CHAPTER

28

FUEL

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Insert latest revised pages; destroy superseded or deleted pages.

* Asterisk indicates pages revised, added, or deleted by the current revision. The portion of the text affected by the current revision is indicated by a vertical line in the outer margin of the page.

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28-1	Inactive	Mar 24/75	28-14-00 Page 201	Mar 24/75	LJ	Jun 8/79 Rev 15	LJ
28-2	Inactive	Apr 8/75	28-12-04 Page 1	Apr 8/75	LJ	Sep 25/92 Rev 57	LJ
28-3	Inactive	May 7/76	28-40-00 Page 203	May 7/76	LJ	Feb 11/00 Rev 68	LJ
28-4	Inactive	May 30/80	28-20-05 Page 201	May 30/80	LJ	Dec 19/80 TR 28-5	LJ
28-5	Inactive	Dec 19/80	28-20-05 Page 201	Dec 19/80	LJ	Apr 30/82 Rev 27	LJ
28-6	Inactive	Jul 27/81	28-12-03 Page 203	Jul 27/81	LJ	Apr 30/82 Rev 27	LJ
28-7	Inactive	Mar 18/94	28-13-05 Page 201	Mar 18/94	LJ	Feb 11/00 Rev 68	LJ
28-8	Inactive	Mar 18/94	28-20-02 Page 201	Mar 18/94	LJ	Feb 11/00 Rev 68	LJ
28-9	Inactive	Mar 23/94	28-00-00 Page 202	Mar 23/94	LJ	Feb 11/00 Rev 68	LJ
28-10	Inactive	Aug 25/95	28-14-00 Page 201	Aug 25/95	LJ	Feb 11/00 Rev 68	LJ
28-11	Inactive	Oct 15/95	28-11-06 Page 201	Oct 15/95	LJ	Feb 11/00 Rev 68	LJ
28-12	Inactive	Oct 15/95	28-00-00 Page 201	Oct 15/95	LJ	Feb 11/00 Rev 68	LJ
28-13	Inactive	Aug 16/02	28-00-00 Page 202	Aug 16/02	LJ	Jan 17/05 Rev 73	LJ

Record of Temporary Revisions

Revision Number	Status	Date	Location	Insertion Date	Inserter's Initials	Removal Date	Removers Initials

FUEL SYSTEM - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The aircraft fuel system consists of fuel storage, fuel tank venting, fuel distribution, and fuel quantity indicating. Fuel is stored in integral wing tanks, the tip tanks, and the fuselage tank.

B. The tip tanks are attached to each wing at two attach points, one forward of spar 7 and one aft of spar 1. Baffles are incorporated to minimize slosh and prevent adverse fuel effects on the aircraft center of gravity. Five access covers, installed in the tip tank, provide entry for inspection and maintenance. Fuel is transferred to the wing tank by gravity flow and the tip tank jet pump.

C. The full-span, integral wing tanks comprise a large portion of each wing. The inboard end of the tank is at the aircraft centerline, and the outboard end is at wing station 205. The forward side of the tank ends at wing spar No. 1 and the aft side terminates at wing spar No. 7. Fuel is not stored in the main landing gear wheel wells and wing leading edge areas. Small vent holes are incorporated in the upper and lower portion of each spar and rib. This allows fuel to move from one compartment to the other due to fuel expansion. It also allows the individual compartments to completely fill and drain. The wing dihedral of 2.5° causes the inboard portion of the wing to be the lowest point of the fuel system. This assures that the jet pumps and standby pumps will be submerged in fuel until the tanks are practically empty. Wing rib 0.0 incorporates two pressure relief valves (allowing flow in opposite directions). The relief valves are set at approximately 1 psi.

D. On Aircraft 36-002 and Subsequent, the fuselage tank, consisting of four bladder-type cells, is located in cavities between frames 18 and 25. The cavity is a sealed compartment with hangers installed in the upper portion. The hangers mate with fasteners on the bladder to provide hanging support. Additional bladder support is gained by the interconnect fittings, access covers, and plumbing fittings incorporated in the bladder. The cavity also incorporates four cavity drain ports. Two are located in the forward cavity area and two in the aft area. Interconnecting tubes and a crossover tube connect the bladders to form a single tank. Access to the bladders is gained through two large access covers in the tailcone, two access covers behind frame 18 pressure bulkhead, an access cover on the top of the fuselage, and through the keel beam access covers.

E. On Aircraft 35-002 and Subsequent, the fuselage tank consists of two bladder-type cells located in the cavity between frames 22 and 25. The cavity is a sealed compartment with hangers installed in the upper portion. The hangers mate with fasteners on the bladder to provide hanging support. Additional bladder support is gained by the interconnect fittings, access covers, and plumbing fittings incorporated in the bladder. Two drain ports are located in the aft portion of the cavity. Interconnecting tubes and a crossover tube connect the bladders to form a single tank. Access to the bladders is gained through two access covers in the tailcone; an access cover on the top of the fuselage and through the

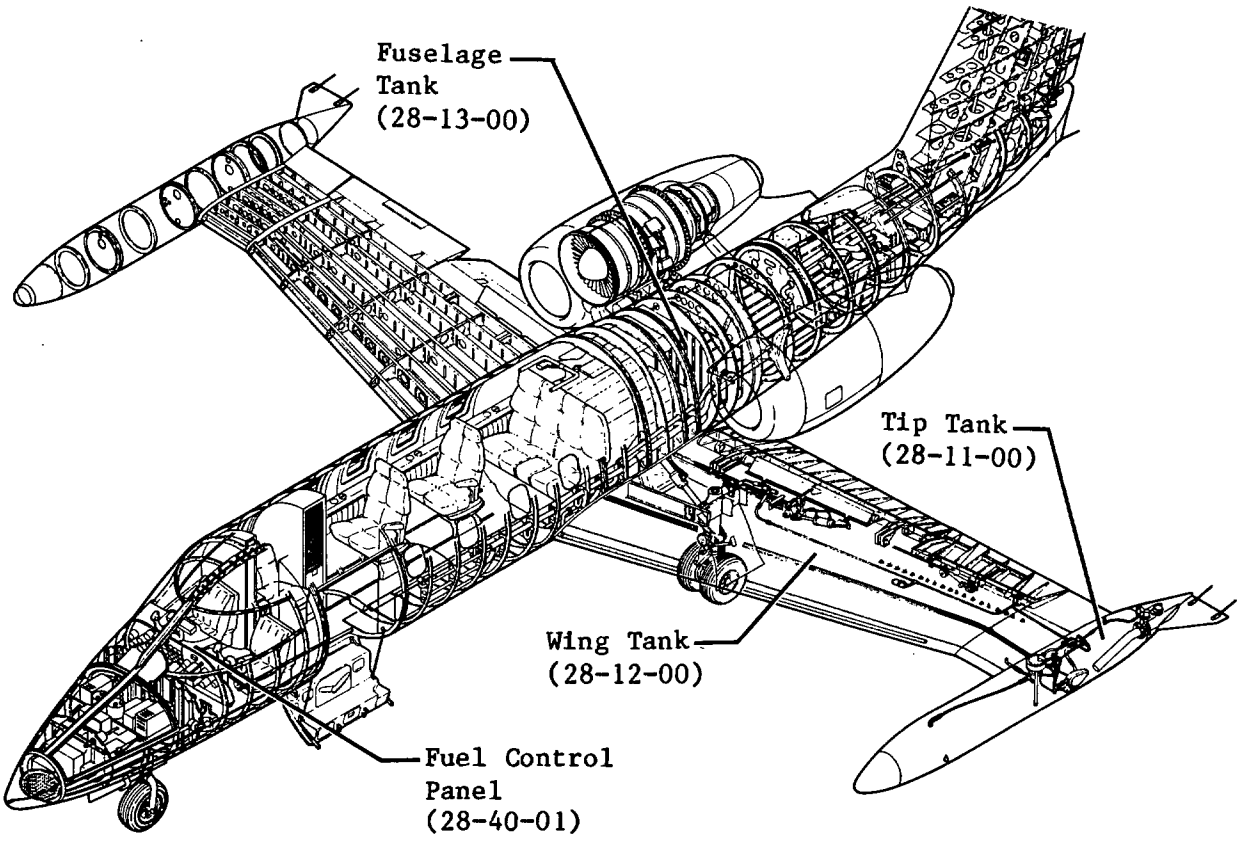
keel beam access covers.

F. The fuel vent system provides continuous ram air pressure to the tip tanks, wing tanks, and the fuselage tank while the aircraft is in flight. Ram air is admitted through the ram air scoops to the tip tanks and the fuselage tank. The ram air pressure is vented to the wing tanks through the wing-to-tip tank interconnects. Ram air pressure is approximately 1 psi. A sump drain valve is located on the aircraft centerline at FS 421 (frame 22).

G. Engine fuel flow is provided by two jet pumps, one located in each wing near wing rib 0.0. Two electrically operated standby pumps are also installed, adjacent to the jet pumps, for engine starting and as a standby in case of jet pump failure.

H. A capacitance-type fuel quantity indicating system is installed in the aircraft. The system components consist of an indicator and a selector switch on the fuel control panel and nine tank unit probes. The tank unit probes are located as follows: one in each tip tank, three in each wing tank, and one in the fuselage tank.

I. When the aircraft is stored for an extended period of time, the fuel system must be preserved in accordance with procedures outlined in Chapter 10.



Fuel System Component Locator
Figure 1

FUEL SYSTEM - MAINTENANCE PRACTICES

1. Safety Practices

NOTE: Before performing maintenance on the aircraft fuel system, maintenance personnel should read, thoroughly understand, and obey the following instructions. These instructions will help in maintaining a functional and trouble-free system and provide maximum safety for the aircraft and personnel.

Check the condition of and replace, if necessary, seals and gaskets removed during maintenance. Fuel system gaskets are neoprene and do not require lubrication before installation.

For corrosion repair of the wing fuel tanks, refer to Chapter 20.

A. Tools and Equipment
(1) Get the necessary tools and equipment.

NOTE: You can use equivalent alternatives for these items:

NAME	PART NUMBER	MANUFACTURER	USE
Explosion Proof Lights		Commercially Available	For use in tank.
Air Mover		Commercially Available	To ventilate tank.
Simpson Milliohmmeter		Commercially Available	Checking resistance.

WARNING: **DO NOT USE SAFETY WIRE TO ATTACH ANY UNIT OR FITTING USED INSIDE THE FUEL CELL. SAFETY WIRE ENDS ARE POTENTIAL POINTS FOR ELECTROSTATIC DISCHARGE AND CAN PUNCTURE THE FUEL BLADDER.**

FUEL TANKS MUST BE PURGED OR BREATHING GEAR MUST BE PUT ON PRIOR TO ENTRY INTO THE FUEL TANK TO PREVENT PERSONAL INJURY FROM EXCESSIVE INHALATION.

DO THE STATIC ELECTRICAL BOND CHECK ON ALL METAL PARTS IN THE FUEL CELL INCLUDING PLUMBING, CLAMPS, VALVES, CONDUITS, BAFFLES, COVER PLATES, AND BLADDER FITTINGS. RESISTANCE TO GROUND MUST NOT EXCEED 1 OHM.

CAUTION: **WIGGINS W901 SERIES CONNECTORS HAVE A SINGLE LEVER TYPE LATCH WHICH CAN UNLATCH IF NOT PROPERLY CLOSED.**

ALL WIGGINS W901 SERIES CONNECTORS IN THE FUEL DISTRIBUTION AND EXPANSION SYSTEM PLUMBING THAT ARE IN THE KEELBEAM AND TAILCONE AREAS MUST BE SAFETY-WIRED.

B. Do the fuel system maintenance in areas which permit free movement of fire fighting and other emergency equipment.

C. The maintenance area selected must not be upwind of any building in which fuel vapor may accumulate, where any open flame or spark-producing equipment is located, or where smoking is permitted.

WARNING: **DO NOT WEAR NYLON OR OTHER SYNTHETIC CLOTHES; THEY WILL GENERATE STATIC ELECTRICITY.**

D. Personnel should wear clean, lint-free, cotton clothes with nonspark-producing zippers or buttons when working in the fuel tanks.

E. Remove all spark-producing items such as electrically powered tools or electronic test equipment from the aircraft and vapor hazard area.

F. Use explosion-proof lights and air-driven tools in the fuel tanks.

G. Connect the grounding cable to an approved ground and the aircraft. (Refer to 12-10-00.)

H. Maker sure that no high-frequency radio transmitters are operated within 200 feet and that no radar equipment is operated within 400 feet of the aircraft during fuel maintenance or while the fuel tank access covers are removed.

CAUTION: **ALTHOUGH THE FUEL VAPOR WITHIN A TANK MAY BE TOO RICH TO BURN WHEN TANK IS OPENED, THE VAPOR CONCENTRATION WILL PASS THROUGH THE EXPLOSIVE MIXTURE LEVEL DURING THE TANK VENTILATION. MIXTURES TOO LEAN TO BURN, IF ALLOWED TO ACCUMULATE IN AN UNVENTILATED SPACE,**

MAY FORM AN EXPLOSIVE MIXTURE WITHIN THE SPACE DUE TO STRATIFICATION.

I. Air ventilate the fuel tanks until the fuel vapor concentration is determined to be below the explosive limit before removing the access covers.

J. Ground the air mover to the aircraft and to the same ground as the aircraft.

K. Support the air mover to prevent the exhaust from contacting any object; a static electrical charge buildup can result.

2. Preventing Contamination of the Tanks

WARNING: USE ONLY AN AIR-DRIVEN VACUUM.

A. All equipment used in the fuel tanks must be free of dirt and dust. Thoroughly clean the air ducts used for ventilation internally and externally. Exercise every precaution to prevent contamination of the fuel tanks at all times while the tanks are open. Close all the tanks when work is not in progress to prevent entry of dirt and dust, or other foreign matter. Vacuum clean the fuel tank in which extensive work has been accomplished.

B. When the fuel lines are disconnected and/or components are removed, provide suitable protection to prevent foreign matter from entering the lines or components.

3. Fuel Hose Installation

A. Installation of the Fuel Hose

NOTE: The following installation instructions are provided to make sure that the fuel hose connection is correct and to prevent damage to the fuel hose assemblies.

CAUTION: DO NOT USE RECTOR SEAL 100 ON THE HOSE CONNECTIONS. THE FUEL SYSTEM CAN BECOME CONTAMINATED.

(1) Get the necessary tools and equipment.

NOTE: You can use equivalent alternatives for these items:

NAME	PART NUMBER	MANUFACTURER	USE
Thread Compound	Liqui-Moly NV	The Lockrey Co. Inc. Merchantville, NJ	Lubricate connections.
Engine Oil	MIL-L-23699 or MIL-L-7808	Commercially Available	Lubricate connections.

(2) Lubricate the bearing surfaces between the fuel hose hex nut and the nipple by placing several drops of engine oil on the nut retaining wire and between the nut and nipple.
(3) Hold the fuel hose assembly so that the engine oil will drain into the bearing surfaces between the nut and nipple.
(4) Spin the nut to distribute the engine oil.
(5) Align the hose assembly with the fitting and engage the threads 1/2 to 1 turn.

CAUTION: DO NOT ALLOW THREAD COMPOUND ON FITTING ENDS, ON THE CONE SURFACES IN THE BORE OF THE FITTINGS, OR INSIDE ANY SYSTEM COMPONENT.

(6) Apply the thread compound, sparingly, to the exposed male threads.
(7) Torque the fuel hose nuts to the minimum torque value. (Refer to 20-40-00.)
(8) The fuel hoses must be held firmly to prevent twisting while torquing fuel nuts.
(9) Fuel hoses that are twisted must be removed and the internal surfaces inspected for permanent deformation.
(10) Any hose that is permanently damaged or is questionable must be replaced.

4. Confined Space Entry

WARNING: THE FUEL CELL IS CONSIDERED A CONFINED SPACE. CONFINED SPACE ENTRY PROCEDURES DESCRIBED BELOW SHALL BE FOLLOWED WHEN PERSONNEL ENTER THE FUEL CELL TO MAKE SURE THAT THE PERSONNEL ARE SAFE.

A. The fuselage fuel cells are considered a confined space. A confined space meets all of the following criteria:
(1) Any space which, by design, has limited openings for entry and exit.
(2) A space that has unfavorable natural ventilation that could contain or produce dangerous air contaminants.
(3) A space not normally intended for human occupation.

B. Before entry into a designated confined space, the following conditions must be met:
(1) The confined space entry permit must be copied and completed. (See Figure 201.) The permit is limited to one shift. Additional permits must be completed at each shift change.
(2) Personnel that enter the confined space must put on protective clothing impervious to fuel.
(3) Standby personnel must be provided to continuously monitor the entrant.
(4) Aircraft equipment must be safetied to prevent hazardous material from entering the occupied fuel cell.
(5) The fuel cell must be purged until the atmosphere within the fuel cell is as follows:
(a) Oxygen level is between 19.5% and 22%.
(b) Lower explosive level (LEL) is 10% or less.
(c) Carbon monoxide level is less than 10 ppm.
(6) Continuous ventilation must be provided either by an external blower or vortex air mover.
(7) An air line must be provided to supply Class D breathing air.
(8) Breathing oxygen must be available for emergency purposes.

C. When the personnel are in the fuel cell, the following conditions must be met:
   (1) Standby personnel must monitor the entrant at all times. If the standby personnel must leave, another must be available to monitor the entrant.
   (2) Class D breathing air must be supplied by an air line into the fuel cell.
   (3) Constant communication must be maintained between the standby personnel and the entrant.
   (4) The atmosphere must be continuously tested to make sure that the environment is safe for entrant.

CONFINED SPACE ENTRY PERMIT - FUEL CELL

This permit valid only for entry into a Learjet fuel cell during one shift. Permit must be signed before entry begins, but not until all actions and conditions necessary for safe entry have been performed.

Aircraft Model and Number: _____

Date: _____ Time: _____

Department: _____

Safety Supervisor:

_____ _____
(PRINT) (SIGNATURE)

Maintenance Supervisors:

_____ _____
(PRINT) (SIGNATURE)

_____
(PHONE)

_____ _____
(PRINT) (SIGNATURE)

_____
(PHONE)

Potential hazards of work space: _____

_____

Special Requirements:	YES	NO
Purge and vent compartment for 15 minutes	_____	_____
Continuous ventilation: filtered vortex cooling assy or blower	_____	_____
Explosion-proof light	_____	_____
Class D breathing air	_____	_____
Standby breathing oxygen	_____	_____
Standby personnel to monitor entrant	_____	_____

Confined Space Entry Permit
Figure 201 (Sheet 1 of 3)

Tests Prior To Entry: SAFE UNSAFE

(PERMIT INVALID IF THESE PARAMETERS ARE EXCEEDED)

Oxygen Level (19.5% to 22%) _____ _____

Lower Explosive Level (Less than 10%) _____ _____

Carbon Monoxide Level (Less than 10 ppm) _____ _____

Test Instruments Used:

_____

Name Type Calibration Date

_____

Name Type Calibration Date

_____

Name Type Calibration Date

Standby Personnel (two):

_____ _____

(PRINT) (SIGNATURE)

_____

(EMPLOYEE NUMBER)

_____ _____

(PRINT) (SIGNATURE)

_____

(EMPLOYEE NUMBER)

Entrants:

_____ _____

(PRINT) (SIGNATURE)

_____

(EMPLOYEE NUMBER)

_____ _____

(PRINT) (SIGNATURE)

_____

(EMPLOYEE NUMBER)

Confined Space Entry Permit
Figure 201 (Sheet 2 of 3)

Emergency Phone Numbers:

_____

_____

Personal Protective Equipment:

Organic Vapor respirators must be used when ketone or sealer is present.

A filtered vortex cooling assembly must be used when the entrant is in the fuel cell. If the shop air alarm activate, this permit is invalid.

Confined Space Permit Closed Out by:

_____ _____
(PRINT) (SIGNATURE)

_____ _____
(TIME) (DATE)

This permit must remain with the aircraft until all the confined space work has been completed. After completion of the work, the original permit must be forwarded to the safety supervisor and a copy must remain in the department files.

Confined Space Entry Permit
Figure 201 (Sheet 3 of 3)

FUEL CONTROL PANEL - MAINTENANCE PRACTICES

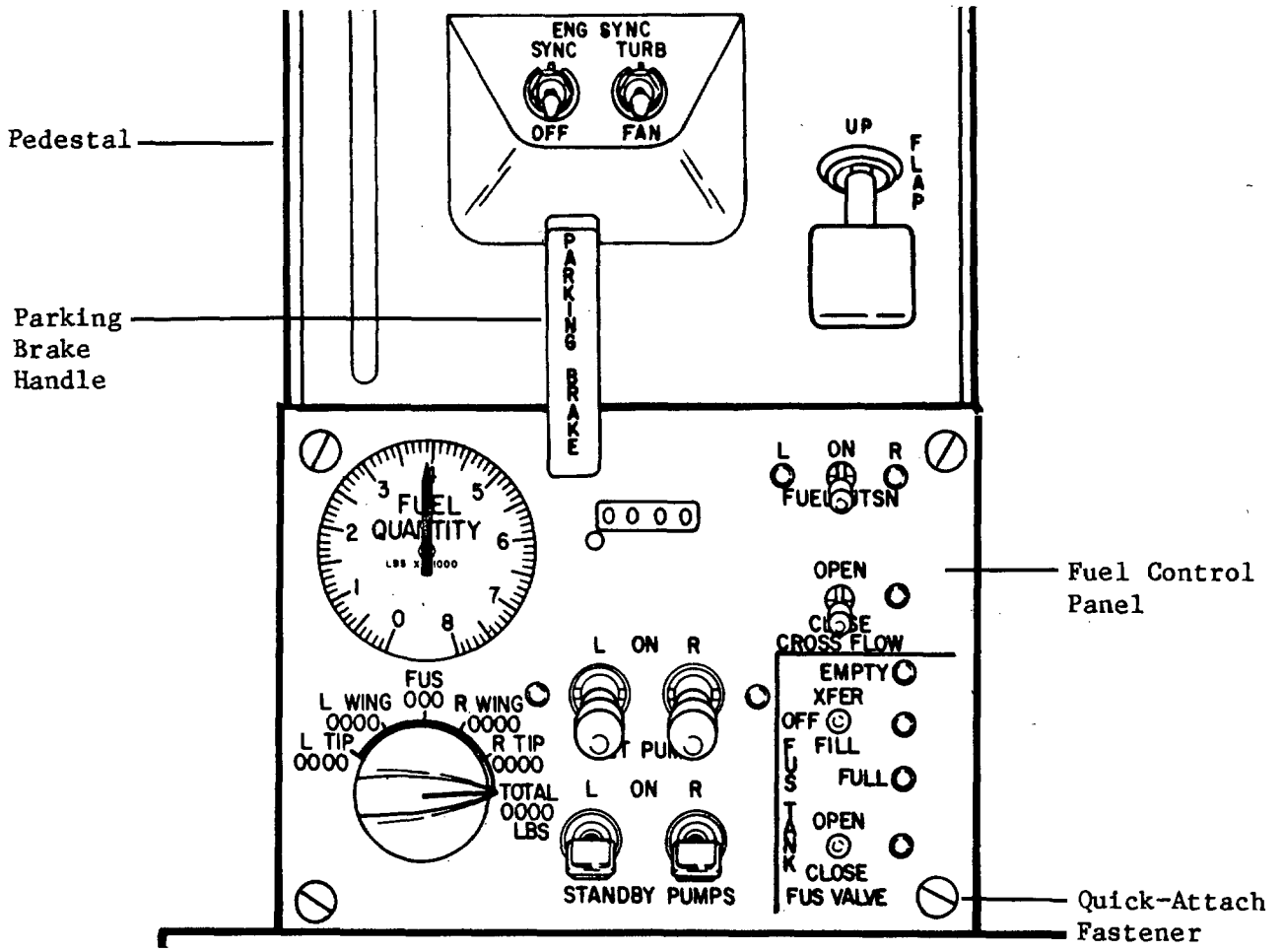
1. REMOVAL/INSTALLATION

A. Remove Fuel Control Panel (See figure 201.)

(1) Remove electrical power from aircraft.
(2) Remove parking brake handle.
(3) Remove attaching parts and fuel control panel from pedestal.
(4) Disconnect electrical connectors from back of fuel control panel.

B. Install Fuel Control Panel (See figure 201.)

(1) Connect electrical connects to back of fuel control panel.
(2) Install fuel control panel in pedestal and secure with attaching parts.
(3) Install parking brake handle.
(4) Restore electrical power to aircraft.



Fuel Control Panel Installation
Figure 201

STORAGE - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The fuel storage system consists of the individual fuel tanks and fuel vent system.

B. The tip tanks are attached to each wing at two attach points, one forward of spar 7 and one aft of spar 1. The metal-to-metal joints are faying surface and fillet sealed. The internal surfaces of the tanks are coated with epoxy for corrosion resistance. Baffles are incorporated to minimize slosh and prevent adverse fuel effects on the aircraft center of gravity. Five access covers are installed to provide entry for inspection and maintenance. Fuel is transferred to the wing tank by gravity flow and the tip tank jet pump. Two drain valves are installed in each tank to drain any accumulation of moisture and sediment.

C. The full-span, integral wing tanks comprise a large portion of each wing. The tank inboard end is at the aircraft centerline and the outboard end is at wing station 205. The forward side of the tank ends at wing spar No. 1 and the aft side terminates at wing spar No. 7. Fuel is not stored in the main landing gear wheel wells and wing leading edge areas. The metal-to-metal joints are faying surface and fillet sealed and the entire inner surfaces are coated with epoxy for corrosion resistance. Small vent holes are incorporated in the upper and lower portion of each spar and rib. This allows fuel to move from one compartment to the other due to fuel expansion. It also allows the individual compartments to completely fill and drain. The wing dihedral of 2.5° causes the inboard portion of the wing to be the lowest point of the fuel system. This assures that the jet pumps and standby pumps will be submerged in fuel until the tanks are practically empty. Wing rib 0.0 incorporates two pressure relief valves that allow flow in opposite directions to equalize tank pressure.

D. On Aircraft 35-002 and Subsequent, the fuselage tank consists of two bladder-type cells located in the cavity between frames 22 and 25. The cavity is a sealed compartment with hangers installed in the upper portion. The hangers mate with fasteners on the bladder to provide hanging support. Additional bladder support is gained by the interconnect fittings, access covers and plumbing fittings incorporated in the bladder. Two drain ports are located in the aft portion of the cavity. Interconnecting tubes and a crossover tube connect the bladders to form a single tank. Access to the bladders is gained through two access covers in the tailcone, an access cover on the top of the fuselage, and through the keel beam access covers.

E. On Aircraft 36-002 and Subsequent, the fuselage tank consists of four bladder-type cells located in the cavity between frames 18 and 25. The cavity is a sealed compartment with hangers installed in the upper portion. The hangers mate with fasteners on the bladder to provide hanging support. Additional bladder support is gained by the interconnect fittings, access covers and plumbing fittings incorporated in the bladder. The cavity also incorporates four cavity drain ports. Two are located in the forward cavity area and two in the aft area. Interconnecting tubes and a crossover tube connect the bladders to form a single tank. Access to the

bladders is gained through two large access covers in the tailcone, two access covers behind frame 18 pressure bulkhead, an access cover on the top of the fuselage, and through the keel beam access covers.

F. The fuel vent system provides continuous ram air pressure to the tip tanks, wing tanks, and the fuselage tank while the aircraft is in flight. Ram air is admitted through the ram air scoops to the tip tanks and the fuselage tank. The ram air pressure is vented to the wing tanks through the wing-to-tip tank interconnects. Ram air is maintained at 1.0 psi by two pressure relief valves, one in each wing tank. A sump drain valve is located at approximately the aircraft centerline (lowest point in the vent system).

STORAGE - MAINTENANCE PRACTICES

1. General
   A. Maintenance practices consist of replacement of defective components and inspection and repairing of sealed areas if deterioration or leakage occurs.
   B. For maintenance practices on components, refer to applicable section in this chapter.
   C. Fuel tank sealing must be applied so that absolutely no leakage exists. Since the fuel has low surface tension and viscosity, it can flow through extremely small openings. Sealing of the structure that has sealant applied to it must be kept to a minimum to avoid adding excessive weight to the airplane. These factors make sealing an important process. In order to maintain the sealing, it is necessary to understand thoroughly how sealant materials are used and the methods of applying sealant to repair leaking fuel tanks. Damage to integral fuel tank sealing which has been evaluated as being in need of repair must be repaired using approved repair procedures. All repairs must be accomplished by the application of approved sealing compounds with special tools.
   D. As a general rule, repair sealant should not be added to areas or parts which were not originally sealed. If the source of leak appears at an area which was not originally sealed, the cause of the leak is probably failure of a pre-pack or faying surface seal not visible. Application of additional sealant would only temporarily stop the leak. A study of surrounding structure should be made for hidden seals. As an option to replacing a failed pre-pack, injection, or faying surface seal, the failed seal may be isolated from fuel by raising (relocating) the seal plane. Raising the seal plane can involve an extensive amount of sealant addition; so, in many cases, structure removal and replacement of the failed seal will be the best action.
   E. Sealing compound used for repair is available as Class A for brush application and Class B for flow gun cartridges. Sealing repair in the integral fuel tanks presents a number of problems and, to be satisfactory, directions for doing the work involved must be followed exactly. Careless workmanship and disregard for basic sealing principles can endanger the safety of the airplane and its personnel. The following conditions are encountered when making leak repairs: structural repair is sometimes necessary; sealing compounds must be properly prepared and applied; and application of sealant is a noninspectable item as the quality of work cannot, in most instances, be immediately determined upon completion. Therefore, close attention to details and faithful accomplishment of the functional steps of the repair in the proper order are essential. The effectiveness of any repair depends entirely upon the skill and integrity of the personnel doing the work. Careful attention must be given to directions for mixing sealant compounds, sealant work life, and the time it takes for the sealant to cure. It must also be remembered, that if all preparation work is done properly and then the sealant is applied to a surface that is not properly cleaned, the sealing will not be satisfactory as the sealant will never adhere to a dirty surface. Repair of failed sealant is not a speedy operation; less manhours will be expended in the long run if ample time is allowed to properly examine and repair the sealant. Effective original repairs will alleviate repetitious leakage and prevent extensive fuel leak difficulties.
   F. Do not apply sealant at temperatures below 60°F or to structure that is below 60°F. Sealant in the integral fuel tanks shall be applied over epoxy finish. Structure that has been sealed, other than faying surface seals, should not be moved until sealant is tackfree.
   G. Further information on types of seals, methods of application, and tools required may be found in Chapter 20.

