CHAPTER

34

NAVIGATION

Learjet

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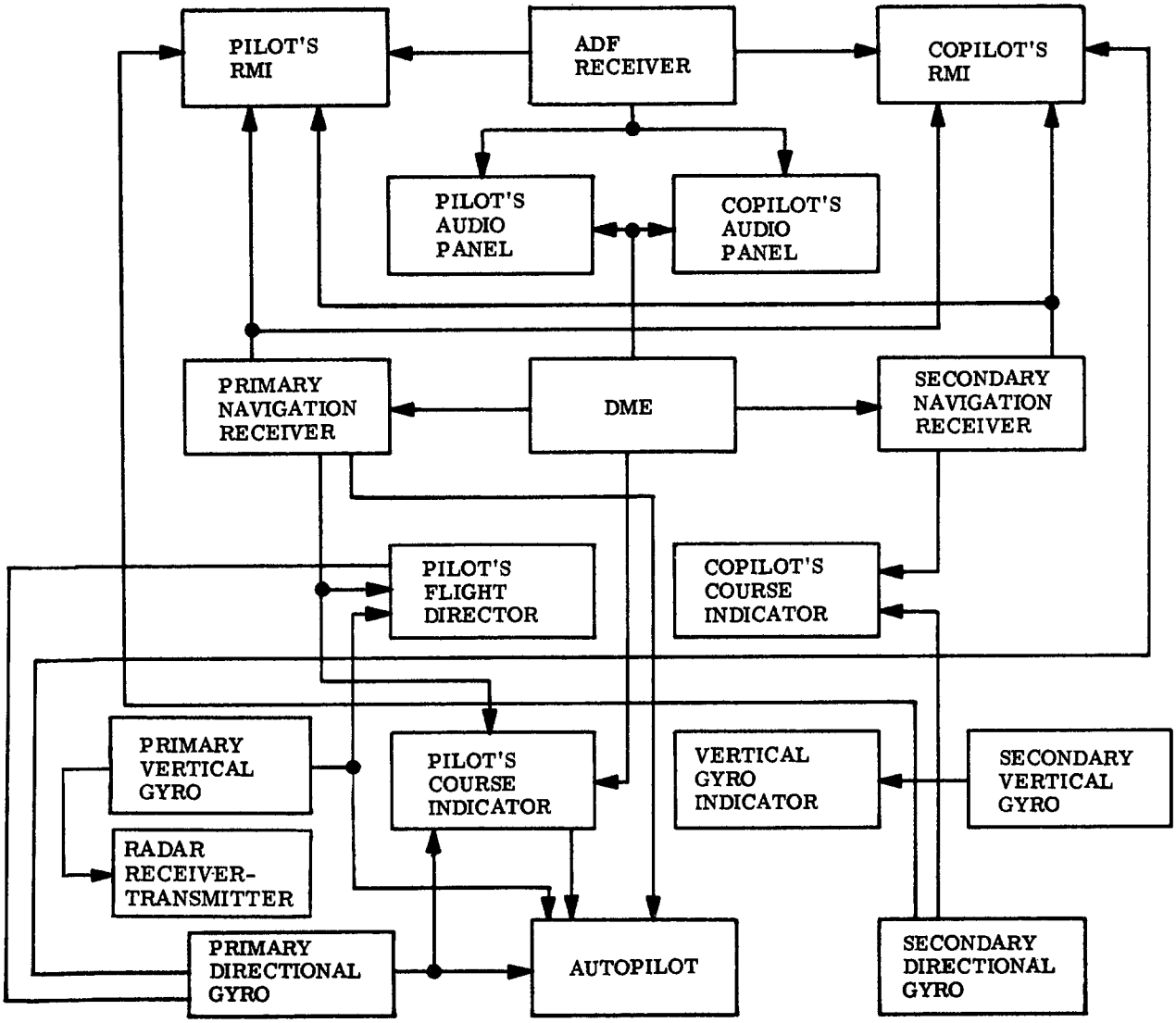
NAVIGATION - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The aircraft navigation systems includes those components and systems which provide attitude, altitude, direction, speed, flight guidance, and enroute navigational information.

B. Figure 1 illustrates the navigational system in block diagram form.



Navigation System Block Diagram
Figure 1

FLIGHT ENVIRONMENT DATA - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The flight environment data system consists of the pitot and static systems which sense and supply air pressure to the air data instruments.

B. The air data instruments using pitot and static pressure are installed in the pilot's and copilot's instrument panels include the following:

(1) On *Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot,"* rate-of-climb indicator, airspeed/machmeter, and altimeter.

(2) On *Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent, and prior Aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot,"* rate-of-climb indicator, altimeter, and airspeed/mach indicator.

C. Other aircraft systems utilizing pitot and static air pressure are the cabin pressurization control and autopilot systems.

(1) Refer to Chapter 22 for further information on the autopilot system.

(2) Refer to Chapter 21 for further information on the cabin pressurization system.

2. OPERATION

A. The copilot's rate-of-climb indicator consists of two air enclosing chambers, a diaphragm, and the airtight case. When the static pressure varies because of changing altitudes, the case pressure lags behind diaphragm pressure due to a restriction in the flow of air into and out of the case. The instrument mechanism converts the resultant pressure differential into a visual indication of the rate of climb or descent of the aircraft in feet per minute. The setting screw on the lower left corner of the instrument is used to zero the pointer. The instrument has a single pointer and two adjoining scales. Refer to Chapter 31 for instrument markings.

B. The pilot's rate-of-climb is operated from a rated output from the pilot's altimeter. This rated signal output, a phase reversing 400 Hz signal, is amplified and demodulated to operate a torque motor in the indicator. The motor drives the indicator pointer through instrument-type gearing. The instrument has a single pointer and two adjoining graduated scales. Refer to Chapter 31 for instrument markings.

C. The airspeed/machmeter has a single pointer and dual scales for accurate speed control throughout the entire flight envelope. The pointer responds to pressure from the pitot heads. A conventional airspeed scale is calibrated in knots and has a reference pointer that is adjusted by rotating the MACH LIMIT PUSH knob on the face of the instrument. The Mach scale is calibrated in percent of Mach and is connected to an aneroid that moves the scale to compensate for changes in pressure altitude. A Mach scale reference pointer is adjusted by turning the MACH LIMIT PUSH knob on the face of the instrument. Refer to Chapter 31 for instrument markings.

D. The copilot's altimeter converts static pressure into a visual indication of aircraft altitude. The indicator, which has a barometric scale, and an adjustment knob and three pointers, is graduated in feet and has a range of 50,000 feet. The large pointer indicates hundreds of feet and makes 50 revolutions to move through the 50,000-foot range. The small pointer, which is an extension of the center dial disc, indicates ten-thousands of feet and makes one-half a revolution. The barometric scale indicates barometric pressure in inches of mercury, ranging from 28.1 to 31.0. Turning the adjustment knob will index ambient pressure on the barometric scale. (Refer to 34-14-00 for further information on the pilot's encoding altimeter system.)

E. One airspeed/mach indicator is installed for each crew position. Each instrument has a single pointer and dual scales for accurate Mach and airspeed indication throughout the flight envelope. The pointer responds to pressure supplied by the pitot-static probes. The indicator face consists of a stationary, circular airspeed scale reading from 0 to 400 knots, a movable circular Mach scale reading from .4 to .9 Mach, an airspeed/mach pointer, and a maximum allowable marker (barber pole). The movable Mach scale rotates with a change in altitude to maintain the correct Mach/airspeed relationship for any given altitude. Because the scales are maintained in the proper relationship, the airspeed/mach pointer indicates both Mach and airspeed over the range the Mach scale is visible. The maximum allowable marker (barber pole) is located over the Mach scale and rotates about the airspeed scale to compensate for altitude changes in the same manner as the Mach scale. The barber pole is positioned so that its lower edge is opposite 350 KIAS at all altitudes up to MMO. Once the MMO limit is obtained, the barber pole moves with the Mach scale to maintain the MMO position. A stationary red line is located at 300 KIAS. A white triangular reference "bug" in the indicator is adjusted by rotating the knob on the instrument bezel. Three white "bugs" on the perimeter of the dial face are adjusted by sliding the "bug" to the desired position. The airspeed/mach indicators also contain airspeed and altitude switches used by the overspeed warning system, stick puller, and stall warning system.

RATE OF CLIMB INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Pilot's Rate of Climb Indicator

(1) Remove electrical power from aircraft.
(2) Lower pilot's instrument panel.
(3) Disconnect electrical connector from indicator.
(4) Loosen instrument clamp screws and remove indicator from instrument panel.

B. Install Pilot's Rate of Climb Indicator

(1) Install indicator and tighten instrument clamp screws.
(2) Connect electrical connector.
(3) Raise and secure pilot's instrument panel.
(4) Restore electrical power to aircraft.

C. Remove Copilot's Rate of Climb Indicator

(1) Remove electrical power from aircraft.
(2) Lower copilot's instrument panel.
(3) Disconnect static line from indicator. Cap exposed openings.
(4) Remove attaching parts and indicator from panel.

D. Install Copilot's Rate of Climb Indicator

(1) Install indicator and secure with attaching parts.
(2) Remove caps and connect static line to indicator.
(3) Perform static system leakage check. (Refer to 34-11-00.)
(4) Raise and secure copilot's instrument panel.

AIRSPEED/MACHMETER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION
   A. Remove Airspeed/Machmeter
      (1) Remove electrical power from aircraft.
      (2) Ensure that Battery and Stall Warning Switches are OFF.
      (3) Lower applicable instrument panel.
      (4) Disconnect pitot and static lines from airspeed/machmeter. Cap all exposed fittings.
      (5) Remove attaching parts and airspeed/machmeter from instrument panel.
   B. Install Airspeed/Machmeter
      (1) Install airspeed/machmeter in panel and secure with attaching parts.
      (2) Remove caps and connect pitot and static lines to airspeed/machmeter.
      (3) Perform pitot and static systems leakage check. (Refer to 34-11-00.)
      (4) Raise and secure instrument panel.
      (5) Restore electrical power to aircraft.

ALTIMETER - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**
   - **A. Remove Altimeter**
     - (1) Remove electrical power from aircraft.
     - (2) Lower copilot's instrument panel.
     - (3) Disconnect static line from altimeter. Cap all exposed fittings.
     - (4) Remove attaching parts and altimeter from aircraft.
   - **B. Install Altimeter**
     - (1) Install altimeter and secure with attaching parts.
     - (2) Remove caps and connect static line to altimeter.
     - (3) Perform static system leakage check. (Refer to 34-11-00.)
     - (4) Raise and secure copilot's instrument panel.
     - (5) Restore electrical power to aircraft.

AIRSPEED/MACH INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Airspeed/Mach Indicator (See figure 201.)
   (1) Remove electrical power from aircraft.
   (2) Set Battery Switches and Stall Warning Switches to OFF.
   (3) Lower applicable instrument panel.
   (4) Disconnect electrical connector from airspeed/mach indicator.
   (5) Remove pitot and static lines from airspeed/mach indicator. Cap open ports of airspeed/mach indicator and pitot and static lines.
   (6) Remove attaching parts and remove airspeed/mach indicator from aircraft.

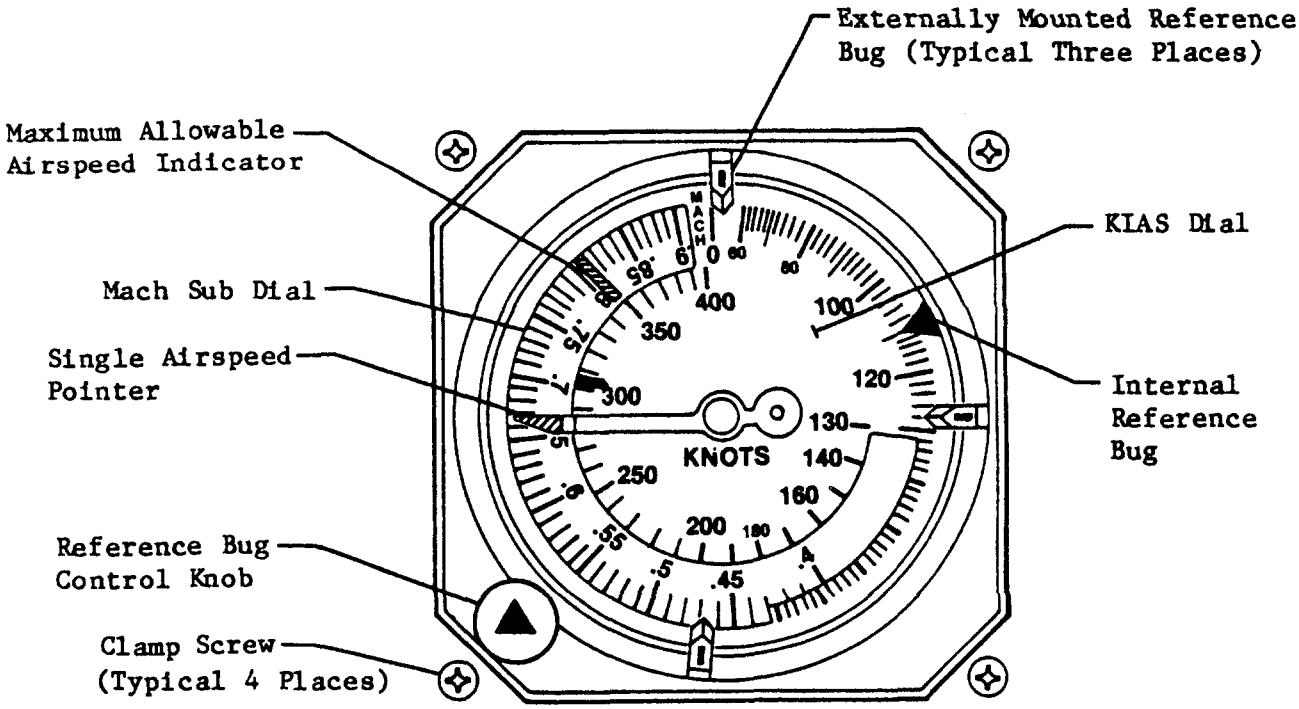
B. Install Airspeed/Mach Indicator (See figure 201.)
   (1) Install airspeed/mach indicator and secure with attaching parts.
   (2) Remove caps from airspeed/mach indicator ports and pitot and static lines. Install pitot and static lines airspeed/mach indicator.
   (3) Connect electrical connector to airspeed/mach indicator.
   (4) Perform pitot and static systems leakage check. (Refer to 34-11-00.)
   (5) Raise and secure instrument panel.
   (6) Restore electrical power to aircraft.

2. ADJUSTMENT/TEST

A. Functional Test of Stall Warning Altitude Switches

NOTE: Perform functional test of stall warning altitude switches in accordance with the current inspection interval specified in Chapter 5.

   (1) Connect pitot-static test to pitot and static systems. (Refer to Chapter 34.)
   (2) Set Stall Warning Switches to L and R and Battery Switches to BAT 1 and BAT 2. Ensure that angle-of-attack vanes are lowered to position where stall margin (angle-of-attack) indicator needles are in the green band. Ensure that flaps are fully retracted.
   (3) Slowly apply vacuum to system and observe pilot's and copilot's stall margin (angle-of-attack) indicators. At 22,500 (±750) feet, both indicators shall abruptly move toward yellow area.
   (4) Slowly bleed off vacuum and remove pitot-static tester.
   (5) Restore aircraft to normal.



Airspeed/Mach Indicator
Figure 201

PITOT AND STATIC SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION (See figure 1.)
   A. *Aircraft 35-002 thru 35-505 except 35-408 and 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot."*
      (1) Pitot pressure is obtained from two pitot heads, one located on each side of the nose compartment.
      (2) The left hand pitot head is connected to the pilot's airspeed indicator.
      (3) The right hand pitot head is connected to the Mach Trim Switch, Mach Warning and Overspeed Switch, copilot's airspeed indicator, and air data sensor.
      (4) Static pressure is sensed from 10 static ports.
         (a) The LH forward, LH aft, RH forward, and RH center static ports provide static pressure for the pilot's and copilot's instruments. On *Aircraft 35-307 and Subsequent, 36-045 and Subsequent, and prior aircraft modified per AAK 79-10 or AMK 83-5, "Installation of Wing Fences, Stall Strips, and Boundary Layer Energizers," or SB 35/36-34-4*, each of these four static ports will be circled by a one-inch-wide, paint-free, polished band.
         (b) The RH forward and LH aft static ports are interconnected and are plumbed to the copilot's instruments.
         (c) The LH forward and RH center static ports are interconnected and are plumbed to the pilot's instruments.
         (d) An instrument alternate static source system is provided as a backup should blockage of the pilot's static ports or tubes occur. The instrument alternate static source consists of a manual control valve mounted on the lower edge of the pilot's instrument panel, a union installed in frame 5 which acts as a static port, and the hoses connecting the union and control valve to the pilot's instruments through the union-type static port and the control valve. The control valve handle, when not in use, is safety wired in the CLOSED position with breakaway safety wire.
         (e) The RH aft static port provides static pressure for the cabin pressurization system.
         (f) An alternate static port, installed in the nose compartment, acts as a backup for the RH aft port should it become blocked.
         (g) The two shoulder static ports installed forward of the windshield halves supply static pressure to the autopilot air data sensor. For further information on the autopilot static system, refer to Chapter 22.
         (h) A static port located at frame 25 is used as the cabin safety valve static source. For further information on the cabin safety valve static source, refer to Chapter 21.
      (5) The pitot heads, LH forward static port, LH aft static port, RH forward static port, and RH center static port are electrically heated to prevent moisture form freezing and obstructing the port openings. (Refer to Chapter 30 for coverage of the electric heating elements.)
      (6) On *Aircraft 35-002 thru 35-059, 36-002 thru 36-017*, the RH pitot and RH forward static port also provide pitot and static pressure to the flap load limiting airspeed switch.
      (7) Drain valves are installed at low points of the pitot and static plumbing to provide a means for draining accumulated moisture from the system.
   B. *Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2,"Installation of FC-530 Autopilot."*
      (1) The pitot-static system consists of two pitot-static heads, four isolation valves, one STATIC SOURCE Switch, and six drain valves.
      (2) The LH pitot port is connected to the pilot's mach/airspeed indicator (mach/overspeed switches). The RH pitot port is connected to the copilots's mach/airspeed indicator (mach/overspeed switches), the mach switch, air data unit (Chapter 22), and optional equipment. Each pitot system is equipped with a drain valve to provide a means for draining accumulated moisture from the system.

(3) The forward static port on either pitot-static head is cross-connected to the aft static port on the opposite pitot-static head to eliminate yaw errors. The pilot's instruments are connected to the LH static 1 port and RH static 2 port. The copilot's instruments, the mach switch, the air data unit, and any optional equipment are connected to the RH static 1 port and the LH static 2 port.

(4) The pilot's and copilot's static systems are equipped with two isolation valves for each system. Operation of the STATIC SOURCE Switch controls the isolation valves for best results.

(5) The pressurization control module is equipped with a separate static source and alternate static source. Refer to Chapter 21 for pressurization system information.

(6) On *Aircraft 35-661 and Subsequent and 36-064 and Subsequent*, a static test port for cabin pressurization checks has been installed at frame 6 .

(7) Component Description.

(a) The pitot-static heads are located just aft of frame 4 on each side of the nose section. The pitot-static heads aerodynamic shape provides an error correction factor in all flight configurations. The pitot-static heads are equipped with heating elements to prevent moisture from freezing on the obstructing the pitot-static ports.

(b) The static isolation valves are located forward of frame 5.

(c) The STATIC SOURCE Switch is located on the center switch panel.

(d) The drain valves are located just outboard of the nose wheel well between frames 4 and 5. The valves are spring loaded to the closed position and are sealed with an internal O-ring.

2. **OPERATION** (See figure 2.)

A. *Aircraft 35-002 thru 35-505 except 35-408 and 36-002 thru 36-053 not modified per AAK 83-2,"Installation of FC-530 Autopilot."*

(1) The pitot heads admit ram air pressure at their forward ends to provide pitot pressure to the instruments connected to the pilot's system.

(2) The static ports accurately sense static air pressure for the instruments connected to the static system.

(3) The drain valves are for draining accumulated moisture and are opened by depressing the knurled hollow stem.

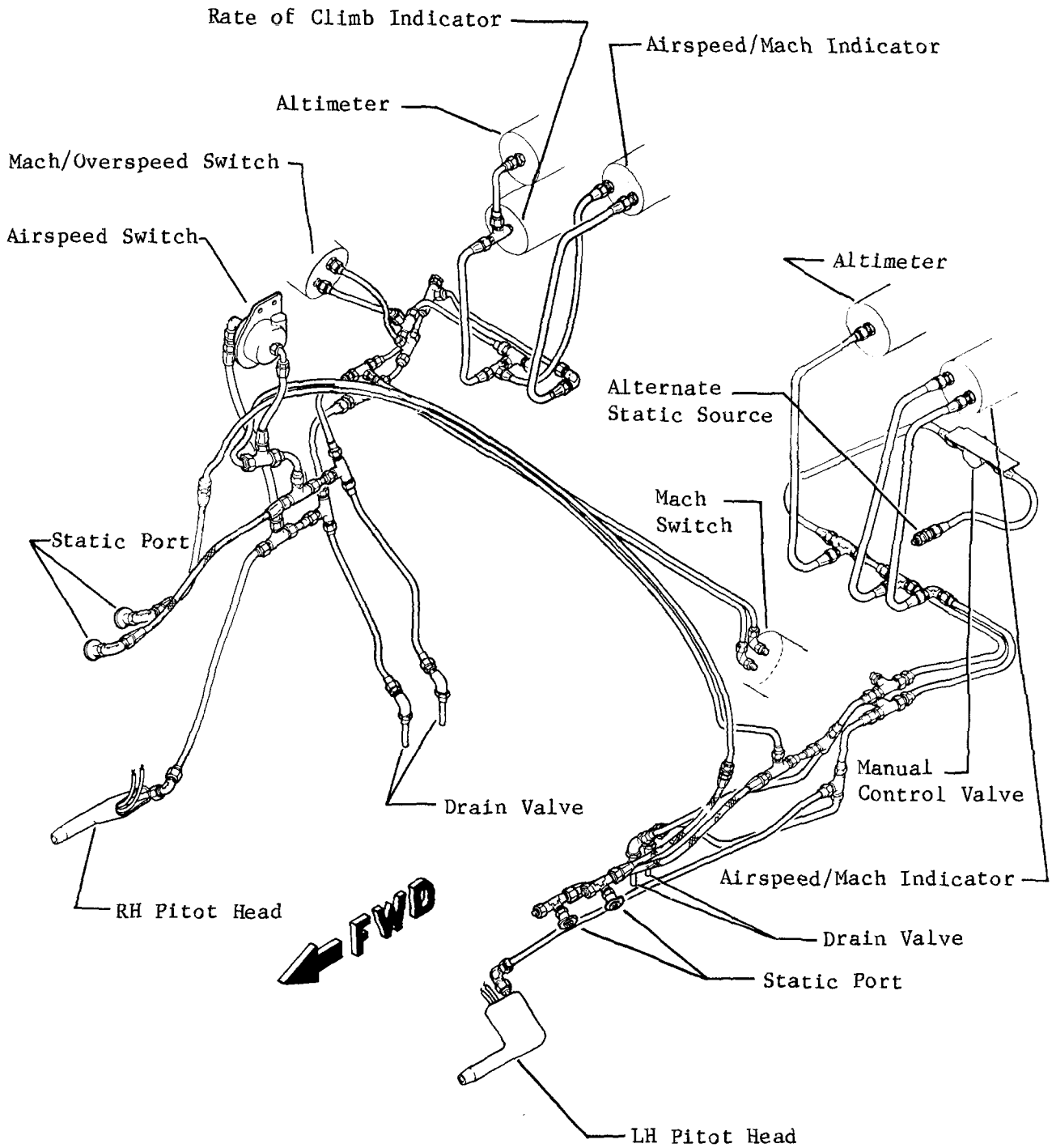
B. *Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot."*

(1) The pitot-static heads admit ram air pressure at the forward end to provide pitot pressure to the instruments connected to the pitot system. The static ports on the sides of the pitot-static heads accurately sense static air pressure for the instruments connected to the pilot's and copilot's static systems.

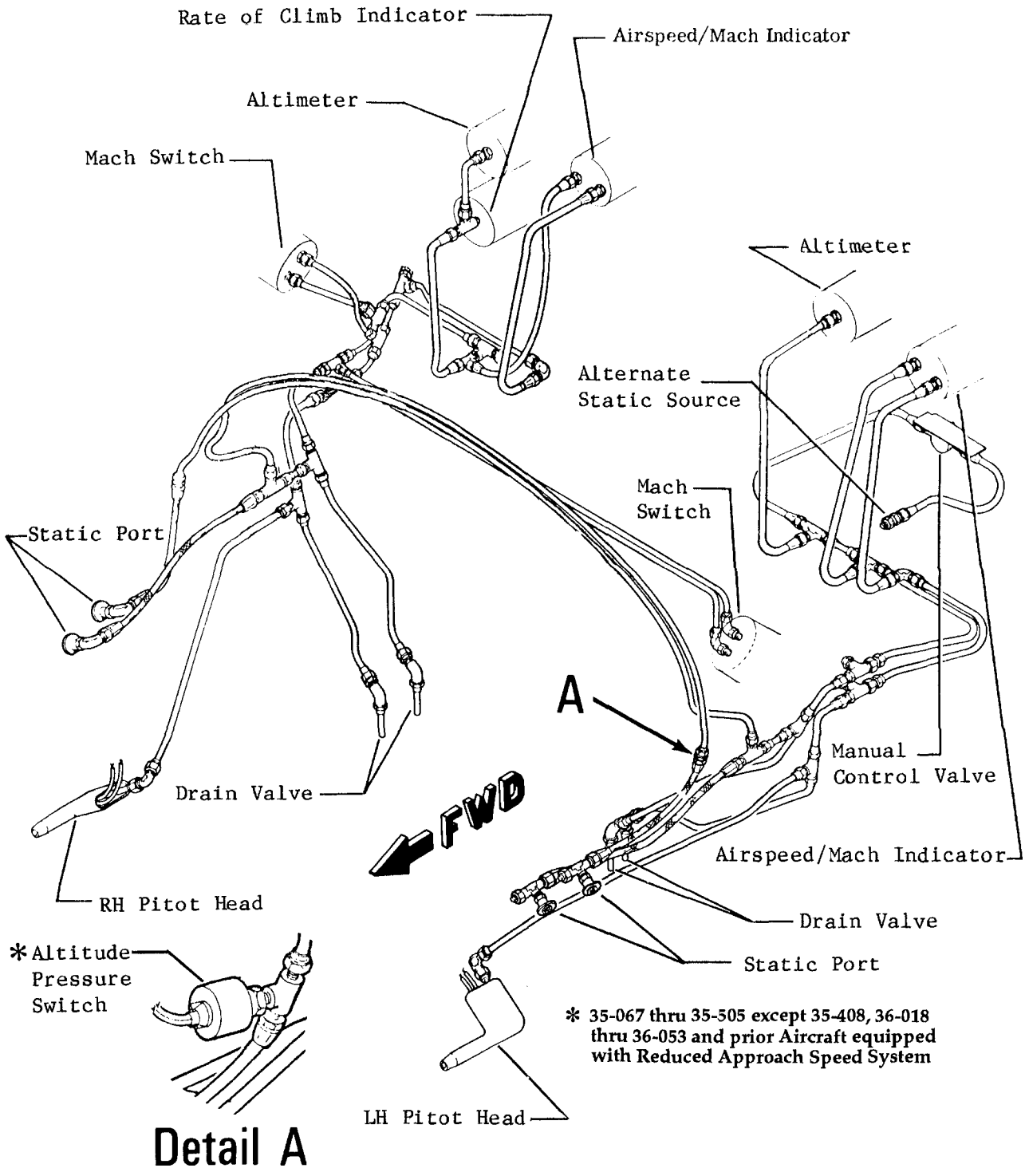
(2) The static system isolation valves are controlled by a three-position STATIC SOURCE Switch. The valves are solenoid actuated and normally open.

(3) The STATIC SOURCE Switch leaves both static systems isolation valves open when set to BOTH, closes the LH isolation valves when set to RIGHT, or closes the RH isolation valves when set to LEFT.

(4) The drain valves are for draining accumulated moisture and are opened by depressing the knurled hollow stem.

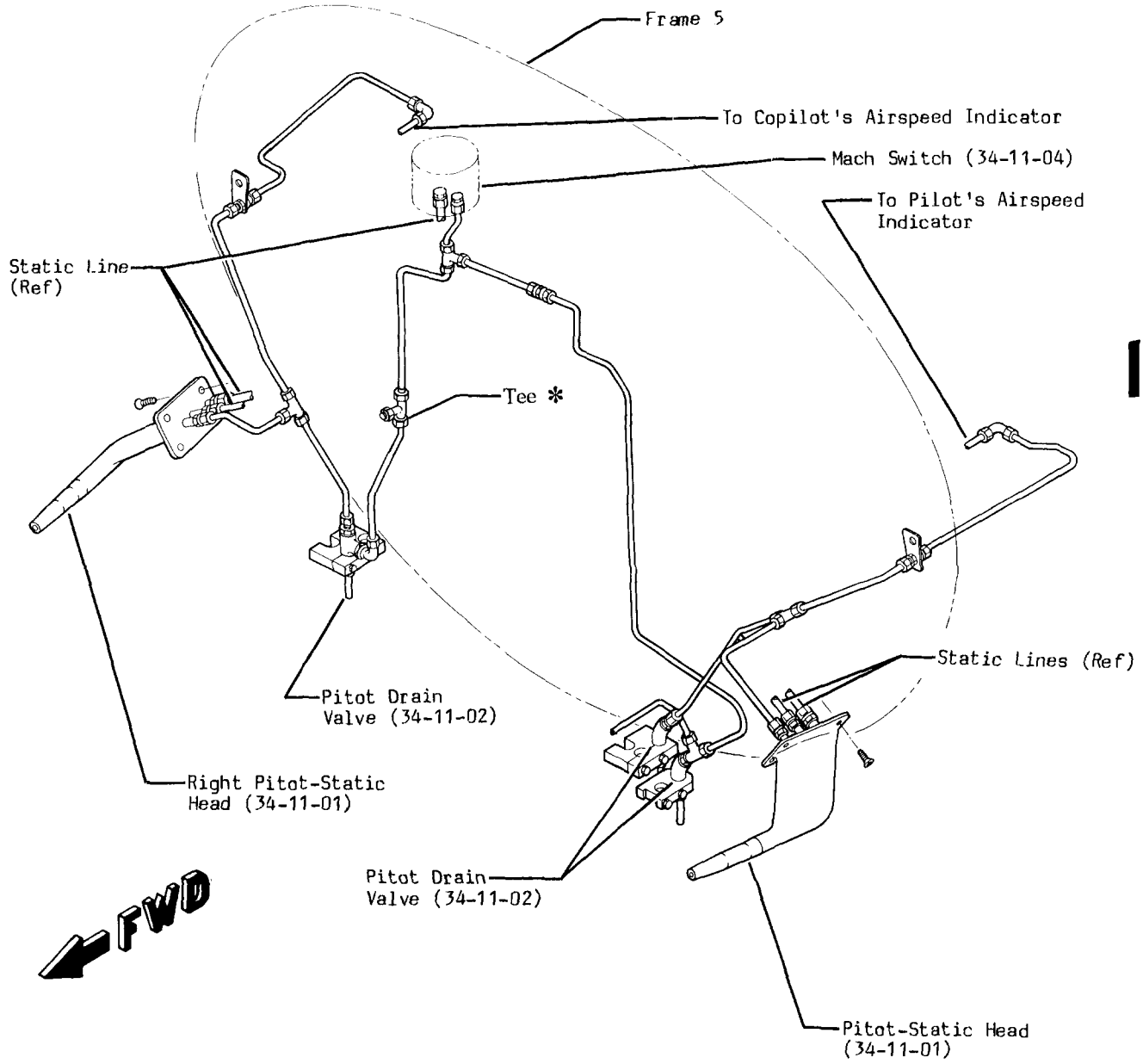


Pitot and Static System Component Location
Figure 1 (Sheet 1 of 4)



Pitot and Static System Component Location
Figure 1 (Sheet 2 of 4)

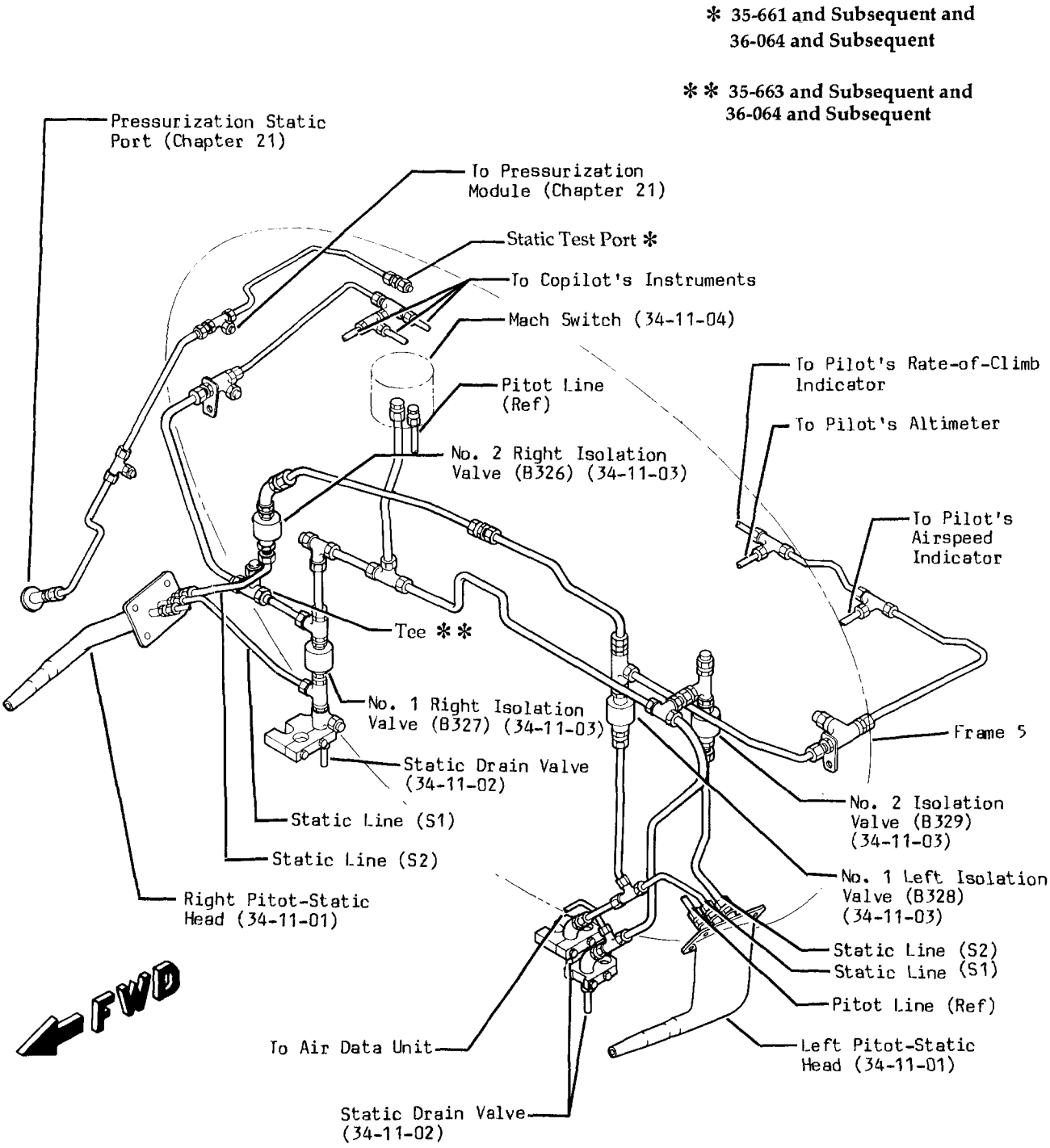
* 35-663 and Subsequent and 36-064 and Subsequent



PITOT SYSTEM

14-174C-1
14-174C

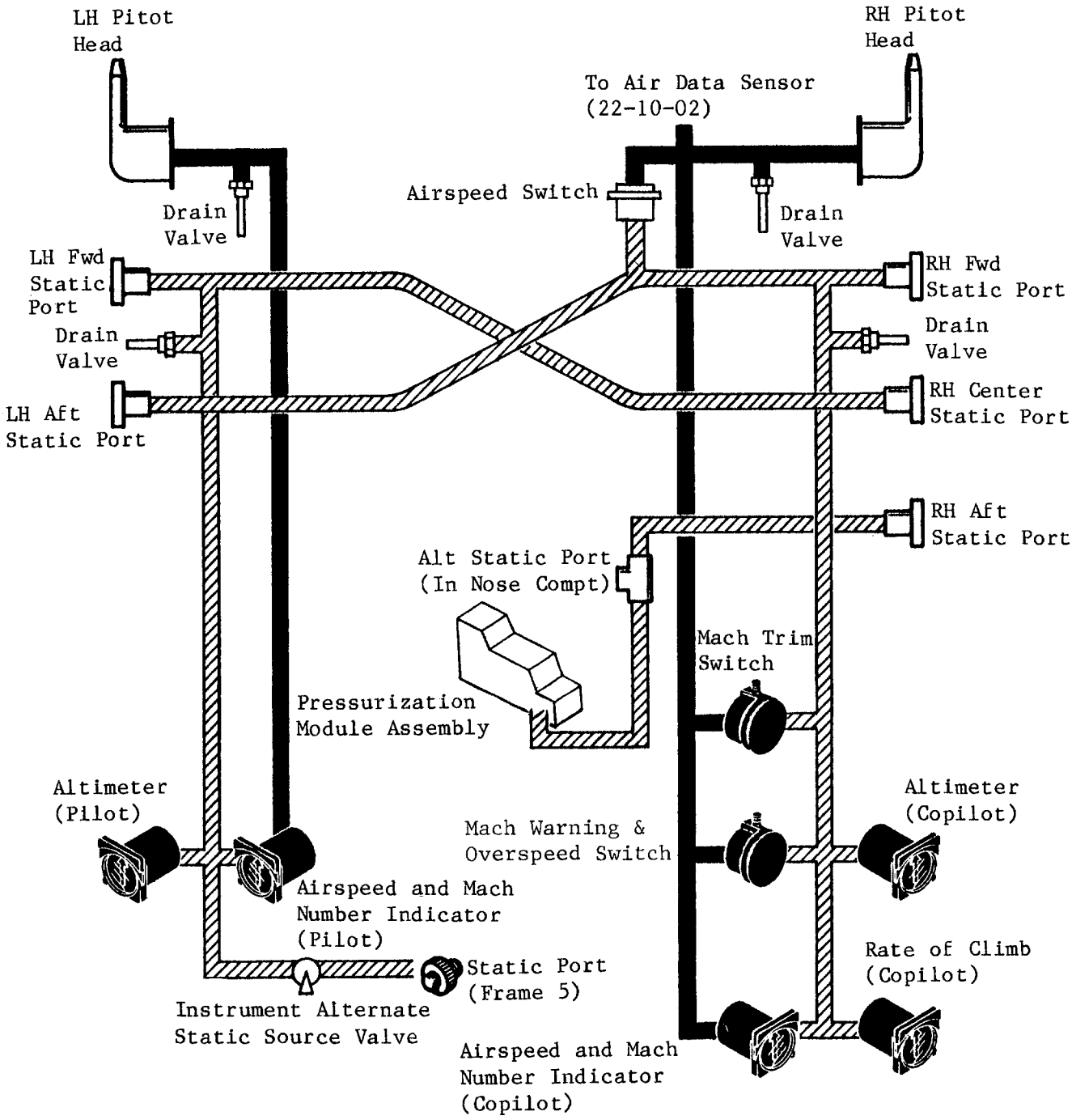
Pitot and Static System Component Location
Figure 1 (Sheet 3 of 4)



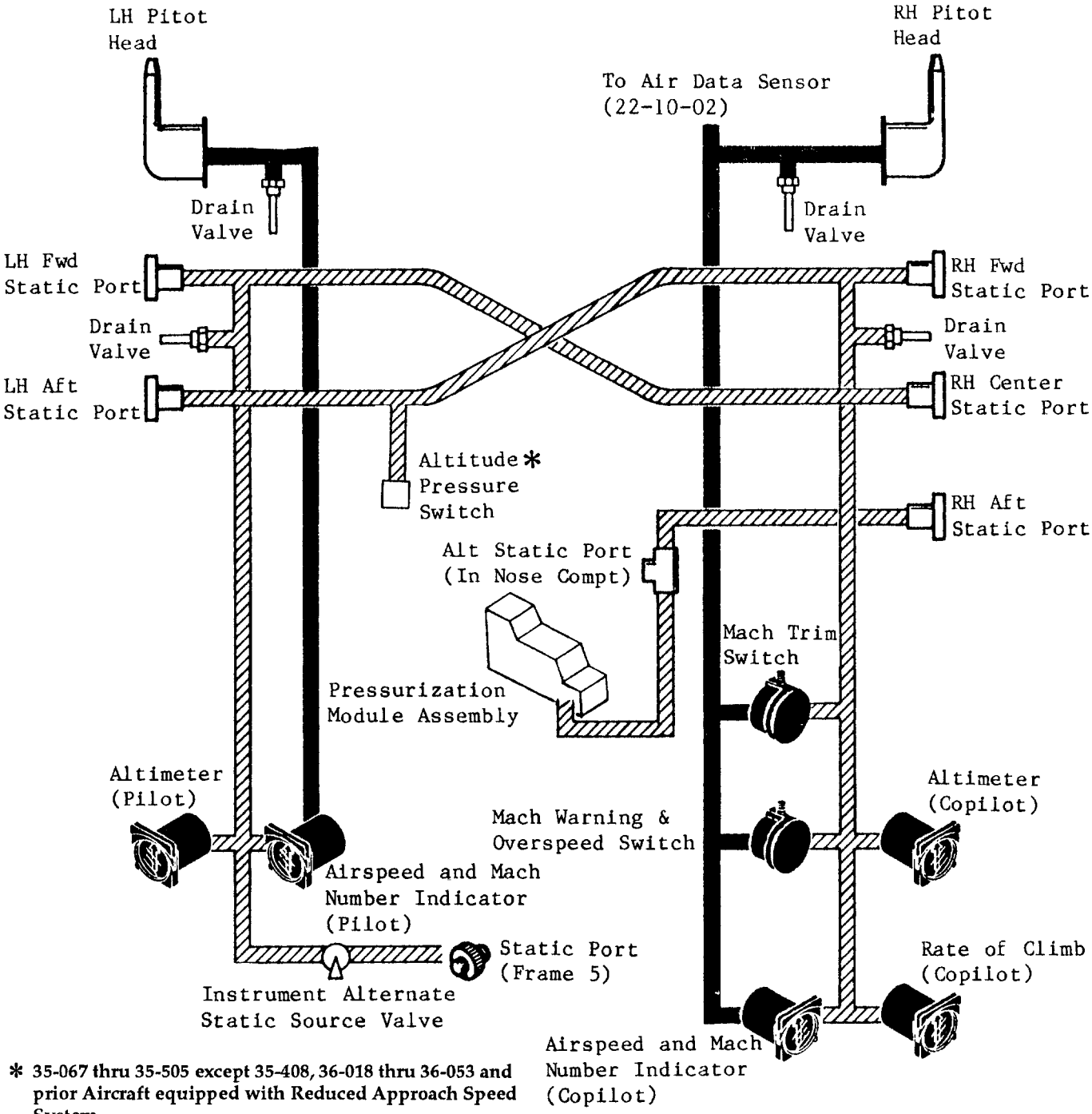
14-174C-1
14-174C

STATIC SYSTEM

Pitot and Static System Component Location
Figure 1 (Sheet 4 of 4)

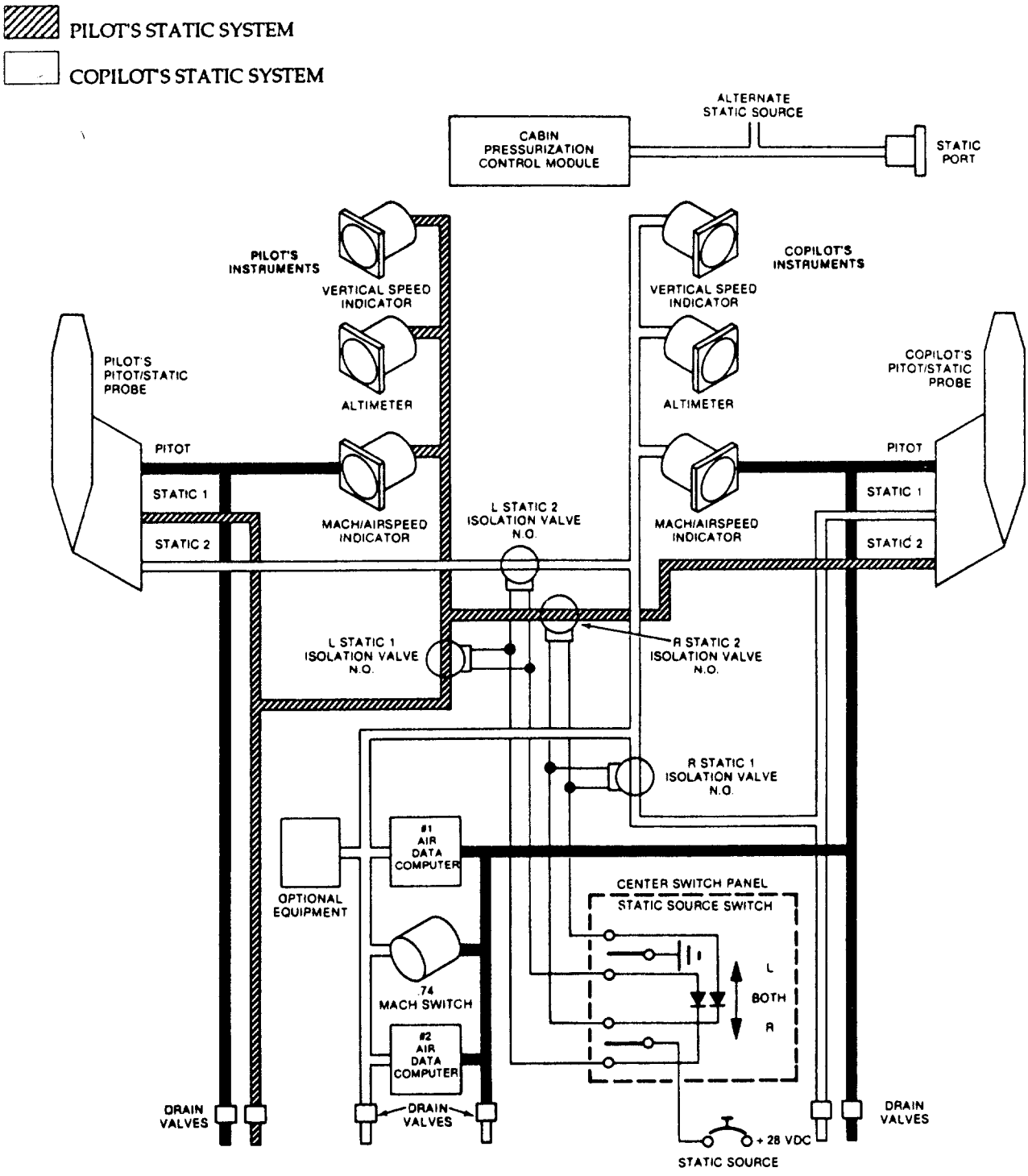


Pitot and Static System Schematic
Figure 2 (Sheet 1 of 3)



*** 35-067 thru 35-505 except 35-408, 36-018 thru 36-053 and prior Aircraft equipped with Reduced Approach Speed System**

Pitot and Static System Schematic
Figure 2 (Sheet 2 of 3)



Pitot and Static System Schematic
Figure 2 (Sheet 3 of 3)

PITOT AND STATIC SYSTEM - MAINTENANCE PRACTICES

1. Maintenance Practices

NOTE: Maintenance personnel should familiarize themselves with the following general maintenance practices prior to performing maintenance on the system.

A. When performing static system leak check, it will be necessary to apply vacuum to both pitot and static systems simultaneously. This will prevent severe pressure differential which could cause instrument damage. Pressure in the pitot system must always be equal to or slightly greater than that in the static system.

WARNING: PULL L PITOT HT CIRCUIT BREAKER ON PILOT'S C/B PANEL AND R PITOT HT CIRCUIT BREAKER ON COPILOT'S C/B PANEL BEFORE PERFORMING THE FOLLOWING PROCEDURES TO PREVENT DAMAGE TO EQUIPMENT AND POSSIBLE INJURY.

CAUTION: TO AVOID DAMAGE TO AIR DATA SENSOR, ALWAYS APPLY EQUAL VACUUM TO RH PITOT HEAD, SHOULDER STATIC PORTS, AND COPILOT'S STATIC SYSTEM.

B. Whenever a pitot or static line is disconnected, all exposed fittings should be capped or plugged.
C. All pitot and static line B-nuts incorporate a fitting seal. Each time a line is disconnected, a new fitting seal must be installed.
D. Pitot system leak check should be performed and all leaks repaired prior to performing static leak check.
E. Pitot and static system leak checks should be performed in accordance with current inspection intervals specified in Chapter 5 as well as anytime an instrument is replaced or a connection is loosened. All maintenance and inspections should be completed prior to performing leak checks.
F. Use of system schematic is recommended to prevent application of reverse pressure and to help determine location of leaks.
G. Test equipment should be checked for leaks prior to use.
H. The rate of pressure change or pressure applied should not exceed design limits of instruments specified in the following procedures.

2. Inspection/Check *(Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot")*

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Pitot and Static Tester	1811G	Barfield Instrument , Co. Atlanta, GA	Test System.
Pressure Seal Tape		3M Co. Saint Paul, MN	Seal Pitot and Static ports.

B. Pitot System Operational Check
(1) The difference between the pilot's and copilot's airspeed indicator shall not exceed 5 knots while maintaining a constant speed within a range of 80 to 140 knots and not exceed 9 knots while maintaining a constant speed within a range of 150 to 400 knots.

C. Pitot System Leakage Check

NOTE: All pitot line B-nuts incorporate a fitting seal, P/N AP50A-4 or AP50A-6. Each time a pitot line B-nut is disconnected, a new fitting seal must be installed.

(1) Ensure that all pitot lines are secure and pilot instruments are securely connected.
(2) Attach hose from pitot static test set to left pitot tube making sure drain hole in pitot tube is covered.

CAUTION: APPLY ONLY PRESSURE (NOT VACUUM) TO THE PITOT LINES. APPLY PRESSURE VERY SLOWLY UNTIL 80 KNOTS IS REACHED; PRESSURE APPLICATION AFTER THIS POINT MUST NOT EXCEED 20 KNOTS PER SECOND.

(3) Slowly apply pressure until pilot's airspeed indicator indicates 300 knots. Rate of pressure increase shall not increase the airspeed indicator in excess of 20 knots per second after 80 knots is reached.
(4) Turn off pressure; this will seal system. System pressure drop shall be less than 5 knots in a 5-minute period.
(5) If excessive leakage is indicated, recheck fittings and repeat steps (1) through (4).

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 20 KNOTS PER SECOND WHEN VENTING ATMOSPHERIC PRESSURE INTO PITOT SYSTEM.

(6) Slowly release pressure and remove test unit, checking that pitot tube is clear of obstructions.
(7) Repeat above procedure utilizing right pitot tube and copilot's airspeed indicator.

D. Static System Leakage Check

NOTE: All static line B-nuts incorporate a fitting seal, P/N AP50A-4 or AP50A-6. Each time a static line B-nut is disconnected, a new fitting seal must be installed.

(1) Instrument Static Lines

NOTE: The following procedure is applicable for either the pilot's or copilot's static systems. Check the static systems individually.

Steps (a) thru (f) consist of a typical vacuum system check. Figures shown will vary with the geographical location where check is make. In all cases, the acceptable check consists of evacuation of the static system until a pressure differential is obtained. Without additional pumping, for a period of 1 minute, the indicated loss of altitude shall not exceed 2% of the equivalent altitude of the maximum cabin differential pressure or 100 feet, whichever is greater. An altitude to inches of mercury (Hg) conversion table is provided to assist personnel in performing the check. All altitude readings are taken to the nearest 100 feet.

(a) Ensure that all instruments and lines are securely connected and all drain lines are tightly capped. Close the alternate static source manual control valve.
(b) Connect pitot/static test set or equivalent to one static port (either right or left) while blocking the remaining static port.

(c) Determine local pressure altitude and convert to inches of mercury (in. Hg). The local pressure altitude may be determined by setting the Barometric Correction on the altimeter to 29.92 in. Hg and reading the altitude from the indicator. Alternatively, the barometric pressure can be determined directly using a barometer.

Example: Set barometric correction on altimeter to 29.92 in. Hg and read current pressure altitude of 1300 feet. From Figure 202, 1300 feet - 28.54 in. Hg.

(d) Convert the cabin differential pressure (8.9 psi) to inches of mercury by multiplying 8.9 by 2.04 (the equivalent of 1 psi in inches of mercury) which equals 18.15 Hg.

(e) Subtract the results of step (d) from results of (c) and convert to altitude. This is the desired altimeter reading to which the system must be evacuated.
Example: 28.54 Hg minus (-) 18.15 Hg = 10.39.
10.39 converted to altitude = 26,500 feet (this is the required altimeter reading).

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, APPLY ONLY SUCTION (VACUUM) TO STATIC SYSTEM AND ENSURE THE TEST SET CROSSBLEED VALVE IS OPEN.

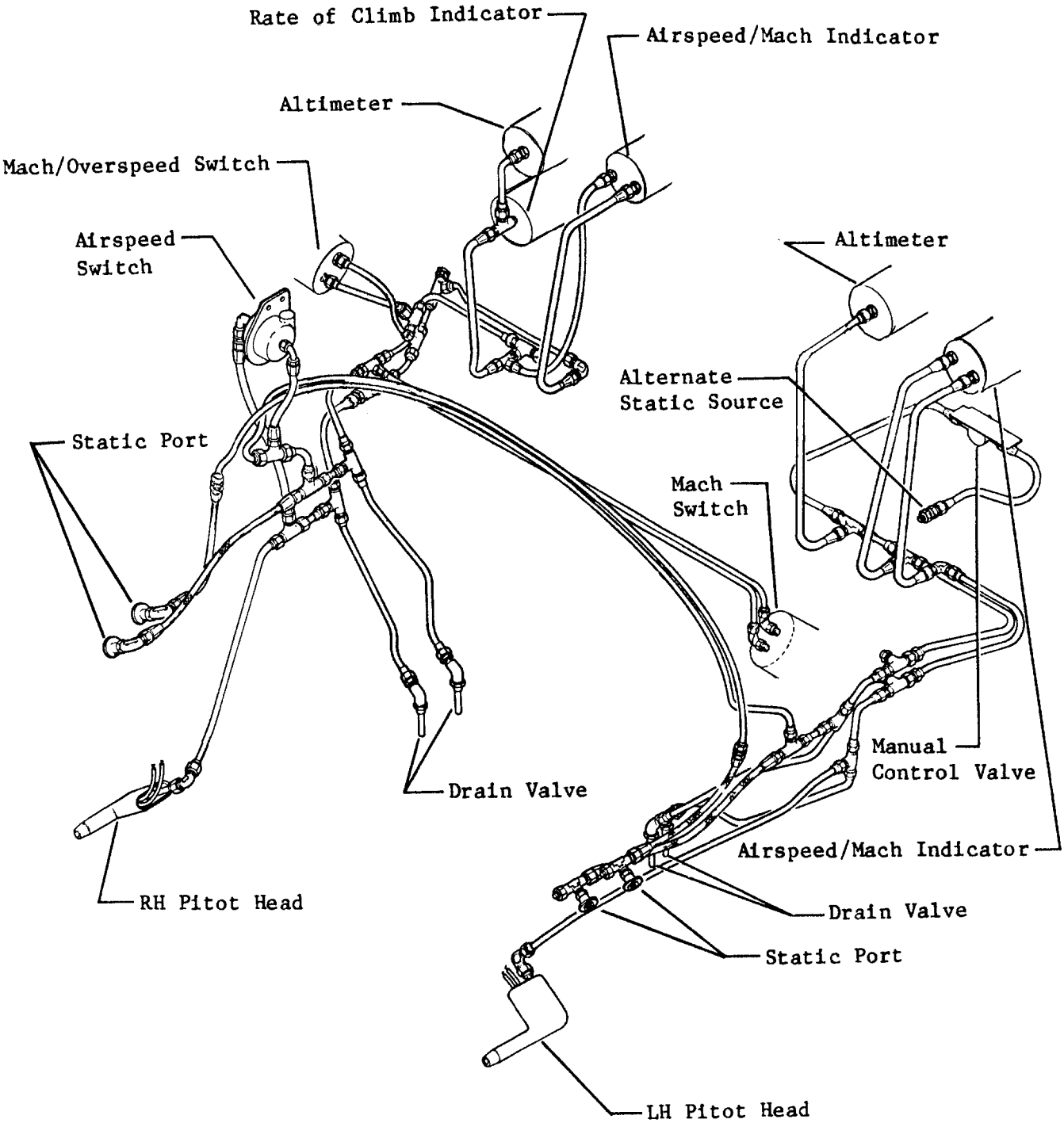
TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT.

(f) Evacuate the system until the altimeter reading determined in step (e) is obtained. Turn off vacuum source, sealing the system. Loss of altitude in 1 minute shall not exceed 2% of the required altimeter reading.

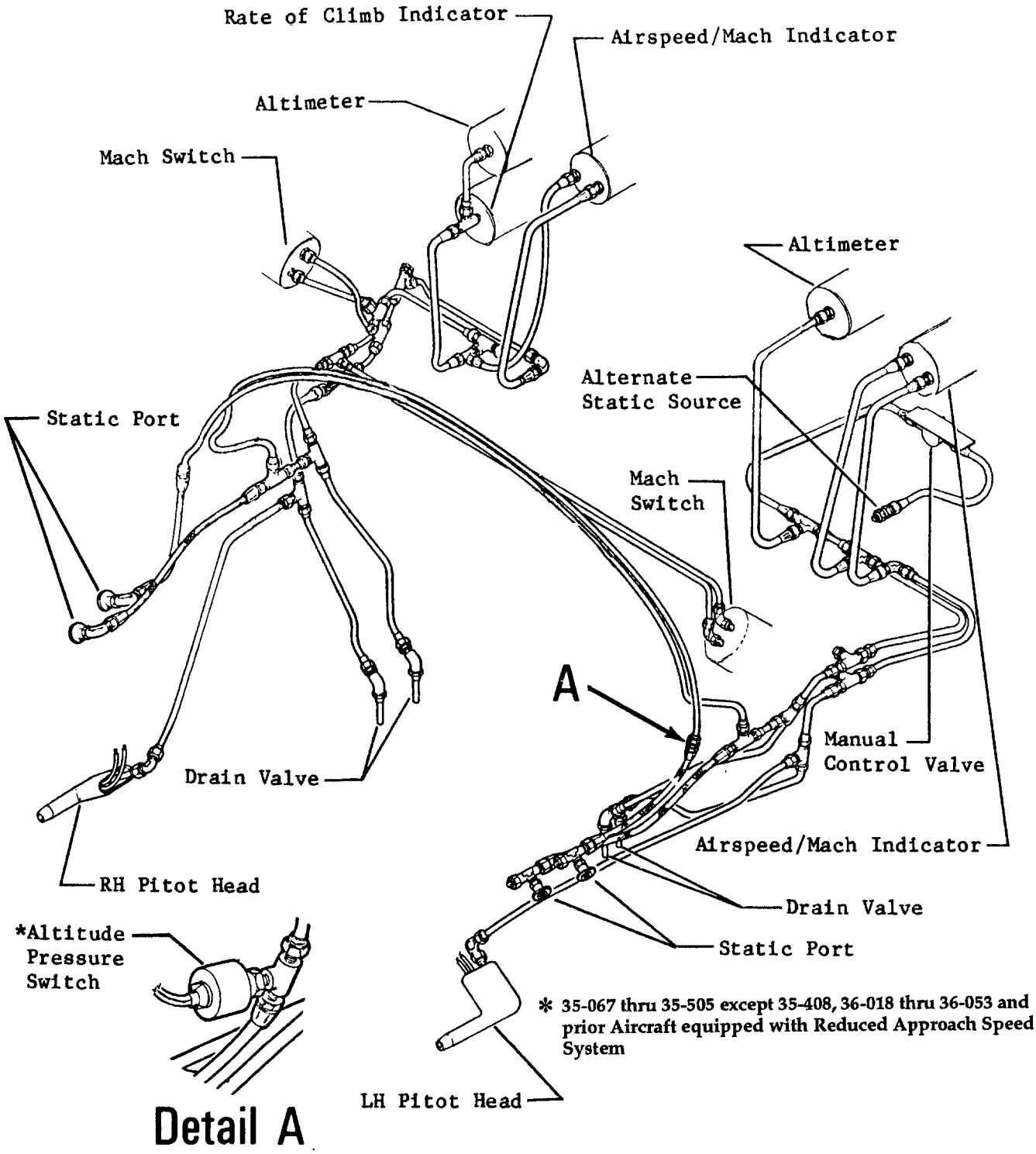
Example: Required altimeter reading 26,500 feet. 2% of 26,500 feet = 530 feet (maximum drop in 1 minute is 530 feet).

