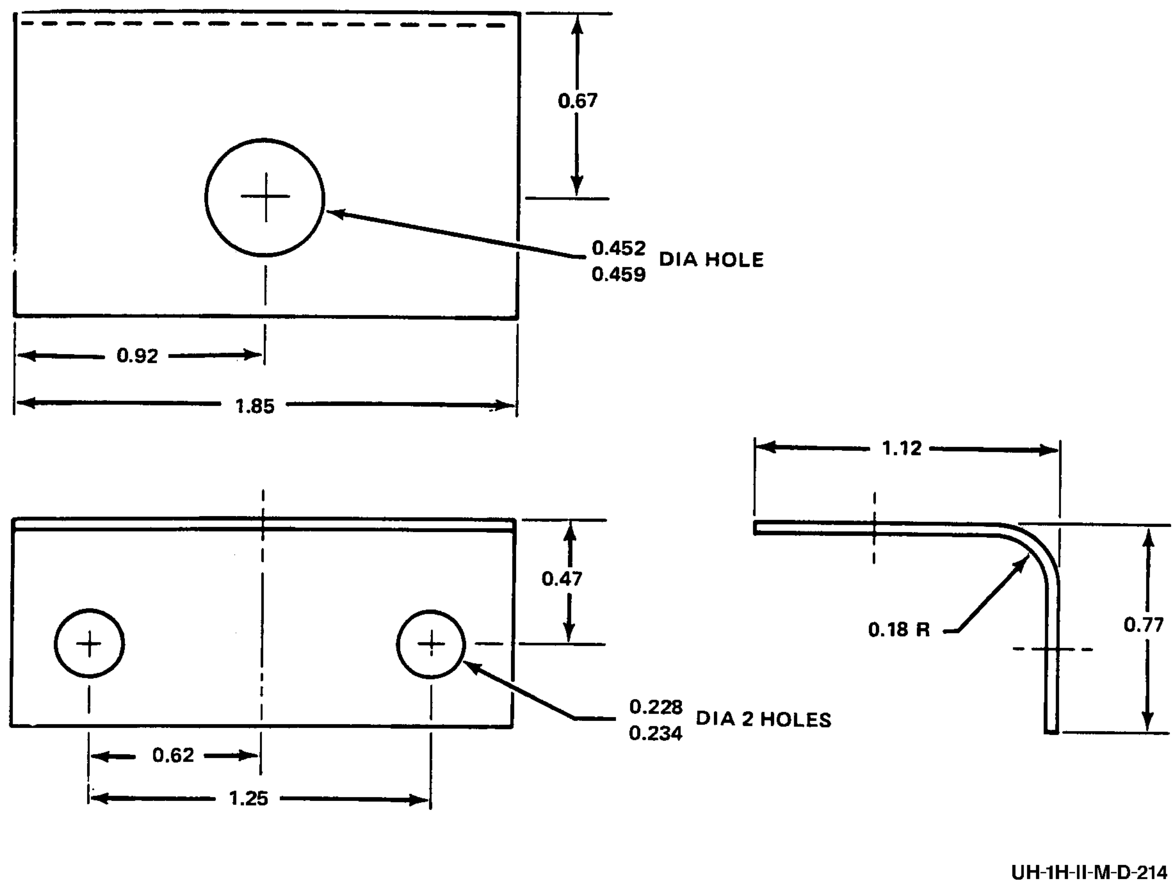


Figure D-214.	Part Number	205-076-102-1, BRACKET
	Fabricate From:	NSN 9535-00-554-1412
	Material:	2024 AL ALY Sheet, Federal Specification QQ-A-362, 0.050 Inch Thick

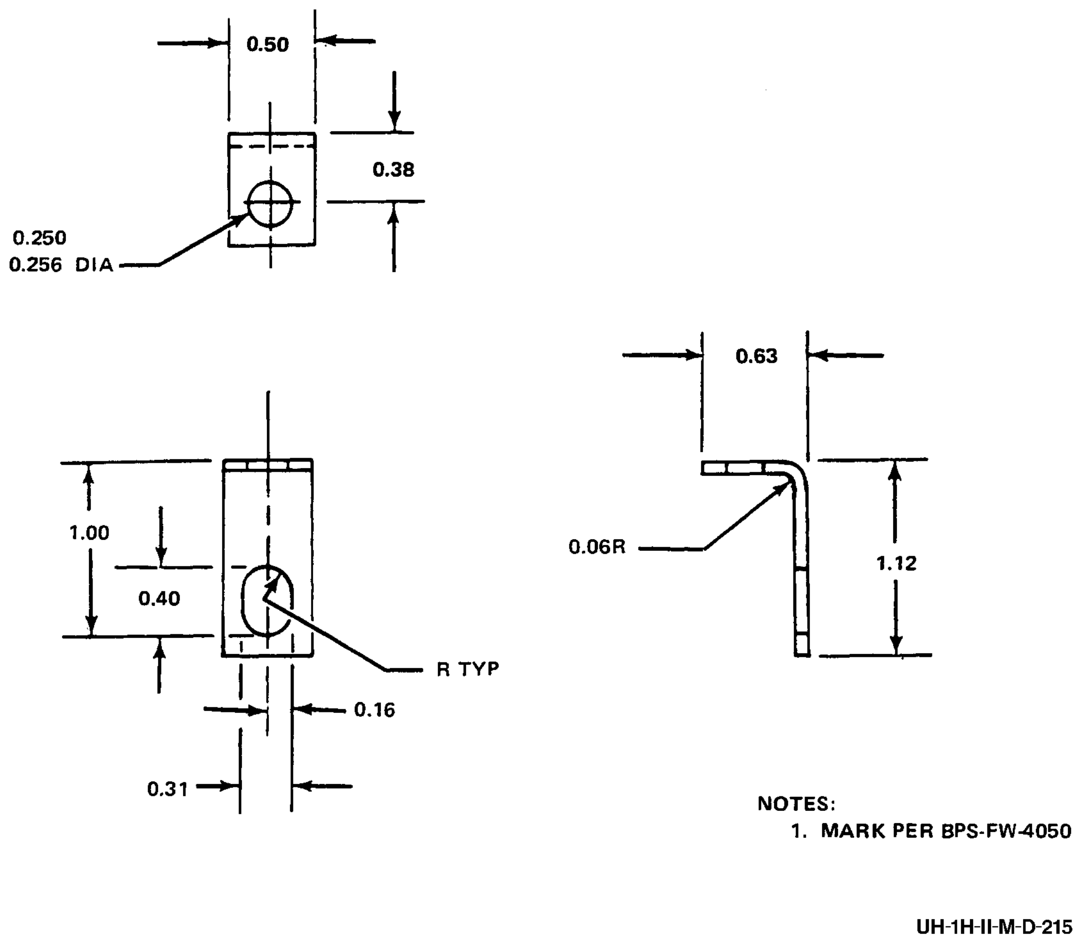


Figure D-215. Part Number 205-076-118-1, BRACKET, Angle
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

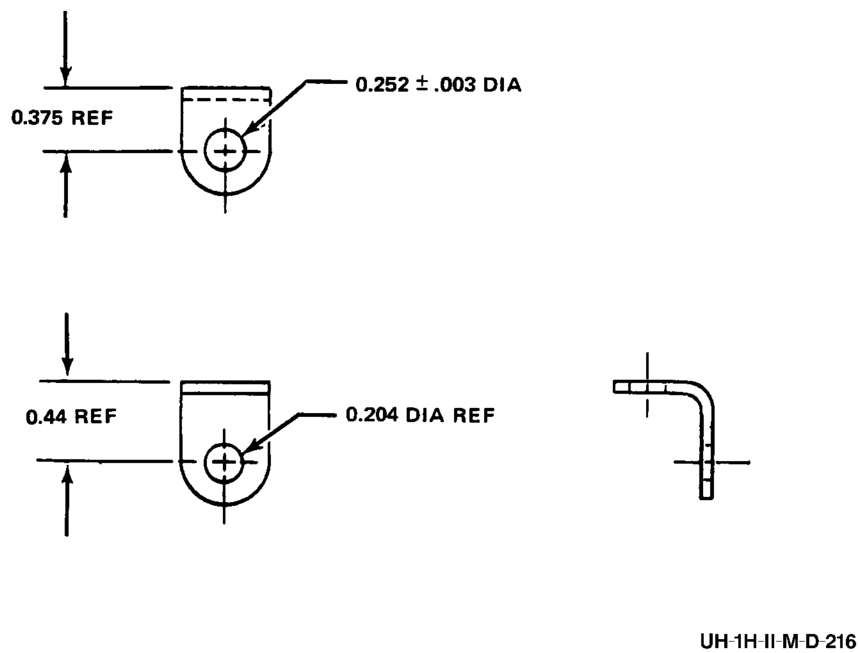


Figure D-216. Part Number 205-076-230-1, BRACKET, Angle
Fabricate From: NSN 9535-00-232-0378
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick

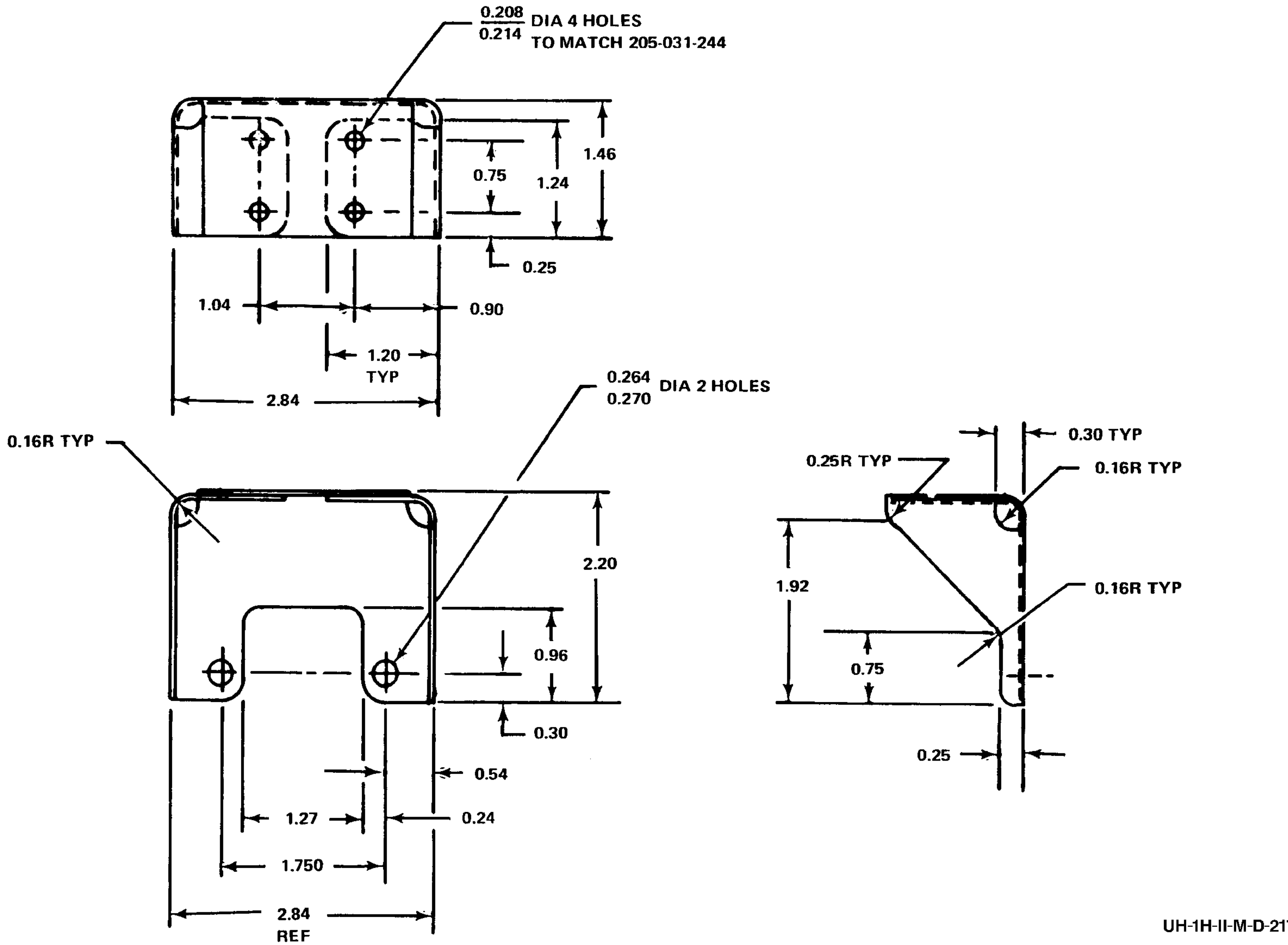
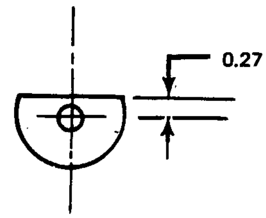
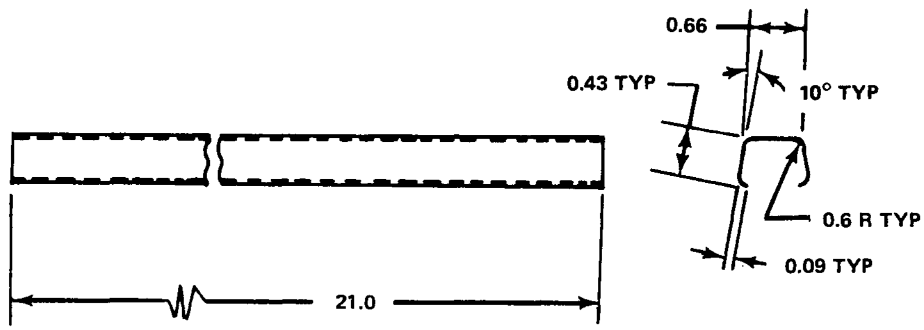


Figure D-217. Part Number 205-075-234-1, BRACKET, HYDRAULIC FILTER
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.040 Inch Thick



DETAIL OF -11 WASHER

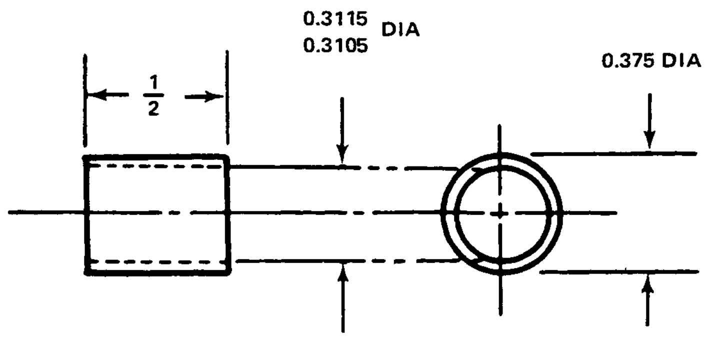


DETAIL OF -15 CHANNEL

NOTES:
1. ZINC CHROMATE FINISH

UH-1H-II-M-D-218

Figure D-218.	Part Number	205-706-025-11, WASHER
	Fabricate From:	NSN 5210-00-167-0766
	Part Number	205-706-025-15 CHANNEL
	Fabricate From:	NSN 9535-00-232-0543
	Material:	Washer, Flat Sheet, Cadmium Plated, Make From AN970-4 Washer 2024 AL ALY Sheet, Federal Specification QQ-A-250/5 0.016 Inch Thick



NOTE:
1. BREAK SHARP EDGES 0.005 TO 0.010

UH-1H-II-M-D-219

Figure D-219. Part Number 1102-1 SLEEVE, Solenoid Shaft
Fabricate From: NSN 9510-00-229-4818
Material: Steel Bar, Carbon, Cold, Federal Specification QQ-S-634, Comp C1045, 0.375 Inch Dia

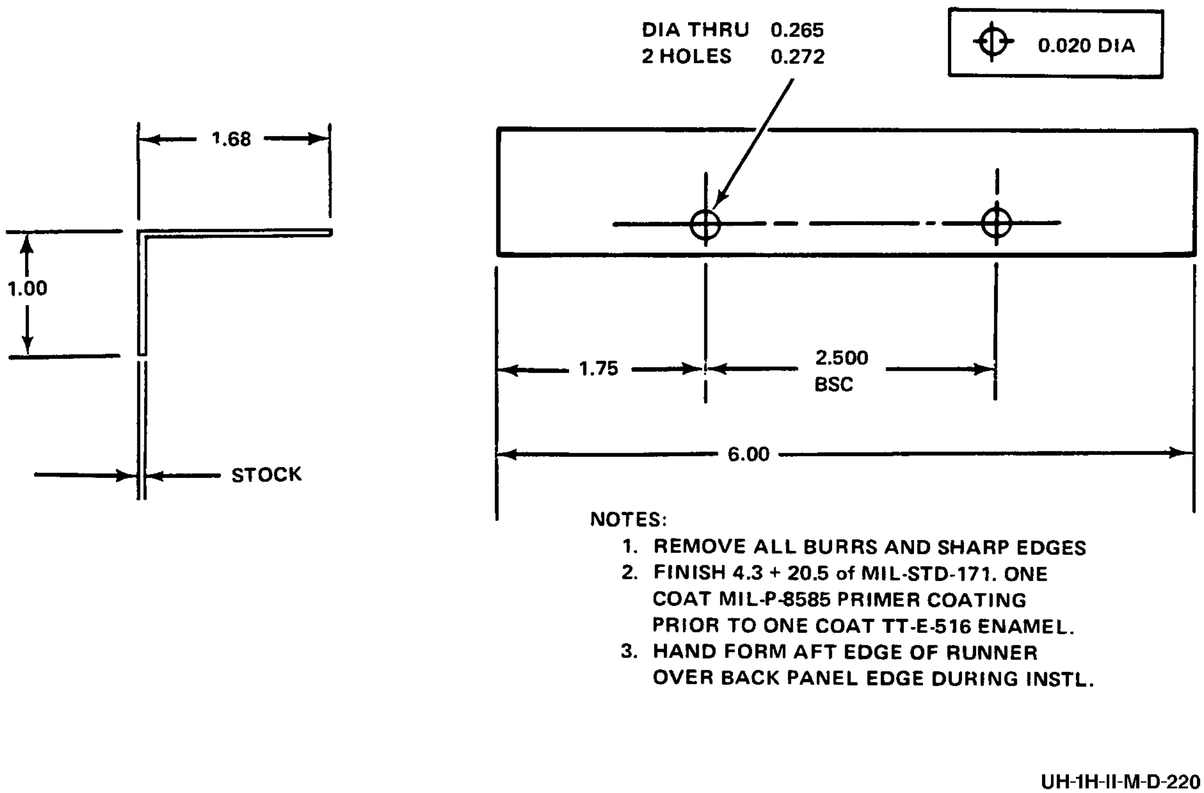


Figure D-220. Part Number 178065-1, RUNNER, Metal
Fabricate From: NSN 9535-00-167-2279
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick

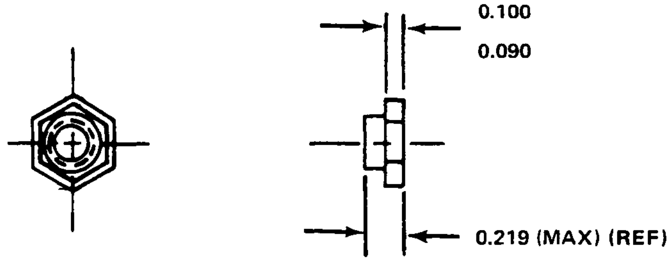
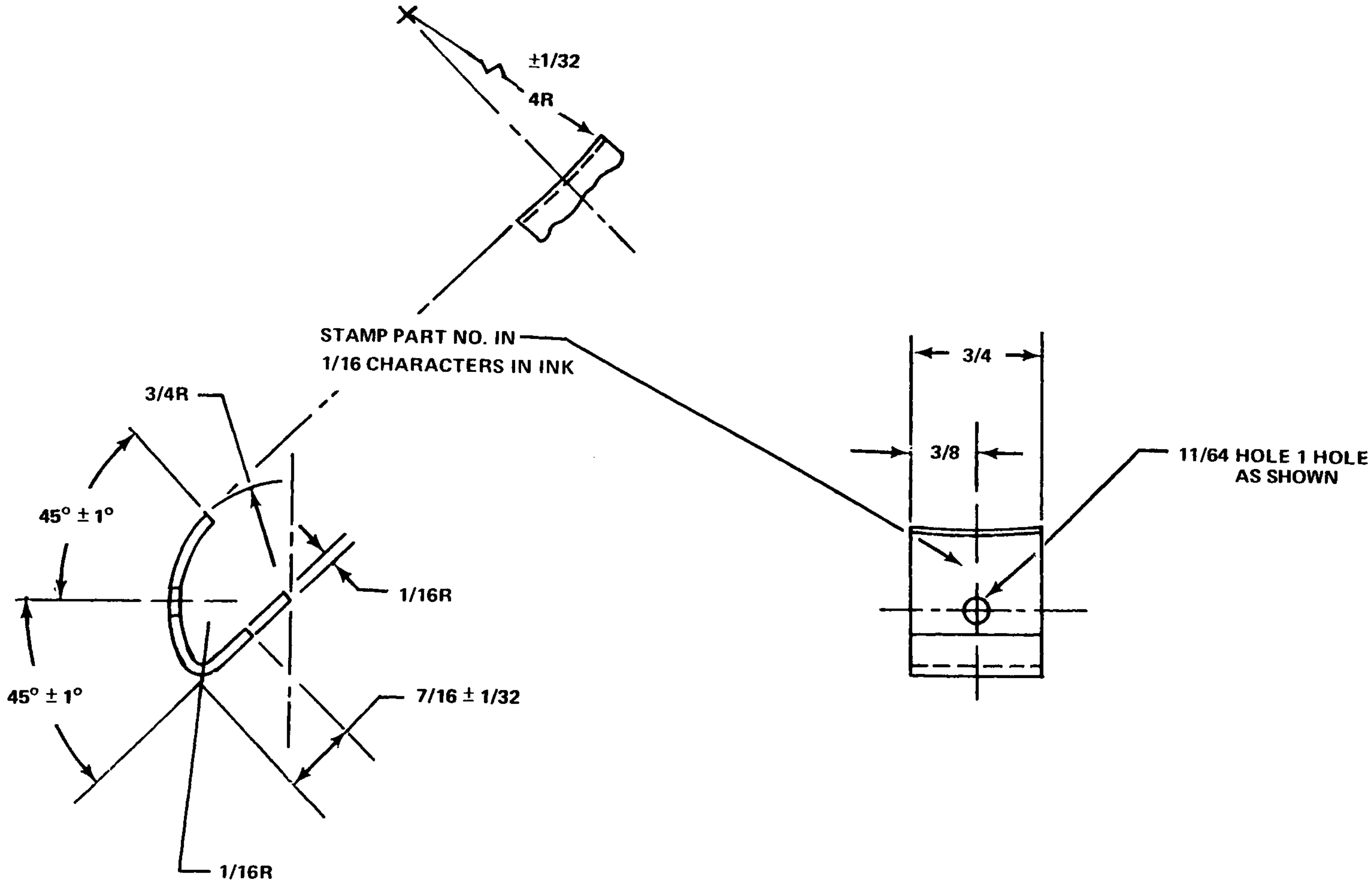


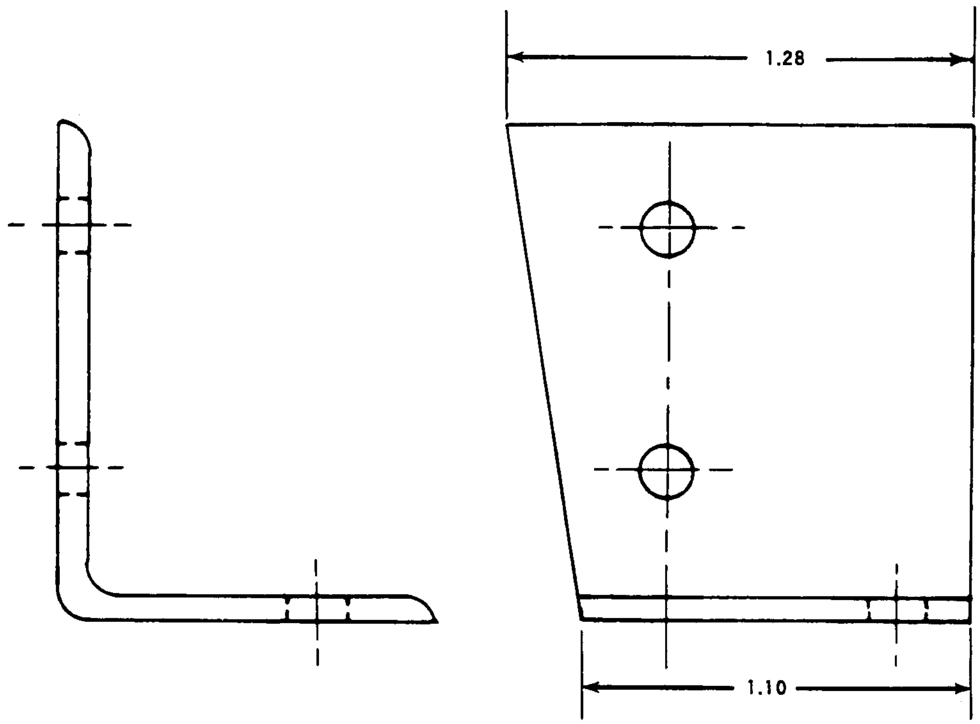
Figure D-221. Part Number 528307, NUT, Self-Locking
Fabricate From: NSN 5310-00-807-1475
Material:



NOTE:
1. PAINT PER SPEC KM9608

UH-1H-II-M-D-222

Figure D-222. Part Number 9524492, CLIP, VALVE
Fabricate From: NSN 9535-00-554-1417
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.063 Inch Thick



NOTES:
1. DRILL HOLES UPON ASSEMBLY
2. CUT WIDTH FROM BULK STOCK AS SHOWN

UH-1H-II-M-D-223

Figure D-223.	Part Number	205-030-919-37 SHN CLIP
		205-030-919-38 OPP
	Fabricate From:	NSN 9540-00-145-5715
	Material:	2024 AL ALY Structural Angle Aluminum, Make from AND 10134-2001

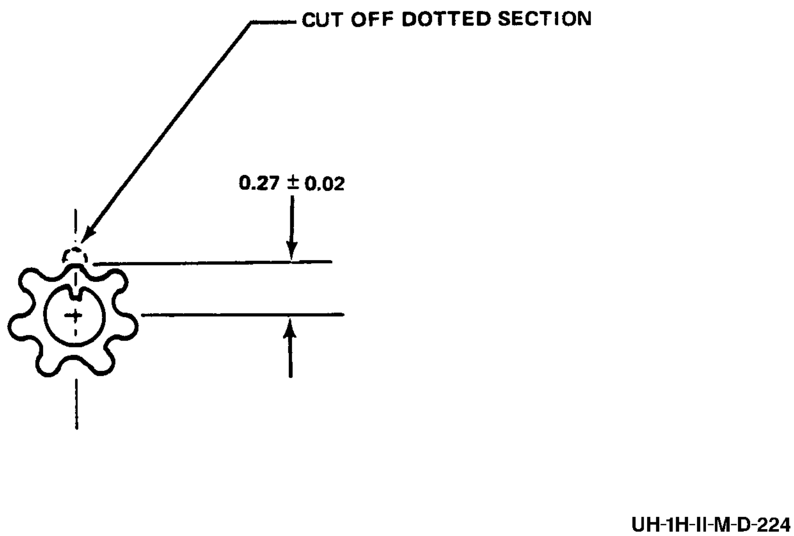


Figure D-224. Part Number 100337, WASHER, KEY
Fabricate From: NSN 5310-00-297-4088
Material: Washer, Key Steel, Make from NAS460-516

PART NUMBER	NOMENCLATURE	FABRICATE FROM	ID	OD	LENGTH
E1112-32-14	SLEEVE-INSULATING	5970-00-235-2728	0.375	0.400	AS REQD.
Y1152-1-6	"	5970-00-235-2721	0.057	0.086	AS REQD.
Y1152-1-11	"	5970-00-235-2733	0.102	0.121	AS REQD.

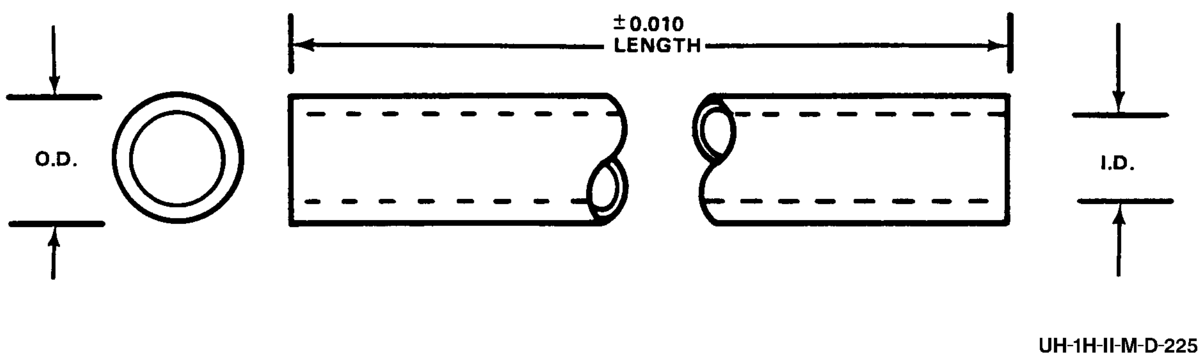


Figure D-225. (Added) Sleeve-Insulating

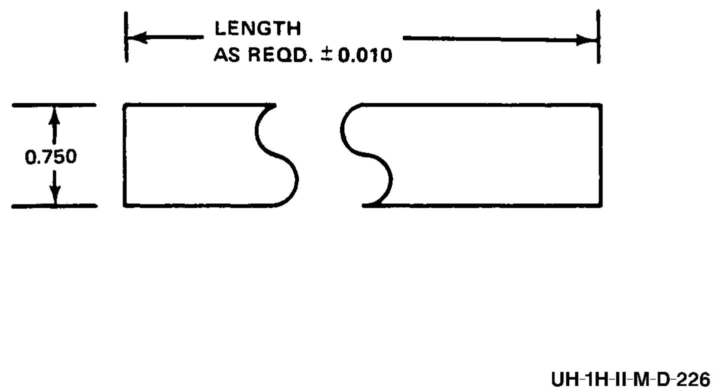
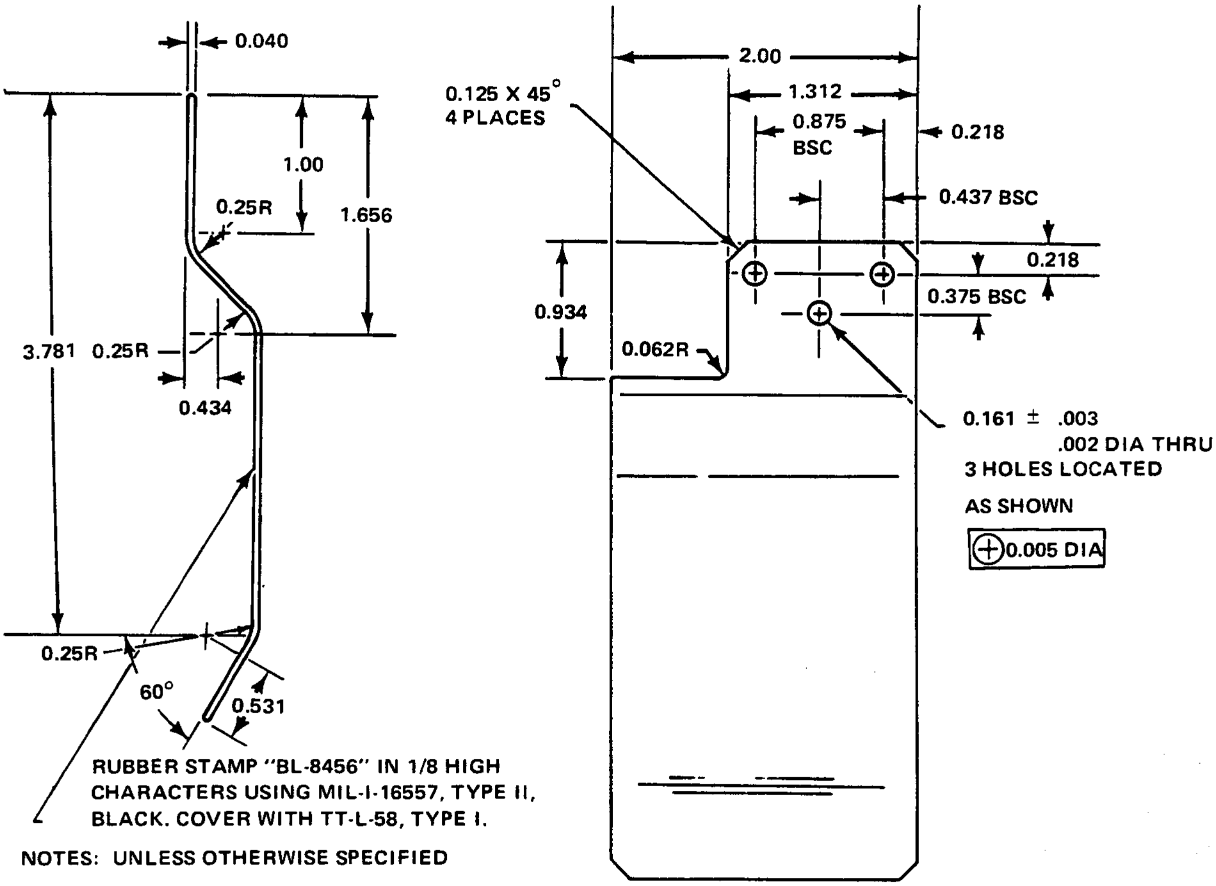


Figure D-226. (Added)
Part Number Y-1159-2-3, Tape, Glass Cloth, Pressure Sensitive
Fabricate From: NSN 5970-00-284-8565
Material:



NOTES: UNLESS OTHERWISE SPECIFIED

1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
2. REMOVE ALL BURRS & SHARP EDGES.
3. SURFACE ROUGHNESS AS ROLLED OR DRAWN. PUNCHED, CUT, OR MACHINED SURFACES TO HAVE 250
4. FINISH ALL OVER WITH CHEMICAL FILM PER MIL-C-5541, TYPE I, CLASS 1, GRADE C.

UH-1H-II-M-D-227

Figure D-227.	(Added)	Shroud, Motor, Right Side
	Part Number	BL8456 FMC08484
	Fabricate From:	NSN 9515-00-580-0405
	Material:	

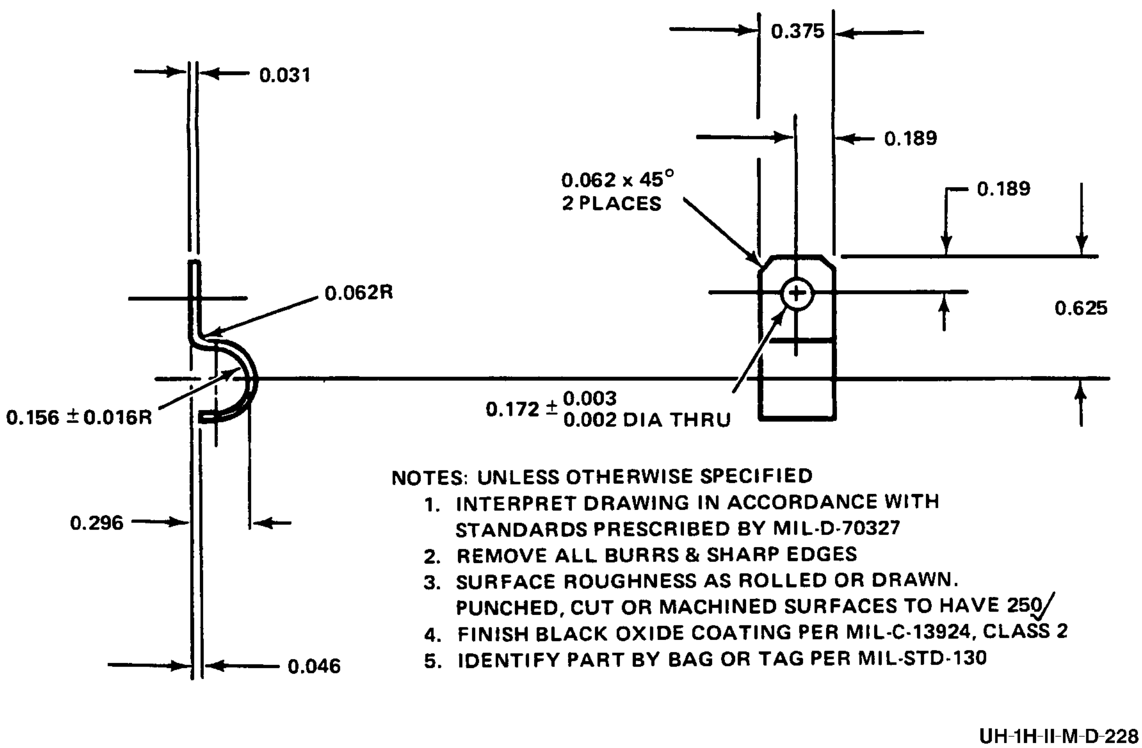
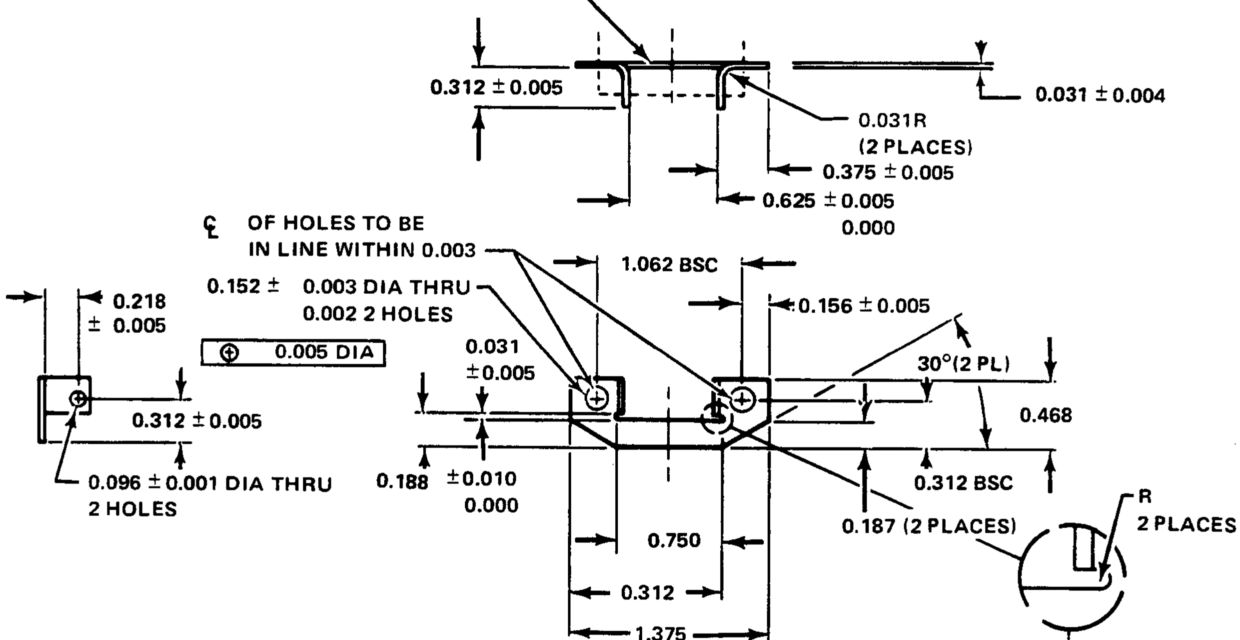


Figure D-228.	**(Added)**	**Clamp, Cable**
	Part Number	**BL8453 FMC08484**
	Fabricate From:	**NSN 9535-00-580-5516**
	Material:	**Metal Strip-Steel, Corrosion Resistant, Federal Specification MIL-S-5059, Comp 201, 0.032 Inch Thick**



NOTES: UNLESS OTHERWISE SPECIFIED
1. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327
2. REMOVE ALL BURRS & SHARP EDGES
3. SURFACE ROUGHNESS AS ROLLED OR DRAWN. PUNCHED, CUT OR MACHINED SURFACES TO HAVE 125√
4. FINISH: PASSIVATE PER MIL-S-5002

UH-1H-II-M-D-229

Figure D-229. (Added) Bracket, Trunnion Actuator
Part Number: BL8379 FMC08484
Fabricate From: NSN 9515-00-580-5516
Material: Metal Strip-Steel, Corrosion Resistant, Federal Specification MIL-S-5059, Comp 302, 0.032 Inch Thick

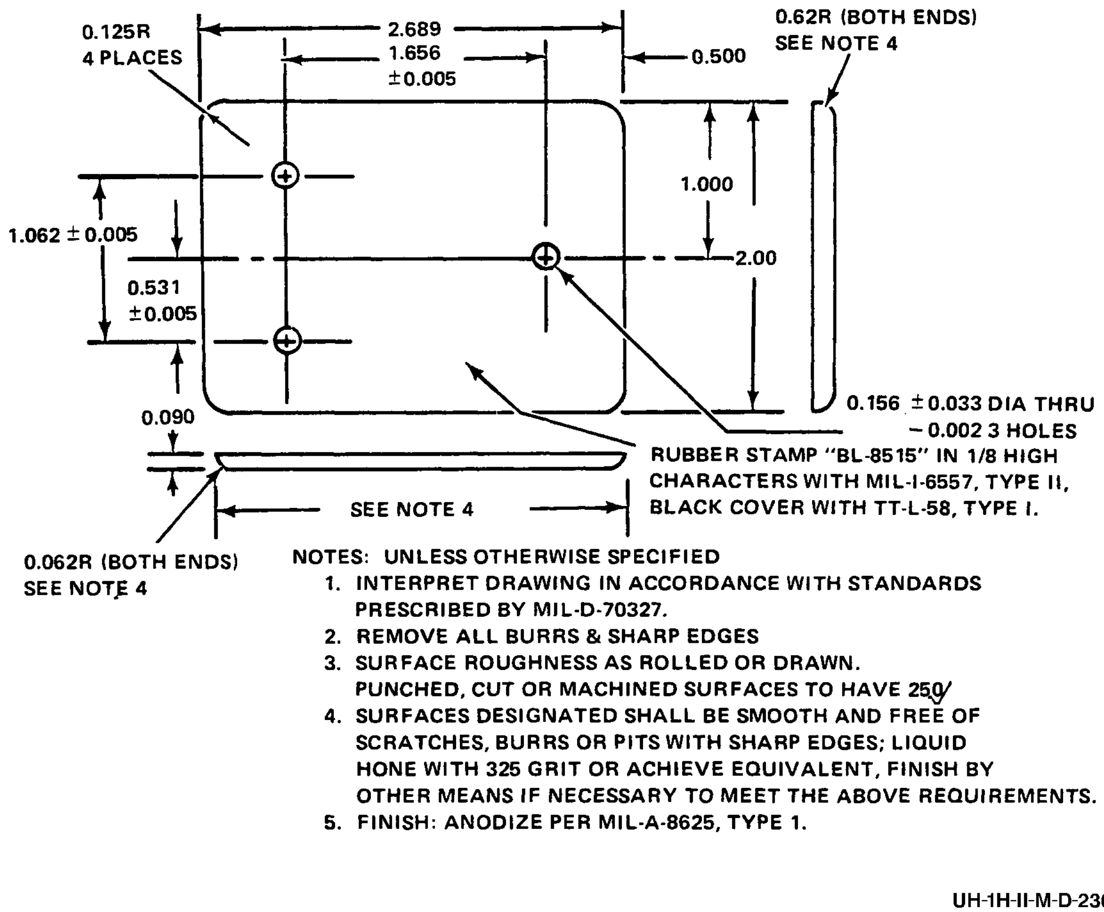
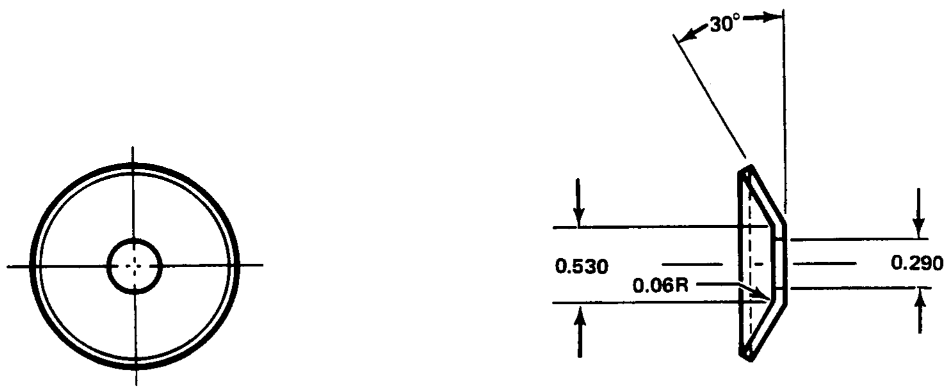


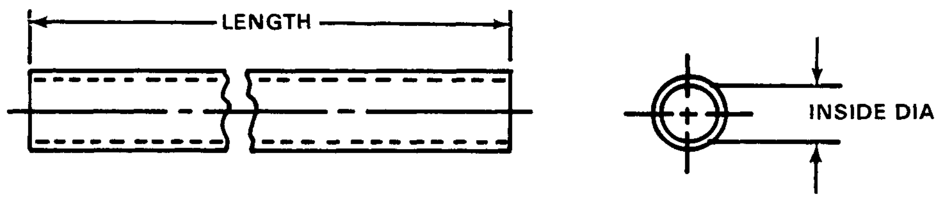
Figure D-230.	(Added)	Retainer, Rectifier Bracket
	Part Number	BL8515 FMC08484
	Fabricate From: Material:	NSN 9535-00-232-0405



NOTES:
1. BRUSH CAD REWORKED AREAS AS REQUIRED.

UH-1H-II-M-D-231

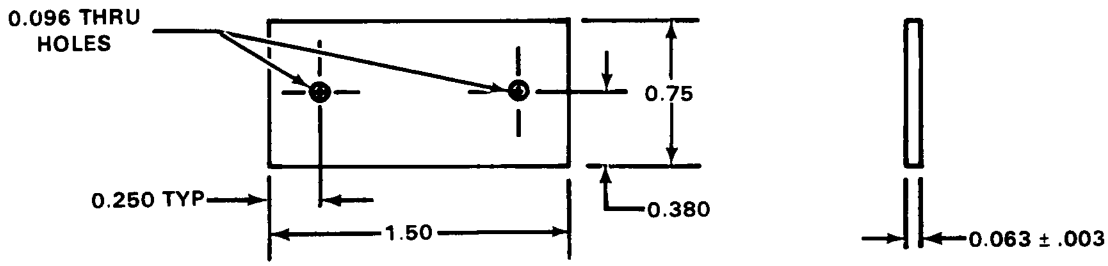
Figure D-231.	**Part Number**	**206-010-324-1 (FSCM 97499) WASHER, Safety**
	Fabricate From:	**NSN 5310-00-167-0766**
	Material:	**Washer Flat, Steel, Cadmium Plated, Make from AN970-4 Washer**



PART NUMBER	ITEM NAME	FABRICATE FROM NSN	LENGTH
130-005-5-2	TUBE	5970-00-	1.00
130-005-6-58	TUBE	5970-00-815-1295	29.00
130-005-7-4	TUBE	5970-00-	2.00
130-005-7-10	TUBE	5970-00-	5.00
130-005-7-50	TUBE	5970-00-	25.00
130-005-7C4	TUBE	5970-00-	2.00
130-005-8-4	TUBE	5970-00-	2.00
130-005-9-6	TUBE	5970-00-914-3118	3.00

UH-1H-II-M-D-232

Figure D-232. Tube Insulating



NOTES:

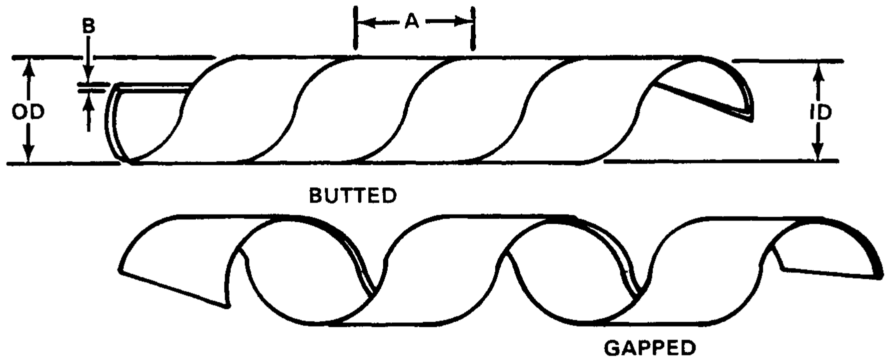
1. PART TO BE LEGIBLY MARKED WITH BHT PART NUMBER.
2. PRODUCT OF THE POLYMER CORP., READING PA. CODE IDENT # 83616.
3. PART SHALL BE FREE OF ALL SHARP EDGES AND SHARP CORNERS.
4. MATERIAL: NYLATRON GS

UH-1H-II-M-D-233

Figure D-233. Part Number 120-069-1, STRIP-ANTICHAFING

Fabricate From: No National Stock Number

Material: Plastic Sheet, 0.063 Inch Thick, 0.75 Inch Wide, 1.5 Inch Long



MATERIAL: NYLON

PART NUMBER	ID	OD	A	B	LENGTH IN INCHES
120-067B020	0.436	0.500 ±0.020	0.500 ±0.015	0.032 ±0.010	20

1. PURCHASE FROM BELL HELICOPTER

UH-1H-II-M-D-234

Figure D-234. Part Number 120-067B020, SLEEVE - Protective Coil
Fabricate From: NSN
Material: Nylon

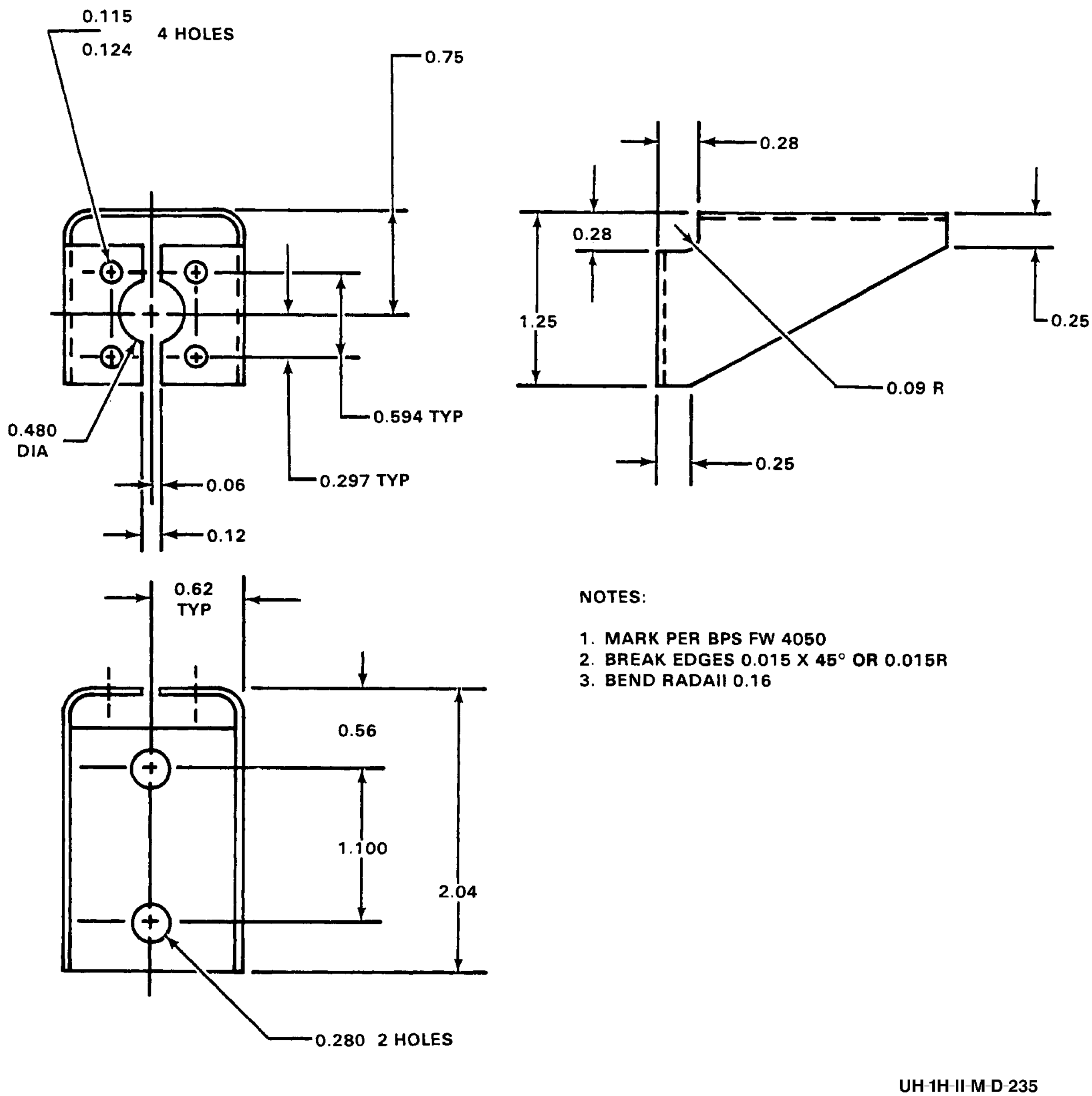


Figure D-235. Part Number 204-011-059-1, BRACKET
Fabricate From: NSN 9535-00-086-9930
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/4, 0.040 Inch Thick, 2.5 Inch Wide, 4.3 Inch Long

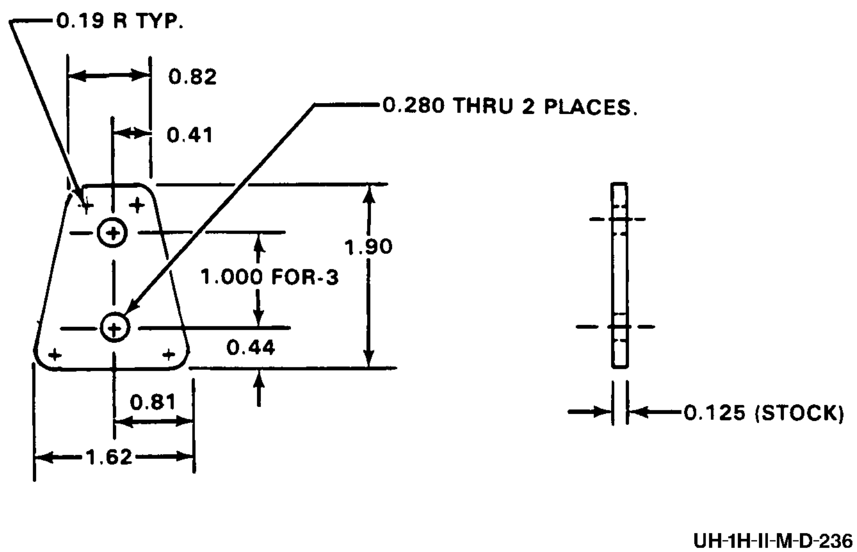


Figure D-236. Part Number 204-012-022-3, RETAINER - Weight
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/4, T3, 0.125 Inch Thick, 2.2 Inch Wide, 2.4 Inch Long

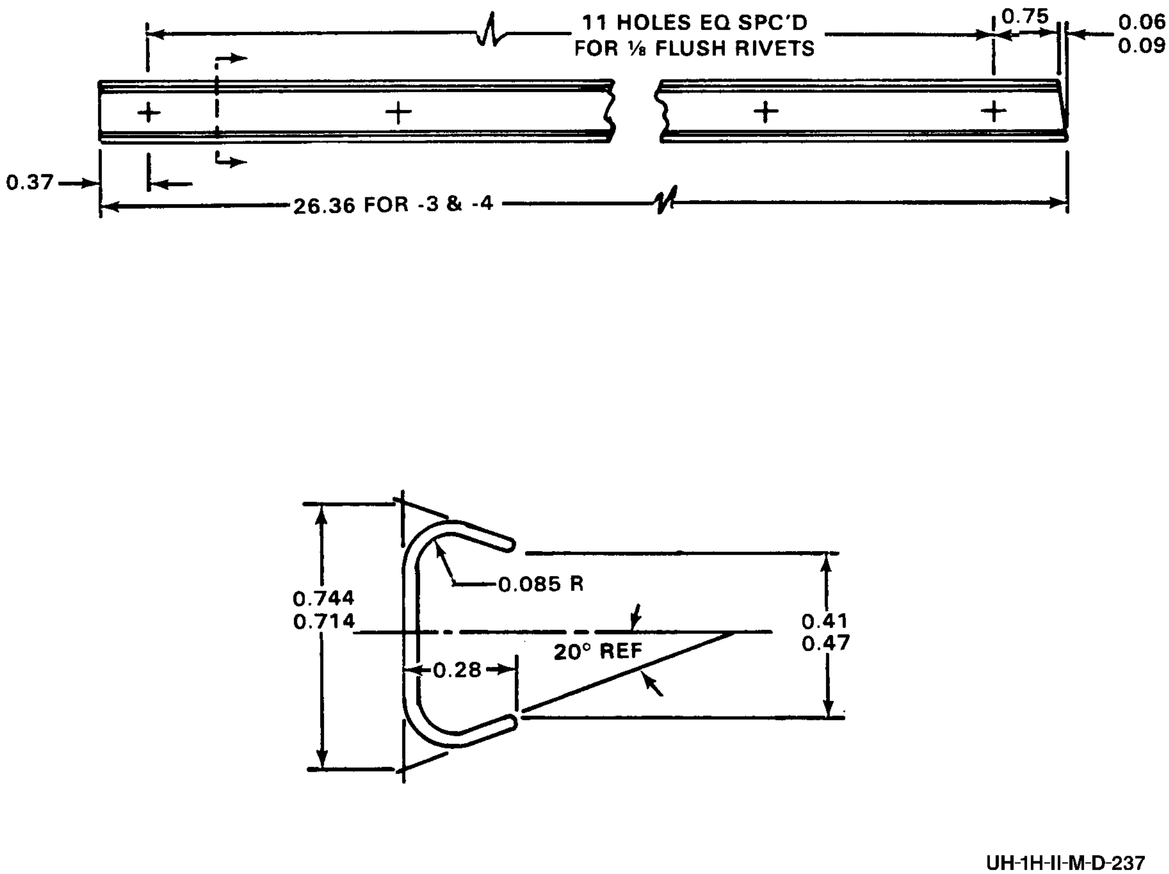
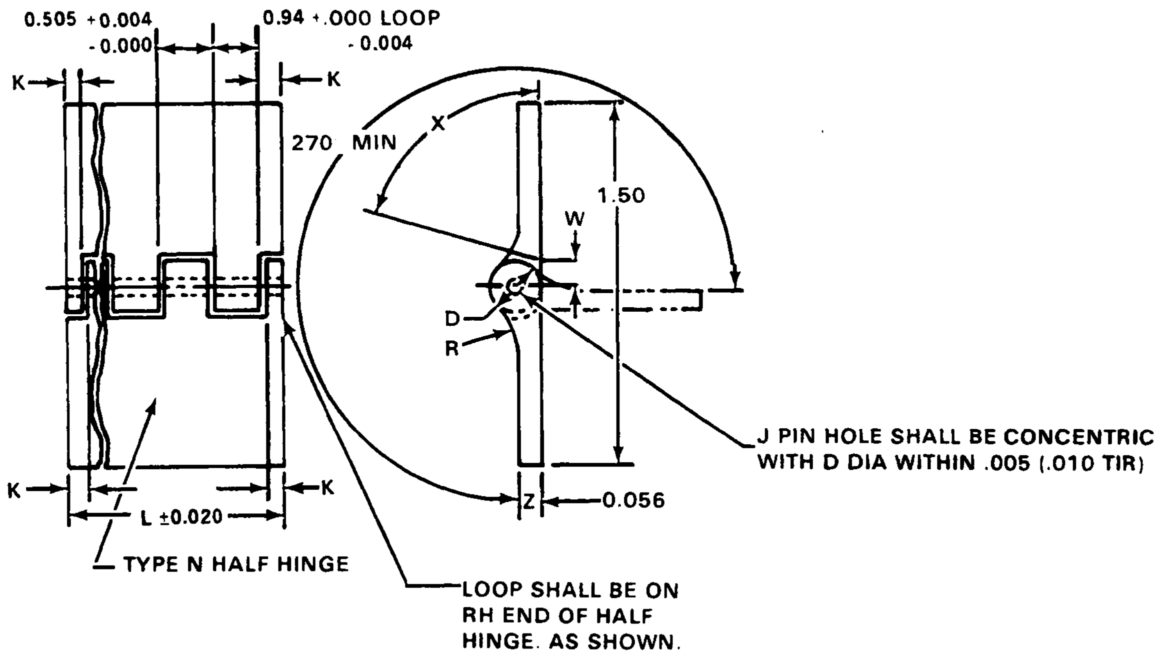


Figure D-237. Part Number 204-030-458-4, RETAINER, Window Channel Crew Door
Fabricate From: NSN 9535-00-086-9729
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, T-0, 0.32 Inch Thick, 1.5 Inch Wide, 27.0 Inch Long



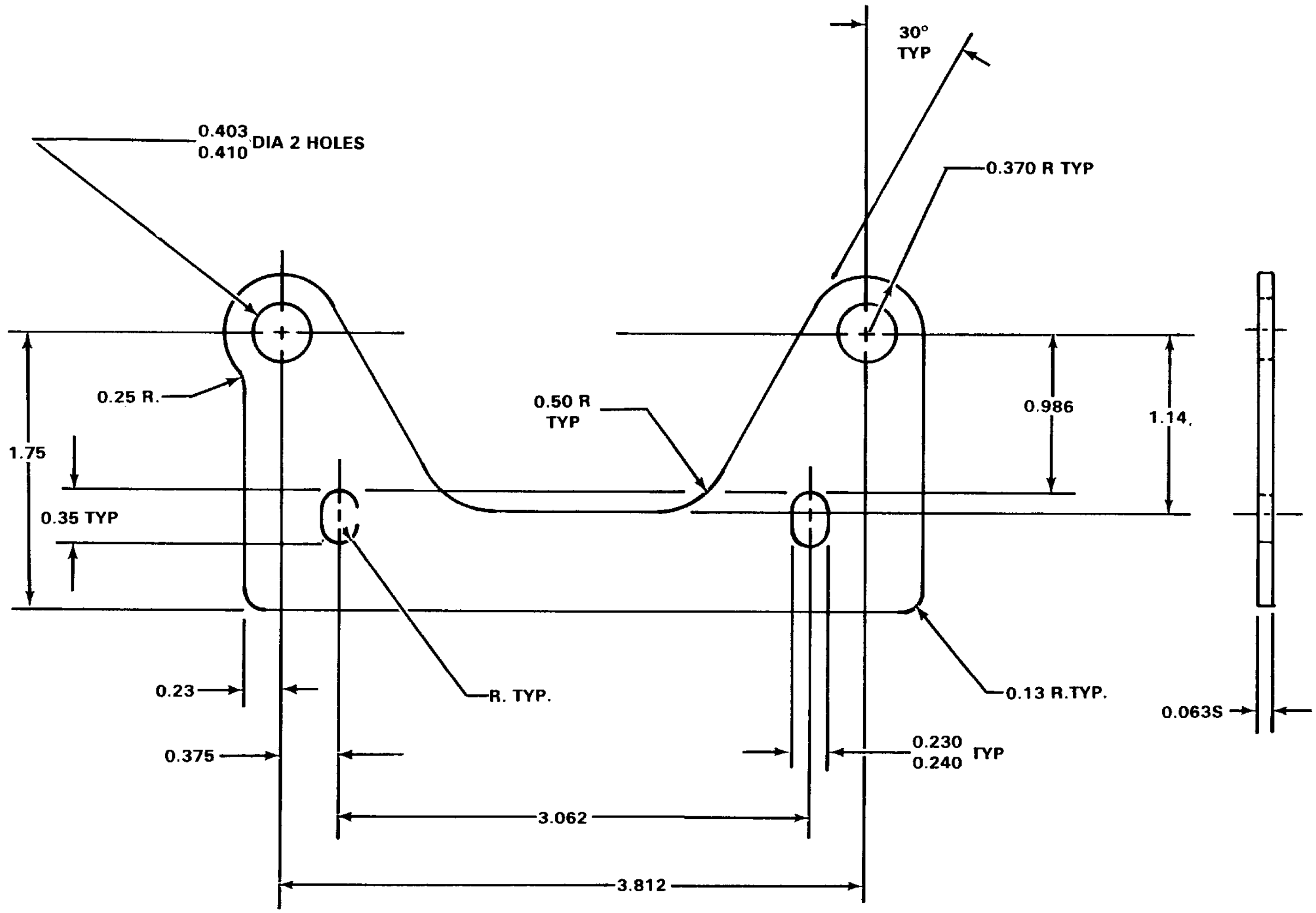
THICKNESS	WIDTH	LENGTH
0.056	1.50	24.00

UH-1H-II-M-D-238

Figure D-238. **Part Number** 204-030-829-15 HINGE HALF
204-030-829-27 HINGE HALF

Fabricate From: NSN 5340-00-949-8274

Material: Left, Butt Hinge AL ALY Anodized, 0.056 Inch Thick, 0.495 Inch Wide, Half Hinge, 1.50 Inch Total Width Make from MS20001P4 2400, Length 24.00 Inches



NOTES:

1. BREAK SHARP EDGES 0.015R or 0.015, 40°-50° CHAMP
2. RUBBER STAMP PART NO. PER BPS FW 4053

Figure D-239. Part Number 204-040-848-1, BRACKET
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, T3, 0.063 Inch Thick, 2.6 Inches Wide, 5.0 Inches Long

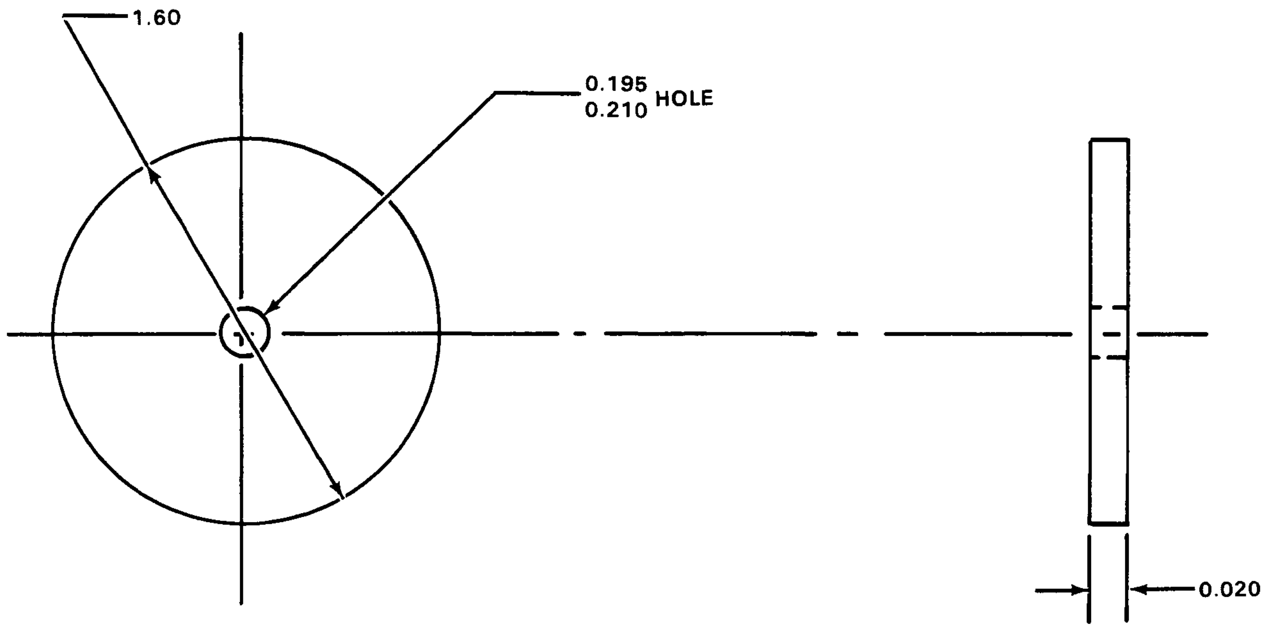


Figure D-240. Part Number 204-060-224-9, PLATE
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, T3, 0.020 Inch Thick, 2.1 Inches Wide, 2.1 Inches Long

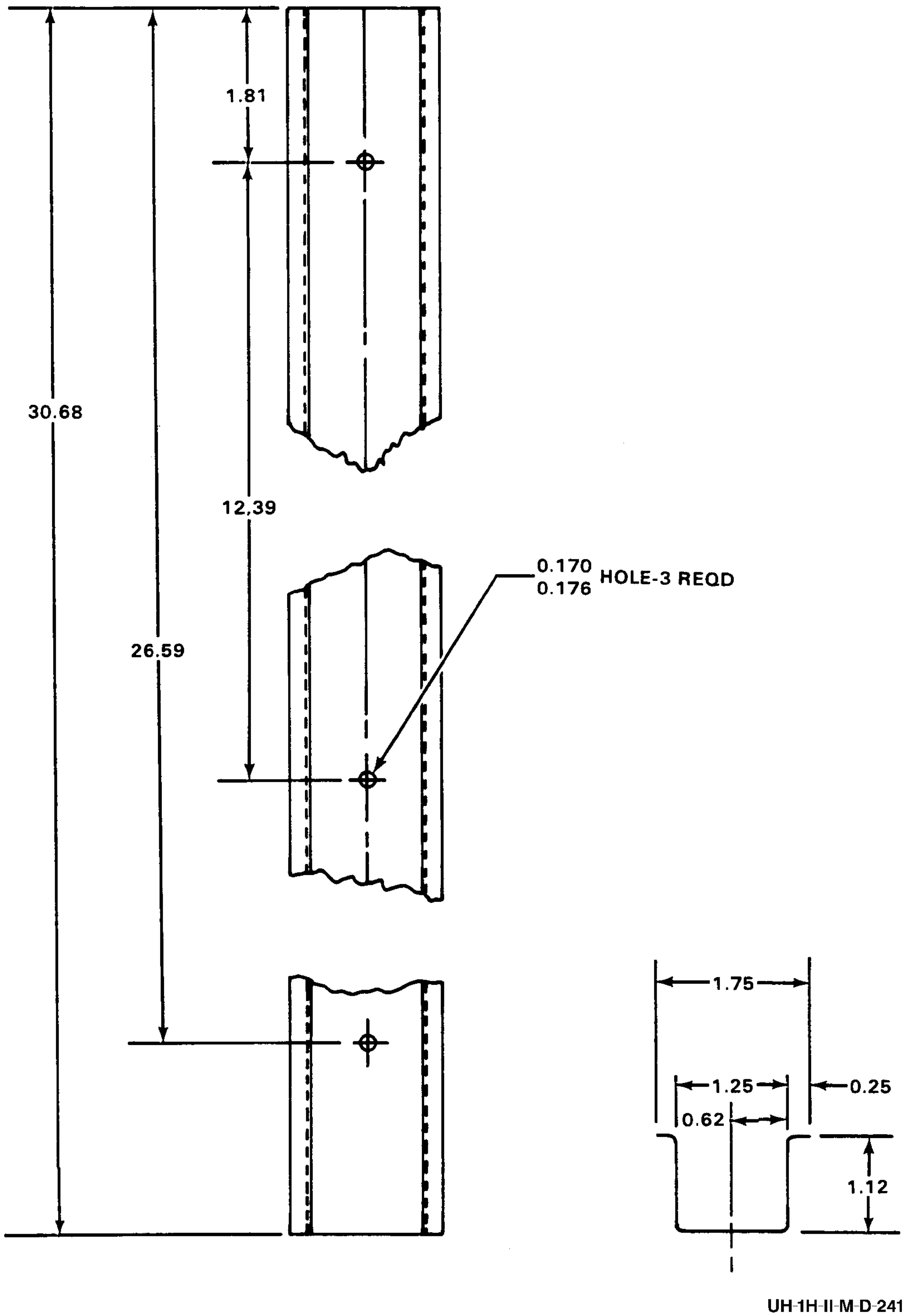


Figure D-241. Part Number 204-030-665-11, CHANNEL
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, T3, 0.016 Inch Thick, 4.3 Inches Wide, 31.0 Inches Long

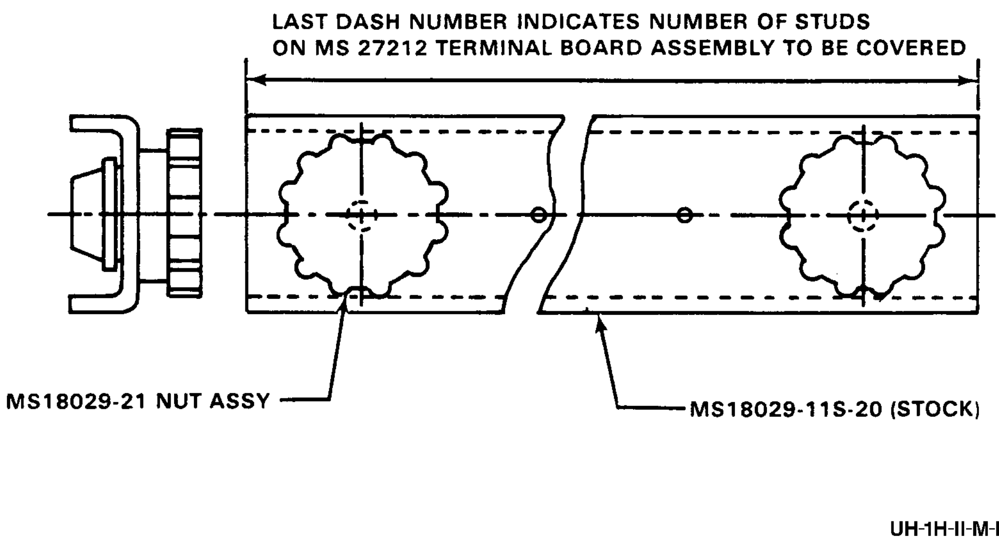
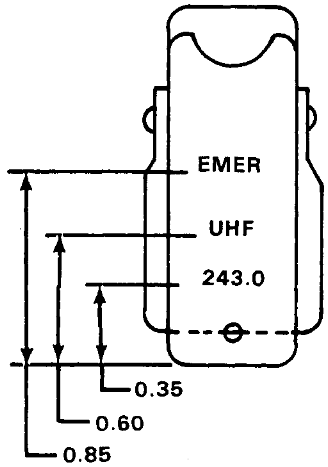


Figure D-242. Part Number MS 18029-1S1
MS 18029-1S10
MS 18029-1S14
MS 18029-1S15
Terminal Board Cover

Fabricate From: NSN 5940-00-082-4642, MS 18029-11S20 COVER,
NSN 5940-00-907-5939, MS 18029-21, NUT ASSY.