2. Leak Classification
   A. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Turbine fuel dye	Type I Red or Type II Yellow MIL-D-81298C	Morton Chemical Co Chicago, IL	Detecting leaks

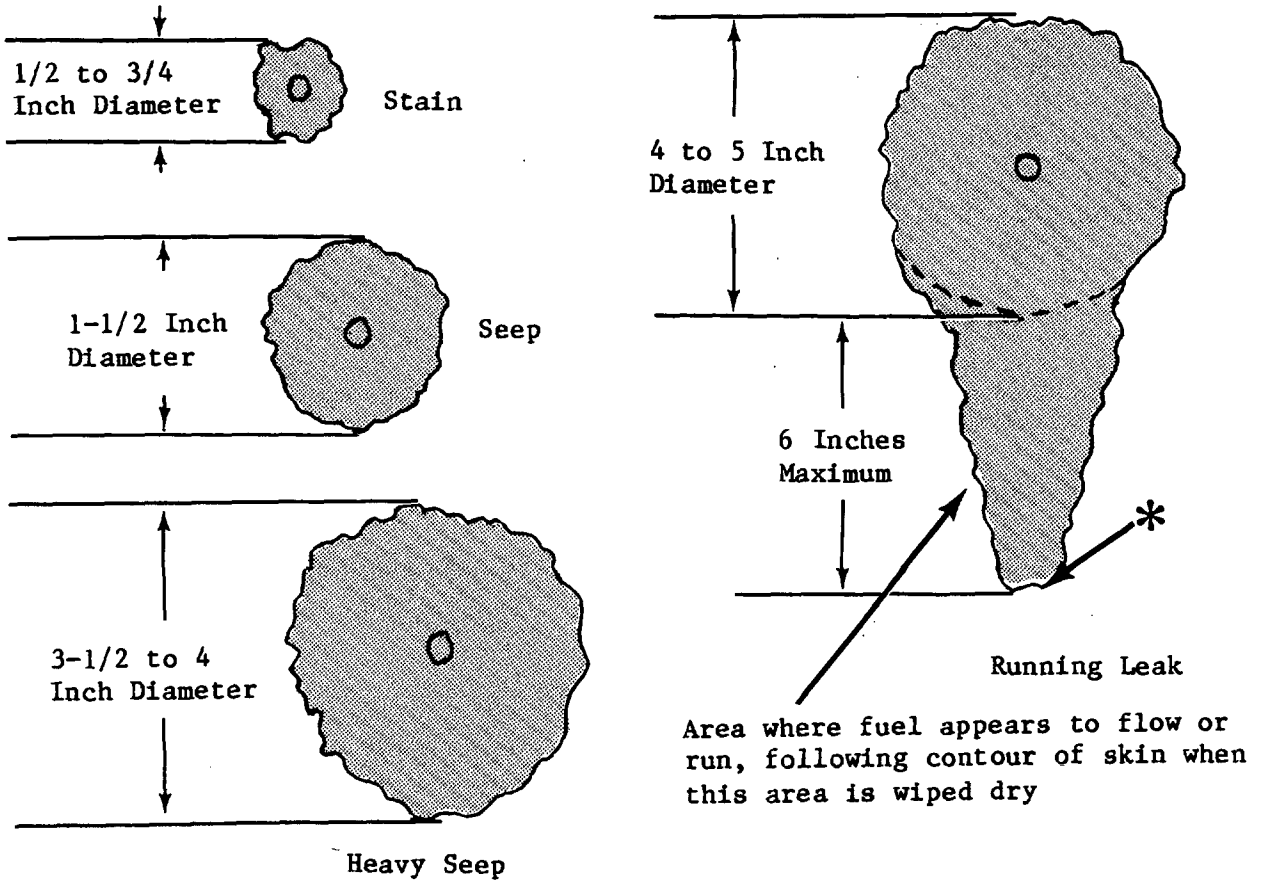
B. Fuel leaks are classified as stains, seeps, heavy seeps, or running leaks. (See figure 201.)
C. Turbine fuel dye may be used as a fuel additive for detecting leaks. The dye should be added in the proportion of 1.6 or fewer ounces per 100 U.S. gallons. It is recommended that a portion of fuel be in the tank before addition of the dye. Agitation incurred during refueling is enough to give a uniform shade throughout the tank.
D. Measure the size of the wetted area around the source of the leak on the aircraft skin to classify the leak.

NOTE: For a more accurate measurement, wipe the aircraft skin dry and apply talcum powder to the leak area. At the end of 30 minutes inspect the leak area and classify the leak. (See Figure 201.)

WARNING: LEAKS WHICH ARE PROGRESSING INTO CRITICAL AREAS OF THE AIRCRAFT (SUCH AS THE WHEEL WELL) OR LEAKS THAT WILL CAUSE FUEL TO BE BLOWN INTO CRITICAL FUSELAGE AREAS, MUST BE REPAIRED IMMEDIATELY REGARDLESS OF THE LEAK CLASSIFICATION.

E. Fuel leaks must be further classified as to whether they occur in an open area or an enclosed area to determine the need for immediate repair or leaks not considered potential flight hazards.
F. A leak classified as a stain, seep, or heavy seep occurring in open areas must be repaired at such time the aircraft is grounded for other maintenance.
G. A leak classified as a stain, seep, or heavy seep occurring in an enclosed area requires immediate repair.
H. A running leak requires immediate repair regardless of the aircraft environment.

3. **Leak Path Analysis**
A. Leak path analysis is one of the most important steps performed in fuel system repair. A repair made without finding the entrance and exit point of a leak is useless, as this type of repair is only temporary.
B. The seal plane is the barrier that prevents escape of the fuel from the tank. When this seal plane is penetrated, the faying surfaces of all structure on the opposite side of the seal plane become wet. The wetted area extends in all directions from the point of penetration until it is stopped by an injection, faying surface, or pre-pack-type hidden seal. Fillet seals act as sides to a channel formed in the structure through which the fuel will flow. Since there are no seals on the opposite side of the seal plane, any fuel that has penetrated the seal plane will leak out where the least resistance exists. For instance, a row of fasteners in the channel may be wet, but the leak will appear at only one fastener due to the looseness at that point. If the leaking fastener were sealed, then the fastener having the next least resistance would leak and so on.
C. After a leak is localized, the next step is to study the structure and sealing of the suspected area. Construct cross sectional views to locate the seal plane. Study these views and trace all potential leak paths from the external leak point to the tank interior, assuming failure of sealant at various locations. This will define the area of the tank in which the leak source or sources will be found.
D. The area where the bubbles appear when locating the interior leak point as described in "Leak Test" should indicate the true point of seal plane penetration, except in the case of failure of a hidden seal. In many cases the failure of an injection, pre-pack, or hidden seal will allow fuel to enter and travel within the structure to appear at a point some distance from the leak point. Repairing the apparent leak area, where the bubbles appear, and not the failed hidden seal may mean a temporary fix which will have to be redone frequently until the true point of penetration of the seal plane is located. To prevent this situation, a fuel leak should be thoroughly analyzed for all possible leak paths between external and internal appearance points.



Fuel Leak Classification
Figure 201

4. **Inspection of Tank Interior**
   A. Thoroughly inspect the interior of the tank in the area determined ("Leak Path Analysis") to contain the leak source. The following instructions will help to reveal the leak source.
      (1) Inspect the area carefully for defective sealant, such as deep cracks, air bubbles, loose fasteners, or loose fillets. Use mirrors to inspect areas which are not otherwise completely visible.
      (2) Inspect location where injection seals have been installed to provide continuity of fillet seals.
      (3) Inspect for topcoat breaks, tears, scuffs, or nicks in sealant. Fuel will penetrate any break in the film of topcoat and cause the sealant to leach. It will not cause a leak, however, until the base sealant has deteriorated to the point where an edge of the structure is bare. A chalky material under the cracked topcoat will indicate leaching of the sealant. All leached sealant shall be removed and replaced with new sealant.
      (4) Inspect fillet seals for adhesion. Fillets suspected of poor adhesion shall be checked by applying air pressure at a maximum of 100 psi with an air gun, placed approximately 1/2 inch from the fillet. This check will loosen a fillet which has poor adhesion. Cut a section through the loose fillet and strip it off by pulling away from the structure. Continue to strip the fillet until it breaks apart within itself. A fillet with poor adhesion will pull away from tank structure rather than pull apart.
      (5) Inspect tank structure for cracks, distortion, corrosion, and loose fasteners.
      (6) Visible defects in sealant or the structure are not necessarily the source of a true leak. Continue inspection until the entire suspected leak area has been carefully inspected. Mark all defective sealant.
      (7) Watch closely for the following:
         (a) Excessive shrinkage.
         (b) Loss of luster or discoloration.
         (c) Loss of elasticity.
         (d) Crumbling sealant.
         (e) Loss of cohesive strength.

5. **Leak Test**
   A. If the leak source has not been definitely isolated by a visual inspection, it may be revealed by the application of a bubble solution to the inside of the tank in the suspected leakage area.
      (1) Apply air pressure to the external leak point. Air pressure should be 100 psi with an air hose held approximately 1/2 inch from the fillet. If leak is present, small bubbles will appear.
      (2) If bubbles are observed, mark the spot internally and externally, and continue the bubble test until entire area has been covered.
      (3) Recheck marked area.
      (4) After completion of test, wipe bubble solution from interior and exterior surfaces. Assure that defective areas are marked.

6. **Fuel Tank Sealing Repairs**
   A. Permanent Repairs
      (1) After the leak path has been carefully analyzed to determine which seal, or seals, have failed and after the actual leak point is known, an effective method of repair can be decided upon. The following paragraphs describe the repair methods used in a few typical situations.
         (a) If leak path tracing procedures determine the actual leak point is a failed fillet or fastener seal, the correct procedure is to remove and replace the faulty seal. All faulty sealant material must be cut away, surfaces thoroughly cleaned, and new sealant applied to produce a seal of the same size and shape as the original seal.

(b) Raising the seal plane can be employed whenever leak path tracing procedures determine that the actual leak point is in a failed pre-pack or faying surface seal. The structure surrounding the failed seal must be carefully reviewed to determine the point to which the seal plane must be raised. The new seal plane must completely isolate the failed seal from fuel but the seal plane should not be raised any more than necessary to accomplish this. As an option, the failed preassembly seal may be replaced as directed in step (d).Raising the seal plane can involve an extensive amount of sealant addition; so, in many cases, structure removal and replacement of the failed seal will be the best action.

(c) When removing a failed injection seal, all sealant material must be removed through the injection channel. A satisfactory seal cannot be formed if the channel is not clear since trapped air will prevent complete filling of the channel with sealant material. As an option, the failed injection seal may be repaired by raising the seal plane.

(d) Replacing a failed pre-pack or faying surface seal involves disassembly of structure to gain access to the faulty seal.

B. Temporary Repair

(1) Tools and Equipment

NAME	PART NUMBER	MANUFACTURER	USE
Click Patch	KA1A1 CP 125 000 005 (Aluminum)	Click Bond 2151 Lockheed Way Carson City, NV 89701	Temporary fuel tank repair of enclosed wing surfaces
	KA1A1 CP 125 000 003 (Stainless Steel)	Click Bond 2151 Lockheed Way Carson City, NV 89701	Temporary fuel tank repair of exposed wing surfaces

(2) Apply Click Patch per manufacturer instructions.

(3) Wing fuel leaks that occur on top of the wing, which are in an enclosed area and will require demating of the wing to repair, may be temporarily repaired using a Click Patch installation, P/N: KA1A1 CP 125 000 005. A log book entry shall be made to flag inspection and maintenance personnel of this condition.

NOTE: This will only be used as a temporary repair, with the permanent repair being accomplished within 400 flight hours or six months from the time a patch is installed, whichever comes first.

CAUTION: CLICK PATCHES INSTALLED ON THE UPPER WING SURFACE INBOARD OF WING STATION 92 SHALL BE CHECKED PRIOR TO FLIGHT FOR SECURITY TO AVOID SEPARATION IN FLIGHT AND POSSIBLE ENGINE INGESTION.

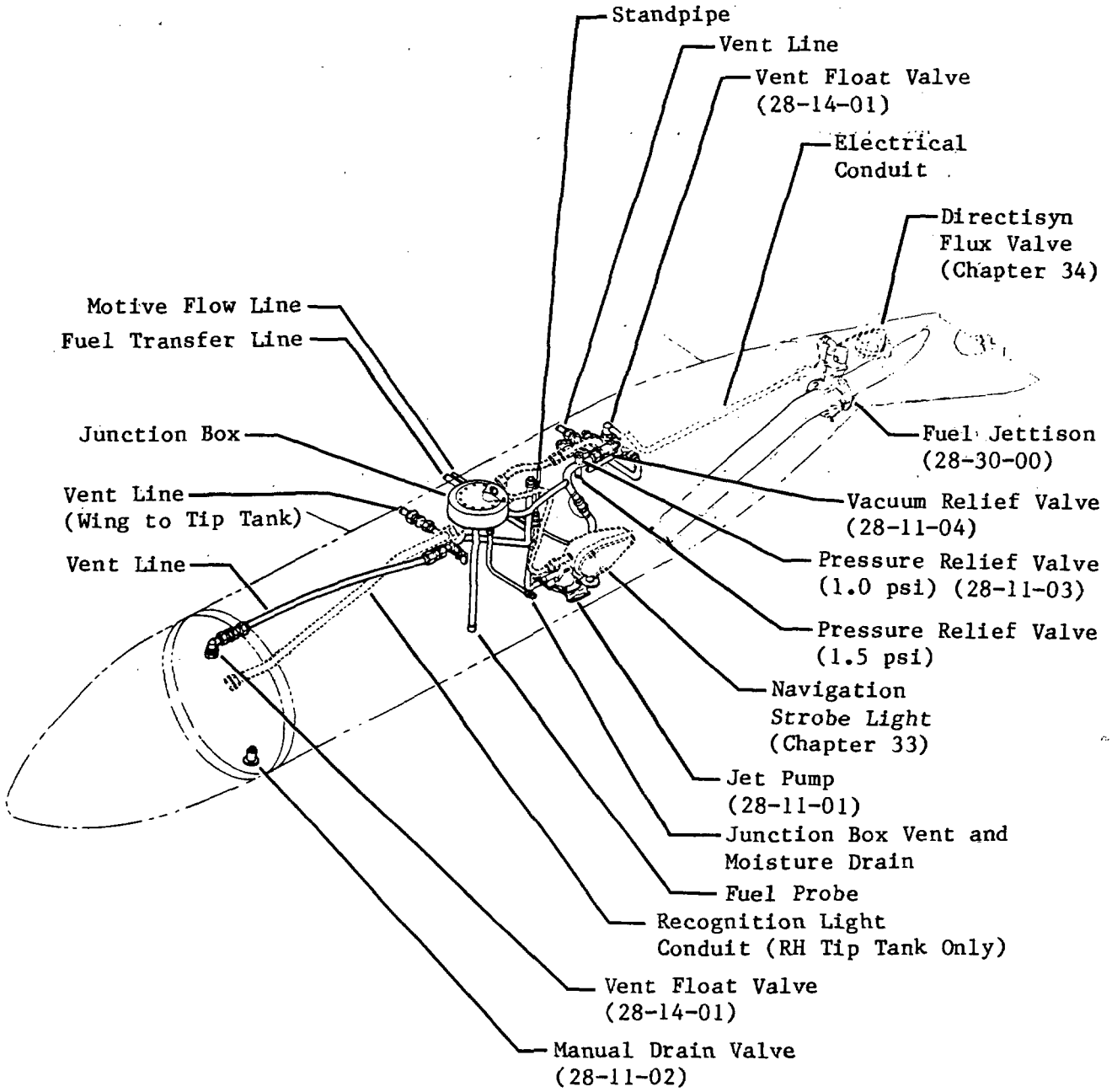
(4) Wing fuel leaks that occur on the exposed portion of the wing may be temporarily repaired by using stainless steel Click Patch, P/N: KA1A1 CP 125 000 000. A log book entry shall be made to flag inspection and maintenance personnel of this condition.

NOTE:
- An exposed wing surface Click Patch shall only be used as a temporary repair with permanent repair being accomplished within 50 flight hours or 60 days.
- When installed, the exposed surface of the Click Patch shall not be more than 0.005 inch above the adjacent wing skin surface (mismatch).

TIP TANK - DESCRIPTION AND OPERATION

1. Description
   A. The tip tanks are part of the fuel storage system. They are attached to each wing at two attach points, one forward of spar 7 and one aft of spar 1. Access covers on the top of the tank provide entry for inspection and maintenance. Baffles are installed to minimize slosh and to prevent adverse fuel effects on the aircraft center of gravity during extreme flight attitudes. A small vent hole, located forward and below the fuel filler cap, is connected by a tube to the tip tank junction box. This vent hole is used to vent and drain any moisture accumulation from the junction box. Ensure that the hole is open at all times.
   B. Each tip tank is equipped with an optional fuel jettison system. (For further information on the fuel jettison system, refer to 28-30-00.)
   C. Each tip tank incorporates a jet pump, a drain valve, two pressure relief valves, a vacuum relief valve, two vent float valves, a standpipe assembly, a fuel probe, and a filler cap.
      (1) The jet pump, installed in the bottom middle of the tip tank, transfers fuel into the inboard portion of the wing tank (WS 23) during engine operation.
      (2) The drain valve, located at the bottom forward end of the tank, is used to drain residual fuel or sediment from the tank.
      (3) The pressure relief valves, located in the vacuum relief tube just forward of tank station 113, protect the tip tank against excessive pressure. One valve is set to operate at 1.0 psi. The other, installed as a backup to the 1.0 psi valve, is set to operate at 1.5 psi.
      (4) The vacuum relief valve, secured to the bulkhead web at tank station 113, opens and admits air to the tip tanks and vent system when a vacuum condition exists.
      (5) The vent float valves, located in the forward and aft ends of the tank, close when the fuel level reaches the vent ports. They thus prevent fuel from entering the vent system.
      (6) The standpipe assembly, installed in the jet pump transfer line, prevents fuel from being siphoned down from the wing tank to the tip tank when the applicable engine is shut down.
      (7) The fuel probe, mounted in the junction box, provides a capacitive signal to the fuel quantity indicating system. (For more information on the fuel probe, refer to 28-40-00.)
      (8) The filler cap, located on the outer surface of the tip tank, is used to service the entire aircraft fuel system.

2. Operation
   A. All fueling operations for the aircraft are accomplished through the tip tanks. Fuel is transferred by the jet pump into the wing tank. Fuel can also gravity flow through flapper check valves into the wing tank. However, any fuel at a lower level than the check valves must be transferred using the jet pump. Further information on tip tank operation is furnished under component operation.
   B. Component Operation
      (1) The jet pumps have no moving parts and operate on the venturi principle. (See figure 2.) When the Starter-Generator Switch is set to GEN and the Jet Pump Switch is set to ON, the motive flow valve opens and high-pressure fuel from the engine-driven fuel pump is directed through a nozzle in the jet pump, drawing fuel from the tank. The motive flow pressure ranges from approximately 300 psi during high fuel flow rates at 45,000 feet altitude to approximately 250 psi at low fuel flow rates at sea level when the engine rpm is at idle. Jet pump discharge pressure increases as engine fuel flow increases; for example, at idle rpm, the fuel flow is 150 pounds per hour, the jet pump discharge pressure is approximately 10 psi with a pump inlet pressure (motive flow) of approximately 250 psi. At full power settings (Standard Day Conditions) the fuel flow is approximately 1700 pounds per hour, the jet pump discharge pressure is approximately 12 psi with a pump inlet pressure (motive flow) of approximately 300 psi.

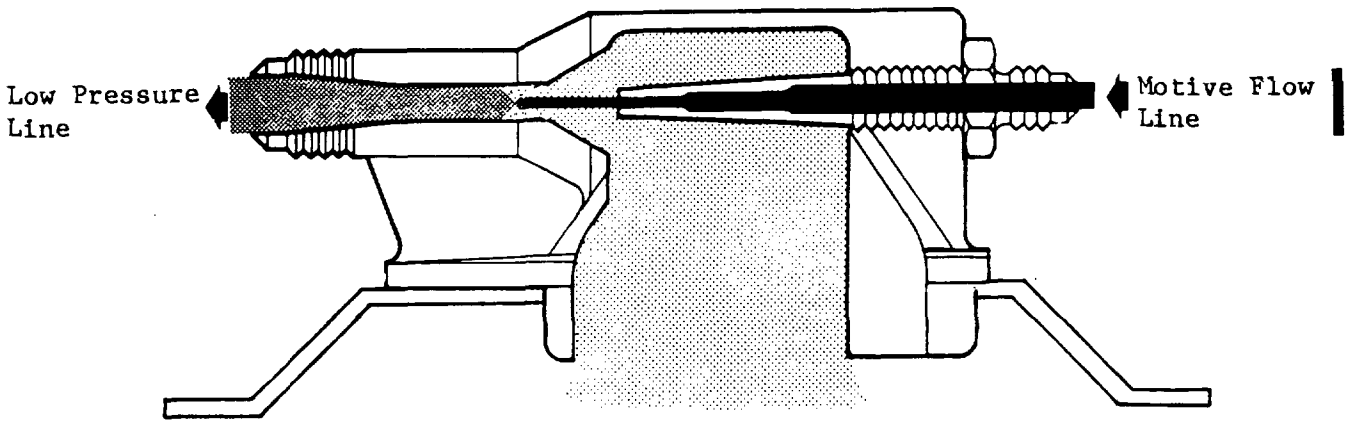


(TYPICAL)

Tip Tank Component Locator
Figure 1

(2) The drain valve is spring loaded to the closed position and sealed with an internal O-ring. To open the valve requires the use of a Phillips screwdriver. On *Aircraft 35-002 thru 35-343 and Aircraft 36-002 thru 36-045*, the poppet assembly is removable. On *Aircraft 35-344 and Subsequent and Aircraft 36-046 and Subsequent*, the poppet assembly is not removable. If a valve should develop a leak, the valve should be fully depressed to clear any sediment which could be preventing the valve from completely closing. If a valve has developed a leak not caused from sediment holding the valve open, the O-ring seal shall be replaced.

(3) The vacuum relief valve has a free flow arrow imprinted on the valve body. For proper operation, the free flow arrow must point aft when installed.



Fuel Jet Pump Schematic
Figure 2

1. REMOVAL/INSTALLATION

WARNING: ADHERE TO ALL SAFETY PRACTICES AS OUTLINED IN 28-00-00-201.

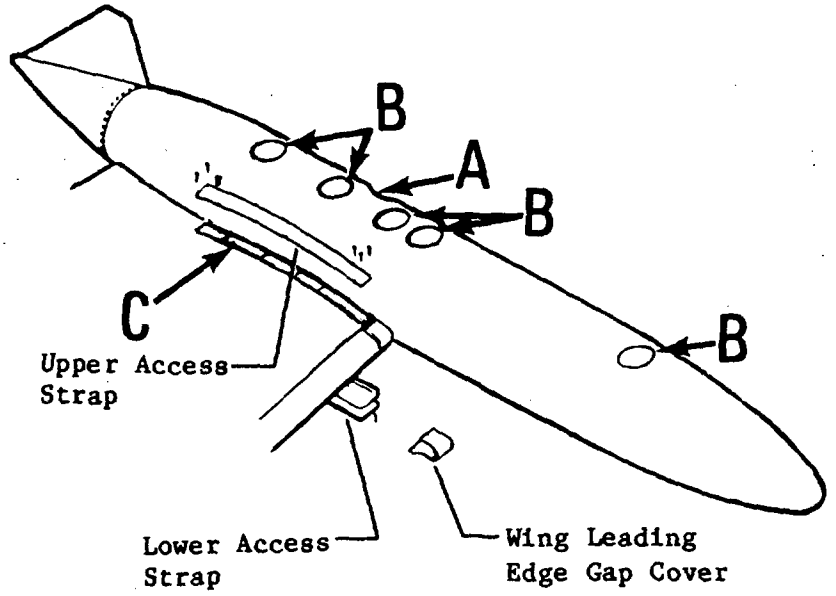
A. The following tip tank removal and installation procedure applies to removing the tip tank for repairs and reinstallation. This procedure does not include the installation of a new tip tank. New tip tank installation requires the locating and fitting of the tip tank to the wing which can be accomplished only at the Learjet Factory or an authorized Service Center. Tip tanks that are removed for repairs should be pressure tested prior to installation. After the tip tank is installed, the tanks should be fully fueled and checked for leaks.

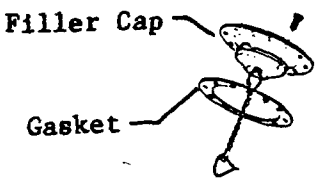
B. Remove Tip Tank (See figure 201.)
   (1) Defuel the aircraft. (Refer to Chapter 12.)
   (2) Disconnect aircraft batteries.
   (3) Support tip tank on a movable dolly.
   (4) Remove three lower outboard wing access panels and the access covers.
   (5) Disconnect motive flow and fuel discharge lines through access openings and remove clamps from boot seals. Disconnect fuel vent lines from tip tank.
   (6) Remove flapper valves and clamps from tip tank interconnect boot seals. Loosen boot seals.
   (7) Remove screws from wing leading edge gap cover. Remove gap cover.
   (8) Remove screws from upper and lower access straps.
   (9) Remove access covers from tip tank and disconnect wiring from all electrical components. Pull wiring from tip tank through aft wing access opening.
   (10) Remove forward and aft attachment bolts and washers.
   (11) Remove tip tank from wing.
   (12) Remove retainer ring and boot seals from wing rib. Discard old boot seals.
   (13) Perform repairs to tip tank structure as required.
   (14) Thoroughly clean interior of tip tank.

C. Install Tip Tank (See figure 201.)
   (1) Clean old sealant from wing rib where boot seals are installed. Apply bead of sealant (Pro-Seal 890) and position new boot seals on wing rib. Secure with retainer rings. Torque bolts 10 inch-pounds.
   (2) Apply bead of sealant around interconnect tubes.
   (3) Position tip tank on wing and install washer and forward attach bolt.

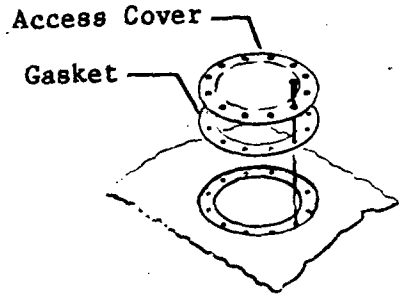
   NOTE: Lubricate inside of boot seals with water to help interconnect tubes slide into boot seals.

   (4) Check for gap between aft tip tank fitting and wing fitting. If gap exists, add AN960-716 or AN960-716L washer as required. Install washer and aft attach bolt.
   (5) Install upper and lower access straps with screws.
   (6) Connect wiring to electrical components in accordance with applicable wiring diagram in wiring book.
   (7) Check that all components and plumbing are secure in the tip tank.
   (8) Apply a thin continuous coat of anti-corrosion grease to access covers. (See figure 202.)
   (9) Install gaskets and access covers and secure with attaching parts.
   (10) Install clamps over boot seals and torque 25 inch-pounds.
   (11) Connect fuel tank vent, motive flow and fuel discharge lines, and tip tank vent interconnect line. Check interconnect lines with air pressure to assure sealant has not blocked lines.
   (12) *On Aircraft 35-427 and Subsequent and 36-050 and Subsequent*, apply a fillet of Pro-Seal 890 around motive flow line and fuel discharge line fittings after connections are complete.