(g) Check the alternate static source by blocking the external static source and opening the manual control valve. Loss of altitude shall not exceed the required reading obtained in step (f).

(h) If acceptable, release vacuum slowly and perform check of remaining static system.



Pitot and Static System Plumbing Installation
Figure 201 (Sheet 1 of 2)



Pitot and Static System Plumbing Installation
Figure 201 (Sheet 2 of 2)

STATIC PRESSURE (IN INCHES OF MERCURY) FOR VALUES OF PRESSURE ALTITUDE (IN FEET)

Pressure Altitude in Ft. (Above Sea Level)	0	100	200	300	400	500	600	700	800	900
-1,000	31.0185									
-0		30.0295	30.1382	30.2471	30.3563	30.4659	30.5758	30.6860	30.7965	30.9073
0	29.9213	29.8133	29.7056	29.5983	29.4913	29.3846	29.2782	29.1721	29.0663	28.9608
1,000	28.8557	28.7508	28.6463	28.5421	28.4382	28.3345	28.2312	28.1282	28.0255	27.9231
2,000	27.8210	27.7193	27.6178	27.5166	27.4157	27.3151	27.2148	27.1148	27.0151	26.9158
3,000	26.8167	26.7179	26.6193	26.5211	26.4232	26.3256	26.2283	26.1312	26.0345	25.9380
4,000	25.8418	25.7459	25.6504	25.5550	25.4600	25.3653	25.2708	25.1767	25.0828	24.9892
5,000	24.8959	24.8029	24.7101	24.6177	24.5255	24.4336	24.3419	24.2506	24.1595	24.0687
6,000	23.9782	23.8880	23.7980	23.7083	23.6189	23.5297	23.4409	23.3523	23.2639	23.1759
7,000	23.0881	23.0006	22.9133	22.8263	22.7396	22.6532	22.5670	22.4811	22.3954	22.3100
8,000	22.2249	22.1401	22.0555	21.9711	21.8871	21.8033	21.7197	21.6364	21.5534	21.4706
9,000	21.3881	21.3058	21.2238	21.1421	21.0606	20.9793	20.8983	20.8176	20.7371	20.6569
10,000	20.5769	20.4972	20.4177	20.3385	20.2595	20.1808	20.1023	20.0241	19.9461	19.8684
11,000	19.7909	19.7136	19.6366	19.5599	19.4834	19.4071	19.3310	19.2553	19.1797	19.1044
12,000	19.0293	18.9545	18.8799	18.8055	18.7314	18.6575	18.5839	18.5105	18.4373	18.3644
13,000	18.2917	18.2192	18.1470	18.0749	18.0032	17.9316	17.8603	17.7892	17.7184	17.6477
14,000	17.5773	17.5072	17.4372	17.3675	17.2980	17.2287	17.1597	17.0909	17.0223	16.9539
15,000	16.8858	16.8187	16.7501	16.6827	16.6154	16.5483	16.4815	16.4149	16.3485	16.2824
16,000	16.2164	16.1507	16.0851	16.0198	15.9547	15.8899	15.8252	15.7608	15.6965	15.6325
17,000	15.5687	15.5051	15.4417	15.3785	15.3155	15.2582	15.1902	15.1279	15.0657	15.0038
18,000	14.9421	14.8806	14.8192	14.7581	14.6972	14.6365	14.5760	14.5157	14.4556	14.3957
19,000	14.3360	14.2765	14.2173	14.1582	14.0993	14.0406	13.9821	13.9238	13.8657	13.8078
20,000	13.7501	13.6926	13.6352	13.5781	13.5212	13.4644	13.4079	13.3516	13.2954	13.2394
21,000	13.1836	13.1281	13.0727	13.0175	12.9624	12.9076	12.8530	12.7985	12.7442	12.6902
22,000	12.6363	12.5826	12.5290	12.4757	12.4225	12.3696	12.3168	12.2642	12.2117	12.1595
23,000	12.1074	12.0556	12.0039	11.9523	11.9010	11.8498	11.7988	11.7480	11.6974	11.6469
24,000	11.5967	11.5466	11.4966	11.4469	11.3973	11.3479	11.2987	11.2496	11.2007	11.1520
25,000	11.1035	11.0551	11.0069	10.9589	10.9110	10.8634	10.8158	10.7685	10.7213	10.6743
26,000	10.6274	10.5808	10.5342	10.4879	10.4417	10.3957	10.3498	10.3041	10.2586	10.2133
27,000	10.1681	10.1230	10.0781	10.0334	9.9890	9.9445	9.90023	9.85616	9.81224	9.76848
28,000	9.72488	9.68144	9.63815	9.59502	9.55205	9.50923	9.46658	9.42407	9.38172	9.33952
29,000	9.29748	9.25559	9.21385	9.17227	9.13083	9.08956	9.04843	9.00745	8.96662	8.92594
30,000	8.88541	8.84503	8.80480	8.76472	8.72479	8.68500	8.64536	8.60587	8.56652	8.52732
31,000	8.48826	8.44935	8.41059	8.37197	8.33349	8.29515	8.25696	8.21891	8.18100	8.14324
32,000	8.10561	8.06813	8.03079	7.99358	7.95652	7.91960	7.88281	7.84616	7.80966	7.77328
33,000	7.73705	7.70095	7.66499	7.62917	7.59348	7.55793	7.52251	7.48722	7.45208	7.41706
34,000	7.38218	7.34743	7.31281	7.27833	7.24397	7.20975	7.17566	7.14170	7.10787	7.07417
35,000	7.04060	7.00716	6.97385	6.94066	6.90761	6.87468	6.84188	6.80920	6.77665	6.74423
36,000	6.71194	6.67977	6.64774		6.58414		6.52115		6.45877	
37,000	6.39698		6.33578		6.27517		6.21514		6.15568	
38,000	6.09679		6.03846		5.98070		5.92348		5.86681	
39,000	5.81069		5.75510		5.70004		5.64551		5.59151	
40,000	5.53801		5.48503		5.43256		5.38059		5.32911	
41,000	5.27813		5.22764		5.17763		5.12809		5.07904	
42,000	5.03045		4.98232		4.93466		4.88745		4.84069	
43,000	4.79439		4.74852		4.70309		4.65810		4.61354	
44,000	4.56940		4.52569		4.48239		4.43951		4.39704	
45,000	4.35497		4.31331		4.27205		4.23118		4.19070	
46,000	4.15061		4.11090		4.07157		4.03262		3.99405	
47,000	3.95584		3.91799		3.88051		3.84339		3.80662	
48,000	3.77020		3.73413		3.69481		3.66303		3.62799	
49,000	3.59328		3.55890		3.52486		3.49113		3.45774	
50,000	3.42466		3.39189		3.35945		3.32731		3.29548	
51,000	3.26395		3.23273		3.20180		3.17117		3.14083	

Conversion Table - Altitude to Inches of Mercury
Figure 202

3. **Inspection/Check** *(Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2,"Installation of FC-530 Autopilot")*

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Pitot and Static Tester	1811G	Barfield Instrument Co. Atlanta, GA	Test System.
Pitot-Static Test Adapter	L50-612*	Learjet Inc. Wichita, KS	Adapt Pitot Static Tester to Mast.

* Adapters (2 each) PSS 50476-3-4-4 must be modified with kits (2 each) SSR 476 to test Model 35/36 aircraft. The modified adapter part number is PSS 50476M1-3-4-4.

B. Pitot System Operational Check
   (1) The difference between the pilot's and copilot's airspeed indicator shall not exceed 5 knots while maintaining a constant speed within a range of 80 to 140 knots and not exceed 9 knots while maintaining a constant speed within a range of 150 to 400 knots.

C. Pitot System Leakage Check (See Figure 204.)
   (1) Connect a pitot-static test adapter (P/N L50-612) to pilot's pitot- static mast.
   (2) Connect pitot-static tester (P/N 1811G) to pitot-static test adapter.

CAUTION: USE EXTREME CARE NOT TO CONTAMINATE INSTRUMENTS OR PITOT-STATIC SYSTEM.

TO PREVENT DAMAGE TO AIRCRAFT INSTRUMENTS, APPLY PRESSURE TO PITOT-STATIC SYSTEM SLOWLY UNTIL THE AIRSPEED INDICATOR INDICATES 80 KNOTS. INCREASED AIRSPEED BEYOND 80 KNOTS SHALL NOT EXCEED A RATE OF 20 KNOTS PER SECOND.

   (3) Apply pressure to pitot system (very slowly until airspeed indicator indicates 80 knots). Increase airspeed to 300 knots at a rate not to exceed 20 knots per second.
   (4) Turn off pressure, sealing off the system. The system pressure drop in 5 minutes shall be less than 5 knots on airspeed indicator.
   (5) Depressurize system at a rate not more than 20 knots per second.
   (6) Repeat steps (1) through (5) for copilot's pitot system.

D. Static System Plumbing Check (See Figure 205.)
   (1) Set Battery and Primary and Secondary Inverter Switches on.
   (2) Set STATIC SOURCE Switch to RIGHT.
   (3) Ensure that pitot-static tester adapter with pitot-static tester attached is properly installed on right pitot-static mast. Disconnect tester from static 2 system at mast.

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS AND TESTER AIRSPEED INDICATOR, ENSURE THAT THE CROSS-BLEED VALVE ON PITOT-STATIC TESTER IS OPEN WHEN APPLYING A VACUUM TO THE PITOT-STATIC SYSTEM.

TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT. DO NOT ALLOW AIRSPEED TO DECREASE BELOW ZERO.

(4) Open tester cross-bleed valve. Apply a vacuum to copilot's pitot- static system until tester altimeter indicates 28,000 feet altitude. Do not exceed a rate-of-climb of 2,000 feet per minute.
(5) Shut off vacuum source at 28,000 feet and seal off pitot-static system. System leakage in one minute shall not cause tester altimeter to indicate any less than 27,640 feet or 360 feet in one minute.

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT. DO NOT ALLOW AIRSPEED TO DECREASE BELOW ZERO.

(6) With tester cross-bleed valve open, release vacuum from pitot-static system. Do not release vacuum at a rate to exceed 2,000 feet per minute.
(7) Remove pitot-static tester adapter with pitot-static tester attached from copilot's pitot-static mast and install on pilot's pitot-static mast.
(8) Set STATIC SOURCE Switch to LEFT.
(9) Repeat steps (4) through (6) for the pilot's static system.

4. Adjustment/Test *(Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2,"Installation of FC-530 Autopilot")*

A. Pitot-Static Isolation Valve Functional Test

NOTE: Perform Pitot-Static Isolation Valve Functional Test in accordance with inspection intervals specified in Chapter 5.

(1) Install pitot-static test adapter to pilot's pitot-static mast and connect pitot-static tester to pilot's static port 1.
(2) Set STATIC SOURCE Switch to BOTH.

CAUTION: WHEN APPLYING VACUUM TO THE PITOT-STATIC SYSTEM, ENSURE THAT TESTER CROSS-BLEED VALVE IS OPEN.

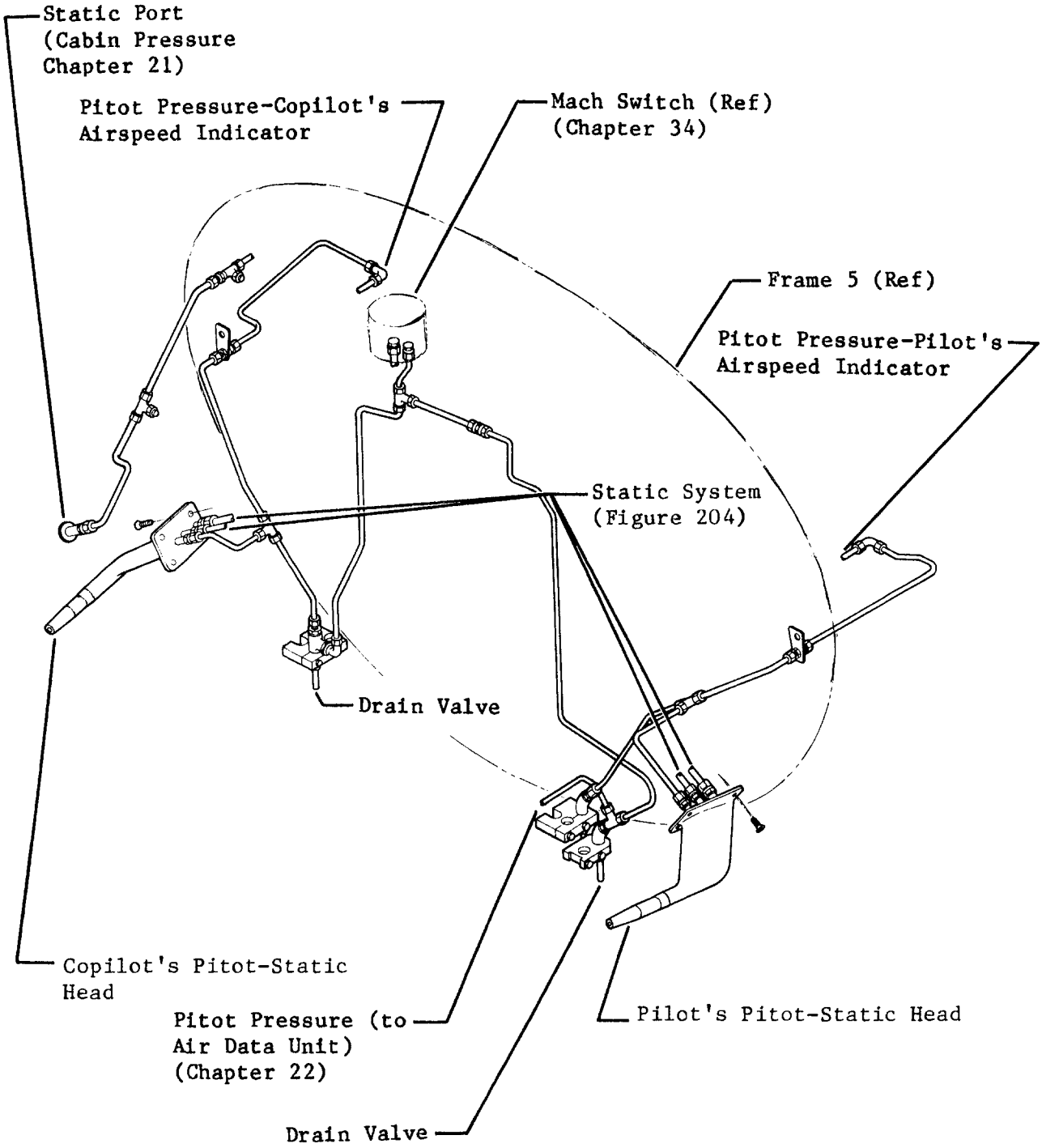
TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT. DO NOT ALLOW AIRSPEED TO DECREASE BELOW ZERO.

(3) Seal off static ports on copilot's mast.
(4) With tester cross-bleed valve open, apply a vacuum to the pilot's pitot-static port 1 until tester altimeter indicates 1,500 feet above field elevation. Do not exceed a rate-of-climb of 2,000 feet per minute.
(5) Slowly remove seal on copilot's static port 2 (refer to Figure 204), and verify air flow at static port 2.
(6) Seal copilot's static port 2.
(7) Disconnect pitot/static tester vacuum source from pilot's pitot/static port 1 and connect to pilot's pitot/static port 2.
(8) With tester cross-bleed valve open, apply a vacuum to pilot's static port 2 until tester altimeter indicates 1,500 feet above field elevation. Do not exceed a rate-of-climb of 2,000 feet per minute.

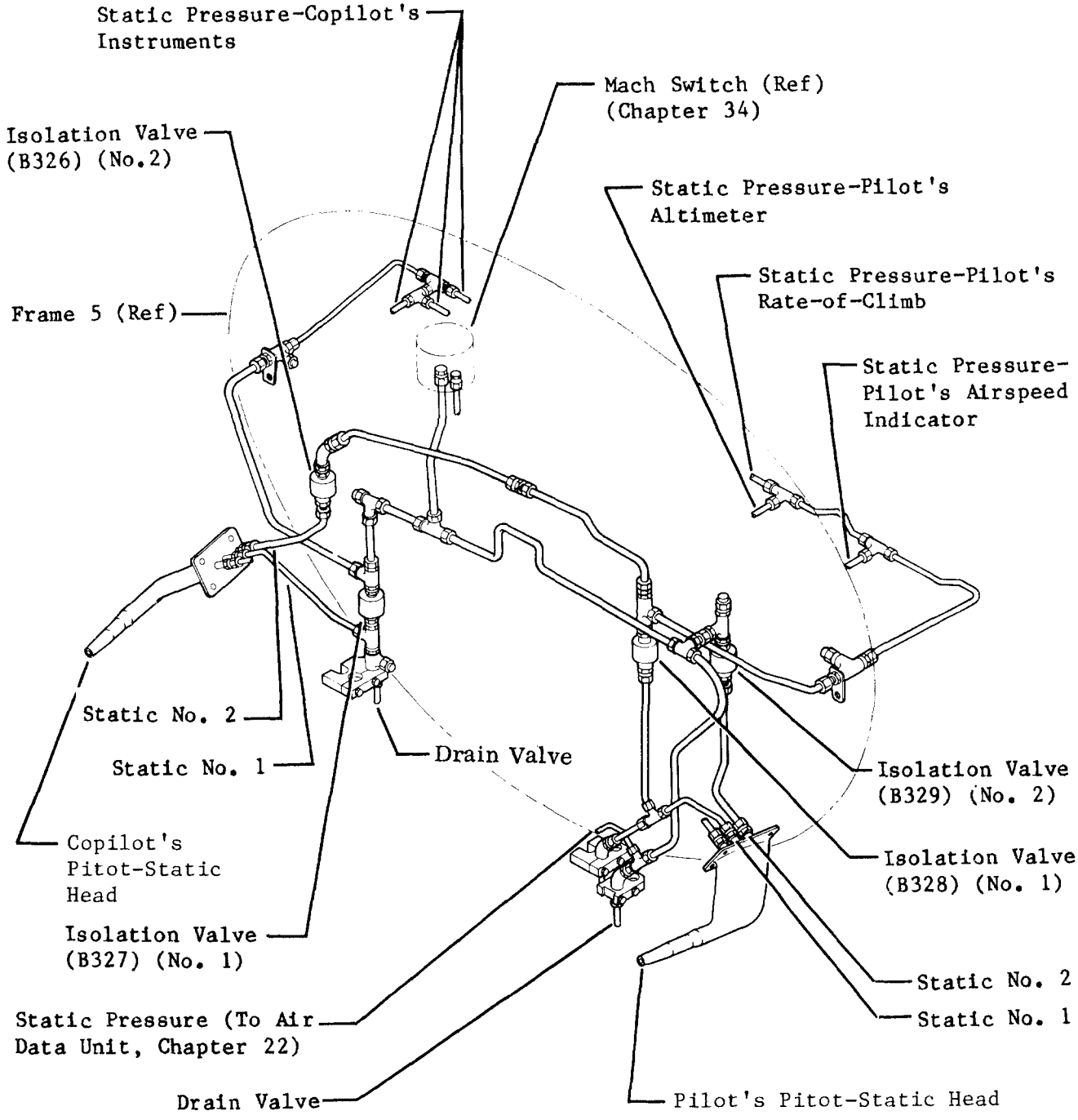
(9) Remove seal from copilot's static port 1 and verify air flow at static port 1.
(10) Seal off static ports on copilot's mast.
(11) Set STATIC SOURCE Switch to LEFT.
(12) With tester cross-bleed valve open, apply a vacuum to pilot's pitot-static system until altimeter indicates 1,500 feet above field elevation. Do not exceed a rate-of-climb of 2,000 feet per minute.
(13) Slowly remove seals from copilot's mast and verify no air flow at copilot's static ports 1 and 2.
(14) Set STATIC SOURCE Switch to BOTH. Verify airflow at copilot's static ports 1 and 2.
(15) Install pitot-static test adapter to copilot's pitot-static mast and connect pitot-static tester to copilot's static port 1.
(16) Seal off static ports on pilot's mast.
(17) Set STATIC SOURCE Switch to RIGHT.
(18) With tester cross-bleed valve open, apply a vacuum to copilot's pitot-static system until tester altimeter indicates 1,500 feet above field elevation. Do not exceed a rate-of-climb of 2,000 feet per minute.
(19) Remove seals from pilot's mast and verify no air flow at pilot's static ports 1 and 2.
(20) Set STATIC SOURCE Switch to BOTH. Verify air flow at pilot's static ports 1 and 2.

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT. DO NOT ALLOW AIRSPEED TO DECREASE BELOW ZERO.

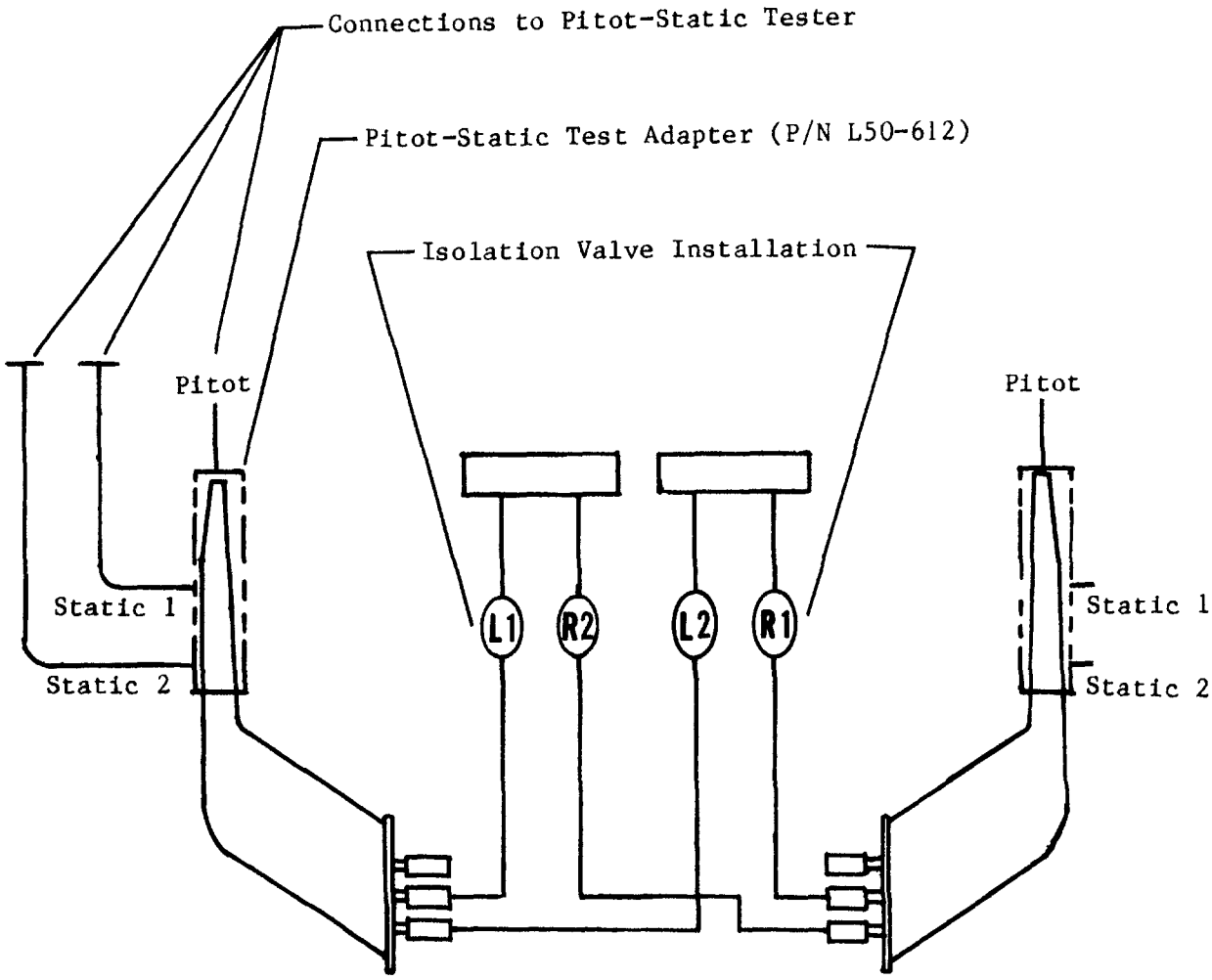
(21) Release vacuum from the pitot-static system.
(22) Remove pitot-static tester from pitot-static test adapter.
(23) Remove pitot-static test adapter from aircraft.



Pitot System Plumbing Installation
Figure 203



Static System Plumbing Installation
Figure 204



Pitot - Static System Test Set-Up
Figure 205

PITOT TUBE - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: *Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot,"* the pitot tubes are located on each side of the nose compartment at F.S. 137.88. Each pitot tube is equipped with two electrical heating elements to prevent moisture from freezing on the mast and/or obstructing the tubes. The tube heaters are powered by 28 vdc and controlled by the Pitot Heat Switches.

Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot," the pitot-static heads are located on each side of the nose compartment between frames 4 and 5. Each pitot-static head is equipped with three electrical heating elements to prevent moisture from freezing on and/or obstructing the pitot-static heads. Tube heaters are powered by 28 vdc and controlled by the Pitot Heat Switches. No polishing, sanding, or abrasive cleaning should be done on the pitot tubes as this destroys the precision contour of the head and rounds the corners of the static ports.

A. Removal of Pitot Tube *(Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot")* (See Figure 201.)

NOTE: Removal and installation procedures for either pitot tube is identical.

(1) Remove nose compartment access doors.
(2) Disconnect pitot line from pitot tube. Cap exposed line.
(3) Disconnect electrical wiring from pitot tube.
(4) Remove attaching parts and pitot tube from mast.

B. Installation of Pitot Tube *(Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot")* (See Figure 201.)

CAUTION: WHEN INSTALLING PITOT TUBE INTO MAST ASSEMBLY, DO NOT PUSH PITOT TUBE IN TOO FAR AS DAMAGE TO THE HEATING ELEMENT MAY RESULT.

(1) Install pitot tube in mast. Apply Loctite Screwlock to screws and secure pitot tube to mast.
(2) Remove cap from pitot line and connect line to pitot tube.
(3) Connect electrical wiring to pitot tube.

C. Removal of Pitot-Static Tube *(Aircraft 35-408, 35-506 and Subsequent and 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot.")* (See Figure 202.)

WARNING: THE FOLLOWING PROCEDURES ARE ONLY APPLICABLE TO REPLACING A PITOT-STATIC TUBE DUE TO HEATER ELEMENT FAILURE.

IN CASE OF A DAMAGED PROBE, SUPPORT STRUCTURE ALIGNMENT MAY HAVE BEEN ALTERED. CONTACT LEARJET CUSTOMER SERVICE DEPARTMENT FOR DISPOSITION OF AIRCRAFT.

NOTE: The Rosemont pitot-static tube base mount incorporates an eccentric nut which is safety wired to the base mount. On some aircraft this eccentric nut is not safety wired. The following procedures provide instructions for safety wiring, if necessary.

(1) Remove nose compartment access doors and remove equipment as required to gain access to the pitot-static tube.
(2) Disconnect electrical connector from pitot-static tube.
(3) Loosen and disconnect pitot and static lines from pitot-static tube.
(4) Remove attaching parts and pitot-static tube from aircraft. Clean old fay sealant from base mount.
(5) If eccentric nut is not safety wired, proceed with step (5)(a) thru (5)(d). If eccentric nut is safety wired, proceed to D. Install Pitot-Static Tube.
  (a) Place an index mark on side of eccentric nut and base mount. Carefully count number of turns and remove eccentric nut from base mount.
  (b) Drill a 0.070 inch [1.78 mm] dia. hole through hex of eccentric nut midway between top of nut and top of threads.
  (c) Locate and drill two (2) 0.040 inch [1.02 mm] dia. holes, 0.70 inch [17.8 mm] apart on flange of base mount.
  (d) Apply Loctite No. 22 to threads of eccentric nut and screw into base mount the number of turns from step (5)(a) until the index marks are aligned.
  (e) Install safety wire (P/N MS20995C20) assuring that eccentric nut cannot rotate in either direction.

D. Installation of Pitot-Static Tube *(Aircraft 35-408, 35-506 and Subsequent and 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot.")* (See figure 202.)
(1) Apply fay seal to surface of base mount. Position pitot-static tube on base mount assuring that probe pin is fully engaged in eccentric nut and install attaching parts. Torque nuts 30 to 40 inch-pounds [3.4 to 4.5 Nm].
(2) Remove caps from pitot and static lines and connect lines to pitot- static tube.
(3) Connect electrical connector to pitot-static tube.
(4) Perform pitot and static plumbing leak check. (Refer to 34-11-00, Inspection/Check.)
(5) Check pitot and static tube for proper heating as follows:
  (a) Set applicable Pitot Heat Switch on.
  (b) Check pitot-static tube starts to warm-up.
  (c) Set applicable Pitot Heat Switch off.
(6) Install previously removed equipment.
(7) Install nose compartment access doors.

2. Inspection/Check

A. Check Heater Power Consumption *(Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot")*
(1) If pitot tube does not heat properly, check power consumption in still, room temperature air. After five minutes of operation, check amperage. Amperage shall be 6.3 to 7.0 amperes.

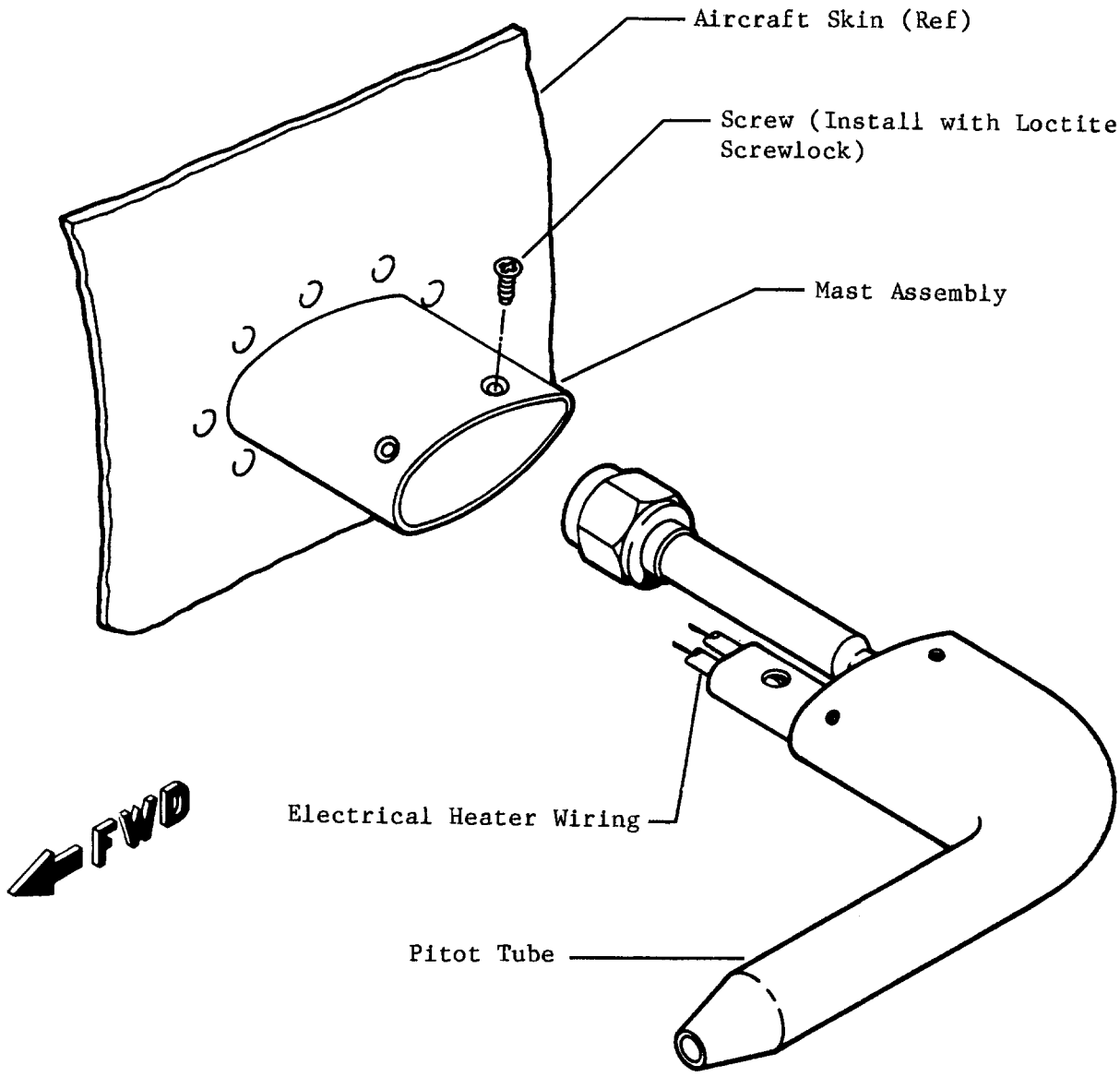
B. Check Pitot Tube Pressure Leakage *(Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot")*
(1) If Pitot System Leakage Check (34-11-00) indicates excessive leakage, check pitot tube pressure leakage. Remove pitot tube. Seal all pressure openings and drain holes in the pitot tube. Apply 80 inches of Hg (39.2 psi) and seal off pressure source. Internal pressure drop shall not exceed 0.40 inches Hg (0.2 psi) in one minute.

C. Pitot Head Drain Hole Check

NOTE: Perform Pitot Head Drain Hole Check in accordance with the current inspection interval specified in Chapter 5.

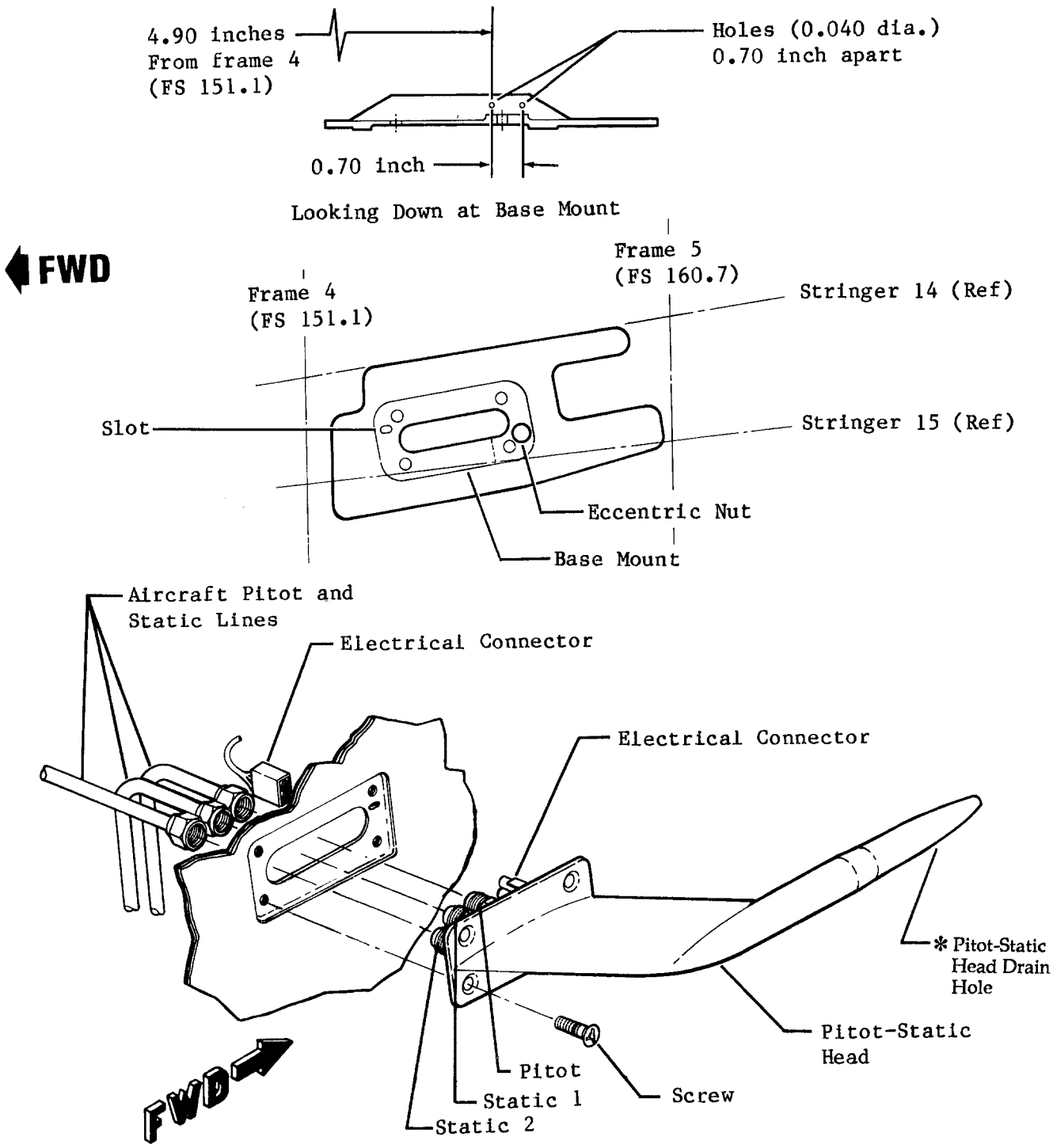
(1) Locate pitot drain hole on pilot's pitot-static head. The drain hole is located approximately 1.5 inches [3.81 cm] aft from front of head on lower surface.
(2) Ensure drain hole is not clogged by shining a high intensity light through the hole while looking through the pitot head.

CAUTION: WHEN INSTALLING PITOT TUBE INTO MAST ASSEMBLY, DO NOT PUSH PITOT TUBE IN TOO FAR AS DAMAGE TO THE HEATING ELEMENT MAY RESULT.



14-105A

Pitot Tube Installation
Figure 201



14-166B
14-200A

* Located approximately 1.5 inches (3.81 cm) from front of head on lower surface.

Pitot - Static Head Installation
Figure 202

NOTE: A 0.020 inch [0.051 cm] diameter wire (brass or copper) may be inserted into the drain hole to check for and/or dislodge any contamination. If contamination exists, disconnect pitot pressure line from head and back-flush contaminate out head's pitot opening using dry nitrogen.

(3) Repeat steps (1) and (2) for copilot's pitot-static head.

D. Inspection of Pitot Tube *(Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot")*

NOTE: Loss of plating from pitot tube is cosmetic and does not affect the operation of the tube.

(1) Inlet opening shall be free of debris from foreign objects. Inlet inside diameter shall be 0.250 (±0.010) inch [6.35 (±0.25)] mm].
(2) Tube/mast alignment shall be within 2°.
(3) Tapered section shall be free of nicks and dents, ensuring proper angle-of-attack readings.
(4) Sleeve drain hole diameter shall be 0.047 (±0.016) inch [1.19 (±0.41) mm].

E. Static Port and Pitot/Static Distortion Check *(Aircraft 35-408, 35-506 and Subsequent and 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot")*

NOTE: The pitot/static probe shall be replaced if the unit fails any visual inspection check criteria.

(1) General probe condition:
  (a) Visually inspect the unit for physical damage to its precision contoured surfaces and for foreign material in the static ports, drain hole, and pitot opening.
  (b) Check the head and strut sections of the unit for any detectable bending or twisting.
(2) Static port check:
  (a) Check static pressure ports to ensure edges remain perpendicular to machined contour surface. Rounded or raised static port edges shall not exceed 0.003 inch [0.076 mm]. (See Figure 203.)
  (b) Check for scratches, nicks or surface irregularities deeper than 0.015 inch [0.381 mm] located within 0.5 inch [12.7 mm] of static port.
  (c) Check for defects exceeding 0.025 inch [0.635 mm] over remainder of head, and exceeding 0.125 inch [3.175 mm] on pitot/static probe strut.
(2) Pitot/static probe tip check:
  (a) Leading edge lip of pitot opening shall be sharp. Flatness of lip shall be between 0.015 and 0.025 inch [0.381 mm and 0.635 mm]. (See Figure 204.)
  (b) Lip edge shall not be curled or flared outward. (See Figure 205.)

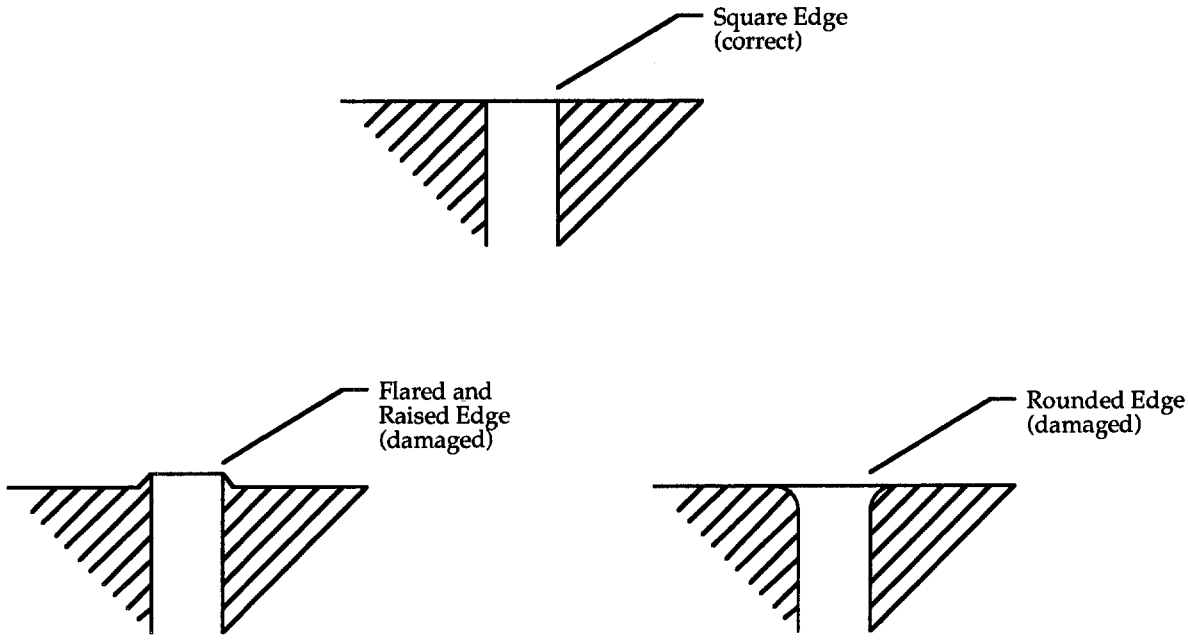
    NOTE: This condition can be detected by sliding a fingernail along outer surface at tip of pitot/static barrel.

  (c) Indentations on lip shall not deviate more than 0.030 inch [0.762 mm] from normal tip diameter. Dent at any location around opening shall not affect more than 20% of circumference. (See Figure 206.)

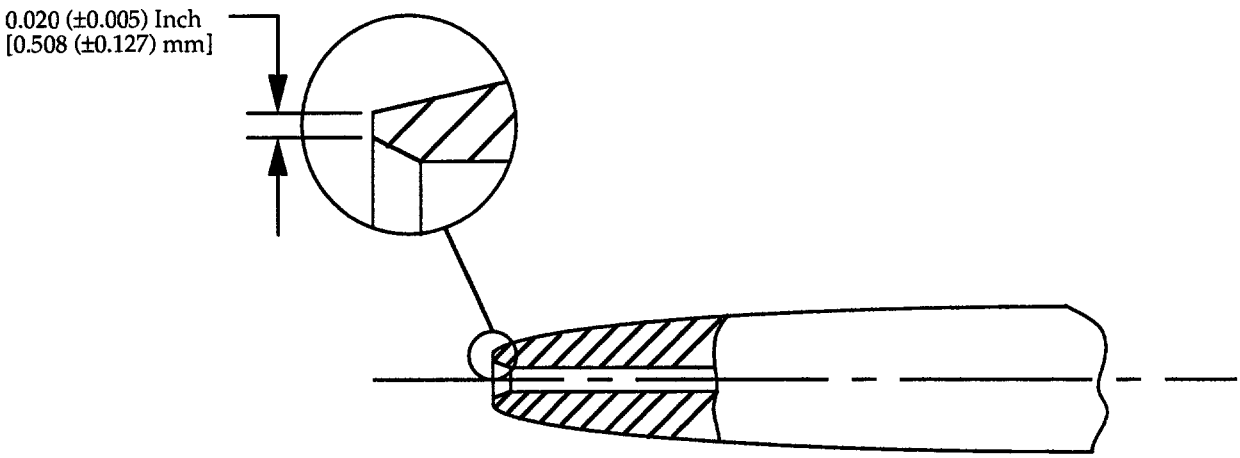
    NOTE: Small inward dents on lip which do not affect roundness of pitot opening are acceptable.

    Damage of this type may be repairable. Return units to Rosemont, Inc. for possible repair.

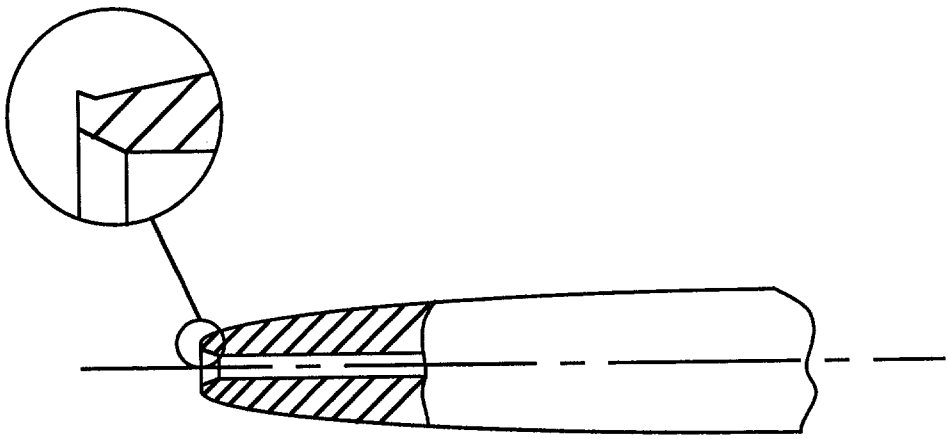
  (d) Leading edge lip can have small nicks or chips. (See Figure 207.) There shall not be more than one nick between 0.025 and 0.035 inch [0.635 and 0.889 mm] deep or any nick more than 0.035 inch [0.889 mm] deep.



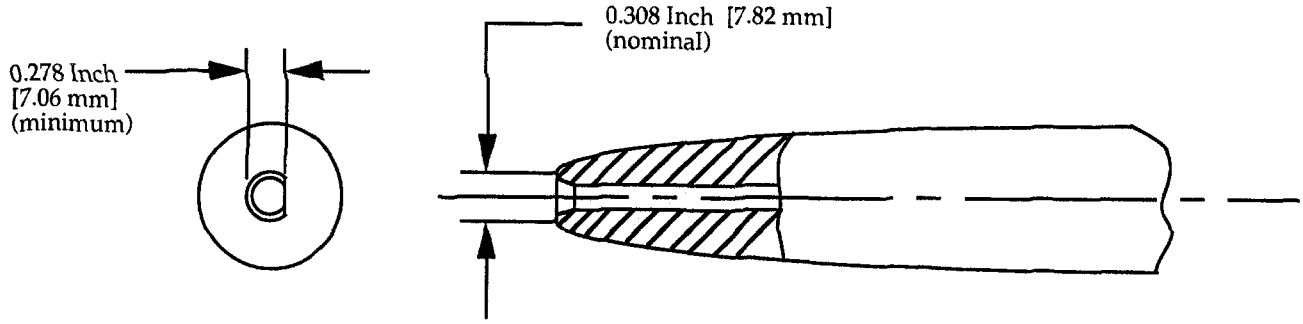
Inspection Criteria for Static Ports
Figure 203



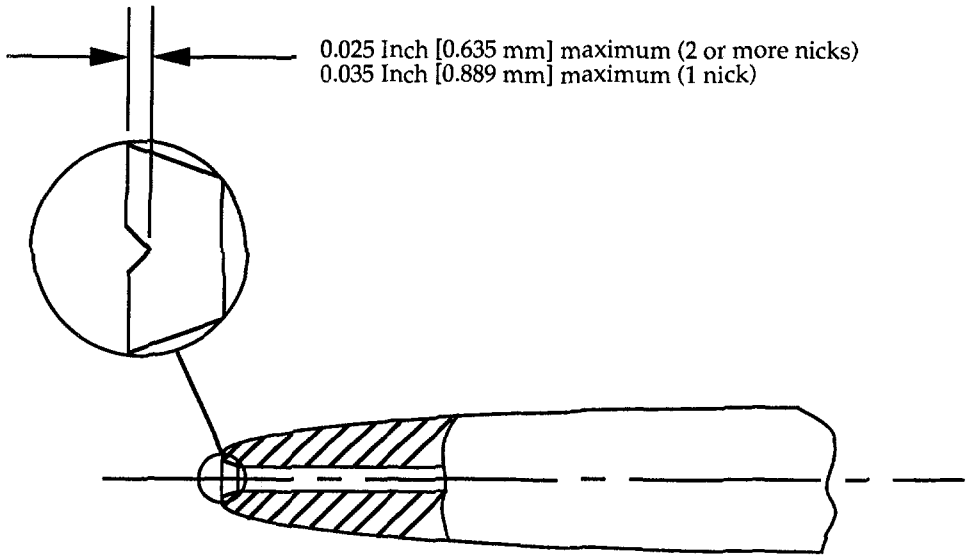
Pitot/Static Probe Lip Flatness
Figure 204



Pitot/Static Probe Lip Outward Flare
Figure 205



Indentation of Pitot/Static Probe Opening
Figure 206



Nicks in Pitot/Static Probe Tip
Figure 207

DRAIN VALVE - MAINTENANCE PRACTICES

1. APPROVED REPAIRS

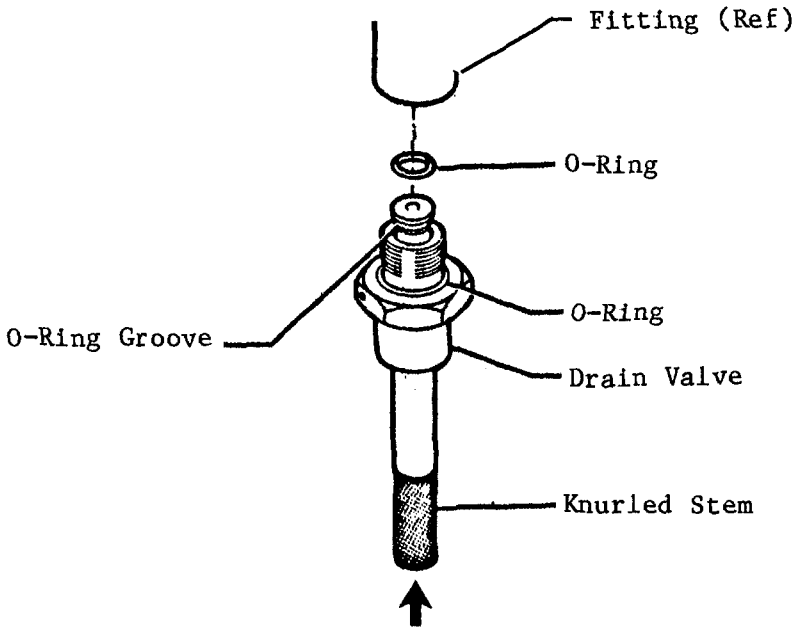
NOTE: ° The pitot-static system incorporates drain valves located in the nose compartment on each side of the nose wheel well.

° If excessive leakage is evident around drain valves, O-ring seals should be checked.

° Drain valves are spring loaded closed and sealed internally with an O-ring. Drain valves have a knurled stem which can be depressed with the fingers. Drain valves may be unscrewed from plumbing fitting.

A. Drain Valve O-Ring Replacement (See figure 201.)

(1) Remove equipment as required to gain access to drain valve installation.
(2) Loosen and remove drain valve from the elbow.
(3) Depress the knurled stem on the drain valve to expose the O-ring.
(4) Using a suitable tool, remove old O-ring.
(5) Inspect valve O-ring groove and seat for scratches, burrs, or dirt.
(6) Replace damaged O-ring or drain valve.
(7) Install drain valve in elbow and tighten.
(8) Install previously removed equipment.



Drain Valve O-Ring Replacement
Figure 201

ISOLATION VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION
   A. Remove No. 1 Right Isolation Valve (B327) (See figure 201.)
      (1) Locate No. 1 right isolation valve (B327) forward of frame 5 at RBL 15.
      (2) Disconnect electrical connector from isolation valve.
      (3) Remove tubing assemblies from the tee above the isolation valve.
      (4) Remove tee fitting from top side of isolation valve.
      (5) Remove isolation valve from union below isolation valve and remove isolation valve from aircraft.
   B. Install No. 1 Right Isolation Valve (B327) (See figure 201.)

      NOTE: An O-ring is incorporated into each pitot-static plumbing connection. Each time a connection is broken, a new O-ring must be installed.

      (1) Install new O-rings at each place pitot-static plumbing is disconnected. Use lubricating grease (Molykote 55M, product of Dow Corning Corp., Midland, Michigan, or MIL-G-4343 equivalent) as necessary to install O-rings without damage.
      (2) Install isolation valve in union and torque to 50-65 inch-pounds.
      (3) Install top tee fitting on isolation valve and torque to 50-65 inch- pounds.

      CAUTION: TO ENSURE THAT TUBING FLARES AND FITTING ENDS ALIGN PROPERLY, HAND TIGHTEN TUBE ASSEMBLY NUTS PRIOR TO TORQUING.

      (4) Install tube assemblies on tee fittings. Hand tighten nuts prior to torquing. Torque nuts 110-130 inch-pounds.
      (5) Connect electrical connector to isolation valve.
      (6) Perform pitot-static plumbing leak test and pitot-static isolation valve functional test. (Refer to 34-11-00, Adjustment/Test.)
   C. Remove No. 2 Right Isolation Valve (B326) (See figure 201.)
      (1) Locate No. 2 right isolation valve (B326) forward of frame 5 above and outboard of No. 1 right isolation valve (B327).
      (2) Disconnect electrical connector from isolation valve.
      (3) Remove tube assembly from bottom of isolation valve.
      (4) Remove isolation valve from elbow fitting above isolation valve and remove isolating valve from aircraft.
   D. Install No. 2 Right Isolation Valve (B326) (See figure 201.)

      NOTE: An O-ring is incorporated into each pitot-static plumbing connection. Each time a connection is broken, a new O-ring must be installed.

      (1) Install new O-rings at each place pitot-static plumbing is disconnected. Use lubricating grease (Molykote 55M, product of Dow Corning Corp., Midland, Michigan, or MIL-G-4343 equivalent) as necessary to install O-ring without damage.
      (2) Install isolation valve in elbow fitting and torque to 50-65 inch- pounds.

      CAUTION: TO ENSURE THAT TUBING FLARES AND FITTING ENDS ALIGN PROPERLY, HAND TIGHTEN TUBE ASSEMBLY NUTS PRIOR TO TORQUING.

      (3) Install tube assembly on isolation valve. Hand tighten nut prior to torquing. Torque tube assembly nut to 110-130 inch-pounds.
      (4) Connect electrical connector to isolation valve.
      (5) Perform pitot-static plumbing leak test and pitot-static isolation valve functional test. (Refer to 34-11-00, Inspection/Check.)

E. Remove No. 1 Left Isolation Valve (B328) (See figure 201.)
   (1) Locate No. 1 left isolation valve (B328) forward of frame 5.
   (2) Disconnect electrical connector from isolation valve.
   (3) Remove tube assembly from bottom of isolation valve.
   (4) Remove isolation valve from tee fitting above isolation valve and remove isolation valve from aircraft.

F. Install No. 1 Left Isolation Valve (B328) (See figure 201.)

   NOTE: An O-ring is incorporated into each pitot-static plumbing connection. Each time a connection is broken, a new O-ring must be installed.

   (1) Install a new O-ring at each place pitot-static plumbing is disconnected. Use lubricating grease (Molykote 55M, product of Dow Corning Corp., Midland, Michigan or MIL-G-4343 equivalent) as necessary to install O-rings without damage.
   (2) Install isolation valve in tee fitting and torque to 50-65 inch- pounds.

   CAUTION: TO ENSURE THAT TUBING FLARES AND FITTING ENDS ALIGN PROPERLY, HAND TIGHTEN TUBE ASSEMBLY NUTS PRIOR TO TORQUING.

   (3) Install tube assembly on isolation valve. Hand tighten nut prior to torquing. Torque tube assembly nut to 70-90 inch-pounds.
   (4) Connect electrical connector to isolation valve.
   (5) Perform pitot-static plumbing leak test and pitot-static isolation valve functional test. (Refer to 34-11-00, Inspection/Check.)

G. Remove No. 2 Left Isolation Valve (B329) (See figure 201.)
   (1) Locate No. 2 left isolation valve (B329) forward of frame 5.
   (2) Disconnect electrical connector from isolation valve.
   (3) Remove tube assembly from bottom of isolation valve.
   (4) Remove isolation valve from tee fitting above isolation valve and remove isolation valve from aircraft.

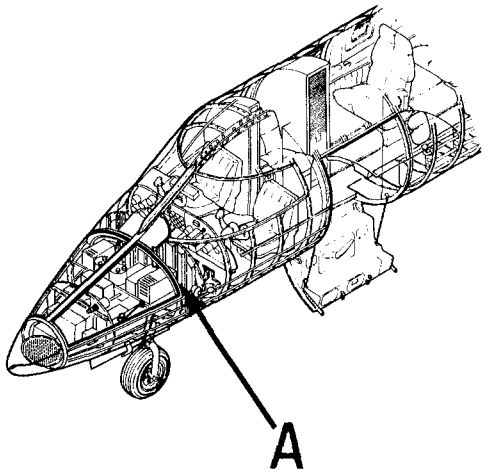
H. Install No. 2 Left Isolation Valve (B329) (See figure 201.)