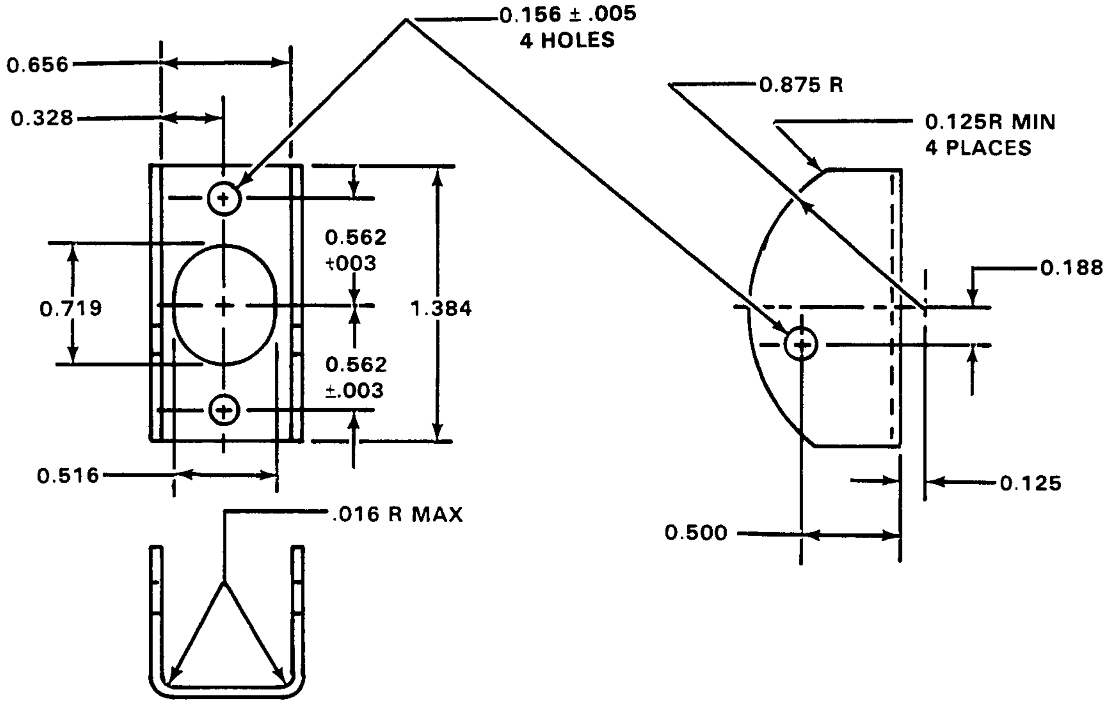


NOTES:

1. EACH LINE OF LETTERING SHALL BE HORIZONTALLY CENTERED ON THE SWITCH GUARD FACE.
2. LETTERS SHALL BE ENGRAVED .16 HEIGHT, AND FILLED WITH WHITE MONOFIL.
3. MAKE FROM MS25224-1 SWITCH GUARD.
4. IDENTIFY WITH BHT PART NO.

UH-1H-II-M-D-243

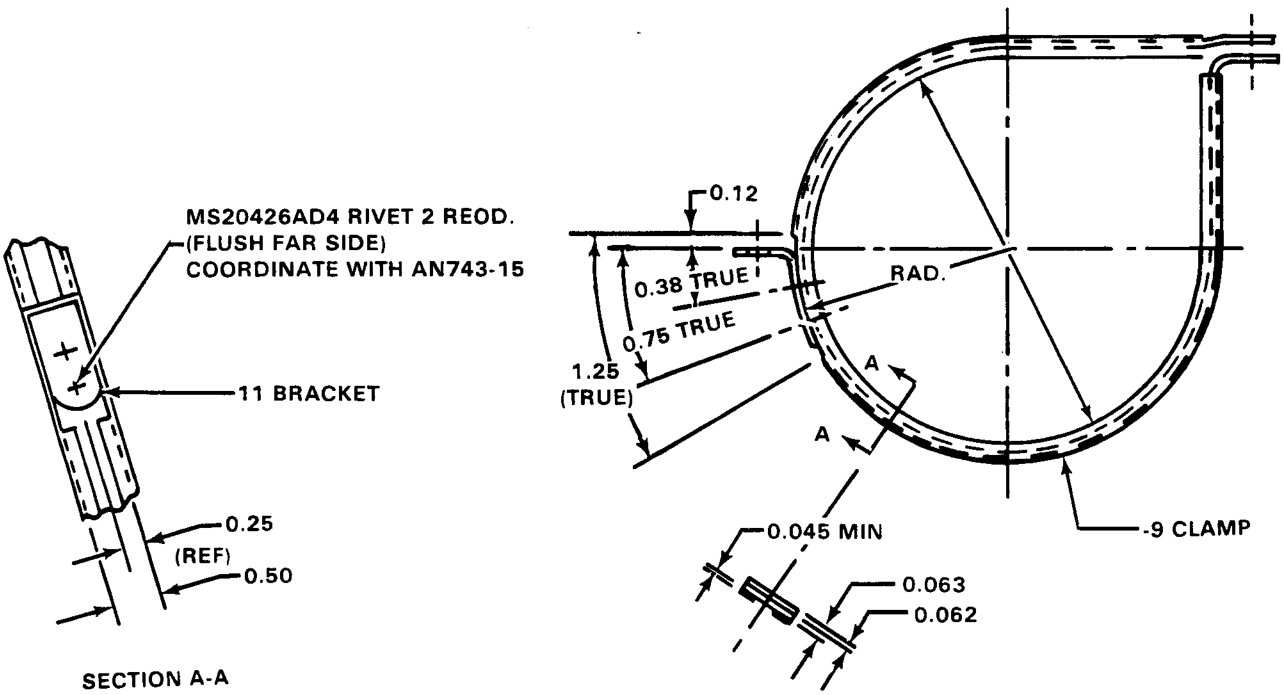
Figure D-243. Part Number 90-045-5, GUARD-SWITCH Engraved Lettering
Fabricate From: NSN 5930-00-615-6731, MS 25224-1 GUARD SWITCH



NOTES:
1. MAY BE MADE FROM MS25221-1 GUARD
2. PART TO BE SMOOTH AND FREE OF BURRS
3. FINISH GUARD WITH INSTRUMENT BLACK ENAMEL, MIL-E-5557 COLOR 27038, FED STD 595.
4. IDENTIFY WITH BHT PART NO.

UH-1H-II-M-D-244

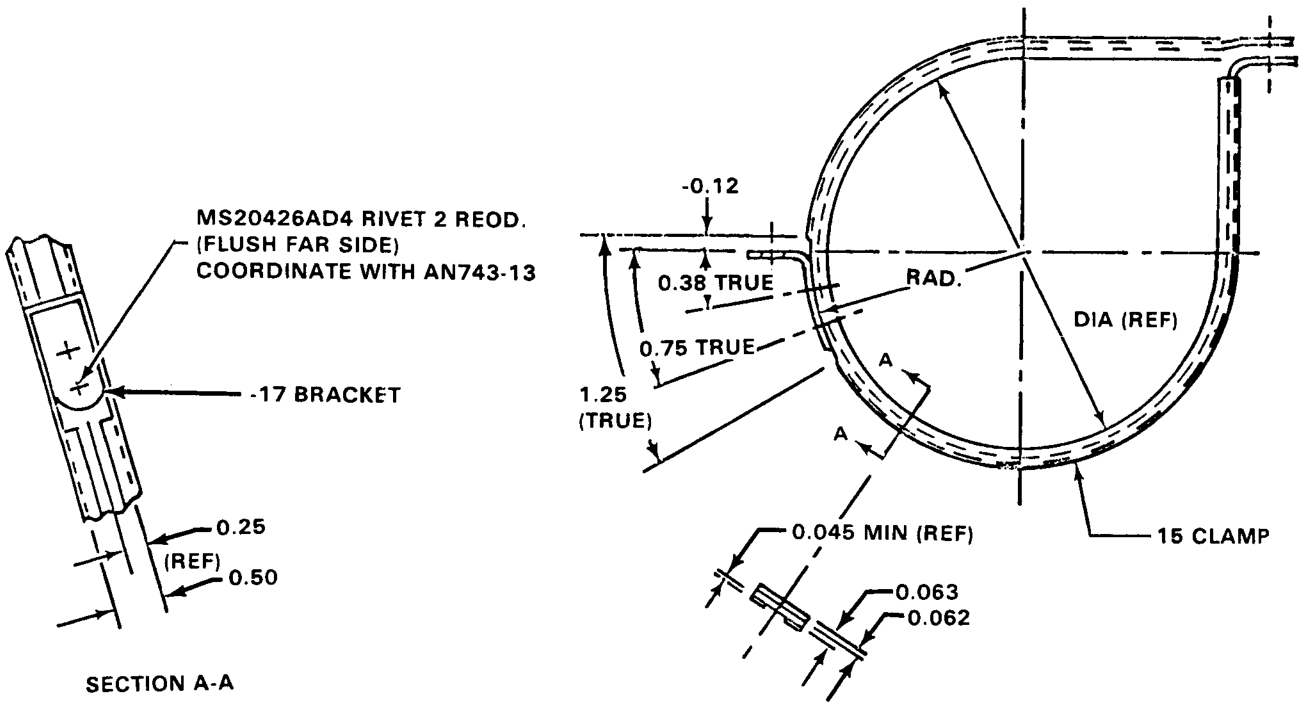
Figure D-244. Part Number 90-047-1, GUARD-SWITCH, Special
Fabricate From: NSN 5930-00-990-5766, MS 25221-1, GUARD



NOTES:
1. PART NO. 204-070-048-9 CLAMP—MAY BE MADE FROM ALTERED MS219190G48 CLAMP NSN 5340-00-514-3017
2. PART NO. 204-070-048-11 BRACKET—MAY BE MADE FROM ALTERED AN743-13 BRACKET NSN 5340-00-721-8182
3. RIVET THE ALTERED AN743-13 BRACKET TO CLAMP WITH MS20426AD4 RIVETS

UH-1H-II-M-D-245

Figure D-245. Part Number 204-070-048-7, CLAMP ASSEMBLY
Fabricate From: NSN 5340-00-514-3017
NSN 5340-00-721-8182



NOTES:
1. PART NO. 204-070-048-15 CLAMP—MAY BE MADE FROM ALTERED MS21919DG32 NSN 5340-00-664-7301
2. PART NO. 204-070-048-17 BRACKET MAY BE MADE FROM ALTERED AN743-13 BRACKET NSN 5340-00-721-8182
3. RIVET THE ALTERED AN743-13 BRACKET TO CLAMP WITH MS20426AD4 RIVETS

UH-1H-II-M-D-246

Figure D-246. Part Number 204-070-048-13, CLAMP ASSEMBLY
Fabricate From: NSN 5340-00-664-7301
NSN 5340-00-721-8182

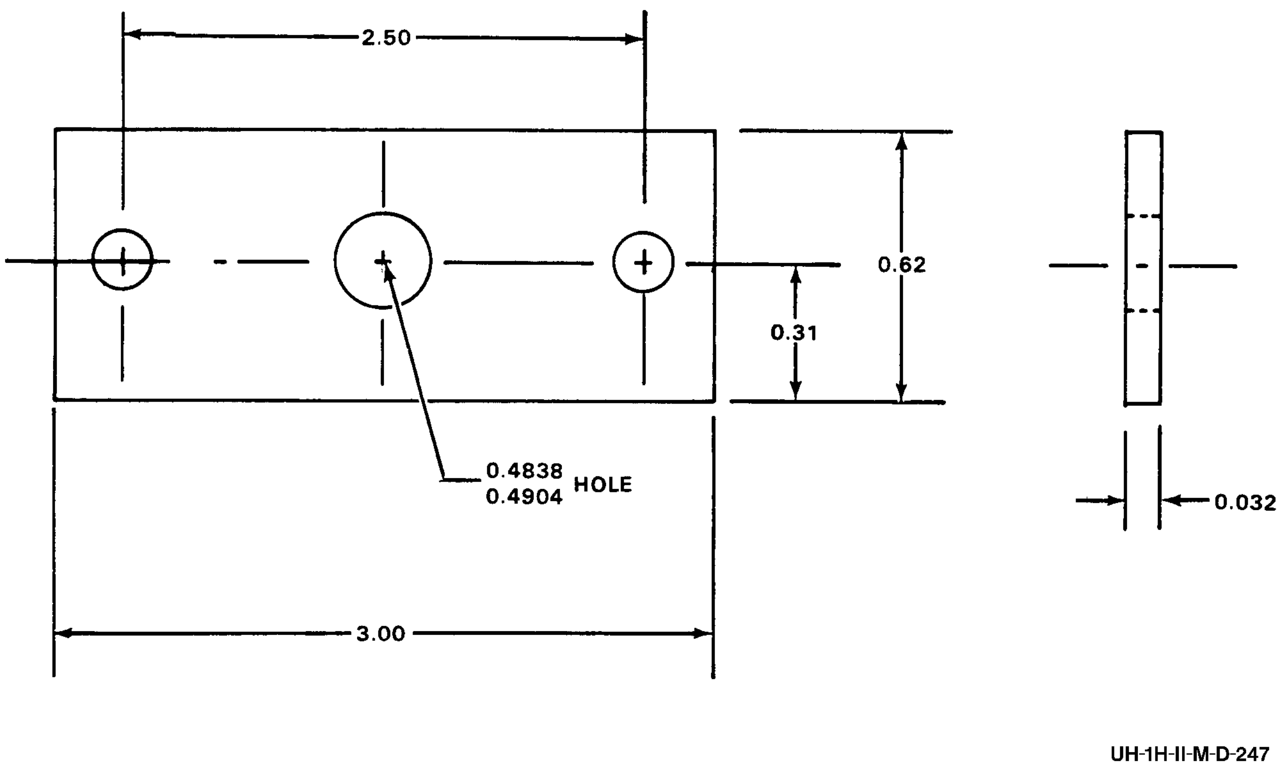
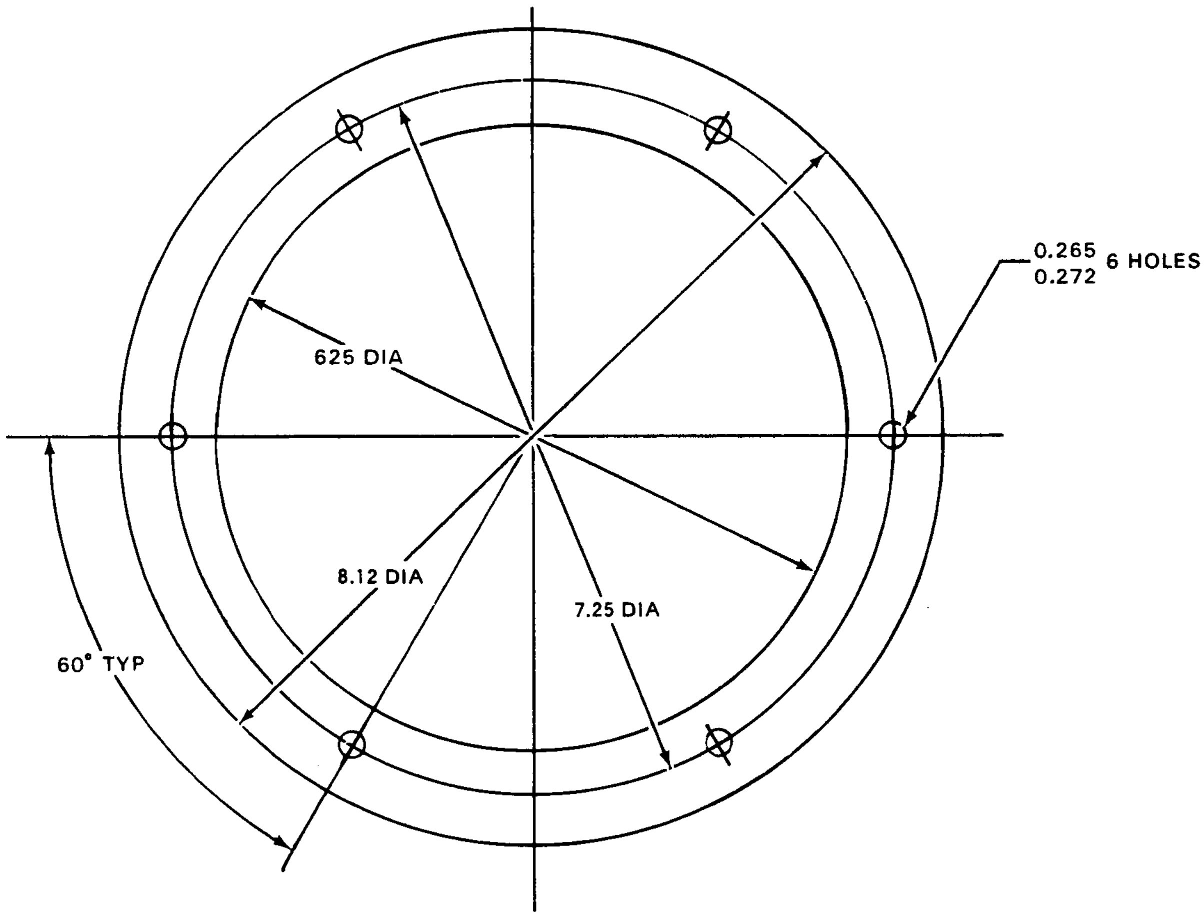


Figure D-247. Part Number 204-070-848-3, RETAINER
Fabricate From: NSN 9535-00-232-0565
Material: 2024 AL ALY Sheet, Federal Specification QQ-A-250/5, 0.032 Inch Thick, 1.0 Inch Wide, 3.5 Inches Long

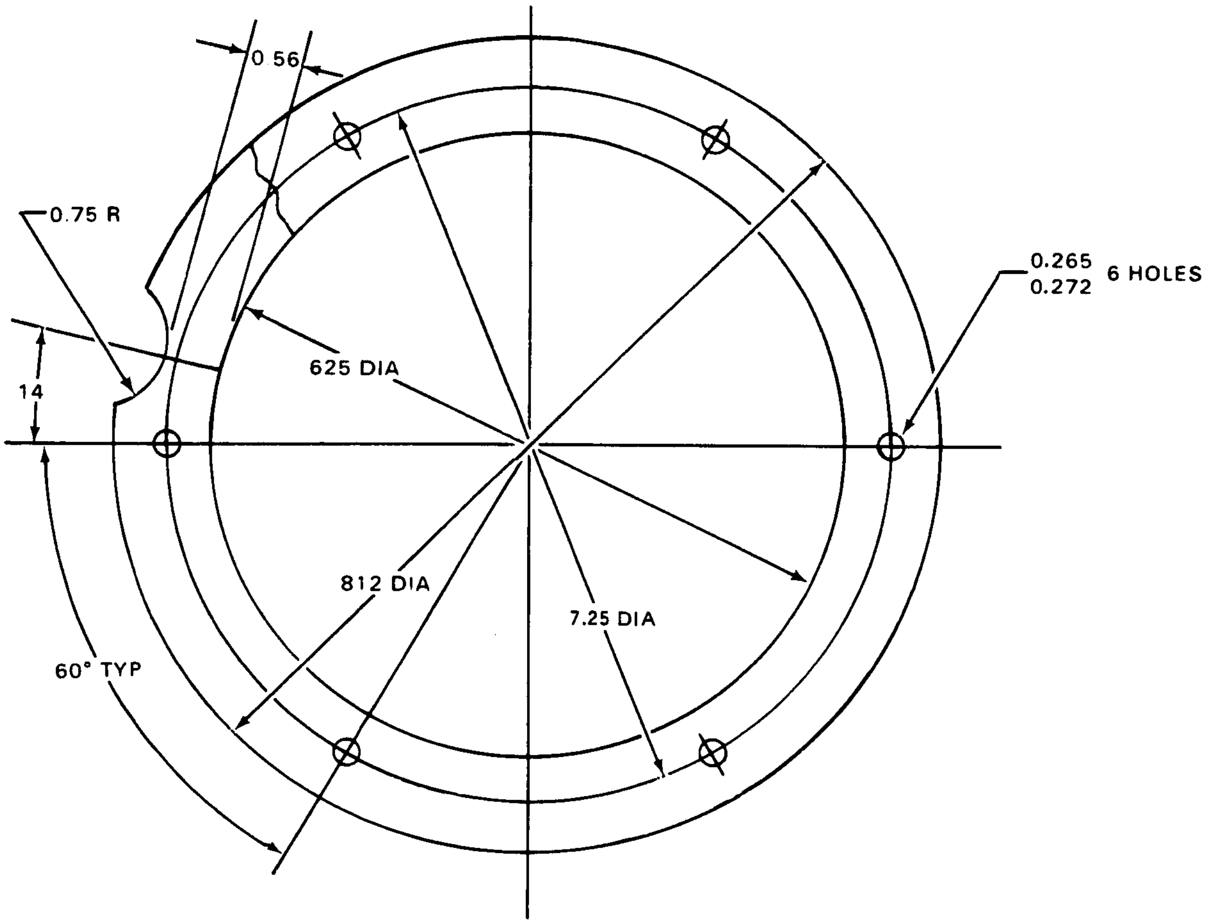


NOTES:
1. PURCHASE FROM JOHNS-MANVILLE PRODUCTS NEW YORK, N.Y. CODE IDENT =92798
2. SPECIAL ASBESTOS MATERIAL NO NSN AVAILABLE
3. DIMENSIONS ARE IN INCHES

THICKNESS	SIZE	STYLE
3/64 INCH	9.0 x 9.0	89

UH-1H-II-M-D-248

Figure D-248. Part Number 204-072-258-1, GASKET
Fabricate From: NSN
Material:

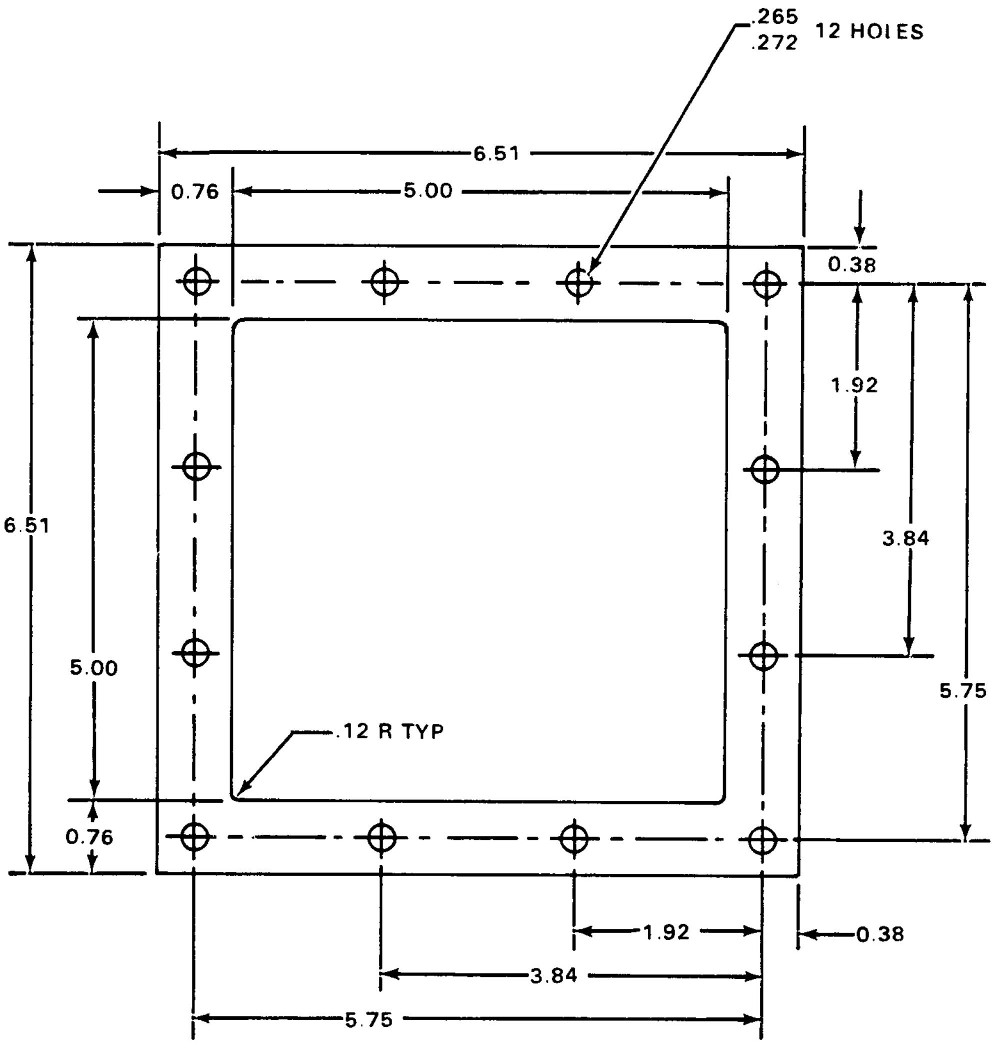


NOTES:
1. PURCHASE FROM JOHN-MANVILLE PRODUCTS, NEW YORK, N.Y. CODE IDENT #92798
2. SPECIAL ASBESTOS MATERIAL NO NSN AVAILABLE
3. DIMENSIONS ARE IN INCHES

THICKNESS	SIZE	STYLE
3/64 INCH	9.0 x 9.0	89

UH-1H-II-M-D-249

Figure D-249. Part Number 204-072-258-3, GASKET
Fabricate From:
Material:



NOTES:
1. MARK PER BPS FW-B 4050
2. PURCHASE FROM JOHNS-MANVILLE PRODUCTS NEW YORK, N.Y.
   CODE IDENT # 92798
3. SPECIAL ASBESTOS MATERIAL NO NSN AVAILABLE

THICKNESS	SIZE	STYLE
3/64 INCH	7.0 × 7.0	89

UH-1H-II-M-D-250

Figure D-250. Part Number 204-072-259-1, GASKET
Fabricate From:
Material:

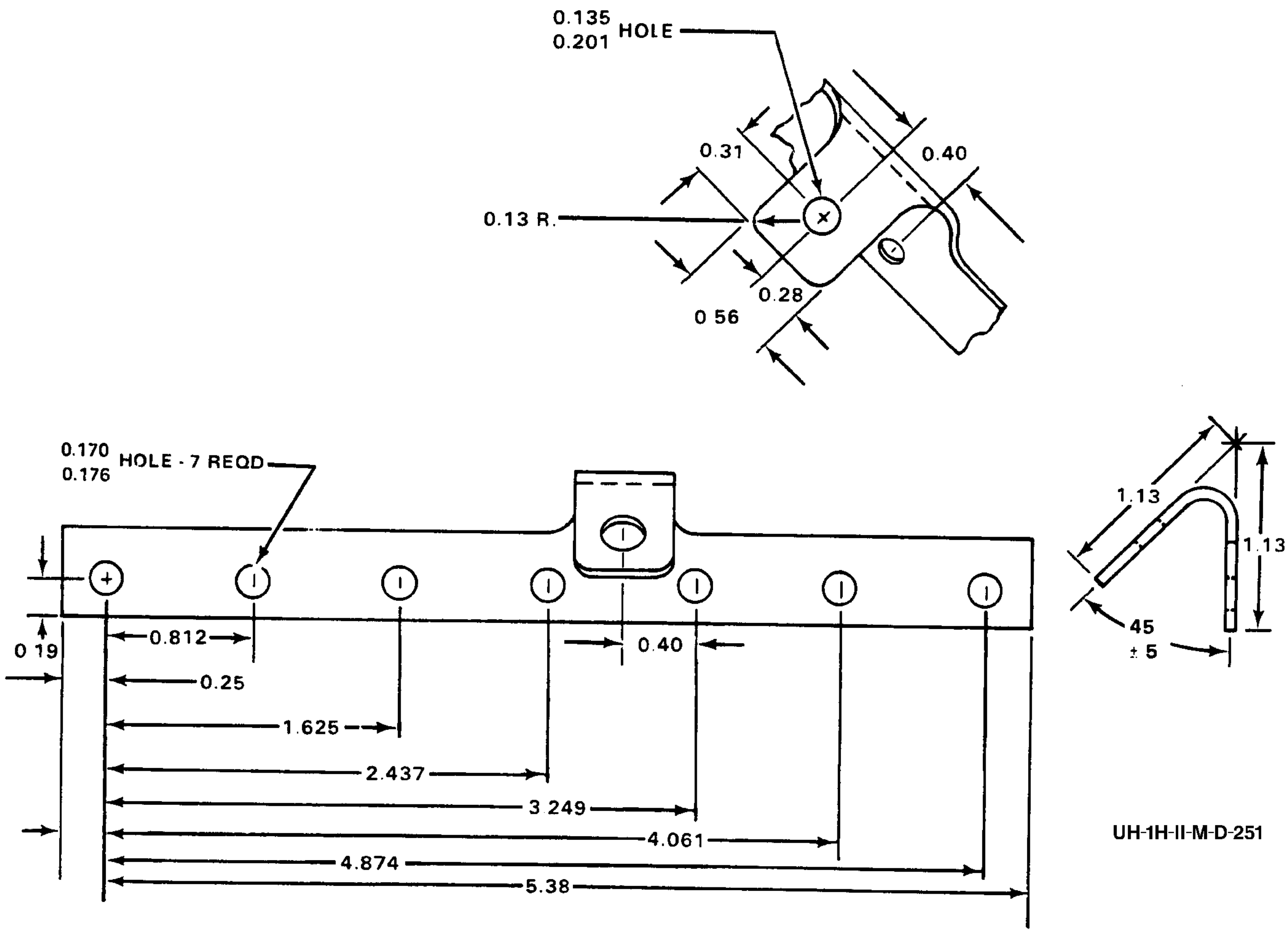


Figure D-251. Part Number 204-075-264-1, BUS BAR
Fabricate From: NSN
Material: Copper Sheet, Federal Specification QQ-C-576, Annealed, 0.063 Inch Thick, 2.0 Inches Wide, 5.8 Inches Long

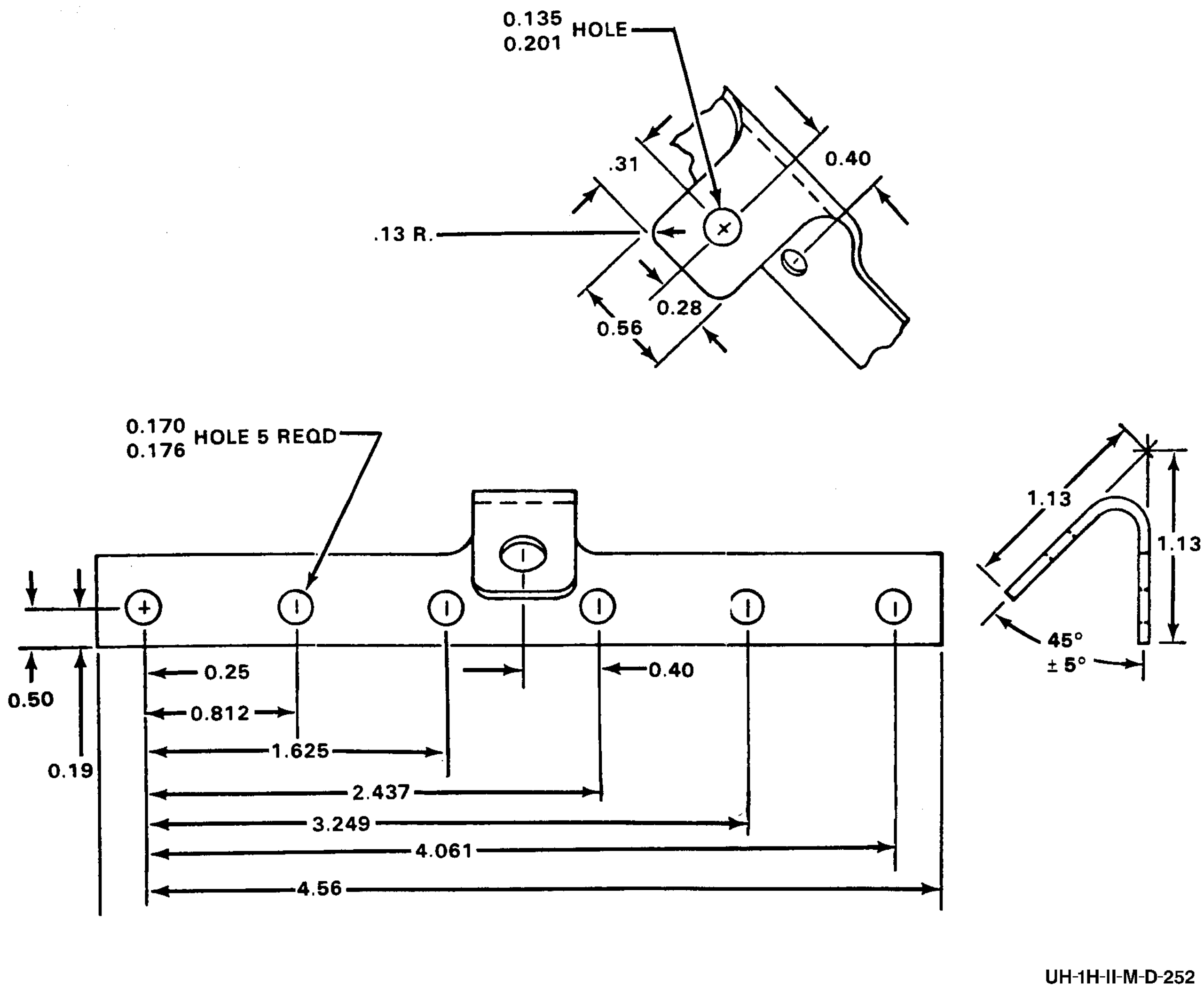


Figure D-252. **Part Number** 204-076-264-3, BUS BAR
Fabricate From: NSN
Material: Copper Sheet, Federal Specification QQ-C-576, Annealed, 0.063 Inch Thick, 2.0 Inches Wide, 5.0 Inches Long

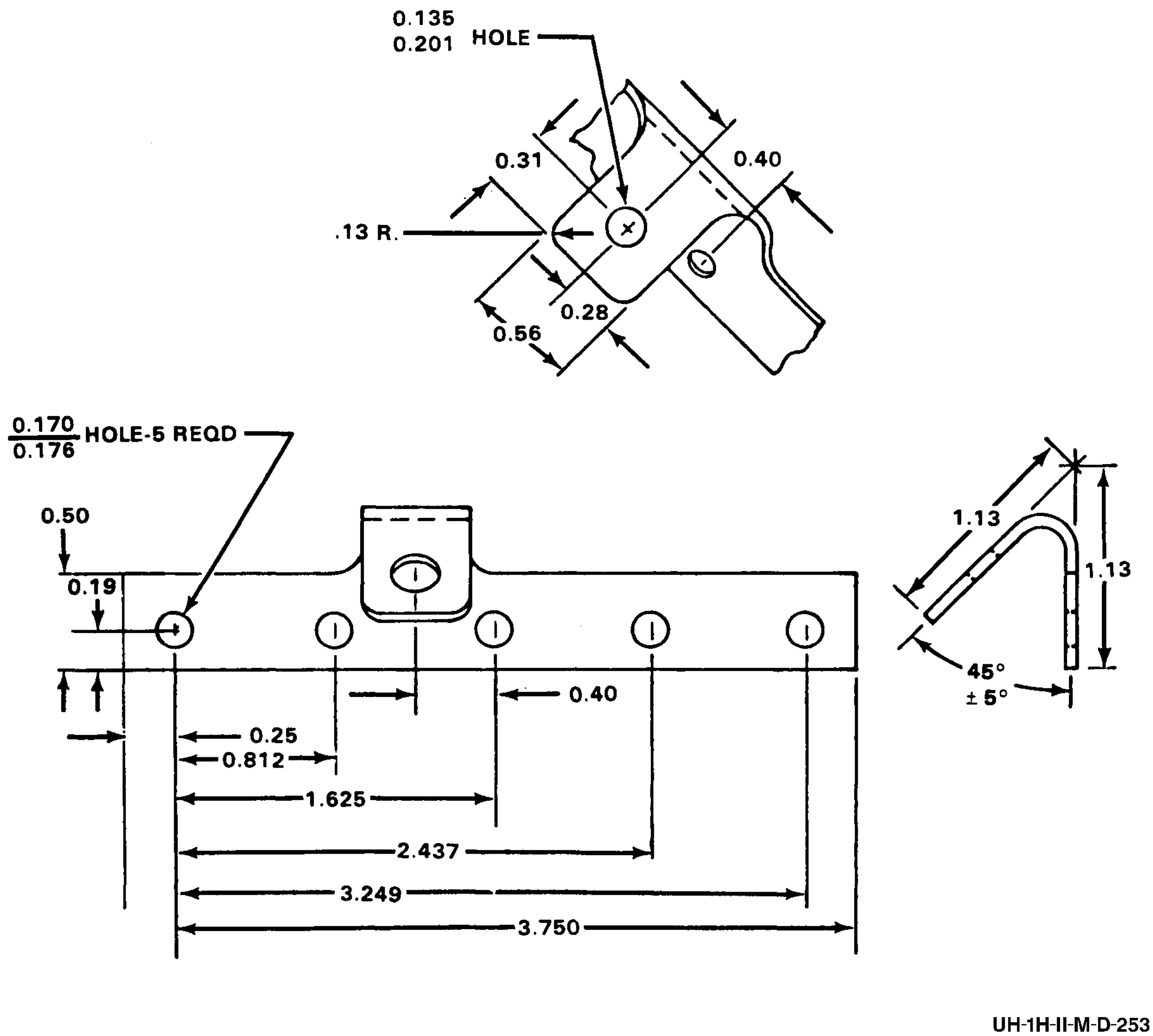
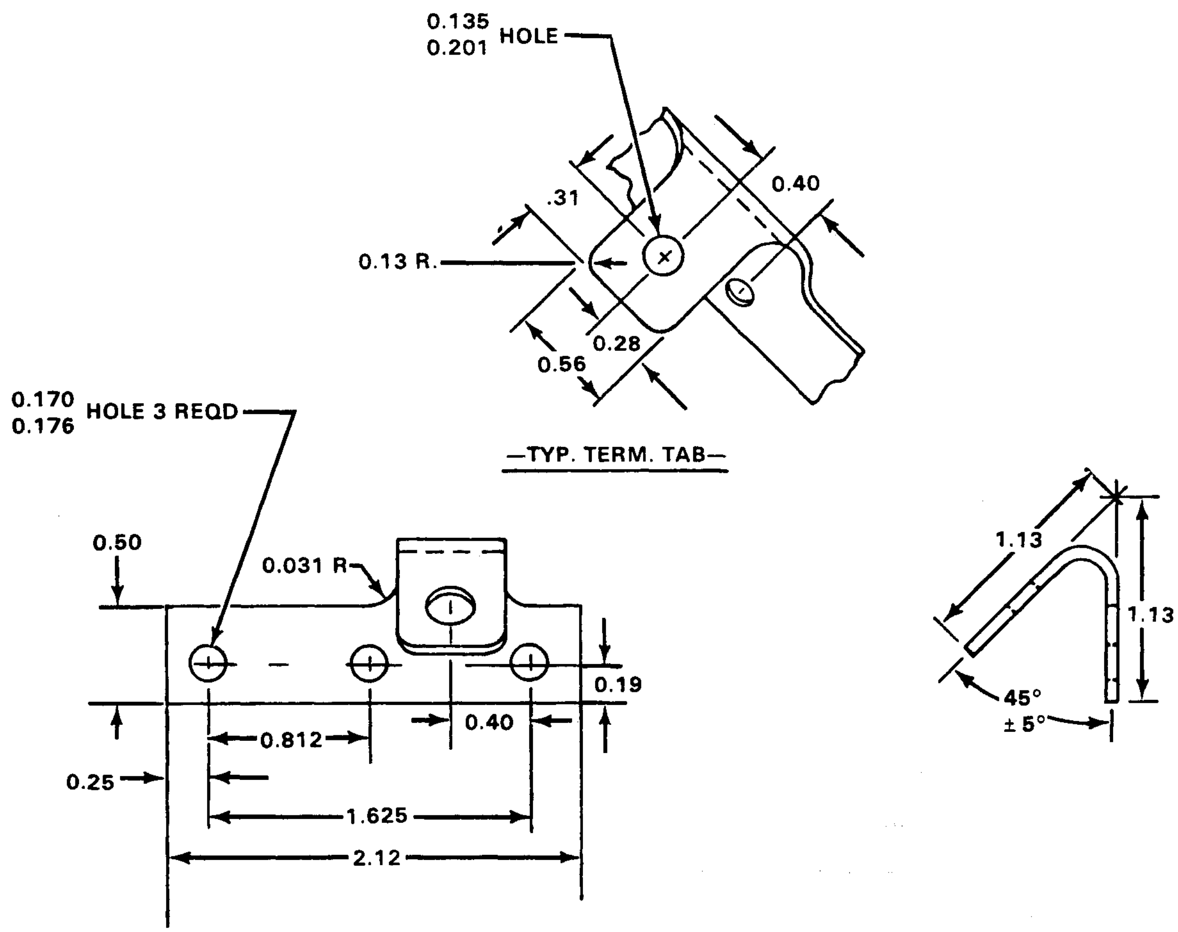


Figure D-253. Part Number 204-075-264-5, BUS BAR
Fabricate From: NSN
Material: Copper Sheet, Federal Specification QQ-C-576, Annealed, 0.063 Inch Thick, 2.0 Inches Wide, 4.3 Inches Long



UH-1H-II-M-D-254

Figure D-254. Part Number 204-075-264-9, BUS BAR
Fabricate From: NSN
Material: Copper Sheet, Federal Specification QQ-C-567, Annealed, 0.063 Inch Thick, 2.0 Inches Wide, 2.6 Inches Long

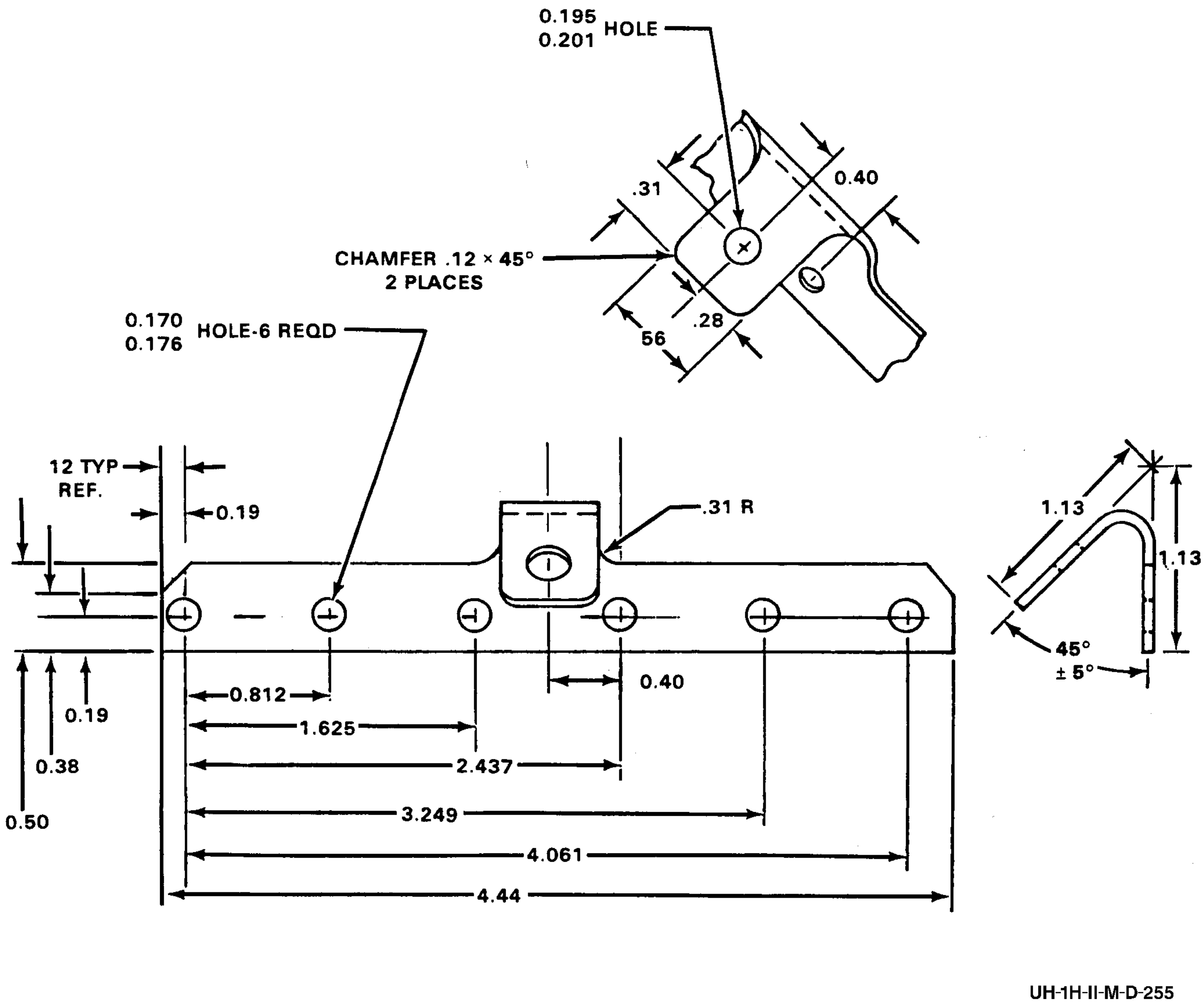
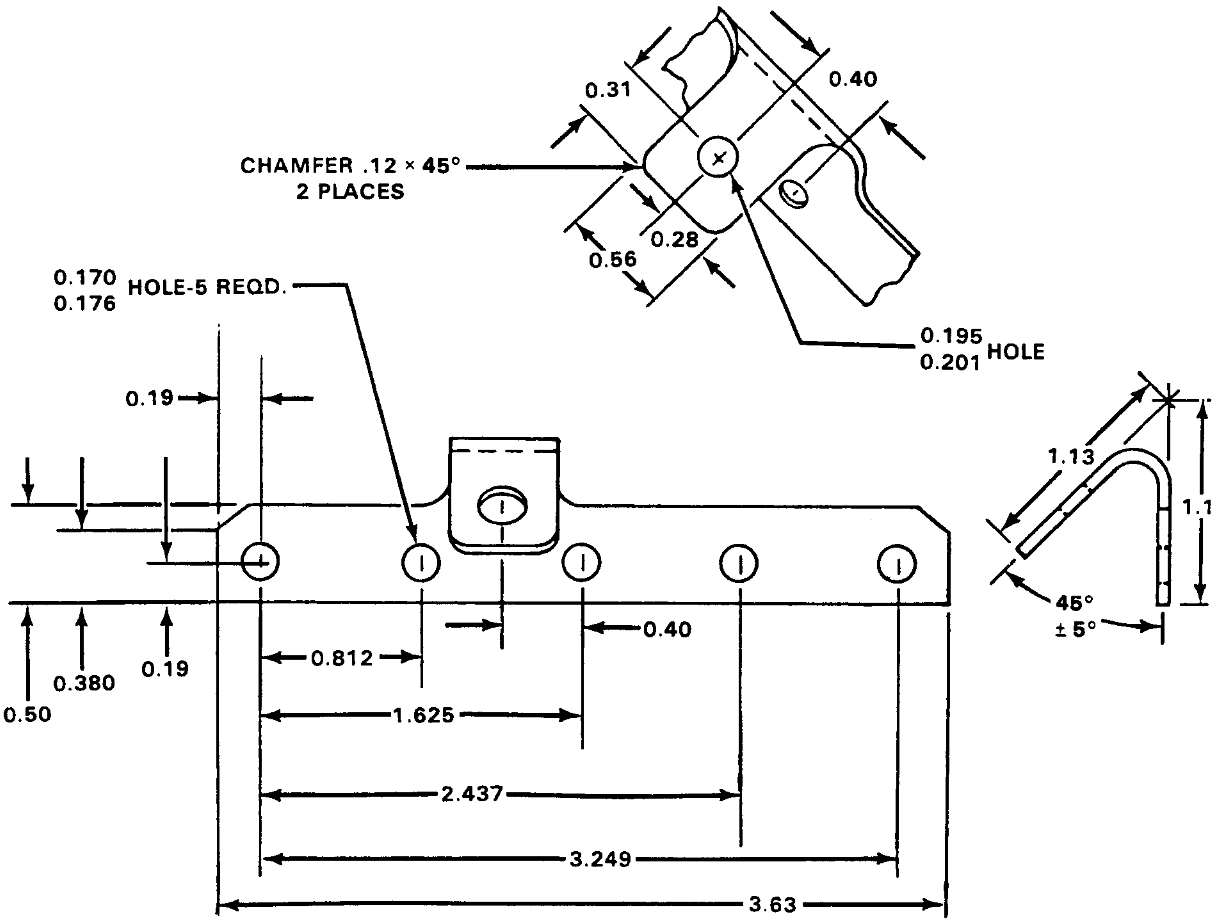
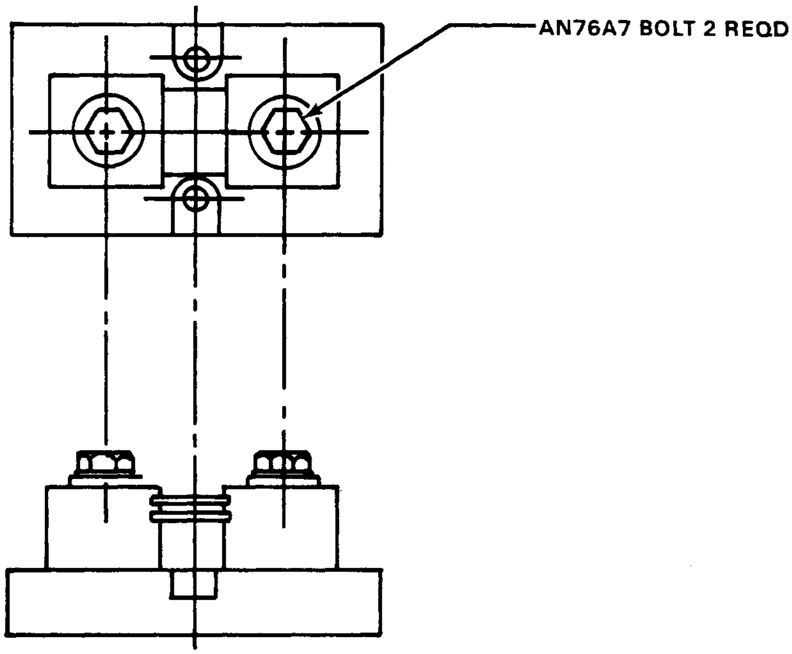


Figure D-255. Part Number 204-075-230-3, BUS BAR
Fabricate From: NSN
Material: Copper Sheet, Federal Specification QQ-C-576, Annealed, 0.063 Inch Thick, 2.7 Inches Wide, 5.0 Inches Long



UH-1H-II-M-D-256

Figure D-256. Part Number 204-075-230-5, BUS BAR
Fabricate From: NSN
Material: Copper Sheet, Federal Specification QQ-C-576, Annealed, 0.063 Inch Thick, 2.7 Inches Wide, 4.1 Inches Long



NOTE:
1. MARK PER BPS 4050
2. MAKE FROM MS91587-4 SHUNT

UH-1H-II-M-D-257

Figure D-257. Part Number 204-075-152-3, SHUNT Assembly
Fabricate From: NSN 6625-00-1005, MS 91587-4, SHUNT
Material: MS 91587-4, SHUNT

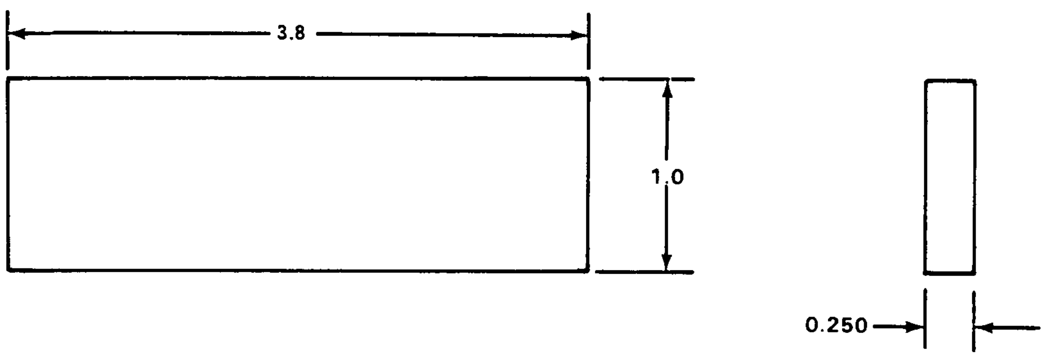


Figure D-258.	**Part Number**	**204-030-029-25, SPACER**
	Fabricate From:	**NSN 9330-00-579-6453**
	Material:	**Phenolic Sheet with Cotton Fabric Base, Federal Specification MIL-P-15035, Type FBI, 0.250 Inch Thick, 1.0 Inch Wide, 3.8 Inches Long**

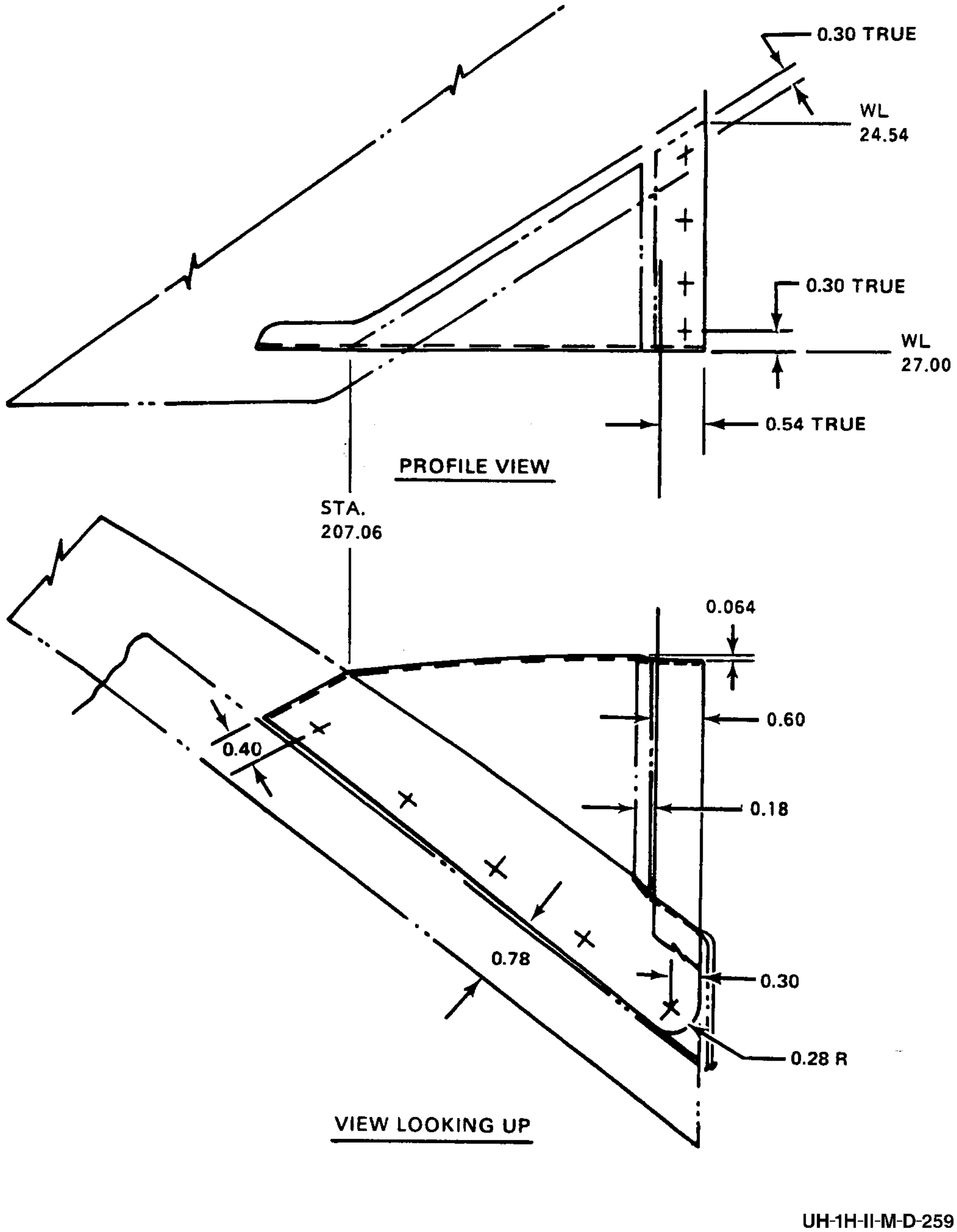
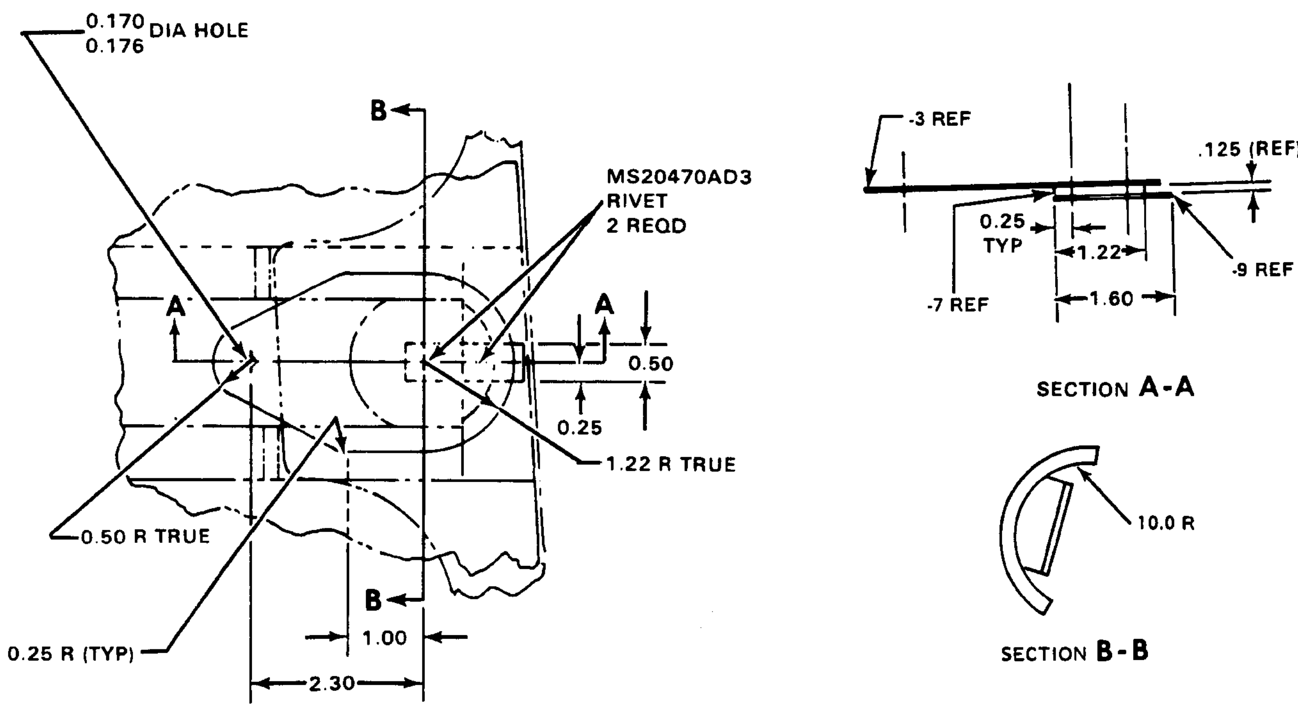


Figure D-259.	Part Number	205-030-137-4, GUSSET
	Fabricate From:	NSN 9535-00-
	Material:	2024 AL ALY Federal Specification QQ-A-250/5,
		Temp 0 - Heat Treat to T42
		0.032 Inch Thick, 5.5 Inches Wide, 6.0 Inches Long



NOTES:
1. 205-030-148-5 COVER MAKE FROM .2024 AL ALY FEDERAL SPECIFICATION QQ-A-250/5 T3 0.040 INCH THICK, 5.0 INCHES LONG, 5.0 INCHES WIDE
2. 205-030-148-7 SPACER MAKE FROM 2024 AL ALY FEDERAL SPECIFICATION QQ-A-250/5 T3 0.125 INCH THICK, 1.0 INCH WIDE, 1.72 INCHES LONG
3. 205-030-148-9 PLATE MAKE FROM 2024 AL ALY FEDERAL SPECIFICATION QQ-A-250/5 T3 0.040 INCH THICK, 1.0 INCH WIDE, 2.1 INCH LONG

UH-1H-II-M-D-260

Figure D-260.	**Part Number**	**205-030-148-3, COVER Assy of**
	Fabricate From:	**NSN 5935-00-**
		NSN 5935-00-
	Material:	**2024 AL ALY Federal Specification QQ-A-250/5, T3, 0.040 Inch Thick**
		2024 AL ALY Federal Specification QQ-A-250/5, TC, 0.125 Inch Thick

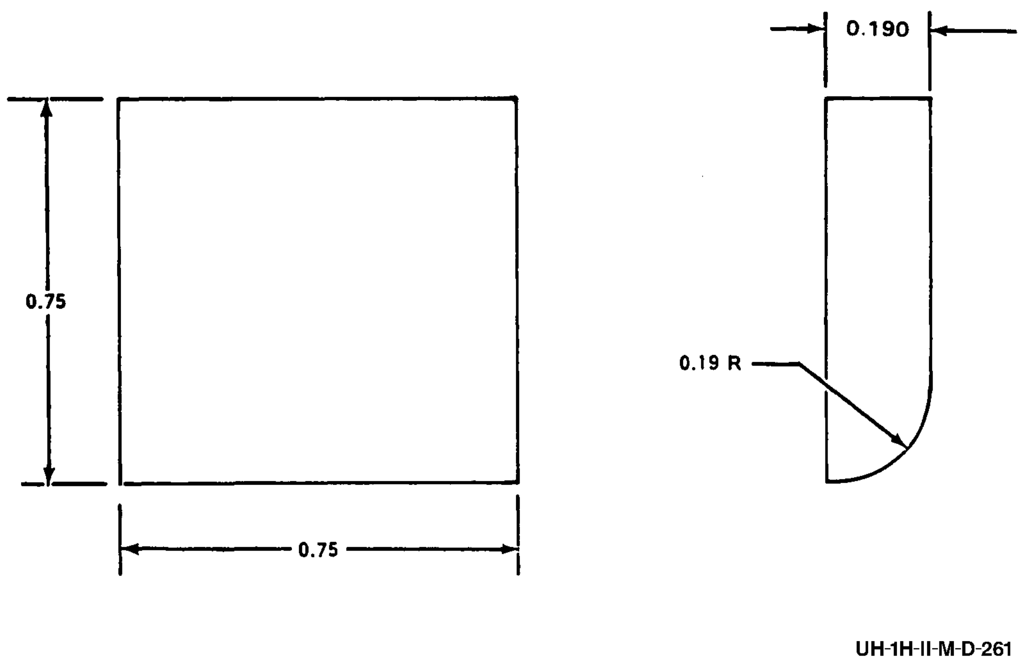


Figure D-261. Part Number 205-030-164-215, RADIAL BLOCK
Fabricate From: NSN 9535-00-
Material: 7075 AL ALY Federal Specification QQ-A-250/3, T6, 0.190 Inch Thick, 0.75 Inch Wide, 0.75 Inch Long

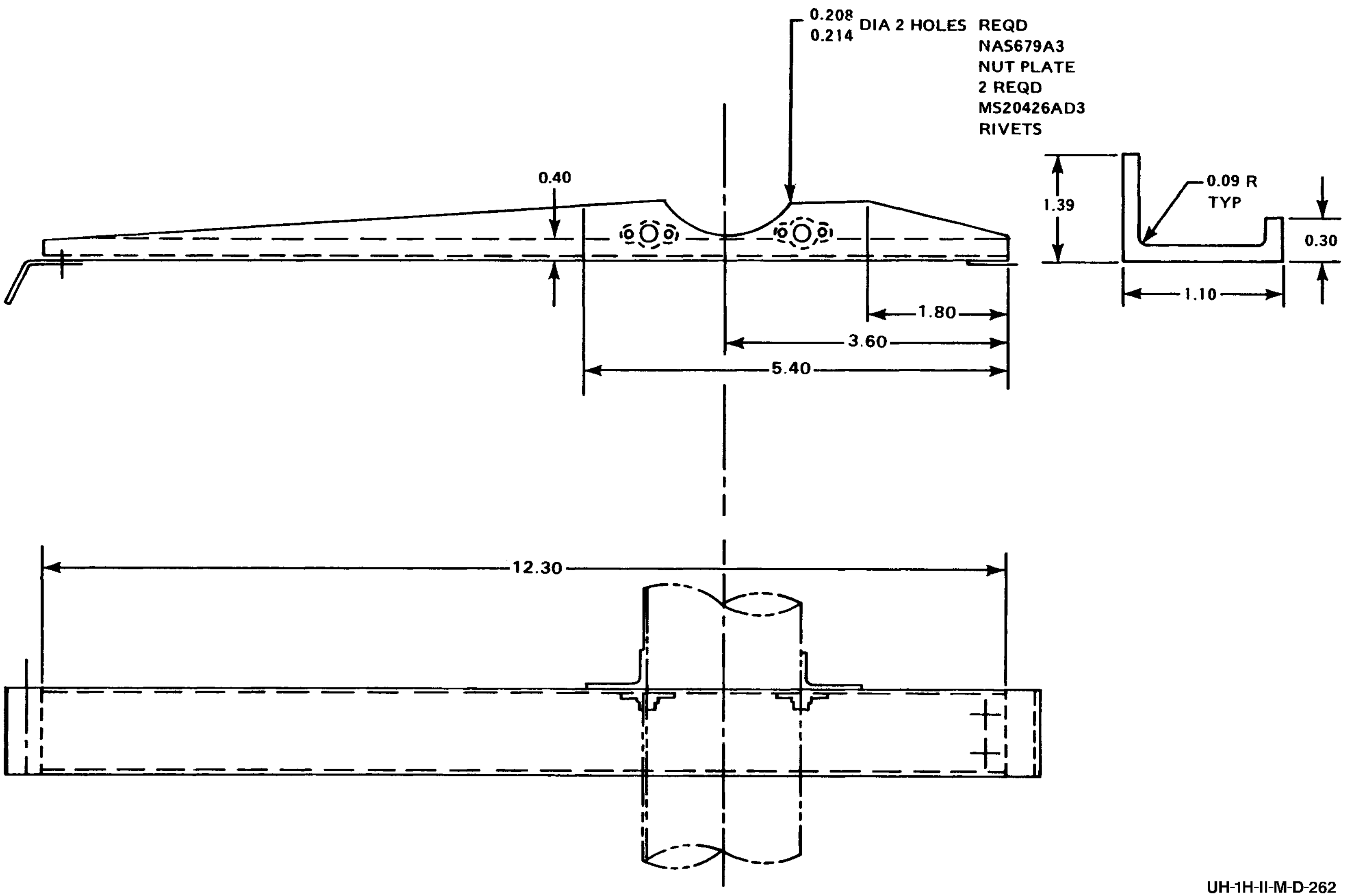
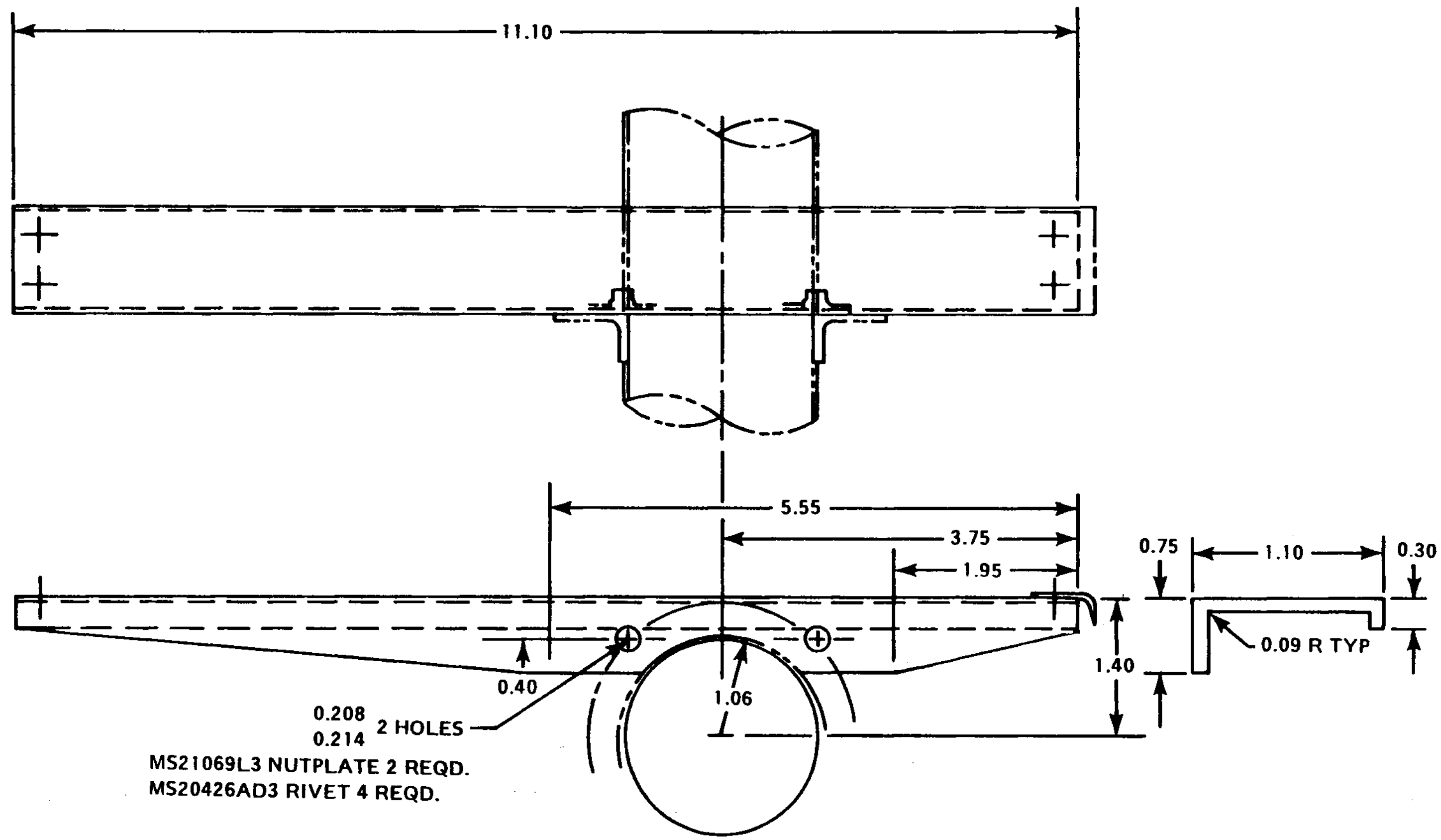


Figure D-262. Part Number 205-030-239-3, BEAM
Fabricate From: NSN
Material: 2024 AL ALY Federal Specification QQ-A-362, T3, 0.020 Inch Thick, 3.6 Inches Wide, 12.8 Inches Long



UH-1H-II-M-D-263

Figure D-263. **Part Number** **205-030-239-5, BEAM**
Fabricate From: **NSN**
Material: **2024 AL ALY Federal Specification QQ-A-250/5, Temp T3, 0.025 Inch Thick, 3.6 Inches Wide, 11.6 Inches Long**

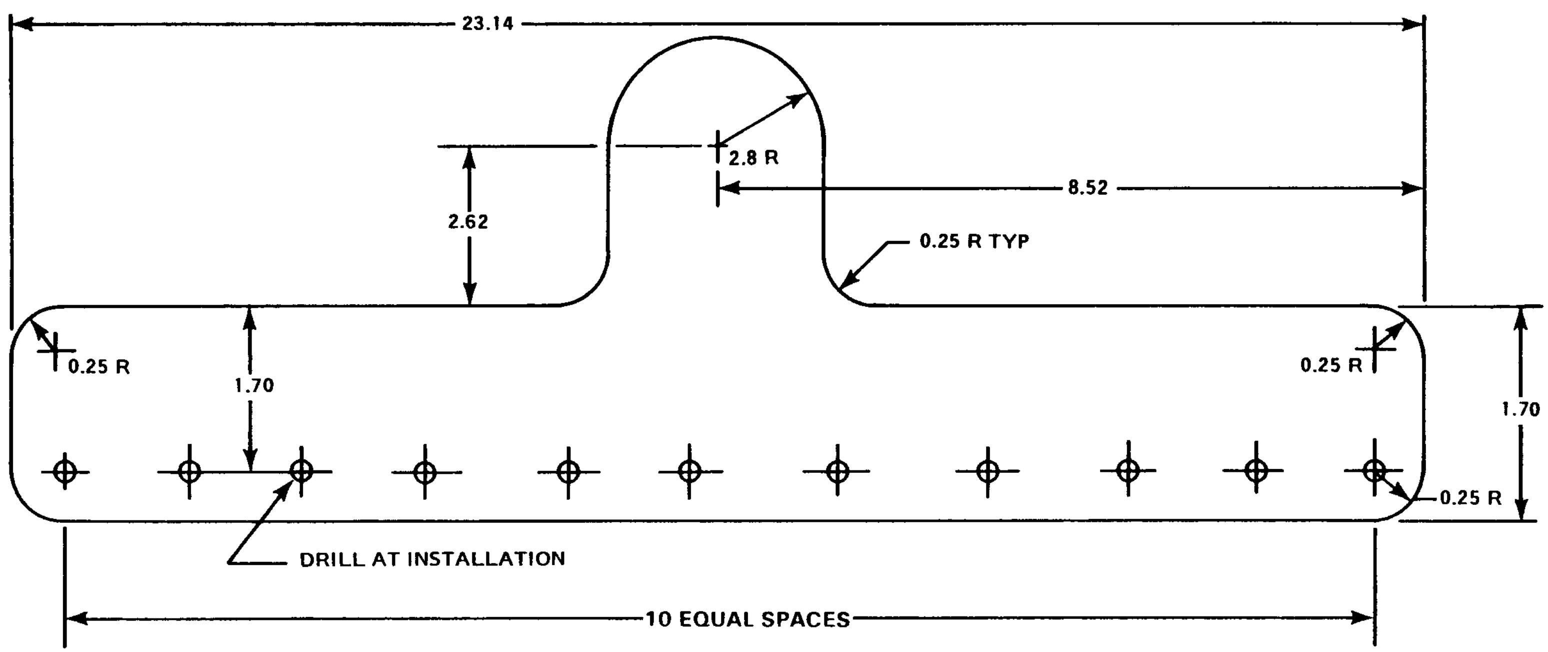


Figure D-264. Part Number 205-030-257-15, DOUBLER
Fabricate From: NSN 9535-00-
Material: 7075 AL ALY Federal Specification QQ-A-250/13, 0.032 Inch Thick, 5.8 Inches Wide, 23.3 Inches Long