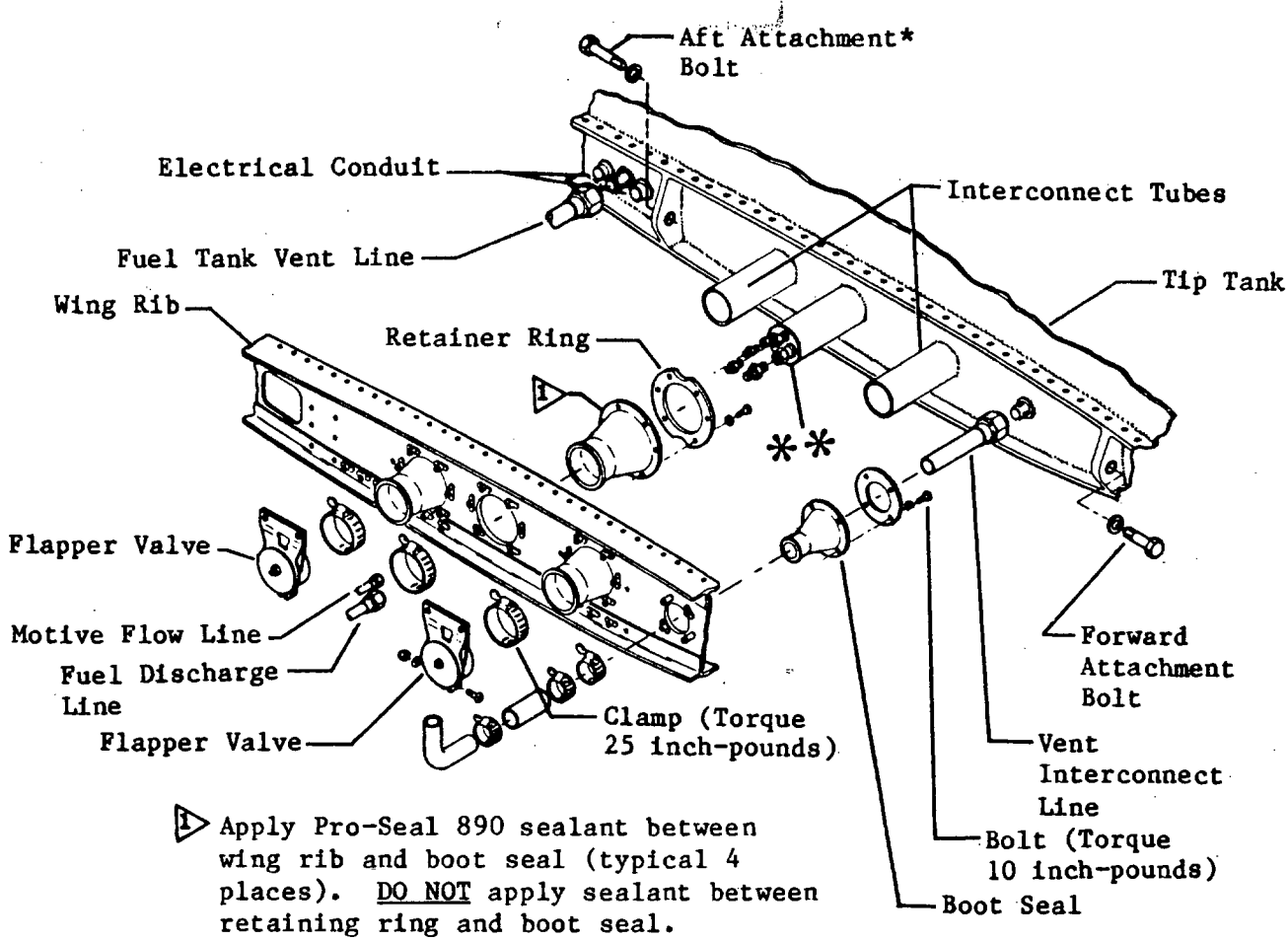


Detail A



Detail B

Tip Tank Installation
Figure 201 (Sheet 1 of 2)



1 Apply Pro-Seal 890 sealant between wing rib and boot seal (typical 4 places). DO NOT apply sealant between retaining ring and boot seal.

*Before installing aft attachment bolt, check for gap between aft tip tank fitting and wing fitting. If gap exists, add AN960-716 or AN960-716L washer between tip tank fitting and wing fitting.

**On Aircraft 35-427 and Subsequent and 36-050 and Subsequent, apply a fillet of Pro-Seal 890 around plate, tubes, and bolt heads after ejector jet pump fuel line connections are complete.

Detail C

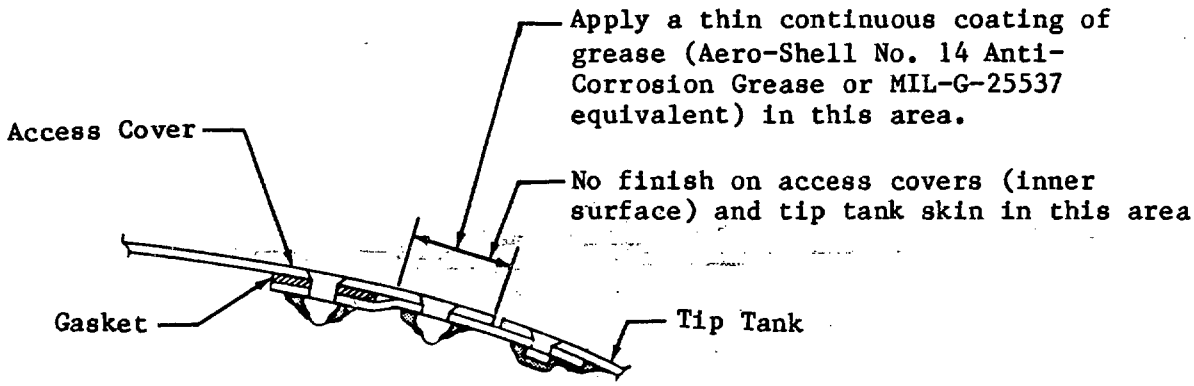
Tip Tank Installation
Figure 201 (Sheet 2 of 2)

(13) Connect flapper valves to interconnect tubes.
(14) Perform operational check of electrical components.
(15) Install leading edge and trailing edge gap covers.
(16) Install wing access panels.
(17) Reconnect aircraft batteries.
(18) Service aircraft fuel tanks and check for leaks. (Refer to Chapter 12.)
(19) Fill gaps between leading edge, tip tank access straps, and wing with body putty.
(20) Paint all affected areas. (Refer to Chapter 20.)
(21) If tip tank was removed for repairs, perform pressure check.

2. INSPECTION/CHECK
A. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Pressure Test Cart	None	Manufacture Locally (See Figure 203)	Pressure test fuel tanks.
Air Pressure Source		Shop Air	Pressurize fuel tanks



Tip Tank Access Cover Anti-Corrosion Protection
Figure 202

B. Wing and Tip Tank Pressure Check
(1) Defuel aircraft. (Refer to Chapter 12.)
(2) Pull left and right engine FIRE EXT circuit breakers.

CAUTION: PULL FIRE EXTINGUISHER SYSTEM CIRCUIT BREAKERS BEFORE PUSHING ENGINE FIRE SWITCHES.

(3) With fire extinguisher system circuit breakers pulled, close left and right main engine fuel shutoff valves by pushing left and right engine ENG FIRE switches.
(4) Set Crossflow Switch to OPEN.
(5) Remove electrical power from aircraft and disconnect aircraft batteries. (Refer to Chapter 12.)
(6) Plug the ram air inlets located on the underside, outboard section of wings.
(7) Cap vent tubes located at underside, inboard section of wings.

NOTE: All plugs, caps, etc., which are temporarily installed in the aircraft for the purpose of pressure testing shall have permanently attached a red streamer with a minimum width of one inch and a minimum length of 36 inches.

(8) Remove filler cap on either tip tank and install test cart adapter. (See figure 203.)
(9) Connect pressure test cart to test cart adapter.
(10) Close shutoff valve (P/N 479K1) on pressure test cart and adjust pressure regulator to zero before connecting test cart to shop air supply.
(11) Connect test cart to shop air.

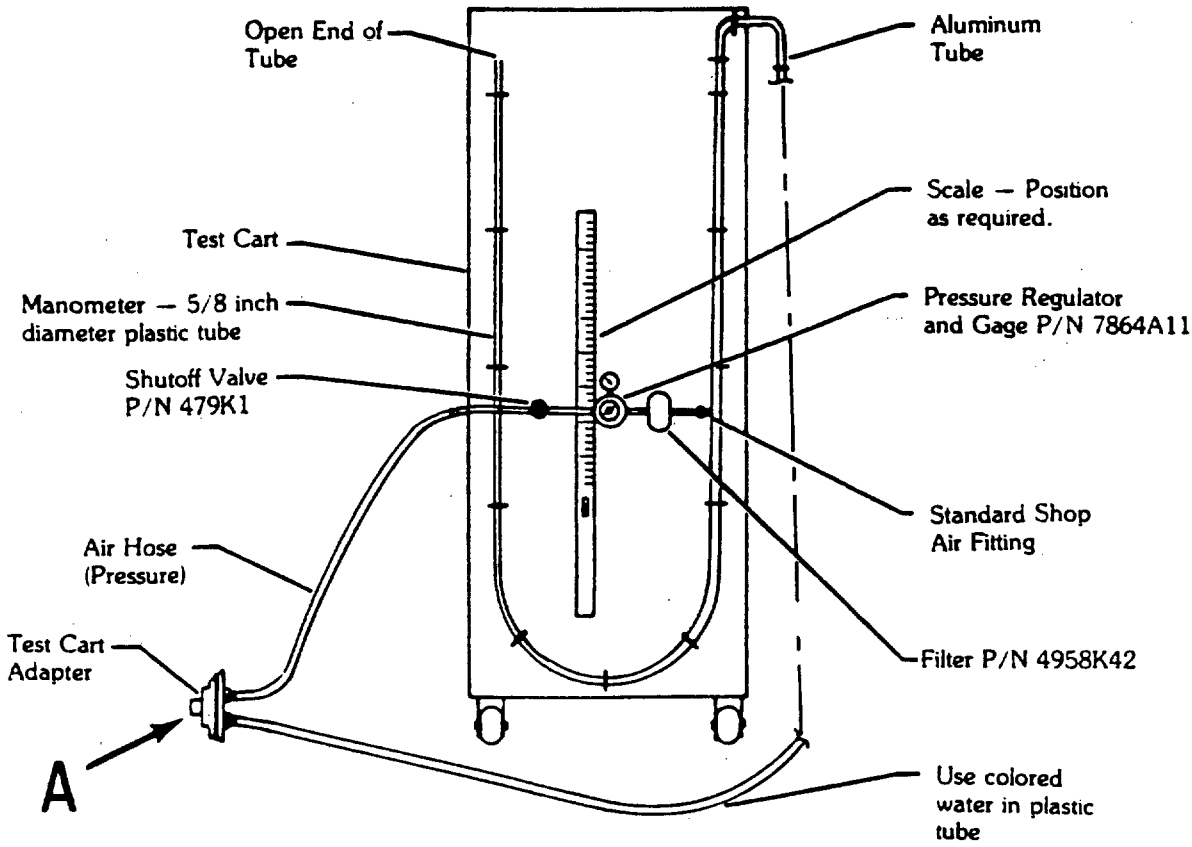
CAUTION:
- ENSURE THAT SENSING AND PRESSURE HOSES ARE NOT KINKED OR OBSTRUCTED.
- DO NOT ALLOW A RAPID INCREASE OR DECREASE OF PRESSURE DURING CHECK OR SEVERE STRUCTURAL DAMAGE COULD RESULT.

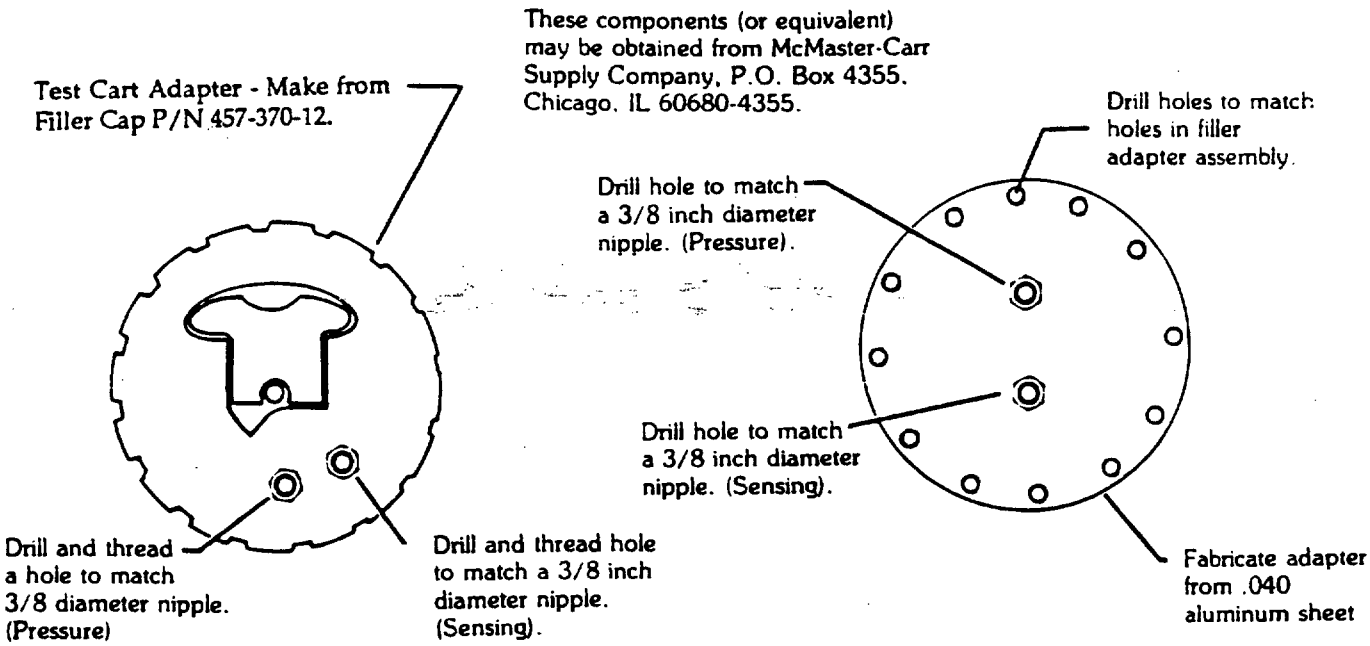
(12) Slowly apply pressure to wing and tip tanks until one (1) psi is reached.

NOTE: Do not exceed 1.5 psi pressure during check or the pressure relief valves in the tip tanks will open.

(13) Allow air pressure in tanks to stabilize, then close shutoff valve.
(14) Allow pressurized tanks to stand for one hour. There shall be no pressure loss.
(15) If pressure-loss occurs, locate external leak point by applying bubble solution to the tip tank and wing exteriors while the tanks are pressurized. Perform a leak path analysis of the fuel leak. (Refer to Chapter 20.)
(16) When leakage is detected, slowly relieve pressure in wing and tip tanks then perform necessary repairs and repeat the pressure check. Clean bubble solution from all surfaces.
(17) Slowly relieve pressure in wing and tip tanks.
(18) Disconnect shop air from test cart.
(19) Remove test cart adapter from tip tank and install regular tip tank filler cap.

CAUTION: ALL PLUGS, CAPS, ETC., WHICH WERE TEMPORARILY INSTALLED IN AIRCRAFT FOR PURPOSE OF PRESSURE TESTING SHALL BE REMOVED.





Detail A

TEST CART ADAPTER **ALTERNATE TEST CART ADAPTER**

Wing and Tip Tank Pressure Test Cart
Figure 203

(20) Remove caps from vent tubes located inboard, underside of wings.
(21) Remove plugs from ram air inlets located outboard, underside of wings.

CAUTION: THE ARMED SWITCHES MUST BE RESET BEFORE RESETTING THE LEFT AND RIGHT FIRE EXTINGUISHER CIRCUIT BREAKERS, ELECTRICAL POWER IS RESTORED AND THE ENGINE FIRE SWITCHES ARE PUSHED IN. FAILURE TO DO SO WILL CAUSE THE ENGINE FIRE EXTINGUISHER CONTAINER(S) TO DISCHARGE IF THE ARMED SWITCH(ES) ARE DEPRESSED AFTER POWER IS RESTORED TO THE AIRCRAFT.

(22) Reset ARMED Switches as follows:

NOTE: The left and right main engine fuel shutoff valves will be opened as part of the reset procedure for the ARMED Switches.

(a) Connect aircraft batteries and restore electrical power to aircraft.
(b) Verify that all ARMED Annunciator/Switches are illuminated.
(c) Push left and right ENG FIRE Switches in. All ARMED annunciator/Switches shall extinguish.

(23) Depress left and right FIRE EXT circuit breakers.
(24) Set Crossflow Switch to CLOSED.

CAUTION: WHEN SEALANT IS USED IN THE REPAIR OF LEAKS, ENSURE AN ADEQUATE AMOUNT OF CURE TIME ELAPSES PRIOR TO REFUELING AIRCRAFT. (REFER TO CHAPTER 20.)

(25) Service aircraft with fuel. (Refer to Chapter 12.)
(26) Restore aircraft to normal.

TIP TANK JET PUMP - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

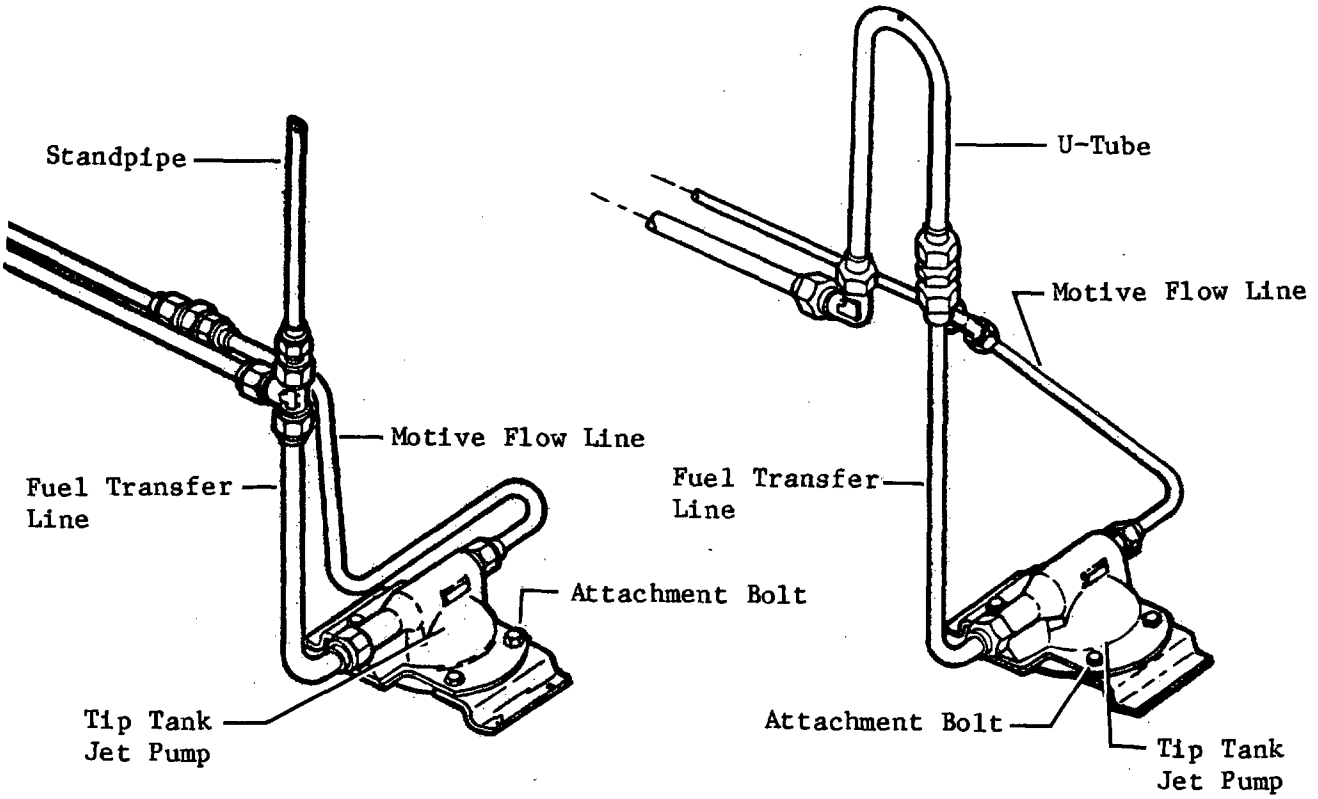
A. Remove Tip Tank Jet Pump (See figure 201.)

WARNING: ADHERE TO ALL SAFETY PRACTICES OUTLINED IN 28-00-00.

(1) Drain the tip tank. (Refer to Chapter 12.)
(2) Remove tip tank access covers.
(3) Disconnect motive flow and fuel transfer lines from tip tank jet pump.
(4) Remove attaching parts and jet pump from tip tank.

B. Install Tip Tank Jet Pump (See figure 201.)

(1) Install tip tank jet pump and secure with attaching parts.
(2) Connect motive flow and fuel transfer lines to tip tank jet pump.
(3) Apply a thin continuous coat of anti-corrosion grease to access covers. (Refer to 28-11-00, figure 202.)
(4) Install gaskets and access covers and secure with attaching parts.



Aircraft 35-002 thru 35-322 and 36-004 thru 36-045

Aircraft 35-323 and Subsequent and 36-046 and Subsequent

12-13D-1
12-82B

Tip Tank Jet Pump Installation (Typical)
Figure 201

DRAIN VALVES - MAINTENANCE PRACTICES

1. APPROVED REPAIRS

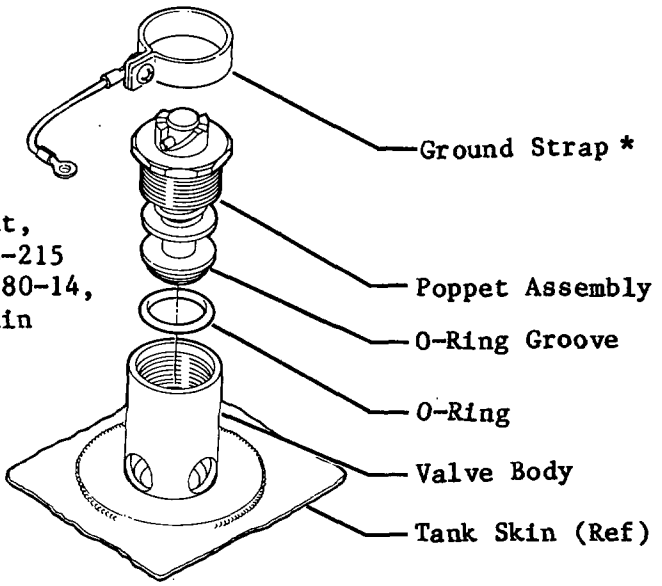
WARNING: ADHERE TO ALL SAFETY PRACTICES OUTLINED IN 28-00-00. SPECIAL CARE SHOULD BE TAKEN FOR PROPERLY VENTILATING THE FUEL CELL PRIOR TO PERFORMING MAINTENANCE PRACTICES.

A. Replace Drain Valve O-Ring (Aircraft 35-002 thru 35-343 and 36-002 thru 36-045) (See figure 201.)

(1) Defuel aircraft as necessary. (Refer to Chapter 12.)
(2) Remove tip tank access cover nearest the drain valve to be repaired.
(3) Reach into tip tank through access opening and unscrew poppet assembly from valve body.
(4) Using a suitable tool, remove old O-ring.
(5) Inspect O-ring groove for scratches, burrs, or dirt. Clean if necessary.
(6) Install a new O-ring.
(7) Inspect seat in valve body for scratches, burrs, or dirt. Clean if necessary.
(8) Install poppet assembly in valve body.
(9) Apply a thin continuous coat of anti-corrosion grease to access cover. (Refer to 28-11-00, figure 202.)
(10) Install gasket and access cover and secure with attaching parts.
(11) Fuel aircraft and check for leaks. (Refer to Chapter 12.)

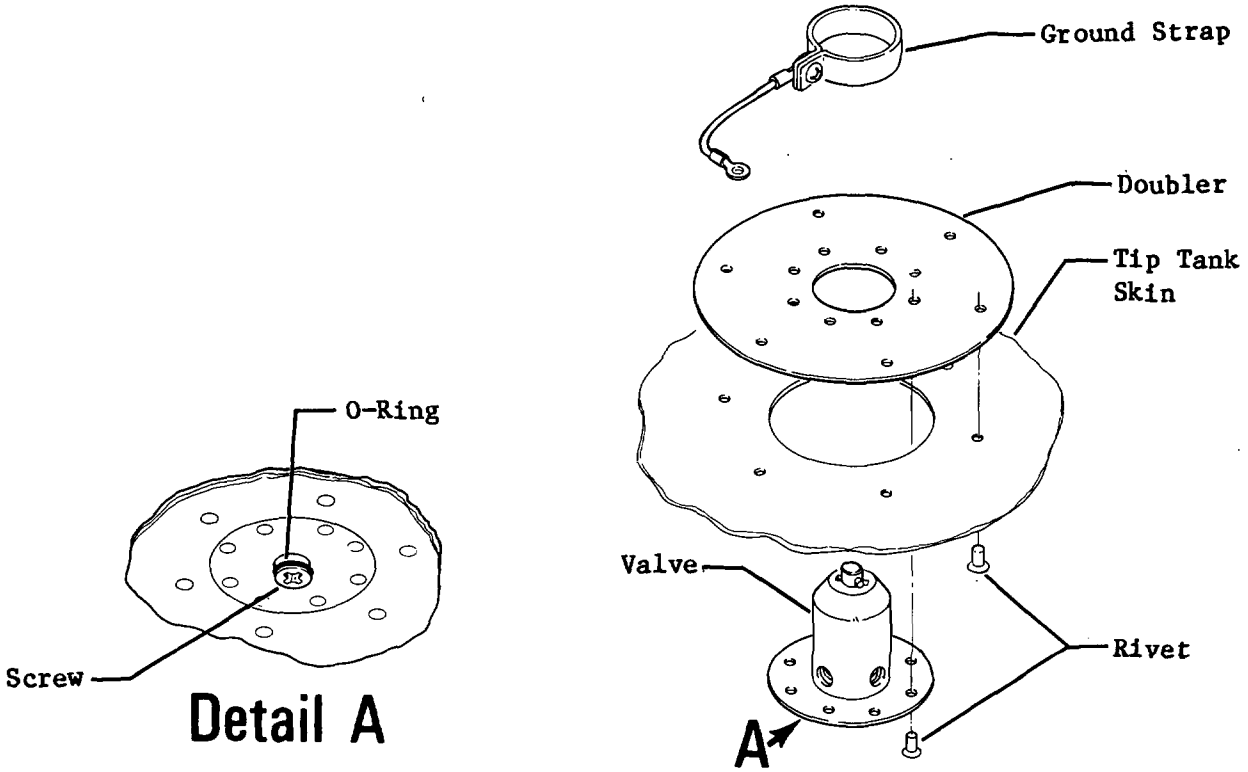
B. Replace Drain Valve O-Ring (Aircraft 35-344 and Subsequent and 36-046 and Subsequent) (See figure 201.)

(1) Place a suitable container for catching leaks directly under drain valve.
(2) Using a Phillips screwdriver, turn valve screw located on outer surface of drain valve slightly to right. This will allow screw and O-ring to pop down into view.
(3) Using a suitable tool, remove old O-ring.
(4) Inspect O-ring groove for scratches, burrs, or dirt. Clean if necessary.
(5) Install new O-ring.
(6) Return valve to normal by pushing upward on screw with a Phillips screwdriver and turning slightly to left.
(7) Check for leaks.



*Aircraft 35-283 and Subsequent, 36-045 and Subsequent, and 35-215 thru 35-282 modified per AMK 80-14, "Installation of Tip Tank Drain Valve Bonding Jumper"

Aircraft 35-002 thru 35-343 and 36-002 thru 36-045



Aircraft 35-344 and Subsequent and 36-046 and Subsequent

Drain Valve O-Ring Replacement
Figure 201

12-95B

PRESSURE RELIEF VALVES - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

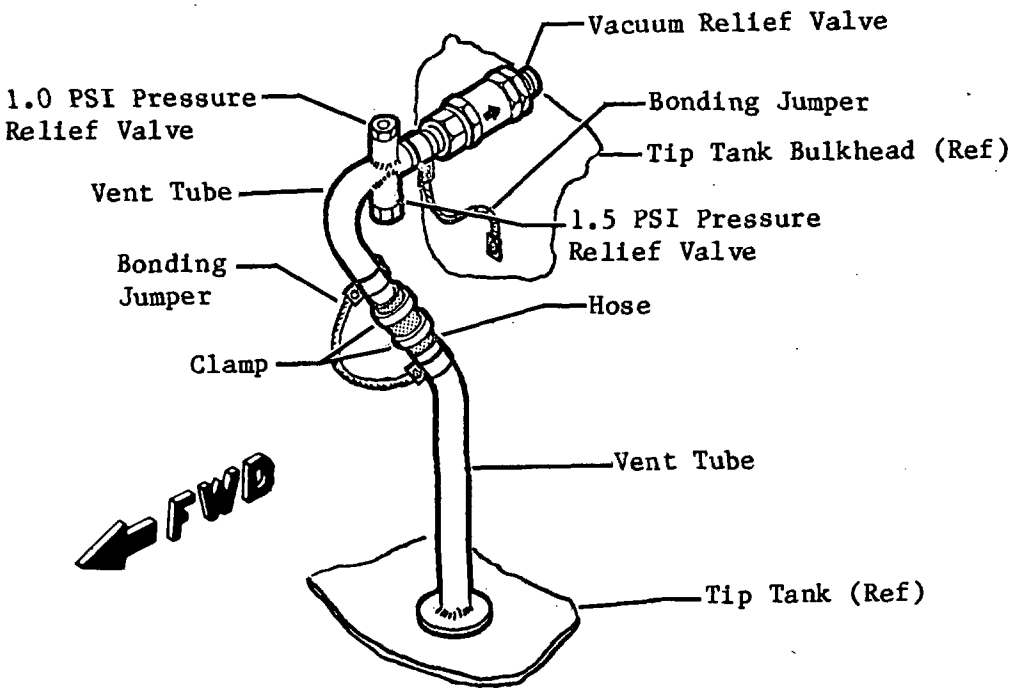
NOTE: Removal and installation procedures for all four tip tank relief valves are identical.

A. Remove Pressure Relief Valve (See figure 201.)

(1) Drain the tip tank. (Refer to Chapter 12.)
(2) Remove attaching parts and access covers from tip tank.
(3) Remove attaching parts and bonding jumpers from vent tubes.
(4) Loosen clamps securing hose to vent tubes.
(5) Disconnect vent tube from vacuum relief valve and remove vent tube with pressure relief valves installed from aircraft.
(6) Remove pressure relief valve and O-ring from vent tube.
(7) Inspect O-ring for serviceability; replace if required.

B. Install Pressure Relief Valve (See figure 201.)

(1) Install O-ring and pressure relief valve in vent tube.
(2) Install vent tube and connect to vacuum relief valve.
(3) Install hose on vent tubes and secure with clamps.
(4) Install bonding jumper and secure with attaching parts. Check resistance between the two tube assemblies. Refer to Chapter 20 of wiring manual for maximum allowable resistance.
(5) Apply a thin coat of anti-corrosion grease to access cover. (Refer to 28-11-00, figure 202.)
(6) Install gaskets and access covers and secure with attaching parts.
(7) Fuel the aircraft. (Refer to Chapter 12.)