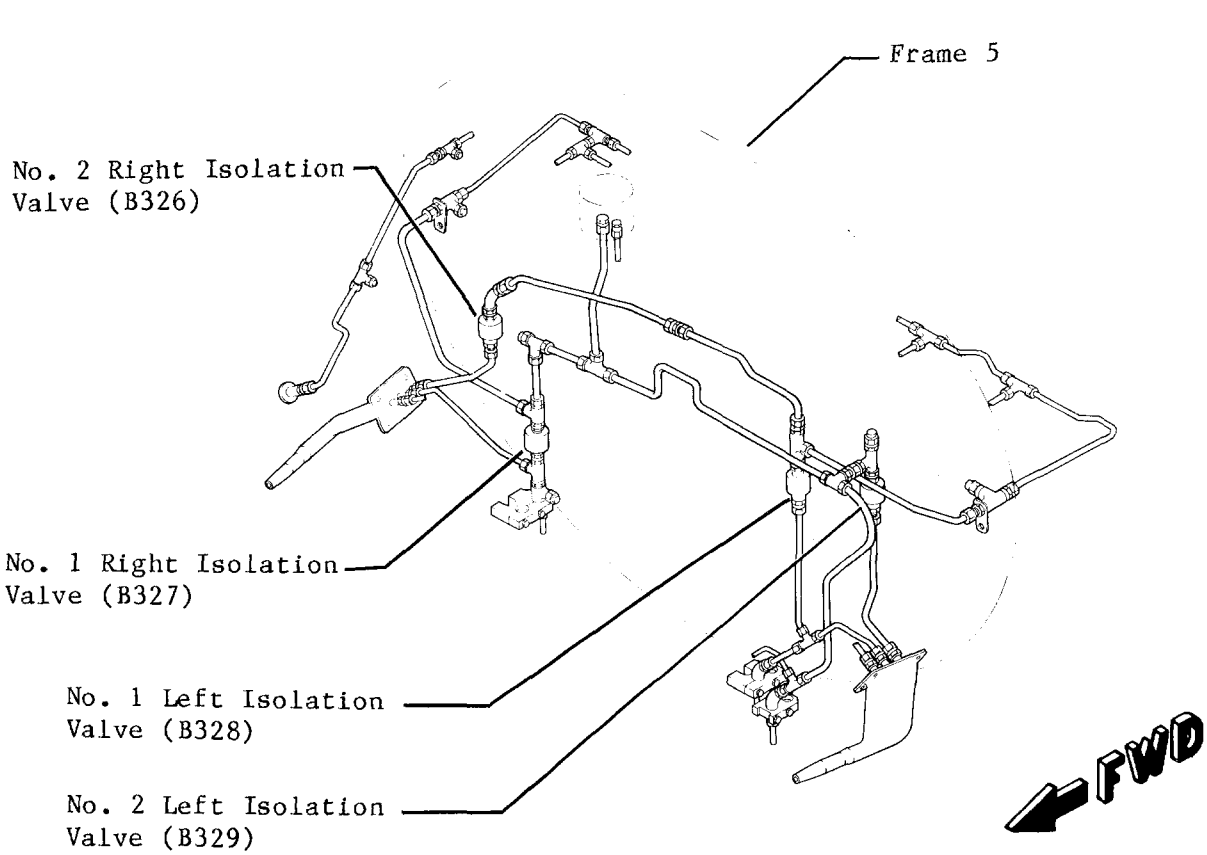
   NOTE: An O-ring is incorporated into each pitot-static plumbing connection. Each time a connection is broken, a new O-ring must be installed.

   (1) Install a new O-ring at each place pitot-static plumbing is disconnected. Use lubricating grease (Molykote 55M, product of Dow Corning Corp., Midland, Michigan or MIL-G-4343 equivalent) as necessary to install O-rings without damage.
   (2) Install isolation valve in tee fitting and torque to 50-65 inch- pounds.

   CAUTION: TO ENSURE THAT TUBING FLARES AND FITTING ENDS ALIGN PROPERLY, HAND TIGHTEN TUBE ASSEMBLY NUTS PRIOR TO TORQUING.

   (3) Install tube assembly on isolation valve. Hand tighten nut prior to torquing. Torque tube assembly nut to 110-130 inch-pounds.
   (4) Connect electrical connector to isolation valve.
   (5) Perform pitot-static plumbing leak test and pitot-static isolation valve functional test. (Refer to 34-11-00, Inspection/Check.)





Detail A

14-174C-1

Isolation Valve Installation
Figure 201

MACH SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Mach Switch (See figure 201.)

(1) Gain access to mach switch through nose avionics door.
(2) Remove electrical power from aircraft.
(3) Disconnect pitot and static lines from mach switch and from tee fittings below mach trim switch. Remove pitot and static lines from aircraft.
(4) Install dust plugs in tee fittings and openings of mach switch.
(5) Disconnect electrical connector from mach switch.
(6) Remove attaching parts and remove mach trim switch from aircraft.

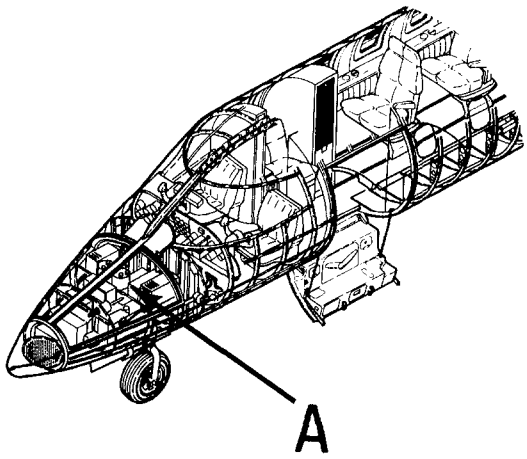
B. Install Mach Switch (See figure 201.)

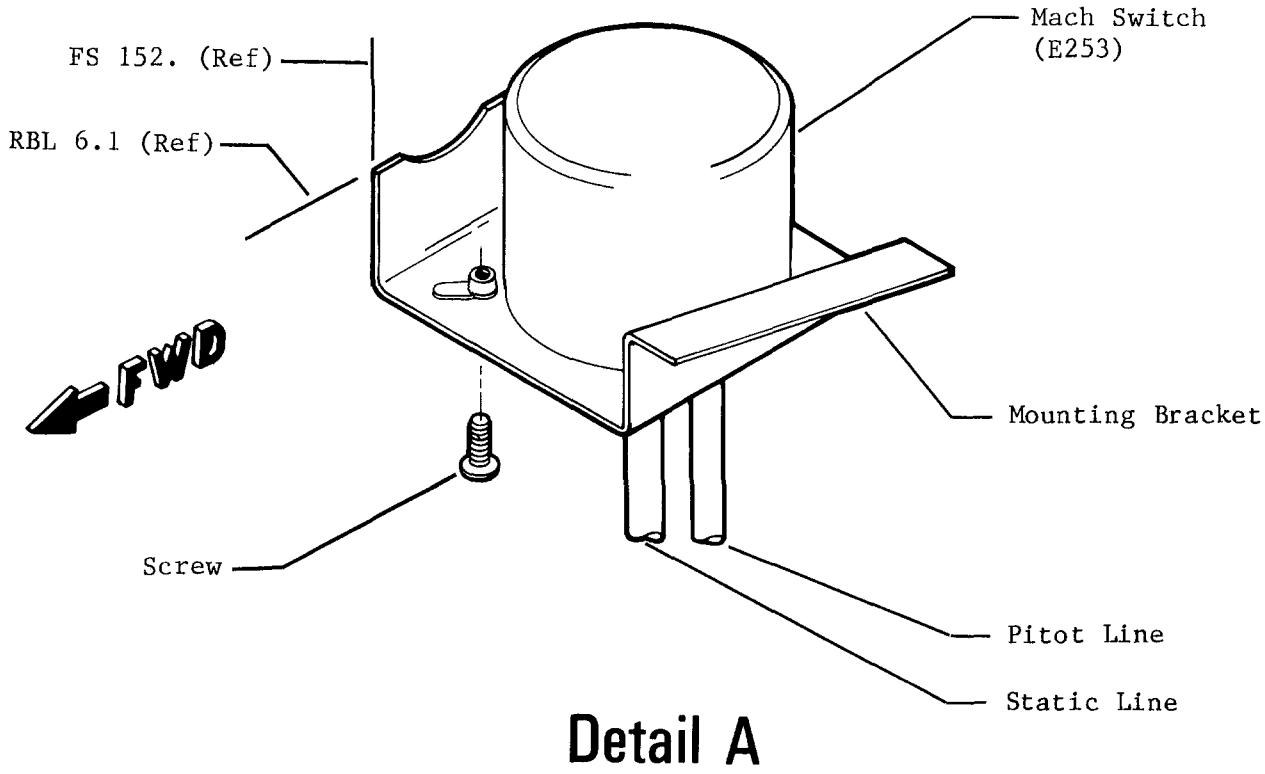
NOTE: An O-ring is incorporated into each pitot-static plumbing connection. Each time a connection is broken a new O-ring must be installed.

(1) Install new O-rings at each place pitot-static plumbing is disconnected. Use lubricating (Molykote 55M, product of Dow Corning Corp., Midland, Michigan or MIL-G-4343 equivalent) as necessary to install O-rings without damage.
(2) Position mach switch is mounting bracket and secure with attaching parts.

CAUTION: TO ENSURE THAT TUBING FLARES AND FITTING ENDS ALIGN PROPERLY, HAND TIGHTEN TUBE ASSEMBLY NUTS PRIOR TO TORQUING.

(3) Remove dust plugs from mach switch, pitot and static lines. Connect pitot and static lines to mach switch. Hand tighten nuts prior to torquing. Torque nuts of pitot line to 50-65 inch-pounds. Torque nuts of static lines to 110-130 inch-pounds.
(4) Connect electrical connector to mach switch.
(5) Perform pitot-static plumbing leak test. (Refer to 34-11-00, Inspection/Check.)
(6) Close and secure nose avionics doors.
(7) Restore electrical power to aircraft.





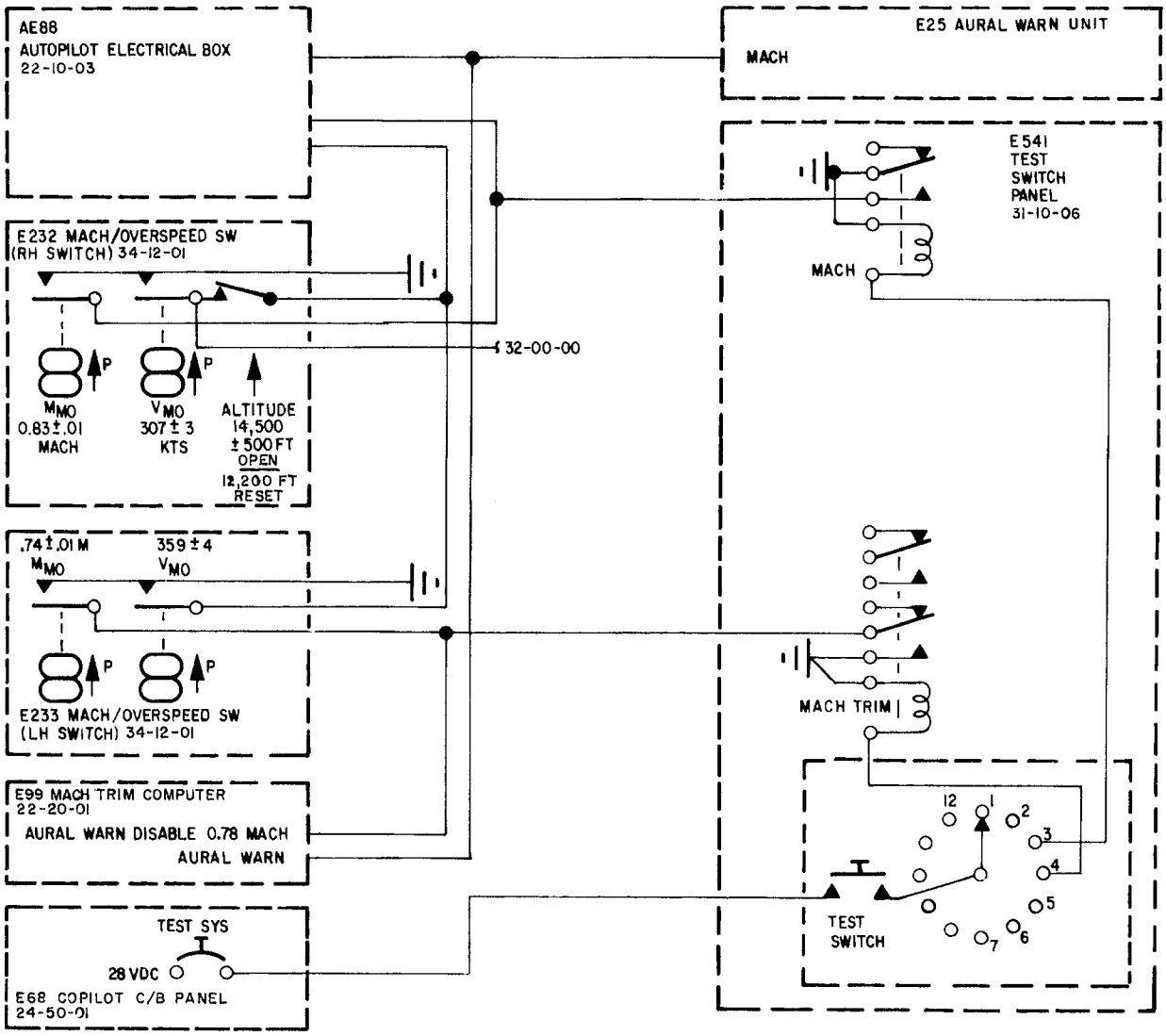
Detail A

13-162A

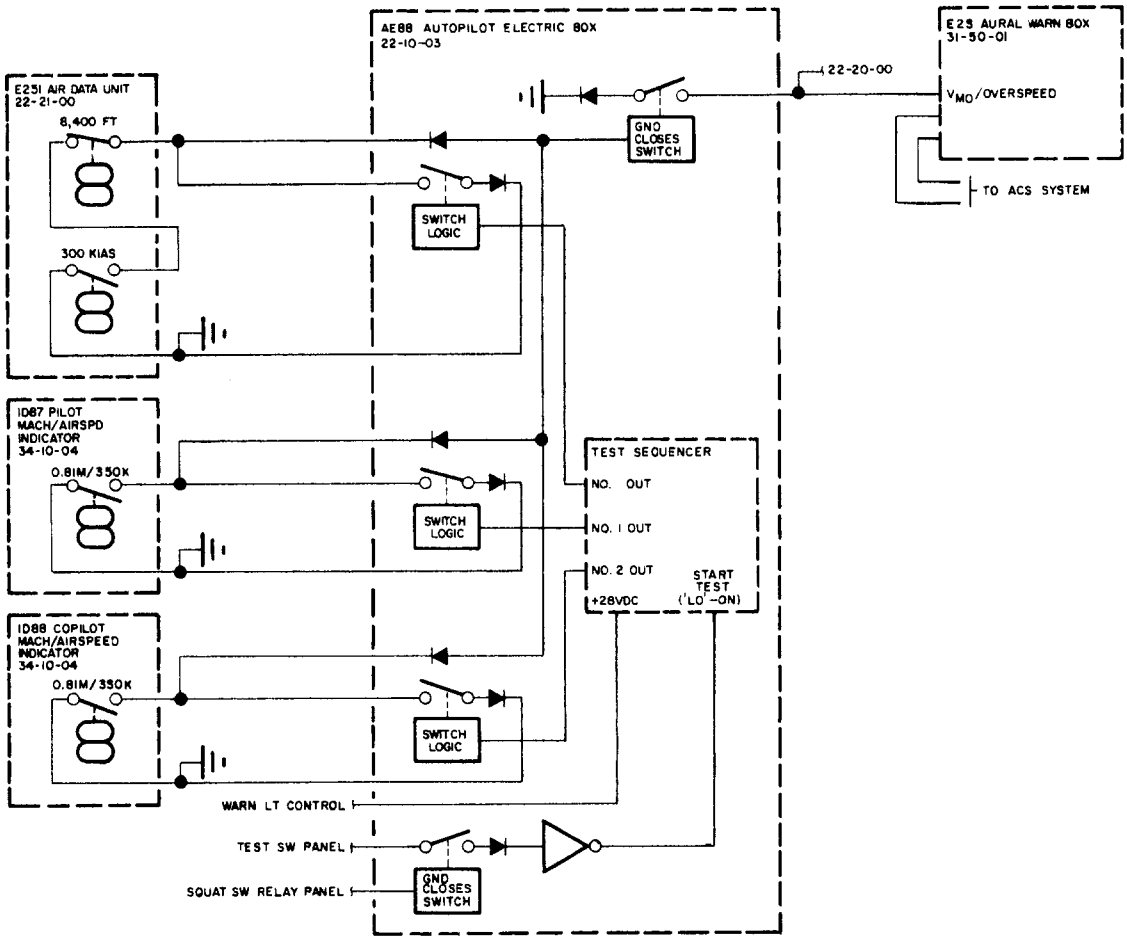
Mach Switch Installation
Figure 201

MACH/OVERSPEED WARNING SYSTEM - DESCRIPTION AND OPERATION

1. **Description** (See Figure 1.)
   A. On *Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot,"* the Mach/overspeed warning system consists of two Mach switches, a pitot and static source (from the copilot's side), and a stick puller adjustment potentiometer and utilizes the aural warning system.
   B. On *Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent, and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot,"* the Mach/overspeed warning system consists of overspeed warning switches in the pilot and copilot Mach/airspeed indicators, the air data unit, autopilot electric box, aural warning unit, and the Mach switch.
   C. Autopilot pitch servo is used for stick puller actuation. A test switch located on the test switch panel is used to check system operation. The system is powered by 28 vdc through the LH stall warning switch. (Refer to Chapter 27.)
   D. On *Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot,"* the Mach/overspeed warning system provides the crew with an aural warning when:
      (1) The aircraft speed exceeds 307 (±3) KIAS below 14,500 (±500) feet.
      (2) The aircraft speed exceeds 359 (±4) KIAS between 14,500 (±500) and 25,000 feet.
      (3) The aircraft speed exceeds 0.83 (±.01) Mach indicated above 25,000 feet with autopilot and Mach trim operative.
      (4) The aircraft speed exceeds 0.74 (±.01) Mach indicated above 25,000 feet with autopilot and Mach trim inoperative.
   E. On *Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot,"* the Mach/overspeed warning system provides the crew with an aural warning when:
      (1) Autopilot is engaged, Mach trim system is operating and:
         (a) *On Aircraft not equipped with electrically heated windshields*, speed exceeds 300 (±5) KIAS (VMO) up to 8,000 feet altitude.
         (b) *On Aircraft not equipped with electrically heated windshields*, speed exceeds 350 (+6; -0) KIAS (VMO) between 8,000 feet and 24,000 feet altitude.
         (c) *On Aircraft equipped with electrically heated windshields*, speed exceeds 350 (+6; -0) KIAS (VMO) up to 24,000 feet altitude.
         (c) Speed exceeds 0.81 Mach (MMO) between 24,000 and 45,000 feet altitude.
      (2) Autopilot is not engaged, Mach trim is not operating, and speed exceeds 0.74 Mach (MMO) above 25,000 feet altitude.
   F. If speed increases above maximum allowable airspeed, the stick puller function is activated. The pitch servo actuates the elevator system so a nose-up attitude will be attained. Refer to Chapter 22 for pitch servo information.

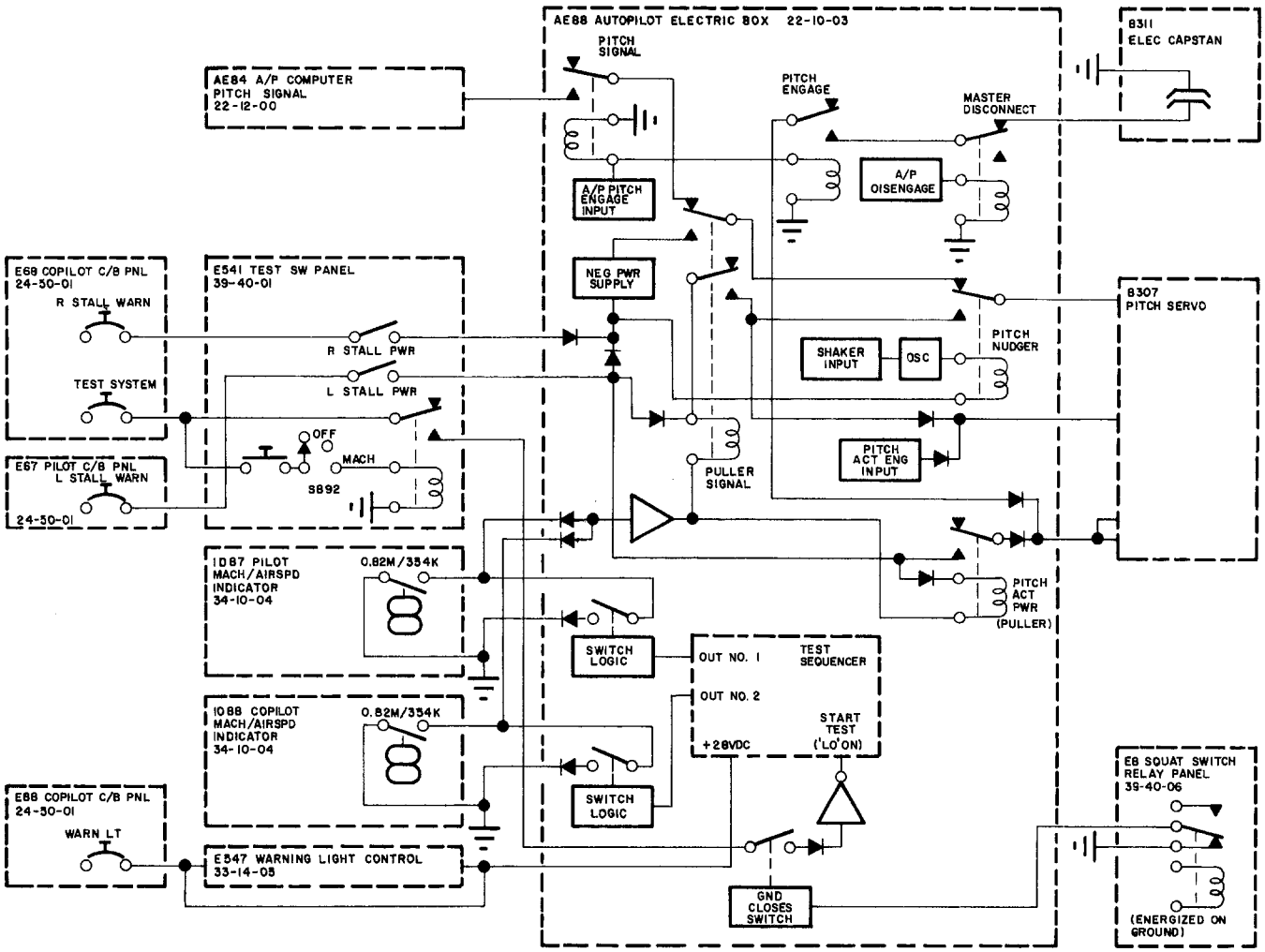


Mach/Overspeed Warning System Electrical Control Schematic
Figure 1 (Sheet 1 of 3)



Aural Warning Function

Mach/Overspeed Warning System Electrical Control Schematic
Figure 1 (Sheet 2 of 3)



Stick Puller Function

Mach/Overspeed Warning System Electrical Control Schematic
Figure 1 (Sheet 3 of 3)

MACH/OVERSPEED WARNING SYSTEM - MAINTENANCE PRACTICES

1. General

A. Maintenance practices for the mach/overspeed warning system consist of a stick-puller functional check, a functional check of the mach switches and replacement of defective components.

B. Refer to applicable removal and installation procedures of the individual components.

2. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following items.

NAME	PART NUMBER	MANUFACTURER	USE
Spring Scale	CATL80D	Chatillion Co. New York	Measure stick force
Pitot Static Tester	1811 F or Equivalent	Barfield Instrument Co. Atlanta, GA	Check Switch
Pitot/Static Test Adapter	L50-612*	Learjet Inc. Wichita, KS	Adapt tester to pitot/static mast.

*Adapters (2 each) PSS 50476-3-4-4 must be modified with kits (2 each) SSR 476 to test Model 35/36 aircraft. The modified adapter part number is PSS 5047M1-3-4-4.

3. Inspection/Check

A. Stick Puller Functional Check *(Aircraft 35-002 thru 35-505 except 35-408, and 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot")*

NOTE: An adjustable potentiometer, located on PCB 123 inside the autopilot electrical box, provides a means of adjusting the stick puller force. Access to this potentiometer is gained by loosening the autopilot electrical box sufficiently to gain access to the printed circuit board.

(1) Gain access to autopilot electrical box printed circuit board PCB 123, refer to 22-10-03.
(2) Observing polarity, connect a DC voltmeter across capacitor C1 on PCB 123.
(3) Set Battery and Inverter Switches to ON.
(4) Adjust stick puller potentiometer to obtain -7.5 volts DC.

NOTE: The positive terminal of C1 is ground.

(5) Depress Go Around Switch on throttle levers and observe that G/A light on glareshield illuminates.
(6) Using manual pitch trim switch, position the horizontal stabilizer to obtain a neutral feel on the control column. Use a hand held scale to verify neutral position.
(7) Set L Stall Warning Switch to on.
(8) Set Test Switch to MACH.

CAUTION: HOLD SPRING SCALE AGAINST CENTER OF CONTROL WHEEL JUST BELOW HUB. A LOWER POSITION WILL CAUSE EXCESSIVE PULLER FORCE.

(9) Hold foot of spring scale firmly against center of control wheel just below the hub.
(10) Depress TEST Switch and observe spring scale reading. Control column aft force shall be 16 to 20 pounds and aural warning horn will sound.

NOTE: If control column force is not within limits, readjust stick puller adjustment potentiometer as required.

(11) Release TEST Switch.
(12) Set L Stall Warning Switch off. Set R Stall Warning Switch on.
(13) Depress TEST Switch. Aural warning will sound with no control column force.
(14) Set R Stall Warning Switch off.
(15) Set Battery and Inverter Switches off.
(16) Reinstall autopilot electrical box. (Refer to 22-10-03.)

B. Functional Test of RH and LH Mach/Overspeed Switches *(Aircraft 35-002 thru 35-505 except 35-408, 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot.")*

WARNING: PULL L PITOT HT CIRCUIT BREAKER ON PILOT'S C/B PANEL, AND R PITOT HT CIRCUIT BREAKER ON COPILOT'S C/B PANEL BEFORE PERFORMING THE FOLLOWING PROCEDURES TO PREVENT DAMAGE TO EQUIPMENT AND POSSIBLE INJURY.

CAUTION: WHEN THIS FUNCTIONAL CHECK IS PERFORMED, PITOT/STATIC TESTER MUST BE CONNECTED TO SHOULDER PORT STATIC SYSTEM TO PREVENT DAMAGE TO AIR DATA SENSOR.

NOTE: Perform Functional Test of RH and LH Mach/Overspeed Switches in accordance with the current inspection interval specified in Chapter 5.

(1) Ensure that Autopilot and Mach Trim Systems are off.

NOTE:
- The MACH TRIM circuit breaker must be pulled to disengage Mach Trim system.
- On some aircraft, a tee is installed in shoulder port static line at approximate FS 139. Remove cap from tee and connect static tester source.
- On remaining aircraft, a union is installed. Remove union and install tee to perform functional check.

(2) Attach hose from pitot/static tester port to RH pitot head. Remove cap from RH static line tee located below instrument panel just forward of copilot's circuit breaker panel and attach one hose from pitot-static tester static port to instrument static line. Attach a second static hose from pitot/static tester to tee installed in shoulder port static system. Ensure that RH forward and LH aft static ports and shoulder static ports are blocked with tape and all drain valves are closed.
(3) Set Battery, Primary and Secondary Inverter, and L Stall Warning Switches on.

NOTE: Follow manufacturer's instructions when using pitot/static tester.

(4) Close pitot/static tester source valves, vent valves, and open crossbleed valve.

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT. DO NOT ALLOW AIRSPEED TO DECREASE BELOW ZERO.

(5) Using pitot/static tester vacuum pump, open static source valve and apply vacuum to pitot and static systems until copilot's altimeter indicates 10,000 feet. Close static source valve and crossbleed valve.

CAUTION: TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 20 KNOTS PER SECOND WHEN VENTING ATMOSPHERIC PRESSURE INTO PITOT SYSTEM.

(6) With crossbleed valve closed, slowly open pitot vent valve and vent atmospheric pressure into pitot system. This will simulate an increasing airspeed to copilot's airspeed indicator, mach, and mach/ overspeed switches.
(7) When aural warning sounds, immediately close pitot vent valve and record airspeed at which aural warning sounds. Aural warning should sound at 307 (±3) KIAS. Slowly open crossbleed valve and return system to ambient conditions.
(8) Open static source valve and apply vacuum to pitot and static systems until copilot's altimeter indicates 16,000 feet. Close static source valve and crossbleed valve.
(9) Slowly open pitot vent valve and vent atmospheric pressure into pitot system.
(10) When aural warning sounds, immediately close pitot vent valve and record airspeed at which aural warning sounds. Aural warning shall sound at 359 (±4) KIAS. Slowly open crossbleed valve and return system to ambient conditions.
(11) Open static source valve and apply vacuum to pitot and static systems until copilot's altimeter indicates 41,000 feet. Close static source valve and crossbleed valve.
(12) Slowly open pitot vent valve and vent atmospheric pressure into pitot system.
(13) When aural warning sounds, immediately close pitot vent valve and record airspeed at which aural warning sounds. Aural warning should sound at 0.74 (±0.01) MI.
(14) Test Autopilot and MACH TRIM overspeed warning as follows:
  (a) Using manual pitch trim, set Pitch Trim within T.O. segment on PITCH TRIM Indicator.
  (b) Engage Autopilot; aural warning shall cease.
  (c) Disengage Autopilot; aural warning shall sound.
  (d) Reset MACH TRIM circuit breaker. Reset the system by rotating the TEST Selector Switch to MACH TRIM and depressing and releasing the TEST button; aural warning shall cease.
(15) Engage Autopilot and slowly open pitot vent valve and continue to vent atmospheric pressure into pitot system.
(16) When aural warning sounds and the stick puller actuates, immediately close pitot vent valve and record airspeed at which aural warning sounds and stick puller actuates. Aural warning and stick puller should actuate at .83 (±.01) MI.

CAUTION:
- TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 5000 FEET PER MINUTE RATE OF CLIMB OR DESCENT. DO NOT ALLOW AIRSPEED TO DECREASE BELOW ZERO.
- TO AVOID DAMAGE TO AIRCRAFT INSTRUMENTS, DO NOT EXCEED 20 KNOTS PER SECOND WHEN VENTING ATMOSPHERIC PRESSURE INTO PITOT SYSTEM.

(17) Return altimeter to field elevation and airspeed indicator to zero.
(18) Disengage Autopilot and set Primary and Secondary Inverter, Left Stall Warning and Battery Switches off.
(19) Disconnect pitot/static tester from pitot and static systems. Install cap on RH static line and remove tape from static source.

C. Functional Test of Mach/Overspeed Warning System *(Aircraft 35-408, 35-506 and Subsequent and 36-054 and Subsequent and prior aircraft modified per AAK 83-2, "Installation of FC-530 Autopilot.")*

NOTE:
- Perform Functional Test of Mach/Overspeed Warning system in accordance with the current inspection interval specified in Chapter 5.
- Refer to 22-21-00 steps 2. B. (13) thru 2. B. (17) for Mach/Overspeed Warning System Functional Test.
  a. Disconnect electrical connector from copilot's airspeed indicator prior to performing steps 2.B. (13) thru 2.B. (17).
  b. Connect electrical connector to copilot's airspeed indicator and disconnect electrical connector from pilot's airspeed indicator. Repeat steps 2.B. (13) thru 2.B. (17).

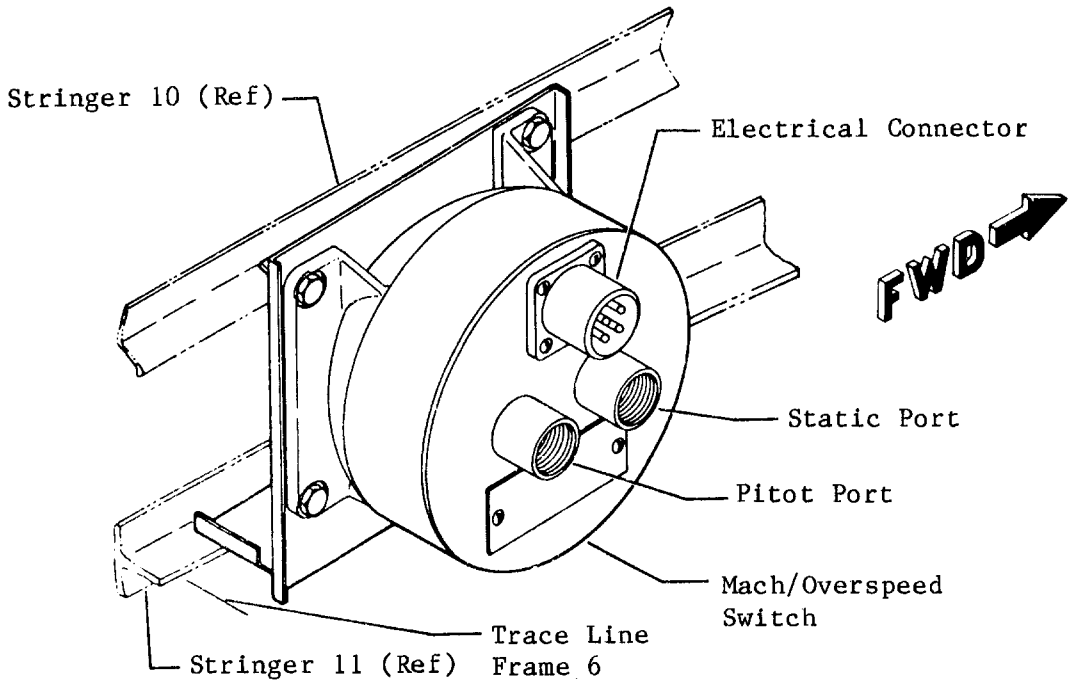
MACH/OVERSPEED SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

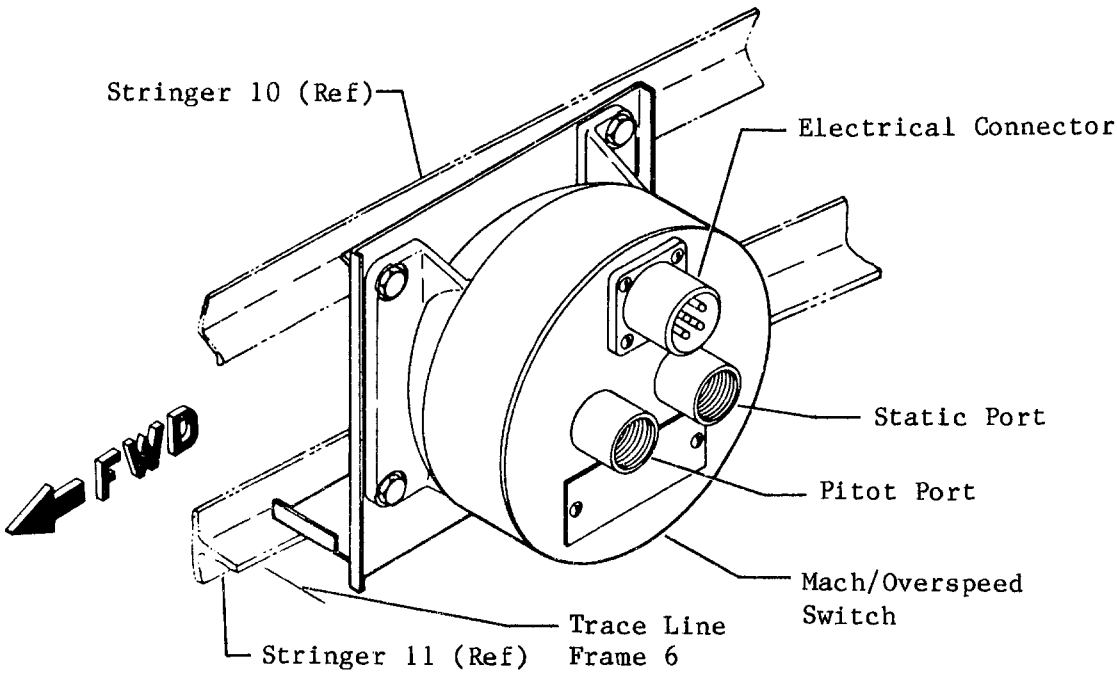
NOTE: The following procedures are applicable to either mach switch.

A. Remove Mach Switch (See figure 201.)
   (1) Ensure that Battery Switches and Stall Warning Switches are off.
   (2) Lower applicable instrument panel (pilot's or copilot's) to gain access to mach switch installation.
   (3) Disconnect electrical plug from mach switch.
   (4) Disconnect pitot and static lines from mach switch. Cap all exposed fittings.
   (5) Remove attaching parts and mach switch from aircraft.

B. Install Mach Switch (See figure 201.)
   (1) Install mach switch and secure with attaching parts.
   (2) Remove caps and connect pitot and static lines to mach switch.
   (3) Connect electrical plug to mach switch.
   (4) Raise and secure instrument panel (pilot's or copilot's).
   (5) Perform pitot and static system leakage check. (Refer to 34-11-00.)
   (6) Perform functional check of mach/overspeed switches. (Refer to 34-12-00.)



LH Mach/Overspeed Switch Installation



RH Mach/Overspeed Switch Installation

Mach/Overspeed Switch Installation
Figure 201

ENCODING ALTIMETER - DESCRIPTION AND OPERATION

1. **Description**
   A. The encoding altimeter system is installed for the pilot. The system consists of an encoding altimeter located on the pilot's instrument panel, an altitude alerter on the center instrument panel, and *on Aircraft 35-002 thru 35-505 except 35-408 and 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot"* a Static Defect Correction (SDC) module.
   B. Component Description
      (1) The basic mechanism of the encoding altimeter is a servo-driven counter-pointer display which follows the synchro input from the SDC module when in the Normal mode or the signal from its own sensitive diaphragm when in the Standby mode. The pilot uses and sets the encoding altimeter in exactly the same way as a standard altimeter. Readout is identical with the familiar counter-drum-pointer presentation. The pointer makes one revolution per one thousand feet. Graduations are at twenty-foot increments. The counter reads altitude in thousands and hundreds of feet.
      (2) The altitude alerter is a direct-reading type, having a five-digit display. A three-digit counter displays thousands and hundreds of feet. Fixed zeros in the tens and units places present the proper number of digits for the preselected aircraft altitude. The unit is self-contained in a metal case. As the aircraft approaches the outer limit of a preset flight level, the altitude alerter lights and audio tone (momentarily) are activated. The light remains on until the aircraft crosses the inner level. Should the aircraft fly through or deviate from the preset altitude, visual and aural tones are activated at the inner level. The visual indicator will remain on until the aircraft returns to ±300 feet of preset altitudes or the pilot selects a new altitude.
      (3) The SDC module measures pitot and static pressures and provides static source error correction for the encoding altimeter. Each module is individually calibrated for the aircraft. The Static Defect Correction (SDC) module is a rack-mounted instrument. The module is located on the LH side of the nose compartment or under the copilot's seat, depending on aircraft configuration. The SDC module incorporates pitot and static line connections which connect to the normal pitot and static systems. *On Aircraft with SDC installed in nose*, the SDC pitot and static lines are connected to normal pitot and static sources adjacent to the LH side pitot and static drain valves. *On Aircraft with SDC installed in cabin*, the SDC pitot and static lines are connected to normal pitot and static sources at frame 5 on the LH side.

ENCODING ALTIMETER - MAINTENANCE PRACTICES

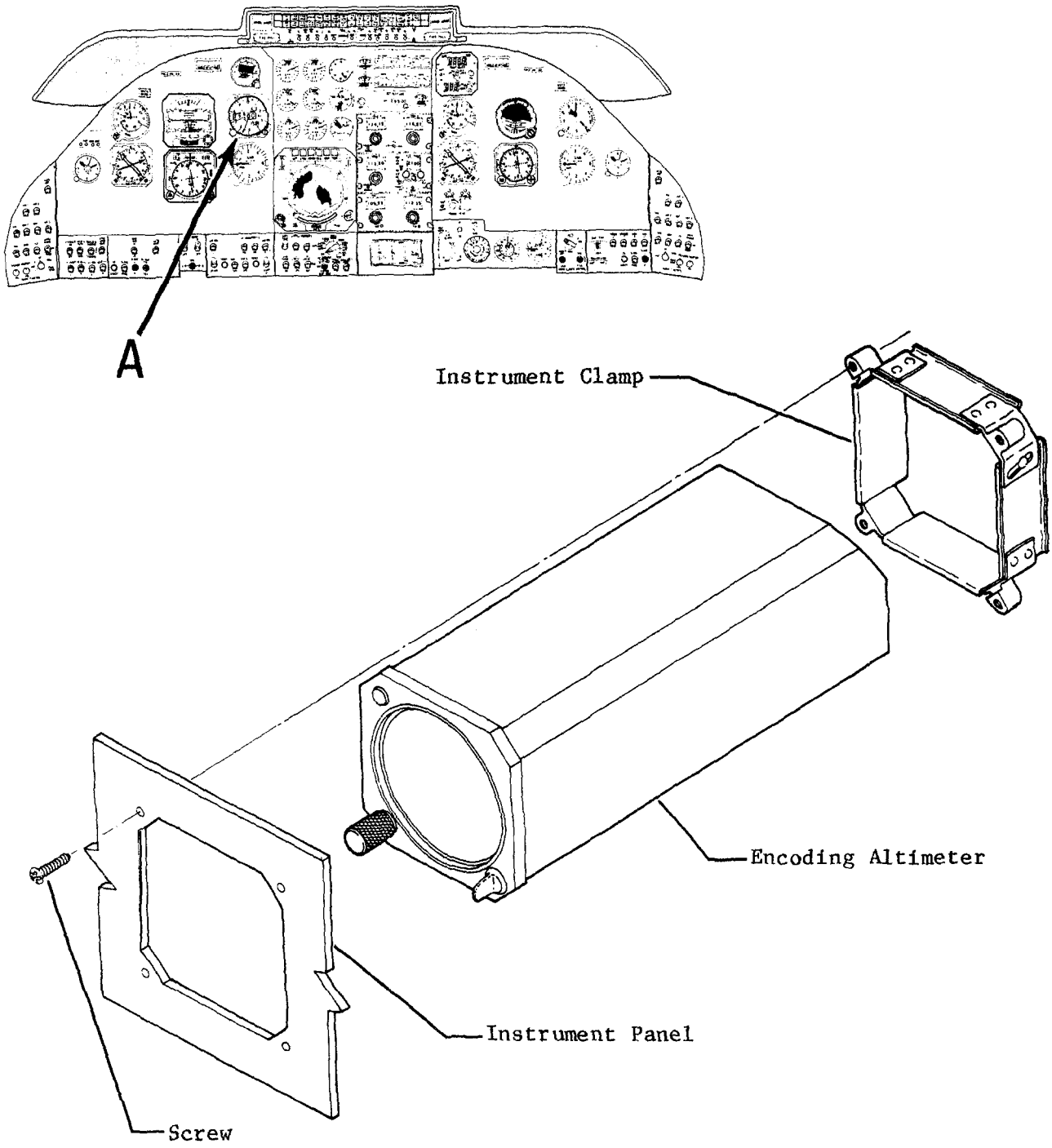
1. Removal/Installation

A. Removal of Encoding Altimeter (AE15) (See Figure 201.)

(1) Set Battery Switch(es) off and disconnect aircraft batteries.
(2) Lower pilot's instrument panel.
(3) Disconnect static line from altimeter. Cap all exposed fittings.
(4) Disconnect electrical connector (RP34) from altimeter.
(5) Loosen altimeter clamp screws and remove altimeter from instrument panel.

B. Installation of Encoding Altimeter (AE15)(See Figure 201.)

(1) Install altimeter and secure clamp.
(2) Connect electrical connector (RP34) and static source to altimeter.
(3) Raise and secure pilot's instrument panel.
(4) Connect electrical connectors to aircraft batteries.
(5) *On Aircraft 35-002 thru 35-505 except 35-408 and 36-002 thru 36-053 not modified per AAK 83-2, "Installation of FC-530 Autopilot"*, perform Static System Leakage Check. (Refer to 34-11-00.)
(6) *On Aircraft 35-408, 35-506 and Subsequent, 36-054 and Subsequent and prior aircraft modified per AAK 83-2,"Installation of FC-530 Autopilot"*, perform Static System Plumbing Check. (Refer to 34-11-00.)

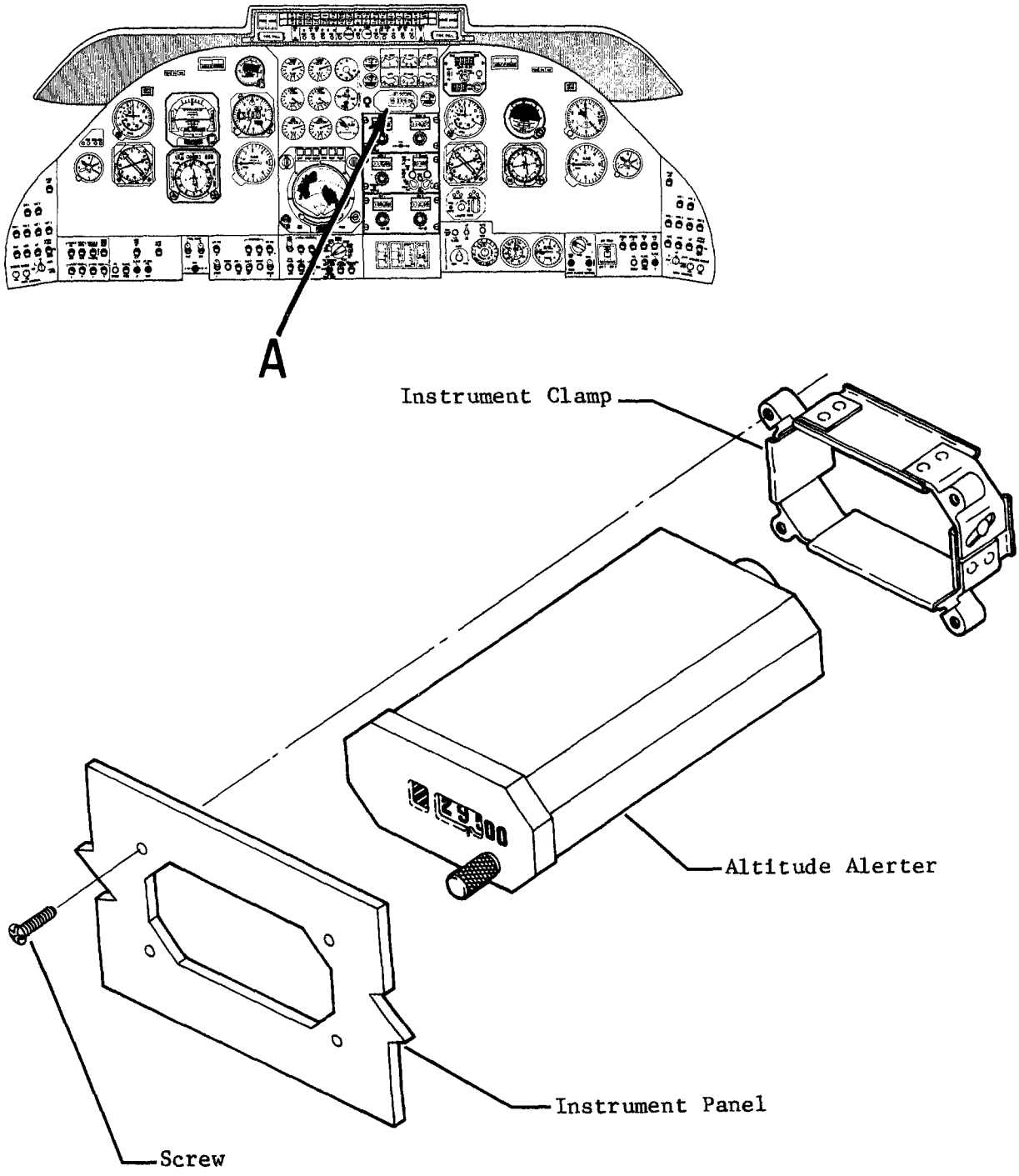


Detail A

Encoding Altimeter Installation
Figure 201

ALTITUDE ALERTER - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**
   - **A. Remove Altitude Alerter** (See figure 201.)
     - (1) Remove electrical power from aircraft.
     - (2) Loosen screws and remove overlay from center instrument panel.
     - (3) Loosen clamp screws and remove altitude alerter from instrument panel sufficiently to gain access to electrical connector.
     - (4) Disconnect electrical connector from altitude alerter.
   - **B. Install Altitude Alerter** (See figure 201.)
     - (1) Connect electrical connector to altitude alerter.
     - (2) Install altitude alerter and secure clamp screws.
     - (3) Install overlay on panel and secure with screws.
     - (4) Restore electrical power to aircraft.



Detail A

Altitude Alerter Installation
Figure 201

STATIC DEFECT CORRECTION MODULE - MAINTENANCE PRACTICES

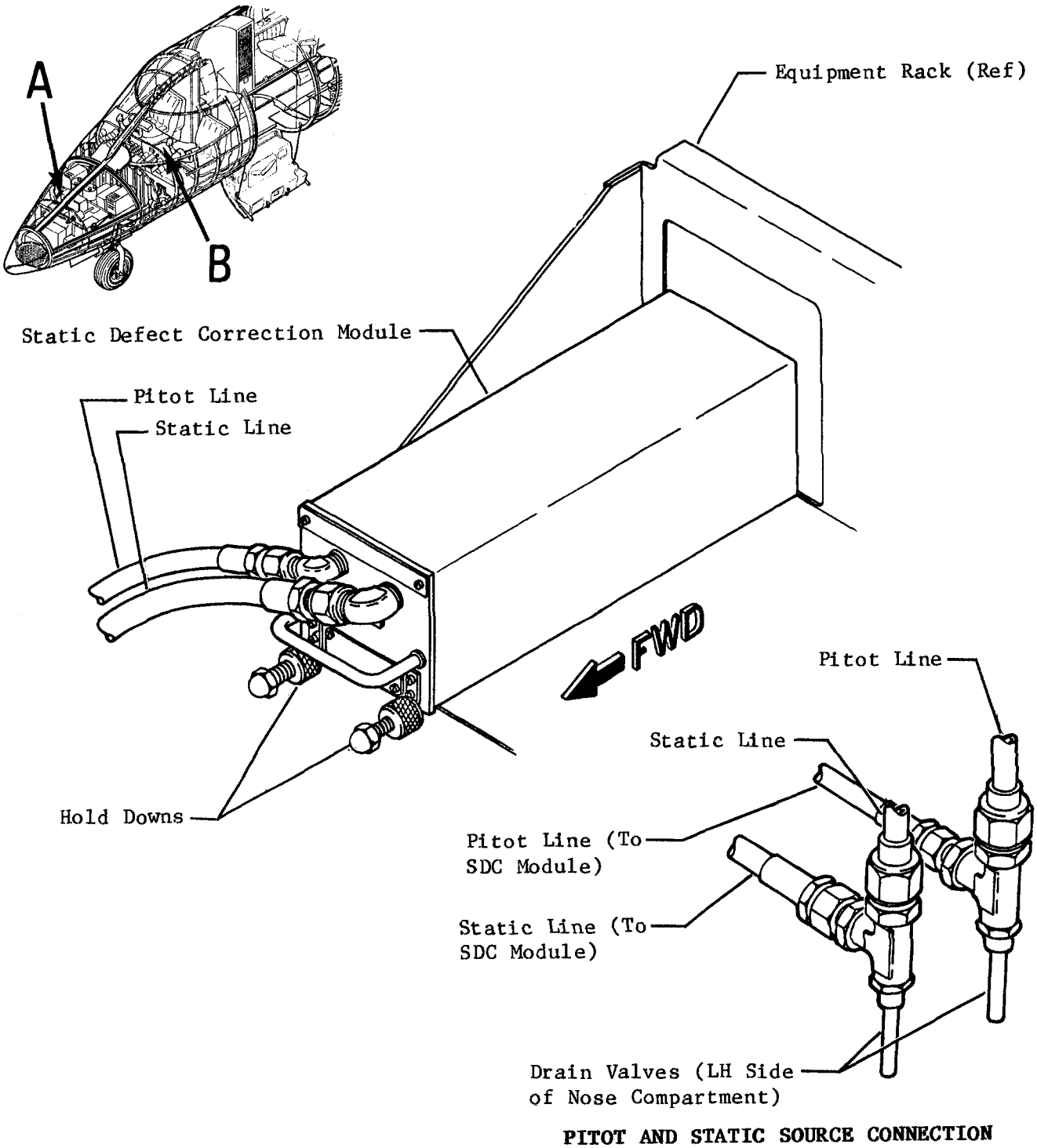
1. Removal/installation

A. Removal of SDC Module (AE15) *(Aircraft with SDC installed in nose.)* (See Figure 201.)
   (1) Remove nose compartment access door.
   (2) Disconnect pitot and static lines from module. Tag lines and cap all exposed fittings.
   (3) Loosen rack hold downs and slide module from rack.

B. Installation of SDC Module (AE15) *(Aircraft with SDC installed in nose.)* (See Figure 201.)
   (1) Slide module into rack and secure with hold downs.
   (2) Remove caps and connect pitot and static lines.
   (3) Install nose compartment access doors.

C. Removal of SDC Module (AE15) *(Aircraft with SDC installed in cabin.)* (See Figure 202.)
   (1) Remove equipment as necessary to gain access to SDC module.
   (2) Disconnect pitot and static lines from module. Tag lines and cap all exposed fittings.
   (3) Loosen rack hold downs and slide module from rack.

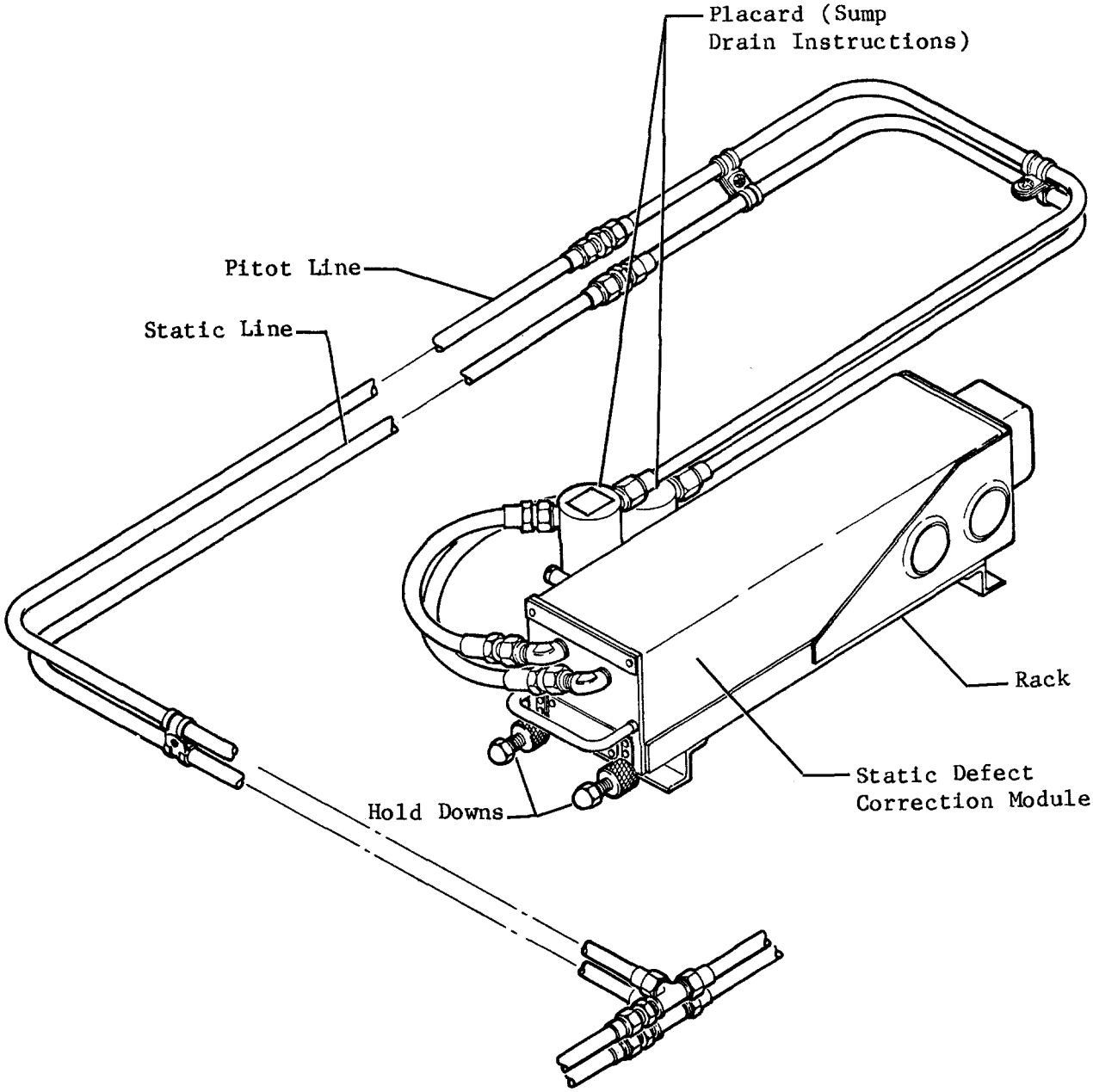
D. Installation of SDC Module (AE15) *(Aircraft with SDC installed in cabin.)* (See Figure 202.)
   (1) Slide module into rack and secure with hold downs.
   (2) Remove caps and connect pitot and static lines.
   (3) Install any equipment removed to gain access to SDC module.



PITOT AND STATIC SOURCE CONNECTION

Detail A

SDC Module Installation (Nose Compartment)
Figure 201



Detail B

SDC Module Installation (Cabin)
Figure 202

RADIO ALTIMETER - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The radio altimeter system consists of the indicator, transceiver, and dual antennas.

B. The system provides the pilot with a precise indication of the aircraft's altitude from 0 to 2500 feet. In addition, the system provides continuous altitude output signals to the pilot's flight director indicator.

RADIO ALTIMETER TRANSCEIVER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The transceiver is located on the baggage compartment floor or on the RH side of the nose compartment.

A. Remove Transceiver

(1) Disconnect antenna leads and electrical plug from transceiver.
(2) Remove attaching parts and transceiver from aircraft.

B. Install Transceiver

(1) Install transceiver and secure with attaching parts.
(2) Connect antenna leads and electrical plugs.

RADIO ALTIMETER INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The indicator is installed in the pilot's instrument panel. The indicator is secured to the panel by an instrument clamp.

° Maintenance practices consist of replacement of defective indicator.

A. Remove Indicator

(1) Assure that Battery Switches and Stall Warning Switches are off.
(2) Lower pilot's instrument panel and disconnect electrical plug from indicator.
(3) Loosen instrument clamp screws and remove indicator from panel.

B. Install Indicator

(1) Install indicator in panel and secure with instrument clamp.
(2) Connect electrical plug to indicator.
(3) Raise and secure pilot's instrument panel.

RADIO ALTIMETER ANTENNA - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The following removal and installation procedures are identical for both antennas.