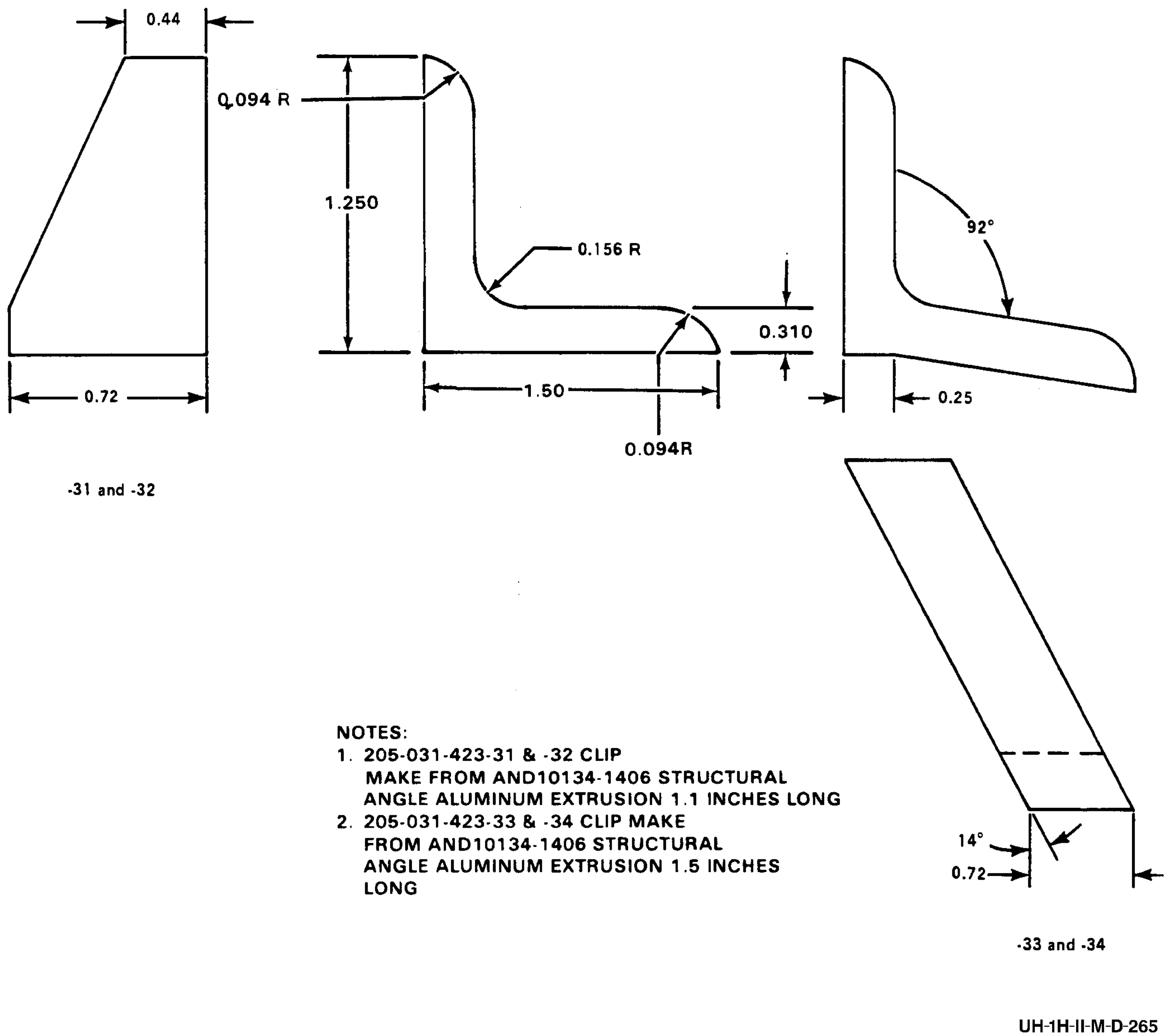
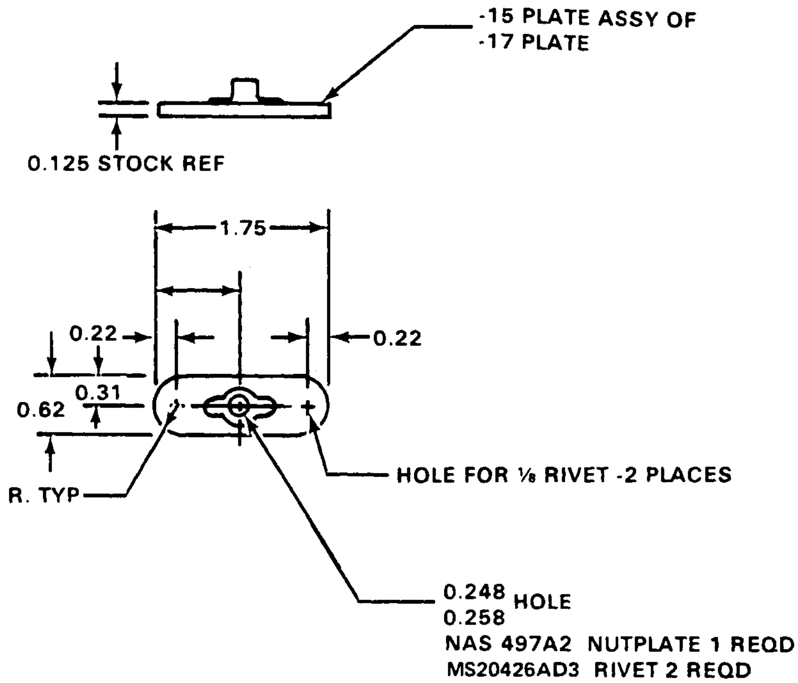


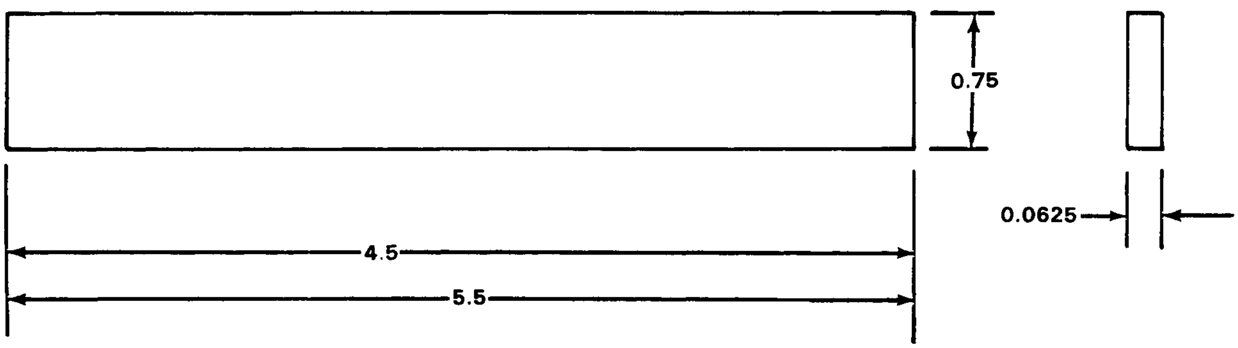
Figure D-265.	**Part Number**	**205-031-423-31, CLIP**
		205-031-423-32, CLIP
		205-031-423-33, CLIP
		205-031-423-34, CLIP
	Fabricate From:	**NSN 9540-00**
	Material:	**7075 Structural Angle Alum ALY Extruded 90 Deg, Federal Specification QQ-A-277, T6, 1.250 Inch H of 1 Leg, 1.50 Inches H of Other Leg, 0.310 Inches Thick**



NOTES:
1. 205-031-481-17 PLATE MAKE FROM METAL STRIP STEEL 0.125 INCH THICK
2. RIVET NUTPLATE TO 205-031-481-17 PLATE

UH-1H-II-M-D-266

Figure D-266. Part Number 205-031-481-15, PLATE, Assy of
Fabricate From: NSN 9515-00-184-8811
Material: Metal Strip, Steel Annealed, Federal Specification MIL-S-18729, Comp 4130, Cond N, 0.125 Inch Thick, 1.2 Inches Wide, 2.3 Inches Long



NOTES:
1. 205-031-481-23 BUMPER MAKE FROM 0.0625 INCH THICK SYNTHETIC RUBBER 5.5 INCHES LONG
2. 205-031-481-29 BUMPER MAKE FROM 0.0625 INCH THICK SYNTHETIC RUBBER 4.5 INCHES LONG

UH-1H-II-M-D-267

Figure D-267.	Part Number	205-031-481-23, BUMPER
		205-031-481-29, BUMPER
	Fabricate From:	NSN
	Material:	Rubber Sheet Synthetic, Federal Specification MIL-R-8855, Class 3, Grade 60.0, 0.0625 Inch Thick, 0.75 Inch Wide

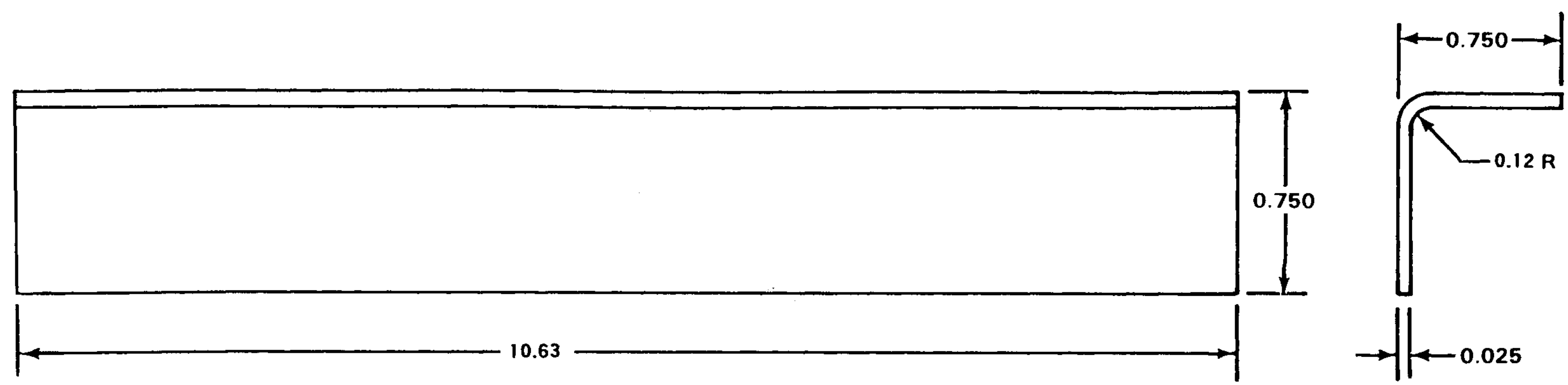
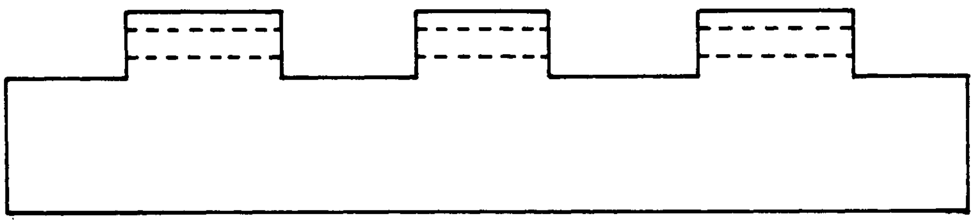


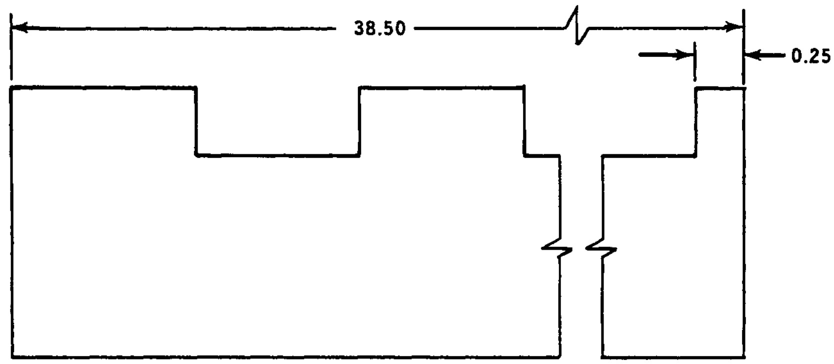
Figure D-268. Part Number 205-031-668-65, ANGLE
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY Federal Specification QQ-A-250/5, T3, 0.032 Inch Thick, 1.9 Inches Wide, 11.2 Inches Long



NOTES:
1. 205-031-862-17S HINGE HALF
   MAKE FROM MS20257HP2-7200 LEAF
   BUTT HINGE MATERIAL
2. 205-031-862-21S HINGE HALF
   MAKE FROM MS20257HP2-7200 LEAF
   BUTT HINGE MATERIAL
3. CUT HINGE MATERIAL TO PROPER
   LENGTH
4. DESIGNATION S IS SYNTHETIC PART NO.

UH-1H-II-M-D-269

Figure D-269. Part Number: 205-031-862-17S, HINGE HALF
205-031-862-21S
Fabricate From: NSN 5340-00-993-1461
Material: Leaf Butt Hinge AL ALY Anodized,
0.040 Inch Thick, 0.531 Inches Wide, 72.0 Inches Long

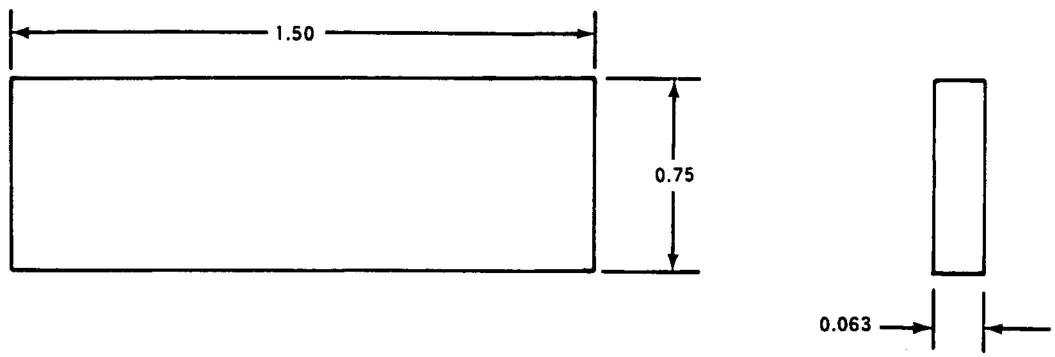


NOTES:

1. 205-031-862-19 HINGE HALF
MAKE FROM MS20257YP2-3850
BUTT HINGE MATERIAL
2. CUT HINGE MATERIAL TO PROPER
LENGTH 38.50 INCH LONG

UH-1H-II-M-D-270

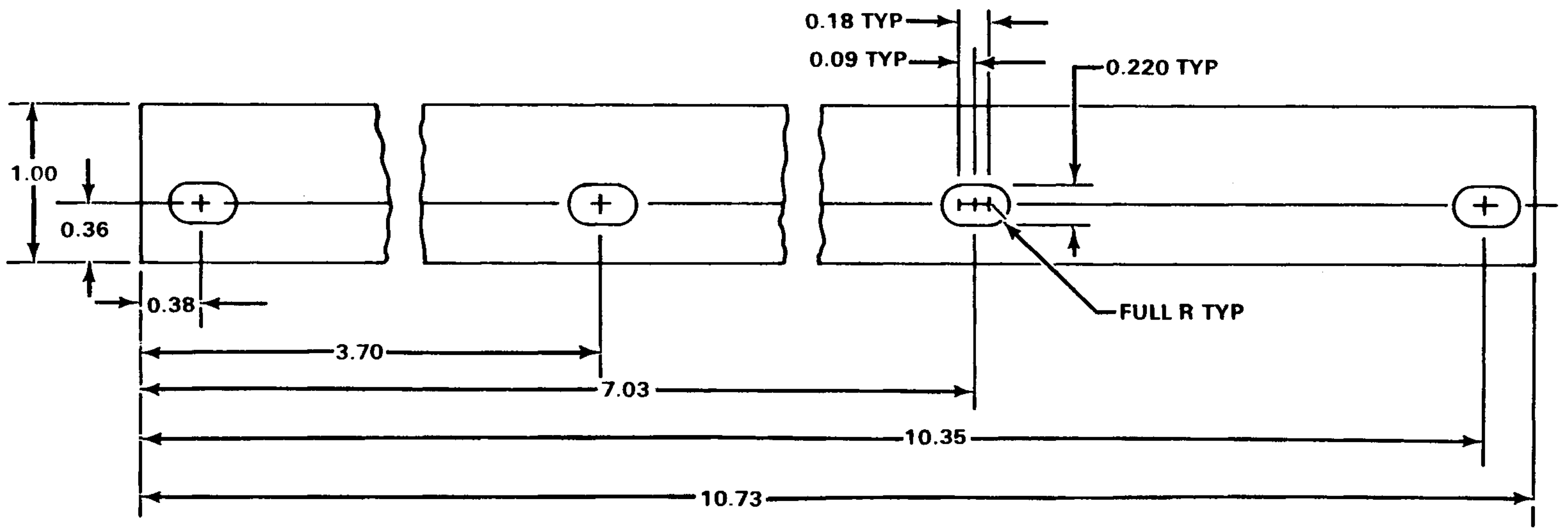
Figure D-270.	Part Number	205-031-862-19, HINGE HALF
	Fabricate From:	NSN 9535-00-
	Material:	Hinge, Butt, AL ALY Anodized, 0.040 Inch Thick, 0.531 Inch Wide



NOTES:
1. 205-031-862-47S STRIP MAKE FROM NYLATRON GS SHEET MATERIAL
2. PART SHALL BE FREE OF ALL SHARP EDGES AND SHARP CORNERS
3. PURCHASE MATERIAL FROM POLY MAR CORP, READING, PA. CODE IDENT NO. 83616

UH-1H-II-M-D-271

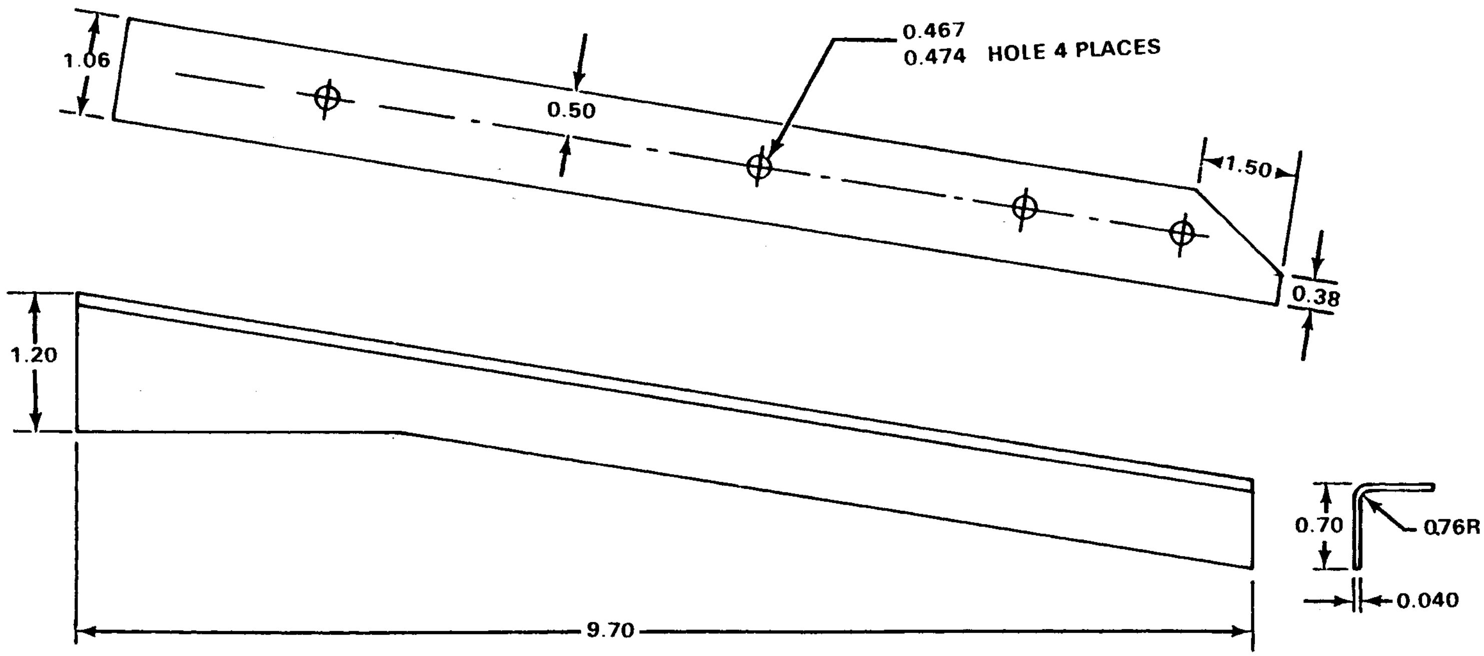
Figure D-271.	**Part Number**	**205-031-862-47S, STRIP**
	Fabricate From:	**No National Stock Number**
	Material:	**Plastic Sheet, 0.063 Inch Thick, 1.25 Inches Wide, 2.0 Inches Long**



NOTES:
1. MARK PER BPS FW 4050
2. 205-060-110-1 FILLER MAKE FROM LAMINATED SHIM AMS 4013

UH-1H-II-M-D-272

Figure D-272. Part Number 205-060-110-1, FILLER, Laminated
Fabricate From: NSN 9535-00-702-7786
Material: Shim Stock, Laminated Aluminum, Federal Specification AMS 4013, 0.125 Inch Thick, 1.5 Inches Wide, 11.2 Inches Long



UH-1H-II-M-D-273

Figure D-273.	**Part Number**	**205-060-205-19, ANGLE (Shown)**
		205-060-205-20, ANGLE (Opposite)
	Fabricate From:	**NSN 9535-00-167-2280**
	Material:	**2024 AL ALY, Federal Specification QQ-A-250/5, T3,**
		0.040 Inch Thick, 2.6 Inches Wide, 10.4 Inches Long

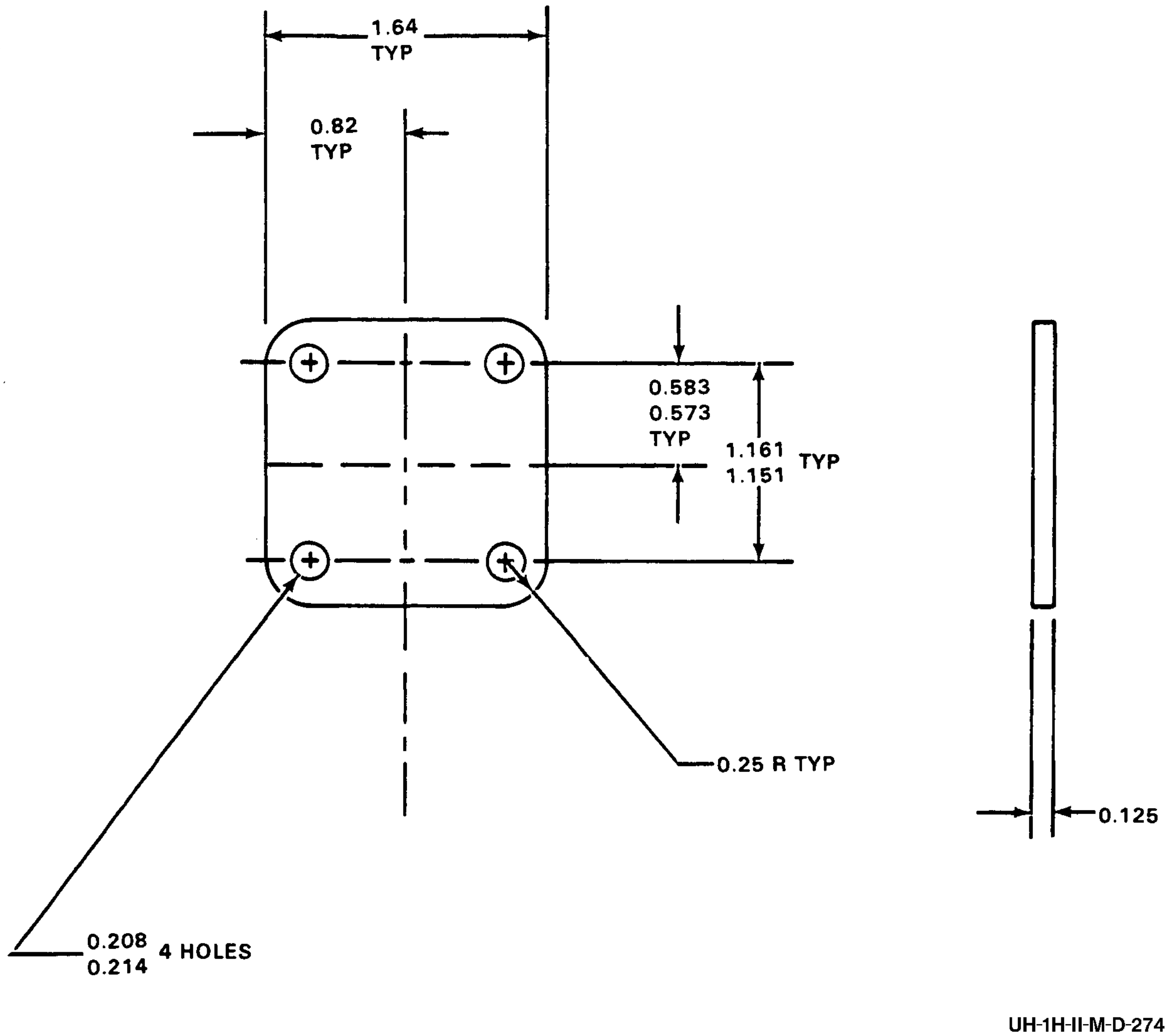
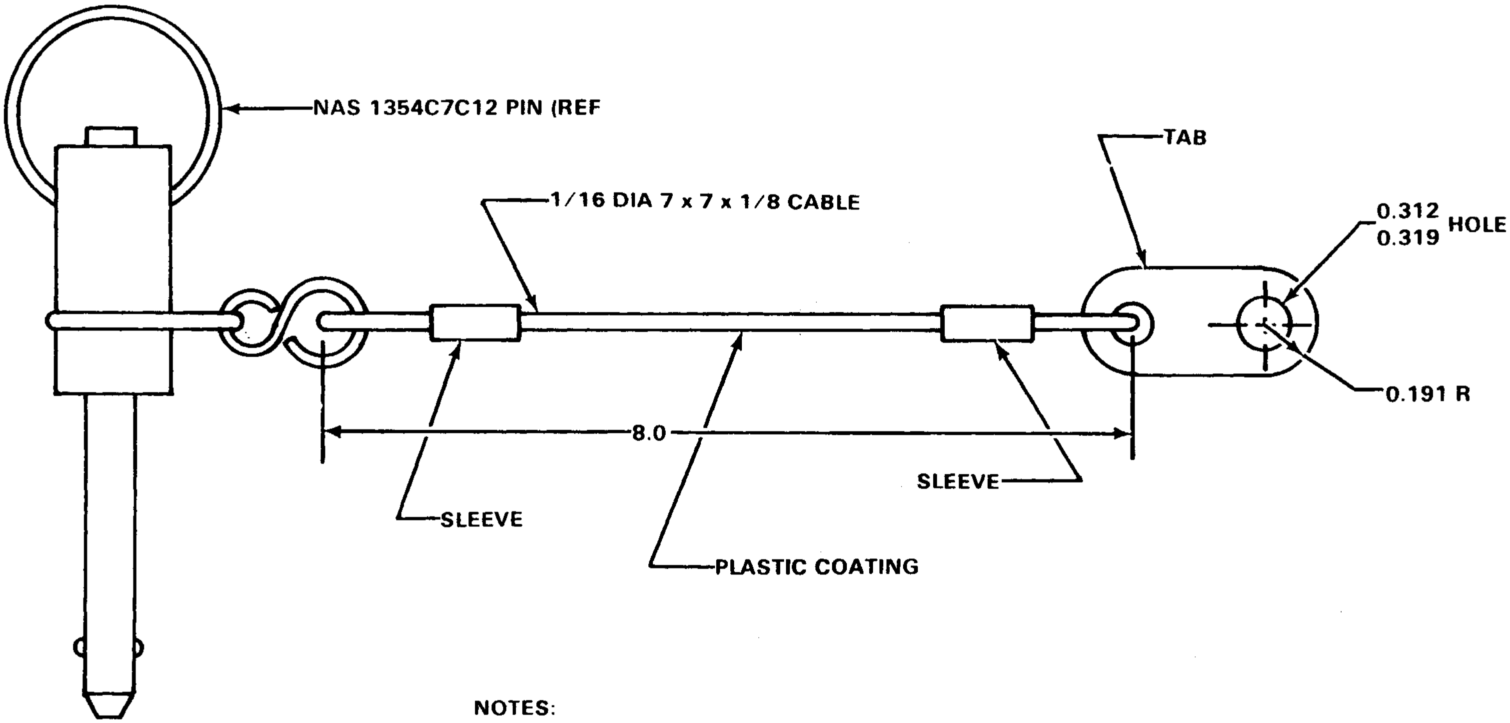


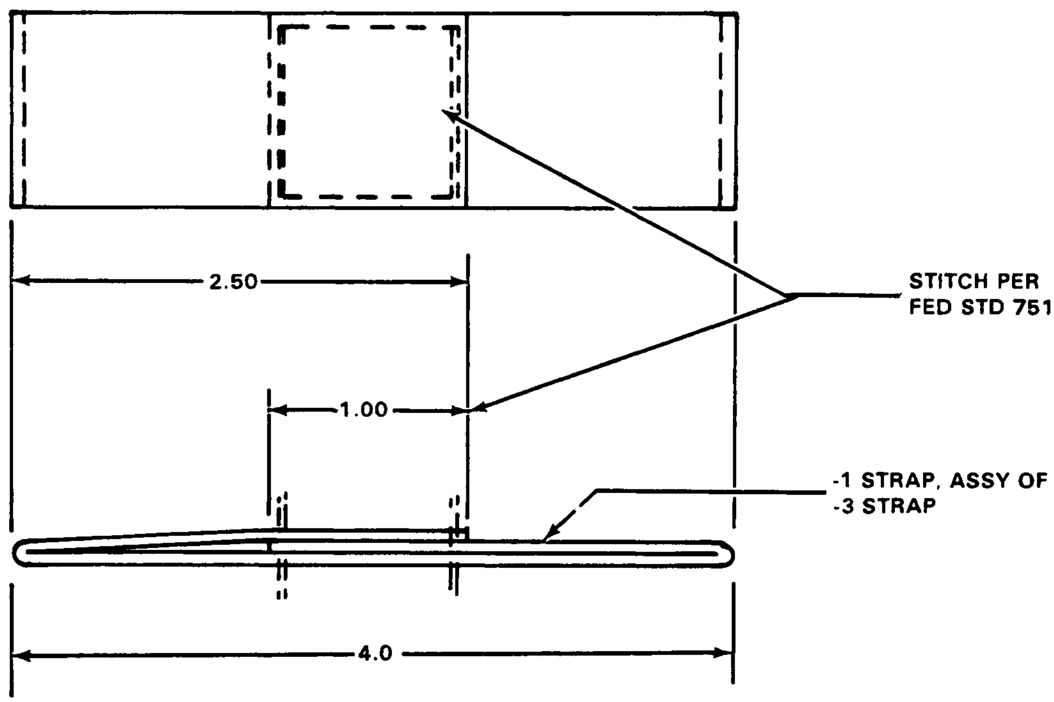
Figure D-274.	Part Number	205-062-696-1, PLATE
	Fabricate From:	NSN 9535-00-232-0478
	Material:	2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.125 Inch Thick, 1.7 Inches Wide, 1.7 Inches Long



NOTES:
1. CABLE: CORROSION RESISTANT PER MIL-W-5424
2. COATING: PLASTIC PER MIL-I-631, TYPE F, GRADE A CLASS II, CAT. I
3. SLEEVE: COPPER, ZINC PLATED 2 REQD.
4. TAB: 2024 AL ALY, FEDERAL SPECIFICATION QQ-A-250 T4, 0.040, NSN 9535-00-086-9930, ANODIZED PER MIL-A-8625, TYPE 1
5. LANYARD MAY BE MADE FROM LW-1023-1-8 PURCHASED FROM HARTWELL CORP, LOS ANGELES, CALIF CODE IDENT NO. 83014

UH-1H-II-M-D-275

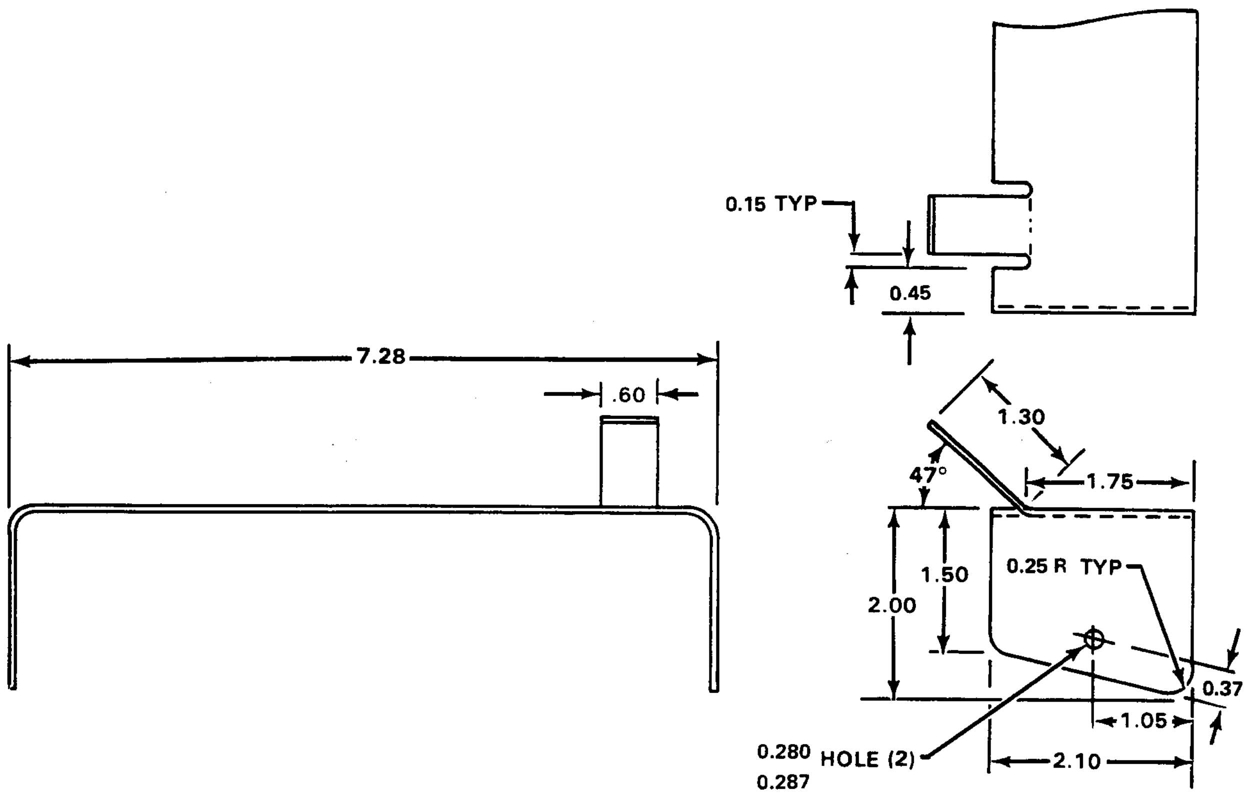
Figure D-275. Part Number 205-072-221-3, LANYARD
Fabricate From: NSN
Material:



NOTES:
1. MARK PER BPS FW 4050
2. 205-070-772-3 STRAP MAKE FROM TYPE XVII X 10.5 NYLON WEBBING MIL-W-4088-COLOR LIGHT GULL GREY NO. 36440 FED STD 595
3. NYLON THREAD MIL-T-7808
4. HEAT SEAR ENDS OF ALL WEBBING

UH-1H-II-M-D-276

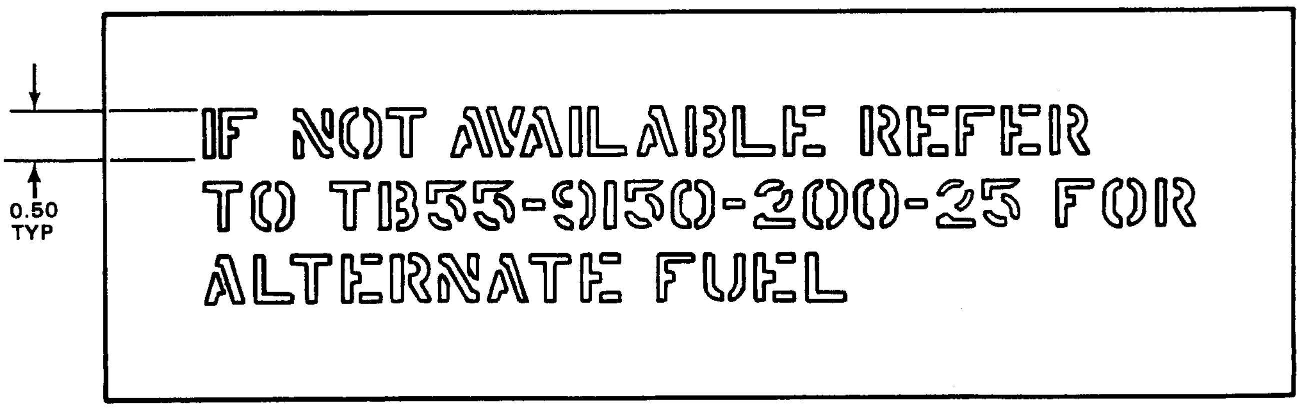
Figure D-276. Part Number 205-070-772-1, STRAP, Assembly
Fabricate From: NSN
Material: Nylon Webbing Type XVII, MIL-W-4088



NOTES:
1. MARK PER BPS FW 4050
2. ALL INSIDE RADII 0.25

UH-1H-II-M-D-277

Figure D-277. Part Number 205-070-795-1, COVER
Fabricate From: NSN 9535-00-554-1413
Material: 2024 AL ALY, Federal Specification QQ-A-362, T3, 0.063 Inch Thick, 3.5 Inches Wide, 11.7 Inches Long

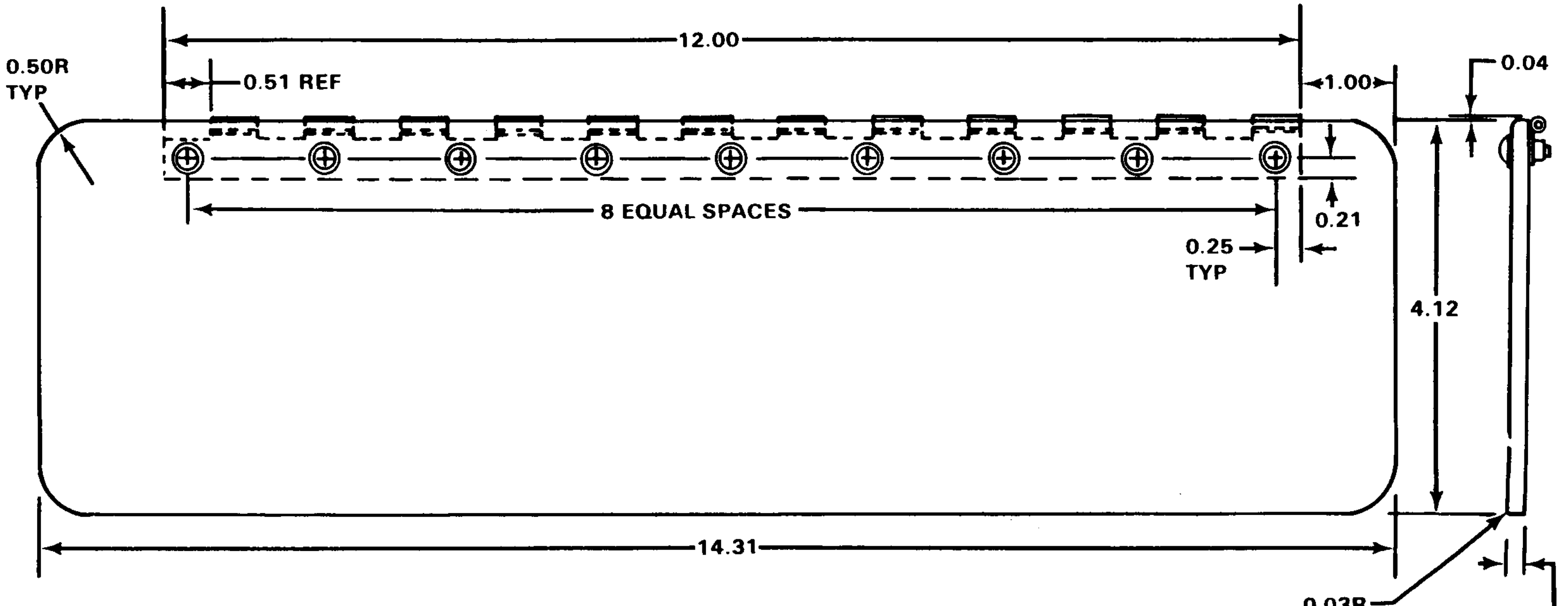


NOTES:

1. MARK PER BPS FW 4050
2. LETTER TO BE SPACED AS SHOWN

UH-1H-II-M-D-278

Figure D-278. Part Number 205-070-882-1, STENCIL
Fabricate From: NSN 9310-00-265-6797
Material: Stencil Board, Federal Specification UU-S-625, Type 2 Grade 1



NOTES:

1. 205-072-039-3 DOOR MAKE FROM ACRYLIC PLASTIC MIL-P-5425
2. 205-072-039-5 HINGE HALF MAKE FROM MS2057H2-130 HINGE MATERIAL

UH-1H-II-M-D-279

Figure D-279.	Part Number	205-072-039-1, DOOR, Assy of
	Fabricate From:	NSN 9330-00-291-4800
		NSN 5340-00-846-9673
	Material:	Plastic Sheet Acrylic Transparent, Federal Specification MIL-P-5425 FINA, 0.187 Inch Thick, 4.2 Inches Wide, 14.4 Inches Long, Leaf, Butt Hinge Al A AL ALY 0.0531 Inch Wide Make from MS 20257HP2-130 (Length 13.0 Inches)

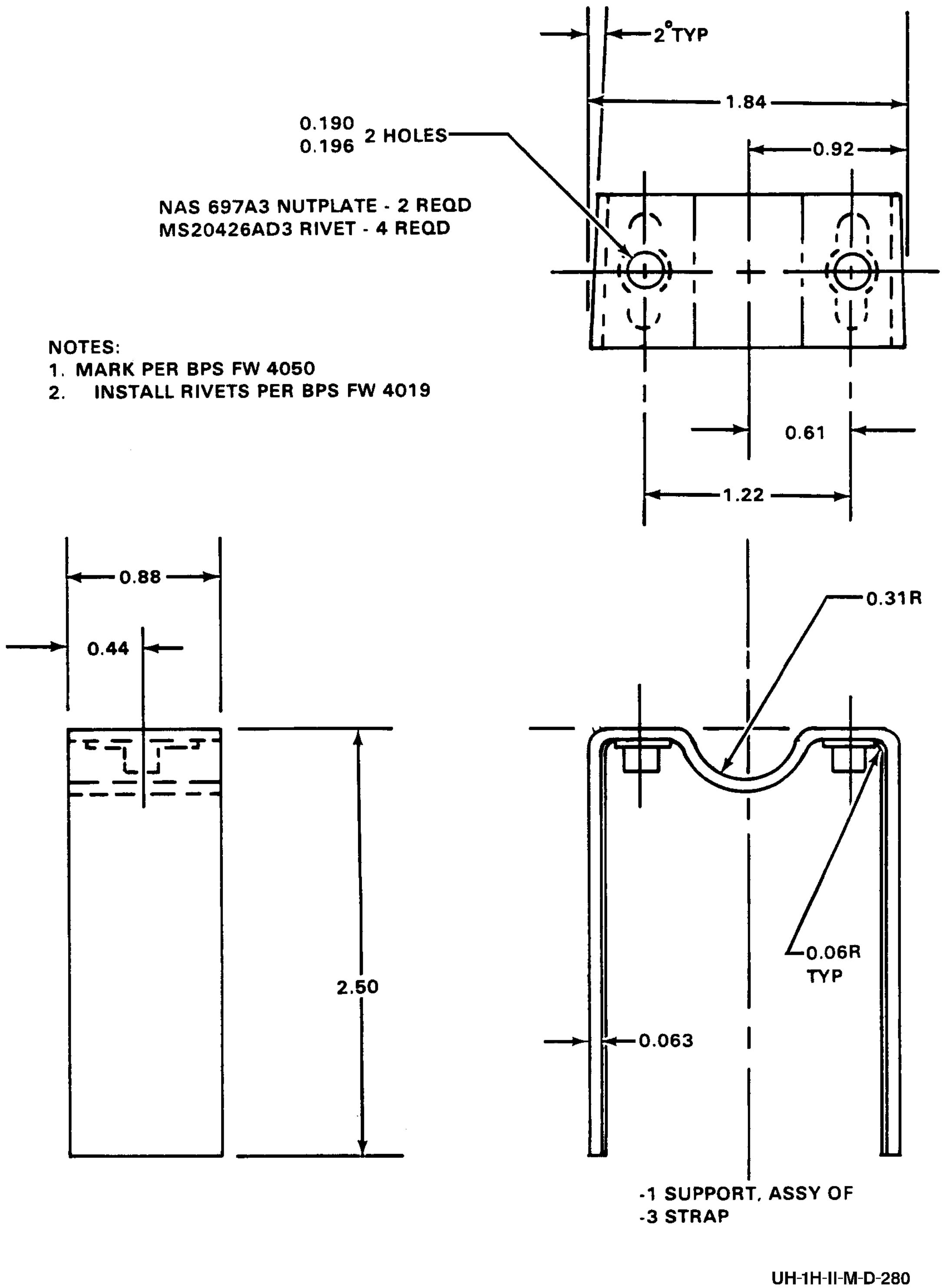


Figure D-280. Part Number 205-072-224-1, GUIDE TUBE
Fabricate From: NSN 9535-00-
Material: 6061 AL ALY, Federal Specification QQ-A-250/11, TO.
0.063 Inch Thick, 1.3 Inches Wide, 7.5 Inches Long

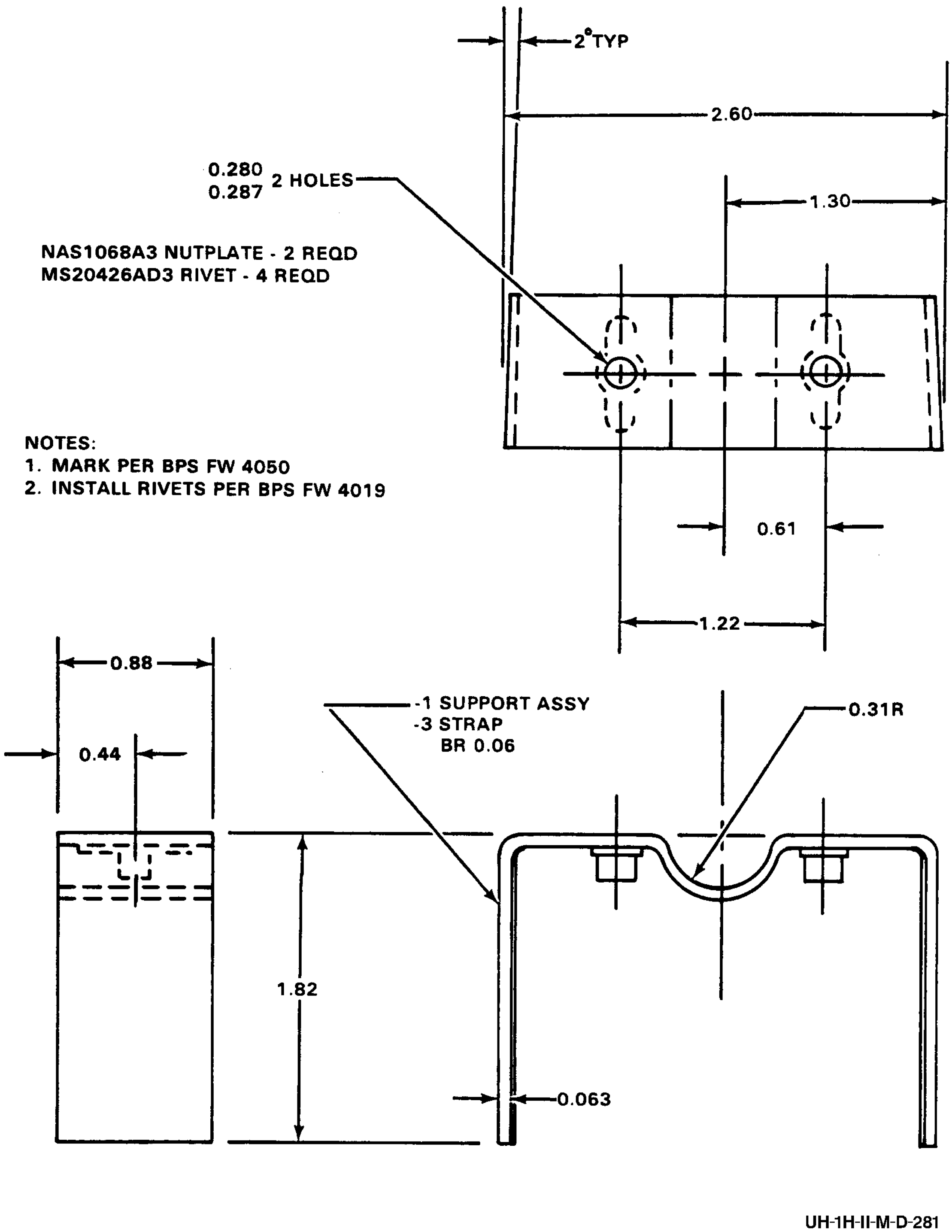
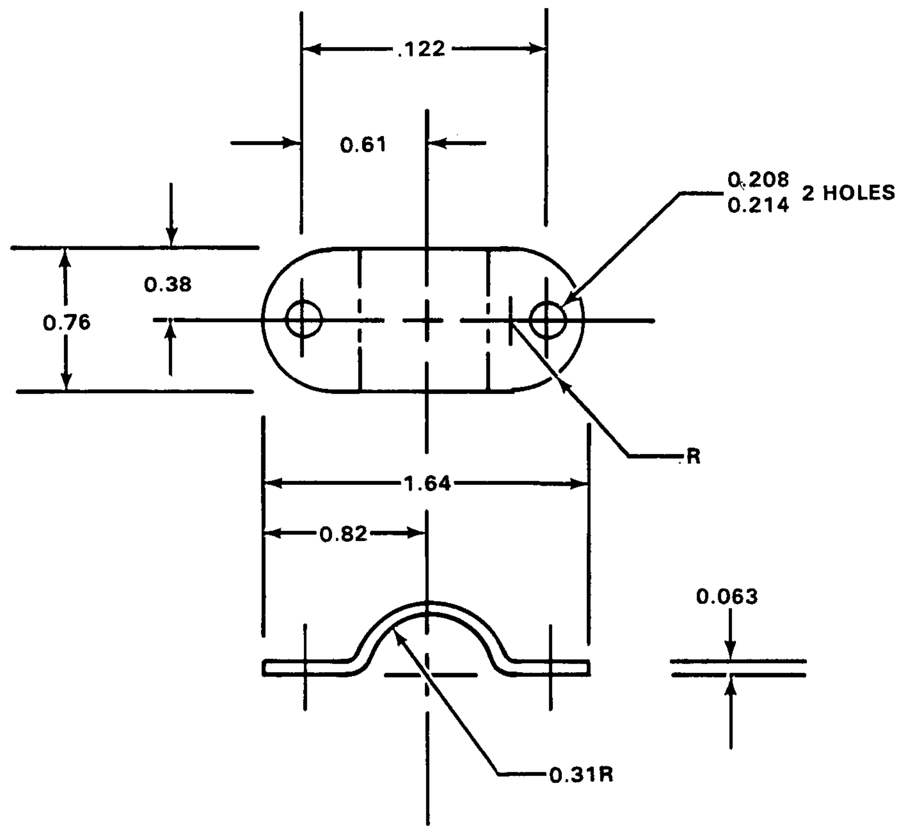


Figure D-281. Part Number 205-072-225-1, GUIDE TUBE
Fabricate From: NSN 9535-00-
Material: 6061 AL ALY, Federal Specification QQ-A-250/11, TO.
0.063 Inch Thick, 1.3 Inches Wide, 6.7 Inches Long



NOTES:
1. MARK PER BPS FW 4050
2. BEND RADIAS 0.06

UH-1H-II-M-D-282

Figure D-282. Part Number 205-072-226-1, CLAMP GUIDE
Fabricate From: NSN 9535-00-
Material: 6061 AL ALY, Federal Specification QQ-A-250/11, TO.
0.063 Inch Thick, 1.0 Inches Wide, 3.0 Inches Long

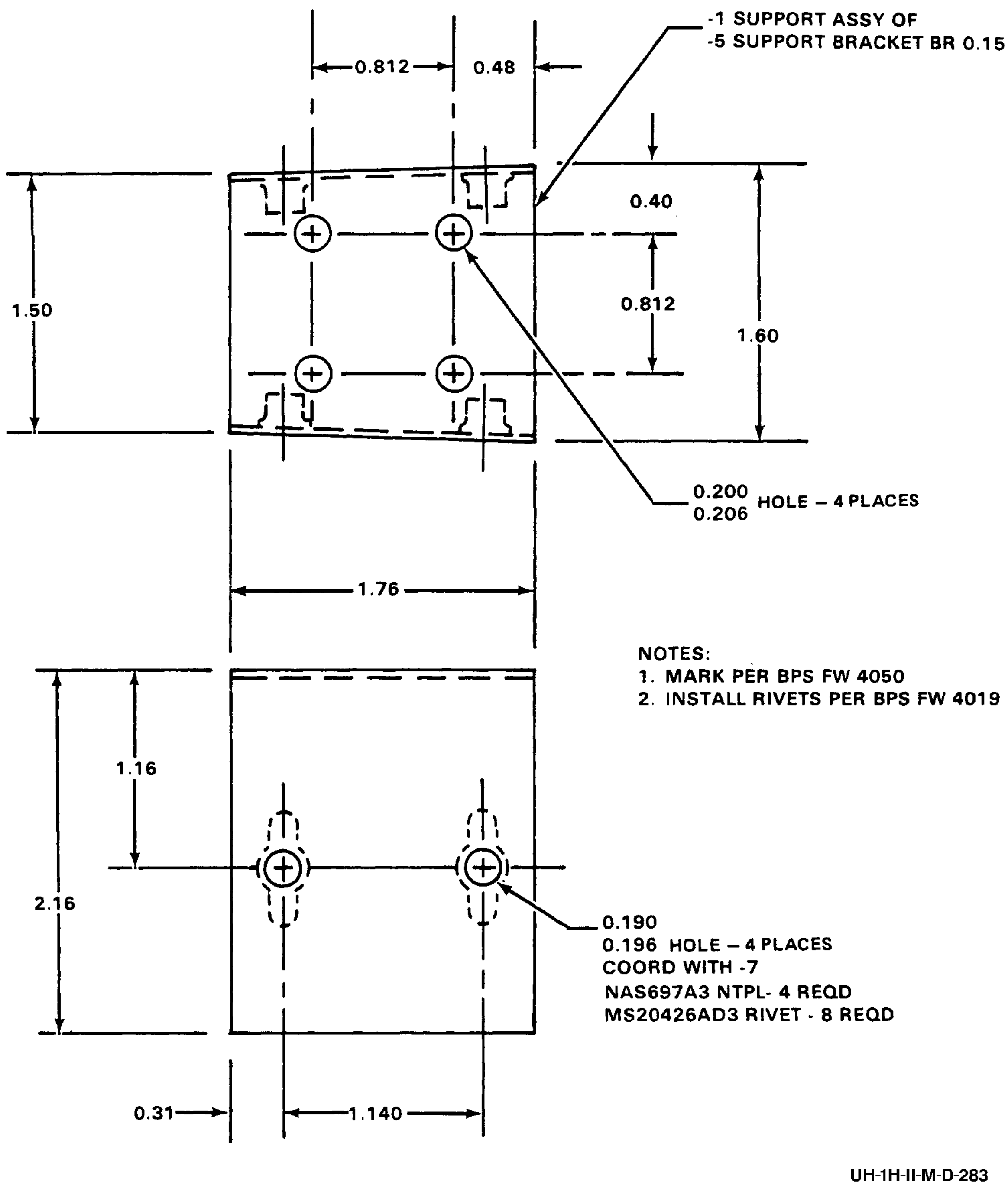


Figure D-283. Part Number 205-072-227-1, SUPPORT BRACKET, Assy of
Fabricate From: NSN 9535-00-167-2267
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, TO. 0.040 Inch Thick, 2.0 Inches Wide, 7.0 Inches Long

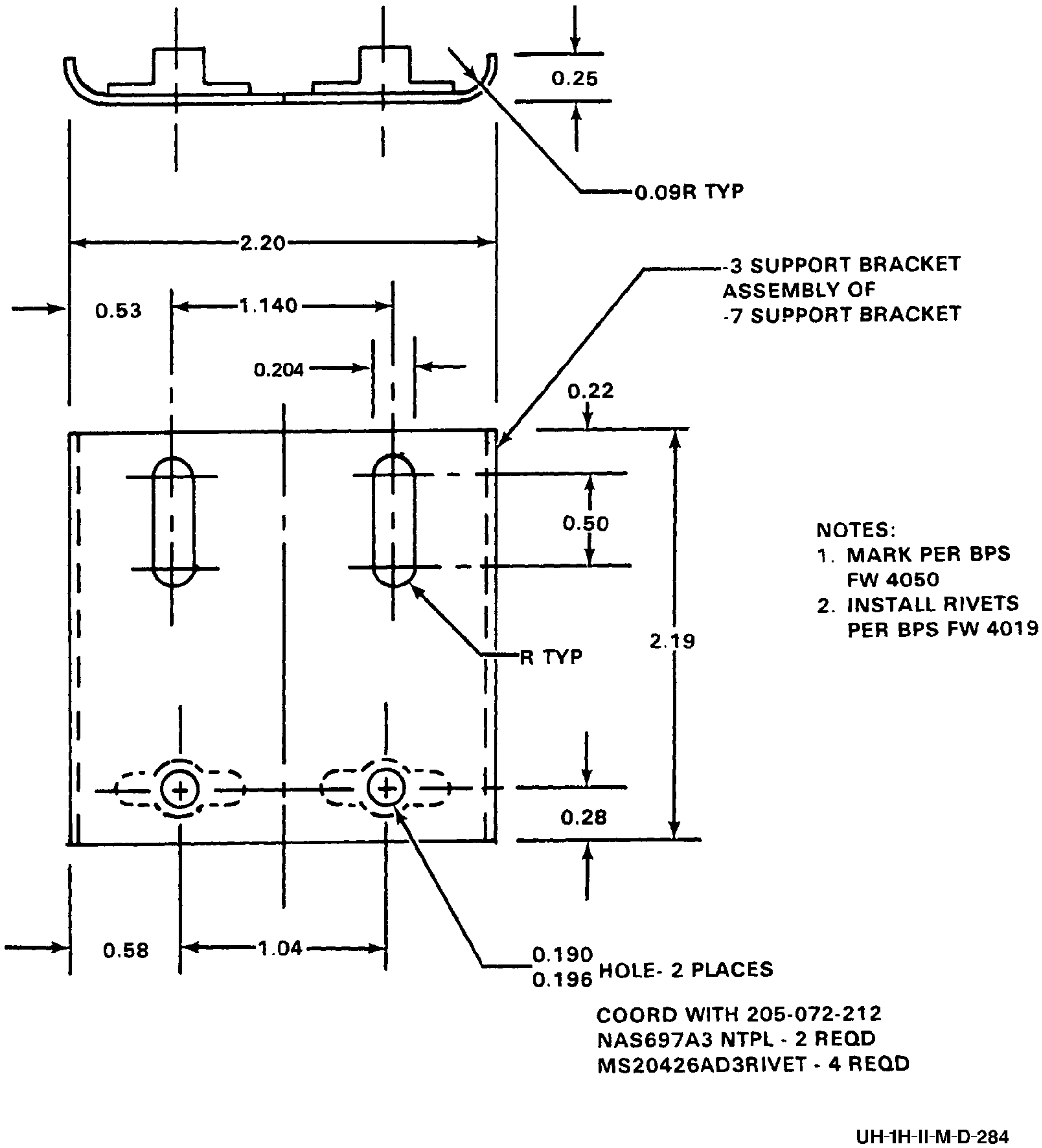


Figure D-284.	Part Number	205-072-227-3, SUPPORT BRACKET, Assy of
	Fabricate From:	NSN 9535-00-
	Material:	2024 AL ALY, Federal Specification QQ-A-250/5, TO. 0.032 Inch Thick, 3.0 Inches Wide, 3.0 Inches Long

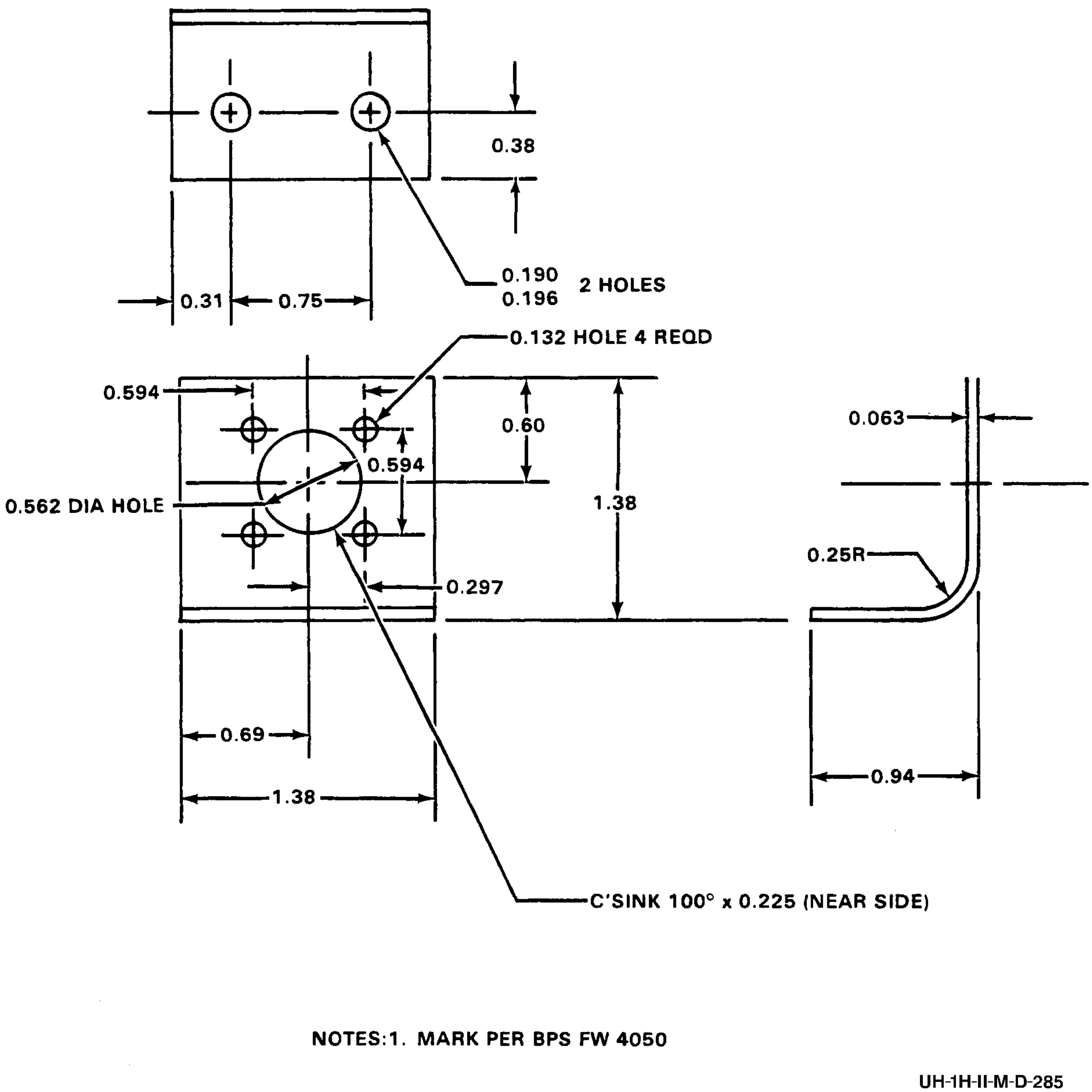
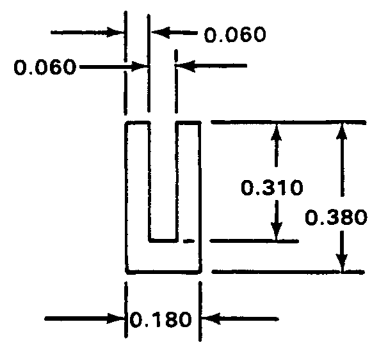


Figure D-285. Part Number 205-072-317-1, BRACKET
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3
0.063 Inch Thick, 1.5 Inches Wide, 2.38 Inches Long



NOTES:
1. PART NO. 205-706-029-11 SEAL
MAKE FROM BELL STD 110-076
20 INCHES LONG
2. RUBBER EXTRUSION MAY BE PURCHASED
FROM BELL HELICOPTER

UH-1H-II-M-D-286

Figure D-286. Part Number 205-706-029-11, SEAL
Fabricate From: NSN
Material: Rubber Synthetic Extruded Federal Specification MIL-R-6855, Class II Grade 60, Color BLACK

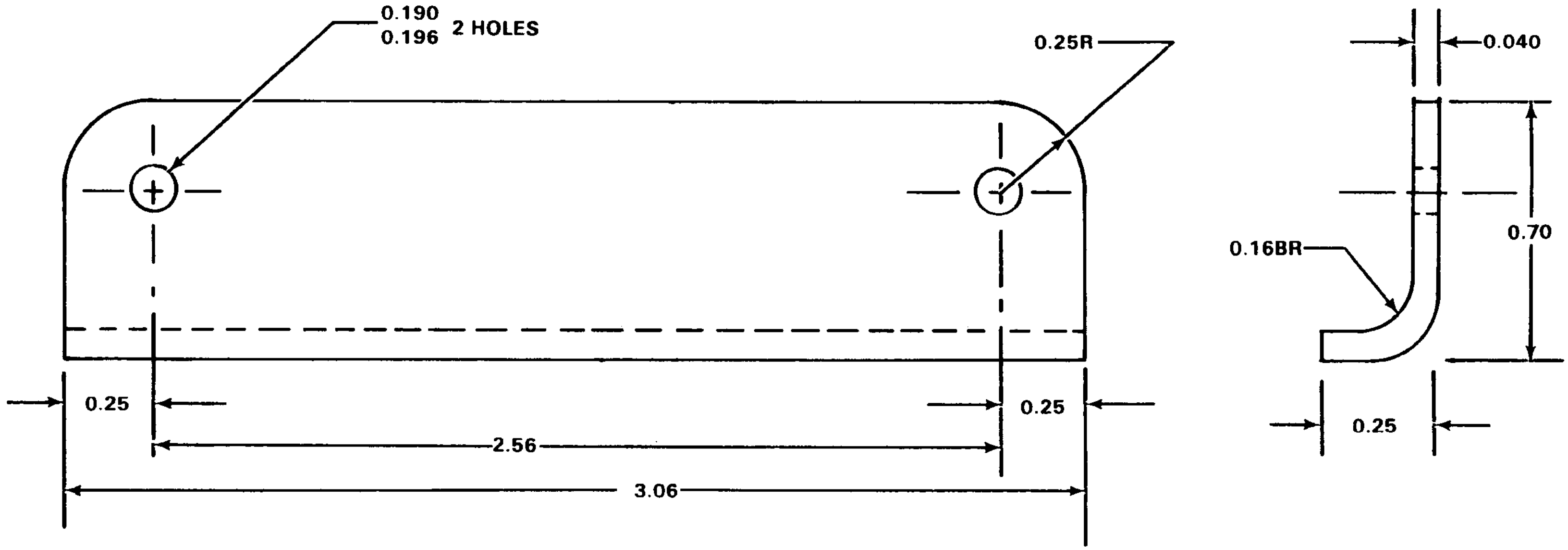
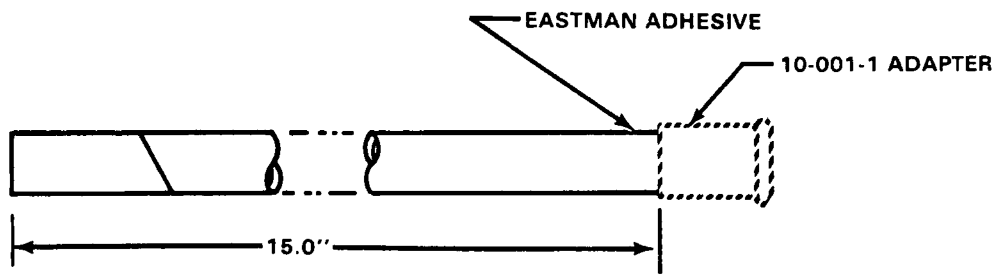


Figure D-287. Part Number 205-706-029-15, LINK
Fabricate From: NSN 9535-00-084-4551
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.040 Inch Thick, 1.0 Inch Wide, 5.0 Inches Long



NOTES:
1. MARK PART PER BPS FW 4050
2. PRIOR TO BONDS CLEAN SURFACES WITH ACETONE CHEM PURE OR METHYL ETHYL KETONE CHEM PURE
3. ALTERNATE MAT'L RUBBER-BLACK MIL-R-6855, CLASS II, GRADE 60

UH-1H-II-M-D-288

Figure D-288.	Part Number	205-075-135-19, TUBE
	Fabricate From:	NSN 4720-00-540-3644
	Material:	Rubber Black Synthetic, Federal Specification MIL-R-6855

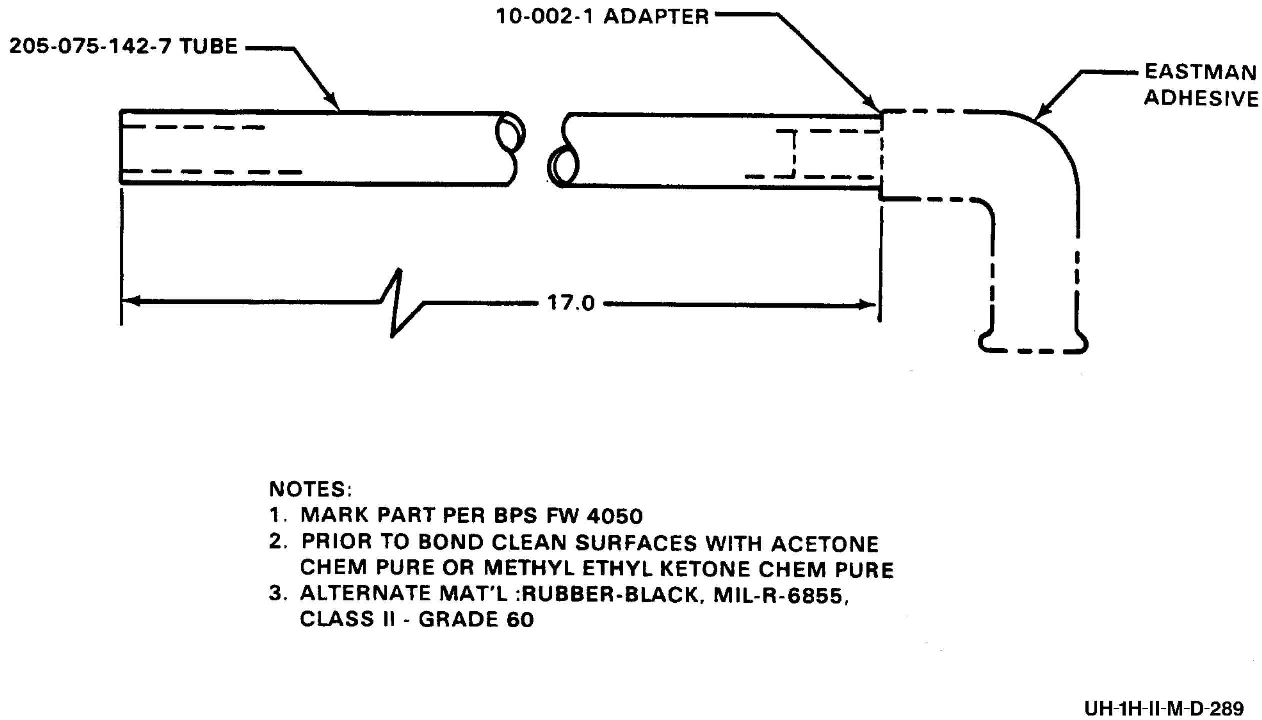
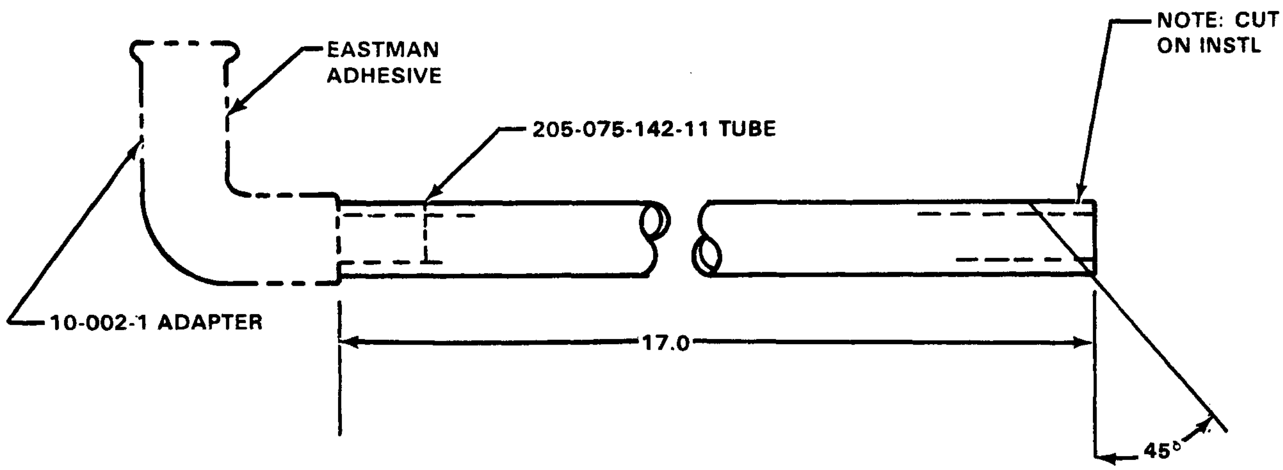