Tip Tank Pressure Relief Valve Installation
Figure 201

VACUUM RELIEF VALVE - MAINTENANCE PRACTICES

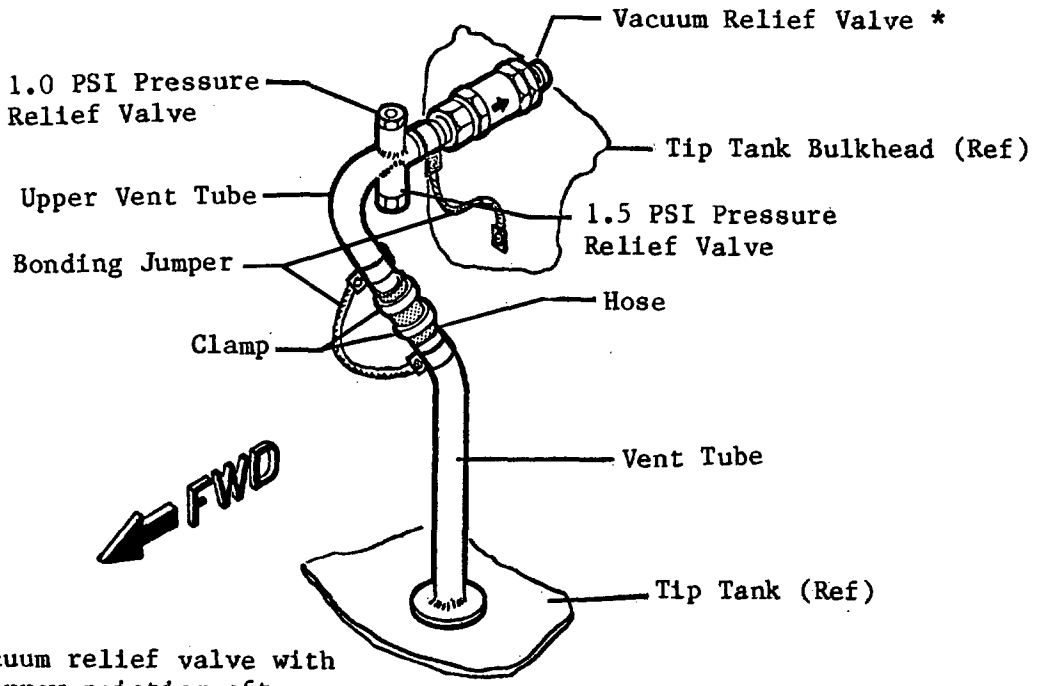
1. REMOVAL/INSTALLATION

A. Remove Vacuum Relief Valve (See figure 201.)

(1) Drain the tip tank. (Refer to Chapter 12.)
(2) Remove attaching parts and access covers from tip tank.
(3) Remove attaching parts and bonding jumpers from vent tubes.
(4) Loosen clamps securing hose to vent tubes.
(5) Disconnect vent tube from relief valve.
(6) Remove attaching parts and relief valve from tip tank.

B. Install Vacuum Relief Valve (See figure 201.)

(1) Install relief valve (arrow toward tip tank bulkhead) and secure with attaching parts.
(2) Connect vent tube to relief valve.
(3) Install bonding jumpers and secure with attaching parts. Check resistance between the two tube assemblies. Refer to Chapter 20 of wiring manual for maximum allowable resistance.
(4) Tighten clamps that secure hose to vent tubes.
(5) Apply a thin coat of anti-corrosion grease to access covers. (Refer to 28-11-00, figure 202.)
(6) Install gaskets and access covers and secure with attaching parts.
(7) Fuel the aircraft. (Refer to Chapter 12.)



* Install vacuum relief valve with free flow arrow pointing aft.

Tip Tank Vacuum Relief Valve Installation
Figure 201

12-13C-3

TIP TANK CONE AND FIN - MAINTENANCE PRACTICES

1. APPROVED REPAIRS

A. Replace Tip Tank Cone and Fin (See figure 201.)

NOTE: For aircraft equipped with fuel jettison system, refer to 28-30-00.

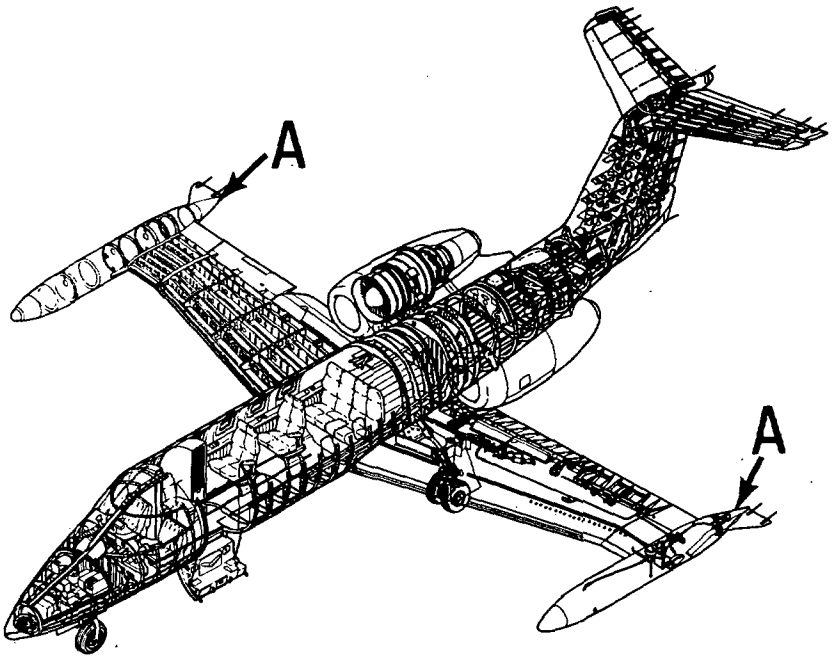
(1) Place a strip of masking tape all the way around tip tank just forward of tip tank cone. Mark location of fin centerline on tape.
(2) Remove tip tank cone and attaching parts from aircraft.

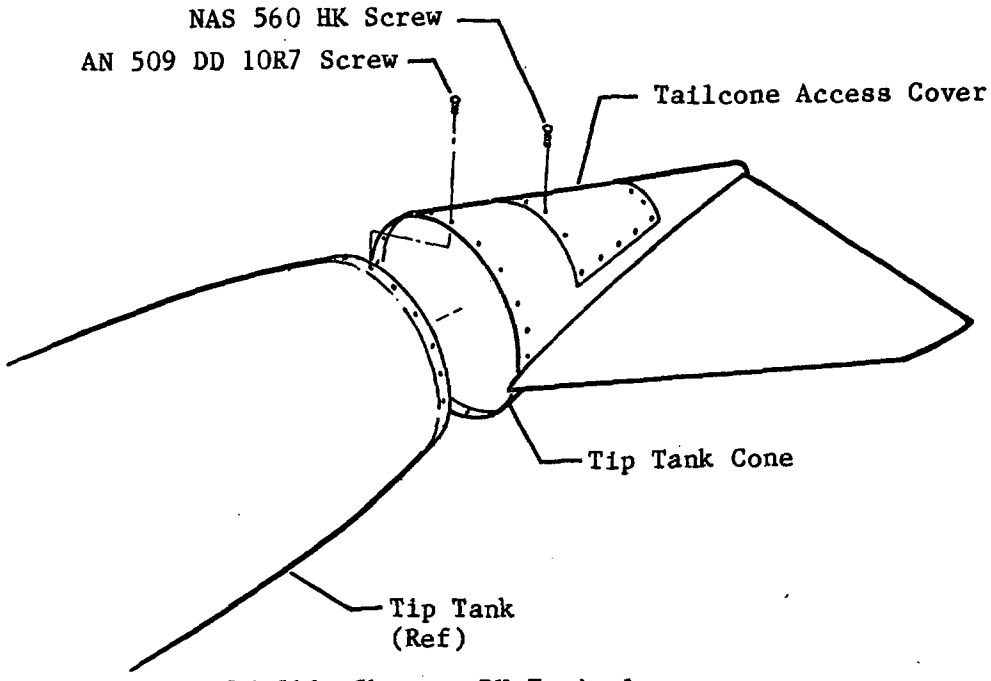
WARNING: IMPROPER INSTALLATION OF TIP TANK CONE AND FIN WILL AFFECT FLIGHT CHARACTERISTICS OF AIRCRAFT.

(3) Position new cone and fin on tip tank using masking tape as a guide.
(4) Locate centerline of fin midway between attachment holes flanking mark on tape.
(5) Using a method of locating blind holes, drill out attachment holes with a No. 12 drill bit. Countersink holes.

NOTE: Attachment screws and nutplates are aluminum to prevent interference with flux valve.

(6) Install attachment screws and remove masking tape.
(7) Paint cone and fin. (Refer to Chapter 20.)





LH Side Shown - RH Typical

Detail A

Tip Tank Cone and Fin Installation
Figure 201

TIP TANK FLAPPER VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

A. Removal of Tip Tank Flapper Valve (See Figure 201.)

(1) Open tailcone access door and disconnect aircraft batteries.
(2) Defuel wings and tip tanks. (Refer to 12-10-10.)
(3) Ensure wings are level to facilitate inspection and rigging of flapper valves. (Refer to 8-10-00.)
(4) Remove two forward wing access covers on the LH and RH lower wing skin immediately inboard of the tip tank.
(5) Loosen plate assembly screw and remove flapper valve assembly from wing.
(6) Remove attaching parts securing flapper valve to plate assembly and retain for reinstallation. Remove flapper valve from plate assembly.
(7) Remove screw, washers, and nut from flapper valve and retain for reinstallation. Discard flapper valve.

B. Installation of Tip Tank Flapper Valve (See Figure 201.)

NOTE: The following procedure steps (a) thru (e) are to be used if flapper valve (P/N NAS 11) is installed.

If the flapper valve (P/N 2323006-5) is used, omit steps (a) thru (e), and proceed with step (2).

(1) Install a hole in the flapper valve (P/N NAS 11) as follows:

NOTE: The following procedure is recommended for installing the correct size hole cleanly through the rubber flapper valve.

(a) Fabricate hole punch tool as shown in Detail B using 0.250 X 0.035 steel or stainless steel tube with a sharpened end.
(b) Place flapper valve on a flat surface with concave side up.
(c) Using the large washer as a template, mark location of screw hole on center of new flapper valve.
(d) Place flapper valve on flat piece of hardwood, press punch tool firmly against flapper valve and strike with small hammer or mallet.

CAUTION: IF THE HOLE IS MISLOCATED OR THE FLAPPER VALVE IS DAMAGED OR TORN WHEN HOLE IS PUNCHED, REPLACE FLAPPER VALVE.

(e) Inspect hole for tears or damage, and for correct location in center of flapper valve. Replace flapper valve if damaged or if hole is mislocated.

CAUTION: TIGHTEN FASTENERS ON FLAPPER VALVE JUST ENOUGH TO FIRMLY SECURE THE PARTS. USE CARE NOT TO OVERTIGHTEN FASTENERS CAUSING

EXCESSIVE COMPRESSION, DISTORTION, OR DAMAGE TO THE FLAPPER VALVE.

USE CARE NOT TO DAMAGE FLAPPER VALVE WITH TOOLS.

(2) Install screw, washers, and nut on new flapper valve. Tighten screw just enough to firmly secure washers.
(3) Install flapper valve on plate assembly with attaching parts. Ensure circular portion of flapper valve is concentric with circular portion of plate assembly. If not, loosen screws to reposition flapper valve. Tighten screws just enough to firmly secure the flapper valve to the plate assembly.
(4) Position flapper valve assembly on tube so that attach flange is horizontal and no gaps exist between end of tube and flapper valve.

NOTE: Ensure flapper valve assembly position does not shift while tightening screw in order to maintain a proper seal.

(5) Torque plate assembly screw to 12 to 15 inch-pounds [1.36 to 1.69 Nm].
(6) Ensure flapper valve completely covers the opening and is still seated against the tube with no gaps.
(7) Verify free movement of flapper valve and all adjacent hardware is properly secured and does not affect the free movement of flapper valve.

CAUTION: USE CARE WHEN REINSTALLING WING ACCESS COVERS TO ENSURE THE OUTBOARD FUEL PROBE DOES NOT INTERFERE WITH THE FLAPPER VALVE AREA OF MOVEMENT.

(8) Install wing access panels.
(9) Connect aircraft batteries and close tailcone door.
(10) Refuel aircraft and check for leaks.

2. Inspection/Check

A. Inspect Tip Tank Flapper Valves (See Figure 201.)

NOTE: Perform Inspection of Wing Tank Flapper Valves in accordance with the current inspection interval specified in Chapter 5.

(1) Open tailcone access door and disconnect aircraft batteries.
(2) Defuel wings and tip tanks. (Refer to 12-10-10.)
(3) Ensure wings are level to facilitate inspection and rigging of flapper valves. (Refer to 8-10-00.)
(4) Remove two forward wing access covers on the LH and RH lower wing skin immediately inboard of the tip tank.
(5) Inspect condition of the rubber of the flapper valve. Pay particular attention to the thin portion of the hinge and circular portion of the flapper valve for cracks.
(6) If any cracks, breakage, or warpage are present in any part of the flapper valve, replace the flapper valve. (Refer to Removal/Installation, this section.)

CAUTION: TIGHTEN FASTENERS IN FLAPPER VALVE JUST ENOUGH TO FIRMLY SECURE THE PARTS. USE CARE NOT TO OVERTIGHTEN FASTENERS CAUSING EXCESSIVE COMPRESSION, DISTORTION, OR DAMAGE TO THE FLAPPER VALVE.

USE CARE NOT TO DAMAGE FLAPPER VALVE WITH TOOLS.

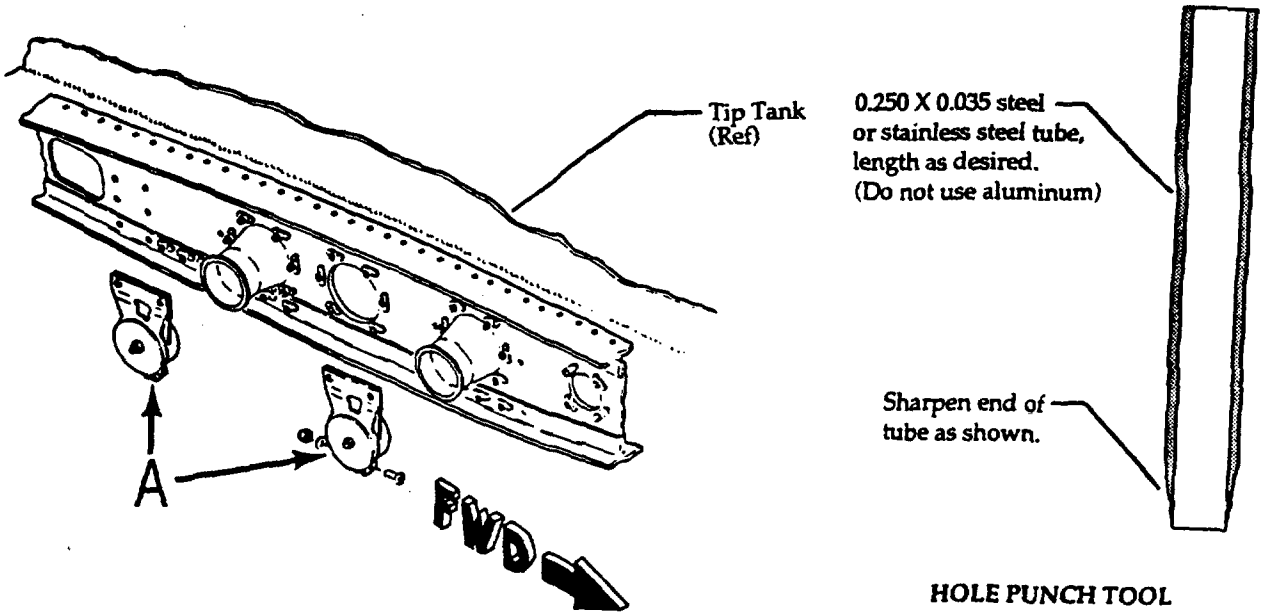
(7) Inspect valve for proper positioning. Verify no gaps exist between the end of the tube and flapper valve and the top attach flange is horizontal. If gaps exist or flange is not horizontal, loosen clamp screw and reposition flapper valve assembly. Torque clamp screw to 12 to 15 inch-pounds [1.36 to 1.69 Nm].

NOTE: Ensure flapper valve assembly does not shift while tightening screw in order to maintain a proper seal.

(8) Inspect condition of screws which retain flapper valve to plate assembly. Ensure screws are tight and securely retain the flapper valve. If necessary, tighten screws just enough to firmly secure flapper valve.
(9) Ensure flapper valve completely covers opening and is still seated against tube with no gaps.
(10) Verify free movement of the flapper valve, and all adjacent hardware is properly secured and does not affect free movement of flapper valve.

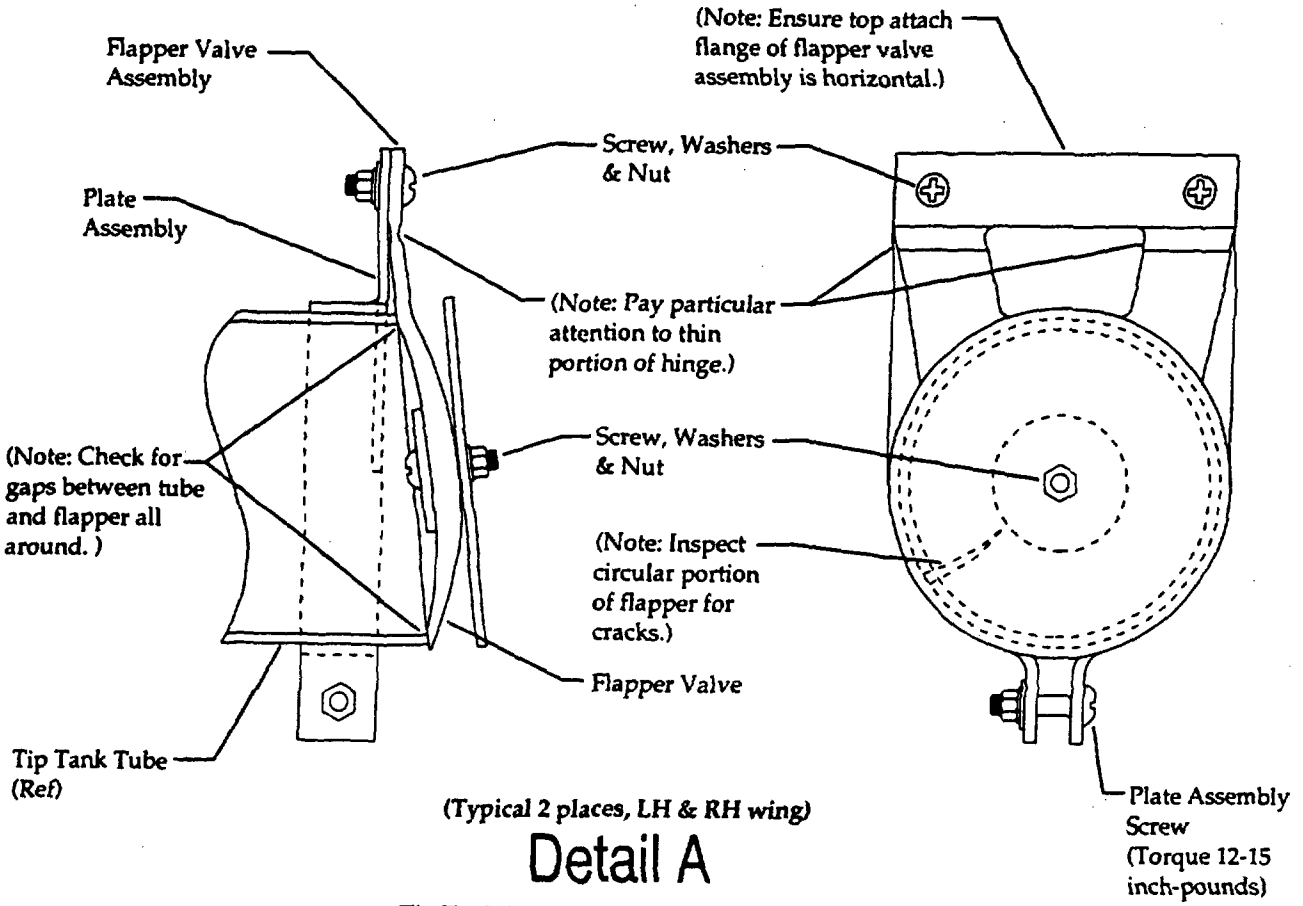
CAUTION: USE CARE WHEN REINSTALLING WING ACCESS COVERS TO ENSURE THE OUTBOARD FUEL PROBE DOES NOT INTERFERE WITH THE FLAPPER VALVE AREA OF MOVEMENT.

(11) Install wing access panels.
(12) Connect aircraft batteries and close tailcone door.
(13) Refuel aircraft and check access panels for leaks.



HOLE PUNCH TOOL

Detail B



(Typical 2 places, LH & RH wing)

Detail A

Tip Tank Flapper Valve Installation/Inspection
Figure 201

WING TANK - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The full-span, integral wing tanks comprise a large portion of each wing. The inboard end of the tank is at the aircraft centerline and the outboard end is at wing station 205. The forward side of the tank ends at wing spar No. 1, and the aft side terminates at wing spar No. 7. Fuel is not stored in the main landing gear wheel well and wing leading edge areas. The tanks are sealed by applying a faying surface seal between the wing skins and all adjacent structure. A bead of sealant is then applied around the entire perimeter of the skins as added protection against fuel tank leakage.

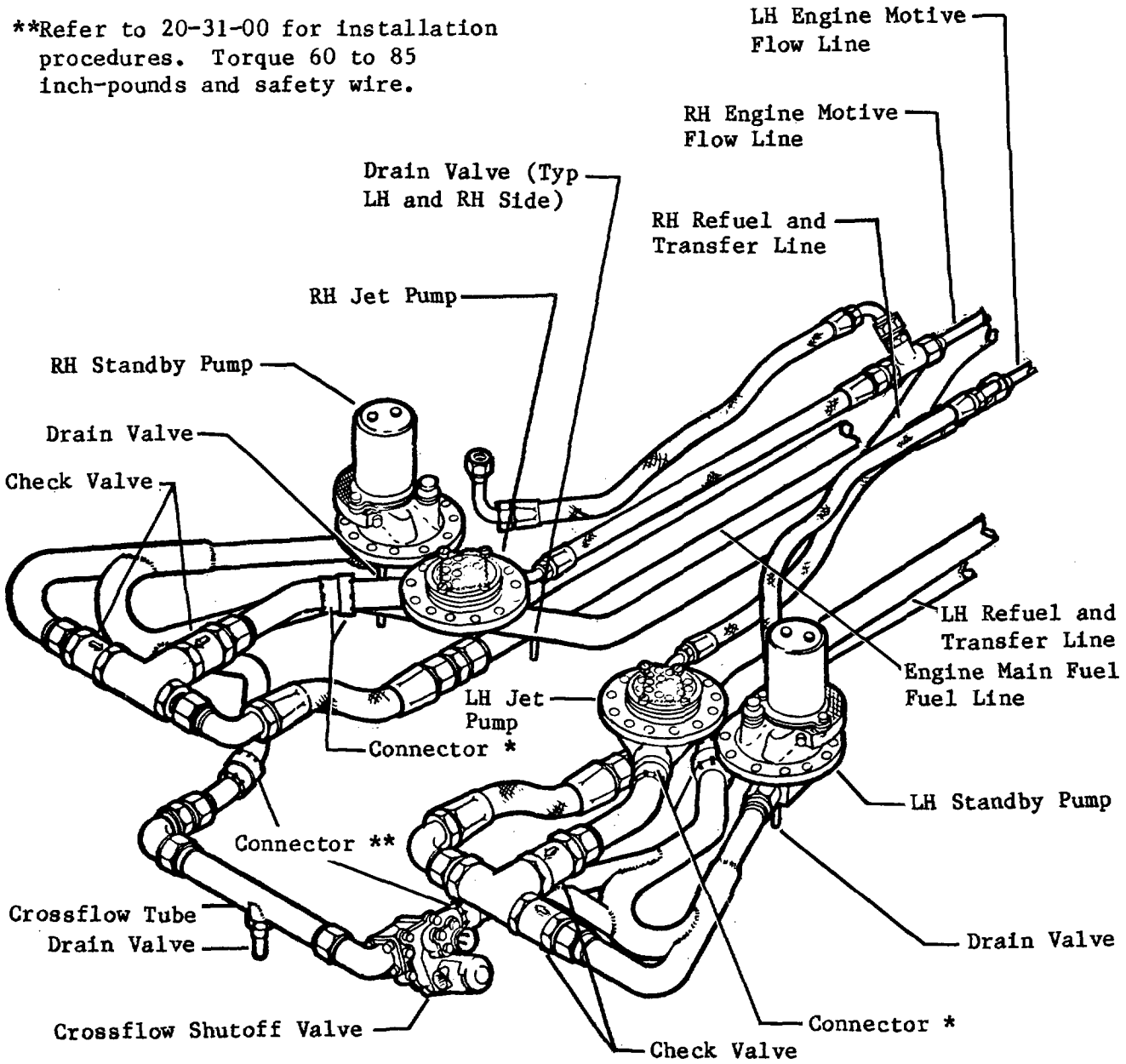
B. Each wing tank incorporates one fuel standby pump, one jet pump, one float switch, and three fuel probes. For further information on the jet pumps and standby pumps, refer to 28-20-01 and 28-20-02. The applicable float switch energizes the LOW FUEL indicator light when wing tank fuel reaches approximately 400 to 500 pounds. The fuel probes are mounted on removable access panels. (Refer to 28-40-00 for fuel probes maintenance practices.) In addition, a sump drain valve and a defuel valve are installed on each inboard fuel probe access door. Flapper-type check valves, located in the wing ribs, allow free fuel flow inboard but restrict outboard fuel flow. Wing rib 0.0 incorporates two pressure relief valves set at approximately 1 psi (allowing flow in opposite directions) to prevent wing tank overpressurization during fuel crossflow operation. A wing pressure switch installed in the RH wheel well, senses wing tank pressure during fuselage fuel transfer and deenergizes the fuselage pump if an overpressurization condition should occur. The wings are vented to the tip tanks which are vented overboard through the ram air fuel vent system. A vacuum relief valve is installed in each tip tank and prevents negative pressure from damaging the tank. Compartment-to-compartment vents are also installed in the spars. Fuel flow between wing tanks is controlled by a shutoff valve installed in the crossflow tube.

C. Fuel crossflow from one wing to the other is accomplished by opening the crossflow shutoff valve on the LH side of keel beam, energizing the applicable standby pump, and deenergizing the opposite standby pump. On Aircraft 35-490 and Subsequent, 36-051 and Subsequent, a FUEL XFLO annunciator on the copilot's glareshield warning light panel will illuminate when the Crossflow Switch is set to OPEN. For further information on the transfer operation, refer to 28-20-00.

D. The wing fuel pressure switch is installed to prevent overpressurization of the wing during transfer of fuselage fuel. The switch is located on the keel beam in the RH wheel well and is plumbed into the inboard access cover on wing spar 5 in the RH wheel well. The switch controls 28 vdc to the fuselage fuel pump via the fuel control panel. The switch senses pressure from the right wing during fuselage fuel transfer and deenergizes the fuselage fuel pump when wing fuel pressure reaches 5 psi. The switch will again energize the fuselage pump when wing fuel pressure drops below 2.5 psi. (See figure 3.)

* Refer to 20-31-00 for installation procedures. Torque 125 to 155 inch-pounds and safety wire.

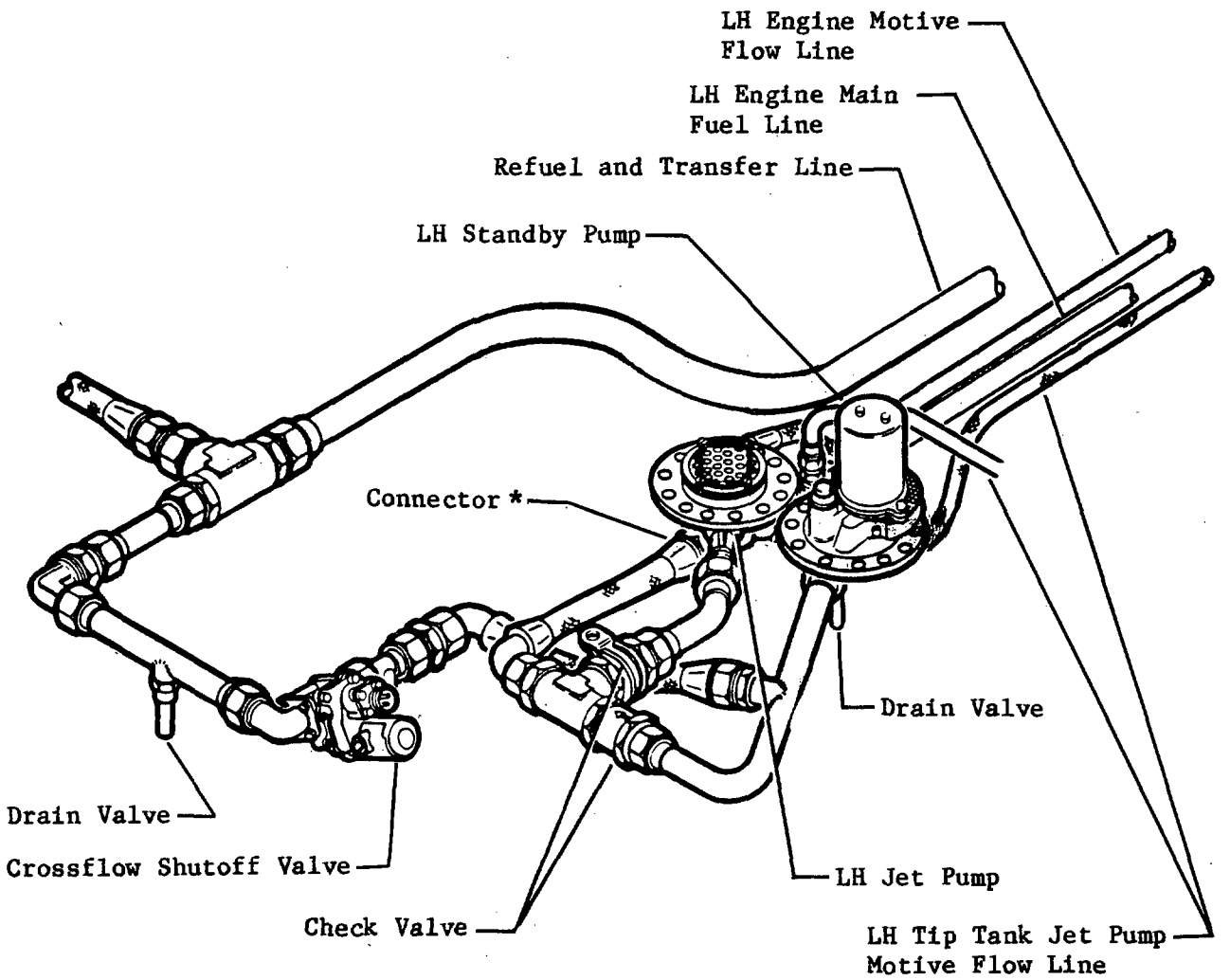
**Refer to 20-31-00 for installation procedures. Torque 60 to 85 inch-pounds and safety wire.