° One radio altimeter antenna is located just aft of frame 10 (FS 228) and the other aft of frame 12 (FS 252).

A. Remove Radio Altimeter Antenna (Aircraft 35-002 thru 35-070 and 36-002 thru 36-020, except 35-036) (See figure 201.)

(1) Remove carpet and floorboards to gain access to antenna installation. Remove insulation as required.
(2) Disconnect antenna lead from antenna.
(3) Remove sealant from attaching parts.
(4) Remove ataching parts, antenna, antenna gasket, and fairing from aircraft.
(5) Remove old sealant from structure and clean surface with MEK.

B. Install Radio Altimeter Antenna (Aircraft 35-002 thru 35-070 and 36-002 thru 36-020, except 35-036) (See figure 201.)

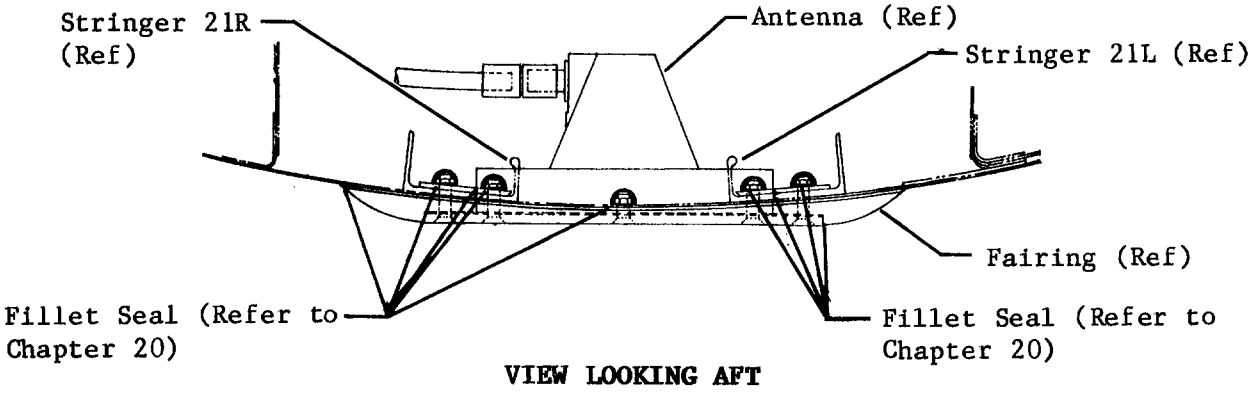
(1) Install fairing, antenna gasket, and antenna and secure with attaching parts.
(2) Apply fillet seal (Pro-Seal No. 890, Class B) to attaching parts and around perimeter of antenna (interior and exterior). (Refer to Chapter 20.)
(3) Connect antenna lead.
(4) Check electrical bond of antenna. (Refer to Wiring Manual, Chapter 20.)
(5) Install insulation, floorboards, and carpets.

C. Remove Radio Altimeter Antenna (Aircraft 35-036, 35-071 and Subsequent and 36-021 and Subsequent) (See figure 201.)

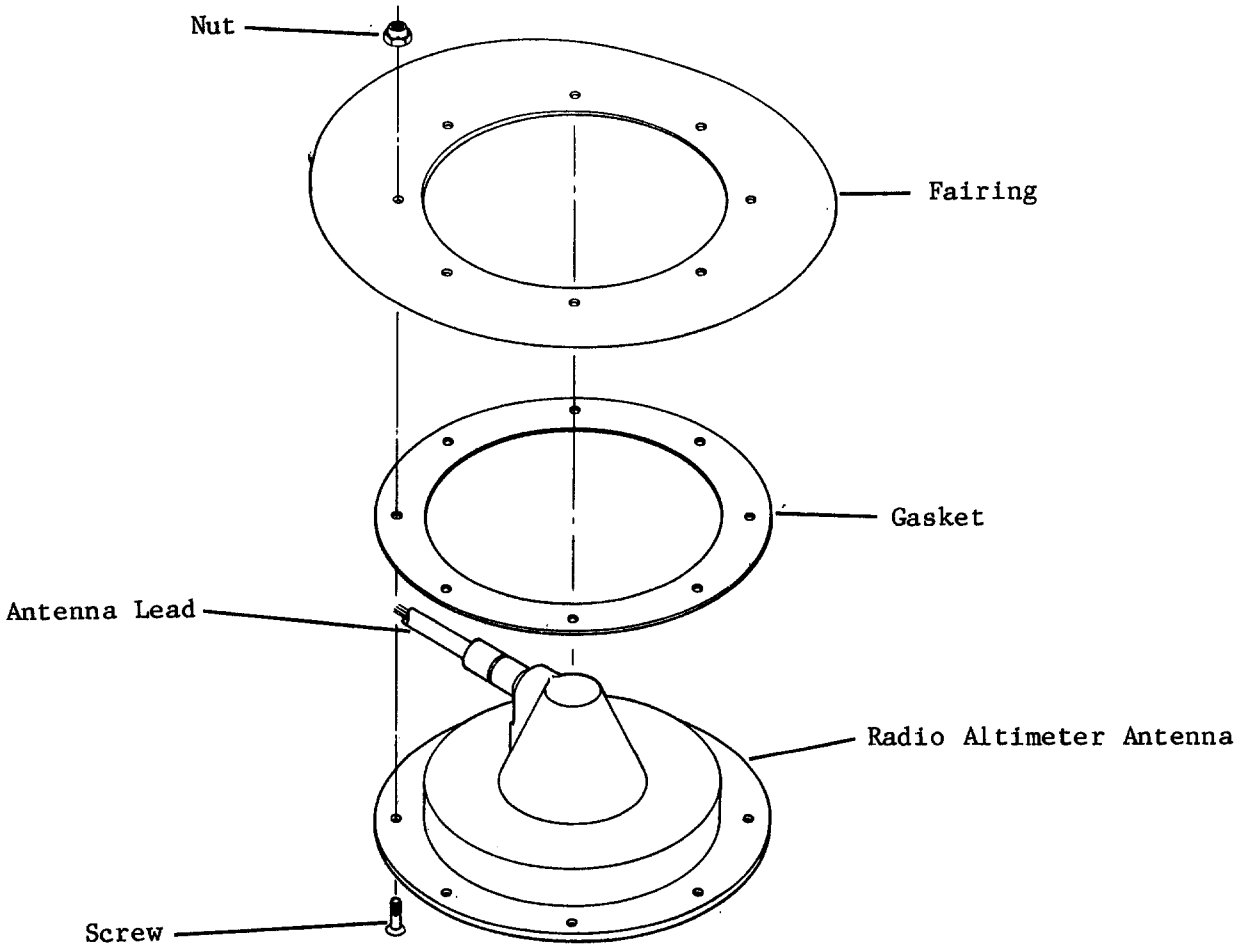
(1) Remove carpet and floorboards to gain access to antenna installation. Remove insulation as required.
(2) Disconnect antenna lead from antenna.
(3) Break sealant bond between stringers and angles and sides of antenna. Remove attaching parts, gasket, and antenna from aircraft.
(4) Clean old sealant from aircraft.

D. Install Radio Altimeter Antenna (Aircraft 35-036, 35-071 and Subsequent and 36-021 and Subsequent) (See figure 201.)

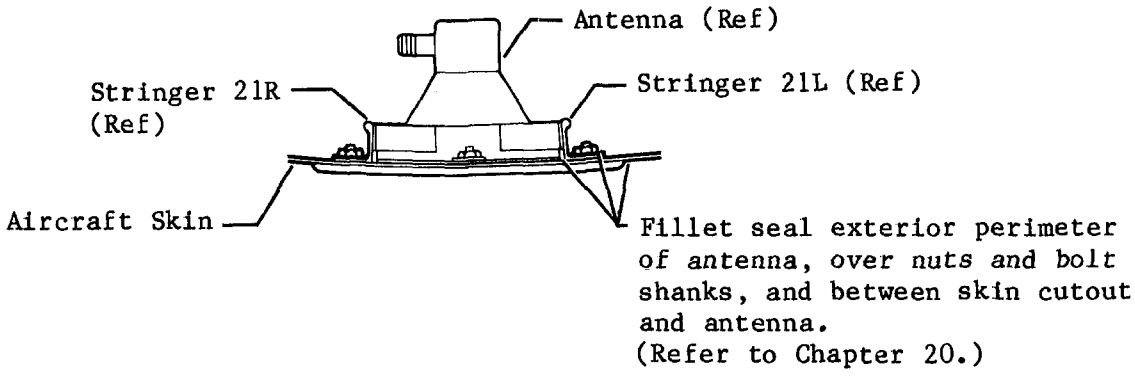
(1) Apply sealant to screw shanks. Position gasket and antenna on aircraft and secure with screws.
(2) Apply a fillet seal around perimeter of antenna and over nuts. Apply a fillet seal between stringers and antenna and between angles and antenna.
(3) Connect antenna lead to antenna.
(4) Install insulation, floorboards, and carpet.



VIEW LOOKING AFT



Radio Altimeter Antenna Installation
Figure 201 (Sheet 1 of 2)



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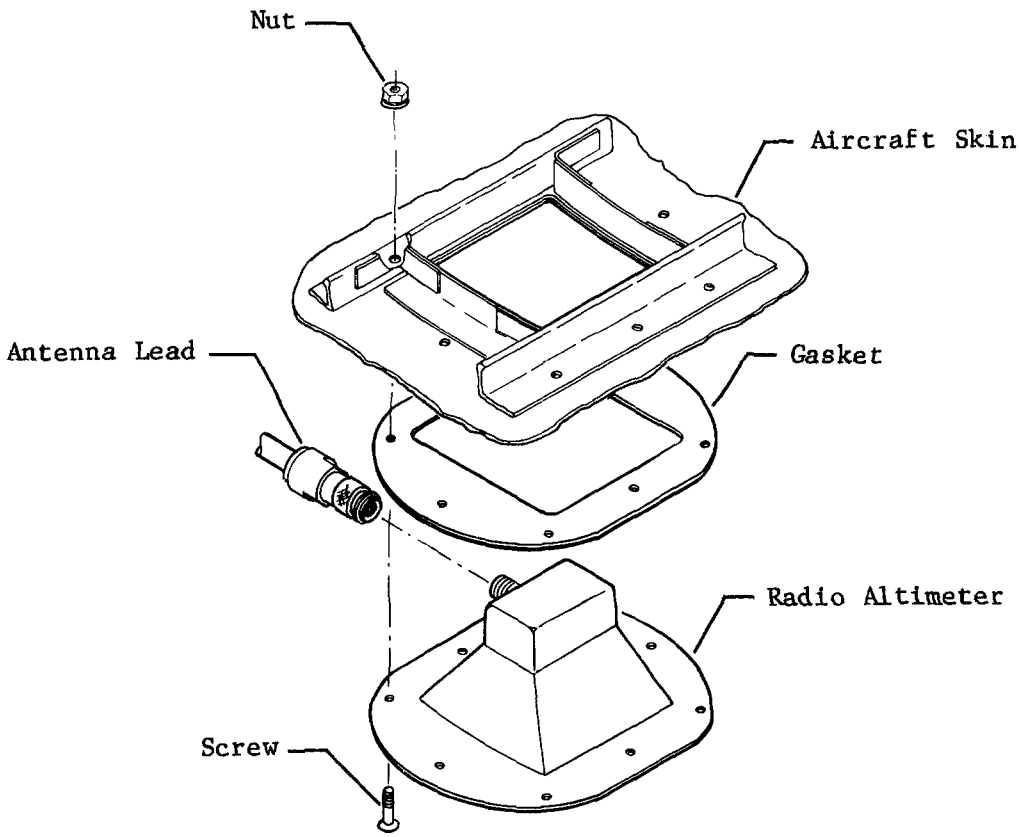


Radio Altimeter Antenna Installation
Figure 201 (Sheet 2 of 2)

ATTITUDE AND DIRECTION - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Altitude and direction instrumentation includes those systems necessary for basic flight maneuvers.

B. The systems include the flight directors, turn and bank, turn coordinator, directional gyros, vertical gyros, and a vertical gyro indicator.

DIRECTIONAL GYRO SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The directional gyros are installed in shock mounted racks in the nose compartment. The racks incorporate hold-down clamps and a receptacle box. All electrical connections are made when the gyro unit is in place and secured to the rack.

B. The flux valve is installed on a mounting bracket in the tailcone of each tip tank. This location minimizes electrical and magnetic disturbances of the aircraft. The flux valve assembly includes a compensator.

C. The directional gyro system provides a full 360 degrees of heading information with standard ARINC levels and gradients. The directional gyro contains an electrically-driven, hermetically-sealed gyro that is slaved to Magnetic North by the externally mounted flux valves and an internal servo-amplifier loop. Cockpit controls provide a free mode of operation which can be selected whenever magnetic operation is unreliable.

DIRECTIONAL GYRO - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: Removal and installation procedures for both directional gyros are identical.

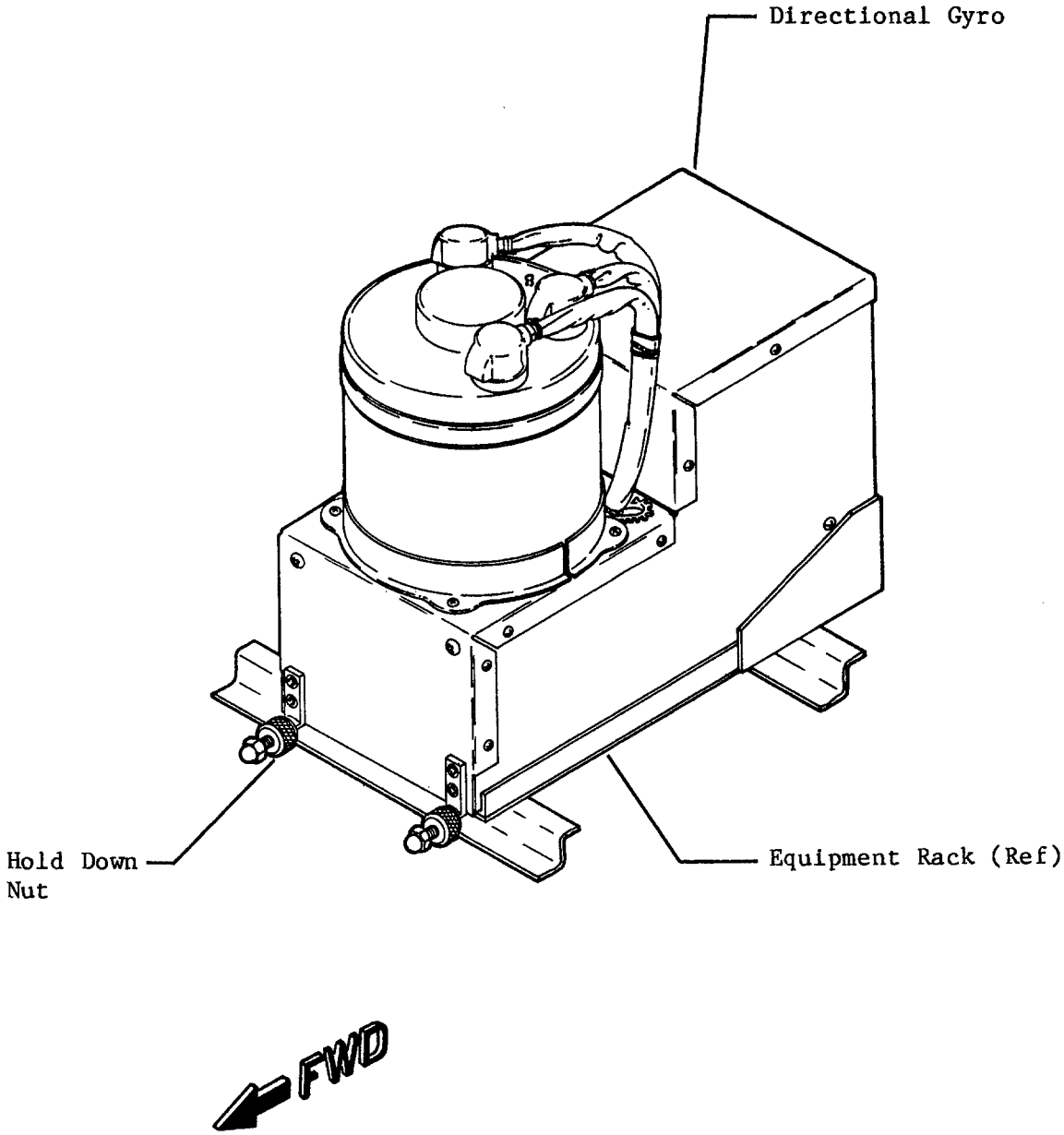
Maintenance practices consist of replacement of defective component.

A. Removal of Directional Gyro (See Figure 201.)

CAUTION: POWER TO GYRO SHALL BE REMOVED FROM GYRO FOR AT LEAST 20 MINUTES PRIOR TO GYRO HANDLING. FAILURE TO PROVIDE A 20 MINUTE SPINDOWN BEFORE HANDLING MAY CAUSE DAMAGE TO GYRO.

(1) Set Battery Switch(es) off and disconnect aircraft batteries.
(2) Remove nose compartment access doors.
(3) Loosen gyro hold-down screws.
(4) Disengage hold-down screws and pull gyro from rack.

B. Installation of Directional Gyro (See Figure 201.)
(1) Set gyro on rack and slide gyro into rack engaging electrical connector.
(2) Engage and secure hold-down screws.
(3) Install nose compartment doors.
(4) Connect electrical connectors to aircraft batteries.



Directional Gyro Installation
Figure 201

FLUX VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° Removal and installation procedures for both flux valves are identical.

° Maintenance practices consist of flux valve calibration and replacement of defective component.

A. Remove Flux Valve (See figure 201.)

(1) Remove tip tank tailcone access door (if installed) or tailcone assembly.
(2) Remove attaching parts and compensator (if installed).
(3) Disconnect electrical wiring from flux valve. Tag electrical wiring.
(4) Remove attaching parts and flux valve from mounting bracket.

B. Install Flux Valve (See figure 201.)

CAUTION: USE ONLY NONMAGNETIC SCREWS TO SECURE FLUX VALVE AND TIP TANK TAILCONE ACCESS DOOR (IF INSTALLED) OR TIP TANK TAILCONE ASSEMBLY.

(1) Install flux valve on mounting bracket and install screws. Do not tighten screws at this time.
(2) Connect electrical wiring to flux valve.
(3) Perform calibration adjustment of flux valve.
(4) Install tip tank tailcone.

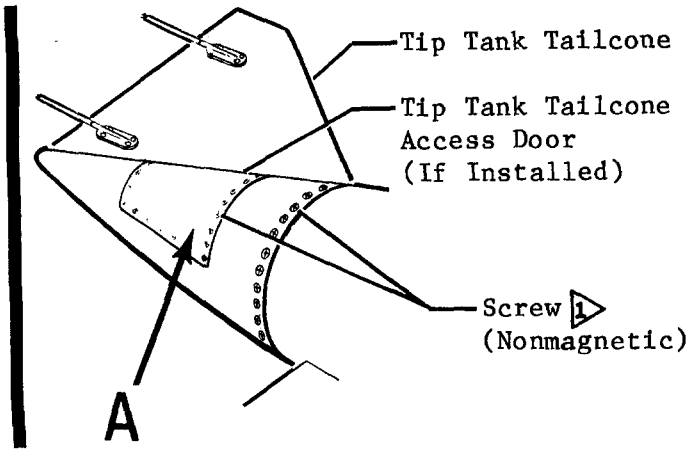
3. ADJUSTMENT/TEST

A. Calibration Adjustment of Flux Valves and Magnetic Compass (See figure 201.)

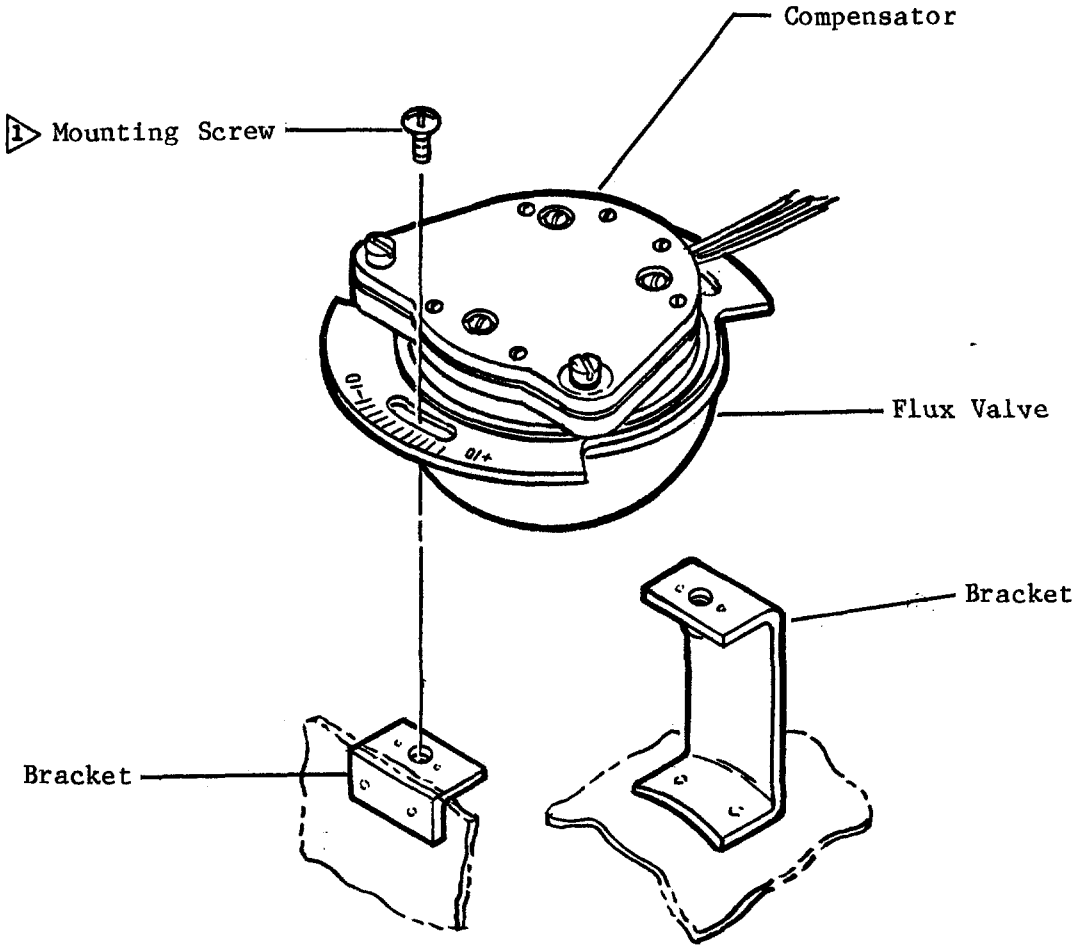
NOTE: The aircraft should be in its normal flight position with all electrical and radio equipment installed and operating, and preferably with both engines running. If an external power source is used, it should be at least 50 feet (15.24 m) aft of aircraft with the power cable on an extended aircraft centerline.

(1) Turn on electrical and radio equipment and assure that gyro slave switches are in SLAVE position.
(2) Attach a plumb bob to the grounding receptacle on each tip tank.
(3) Position aircraft left main gear on a turntable at the center of a compass rose.
(4) Maneuver the aircraft to a south heading, and so that the tips of each plumb bob hang on a common line, ±1.2 inch perpendicular to the aircraft heading. Allow five (5) minutes elasped time between positioning of aircraft and readings.

NOTE: Shield the plumb bobs and cords from wind during measurement.



1 Use only nonmagnetic screws to secure flux valve, tip tank tailcone access door (if installed) and tip tank tailcone assembly.



Detail A

Flux Valve Installation
Figure 201

(5) Record primary and secondary flux valve and magnetic compass reading on worksheet 201.
(6) Repeat steps (4) and (5) except position aircraft on east heading.
(7) Repeat steps (4) and (5) except position aircraft on north heading.
(8) Determine compass deviations for north and south readings. (Deviation is computed by subtracting the compass reading from the actual heading of the aircraft.) Enter deviation on worksheet 201.
(9) Compute the coefficient "C" on worksheet 201.
(10) Adjust the N/S error compensator on the compass to cause the compass reading to increase or decrease by the coefficient "C". Increase reading if "C" is negative, or decrease reading if "C" is positive.

NOTE: Remove compensator coverplate to gain access to compensator screws.

(11) Repeat steps (4) and (5) except position aircraft on west heading.
(12) Determine compass deviations for east and west readings. Enter deviations on worksheet 201.
(13) Compute coefficient "B" on worksheet 201.
(14) Adjust the E/W error compensator to cause the compass reading to increase or decrease by the coefficient "B". Increase reading if "B" is negative or decrease reading if "B" is positive.
(15) Compute coefficient "A" on worksheet 201.
(16) Index adjustment is required if coefficient "A" exceeds 1/2 degree for primary and secondary systems (flux valves) or one (1) degree for the magnetic compass.
(17) If flux valve index adjustment is required, proceed with step (18)(a) thru (18)(e). If flux valve index adjustment is not required, proceed with step (21).
(18) Adjust flux valve as follows:
  (a) Loosen mounting screws on applicable flux valve.
  (b) Rotate flux valve clockwise to increase compass reading.
  (c) Rotate flux valve counterclockwise to decrease compass reading.
  (d) Tighten mounting screws.
  (e) The difference between the flux valves (primary and secondary systems) shall not be greater than 5 degrees.
(19) If magnetic compass index adjustment is required, proceed with step (20). If index adjustment is not required, proceed with step (21).
(20) Remove the windshield center post cover, first removing the two screws in the compass calibration card holder.
  (a) Index magnetic compass by installing AN960D-6 series washers as required on the right mounting screw for positive "A", or left mounting screw for negative "A".
(21) Position the aircraft in 30 degree increments around the compass rose, beginning with west heading, and record each reading for the primary and secondary HSI's and the magnetic compass on worksheet 202.

NOTE: Magnetic compass readings should not deviate from the actual headings by more than 3 degrees. Difference between either primary or secondary HSI and the magnetic compass should not exceed 5 degrees.

(22) Determine deviation for each heading recorded.
(23) The spread between the maximum positive deviation and the maximum negative deviation should not exceed 6 degrees.
(24) Compare the READING column of worksheet 202 against the existing compass calibration card.
(25) If the READING column of worksheet 202 does not agree with the STEER rows on the existing compass calibration card, fill out a new calibration card using the figures from the worksheet.
(26) Turn off operating electrical and radio equipment and shut down engines or disconnect power source from aircraft, whichever is applicable.
(27) Remove plumb bobs from wings; install windshield center post cover and card holder, and remove aircraft from turntable and compass rose.

Actual Head	MAGNETIC		PRIMARY FLUX VALVE		SECONDARY FLUX VALVE	
	Reading	Dev'n	Reading	Dev'n	Reading	Dev'n
N 000						
S 180						
E 090						
W 270						
COEF C $C = \frac{(N) - (S)}{2}$	$\frac{(\ ) - (\ )}{2} =$		$\frac{(\ ) - (\ )}{2} =$		$\frac{(\ ) - (\ )}{2} =$	
COEF B $B = \frac{(E) - (W)}{2}$	$\frac{(\ ) - (\ )}{2} =$		$\frac{(\ ) - (\ )}{2} =$		$\frac{(\ ) - (\ )}{2} =$	
COEF A $\frac{(N) + (E) + (S) + (W)}{4}$	$\frac{(\ )+(\ )+(\ )+(\ )}{4} =$		$\frac{(\ )+(\ )+(\ )+(\ )}{4} =$		$\frac{(\ )+(\ )+(\ )+(\ )}{4} =$	

Compensation Swing
Worksheet 201

Actual Head	PRIMARY FLUX VALVE		SECONDARY FLUX VALVE		MAGNETIC COMPASS	
	Reading	Dev'n	Reading	Dev'n	Reading	Dev'n
000						
030						
060						
090						
120						
150						
180						
210						
240						
270						
300						
330						

Residual Swing
Worksheet 202

VERTICAL GYRO - MAINTENANCE PRACTICES

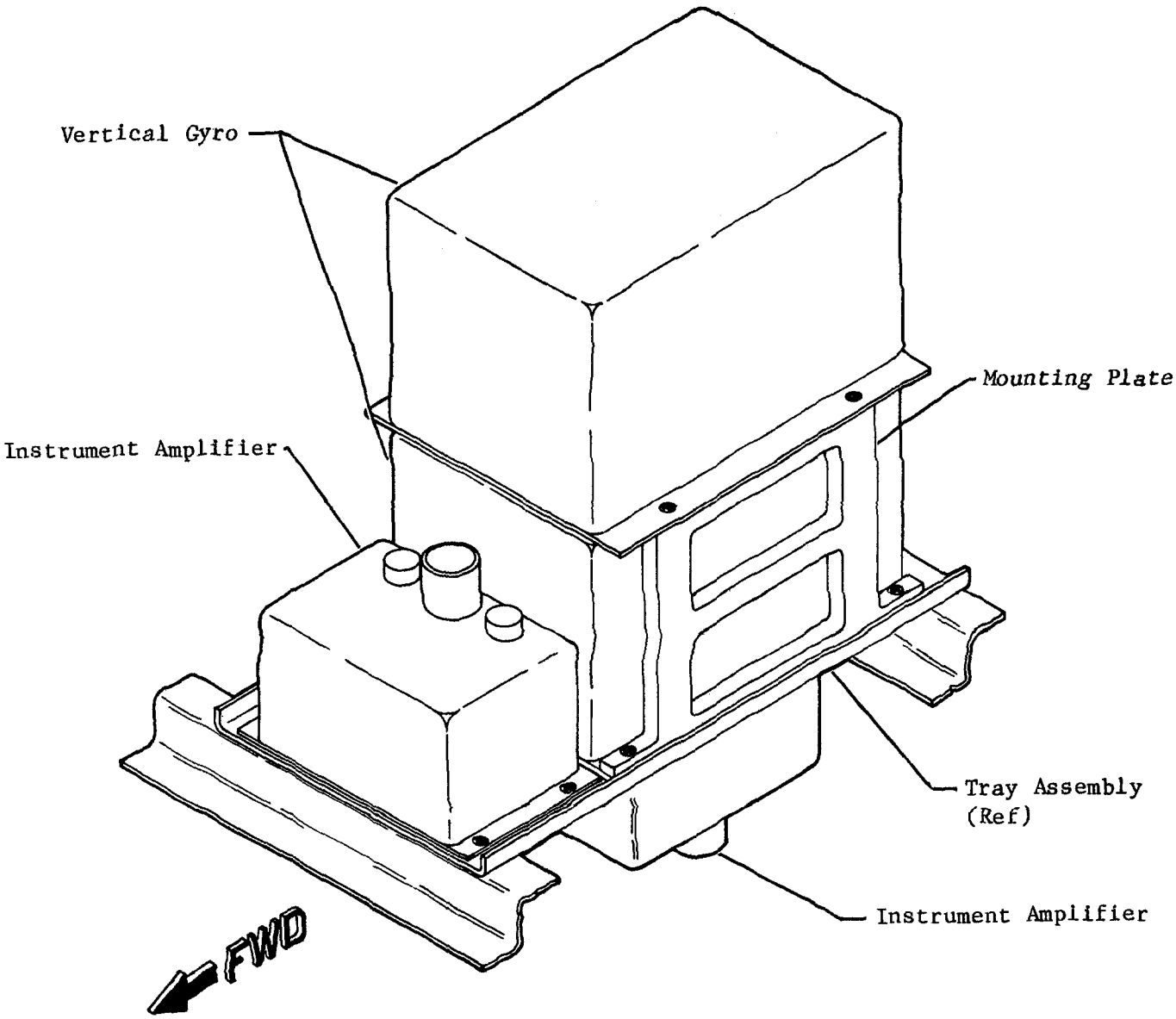
1. Removal/Installation

A. Removal of Vertical Gyro (GY8, 2GY8) (See Figure 201.)

CAUTION: POWER TO GYRO SHALL BE REMOVED FROM GYRO FOR AT LEAST 20 MINUTES PRIOR TO GYRO HANDLING. FAILURE TO PROVIDE A 20 MINUTE SPINDOWN BEFORE HANDLING MAY CAUSE DAMAGE TO GYRO.

(1) Set Battery Switch(es) off and disconnect aircraft batteries.
(2) Remove nose compartment access doors.
(3) Disconnect electrical connector (RP181, 2RP181) from gyro.
(4) Remove attaching parts and vertical gyro from aircraft.

B. Installation of Directional Gyro (GY8, 2GY8) (See Figure 201.)
(1) Install gyro and secure with attaching parts.
(2) Connect electrical connector (RP181, 2RP181) to gyro.
(3) Install nose compartment doors.
(4) Connect electrical connectors to aircraft batteries.



Vertical Gyro Installation
Figure 201

FLIGHT DIRECTORS AND COURSE INDICATORS - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The following removal and installation procedures are common to the flight directors, course indicators, andd vertical gyro indicator.

° Maintenance practics for the flight directors, course indicators, and vertical gyro indicator consists of replacement of the defective component.

A. Remove Indicator

(1) Assure that Battery Switches and Stall Warning Switches are off.
(2 Lower pilot's or copilot's instrument panel.
(3) Disconnect electrical plug(s) from indicator.
(4) Loosen instrument clamp screw and remove indicator from panel.

B. Install Indicator

(1) Install indicator in panel and secure with instrument clamp.
(2) Connect electrical plug to indicator.
(3) Raise and secure instrument panel.

FLIGHT DIRECTOR SYSTEM - ADJUSTMENT/TEST

1. **GENERAL**
   A. The following procedures are for the Collins (FD-108Y) Flight Director System.
   B. Assure that the Automatic Flight Control System is functioning properly. (Refer to 22-10-00 for Functional Test.)

      NOTE: This functional test may be accomplished concurrently with Automatic Flight Control System, reference 22-10-00.

2. **TOOLS AND EQUIPMENT**

NAME	NUMBER	MANUFACTURER	USE
Extension Cable (Directional Gyro)		Fabricate Locally	
Extension Cable (Vertical Gyro)		Fabricate Locally	
Turn Table (Directional Gyro)	TN26409	Gates Learjet	
Tilt Table (Vertical Gyro)	TN26410	Gates Learjet	
Pitot-Static Tester	1811F	Aircraft Products Co. Bridgeport, PA	
External Power Supply		Commercially Available	
VOR/ILS Radio Simulator	NAV-401L	IFR	

3. **ADJUSTMENT/TEST**
   A. Functional Test of Collins (FD-108Y) Flight Director System
      (1) Assure the automatic flight control system is operational. The operational check of the automatic flight control system may be done in conjunction with this operational check.
      (2) Remove nose compartment access doors and remove vertical and directional gyros. (Refer to 34-21-00 and 34-22-00.)
      (3) Install vertical gyros on tilt table and connect to aircraft wiring with extension cable.
      (4) Install directional gyros on turn table and connect to aircraft wiring with extension cable.

(5) Connect external power source to aircraft.
(6) Assure that AFCS, Flight Director, and Air Data Sensor circuit breakers are depressed.
(7) Set Battery, Inverter (Primary), and Autopilot Switches to on.
(8) Assure that no vertical or lateral modes are selected on the autopilot controller and that the command bars are biased out of view.
(9) Attach MB-1 pitot-static tester to the shoulder static ports and to the RH pitot tubes. Cover remaining shoulder static ports with tape.

CAUTION: APPLY VACUUM TO SHOULDER STATIC PORTS AT A RATE NOT TO EXCEED 2000 FT. PER MINUTE OR DAMAGE TO THE AIR DATA SENSOR COULD OCCUR.

(10) Apply vacuum until altimeter on tester indicates 20,000 feet.
(11) Simulate a vertical speed (descent) of 1,000 feet per minute and engage V/S button on autopilot controller. The command bars will come into view and center.
(12) Decrease the simulated rate of descent to 500 feet per minute. The commands will show a fly down command.
(13) Disengage the vertical speed (V/S) mode. The command bars will disappear out of sight.
(14) Re-engage the vertical speed mode. The command bars will recenter.
(15) With the pitot static tester, establish an airspeed of 200 KIAS. Rate of pressure increase shall not increase the airspeed indicator in excess of 20 knots per second.
(16) Engage the SPD mode button. Command bar will be centered.
(17) Increase the simulated airspeed to 220 KIAS. The command bars will show a fly up command.

CAUTION: RELEASE PRESSURE FROM MB-1 PITOT STATIC TESTER AT A RATE NOT TO EXCEED 20 KNOTS PER SECOND.

(18) Decrease the simulated airspeed to 180 KIAS. The command bars will show a fly down command.
(19) Release presure from pitot tube.
(20) Simualte an altitude of 10,000 feet and engage altitude hold (ALT). The (ALT) annunciator will light and command bars will center.
(21) Decrease the altitude by 50 feet. The command bars will indicate a fly up command.
(22) Engage the autopilot; the command bars will center and the ALT mode will disengage.
(23) With the autopilot engaged, vary the altitude and verify that the command bars are not affected.
(24) Engage the ALT mode. Decrease altitude by 50 feet. The command bars will indicate a fly up command.
(25) Disengage the autopilot. The command bars will maintain a fly up command.
(26) Disengage the ALT mode.

(27) Release vacuum and disconnect pilot static tester from shoulder static ports.
(28) Tune the navigation receiver to an ILS frequency.
(29) Simulate a G/S up indication with the ILS radio simulator.
(30) Engage ALT, NAV, and G/S modes in that order. The command bars will be centered.
(31) Reduce the G/S up indication to zero. The command bars will remain centered. The ALT and G/S ARM lights will extinguish when the G/S needle is between zero and one needle width above zero. The G/S CAPT annunciator will illuminate.
(32) Increase the G/S indication. The command bars will move to indicate a command to return to the beam center. Tilt the vertical gyro to re-center the beam.
(33) Engage the Go-Around (G/A) Switch located on the outer portion of each throttle handle. Command bars will indicate a fly up command, the LVL light will illuminate and the G/S CAPT and NAV annunciators will extinguish.
(34) Disengage the G/A mode and level the vertical gyro.
(35) Turn the heading knob on the course indicator until the heading bug is 90° off the indicated heading (either direction).
(36) Engage the HDG mode. The command bars will turn in the same direction as the heading marker indicates.
(37) Tilt the vertical gyro to a 30° bank in the direction of the command turn. The command bars will return to approximate center position.
(38) Disengage the HDG mode.
(39) Turn the heading knob on the course indicator until the heading bug is 90° off the indicated heading (opposite direction to step 35).
(40) Engage the HDG mode. The command bars will turn in the same direction as the heading marker indicators.
(41) Tilt the vertical gyro to a 30° bank in the direction of the command turn. The command bars will return to approximate center position.
(42) Disengage the HDG mode and level vertical gyro.
(43) Tune the Navigation receiver to 108.00 MH_z.
(44) Turn the heading knob to the aircraft heading and the course knob 90° off the indicated aircraft heading. Set the VOR simulator to the bearing of the aircraft.
(45) Engage HDG and NAV modes. The HDG and NAV ARM annunciators will illuminate.
(46) Slowly turn the course knob to the aircraft heading.
(47) The HDG and NAV ARM annunciators will extinguish and the NAV CAPT and TRK annunciators will illuminate.
(48) Simulate an outer marker beacon. Engage G/S mode and set flaps below 13°. The TRK and APPR annunciators will light.
(49) Disengage the NAV and G/S modes.
(50) Tune the Navigation REceiver to an ILS frequency such as 109.1 MH_z.
(51) Set course pointer on HSI to 30° to the right of the indicated aircraft heading on the azimuth card.

(52) Turn the heading knob to align the bug with the indicated aircraft heading.
(53) Assure that vertical gyro tilt table is level. Set flaps below 13° and NAV simulator to a fly left signal. The APPR annunciator will light.
(54) Engage the HDG and NAV modes. The NAV ARM and HDG annunciators will illuminate and command bars will be centered.
(55) Set the simulator to an on course signal. The NAV ARM and HDG lights will extinguish and the NAV CAPT light will illuminate.
(56) The command bars will indicate a fly right command and the course deviation bars will center.
(57) Rotate the heading gyro to the right. The aximuth card will rotate to the left.
(58) Turn the gyro until the course pointer aligns with the heading bug. The TRK annunciator will illuminate and the command bar will center.
(59) Set the NAV simulator from an on-course signal to a fly-left signal. Observe that the course deviation bar indicates fly left, and that the command bars indicate fly left.
(60) Check the Flight Directional Gyro as follows:
  (a) Observe that command bars on the flight director indicator are out of view.
  (b) Observe the GYRO warning flag on the flight director indicator is out of view.
  (c) Observe the CMPTR warning flag on the flight director indicator is out of view.
  (d) Observe that the SPEED warning flag and speed deviation indicator on the flight director ar out of view, if installed.
  (e) Observe that flight director indicator reflects current aircraft attitude.
  (f) Observe that the course indicator HEADING flag is retracted out of view and that the course indicator heading and corresponding RMI heading slave to the aircraft heading.
  (g) Rotate the directional gyro 90° clockwise. Observe that the course indicator and corresponding RMI increase heading 90 ±2 degrees.
  (h) Rotate the directional gyro 180° counterclockwise. Observe that the course indicator and corresponding RMI decrease heading 90 ±2 degrees from the original aircraft heading.
  (i) Return the directional gyro to the aircraft heading.
  (j) Rotate directional gyro 10 degrees clockwise. Observe the slow slaving of the gyro, indicated by the course indicator slowly moving to the aircraft heading at a nominal 2 degrees per minute.
  (k) Hold the SLAVE L-R Switch to either L or R. Observe the fast slave of the gyro. This is indicated by the course indicator heading moving to the aircraft heading at 4 to 6 degrees per second. Release the switch.

(l) Rotate the directional gyro 10 degrees counterclockwise from the aircraft heading. Observe the slow slaving of the gyro by course indicator heading slowly moving toward the aircraft heading. Observe the nominal 2 degrees per minute slaving rate.

(m) Hold the SLAVE L-R Switch either L or R. Observe the fast slave of the gyro. This is indicated by the course indicator heading moving to the aircraft heading at 4 to 6 degrees per second.

(n) Observe that the course indicator HEADING flag appears.

(61) Check the Flight Director Attitude Gyro as follows:

(a) Push PRESS TO TEST button on flight director indicator, if installed. Observe that the flight director indicator pitch attitude display indicates 10 ±4 degrees climb and that the roll attitude display indicates 20 ±4 degrees right roll. Release the PRESS TO TEST button.

NOTE: If you press PRESS TO TEST button, the GYRO flag will appear.

(b) Tilt the vertical gyro 10 degrees nose up. Observe that the flight director indicator pitch attitude display indicates 10 ±2 degrees climb.

(c) Tilt the vertical gyro 10 degrees nose down. Observe that the flight director indicator pitch attitude display indicates 10 ±2 degrees dive.

(d) Tilt the vertical gyro 70 degrees nose down. Observe that the flight director indicator pitch attitude display indicates 70 ±4 degrees dive.

(e) Tilt the vertical gyro 70 degrees nose up. Observe that the flight director indicator pitch attitude display indicates 70 ±4 degrees climb.

(f) Level vertical gyro in roll and pitch attitude.

(g) Roll vertical gyro to a 30 degrees right roll. Observe that the flight director roll attitude display and roll bank index at top of instrument indicate 30 ±3 degrees right roll (index left of center line).

(h) Position the vertical gyro to 90 degrees right roll. Observe that the flight director indicator attitude display and bank index indicate 90 ±4 degrees right roll.

(i) Position the vertical gyro to 30 degrees left roll. Observe that the flight director indicator attitude display and bank index indicate 30 ±3 degrees left roll.

(j) Position the vertical gyro to 90 degrees left roll. Observe that the flight director indicator attitude display and bank index indicate 90 ±4 degrees left roll.

(k) Level the vertical gyro in roll and pitch attitude.

(62) Set all switches to off. Disconnect external power from the aircraft.

(63) Install vertical and directional gyros. (Refer to 34-21-00 and 34-22-00.)

(64) Install nose compartment access doors.

FLIGHT DIRECTOR SYSTEM - ADJUSTMENT/TEST

1. GENERAL

A. The following procedures are for the Collins (FD-109Y and FD-109Z) Flight Director Systems.

B. Assure that the Automatic Flight Control System is functioning properly. (Refer to 22-10-00 for Functional Test.)

2. TOOLS AND EQUIPMENT

NAME	NUMBER	MANUFACTURER	USE
Extension Cable (2) (Directional Gyro)		Fabricate Locally	Connect gyro to aircraft.
Extension Cable (2) (Vertical Gyro)		Fabricate Locally	Connect gyro to aircraft.
Turn Table (Directional Gyro)	TN26409	Gates Learjet	
Tilt Table (Vertical Gyro)	TN26410	Gates Learjet	
Pitot-Static Tester	MB-1	Available Locally	
External Power Supply		Available Locally	
VOR/ILS Radio Simulator	G250C	Gables	Systems test.
VOR/ILS Radio Simulator	NAV-401L	IFR	

3. ADJUSTMENT/TEST

A. Functional Test of Collins (FD-109Y and FD-109Z) Flight Director Systems

(1) Assure the automatic flight control system is operational.

(2) Remove nose compartment access doors and remove vertical and directional gyros. (Refer to 34-21-00 and 34-22-00.)

(3) Install vertical gyros on tilt table and connect to aircraft wiring with extension cable.

(4) Install directional gyros on turn table and connect to aircraft wiring with extension cable.

(5) Connect external power source to aircraft.

(6) Assure that AFCS, Flight Director, and Air Data Sensor circuit breakers are depressed.

(7) Set Battery and Inverter Switches to on.

(8) Assure that no vertical or lateral modes are selected on the autopilot controller and that the command bars on the flight directors are biased out of view.

(9) When aircraft is equipped with a secondary flight director system, assure that no vertical or lateral modes are selected on the mode controller. The mode controller is located in the center pedestal.

NOTE: ° The following functional test procedures are for dual flight director indicators. If the aircraft is equipped with a primary flight director only, disregard all references to the secondary side.

° When aircraft is equipped with FD-109Z Flight Director System, assure that INS mode is disengaged.

° HDG and CRS control knobs for the FD-109Z course indicator are located on the course selector panel. HDG and CRS control knobs for the FD-109Y course indicator are on the indicator.

(10) Perform flight director heading check as follows:

NOTE: ° Pilot's course indicator corresponds to the copilot's RMI and the copilot's course indicator corresponds to the pilot's RMI.

° If the aircraft is equipped with a secondary flight director system, assure that the following checks are made for the secondary system in addition to the primary.

(a) Assure that all applicable circuit breakers are depressed.
(b) Check that command bars on the flight director indicators are out of view.
(c) Check that the GYRO warning flags on flight director indicators are out of view.
(d) Check that the CMPTR warning flags on the flight director are out of view.
(e) Check that the SPEED warning flag on the flight director indicators are out of view.
(f) Check that the flight director indicators reflect current aircraft attitude.
(g) Check that both course indicator HEADING flags are out of view and that the course indicator heading and corresponding RMI headings are on the aircraft headings.
(h) Rotate the primary directional gyro 90 degrees clockwise. Check that primary course indicator and corresponding RMI (copilot's) increase heading 90 (±2) degrees. Repeat procedure utilizing the secondary directional gyro and secondary course indicator.

(i) Rotate the primary directional gyro 180 degrees counterclockwise. Check that the primary course indicator and corresponding RMI (copilot's) decrease heading 90 (±2) degrees from the original aircraft heading. Repeat procedure utilizing the secondary directional gyro and secondary course indicator.

(j) Rotate both directional gyros to the aircraft heading.

(k) Rotate the primary directional gyro 10 degrees clockwise. Check the slow slaving of the gyro. This is indicated by the course indicator slowly moving to the aircraft heading at a nominal 2 degrees per minute. Repeat procedure utilizing the secondary gyro.

(l) Hold the pilot's SLAVE L-R Switch to L and hold the SLAVE-FREE Switch to SLAVE. Check the fast slave of the gyro. This is indicated by the course indicator heaidng moving to the aircraft heading at 4 to 6 degrees per second. Repeat procedure utilizing the secondary gyro and the copilot's SLAVE L-R Switch.

(m) Rotate the primary directional gyro turn table 20 degrees counterclockwise and repeat steps (k) and (l). Repeat procedure utilizing the secondary directional gyro and the copilot's SLAVE L-R Switch.

(n) Holding both the SLAVE-FREE Switch to SLAVE, check that the course indicator HEADING flag appears.

(11) Perform flight director attitude gyro check as follows:

(a) Depress and hold the TEST pushbutton on the flight indicator. Check that the pitch attitude indicates 10 (±4) degrees climb and the roll attitude indicates 20 (±4) degrees right roll. Release the pushbutton. Repeat procedure for copilot's flight director indicator.

NOTE: The GYRO and CMPTR flags will appear.

(b) Tilt the primary vertical gyro 10 degrees nose up. Check that the flight director indicates 10 (±2) degrees climb. Repeat procedure utilizing the secondary vertical gyro and the copilot's flight director indicator.

(c) Tilt the primary vertical gyro 10 degrees nose down. Check that the flight director indicator indicates 10 (±2) degrees dive. Repeat procedure utilizing the secondary vertical gyro and the copilot's flight director indicator.

(d) Tilt the primary vertical gyro 70 degrees nose down. Check that the flight director indicator indicates 70 (±4) degrees dive. Repeat procedure utilizing the secondary vertical gyro and the copilot's flight director.

(e) Tilt the primary vertical gyro 70 degrees nose up. Check that the flight director indicator indicates 70 (±4) degrees climb. Repeat procedure utilizing the secondary vertical gyro and the copilot's flight director indicator.

(f) Level the primary and secondary vertical gyro in roll and pitch attitude.

(g) Roll the vertical gyro to a 30 degree right roll. Check that flight director indicator indicates a 30 (±3) degree right roll (index left of center line.) Repeat procedure utilizing secondary vertical gyro and copilot's flight director indicator.

(h) Roll the vertical gyro to a 90 degree right roll. Check that flight director indicator indicates a 90 (±4) degree right roll. Repeat procedure utilizing the secondary vertical gyro and copilot's flight director indicator.

(i) Roll the vertical gyro to a 30 degree left roll. Check that flight director indicator indicates 30 (±3) degrees left roll. Repeat procedure utilizing the secondary vertical gyro and copilot's flight director indicator.

(j) Roll the vertical gyro to a 90 degree left roll. Check that flight director indicator indicates a 90 (±4) degree left roll. Repeat procedure utilizing the secondary vertical gyro and copilot's flight director indicator.

(k) Level the primary and secondary vertical gyros in the roll and pitch attitudes.

(l) Set Autopilot Switch to ON and engage autopilot.

(m) Depress the autopilot controller HDG pushbutton. Check HDG annunciator light is illuminated. Depress the HDG pushbutton on the copilot's mode controller and check for the ON flag at the upper edge of the pushbutton.

(n) Depress and hold the Pitch Sync Switch on the control wheel; check that the command bars are centered in pitch.

(o) Tilt the vertical gyro 20 degrees nose down and depress and hold Pitch Sync Switch. Check that the command bars stay centered in pitch. Level the vertical gyro.

(p) Tilt the vertical gyro 10 degrees nose down and release the Pitch Sync Switch. Check that the command bars indicate a fly up command.

(q) Depress and hold Pitch Sync Switch. Check that command bars return to center. Release the Pitch Sync Switch.

(r) Return the vertical gyro back to a level position and check that the command bars indicate a pitch down command.

(s) Depress and hold the Pitch Sync Switch. Check that the command bars return to center.

(t) Set the heading on the course indicator (HSI) index to the aircraft heading.

(u) Tilt the vertical gyro 30 degrees right roll. Check that the command bars indicate a left roll command.

(v) Tilt the vertical gyro 30 degrees left roll. Check that the command bars indicate a right roll. Return the vertical gyro to a level position.

(w) Assure that course indicator heading index is set on the aircraft heading and check that the command bars show a wing level condition.

NOTE: On aircraft equipped with FD-109Z flight director system, the course and heading knobs are located on a separate panel and not on the HSI.

(x) Move the heading index clockwise 20 degrees from the aircraft heading. Check that the command bars indicate a right bank.

(y) Move the heading index counterclockwise 20 degrees from the aircraft heading. Check that the command bars indicate a right bank.

(z) Move the heading index 90 degrees from the aircraft heading either right or left. Check that the command bars indicate a right or left bank corresponding to the heading index.

(aa) Tilt the vertical gyro either right or left until the command bars are level. This should occur at approximately 30 degrees of gyro tilt.

(ab) Return the vertical gyro to level.

(12) Turn the NAV 1 and NAV 2 Switches on the control head on.

(13) Set the Navigation simulator to an on-course signal at the same VOR frequency as the aircraft nav controls.

(14) Check that the NAV flag on the course indicator, the expanded localizer/runway and glideslope indicators are out of view.

(15) Depress the NAV pushbutton on the autopilot controller. Check that the NAV ARM annunciator light is illuminated.

(16) Set the course knob so that the index is on the aircraft heading. Check that the course deviation needle is within approximately one-half dot of center.

(17) The NAV CAPT annunciator will illuminate, the NAV ARM annunciator will go out and the command bars will go to a wing level position. The TO ambiguity pointer will be in view.

(18) Change the navigation control frequency to any of the unused VOR frequencies. Check that the NAV CAPT annunciator goes out and the NAV ARM annunciator is illuminated.

NOTE: There will be some time delay between the NAV CAPT and NAV ARM.

(19) Change the course index right 20 degrees from the aircraft heading. Check that the command bars indicate a right roll command and that the deviation needle is centered.

(20) Change the course index left 20 degres from the aircraft heading. Check that the command bars indicate a left roll command and that the deviation needle is centered.

(21) Move the course index to the aircraft heading.

(22) Return the navigation control to the original selected VOR frequency. The NAV CAPT annunciator will illuminate and the NAV ARM light will go out.

(23) Move the course index right 10 (±2) degrees from the aircraft heading. Check that the command bars move to the last dot (150 micro amperes) left and the command bars indicate a left roll command.
(24) Move the course index left 10 (±2) degrees from the aircraft heading. check that the command bars move to the last dot (150 micro amperes) right and the command bars indicate a right roll command.
(25) Move the course index to the receiprocal heading of the aircraft. Check that the course deviation centers and the (FROM) ambiguity pointer is in view. Return the course index to the aircraft heading.

NOTE: The TO-FROM ambiguity pointer is hidden from view at 90± degrees off course. Partial indication may be observed at ±70 degrees and ±110 degrees off course.

(26) With the course index set to the aircraft heading, increase the simulator bearing by 15 degrees. Check that the course deviation bar indicates fly right and the command bars indicate a right roll command.
(27) Vary the simulated station bearing and check that the bearing pointer (pink diamond) properly indicates the bearing on the azimuth card of the course indicator (HSI).
(28) Assure that the glideslope circuit breaker is depressed.
(29) Set the navigation simulator on a localizer frequency.
(30) Tune the navigation receivers to the same localizer frequency and set the course arrow to inbound localizer course.
(31) Set in a 150 micro ampere radio deviation and a 150 micro ampere up glideslope deviation.

NOTE: On some simulators LOC and G/S frequencies cannot be obtained at the same time. On simulator where only one frequency can be obtained, set in a 150 micro ampere up glideslope deviation and proceed with step (32).

(32) Depress the G/S pushbutton on the autopilot controller.
(33) Check that the runway comes into view on the flight director indicator and that the lateral deviation bar and glideslope pointer show a deflection in the proper direction.
(34) Check that the G/S flags are out of view and that the NAV ARM and G/S ARM annunciators are illuminated.
(35) Reduce the localizer deviation very slowly to zero and check that the NAV ARM annunciator goes out and the NAV CAPT annunciator light is illuminated.
(36) Move the deviation to the left and right of course and check that the command bars slowly follow the localizer deviation.
(37) Reduce the glideslope deviation to zero and check that the G/S arm annunciator goes out and the G/S CAPT annunciator is illuminated. Check that the command bars follow the glideslope deviation.

(38) On simulators where only one frequency can be obtained, set in a 150 micro ampere radio deviation.
(39) Assure that Marker Beacon circuit breaker is depressed and the MKR BCN HI-LO Switch is set to LO.

NOTE: Some aircraft are equipped with a marker beacon ON-OFF Switch. On these aircraft, the Switch is set to on.

(40) Set the simulator to a middle marker signal.
(41) Check that both the pilot's and copilot's middle marker lights are illuminated and the FNL annunciator on the copilot's annunciator panel is illuminated.
(42) Set the simulator to an outer marker signal.
(43) Check that both the pilot's and copilot's outer marker lights are illuminated and the FNL annunciator on the autopilot controller is illuminated.
(44) Set the marker beacon switch to off.
(45) Increase glideslope deviation to give full command bar deflection.
(46) Assure that the radio altimeter circuit breaker is depressed.
(47) Set the RADIO ALT-OFF Switch to RADIO ALT and check that there is no change to command bar deflection.

NOTE: On aircraft equipped with secondary flight director system, the copilot's flight director indicator will show a command bar deflection to zero.

(48) Check that the RUNWAY flag goes out of view and the runway symbol shows the aircraft on the ground.
(49) Check that the DH light on the flight director indicator illuminates. This indicates the aircraft is below the minimum decision altitude.

NOTE: The minimum decision altitude is between 10 and 20 feet. This height is set on the radio altimeter.

(50) Set RADIO ALT Switch to off and check that command bars return to the maximum deflection.
(51) Depress the go-around switches on the throttle lever knobs.
(52) Observe that the GA annunciator on the autopilot controller is illuminated and the command bars show a wing level attitude and a pitch up command.
(53) Tilt the vertical gyro until command bars and the reference airplane are aligned. The pitch up angle should be 8 to 12 degrees.
(54) Check that the G/S CAPT and the NAV CAPT annunciator lights go out and the LVL annunciator is illuminated.
(55) Depress the ALT mode pushbutton and check the GA annunciator light goes out.
(56) Engage the G/S mode on the autopilot controller and repeat steps (51) through (54).

(57) Depress the pilot's Pitch Sync button on the control wheel. Check that the GA annunciator goes out.
(58) Select a localizer frequency on the navigation control head. Engage the G/S mode on the autopilot controller.
(59) Engage NAV mode on the autopilot controller. Rotate the course knob and check that the command bars track the course arrow.
(60) Engage REV mode on the autopilot controller and check that command bar shifts position 180 degrees.
(61) Simuate a right deviation localizer signal with the simulator and position the flight director course arrow on the reciprocal of the aircraft heading. Check the course deviation bar moves to the left and the command bars indicate fly-left.
(62) Depress the HDG mode pushbutton on the autopilot controller.
(63) Center the command bars with the pitch sync switch.
(64) Attach MB-1 Pitot-Static tester to one of the shoulder static ports and the forward RH static port. Cover remaining static ports with tape.
(65) Engage the ALT mode by depressing the ALT pushbutton on the autopilot controller.

CAUTION: APPLY VACUUM TO SHOULDER STATIC PORTS AT A RATE NOT TO EXCEED 2000 FT. PER MINUTE OR DAMAGE TO THE AIR DATA SENSOR AND ALTIMETER COULD OCCUR.

(66) Apply vacuum until altimeter on tester indicates 20,000 feet. Check command bars on flight director for a down indication as the vacuum is applied.
(67) Simualte a descent of 1000 feet per minute and check that command bars indicate a climb.
(68) Engage G/S mode on the autopilot controller. The ALT annunciator light will go out and the G/S ARM annunciator will illuminate.
(69) Apply vacuum until altimeter on tester indicates 20,000 feet. Check command bars on flight director indicator are not affected with altitude changes.
(70) Simulate a descent of 1000 feet per minute and check that command bars are not affected by descent.
(71) Release vacuum from pitot static system and disconnect MB-1 tester from static ports. Remove tape from static ports.
(72) Pull the flight director attitude (AC) circuit breaker. Check that R/T, CMPTR, GYRO, and RUNWAY flags on the pilot's flight director indicator come into view.