Figure D-289. Part Number 205-075-142-5, TUBE
Fabricate From: NSN 4720-00-540-3644
Material: Tubing Rubber Synthetic Black, Federal Specification MIL-R-6855, Class II Grade 40, 1/8 Inch Wall Thick, 3/8 Inch ID



NOTES:
1. MARK PART PER BPS FW 4050
2. PRIOR TO BOND CLEAN SURFACES WITH ACETONE CHEM PURE OR METHYL ETHYL KETONE CHEM PURE
3. ALTERNATE MAT'L: RUBBER-BLACK MIL-R-6855, CLASS II - GRADE 60

UH-1H-II-M-D-290

Figure D-290. Part Number 205-075-142-9, TUBE
Fabricate From: NSN 4720-00-540-3644
Material: Tubing Rubber Synthetic Black, Federal Specification MIL-R-6855, Class II Grade 40, 1/8 Inch Wall Thick, 3/8 Inch ID

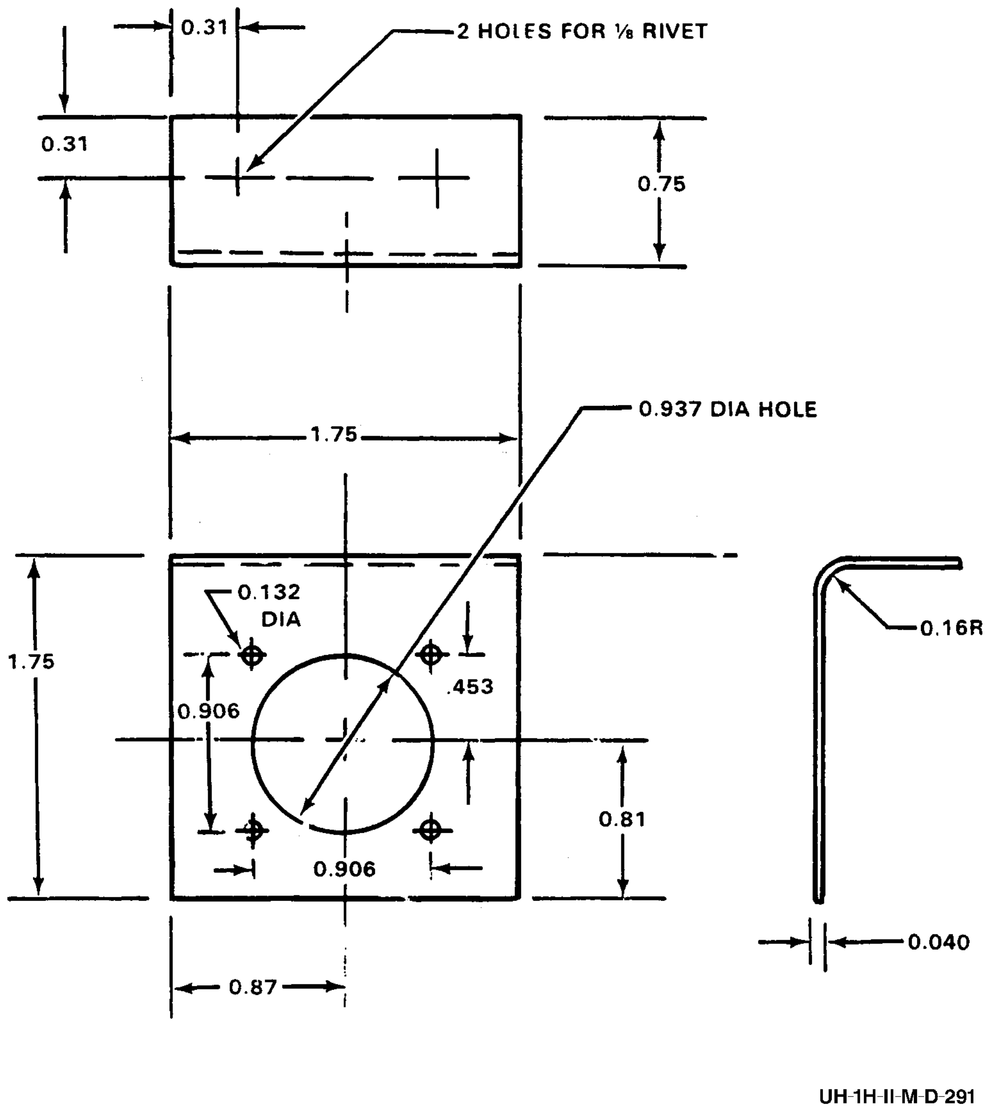


Figure D-291. Part Number 205-075-151-1, BRACKET
Fabricate From: NSN 9535-00-167-2280
Material: 2024 AL ALY, Federal Specification QQ-A-250, T3
0.040 Inch Thick, 2.2 Inches Wide, 3.0 Inches Long

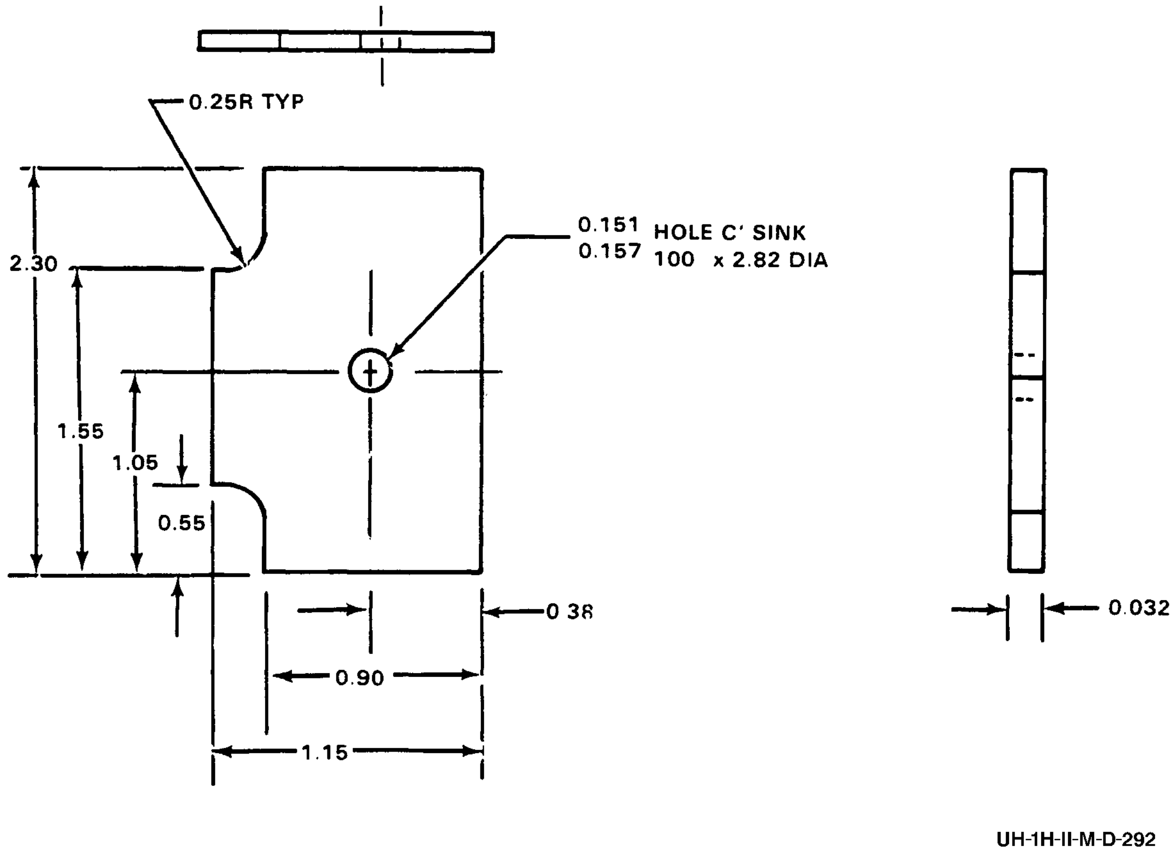


Figure D-292. Part Number 205-075-210-3, PLATE
Fabricate From: NSN 9535-00-232-0565
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, 0.032 Inch Thick, 2.5 Inches Wide, 2.5 Inches Long

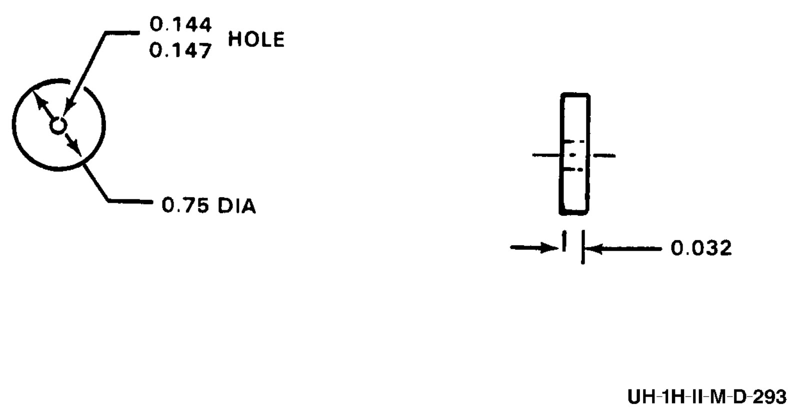


Figure D-293. Part Number 205-075-210-5, PLATE
Fabricate From: NSN 9535-00-232-0565
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, 0.032 Inch Thick, 1.0 Inch Wide, 1.0 Inch Long

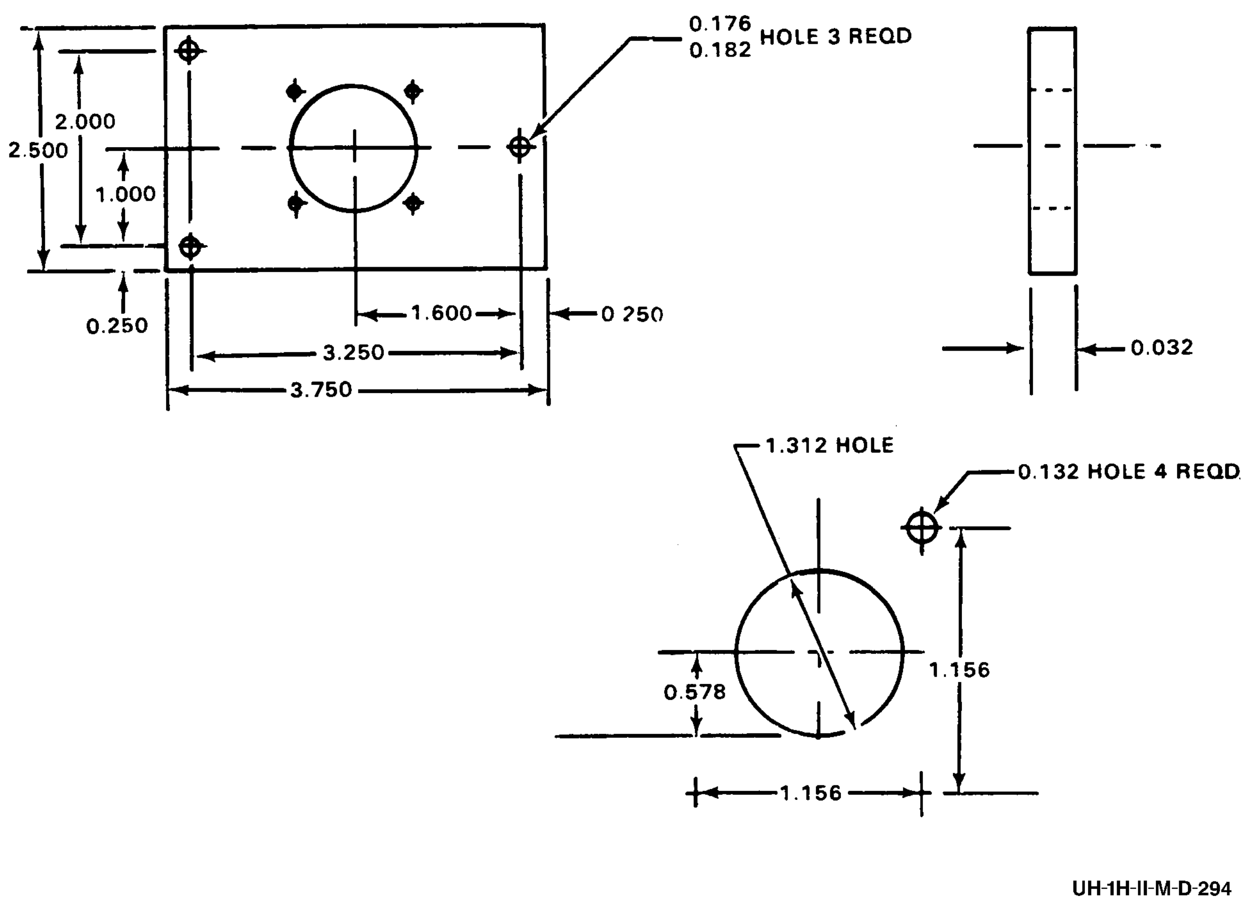
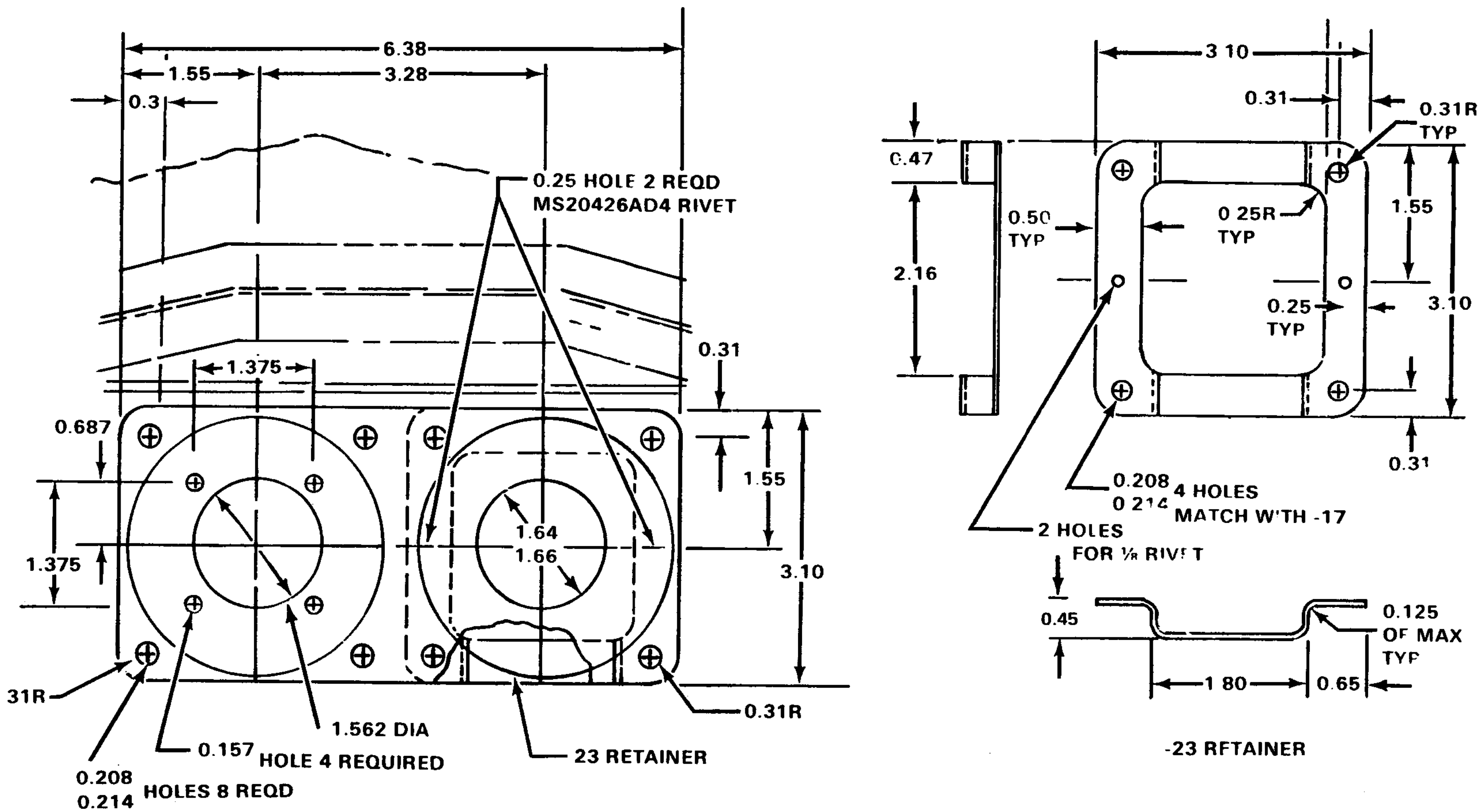


Figure D-294. Part Number 205-075-237-5, PLATE RECEPTACLE
Fabricate From: NSN 9535-00-232-0565
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, 0.032 Inch Thick, 2.7 Inches Wide, 4.0 Inches Long



NOTES:
1. RIVET 205-961-102-23 RETAINER TO 205-961-102-17 COVER

UH-1H-II-M-D-295

Figure D-295. Part Number 205-961-102-17, COVER
Fabricate From: NSN 9535-00-086-9729, NSN
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.032 Inch Thick, 3.3 Inches Wide, 6.6 Inches Long, Metal Sheet Corrosion, Federal Specification MIL-S-5059 Comp 302, Cres 18-18, 0.060 Inch Thick, 3.6 Inches Wide, 4.6 Inches Long

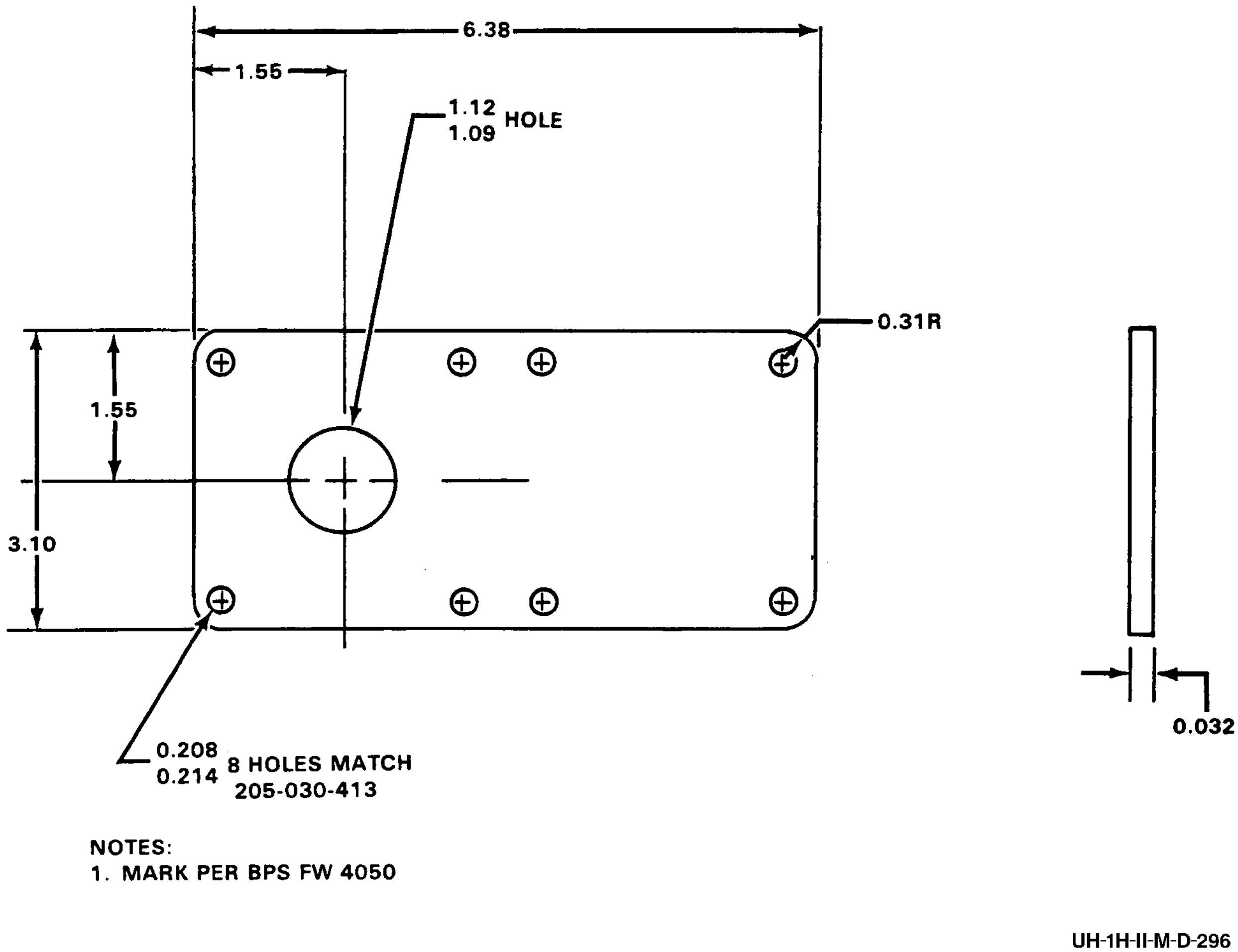


Figure D-296. Part Number 205-961-102-25, COVER
Fabricate From: NSN 9535-00-086-9729
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.032 Inch Thick, 3.3 Inches Wide, 6.6 Inches Long

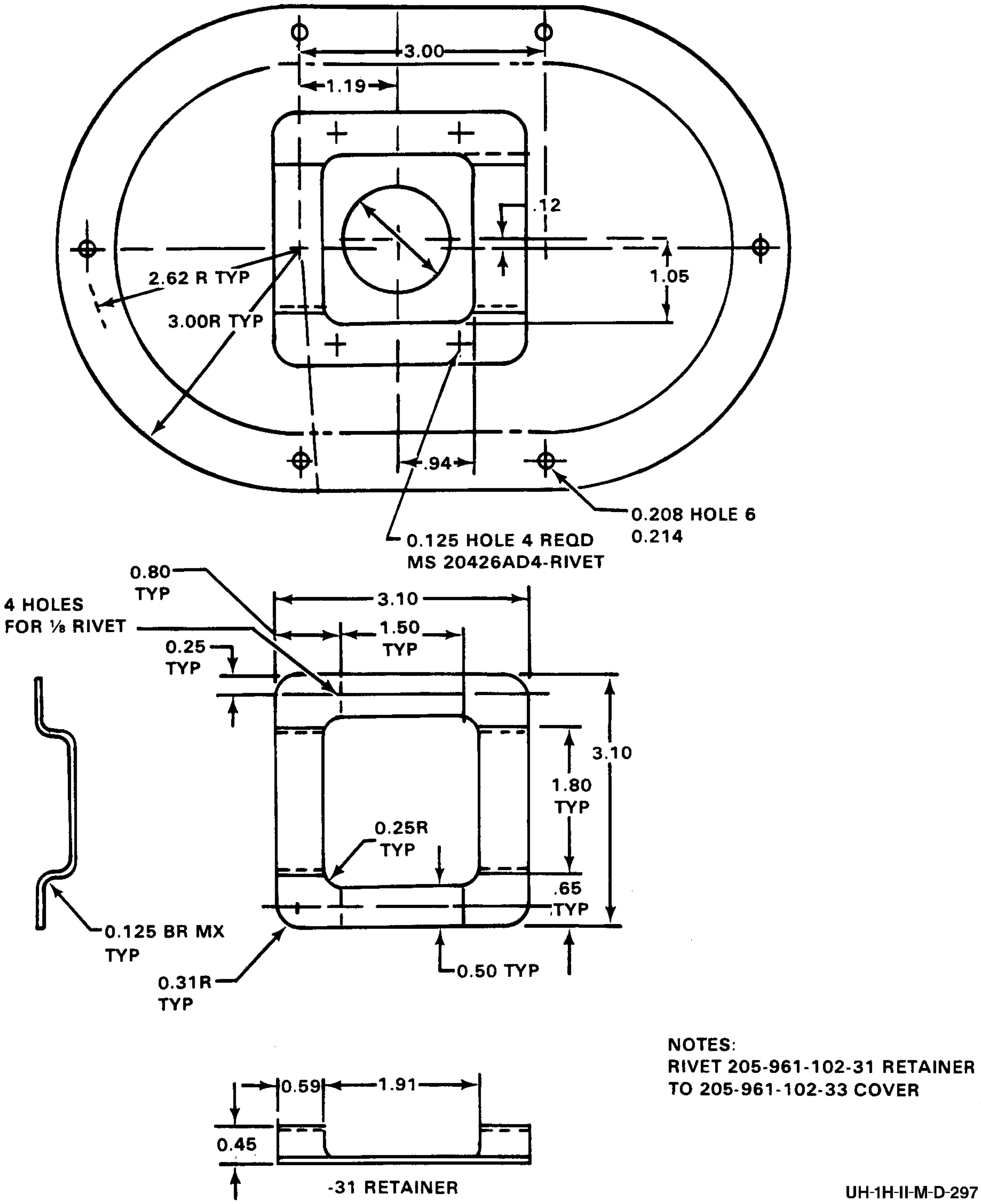
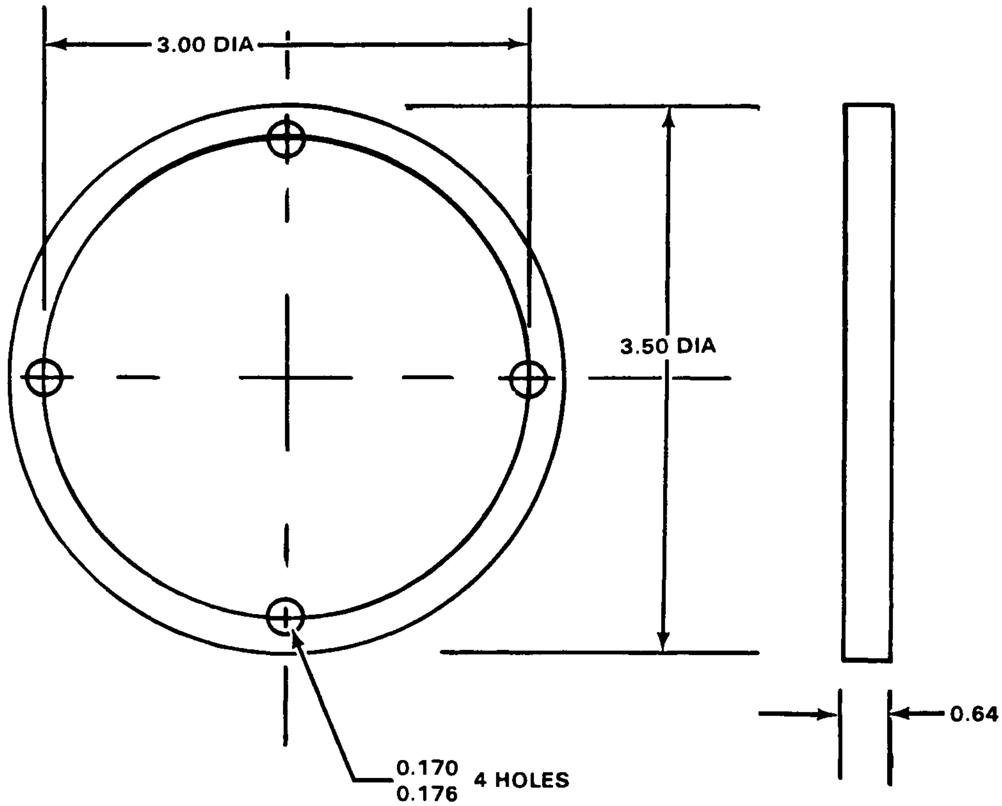


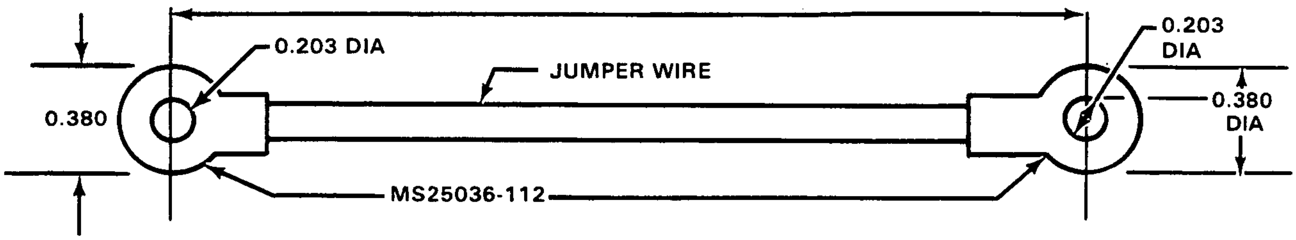
Figure D-297. Part Number 205-961-102-33, COVER
Fabricate From: NSN
Material: Metal Sheet Corrosion, Federal Specification MIL-S-5059 Comp 302, Annealed, Cres 18-8, 0.060 Inch Thick, 6.7 Inches Wide, 9.8 Inches Long, 3.16 Inches Wide, 4.6 Inches Long



NOTES:
1. 205-961-155-3 WINDOW MAKE FROM 0.064 INCH THICK POLYCARBONATE MATERIAL
2. PURCHASE FROM TEXAS WESTERN PLASTICS INC, 1824 INDUSTRIAL BLVD, DALLAS, TEXAS PER BELL HELICOPTER SPEC 299-947-044 AND FEDERAL SPECIFICATION L-P-393

UH-1H-II-M-D-298

Figure D-298. **Part Number** **205-961-155-3, WINDOW**
Fabricate From: **NSN**
Material: **Polycarbonate Resin Material, Federal Specification L-P-393 and Bell Helicopter SPEC 299-947-044, 0.064 Inch Thick, 4.0 Inches Wide, 4.0 Inches Long**

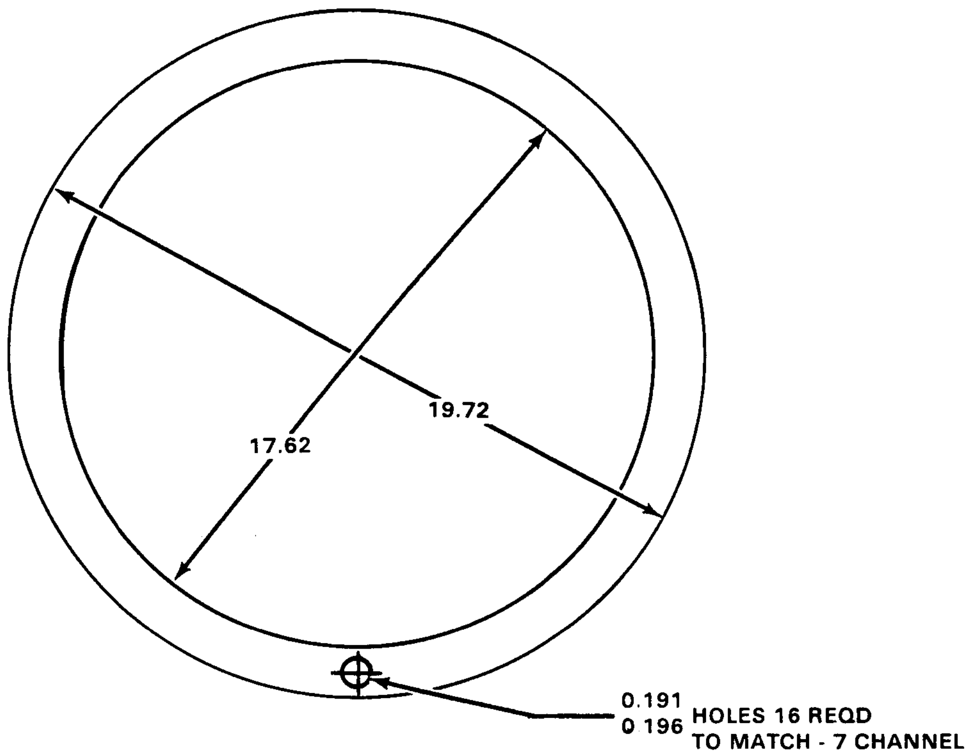


NOTES:
1. SECURE TERMINAL LUG AND BULK WIRE.
2. ATTACH TERMINALS TO COPPER WIRE WITH MS3316 OR MS17726 CRIMPING TOOLS AS APPLICABLE.

PART NO.	JUMPER WIRE	LENGTH
MS25083-2BB5	TINNED STRANDED COPPER	5.0
MS25083-2BB6	TINNED STRANDED COPPER	6.0

UH-1H-II-M-D-299

Figure D-299. Part Number MS 25083-BB5, JUMPER ASSY
MS 25083-2BB6, JUMPER ASSY
Fabricate From: NSN 5940-00-143-4794
NSN 6145-00-819-0058
Material: Terminal Lub Copper (MS 25036-112) Wire, Electrical Copper Tinned, Federal Specification QQ-W-343-TYPE RB Class I, AWG 12



NOTES:
1. MARK PER BPS FW 4050
2. PURCHASE FROM JOHNS-MANSVILLE PRODUCTS NEW YORK, NEW YORK CODE IDENT 92798
3. SPECIAL ASBESTOS MATERIAL NO. NSN AVAILABLE

THICKNESS	SIZE	STYLE
0.047 INCH	20.00 x 20.00	89

UH-1H-II-M-D-300

Figure D-300. Part Number 204-060-816-33, GASKET
Fabricate From:
Material:

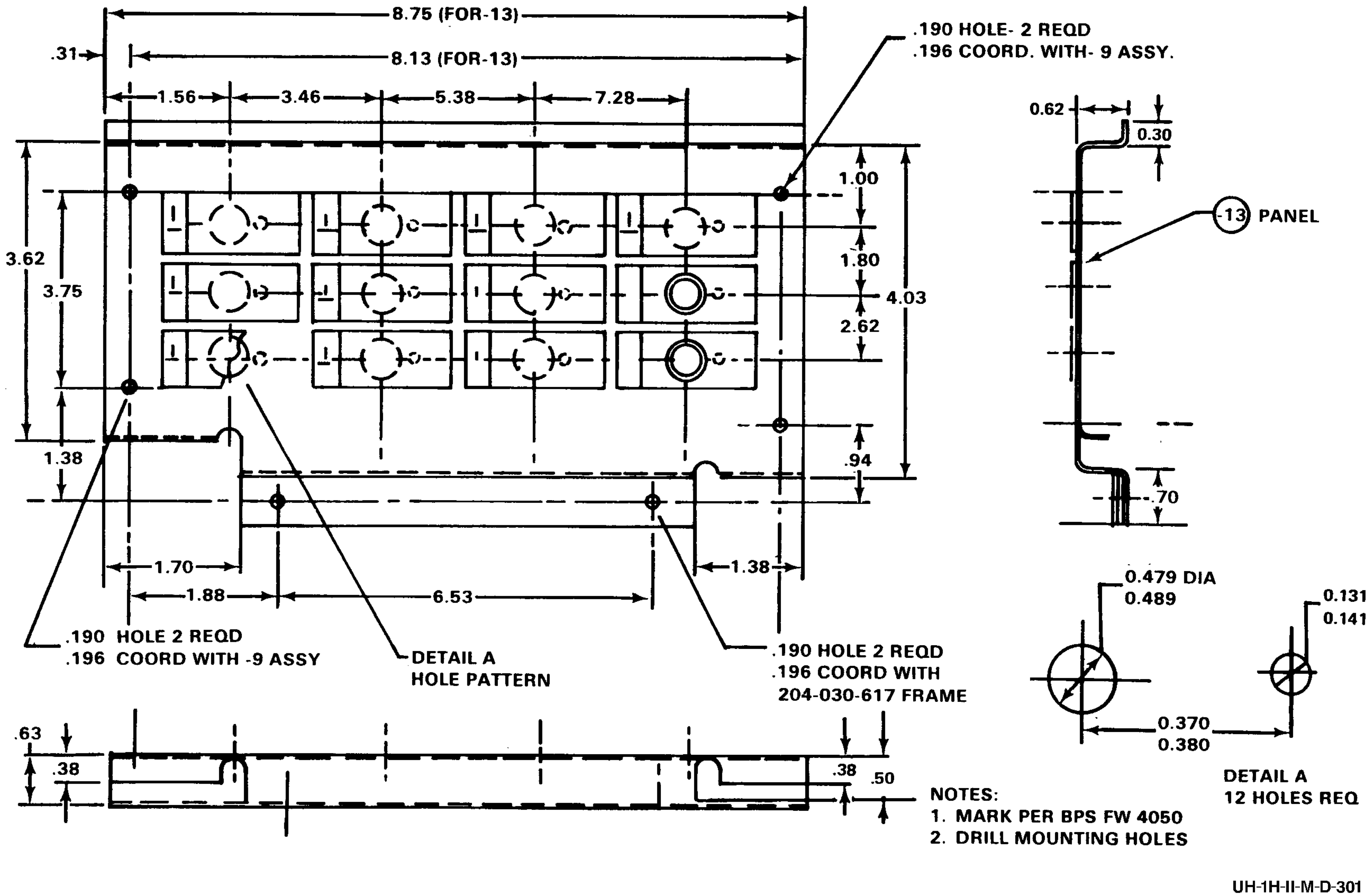


Figure D-301. Part Number 204-075-177-13, PANEL
Fabricate From: NSN 9535-00
Material: 2024 AL ALY, Federal Specification QQ-A-362, T3, 0.032 Inch Thick, 6.8 Inches Wide, 9.3 Inches Long

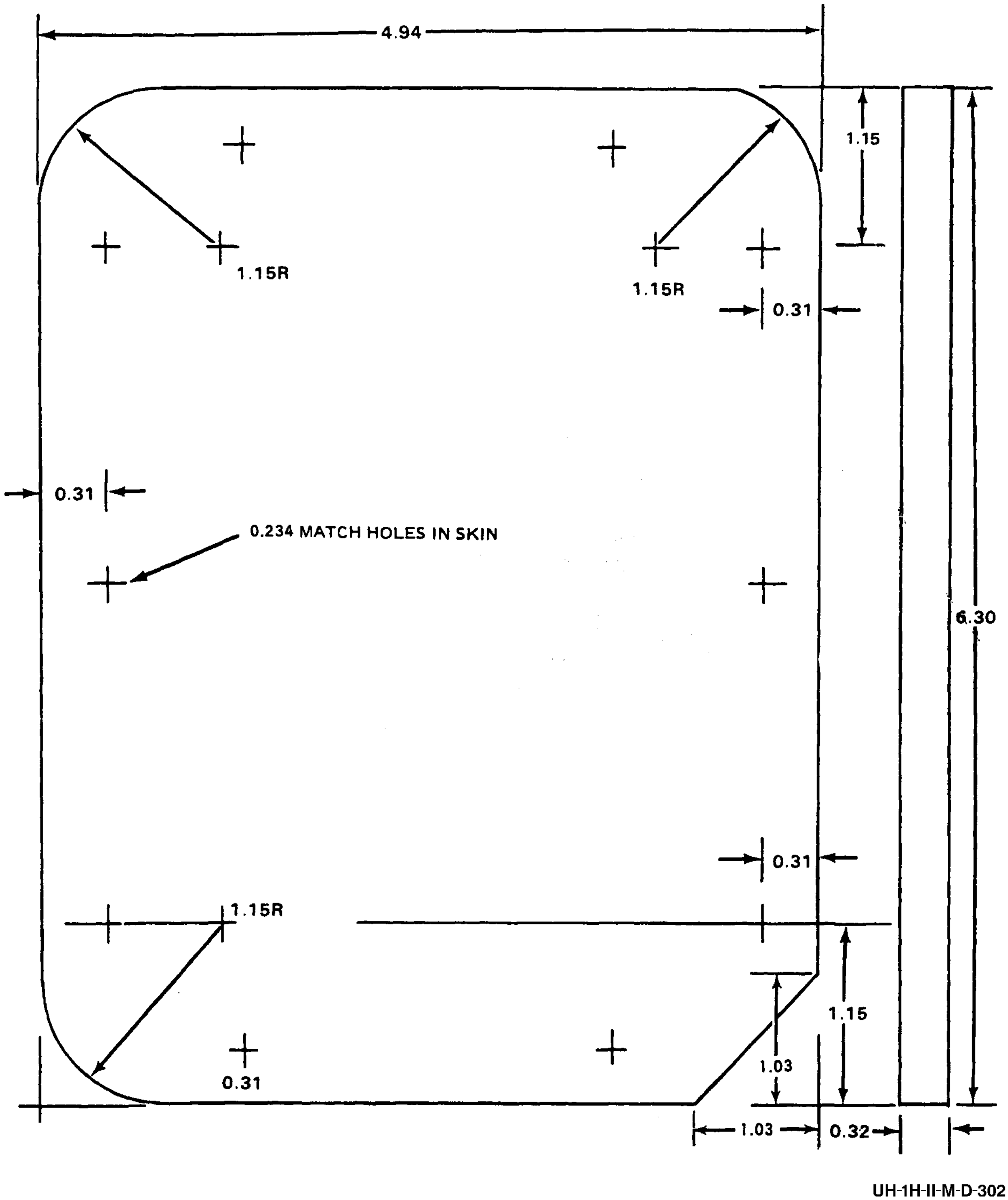
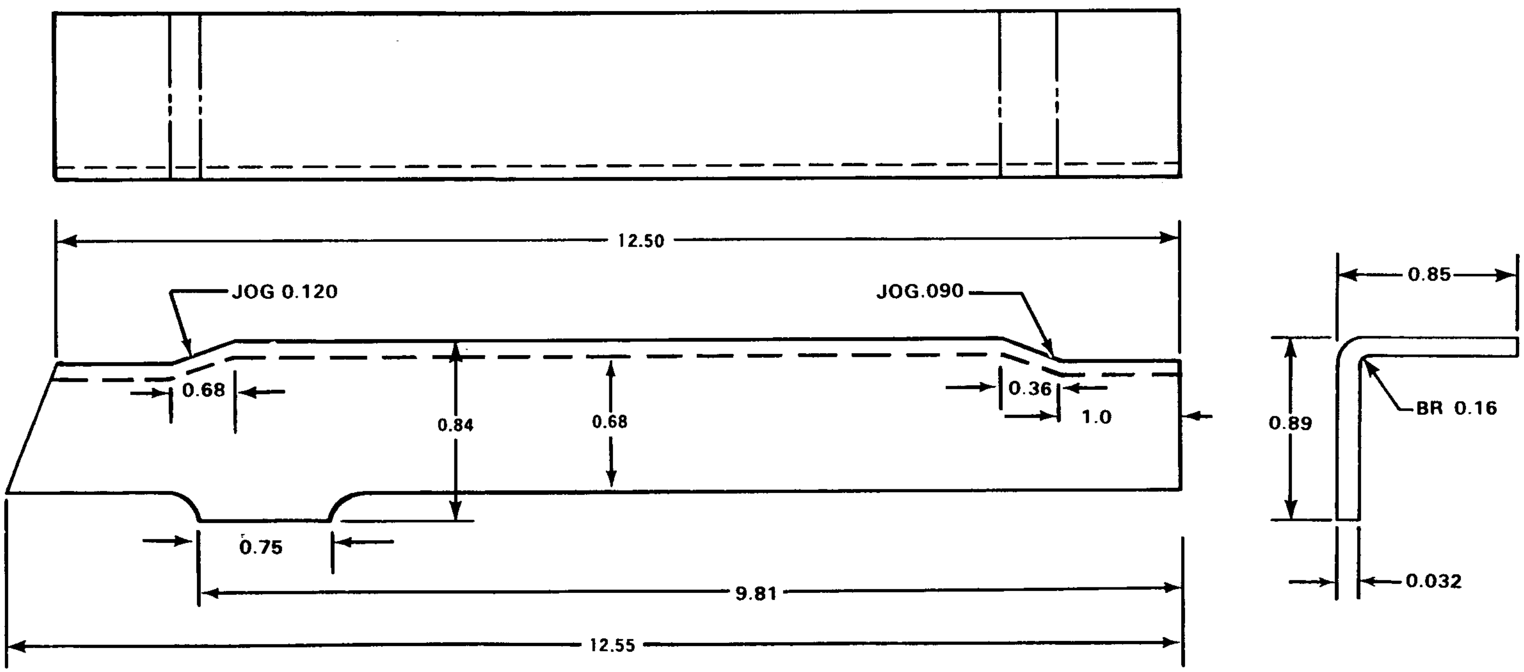
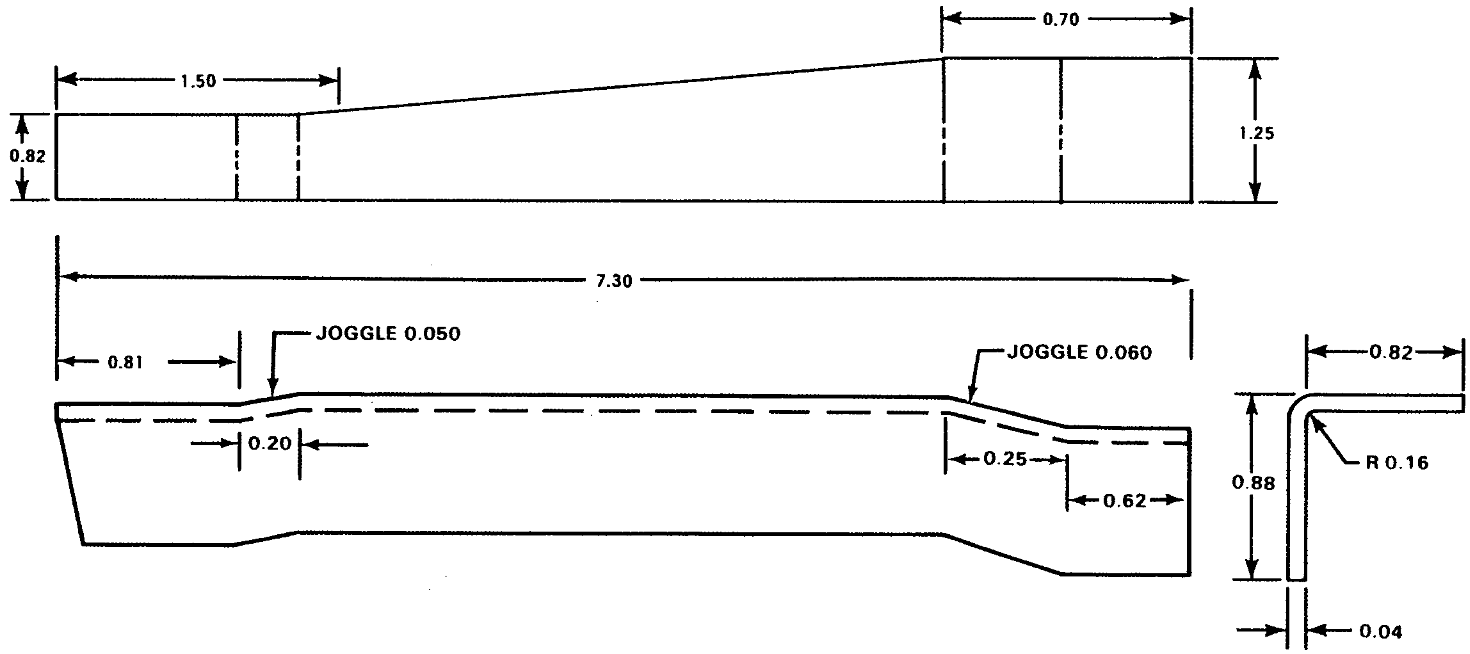


Figure D-302.	Part Number	205-030-007-347, DOOR
	Fabricate From:	NSN 9535-00
	Material:	2024 AL ALY, Federal Specification QQ-A-250/5, T13, 0.032 Inch Thick, 5.5 Inches Wide, 6.8 Inches Long



UH-1H-II-M-D-303

Figure D-303. Part Number 205-030-163-25, ATTACHMENT
Fabricate From: NSN 9535-00-086-9860
Material: 7075 AL ALY, Federal Specification QQ-A-250/13, TO.
0.032 Inch Thick, 2.5 Inches Wide, 13.2 Inches Long



UH-1H-II-M-D-304

Figure D-304. Part Number 205-030-163-125, ATTACHMENT
Fabricate From: NSN 9535-00-086-9860
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3
0.040 Inch Thick, 3.2 Inches Wide, 8.3 Inches Long

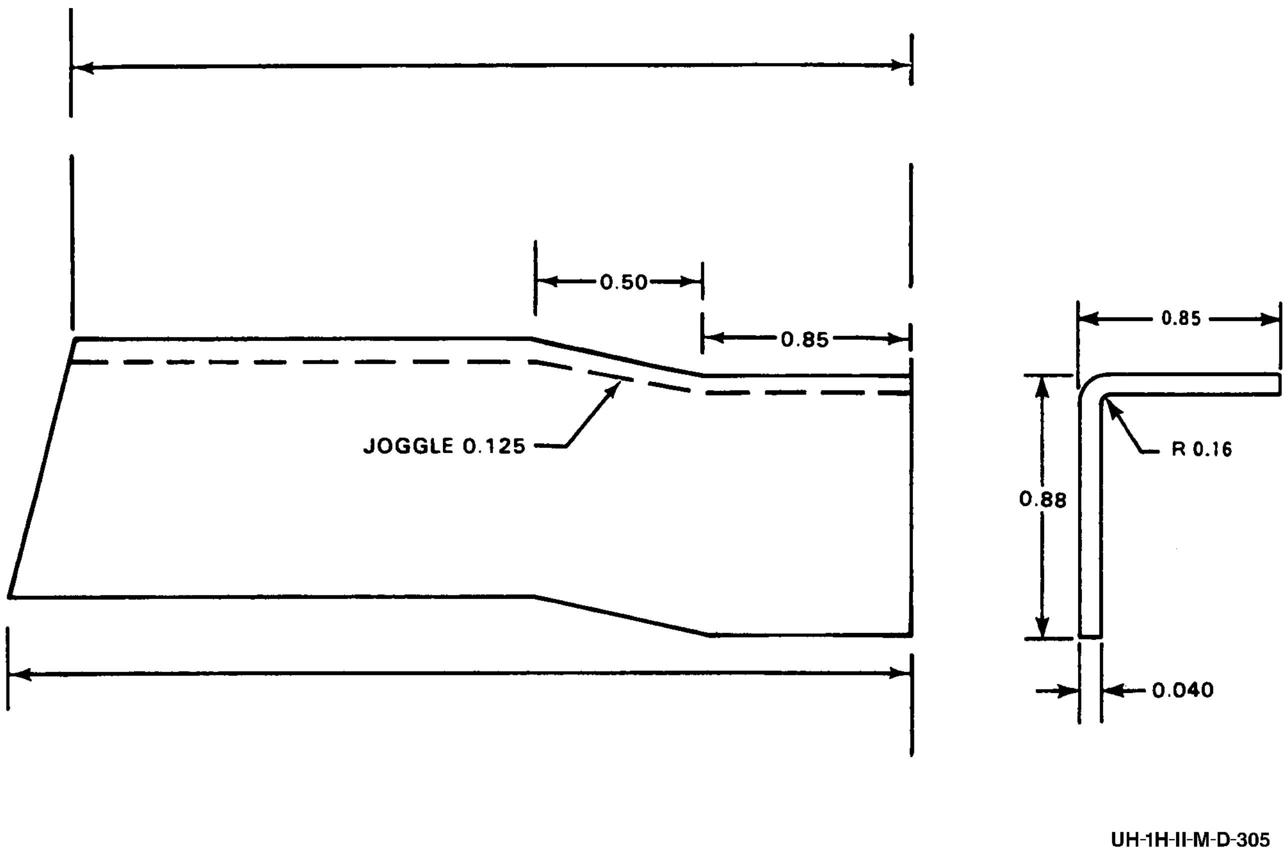


Figure D-305. Part Number 205-030-163-129, ATTACHMENT
Fabricate From: NSN 9535-00-084-4551
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3
0.040 Inch Thick, 2.2 Inches Wide, 4.2 Inches Long

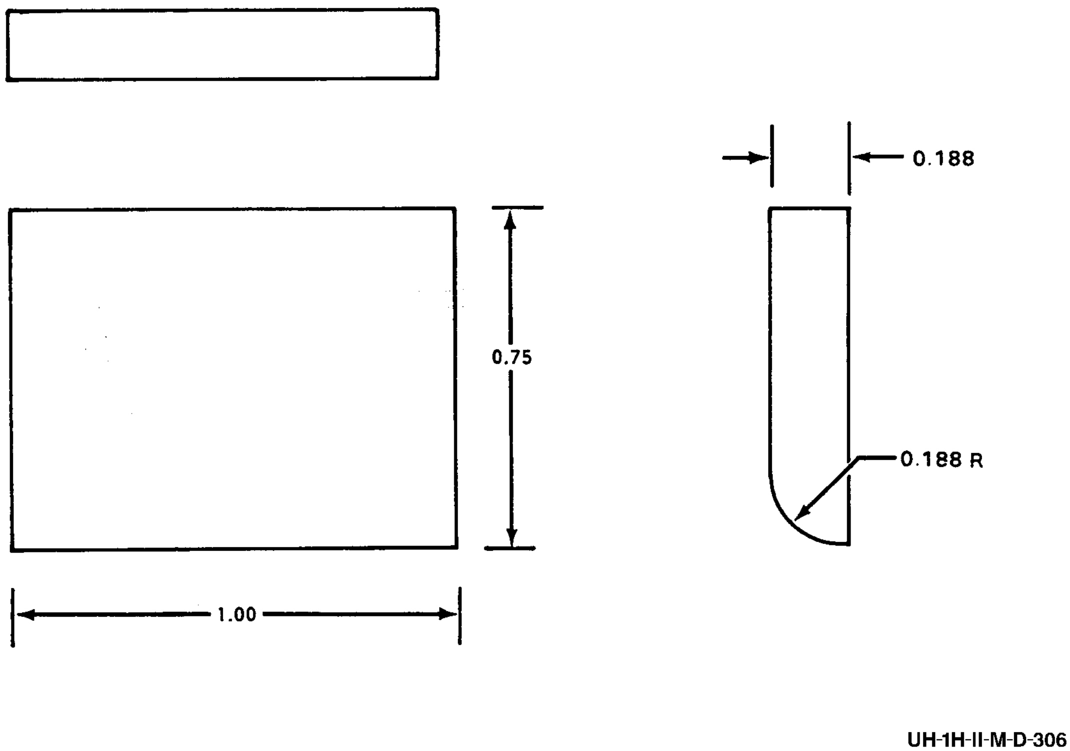


Figure D-306. Part Number 205-030-163-231, RADIUS BLOCK
Fabricate From: NSN 9535-00-084-4516
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3
0.188 Inch Thick, 1.5 Inches Wide, 1.5 Inches Long

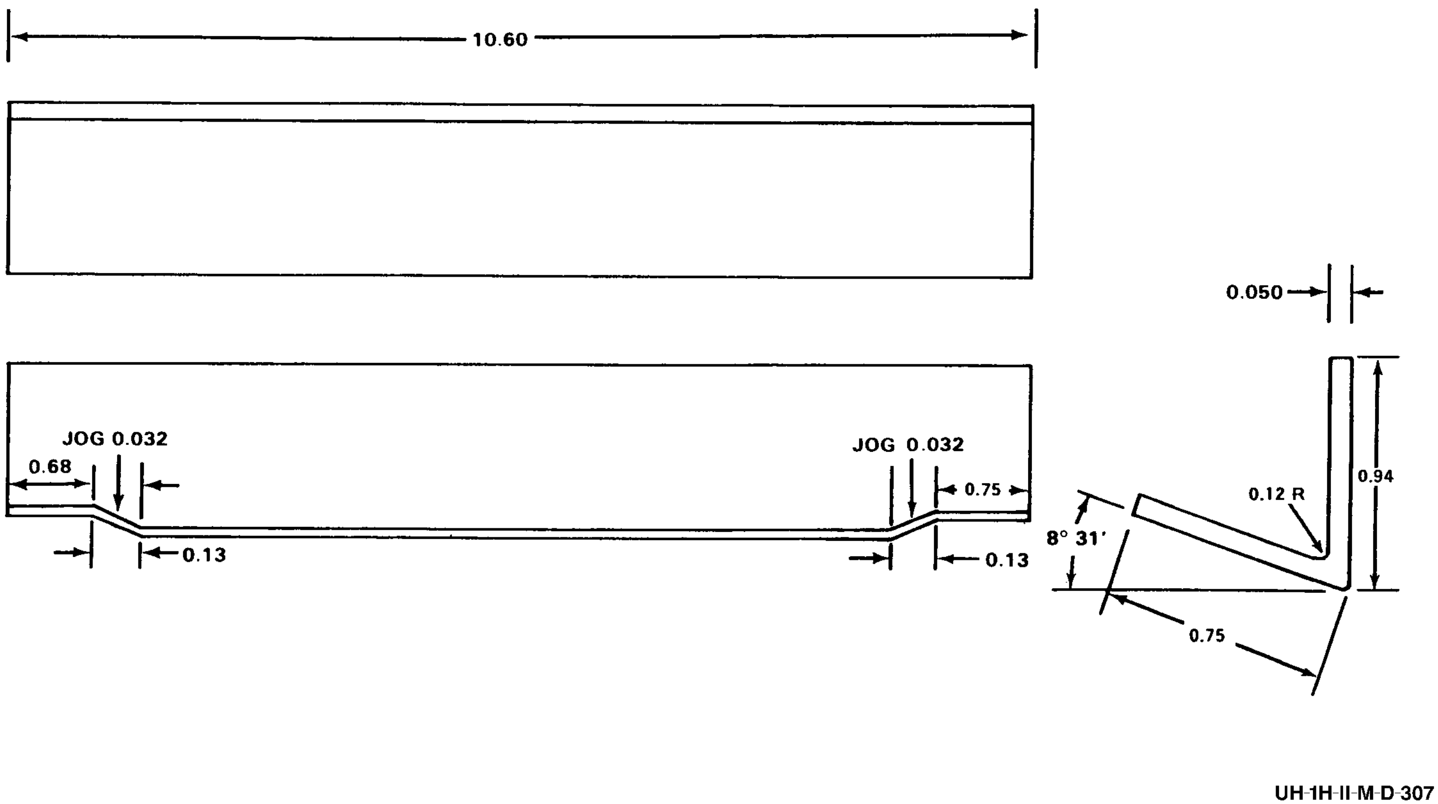


Figure D-307. Part Number 205-030-163-329, STIFFNER
Fabricate From: NSN 9535-00-
Material: 7075 AL ALY, Federal Specification QQ-A-250/13
Temp O Heat Treat to T6 To, 0.050 Inch Thick, 2.5 Inches Wide, 11.2 Inches Long

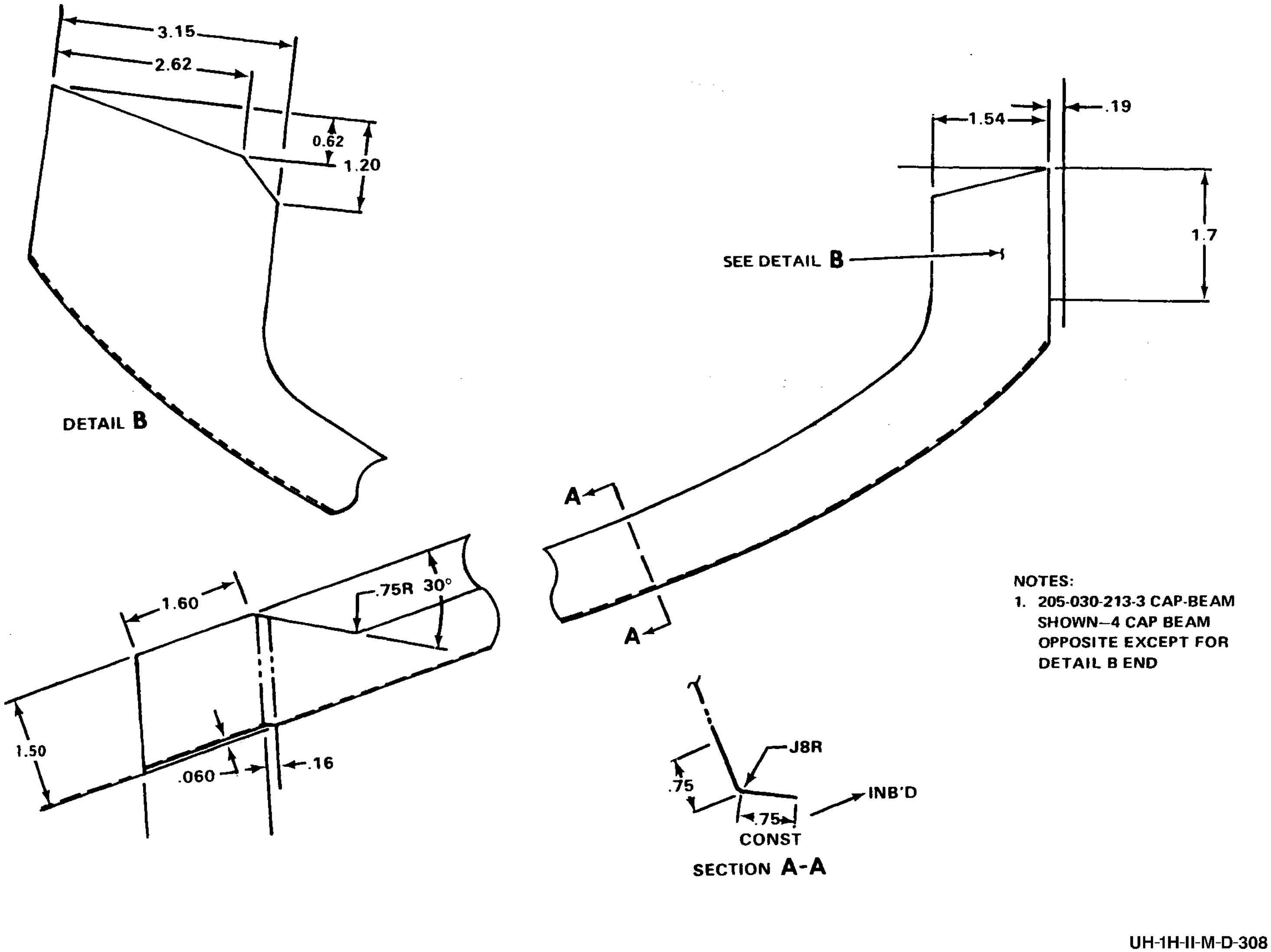
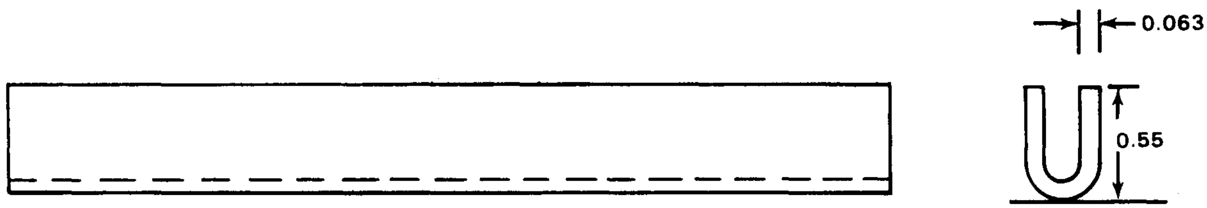


Figure D-308.	Part Number	205-030-213-4, CAP-BEAM
	Fabricate From:	NSN 9535-00
	Material:	2024 AL ALY, Federal Specification QQ-A-362-To. 0.032 Inch Thick, 3.4 Inches Wide, 40.0 Inches Long

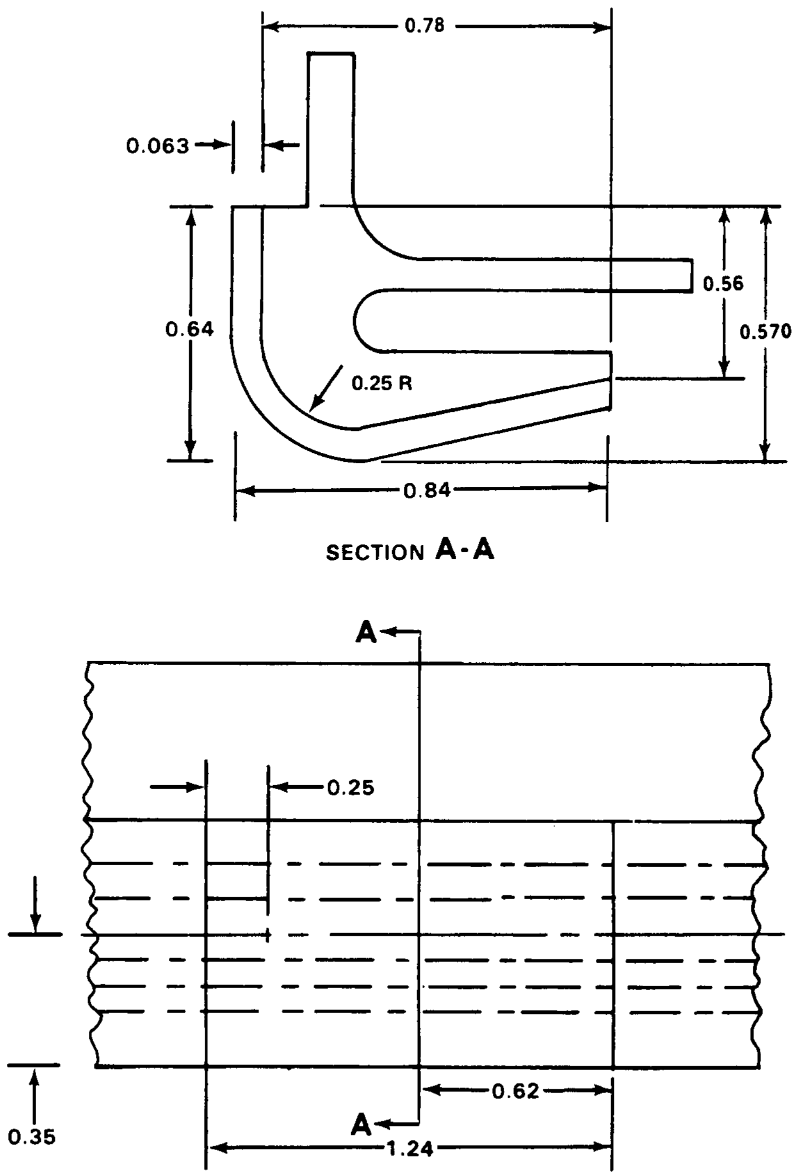


NOTE:

1. 205-030-385-17 GUIDE MAKE FROM FABRIC #6112 PURCHASE FROM SUMMER AND MACA GLASS MACHINERY CO. CHICAGO, ILL. CODE IDENT 55899
2. 205-030-385-17 GUIDE SHOWN —18 GUIDE OPPOSITE
3. CUT CLOTH TO DESIRED LENGTH 92.5 INCHES
4. BOND GUIDE TO TRACK WITH PROSEAL 584 ADHESIVE

UH-1H-II-M-D-309

Figure D-309. Part Number 205-030-385-17, GUIDE
205-030-385-18, GUIDE OPPOSITE
Fabricate From: NSN
Material: Weather Strip, Cloth Fabric
0.063 Inch Thick, 1.25 Inches Wide, 92.5 Inches Long



NOTES:

1. RIVET -21 DOUBLER TO TRACK WITH CR2248-4 RIVETS
2. BOND -21 DOUBLER TO TRACK WITH EPON 934 ADHESIVE

UH-1H-II-M-D-310

Figure D-310.	**Part Number**	**205-030-385-21, DOUBLER**
	Fabricate From:	**NSN 9515-00-234-7953**
	Material:	**Metal Steel Corrosion Resistant 18-8 Rolled, Annealed, Federal Specification MIL-S-5059 Comp 301, 0.063 Inch Thick, 1.8 Inches Wide, 2.0 Inches Long**

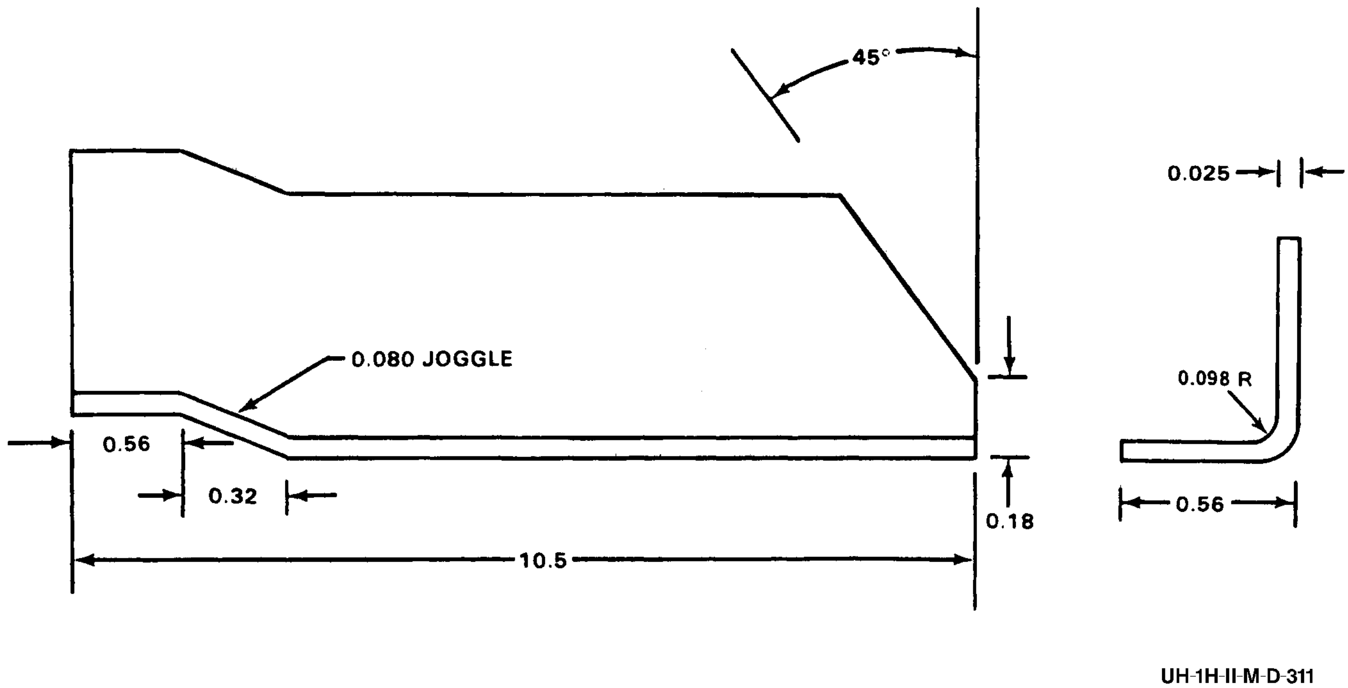
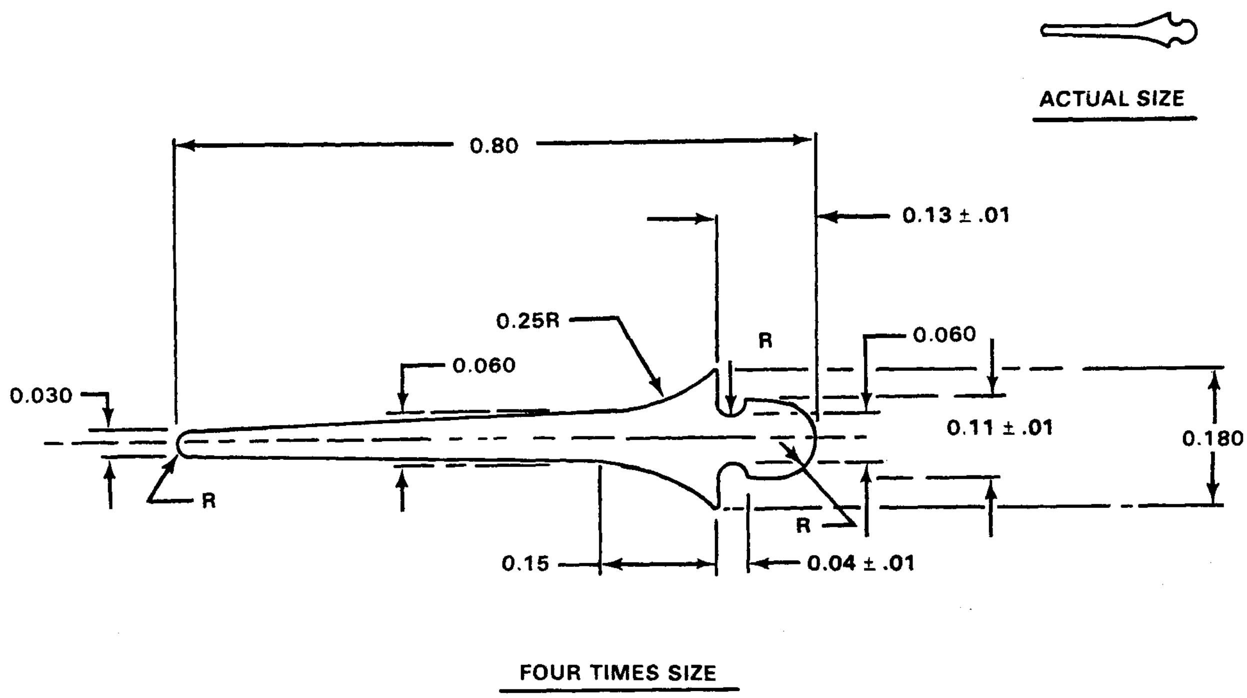


Figure D-311. Part Number 205-030-407-121, ANGLE
Fabricate From: NSN 9535-00-167-2278
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.025 Inch Thick, 1.2 Inches Wide, 11.0 Inches Long



NOTES:

1. MARK PER BPS FW 4050
2. PART NO. 205-030-407-317 SEAL MAKE FROM BELL STD 110-032-1 MATERIAL 51.2 INCHES LONG
3. PURCHASE FROM BELL HELICOPTER OR BURKE RUBBER CO., 2250 SOUTH TENTH, SAN JOSE, CALIFORNIA.