12-22C-13

Wing Fuel Plumbing Installation
Figure 1

E. The wing float switch is located in the LH and RH wheel well areas on an access panel secured to spar 5. The float completes a ground circuit to light the LOW FUEL warning light when wing fuel reaches approximately 400 to 500 pounds. (See figure 4.)

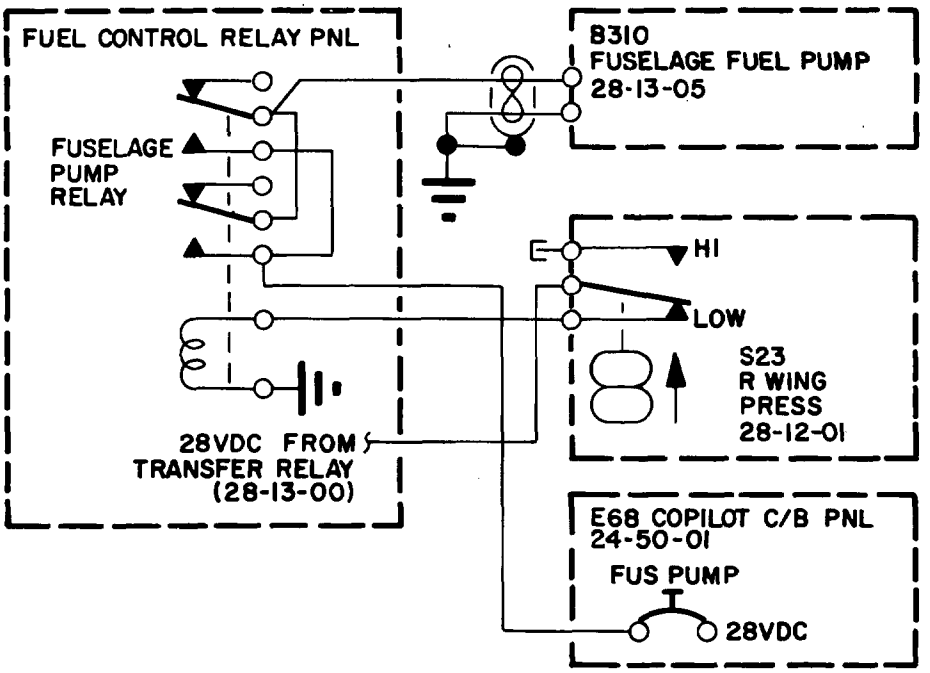


*35-180 and Subsequent. Refer to 20-31-00, for installation procedures. Torque 125 to 155 inch-pounds and safety wire.

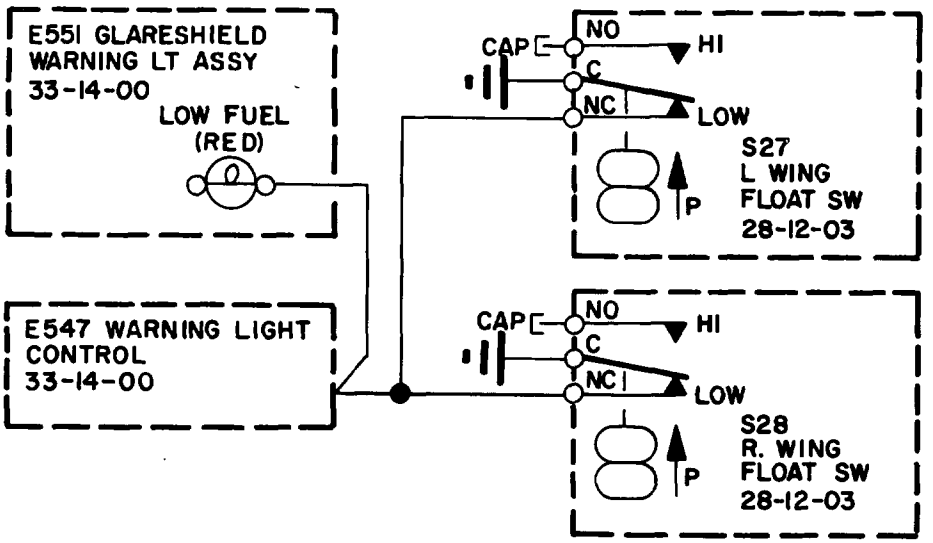
LH SIDE SHOWN (RH TYPICAL)

12-22D-2

Wing Fuel Plumbing Installation
Figure 2



Wing Fuel Pressure Switch Electrical Control Schematic
Figure 3



Wing Float Switch Electrical Control Schematic
Figure 4

1. LIGHTNING STRIKE PROTECTION SEAL APPLICATION
   A. Refer to Chapter 57 for Lightning Strike Protection Seal Application Information.

2. INSPECTION/CHECK
   A. Refer to 28-11-00 for wing and tip tank pressure check.

WING FUEL PRESSURE SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Pressure Switch (See Figure 201.)
   (1) Defuel the aircraft. (Refer to Chapter 12.)
   (2) Lower RH inboard gear door. (Refer to Chapter 32.)
   (3) Disconnect pressure switch wiring at splices. Tag wiring.
   (4) Disconnect tube from pressure switch.
   (5) Remove attaching parts, clamps, and pressure switch from aircraft.

B. Install Pressure Switch (See Figure 201.)
   (1) Install pressure switch and secure with clamps and attaching parts.
   (2) Connect pressure switch wiring at splices.
   (3) Connect tube to pressure switch.
   (4) Check pressure switch for proper operation.
   (5) Fuel the aircraft. (Refer to Chapter 12.)

2. INSPECTION/CHECK

NOTE: The following functional check is to be performed in accordance with the current inspection interval specified in Chapter 5.

A. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Pressure Gage, 0-15 Psi	213.40-2.5-1/4 Lm-15	WIKA Instrument Corp. Hauppauge, NY	Read pressure
Pressure Regulator, 0 to 10 psi		Commercially Available	Regulate and bleed pressure
Pressure source, minimum 10 psi output.		Commercially Available	Apply pressure to switch.

B. Functional Test of Wing Fuel Pressure Switch

CAUTION: ALL PLUGS, CAPS, ETC., WHICH ARE TEMPORARILY INSTALLED IN THE AIRCRAFT FOR THE PURPOSE OF PRESSURE TESTING SHALL HAVE A PERMANENTLY ATTACHED RED STREAMER A MINIMUM OF ONE INCH WIDE AND 36 INCHES LONG.

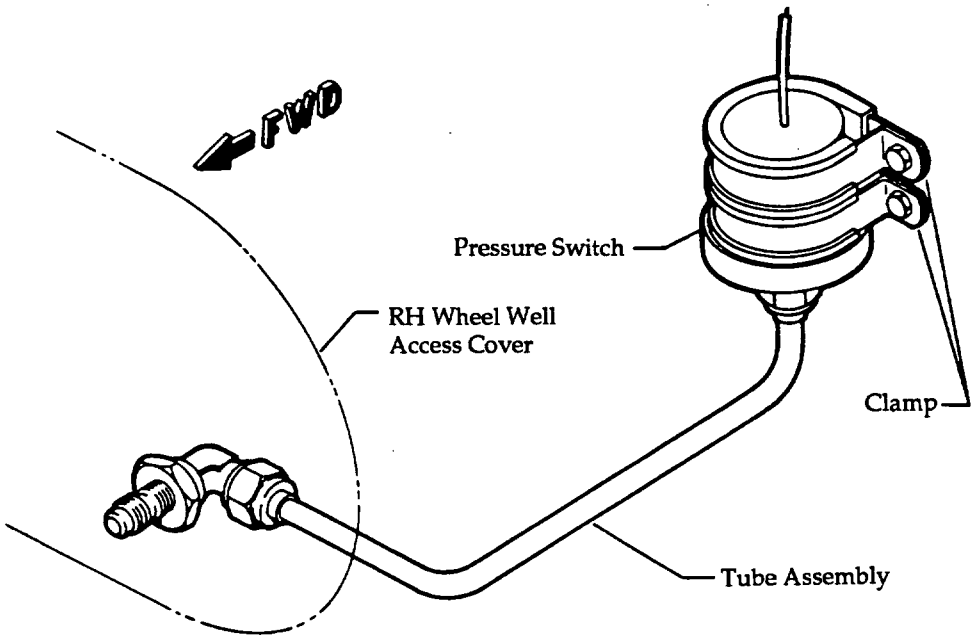
(1) Disconnect and cap plumbing which leads from wing to wing fuel pressure switch. Use a container to catch fuel which runs out during capping operation. Switch plumbing is located on inboard access cover on wing spar No. 5 in RH wheel well.
(2) Connect pressure gage, pressure regulator and pressure source to wing fuel pressure switch as shown in test schematic. (See figure 202.)
(3) Set Battery Switches on.

(4) Set Fuselage Tank Switch to XFER. Fuselage fuel pump shall energize.

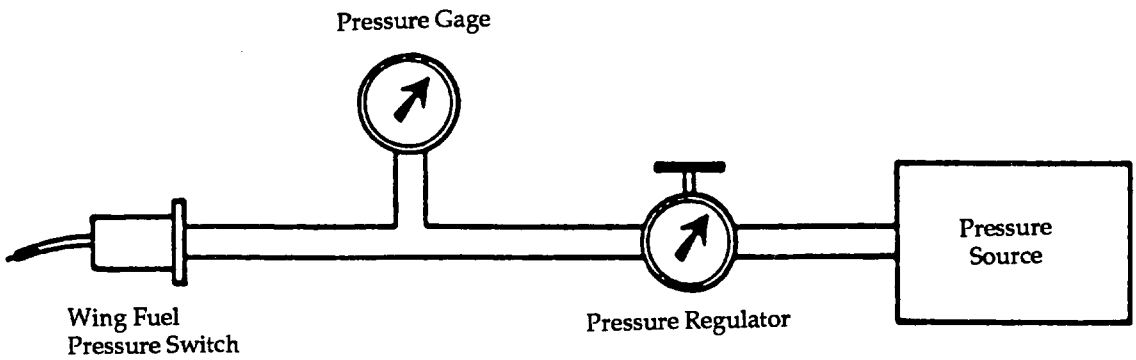
NOTE: A humming sound shall be audible immediately aft of the wheel well when the fuselage fuel pump is energized.

CAUTION: IF THE FUSELAGE FUEL PUMP FAILS TO DE-ENERGIZE AT A PRESSURE OF 5.5 PSI, IMMEDIATELY SET THE FUSELAGE TANK SWITCH TO FILL OR WING OVERPRESSURIZATION AND LEAKAGE MAY OCCUR.

(5) Apply pressure to the switch and monitor gage. Fuselage fuel pump shall deenergize at 5.0 (±0.5) psi. If it does not, replace switch and repeat test.
(6) Bleed pressure off while monitoring gage. Fuselage fuel pump shall energize at 2.5 (±0.5) psi. It if does not, replace switch and repeat test.
(7) Set Fuselage Tank Switch to OFF.
(8) Set Battery Switches off.
(9) Remove pressure source, pressure regulator, and pressure gage.
(10) Uncap and install plumbing.



Wing Fuel Pressure Switch Installation
Figure 201



Wing Fuel Pressure Switch Functional Test
Figure 202

DRAIN VALVES - MAINTENANCE PRACTICES

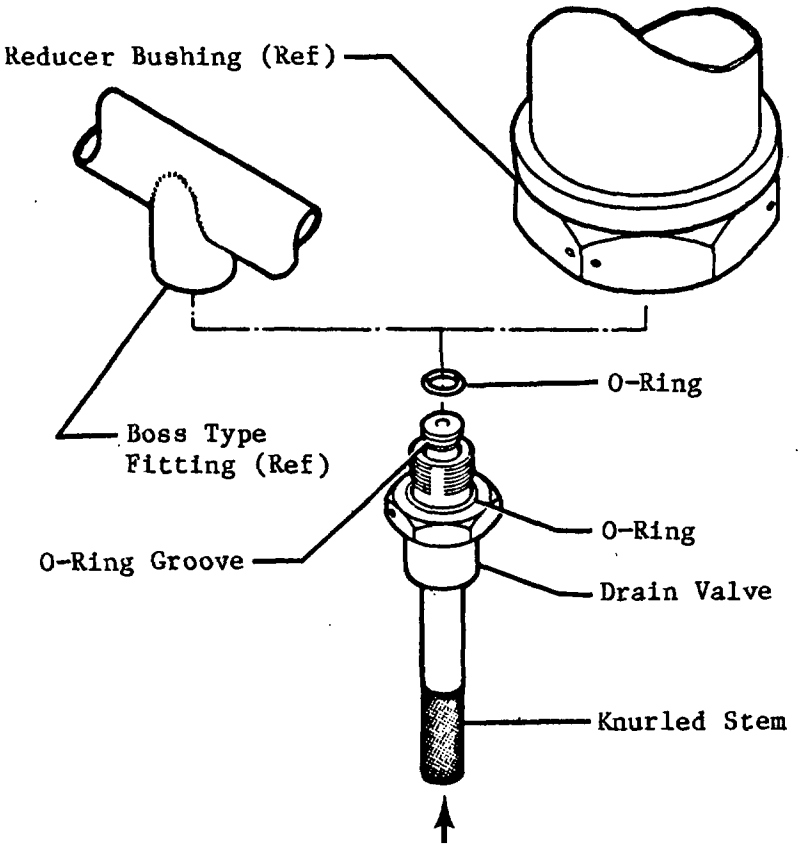
1. **APROVED REPAIRS**

NOTE: ° A drain valve is incorporated in the crossover tube. The valve is used to drain moisture accumulation and sediment from the fuel.

° The valve is spring loaded to the closed position and sealed with an internal O-ring. The valve has a knurled stem which can be depressed with the fingers. The valve may be unscrewed from the boss or reducer bushing in which it is installed. If a drain valve should develop a leak, the valve should be fully depressed to clear any sediment which could be preventing the valve from completely closing. If a valve has developed a leak not caused from sediment holding the valve open, then the O-ring seal should be replaced.

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

(1) Place a suitable container for catching fuel beneath drain valve to be repaired.
(2) Gain access to the drain valve, cut safety wire and loosen drain valve.
(3) Quickly unscrew the drain valve and replace with a suitable plug with 7/16-20NF threads.
(4) Depress the knurled stem on the drain valve to expose the O-ring.
(5) Using a suitable tool, remove the old O-ring.
(6) Inspect the O-ring groove and seat for scratches, burrs, or dirt.
(7) Again with the knurled stem depressed, install a new O-ring.
(8) Install a new O-ring at the base of the drain valve threads.
(9) Quickly unscrew the plug in the drain valve fitting and install the drain valve and safety wire.
(10) Assure that there are no leaks.
(11) Secure any accesses which were removed.



Drain Valve O-Ring Replacement
Figure 201

WING FLOAT SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

WARNING: **MAINTENANCE PERSONNEL MUST WORK WITHIN OPEN FUEL TANKS WHEN REMOVING AND INSTALLING FLOAT SWITCHES. ALL SAFETY PRACTICES AS OUTLINED IN 28-00-00 MUST BE FOLLOWED.**

NOTE: The following procedures are applicable to either wing float switch.

A. Remove Wing Float Switch (See figure 201.)
   (1) Defuel the aircraft. (Refer to Chapter 12.)
   (2) Remove attaching parts and wing access panel from wing between spars 2 and 3, forward of wing float switch installation.

      NOTE: Spars 3 and 4 incorporate lightening holes which provide access to the wing float switch.

   (3) Disconnect wing float switch electrical wiring at splices (outside of the fuel cell) and attach a string to leads of float switch. This will aid in routing float switch wiring when float switch is installed.
   (4) Remove sealant from float switch wiring and float switch attaching nut as necessary to facilitate removal of wiring.
   (5) Remove attaching parts from float switch. Remove float switch thru lightening holes and access opening. Remove string from float switch leads.

B. Install Wing Float Switch (See figure 201.)

   CAUTION: **EXTREME CARE SHOULD BE TAKEN WHEN REMOVING SEALANT FROM AREAS INSIDE THE WING FUEL TANKS TO AVOID DAMAGING THE TANK FINISH. DAMAGE TO THE FINISH OF METAL PARTS WILL CAUSE CORROSION AND EVENTUALLY CONTAMINATE THE FUEL SUPPLY. ENSURE THAT ALL PARTICLES OF LOOSE SEALANT ARE REMOVED FROM THE WING FUEL TANKS TO AVOID CONTAMINATION OF THE FUEL SUPPLY.**

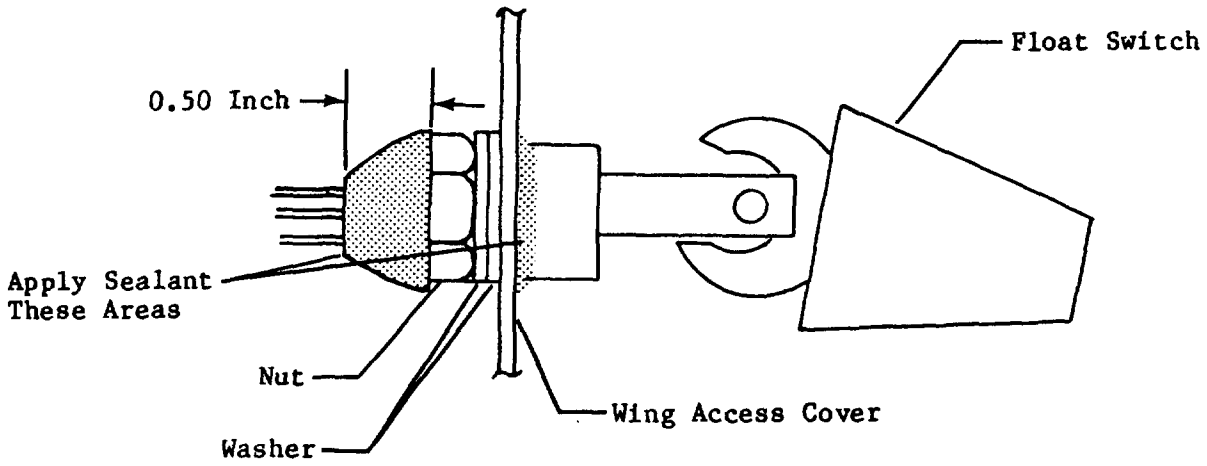
   (1) Clean old sealant from switch mounting position (spar 5 fuel side). Ensure that all loose particles of sealant are removed from fuel tank.
   (2) Apply a bead of sealant around perimeter of mounting hole (fuel side.)

      NOTE: Apply sufficient sealant so that a fillet seal can be formed from the excess sealant around base of float switch and mounting plate.

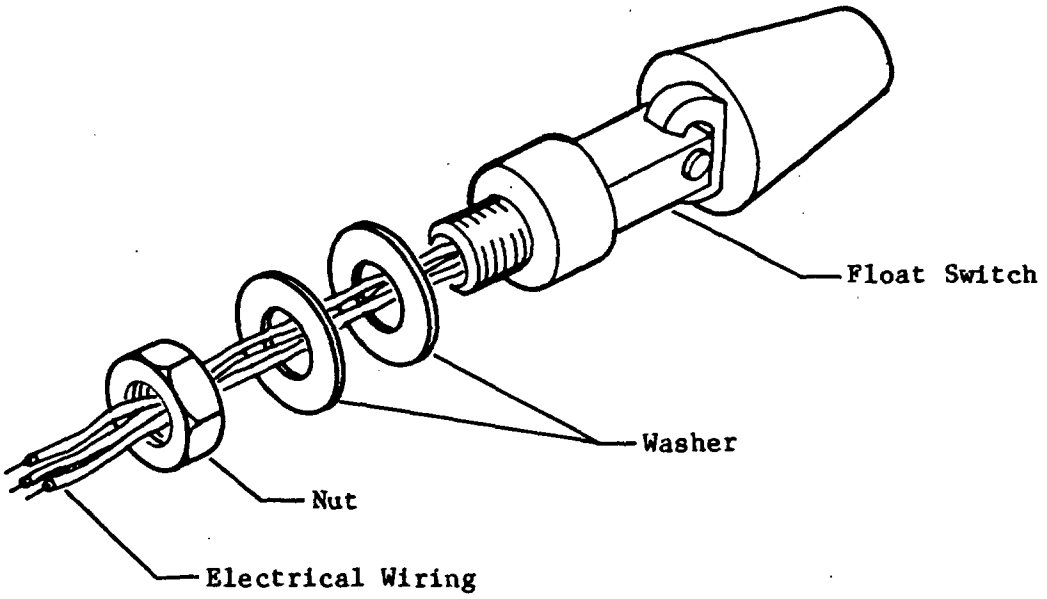
   (3) Attach string to float switch wiring. Pull string back through mounting hole and position the float switch.

      NOTE: The threaded portion of the float switch may be marked with the word "TOP" (figure 201). This will aid in holding the float switch in the proper position when the attaching parts are installed.

   (4) Assure that float switch is positioned with the word "TOP" facing up and secure with attaching parts.
   (5) Form a fillet seal from excess sealant around base of float switch and mounting plate.
   (6) Apply sealant to float switch nut and wiring (ambient side) as shown in figure 201.



Float Switch Seal Application



Wing Float Switch Installation
Figure 201

(7) Remove string from float switch wiring and connect float switch wiring to aircraft wiring. (Refer to Wiring Manual.)
(8) Perform Operational Check of float switch as follows:
  (a) Set Battery Switches to BAT 1 and BAT 2.
  (b) With the float down (hanging free), the LOW FUEL (red) warning light will illuminate.
  (c) Position float up, the LOW FUEL warning light will extinguish.
  (d) Set Battery Switches to OFF.
(9) Install access cover and secure with attaching parts.
(10) Fuel the aircraft and check for fuel leaks. (Refer to Chapter 12.)

2. Inspection/Check

A. Operationally Check Wing Low Fuel Warning System

NOTE: Perform Operational Check of Wing Low Fuel Warning System in accordance with the current inspection intervals specified in Chapter 5.

This operational check must be performed with 600 to 650 pounds of fuel in each wing tank. Larger quantities of fuel will cause the standby pumps to work against the wing flapper valves.

This operational check is performed by transferring fuel from one wing tank to the other utilizing the crossflow valve and the standby fuel pumps.

(1) Set Battery Switches to BAT 1 and BAT 2.
(2) Set Crossflow Valve Switch to OPEN.
(3) Set Left Standby Pump Switch to L.
(4) Monitor LOW FUEL warning light on glareshield.
(5) When LOW FUEL warning light illuminates, set Left Standby Pump Switch off.
(6) Set Right Standby Pump Switch to R.
(7) Monitor LOW FUEL warning light on glareshield.

NOTE: The LOW FUEL warning light will extinguish as the left wing tank float switch is actuated (L wing tank fuel level rises) then illuminate as the right wing tank float switch is actuated (R wing tank fuel level lowers).

(8) When LOW FUEL warning light illuminates, set Right Standby Pump Switch off.
(9) Equalize wing fuel tank loading.
(10) Set Battery Switches to OFF.

CHECK VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: ° Two check valves are installed in wing rib 0.0 between spar 3 and spar 4.

° The valves are installed to allow fuel flow in either direction, thus allowing the fuel level to be equal in both wings.

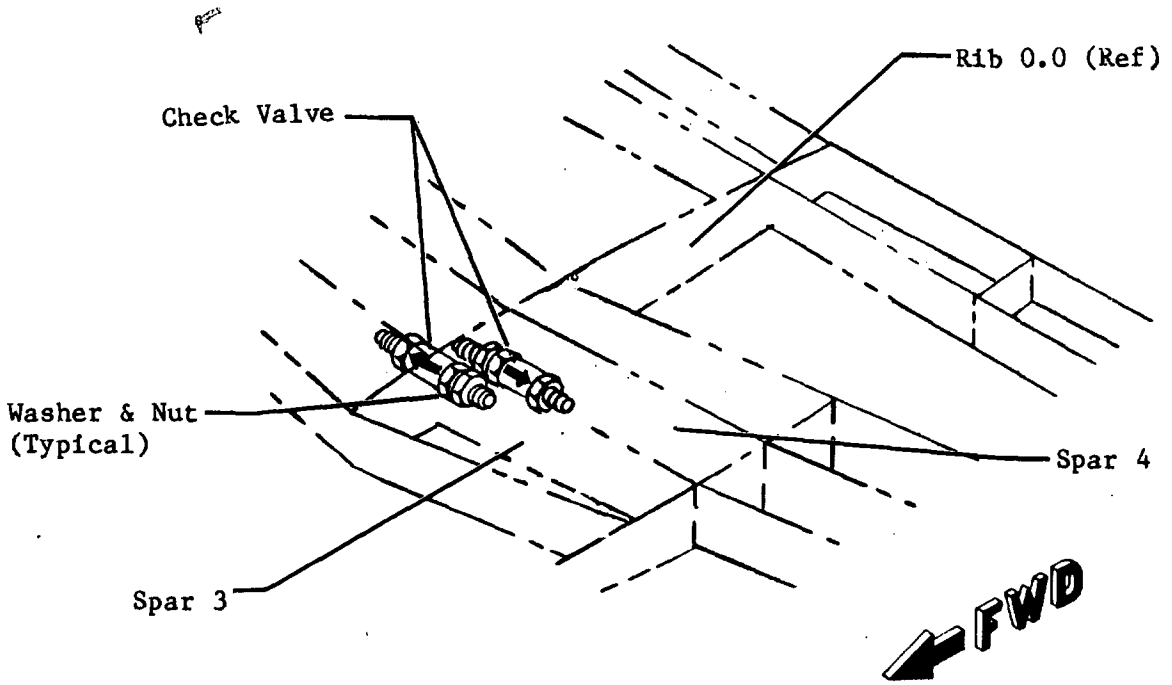
A. Remove Check Valve (See figure 201.)

(1) Defuel the aircraft. (Refer to 12-10-10.)
(2) Remove inboard wing fuel probe. (Refer to 28-40-02.)
(3) Loosen and remove nut, washer, and check valve from wing.

B. Install Check Valve (See figure 201.)

NOTE: Inspect check valve for clogging or contamination. Clean out all contamination by soaking or flushing the valve with kerosene.

(1) Install check valve and secure with nut and washer.
(2) Install fuel probe. (Refer to 28-40-02.)



Check Valve Installation
Figure 201

CROSSFLOW VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: The crossflow valve is installed to provide the capability to transfer fuel from one wing to the other, from the fuselage tank to the wings, and from the wings to the fuselage tank.

The crossflow valve is located to the left of the aircraft centerline, forward of the LH jet pump.

A. Remove Crossflow Valve (See Figure 201.)
   (1) Defuel the aircraft. (Refer to Chapter 12.)
   (2) Gain access to the crossflow valve by removing wing lower access panels.
   (3) Disconnect electrical connector from crossflow valve.
   (4) Remove attaching parts and remove connector assembly, forward of crossflow valve, and remove fuel plumbing from crossflow valve.
   (5) Remove attaching parts and crossflow valve from aircraft.

B. Install Crossflow Valve (See Figure 201.)
   (1) Position crossflow valve in place and secure with attaching parts.
   (2) Connect fuel plumbing to aft side of crossflow valve.
   (3) Install fuel plumbing connector assembly forward of crossflow valve. Install connector assembly bolts with bolt heads forward and torque 20 to 25 inch-pounds.
   (4) Connect electrical connector to crossflow valve.
   (5) Install wing lower access panels and seal in accordance with 28-12-00.
   (6) Fuel aircraft and check for leaks. (Refer to Chapter 12.)