NOTE: Check R/T and GYRO flags on the copilot's flight director indicator cover into view.

(73) Depress the flight director attitude (AC) circuit breaker. Check that the flags in step (72) and NOSE are now of view.

(74) Verify that the flight director course indicator, the flight director indicator, mode selector (copilot's) mode annunciator lights are controlled by their respective panel light controls.

NOTE: The following steps are for aircraft equipped with a comparator warning monitor system.

(75) Assure that both the primary and secondary inverters are functioning.
(76) Assure that all flight director circuit breakers are depressed, vertical gyros are on tilt table and connected to the aircraft wiring, and directional gyros on turn table and connected to the aircraft wiring.

NOTE: The pilot's course indicator (HSI) corresponds to the copilot's RMI and the copilot's course indicator (HSI) corresponds to the pilot's RMI.

(77) Check that the GYRO and CMPTR flags are out of view on both HSI's.
(78) Check that both flight director indicators reflect current aircraft attitudes.
(79) Check that the heading on both HSI's and the corresponding RMI headings are the same as the aircraft.
(80) Set NAV 1 and NAV 2 receivers to localizer frequency and check that the G/S flags are out of view.
(81) Depress the TEST RESET pushbutton on the warning monitor indicator. Check that all indicators are illuminated. The comparator resets upon release of the TEST RESET button and all warning lights will go out.
(82) Slowly rotate the primary directional gyro clockwise until the compass warning indicator on the warning panel is illuminated. This should occur when the primary and secondary headings are approximately 8 degrees apart.
(83) Return the primary directional gyro to the aircraft heading and depress the TEST RESET pushbutton. The compass warning light will go out and stay out.
(84) Repeat steps (82) and (83) rotating the primary directional gyro in a counterclockwise direction.
(85) Slowly roll the secondary vertical gyro right until the bank warning light is illuminated. This should occur when the primary and secondary indicators are 3 to 6 degrees apart.
(86) Retrun the secondary vertical gyro to level and depress the TEST RESET pushbutton. The bank warning light will go and stay out.
(87) Repeat steps (85) and (86) rolling the secondary vertical gyro to the left.
(88) Slowly tilt the secondary vertical gyro nose up until the pitch warning light is illuminated. This should occur when the primary and secondary indicators are approximately 3 to 6 degrees apart.
(89) Return the primary vertical gyro to level and depress TEST RESET pushbutton. The pitch arning light will go out and stay out.

(90) Repeat steps (88) and (89), tilting the secondary vertical gyro nose down.
(91) Tune the navigation simulator to 108.1 MH_z with beam center modulation.
(92) Tune both NAV 1 and NAV 2 receivers to 108.1 MHz. Check that both HSI needles are centered.
(93) Depress and hold NAV 1 test pushbutton. Check that the flag on the pilot's HSI is retracted and the LOC warning light is illuminated.
(94) Release the test button and depress the TEST RESET pushbutton. Check that the LOC warning light goes out and stays out.
(95) Repeat steps (93) and (94) using the NAV 2 receiver.
(96) Tune the navigation simulator to 334.4 MH_z and beam center modulation. Check that the glideslope deviation pointers on both HSI's are centered.
(97) Depress and hold NAV 1 test pushbutton. Check that the flag on the pilot's HSI is retracted and the glideslope warning light is illuminated.
(98) Release the test pushbutton and depress the TEST RESET pushbutton. Check that the glideslope warning light goes out and stays out.
(99) Repeat steps (97) and (98) using the NAV 2 receiver.
(100) Set Inverter, Battery, and Autopilot Switches off and disconnect external power from the aircraft.
(101) Disconnect extension cables from gyros and remove gyros from turn table and tilt.
(102) Install vertical gyros and directional gyros in aircraft. (Refer to 34-21-00 and 34-22-00.)
(103) Install nose compartment access doors.

VLF-1000-2 NAVIGATION SYSTEM - ADJUSTMENT/TEST

1. GENERAL

A. The following functional check is for the Ontrac II (VLF-1000-2) VLF Navigation System.

2. TOOLS AND EQUIPMENT

NAME	NUMBER	MANUFACTURER	USE
External Power Supply	+28 vdc	Commercially Available	To provide 28 vdc to aircraft.

3. ADJUSTMENT/TEST

A. Functional Test of VLF-1000-2 Navigation System

(1) Locate the aircraft on ramp clear of buildings which might interfere with receiving VLF signals.

(2) Connect external power supply to aircraft.

(3) Check the following:

(a) VLF RCVR Circuit Breaker - Pulled.

(b) Master Switch on Ontrac II Control Head - OFF.

(4) Set Battery Switches to BAT 1 and BAT 2. Monitor DC voltmeter for 28 vdc reading.

(5) Depress VLF RCVR circuit breaker.

(6) Set FUNCTION switch on control head to "LAT".

(7) Set WAYPOINT Switch to "S".

(8) Set DIM controls on the control head and display unit fully clockwise.

(9) Set control head MASTER Switch to on.

NOTE: The computer/receiver contains a thermostatically controlled fan. When the computer/receiver temperature is approximately 50 degrees F and higher, the fan should start.

(10) Check that the red letter "E" in the upper right hand corner of the station indicator is NOT illuminated. This indicates the system is being powered by normal aircraft power and not by emergency battery.

(11) Check the following:

(a) The letter "N" on the display unit should be illuminated.

(b) The two upper register decimals are illuminated.

(c) The five digits of the upper register read zeros.

(d) Tow of the four lower register decimals #1 and #3 as counted from right to left are illuminated.

(e) The DR light illuminated.

NOTE: It is normal for the DR light to be illuminated in all ENTER DATA modes prior to initially switching to ENROUTE modes.

(f) All left/right indicator dots will probably be illuminated.

NOTE: The left/right indicators should be disregarded as meaningful until navigational data is entered and system is in the ENROUTE mode of operation.

(g) Check for flashing control head ENTER data light. It is normal for ENTER DATA to flash in all ENTER DATA modes of the FUNCTION Switch.
(h) With the WAYPOINT Switch set to the "S" position and the FUNCTION Switch in either LAT or LON, the RESET button light will flash.
(i) The control head keyboard will be illuminated.

NOTE: The keyboard lights are illuminated in the ENTER DATA function only.

(12) Depress the APCH pushbutton on the control head. The switch will illuminate and APCH on the display unit will illuminate.
(13) Vary the control head DIM control knob. The intensity of all control head lights and station indicator lights will be affected.

NOTE: Station indicator lights may not have any display until "S" light is illuminated. This is approximately five minutes from power turn on if aircraft is located in hangar.

(14) Depress and hold control head TST Switch and observe that all segments of all digits on both display registers illuminate, forming the numerical eight (8).

NOTE: The TST Switch also test the display left/right dots and the DR lights when not already illuminated.

(15) While observing the TST Switch, vary the display DIM control knob, observe that the intensity of all display lights change.
(16) Deactivate the APCH Switch. The switch light and APCH light on the display will go out.
(17) Depress the S/W pushbutton on the control head. The "N" will go out and the "S" will illuminate.
(18) Depress the N/E pushbutton on the control head. The "S" will g out and the "N" will illuminate.
(19) Enter CLR-N-1-2-3-4-5 on the keyboard. The display upper register should read "N.12.34.5."
(20) Depress CLR pushbutton. The upper register will return to all zeros.
(21) Set FUNCTION Switch to LON and observe the following:
(a) The letter "E" illuminated.
(b) The upper register decimals and two of the four lower register decimals (#1 and #3) counting from the right are illuminated.

(c) The six digits of the lower register read zeros.
(d) The DR light illuminated.

(22) Depress the S/W pushbutton. The "E" will go out and the "W" will illuminate.

(23) Depress the N/E pushbutton. The "W" will go out and the "E" will illuminate.

(24) Enter CLR-E-1-6-7-8-9-0 on the keyboard. The display lower register will read "E167.89.0."

(25) Depress CLR pushbutton. The lower register will return to six zeros.

(26) Set the FUNCTION Switch to LAT. Display readout will return to as outlined in steps (11)(a) through (11)(i).

NOTE: ° Station monitor lights on the station indicator will light within one minute after system power is applied, indicating reception of the VLF signals which are reliable and which will be automatically selected by the computer for navigation. Some signals may be of a threshold such as to cause associated monitor lights to blink on and off. In the case where fewer than two signals are being received, the computer goes into the dead reckoning (DR) mode. Interference from a noisy APU may prevent locking onto weak signals. If this problem exists, switch to aircraft power.

° The system is ready for navigation when the letter "S" illuminates in the lower right hand corner of the station indicator, indicating the frequency standard has stabilized. This occurs approximately five minutes after system power is applied. Data may be entered before the letter "S" appears, but the FUNCTION Switch should not be switched to ENROUTE prior to stabilization of the frequency standard.

(27) Enter the start latitude as follows: CLR-N-37-43.7.

(28) Set the FUNCTION Switch to LON and enter the start longitude as follows: CLR-W-97-27.2.

(29) Set FUNCTION Switch to MAG and enter magnetic variation as follows: CLR-E-9.0.

(30) Set FUNCTION Switch to BRG and enter the magnetic heading from the VORTAC to the aircraft. Enter CLR-159.0.

(31) Set FUNCTION Switch to DME and enter the distance from the VORTAC to the aircraft in nautical miles. Enter CLR-3.7.

(32) Set FUNCTION Switch to LAT and verify entered data. Refer to step (27).

(33) Set FUNCTION Switch to LON and verify entered data. Refer to step (28).

(34) If correct, depress flashing RESET pushbutton.

NOTE: Do not depress the RESET pushbutton when flashing for balance of test unless a new start position is to be stowed in the computer.

(35) Set the FUNCTION Switch to DATE and observe the display lower register reads zeros. Enter the date using the format: CLR-XX (month) -XX (day) -XX (year). The display lower register should read the entry.
(36) Set the FUNCTION Switch to GMT and observe the display lower register reads zeros. Enter the Greenwich Mean Time in 24 hours using the format: CLR-XX (hours) -XX (minutes). The display lower register should read the entry.
(37) Set the FUNCTION Switch to POS and read the LAT and LON position displayed. The readout should agree with the coordinates: LAT is N 37° 40.0'. LON is W 97° 26.2'.

NOTE: Position tolerance: LAT ±0.1', LON ±0.1'.

(38) Set FUNCTION Switch to MAG and depress the CLR pushbutton.
(39) Repeat step (38) for BRG and DME pushbuttons.
(40) Set FUNCTION Switch to LAT and WAYPOINT Switch to desired waypoint location. (See table I.)

WAYPOINT/LOCATION	LAT	LON	TK	DIS
1. Kansas City, MO	N30° 18.0'	W94° 44.0'	51.4	160.5
2. San Francisco, CA	N37° 37.0'	W122° 23.0'	277.5	1183.5
3. Atlanta, GA	N33° 39.0'	W84° 26.0'	106.9	678.5
4. Monterrey, MEX	N25° 47.0'	W100° 06.0'	191.5	727.0
5. JFK Intl., NY	N40° 38.0'	W73° 47.0'	73.4	1113.3

TABLE I

(41) Enter latitude corresponding to the waypoint location.
(42) Set FUNCTION Switch to LON and enter waypoint longitude data.

NOTE: When longitude is less than 100 degrees, the leading digit will be zero and need not be entered. Leading zeros are not entered into the display registers, but all subsequent zeros must be entered.

(43) Enter destination latitude and longitude data for each waypoint. (See table I.)
(44) Assure that the letter "S" and at least two station monitors are illuminated on station indicator.

NOTE: If the aircraft is in hangar, a minimum of two station monitor lights must be illuminated.

(45) Set the FUNCTION Switch to TK/DIS and observe the following:
(a) ENTER DATA light goes out.
(b) ENROUTE light illuminates.
(c) Keyboard lights go out.

(46) Set WAYPOINT Switch to WAYPOINT 1. Observe readout on display.

NOTE: It is normal for the readout to lag the FUNCTION or WAYPOINT Switches by a few seconds.

(47) The large center dot of the left/right indicator is illuminated, indicating on track.
(48) The DR light will go out only if two or more station monitor lights are illuminated on the station indicator. This will occur approximately 15 to 20 seconds after initially switching to ENROUTE mode.
(49) The HDG light on the display will illuminate and the upper register will readout true track in degrees to each waypoint.

NOTE: Tolerance for each initial track readout is ±0.4 degrees from values shown Table I.

(50) The NM will illuminate and the lower register should read out nautical miles to each waypoint.

NOTE: Tolerance for nautical miles is ±0.4 from distance shown in table I.

(51) Repeat steps (46) through (50) for waypoints 2 through 5.
(52) Set FUNCTION Switch to RTK/XTK and observe display readouts.
(a) The R-HDG light shall illuminate and the upper register will read the reciprocals of HDG readouts observed for each waypoint.
(b) The N.M. shall read the same crosstrack error as displayed on the left/right indicator dots to nearest one-tenth N.M.
(53) Set the FUNCTION Switch to TIME/GS and observe display readouts.
(a) The TTW, KTS and the two upper register decimals are illuminated.

NOTE: Since the aircraft is not moving, the registers may readout noise only in TIME/GS function. Thus, random readings are normal.

(54) Set the FUNCTION Switch to TK/DIS and observe display to one of the waypoints.

CAUTION: OPTIMUM SYSTEM PERFORMANCE REQUIRES THAT THE EMERGENCY BATTERY BE MAINTAINED IN A FULLY-CHARGED STATE. THE FOLLOWING TESTS SHOULD BE OF A SHORT DISTANCE.

(55) Pull the VLF circuit breaker and leave the ONTRAC II Master Switch on.
(56) The red letter E in the upper right hand corner of the station indicator will illuminate.
(57) This indicates that the system is on emergency power. The system should continue to readout navigational information as when on regular aircraft poiwer.

(58) Depress the VLF circuit breaker. The red "E" will extinguish.
(59) Set night lighting control for the control panel location to full brightness. Observe that control panel integral night lighting is illuminated and varies with changes to aircraft controls.
(60) Set control head Master Switches to off and Battery Switches to off.

GNS-500 VLF NAVIGATION SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The GNS-500 VLF Navigation System consists of a receiver/computer, a control display unit (CDU), an optional equipment unit (OPU), an antenna, a switch panel, and an interface box.

B. The receiver/computer is installed on the RH side of the nose compartment or in the aft cabin area beneath the divan seat. The receiver/computer is mounted in a 3/4 ATR short rack and is held in place by hold down screws. Electrical connections are made when the unit is in place and secured.

C. The control display unit (CDU) is located in the pedestal extension in the instrument panel.

D. The optional equipment unit is installed in the aft cabin under the divan seat or on the LH side of the nose compartment. The unit is rack mounted and secured in place by hold down screws.

E. The primary VLF antenna is installed on the lower side of the aircraft on centerline between frames 13 and 13E. When the aircraft is equipped with a dual GNS-500 VLF system, the secondary VLF antenna is located on the RH side of centerline between frames 13A and 14.

F. The interface box is installed on the LH side of the nose compartment.

GNS-500 VLF NAVIGATION SYSTEM - MAINTENANCE PRACTICES

1. **GENERAL**
   A. Maintenance practices on the GNS-500 VLF Navigation System consist of removal/installation and replacement of defective component.
   B. The receiver/computer and optional equipment unit are rack mounted and secured by hold-down screws. All electrical connections are made when the black boxes are secured in place.
   C. The primary and secondary VLF antenna are secured in place by screws. The antennas are fillet sealed (refer to 20-10-00) around the perimeter of the antenna.

GNS-500 NAVIGATION SYSTEM - ADJUSTMENT/TEST

1. GENERAL

A. The following functional check is for GNS-500 Global Navigation System.

2. TOOLS AND EQUIPMENT

NAME	NUMBER	MANUFACTURER	USE
External Power Supply	+28 vdc	Commercially Available	To provide 28 vdc to aircraft.

3. ADJUSTMENT/TEST

A. Functional Test of GNS-500 Navigation System

CAUTION: DURING GROUND TEST DO NOT ALLOW 28 VDC POWER TO BE REMOVED FROM THE AIRCRAFT, EXCEPT IN STEPS (9) and (10). IF POWER IS OFF FOR MORE THAN FIVE (5) MINUTES, THE STANDBY BATTERY WILL BE DISCHARGED.

(1) Locate the aircraft on the ramp clear of buildings which might interfere with receiving VLF signals.
(2) Connect external power supply to aircraft. Do not turn power supply on.
(3) Turn Mode Selector Switch CCW to the stop.
(4) Assure that VLF NAV circuit breaker is open.
(5) Turn power supply on. Set Battery Switches and Inverter Switches to on. Verify 28 vdc and 115 vac.
(6) Depress the VLF NAV circuit breaker.
(7) Set the Mode Selector Switch on the Control Display Unit (CDU) to M(manual).

(8) Turn the DIM control fully "CW." Check that panel lighting intensity varies when the control is turned.

(9) Momentarily pull the VLF NAV circuit breaker. Check that the panel lighting and any readouts present on the left and right displays remain illuminated and uninterrupted during the time that power is off.

(10) This will verify that the optional equipment unit standby battery circuitry is functioning properly.

(11) Depress the "VLF NAV" circuit breakers.

(12) Turn the Mode Selecter Switch to "POS."

(13) Check that the green "VLF" indicator is flashing and that the amber "DR" indicator is illuminated.

(14) Depress the "N" (North) pushbutton. Check that the letter "N" is illuminated at the right side of the Left Display.

NOTE: Depressing either the "N" (North) of the "S" (South) key clears and provides access to the Left Display. Depressing either the "E" (East) or the "W" (West) key clears and provides access to the Right Display.

(15) Enter the aircraft's present latitude into the left display in the order of degrees, minutes and tenths of minutes. Check for accuracy of entered data in the left display.

NOTE: If any portion of the entry is incorrect, depress the "BACK" pushbuton successively until the incorrect portion of the display is extinguished. Then re-enter the correct data.

(16) Depress the illuminated "ENTER" pushbutton. The "ENTER" lamp will remain illuminated.

(17) Depress the "W" pushbutton. Check that the letter "W" is illuminated at the right side of the right display.

(18) Enter the aircraft's present longitude into the right display.

NOTE: When longitude is less than 100 degrees the leading digit will be zero and need not be entered. Leading zeroes are not entered into the displays, but all subsequent zeroes must be entered.

(19) Depress the "ENTER" pushbutton. The "ENTER" lamp should extinguish indicating that the data is entered.

NOTE: ° After inserting latitude and longitude data, either in the initial position or any one of the nine waypoint positions, or a change of more than ten arc-minutes has been injected into the memory; the "ENTER" light will begin flashing when depressed for the second time for a latitude/longitude data entry.

° This is an indication that a "Position Reasonableness Check" is required for the latitude/longitude data just entered. The entries should be verified and if they are correct, depress the "ENTER" light will extinguish, indicating the system is ready for the next input.

(20) Set the Display Selector Switch to "GMT/DATE."
(21) Insert the day, month and year. The information will appear in the right hand display.
(22) Depress the "ENTER" pushbutton.
(23) Insert the present GMT. The information will appear on the left hand display.

NOTE: ° When the actual time is equal to the time as entered, depress the "ENTER" pushbutton. Verify that the display blanks out momentarily, the "ENTER" light extinguishes and the internal GMT timer starts.

° An invalid entry such as 3200 hours or the 30th of February will not be accepted. This will be indicated by the "ENTER" light flashing until the error is corrected.

(24) Turn the Display Selector Switch to the "WPT" position.
(25) Depress the "1" pushbutton. The number "1" should appear in the "WPT DEF" display.

NOTE: If latitude and longitude for any waypoint exists in the number "1" waypoint storage location, the number "1" will appear in the FR/TO display. This will occur as each of the "0" through "9" waypoint storage locations is selected. Once entered, waypoint coordinates will remain in the system until new waypoints are entered or the system is shut down.

(26) Depress the WPT DEF pushbutton.
(27) Enter latitude and longitude of the first waypoint destination. (Refer to table 1 for entries.)
(28) Depress the "ENTER" pushbutton. The "ENTER" light will extinguish.
(29) Repeat steps (27) and (28) and enter latitude and longitude in waypoint positions "2" through "9." Use Table 1 for latitude and longitude information.
(30) Depress the "0" pushbutton.
(31) Depress the "WPT DEF" pushbutton. Check that the aircraft's present position appears automatically in the left and right displays and the "ENTER" pushbutton is illuminated.
(32) Depress the "ENTER" pushbutton. The "ENTER" light will extinguish indicating that the system storage location "0" has accepted the aircraft's present location data.

NOTE: ° The initial leg is the direct Great Circle route between the aircraft's present position (waypoint "0" at this point in this test procedure) and the next waypoint selected (waypoint "1" in this test.) This second waypoint can be any one of the "1" through "9" waypoints stored in the system memory locations during the performance of step (29) of this procedure while the system Mode Selector switch is in "M" (Manual) position.

° During flight an Initial Leg is the projected Great Circle path from the aircraft's airborne location at the time the pilot keys in the next waypoint data to the latitude/longitude of the new location.

NOTE: In the event only Initial Leg Selection is to be checked, it is necessary that the latitudes and longitudes for waypoints "0" and "1" be entered into those system waypoint memory locations prior to proceeding with this test. However, the system will keep position in the "POS" mode without any waypoints having been defined.

(33) Set the Mode Selector Switch to "M."
(34) Depress the "LEG CHG" pushbutton. Check that the "FR/TO" Display blanks out and the "ENTER" lamp is illuminated.
(35) Depress the "0" pushbutton. The "0" should appear in the "FR" side of the "FR/TO" window.
(36) Depress the "1" pushbutton. The "1" should appear in the "TO" side of the "FR/TO" window. Check that the "ENTER" light extinguishes.

NOTE: If waypoint for either "FROM" or "TO" is selected that has not previously been defined an "E" (EMPTY) will appear in the appropriate side of the Display, and the "VOR/LOC" flag on the Course Indicator will drop into view if the "Pilot's CDI" switch is in "VLF" position.

(37) Display Selector Switch to "BRG/VAR."
(38) The Left Display should read the Initial Heading referenced to Tru North. The reading for this test will be "051N' ±1°.
(39) Depress the "E" pushbutton. The "ENTER" lamp will illuminate and the Right Display should display 000E.

NOTE: The "E" (EAST) key is used in geographic areas where the magnetic variaton is to the east, while the "W" (WEST) key will be used in areas where the charts show a west variation.

(40) Enter the magnetic variation for the Wichita locale, i.e., E-0-09. Check that the Right Display indicates "009E." Depress the "ENTER" pushbutton. The "N" should disappear from the Left Display, indicating that the system is now performing with Magnetic North as its directional reference, rather than True North.
(41) The Left Display should now indicate "043."
(42) Set the Display Selector Switch to "DIS/ETE."
(43) The distance between waypoints "0" and "1" should be present on the Left Display. The Display should read "160.6 nautical miles for the Initial Leg set in for this test. Check that reading is within ±.1. (For any other choice than Kansas City, Mo. as the "1" waypoint of the Initial Leg check, refer to Table 1 for the appropriate distance.)
(44) Set the Display Selector Switch to "BRG/VAR." Bearing with relation to magnetic north should reappear in the Left Display and Magnetic Variation should reappear in the Right Display.
(45) Depress the "E" pushbutton (or the "W" pushbutton.) The "ENTER" light will illuminate.
(46) Depress the "ENTER" pushbutton. The "ENTER" light will extinguish indicating that the system has returned to a True North reference.
(47) Set the Display Selector Switch to the "XTK/SX" position. The Left Display should be blank.
(48) Operate the Pilot's CDI "VLF-NAV 1" Selector Switch to "VLF." The pilot's CDI Lateral Deviation Bar should indicate "ON COURSE."
(49) Insert Selected Cross-Track flight path distance of "R 6.0" nautical miles. Check the input on the Right Display.
(50) Depress the "ENTER" pushbutton.
(51) Check that the CDI Laterla Deviation Bar swings to the right almost full scale and that the Left Display reads "L 0.0" nautical miles. (Cross-Track Distance.)
(52) Insert a cross-track distance 1f "L 6.0" nautical miles. Check the input on the Right Display.
(53) Depress the "ENTER" pushbutton.
(54) Check that the CDI Lateral Deviation Bar swings to the left almost full scale and that the Left Display reads "R 0.0" nautical miles. (Cross Track Distance.)
(55) With aircraft on internal power, remove ground power line and shut down ground power unit. Set the Display Selector Switch to "POS." Depress the HOLD pushbutton, then depress the ENTER pushbutton. Check the DR light is extinguished.
(56) The green "VLF" button will illuminate continuously, indicating that a sufficient number of VLF signals are being received, and have acceptable geometry to reommend the VLF system for navigation.
(57) With the "VLF" light continuously illuminated, operate the Flight Director Course Deviation Indicator (Pilot's CDI) switch, to the "VLF" position.
(58) Check that the green "VLF" lamp on the pilot's/copilot's Annunciator Panel illuminates.
(59) Check that the VOR/LOC flag fully retracts.
(60) Depress the "NAV 1" circuit breaker.

(61) Set the "NAV 1" receiver to "on" and select a localizer channel. (Localizer channels lie between 108.1 to 111.9 MHz at increments of 100 KHz.)

(62) Check that switching to a Nav "1" localizer frequency causes the Annunciator Panel "VLF" lamp to extinguish and the "Pilot's CDI" switch to drop out of the "VLF" position.

(63) Select a non-localizer channel on Nav "1."

(64) Return the "Pilot's CDI" switch to the "VLF" position. Check that the Instrument Panel "VLF" annunciator lamp illuminates.

(64) Return the "Pilot's CDI" switch to the "VLF" position. Check that the Instrument Panel "VLF" annunciator lamp illuminates.

(65) In the event the "VLF" lamp is illuminated and the VOR/LOC flag is in view, the amber "DR" lamp will be continuously illuminated and VLF navigation will not be possible. Wait for the "DR" lamp to begin flashing and perform a Quality Factor Check. (Refer to steps 68 through 69.)

(66) Check that the display selector panel "FR/TO" Display indicates "01."

(67) Return the "Pilot's CDI" "VLF-NAV 1" switch to the "NAV 1" position.

(68) Set the Display Selector Switch to "Q/TAS" position. The Left Display will present two separate indications pertaining to the general quality of navigation possible with the GNS-500 system. The left digit of the Display should read "1", indicating that the GNS-500 system Atomic Frequency Stnadrd contained in the OEU (Optional Equipment Unit) is operating stably. If this digit position is blank (unlit), the Atomic Frequency Standard is unstable and will have to be repaired or replaced.

NOTE: The OEU is an optional piece of equipment and may not be present in the GNS-500 system on some aircraft. If this unit is not part of the system under test the left digit will be blank.

(69) The right two digits of the Left Display indicate navigation Quality Factor by representing a number from "1" to "99." Read and record the number present for this test.

NOTE: The navigational Quality Factor is determined by: (1) The number of VLF stations being received, (2) the signal strength of the stations being received, (3) the angularity between received signals, (4) the status of the system Atomic Frequency Standard. The Quality Factor is highest when the Number "1" is presented, "99" being the lowest quality presented by the computer. Readouts from "1" to "7" indicate a navigationally capable system. Readouts from "8" to "99" indicate a system quality good enough for dead reckoning only. Numbers from "1" to "4" indicate an optimum state for VLF Navigation.

WAYPOINT	LATITUDE	LONGITUDE	DISTANCE (N.M.)	INITIAL HEADING
Wichita, (Gates) ICT	N37° 40.0'	W97° 26.2'	0	-
Kansas City, Mo. MKC	N39° 18.0'	W94° 44.0'	160.6	051°
San Francisco, Cal.	N37° 37.0'	W122° 23.0'	1185.6	278°
Atlanta, Ga.	N33° 39.0'	W84° 26.0'	679.2	107°
Monterrey, Mexico	N25° 47.0'	W100° 06.0'	724.4	192°
JFK Int'l., New York City	N40° 38.0'	W73° 47.0'	1115.0	073°
Minneapolis, Minn. MSP	N45° 08.8'	W093° 22.4'	484.5	021°
San Antonio, Tx. SAT	N29° 38.6'	W098° 27.7'	483.3	186°
Los Angeles, Cal., LAX	N33° 56.0'	W118° 25.9'	1046.6	264°
Seattle, Wash., SEA	N47° 26.1'	W122° 18.5'	1241.5	306°

Table 1

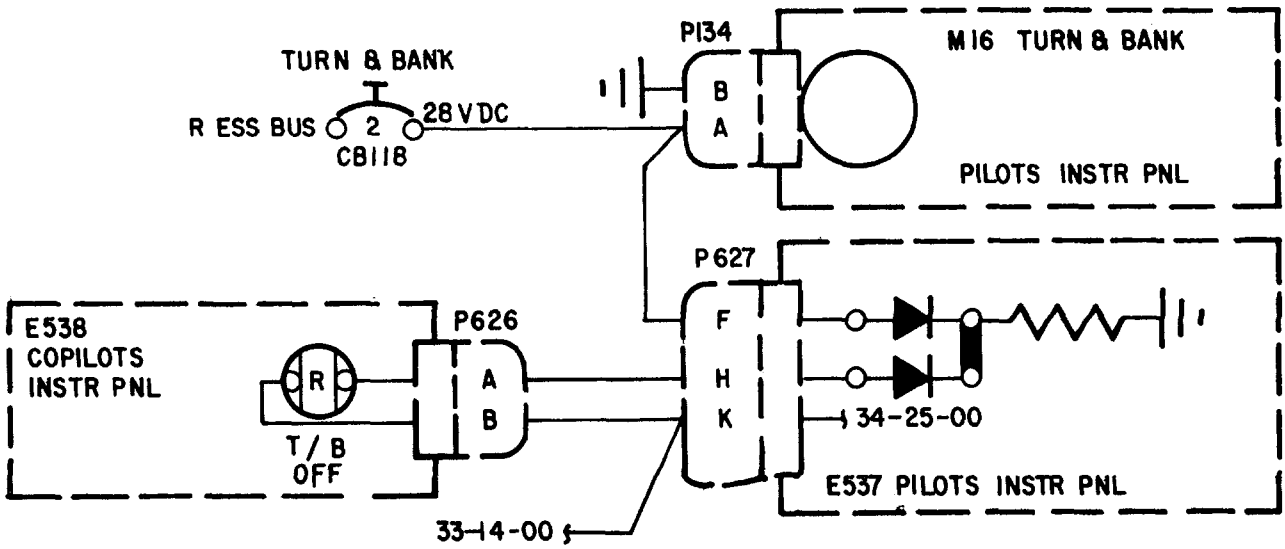
TURN AND BANK INDICATOR - DESCRIPTION AND OPERATION

1. DESCRIPTION

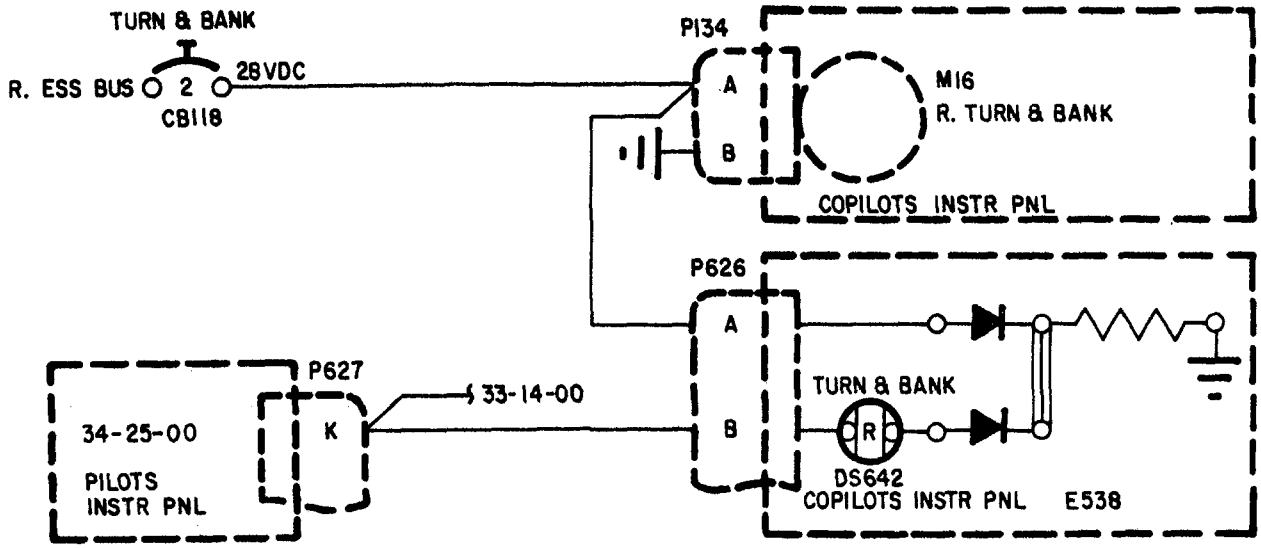
A. The turn and bank indicator is installed in the copilot's instrument panel. An indicator light (Red), labeled T/B OFF, is located adjacent to the indicator. The light provides the copilot with an indication of turn and bank operation.

B. The turn and bank indicator is powered by 28 vdc through a 2 ampere circuit breaker.

C. The turn and bank indicator consists of an electrically driven gyroscopic rate of turn indicator and a fluid damped inclinometer. The turn indicator pointer, actuated by an electrically driven gyro, moves in the direction of a turn in an amount proportional to the rate of turn of 90° per minute. The relationship of the black ball in the inclinometer to the two wires at the center of the inclinometer indicates the lateral attitude of the aircraft.



Turn and Bank Electrical Control Schematic
Figure 1 (Sheet 1 of 2)



Turn and Bank Electrical Control Schematic
Figure 1 (Sheet 2 of 2)

TURN AND BANK INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The turn and bank indicator is installed in the copilot's instrument panel.

A. Remove Turn and Bank Indicator

(1) Assure that Battery Switches and Stall Warning Switches are off.
(2) Lower copilot's instrument panel.
(3) Disconnect electrical plug from turn and bank indicator.
(4) Loosen and remove attaching parts and indicator from panel.

B. Install Turn and Bank Indicator

(1) Install indicator and secure with attaching parts.
(2) Connect electrical plug to indicator.
(3) Raise and secure copilot's instrument panel.

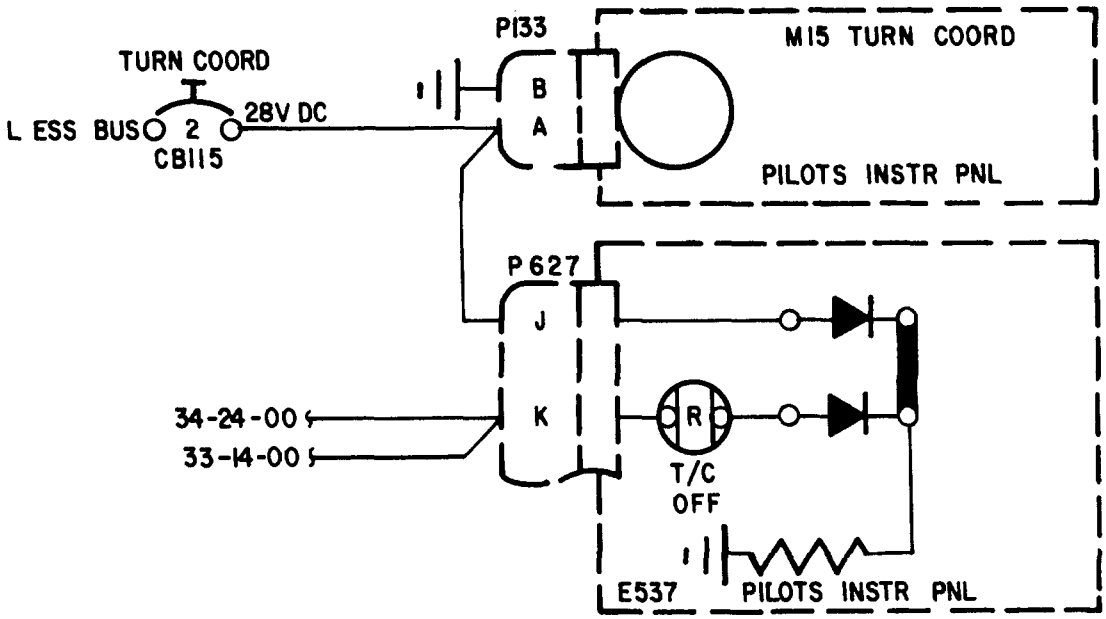
TURN COORDINATOR - DESCRIPTION AND OPERATION

1. DESCRIPTION

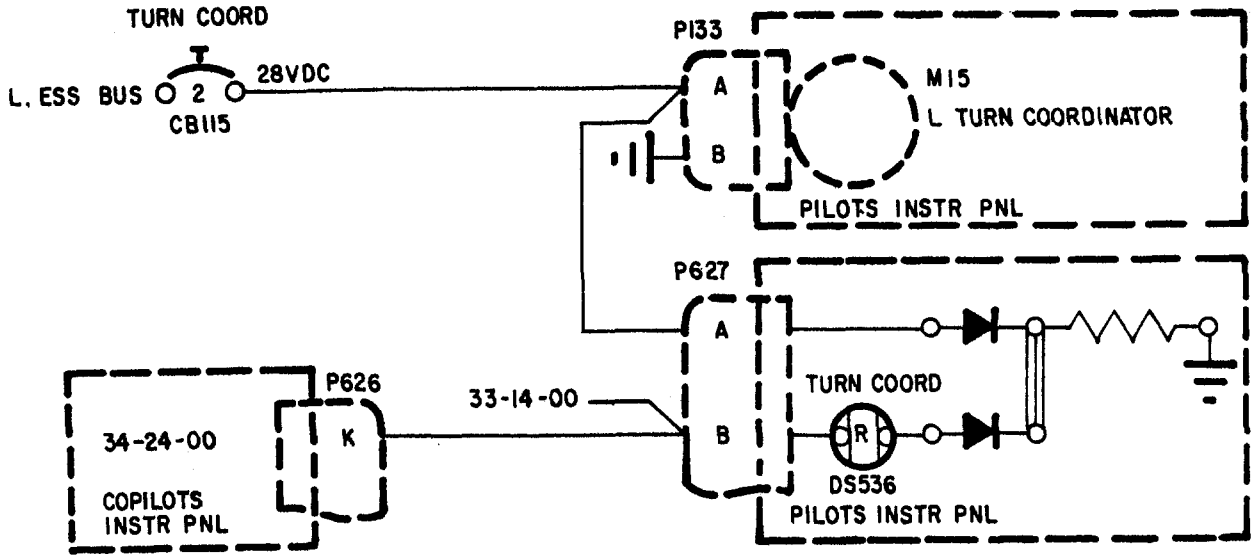
A. The turn coordinator is installed in the pilot's instrument panel. An indicator light (Red), labeled T/C OFF, is located adjacent to the coordinator. The light provides the pilot with a positive indication of turn coordinator operation.

B. The turn coordinator is powered by 28 vdc thru a 2 ampere circuit breaker.

C. The turn coordinator consists of an electrically driven gyroscopic roll-turn rate indicator and a fluid damped inclinometer. The turn indicator airplane, actuated by an electrically driven gyro, moves in the direction of a turn in an amount proportional to the rate of turn. The relationship of the white ball in the inclinometer to the white pointer at the center of the inclinometer indicates the lateral attitude of the aircraft.



Turn Coordinator Electrical Control Schematic
Figure 1 (Sheet 1 of 2)



Turn Coordinator Electrical Control Schematic
Figure 1 (Sheet 2 of 2)

TURN COORDINATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The turn coordinator is installed on the pilot's instrument panel.

A. Remove Turn Coordinator

(1) Assure that Battery Switches and Stall Warning Switches are off.
(2) Lower pilot's instrument panel.
(3) Disconnect electrical plug from indicator.
(4) Loosen and remove attaching parts and indicator from panel.

B. Install Turn Coordinator

(1) Install indicator and secure with attaching parts.
(2) Connect electrical plug to indicator.
(3) Raise and secure pilot's panel.

MAGNETIC COMPASS - MAINTENANCE PRACTICES

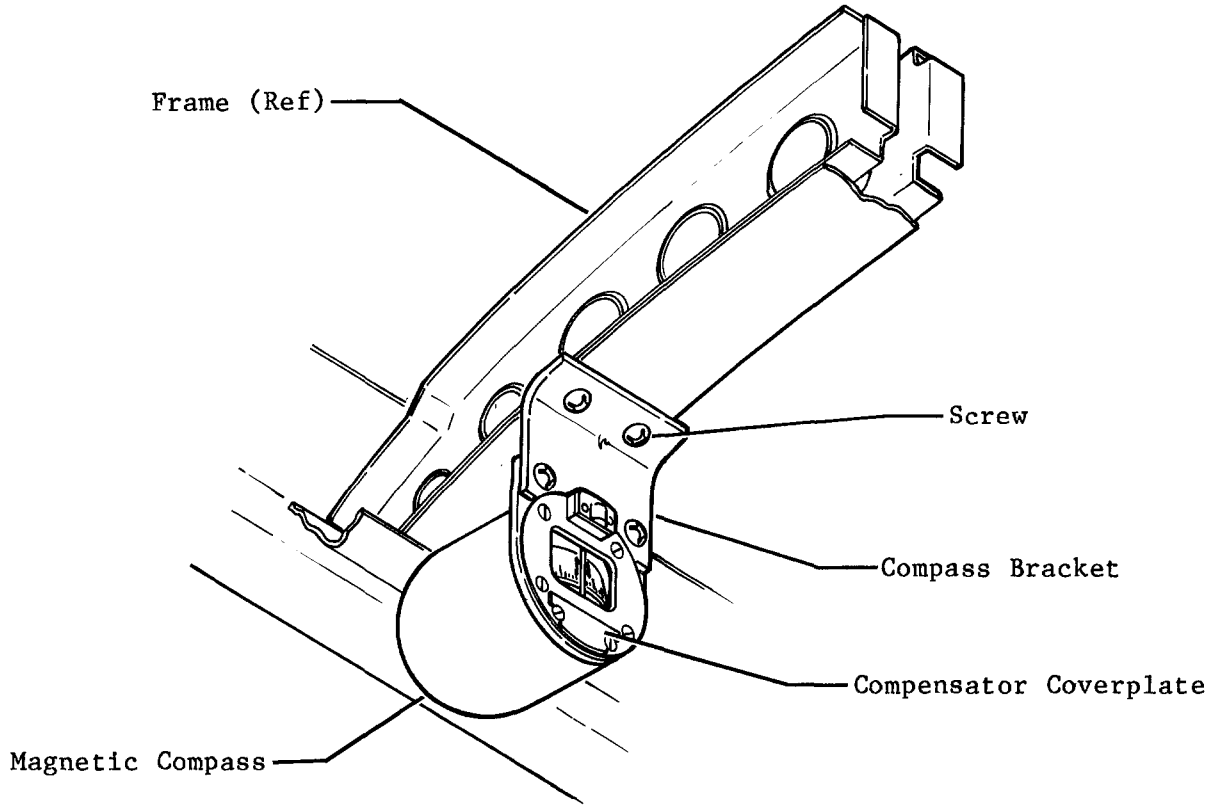
1. REMOVAL/INSTALLATION

A. Remove Magnetic Compass (See figure 201.)

(1) Remove interior as required to gain access to magnetic compass.
(2) Disconnect electrical wiring from compass.
(3) Remove attaching parts and compass bracket, with compass attached, from frame.

B. Install Magnetic Compass (See figure 201.)

(1) Position compass bracket on frame and secure with attaching parts.
(2) Connect electrical wiring to compass.
(3) Perform Calibration Adjustment of Magnetic Compass. (Refer to Adjustment/Test, 34-21-01, for procedures.)



Magnetic Compass Installation
Figure 201

9-193A

LANDING AND TAXIING AIDS - DESCRIPTION AND OPERATION

1. GENERAL

A. The receivers for localizer, glideslope, marker eacon and also VOR/ILS are all combined into the navigation receivers.

B. Selecting a localizer frequency automatically selects the paired glideslope channel.

C. The volume control varies the level of audio signals to the audio control system for VOR/localizer and marker beacon reception.

GLIDESLOPE ANTENNA - MAINTENANCE PRACTICES

1. TOOLS AND EQUIPMENT

NOTE: ° The primary and secondary glideslope antennas are installed in the radome.

° The primary glideslope antenna is installed in the upper portion of the radome. The secondary glideslope antenna is installed in the lower portion of the radome.

NAME	NUMBER	MANUFACTURER	USE
Pressure Sensitive Tape	#898 (#46 Alternate)	Minnesota Mining & Mfg. Co.	Installation of Antenna
Cleaning Solvent	MEK	Commercially Available	Cleaning Radome

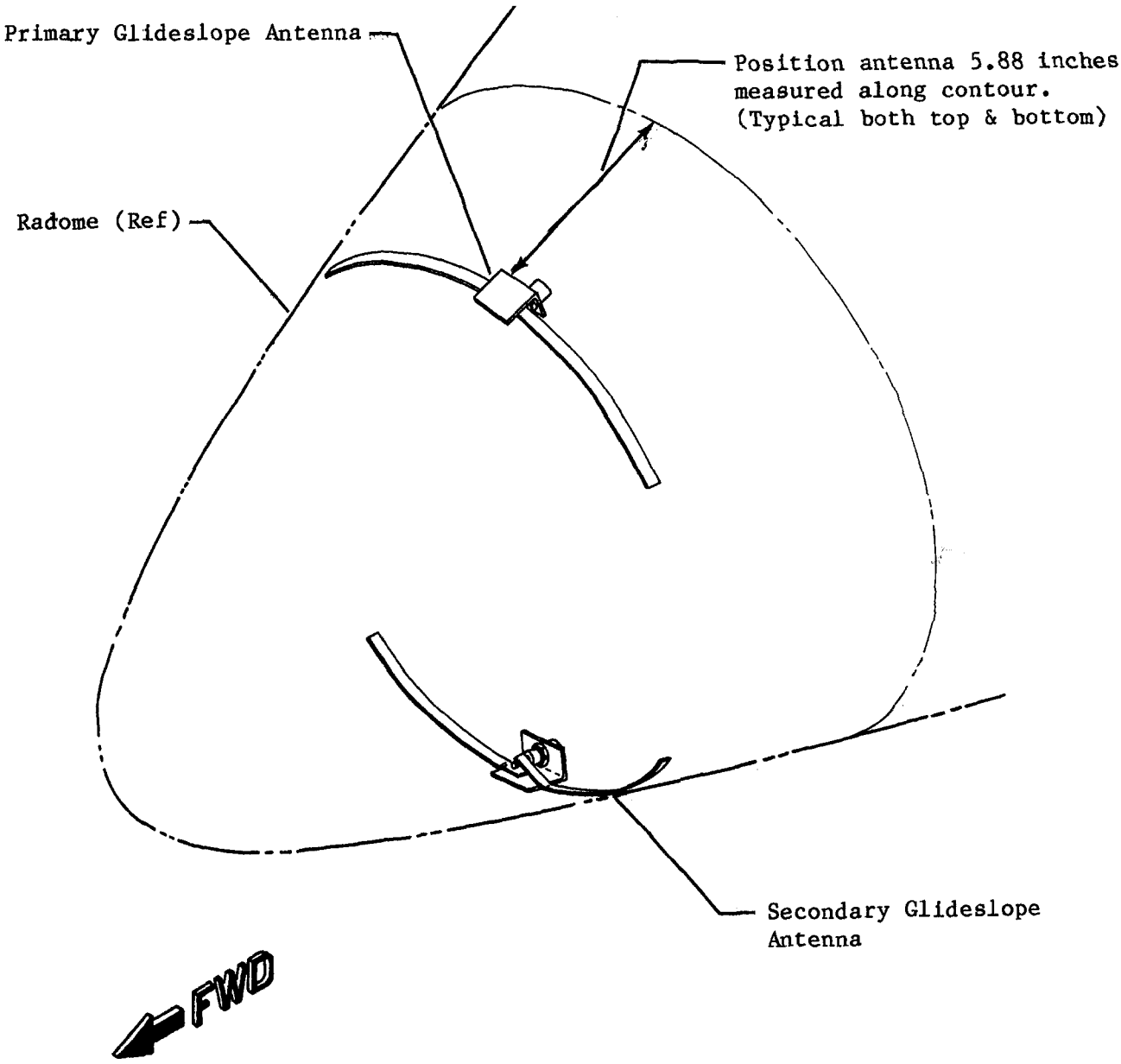
2. REMOVAL/INSTALLATION

A. Remove Antenna (See figure 201.)

(1) Remove nose compartment access doors.
(2) Disconnect glideslope antenna leads.
(3) Disconnect radome anti-ice alcohol line.
(4) Remove screws and radome from aircraft.
(5) Remove pressure sensitive tape and antenna from radome.

B. Install Antenna (See figure 201.)

(1) Clean inner surface of radome where antenna was installed with MEK.
(2) Position antenna on radome as shown.
(3) Place strip of tape over lower element and mounting bracket.
(4) Place second strip of tape over upper element.
(5) Install radome and secure with attaching parts.
(6) Connect glideslope antenna leads.
(7) Connect radome anti-ice alcohol line.
(8) Install nose compartment access doors.



Glideslope Antenna Installation
Figure 201

1. Removal/Installation

NOTE:
- The marker beacon antenna is installed beneath the aircraft just aft of the nose wheel doors (approximately FS 163).
- Access to the marker beacon antenna is gained by removing the nose gear strut.

A. Remove Marker Beacon Antenna. (See Figure 201.)
(1) Place the aircraft on jacks. (Refer to Chapter 7.)
(2) Remove nose gear strut. (Refer to Chapter 32.)
(3) Disconnect marker beacon antenna lead.
(4) Disconnect bonding jumpers from frames 5 and 6.
(5) Remove attaching parts, antenna and gasket from aircraft. *Effective 35-654 and Subsequent, 36-062, 36-064 and Subsequent*, the antenna gasket is not used.
(6) Remove old fillet seals from exterior surface of aircraft skin and interior surface where antenna receptacle protrudes through skin.
(7) Clean surfaces with methyl-ethyl-ketone (MEK).

B. Install Marker Beacon Antenna. (See Figure 201.)
(1) Install gasket and antenna and secure with attaching parts. *Effective 35-654 and Subsequent, 36-062, 36-064 and Subsequent*, the antenna gasket is not used.
(2) Secure electrical jumpers to aircraft frame with attaching parts.
(3) Apply fillet of Pro-Seal 890B around entire external perimeter of antenna and brush on Pro-Seal 890A around antenna receptacle on inside surface of aircraft.
(4) Connect antenna lead to marker beacon receiver.
(5) Install nose gear strut. (Refer to Chapter 32.)
(6) Remove aircraft from jacks. (Refer to Chapter 7.)

2. Inspection/Check

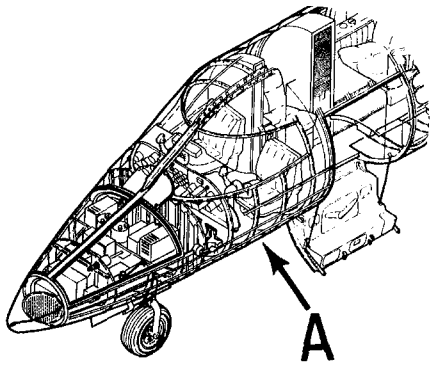
A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

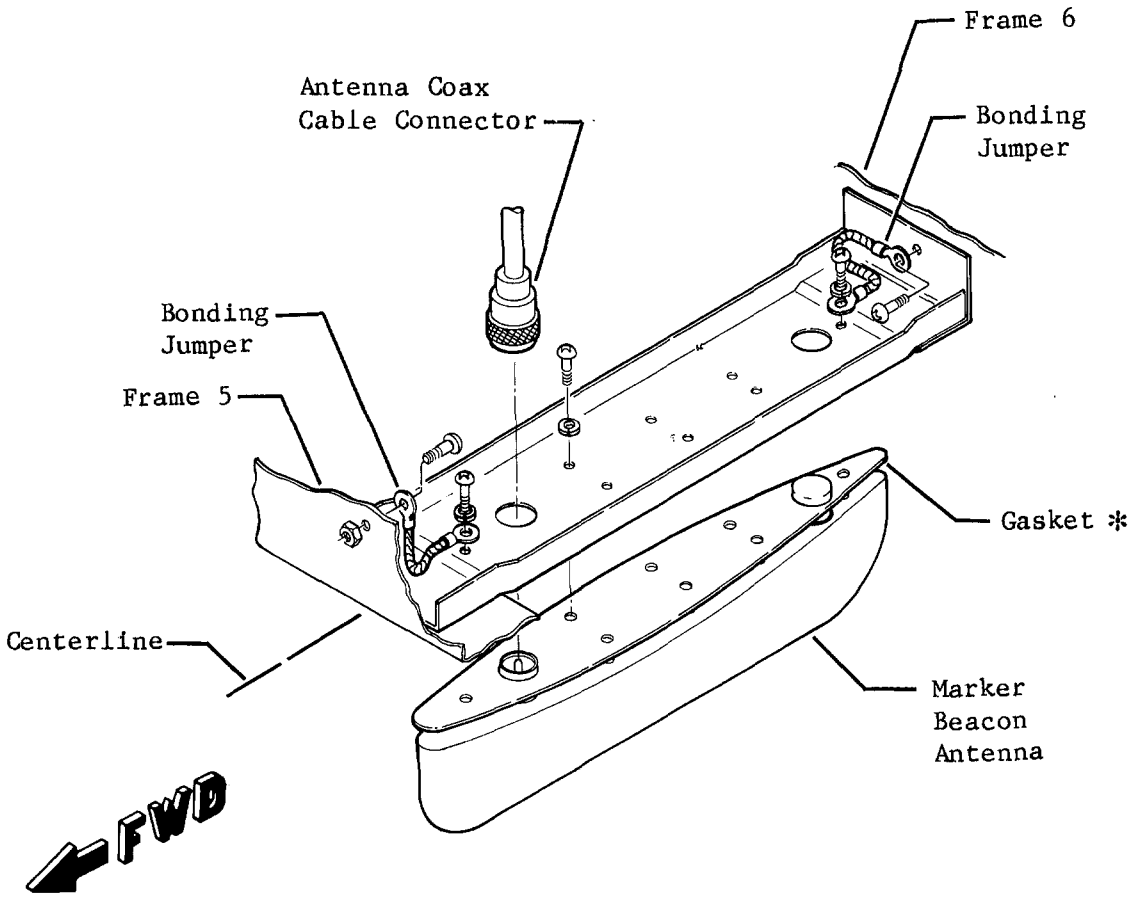
NAME	NUMBER	MANUFACTURER	USE
Marker Beacon Test Generator	MBG-1	Dare Inc.	Provide test tones for Marker Beacon

B. Operational Check of Marker Beacon
(1) Place MBG-1 directly beneath the Marker Beacon Antenna.
(2) Extend MBG-1 whip antenna to its full length.
(3) Set the generator for 10K microvolt output.
(4) Set Battery Switches on. Allow 2 minutes warmup time.
(5) Set MBG-1 power switch ON, and adjust the modulation to 3 KHz @ 95%.
(6) Set Marker Beacon sensitivity switch, located on pilot's switch panel, to HI.
(7) A 3 KHz tone should be heard in the pilot's and copilot's headphones and speakers, and the white FM/Z marker lamps should be brightly illuminated.
(8) Adjust MBG-1 modulation to 1.3 KHz @ 95%. A 1.3 KHz tone should be heard over the headsets and speakers and the MM marker lamps should be illuminated.

(9) Adjust MBG-1 to 400 Hz at 95%. A 400 Hz tone should be heard over the headsets and speakers and the OM marker lamps should be brightly illuminated.
(10) Set Battery Switches off.
(11) Set MBG-1 power switch off.



* *Effective 35-654 and Subsequent, 36-062, 36-064 and Subsequent, the gasket is not used.)*



Detail A

10-38B

Marker Beacon Antenna Installation
Figure 201

WEATHER RADAR - DESCRIPTION AND OPERATION

1. GENERAL

A. The weather radar system is a lightweight, compact, solid-state, X-band airborne system designed for weather detection, ranging, and analysis. The overall system consists of the Receiver-Transmitter, Indicator and Antenna.

2. DESCRIPTION (RCA AVQ21 WEATHER RADAR)

A. Receiver-Transmitter

(1) The Receiver-Transmitter is housed in a short 1/2 ATR case. The receiver-transmitter is installed in the nose compartment just forward of the nose wheel well.

(2) The receiver-transmitter incorporates a blower for internal cooling. A push-pull switch labeled MOD ON PUSH/MOD OFF PULL is located on the front panel of the receiver-transmitter. After power has been applied, this switch permits maintenance personnel to disable the modulator and prevent the receiver-transmitter from transmitting. The modulator can be reactivated by pushing the push-pull switch. A means for calibrating the antenna roll and pitch stabilization amplifier to the aircraft stabilization source is available on the receiver-transmitter front panel. The pitch and roll adjustments are labeled PITCH GAIN and ROLL GAIN. All other electrical connections are made to two electrical connections on the front panel.

B. Indicator

(1) The radar indicator is located in the center instrument panel. All system operating controls, including the pushbutton-type, function-select switches, are grouped around the display on the instrument front panel.

(2) The indicator uses a 5-inch display-storage cathode-ray tube designed for direct viewing under all lighting conditions. It presents an offset, plan-position, 120 degree sector display. Because of its high brightness and controlled persistence, the indicator never requires a viewing hood. A variable-density polarized filter on the front panel is used for attenuating the display brightness under conditions of low lighting. When the filter is adjusted for maximum attenuation, the display turns a deep subdued greenish-yellow color for night viewing.

C. Antenna

(1) The antenna is installed on frame 1 bulkhead.

(2) The antenna, equipped with a flat-plate radiator, provides line-of-sight stabilization and is designed for a cantilever-type installation. All azimuth and elevation electro-mechanical drive components are located on the antenna frame. The stabilization amplifier is located in the receiver-transmitter. A switch on the top side of the antenna adjacent to the connector allows azimuth scaning to be switched off or on as required by the maintenance personnel.

D. For further information on the weather radar system, refer to RCA AVQ-21 Weather Radar Instruction Manual; publication No. 1B8029017.

3. DESCRIPTION (BENDIX RDR-1200 WEATHER RADAR)

A. Receiver - Transmitter

(1) The receiver - transmitter is housed in a short 1/2 ATR case. The receiver transmitter is located in the nose compartment just forward of the nose wheel well.

B. Indicator

(1) The radar indicator is located in the center instrument panel. The system controls are grouped below the radar screen on the front of the radar indicator.

(2) The indicator utilizes a high-contrast rectangular cathode ray tube with a 3.3x4.3 display area. The display is continuous with data update every few seconds.

C. Antenna

(1) The antenna is installed on the forward side of frame 1.

(2) The antenna will operate in ambient air pressures without pressurization.

WEATHER RADAR - MAINTENANCE PRACTICES

1. TOOLS AND EQUIPEMENT

NAME	NUMBER	MANUFACTURER	USE
Pitot and Static System Tester	1811F or Equivalent	Barfield Instrument Co. Atlanta, Ga.	Pressurization Test of Receiver-Transmitter
Spirit Level		Commercially Available	
Tilt Table	TN26410	Gates Learjet Corp.	to rotate gyros.
Patch Cable		Manufactured Locally	

2. ADJUSTMENT/TEST

A. Pressurization Test of Receiver-Transmitter

(1) Remove nose compartment access doors.
(2) Disconnect radar pressurization line at the forward side of frame 5.
(3) Connect the pressurization line to the pressure side of the pitot static tester.
(4) Apply pressure to receiver-transmitter until MB-1 airspeed indicator reads 592 (±2) knots.
(5) close off system and allow to stand for 30 seconds. Pitot static tester airpseed indicator should not read less than 435 knots.
(6) Disconnect pressurization line from pitot static tester.