UH-1H-II-M-D-312

Figure D-312. Part Number 205-030-407-317, SEAL
Fabricate From: NSN
Material: Extruded Silicone Rubber, Bell Specification 299-947-095, Color BLACK or GREY

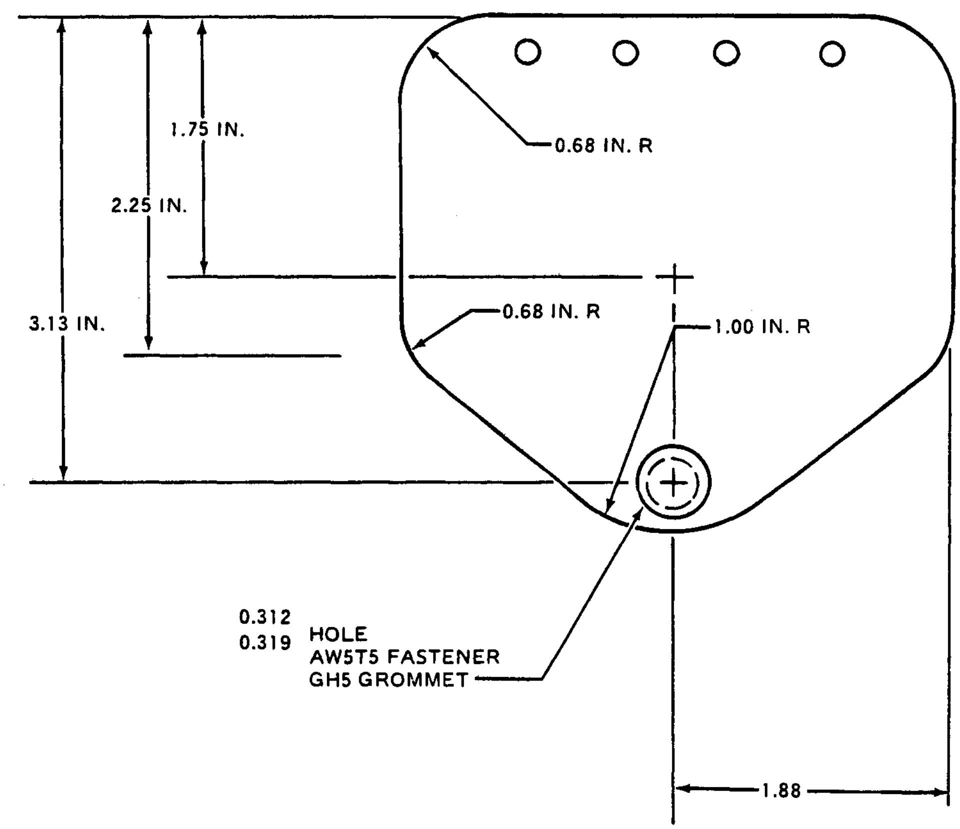


Figure D-313. Part Number 205-030-539-7, DOOR
Fabricate From: NSN 9535-00
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.025 Inch Thick, 4.0 Inches Wide, 4.5 Inches Long

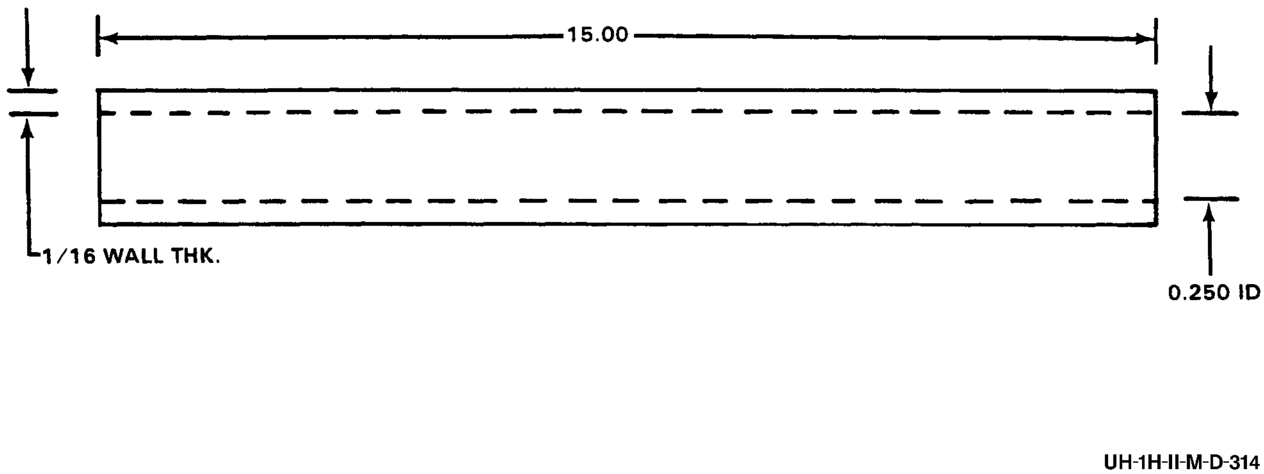
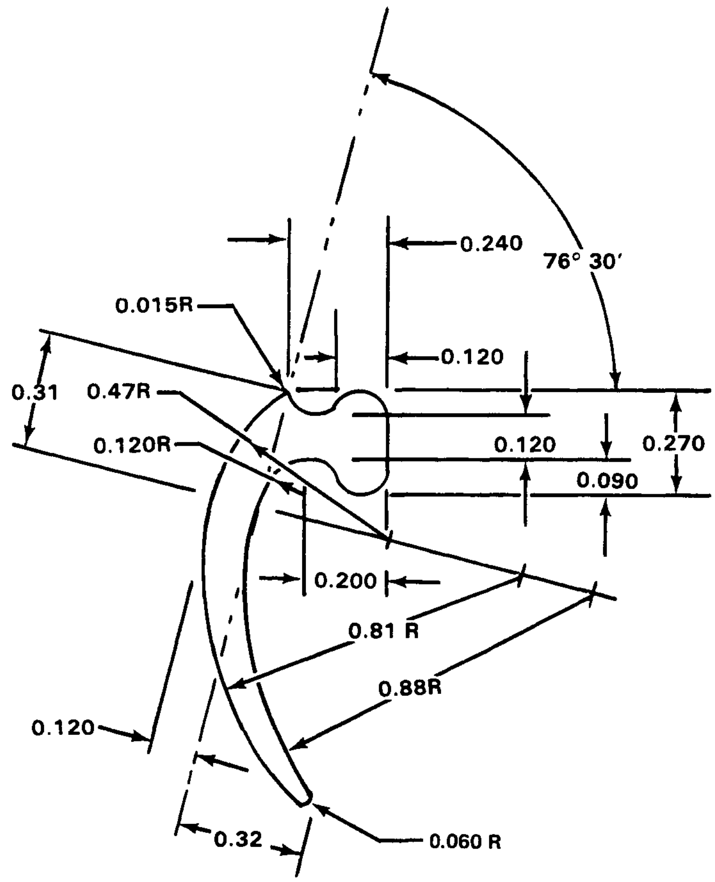


Figure D-314.	**Part Number**	**205-030-611-15, TUBE**
	Fabricate From:	**NSN 4720-00**
	Material:	**Hose, Rubber Synthetic, Federal Specification MIL-R-6855, Class V 1/4 ID, 1/16 Wall Thick, 15.0 Inches Long**



NOTES:

1. MARK PER BPS FW 4050
2. PART NO. 205-030-615-93 AND -94
   MAKE FROM BELL STD 110-015-1
   MATERIAL BOTH ITEMS 98.00 INCH LONG.
3. PURCHASE FROM BELL HELICOPTER OR
   BURKE RUBBER CO. 2250 SOUTH TENTH,
   SAN JOSE, CALIFORNIA

UH-1H-II-M-D-315

Figure D-315.	**Part Number**	**205-030-615-93, SEAL**
		205-030-615-94, SEAL
	Fabricate From:	**NSN**
	Material:	**Extrusion Rubber, Door Seal, Bell Specification 299-947-095, Color BLACK or GREY**

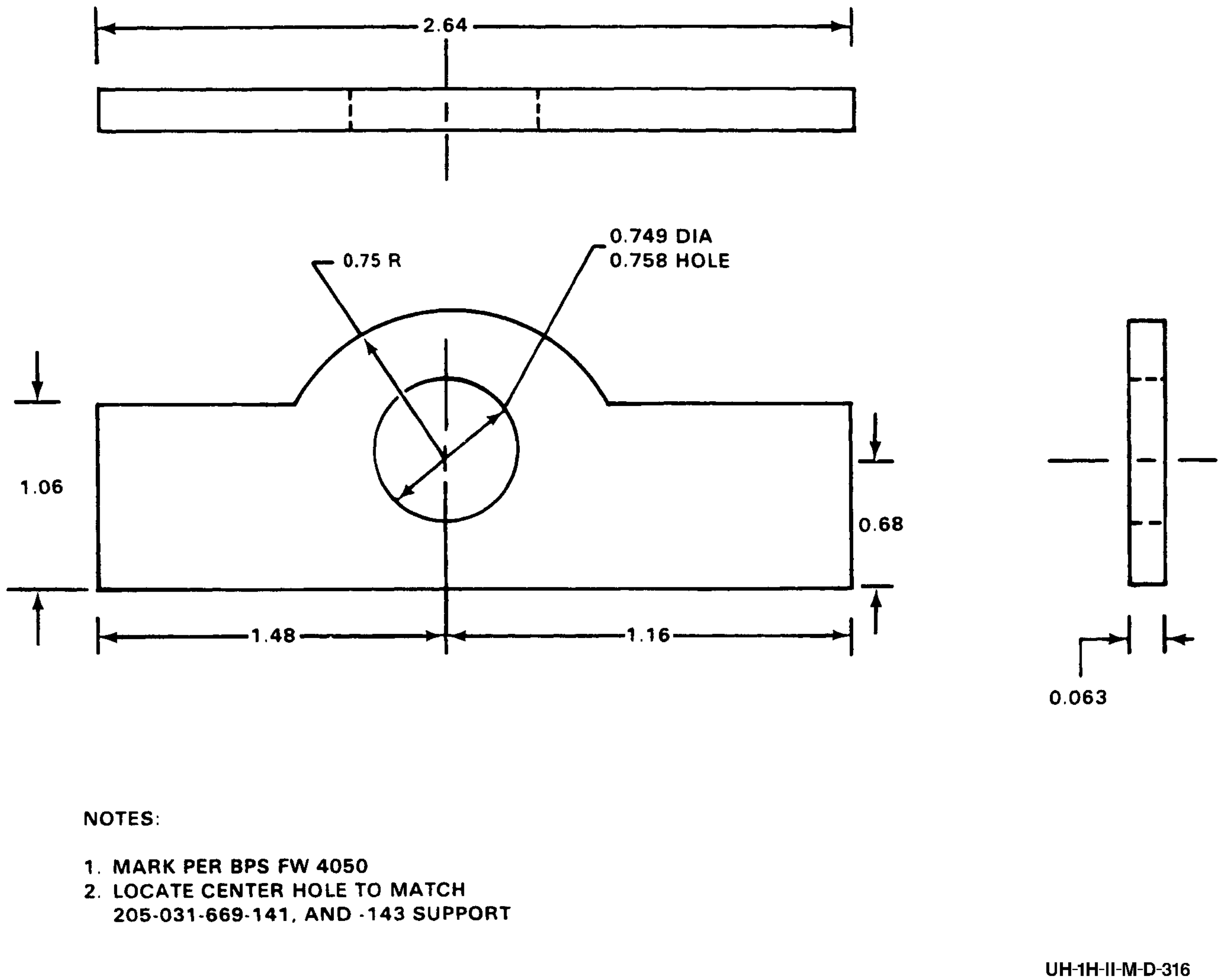
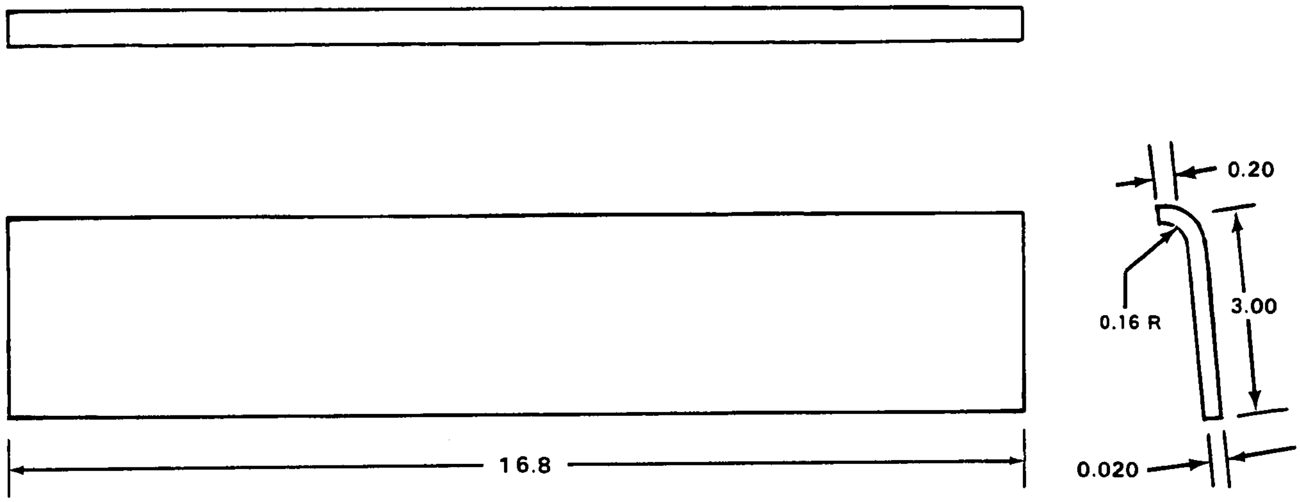


Figure D-316. **Part Number** **205-031-699-137, DOUBLER**
Fabricate From: **NSN 9535-00**
Material: **2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.063 Inch Thick, 2.0 Inches Wide, 3.4 Inches Long**

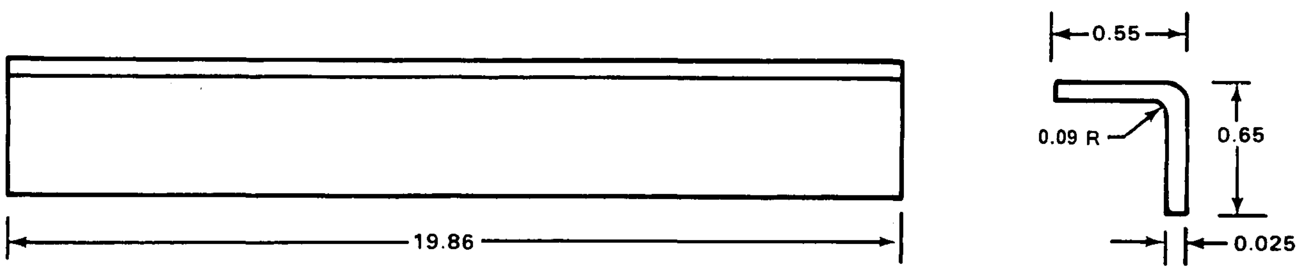


NOTES:

1. 205-030-711-27 CAP STRIP SHOWN
   205-030-711-28 CAP STRIP OPPOSITE

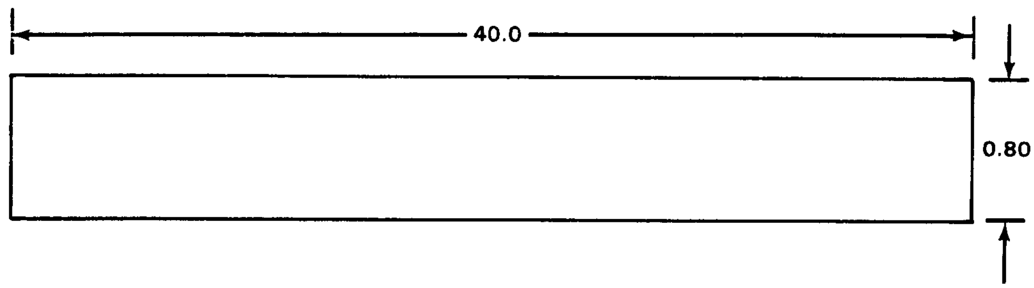
UH-1H-II-M-D-317

Figure D-317. Part Number 205-030-711-27, CAP STRIP
205-030-711-28, CAP STRIP
Fabricate From: NSN 9535-00-086-9809
Material: 7075 AL ALY, Federal Specification QQ-A-250/13, T6,
0.020 Inch Thick, 3.2 Inches Wide, 16.8 Inches Long



UH-1H-II-M-D-318

Figure D-318. Part Number 205-030-729-49, SUPPORT COVER
Fabricate From: NSN 9535-00
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.025 Inch Thick, 1.7 Inches Wide, 20.4 Inches Long

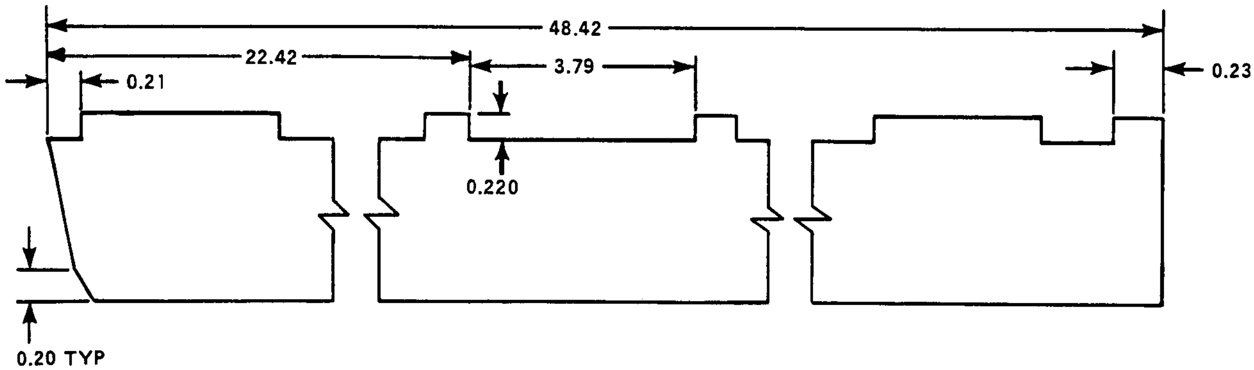


NOTES:

1. PART NO. 205-030-819-21 MAKE FROM ANTI-CHAFFING TAPE #366, 0.80 INCH WIDE, 40.0 INCH LONG. PURCHASE FROM MINNESOTA MINING AND MFG COMP ST PAUL, MINN. CODE IDENT 76381
2. ALTERNATE MATERIAL FOR ANTI-CHAFFING TAPE #549-3½ MILLS PURCHASE FROM MINNESOTA MINING AND MFG. COMP, ST PAUL, MINN. CODE IDENT 76381

UH-1H-II-M-D-319

Figure D-319.	Part Number	205-030-819-21, STRIP-CHAFFING
	Fabricate From:	NSN
	Material:	TAPE, ANTI-CHAFFING #366, 0.080 Inch Wide, 40.0 Inches Long

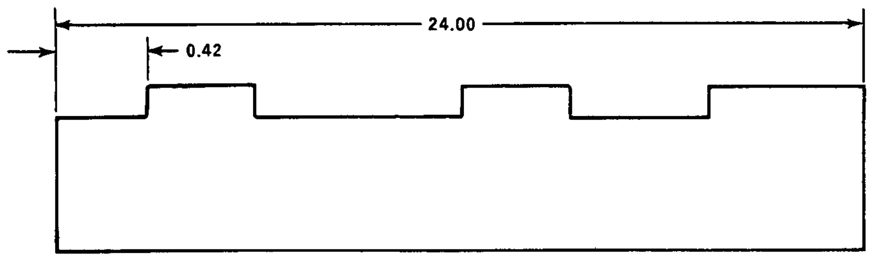


NOTES:

1. 205-030-846-33S HINGE MAKE FROM MS20001PH4-7200 LEAF BUTT HINGE MATERIAL
2. CUT HINGE MATERIAL TO PROPER LENGTH 49.00 INCH LONG
3. DESIGNATION S IS SYNTHETIC PART NO.

UH-1H-II-M-D-320

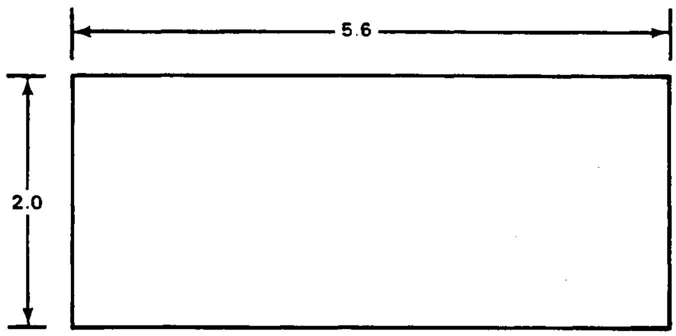
Figure D-320. Part Number: 205-030-846-33S, HINGE
Fabricate From: NSN 5340-00-949-8274
Material: HINGE, BUTT AL ALY Anodized, 0.056 Inch Thick, 0.495 Inch Wide, 72.0 Inches Long



NOTES:
1. PART NO. 205-030-850-21 HINGE HALF MAKE FROM MS20257HP2-7200 STOCK
2. CUT HINGE MATERIAL TO THE REQUIRED LENGTH 24.00 INCH LONG

UH-1H-II-M-D-321

Figure D-321. Part Number 205-030-850-21, Hinge Half
Fabricate From: NSN 5340-00-993-1461
Material: Leaf, Butt Hinge - AL ALY Anodized, 0.040 Inch Thick, 0.531 Inch Wide, 72.0 Inches Long

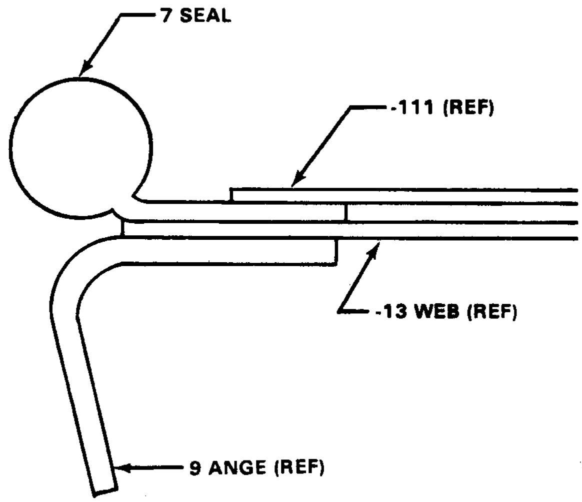


NOTES:

1. PART NO. 205-060-826-79 GRIP MAKE FROM SCOTCH-TRED COLOR GREY PURCHASE FROM MINNESOTA MINING AND MFG. CO. ST. PAUL, MINN. (CODE IDENT NO 76381)
2. ATTACH GRIP MATERIAL TO COWL ASSY. HAND HOLD.

UH-1H-II-M-D-322

Figure D-322.	Part Number	205-060-826-79, GRIP
	Fabricate From:	NSN
	Material:	Cloth Material, Adhesive Backing One Side, Abrasive Material Other Side, Scotch-Tred, Color GREY

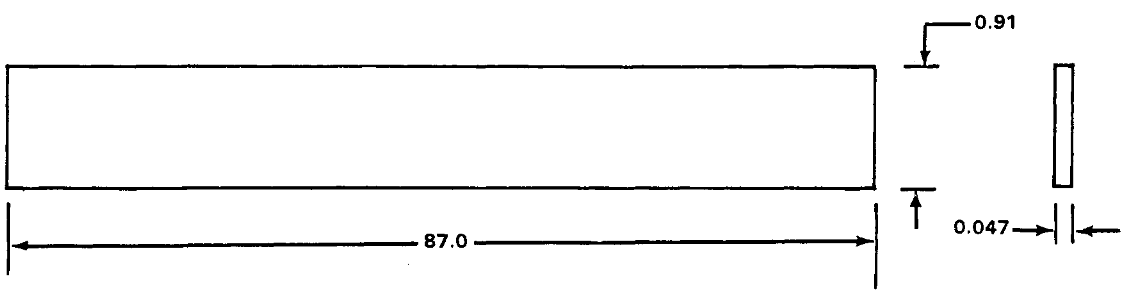


NOTES:

1. MARK PER BPS FW 4050
2. 205-060-909-7 SEAL MARK FROM
   ⅜ DIA BULB, TADPOLE SEAL, FIREWALL
   1.2 INCH WIDE, 87.0 INCH LONG
3. PURCHASE SEAL FROM JOHNS-MANSVILLE
   COM, NEW YORK N.Y CODE IDENT 92789

UH-1H-II-M-D-323

Figure D-323.	Part Number	205-060-909-7, SEAL
	Fabricate From:	NSN
	Material:	SEAL, Bulb 3/8 Inch Dia., Firewall Seal



NOTES:

1. MARK PER BPS FW 4050
2. PURCHASE FROM JOHNS-MANSVILLE PRODUCTS CO., NEW YORK, N.Y. CODE IDENT 92789
3. SPECIAL ASBESTOS MATERIAL NO NSN AVAILABLE

THICKNESS	SIZE	STYLE
0.047 INCH	1.9 X 87.0 INCH	# 89

UH-1H-II-M-D-324

Figure D-324. Part Number 205-060-909-17, GASKET
Fabricate From: NSN
Material: GASKET, Asbestos Material
0.047 Inch Thick, 1.9 Inches Wide, 87.0 Inches Long

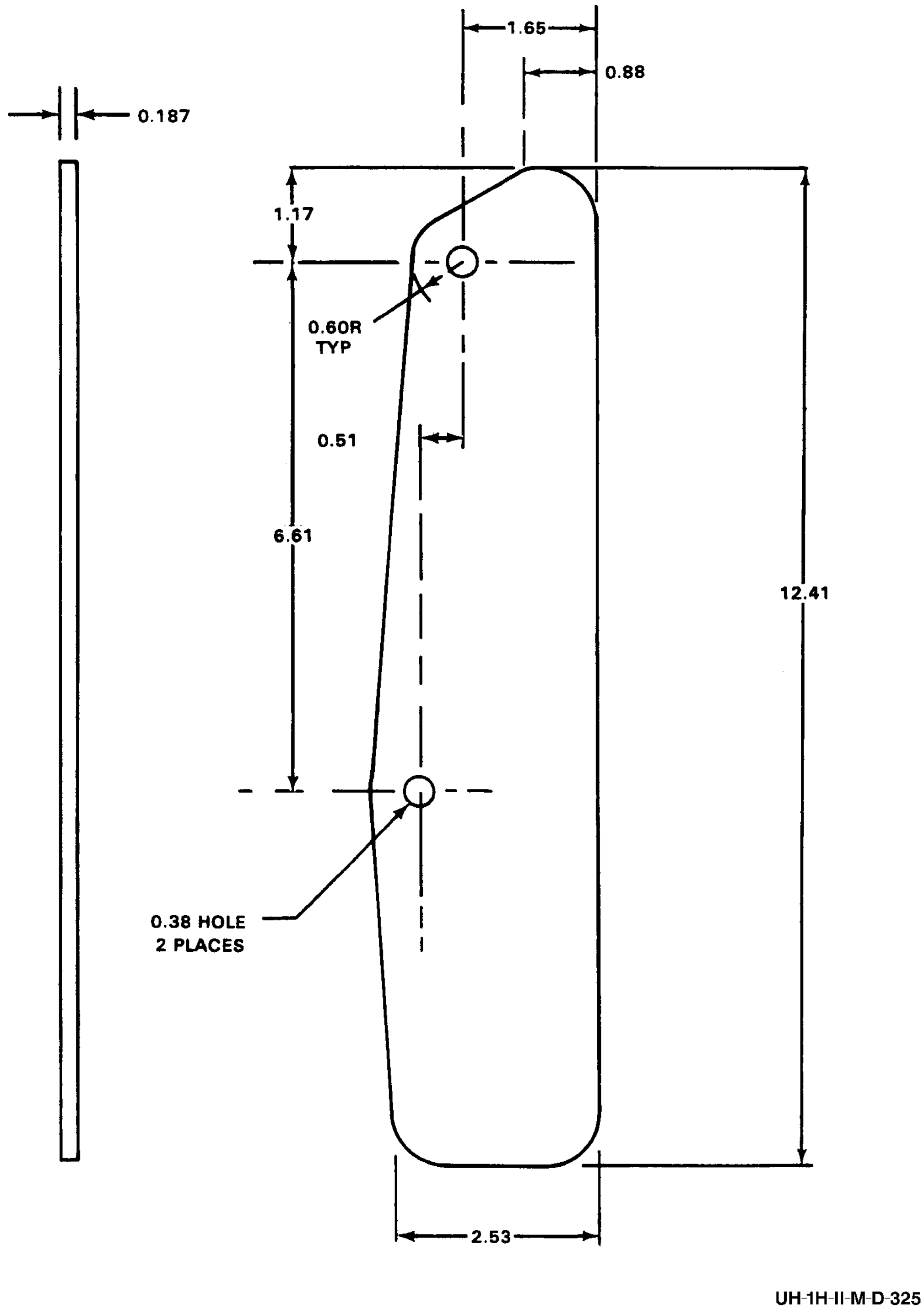


Figure D-325. Part Number 205-061-232-1, SEAL
Fabricate From: NSN
Material: Closed Cell Medium Sponge, Federal Specification AMS-3195, 0.187 Inch Thick, 3.2 Inches Wide, 13.0 Inches Long

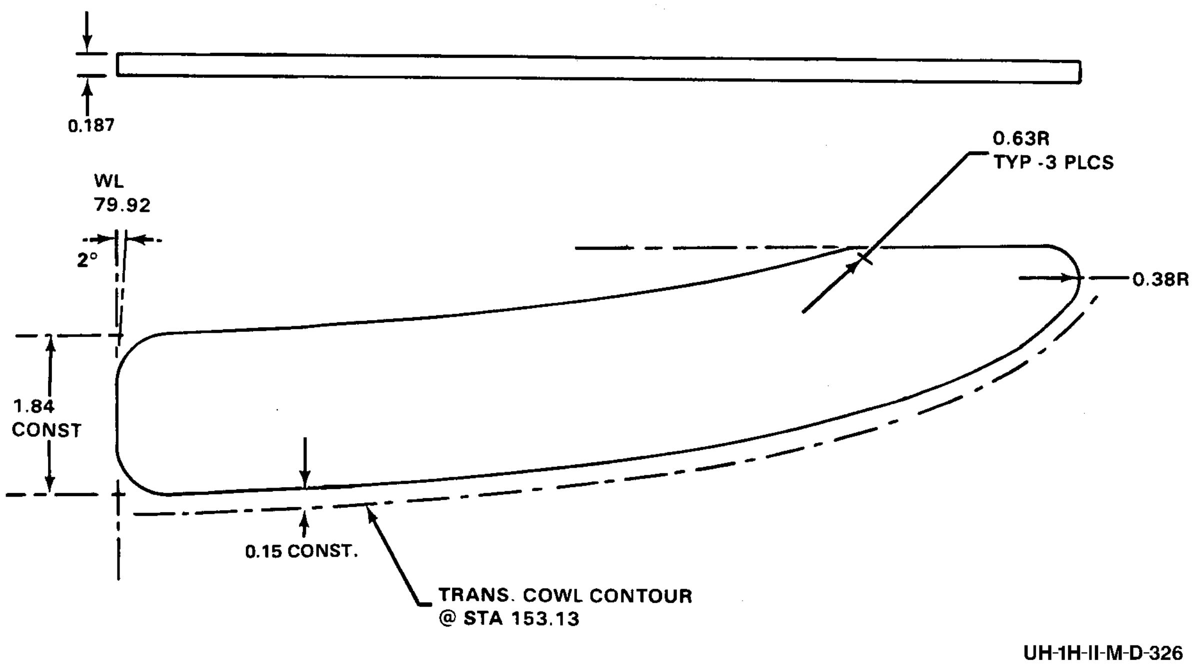


Figure D-326. Part Number 205-061-234-1, SEAL, FORWARD
Fabricate From: NSN
Material: Closed Cell Medium Sponge, Federal Specification AMS-3195, 0.187 Inch Thick, 3.0 Inches Wide, 13.5 Inches Long

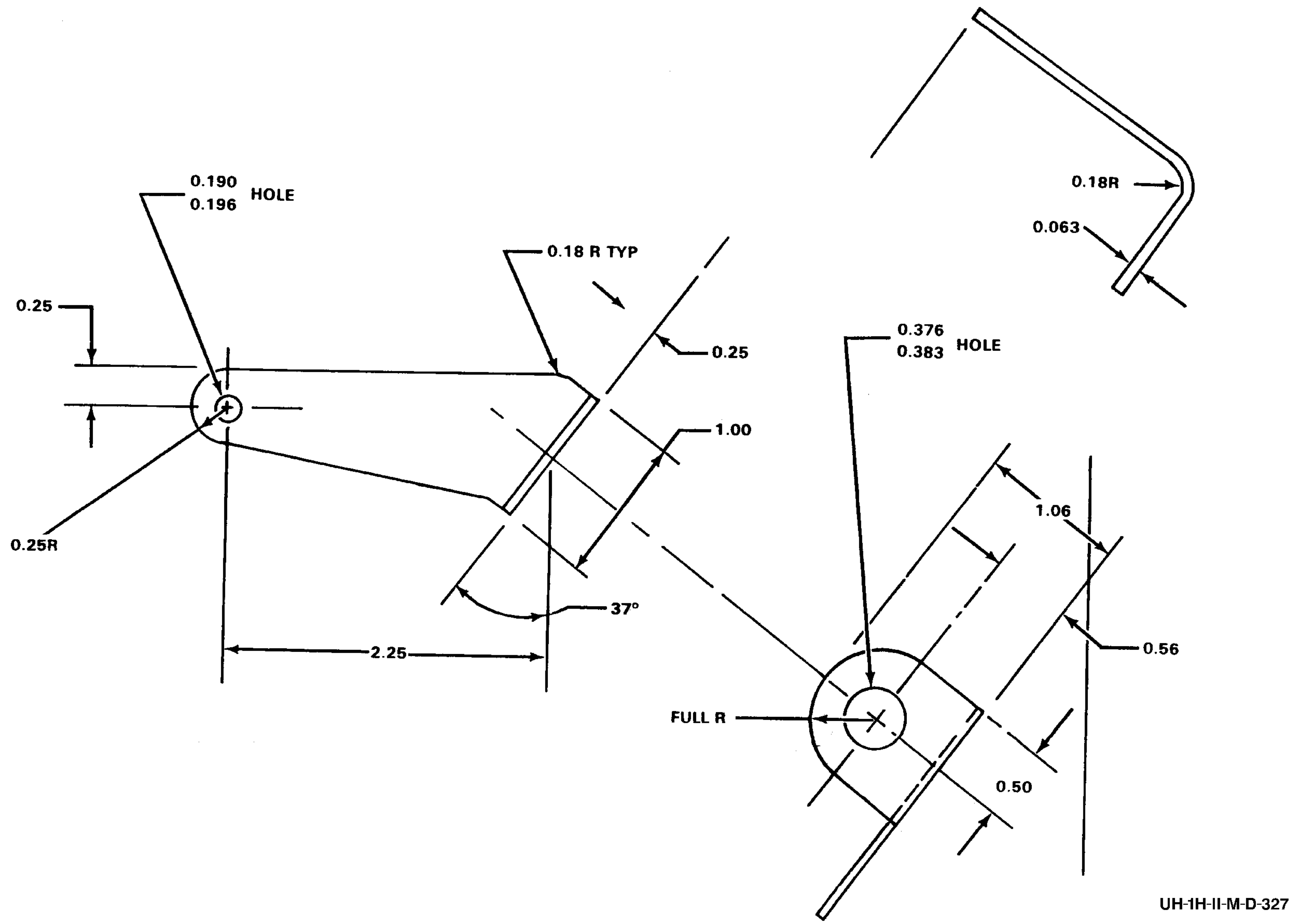
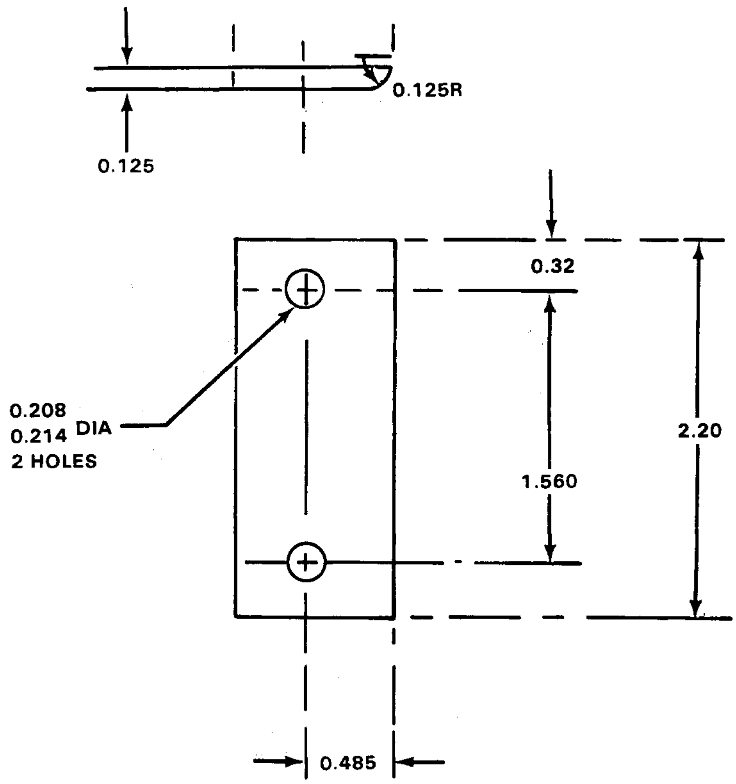


Figure D-327. Part Number 205-061-412-1, BRACKET
Fabricate From: NSN 9535-00-232-0478
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.063 Inch Thick, 2.2 Inches Wide, 4.0 Inches Long



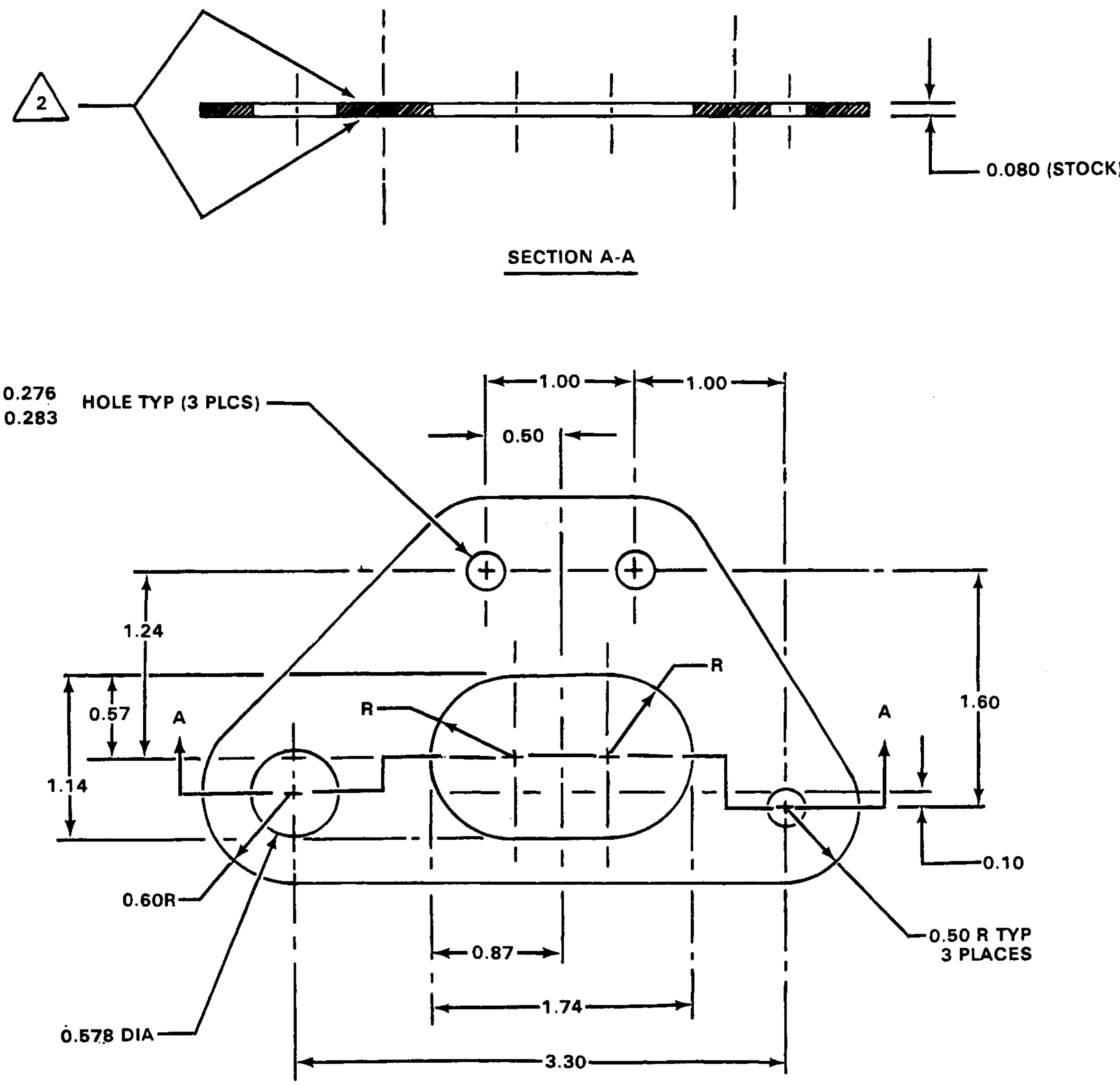
NOTES:

1. MARK PER BPS 4050
2. PART NO. 205-061-521-1 MAKE FROM BELL STD 20-042-3 BULK STOCK EXTRUSION
3. EXTRUSION MAY BE PURCHASED FROM:

COMPANY	SOURCE DIE NO.
REYNOLDS ALUMINUM	32537
PIONEER ALUMINUM	PA16364
HOWMET CORPORATION	T-16657

UH-1H-II-M-D-328

Figure D-328. Part Number 205-061-521-1, RADIUS BLOCK
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY, Federal Specification QQ-A-200/3, T4, or T3510 or T3511, 0.125 Inch Thick, 0.875 Inch Wide

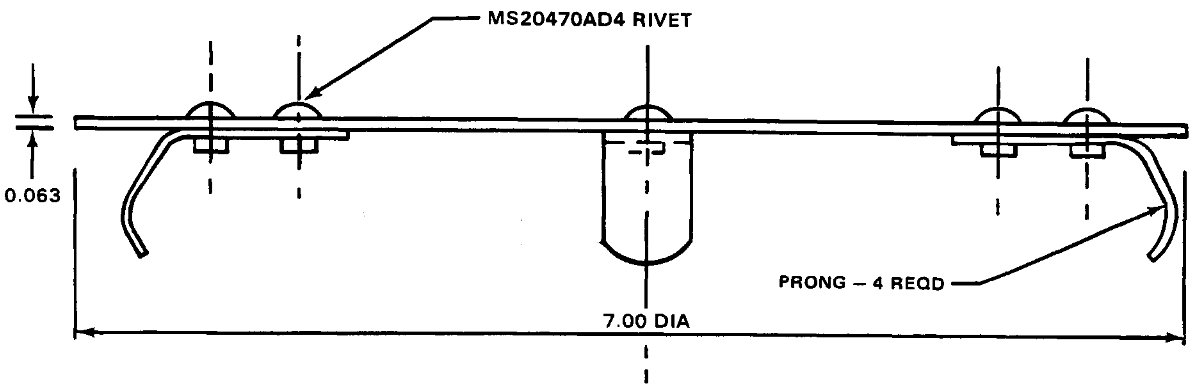


NOTES:

1. MARK PARTS PER BPS FW 4050
2. BOTH SURFACES SHALL BE FLAT WITHIN 0.005 TIR

UH-1H-II-M-D-329

Figure D-329. Part Number 205-061-643-3, PLATE
Fabricate From: NSN 9535-00-232-0398
Material: 2024 AL ALY, Federal Specification QQ-A-250/5, T3, 0.080 Inch Thick, 3.1 Inches Wide, 4.9 Inches Long

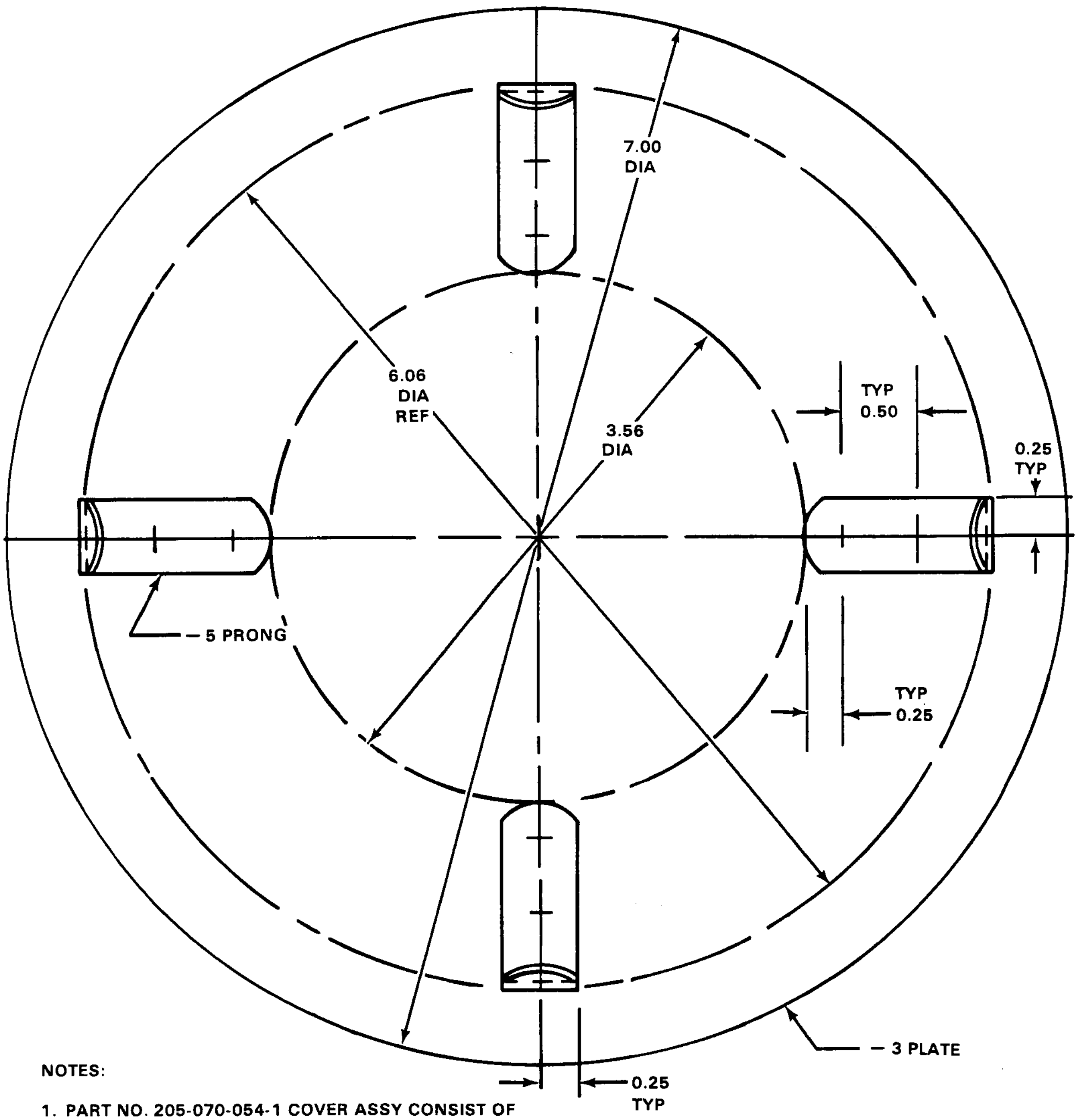


NOTES:

1. ASSEMBLE 205-070-054-5 CLIP TO 205-070-054-3 PLATE
2. MARK PER BPS FW 4050

UH-1H-II-M-D-330-1

Figure D-330.	Part Number	205-070-054-1, COVER ASSY (Sheet 1 of 3)
	Fabricate From:	NSN 9535-00-232-0378
		NSN 9515-00-184-8822
	Material:	2024 AL ALY, Federal Specification QQ-A-250/5, T3,
		0.063 Inch Thick, Steel Corrosion Resistant 18-8,
		Federal Specification MIL-S-5059, Comp 301, 1/2 Hard, 0.025 Inch Thick

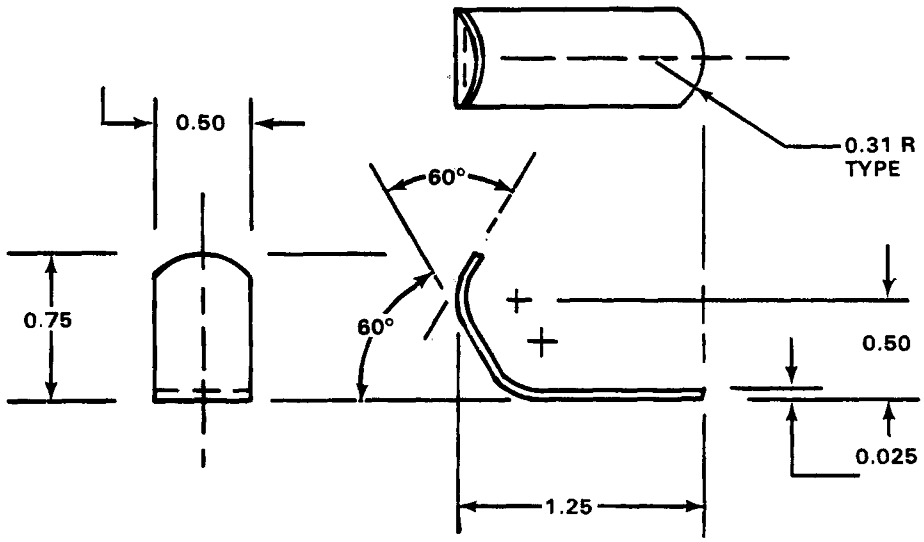


NOTES:

1. PART NO. 205-070-054-1 COVER ASSY CONSIST OF 205-070-054-3 PLATE AND 205-70-054-5 PRONG
2. 205-070-054-3 PLATE MAKE FROM 2024 AL ALY FEDERAL SPECIFICAION QQ-A-250/5 T3, 0.063 INCH THICK, 7.5 INCH WIDE, 7.5 INCH LONG (NSN 9535-00-232-0478)
3. BREAK ALL SHARP EDGES AND MARK PER BPS FW 4050

UH-1H-II-M-D-330-2

Figure D-330. (Sheet 2)



DETAIL -5

BEND RADII -.25
BEND ANGLE TOL. ± 5°

NOTES:

1. PART NO. 205-070-054-5 PRONG MAKE FROM STEEL, CORROSION RESISTANT 18-8, FEDERAL SPECIFICATION MIL-S-5959 COMP 301, ½ HARD (NSN 9515-00-184-8822, 0.025 INCH THICK, 1.0 INCH WIDE, 2.3 INCH LONG
2. MARK PER BPS FW 4050
3. BREAK ALL SHARP EDGES

UH-1H-II-M-D-330-3

Figure D-330. (Sheet 3)

NOTES:

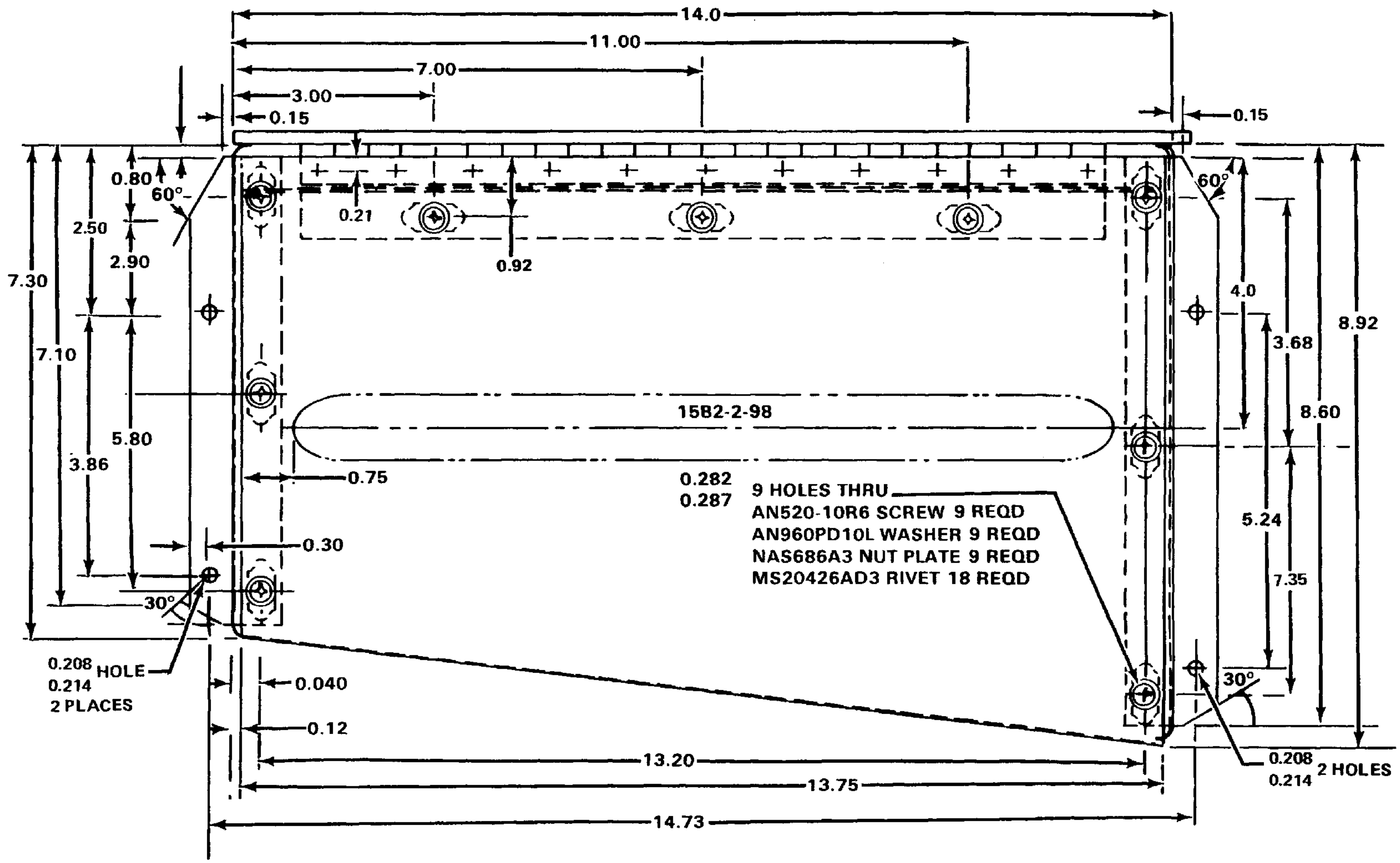
1. PART NO. 205-072-038-1 INSTRUMENT PANEL ASSY CONSIST OF THESE PARTS.

PART NO.	DESCRIPTION	SHEET
205-072-083-3	SIDE	2
205-072-038-5	END	3
205-072-038-7	END	4
205-072-038-9	PANEL	5
205-072-038-11	HINGE HALF	6
205-072-038-13	HINGE PIN	6

2. MARK PER BPS FW 4050
3. ASSEMBLE PARTS TO MAKE THE COMPLETE UNIT.

UH-1H-II-M-D-331-1

Figure D-331. Part Number 205-072-038-1, INSTRUMENT PANEL ASSY (Sheet 1 of 7)
Fabricate From: See Part Number Sheets
Material: See Part Number Sheets



UH-1H-II-M-D-331-2

Figure D-331. Part Number 205-072-038-3, SIDE (Sheet 2 of 7)
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY, Federal Specification QQ-A-250/4, T3, 0.032 Inch Thick, 9.7 Inches Wide, 14.3 Inches Long

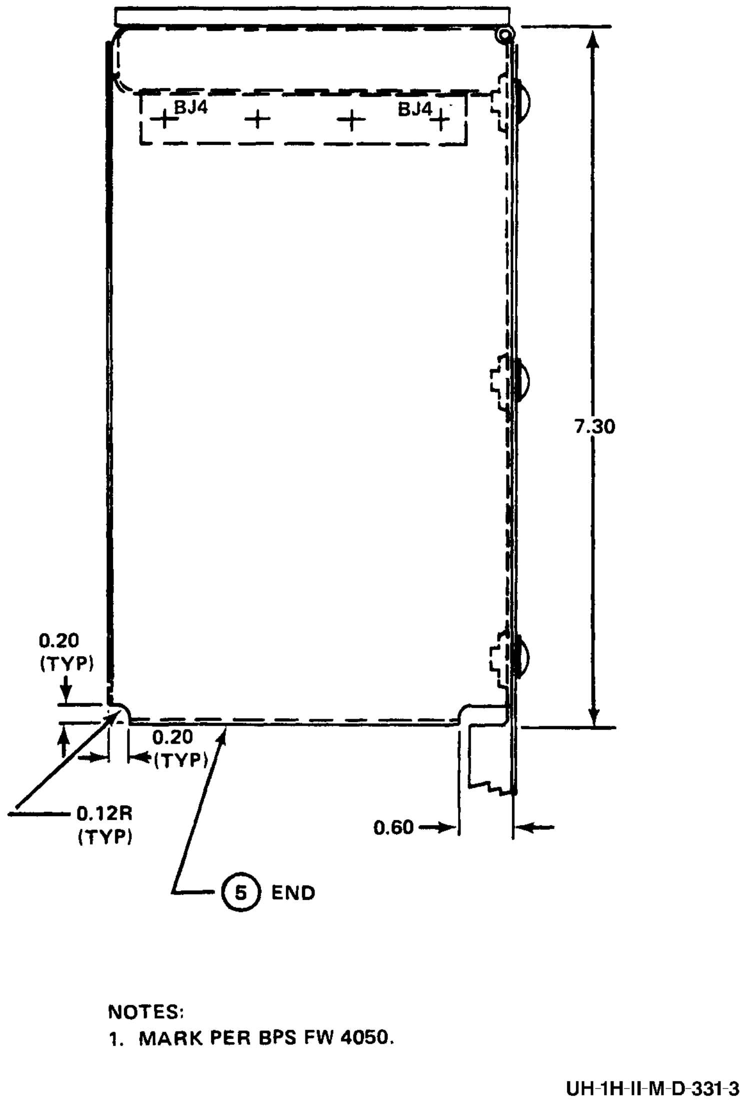


Figure D-331.	Part Number	205-072-028-5, END (Sheet 3 of 7)
	Fabricate From:	NSN 9535-00-
	Material:	2024 AL ALY, Federal Specification QQ-A-250/4, T13, 0.032 Inch Thick, 6.1 Inches Wide, 8.2 Inches Long

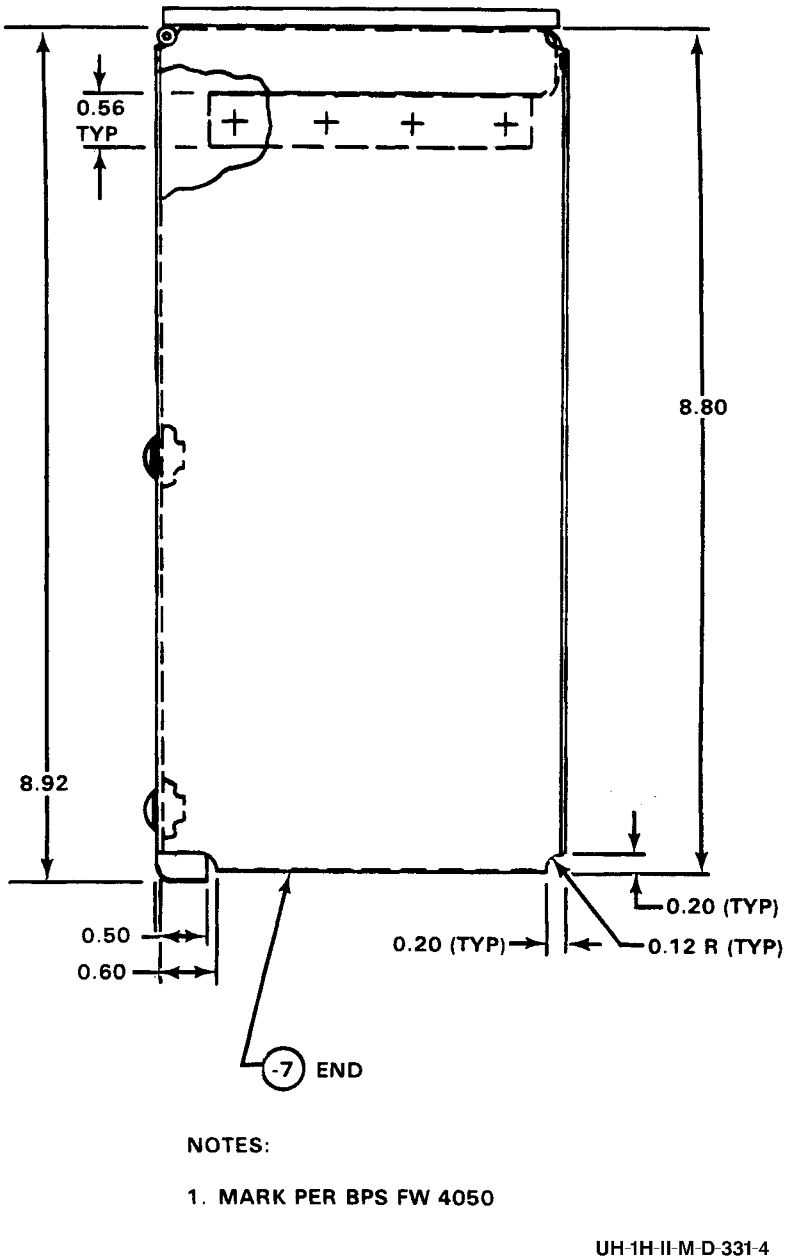
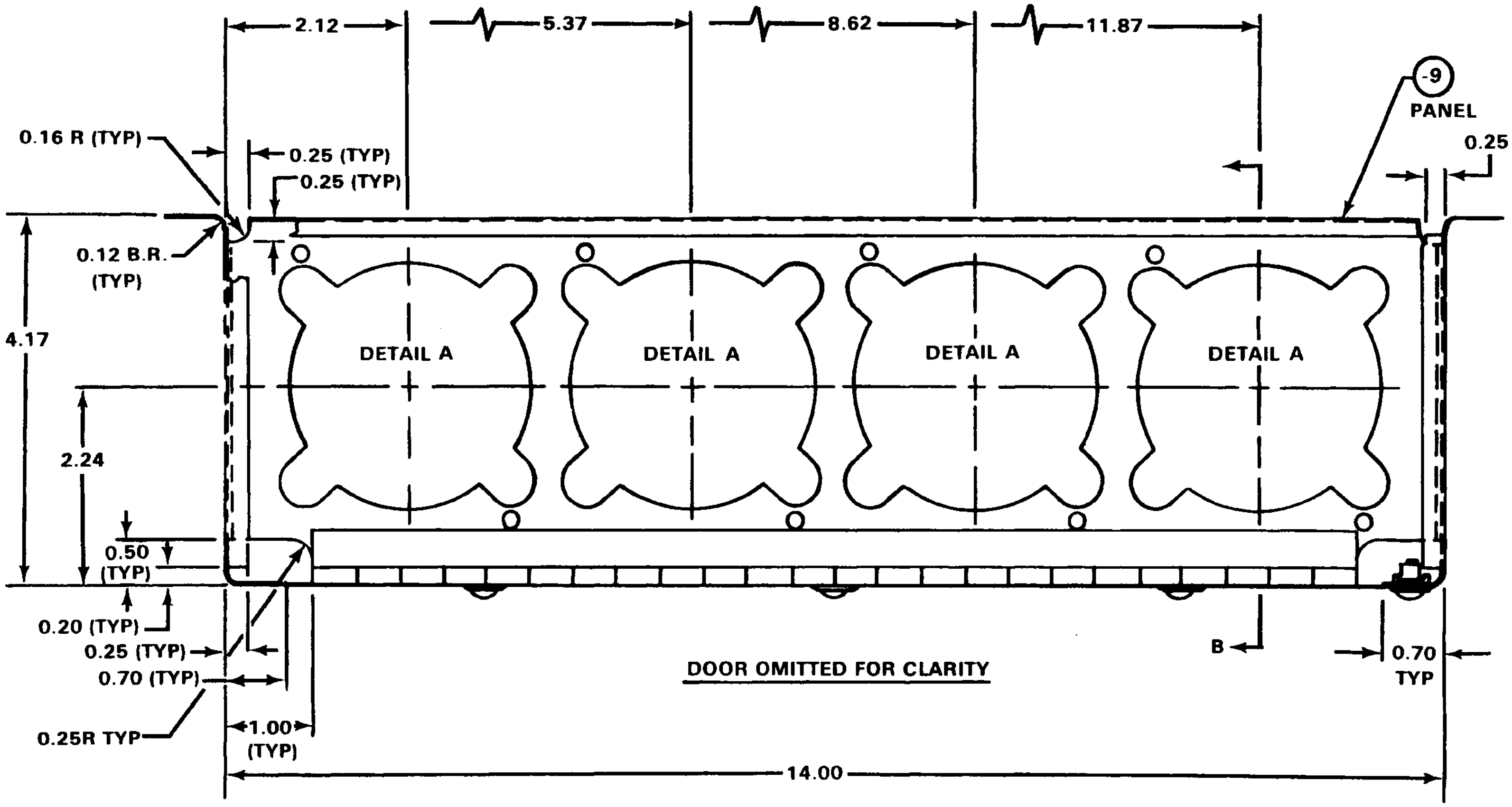


Figure D-331. Part Number 205-072-038-7, END (Sheet 4 of 7)
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY, Federal Specification QQ-A-250/4, T3, 0.032 Inch Thick, 6.1 Inches Wide, 10.0 Inches Long

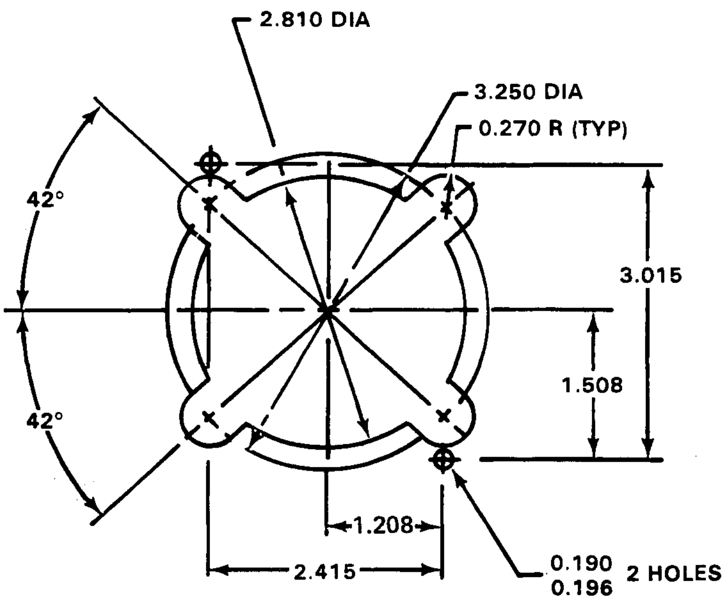


NOTES:

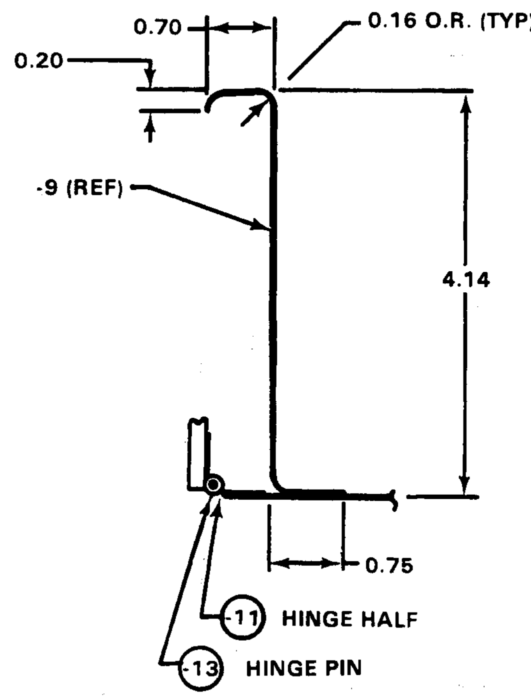
1. MARK PER BPS FW 4050

UH-1H-II-M-D-331-5

Figure D-331. Part Number 205-072-038-9, PANEL (Sheet 5 of 7)
Fabricate From: NSN 9535-00-086-9930
Material: 2024 AL ALY, Federal Specification QQ-A-250/4, T3, 0.040 Inch Thick, 7.0 Inches Wide, 16.0 Inches Long



DETAIL A



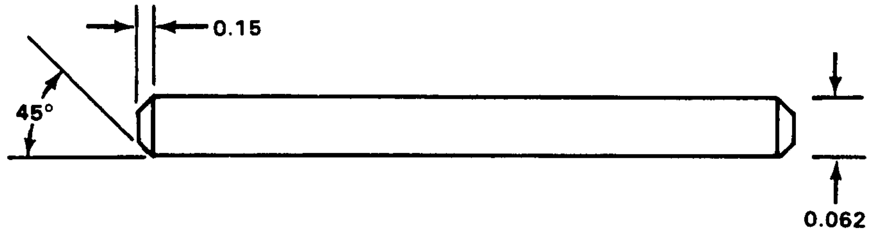
SECTION B-B

NOTES:

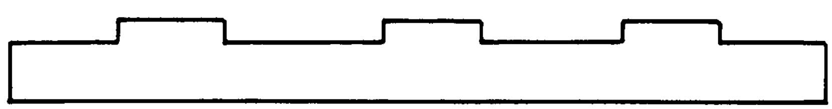
1. CUT HOLES IN -9 PANEL PER DETAIL A AND SECTION B

UH-1H-II-M-D-331-6

Figure D-331. Part Number 205-072-083-9, PANEL (Sheet 6 of 7)



NOTES:
1. 205-072-038-13 HINGE PIN MAKE
FROM MS20253P1-1188 MATERIAL

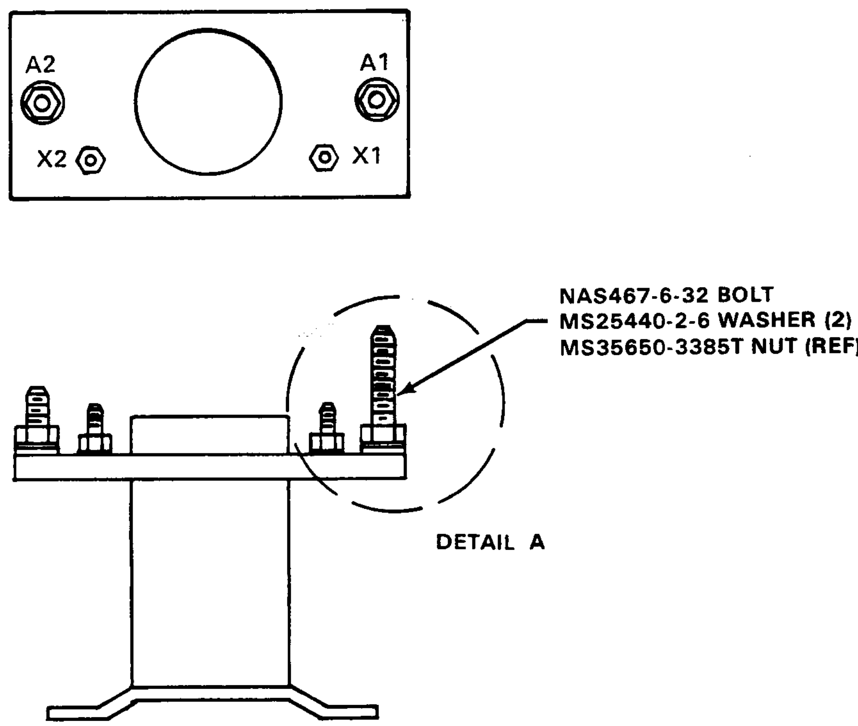


NOTES:

1. 205-072-038-11 HINGE HALF MAKE FROM
MS 20257HP2-1200 STOCK MATERIAL

UH-1H-II-M-D-331-7

Figure D-331. Part Number 205-072-083-11, HINGE HALF (Sheet 7 of 7)
Fabricate From: NSN 5340-00
Material: Leaf Butt Hinge, AL ALY, Anodized
0.531 Inch Wide, 0.040 Inch Thick, 12.0 Inches Long

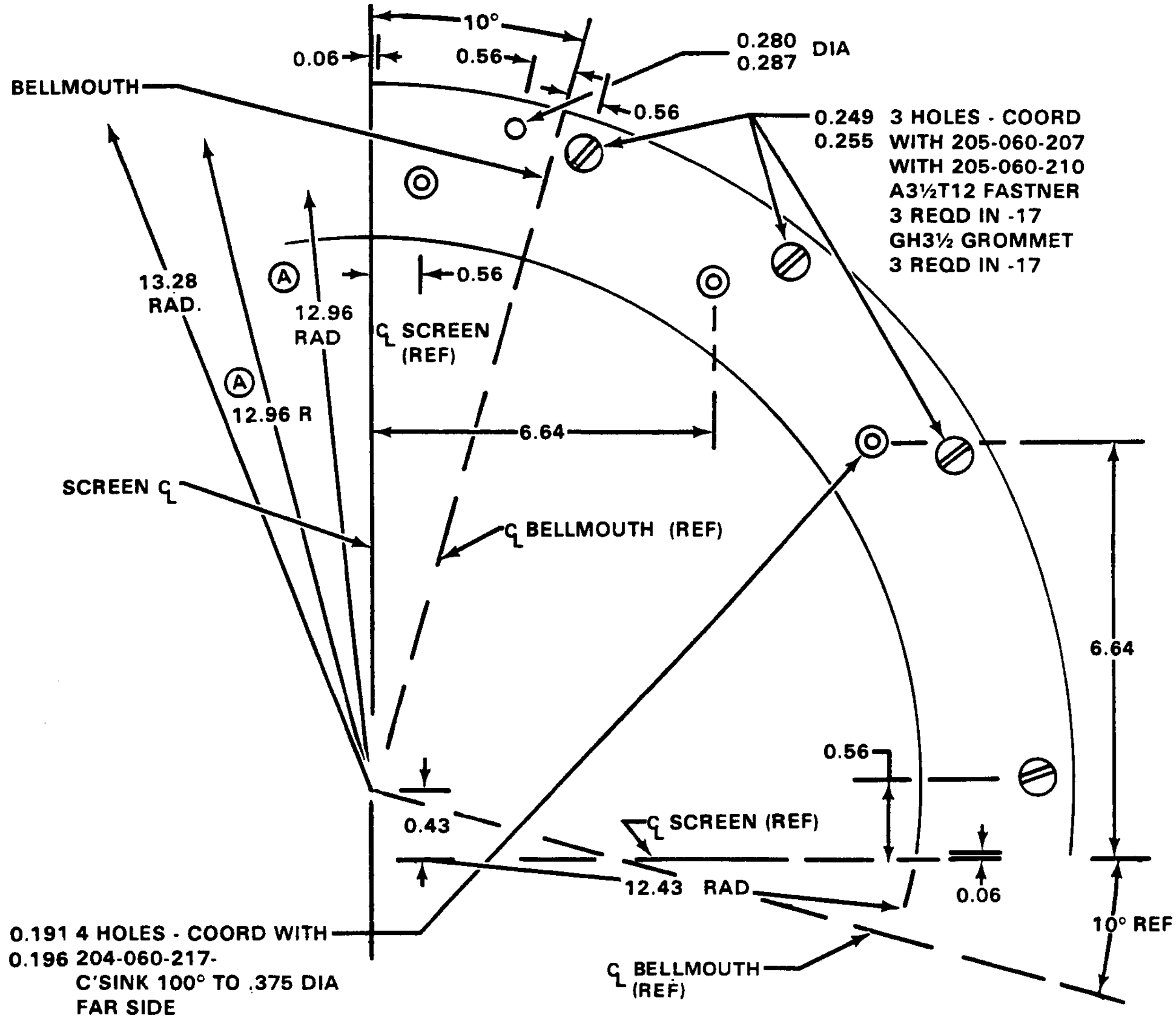


NOTES:

1. MARK PER BPS 4050
2. ALTER MS 24171-D1 RELAY PER DETAIL A
   REMOVE EXISTING STUD AT POSITION A1
   AND INSTALL NAS 467-6-32 BOLT
3. 205-075-137-3 RELAY MAKE USING
   ALTERED MS 24171-D1 RELAY SOLENOID

UH-1H-II-M-D-332

Figure D-332.	Part Number	205-075-137-3, RELAY
	Fabricate From:	NSN 5306-00-819-5120
		NSN 5945-00-660-9315
	Material:	Machine Bolt (NAS 467-6-32)
		Relay Solenoid (MS 24171-D1)

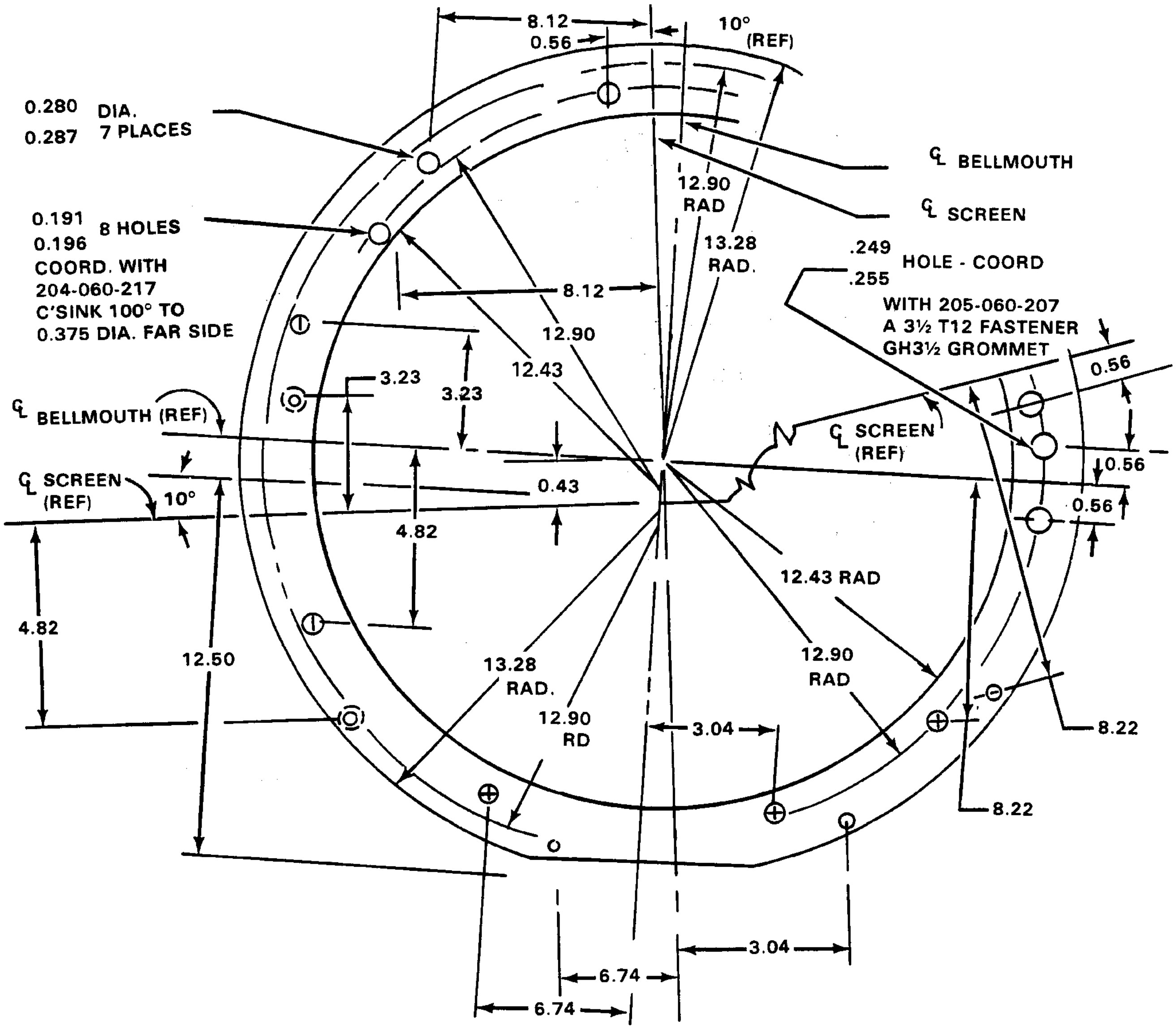


NOTES:

1. MARK PER BPS FW 4050
2. 2024 AL ALY FEDERAL SPECIFICATION QQ-A-362 T3, 0.090 INCH THICK MATERIAL MAY BE USED AS AN ALTERNATE

UH-1H-II-M-D-333

Figure D-333. Part Number 205-706-025-17, ADAPTER SEGMENT
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY, Federal Specification QQ-A-362, T3, 0.093 Inch Thick, 13.7 Inches Wide, 14.0 Inches Long

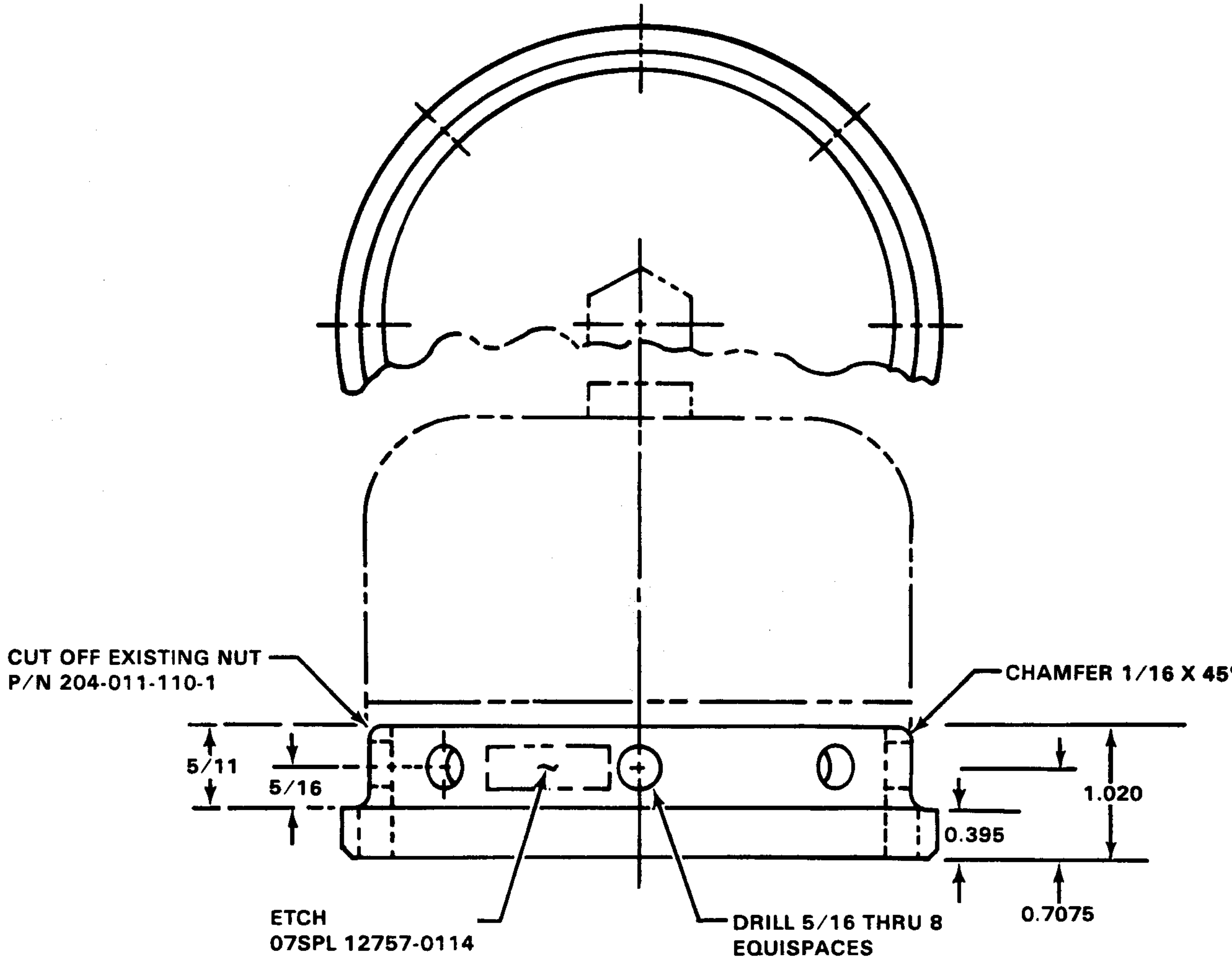


NOTES:

1. MARK PER BPS FW 4050
2. 2024 AL ALY FEDERAL SPECIFICATION QQ-A-362 T3, 0.090 INCH THICK MATERIAL MAY BE USED AS AN ALTERNATE

UH-1H-II-M-D-334

Figure D-334. Part Number 205-706-025-19, ADAPTER SEGMENT
Fabricate From: NSN 9535-00-
Material: 2024 AL ALY, Federal Specification QQ-A-362, T3, 0.093 Inch Thick, 27.5 Inches Wide, 27.5 Inches Long

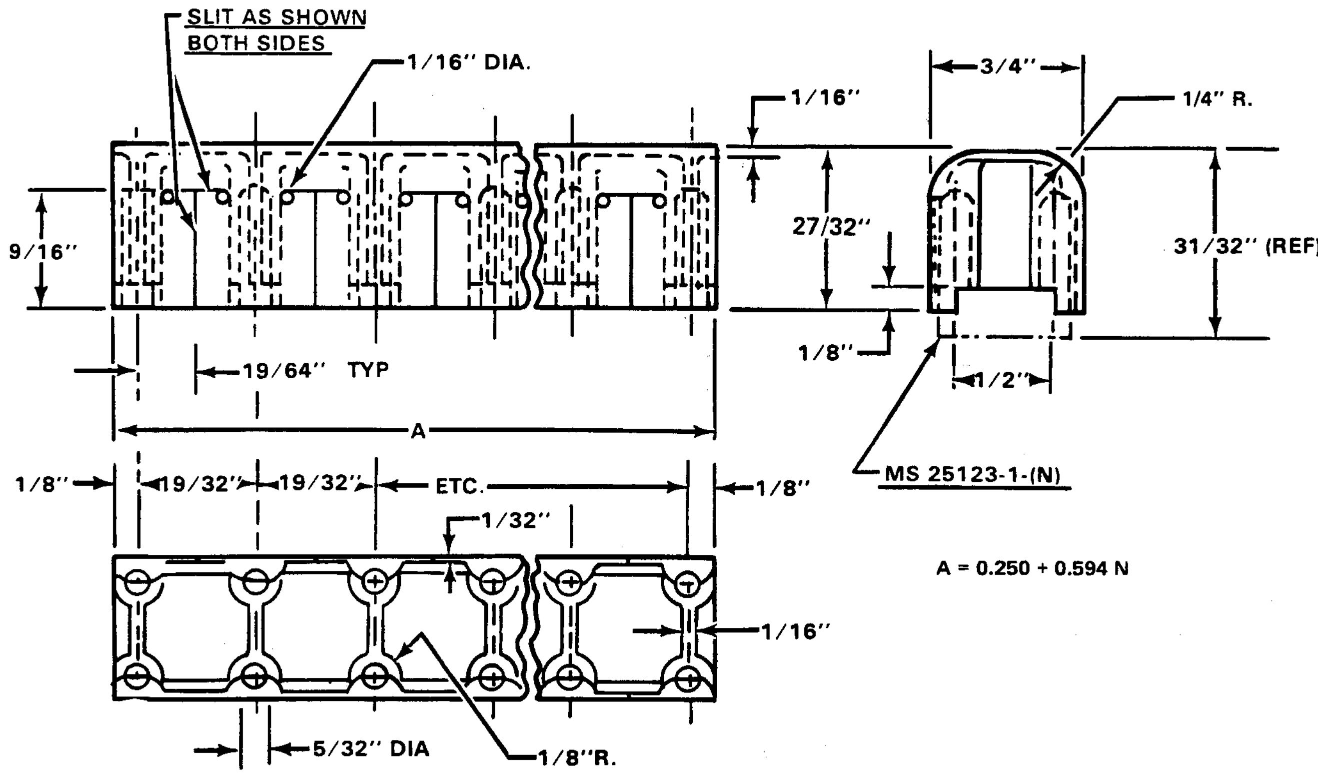


NOTES:

1. USE 204-011-116-1 NUT FOR REWORK INTO WRENCH ADAPTER.
2. REMOVE EXCESS MATERIAL AS INDICATED ABOVE, AND DRILL HOLES.
3. MARK NEW PART NO AS INDICATED ON FIGURE ABOVE.

UH-1H-II-M-D-335

Figure D-335. Part Number 67SPL1275-0114, WRENCH ADAPTER
Fabricate From: NSN
Material: Steel Bar, 4140, Federal Specification MIL-S-3626, Condition D1, 4.5 Inches Dia., 4.0 Inches Wide

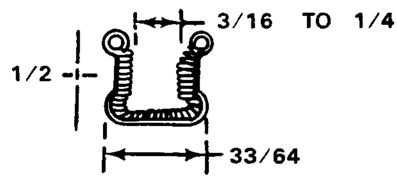


NOTES:

1. COVER DESIGNED FOR USE ON MS 25123-1-(N) AN3436-1-(N), AN3436-2(N) TERMINAL BOARD
2. DESIGNATION (N) INDICATES THE NUMBER OF TERMINAL STUDS WILL COVER
3. PURCHASE COVER FROM HENRY ENGINEERING COMPANY, BURBANK, CALIF. CODE IDENT 94640

UH-1H-II-M-D-336

Figure D-336. Part Number 397-1, COVER, ELECTRICAL TERMINAL BOARD
Fabricate From:
Material: Synthetic Rubber - Specification HRS-1



NOTES:

1. MARK PER BPS FW 4050
2. PART NO. 204-030-853-97, -98, -99, -100 CHANNEL MAKE FROM COMMERCIAL PART Y563-2 CHANNEL EACH PART NO ALL 127.0 INCH LONG
3. PURCHASE CHANNEL FROM STANDARDS PRODUCTS CO. 2130 WEST 10TH STREET CLEVELAND, OHIO CODE IDENT 82654

UH-1H-II-M-D-337

Figure D-337.	**Part Number**	**204-030-853-97, CHANNEL**
		204-030-853-98, CHANNEL
		204-030-853-99, CHANNEL
		204-030-853-100, CHANNEL
	Fabricate From:	**NSN 1560-00-004-4458**
	Material:	**Channel, Rigid Pile Lining, Uncovered,**
		33/64 Inch Wide, 1/2 Inch High, 3/16 to 1/4 Opening

APPENDIX E

STORAGE OF HELICOPTER

SECTION I — GENERAL INFORMATION

E-1. GENERAL.

E-2. Components Involved In An Accident. Any components removed for reason of an accident shall not be preserved, but shall be shipped in the same condition as it was in after the accident.

E-3. Appendix Purpose. This appendix provides detailed preparation procedures to place the helicopter in storage for a period of six months or less. This storage procedure is divided into three categories of storage; flyable storage, short term storage, and intermediate storage.

E-4. Corrosion Control. Storage of helicopter includes corrosion control which consists primarily of preventing the moisture from contacting exposed metal surfaces by the use of preservatives.

E-5. ENVIRONMENTAL CONSIDERATIONS.

E-6. Selection of Storage Category. The existing environmental conditions and available facilities must be taken into account when a helicopter is to be placed in storage. A choice of storage procedures is permissible for short periods of storage. For example, a choice must be made between flyable storage and short term storage for a period of time up to 45 days. The decision will be based on such on-site conditions as availability of men, materials, equipment necessary to perform ground runups, motoring of engines, defueling and purging of fuel tanks and other elements of various procedures.

E-7. Wet Weather Conditions. Wet weather conditions create corrosion, rot, mildew, and mold. To prevent these deteriorating effects, perform inspections regularly and take proper preventive maintenance action. The following practices should be used as a guide during exceptionally wet weather conditions:

a. Prevent rot, mildew, and mold from forming on nonmetallic materials by keeping them clean and dry as possible. Keep fabric material in the helicopter clean. (Chapter 1.)

b. Treat for visible corrosion in accordance with Chapter 1.

c. Check that drain valves are open, covered with screening, and free from blockage.

d. Keep fuel tanks full to prevent condensation in the tanks.

e. Store helicopter in a hanger or shed if space permits.

E-8. Categories of Storage. The length of time the helicopter will be inactive and the facilities and manpower available will determine which of the following categories of storage will be used.

a. *Flyable Storage*. (No time limit.) Flyable storage is the prescribed procedure to maintain a stored helicopter in an operable condition. Next to daily use, this keeps the helicopter in the best possible condition. It does, however, require attention periodically.

b. *Short Term Storage*. (From one to 45 days.) This category of storage is used to store a helicopter up to 45 days with very little attention during the storage period.

c. *Intermediate Storage*. (From 46 to 180 days.) A helicopter that will be inactive for more than 45 days, but not exceeding 180 days, shall be prepared and maintained in intermediate storage.

E-9. Maintenance to All Categories of Storage. The following is to be used when a helicopter is in flyable, short term or intermediate storage.

a. *Preservation*. Preservation should be accomplished in an uninterrupted series of operations. When periods of interruption are necessary, temporary protection shall be provided for partially processed items as required to avoid contamination.

NOTE

For component assemblies removed from the helicopter, preservation and packaging instructions may usually be found in the section of this manual which carries instructions for removing the component. Further information may be found in TM 38-230, Preservation Packaging of Material.

b. *Ventilation*. The prevention of corrosion depends on the control of moisture. One method is ventilation. On days when the relative humidity is 55 percent or below, the doors and other openings can be temporarily opened to allow a circulation of dry air through the helicopter. Use fans or blowers, when available.

c. *Drainage*. Ensure water drain holes are free from obstruction and are kept open for duration of the storage period.

d. *Towing*. (Chapter 1.)

e. *Parking*. (Chapter 1.)

f. *Mooring*. (Chapter 1.)

g. *Lubrication*. Lubricate the helicopter prior to placing it in storage in accordance with Chapter 1.

h. *Corrosion Preventive Concentrate*. (Short term and intermediate storage only.) Prior to engine runup add corrosion preventive (C-124) to engine, transmission, and gearbox oil systems in quantities specified in TB 55-9150-200-24. Flushing of engine, transmission and gearbox oil systems is not required during depreservation and activation of the helicopter.

E-10. Inspection of Stored Helicopter. The local maintenance officer is responsible for establishing an inspection program for a stored helicopter. The BHT PUB-92-004-PMS Manual may be used as a guide for areas to be covered. The frequency of inspection will be the responsibility of the local maintenance officer. The inspection program is to include the following for all categories of storage:

a. When the helicopter protective covers are not available, the areas concerned will be protected with barrier material (C-427) and the barrier material cover secured with tape (C-410). This barrier material should be installed in such a manner as to prevent the accumulation of water on the surface of the cover. Provide drains if necessary. Replace barrier material or protective covers which are damaged or deteriorated.

b. Determine peak interior helicopter temperatures during hot weather conditions. Obtain temperature information from standard thermometers temporarily installed in the helicopter. Record interior temperatures at intervals during the hottest part of the day. Ventilate the helicopter if interior temperatures exceed 135°F (57°C). Provide forced ventilation if normal ventilation procedures are not adequate to prevent condensation, possible mildew, and corrosion.

c. Inspect and treat the helicopter against corrosion. Inspection for corrosion includes close observation of areas where moisture does not evaporate rapidly. Evidence of corrosion will not be as prevalent on painted surfaces as it is on unpainted surfaces. Corrosion can attack metal through paint and will be evidenced by blisters or scaly appearance.

d. Inspect static ground wires, rotor tiedown straps, and mooring devices (ropes, cables, rods, or eyes) at regular intervals. Inspect tiedown devices immediately after the helicopter has been subjected to winds exceeding 40 mph. Replace ground wires, mooring devices or tiedown straps which are deformed or deteriorated.

e. For preservation, packaging, and handling of communications and avionics equipment refer to Avionics Manual.

f. If possible the helicopter will be stored in a hangar or under a shed roof, otherwise, it will be parked and moored in accordance with Chapter 1.

g. Enter the type of storage and the date helicopter was placed in storage in the helicopter log book.

SECTION II — FLYABLE STORAGE

(No time limit.)

E-11. Inspection Prior to Flyable Storage. Perform daily inspection prior to performing the requirements in paragraph E-8. Refer to BHT PUB-92-004-PMS for additional instructions. Ensure date and type of storage is recorded in the helicopter log book.

E-12. Preparation For Flyable Storage.

a. *Power Train.*

(1) Check the power train system lubrication including sight gages. Service the Power Train system in accordance with Chapter 1.

(2) The accomplishment of paragraph E-12. b. (3) completes the preservation of the transmission and gearboxes.

b. *Engine.* Preserve the engine as follows:

(1) Exercise every precaution to keep the engine and accessories clean. Keep the air intake duct, plenum chamber, and compressor inlet screen clean and free of any foreign materials. When external cleaning is necessary, use solvent (C-304).

(2) Refer to BHT PUB-92-004-10 for engine starting procedures. Start engine.

(3) Operate the engine a minimum of 10 minutes at a minimum N_2 RPM of 5500. Restrict the operation of the engine at idle position to a maximum of two minutes at each period. Check all instruments for normal operation and ensure that the engine and transmission temperatures have stabilized. Refer to BHT PUB-92-004-10.

NOTE

This runup may be omitted if the helicopter was recently operated and known to be dry.

(4) Shutdown engine. Refer to BHT PUB-92-004-10 for engine shutdown procedures.

(5) Install engine inlet and exhaust protective covers. If engine covers are not available, seal the air inlet and exhaust openings with barrier material (C-427) and secure material with tape (C-410).

(6) Cover additional engine cowling openings in a similar manner as outlined in paragraph E-12 b. (5) above.

(7) Record the date engines were placed in flyable storage in the helicopter log book.

c. *Hydraulic Systems.* Fill hydraulic reservoirs with hydraulic fluid (C-002). (Chapter 1.)

d. *Fuel System*. Service fuel tanks to normal capacity after each engine preservation run. Drain water from the fuel tanks before adding fuel.

NOTE

Tanks filled to normal capacity will reduce fuel contamination by condensation. The maintenance chief will determine the interval of periodic drainage.

e. *Airframe.*

(1) Install pitot tube cover. If cover is not available, wrap the pitot tube with barrier material (C-427) and secure wrap with tape (C-410).

(2) Disengage circuit breakers.

(3) Close all doors, windows, cowling, and panels.

(4) Install helicopter all weather covers in accordance with Chapter 1.

E-13. Maintenance During Flyable Storage.

a. Inspect and maintain helicopter in accordance with local directives and paragraphs E-9 and E-10.

b. Perform a daily inspection in accordance with BHT PUB-92-004-PMS Manual at least once every 7 days.

c. Operate the engine at least once every 7 days for approximately 10 minutes at a minimum N_2 RPM of 5500. Restrict the operation of the engine at flight idle to a maximum of two minutes at each period. Check all instruments for normal operation and ensure that the engine and transmission temperature has stabilized. Refer to BHT PUB-92-004-10.

d. Install engine and exhaust covers in accordance with paragraph E-12 b. (5).

E-14. Removal From Flyable Storage.

a. Remove protective covers and stow.

b. Remove all barrier material and tape. Remove tape residue with solvent (C-304).

c. Clean helicopter as necessary in accordance with Chapter 1.

d. Open all doors and windows to ventilate helicopter.

e. Remove main and tail rotor tiedowns, if applicable.

f. Perform daily inspection in accordance with BHT PUB-92-004-PMS Manual.

g. Record the date the helicopter was prepared for service in the helicopter log book.

h. Remove static ground wire and stow.

SECTION III — SHORT TERM STORAGE

(1 to 45 Days)

E-15. Inspection Prior to Short Term Storage.

a. Ensure all removed components are preserved and stowed within the helicopter in suitable containers.

b. Ensure a record of all removed or disconnected parts are entered in the helicopter log book.

c. Check fuel, oil, and hydraulic lines and hoses for leakage.

d. Lubricate the helicopter for the 50-hour interval. (Chapter 1.)

e. Ensure bolts, washers, nuts, etc., which are removed during disassembly, are coated with a light coat of corrosion preventive compound (C-110) and reinstalled as removed from the major component unless otherwise specified.

f. Record the date and type of storage in the helicopter log book.

E-16. Preparation For Short Term Storage.

a. *Power Train.*

(1) Clean the exposed metal surfaces of the power train system with a clean cloth dampened with solvent (C-304).

(2) Check the power train lubrication system including the sight gages and service in accordance with Chapter 1.

(3) Coat the exposed metal surfaces with corrosion preventive compound (C-110).

NOTE

If the engine is inoperable, complete preservation of power train in accordance with paragraph E-16. a. (7).

(4) Operate the engine for approximately 10 minutes at a minimum N_2 RPM of 5500. Restrict the operation of the engine at the engine idle position to a maximum of two minutes at each

period. Check all instruments for normal operation and ensure that engine and transmission temperature has stabilized. Refer to BHT PUB-92-004-10.

(5) Shutdown engine. Refer to BHT PUB-92-004-10 for engine shutdown procedures.

(6) Cover breather holes in transmission and gearboxes with a barrier material (C-427) and secure with tape (C-410). The accomplishment of paragraph E-16. a. (4) completes the preservation of the transmission and gearbox.

(7) If engine cannot be motored, preserve power train as follows:

(a) Remove main rotor. (Chapter 5.)

(b) Remove mast assembly. (Chapter 6.)

(c) Spray inside of transmission, through top opening, with approximately one gallon of lubricating oil (C-011). While spraying, manually rotate internal gears and bearings with main driveshaft.

(d) Reinstall mast assembly. Apply corrosion preventive (C-105) to all unpainted surfaces of mast assembly. Wipe mast dry with clean lint-free cloth. Apply corrosion preventive compound (C-110) to all unpainted surfaces.

(e) Install main rotor. (Chapter 5.)

(f) Ensure intermediate and tail rotor gearboxes have been filled with operating oil to the proper operating level.

(g) Cover breather holes in transmission and gearboxes with barrier material (C-427) and secure with tape (C-410).

b. *Operable Engine.*

(1) Exercise every precaution to keep the engine and its accessories clean. Keep the air intake duct, plenum chamber, and compressor inlet screens clean and free of any foreign materials. When external cleaning is required, use solvent (C-304).

(2) Check the oil level; service as necessary in accordance with Chapter 1.

CAUTION

Lubricating oil (C-010 or C-011) may soften paint upon contact. If lubricating oil is spilled on paint surfaces, remove it by wiping affected area with a clean cloth dampened with solvent (C-304).

CAUTION

To prevent accidental firing of the engine ensure IGNITION SYSTEM IGNITER SOL circuit breaker is open. (Pulled out.)

(3) Open IGNITION SYSTEM IGNITER SOL circuit breaker and secure red tag stating DO NOT CLOSE.

(4) Remove fuel inlet strainer and pump discharge strainer from fuel control. Refer to T53-L-703. Clean with solvent (C-304) and reinstall. Replace servo supply filter.

(5) Disconnect the main fuel hose from main fuel flow divider and the starting fuel hose from inlet side of starting fuel solenoid valve. Install temporary lines on ends of hoses to allow drainage into suitable container.

(6) Connect hose from a source of lubricating oil (C-011) to fuel control inlet fitting.

(7) Ensure engine has cooled enough to prevent auto-ignition. Set throttle arm to idle position.

CAUTION

Do not operate starter in excess of operating limit. Operation of starter is limited to three runs of 40 seconds each during any 60 minute period. Three minutes cooling time between operations is required. Do not engage starter until engine has come to a complete stop.

(8) With power lever arm in the full open position, motor engine with starter (An APU may be used for higher starter speed) to pump lubricating oil

into fuel system. Actuate starting fuel solenoid while motoring. Continue motoring until lubricating oil is observed draining from starting and main fuel hoses. Close starting fuel solenoid. Allow oil to drain from hoses.

NOTE

Initial procedures may require the fuel control changeover solenoid to be in the emergency position until oil starts to flow into the oil storage container.

(9) With engine stopped, spray power turbine rotor with sufficient amount of lubricating oil (C-011, C-010) to cover blades.

NOTE

Use dehydrated air for spraying operation.

(10)Disconnect lubricating oil hose from fuel control and connect fuel inlet line.

(11)Remove temporary lines from fuel hoses and connect main fuel hose to main fuel flow divider. Connect starting fuel hose to starting fuel solenoid valve.

(12)Remove warning tag from and close IGNITION SYSTEM IGNITER SOL circuit breaker.

(13)Install engine inlet and exhaust covers. When covers are not available, seal openings with barrier material (C-427) and secure with tape (C-410).

(14)Remove oil filter, disassemble and clean. Immerse in operating lubricant, reassemble, and reinstall.

(15)Attach a tag to the controls stating: ENGINE PRESERVED, FUEL CONTROL HAS BEEN PRESERVED WITH OIL, MIL-L-6081. FLUSH WITH STANDARD FUEL BEFORE PLACING IN SERVICE.

(16)Visually check entire engine. Plug all holes, cap all ports, and check that external parts are complete and secure. Bare metal, including internal and external threads, should be covered with corrosion preventive (C-106).

(17)Record date and extent of engine preservation in the engine historical records. In addition, annotate records that a corrosion preventive concentrate has been added to engine, transmission, and gearboxes oil systems in accordance with TB 55-9150-200-24 and that flushing is required during depreservation.

c. *Inoperable engine.*

NOTE

Engine involved in an accident shall not be preserved. Refer to T53-L-703.

(1) Exercise every precaution to keep the engine and its accessories clean. Keep the air intake duct, plenum chamber, and compressor inlet screen clean and free of any foreign materials. When external cleaning is required, use solvent (C-304).

CAUTION

To prevent accidental firing of the engine, ensure IGNITION SYSTEM IGNITER SOL circuit breaker is open (pulled out).

(2) Open IGNITION SYSTEM IGNITER SOL circuit breaker and secure red tag to it stating, DO NOT CLOSE.

(3) Disconnect the fuel lines from the fuel control inlet and outlet ports; remove fuel control drain plug and drain fuel from the fuel control and hoses.

(4) Remove overspeed governor and drain fuel. Replace drain plug.

(5) Lockwire throttle arm into closed position.

(6) Pour lubricating oil (C-009) into openings made accessible by removal of overspeed governor, until fuel regulator is filled.

(7) Pour lubricating oil (C-009) into overspeed governor while rotating the driveshaft by hand.

(8) Pour excess oil from overspeed governor and reinstall.

(9) Install engine inlet and exhaust covers. When covers are not available, seal openings with barrier material (C-427) and secure with tape (C-410).

(10)Seal the gap between bleed band and compressor housing by encircling the engine with a narrow strip of barrier material (C-427) and secure with tape (C-410).

(11)Attach a tag to controls stating: ENGINE PRESERVED, FUEL CONTROL HAS BEEN PRESERVED WITH LUBRICATING OIL, (C-009). FLUSH WITH STANDARD FUEL BEFORE PLACING IN SERVICE.

(12)Visually check entire engine. Plug all holes, cap all ports, and check that external parts are complete and secure. Bare metal, including internal and external threads, should be covered with corrosion preventive (C-106).

(13)Record date and extent of engine preservation in the engine historical records. In addition, annotate records that a corrosion prevention concentrate has been added to engine, transmission, and gearboxes oil systems in accordance with TB 55-9150-200-24 and that flushing is not required during depreservation.

d. *Hydraulic Systems.*

(1) Fill hydraulic reservoir with fluid (C-002). (Chapter 1.)

(2) Wipe exposed portions of hydraulic boost cylinder actuator pistons with lint-free cloth moistened with hydraulic fluid (C-107).

e. *Fuel System*. Service fuel tanks to normal capacity after each engine preservation run. Drain water from the fuel tanks before adding fuel. Refer to paragraph E-20. d. (2) if tanks are unserviceable.

NOTE

Tanks filled to normal capacity will reduce fuel contamination by condensation. The maintenance officer will determine the interval of periodic drainage.

f. *Rotors and Controls.*

(1) Lubricate systems in accordance with Chapter 1.

(2) Apply corrosion preventive (C-105) to all unpainted metal surfaces. Remove any film residue of corrosion preventive with solvent (C-304).

(3) Wipe all parts dry with clean, lint-free cloth, and apply corrosion preventive compound (C-110) on all unpainted metal surfaces not in contact with bearings.

(4) Clean and wax rotor blades in accordance with Chapter 1.

g. *Battery.*

(1) Disconnect battery and allow to remain in helicopter.

(2) Wrap battery quick-disconnect with barrier material (C-427) and secure with tape (C-410).

h. *Avionic Equipment.*

(1) Remove, attach condition tags, and return all headsets and microphones to supply.

(2) Leave all other unclassified avionic equipment installed.

i. *Landing Gear.*

(1) Place blocks or shoring under skid tubes to provide free air passage.

(2) Clean cross tubes and treat corrosion in accordance with TM 55-1500-204-25/1 or CSSD-PSE-87-001.

(3) Repaint any exposed metal surfaces. If the paint system cannot be touched up, coat the bare metal surfaces with corrosion preventive compound (C-110).

j. *Airframe.*

(1) Moor helicopter with main and tail rotor tiedowns installed in accordance with Chapter 1.

(2) Install pitot tube cover. If cover is not available, wrap pitot tube with barrier material (C-427) and secure with tape (C-410).

(3) Cover both static vents with barrier material (C-427) and secure with tape (C-410).

(4) Disengage circuit breakers.

(5) Close all doors, windows, cowling and panels.

(6) Install helicopter all weather covers in accordance with Chapter 1.

(7) Close all openings not already covered with barrier material (C-427) and secure with tape (C-410).

E-17. Maintenance During Short Term Storage.

a. Inspect and maintain helicopter in accordance with local directives and paragraphs E-9 and E-10.

b. If helicopter is to remain in storage for more than 45 days, place helicopter in intermediate storage in accordance with Section IV. DO NOT RENEW SHORT TERM STORAGE.

E-18. Removal From Short Term Storage.

a. *Airframe.*

(1) Remove helicopter all weather covers and stow.

(2) Remove all barrier material and tape. Remove tape residue with solvent (C-304).

(3) Open all doors, windows, and cowling to ventilate helicopter.

(4) Remove main and tail rotor tiedown.

(5) Remove mooring.

b. *Landing gear.* Remove blocks or shoring from under skid tubes.

c. *Avionic Equipment.* Obtain headsets and microphones from supply and install.

d. *Battery.*

(1) Remove barrier material and tape from quick disconnect plug.

(2) Connect battery.

e. *Rotors and Controls.*

(1) Clean main and tail rotor assemblies with solvent (C-304). Wipe dry with lint-free cloth.

(2) Lubricate in accordance with Chapter 1.

f. *Fuel System.*

NOTE

Unserviceable fuel system shall be repaired in accordance with Chapter 10.

(1) Check fuel tanks for the presence of water and drain as necessary.

(2) Fill fuel tanks in accordance with Chapter 1.

g. *Hydraulic Systems.*

(1) Clean exposed portion of hydraulic boost cylinder actuator pistons with a clean cloth dampened with hydraulic fluid (C-002).

(2) Coat hydraulic pistons with a light coat of the same hydraulic fluid.

h. *Power Train.*

NOTE

Synthetic oil used in power train will stain sight glass or indicator. Verify actual presence oil in sight glass.

(1) Fill transmission, intermediate and tail rotor gearbox as necessary in accordance with Chapter 1.

(2) Check and clean transmission oil filters.

(3) Clean driveshafts as necessary with solvent (C-304).

i. *Engine.*

NOTE

Inoperable engine shall be replaced in accordance with Chapter 4. Engine involved in an accident shall be processed in accordance T53-L-703.

(1) Remove, if applicable, covers or barrier material from engine exhaust, inlet and bleed band area.

(2) Inspect openings for foreign material and corrosion. Wipe clean with solvent (C-304).

(3) Remove chip detector from accessory drive gearbox and drain plugs from fuel control. Allow oil to drain. Clean and reinstall chip detector and plugs.

CAUTION

To prevent accidental firing of the engine, ensure IGNITION SYSTEM IGNITER SOL circuit breaker is open (pulled out).

(4) Open IGNITION SYSTEM IGNITER SOL circuit breaker (pull out).

(5) Disconnect main fuel hose from main fuel flow divider and drain into a container of at least a two-gallon capacity.

(6) Check oil level; service if necessary in accordance with Chapter 1.

(7) Operate helicopter boost pump to prime fuel system and motor engine with starter.

CAUTION

Do not exceed starter limitations.

(8) Move throttle arm to maximum until a solid stream of fuel with no air bubbles is observed flowing into container. At least one gallon of fuel must flow into container.

NOTE

Engine lubrication system is fully primed when oil pressure gage shows a steady position indication.

(9) Connect main fuel hose to main fuel flow divider and inspect engine for leakage.

(10)Remove warning tag from and close IGNITION SYSTEM IGNITER SOL circuit breaker.

(11)Operate the engine for approximately 10 minutes at a minimum N_2 RPM of 5500. Restrict the operation of the engine at the engine idle position to a maximum of 2 minutes at each period. Check all instruments for normal operation and ensure that the engine temperature has stabilized. Refer to BHT PUB-92-004-10.

(12)Shutdown engine. Refer to BHT PUB-92-004-10 for engine shutdown procedures.

(13)Remove oil filter. Check for excessive contamination and replace.

(14)Remove chip detector. Check for excessive contamination, clean and reinstall.

(15)Remove fuel inlet strainer and pump discharge strainer from fuel control. Refer to T53-L-703. Check for contamination. Clean with solvent (C-304) and reinstall. Replace servo supply filter.

(16)If no contamination is evident, the engine is ready for ground test.

(17)If there is a slight contamination, drain the oil and refill system with new oil.

(18)Repeat paragraphs E-18. i. (11) through E-18. i. (14). Evidence of continued contamination in oil system requires a thorough investigation. Refer to T53-L-703.

NOTE

If there is less than 10 hours operating time on engine since new, or since last overhaul, repeat paragraphs E-18. i. (11) through E-18. i. (14) until no contamination is evident, or analysis of the contamination determines engines shall be replaced.

j. Miscellaneous.

(1) Clean helicopter as necessary in accordance with Chapter 1.

(2) Ensure all removed components have been reinstalled on the helicopter. Check the helicopter log book for a record of components that have been removed or disconnected. Check for subsequent installation or connection.

(3) Ensure related systems have been properly depreserved and serviced before any system or component operational check has been performed.

(4) Perform necessary inspection required by helicopter log book in accordance with Chapter 1.

(5) Remove static ground wire installed for storage.

(6) Record the date the helicopter was prepared for service in helicopter log book.

SECTION IV — INTERMEDIATE STORAGE

(46 to 180 Days)

E-19. Inspection Prior to Intermediate Storage.

a. Ensure all removed components are preserved and within the helicopter in suitable containers or at designated locations.

b. Ensure a record of all removed or disconnected components is entered in the helicopter log book.

c. Check fuel, oil and hydraulic lines and hoses for leakage.

d. Lubricate the helicopter for the 50 and 100-hour interval. (Chapter 1.)

e. Ensure bolts, washers, nuts, etc., which are removed during disassembly, are coated with a light coat of corrosion preventive compound (C-110) and reinstalled as removed from the major component unless otherwise specified.

f. Record the date and type of storage in the helicopter log book.

E-20. Preparation For Intermediate Storage.

a. *Power Train*. Preserve the power train in accordance with paragraph E-16. a.

b. *Engine*. Preserve the engine in accordance with paragraphs E-16. b. (operable engine) or E-16. c. (inoperable engine).

c. *Hydraulic Systems*. Preserve the systems in accordance with paragraph E-16. d.

d. *Fuel System*.

WARNING

In the interest of safety of personnel and equipment, the following precautions shall be observed while preparing helicopter fuel tanks for storage: The helicopter and all equipment used in performing the operation shall be properly grounded. This includes defueling equipment, work stands, purging equipment, and any powered or pneumatic devices. Work stands shall be equipped with a personnel static discharge plate of copper or zinc plate, which shall be affixed in such a position that personnel can contact the plate before coming in contact with the helicopter. Fuel tanks should not be drained near the end of the working day and then allowed to stand "empty" overnight. Residual fuel drains down the sides of the tank and forms puddles. Overnight, fuel from these puddles evaporates into the air in the tank and should a critical fuel air ratio develop, an explosion could be set off by a spark. A lapse of time between draining and purging should be avoided.

(1) *Serviceable Fuel System*.

(a) Drain the fuel tanks in accordance with Chapter 1.

(b) Fill the fuel tanks with lubricating oil (C-009) and allow it to remain in the tanks overnight or for a period of approximately 10 hours.

(c) Drain the lubricating oil. Test fuel tanks with a combustible gas indicator. If a dangerous level of fuel fumes still exists, discard the drained lubricating oil and reflush tanks with fresh oil until a safe reading is obtained.

(d) Tag fuel cap as follows: THIS FUEL SYSTEM HAS BEEN PRESERVED WITH OIL, MIL-L-6081. FLUSH WITH STANDARD FUEL BEFORE PLACING IN SERVICE.

(2) *Unserviceable Fuel Systems.* Fuel tanks which cannot be filled with lubricating oil because of leaks will be purged and preserved as follows:

(a) Gain access to the fuel tank areas. Clean up all fuel spills and ventilate the bays with rapidly moving air until the areas are completely dry. Drain all remaining fuel from fuel tanks, sumps, fuel lines and fuel filter modules. Reconnect all fuel lines and reinstall filter elements.

(b) Open fuel cells in accordance with Chapter 10 and ventilate tanks with rapidly moving dry air until fumes are below the danger level as shown by test with a combustible gas indicator.

(c) Preserve the tanks by spraying with lubricating oil (C-009) through the access openings; coat the entire interior surface.

(d) Tag the fuel system in accordance with paragraph E-20. d. (1) (d).

e. *Rotors and Controls.* Preserve the rotors and controls in accordance with paragraph E-16. f. Remove the main rotor blades, place in a metal shipping and storage container, and store under cover.

f. *Battery.*

(1) Remove the battery and turn into battery shop for storage.

(2) Clean the battery compartment and accessories as necessary. (Chapter 1.)

(3) Wrap battery quick-disconnects with barrier material (C-427) and secure with tape (C-410).

g. *Avionics Equipment.* Preserve the equipment in accordance with paragraph E-16. h.

h. *Landing Gear.* Preserve the gear in accordance with paragraph E-16. i.

i. *Airframe.*

(1) Remove the clock, fire extinguishers, first aid kits, and equipment subject to mildew and deterioration. Attach condition tags to these items and return to supply.

(2) Accomplish paragraph E-16. j. except for installing the main rotor tiedown.

E-21. Maintenance During Intermediate Storage.

a. Inspect and maintain helicopter in accordance with local directives and paragraphs E-9 and E-10.

b. If helicopter is to remain in storage for more than 180 days, represerve the helicopter.

E-22. Removal From Intermediate Storage.

a. *Airframe.*

(1) Obtain the clock, fire extinguishers, first aid kits, and equipment subject to mildew and deterioration from supply and install.

(2) Accomplish paragraph E-18. a. except for removing the main rotor tiedown.

b. *Landing Gear.* Remove blocks or shoring from under skid tubes.

c. *Avionic Equipment.* Obtain headsets and microphones from supply and install.

d. *Battery.*

(1) Remove barrier material and tape from quick disconnects.

(2) Obtain battery from battery shop and install.

e. *Rotors and Controls.*

(1) Clean main and tail rotor assemblies with solvent (C-304). Wipe dry with lint-free cloth.

(2) Install main rotor blades.

(3) Lubricate in accordance with Chapter 1.

(4) Check stabilizer bar dampers to be full of hydraulic fluid (C-002). If oil level is much below top of window on damper, check timing after refilling and replace damper if unsatisfactory. (Chapter 5.)

f. *Fuel System.*

NOTE

Unserviceable fuel system shall be repaired in accordance with Chapter 10.

(1) Disconnect the fuel to the main fuel flow divider.

(2) Fill fuel tanks with operational fuel in accordance with Chapter 1.

(3) Motor engine with an auxiliary power supply until oil free fuel is discharged from open fuel line.

(4) Connect fuel hose.

g. *Hydraulic Systems.* Refer to paragraph E-18. g.

h. *Power Train.* Refer to paragraph E-18. h.

i. *Engine.* Refer to paragraph E-18. i.

j. *Miscellaneous.* Refer to paragraph E-18. j.

APPENDIX F

WIRING DIAGRAMS

F-1. WIRING DIAGRAMS.

F-2. Description — Wiring Diagrams. This appendix contains wiring diagrams and essential wiring information for the electrical systems and circuits in the helicopter. Its purpose is to assist maintenance personnel in understanding the circuits and components and to augment troubleshooting and tracing of inoperative and malfunctioning circuits.

F-3. WIRING DATA.

F-4. Wire Identification. All wires on diagrams are indentified by coded wire numbers exactly as they are marked in the helicopter. The coded wire numbers indicate circuit function, wire number, wire segment letter, and wire size (gage). (Figure F-1).

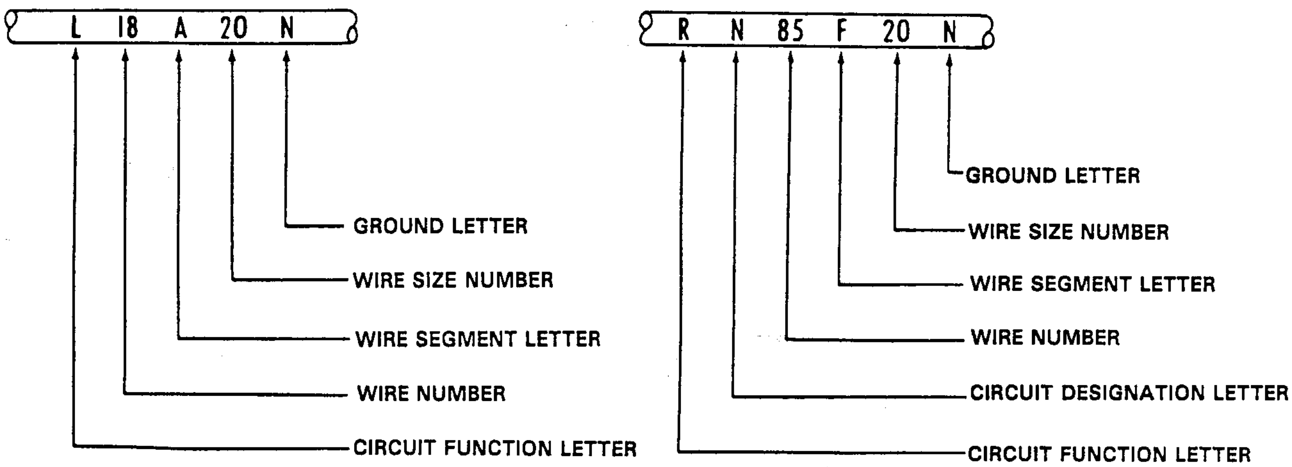
F-5. Abbreviations. Abbreviations are in accordance with MIL-STD-12 and AR310-50, except when the abbreviation depicts a marking or decal contained in or on the helicopter.

F-6. EQUIPMENT LISTS.

F-7. Description — Equipment List. Table F-1 lists each item of equipment shown on the electrical system wiring diagrams. Each item of equipment is identified by the reference designator and nomenclature.

F-8. WIRING DIAGRAM INDEX.

WIRING IDENTIFICATION CODE



CIRCUIT FUNCTIONS

CODE	NOMENCLATURE	CODE	NOMENCLATURE
A	ARMAMENT	RC	COMMAND
C	CONTROL SURFACES	RF	VHF LIAISON
D	INSTRUMENTS (OTHER THAN FLIGHT OR ENGINE)	RL	LIAISON
E	ENGINE INSTRUMENTS	RM	MARKER BEACON
F	FLIGHT INSTRUMENTS	RN	NAVIGATION
H	HEATING, VENTILATION AND ANTI-ICING	RU	UHF COMMAND
J	IGNITION	RV	VHF COMMAND
K	ENGINE CONTROL	RZ	INTERPHONE AND HEADPHONE
L	LIGHTING	S	RADAR
M	MISCELLANEOUS ELECTRIC	SX	RECOGNITION (IFF)
N	GROUND	TN	TRACKING NAVIGATION
P	DC POWER	V	DC POWER AND DC CONTROL CABLES FOR AC SYSTEM
Q	FUEL AND OIL	W	WARNING AND EMERGENCY
R	RADIO (NAVIGATION AND COMMUNICATION)	X	AC POWER

UH-1H-II-M-F-1

Figure F-1. 1. Wiring identification code

Table F-1. Equipment List

ITEM NO.	DESCRIPTION
A1	Panel, DC Power
A2	Panel AC Power
A3	Panel, Engine
A4	Panel, Caution
A5	Panel, Dome Lights
A6	Panel, Instrument Lights
A7	Panel, External Lights
A8	Panel, Hydraulic Control
A10	Panel, Miscellaneous
A11	Panel, Heating
A12	Cargo Hook Assembly
A13	Panel, Resistor
A14	Panel, AC Circuit Breaker
A20	Panel, Assembly, Aft Dome Lights
A21	Panel, Dome Light & Pitot Heater
A26	Panel Assembly, External Fuel
B1A	Syncro XMTR, Torque Pressure
B2A	Syncro XMTR, XMSN Oil Pressure
B3A	Syncro XMTR, Engine Oil Pressure
B4	Syncro XMTR, Fuel Pressure
B5	Motor, Fuel Shut-Off Valve
B6	Motor, R/H Fuel Boost Pump
B7	Motor, Windshield Wiper
B8	Motor, R/H Auxiliary Fuel Pump
B9	Motor, L/H Fuel Boost Pump
B12	Motor, Governor RPM Actuator
B13	Motor, L/H Auxiliary Fuel Pump
B22	Boom Actuator
B31	Motor, Copilot Windshield Wiper
B33	Winch Assembly
B34	Motor, Bleed Air Valve
BT2	Battery (Fwd Location)
BT2	Battery (Aft Location)
C1	Capacitor, PF Corr (MIL-C-25)
C7	Capacitor, Filter, JN14
C8	Capacitor, Filter, JN14
CB1	Circuit Breaker (5A)
CB2	Circuit Breaker (10A)
CB3	Circuit Breaker (15A)
CB4	Circuit Breaker (20A)
CB5	Circuit Breaker (25A)
CB6	Circuit Breaker (1A)
CB7	Circuit Breaker (35A)
CB8	Circuit Breaker (2A)
CB11	Circuit Breaker (7.5A)
CB13	Circuit Breaker (1A)
CP1	Coupler, Fuel Quantity Unshielded

ITEM NO.	DESCRIPTION
CP2	Coupler, Fuel Quantity Shielded
CR2	Diode, External Power Relay
CR30	Diode, Battery Voltage Fwd Location
CR31	Diode, Battery Voltage Aft Location
CR32	Diode, Overheat Relay
CR97	Diode, XMSN Chip Detector
CR98	Diode, XMSN Chip Detector
CR99	Diode, XMSN Chip Detector
CR500	Diode, Baggage Door Open Indicator
CR501	Diode, Engine Oil Filter Indicator
D1	Inverter, 250 V.A. 3 Ph (Main)
D2	Inverter, 250 V.A. 3 Ph (Spare)
DS1	Control Assembly, RPM Warning
DS19	Light, Baggage Compartment
DS20	Light, Baggage Compartment
DS27	Light, L/H Tail
DS28	Light, R/H Tail
DS50	Indicator, XMSN Sump
DS51	Indicator, XMSN Planetary
DS52	Indicator, XMSN Upper Mast
E1	Detector, Magnetic Chip
E4	Detector, Magnetic Chip
E16	Detector, Magnetic Chip
E17	Detector, Magnetic Chip
G2	Generator, 30 VDC (300A)
G3	Generator, Tachometer (Gas Producer)
G4	Generator, Tachometer (Power Turbine)
G5	Generator, Tachometer (Rotor)
G6	Generator, Starter 28 VDC (200A)
HR1	Heater, Pitot Tube
I1	Indicator, Attitude (Copilot)
I2	Indicator, Fuel Quantity
I3A	Indicator, Torque - Pilot
I4A	Indicator, Oil Pressure and Temperature (Engine)
I5A	Indicator, Oil Pressure and Temperature (XMSN)
I6	Indicator, Fuel Pressure
I7	Indicator, Tachometer (Gas Producer)
I8	Indicator, Tachometer-Dual
I9	Light, Utility (Pilot)
I10	Light, Dome
I11	Light, Search
I12	Light, Fire Warning

Table F-1. Equipment List (Cont)

ITEM NO.	DESCRIPTION
I13	Light, Master Caution
I14	Light, Instrument, Secondary
I15	Lamp, Instrument & Edge Lights
I16	Light, Landing
I17	Light, Left Navigation
I18	Light, Right Navigation
I20	Light, Top Fuselage
I23	Indicator, Turn & Slip (Pilot)
I25	Light, XMSN Sump Inspect
I26	Light, Bottom Fuselage
I28	Light, Utility (Copilot)
I31A	Indicator, Engine Gas Temperature (Pilot)
I34	Standby Compass (Pilot)
I40	Light, Anti-Collision
I42	Indicator, Attitude (Pilot)
I44	Light, Cargo Release Armed
I45	Light, Hi-Lo RPM Warning
J2	Receptacle, Pitot Tube Heater
J3	Receptacle, Instrument Panel Disconnect
J4	Receptacle, Fuel Quantity Indicator
J5	Receptacle, Fuel Pressure Indicator
J6	Receptacle, Copilot Attitude Indicator
J7A	Receptacle, Engine Oil Temperature Indicator
J9	Receptacle, Pilot Dual Tachometer Rotor
J10	Receptacle, Pilot Dual Tachometer Power Turbine
J12A	Receptacle, XMSN Oil Pressure Indicator
J15A	Receptacle, Pilot Torque Meter
J16	Receptacle, Pilot Turn & Slip Indicator
J17	Receptacle, Gas Producer Tachometer
J20	Receptacle, Pilot Cyclic Stick
J21	Receptacle, Hydraulic Control Panel
J22	Receptacle, Copilot Cyclic Stick
J23	Receptacle, Engine Panel
J24	Receptacle, Caution Panel
J25	Receptacle, Pilot Collective Stick
J26	Receptacle, Windshield Wiper
J28	Receptacle, Hydraulic Bypass Solenoid
J29	Receptacle, Hydraulic Pressure Warning Switch
J31	Receptacle, Cargo Hook
J31A	Receptacle, Engine Gas Temperature Indicator
J32	Receptacle, Cargo Sling Disconnect
J35	Receptacle, Rotor, Tachometer Generator
J36	Receptacle, XMSN Oil Pressure Switch
J37	Receptacle, XMSN Oil Temperature Bulb
J38	Receptacle, Copilot Windshield Wiper
J39A	Receptacle, XMSN Oil Pressure XMTR
J41	Receptacle, XMSN Disconnect
J42	Receptacle, Fuel Tank Disconnect R/H
J43	Receptacle, Compensator Fuel Tank Disconnect R/H
J44	Receptacle, Fuel Tank Disconnect R/H
J53	Receptacle, Bulkhead Feed-thru-aft Fuel Cell
J54	Receptacle, Bulkhead Feed-thru-aft Fuel Cell
J57	Receptacle, External Fuel Control Panel
J60	Receptacle, Socket, Relay-Generator Field
J64A	Receptacle, Torque Pressure XMTR
J65A	Receptacle, Engine Oil Pressure XMTR
J66	Receptacle, Fuel Pressure XMTR
J68	Receptacle, Disconnect Muff Heater
J71	Receptacle, Engine Fuel Valve
J72	Receptacle, Engine Oil Pressure Switch
J74	Receptacle, Battery Disconnect Fwd
J75	Receptacle, Navigation Lights Flasher
J80	Receptacle, Engine Air Filter Pressure Switch
J81	Receptacle, Starter Deck
J84	Receptacle, De-Icing Hot Air Valve
J85	Receptacle, Engine Oil Temperature Bulb
J86	Receptacle, Power Turbine Tachometer
J87	Receptacle, Gas Turbine Tachometer
J88	Receptacle, Ignition Unit, Engine
J89	Receptacle, Primer Valve (Fuel Ignition Solenoid)
J90	Receptacle, Fuel Control Solenoid Valve
J91	Receptacle, Engine Disconnect
J92	Receptacle, Engine Fwd Disconnect
J93	Receptacle, Fire Detector Fwd Disconnect
J94	Receptacle, Fire Detector Element R/H
J95	Receptacle, Fire Detector Element L/H
J96	Receptacle, Fire Detector Element R/H
J97	Receptacle, Fire Detector Element L/H
J98	Receptacle, Tail Light Disconnect
J99	Receptacle, Thermocouple Disconnect
J102	Receptacle, Standby Compass (Pilot)
J105	Receptacle, Heated Blanket L/H
J106	Receptacle, Heated Blanket R/H
J107	Receptacle, Copilot Collective Stick
J108	Receptacle, Fuel Differential Pressure Switch
J109	Receptacle, External Power

Table F-1. Equipment List (Cont)

ITEM NO.	DESCRIPTION
J110	Receptacle, Anti-Collision Light Disconnect
J111	Receptacle, Anti-Collision Light
J112	Receptacle, Magnetic Brake Anti-Torque
J113	Receptacle, Magnetic Brake Fore & Aft
J114	Receptacle, Magnetic Brake Lateral
J115	Receptacle, Test-Engine Vibration Meter
J119	Receptacle, Cabin Roof Disconnect
J127	Receptacle, Variable Mix Valve Disconnect
J129	Receptacle, Displacement-Roll & Pitch Gyro
J130	Receptacle, Rate Switching Gyro
J131	Receptacle, Attitude Indicator
J138	Receptacle, Door Post Outlet Valve Actuator
J146	Receptacle, Bleed Air Valve
J147	Receptacle, Internal Auxiliary Fuel Disconnect L/H
J148	Receptacle, Internal Auxiliary Fuel Disconnect R/H
J155	Receptacle, Hi-Lo RPM Warning
J156	Receptacle, Engine Fuel Filter Bypass Switch
J166	Receptacle, Aft, Outlet Valve
J191	Receptacle, Main Inverter Power
J192	Receptacle, Spare Inverter Power
J194	Receptacle, Engine Chip Detector
J267	Receptacle, Battery Disconnect Aft
J268	Receptacle, Hoist Control Box
J269	Receptacle, Hoist Control Box
J270	Receptacle, Hoist Control Box
J271	Receptacle, Hoist Control Box
J272	Receptacle, Hoist Control Box
J273	Receptacle, Control Pendant
J274	Receptacle, Boom Actuator
J275	Receptacle, Winch Assembly
J279	Receptacle, Traction Motor Sheave
J1017	Receptacle, External Fuel Disconnect L/H
J1024	Receptacle, External Fuel Disconnect R/H
K1	Relay, External Power
K2	Relay, Non-Ess Bus
K2	Relay, Non-Ess Bus
K2	Relay, Non-Ess Bus
K3	Relay, Starter
K4	Relay, Bus Control (Generator Fail)
K5	Relay, Reverse Current (Main)
K6	Relay, Overvoltage
K7	Relay, Generator Field
K8	Relay, AC Failure
K9	Relay, Battery
K10	Relay, Fuel Transfer
K15	Relay, Standby Generator Field
K23	Relay, Standby Generator Reverse Current
K24	Relay, Cargo Hook Release
K27	Relay, Inverter
K32	Relay, Hoist Power
K35	Relay, Main Inverter Power
K36	Relay, Spare Inverter Power
K37	Relay, Lo-Fuel Caution Light
K38	Relay, Lo-Fuel Caution Light
K46	Relay, Overheat
K65	Relay, Battery, Aft Location
K66	Relay, Battery Feeder
L1	Solenoid, Primer (Ignition)
L2	Solenoid, Fuel Control Valve
L4	Solenoid, Hydraulic Bypass
L6	Solenoid, Hot-Air De-icer
L7	Solenoid, Idle Stop Release
L8	Magnetic Brake - Anti-Torque Force Trim
L9	Magnetic Brake - F & A Force Trim
L10	Magnetic Brake - Lateral Force Trim
L14	Solenoid, Door Post Heater Outlet Valve
L15	Solenoid, Aft Outlet Valve Actuator
L21	Solenoid, Variable Mix Valve
M1	Meter, DC Load (Standby Generator)
M2	Meter, DC Volts
M3	Meter, AC Volts
M4	Meter, DC Load (Main Generator)
O2	Guard - Generator Switch DC Power Panel
P2	Plug, Pitot Tube Heater
P3	Plug, Instrument Panel Connector
P4	Plug, Fuel Quantity Indicator
P5	Plug, Fuel Pressure Indicator
P6	Plug, Copilot Attitude Indicator
P7A	Plug, Engine Oil Temperature Indicator
P9	Plug, Pilot Dual Tachometer (Rotor)
P10A	Plug, Pilot Dual Tachometer (Power Turbine)
P12A	Plug, XMSN Oil Pressure and Temperature Indicator
P15A	Plug, Pilot Torque Meter
P16	Plug, Pilot Turn & Slip Indicator
P17	Plug, Gas Producer Turbine Tachometer

Table F-1. Equipment List (Cont)

ITEM NO.	DESCRIPTION
P20	Plug, Pilot Cyclic Stick
P21	Plug, Hydraulic Control Panel
P22	Plug, Copilot Cyclic Stick
P23	Plug, Engine Panel
P24	Plug, Caution Panel
P25	Plug, Pilot Collective Stick
P26	Plug, Windshield Wiper
P28	Plug, Hydraulic Bypass Solenoid Valve
P29	Plug, Hydraulic Pressure Warning Switch
P31	Plug, Cargo Hook
P31A	Plug, Engine Gas Temperature Indicator
P32	Plug, Cargo Hook Disconnect
P35	Plug, Rotor, Tachometer Generator
P36	Plug, XMSN Oil Pressure Switch
P37	Plug, XMSN Oil Temperature Bulb
P38	Plug, Copilot Windshield Wiper
P39A	Plug, XMSN Oil Pressure XMTR
P41	Plug, XMSN Disconnect
P42	Plug, Shielded Tank Unit Disconnect (R/H Tank)
P43	Plug, Monitor Tank Unit Disconnect (R/H Tank)
P44	Plug, Unshielded Tank Unit Disconnect (R/H Tank)
P46	Plug, Fuel Tank Disconnect R/H Cell
P47	Plug, Fuel Tank Disconnect R/H Cell
P48	Plug, Fuel Tank Disconnect R/H Cell
P53	Plug, Unshielded Tank Unit-Aft Cell
P54	Plug, Shielded Tank Unit-Aft Cell
P55	Plug, Fuel Tank Disconnect - Aft Cell
P56	Plug, Fuel Tank Disconnect - Aft Cell
P57	Plug, External Fuel Control Panel
P60	Plug, Field Relay Generator
P64A	Plug, Torque Pressure XMTR
P65A	Plug, Engine Oil Pressure XMTR
P66	Plug, Fuel Pressure XMTR
P68	Plug, Muff Heater Disconnect
P71	Plug, Fuel Valve Shut-Off
P72	Plug, Engine Oil Pressure Switch
P74	Plug, Battery Disconnect Fwd
P75	Plug, Navigation Lights Flasher
P80	Plug, Engine Air Filter Pressure Switch
P81	Plug, Starter Deck
P84	Plug, De-Icing Hot Air Valve
P85	Plug, Oil Temperature Bulb
P86	Plug, Power Turbine Tachometer
P87	Plug, Gas Producer Tachometer
P88	Plug, Ignition Unit-Engine
P89	Plug, Ignition Solenoid Valve
P90	Plug, Fuel Control Solenoid Valve
P91	Plug, Engine Disconnect
P92	Plug, Engine Fwd Disconnect
P93	Plug, Fire Detector Fwd Disconnect
P94	Plug, Fire Detector Element R/H
P95	Plug, Fire Detector Element L/H
P96	Plug, Fire Detector Element R/H
P97	Plug, Fire Detector Element L/H
P98	Plug, Tail Light Disconnect
P99	Plug, Thermocouple Disconnect -Engine
P99A	Plug, Thermocouple Disconnect -Engine
P99B	Plug, Thermocouple Disconnect -Engine
P102	Plug, Standby Compass (Pilot)
P107	Plug, Copilot Collective Stick
P108	Plug, Fuel Differential Pressure Switch
P110	Plug, Anti-Collision Light Disconnect
P111	Plug, Anti-Collision Light
P112	Plug, Magnetic Brake Anti-Torque
P113	Plug, Magnetic Brake F & A
P114	Plug, Magnetic Brake - Lateral
P119	Plug, Cabin Roof Disconnect
P127	Plug, Variable Mix Valve Disconnect
P129	Plug, Displacement, Roll & Pitch Gyro
P130	Plug, Rate Switching Gyro
P131	Plug, Attitude Indicator
P138	Plug, Door Post-Aft Outlet Valve Actuator
P146	Plug, Bleed Air Valve
P147	Plug, Unshielded Tank Coupler Disconnect
P148	Plug, Unshielded Tank Coupler Disconnect
P149	Plug, Unshielded Tank Coupler Disconnect
P151	Plug, Shielded Tank Coupler Disconnect
P152	Plug, Shielded Tank Coupler Disconnect
P153	Plug, Shielded Tank Coupler Disconnect
P155	Plug, Hi-Lo RPM Warning
P156	Plug, Engine Fuel Filter Bypass
P166	Plug, Aft Outlet Valve
P191	Plug, Inverter Disconnect - Main
P192	Plug, Inverter Disconnect - Spare
P194	Plug, Engine Chip Detector
P267	Plug, Battery Disconnect Aft
P268	Plug, Hoist Control Box
P269	Plug, Hoist Control Box
P270	Plug, Hoist Control Box
P271	Plug, Hoist Control Box
P272	Plug, Hoist Control Box
P273	Plug, Control PendantP274

Table F-1. Equipment List (Cont)

ITEM NO.	DESCRIPTION
P274	Plug, Boom Actuator
P275	Plug, Winch Assembly
P279	Plug, Traction Motor Sheave
P1017	Plug, External Fuel Disconnect L/H
P1024	Plug, External Fuel Disconnect R/H
R1	Shunt, Ammeter (Standby Generator)
R2	Shunt, Ammeter (Main Generator)
R3	Resistor, Windshield Wiper
R4	Rheostat, Pilot Instrument Light Dim
R5	Rheostat, Sec. Instrument Light Dim
R6	Rheostat, Overhead Console
R7	Resistor, Navigation Lights Dim
R8	Rheostat Pedestal Lights Dim
R9	Rheostat, Engine Instrument Lights Dim
R10	Rheostat, Copilot Instrument Lights Dim
R11	Rheostat, Fire Detector Control
R21	Rheostat, Aft Dome Lights
R26	Rheostat, Course Indicator Light Dim
R27	Rheostat, AC Loading Balancing
S1	Switch, Aft Dome Light
S2	Switch, Rotary, (DC VM Sel)
S4	Switch, XMSN Sump Inspection Light
S5	Switch, Fuel Quantity Test
S6	Switch, Starter (Pilot Collective)
S7	Switch Hydraulic Boost Control
S8	Switch, Generator (On-Off Reset)
S9	Switch, Pitot Heater
S10	Switch, Force Trim (Copilot Cyclic)
S11	Switch, Rotary (AC VM Sel)
S12	Switch, Searchlight Control
S13	Switch, Navigation Lights (Flash Steady)
S14	Switch, Navigation Lights (Bright-Dim)
S18	Switch, Force Trim (Pilot-Cyclic)
S20	Switch, Test (Fire Detector)
S23	Switch, Windshield Wiper
S25	Switch, Landing Light (Ext-Retr)
S26	Switch, XMSN Oil Temperature
S27	Switch, Hydraulic Pressure
S28	Switch, XMSN Oil Pressure Warning
S29	Switch, Engine Oil Pressure Warning
S31	Switch, Limit (External Power Door)
S32	Switch, Cargo Release (Pilot)
S33	Switch, Governor (Auto-Emer)
S36	Switch, Cargo Release
S37	Switch, RPM Governor (Pilot)
S38	Switch, Fuel (ON-OFF)
S39	Switch, Inverter (Main-Spare)
S40	Switch, Battery (ON-OFF)
S41	Switch, Upper Float
S42	Switch, Lower Float
S44	Switch, Fuel-Low Level
S45	Switch, Fuel-Transfer L/H
S46	Switch, Fuel-Transfer R/H
S50	Switch, Idle Stop Release (Pilot)
S51	Switch, RPM Governor (Copilot)
S52	Switch, Fuel Level Ferry Tank R/H
S53	Switch, Fuel Level Ferry Tank L/H
S58	Switch, Fuel Differential Pressure
S59	Switch, Anti-Collision Light
S62	Switch, Non-Ess Bus Control
S63	Switch, External Fuel Jettison
S68	Switch, Force Trim
S70	Switch, Starter-Generator
S73	Switch, Overheat Bleed Air
S75	Switch, Searchlight (ON-STOW)
S76	Switch, Landing Light (ON-OFF)
S78	Switch, Cargo Release (Copilot)
S79	Switch, Fuel Ejector Flow Switch L/H
S80	Switch, Fuel Ejector Flow Switch R/H
S81	Switch, De-ice (ON-OFF)
S83	Switch, Bleed Air (ON-OFF)
S85	Switch, Aft Outlets (Heater)
S87	Switch, Aft-Outlet Limit
S93	Switch, Hi-Lo RPM
S94	Switch, Fuel Filter Bypass
S96	Switch, Hoist Cable Cutter
S97	Switch, Up Limit
S101	Switch, Over Load Sense
S111	Switch, Fuel Transfer Pump
S112	Switch, Pilot Hoist Control
S124	Switch, Sel-Windshield Wiper
S134	Switch, Chip Detector Sel.
S195	Switch, Differential Pressure
T1	Transformer 115/28V
TB1	Terminal Block, Fwd Instrument Panel
TB2	Terminal Block, Overhead Console R/H
TB3	Terminal Block, Overhead Console L/H
TB4	Terminal Block, Aft Fuel Cell
TB9	Terminal Block, Top External & Dome Lights
TB12	Terminal Block, Pedestal Panel Edge Lights
TB13	Terminal Block, Instrument Panel Lights
TB14	Terminal Block, Instrument Panel Section Lights

Table F-1. Equipment List (Cont)

ITEM NO.	DESCRIPTION
TB15	Terminal Block, Cockpit Lights L/H
TB16	Terminal Block, Cockpit Lights R/H
TB22	Terminal Block, Copilot Headset
TB23	Terminal Block, Pilot Headset
TB26	Terminal Block, DC Ground & Audio
TB29	Terminal Block, Instrument Ground
TB34	Terminal Block, Aft Dome Light Panel
TB35	Terminal Block, R/H Fuel Cell
TB36	Terminal Block, External Power Diode
TB38	Terminal Block, L/H Fuel Cell
TB39	Terminal Block, Electrical Compartment Aft
TB45	Terminal Block, Pitot Heater - Disconnect
TB60	Terminal Block, Battery Voltage, Fwd
TB61	Terminal Block, Battery Voltage, Aft
TB80	Terminal Block, XMSN Chip Detector
VR1	Regulator - Voltage (Main Generator)
VR2	Regulator - Voltage (Standby Generator)
W1	Cable Assembly, Fire Detector
Z2	Engine Ignition Unit
Z3	Flasher Unit - Navigation Lights
Z5	XMSN Oil Temperature Bulb
Z6	Engine Oil Temperature Bulb
Z9	Fire Detector Control
Z16	Fuel Quantity Tank Unit - Aft
Z17	Displacement-Roll & Pitch Gyro
Z18	Rate Switch Gyro
Z22	Fuel Quantity Tank Unit R/H Fwd
Z24	Hoist Control Box
Z25	Cable Cutter
Z41	Control Pendant
8CB21	Circuit Breaker, (5A) Smoke Detector
8CB22	Circuit Breaker, (2A) Baggage Compartment
8CB23	Circuit Breaker, (1A) Torque Pressure
8CB24	Circuit Breaker, (1A) Engine Oil Pressure
8CB25	Circuit Breaker, (1A) XMSN Oil Pressure
8CB26	Circuit Breaker, (1A) XMSN Chip Detector
8DS1	Indicator, Baggage Fire
8DS2	Indicator, Baggage Open
8DS3	Indicator, Engine Oil Filter
8DS4P1	Plug, Lower Anti-Collision Light
8E7	Detector, Tail Rotor Shaft 42° GB
8E8	Detector, Tail Rotor 90° GB
8E11	Detector, XMSN Lube/Debris Monitor
8E11P1	Plug, XMSN Lube/Debris Monitor
8S1	Switch, Baggage Compartment Fire &Door Warning Test
8S7	Switch, Baggage Compartment Door
8Z4	Amplifier, Smoke Detector
8Z4P1	Plug, Smoke Detector
8Z4P2	Plug, Smoke Detector
8Z5	Detector, Baggage Compartment Smoke Detector
8Z5J1	Receptacle, Baggage Compartment Smoke Detector
8Z5P1	Plug, Baggage Compartment Smoke Detector