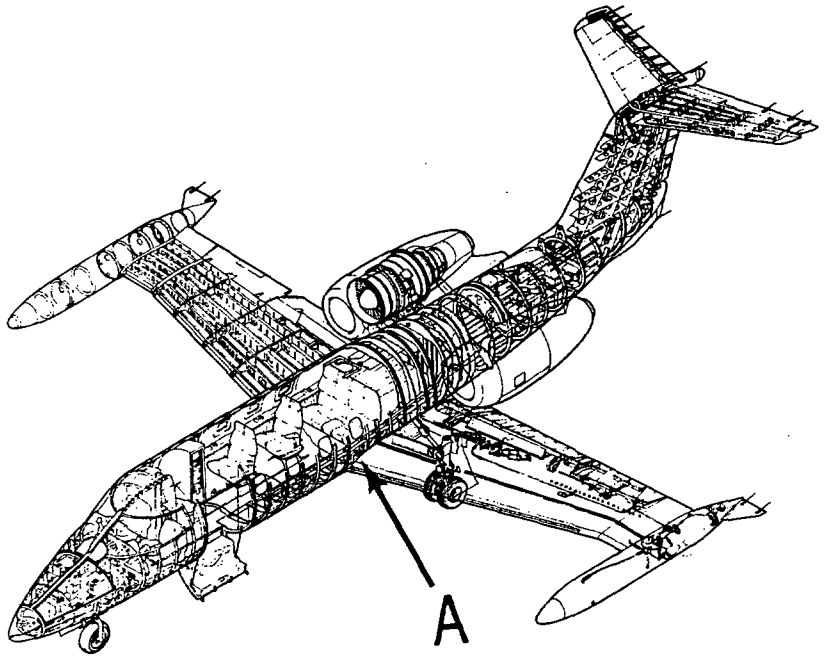
2. Inspection/Check

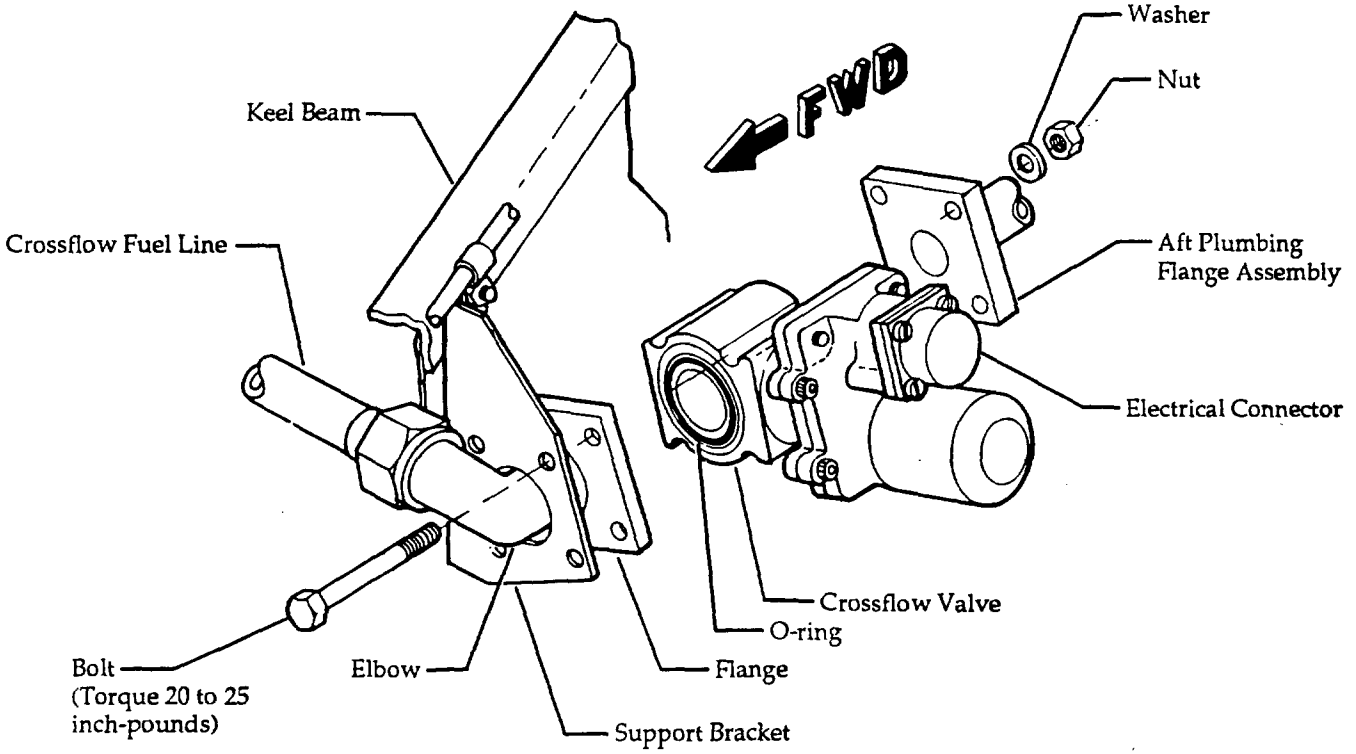
A. Operational Check of the Crossflow Valve

NOTE: Perform Operational Check of the Crossflow Valve in accordance with the current inspection interval specified in Chapter 5.

CAUTION: ENSURE BOTH WINGS CONTAIN FUEL LEVEL SUFFICIENT TO OPERATE FUEL STANDBY PUMPS.

(1) Connect external electrical power source to aircraft.
(2) Set Battery Switches on. Ensure L and R FUEL PRESS annunciators are illuminated.
(3) Ensure CROSSFLOW Switch is in the closed position.
(4) Set L STANDBY PUMP Switch ON. L FUEL PRESS annunciator shall extinguish.
(5) Set L STANDBY PUMP Switch OFF. L FUEL PRESS annunciator shall illuminate.
(6) Set R STANDBY PUMP Switch ON. R FUEL PRESS annunciator shall extinguish.
(7) Set R STANDBY PUMP Switch OFF. R FUEL PRESS annunciator shall illuminate.
(8) Set L STANDBY PUMP Switch ON. L FUEL PRESS annunciator shall extinguish.
(9) Set CROSSFLOW Switch to OPEN. Crossflow Indicator Light (on Fuel Control Panel) shall illuminate momentarily and extinguish and R FUEL PRESS annunciator shall extinguish.
(10) Set CROSSFLOW Switch to closed. Crossflow Indicator Light (on Fuel Control Panel) shall illuminate momentarily and extinguish and R FUEL PRESS annunciator shall illuminate.
(11) Set L STANDBY Switch OFF. L FUEL PRESS annunciator shall illuminate.
(12) Disconnect external electrical power source.
(13) Set Battery Switches off.
(14) Restore Aircraft to normal.





Detail A

Crossflow Valve Installation
Figure 201

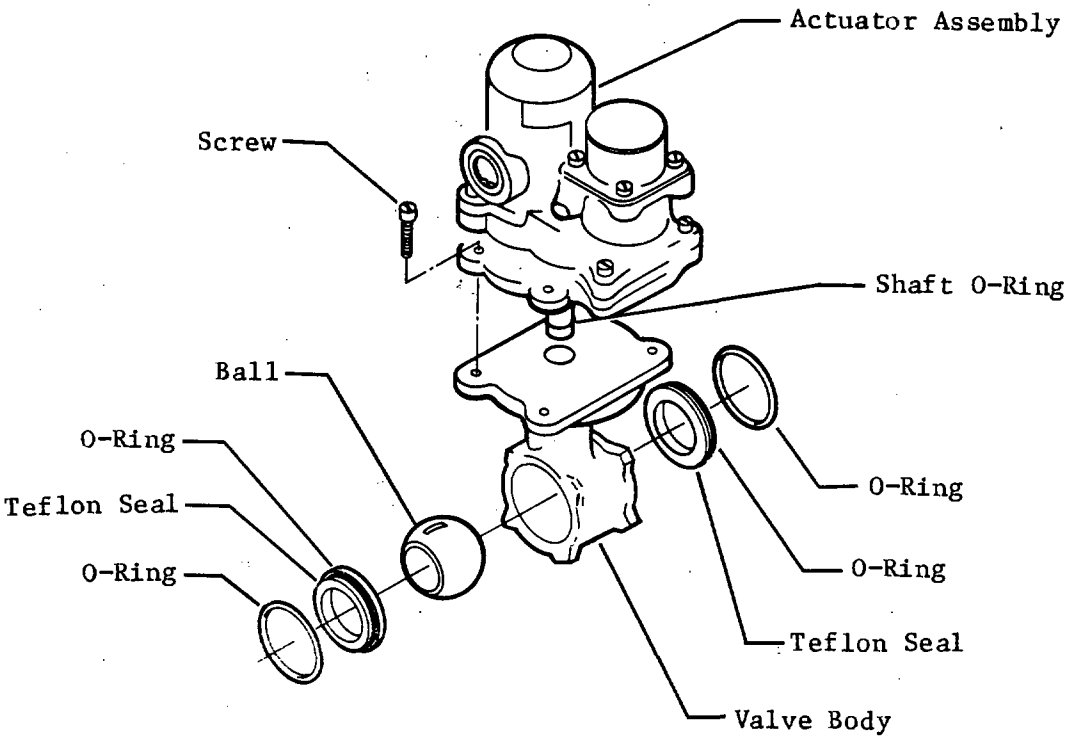
3. Approved Repairs

NOTE: Replace the crossflow valve O-rings when fuel is found to be leaking from the valve.

A. O-Ring Replacement (See figure 202.)

NOTE: It is important to note the position of each O-ring to ensure that each new O-ring is installed in its proper position.

(1) Remove fuel crossflow valve from aircraft as described in paragraph 1.A.
(2) Remove outer O-rings, teflon seals, and ball.
(3) Remove safety wire and remove screws which attach valve body to actuator assembly. Remove actuator assembly from valve body to expose shaft O-ring.
(4) Remove old O-ring from actuator shaft. Lubricate a new O-ring with petroleum jelly and install O-ring on shaft. Ensure that O-ring is not twisted and is properly installed on shaft.
(5) Apply a light coating of petroleum jelly to shaft O-ring and insert shaft into valve body. Secure valve body to actuator assembly with attaching screws and safety wire.
(6) Align groove of ball with actuating shaft which protrudes into valve body and install ball.
(7) Remove old O-rings from teflon seals. Lubricate new O-rings with petroleum jelly and install O-rings on teflon seals.
(8) Apply a light coating of petroleum jelly to O-rings installed on teflon seals and install teflon seals in valve body.
(9) Lubricate outer O-rings with petroleum jelly and install in valve body.
(10) Install crossflow valve as described in paragraph 1.B.



Crossflow Valve O-Ring Replacement
Figure 202

FLAPPER VALVE - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Removal of Flapper Valve (See Figure 201.)
      (1) Defuel the aircraft. (Refer to Chapter 12.)

      WARNING: OBSERVE ALL SAFETY PRACTICES DESCRIBED IN 28-00-00. SPECIAL CARE SHOULD BE TAKEN TO PROPERLY VENTILATE THE FUEL CELLS PRIOR TO PERFORMING MAINTENANCE PROCEDURES.

      (2) Remove applicable access panel. (Refer to Chapter 52.)
      (3) Remove attaching parts securing flapper valve and remove flapper valve.
   B. Installation of Flapper Valve (See Figure 201.)

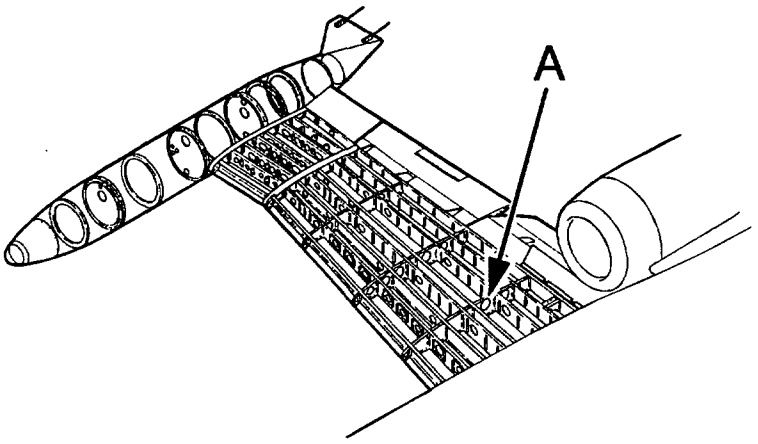
      CAUTION: FLAPPER VALVE ATTACH BOLTS MUST BE SNUG ONLY. IF TOO SNUG (TIGHT) FLAPPER VALVE WILL DISTORT AND NOT FUNCTION PROPERLY.

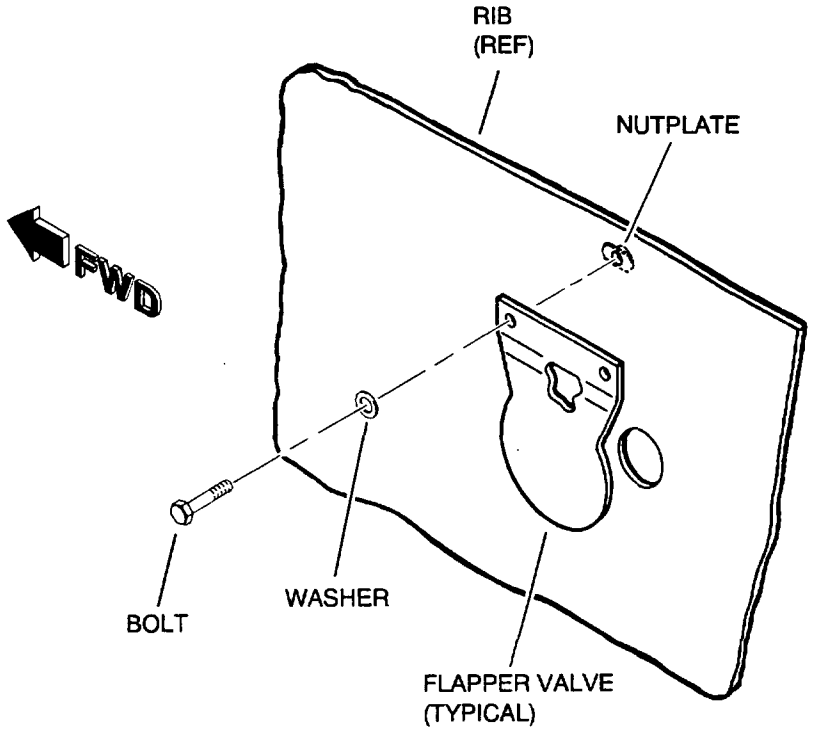
      (1) Install flapper valve and secure with attaching parts.
      (2) Perform Operational check and Inspection of flapper valve. (Refer to Inspection/Check, this section.)
      (3) Install access panel.
      (4) Fuel aircraft. (Refer to Chapter 12.)
      (5) Check all previously removed access panels for leaks.

2. **Inspection/Check**
   A. Operational Check and Inspection of Flapper Valve

      NOTE: Perform Operational Check and Inspection of Flapper Valves in accordance with the current inspection interval specified Chapter 5.

      (1) Ensure flapper valve is not distorted.
      (2) Ensure flapper valve covers wing rib hole completely.
      (3) Ensure that no gaps exist between flapper valve and wing rib hole.
      (4) Ensure flapper valve moves freely.
      (5) Ensure adjacent hardware is properly secured and does not interfere with flapper valve operation.





Detail A

Flapper Valve Installation
Figure 201

FUSELAGE TANK - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The fuselage tank components consist of multiple bladder-type cells, a fuel transfer pump, float switch, fuel probe, drain valve, vent float valve, and vacuum relief valve. A fuselage tank low pressure switch is installed in the fuselage transfer-fill line.

(1) On Aircraft 36-002 and Subsequent, the fuselage tank consists of four bladder-type cells located in cavities between frames 18 and 25. The cavity incorporates four drain ports. Two are located in the forward cavity area and two in the aft cavity area. The two forward drain ports are connected to a common drain line. The aft ports are connected to individual drain lines.

(2) On Aircraft 35-002 and Subsequent, the fuselage fuel tank consists of two bladder-type cells located in the cavity between frames 22 and 25. The cavity incorporates two drain ports located in the aft area of the cavity. The drain ports are connected to individual drain lines. The crossover tube and three interconnect tubes connect the two cells to form the tank.

B. Component Description

(1) An electric fuselage fuel pump is installed in the left forward fuselage tank. The fuselage fuel pump is submerged-type with a maximum output of 18 psi. The fuselage fuel pump is used to transfer fuel from the fuselage tank to the wing tanks. The fuselage fuel pump, powered by 28 vdc, is controlled by Fuselage Transfer Switch on the fuel control panel.

(2) On Aircraft 36-002 and Subsequent and Model 35A Aircraft equipped with optional gravity fuel transfer, the fuselage tank low pressure switch is located in the LH transfer line. Access to the switch is gained through the lower fuselage access panels. On Aircraft 35-002 and Subsequent except 35A Aircraft equipped with optional gravity fuel transfer, the fuselage tank low pressure switch is located forward of frame 22 directly above the keel beam. Access to the switch is gained through the center access cover aft of the right wheel well.

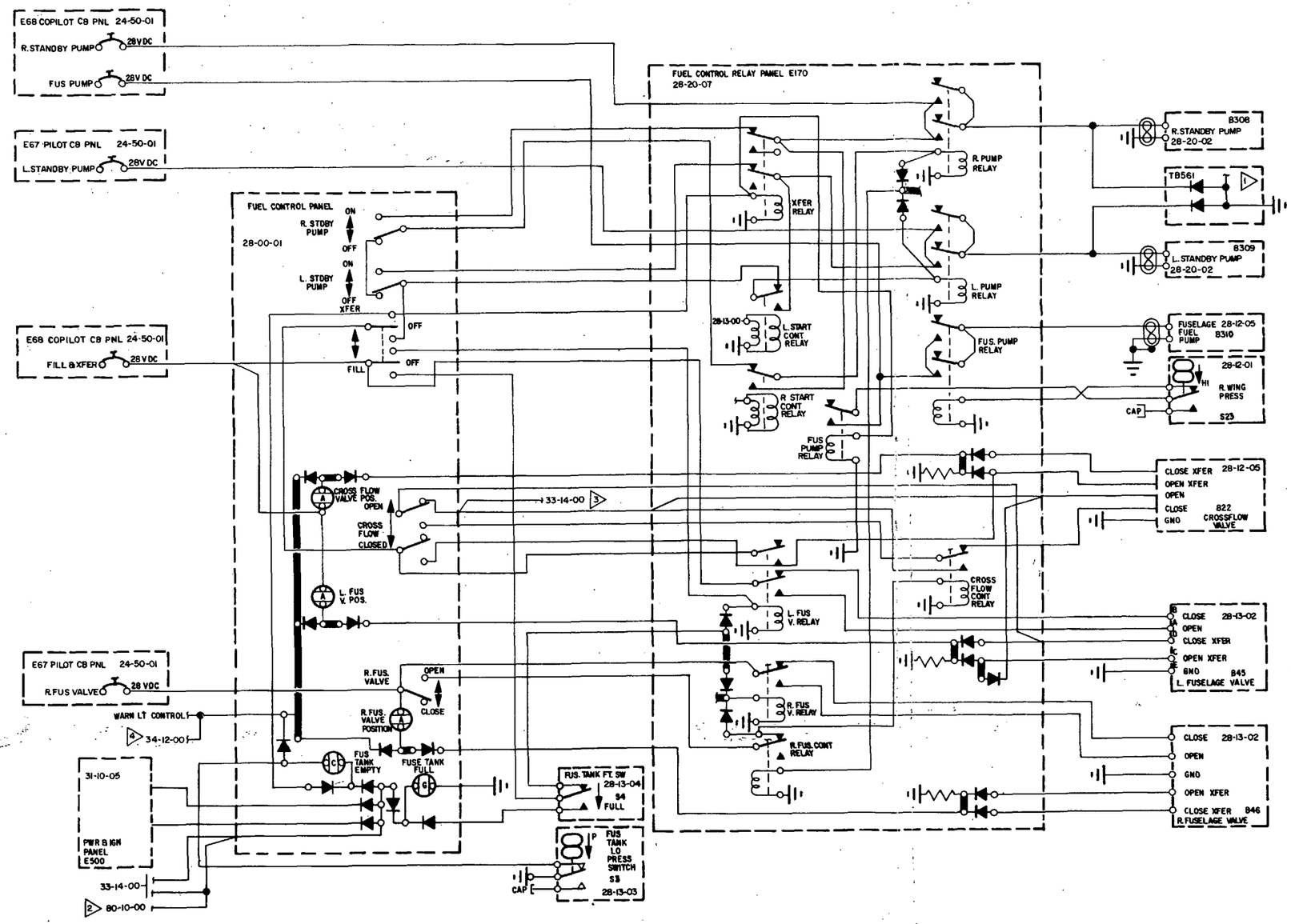
2. OPERATION

A. On Aircraft 36-002 and Subsequent (see figure 1), fueling of the fuselage fuel tank is accomplished by pumping fuel from the wing tanks through two refuel and transfer lines common to the fuel cells. Motorized fuel transfer valves, located in both refuel and transfer lines, shut off fuel flow to the cells when the float switch, located in the upper aft right access panel is activated to the full position. The float switch also deenergizes the wing tank standby pumps and lights the TANK FULL indicator. Fuel is transferred from the fuselage tank by a fuselage fuel pump that provides fuel flow through the LH transfer valve to the wing tanks and is controlled by the Fuselage Tank Transfer - Fill Switch. The RH transfer valve can be opened to provide gravity fuel flow to the wing tanks in case of normal fuel transfer failure and is controlled by the FUS Valve Switch. A fuselage tank low pressure switch is installed to alert the pilot when fuselage

fuel is depleted. The tank is vented by a vent tube which opens in the forward bladders. Connected to the forward vent tube is a venting arrangement which prevents siphoning of fuel into the vent system at extreme flight attitudes.

B. On Aircraft 35-002 and Subsequent (see figure 2), fueling of the fuselage fuel tank is accomplished by pumping fuel from the wing tanks through a fuel and transfer line common to both cells. A motorized fuel transfer valve, located in the fuel and transfer line, shuts off fuel flow to the tank when the float switch attains the full position. Additionally, the float switch in the tank full position, deenergizes the standby pumps and lights the TANK FULL indicator light. A fuselage tank low pressure switch is installed to alert the pilot when fuselage fuel is depleted. Fuel is transferred from the fuselage tank by a fuselage fuel pump that provides fuel flow through the transfer valve to the wing tanks. The transfer valve is controlled by the Fuselage Tank Transfer - Fill Switch located on the Fuel Control Panel. The tank is vented by a vent tube with an opening at the forward end of the tank and a float valve connected to the vent tube at the aft end of the tank. The vent tube is connected to the external vent system. The vacuum relief valve has a free flow directional arrow imprinted on the valve body. This free flow arrow must point forward when installed. A drain valve, located in the fuel crossover tube, is used to drain moisture accumulation.

C. On Model 35A Aircraft Equipped with Optional Gravity Fuel Transfer (see figure 1), fueling of the fuselage fuel tank is accomplished by pumping fuel from the wing tanks through two refuel and transfer lines common to the fuel cells. Motorized fuel transfer valves, located in both refuel and transfer lines, shut off flow to the fuel cells when the float switch is actuated to the full position. The float switch also deenergizes the wing tank standby pumps and lights the TANK FULL indicator. Fuel is transferred from the fuselage tank by a fuselage fuel pump that provides fuel flow through the LH transfer valve to the wing tanks and is controlled by the Fuselage Tank Transfer - Fill Switch. The RH transfer valve can be opened to provide gravity fuel flow to the wing tanks in case of normal fuel transfer failure and is controlled by the FUS Valve Switch. A fuselage tank low pressure switch is installed to alert the pilot when fuselage fuel is depleted. The tank is vented by a vent tube with an opening at the forward end of the tank and a float valve connected to the external vent system at the upper LH fuel cell access panel. The fuel cell vent check valve (vacuum relief) is connected to an overboard vent line at the upper LH fuel cell access panel. The vacuum relief valve has a free flow directional arrow imprinted on the valve body. This free flow arrow must point forward (into tank) when installed.



NOTES:

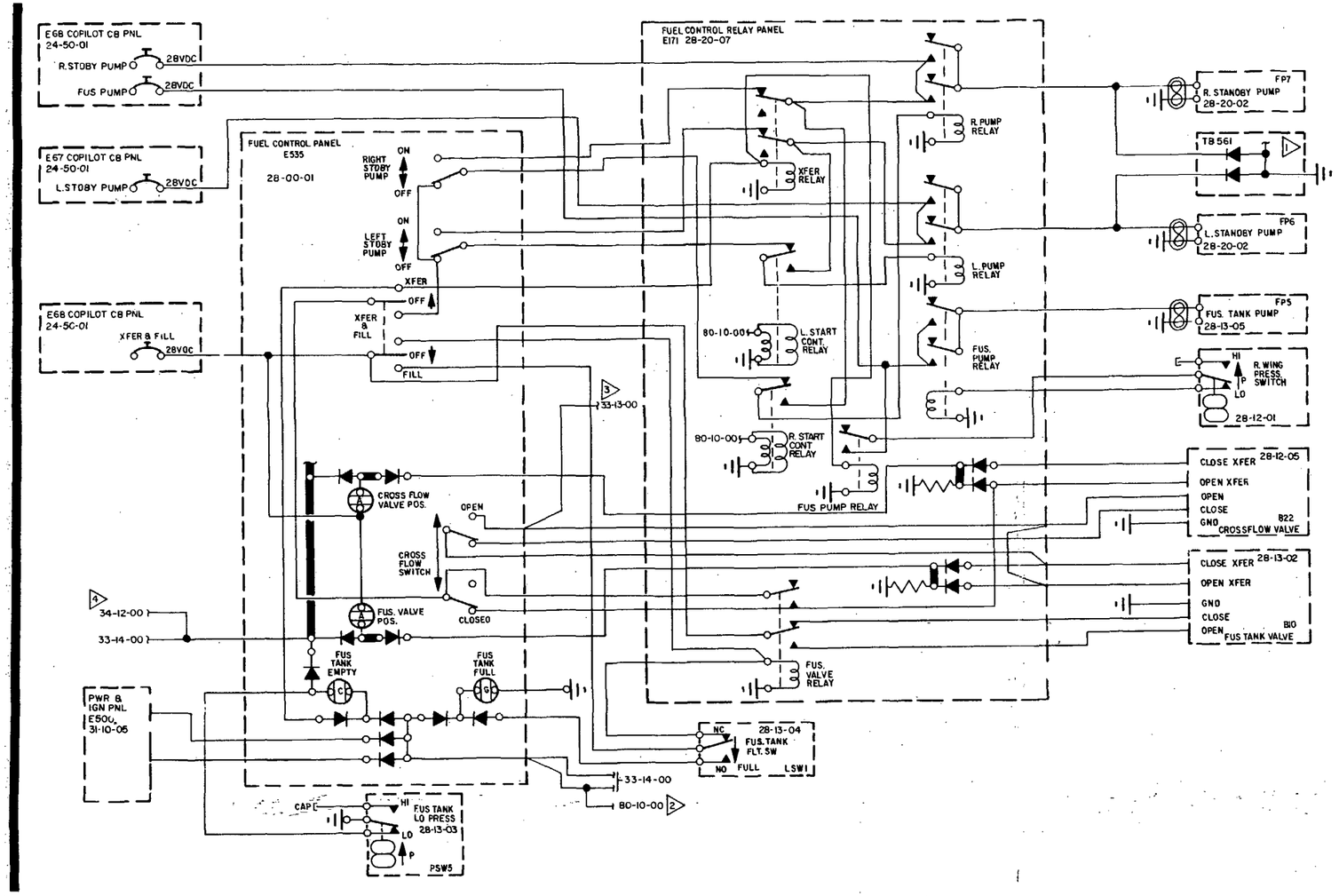
1. Aircraft 36-045 and Subsequent, 35-291 and Subsequent.

2. Aircraft modified per AMK 80-17, "Installation of Current Limiter Warning and Starter Indicator Lights," or AAK 81-1, "Installation of Starter Secondary Electrical Contactors."

3. Aircraft 36-051 and Subsequent, 35-490 and Subsequent.

4. Aircraft 36-002 thru 36-053, 35-002 thru 35-408 modified per AAK 83-2, "Installation of FC-530 Autopilot."

Fuel Transfer, Crossflow and Fill Schematic
Figure 1



Fuel Transfer, Crossflow and Fill Schematic
Figure 2

NOTES:

1. Aircraft 35-291 and Subsequent.

2. Aircraft modified per AMK 80-17, "Installation of Current Limiter Warning and Starter Indicator Lights," or AAK 81-1, "Installation of Starter Secondary Electrical Contactors."

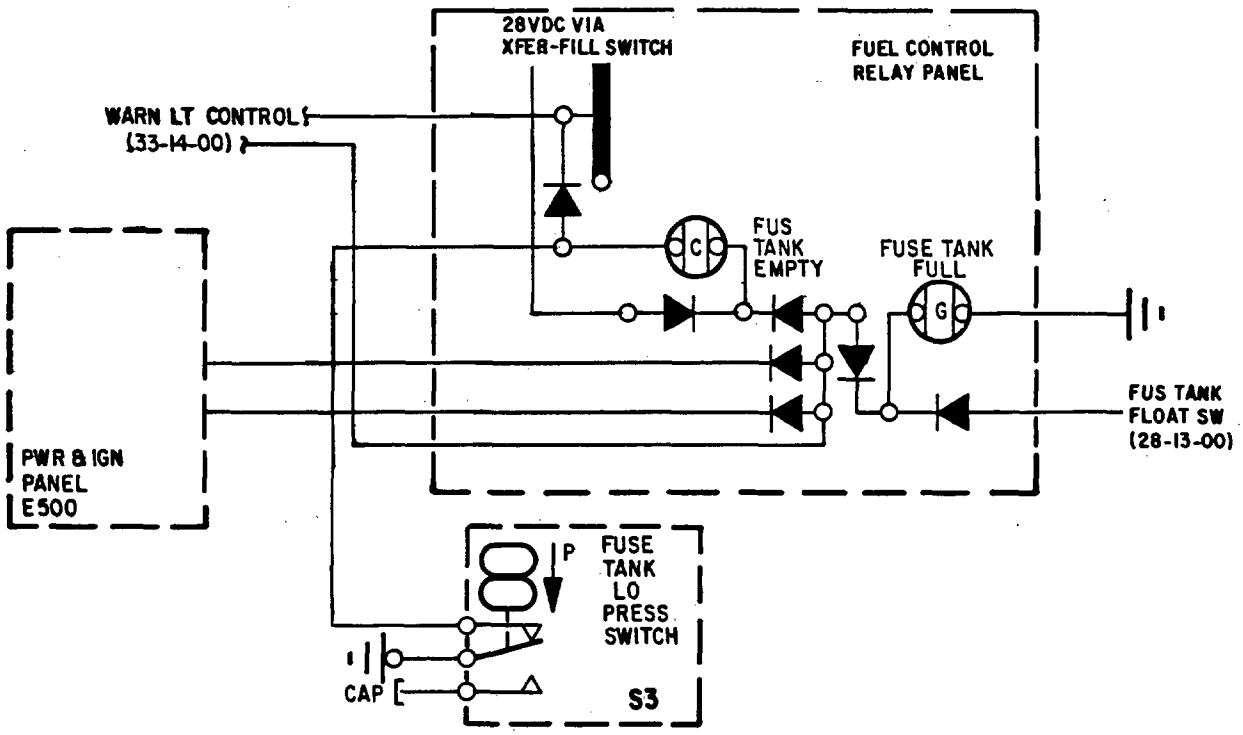
3. Aircraft 35-490 and Subsequent.