3. INSPECTION/CHECK

A. Operational Check of RCA AVQ21 Weather Radar

(1) Position the aircraft so that no large objects are within a 160° area scanned by the radar antenna.

WARNING: TESTS INVOLVING RADIATION OF RF ENERGY BY THE RADAR ANTENNA MUST NOT BE MADE IN THE VICINITY OF REFLECTIVE STRUCTURES, REFUELING OPERATIONS OR WHEN PERSONNEL ARE STANDING DIRECTLY IN FRONT OF THE RADAR ANTENNA. RF ENERGY IS GENERATED IN ALL MODES EXCEPT STANDBY AND TEST. DO NOT ALLOW PERSONNEL WITHIN 15 FEET OF AREA BEING SCANNED BY ANTENNA.

(2) Level the aircraft. (Refer to 8-00-00).
(3) Remove radome from aircraft. (Refer to 53-50-00).
(4) Remove primary vertical gyro from aircraft. (Refer to 34-22-00).

(5) Place vertical gyro on tilt table and connect to aircraft wiring with patch cable.
(6) Connect external power to aircraft.
(7) Set Battery Switches to BAT 1 and BAT 2 and Inverter Switches to PRI and SEC.
(8) Pull Mode-Selection push pull knob on the receiver-transmitter out.
(9) Set the indicator controls in the following positions:
  (a) Operation (Mode-Selection Push Button) - OFF
  (b) Gain Control (fully counterclockwise)
  (c) Trace - Mid-range
  (d) Range - 25 miles
  (e) Tilt Control - Zero degrees
  (f) Range Marks - Mid-range
  (g) Polarizing Filter Handle - Full left
(10) Assure that radar DC and AC circuit breakers are depressed.
(11) Pull vertical gyro circuit breaker.
(12) Depress STBY operation push button and allow 4 minutes warmup time.
(13) Set the Scan-Disable Switch on the antenna to the OFF (up) position.
(14) Depress the NORM push button on the indicator.
(15) Place spirit level upright against front of antenna radiator. Antenna radiator should read zero degree tilt. Note any degree pitch.
(16) Turn tilt control alternately to 15° up and down.
(17) Observe spirit level and verify that antyenna radiator responds in the proper direction to an amount equal to the aircraft pitch (if any) plus 15° (±1.5) degrees.
(18) Depress vertical gyro circuit breaker.
(19) Set Autopilto Switch to ON.
(20) Assure that vertical gyro on tilt table is level in both the pitch and roll axis.
(21) Turn tilt control so that spirit level on antenna radiator indicates zero degree pitch.
(22) Manually position antenna radiator to zero degree azimuth with respect to the aircraft.
(22a) Alternately rotate the tilt table, in the pitch axis, 20° up and down.
(23) Verify that the antenna radiator pitches 20 (±1.5) degrees in the opposite direction.
(24) Adjust the pitch gain adjustment screw on the receiver-transmitter unit to compensate for any variations.
(25) Level tilt table in pitch and roll axis.
(26) Manually position the antenna radiator to 60° left of center.
(27) Check that spirit level indicates zero degree pitch.
(28) Rotate the vertical gyro 29° both right wing down and left wing down.
(29) Verify that antenna radiator moves between 25.5 to 27.5 degrees in the following manner:
  (a) With the vertical gyro in the left wing down position and the antenna radiator at 60° left azimuth, the antenna should move upward 25.5 to 27.5 degrees. At 60° right azimuth the antenna should move downward 25.5 to 27.5 degrees.

(b) With the vertical gyro in the right wing down position and the antenna radiator at 60° left azimuth, the antenna should move downward 25.5 to 27.5 degrees. At 60° right azimuth the antenna should move upward 25.5 to 27.5 degrees.

(30) Level tilt table in pitch and roll axis.
(31) Depress the STBY operation push button on the indicator.
(32) Remove spirit level from antenna radiator.
(33) Set the Scan-Disable Switch to the down position.
(34) Pull vertical gyro circuit breaker.
(35) Disconnect patch cable from vertical gyro and install gyro in aircraft. (Refer to 34-22-00).
(36) Install radome. (Refer to 53-50-00).
(37) Set Battery Switches and Inverter Switches to OFF.

B. System Adjustments

(1) Refer to applicable section in RCA, AVQ-21 Weather Radar Instruction Manual; publication number IB8029017, for complete adjustment procedures.

C. Operational Check of Bendix RDR-1200 Weather Radar

WARNING: TESTS INVOLVING RADIATION OF RF ENERGY BY THE RADAR ANTENNA MUST NOT BE MADE IN THE VICINITY OF REFLECTIVE STRUCTURES, REFUELING OPERATIONS, OR WHEN PERSONNEL ARE STANDING DIRECTLY IN FRONT OF THE RADAR ANTENNA. RF ENERGY IS GENERATED IN ALL MODES EXCEPT STANDBY AND TEST. DO NOT ALLOW PERSONNEL WITHIN 15 FEET OF AREA BEING SCANNED BY ANTENNA.

(1) Position the aircraft so that no large objects are within a 120 degrees area scanned by the radar antenna.
(2) Remove radome from the aircraft. (Refer to 53-50-00).
(3) Manually rotate the antenna in tilt and azimuth axis to insure freedom of movement.
(4) Remove primary vertical gyro from aircraft. (Refer to 34-22-00).
(5) Place vertical gyro on tilt table and connect to aircraft wiring with patch cable.
(6) Connect external power to the aircraft.
(7) Set Battery Switches and Inverter Switches to "on."
(8) Assure that radar and primary vertical gyro circuit breakers are depressed.
(9) Set the range selector switch on the radar indicator to STBY and wait approximately one minute for system warmup.
(10) Set mode selector to WX position and turn range selector to TEST position. Check that the fault lamp on the radar panel is illuminated.
(11) Set scan selector to 120° STAB ON position. Check that the antenna drive assembly scans 120 degrees azimuth range.
(12) Set scan selector to HOLD STAB ON position. Check that the antenna continues to scan. Return scan selector to 120° on position.
(13) Set range selector to STBY position.
(14) Set tilt control to +5°, +10° and +15°. Check that the antenna radiator tilts upward smoothly, and without interference.

(15) Set the tilt control to -5°, -10° and -15°. Check that the antenna radiator tilts down smoothly, and without interference.
(16) Set the tilt control to 0°.
(17) Set range selector to TEST. Adjust brightness control for comfortable viewing level and observe the test pattern on the radar indicator.
  (a) There should be five equally spaced range marks with the last mark within approximately 1/8 inch of the edge of the indicator screen.
  (b) There should be no extraneous noise appearing on the display.
  (c) There should be two distinct levels of brightness with a dark (contour) band between the two areas of highest brightness.
(18) The update line should move across the screen fully, indicating the antenna is scanning the full 120°.
(19) Depress the WX push button, elevate display, then release the push button. While the push buton is being depressed, the dark (contour) band should disappear and the brightest shade should appear in its place.
(20) Set the range selector to 60° STAB ON position. The test pattern should remain unchanged except for the smaller azimuth angle.
(21) Set the Scan selector to HOLD. The update line should disappear and the test pattern should remain. Return Scan selector to 120° STAB ON position.
(21a) Set Autopilot Switch to ON.
(22) Set range selector to STBY.
(23) Set vertical gyro to 0° pitch and 0° roll.
(24) Set the tilt control on the radar indicator to the zero position. Check that the antenna elevation position is 0° (±1°).
(25) Set the tilt control to +10°. Check that the antenna elevation is 10° (±1.5°) up.
(26) Set the tilt control to -10°. Check that the antenna elevation is -10° (±1.5°) down.
(27) Manually position the antenna to zero degrees in azimuth and insert a retaining pin into the 0°slot to lock the antenna.
(28) Adjust the tilt control on the radar indicator to exactly zero degrees in elevation.
(29) Position the vertical gyro to 10° nose up and zero degrees roll. The antenna elevation position should be 10° (±1.5°) down.
(30) Position the vertical gyro to 10° nose down and zero degrees roll. The antenna elevation position should be 10° (±1.5°) up.
(31) Position vertical gyro to level in pitch and roll and remove the retaining pin.
(32) Manually position the antenna to 60° right and lock the azimuth drive by inserting the retaining pin into the 60° CW slot.
(33) Position the verticaly gyro to zero degrees pitch and 30° right roll. The antenna elevation should be 26° (±1.5°) up.
(34) Position the vertical gyro to zero degrees pitch and 30° left roll. The antenna elevation should be 26° (±1.5°) down.
(35) Position the vertical gyro to zero degrees pitch and roll and remove retaining pin.

(36) Set the Scan selector to 60° STAB OFF position. The antenna will level in pitch and roll.
(37) Set range selector to TEST.
(38) Check position of aircraft vertical gyro. Note the antenna scans 60° sector and remains fixed in pitch and roll.
(39) Set Scan selector to 120° STAB ON position and range selector to STBY.
(40) Place range selector to a convenient range position (after being in STBY or TEST at least one minute.) Fault lamp should go out.
(41) Set the Scan selector to 120° STAB ON position.
(42) Check for target reflections of local weather (using range and tilt controls.)
(43) Set Mode selector to GAIN position and check for conventional radar returns.
(44) Disconnect patch cable from vertical gyro and install gyro in aircraft. (Refer to 34-22-00).
(45) Install radome. (Refer to 53-50-00).
(46) Set Battery Switches and Inverter Switches to "OFF."

D. System Adjustment

(1) For further information on Bendix RDR-1200 Weather Radar System, refer to Installation Manual, publication number 1.B.21200.

E. Operational Check of RCA PRIMUS 400 COLOR WEATHER RADAR

(1) Position the aircraft so that no large objects are within a 120 degree area scanned by the radar.

WARNING: TESTS INVOLVING RADIATION OF RF ENERGY BY THE RADAR ANTENNA MUST NOT BE MADE IN THE VICINITY OF REFLECTIVE STRUCTURES, REFUELING OPERATIONS OR WHEN PERSONNEL ARE STANDING DIRECTLY IN FRONT OF THE RADAR ANTENNA. RF ENERGY IS GENERATED IN ALL MODES EXCEPT STANDBY AND TEST. DO NOT ALLOW PERSONNEL WITHIN 15 FEET OF AREA BEING SCANNED BY THE ANTENNA.

(2) Remove radome from aircraft. (Refer to 53-50-00).
(3) Remove primary vertical gyro from aircraft. (Refer to 34-22-00).
(4) Place vertical gyro on tilt table and connect to aircraft wiring with patch cable.
(5) Pull Mode-Selection push-pull knob on the receiver-transmitter out.
(6) Set Battery Switches and Inverter Switches to "on."
(7) Set indicator controls to the following positions:
(a) Mode - OFF
(b) Range - TEST
(c) Tilt - 15° UP
(d) Intensity - MID-RANGE
(e) Gain - GAIN PRESET
(f) Stabilization - ON
(g) Sweep -120°
(h) TGT ALERT, FR2, SEC SCAN, and AZIM - OFF (out position)

(8) Antenna Stabilization Checks

NOTE: The following procedures to check and calibrate antenna stabilization whenever a stabilization circuit in either the R-T or antenna has been serviced or whenever faulty operation of the stabilization system is suspected.

(a) Assure that the SCAN switch on antenna is OFF.
(b) Press WX push button, and set STAB switch to OFF.
(c) Using the mounting surface of where vertical gyro was installed, determine and record pitch angle of aircraft as it rests on the ramp.
(d) Set Autopilot Switch to ON.
(e) Manually position antenna radiator to dead-ahead position as indicated by antenna azimuth scale.
(f) Level the primary vertical gyro on the tilt table.
(g) Set TILT control on indicator to zero degree.
(h) Using a spirit level, check that antenna pitch is equal to that determined in step (8) (c) (±1.5°).
(i) Alternately turn TILT control to 15° up and then 15° down and check that antenna radiator responds in same direction in an amount equal to the pitch of the aircraft plus 15 (±1.5°).
(j) Set STAB Switch to ON.
(k) Position the antenna radiator dead-ahead and adjust TILT control until the spirit level is centered (1° elevation). Disregard TILT control setting and aircraft pitch angle.
(l) Alternately displace the vertical gyro (pitch axis) 20° up and 20° down.
(m) verify that antenna radiator elevates 20 (±1.5°) in opposite direction. If not, adjust PITCH GAIN on front panel of receiver-transmitter.
(n) Manually position antenna radiator to 60° left.
(o) Adjust TILT control until antenna radiator is perpendicular to earth as measured by the spirit level. Disregard position of the TILT control.
(p) Alternately position the vertical gyro in roll axis 29° right and 29° left (keeping gyro at 0° in pitch).
(q) Check that antenna radiator elevation changes to 25 (±1.5°) down and 25 (±1.5°) up respectively. If not, adjust ROLL GAIN on receiver-transmitter front panel as necessary to compensate.
(r) Press OFF push button on indicator; set SCAN Switch on antenna to ON and push MOD ON PUSH/MOD OFF PULL push button on receiver-transmitter.
(s) Install vertical gyro in aircraft.

(9) Assure that radar circuit breaker is depressed and depress STBY push button on indicator.

(10) Turn Intensity control for center panel instrument lighting to maximum brightness.

(11) On Digital Indicator, set RANGE control to TEST and depress WX push-button.

(12) After warmup period has expired, rotate INT control clockwise to desired viewing level. Check that display swept is in synchronism with antenna scan. Sweep trace should sector across display at 28 looks-per-minute (60-degree sweep), or 14 looks-per-minute (120-degree sweep).

(13) Set Range Control to TEST position, and observe 10 NM wide noise band at approximately 85 to 95 NM.

(14) If noise band is weak or missing, receiver sensitivity is poor; presence of full noise band indicates good receiver sensitivity.

(15) If noise band is broken into segments (not continuous), AFC or transmitter is at fault.

NOTE: Noise band test is not valid when A/C is in hangar or when MOD button, on front of R/T is pulled.

(16) Turn INTENSITY control both clockwise and counterclockwise, and verify that brightness of display varies as control is rotated. Display should gewt dimmer as control is turned counterclockwise and bright as control is turned clockwise.

(17) Depress the CYC mode push button. Check that the display is in the normal and contour modes on alternate sweepps of the trace. At each end of the sweep, the entire display should simultaneously change to the contour of normal mode. The displayed contourable targets will flash on and off at 0.5 second intervals.

(18) Depress the TGT ALRT push button. Check that the TGT ALRT label is flashing 1/2 second on and 1/2 second off.

(19) Depress the AZIM push button. Check that azimuth strobe lines are displayed every 30°.

(20) Depress the FRZ push button. Check that the display data updating is stopped. Check that the FRZ lamp is illuminated and that the FRZ label is flashing.

(21) Depress WX mode push button. Select the 300 NM range and check if the display video increases as the GAIN control is turned clockwise and decreases as it is turned counterclockwise. Also check that VAR is displayed in the CRT Auxiliary Field.

(22) Turn RANGE control to each of the six ranges. Check that display range marks correspond to following values (NM):

SELECTED RANGE	NUMBER OF RANGE MARKS	INTERVAL
10	5	2
25	5	5
50	5	10
100	5	20
200	5	40
300	5	60

(23) Depress MAP mode push button. Check that targets appear. Adjust TILT as required.
(24) Depress the STBY mode push button, and check that the display disappears and the antenna stops scanning.
(25) Install radome. Refer 53-50-00.
(26) Set Battery Switches and Inverter Switches to OFF.

F. System Adjustments

(1) For further information on the RCA Primus 400 Color Weather Radar, refer to System Description and Installation Manual, publication number IB8029076.

RADAR RECEIVER-TRANSMITTER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The radar receiver-transmitter is installed in the nose compartment forward of the nose wheel well. The receiver-transmitter is secured to the mounting panel by two hold-down clamps.

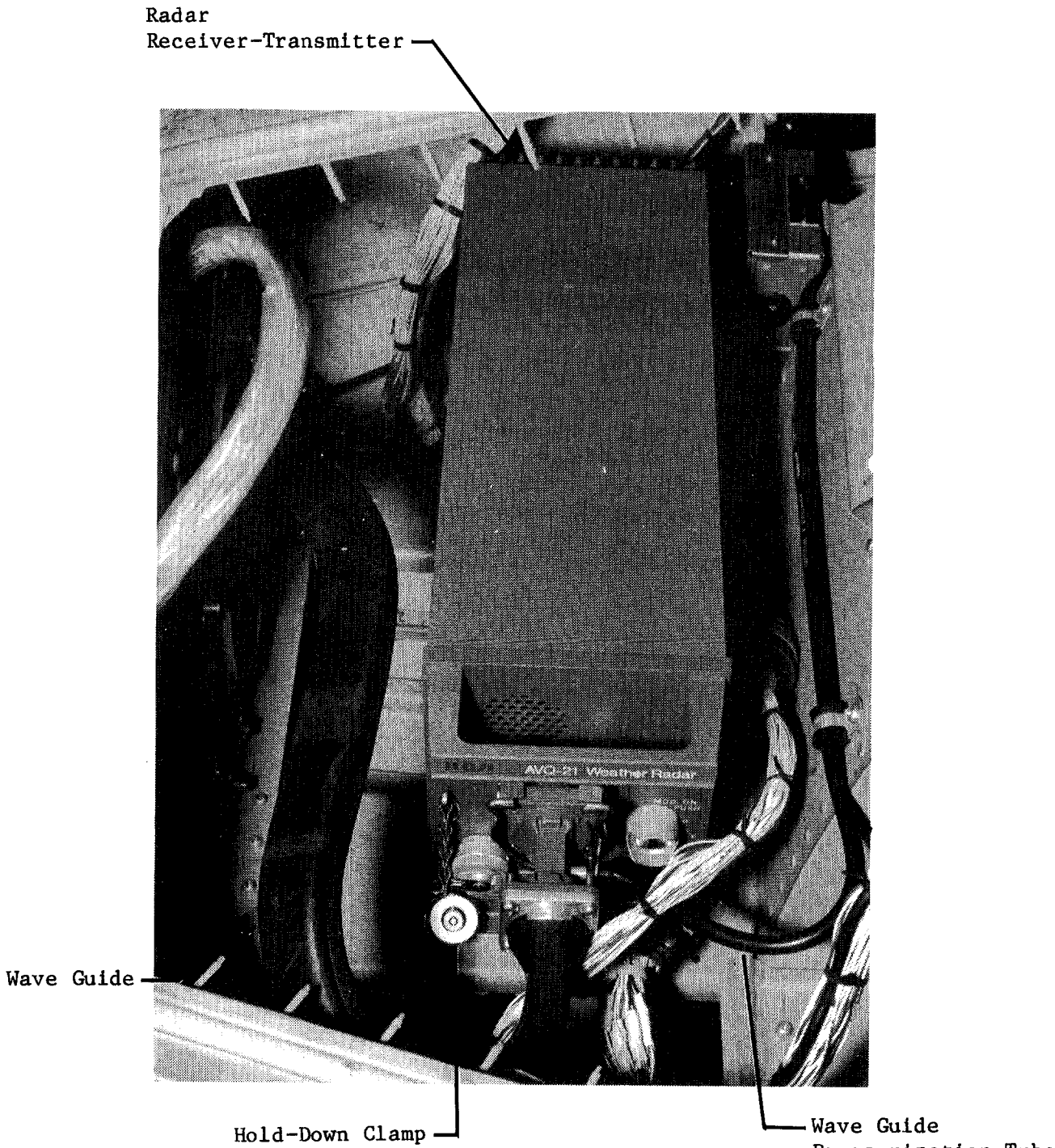
° Maintenance practices consist of removal of defective component and installation of a new unit.

A. Remove Radar Receiver-Transmitter (See figure 201.)

(1) Remove nose compartment access doors.
(2) Disconnect waveguide from reciever-transmitter.
(3) Cap exposed end of waveguide.
(4) Disconnect electrical plugs from receiver-transmitter.
(5) Loosen hold-down clamps and remove receiver-transmitter.

B. Install Radar Receiver-Transmitter (See figure 201.)

(1) Install receiver-transmitter and secure hold-down clamps.
(2) Connect electrical plugs to receiver transmitter.
(3) connect waveguide to receiver-transmitter.
(4) Install nose compartment access doors.



ORIGINAL
As Received By
ATP

RCA Receiver-Transmitter

Radar Receiver-Transmitter Installation
Figure 201

RADAR ANTENNA - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° Maintenance practices consist of removal of defective unit and installation of new unit.

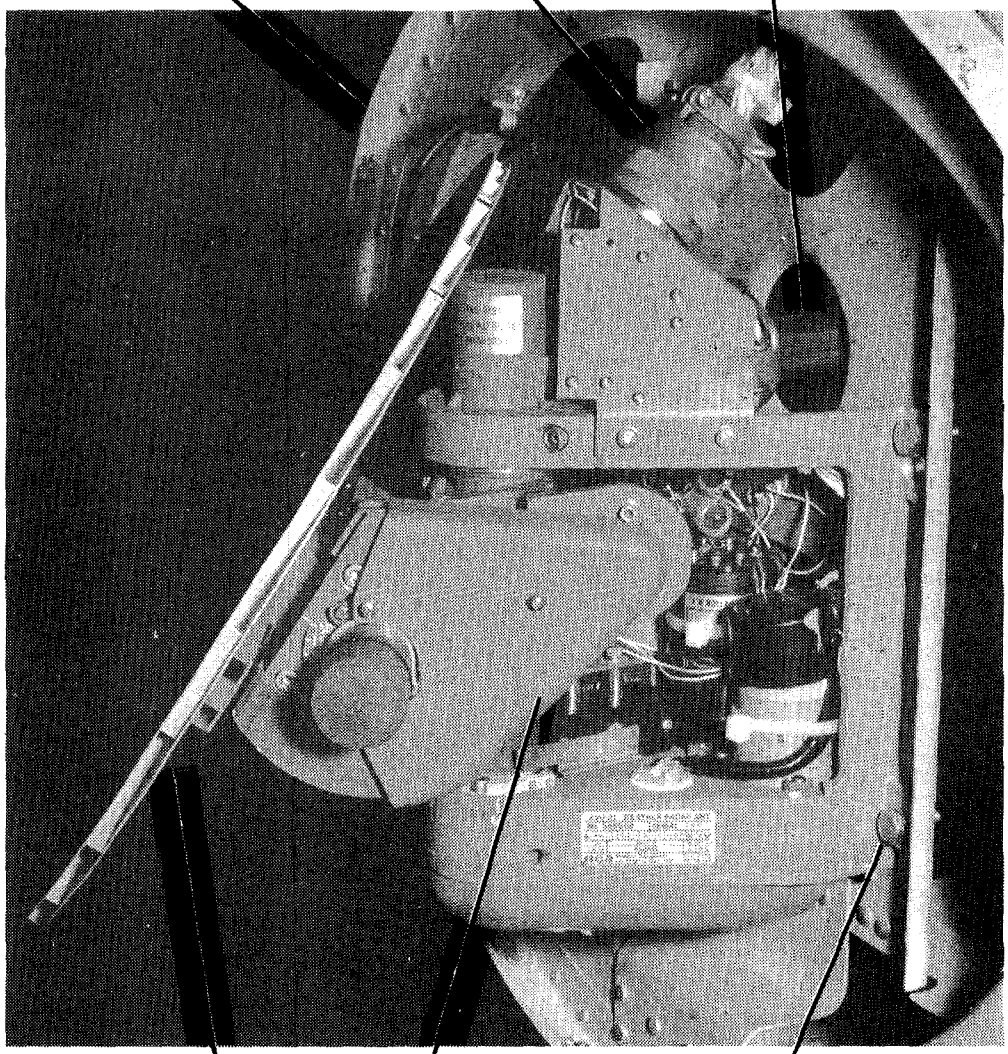
° The radar antenna is installed on the forward side of frame 1. Access to the antenna is gained by removing the radome.

A. Remove Radar Antenna (See figure 201.)

(1) Remove nose compartment access doors.
(2) Disconnect coax leads from glideslope antennas.
(3) Remove radome. (Refer to 53-50-00.)
(4) Disconnect waveguide from antenna.
(5) Cap exposed waveguide.
(6) Disconnect electrical plug from antenna.
(7) Remove attaching parts and antenna from aircraft.

B. Install Radar Antenna (See figure 201.)

(1) Install antenna and secure with attaching parts.
(2) Connect electrical plug to antenna.
(3) connect waveguide to antenna.
(4) Install radome and secure with attaching parts.
(5) Connect coax lead to secondary glideslope antenna.
(6) Install nose compartment access doors.



ORIGINAL
As Received By
ATP

RCA Antenna

Radar Antenna Installation
Figure 201

EFFECTIVITY: OPTIONAL
MM-99
D916

RADAR INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The RCA radar indicator is located on the center instrument panel. The indicator incorporates a receptacle which mates with a plug on the indicator mounting rack. The mounting rack incorporates guide pins which aid in alighing the receptacle and plug when installing the indicator. The indicator is secured in place by a clamp located approximately halfway back on the indicator.

° The Bendix radar indicator is located in the center instrument panel. The indicator is secured in place by two locking pawls on the bottom front of the indicator, and two spring-loaded pins on the rear of the indicator. Electrical connections are made by a plug at the rear of the indicator. A clamp is also installed approximately halfway back on the indicator.

A. Remove RCA AVQ-21 Radar Indicator (See figure 201.)
(1) Assure that Battery and Stall Warning Switches are OFF.
(2) Lower pilot's instrument panel.
(3) Loosen clamp assembly securing indicator in mounting rack.
(4) Loosen screws and remove small triangular clips in upper corners.
(5) Pull indicator from panel.

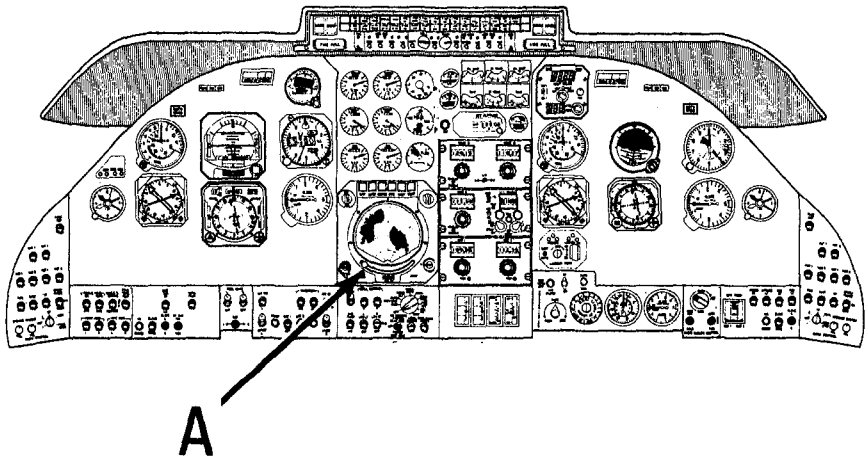
B. Install RCA AVQ-21 Radar Indicator (See figure 201.)
(1) Install indicator in panel and secure in place with clamp assembly.
(2) Install small triangular clips and secure with screws.
(3) Raise pilot's instrument panel.

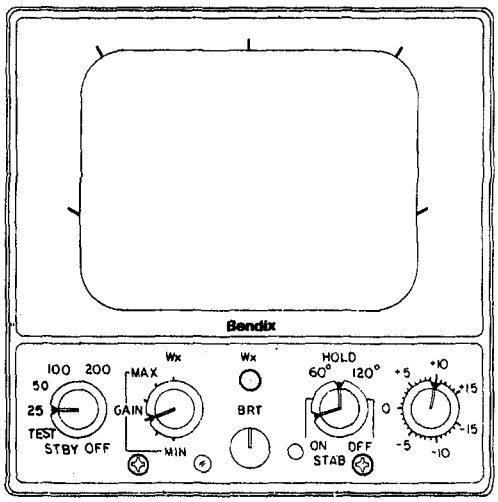
C. Remove Bendix RDR-1200 Radar Indicator (See figure 201.)
(1) Assure that Battery and Stall Warning Switches are OFF.
(2) Lower pilot's instrument panel.
(3) Loosen clamp assembly securing indicator in mounting rack.
(4) Using a screwdriver disengage the locking pawls.

NOTE: Clockwise rotation engages locking pawls, counter-clockwise rotation disengages locking pawls.

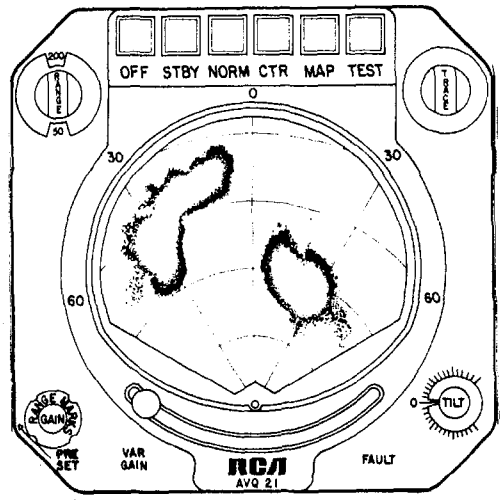
(5) Disconnect electrical plug from indicator.
(6) Pull indicator from panel.

D. Install Bendix RDR-1200 Radar Indicator (See figure 201.)
(1) Install indicator in panel and engage the locking pawls.
(2) Secure clamp assembly in place.
(3) connect electrical plug to indicator.
(4) Raise pilots instrument panel.





Bendix RDR-1200 Indicator



RCA AVQ-21 Indicator

Detail A

Radar Indicator Installation
Figure 201

INS-61B NAVIGATION SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The INS-61B Inertial Navigation System consists of a mode selector unit (MSU), a control and display unit (CDU), an inertial navigation unit (INU) and a battery.

(1) The mode selector unit (MSU) is located in the pedestal. The MSU is secured by two quick release type fasteners.

(2) The control and display unit (CDU) is located in the pedestal. The CDU is secured by four quick release type fasteners.

(3) The inertial navigation unit (INU) is located in the baggage compartment. The INU is rack mounted and is secured by standard hold down hooks.

(4) The battery is located in the baggage compartment adjacent to the INU. The battery is rack mounted and is secured by standard hold down hooks. The battery consists of 20 nickel-cadmium medium-rated cells, a temperature sensing circuit and protective circuits.

B. For information related to maintenance and troubleshooting, refer to the applicable publication listed under "Supplementary Publications."

C. The INS-61B inertial navigation system will continually display the aircraft present position (in latitude and longitude) throughout the flight without reference to outside navigational aids. For further information on the INS-61B inertial navigation system, refer to Supplementary Publications.

2. SUPPLEMENTARY PUBLICATIONS

A. The following publications are listed.

Maintenance Manual, INS-61B Inertial Navigation System - Publications No. 523-0763768-201114

Operations Manual, INS-61B Inertial Navigation System - Publications No. 523-0764097-101111

INS-61B NAVIGATION SYSTEM - FUNCTIONAL TEST

1. GENERAL

A. The following functional check is for the Collins INS-61B Inertial Navigation System.

2. TOOLS AND EQUIPMENT

NAME	NUMBER	MANUFACTURER	USE
External Power Supply		Commercially Available	To provide 28 vdc to aircraft.
Pitot Static Tester	MB-1	Aircraft Products Company Bridgeport, Pa.	For static and pressure during test.

3. ADJUSTMENT/TEST

A. Functional Test of INS-61B Inertial Navigation System

CAUTION: COOLING AIR MUST BE SUPPLIED AT ALL TIMES THE INS-61B SYSTEM IS IN OPERATION OR EQUIPMENT DAMAGE COULD RESULT. THIS IS ASSURED BY CHECKING FOR PROPER BLOWER OPERATION ON THE COMPUTER.

NOTE: Pull the SNSR HTR circuit breaker.

(1) Connect the external power source and set the Battery Switches to "on."
(2) Set the Primary, Secondary and Auxiliary Inverter Switches to "on."
(3) Tune the DME with the NAV #1 control and obtain DME lock-on.
(4) Set INS Switch on the annunciator and switch panel to ON.

NOTE: The INS Switch must be in the ON position or an invalid alignment will occur. Should an invalid alignment occur, it is necessary to power down the system and perform a realignment. Realignment can be accomplished by waiting 3 to 5 minutes after shutdown and repeating steps (1) thru (4).

(5) Set the Mode Selector unit selector switch to ALIGN. Check to assure that cooling air is being circulated thru the inertial navigation unit (INU).
(6) Check that the ALIGN light is illuminated.
(7) Depress the RESET pushbutton on the front of the (INU).
(8) Set the Control Display Unit (CDU) Function Switch to M.

NOTE: The INU failure lights should not be illuminated at this time.

(9) Set the CDU Data Selector Unit Switch to the following positions and check for proper display.

TK/GS	- L & R Displays are blank or (=).
HDG/DA	- L & R Displays are blank or (=).
XTK/TKE	- L & R Displays are blank or (=).
POS	- Display is 0000 or shows aircraft position at last power down.
WPT	- L & R Displays are blank or (=).
DIS/TIME	- L & R Displays are blank or (=).
WIND	- L & R Displays are blank or (=).
DSRTK/SXTK	- L & R Displays are blank or (=).
STATUS	- Initially shows 0090 for 64 seconds, then decreases towards 0000 until end of alignment cycle.

L/L DEF light is flashing.

(10) Turn the DIM/LAMP TEST knob fully clockwise and depress.

(11) Check that the BATT WARN, READY and ALIGN lights on the MSU are illuminated.

(12) Check that the ALERT, WARN, BATT, UD, NAV DEF and L/L DEF lights on the CDU are illuminated.

(13) Check that all segments of each light in the left and right displays, the FR-TO display and WPT display are illuminated.

(14) Turn the DIM/LAMP TEST knob counterclockwise and note that all lights except ALERT, WARN, BATT and UD have continuous dimming. The ALERT, WARN, BATT and UD lights will go from bright to dim in one step.

(15) Turn the DIM/LAMP TEST knob fully clockwise and release.

(16) Pull the INS SYNC EXCIT circuit breaker. Verify that the ALIGN light is illuminated.

(17) Reset the INS SYNC EXCIT circuit breaker. Verify that the ALIGN light is illuminated and steady.

(18) Turn the Data Selector knob to POS. Check that WPT display reads P.

(19) Depress L/L DEF. Check that the L/L DEF lights are steady, the INSERT light is illuminated and the WPT display reads H.

(20) Enter hemisphere and then degree and minutes from most significant digit to nearest tneth of a minute. Enter latitude coordinates n 37° 40.0'.

(21) Depress L/L DEF and enter longitude W 097° 26.2'.

(22) The latitude and longitude data is displayed in the left and right displays respectively.

(23) Depress INSERT. The L/L DEF and INSERT lights will extinguish and the data displays will not change.

(24) Turn the Data Selector knob to STATUS. The left display will show less then 90 and decreasing.

(25) Turn the Data Selector knob to WPT.

(26) Depress 0 thru 9 on the keyboard and observe WPT display. Data display should be (=) for each number.

(27) Depress the following and enter data:

(a) Key #1

(b) L/L DEF
(c) N
(d) 38° 40.0'
(e) L/L DEF
(f) W
(g) 097° 26.2'
(h) INSERT

Observe that latitude and longitude and WPT 1 are displayed.

(28) Depress the following and enter data:
(a) Key #2
(b) L/L DEF
(c) N
(d) 39° 40.0'
(e) L/L DEF
(f) W
(g) 097° 26.2'
(h) INSERT

Observe that latitude and longitude and WPT 2 are displayed.

(29) Depress the following and enter data:
(a) Key #3
(b) L/L DEF
(c) N
(d) 37° 35.0'
(e) L/L DEF
(f) W
(g) 097° 00.0'
(h) INSERT

Observe that latitude and longitude and WPT 3 are displayed.

(30) Depress the following and enter data:
(a) Key #4
(b) L/L DEF
(c) N
(d) 37° 35.0'
(e) L/L DEF
(f) W
(g) 098° 00.0'
(h) INSERT

Observe latitude and longitude and WPT 4 are displayed.

(31) Depress NAV DEF, 0, 0, INSERT; the FR-TO display will be blank.

(32) Depress NAV DEF, 1 2; the INSERT light will illuminate.

(33) Depress INSERT, the FR-TO displays a flashing 12.

(34) Turn Data Selector knob to DIS/TIME; the left display should indicate 0060 and the right display should indicate 007.2.

(35) Depress NAV DEF, 0, 0, INSERT; both the left and right displays will indicate (=) and the FR-TO display should indicate 0000.

(36) Turn the Data Selector knob to STATUS and check left display until MSU ALIGH light goes out and the READY light illuminates. The left display should indicate 0000.

(37) On MSU equipped with Alignment Override (AOR) lights, the light will illuminate when STATUS changes from 0040 to 0000. The AOR light will go out when READY light illuminates.
(38) Turn the MSU Mode Selector knob to NAV; the MSU READY light should go out, left display remains at 0000. and the NAV DEF light will flash.
(39) Depress NAV DEF, 1, 2, and INSERT; the NAV DEF light will go out.
(40) Set the Autopilot Switch to ON and engage autopilot.
(41) Engage the autopilot HDG mode.
(42) On the INS Annunciator Switch panel, set the INS ENGAGE Switch to INS ENGAGE. Check that the flight director controller mode light is illuminated, INS light on the annunciator panel is illuminated and the DME light on the annunciator panel is out.
(43) Check the following on the pilot's flight director indicator: command bars in view and the computer flag out of view.
(44) Check the following on the pilot's HSI: INS annunciator in view and the HDG and NAV flags are out of view.

NOTE: When the INS-61B system is integrated with a FD-109Z Flight Director Indicators and when the INS ENGAGE Switch is set to INS ENGAGE, note the following.

(a) The course arrow on the HSI shows the desired track to be flown to reach the next waypoint.
(b) The bearing pointer shows the drift angle. (The angle in degrees, between the aircraft track and the aircraft heading.)

(45) On INS-61B systems integrated with FD-109Z flight director, turn the Data Selector knob to DIS/TIME. Check that the distance displayed in the left display is the same as the "Miles" display on the pilot's HSI (±2 miles).
(46) Turn the Data Selector knob to HDG/DA. Check that the heading displayed in the left display is the same as the heading shown under the lubber line in pilot's HSI.
(47) On INS-61B systems integrated with FD-109Z flight director, turn the Data Selector knob to DSRTK/SXTK. Check that the desired track displayed in left display is the same as the desired track shown by course arrow and course display window on pilot's HSI (±2°).
(48) On INS-61B systems integrated with FD-109Z flight director, turn the Data Selector knob to TK/GS. Check that the track display in left display is the same as indicated by bearing pointer on pilot's HSI.
(49) Turn Data Selector knob to XTK/TKE. Check that cross track displayed in left display is the same as shown by course deviation bar on pilot's HSI. (One dot = 3.75 n.m.)
(50) Depress NAV DEV, 3, 4, and INSERT. Check that FR-TO display shows 34.
(51) Repeat steps (45) thru (40).
(52) Switch to a DME HOLD mode. Check that the DME mode light on the annunciator panel is illuminated.
(53) Set DME Control Switch to OFF. The DME mode light will go out.
(54) Set DME Control Switch to NAV #2. The DME mode light will illuminate.
(55) Set DME Control Switch to NAV #1. The DME mode light will go out.

(56) Interrupt the DME lock-on. The DME mode light will illuminate.
(57) Set the CDU Function Switch to T and depress the NAV DEF, 2, 9 and INSERT. The INS ENGAGE Switch will drop to the OFF position.
(58) Manually hold the INS ENGAGE Switch in the INS ENGAGE position. The HSI VOR/LOC flag shall appear and the HSI compass card will slew for one minute. Release the INS ENGAGE Switch.

NOTE: Do not move the CDU Function Switch from the T position until the HSI compass card stops slewing.

(59) Turn the CDU Function Switch to M, depress NAV DEF, 1, 2 and INSERT.
(60) Set the INS ENGAGE Switch to INS ENGAGE. The switch should hold. Turn the CDU Function Switch to T.
(61) Depress NAV DEF, 1, 9 and INSERT. Turn the Data Selector Switch to the following positions and monitor the displays.

	Left Display	Right Display
XTK/TKE	L3.7	R30
DIS/TIME	10	1.2
WIND	45	100
DSRTK/SXTK	90	R100

(62) Check that the ALERT light is illuminated on the CDU and that the INS ENGAGE Switch has dropped off.
(63) Set the INS ENGAGE Switch to INS ENGAGE. The switch shoulld hold.
(64) Engage the autopilot HDG mode.
(65) Check that the command bars on the Flight Director show a "Steer Right" command.
(66) Check that the HSI TO/FROM indicator indicates TO and Deviation indicates one dot right.
(67) Set the CDU Function Switch to M.
(68) Connect the pitot-static tester to the Air Data System. Simulate an airspeed of 200 knots and an altitude of 15,000 feet.

NOTE: Assure that the SNSR HTR circuit breaker is pulled.

(69) Set pilot's altimeter barometric pressure knob to 29.92.
(70) Turn CDU Data Selector Switch to WIND and check that the right display indicates 267 ±10.

NOTE: This wind velocity (267 knots) is based on an ambient temperature of 70 °F, measured at the total temperature sensor probe. If the temperature is lower, the wind readout will be lower and if the temperature is higher the wind readout will be higher. For example, at 50°F the wind readout will be approximately 262 knots and at 90°F will be approximately 272 knots.

(71) Set Data Selector Switch to STATUS. Left display will read 0000.

(72) Set Data Selector Switch to TK/GS. Left display will show aircraft TRUE HDG. Right display will show 000X.

NOTE: The X in the right display can be any value.

(73) Set the INS ENGAGE Switch to INS ENGAGE and hold. Compare HSI compass card heading to CDU heading displayed in the left display. Compass card should read ±2 degrees of the value indicated on CDU. Release the INS ENGAGE Switch.

(74) Turn the CDU Data Selector Switch to XTK/TKE. Both left and right displays show (=).

(75) Depress NAV DEF, 1, 2 and INSERT. Set the INS ENGAGE Switch to INS ENGAGE. The left display indicates L or R 000X. The right display indicates track error.

NOTE: Track error equals right when true heading is less than 180 degrees. Track error equals left when true heading is between 180 and 360 degrees. Track error equals the difference in degrees between desired track and actual aircraft heading.

(76) Turn the CDU Data Selector Switch to DSRTK/SXTK. Both left and right displays indicate 359.9 to 000.0.

(77) Depress NAV DEF, 9, 9, R04 and INSERT. Right display indicates R04 and the HSI deviation indicates 1 dot right of center.

(78) Turn the CDU Data Selector Switch to HDG/DA and note the aircraft true heading in left display.

(79) Turn Data Selector Switch to DSRTK/SXTK and depress NAV DEF, 7, 7, aircraft true heading, INSERT. The left display indicates the true heading and the right display indicates R or L 00.

(80) Depress NAV DEF, 9, 9, L07 and INSERT. The left display indicates aircraft true heading. The HSI deviation indicates 2 dots left of center and the right display indicates L07.

(81) Turn Data Selector Switch to DIS/TIME.

(82) Depress NAV DEF, 0, 0, INSERT and NAV DEF, 2, 1 and INSERT.

(83) Left display shows distance from WPT 2 to WPT 1 = 60 n.m. The right display shows time between WPT 2 and WPT 1 at 500 kts as 7.2 minutes.

(84) Pull INS BATT and INS PWR circuit breakers. Check that INS computer continues to function by checking CDU displays and that BATT light on CDU illuminated. Reset circuit breakers.

(85) Pull circuit breaker on front of INS battery unit and INS PWR circuit breaker. Check that INS computer continues to operate and that BATT light on CDU is illuminated. Reset circuit breaker.

(86) Disconnect pitot static tester from Air Data System and return system to normal.

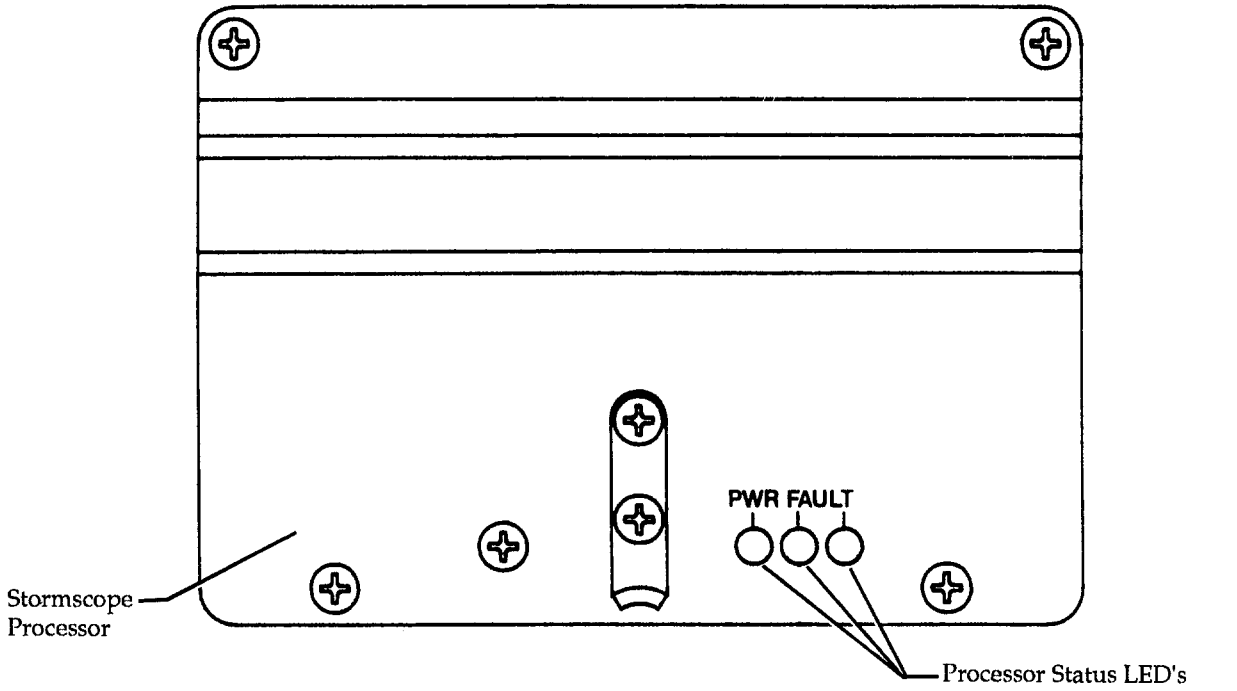
(87) Turn the MSU Mode Selector Switch to OFF. Set Inverter Switches and Battery Switches to "off." Disconnect external power from aircraft.

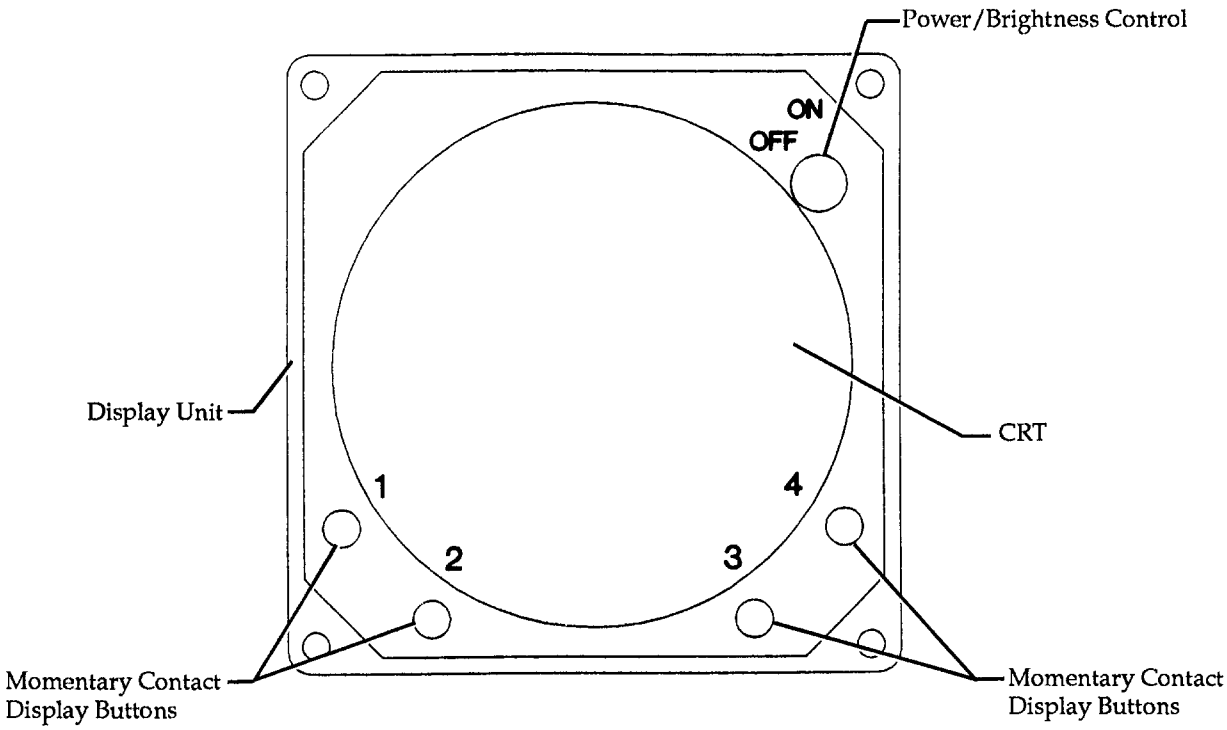
NOTE: If the MSU Mode Selector Switch is not set to OFF, the INS-61B system will continue to operate from INS battery power even after the aircraft power is off.

STORMSCOPE WEATHER MAPPING SYSTEM - DESCRIPTION AND OPERATION

1. **Description**
   A. The WX-1000 and WX-1000+ Stormscope is a passive weather mapping system. The primary purpose is thunderstorm avoidance. The system detects, maps and displays the relative position of electromagnetic discharge activity 360 degrees around the aircraft to a distance of 200 nautical miles.
   B. In addition to the storm display the system also provides electronic checklists which may be customized in the field for specific customer requirements, and an electronic clock which provides the current time and date, an elapsed time, and a stopwatch. The WX-1000+ also has the capability of being connected to an external synchro heading source to maintain proper display orientation during turns.
   C. The system consists of a processor, display and antenna.
   D. Processor
      (1) The processor is housed in a 1/2 short dwarf ATR case. The processor is installed in the seat and baggage floor area at the rear of the passenger cabin.
      (2) The processor contains all system processing and control circuits. There are three external LED's which show the processor status as follows: (See Figure 1.)
         (a) Green LED - Power on indicator
         (b) Yellow LED - Power supply fault indicator
         (c) Red LED - System self test fault indicator
      (3) The Stormscope system is acquiring storm data continuously on all ranges even if the system is not in the Weather Mapping mode. This ensures that the data displayed is always current. The system performs a continuous Self-Test during operation. Faults detected by the system are logged in non-volatile memory with a fault code and a time tag. A message is displayed on the CRT indicating the error and any degradation of operating functions. To resume operation, the operator must depress any button, thereby acknowledging the message.
      (4) An inhibit function is provided to prevent interference to storm data during communications radio transmissions. Storm data acquisition is inhibited when the mic key is depressed.
   E. Display
      (1) The display is a 3ATI unit mounted in the copilot's instrument panel.
      (2) The display houses the CRT and contains all operating controls.
   F. Antenna
      (1) The antenna is aerodynamically shaped and is mounted on the aircraft exterior.
      (2) The antenna is a combined crossed-loop and sense antenna, incorporating internal active circuits.

2. **Operation**
   A. General
      (1) All system operating controls are located on the panel mounted display. (See Figure 1.) They are as follows:
         (a) Power/Brightness - Rotating the power/brightness control turns the WX-1000/WX-1000+ on or off and adjusts the brightness of the display.
         (b) Four Momentary Contact Display Buttons - Numbered 1 through 4 from left to right. A legend is generated on the display to identify the function of each button in the various modes of operation.
         (c) The panel mounted display generates all operator usable information. General features of the display are:
            1) Mode Legend - The Mode Legend appears on the display to identify the selected mode of operation. In the Weather Mode, heading information may also appear in this location (WX-1000+ only).
            2) Display Button Legend - A Display Button Legend appears on the display to identify the function of each button in each of the various modes.





Stormscope System Indicators and Displays
Figure 1

B. Operating Modes.

(1) Self-Test - When the system is first turned on, the mode legend displays "SELF-TEST". During self-test the system performs a complete power up self test, initializes video timing and storm processing, displays "ALL TESTS ARE OK" upon satisfactory completion, and automatically proceeds to Main Menu.

NOTE: The system self-test at power up takes approximately 15 seconds. If the system is turned on cold, it may complete the system self test before the display warms up. If this occurs, the initial display seen will be the Main Menu.

(2) Main Menu - This mode presents the operator with a menu of system operating modes.
(a) Checklists
(b) Time/Date
(c) Options
The display buttons perform the following operations in this mode:
1 "->360" selects the 360 Degree Weather Mapping Mode.
2 "NEXT->" steps the highlight through the menu selections.
3 "GO" selects the mode indicated by the highlighted menu selection.
4 "->120" selects the 120 Degree Weather Mapping Mode.

(3) 360 Degree Weather Mapping Mode - The system displays 360 degree weather information on the CRT. On the WX-1000+ storm data is heading stabilized in this mode, and the aircraft heading may be displayed at the top of the CRT. The buttons perform the following operations in this mode:
1 "MENU" switches the system back to the Main Menu.
2 "CLEAR" clears the strike memory and storm information from the CRT screen.
3 "nm" will be labeled with the current operating range. Depressing this button steps down through the operating ranges. The selectable ranges are 200, 100, 50 and 25 nm.

NOTE: The system will display up to 512 of the most recent electrical discharges which fall within the selected range.

4 "->120" selects the 120 Degree Weather Mapping Mode.

(4) 120 Degree Weather Mapping Mode - The system displays the 120 degree forward only sector weather information on the CRT. On the WX-1000+ storm data is heading stabilized in this mode and aircraft heading may be displayed at the top of the CRT. The buttons perform the following operations in this mode:
1 "MENU" switches the system back to Main Menu.
2 "CLEAR" erases the strike memory and storm information from the screen.
3 "nm" is labeled with the current operating range. Pressing this button steps down through the operating ranges. The selectable ranges are 200, 100, 50 and 25 nm.

NOTE: The system displays the 256 most recent electrical discharges which fall within the selected range and 120 degree view.

4 "->360" selects the 360 Degree Weather Mapping Mode.

(5) Checklist Mode - This display presents the operator with the titles of the checklists that were previously entered using the WX-PA.

NOTE: The system stores a maximum of 6 checklists with a maximum of 30 items per checklist. Each checklist title has a maximum of 15 characters. Each checklist item has a maximum of 20 characters.

The buttons perform the following operations in this mode:

1 "MENU" switched back to the Main Menu.
2 "NEXT->" steps the highlight bar through the checklists.
3 "GO" selects the checklist indicated by the highlighted selection.
4 No function.

(a) In the checklist display mode the operator is presented with the list of items in the selected checklist. The buttons perform the following operations in this mode:

1 "MENU" switches back to the Main Menu.
2 "CHECK" checks off the highlighted item and scrolls the next item into the highlight.
3 "SKIP" skips the current item in the highlight and scrolls the next item into the highlight.
4 "BACKUP" scrolls the list downward so that the previous item is highlighted.

NOTE: Skipped items will reappear at the end of the list after all other items have been checked off. Skipped items are indicated by a large dot. Checked items are indicated by a check mark. The message "checklist complete" will appear after all items have been checked off.

(6) Time/Date Mode - This mode displays the stopwatch, elapsed time counter, and current time and date. The buttons perform the following operations in this mode:

1 "MENU" switched back to the Main Menu.
2 "NEXT" steps the highlight bar through the stopwatch, elapsed time counter and each portion of the Time/Date display.
3 Function varies depending on highlighted item.
4 Function varies depending on highlighted item.

(a) Stopwatch - The stopwatch is an upcounting timer which counts hours, minutes and seconds up to 99:59:59. The stopwatch is selected by placing the highlight bar over the stopwatch time using the "NEXT" button. Display buttons 3 and 4 have the following functions:

3 "START" when the stopwatch is not running.
"STOP" when the stopwatch is running.
4 "RESET" when the stopwatch is selected.

(b) Elapsed Timer - The elapsed timer is an upcounting timer which counts hours, minutes and seconds up to 99:59:59. The elapsed timer is selected by placing the highlight bar over the elapsed time. Display buttons 3 and 4 have the following functions:

3 "START" when the timer is not running.
"STOP" when the timer is running.
4 "RESET" when the timer is selected and stopped.

NOTE: The elapsed timer will retain its count in the absence of power. Removing power will have the same effect as pressing "STOP".

(c) Time/Date - The Time/Date display is an automatically incrementing clock. The Time/Date display is set by stepping the highlight through the hours, minutes, seconds, date, month and year using the "NEXT" button. Display buttons 3 and 4 have the following functions:

3 Steps "DOWN" the highlighted numeral.
4 Steps "UP" the highlighted numeral.

NOTE: The time and date remains current in the absence of power.

(7) Options Mode - This mode displays the results of the continuous self test and allows the operator to initiate a complete self test. If WX-1000+, this mode also allows manual disabling of the heading stabilization and heading display if a compass failure should occur without causing a flag condition. When operating with the heading stabilization, the operator may elect to have the heading display on or off when in any weather mode. The buttons perform the following functions:

1 "MENU" switched back to Main Menu.
2 "NEXT" steps the highlight through the self test, heading stabilization, and heading display.
3 Function varies depending on highlighted item.
4 No function.

(a) Self Test Results - The system displays the results of the continuous self test. If no faults have been detected, the message "OK" is displayed. If a fault has been detected, the message "FAULT" is displayed. When the highlight is placed over continuous test, button 3 is labeled "TEST". Depressing this button causes the system to conduct the operator initiated test. If any errors are detected, a message indicating the affected functions is displayed.

(b) Heading Stabilization (WX-1000+) - When the highlight is placed over "heading stabilization", button 3 is labeled "ON/OFF". Pressing the button turns the heading stabilization on or off as indicated by the highlight.

(c) Heading Display (WX-1000+) - When the highlight is placed over "heading display", button 3 is labeled "ON/OFF". Pressing the button turns the heading display on or off as indicated in the highlight.

1. Troubleshooting

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Model 260	Simpson	Check continuity
Tester/Analyzer	WX-PA	3M	Test and program Stormscope system

B. Self Test

(1) The system performs a complete self test upon power up, a continuous self test during operation and an operator initiated self test when commanded by the operator. Table 101 lists the functions tested in each self test. Table 102 lists the self test error messages and probable cause.

Test Item	Power Up	Operator Initiated	Continuous	Failure Precludes
Antenna	X		X	Storm Display
Analog Processing	X	X	X	Storm Display
Video Output	X	X		System Operation
Data Memory	X	X		System Operation
Video Memory	X	X		System Operation
Program Memory	X	X	X	System Operation
Non-Volatile Memory	X	X		1. Checklist Operation 2. Fault Log Operation
Heading Valid Flag			X	1. Heading Stabilization 2. Heading Display
Heading Processing	X	X		1. Heading Stabilization 2. Heading Display
Serial Communications	X	X		Communication with Test Equipment
Inhibit Stuck			X	System Operation
Clock Battery	X	X	X	Time/Date Display

System Self Tests
Table 101

NOTE: Refer to Avionics and Optional Electrical Customization Wiring Manual for Wiring Diagram.