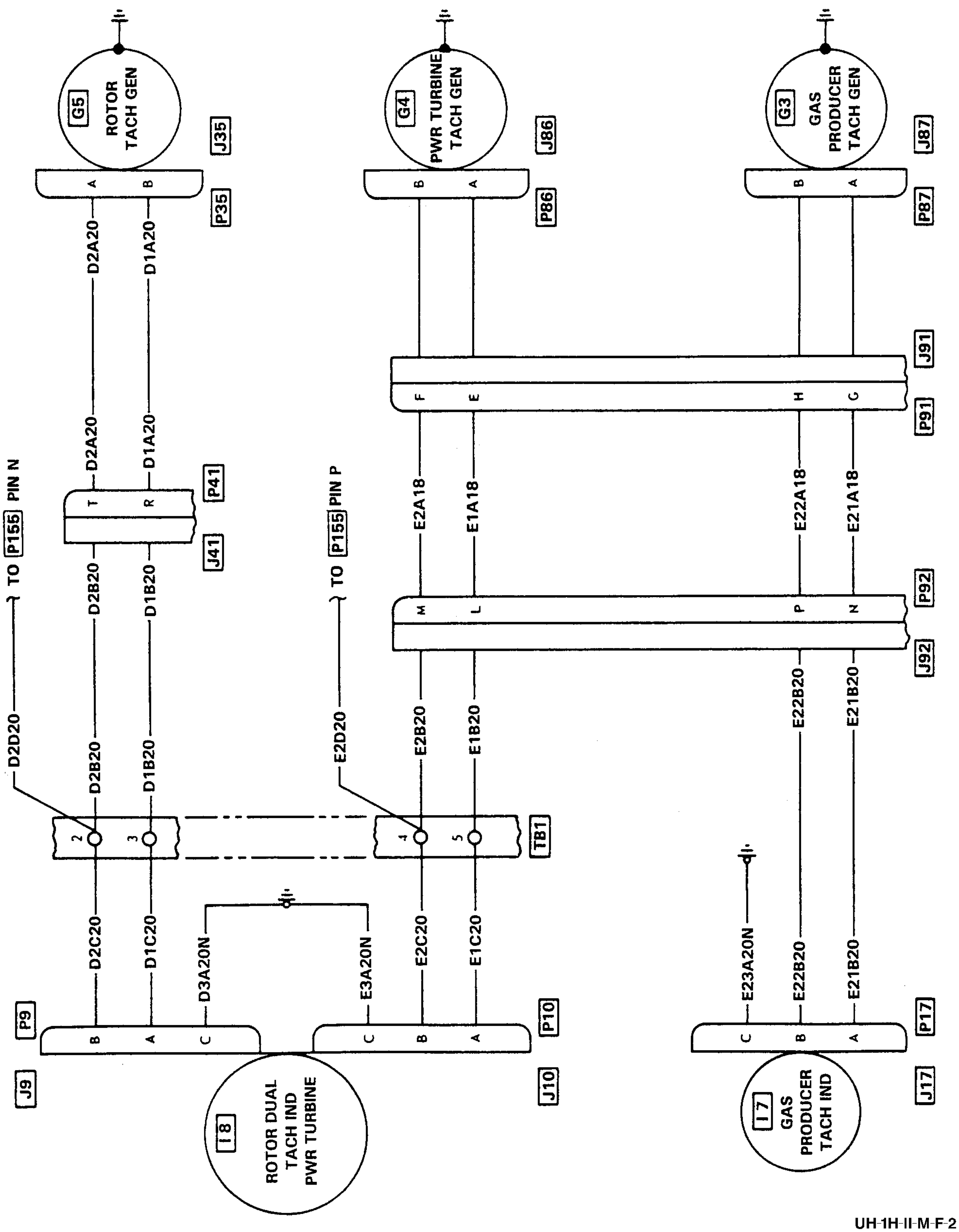


Figure F-2. Tachometer generator system

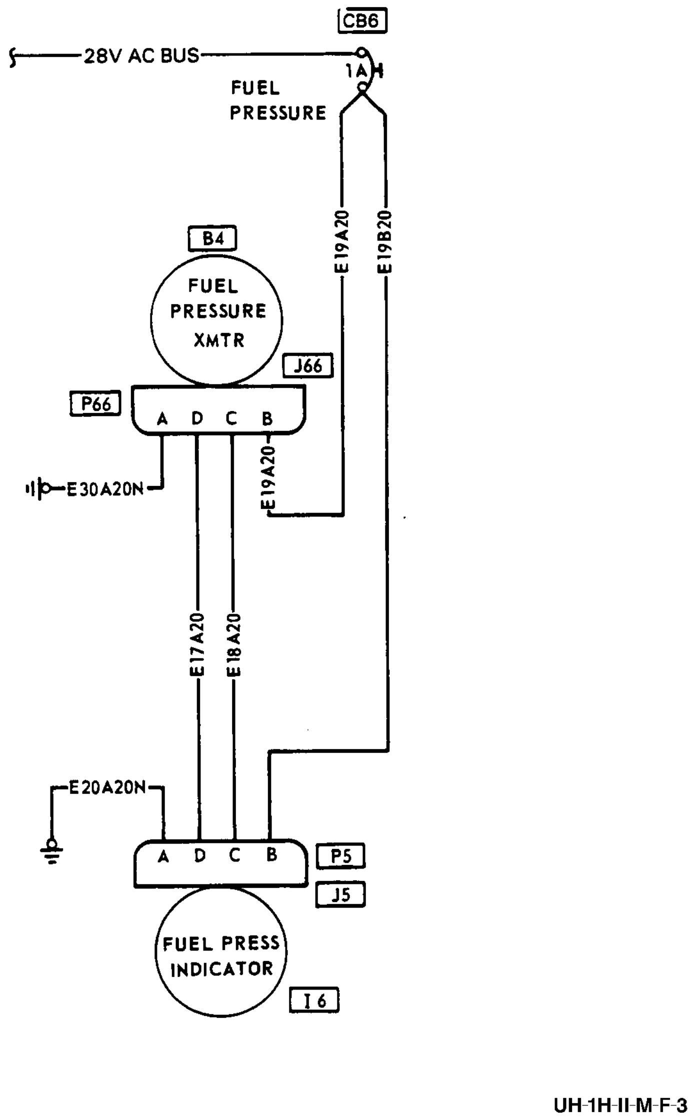


Figure F-3. Fuel pressure indicator system

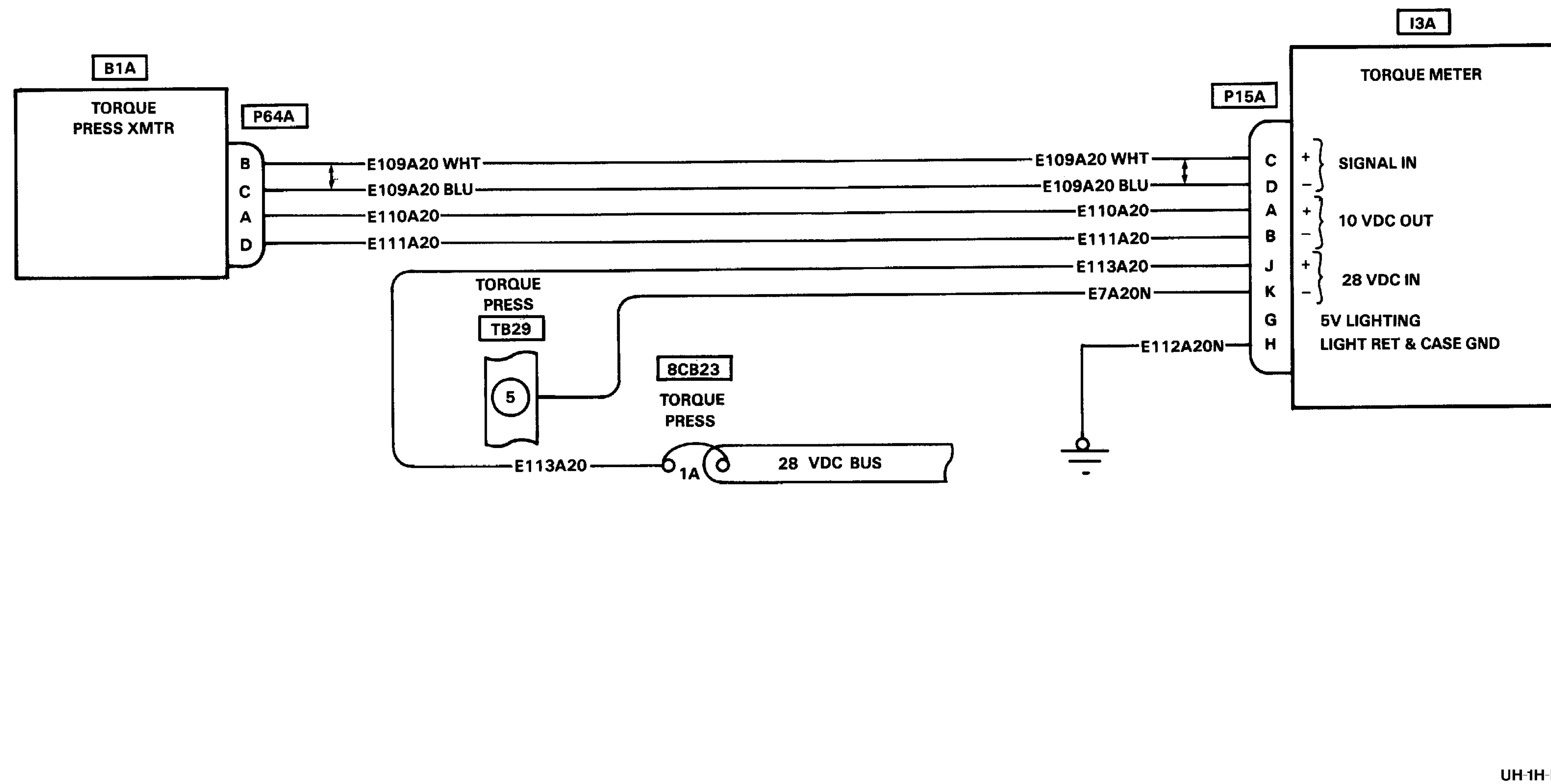


Figure F-4. Torque meter indicator system

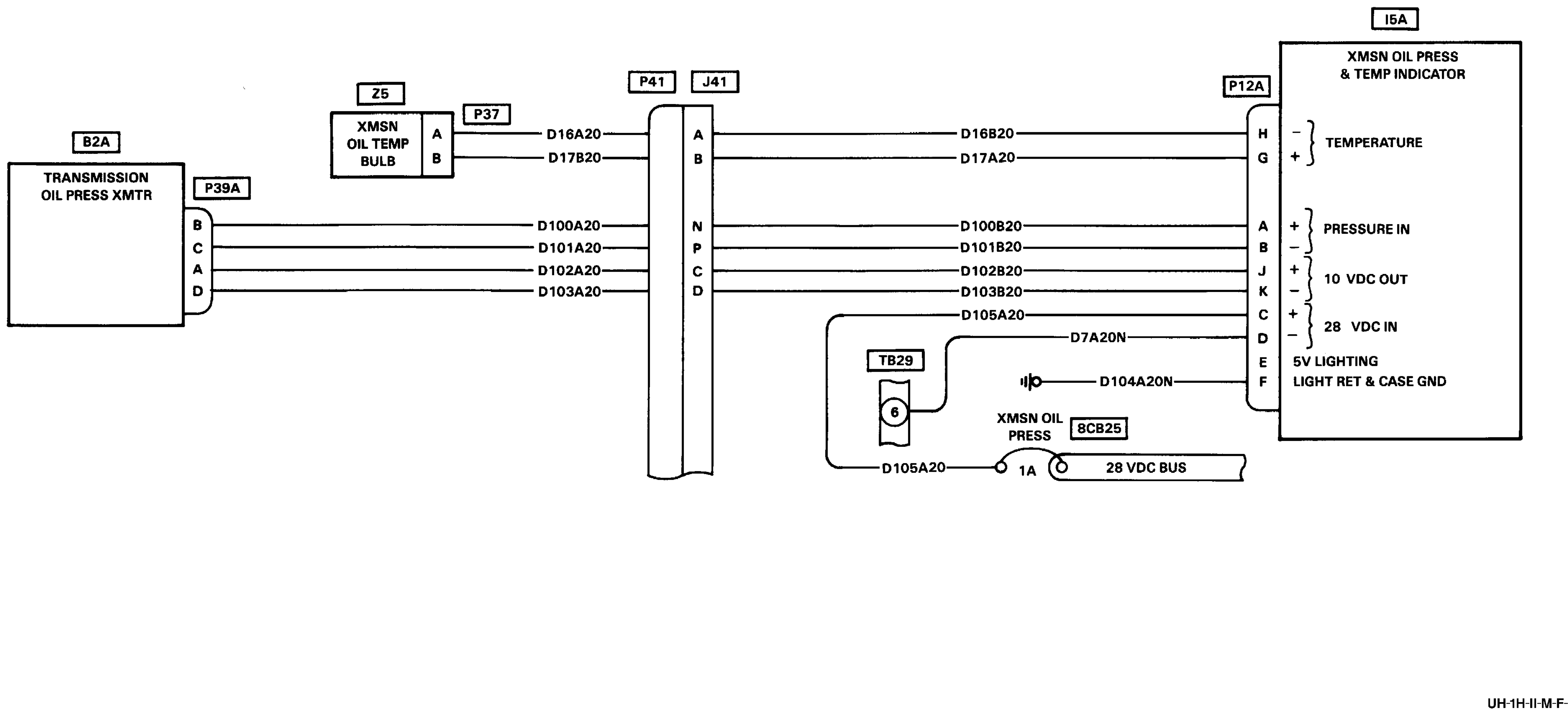


Figure F-4. Transmission oil pressure and temperature indicator system

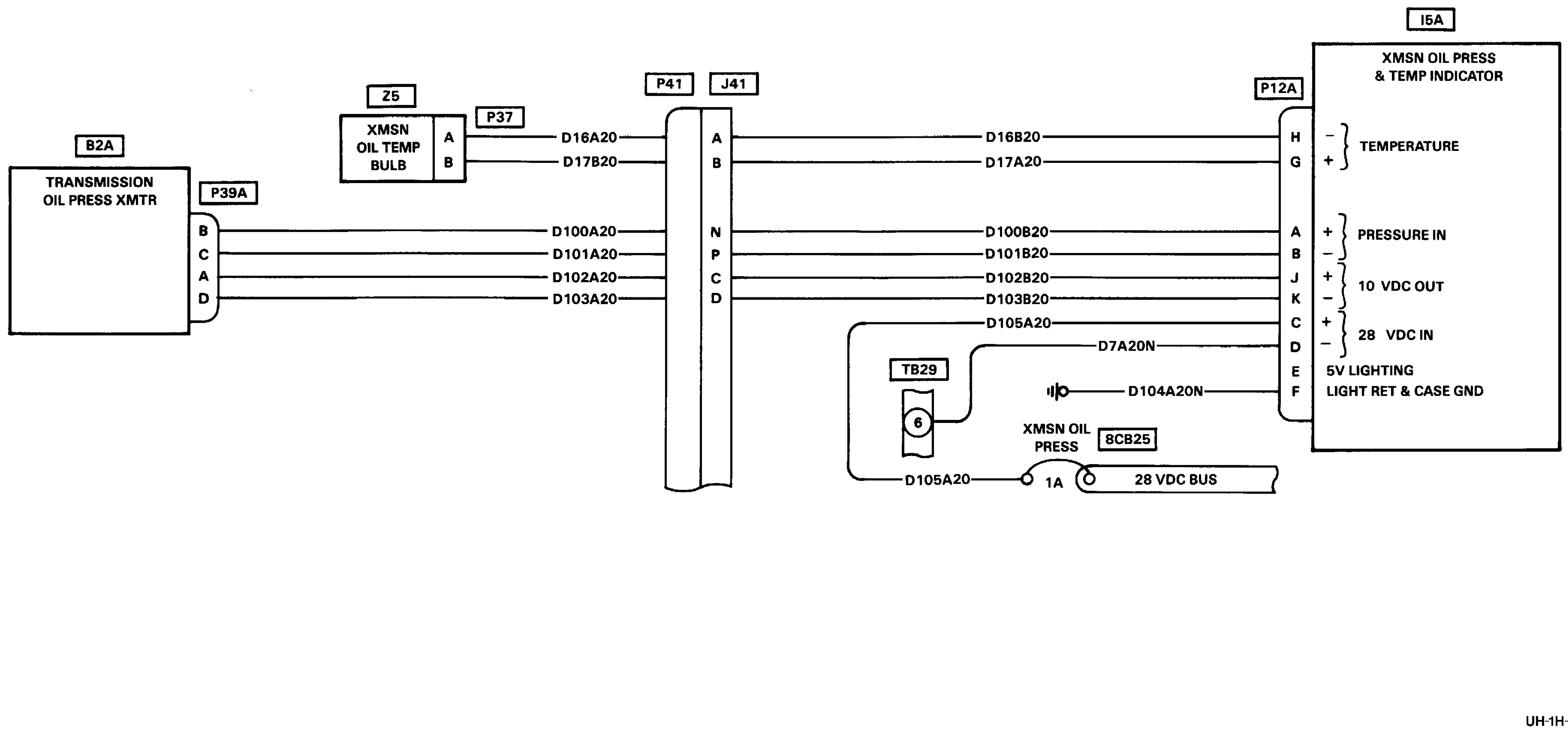
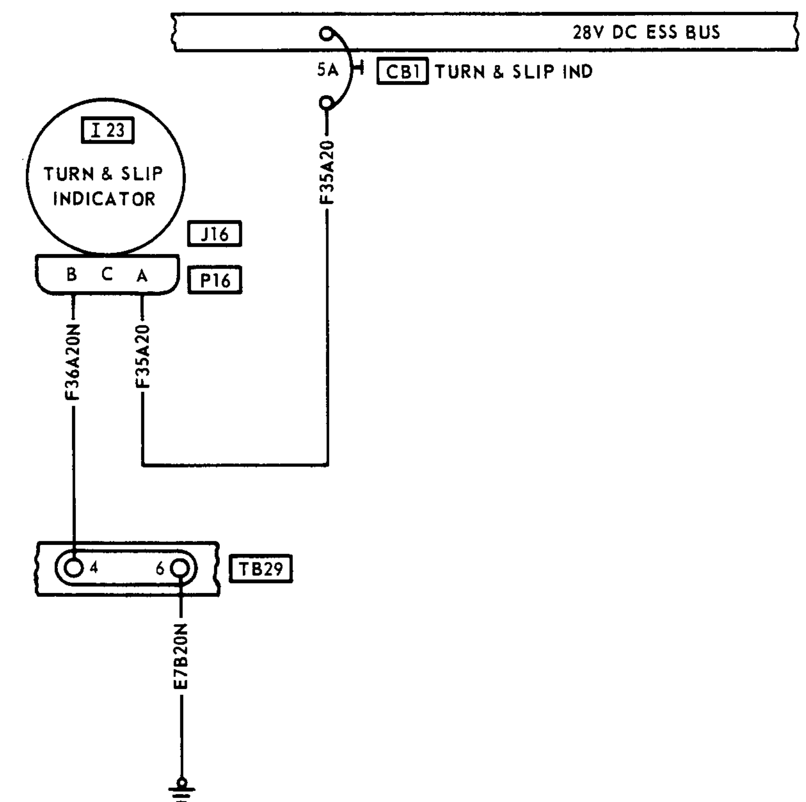


Figure F-5. Engine oil pressure and temperature indicator system



UH-1H-II-M-F-7

Figure F-6. Turn and slip indicator system

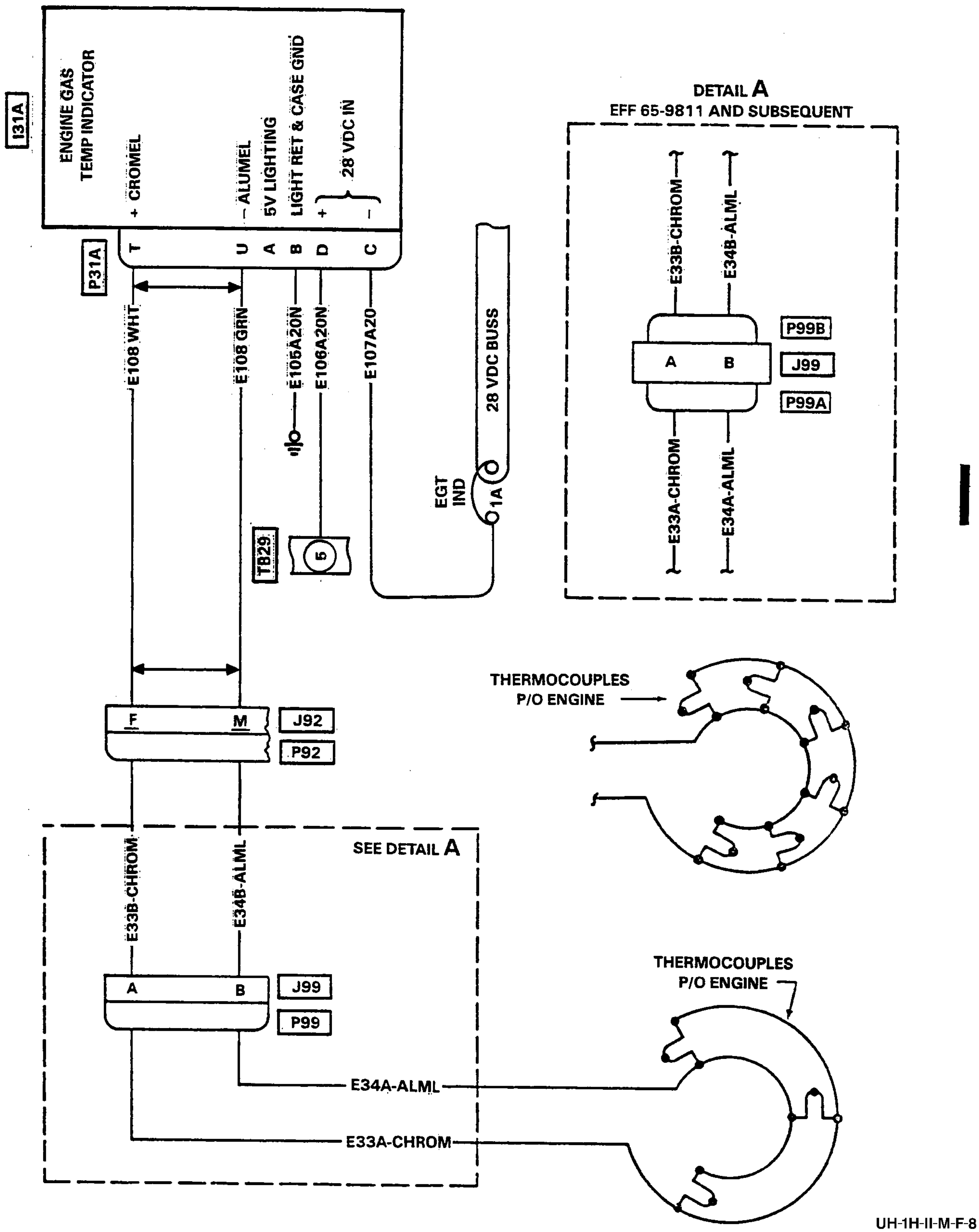
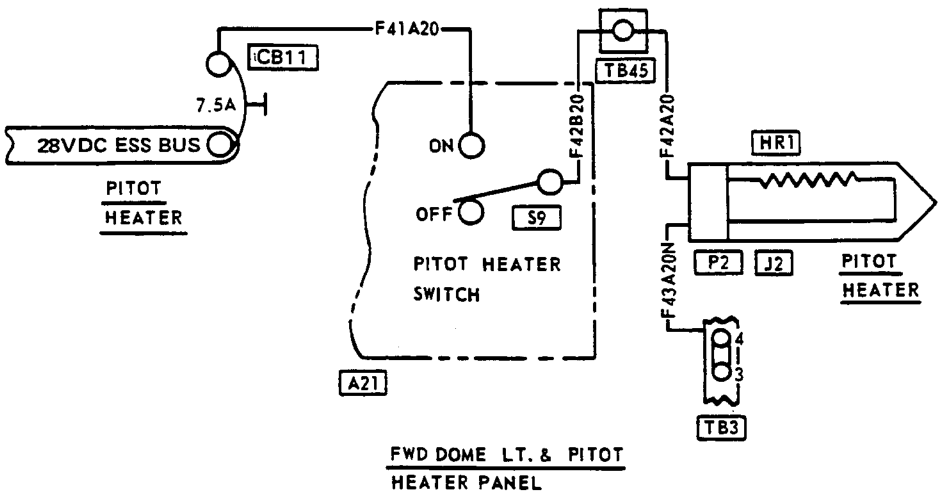


Figure F-8. Engine gas temperature indicator system



UH-1H-II-M-F-9

Figure F-9. Pitot heater system

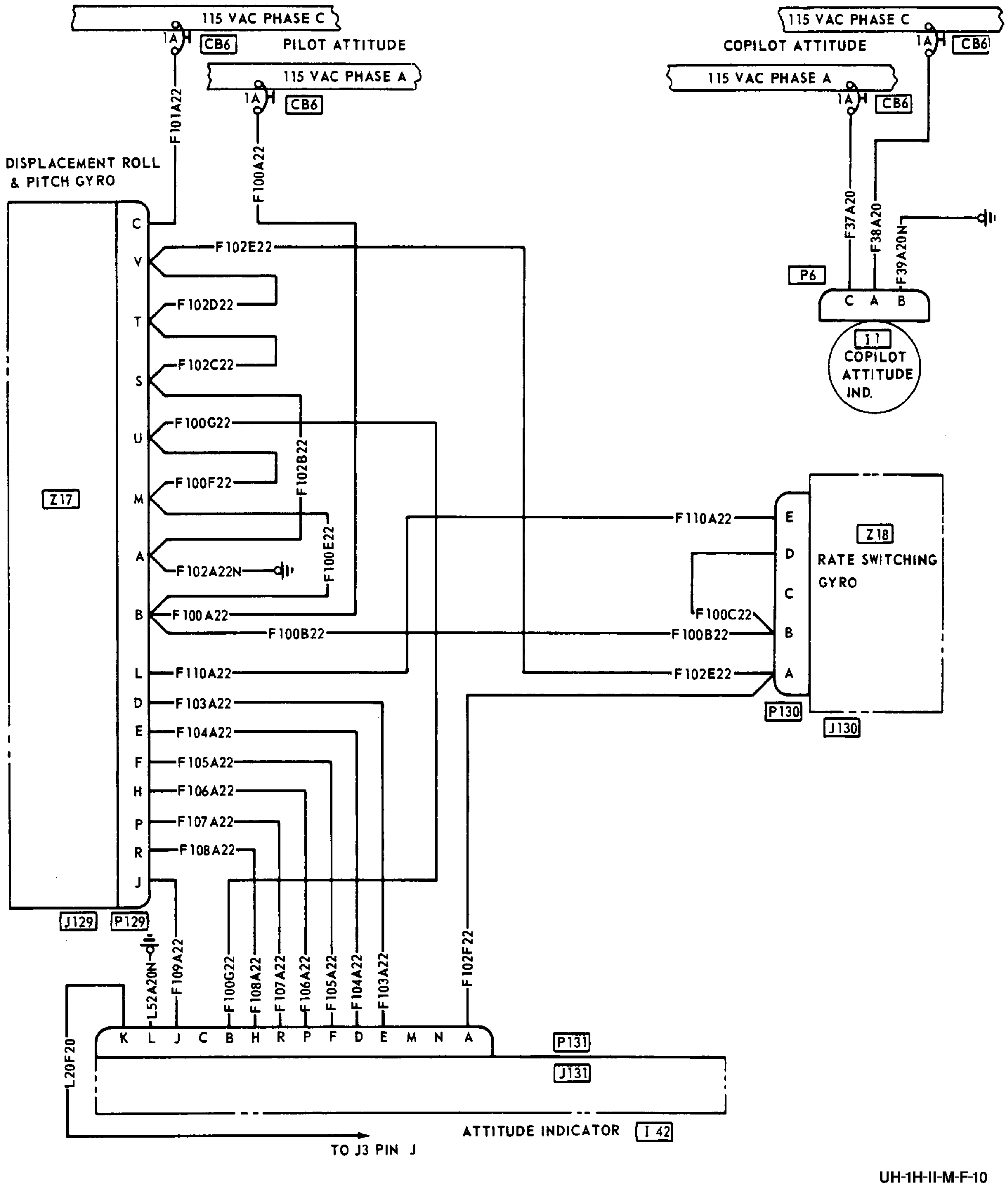


Figure F-10. Attitude indicator system

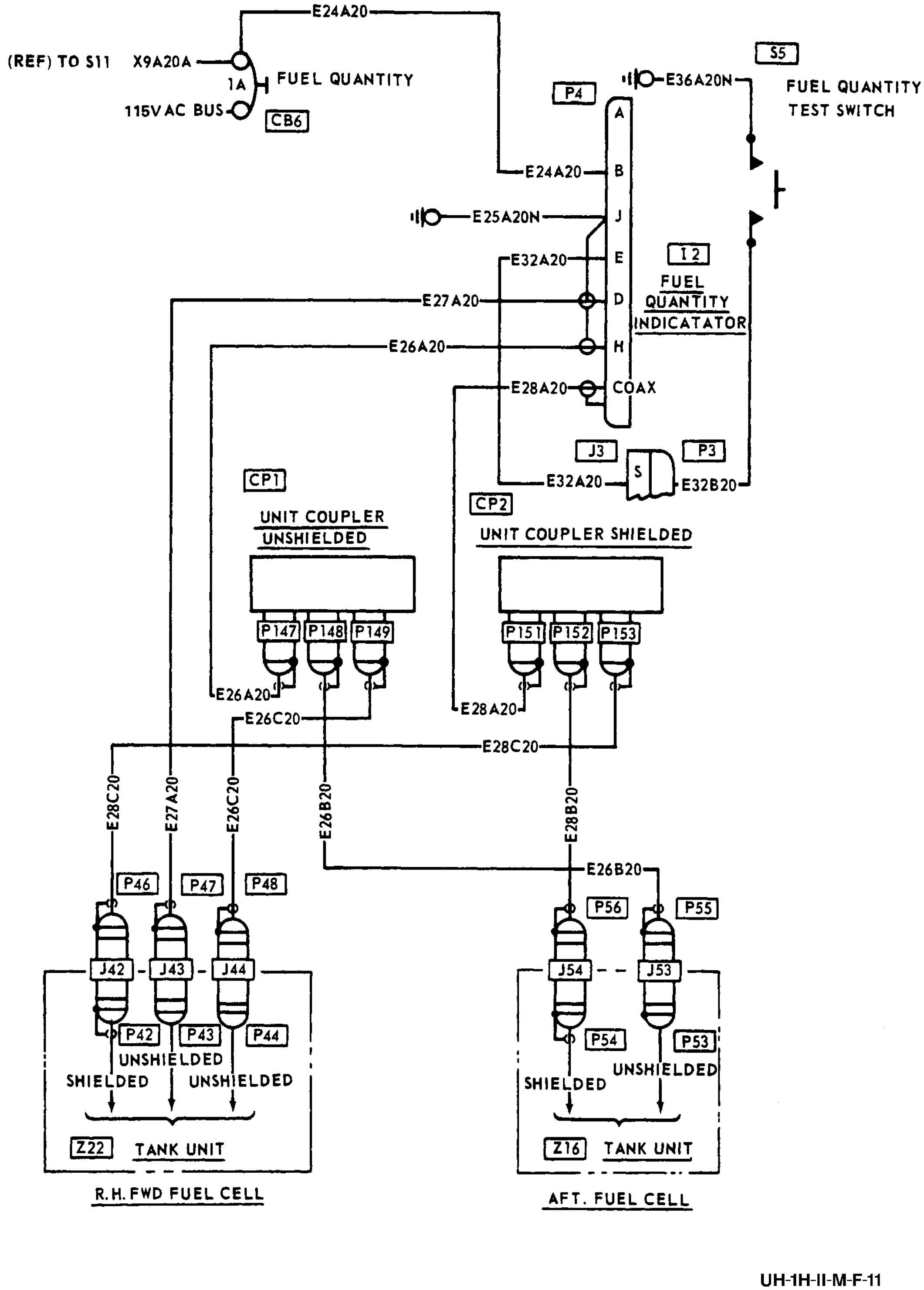


Figure F-11. Fuel quantity system

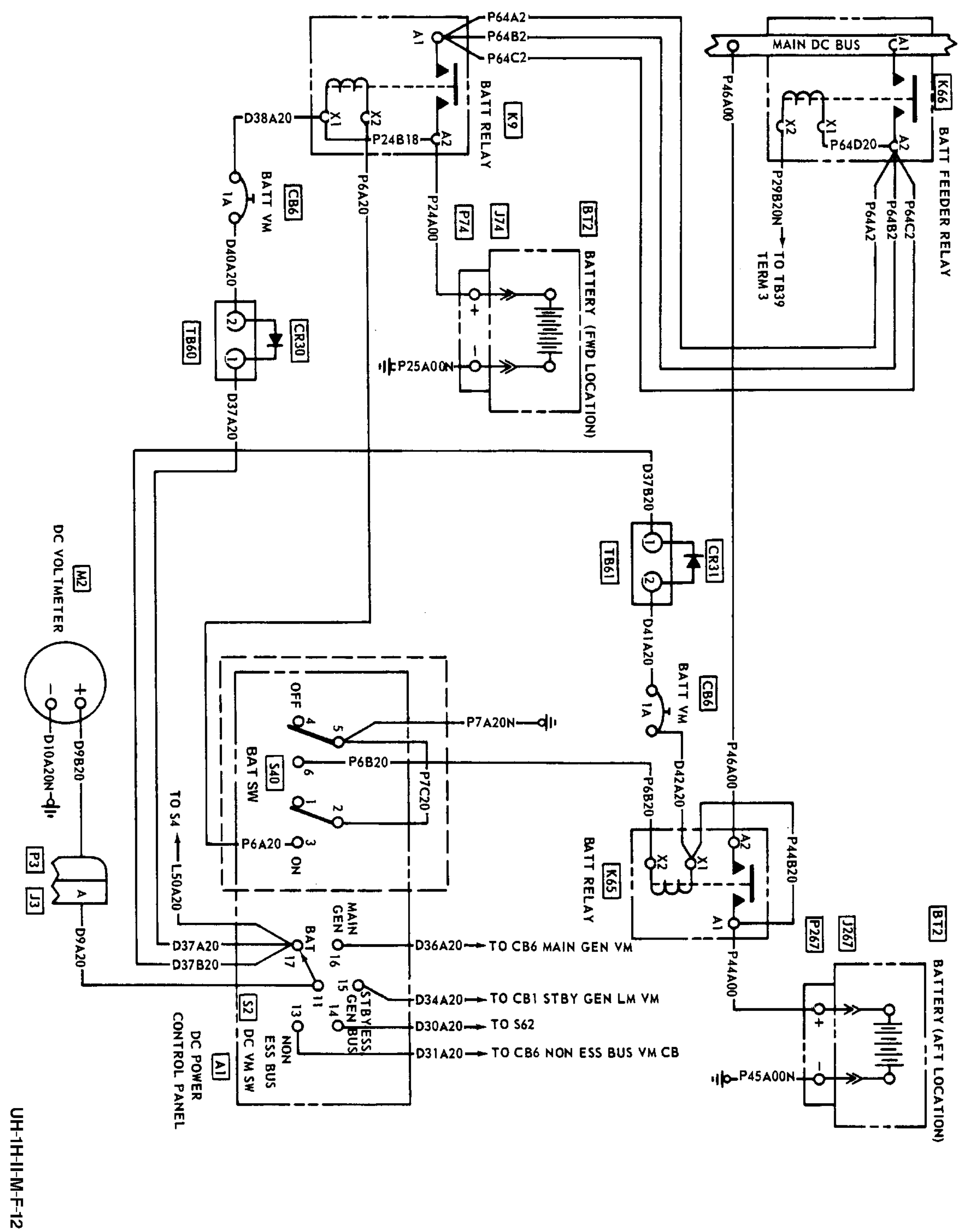


Figure F-12. Battery system

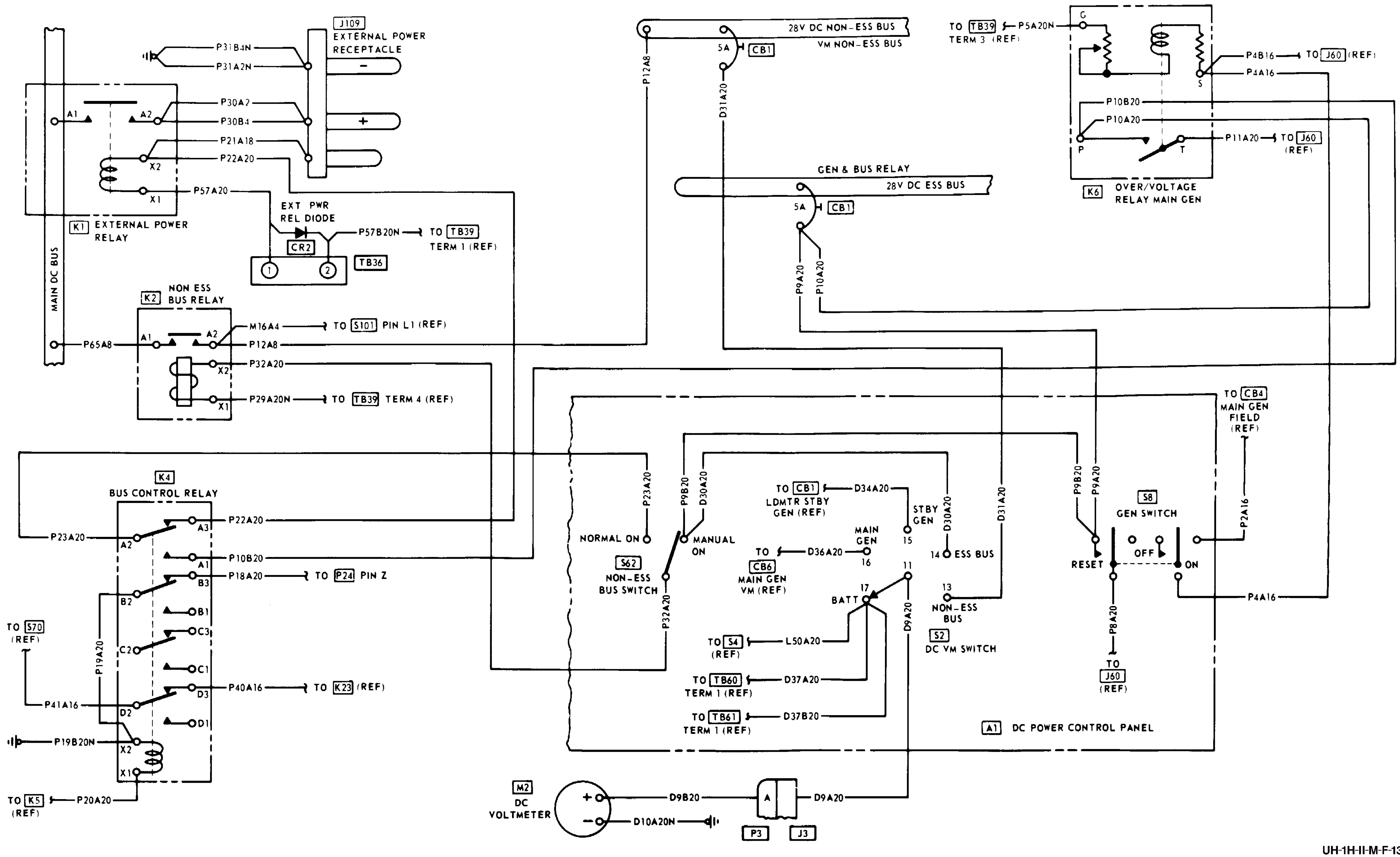


Figure F-13. External power system

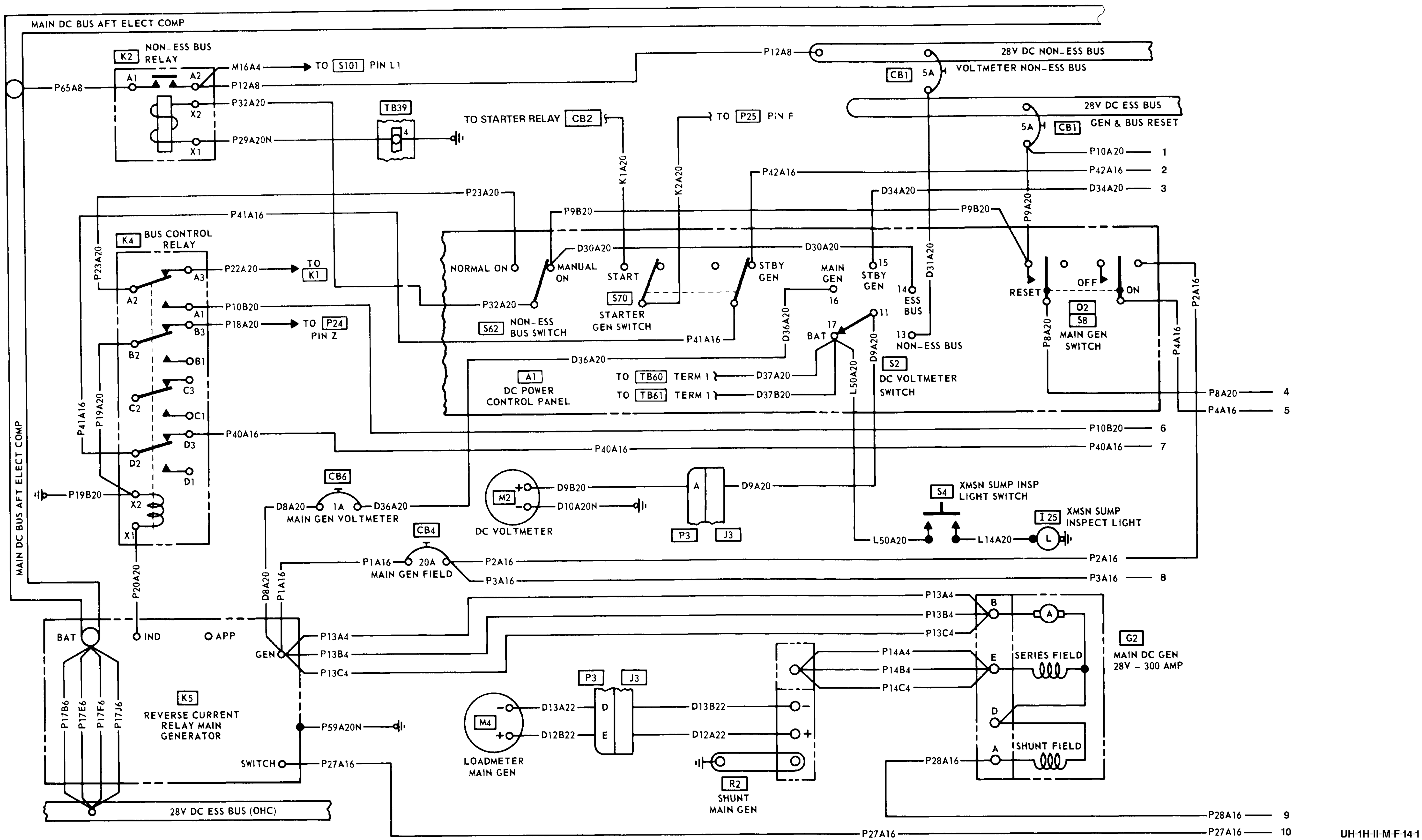


Figure F-14. Generator bus system (Sheet 1 of 2)

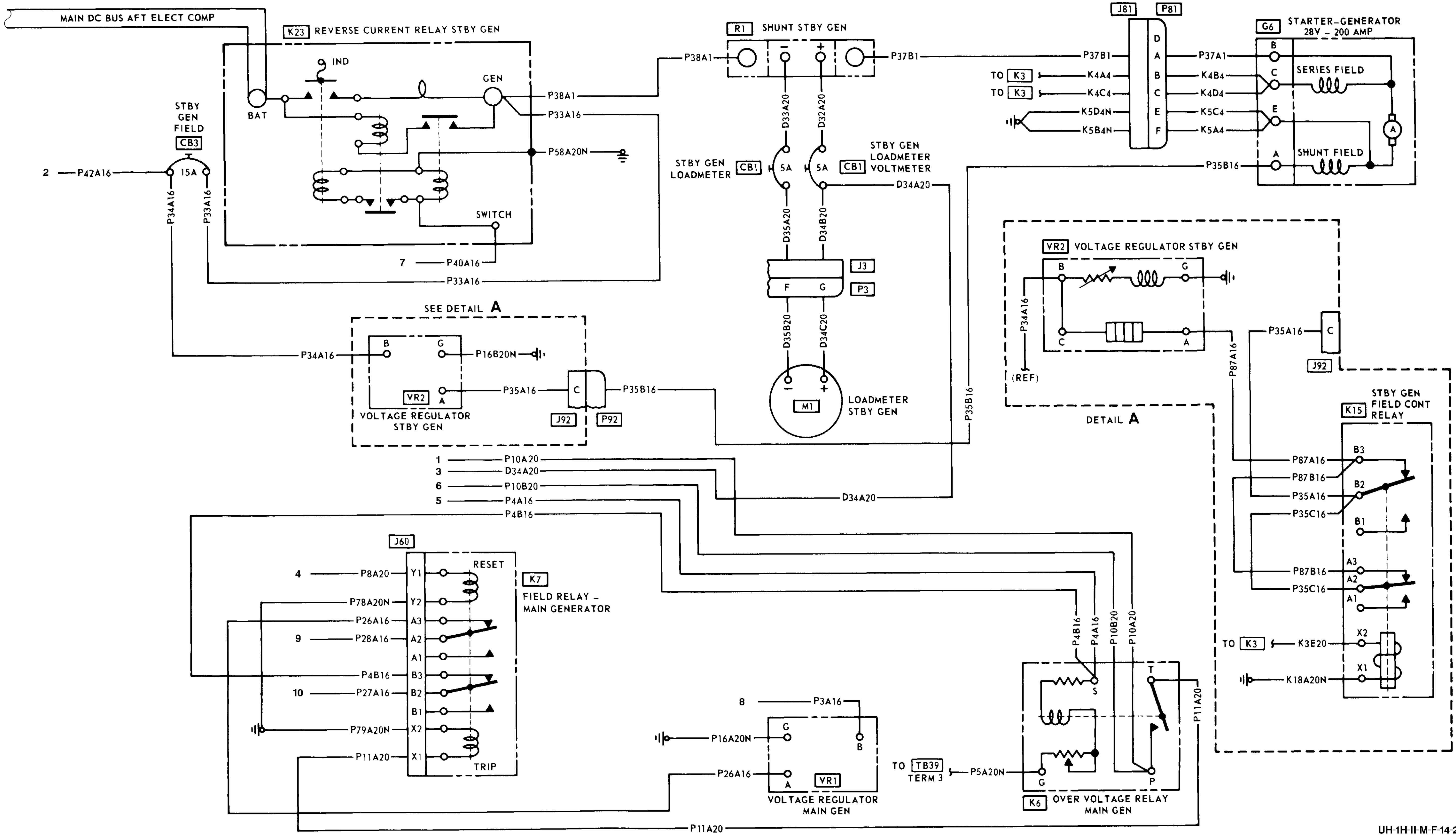
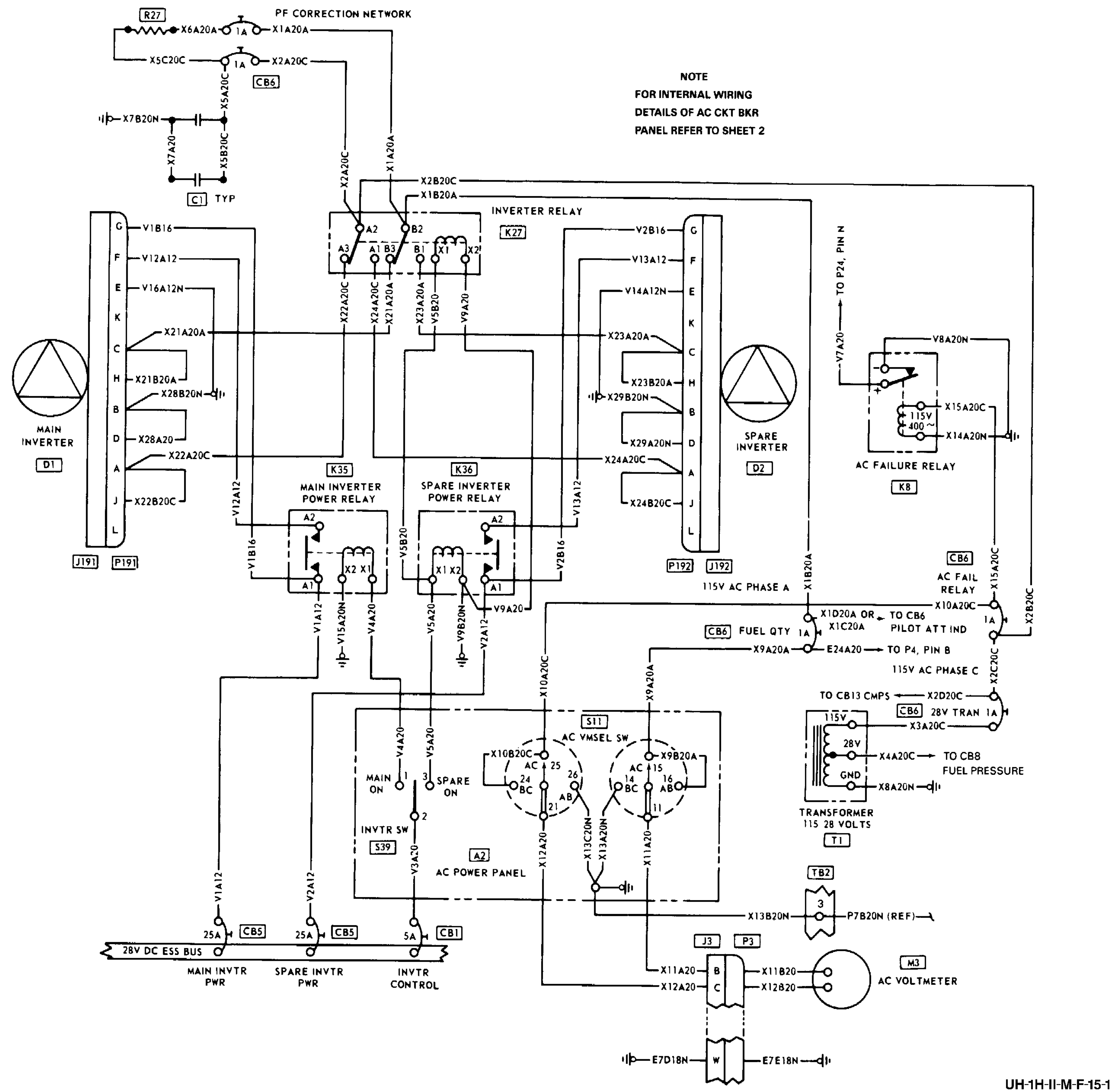
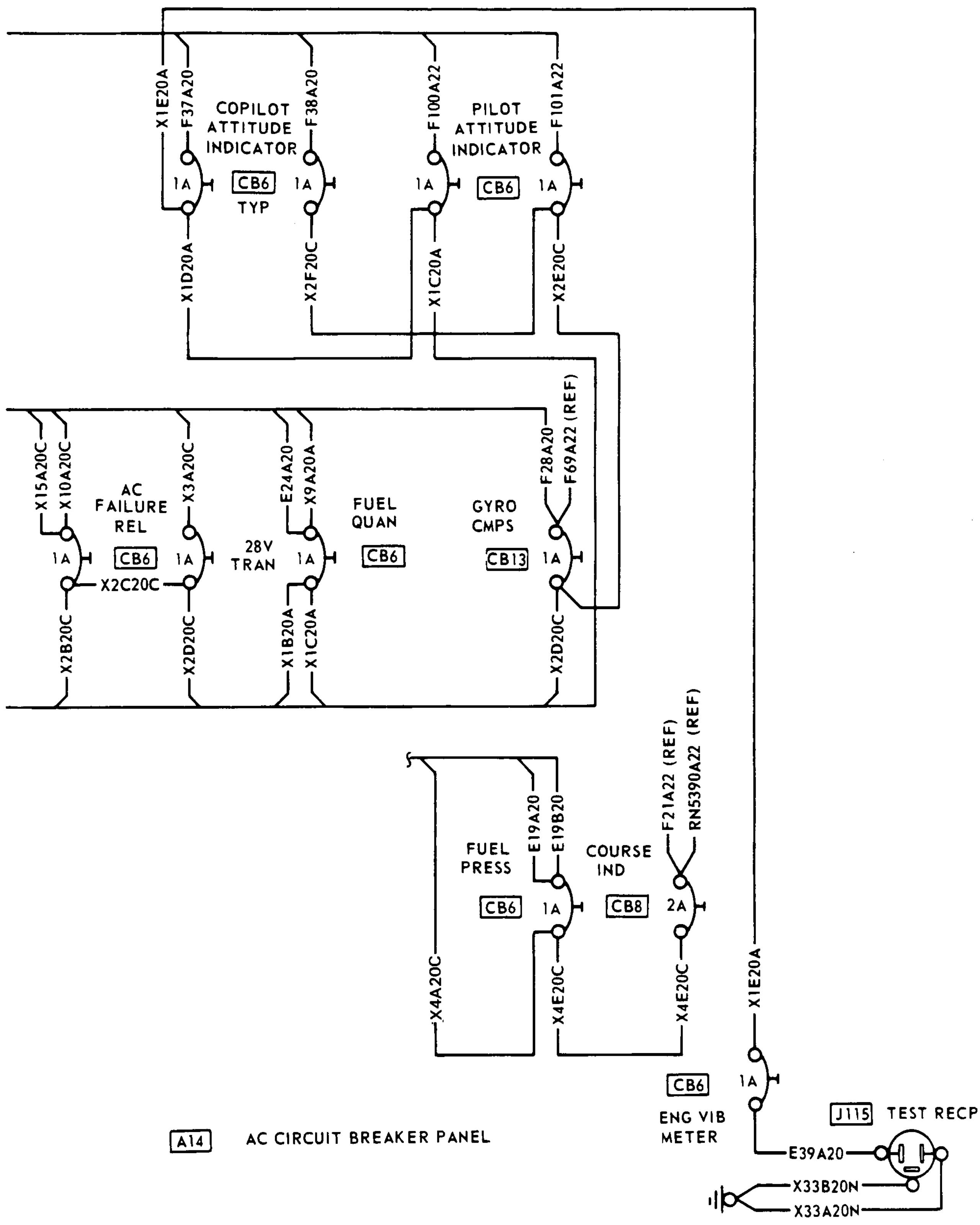


Figure F-14. Generator bus system (Sheet 2 of 2)



UH-1H-II-M-F-15-1

Figure F-15. AC power system (Sheet 1 of 2)



UH-1H-II-M-F-15-2

Figure F-15. AC power system (Sheet 2 of 2)

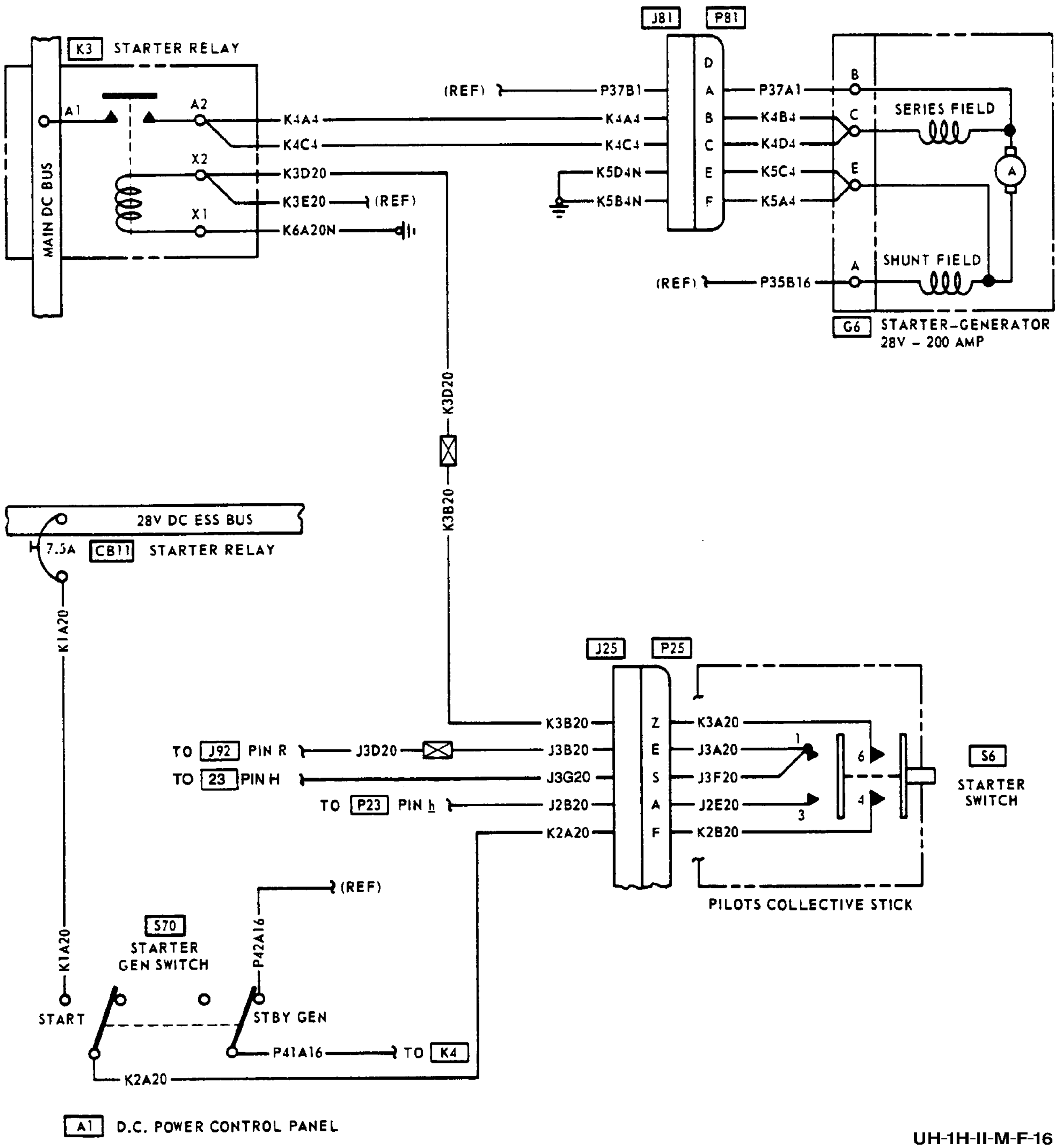


Figure F-16. Starter system

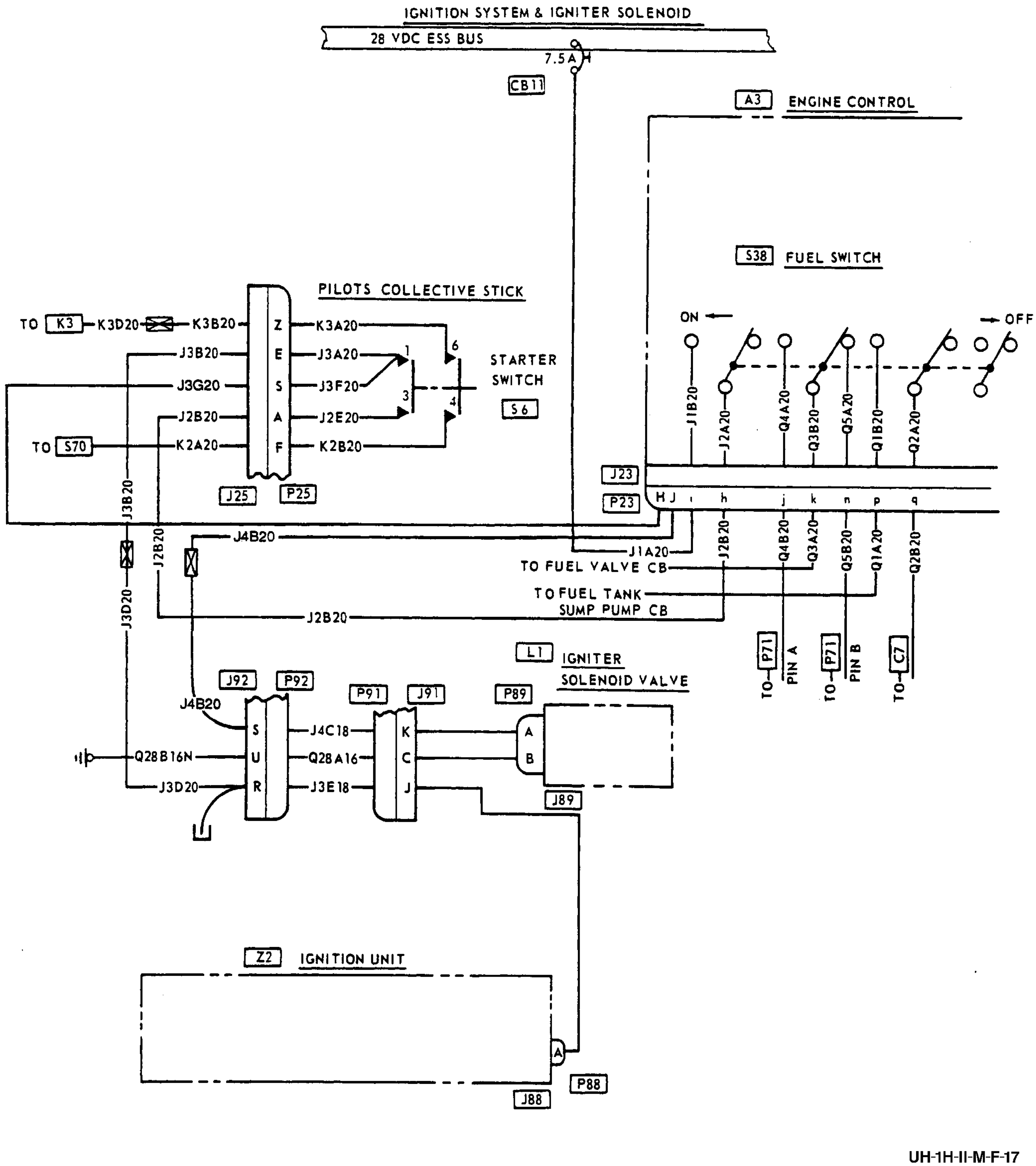


Figure F-17. Ignition system

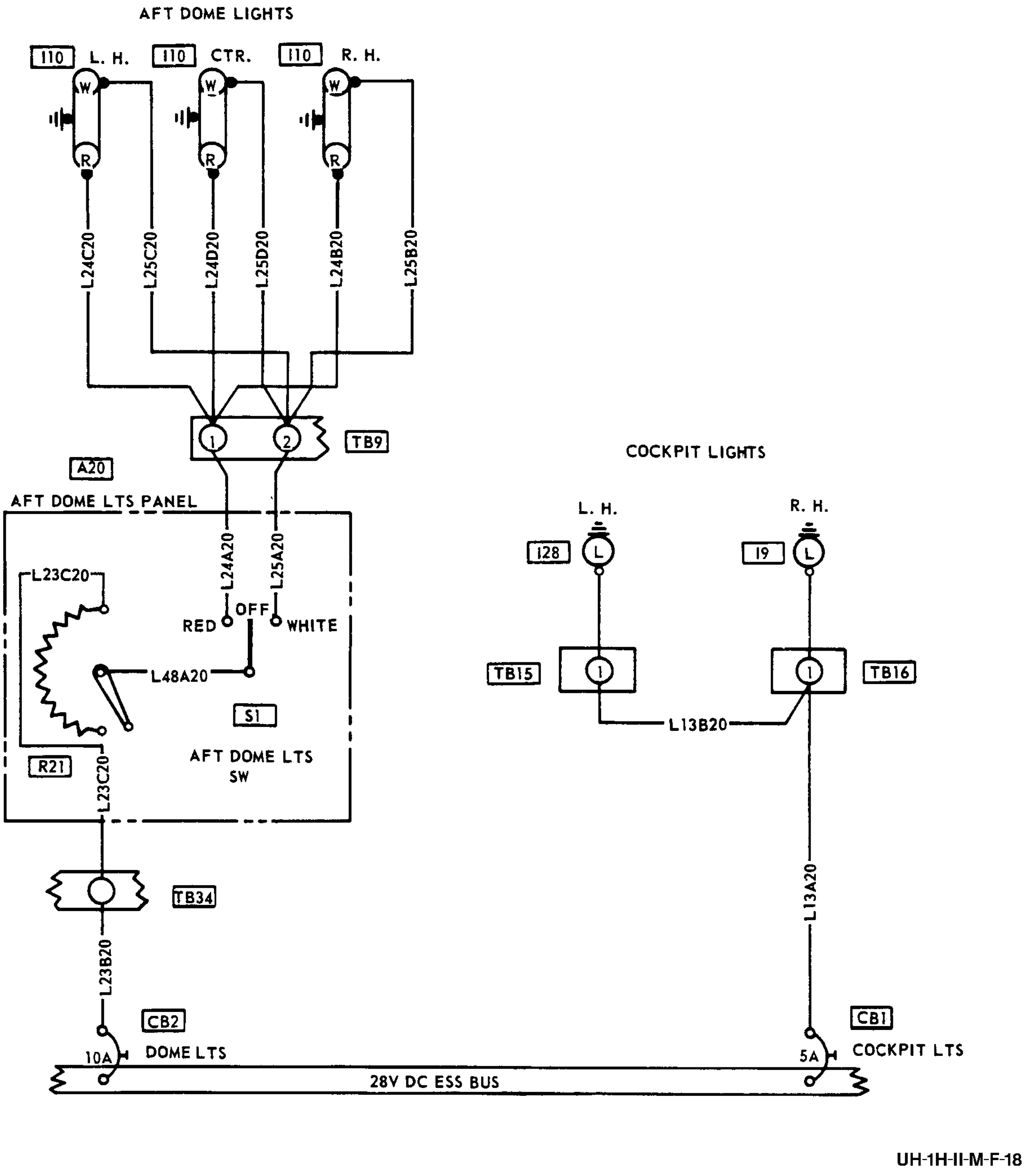
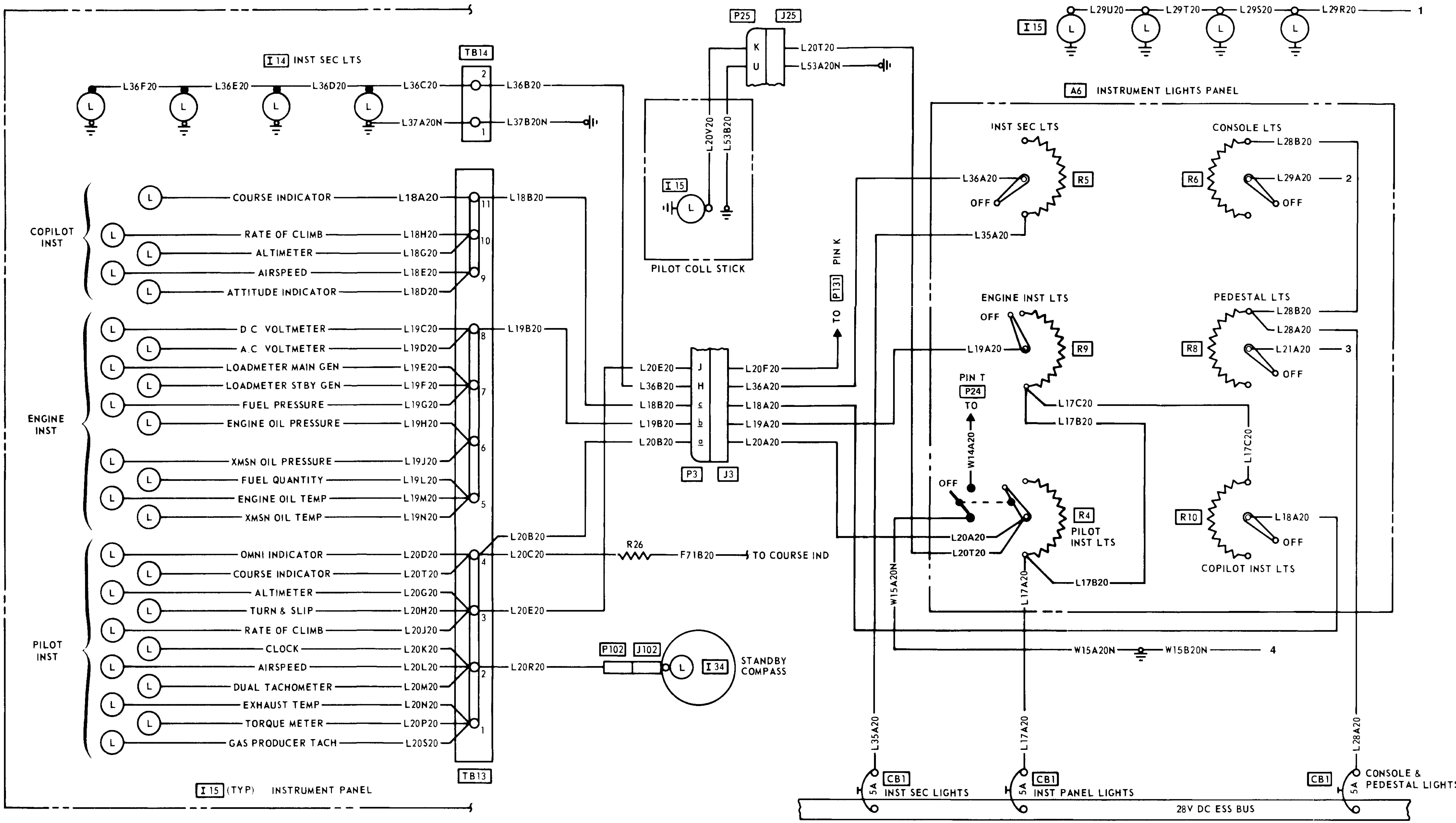


Figure F-18. Cockpit and dome lights system



UH-1H-II-M-F-19-1

Figure F-19. Instrument, console, and pedestal lights system (Sheet 1 of 2)

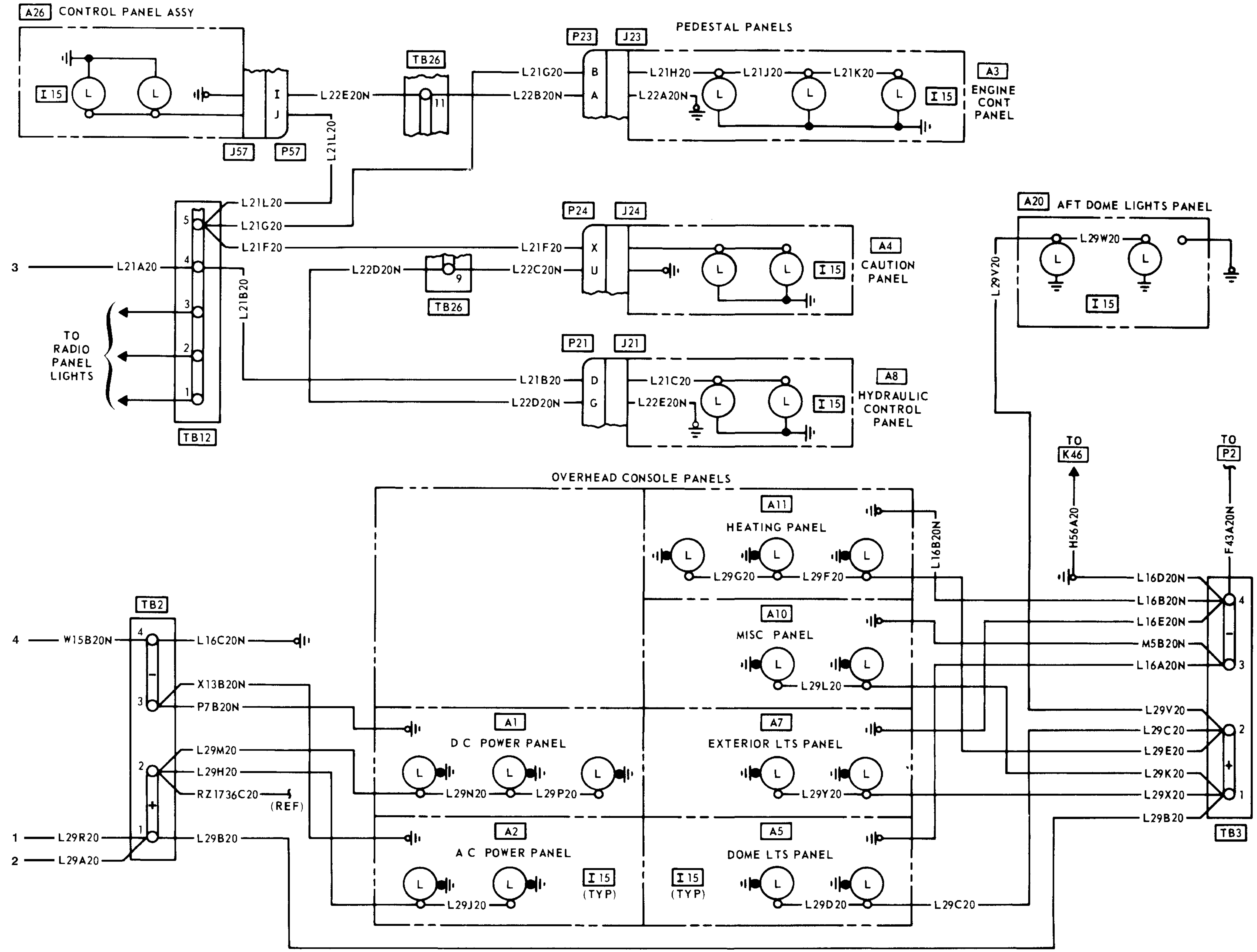


Figure F-19. Instrument, console, and pedestal lights system (Sheet 2 of 2)