4. Aircraft 35-002 thru 35-505 except 35-408 modified per AAK 83-2, "Installation of FC-530 Autopilot."

D. Component Operation

(1) During the fill cycle, the fuselage fuel pump is deenergized. When the Fuselage Transfer Switch is set to XFER, the pump is energized and transfers fuel to the wing tank. When fuel transfer is completed, the Fuselage Transfer Switch must be set to OFF to deenergize the pump. A wing fuel pressure switch (refer to 28-12-01) sensing fuel pressure in the right wing, will deenergize the fuselage fuel pump if fuel pressure reaches 5 psi. The fuselage fuel pump will reenergize when the pressure drops below 2.50 psi.

(2) The function of the fuselage tank low switch (see figure 3) is to sense pressure from the fuselage transferfill line and energize the Fus Tank Empty indicator light on the fuel control panel. The switch closes and energizes the light when pressure drops below 2.75 psi. The switch reopens at a pressure of 3.75 psi.



Fuselage Pressure Switch Electrical Control Schematic
Figure 3

FUEL BLADDER - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE:
- Maintenance practices consist of replacement of defective bladder. When replacement bladder is installed, protect new bladder at all times to avoid damage.
- For maintenance practices on the inspection and repairing of sealed areas in the fuselage fuel cell cavity, refer to 28-10-00.

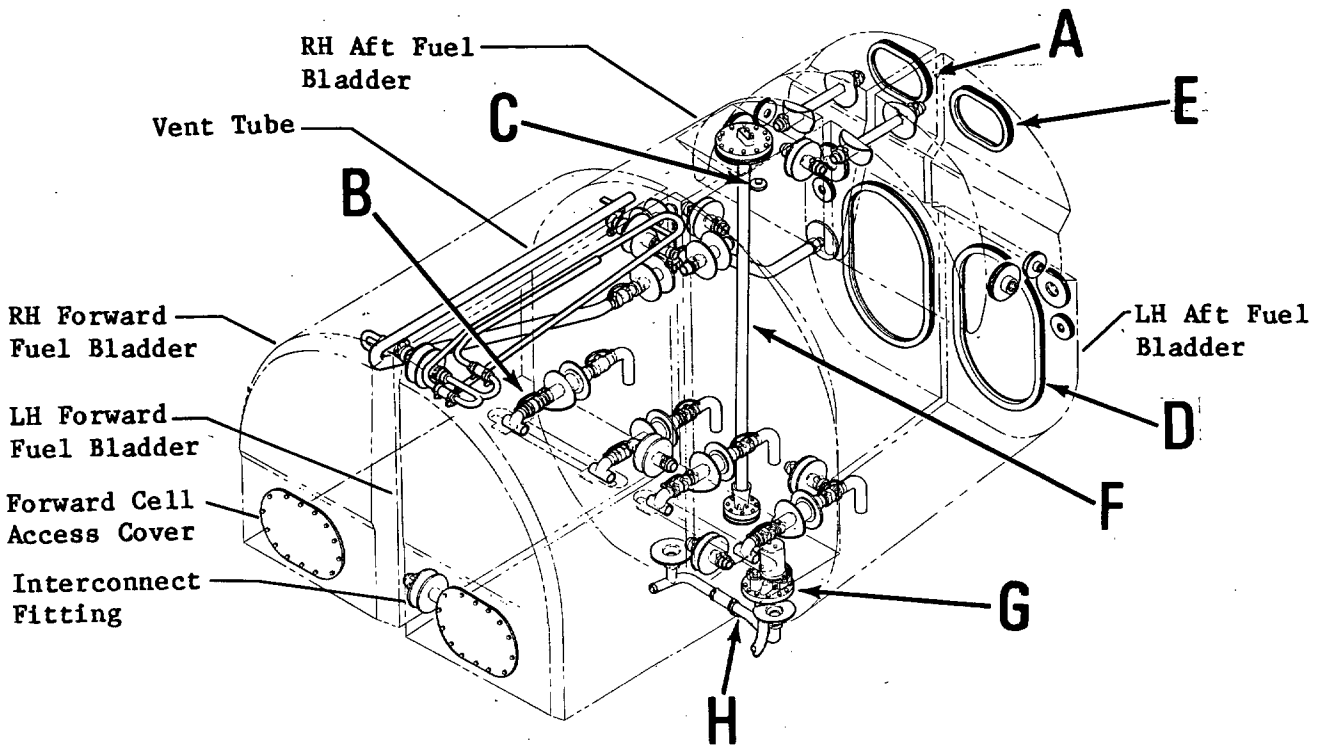
A. Remove Forward Fuel Bladder (See figure 201.)
   (1) Assure that fuselage tank is empty. (Refer to Chapter 12.)
   (2) Disconnect aircraft batteries.
   (3) Remove interior lining forward of frame 18; remove cabin air conditioning components and electrical equipment.
   (4) Remove sealant from bolts securing upper access cover to pressure bulkhead.
   (5) Remove bolts and washer securing inner access cover.
   (6) Remove bolts and washers that secure pressure bulkhead to frame 18.
   (7) Remove pressure bulkhead.
   (8) Remove bolts from LH and RH fuel tank bladder access covers.
   (9) Remove LH and RH tank bladder access covers and gaskets.
   (10) Remove support clamps that secure vent tubes.
   (11) Remove bonding jumper and tube clamps at aft end of vent tube.
   (12) Remove vent tubes from aircraft.
   (13) Remove bonding jumpers and clamps from the four lower aft tank bladder interconnect tubes and tee assemblies.
   (14) Remove interconnect tubes from aircraft.
   (15) Remove remaining tank bladder interconnect tubes and clamps.
   (16) Unlatch tank bladder hanger fasteners from structure.
   (17) Remove tank bladders from aircraft.

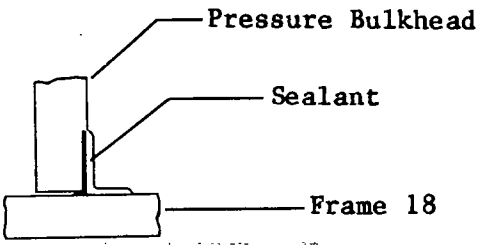
B. Install Forward Fuel Bladder (See figure 201.)
   (1) Clean fuel cavities of all burrs and foreign matter and check for fuel cavity drain obstructions. Assure that all rivet heads in cavities are properly sealed.
   (2) Clean fuel tank bladders and inspect for condition.

CAUTION: PRIOR TO INSTALLING BLADDERS, COVER FITTINGS WITH PROTECTIVE PAPER AND MASKING TAPE TO AVOID POSSIBLE DAMAGE TO BLADDER AND FITTINGS DURING INSTALLATION.

NOTE: Do not reinstall gaskets that have been removed. Replace with new gaskets.

   (3) Insert tank bladders into cavities through openings above cell access supports.
   (4) Remove protective covering from bladder fittings.
   (5) Position tank bladders into cavities and latch hanger fasteners (12 places for each cell).
   (6) Install interconnect fittings. If necessary, dampen tube with water to permit tube to slide into bladder nipple.
   (7) Install interconnect tube clamps.
   (8) Install the four lower bladder interconnect tubes and insert tee assemblies under fabric retainers.
   (9) Secure interconnect tubes and tee assemblies with clamps and install bonding jumpers.
   (10) Connect vent tubes to tank vent connection and secure with clamps.
   (11) Install vent tube support clamps.

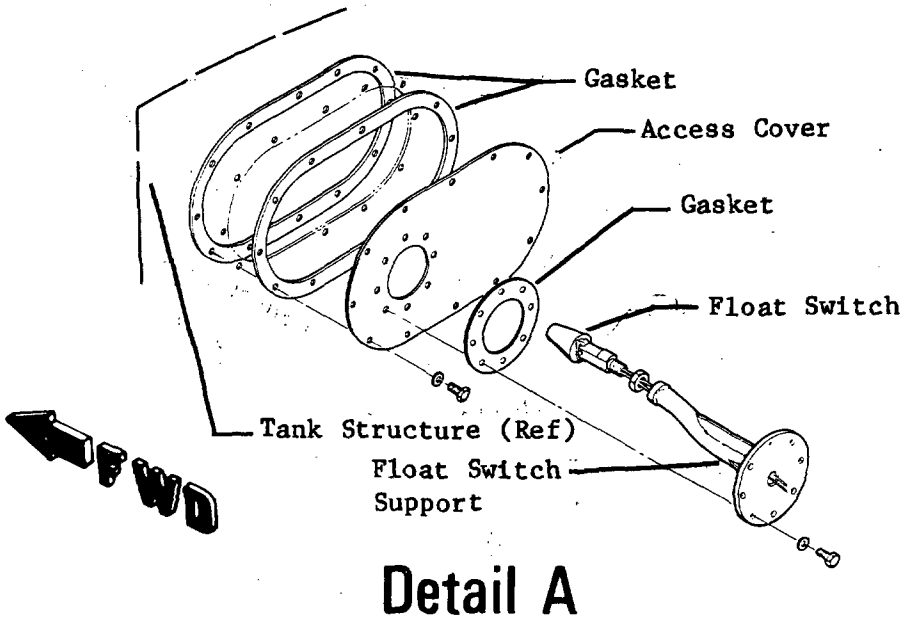




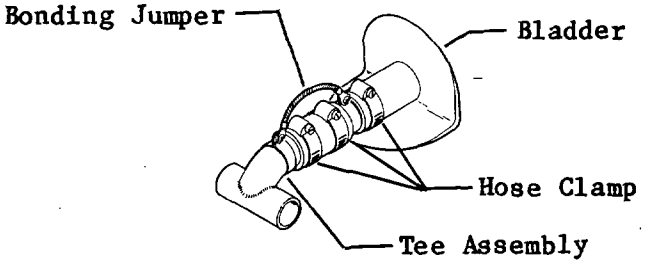
Apply faying surface seal on frame. Apply a coat of paste wax around the edge and down the center of the pressure bulkhead.

PRESSURE BULKHEAD SEALING

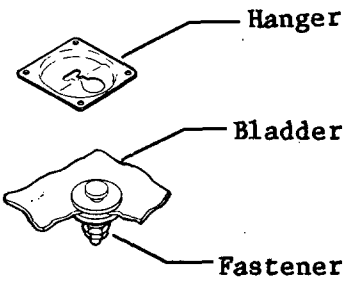
Fuselage Fuel Tank Bladder Installation
Figure 201 (Sheet 1 of 3)



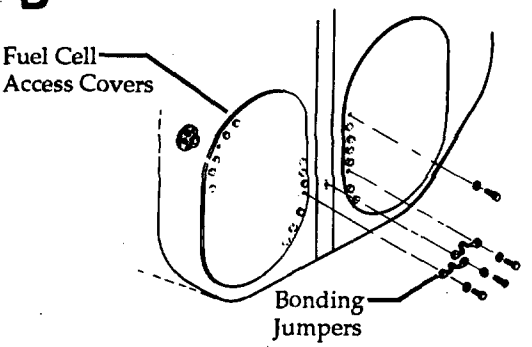
Detail A



Detail B



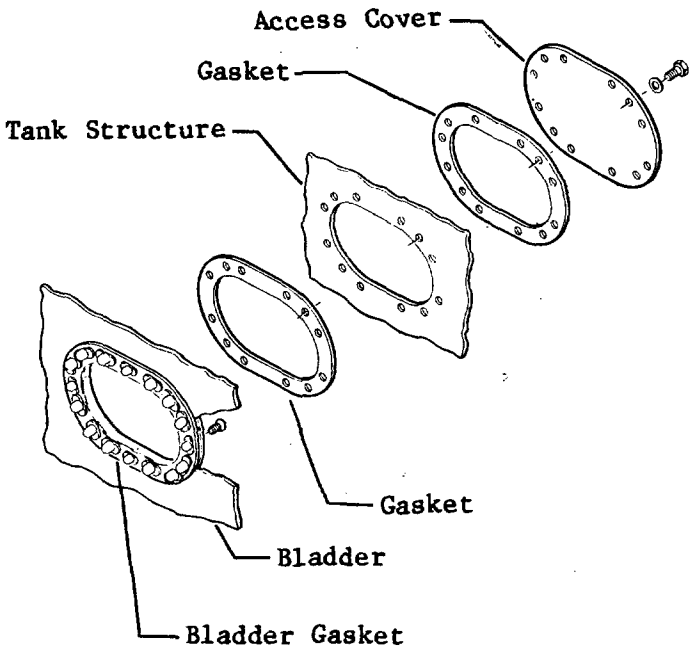
Detail C



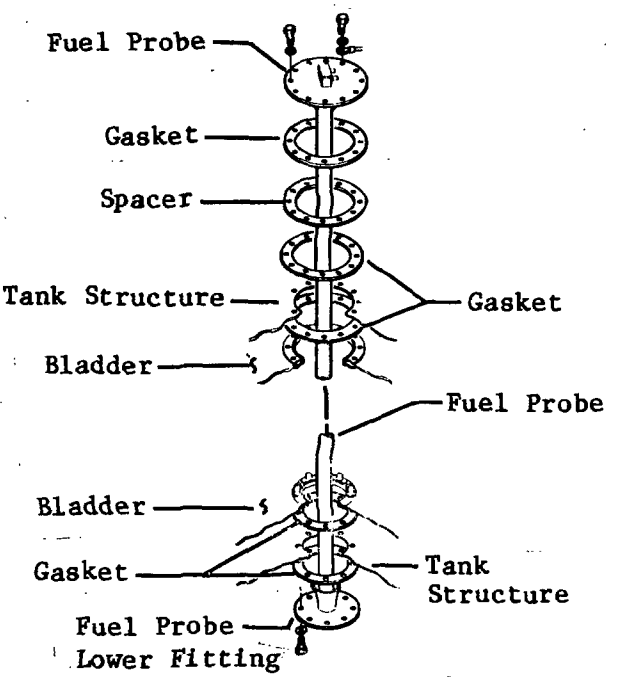
36-060, 061, 064 and Subsequent

Detail D

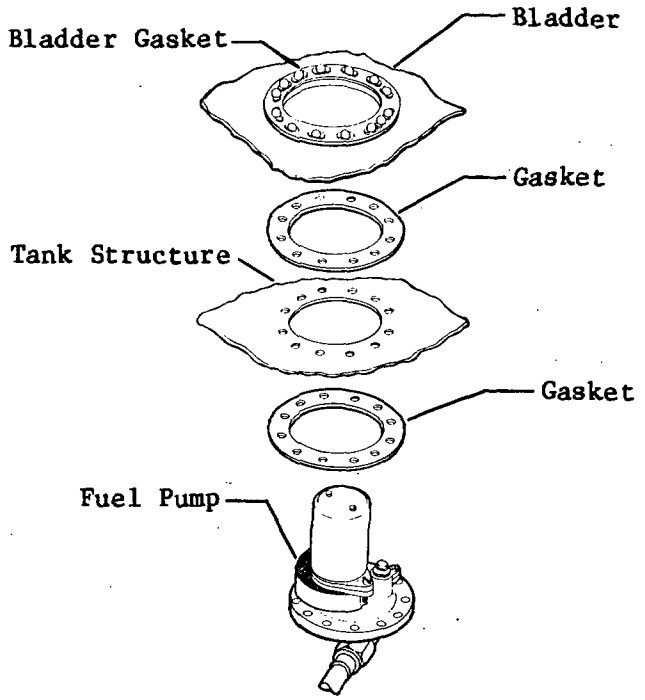
Fuselage Fuel Tank Bladder Installation
Figure 201 (Sheet 2 of 3)



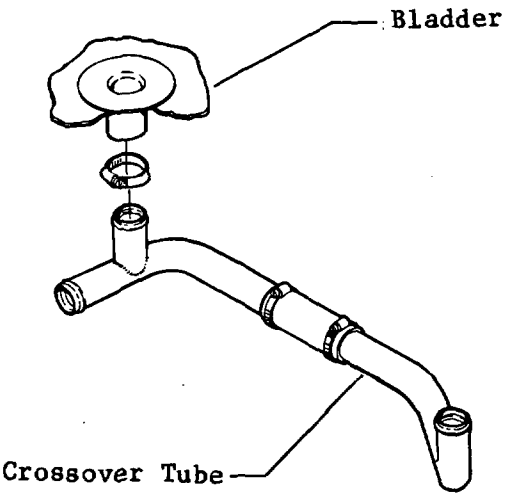
Detail E



Detail F



Detail G



Detail H

Fuselage Fuel Tank Bladder Installation
Figure 201 (Sheet 3 of 3)

(12) Install vent tube bonding jumper.
(13) Fabricate alignment pins by cutting off heads of three AN4-30 bolts.
(14) Install tank bladder access covers as follows:
  (a) Install alignment pins (equally spaced around perimeter of bladder fitting).
  (b) Install gasket over alignment pins and position pins through holes of bladder support.
  (c) Install gasket on forward side of bladder support and install access covers and secure with washers and bolts equally spaced around perimeter of access cover. Tighten bolts finger-tight.
  (d) Remove alignment pins and install remaining washers and bolts.
  (e) Torque bolts in a crisscross pattern 50 to 70 inch-pounds.
  (f) Repeat steps (a) thru (e) on remaining access cover.
(15) Install four alignment pins into upper access bladder fittings. Install gasket on alignment pins. Position alignment pins at 12, 3, 6 and 9 o'clock around perimeter of bladder fitting.
(16) Install pressure bulkhead as follows:
  (a) Inspect each bulkhead nutplate for condition of threads and security of mounting.
  (b) Clean sealing surface.
  (c) Apply a generous coat of paste wax to the perimeter and down the center of the bulkhead.
  (d) Apply faying surface seal to the pressure bulkhead. (See figure 201.)
  (e) Insert float switch fitting alignment pins into fittings of bulkhead.
  (f) Install washer and bolts around perimeter and through the center of the bulkhead. Tighten bolts finger-tight.
  (g) Tighten bolts in a crisscross pattern and torque per torque table in Chapter 20.
  (h) Inspect for a continuous bead of sealant around the pressure bulkhead.
(17) Install gasket and upper access cover over alignment pins. Install bolts in open holes and tighten finger tight.
(18) Remove alignment pins and install remaining bolts. Torque bolts in a crisscross pattern 50 to 70 inch-pounds.
(19) Apply sealant around perimeter of coverplate and over bolts.
(20) Install electrical equipment and cabin pressurization components previously removed.
(21) Install interior lining.
(22) Connect aircraft batteries.
(23) Fill fuselage tank (Refer to Chapter 12.) and check for leaks.

C. Remove Aft Fuel Bladder (See figure 201.)
(1) Assure that the fuselage tank is empty.
(2) Lower tailcone access door.
(3) Remove aircraft batteries. (Refer to Chapter 24.)
(4) Remove LH and RH pylon access panels, located on lower side of engine pylon, and disconnect main fuel and motive flow lines from pylon tank fittings. Remove bolts and free bladder fittings from tank structure.

NOTE: The lower end of the fuel probe is set in the lower fuel probe fitting.

(5) Remove fuselage fuel probe access panel and disconnect electrical wiring from fuel probe. Remove attaching parts and fuel probe from aircraft. Do not remove bonding jumper from fuselage structure.
(6) Remove lower fuselage access panels to gain access to fuselage fuel pump, crossover tube, and fuel probe lower fitting.
(7) Remove fuselage fuel pump. (Refer to 28-13-05.)
(8) Remove tape and sealant securing bladder nipples to fuselage tank structure.
(9) Remove attaching parts and fuel probe lower fitting.
(10) Disconnect main fuel and motive flow lines at frame 24 connection and fuel cell connections. Remove aft fuel cell main fuel and motive flow fittings.

(11) Disconnect fuel filter drain lines at aircraft skin connection.
(12) Disconnect pressure relief valve drain lines from engine main fuel line connection and aircraft skin connection. Remove drain lines from aircraft.
(13) Disconnect wiring from fuel pressure switches.
(14) Disconnect float switch wiring at splice. Tag wiring.
(15) Remove attaching parts and large fuel cell access covers from aircraft.
(16) Disconnect internal fuel vent line and remove clamps.
(17) Remove attaching parts and RH and LH upper access covers from fuel cell.
(18) Disconnect and remove main fuel and motive flow lines from internal fuel tank fittings.
(19) Remove clamp and interconnect tubes.
(20) Unlatch fuel cell bladders from structure and remove through large access opening.

D. Install Aft Fuel Bladder (See figure 201.)
(1) Clean fuel cell cavities of all burrs and foreign matter. Assure that all rivet heads in cavities are properly sealed.
(2) Clean fuel tank bladders and inspect for condition.

NOTE:
- Prior to installing bladders, cover fittings with protective paper and masking tape to avoid possible damage during installation.
- Do not reinstall gaskets that have been removed. Replace with new gaskets.

(3) Insert LH bladder (bottom end first) through large access opening in aft side of fuel cell. Position bladder in cavity and latch hanger fasteners (11 places). Repeat same procedure for RH cell, except bladder has 10 fasteners.
(4) Install interconnect tubes. If necessary, dampen tube with water to permit tube to slide into bladder nipple.
(5) Install interconnect tube clamps.
(6) Secure nipples to tubes with clamps.
(7) Install fuselage fuel pump. (Refer to 28-13-05.)
(8) Wrap bladder nipple with tape (P/N 853, manufactured by the 3M Co.) and apply a fillet seal to tape and tank structure. (Refer to 28-10-00.) Allow sealant to dry before installing crossover tube.
(9) Fabricate three alignment pins by cutting off the heads of three 1/4 x 3 inch bolts.
(10) Install fuel probe and lower fitting as follows:
(a) Install alignment pins (equally spaced) around perimeter of bladder metal gasket.
(b) Install gasket over alignment pins and position pins through holes in tank structure.
(c) With bladder metal gasket held firmly in place, position gasket and upper portion of fuel probe over alignment pins. Install attaching bolts and tighten finger-tight. Remove alignment pins and install remaining bolts. Torque bolts in a crisscross pattern 50 to 70 inch-pounds.
(11) Install fuel cell fittings as follows:
(a) Install alignment pins (equally spaced) around perimeter of bladder metal gasket.
(b) Install gasket over alignment pins and position pins through holes in tank structure.
(c) With bladder metal gasket held firmly in place, position fitting over alignment pins and install bolts. Remove alignment pins and install remaining bolts. Torque bolts in a crisscross pattern 50 to 70 inch-pounds.
(d) Repeat steps (a) thru (c) on remaining fuel cell fittings.
(e) Position hoses on internal vent line and secure with clamps.
(12) Install RH and LH upper access covers as follows:
(a) Install three alignment pins in perimeter of bladder metal gasket. Position gasket over alignment pins and insert pins into hole around RH access opening.

(b) Position a second gasket over alignment pins. Position RH access cover over alignment pins and install washers and bolts.
(c) Remove alignment pins and install remaining washers and bolts. Torque bolts 25 (±5) inch-pounds in a crisscross pattern. Safety wire per double twist method.
(13) Connect float switch wiring.
(14) Install large access covers as follows:
(a) Install alignment pins into bladder metal gaskets equally spaced around perimeter of opening.
(b) Install a gasket on alignment pins and position metal gasket and gasket to fuel cell opening.
(c) Holding metal bladder gasket in place, install gasket on the aft side of fuel cell structure. Install access cover and secure with three washers and bolts equally spaced around perimeter of cover panel. Tighten bolts finger-tight.
(d) Remove alignment pins and install remaining washers and bolts.
(e) Torque bolts in a crisscross pattern 50 to 70 inch-pounds.
(f) Repeat steps (a) through (e) on remaining access cover.
(15) Install all lower access panels.
(16) Connect all fuel plumbing and electrical wiring previously removed.
(17) Install aircraft batteries. (Refer to Chapter 24.)
(18) Fill fuselage tank (Refer to Chapter 12.) and check for leaks.
(19) Secure tailcone access door.

2. REMOVAL/INSTALLATION *(Model 35/35A Aircraft)*
A. Remove Fuel Bladder (See figure 202.)
(1) Ensure that fuselage tank is empty. (Refer to Chapter 12.)
(2) Lower tailcone access door and remove batteries. (Refer to Chapter 24.)
(3) Remove LH and RH pylon access panels, located on lower side of engine pylon, and disconnect main fuel and motive flow lines from pylon tank fittings. Remove bolts freeing bladder fittings from tank structure.
(4) Remove fuselage fuel probe access cover and disconnect electrical wiring from fuel probe. Remove attaching parts and fuel probe from aircraft. Lower end of fuel probe is set in lower fuel probe fitting. Do not remove bonding jumper from fuselage structure.
(5) Remove lower fuselage access panels to gain access to fuselage transfer pump, crossover tube, and fuel probe lower fitting.
(6) Remove fuselage fuel pump. (Refer to 28-13-05.)
(7) Remove tape and sealant securing bladder nipples to fuselage tank structure.
(8) Remove attaching parts and fuel probe lower fitting.
(9) Disconnect fuel vent line at upper RH access cover connection.
(10) Disconnect main fuel and motive flow lines at frame 24 connection and fuel cell connections. Remove aft fuel cell connections. Remove aft fuel cell main fuel and motive flow fittings.
(11) Disconnect fuel filter drain lines at aircraft skin connection.
(12) Disconnect pressure relief valve drain lines from main fuel line connection and aircraft skin connection.
(13) Disconnect wiring from fuel pressure switches.
(14) Disconnect float switch wiring at splice. Tag wiring.
(15) Remove attaching parts and large fuel cell access covers from aircraft.
(16) Disconnect internal fuel vent line and remove clamps.
(17) Remove attaching parts and RH and LH upper access covers from fuel cell.
(18) Disconnect and remove main fuel and motive flow lines from internal fuel tank fittings.
(19) Remove clamp and crossover tubes.
(20) Unlatch fuel cell bladders from structure and remove through large access openings.

B. Install Fuel Bladder (See figure 202.)
(1) Clean fuel cell cavities of all burrs and foreign matter. Ensure that all rivet heads in cavities are properly sealed.
(2) Check for fuel cavity drain obstructions.
(3) Clean fuel bladders and inspect for condition.

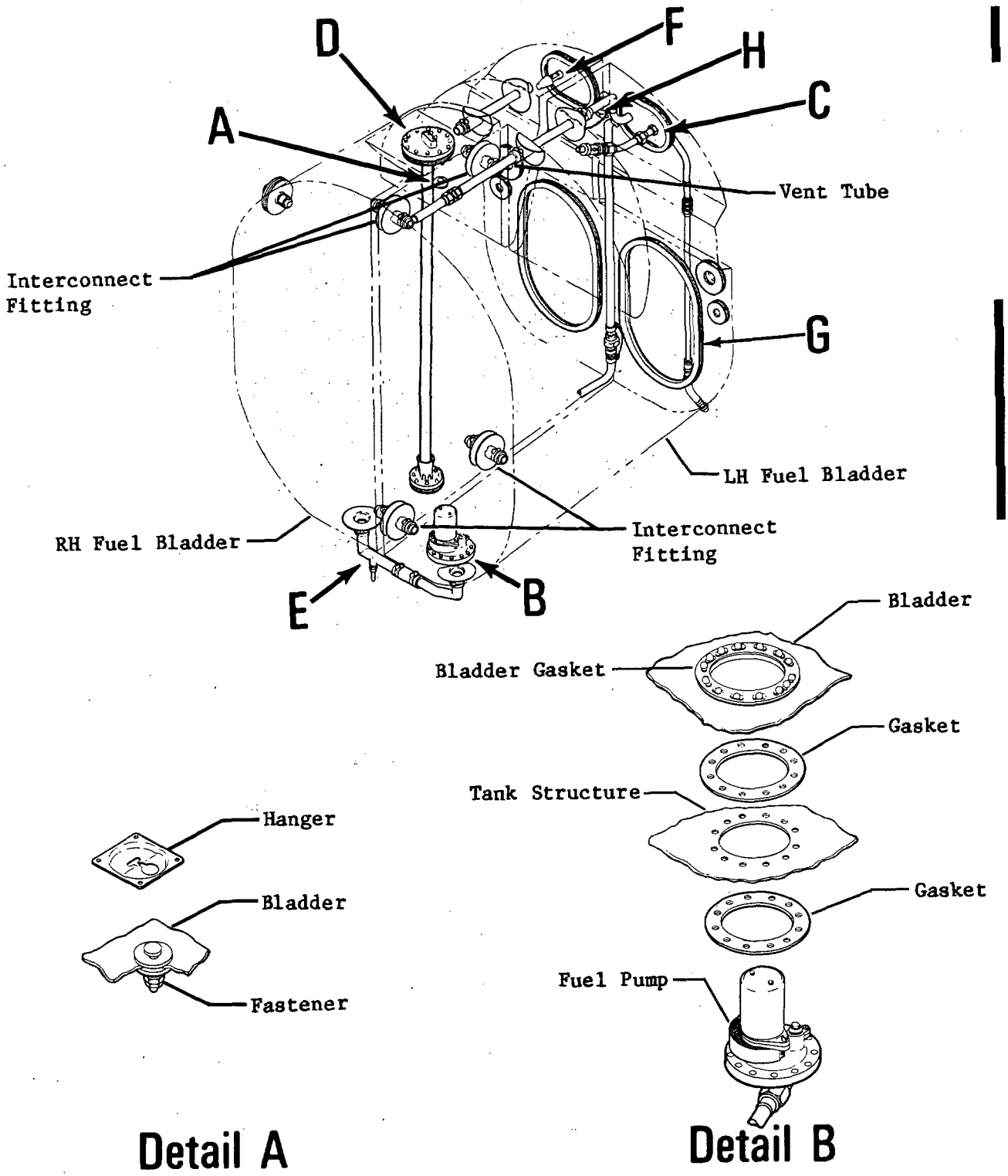
CAUTION: PRIOR TO INSTALLING BLADDERS, COVER CELL FITTINGS WITH PROTECTIVE PAPER AND MASKING TAPE TO AVOID POSSIBLE DAMAGE TO BLADDER AND FITTINGS DURING INSTALLATION.