Software Version 1.21 or Lower	Software Version 2.00 or Higher	Indicates	Action
ANTENNA ERROR	ERROR 46	Antenna Fault	Check antenna cable
HARDWARE ERROR No Test Strikes	ERROR 45 ERROR 47	Strike Processing Test Failure	Possible electrical Interference
HARDWARE ERROR Invalid Test Strikes		Strike Processing Test Failure	
	ERROR 40	Possible wiring error	Verify continuity from pin 45, RP6381 to pin B, RP6383; pin 24, RP6381 to pin C, RP6383.
	ERROR 41	Possible wiring error	Verify continuity from pin 17, RP6381 to pin G, RP6383; pin 33, RP6381 to pin H, RP6383.
	ERROR 42	Possible wiring error	Verify continuity from pin 49, RP6381 to pin M, RP6383; pin 50, RP6381 to pin L, RP6383.
	ERROR 43	Possible wiring error	Verify continuity from pin 15, RP6381 to pin E, RP6383; pin 48, RP6381 to pin F, RP6383
	ERROR 44	Possible wiring error	Verify antenna mount jumper selection; pins 24 to 41, P302 (In, top; Out, bottom;)
HARDWARE ERROR System Inoperative	ERROR 01 ERROR 20,21,22 ERROR 23,24,25 ERROR 30,31,32,33 ERROR 34,35,36	Processor Fault	Replace Processor
CLOCK BATTERY DEAD	ERROR 03	Real time clock battery dead	Replace Processor
HARDWARE ERROR Heading Stabilization is not available	ERROR 10 ERROR 11	Heading processing error	Check synchro wiring, heading source, 400Hz source
MIC KEY STUCK	MIC KEY STUCK	Inhibit line active >1 min.	Check mic key. Verify radios turned on. Verify continuity from pin 10, RP6381 to pin13, RP6220 and 2RP6220
MEMORY ERROR	ERROR 26 ERROR 27	System memory error	Replace processor

Self Test Error Messages
Table 102

C. Stormscope WX-1000/WX-1000+ System Troubleshooting

NOTE: Refer to Avionics and Optional Electrical Customization Wiring Manual for wiring diagram.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. Display Presentation Does Not Appear. Green LED not lit.		
a. No power to processor	Verify continuity from pins 34 and 35 of RP6381to the Stormscope circuit breaker.	Verify processor seated. Repair or replace defective circuit components as necessary to restore continuity.
2. *Display Presentation Does Not Appear. Green LED lit faintly.*		
a. Processor is getting power, but not power switch from display.	Verify continuity from pin21, RP6381 to pin 22, RP6382; pin 20, RP6381 to pin 23, RP6382.	Repair or replace defective circuit components as necessary to restore continuity.
3. Display Presentation Does Not Appear. Green LED lit brightly.		
a. Display malfunction	Brightness fully cw. Verify continuity between the following pins: RP6381 RP6382 39 8 22 7 6 6 23 5 40 9 7 10	Repair or replace defective circuit components as necessary to restore continuity.
4. Display Presentation Does Not Appear. Green and Yellow LED's lit.		
a. Processor power supply overload or fault.	Verify continuity between the following pins: RP6381 RP6382 3 19 38 18 36 14 RP6381 RP6383 14 D 30 A 47 J	Repair or replace defective circuit components as necessary to restore continuity.
5. Display Presentation Does Not Appear. Green and Red LED's lit.		
a. Processor is ON. Software detected fault. Problem in processor	Check brightness fully cw. Cycle power and verify self test passes or reports fault.	Repair or replace defective circuit components as necessary to restore proper system operation.

WX-1000/WX-1000+ Stormscope System Troubleshooting
Figure 101 (Sheet 1 of 3)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
6. Display Presentation is Distorted.		
a. Display cable wiring.	Verify continuity between the following pins: RP6381 RP6382 39 8 22 7 6 6 23 5 40 9 7 10	Repair or replace defective circuit components as necessary to restore proper system operation.
7. Display Presentation "Vibrates".		
a. Electrical or Magnetic Interference to display.	Perform noise test.	Repair or replace defective aircraft system components causing interference.
8. Improper Brightness Control. Focus Problem or "Blooming".		
a. Display problem.		Replace defective display.
9. Improper Response to Buttons.		
a. Display cable wiring	Verify continuity between the following pins: RP6381 RP6382 9 13 26 12 43 25 44 24	Repair or replace defective circuit components as necessary to restore continuity. Button 1 Button 2 Button 3 Button 4
10. System Plots Non-Existing Storms.		
a. Possible Interference	Perform noise test.	Repair or replace defective aircraft system components causing interference.
11. Improper Compass Tracking. Heading Incorrect.		
a. Synchro cable wiring	Verify continuity between pins 25, 41, 8, 11 and 28 of RP6381 and applicable RMI wiring	Repair or replace defective circuit components as necessary to restore continuity.

WX-1000/WX-1000+ Stormscope System Troubleshooting
Figure 101 (Sheet 2 of 3)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
12. No Response to WX-PA.		
a. Component or wiring failure. Interference	Check system wiring, particularly antenna cable. Verify continuity between the following pins: RP6381 RP6383 17 G 33 H 49 M 50 L 15 E 48 F	Repair or replace defective circuit components as necessary to restore proper system operation. Eliminate source of interference.
13. Improper Range or Azimuth With WX-PA.		
a. Test box problem	Verify WX-PA Antenna alignment. Verify WX-PA Menu sections.	Correct test box configuration
b. Antenna cable problem	E-W or N-S reversed. Verify NO continuity between the following pins: RP6381 RP6383 17 H 33 G 50 E 15 L	Repair or replace defective circuit components as necessary to restore continuity.
c. Self test problem	Verify that Self Test is disabled	Power up system while holding display button 4 (Software Ver. 1.21 or lower) or buttons 1 and 2 (Software Ver. 2.00 or higher) depressed. Disable self-test . System operation continues without self test when any display button is depressed.
14. WX-PA Strike Points Become Scattered, Delayed or Smeared.		
a. Possible interference.	Perform noise test.	Repair or replace defective aircraft system components causing interference.

WX-1000/WX-1000+ Stormscope System Troubleshooting
Figure 101 (Sheet 3 of 3)

D. Troubleshooting Electrical Noise

NOTE: A certain amount of noise is considered tolerable if storm data can still be read. This is acceptable if the noise data is clustered and occurs at a slow periodic rate.

(1) If it is suspected the system may not be operating properly due to electrical interference, perform the interference test. (Refer to paragraphs E and F.)
   (a) The noise source can be isolated by switching off one system at a time until the proper WX-PA response or system self test response is restored.
   (b) Electrical noise can be coupled into the WX-1000 or WX-1000+ system by several routes.
      1) Radiation directly into the antenna. The processor can be direct driven by the WX-PA with the antenna removed.
      2) Grounding problems. Ensure that all system grounds conform to Learjet standards. (Refer to Wiring Manual, Chapter 20.) It may be necessary to relocate the system airframe grounds or airframe grounds on the interference source.
      3) Excessive noise or ripple on the 28 vdc line to the processor. This can be confirmed by powering the processor from an isolated DC power source. Additional filtering on the processor or interference source may be required.
      4) Interference source may have a faulty component. Replace the suspected interference source.

E. Interference Test. (Software Version 2.00 or higher.)

NOTE: This test must be performed with aircraft engines running, all electrical systems and avionics operating, and RPM sufficient that aircraft generators can carry the full electrical load. This test should be conducted with a minimum of thunderstorm activity within a 400 mile radius. This test may be performed in flight or on the ground.

(1) Select the Service Menu by turning on the display with button 1 and 2 depressed. Release the buttons only after the Service Menu appears on the display.
(2) Move the highlight to the "Noise Tests" using the "NEXT" button and then press the "GO" button.

NOTE:
- Strike points appearing on the screen represent ambient electrical noise or thunderstorm activity within 400 miles. Strike points caused by thunderstorm activity can be verified by changing the aircraft heading and clearing the display. Strike points caused by interference will reappear at the same position on the screen.
- Some strike points outside the circle graticule are acceptable and usually will not affect system performance. Strike points inside the circle graticule, caused by electrical interference, may affect system performance, as they may also appear in the weather mapping mode. Strike points caused by switch transients are acceptable if they do not reappear after clearing the screen. A few non-clustered strike points inside the circle graticule are acceptable as they will not affect the presentation of thunderstorm activity.
- If excessive strike points or clusters appear inside the circle graticule due to interference, the source can be isolated by shutting down one system at a time, clearing the display and observing for the reappearance of the strike points.

(3) Press the display button labelled "TEST". A box will appear in the upper right portion of the screen for a bottom mounted antenna, or in the upper left portion for a top mounted antenna.

NOTE:
- Strike points generated by the automatic self test of the antenna should appear inside the box at a rate of one per second. Clear the screen frequently, each time observing that the strike points reappear inside the box within one second.
- Excessive electrical noise will delay or inhibit the appearance of strike points, or may cause the strike points to appear outside the box. An occasional strike point outside the box is acceptable.

(4) To pass the interference test the system must pass both the NOISE MONITOR TEST and the SELF TEST as described.

F. Interference Test. (*Software Version 1.21 and lower and all other Software Versions.*)

NOTE: This test must be performed with aircraft engines running, all electrical systems and avionics operating, and RPM sufficient that aircraft generators can carry the full electrical load. This test should be conducted with a minimum of thunderstorm activity within a 400 mile radius. This test must be conducted on the ground since the WX-PA portable analyzer is attached to the aircraft antenna.

(1) Select the 200 nm and 360 degree weather mapping mode. Set up the WX-PA to generate a circular pattern at 120 nm.

(2) Observe the display to ensure that a circular pattern of strike point clusters appear at each 30 degree increment and 120 nm. Clear the screen each time the strike clusters begin to repeat a given azimuth. Ensure that the strike point clusters appear in sequence, stepping to the next 30 degree azimuth at a constant rate.

NOTE:
- Excessive electrical noise will inhibit or delay the appearance of strike point clusters or may scatter the strike point clusters.
- If an error message appears, disable the self test feature and repeat the test.
- Extraneous strike point clusters may be caused by electrical interference or thunderstorm activity within 200 nm. Changing the aircraft heading and clearing the display will verify thunderstorm activity. Strike points caused by interference will reappear at the same position on the screen. Thunderstorm activity will reappear at a new azimuth.
- Electrical interference may be isolated by shutting down one system at a time, clearing the display, and observing for proper response.

1. Tools and Equipment

NAME	NUMBER	MANUFACTURER	USE
Portable Analyzer	WX-PA	3M Aviation Safety Systems Columbus, OH	Test and Program Stormscope Weather Mapping Systems.

2. Inspection/Check

A. Operational Check of WX-1000/WX-1000+ Stormscope Weather Mapping System

(1) Connect external electrical power source to aircraft.

(2) Set battery and inverter switches on.

(3) Ensure Stormscope circuit breaker is depressed.

(4) Power up Stormscope system and observe successful completion of self test. If a self test error occurs, refer to 34-43-00, Troubleshooting, for self test failure information.

(5) Turn off Stormscope system.

(6) Set up WX-PA test equipment as follows:

(a) Attach WX-PA antenna centered on Stormscope antenna with arrows aligned. *(See Figure 201.)*

NOTE: The suction cups on the WX-PA antenna should be moistened to ensure that they hold securely. The antenna cable is supplied with a suction cup to provide a strain relief for the WX-PA antenna.

(b) Connect antenna cable between WX-PA J1 and antenna J3.

(c) Depress POWER on keyboard and select "Continuous Output Mode".

(d) Set range at 170 nm using the F1 and F2 keys, and bearing at 0 degrees using the F3 and F4 keys.

(e) Select Series II with the "S" key.

(f) If the aircraft antenna is mounted on top of the aircraft, press "A" on the WX-PA to select "Top Mount".

NOTE: If "Top Mount" is not selected when testing a top mounted antenna the data displayed will be reversed East to West. The antenna mount default is "Bottom Mount".

(7) Power up Stormscope system in the "Self Test Disable" Mode by holding button 1 and 2 in while turning on power. Select 200 nm range and 360 degree weather mapping mode.

(8) Press "ENTR" on the WX-PA to start the test signal. Verify that the system is plotting discharge points inside the 200 nm range ring at 0 degrees.

(9) Change strike bearing on WX-PA to 90 degrees. Verify that system is plotting discharge points inside the 200 nm range ring at 90 degrees.

(10) Repeat step (9) at 180 and 270 degrees.

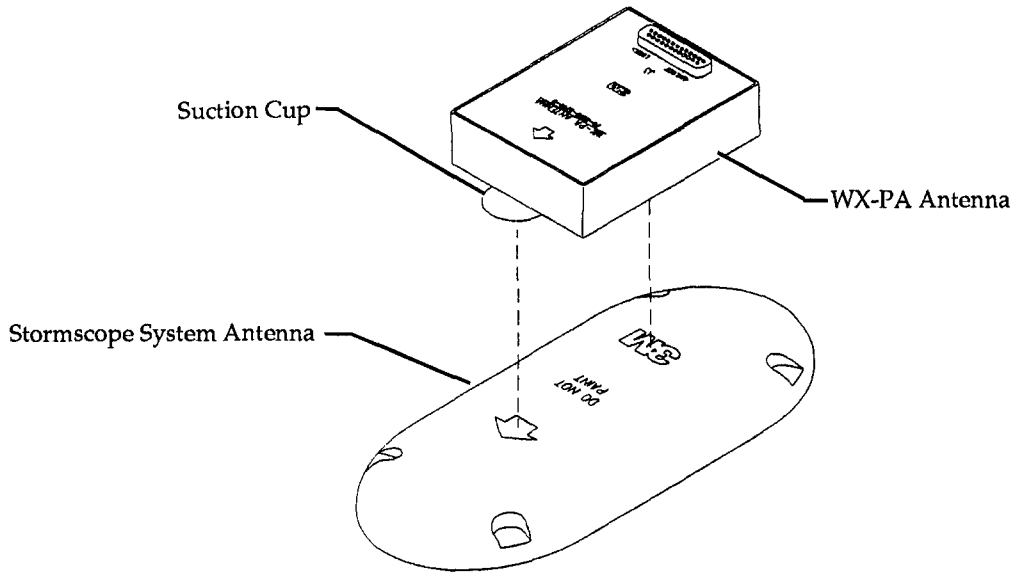
(11) Exit "Continuous Output Mode" and select "Circular Pattern Mode". Set WX-PA range to 120 nm and bearing to 30 degrees. Press "ENTR" to start the test strike output.

(12) Set Stormscope to 200 nm and 360 degree Weather Mapping Mode. Verify that a circle of discharge points is plotted outside the 100 nm range ring, spaced 30 degrees apart.

(13) Repeat step (12) with the Stormscope set to 100, 50 and 25 nm range, setting the WX-PA to 50, 30 and 15 nm correspondingly.
(14) Turn on all aircraft radios and set to an unused frequency.
(15) Set pilot's transmit selector to VHF1 and "CLEAR" Stormscope display. Key pilot's mic. Verify that no dots appear on display.
(16) Depress "CLEAR" button, while keying a microphone and verify that no dots appear. Continue to key mic for about 1 minute. Verify that "MIC KEY STUCK" message appears.
(17) Resume operation by pressing any key. The message "MIC KEY STUCK" will remain as long as the key remains stuck. Release mic key. Verify that message disappears.
(18) Repeat step (15) for copilot's transmit selector and microphone.

NOTE: If the Stormscope system does not plot correctly the antenna can be eliminated with the following procedure.

(19) Remove power from Stormscope system.
(20) Disconnect WX-PA antenna and system antenna. (Refer to 34-43-03, Removal/Installation.)
(21) Connect WX-PA antenna cable adaptor between WX-PA antenna cable and system antenna cable.
(22) Repeat steps (6) through (13). If the original problem persists, either the system wiring or processor is at fault. If the test results are good, then either the antenna is faulty or there is excessive electrical noise in the area of the antenna installation.
(23) Turn off Stormscope system and WX-PA tester.
(24) Remove electrical power from aircraft.



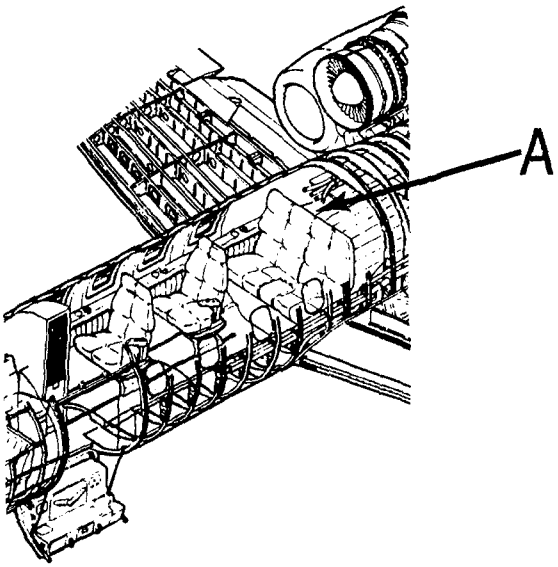
Repro

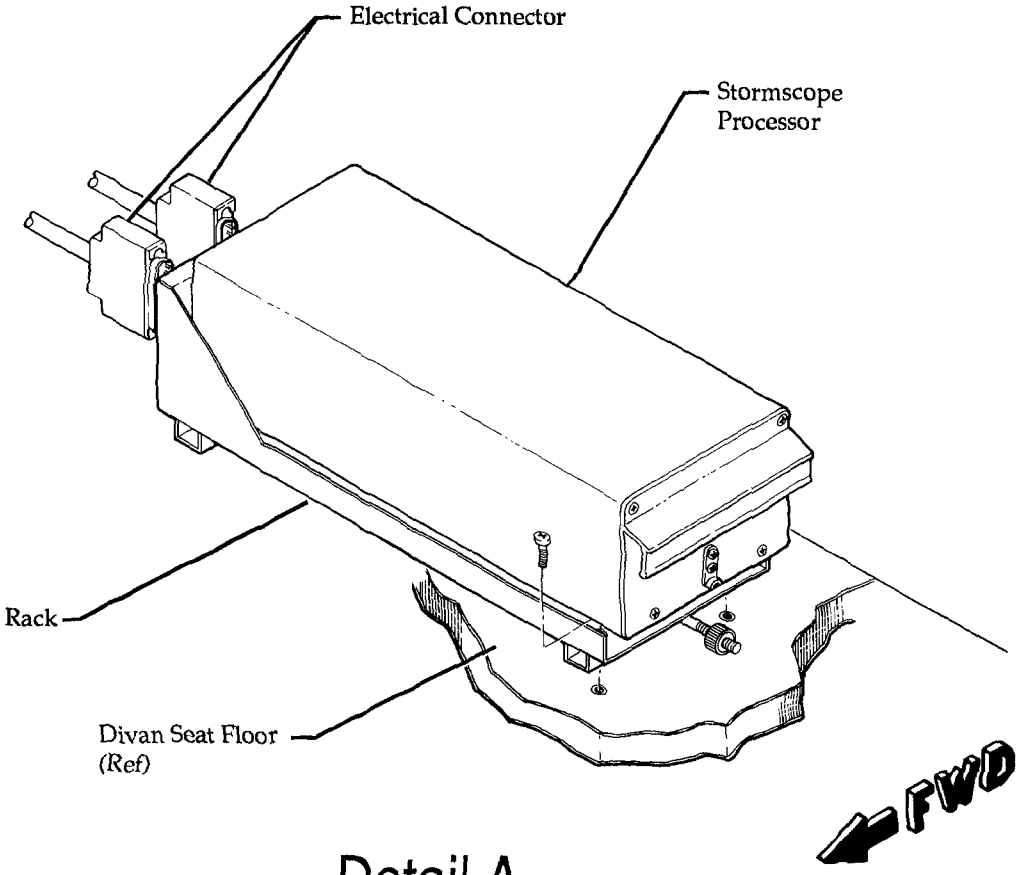
WX-PA Antenna Alignment
Figure 201

1. **Removal/Installation**
   A. Remove Stormscope Processor. (See Figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Remove seat and backrest cushions from divan.
      (3) Remove safety wire and loosen hold-down clamp securing Stormscope processor.
      (4) Remove processor from aircraft.
   B. Install Stormscope Processor. (See Figure 201.)
      (1) Install Stormscope processor and secure hold-down clamp.

      NOTE: If Stormscope processor is being replaced, verify electrical configuration jumper plug (RP6385) is removed from defective processor and installed on replacement unit connector (J302).

      (2) Safety wire processor hold-down clamp.
      (3) Install divan seat and backrest cushions.
      (4) Restore electrical power to aircraft.
      (5) Perform operational check of Stormscope system. (Refer to 34-43-00, Inspection/Check.)



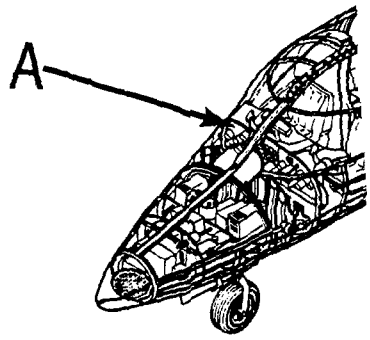


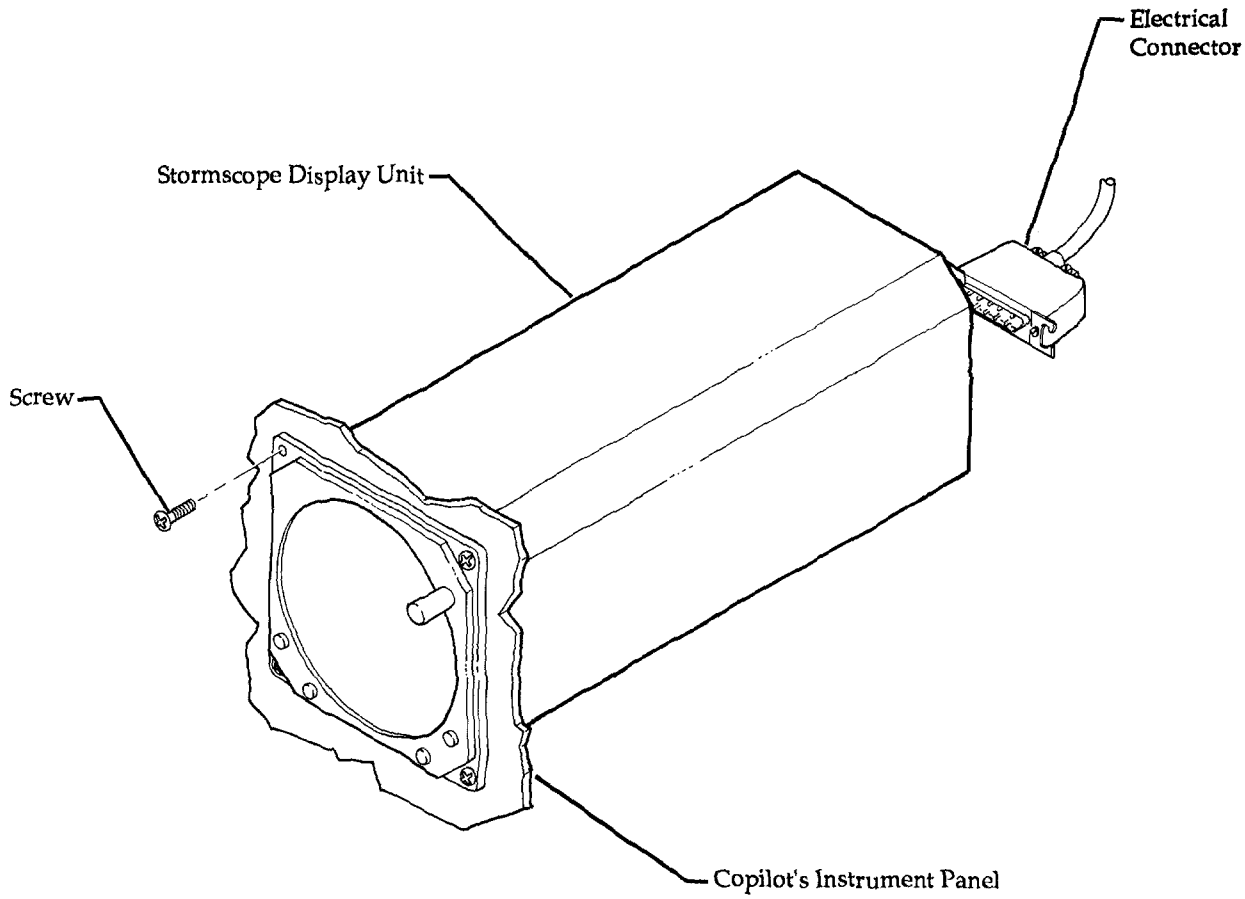
Detail A

10-201B

Stormscope Processor Installation
Figure 201

1. **Removal/Installation**
   A. Remove Stormscope Display. (See Figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Remove attaching parts and pull Stormscope display out of copilot's instrument panel.
      (3) Disconnect electrical connector (RP6382) from display connector (J101).
      (4) Remove display from aircraft.
   B. Install Stormscope Display. (See Figure 201.)
      (1) Connect electrical connector (RP6382) to Stormscope display connector (J101).
      (2) Install display in copilot's instrument panel and secure with attaching parts.
      (3) Restore electrical power to aircraft.
      (4) Perform operational check of Stormscope system. (Refer to 34-43-00, Inspection/Check.)





Detail A

10-204A

Stormscope Display Installation
Figure 201

EFFECTIVITY: OPTIONAL

1. **Removal/Installation**

A. Remove Stormscope Antenna. (See Figure 201.)

NOTE: Due to the possibility of electrical interference, antenna location may vary from aircraft to aircraft, depending on optional equipment installations.

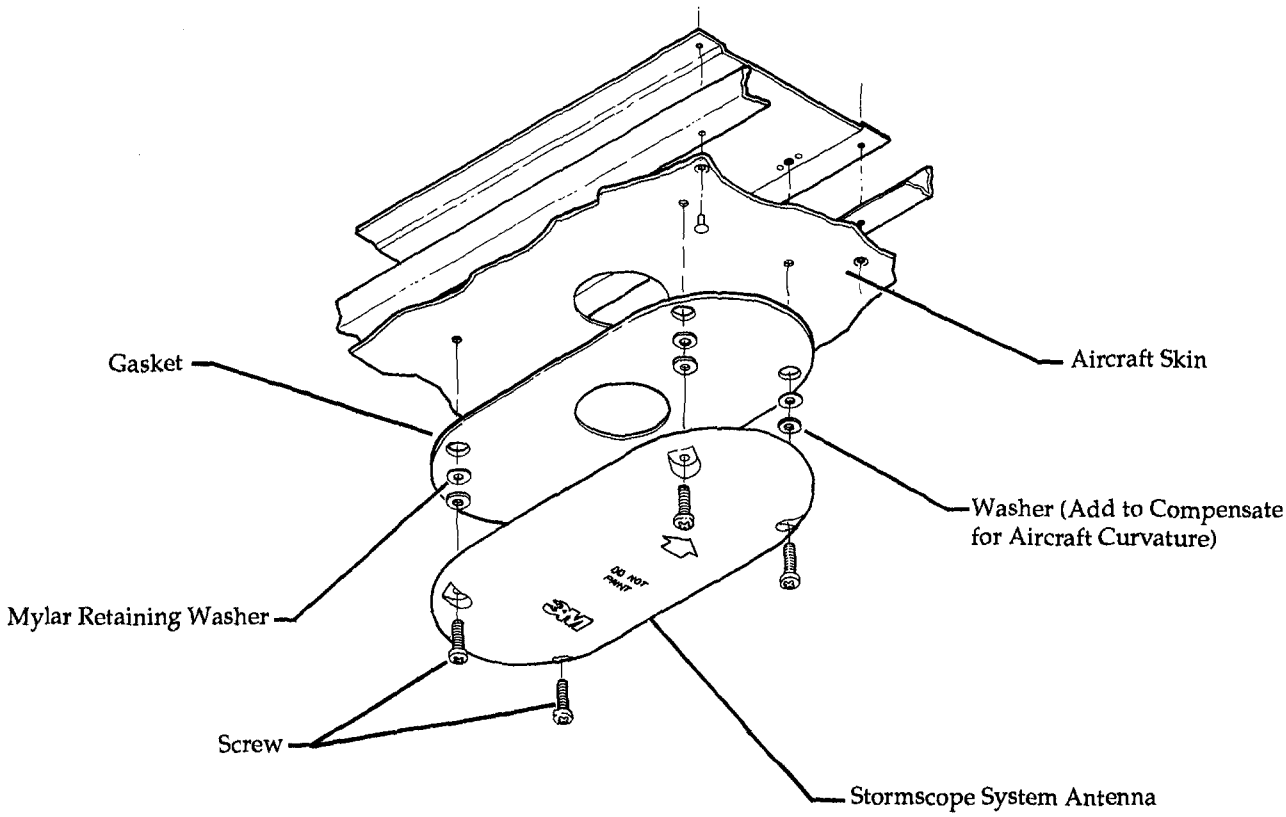
(1) Remove electrical power from aircraft.
(2) Remove screws securing Stormscope antenna to aircraft.

CAUTION: WHEN REMOVING SEALANT, USE CARE NOT TO DAMAGE AIRCRAFT SKIN.

(3) Cut sealant and remove antenna from skin surface, using caution not to damage antenna gasket.
(4) Disconnect electrical connector (RP6383) from antenna connector (J201), and remove antenna and gasket from aircraft.

NOTE: On top mounted antenna, attach a length of string around antenna cable just behind connector and secure loose end of string to keep antenna cable from slipping back into fuselage.

B. Install Stormscope Antenna. (See Figure 201.)
(1) Clean all traces of old sealant from fuselage skin.
(2) Position antenna gasket on antenna.
(3) Connect electrical connector (RP6383) to antenna connector (J201).
(4) Apply sealant (Pro-Seal 890B or equivalent) around connector opening in aircraft skin.
(5) Position antenna on aircraft skin and secure with attaching parts.
(6) Clean antenna base and fuselage mating area with a clean cloth and methyl-ethyl-ketone (MEK).
(7) Apply fillet seal (Pro-Seal 890B) around entire perimeter of antenna.
(8) Restore electrical power to aircraft.
(9) Perform operational check of Stormscope system. (Refer to 34-43-00, Inspection/Check.)



10-203A

Stormscope Top Antenna Installation (Typical)
Figure 201

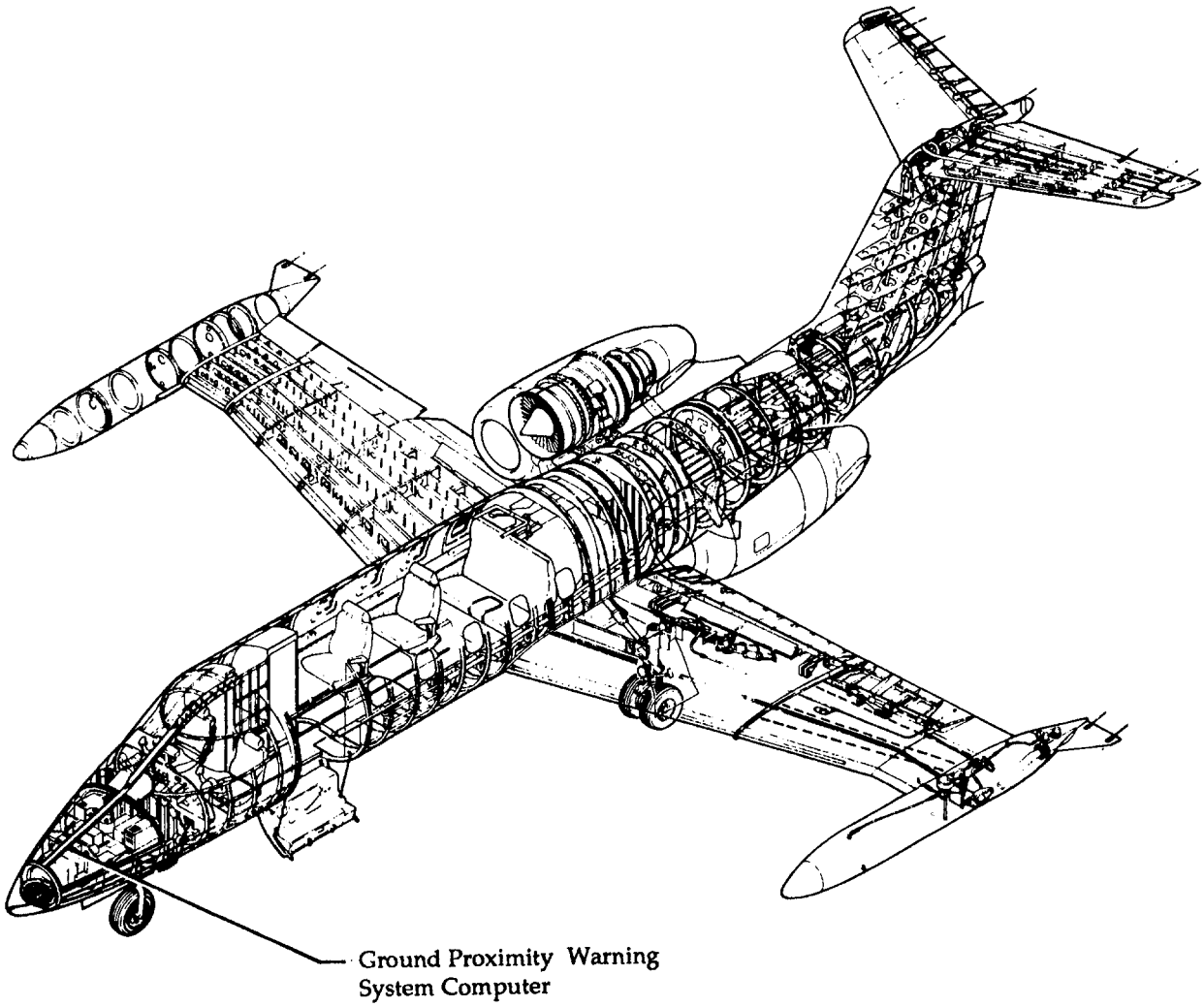
GROUND PROXIMITY WARNING SYSTEM (GPWS) - DESCRIPTION AND OPERATION

1. **Description** (See Figure 1.)
   A. The Ground Proximity Warning System (GPWS) consists of a ground proximity warning system computer, associated annunciators, a flap position override switch, and utilizes control circuits in the STU-3 and 2STU-3 switching terminal units.
   B. The ground proximity warning system automatically and continuously monitors the airplanes flight path with respect to terrain at all altitudes between 50 and 2450 feet. If the airplanes projected flight path would imminently result in terrain impact, the system issues appropriate visual and voice warnings. Warnings are issued for excessive sink rate, excessive terrain closure rate, descent after takeoff, proximity to terrain with flaps and/or gear up, descent below glideslope and descent below decision height (DH).
   C. Voice warnings are made through the cockpit speakers and the headphones. The system receives inputs from the #1 air data computer, radio altimeter, navigation receiver (G/S), nose gear down and locked switch and the right flap 25° switch.
   D. The system operates on 28 vdc and 115 vac supplied through the 1 amp GPWS circuit breakers on the copilot's circuit breaker panel.
   E. Component Description
      (1) Ground Proximity Warning Computer (GPC2) - The ground proximity warning system computer is located in the nose compartment equipment section just aft of frame 1, at BL 0.00.

2. **Operation**
   A. GPWS Flight Operation - During flight, operation of the GPWS is fully automatic and requires no special procedures provided the system is receiving power and the proper inputs. A system malfunction, except for altitude rate input, will be indicated by illumination of the GPWS FAIL annunciators.

      NOTE: If AC power to the pilot's altimeter is lost, the GPWS FAIL annunciators will not illuminate. However, all GPWS modes associated with altitude rate (Modes 1 and 3) will be inoperative.

   B. System warnings are as follows:
      (1) Mode 1 (Excessive Sink Rate) - Warning is given for excessive rate of descent below 2450 feet radio altitude. This mode has two boundaries. When the outer boundary is penetrated, a "SINK RATE" voice warning will be given and the PULL UP annunciator will illuminate and flash. The sink rate warning will continue until the condition is corrected. If the condition is not corrected and the inner boundary is penetrated, a "WHOOP, WHOOP, PULL UP" voice warning will be given. Warning will cease when aircraft is flown out of warning envelope.
      (2) Mode 2 (Excessive Terrain Closure Rate) - Excessive terrain closure rate below 2450 feet radio altitude. This mode has two boundaries with respect to rising terrain. For increased closure rates above 1500 feet radio altitude the upper limit is increased from 0.35 MI to 0.45 MI and the mode sensitivity is increased. When the outer boundary is penetrated, a "TERRAIN, TERRAIN" voice warning will be given and the PULL UP annunciator will illuminate and flash. If the aircraft remains within the warning envelope, a "WHOOP, WHOOP, PULL UP" voice will be given repeatedly. When the aircraft departs the warning boundary, due to either terrain changes or a pull up maneuver, the voice warning changes to "TERRAIN, TERRAIN, TER...". The repeating "TERRAIN" voice warning will continue until the aircraft has gained an additional 300 feet barometric altitude from the point where the pull up warning stopped.
      (3) Mode 3 (Descent After Takeoff) - Warning is given if aircraft loses barometric altitude after takeoff between 65 and 700 feet. If the altitude loss boundary is penetrated, the "DON'T SINK" voice warning will be given repeatedly until a positive rate of climb is established. At a climb out altitude of 100 feet, a 15 foot altitude loss will trigger the warning. At 700 feet, an altitude loss of 70 feet is required to trigger the warning.



Ground Proximity Warning System (GPWS) Component Locator
Figure 1

(4) Mode 4 (Terrain Clearance - Not in Landing Configuration) - Warning is given when the aircraft is near terrain (below 1000 feet) and not in the landing configuration (Flaps and Gear -- Down). These warnings are given even with low closure rates. Three types of warnings are given under this mode.

(a) Too Low Terrain Warning - If the aircraft is near terrain at high speed with the gear and flaps not down the "TOO LOW, TERRAIN" voice warning will be given repeatedly and the PULL UP annunciators will illuminate and flash. At 1000 feet radio altitude the warning boundary occurs at 0.45 MI and, as the altitude decreases to 500 feet, the warning boundary decreases linearly to 0.35 MI.

(b) Too Low Gear Warning - If the aircraft penetrates 500 feet radio altitude below 0.35 MI with the landing gear up, the "TOO LOW, GEAR" voice warning will be given repeatedly.

(c) Too Low Flaps Warning - If the aircraft penetrates 200 feet radio altitude below 0.29 MI with the landing gear down and the flaps not full down (40°), the "TOO LOW, FLAPS" voice warning will be given repeatedly. Above 0.29 MI, the "TOO LOW, TERRAIN" voice warning will be given. In the event a landing must be made with the flaps not full down, the GPWS FLAPS Switch on the pedestal may be used to override the warning.

(5) Mode 5 (Descent Below Glideslope) - Below 1000 feet radio altitude during an ILS approach, a warning is given if glideslope deviation exceeds 1.3 dot fly-up. The warning occurs at two levels. When the glideslope deviation reaches 1.3 dots fly-up, the "GLIDESLOPE" voice warning will be given repeatedly and the BELOW G/S annunciators will illuminate. Volume of this message is 6 dB below that of the PULL UP message. The "GLIDESLOPE" voice warning repeats at an increased rate as the deviation increases and/or the altitude decreases. Between 300 feet and 150 feet radio altitude and deviation of 2.0 dots fly-up or more, the volume of the "GLIDESLOPE" voice warning increases to the volume level of the PULL UP message. Below 150 feet of radio altitude, the amount of glideslope deviation necessary to produce a warning is increased to eliminate nuisance warnings caused by proximity to the glideslope transmitter. The glideslope warnings may be cancelled by flying the aircraft to within 1.0 dot deviation or by depressing either GS INH annunciator switch. Glideslope warnings are automatically inhibited during an ILS Backcourse approach when the localizer is captured.

(6) Mode 6 (Below Selected Decision Height) - When the aircraft descends through the decision height selected on the radio altimeter, and the aircraft is below 1000 feet radio altitude, the "MINIMUMS, MINIMUMS" voice alert will be given once and the DH annunciator on the RAD ALT display unit will illuminate. To inhibit this advisory for VFR approaches, set DH to zero.

B. GPWS Warning Priority - Two or more warning envelopes may be penetrated simultaneously; therefore, a priority for voice warnings has been established. Voice warnings of a higher priority will override a lower priority message in progress and lower priority messages will function only upon cessation of higher priority messages. The message priority is as follows:

Priority	Message	Mode
1	WHOOP, WHOOP, PULL UP	1 and 2
2	TERRAIN	2
3	TOO LOW, TERRAIN	4
4	TOO LOW, GEAR	4A
5	TOO LOW, FLAPS	4B
6	MINIMUMS	6
7	SINK RATE	1
8	DON'T SINK	3
9	GLIDESLOPE	5

C. Component Operation

(1) GPWS Flap Switch - The GPWS FLAP Switch, located on the forward pedestal, is used to inhibit the Mode 4 "TOO LOW, FLAPS" voice warning. When the switch is set to NORM, the "TOO LOW, FLAPS" voice warning will be given whenever the aircraft is below 200 feet radio altitude and 0.28 MI. When the switch is set to OVRD, the voice warning will be inhibited.

(2) GPWS Fail Annunciators - The amber GPWS FAIL annunciators on the pilot's and copilot's instrument panels illuminate to indicate a GPWS system malfunction. The GPWS computer continuously monitors system power supply and computer inputs. Should a fault occur, the computer will cause both GPWS FAIL annunciators to illuminate.

NOTE: The GPWS FAIL annunciators will not illuminate if AC power to the pilot's altimeter is lost; however, all GPWS modes associated with altitude rate (Modes 1 and 3) will be inoperative.

(3) GPWS Test Annunciator Switches - The white GPWS TST annunciator switches on the pilot's and copilot's instrument panels are used to initiate self test of the GPWS. Each annunciator switch lens is divided into two portions. The upper half is labeled GPWS TST and the lower half is used for the PULL UP annunciation. In order to perform the GPWS test, the flaps must not be down (below 25°), the GPWS flap switch must be set to NORM, the radio altimeter and navigation receiver must be on, and the pilot's altimeter must be operating. When all the conditions are met, depressing and holding either GPWS TST annunciator/switch will initiate self test of the system. When the test is initiated the GPWS FAIL and BELOW GS annunciators will illuminate and the "GLIDESLOPE" voice warning will be given. After approximately one second the PULL UP annunciators will illuminate and flash and the "WHOOP, WHOOP, PULL UP" voice warning will be given. When the GPWS TST switch is released the voice warning will cease and the annunciator lights will go out.

(4) PULL UP Annunciators - The red PULL UP annunciators on the pilot's and copilot's instrument panels illuminate and flash in con- junction with modes 1, 2 and 4. In modes 1 and 2, the PULL UP annunciation is given in conjunction with the "WHOOP, WHOOP, PULL UP" voice warning. In mode 4 the PULL UP annunciation is given in conjunction with the "TOO LOW, TERRAIN" voice warning.

(5) GS INH Annunciator Switches - The white GS INH annunciator switches on the pilot's and copilot's instrument panels are used to inhibit mode 5 visual and voice warnings. Each annunciator switch lens is divided into two portions. The upper half is labeled GS INH and the lower half is used for the BELOW G/S annunciation. When the GS INH annunciator switch is depressed after descending below 1000 feet radio altitude will inhibit the "GLIDESLOPE" voice warning and the BELOW G/S annunciator light. The mode will automatically re-arm after a missed approach, landing, or climb above 1000 feet radio altitude.

(6) BELOW G/S Annunciator - The amber BELOW G/S annunciators on the pilot's and copilot's instrument panels illuminate to indicate that glideslope deviation more than 1.3 dots below the glideslope. The BELOW G/S annunciation is always given in conjunction with the "GLIDESLOPE" voice warning. The BELOW G/S annunciation and the voice warning can be inhibited using the GS INH annunciator switch.

GROUND PROXIMITY WARNING SYSTEM (GPWS) - TROUBLESHOOTING

1. Troubleshooting

A. Tools and Equipment

NOTE: Equivalent substitutes may be used in lieu of the following:

NAME	PART NUMBER	MANUFACTURER	USE
Multimeter	Simpson 260	Simpson	Check voltages and continuity.

B. Ground Proximity Warning System (GPWS) Troubleshooting. (See Figure 101.) (Refer to Avionics and Optional Electrical Customization Wiring Manual for Ground Proximity Warning System wiring diagrams.)

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
1. GPWS Inoperative, GPWS FAIL Annunciator Illuminated.		
a. Loss of 115 vac power.	Check for open GPWS 115 vac circuit breaker.	Depress GPWS 115 vac circuit breaker.
b. Open circuit to GPWS.	Check for continuity in all power supply wires and all ground wires.	Repair or replace defective wiring or components as necessary.
c. Faulty GPWS Computer.	Check for continuity in the GPWS interconnect wiring. Substitute with known operational GPWS Computer.	Replace GPWS Computer. (Refer to 34-44-01, Removal/ Installation.)
2. Visual Annunciators Inoperative in Test Mode.		
a. Loss of 28 vdc power.	Check for open GPWS 28 vdc circuit breaker.	Depress GPWS 28 vdc circuit breaker.
b. Open circuit to GPWS.	Check for continuity in all power supply wires and all ground wires.	Repair or replace defective wiring or components as necessary.
3. Aural Annunciators Inoperative.		
a. Faulty GPWS Computer.	Check for continuity in the GPWS interconnect wiring. Substitute with known operational GPWS Computer.	Replace GPWS Computer. (Refer to 34-44-01, Removal/ Installation.)

Ground Proximity Warning System (GPWS) Trouble Shooting
Figure 101

1. Tools and Equipment

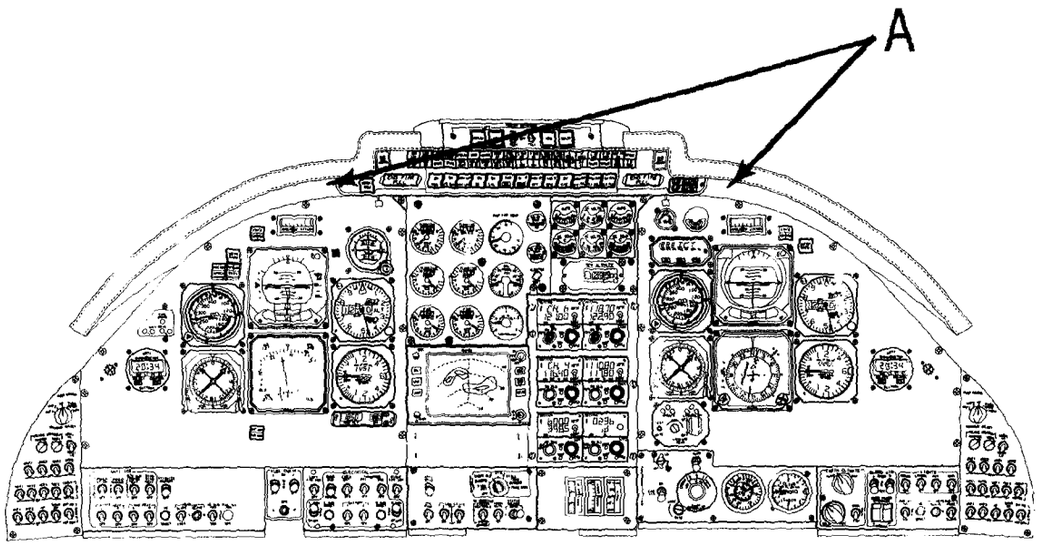
NOTE: Equivalent substitutes may be used in lieu of the following:

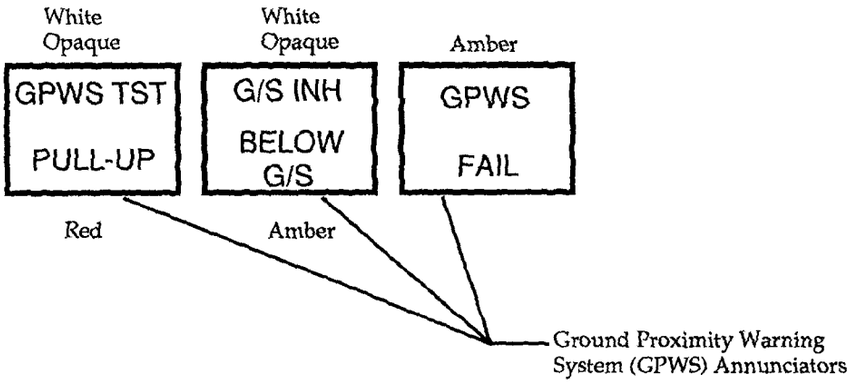
NAME	NUMBER	MANUFACTURER	USE
Stopwatch		Commercially available	Perform tests
Air Data Tester (Pitot/Static System Tester)	VPT-10C-28888	Intercontinental Dynamics Corp. Wichita, KS	Apply pressure or vacuum to system.
Radio Altimeter Simulator	Fabricate locally		Simulate radio altitude signal.
Glideslope Ramp Tester	TIC-T30A		Simulate glide-slope signal.
Digital VTVM	8010	Fluke	Measure voltage.

2. Adjustment/Test

A. Functional Test of Ground Proximity Warning System (GPWS)

(1) Place aircraft on jacks. (Refer to Chapter 7.)
(2) Connect external electrical power to aircraft.
(3) Verify that all required circuit breakers are depressed.
(4) Set Battery Switches and Inverter Switches on.
(5) Verify that DC VOLTS meter on instrument panel indicates +28 (±2) vdc.
(6) Verify that GPWS FLAP Switch is set to NORM, radio altimeter transceiver and navigation receiver are on, and pilot's altimeter is operating.
(7) Set flaps UP (0°).
(8) Ensure that landing gear is down and locked.
(9) Perform GPWS self test. (See Figure 201.)
  (a) Press and hold pilot's GPWS TST Switch, located at the upper LH corner of the pilot's instrument panel. Pilot's and copilot's BELOW G/S and GPWS FAIL annunciators shall illuminate. Voice annunciation "GLIDESLOPE" shall be heard.
  (b) Approximately one second after initiation of self test, pilot's and copilot's PULL UP annunciators shall flash and voice warning "WHOOP, WHOOP, PULL UP" shall sound.
  (c) Release GPWS TST Switch. All annunciators shall extinguish and all voice warnings shall cease.
  (d) Repeat test using copilot's GPWS TST Switch, located on upper RH corner of copilot's instrument panel.
(10) Perform GPWS inhibit test.
  (a) Pull GPWS (115 vac) circuit breaker, located on the copilot's circuit breaker panel. Reset circuit breaker. No GPWS warnings shall occur.
  (b) Pull RAD ALT circuit breaker. GPWS FAIL annunciator illuminates. Reset circuit breaker. GPWS FAIL annunciator extinguishes.





Detail A

Ground Proximity Warning System (GPWS) Annunciator Installation
Figure 201

NOTE: Approximately a 5-second delay is involved for annunciator to illuminate and extinguish.

(c) Pull ALTM circuit breaker, located on the pilot's circuit breaker panel. Press PULL UP Switch. G/S and GPWS FAIL annunciators shall illuminate and voice annunciation "GLIDESLOPE" shall sound. Reset circuit breaker.

B. Operational Check of GPWS.

(1) Connect Air Data Tester to aircraft and perform leak check of pitot/static system. (Refer to Chapter 34.)

(2) Attach radio altimeter simulator to Collins radio altimeter receiver/transmitter. (See Figure 202.)

(a) Pull RAD ALT circuit breaker.

(b) Remove radio altimeter receiver/transmitter from rack mount.

NOTE: The radio altimeter receiver/transmitter may be located in the nose compartment or the baggage compartment electronics area.

(c) Plug simulator plug P2 into rack mount electrical connector and P1 into connector on rear of radio altimeter receiver/transmitter.

(d) Connect voltmeter to simulator TP1 and TP2.

(e) Depress RAD ALT circuit breaker and turn on altimeter system.

(d) Set radio altitude to zero feet. (See Figure 203.)

NOTE:
- ARINC voltages shall be used when simulating radio altitude. (See Figure 203.)
- The descent rates may be read from the radio altimeter indicator.

(3) Check Warning Mode 3 - Altitude Loss After Take Off.

(a) Set Air Data Tester to a 10,000 (±100) feet altitude.

(b) Set radio altitude to 500 feet.

(c) Decrease barometric altitude at a rate of 350 (±50) FPM. After a barometric altitude loss of between 32 to 90 feet, (average 65 - 70 feet) voice annunciation "DON'T SINK" shall activate.

(d) Discontinue descent rate and begin a climb rate of 300 FPM. Voice annunciation shall cease.

(e) Increase radio altitude to 1000 feet

(f) Decrease barometric altitude 300 feet at a rate of 300 FPM. No aural warning shall sound.

(4) Check Warning Mode 1 - Excessive Sink Rate.

(a) Set barometric altitude to 15,000 (±100) feet.

(b) Set radio altitude to 1850 feet.

(c) Smoothly adjust Air Data Tester for a decreasing altitude. At a rate of 4000 (±400) FPM, voice annunciation "SINK RATE" shall activate.

(d) Immediately decrease radio altitude to approximately 1200 feet. At 1200 (±200) feet, voice annunciation "WHOOP, WHOOP, PULL UP" shall activate.

(e) Decrease rate of descent to 2000 FPM. Voice annunciation shall cease.

(f) Set barometric altitude to 1000 feet AGL.

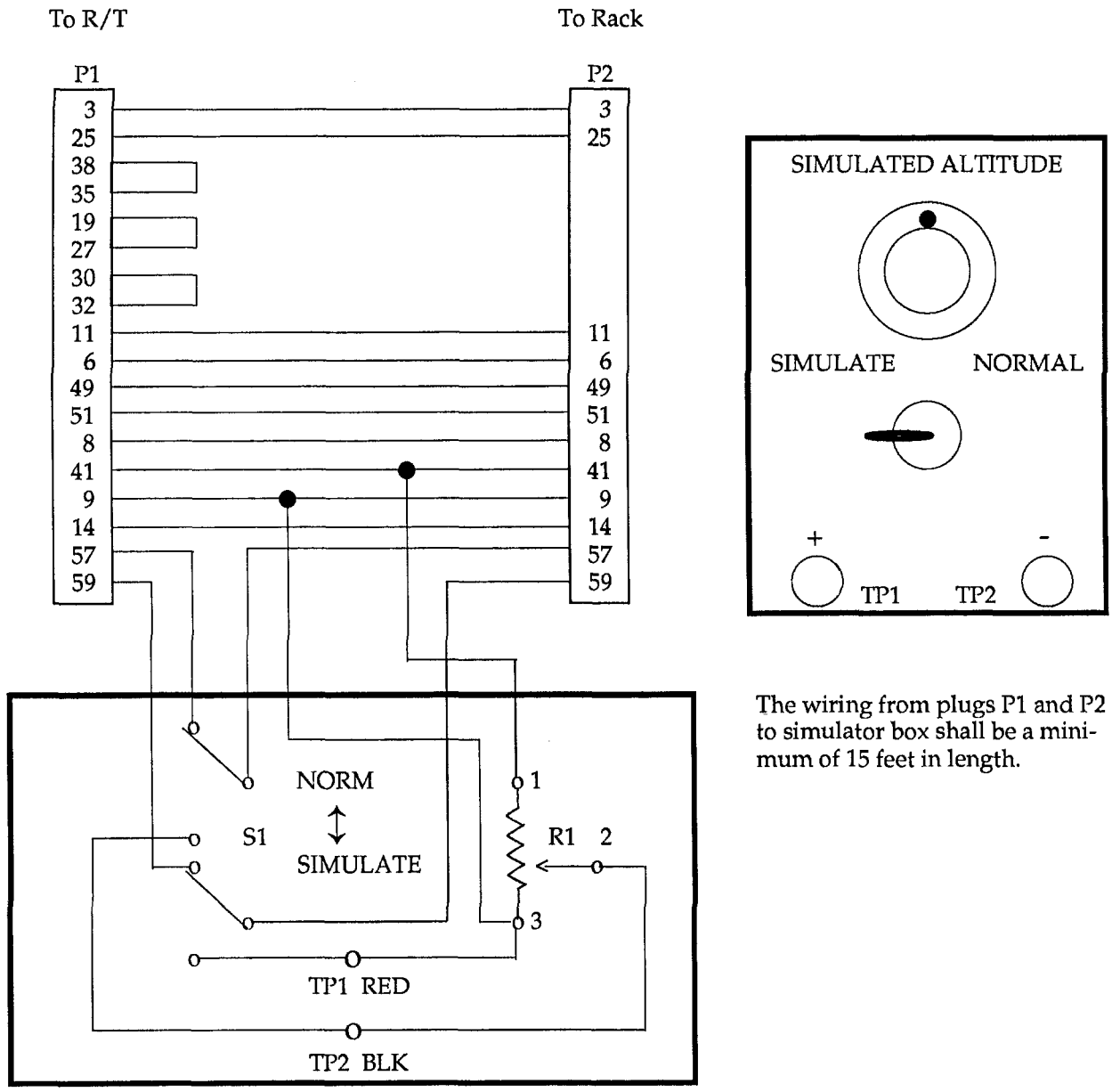
(5) Check Warning Mode 4 - Landing Gear and Flaps.

(a) Raise landing gear and verify that gear is not down and locked.

(b) Set Air Data Tester to simulate an airspeed of 325 knots and an altitude of 1000 feet AGL.

NOTE: Disregard the warning horn if it activates at this time. This is not part of the GPWS.

(c) Set radio altitude to 1500 feet.



The wiring from plugs P1 and P2 to simulator box shall be a minimum of 15 feet in length.

SYMBOL	PART NUMBER	NOMENCLATURE	VENDOR
R1	RV4NAY5D253A 35095	Resistor	A • B Bourns
TP2	1505BLK	Test Point	
TP1	1505R	Test Point	
P2	621-1545-001	Connector	Collins
P1	618-1657-001	Connector	Collins
S1	MST 305D	Switch	Alcon
Box	ZT48-80C	Box	Zero Can

T2670100

Radio Altimeter Simulator
Figure 202

(d) Decrease radio altitude at approximately 500 FPM.
(e) At a radio altitude of 1000 (±100) feet, voice annunciation "TOO LOW, TERRAIN" shall activate.
(f) Slowly decrease simulated airspeed. Voice annunciation shall cease before airspeed reaches 100 knots. Continue decreasing airspeed to 100 knots.
(g) Continue to decrease radio altitude at 500 FPM.
(h) At a radio altitude of 500 (±50) feet, voice annunciation "TOO LOW, GEAR" shall activate.
(i) Lower landing gear. Voice annunciation shall cease.
(j) Continue to decrease radio altitude at 500 FPM.
(k) At a radio altitude of 200 (±20) feet, voice annunciation "TOO LOW, FLAP" shall activate.
(l) Set GPWS FLAP Switch to OVRD. Voice annunciation shall cease. Set GPWS FLAP Switch to NORM. Voice annunciation shall remain off.
(m) Set radio altitude to 800 feet AGL.
(n) Decrease radio altitude at a rate of 500 FPM.
(o) At a radio altitude of 200 (±20) feet, voice annunciation "TOO LOW, FLAP" shall activate.
(p) Set flaps to FULL DOWN. Voice annunciation shall cease.
(q) Return flaps to FULL UP. Voice annunciation shall remain off.

(6) Check Warning Mode 5 - Below Glideslope.
(a) Set radio altitude to 1500 feet.
(b) Select 108.10 MHz on NAV 1 control.
(c) Using a glideslope ramp tester, simulate a full scale "fly up" glideslope signal. No GPWS warning shall occur.
(d) Set glideslope tester for zero glideslope deviation.
(e) Set radio altitude to 900 feet.
(f) Slowly adjust glideslope ramp tester for a "fly up" signal. At 1.3 (±0.2) dots indicated glideslope deviation, BELOW G/S annunciator shall illuminate and voice annunciator "GLIDESLOPE" shall activate.