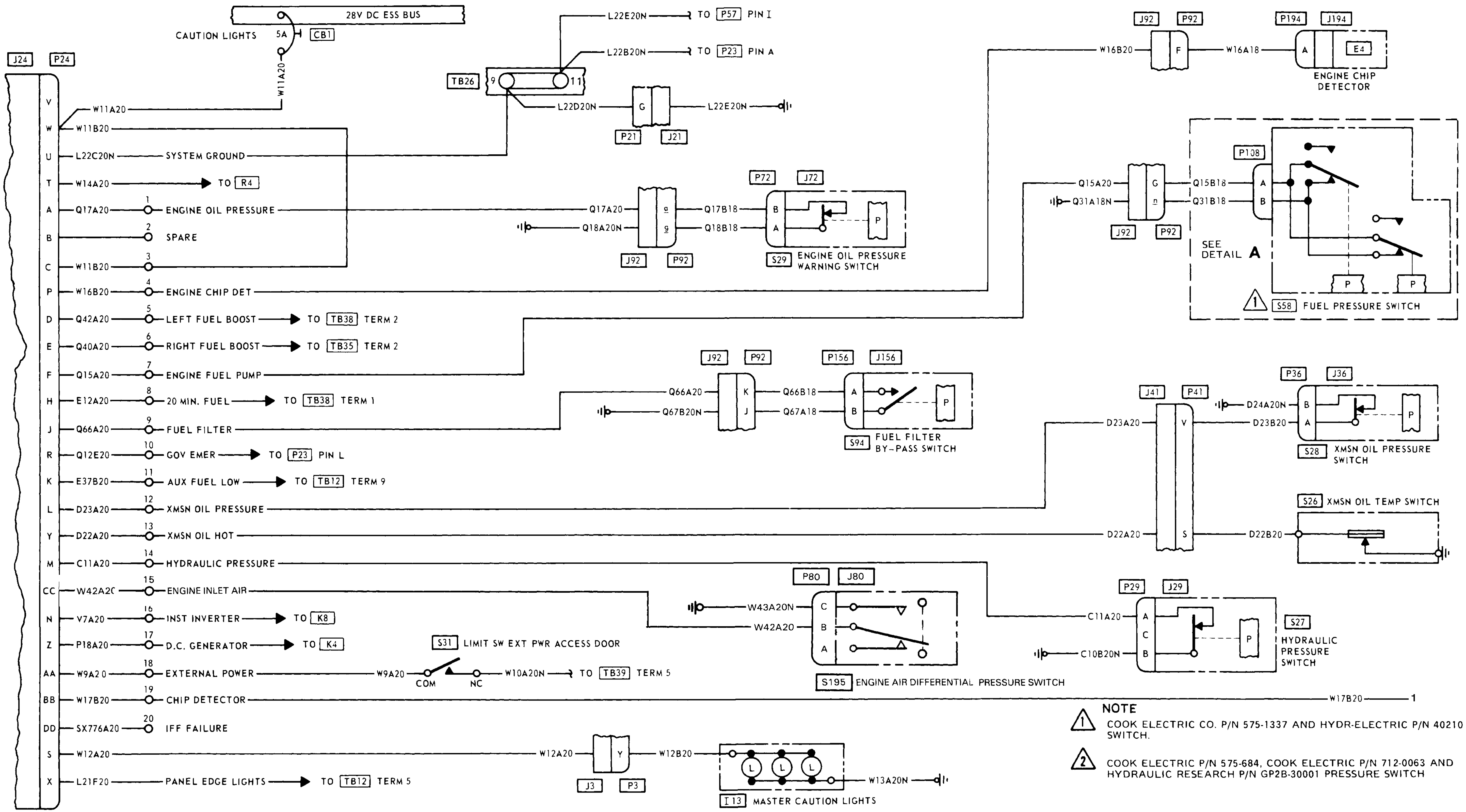


Figure F-20. Caution lights system (Sheet 1 of 2)

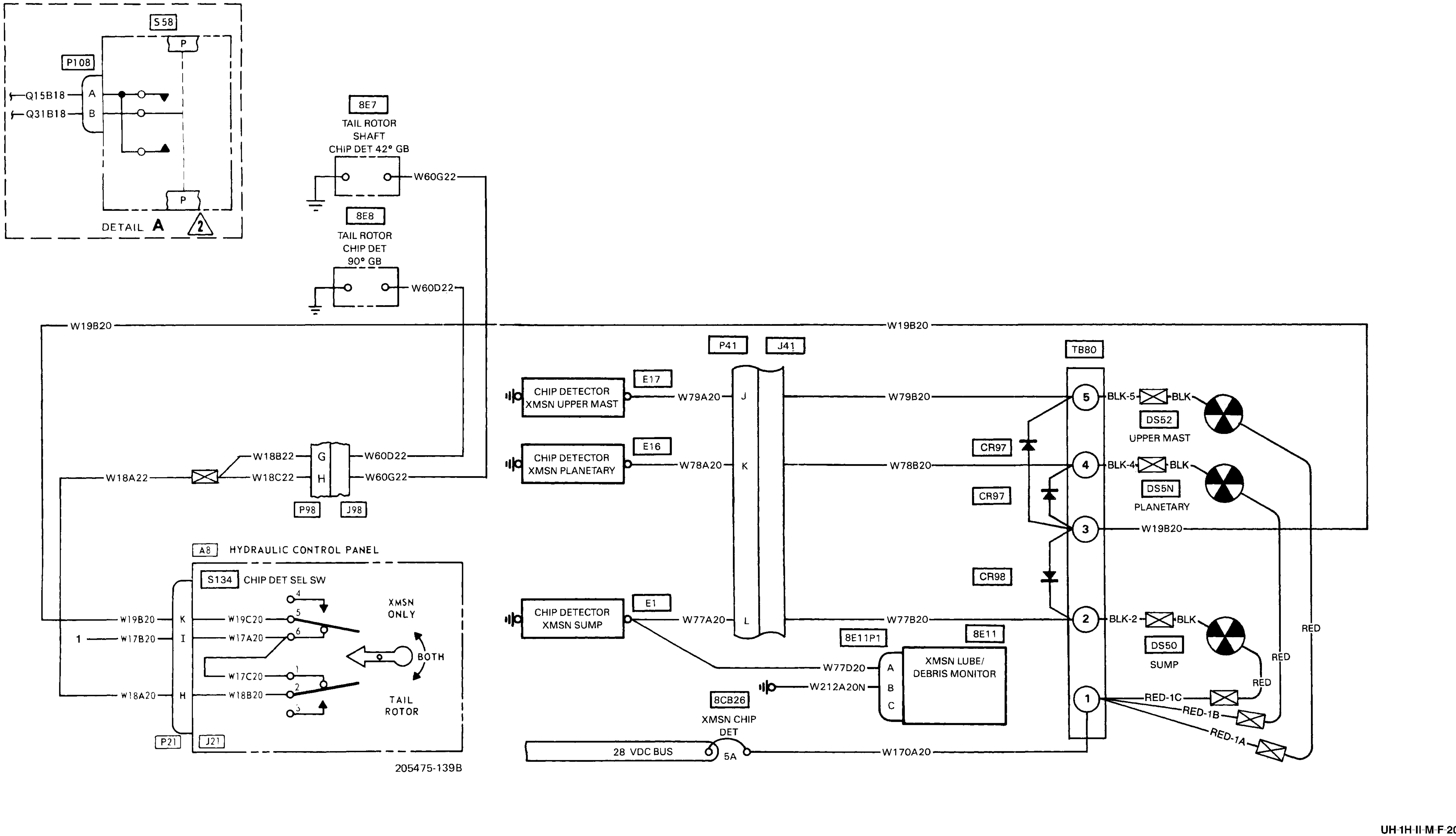


Figure F-20. Caution lights system (Sheet 2 of 2)

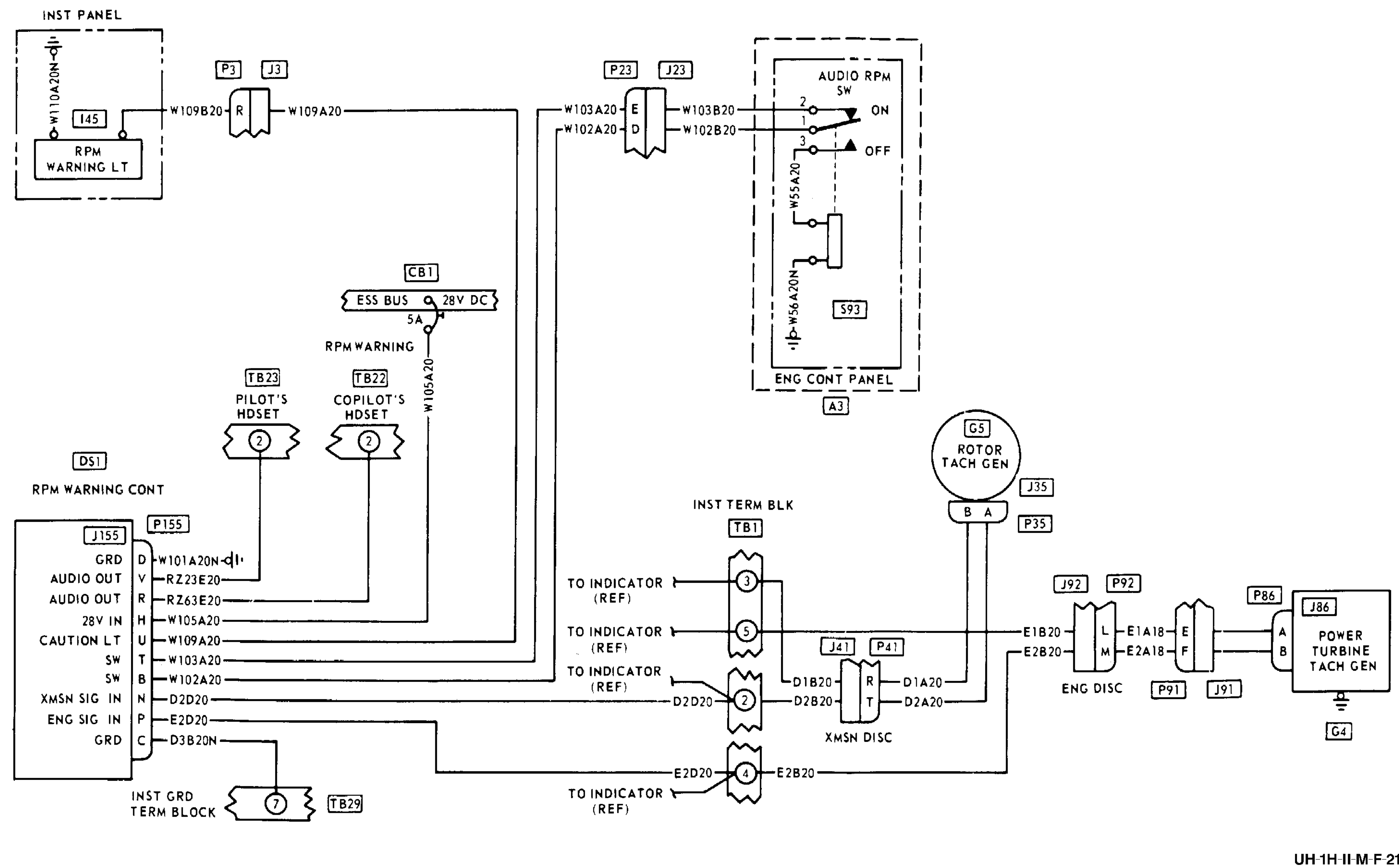


Figure F-21. RPM warning system

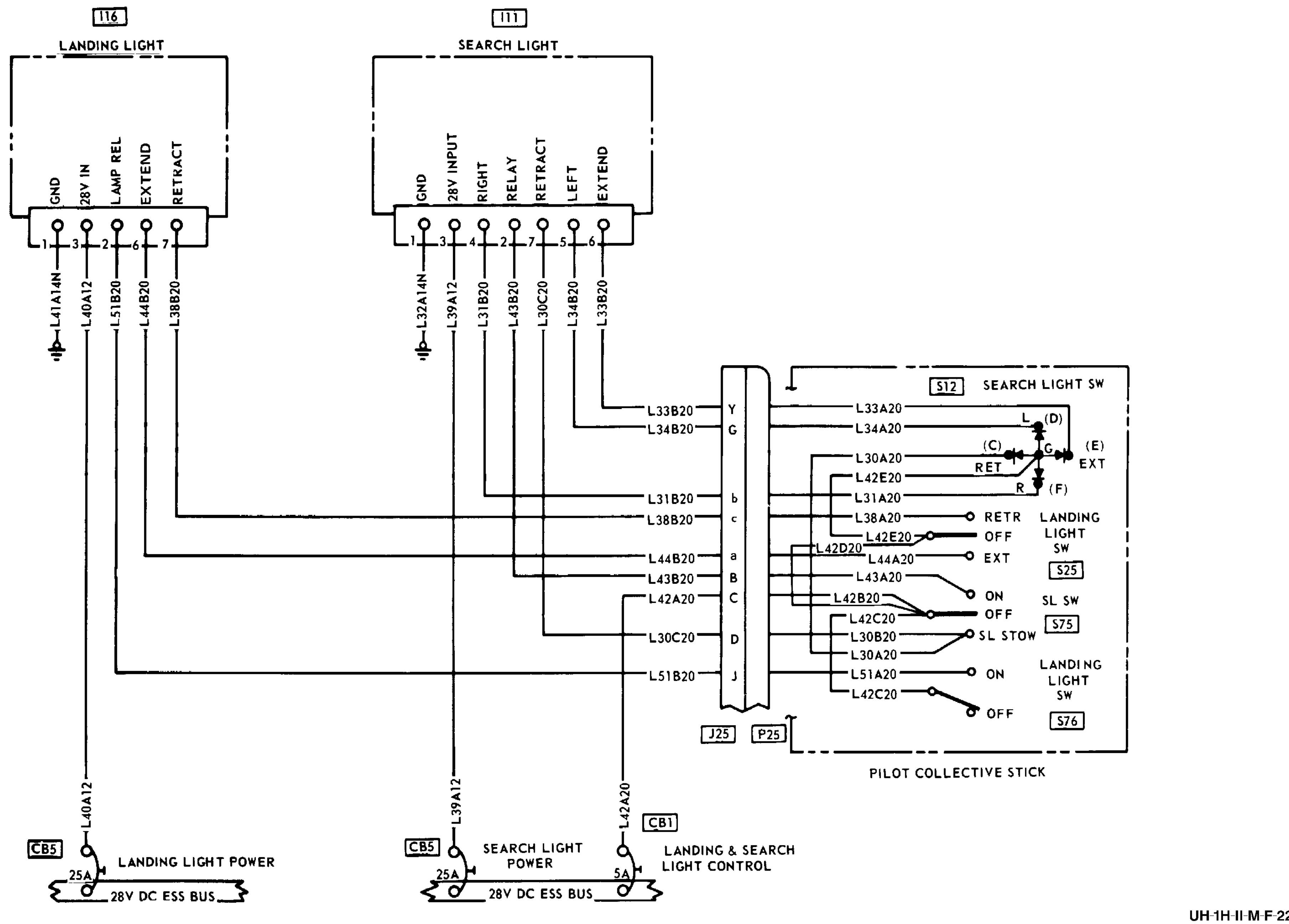


Figure F-22. Landing and searchlight system

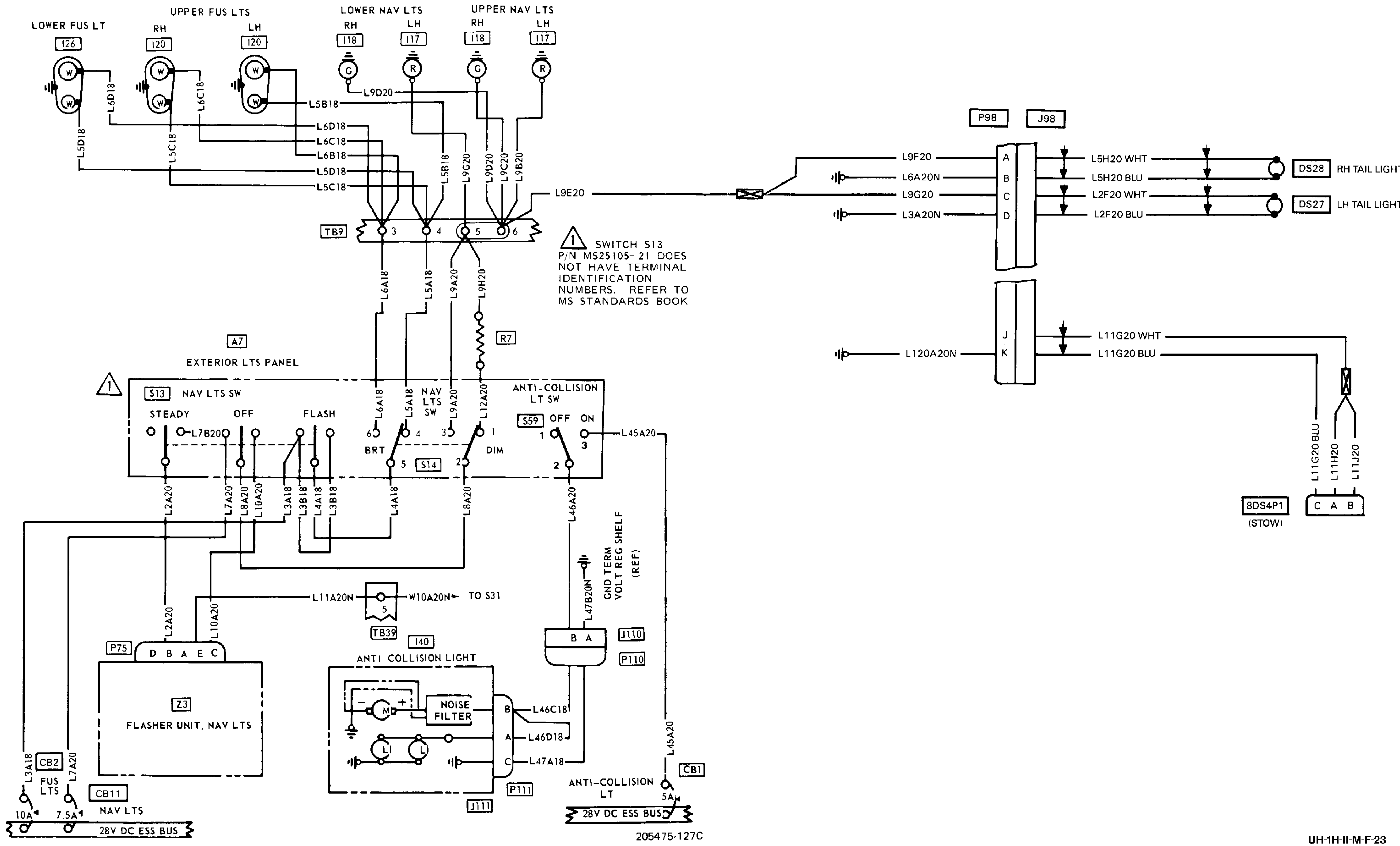


Figure F-23. Navigation, fuselage, and anti-collision lights system

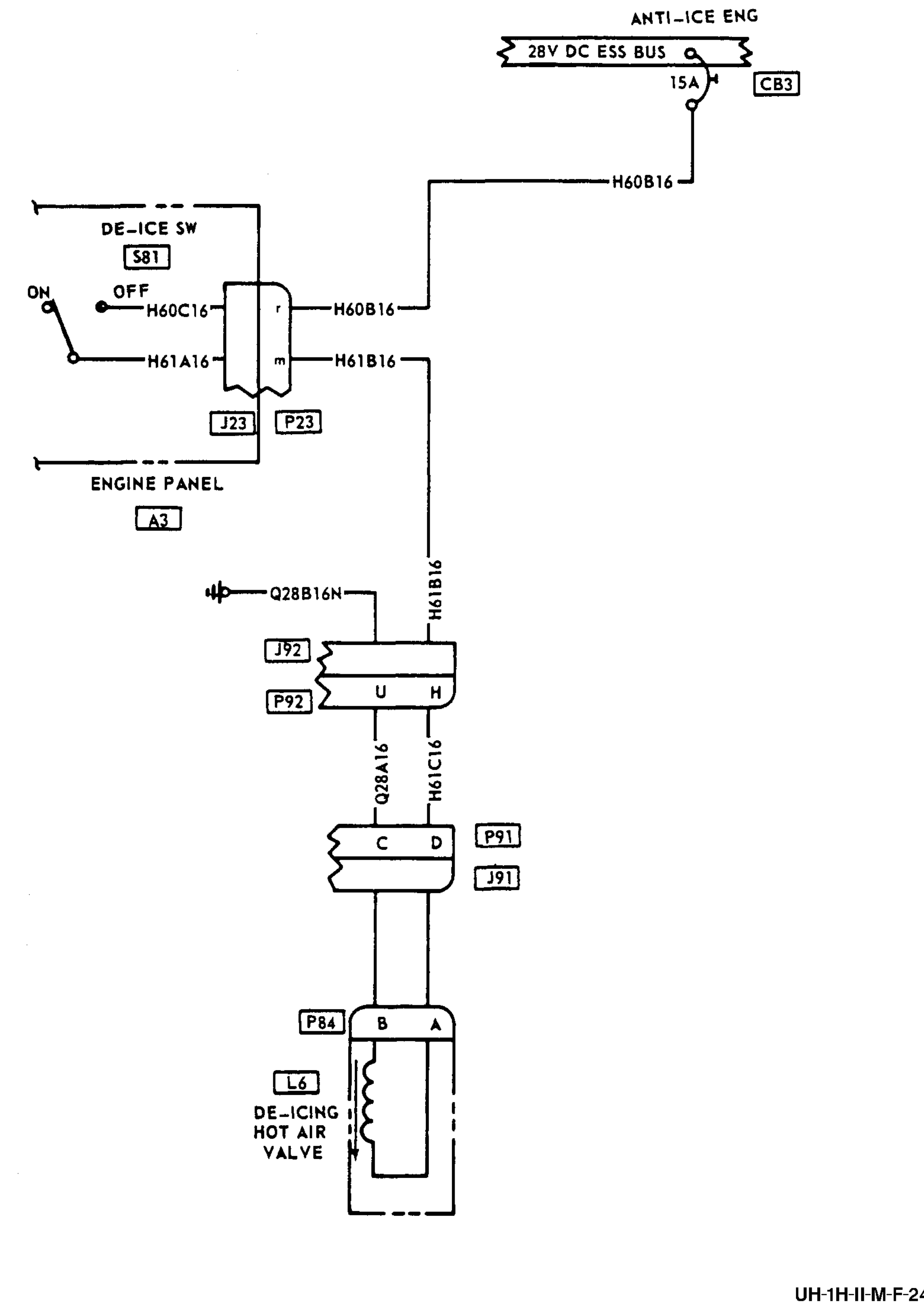


Figure F-24. De-ice system

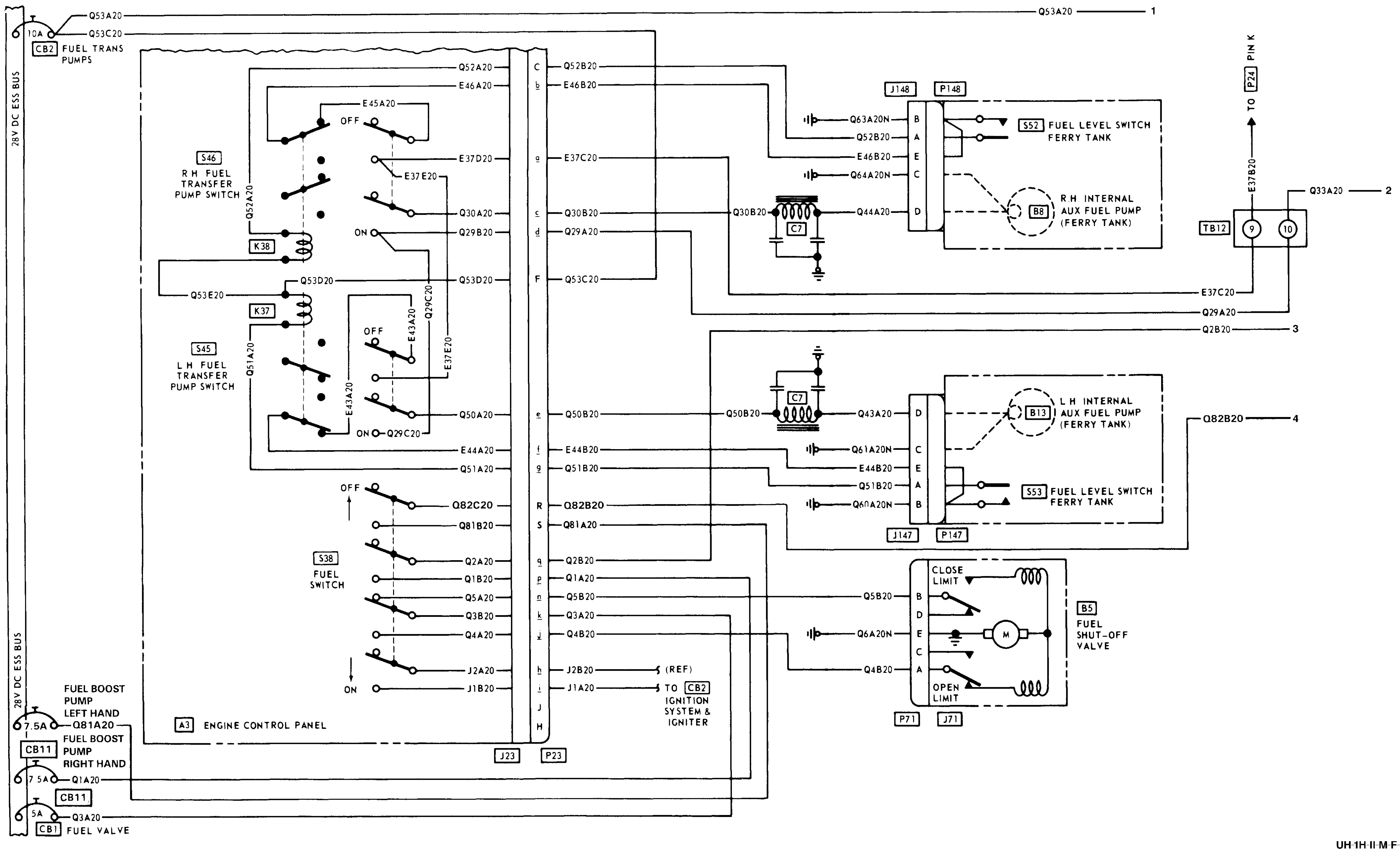


Figure F-25. Fuel boost and fuel valve system (Sheet 1 of 2)

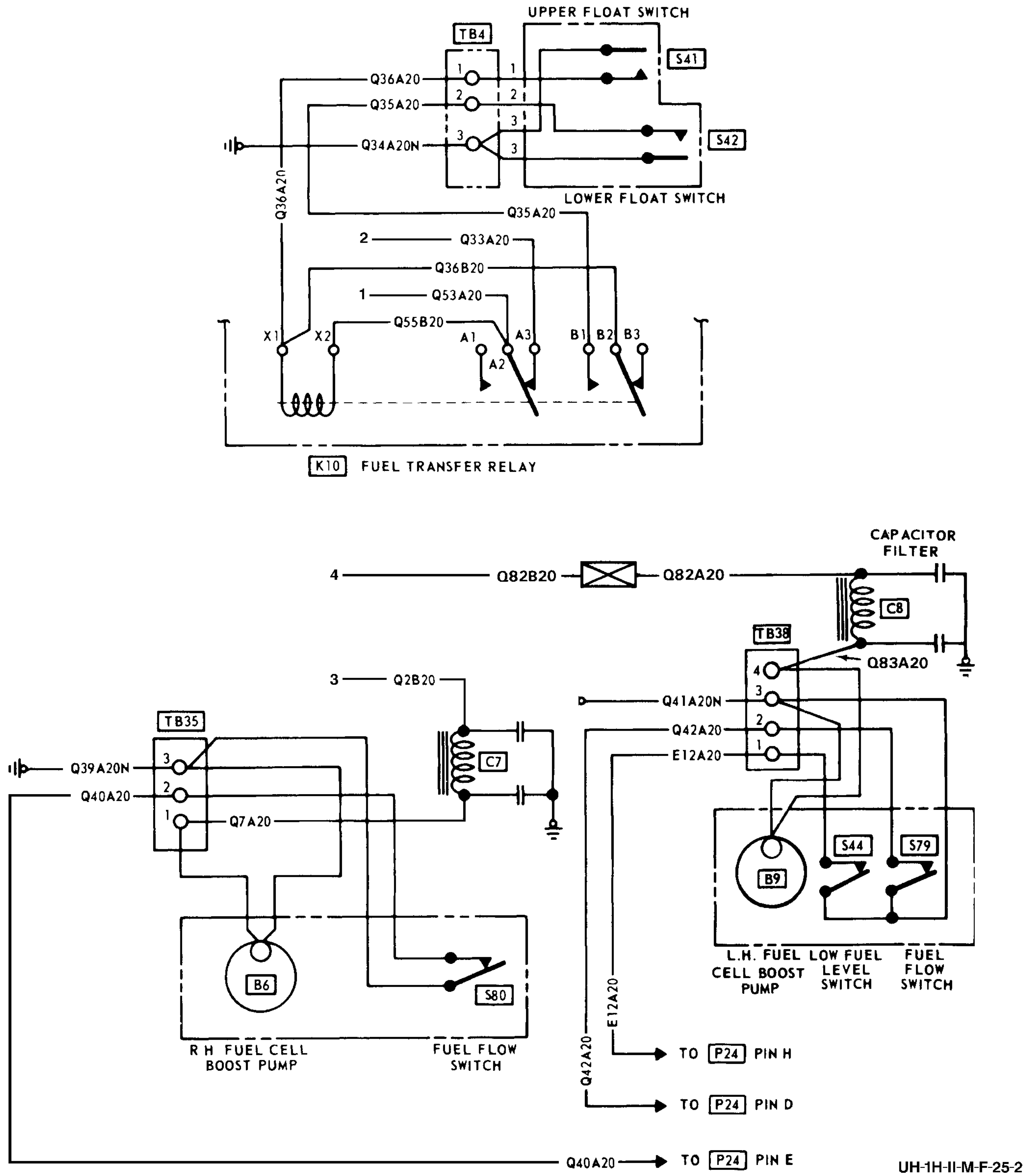


Figure F-25. Fuel boost and fuel valve system (Sheet 2 of 2)

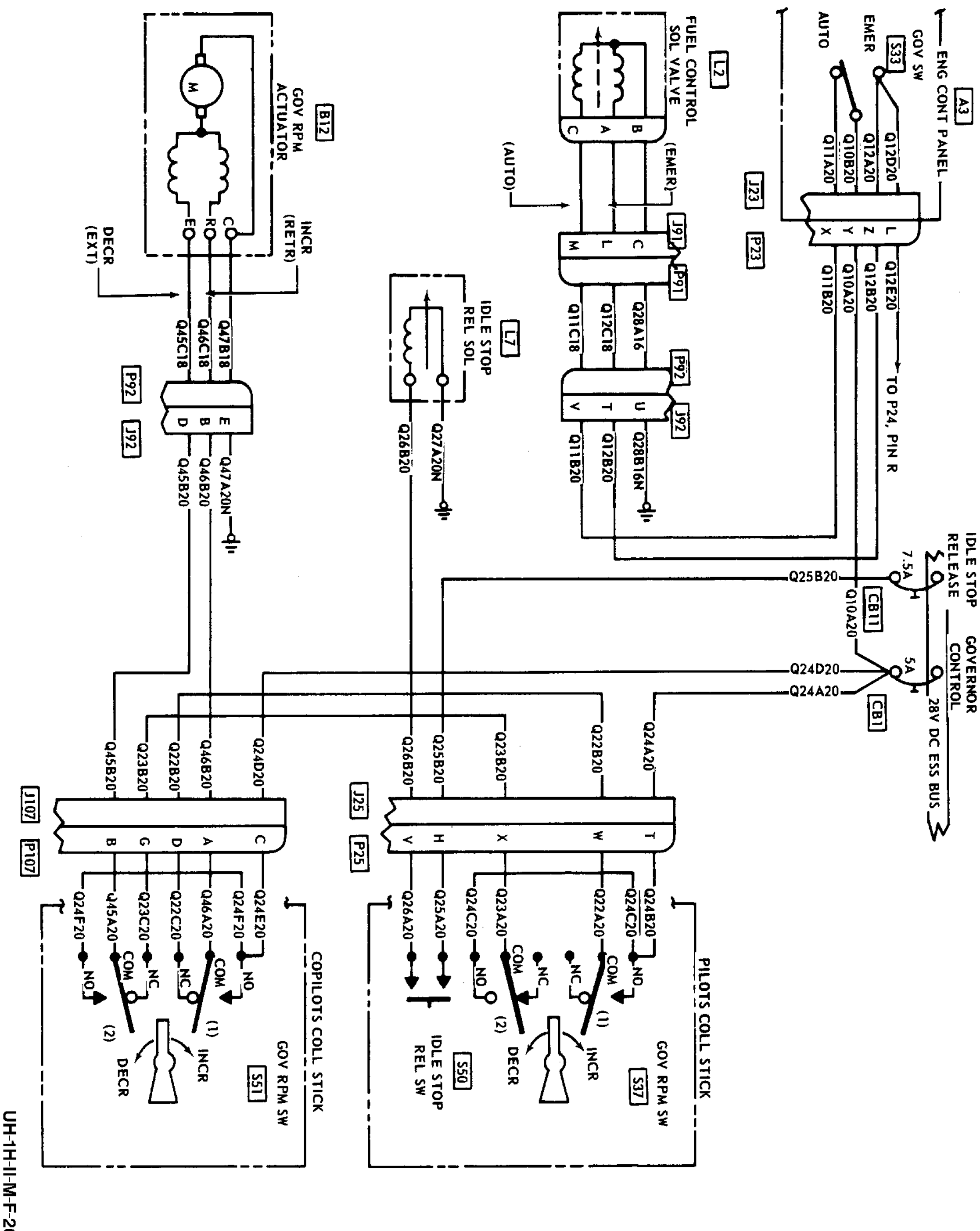


Figure F-26. Governor control and idle stop systems

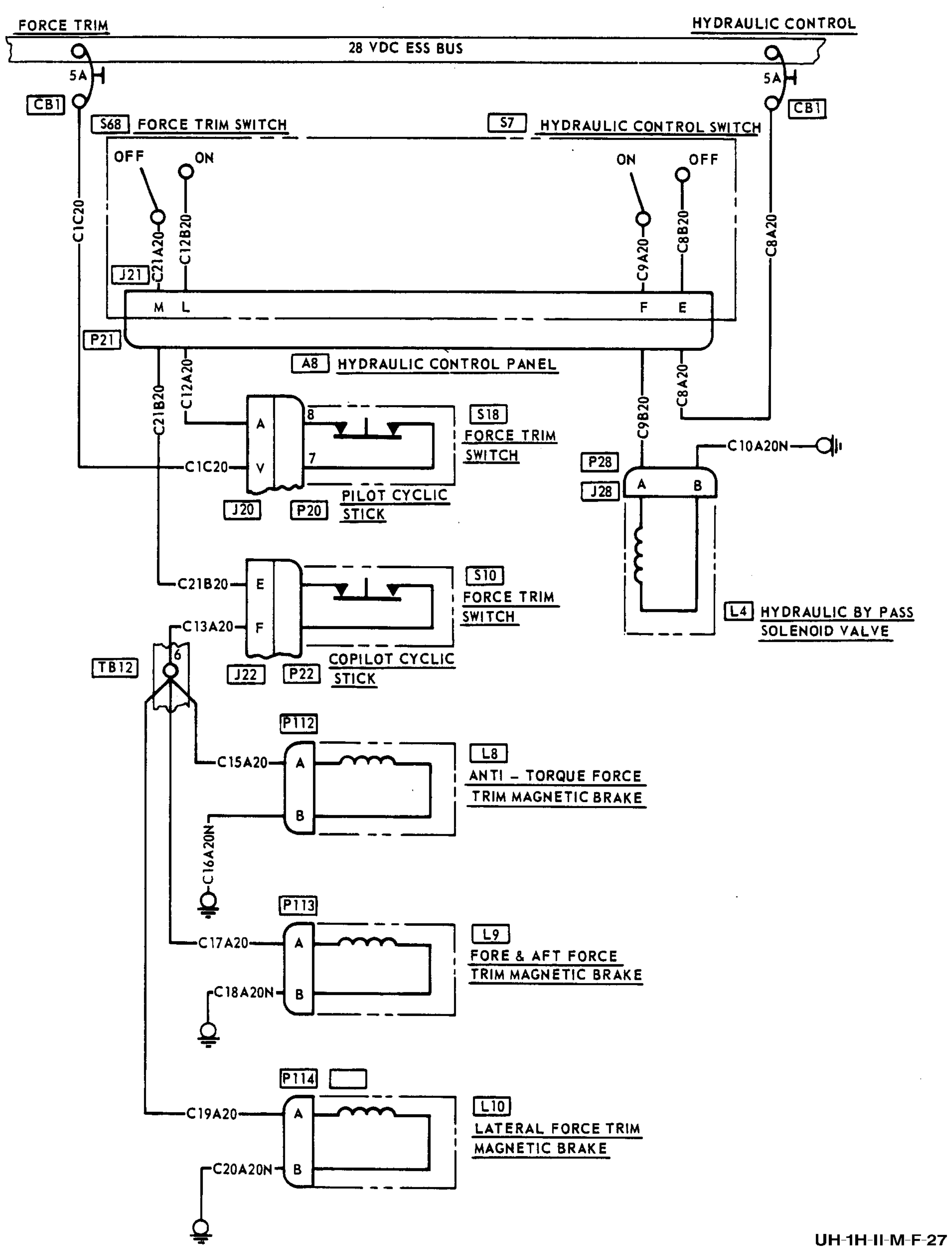


Figure F-27. Force trim and hydraulic control system

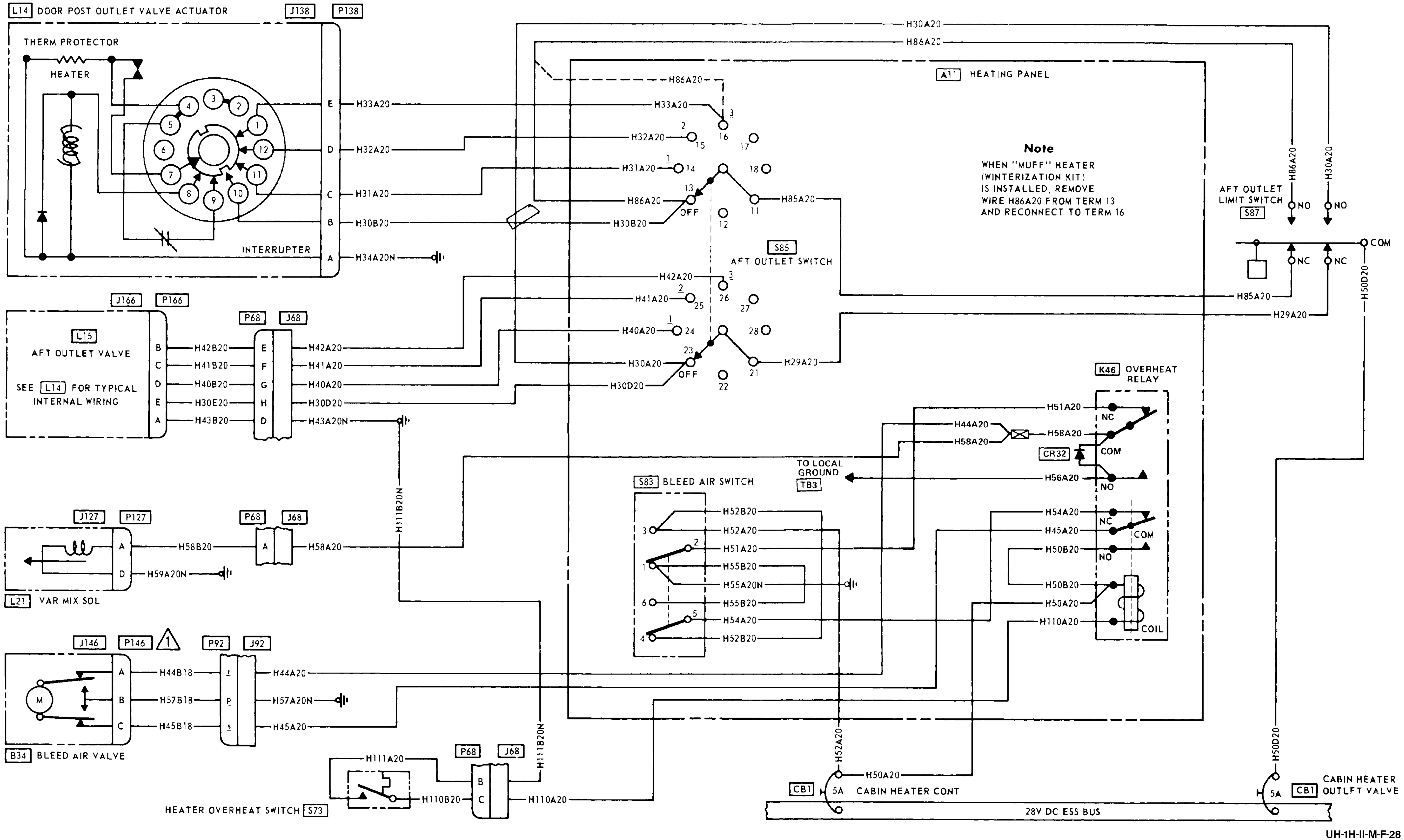
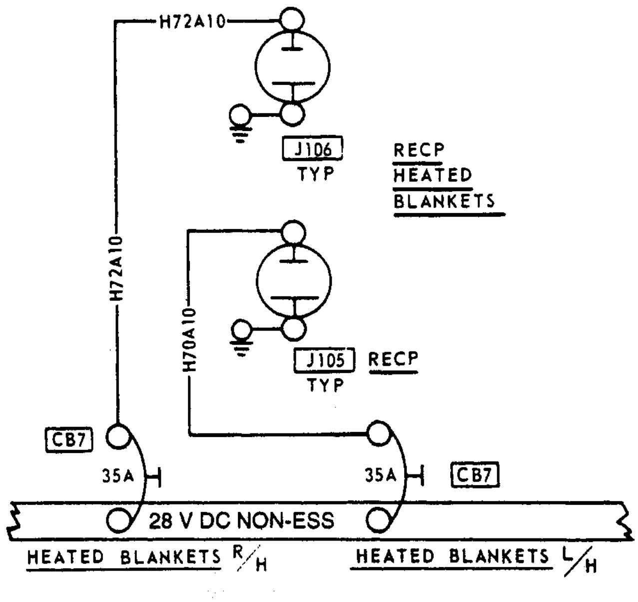
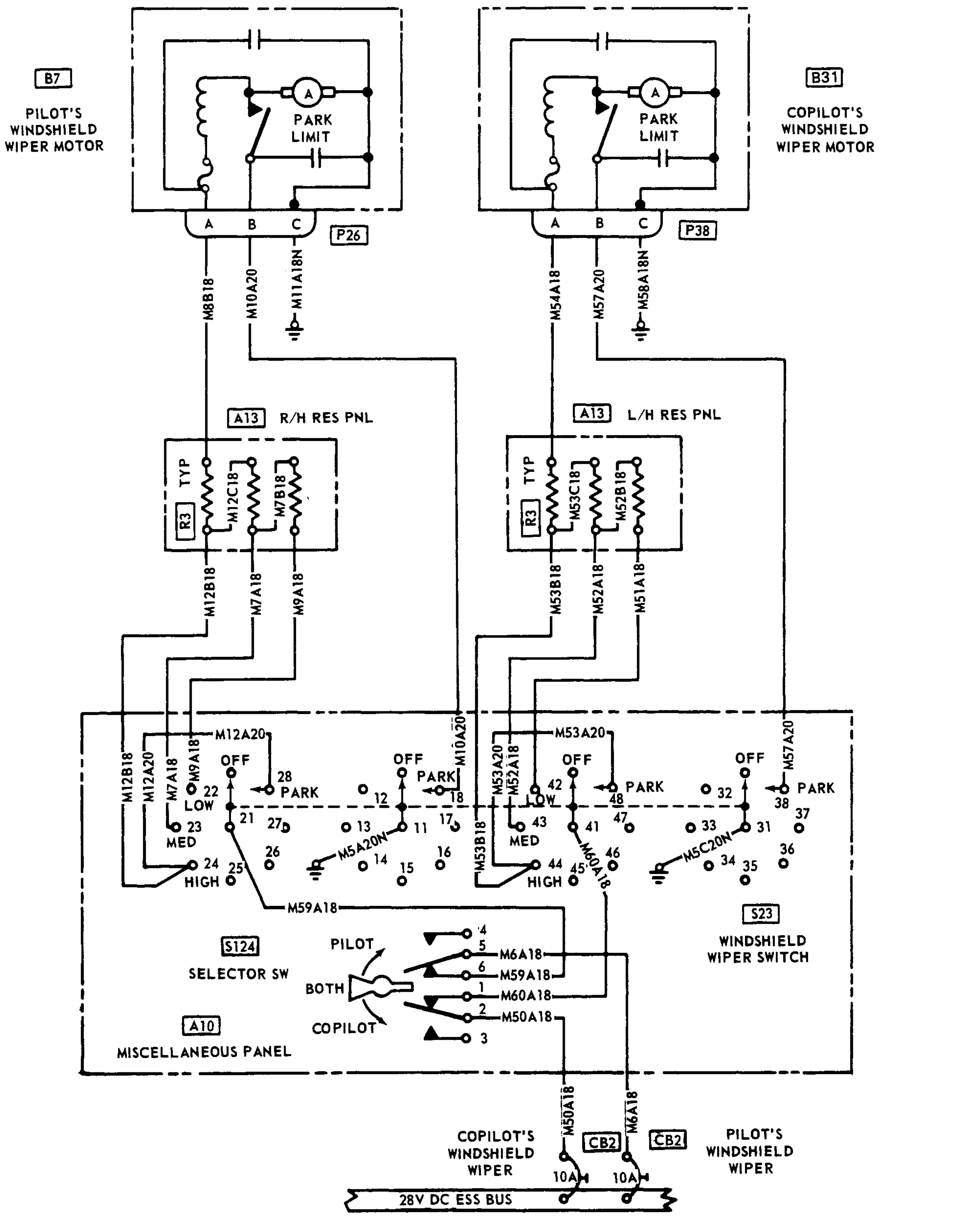


Figure F-28. Cabin heater system



UH-1H-II-M-F-29

Figure F-29. Heated blanket receptacle system



UH-1H-II-M-F-30

Figure F-30. Windshield wiper system

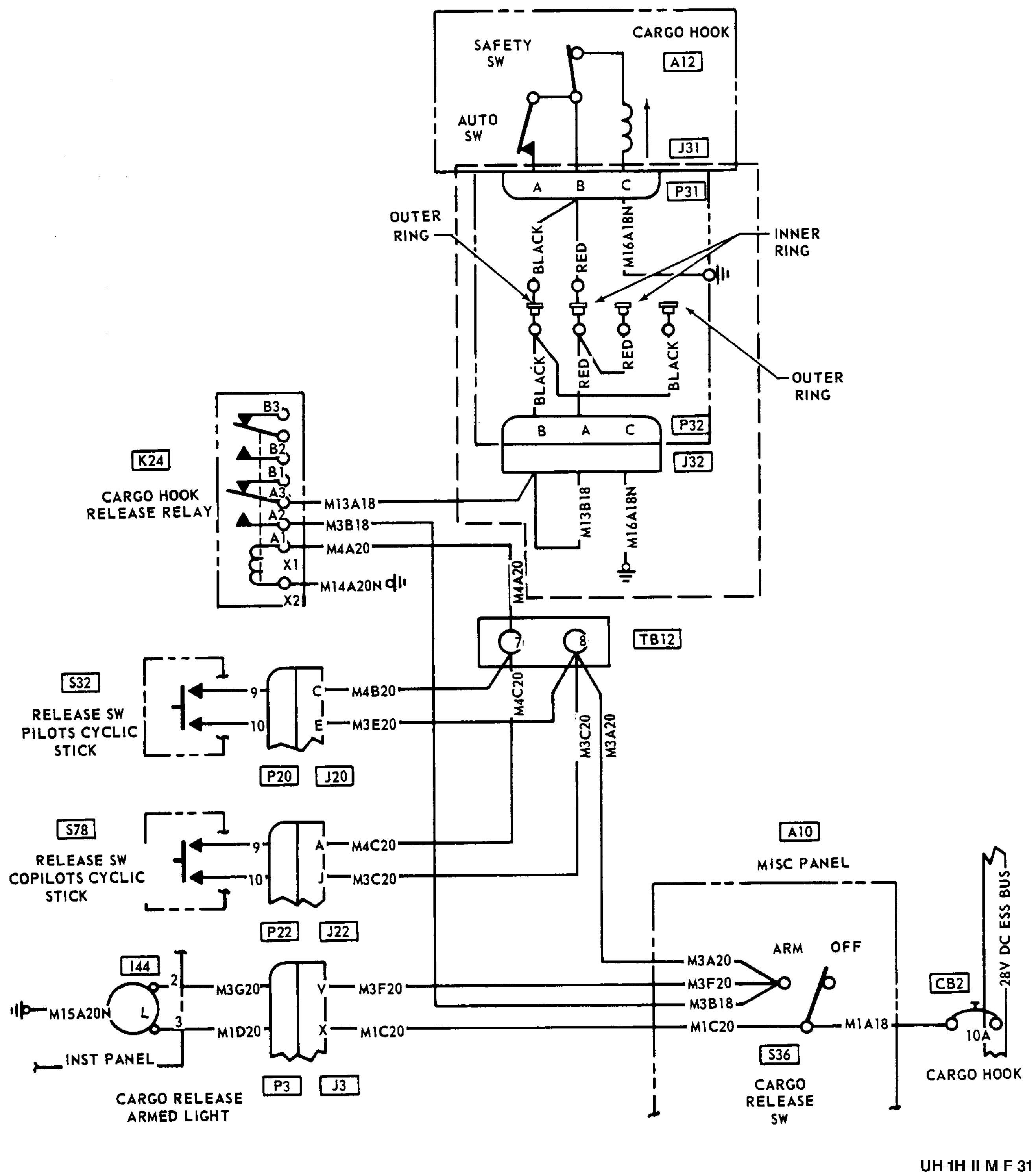
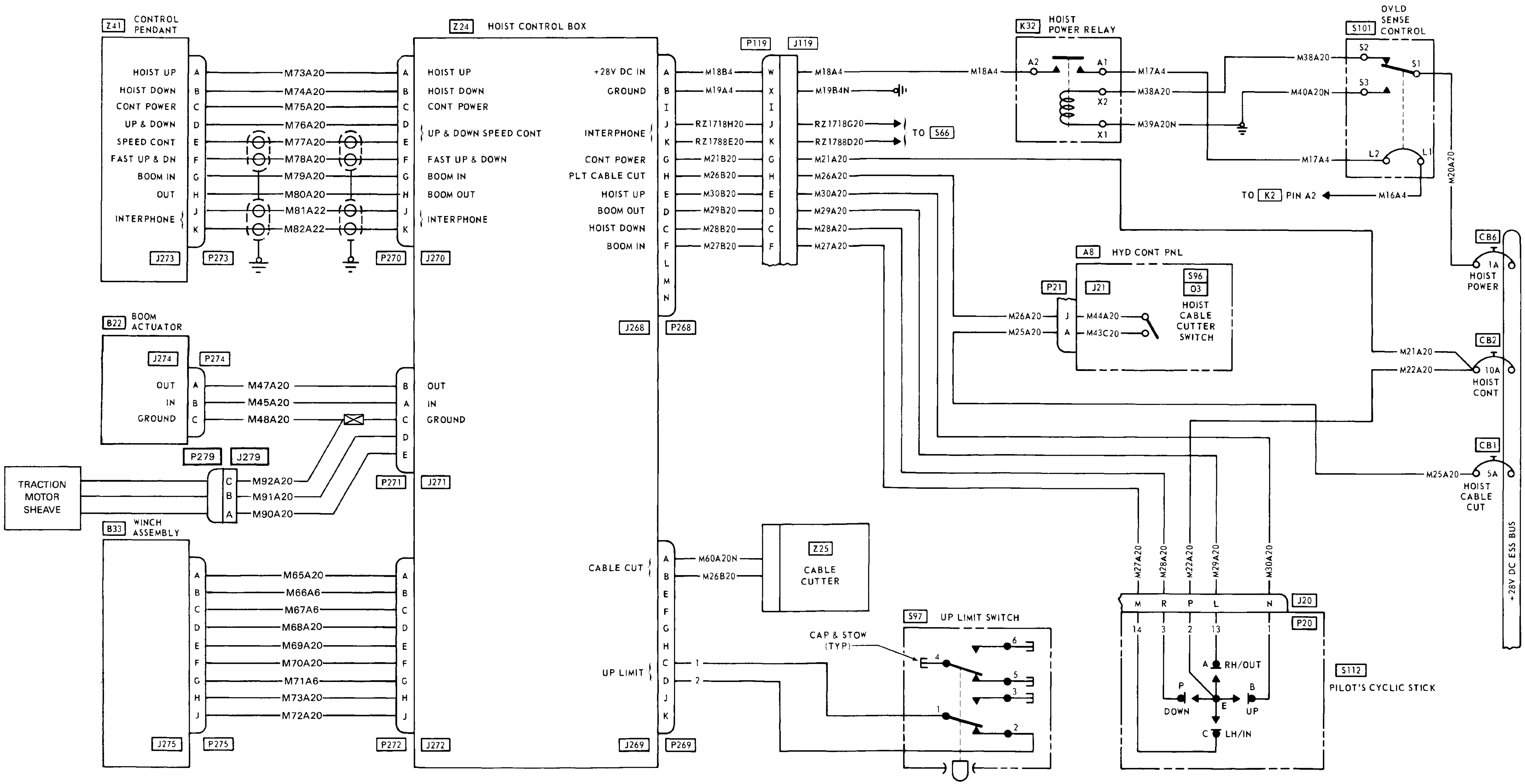


Figure F-31. Cargo hook system



UH-1H-II-M-F-32

Figure F-32. Rescue hoist system

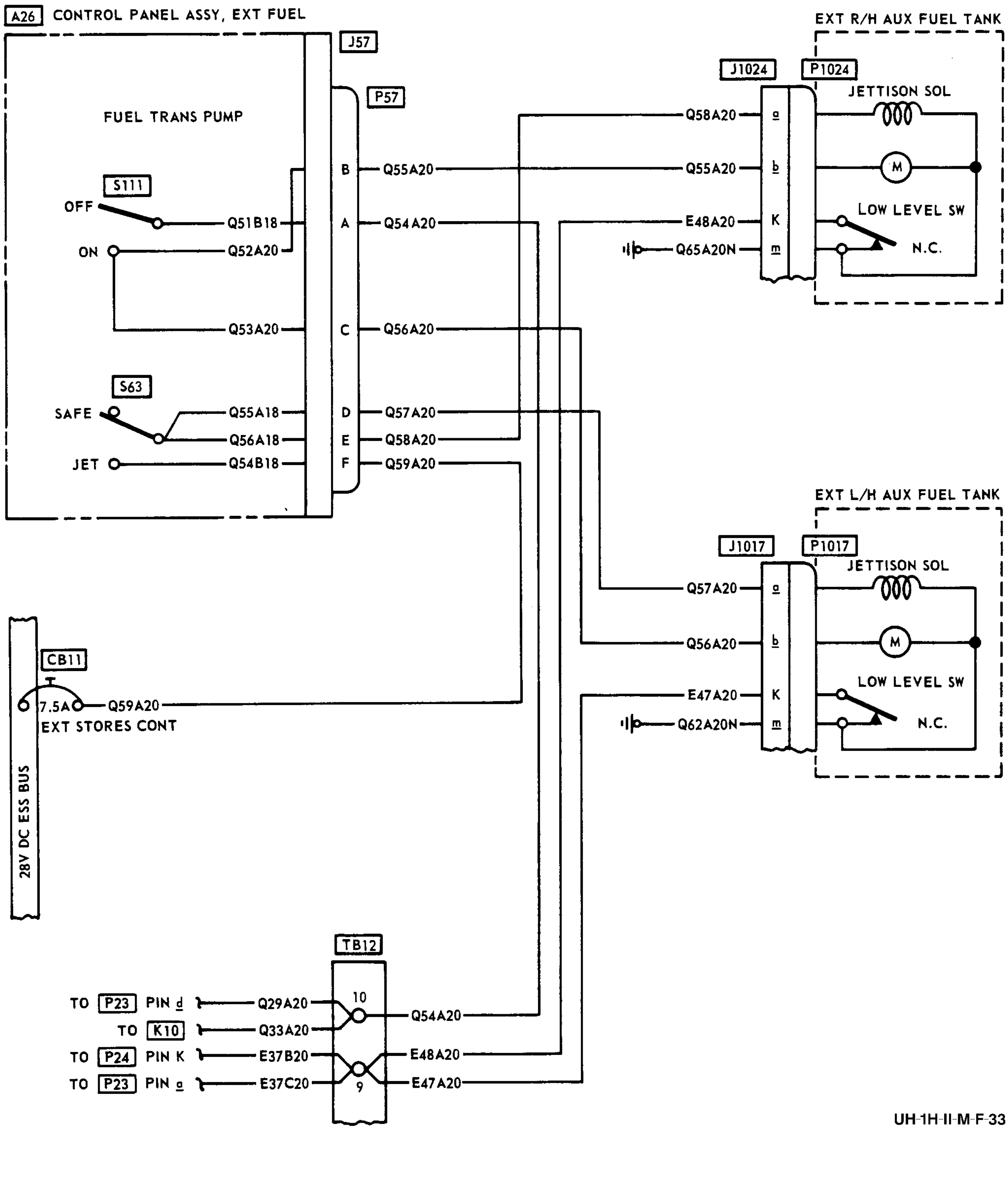


Figure F-33. External fuel system

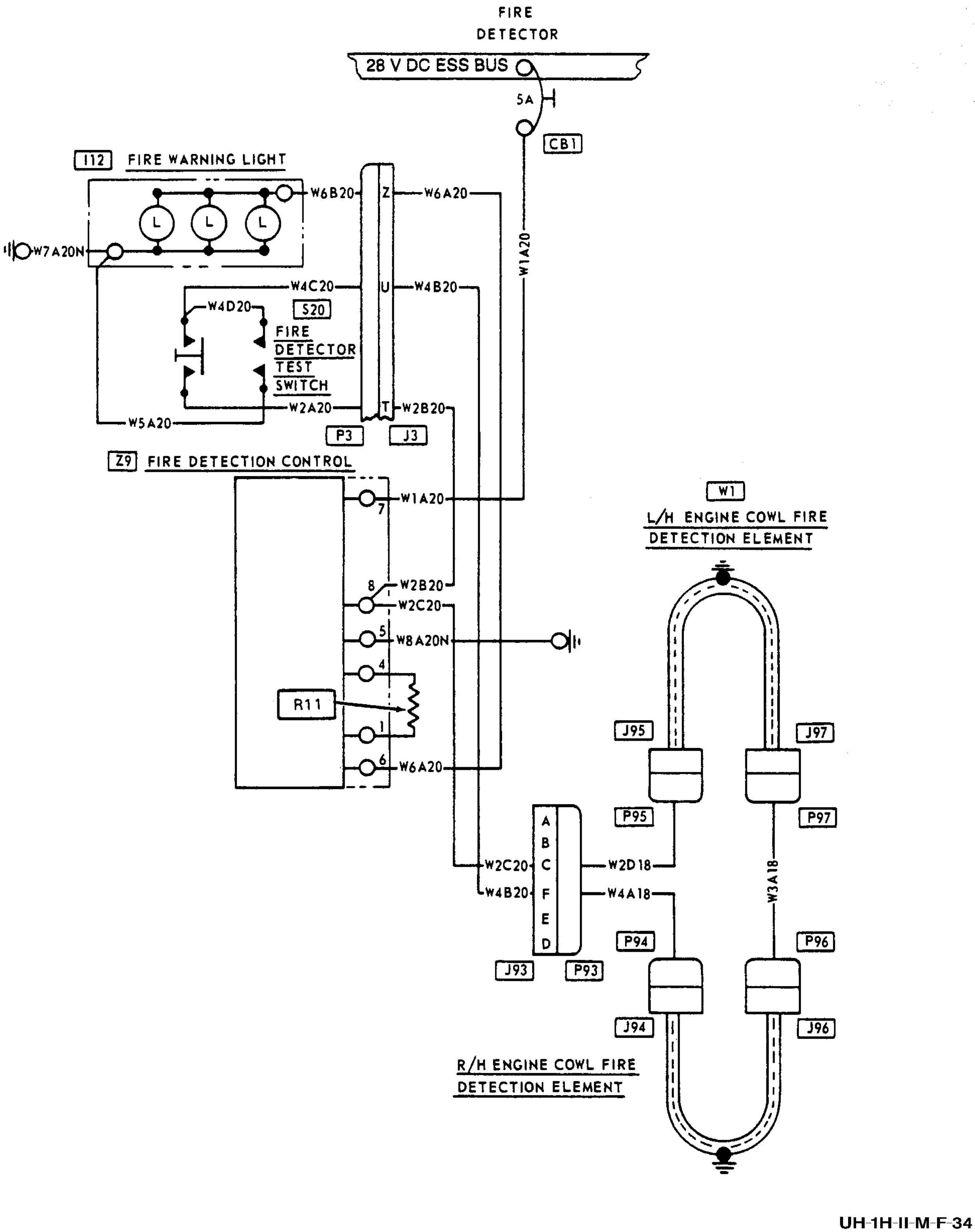
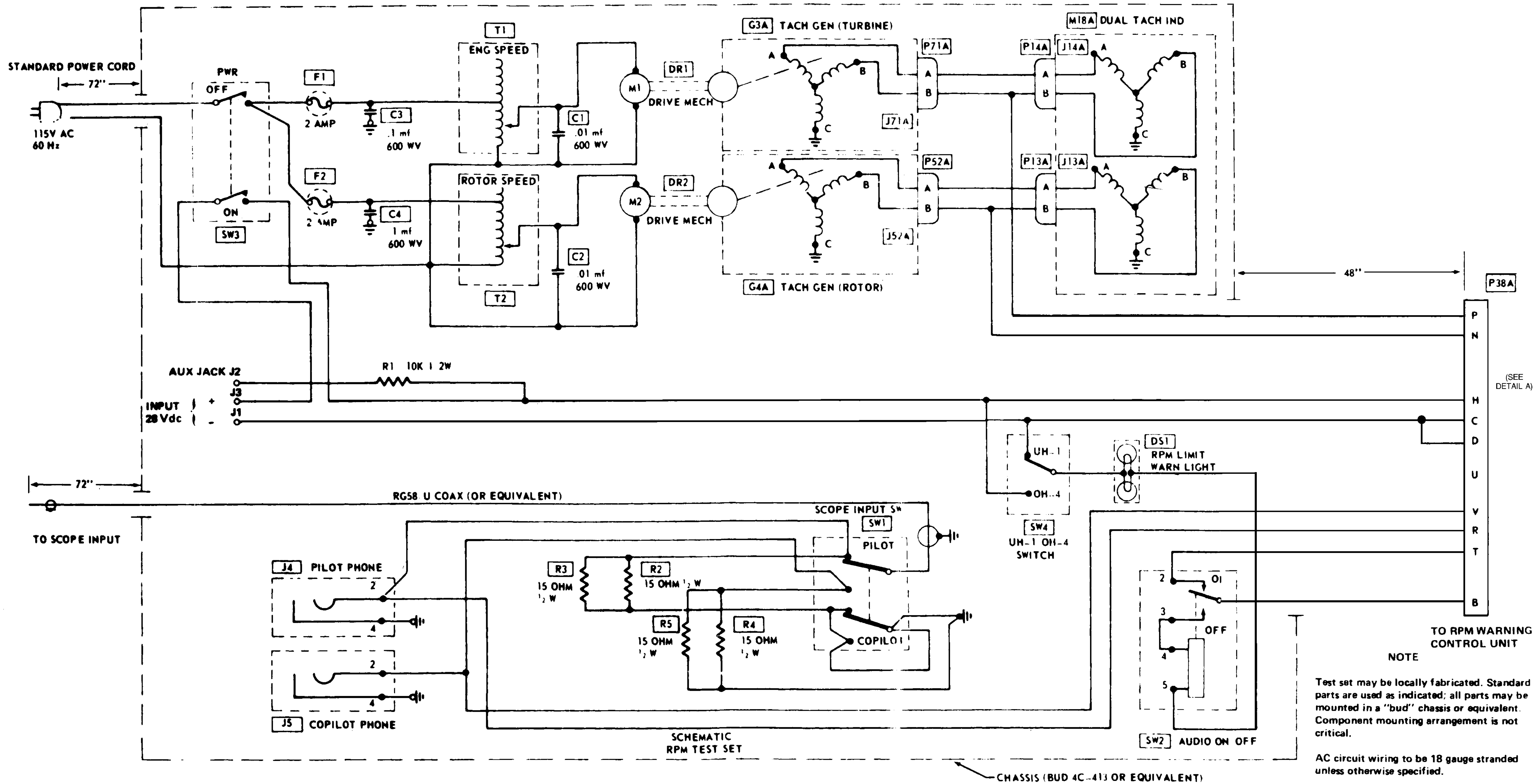


Figure F-34. Fire detector system



NOTE

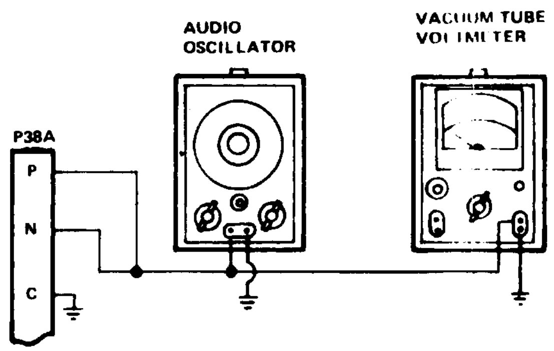
Test set may be locally fabricated. Standard parts are used as indicated; all parts may be mounted in a "bud" chassis or equivalent. Component mounting arrangement is not critical.

AC circuit wiring to be 18 gauge stranded unless otherwise specified.

DC circuit wiring to be 22 gauge stranded unless otherwise specified.

UH-1H-II-M-F-35-1

Figure F-35. RPM limit warning test set schematic (Sheet 1 of 2)



DETAIL A

FREQ HZ	VRMS	ENG RPM	ROTOR RPM
66.5	19.5	6200	305
69.0	20.0	6400	315
73.5	22.0	6800	334
76.0	22.5	7000	

ID CODE	NOMENCLATURE	PART. NO.
C1, C2	Line Filter .01 mf, 600 WV	(Non Polarized)
C3, C4	Line Filter .1 mf, 600 WV	(Non Polarized)
DR1, DR2	Rubber Flex Tube	Rubber Hose 1/4" I.D.
DS1	Korry Light (033-0861-001)	(Bell 205-074-026-1)
F1, F2	Fuse Holder	HKF
G3A,	Tach Generator (MIL-G26611)	Type GEU-7/A
G4A	Tach Generator (MIL-G26611)	Type GEU-7/A
J1, J2, J3	Banana Jack	Standard
J4, J5	Phone Jack	092 A/U
M1, M2	Tach Gen Drive Motor - Dayton Mod 2M037 - Ball Bearing 1/4" Shaft, 1/10 HP, 8000 RPM, 115Vac, 60 Hz	
M18A	Dual Tach Indicator - GE 8DJ67FBC Sub 1	(Bell 204-070-055-1)
P13A	Plug, Dual Tach Indicator	MS3106R14S-7S
P14A	Plug, Dual Tach Indicator	MS3106R14S-7S
P38A	Plug, Eng RPM Warning Control	MS3126F14-19S
P52A	Plug, Tach Generator	MS3108R12S-3S
P71A	Plug, Tach Generator	MS3108R12S-3S
R1	Resistor, 10K OHM 1/2W Carbon	(Tol. 5%)
R2, R3		
R4, R5	Resistor, 15 OHM 1/2W Carbon	(Tol. 5%)
SW1	Switch, Scope Input	MS24659-23G
SW2	Swtich, Audio On/Off (Micro)	5 ET1-S
SW3	Switch, Power On6Off	MS35059-22
T1, T2	Speed Control - Power Stat, Superior Electric Co. (0-140Vac, 60 Hz)	Type 10B

UH-1H-II-M-F-35-2

Figure F-35. RPM limit warning test set schematic (Sheet 2 of 2)

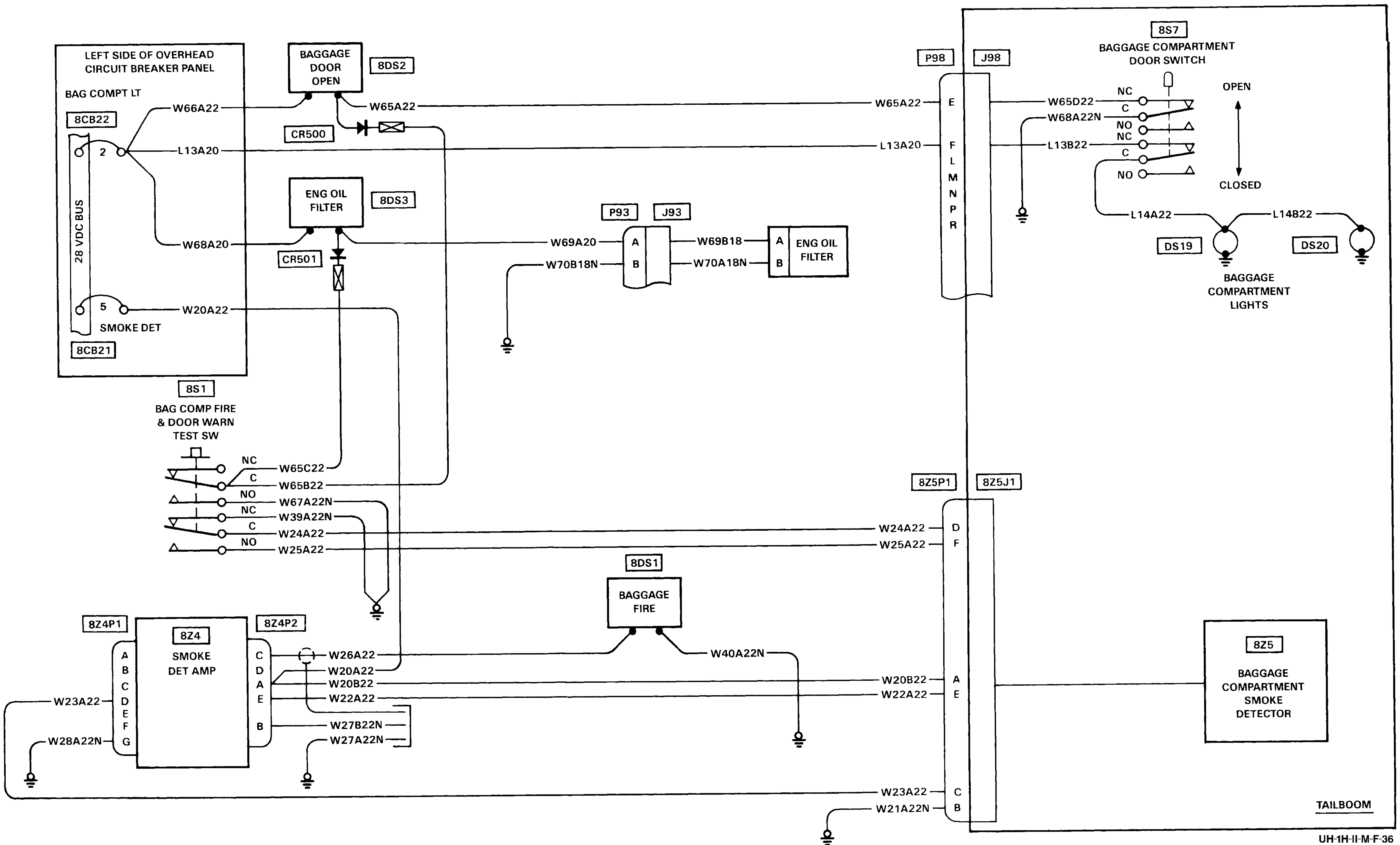


Figure F-36. Baggage compartment lights and detector systems

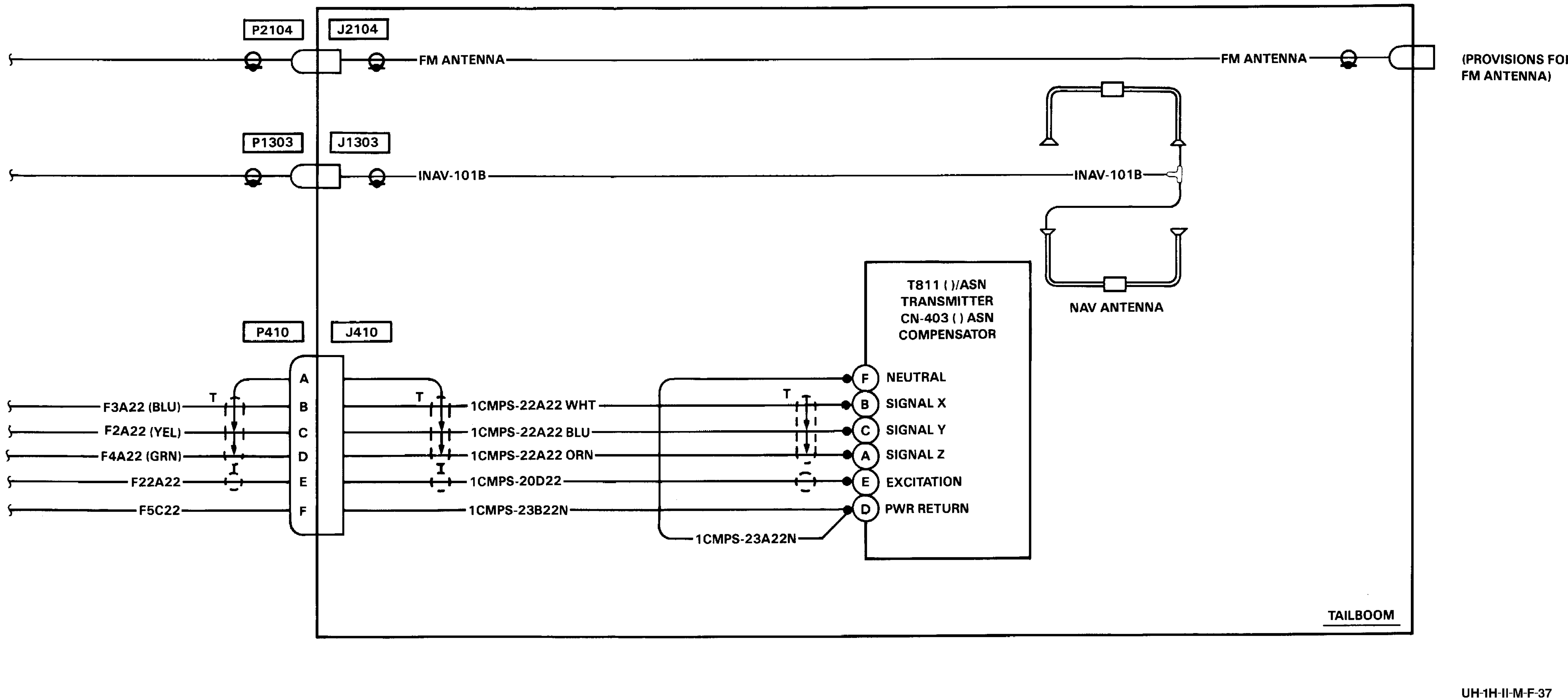


Figure F-37. Avionics installation — tail boom