NOTE: Glideslope deviation must be adjusted very slowly. Glideslope warning may take several seconds (up to 15) to activate.

(g) Set NAV LT Switch on. Verify that BELOW G/S annunciator dims.
(h) Set NAV LT Switch off. Verify that BELOW G/S annunciator returns to its original illumination.
(i) Momentarily depress BELOW G/S annunciator. Verify that glideslope warning ceases.
(j) Set radio altitude to 1200 feet.
(k) Slowly decrease radio altitude. At 1000 (±100) feet, voice annunciator "GLIDESLOPE" will activate.
(l) Continue to slowly decrease radio altitude. Rate of repetition of voice annunciator shall increase as altitude decreases.
(m) Set radio altitude to 250 feet.
(n) Increase glideslope deviation slowly to full up. Voice annunciator repetition rate and volume shall increase.
(o) Rotate pilot's HSI course indicator into REV CRS. Voice annunciation shall cease. Rotate pilot's HSI course indicator back to normal heading position. Voice annunciator shall resume.
(p) Momentarily depress BELOW G/S annunciator. Glideslope warning shall cease.

(7) Check Warning Mode 2 - Terrain Closure Rate.
(a) Set flaps UP (0°).
(b) Raise landing gear.
(c) Set pitot/static test set to 3000 feet AGL. Maintain this altitude during entire test.
(d) Set radio altitude to 2500 feet.

NOTE: Several attempts may be necessary to accomplish the following step. The objective is to adjust the radio altitude in a manner that simulates a constant rate of change in altitude.

(e) Smoothly and continuously decrease radio altitude from 2500 feet to 1000 feet at a rate of 5000 FPM. This altitude change takes 15 to 18 seconds.
(f) When PULL UP annunciator begins to flash and voice annunciation "TERRAIN, TERRAIN, followed by "WHOOP, WHOOP, PULL UP" activates, discontinue radio altitude change. This shall occur between 2000 feet and 1000 feet radio altitude.
(g) Set NAV LT Switch on and verify that PULL UP annunciator dims.
(h) Set NAV LT Switch off and verify that PULL UP annunciator returns to original brightness.
(i) Slowly increase barometric altitude by 300 to 400 feet from value in step (7) (a). Voice annunciation shall cease.
(j) Repeat steps (7) (c) through (7) (f).
(k) Set GPWS FLAP switch to OVRD. Verify that voice annunciation ceases.
(l) Set GPWS FLAP switch to NORM and verify that voice annunciation remains off.

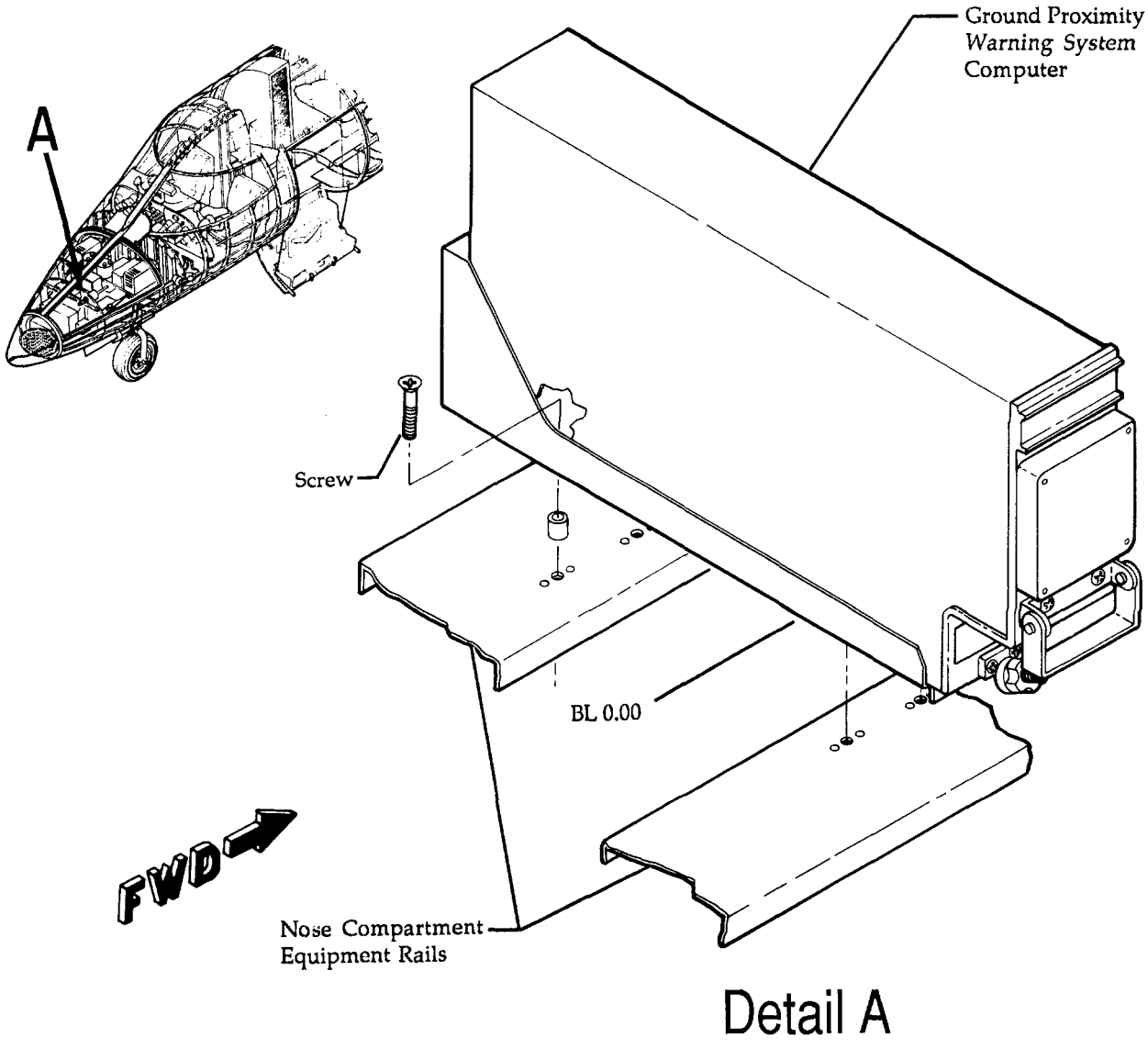
(8) Check Warning Mode 6 - Below Selected Decision Height.
(a) Set radio altitude to 900 feet.
(b) Adjust radio altimeter fiducial marker to 950 feet.
(c) Radio altitude warning lamp shall illuminate and voice annunciation"MINIMUMS" activates.
(d) Set radio altimeter fiducial marker to 50 feet.
(e) Verify that radio altimeter altitude warning lamp extinguishes and that voice annunciation ceases.
(f) Set radio altitude to 50 feet or less.
(g) Move radio altimeter fiducial marker and verify that voice annunciation "MINIMUMS" does not occur below 50 feet radio altitude.

(9) Set landing gear selector to DOWN AND LOCKED.
(10) Remove aircraft from jacks. (Refer to Chapter 7.)
(11) Disconnect all test equipment.
(12) Restore aircraft to normal.

ALTITUDE (FEET)	NOMINAL DC ANALOG ALTITUDE OUTPUT VOLTAGE (V)	ALTITUDE (FEET)	NOMINAL DC ANALOG ALTITUDE OUTPUT VOLTAGE (V)
0	0.400	360	7.600
10	0.600	370	7.800
20	0.800	380	8.000
30	1.000	390	8.200
40	1.200	400	8.400
50	1.400	410	8.600
60	1.600	420	8.800
70	1.800	430	9.000
80	2.000	440	9.200
90	2.200	450	9.400
100	2.400	460	9.600
110	2.600	470	9.800
120	2.800	480	10.000
130	3.000	490	10.200
140	3.200	500	10.400
150	3.400	600	10.700
160	3.600	700	11.000
170	3.800	800	11.300
180	4.000	900	11.600
190	4.200	1000	11.900
200	4.400	1100	12.200
210	4.600	1200	12.500
220	4.800	1300	12.800
230	5.000	1400	13.100
240	5.200	1500	13.400
250	5.400	1600	13.700
260	5.600	1700	14.000
270	5.800	1800	14.300
280	6.000	1900	14.600
290	6.200	2000	14.900
300	6.400	2100	15.200
310	6.600	2200	15.500
320	6.800	2300	15.800
330	7.000	2400	16.100
340	7.200	2500	16.400
350	7.400		

Altitude Conversion Table (ARINC Std. #552A) - Radio Altimeter Simulator
Figure 203

1. **Removal/Installation**
   A. Remove Ground Proximity Warning System Computer. (See figure 201.)
      (1) Remove electrical power from aircraft.
      (2) Remove nose compartment access panel.
      (3) Disconnect attaching parts and remove computer from aircraft.
   B. Install Ground Proximity Warning System Computer. (See figure 201.)
      (1) Position computer in aircraft and secure with attaching parts.
      (2) Restore electrical power to aircraft.
      (3) Perform Functional Test of Ground Proximity Warning System (GPWS). (Refer to 34-44-00, Adjustment/Test.)
      (4) Reinstall nose compartment access panel.



10-145B-3

Ground Proximity Warning System Computer Installation
Figure 201

NAVIGATION - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The navigation-receiver receives and processes VOR, localizer, glideslope, and marker beacon signals to provide VOR deviation, VOR to/from indication, localizer deviation, localizer audio, glideslope deviation, high-and-low level flag signals, and amrker beacon lamp signals.

(1) Two navigation receivers (primary and secondary) are installed in the nose compartment.

B. The navigation balanced loop antenna consists of two half loop antennas, installed on each side of the vertical stabilizer. Each half is interconnected by coaxial tees.

C. The navigation receivers are designated as NAV 1 for the pilot and NAV 2 for the copilot.

(1) NAV 1 provides VOR/LOC and G/S information for the pilot's flight director indicator and course indicator. This same information is provided for the autopilot computer (22-00-00.) VOR bearing information is also available to both RMI's.

(2) NAV 2 provides VOR/LOC and G/S information for the copilot's flight director. This same information is provided for the autopilot computer (22-00-00.) VOR bearing information is also available to both RMI's.

D. Both navigation receivers are connected to the DME to control DME frequency. A switch on the DME distance ground speed indicator selects whether NAV 1 or NAV 2 is to be the controlling unit. Selecting either a VOR or localizer frequency on selected NAV, tunes the DME to the correct frequency for that channel.

E. A signal is directed to the audio control system when a VOR or localizer signal is being received. Volume is controlled by the volume control in the audio control panel.

NAVIGATION RECEIVERS - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The navigation receivers are enclosed in a 3/8 ATR short, low case. All electrical connections are made at the rear of the case when installed.

° Removal and installation procedures are identical for both receivers.

A. Remove Navigation Receiver

(1) Remove nose compartment access doors.
(2) Disconnect electrical plug and antenna leads.
(3) Loosen navigation receiver hold-down clamps and remove receiver from mounting rack.

B. install Navigation Receiver

(1) Install navigation receiver in mounting rack and secure hold-down clamps.
(2) Connect electrical plug and antenna lead.
(3) Install nose compartment access doors.

NAVIGATION ANTENNA - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**

A. Remove Navigation Antenna (35-002 thru 35-210 and 36-002 thru 36-042) (See figure 201.)

(1) Remove vertical stabilizer access doors.
(2) Disconnect antenna leads from antenna.
(3) Remove nut and washer from antenna ground studs.
(4) Remove attaching parts and antenna from vertical stabilizer.

B. Install Navigation Antenna (35-002 thru 35-210 and 36-002 thru 36-042) (See figure 201.)

(1) Clean old sealant from vertical stabilizer and base of antenna. Electrical bond area where antenna installs including taper skins.
(2) Install navigation antenna and secure with attaching parts.
(3) Install washer and nut on antenna ground studs.
(4) connect antenna leads. Check electrical bond. (Refer to Wiring Manual, Chapter 20.)
(5) Apply fillet seal around perimeter of antenna. (Refer to Chapter 20.)
(6) Install and secure vertical stabilizer access panels.
(7) Check operation of navigation system.

C. Remove Navigation Antenna (35-211 and Subsequent and 36-043 and Subsequent) (See figure 201.)

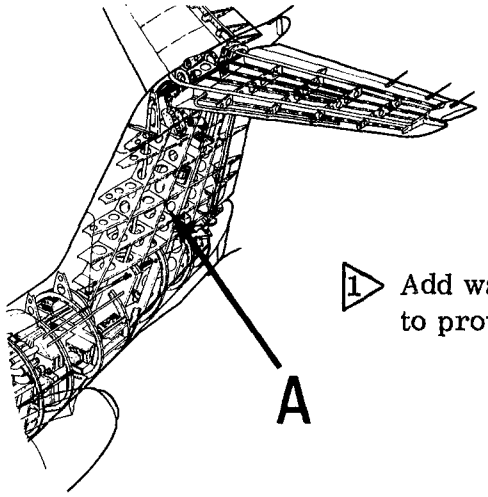
(1) Remove vertical stabilizer access doors.
(2) Disconnect antenna leads from antenna.
(3) Remove nut and washer from antenna ground studs.
(4) Remove attaching screws, antenna spacer, and antenna from vertical stabilizer.

D. Install Navigation Antenna (35-211 and Subsequent and 36-043 and Subsequent) (See figure 201.)

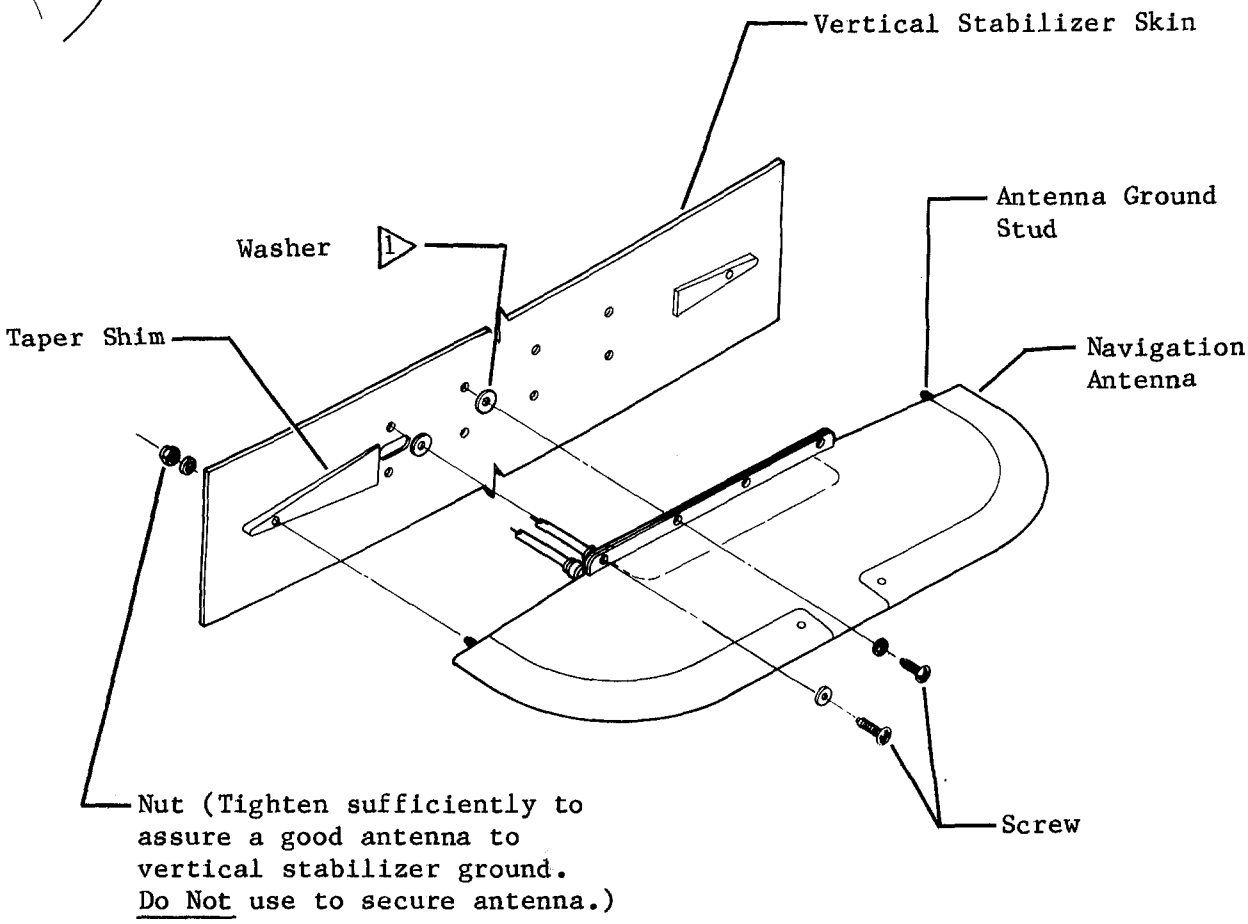
(1) clean old sealant from vertical stabilizer and from base of antenna. Electrical bond area where antenna installs and both sides of antenna spacer.

NOTE: If new spacer is installed drill holes in ends of antenna spacer to match ground studs on antenna.

(2) Apply anti-corrosion grease, Penetrox A, P8A, mfd. by Brundy Co., to base of antenna and flat surface of antenna spacer. Position antenna spacer on antenna ground studs.
(3) Apply anti-corrosion grease to contoured side of antenna spacer and to surface of vertical stabilizer where antenna installs.
(4) Position antenna on vertical stabilizer and secure with attaching screws. Wipe off excess grease. Install nut and washer on ground studs and tighten.
(5) Connect antenna leads. Check electrical bond of antenna. (Refer to Wiring Manual, Chapter 20.) Apply fillet seal around perimeter of antenna.
(6) Check operation of navigation systems.
(7) Install and secure vertical stabilizer access panels.



1 Add washers (AN960D10L) as required to provide rigid mounting.

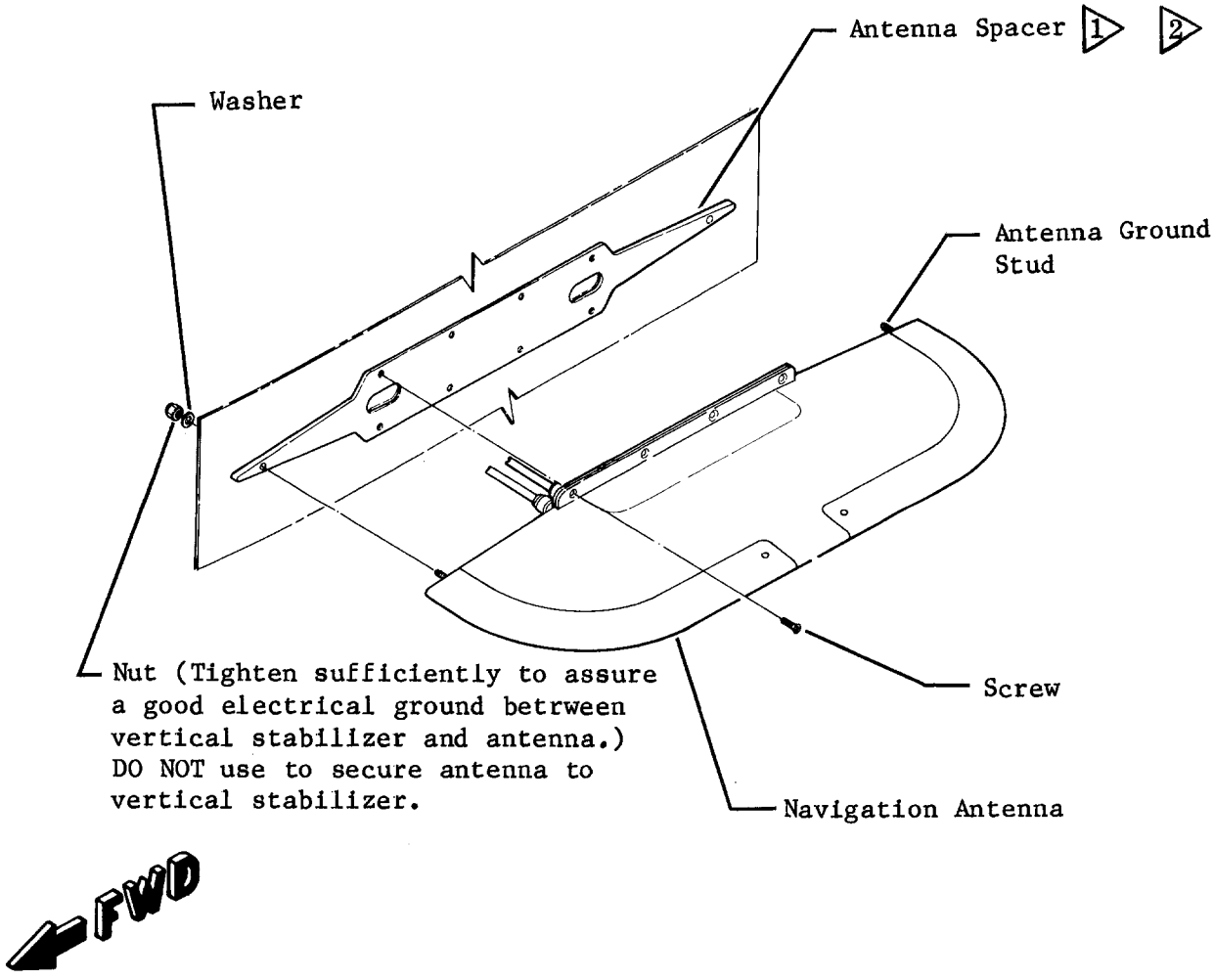


Detail A

Navigation Antenna Installation
Figure 201 (Sheet 1 of 2)

1 Apply anti-corrosion grease, Penetrox A, P8A, mfd. by Brundy Co., between antenna spacer and vertical stabilizer skin and between antenna spacer and antenna.

2 Electrical bond antenna spacer and area where antenna spacer is installed. (Refer to Wiring Manual, Chapter 20.)



Navigation Antenna Installation
Figure 201 (Sheet 2 of 2)

DME - DESCRIPTION AND OPERATION

1. Description

A. The DME system is an airborne four-in-one avionics system (transmitter, receiver, computer and display) that continuously measures the slant range between the aircraft and a ground station and displays this information to the pilot in terms of nautical miles.

B. The DME system consists of the interrogator, distance ground/speed indicator, digital to synchro converter and DME antenna.

(1) The interrogator and mounting rack are installed on the RH side of the baggage compartment floor. All electrical connections are made to the front face of the interrogator.

(2) The converter is installed under the divan seat on the aircraft centerline.

(3) The indicator is installed on the copilot's instrument panel.

(4) The primary DME antenna is installed beneath the aircraft at F.S. 240. On aircraft with secondary DME systems, the secondary DME antenna is installed beneath the aircraft at F.S. 115.

2. Operation

A. The center of the DME system is the interrogator which functions remotely with respect to the control unit and indicator. The DME frequency channel is automatically selected for the DME when the navigation receiver is tuned to the co-located VOR station. The DME transmits interrogation pulse pairs on the ground station's receiving frequency, and the ground station returns coded reply pulse pairs on its transmitting frequency. The reply signals, picked up by the transmit-receive DME antenna on the aircraft, are fed to the interrogator for amplification, verification, and distance measurement. By computing elapsed time between transmission of the interrogation signals and receipt of the reply signals, the interrogator determines the linear distance between the airplane and the ground station.

B. The digital-to-synchro converter receives distance information from the interrogator in the form of a gated clock pulse train, and converts it to synchro signals which are used to drive the synchro distance indicator.

INTERROGATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The interrogator and mounting rack are located on the baggage compartment floor or on the RH side of the tailcone between frames 27 and 28.

° Maintenance practices consist of replacement of defective component.

A. Remove Interrogator

(1) Disconnect electrical connectors and antenna lead from interrogator.
(2) Loosen hold-down clamps and remove interrogator from mounting rack.

B. Install Interrogator

(1) Install interrogator in mounting rack and secure hold-down clamps.
(2) Connect electrical connectors and antenna lead.

DME CONVERTER - MAINTENANCE PRACTICES

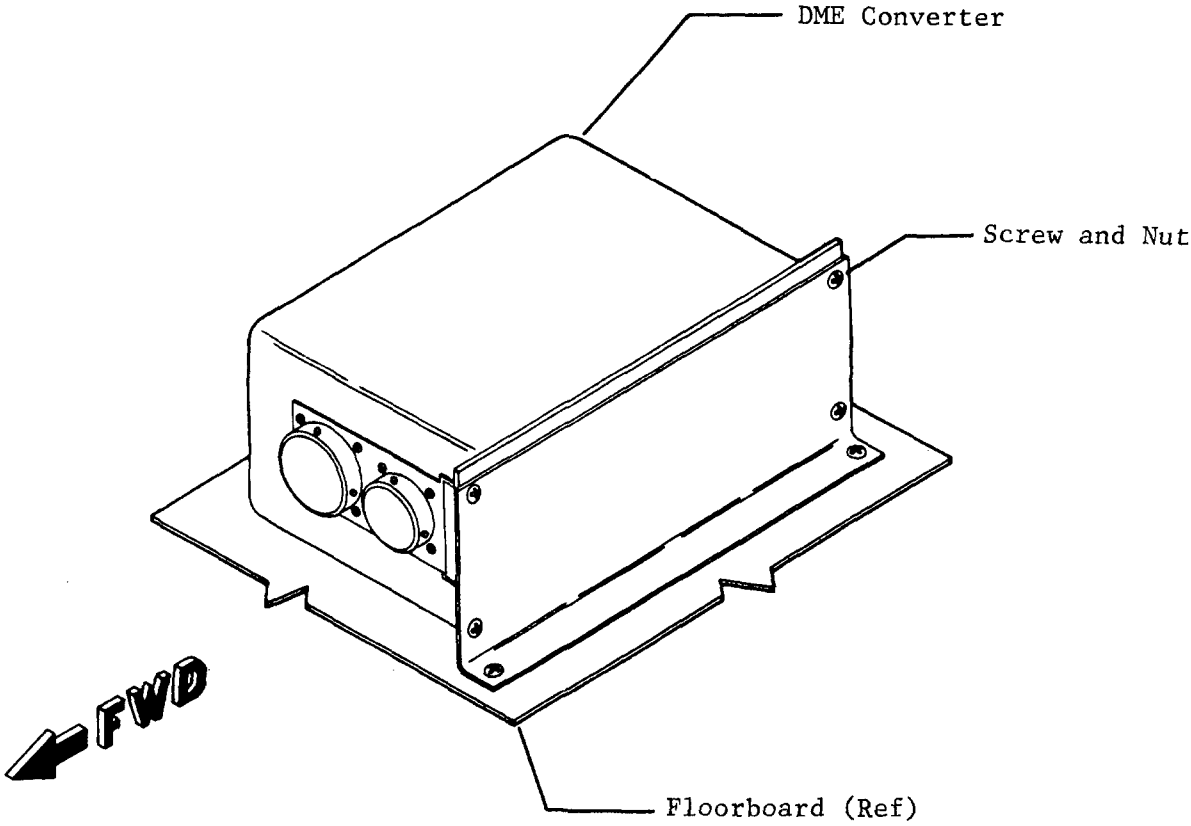
1. REMOVAL/INSTALLATION

NOTE: ° The DME converter is installed beneath the divan seat on the aircraft centerline or in the RH side of the tailcone adjacent to the interrogator. The converter is secured to a mounting bracket.

° Maintenance practices consist of replacement of defective component.

A. Remove Converter (See figure 201.)
(1) Remove divan seat.
(2) *Disconnect electrical connectors from converter.*
(3) Remove attaching screws and converter from mounting bracket.

B. Install Converter (See figure 201.)
(1) Install converter on mounting bracket and secure with attaching screws.
(2) Connect electrical connectors to converter.
(3) Install divan seat.



DME Converter Installation
Figure 201

DME ANTENNA - MAINTENANCE PRACTICES

1. Removal/Installation

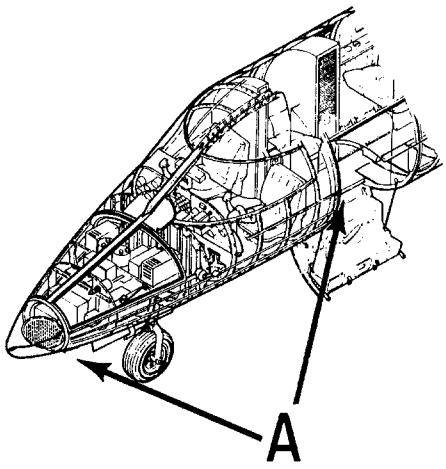
NOTE: The primary DME antenna is located beneath the aircraft at FS 240. On aircraft with a secondary DME system, the secondary DME antenna is located at FS 115.

A. Remove Antenna (Primary) (See figure 201.)
   (1) Remove carpet and floorboards as necessary to gain access to antenna installation.
   (2) Disconnect antenna lead from antenna.
   (3) Remove attaching screws and antenna from aircraft.

B. Install Antenna (Primary) (See figure 201.)
   (1) Electrical bond antenna base and area where antenna is installed. (Refer to Wiring Manual, Chapter 20.)
   (2) Install gasket and antenna on aircraft and secure with attaching parts.
   (3) Connect antenna lead to antenna. Check electrical bond of antenna. (Refer to Wiring Manual, Chapter 20.)
   (4) Check operation of DME system.
   (5) Install floorboards and carpet.

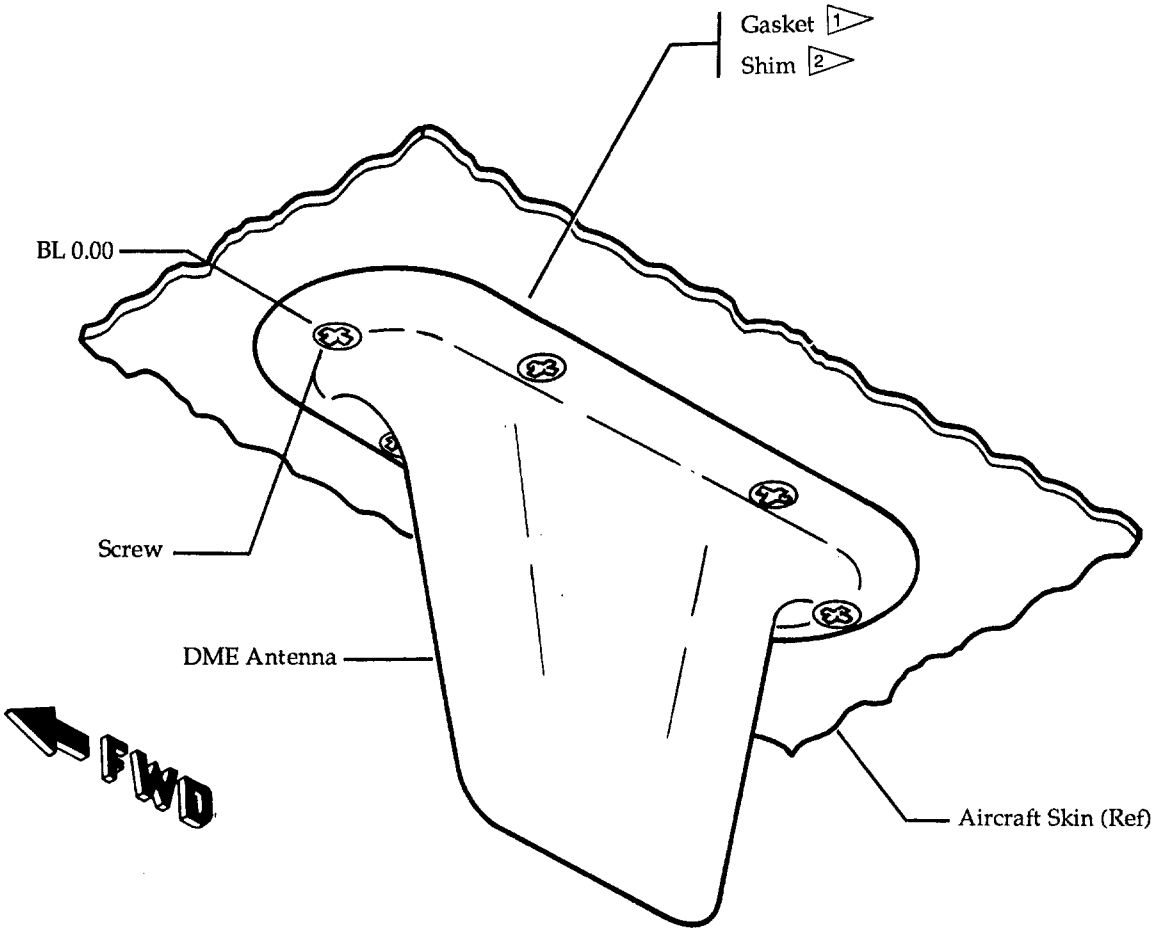
C. Remove Antenna (Secondary) (See figure 201.)
   (1) Remove nose access doors.
   (2) Remove equipment as necessary to gain access to antenna installation.
   (3) Disconnect antenna lead from antenna.
   (4) Remove attaching screws, gasket or shim and antenna from aircraft.

D. Install Antenna (Secondary) (See figure 201.)
   (1) Electrical bond antenna base and area where antenna is installed. (Refer to Wiring Manual, Chapter 20.)
   (2) Install gasket or shim and antenna on aircraft and secure with attaching parts.
   (3) Connect antenna lead to antenna.
   (4) Check electrical bond of antenna. (Refer to Wiring Manual, Chapter 20.)
   (5) Check operation of DME system.
   (6) Install equipment removed to gain access to antenna.
   (7) Perform operational check on all equipment previously removed.
   (8) Install nose access doors.



1 *Effective Aircraft 35-002 thru 35-674; 36-002 thru 36-063*

2 *Effective Aircraft 35-675 and Subsequent; 36-064 and Subsequent*, for secondary DME antenna installation only.



Detail A

DME Antenna Installation
Figure 201

DISTANCE GROUND SPEED INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The distance-ground speed indicator is located on the copilot's instrument panel. The indicator is secured by an instrument clamp.

° Maintenance practices consist of replacement of defective component.

A. Remove Indicator

(1) Set Battery Switches to OFF and Stall Warning Switches to "off" position.
(2) Lower copilot's instrument panel.
(3) Disconnect electrical connector from indicator.
(4) Loosen instrument clamp screws and remove indicator from instrument panel.

B. Install Indicator

(1) Install indicator on instrument panel and secure instrument clamp.
(2) connect electrical connector to indicator.
(3) Raise copilot's instrument panel and secure.

ADF - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The automatic direction finder (ADF) system is a navigational aid which provides the crew with continuous relative bearing readings to low-frequency homing stations, radio beacon, and broadcast stations.

B. In the ADF mode of operation the receiver processes the selected radio signal from the loop and sense antennas into relative bearing information for use by the indicator and the RMI's. In ANT mode, the receiver functions as a conventional lf and broadcast band receiver.

ADF RECEIVER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The ADF receiver is installed in the nose compartment on the LH side of the nose wheel well box. The receiver is mounted in a rack which incorporates a plug in type connector.

° Maintenance practices consists of replacement of defective component.

A. Remove ADF Receiver

(1) Remove nose compartment access doors.
(2) Disconnect antenna leads from receiver.
(3) Loosen and disengage receiver hold-down screw.
(4) Remove receiver from aircraft.

B. Install ADF Receiver

(1) Install receiver and secure with hold-down screw.
(2) Connect antenna leads to receiver.
(3) Install nose compartment access doors.

ADF CONTROL HEAD - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The ADF control head is installed in the pedestal. The control head is secured by quick-release fasteners.

° The control head incorporates all control switches for the ADF system.

A. Remove Control Head

(1) Loosen quick release fasteners.
(2) Remove control head sufficiently to gain access to electrical plug.
(3) Disconnect electrical plug and remove control head from pedestal.

B. Install Control Head

(1) Connect electrical plug to control head.
(2) Position control head in pedestal and secure with attaching parts.

ADF SENSE ANTENNA - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The ADF sense antenna is installed beneath the aircraft from approximate F.S. 142.00 to F.S. 350.0

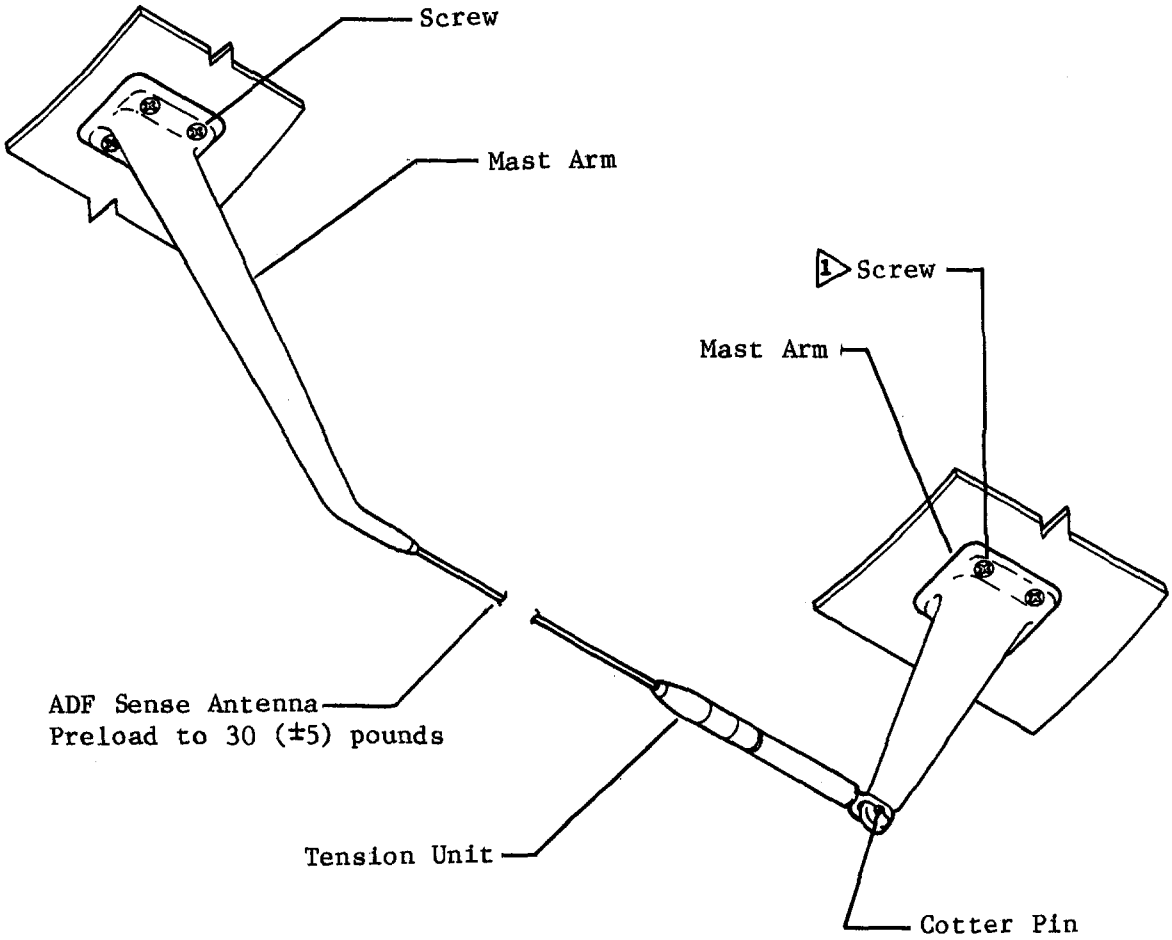
A. Remove Sense Antenna (See figure 201.)

(1) Remove nose compartment access doors.
(2) Loosen screws securing aft mast arm to fuselage.
(3) Remove cotter pin and end of antenna from aft mast arm.
(4) Remove screws and aft mast arm from aircraft.
(5) Disconnect antenna lead from forward mast arm.
(6) Remove attaching parts and forward mast arm from aircraft.

B. Install Sense Antenna (See figure 201.)

(1) Install forward mast arm and secure with attaching parts.
(2) Connect antenna lead to forward mast arm.
(3) Install aft mast arm and secure with attaching parts.
(4) Install antenna on mast arm and check loading of antenna wire. Antenna shall be preloaded to 30 (±5) pounds.

1 After installation of screws, apply a coat of Pro-Seal 890 sealant to screw heads.



ADF Sense Antenna Installation
Figure 201

ADF LOOP ANTENNA - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

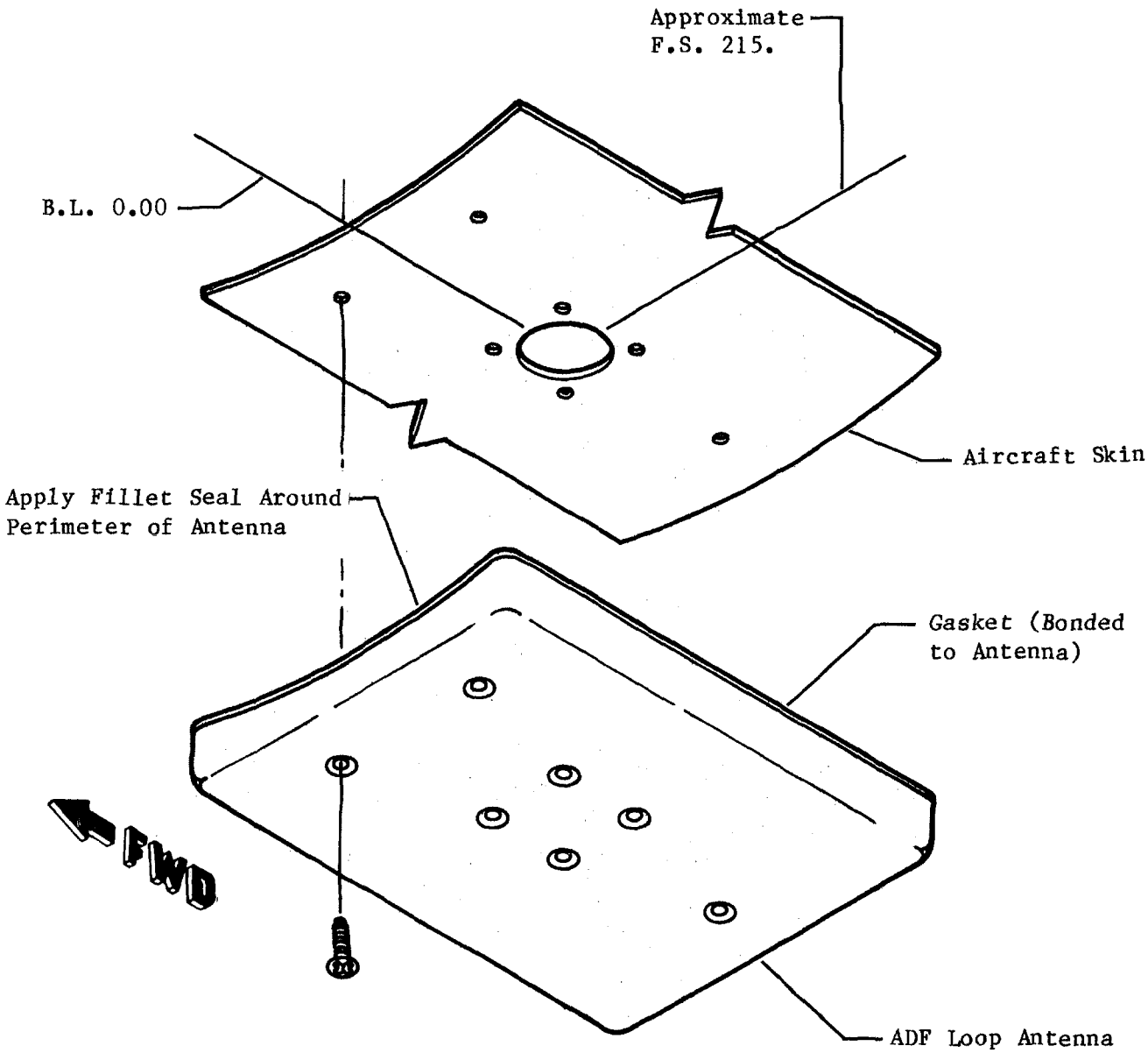
NOTE: The ADF loop antenna is located beneath the aircraft at approximate F.S. 215.

A. Remove Loop Antenna (See figure 201.)

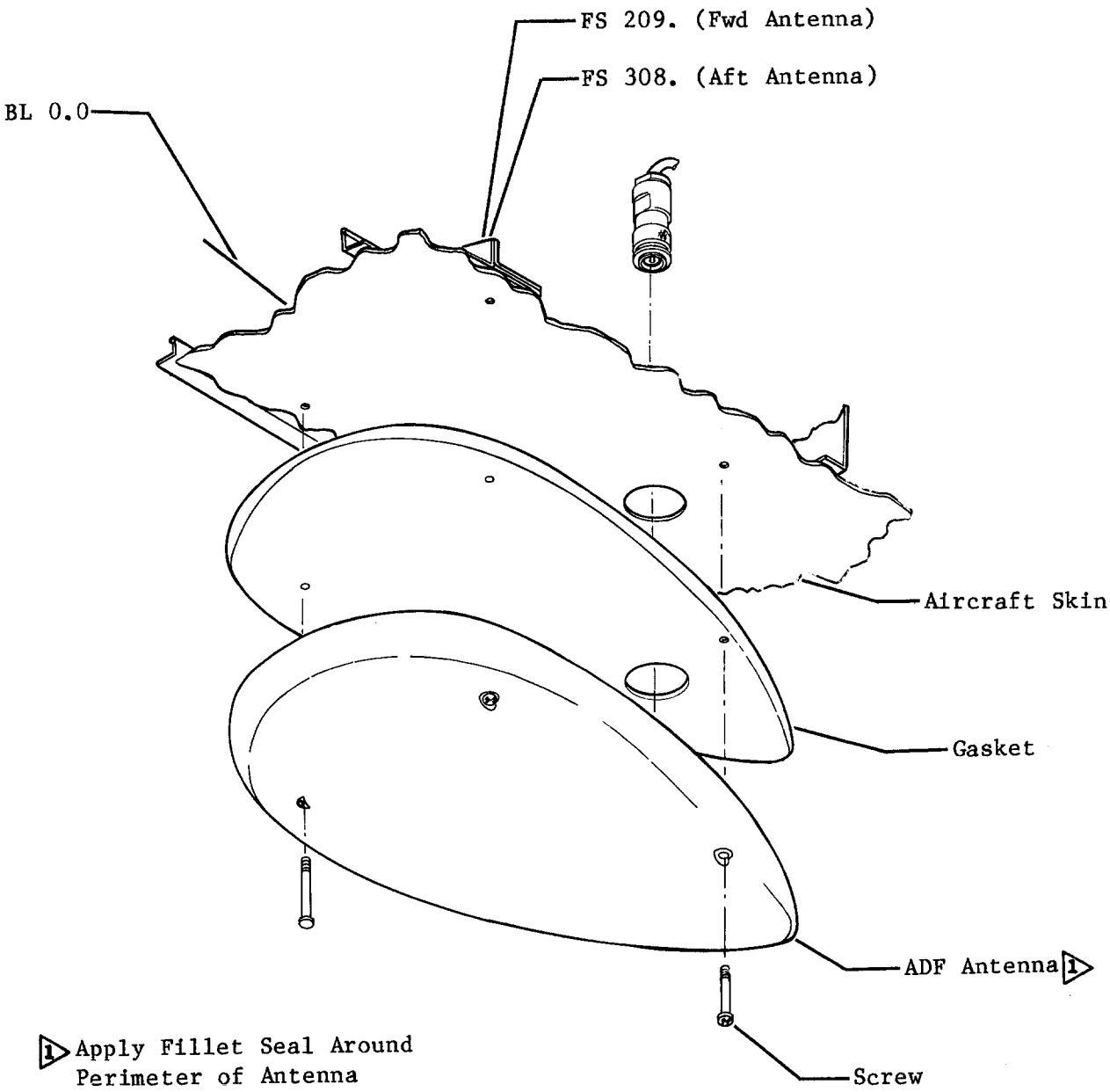
(1) Remove carpet and floorboards to gain access to loop antenna installation.
(2) Disconnect loop antenna lead.
(3) Remove screws and loop antenna from aircraft.

B. Install Loop Antenna (See figure 201.)

(1) Install loop antenna and secure with attaching parts.
(2) Connect antenna lead.
(3) Install floorboards and carpet.
(4) Apply a fillet seal around perimeter of antenna. (Refer to 20-10-00.)



ADF Fixed Loop Antenna Installation
Figure 201 (Sheet 1 of 2)



ADF Fixed Loop Antenna Installation
Figure 201 (Sheet 2 of 2)

14-154B-1

EFFECTIVITY: ALL
MM-99
D918

RADIO MAGNETIC INDICATOR - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. Two radio magnetic indicators are installed: one on the pilot's instrument panel and one on the copilot's instrument panel.

B. The RMI's display aircraft heading by a rotating compass card. They also display VOR and ADF bearing information, both relative and magnetic.

2. OPERATION

A. The RMI's receive heading information from the primary and secondary directional gyros and the primary and secondary navigation receivers. The pilot's RMI utilizes the primary systems and the co-pilot utilizes the secondary systems.

RADIO MAGNETIC INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° Removal and installation procedures for both RMI's are identical.

° Maintenance practices consist of replacing the defective component.

A. Remove RMI

(1) Assure that battery and Stall Warning Switches are OFF.
(2) Lower applicable instrument panel.
(3) Disconnect electrical plug from RMI.
(4) Loosen instrument clamp screws and remove RMI from panel.

B. Install RMI

(1) Position RMI in instrument panel.
(2) Secure instrument clamp and RMI.
(3) Raise instrument panel and secure.

ATC TRANSPONDER - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The transponder installation consists of either single or dual transponders which are installed either in the nose compartment, under the aft divan seat, or in the tailcone equipment section.

B. the control head is installed in the center instrument panel.

C. Two ATC transponder antennas are installed. One is located at Sta. 341.13 (Pri) and one at Sta. 314.26 (Sec) along the lower aircraft centerline. Access to the antennas is gained through the floorboards.

D. The transponder system enables identification interrogators to identify the aircraft, or ground Air Surveillance Radar (ASR), with interrogators, to both see and identify the aircraft at ranges beyond normal radar range. In addition, altitude reporting information is furnished to the identification interrogators. The transponder is housed in a short 1/4 ATR case. All electrical connections are made at the case front panel.

E. The control head is a switching and indicator unit for control of power, test, monitor, code, identification and mode functions of the transponder.

ATC TRANSPONDER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The upper transponder (Secondary) is secured to the lower transponder (Primary) by screws through the handle of the unit.

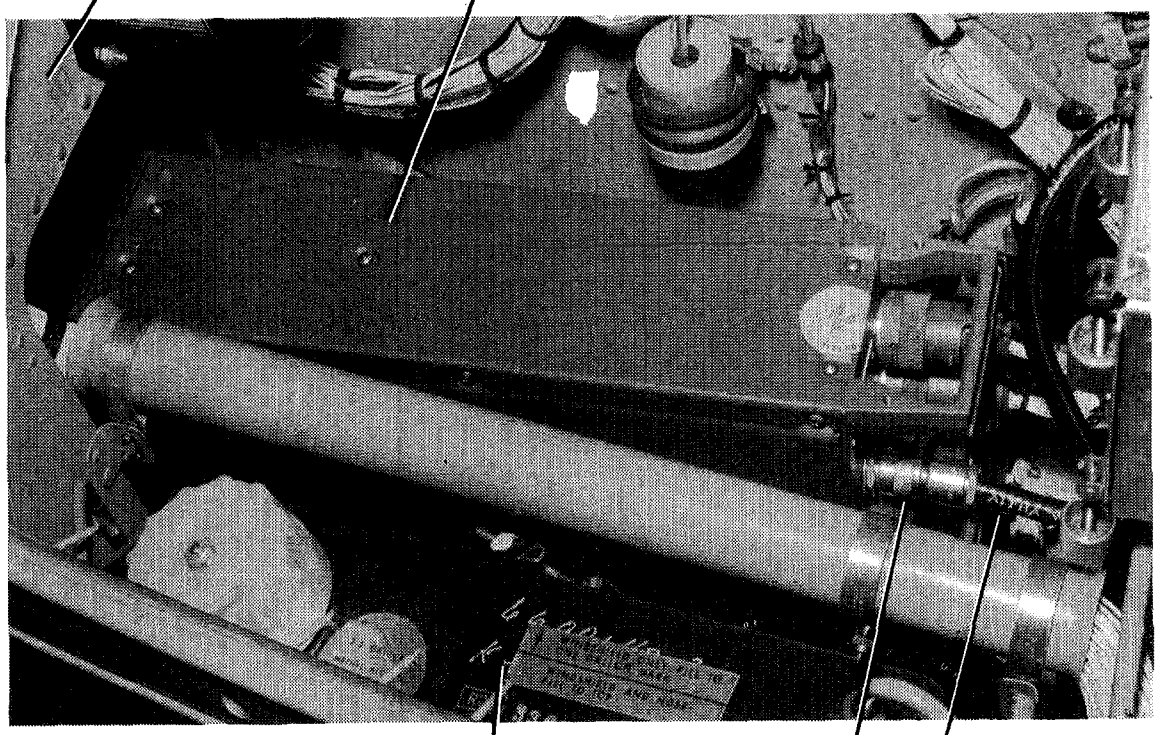
° Maintenance practices consist of replacement of defective component.

A. Remove Transponder Case (See figure 201.)

(1) Disconnect electrical plugs from transponders.
(2) Loosen hold-down clamp and remove transponders from transponder rack.

B. Install Transponder (See figure 201.)

(1) Position transponders in rack and secure with hold-down clamp.
(2) Connect electrical plugs to transponders.



ORIGINAL
As Received By ATP

View Looking at Left Side of Nose Compartment

ATC Transponder Installation
Figure 201

TRANSPONDER CONTROL HEAD - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: Maintenance practives consist of replacing defective components.

A. Remove Control Head

(1) Loosen quick release fasteners securing control head to instrument panel.
(2) Remove control from instrument panel sufficiently to allow removal of electrical connectors.
(3) Disconnect electrical connectors from control head.

B. Install Control Head

(1) Connect electrical connectors to control head.
(2) Position control head in panel.
(3) Secure control head to panel with quick release fasteners.

ATC TRANSPONDER ANTENNA - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° The antennas are located beneath the aircraft. The primary transponder antenna is located at FS 341 and the secondary is located at FS 302.

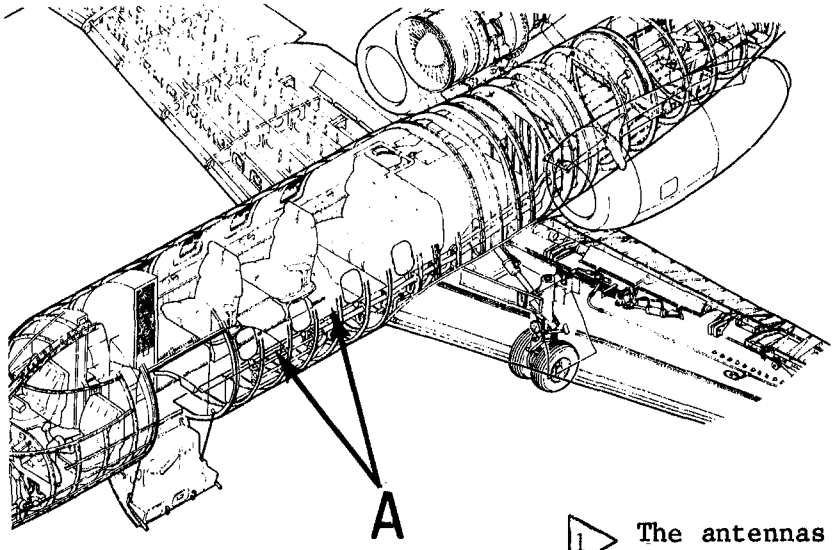
° Removal and installation instructions are the same for the antennas at either location.

A. Remove Antenna (See figure 201.)

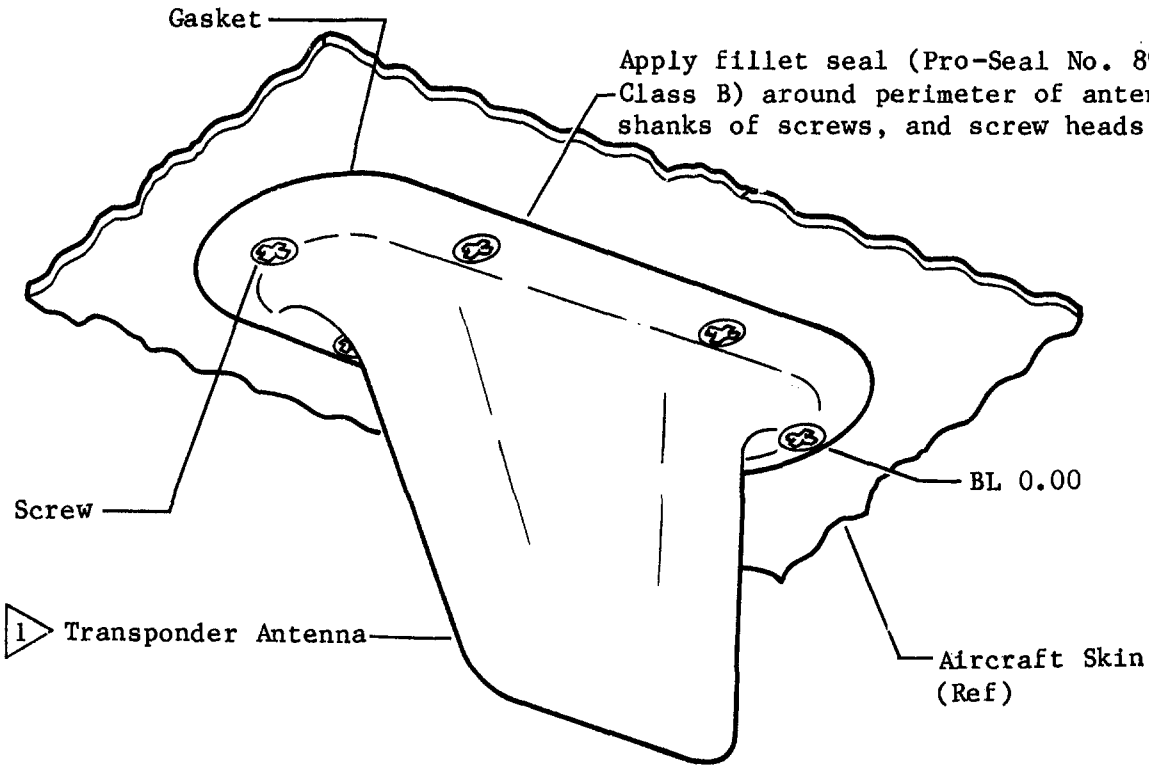
(1) Remove attaching parts and lower antenna sufficiently to gain access to antenna lead.
(2) Disconnect antenna lead from antenna.
(3) Remove gasket and antenna from aircraft.

B. Install Antenna (See figure 201.)

(1) Electrical bond area where antenna is installed. (Refer to Wiring Manual, Chapter 20.) Clean antenna base with MEK and wipe dry.
(2) Apply a bead of sealant around hole in aircraft skin. This will provide a seal between hole in aircraft skin and antenna connector when antenna is installed.
(3) Position gasket on antenna.
(4) Position antenna and connect antenna lead to antenna. Use care not to disturb bead of sealant.
(5) Carefully position antenna on aircraft and secure with attaching parts.
(6) Check eletrical bond of antenna. (Refer to Wiring Manual, Chapter 20.)
(7) Check operation of transponder system.



1 The antennas are located beneath the aircraft. The primary transponder antenna is located at FS 341 and the secondary is located at FS 302.



Detail A

ATC Transponder Antenna Installation
Figure 201