NOTE: Replace old gaskets with new gaskets.

(4) Insert LH bladder (bottom end first) through large access opening in aft side of fuel cell. Position bladder in cavity and latch hanger fasteners (11 places). Repeat same procedure for RH cell, except bladder has 10 fasteners.
(5) Remove protective covering from bladder fittings.
(6) Insert interconnect tubes from LH bladder through structure cell divider into RH bladder. If necessary, dampen interconnect tubes with water to permit tubes to slide into bladder nipples.
(7) Position interconnect tubes flush with end of internal nipples.
(8) Secure nipples to tubes with clamps.
(9) Install fuselage fuel pump. (Refer to 28-13-05.)
(10) Wrap bladder nipple with tape (P/N 853, manufactured by the 3M Co.) and apply a fillet seal to tape and tank structure. Allow sealant to dry before installing interconnect tube.
(11) Fabricate three alignment pins by cutting off the heads of three AN4-30 bolts.
(12) Install fuel probe and lower fitting as follows:
(a) Install alignment pins (equally spaced) around perimeter of bladder metal gasket.
(b) Install gasket over alignment pins and position pins through holes in tank structure.
(c) With bladder metal gasket held firmly in place, position gasket and upper portion of fuel probe over alignment pins. Install attaching bolts and tighten finger-tight. Remove alignment pins and install remaining bolts. Torque bolts 50 to 70 inch-pounds.
(13) Install fuel cell fittings as follows:
(a) Install alignment pins (equally spaced) around perimeter of bladder metal gasket.
(b) Install gasket over alignment pins and position pins through holes in tank structure.
(c) With bladder metal gasket held firmly in place, position fitting over alignment pins and install bolts. Remove alignment pins and install remaining bolts. Torque bolts in a crisscross pattern 50 to 70 inch-pounds.
(d) Repeat steps (a) through (c) on remaining fuel cell fittings.
(14) Install RH and LH upper access covers as follows:
(a) Position hose on internal vent line and secure with clamp.
(b) Install three alignment pins in perimeter of bladder metal gasket. Position gasket over alignment pins and insert pins into holes around RH access opening.

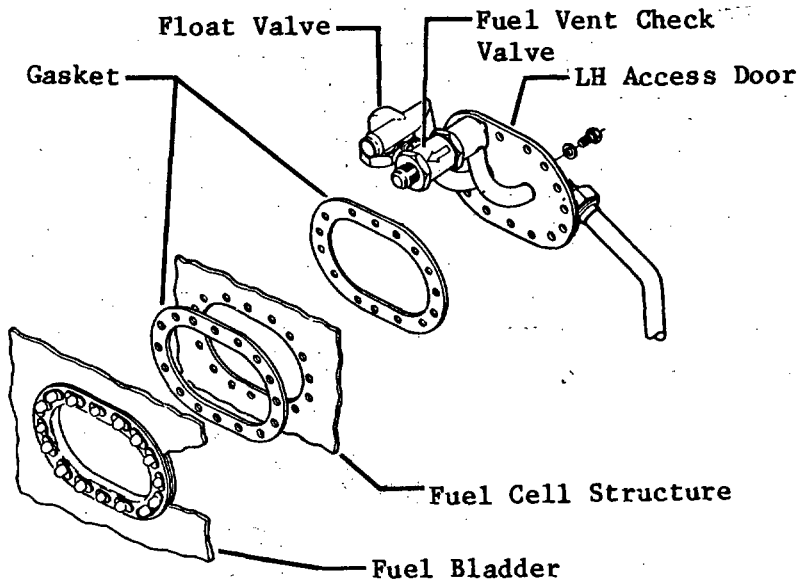
NOTE: The LH access cover is installed the same as the RH, except the LH has no vent line connection.

(c) Position a second gasket over alignment pins. Position RH access cover over alignment pins while seating access cover vent line into hose. Secure hose to vent line with clamp and access cover to tank structure with bolts. Remove alignment pins and install remaining bolts. Torque bolts 50 to 70 inch-pounds in a criss cross fashion. Safety wire per the double twist method.
(15) Connect float switch wiring.

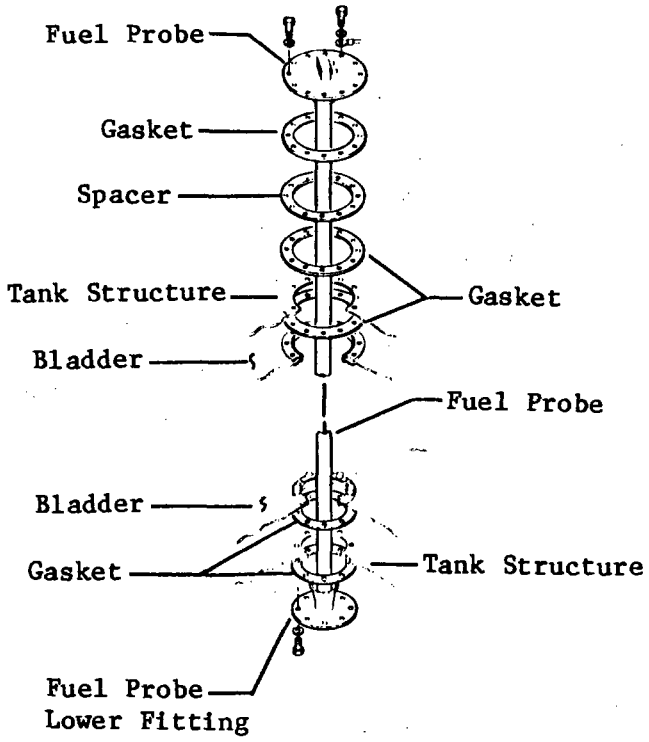


Fuselage Fuel Tank Bladder Installation
Figure 202 (Sheet 1 of 3)

EFFECTIVITY: 35-002 and Subsequent

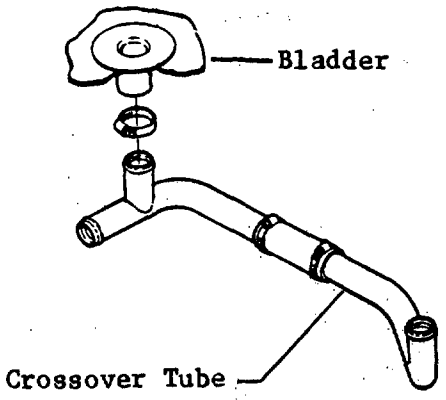


Detail C

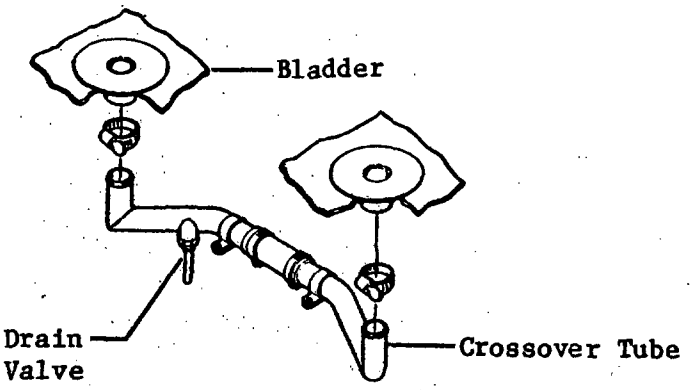


Detail D

Fuselage Fuel Tank Bladder Installation
Figure 202 (Sheet 2 of 3)

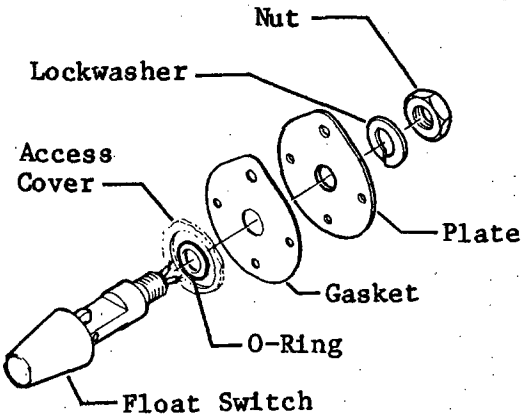


35A Aircraft Equipped with Gravity Fuel Transfer



35A Aircraft Not Equipped with Gravity Fuel Transfer

Detail E



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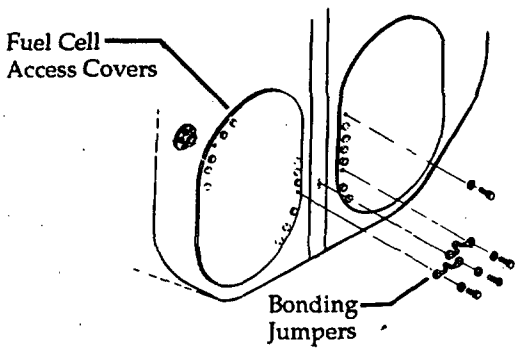
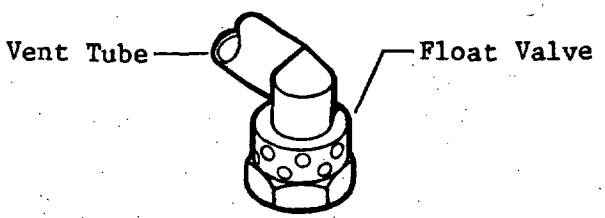
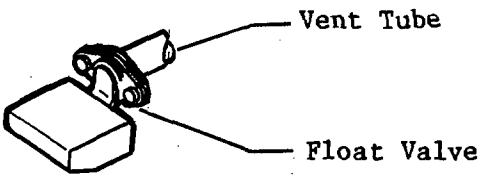


35-661 and Subsequent

Detail G



35-002 thru 35-484



35-485 and Subsequent

Detail H

Fuselage Fuel Tank Bladder Installation
Figure 202 (Sheet 3 of 3)

(16) Install large access covers as follows:
  (a) Install alignment pins into bladder metal gaskets equally spaced around perimeter of opening.
  (b) Install a gasket on alignment pins and position bladder metal gasket and gasket to fuel cell opening.
  (c) Holding bladder metal gasket in place, install gasket on the aft side of fuel cell structure. Install access covers and secure with three washers and bolts equally spaced around perimeter of access covers. Tighten bolts finger-tight.
  (d) Remove alignment pins and install remaining washers and bolts.
  (e) Torque bolts 50 to 70 inch-pounds.
  (f) Repeat steps (a) through (e) on remaining access cover.
(17) Install all lower access panels. Torque bolts 50 to 70 inch-pounds in a crisscross fashion.
(18) Connect all fuel plumbing and electrical wiring previously removed.
(19) Install aircraft batteries. (Refer to Chapter 24.)
(20) Fill fuselage tank (Refer to Chapter 12.) and check for leaks.
(21) Secure the tailcone access door.

3. STORAGE

A. Fuel Cell Bladder Storage and Handling

NOTE: The following rules apply to handling and storage of all fuel cell bladders.

CAUTION:
- **STORE FUEL CELLS IN A SHIPPING CONTAINER.**
- **STORE IN A WELL VENTILATED AREA AT A TEMPERATURE OF 50° TO 110° F. DO NOT STORE IN DIRECT SUNLIGHT OR NEAR ANY HEAT SOURCE.**
- **DO NOT STACK CELLS EXCEPT IN A SHIPPING CONTAINER. CONTAINERS MUST BE PLACED SQUARELY ON EACH OTHER.**
- **PLACE CELLS ON A PADDED WORK SURFACE WHEN IT IS REMOVED FROM ITS SHIPPING CONTAINER.**
- **DO NOT PLACE CELL ON ANY SHARP EDGE OR POINT AND KEEP ALL SHARP POINTED TOOLS AWAY FROM CELL.**
- **PROTECT ALL PROJECTIONS, FITTINGS, ETC. OF THE CELL DURING HANDLING.**
- **DO NOT LIFT CELL BY THE FITTINGS OR ACCESS OPENINGS.**

(1) If bladder has contained fuel and removal is for less than 30 days, the cell shall be placed on a padded surface in an isolated/protected area. It shall be protected against entry of contaminants. Do not store in direct sunlight or near any heat source.
(2) If bladder has contained fuel and removal is for a period greater than 30 days;
  (a) Wipe down the exterior surfaces of the cell with a sponge wetted with water.
  (b) Add approximately 1/2 cup of water into the interior of the cell.
  (c) As soon as possible place cell in a polyethylene bag and a shipping container.
  (d) Date the shipping container.
(3) If the storage period is expected to be greater than 6 months, wipe down the interior of the fuel cell bladder with MIL-L-6082 lube oil in lieu of adding water.

4. Approved Repairs

A. Fuselage Fuel Cell Repair

(1) Fuel cells may be repaired using the manufacturer's repair kit. The manufacturer's and kit part numbers are as follows:

Fuel Cell Manufacturer	Repair Kit
American Fuel Cell and Coated Fabrics Co. Magnolia, AR	TB-295
Engineered Fabrics Corp. Rockmart, GA	2F1-3-37813

FUEL TRANSFER VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Transfer Valves (Typical) (See figures 201 and 202.)

(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Remove lower fuselage access covers.
(3) Provide a suitable container to catch fuel when plumbing is disconnected from transfer valves.
(4) Disconnect electrical connector from transfer valve.
(5) Disconnect plumbing and remove transfer valve from aircraft.

B. Install Transfer Valves (Typical) (See figures 201 and 202.)

CAUTION: THE TRANSFER VALVES INCORPORATE TWO TEFLON SEALS, ONE BLACK AND ONE WHITE, AGAINST THE BALL VALVES. THE BLACK SEAL INCORPORATES A SMALL ORIFICE TO RELIEVE SYSTEM PRESSURE. PRESSURE IS APPLIED TO BOTH SIDES OF THE TRANSFER VALVES, THEREFORE, WHEN INSTALLING THE TRANSFER VALVES, ALWAYS POSITION THE VALVE WITH THE BLACK SEAL TO THE SIDE WITH THE GREATEST PRESSURE (NEAREST THE PUMP).

(1) Install transfer valve and connect plumbing. Assure that Teflon gasket is properly installed.
(2) Connect electrical plug to valve.
(3) Fuel the aircraft (refer to Chapter 12) and check for leaks.
(4) Install access covers previously removed.

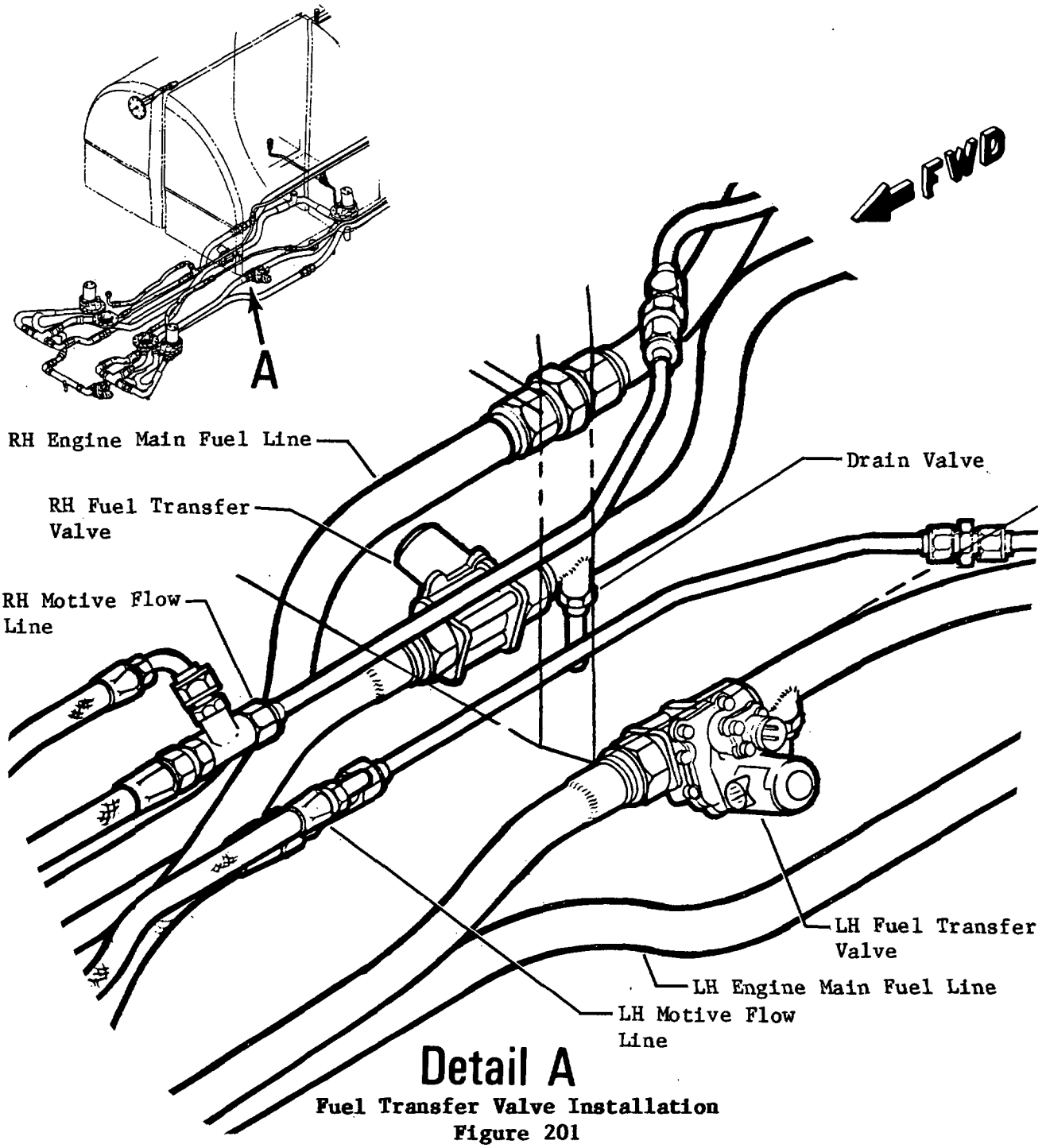
2. APPROVED REPAIRS

A. O-Ring Replacement (See figure 203.)

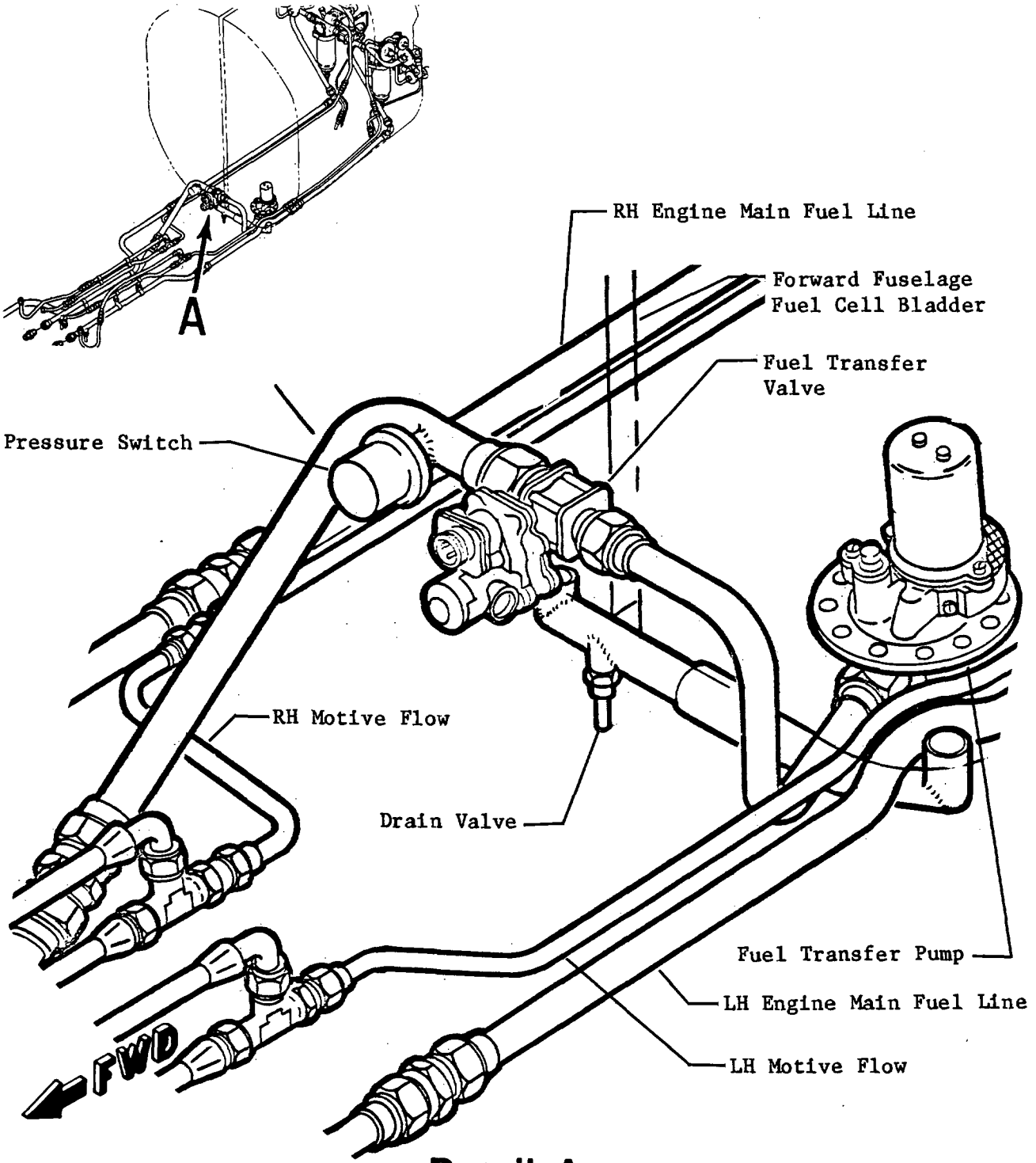
NOTE: It is important to note the position of each O-ring to ensure that each new O-ring is installed in its proper position.

(1) Remove fuel transfer valve from aircraft as described in paragraph 1.A.
(2) Remove outer O-rings, teflon seals, and ball.
(3) Remove safety wire and remove screws which attach valve body to actuator assembly. Remove actuator assembly from valve body to expose shaft O-ring.
(4) Remove old O-ring from actuator shaft. Lubricate a new O-ring with petroleum jelly and install O-ring on shaft. Ensure that O-ring is not twisted and is properly installed on shaft.
(5) Apply a light coating of petroleum jelly to shaft O-ring and insert shaft into valve body. Secure valve body to actuator assembly with attaching screws and safety wire.
(6) Align groove of ball with actuating shaft which protrudes into valve body and install ball.
(7) Remove old O-rings from teflon seals. Lubricate new O-rings with petroleum jelly and install O-rings on teflon seals.
(8) Apply a light coating of petroleum jelly to O-rings installed on teflon seals and install teflon seals in valve body.

(9) Lubricate outer O-rings with petroleum jelly and install in valve body.
(10) Install fuel transfer valve as described in paragraph 1.B.

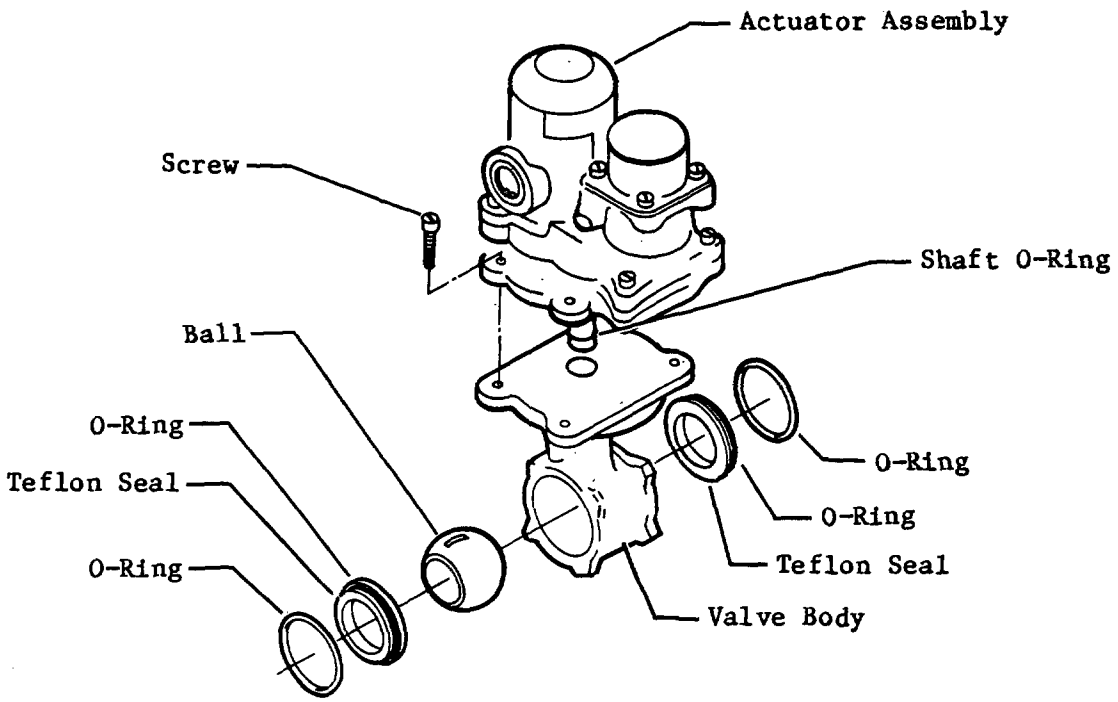


Detail A
Fuel Transfer Valve Installation
Figure 201



Detail A

Fuel Transfer Valve Installation
Figure 202



Fuel Transfer Valve O-Ring Replacement
Figure 203

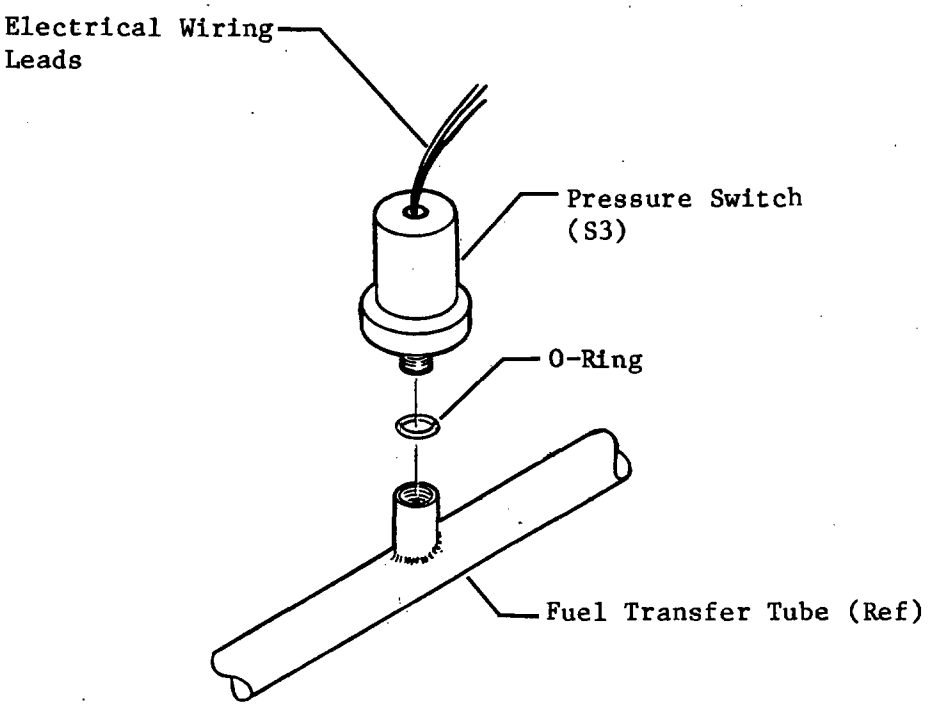
FUSELAGE FUEL TANK LOW PRESSURE SWITCH - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The following removal and installation procedures are typical.

A. Remove Pressure Switch (See figure 201.)
(1) Defuel the fuselage tank. (Refer to Chapter 12.)
(2) Remove electrical power from aircraft.
(3) Gain access to pressure switch installation.
(4) Disconnect and identify switch wiring leads at splice.
(5) Remove pressure switch from fuel transfer tube.

B. Install Pressure Switch (See figure 201.)
(1) Install pressure switch in fuel transfer tube.
(2) Identify and connect wiring leads at splice.
(3) Fuel the aircraft. (Refer to Chapter 12.)
(4) Restore aircraft to normal.
(5) Restore electrical power to aircraft.



Fuselage Fuel Tank Low Pressure Switch Installation
Figure 201

2. **ADJUSTMENT/TEST**

A. Perform Functional Test of Fuselage Fuel Tank Low Pressure Switch (See figure 202.)

(1) Remove pressure switch from fuel transfer tube per procedures outlined in steps 1.A.

(2) Secure pressure switch to work bench.

(3) Connect multimeter (preselect ohms mode) to pressure switch as follows:

(a) Connect one multimeter probe to the white wire lead of pressure switch.

(b) Connect other multimeter probe to the blue wire lead of pressure switch.

(c) Multimeter shall indicate an open circuit.

(4) Connect a pressure gage, pressure regulator, and pressure source (with a pressure rating not to exceed 15 psig) to pressure switch.

CAUTION: USE EXTREME CAUTION WHEN APPLYING PRESSURE TO PRESSURE SWITCH. DO NOT EXCEED 15 PSIG, OTHERWISE PRESSURE SWITCH WILL BE DAMAGED.

(5) Apply pressure slowly to pressure switch and closely monitor pressure gage. Verify that multimeter indicates continuity when pressure gage indicates 3.75 psig.

(6) Bleed pressure slowly and monitor pressure gage. Verify that multimeter indicates an open circuit when pressure gage indicates 2.75 psig.

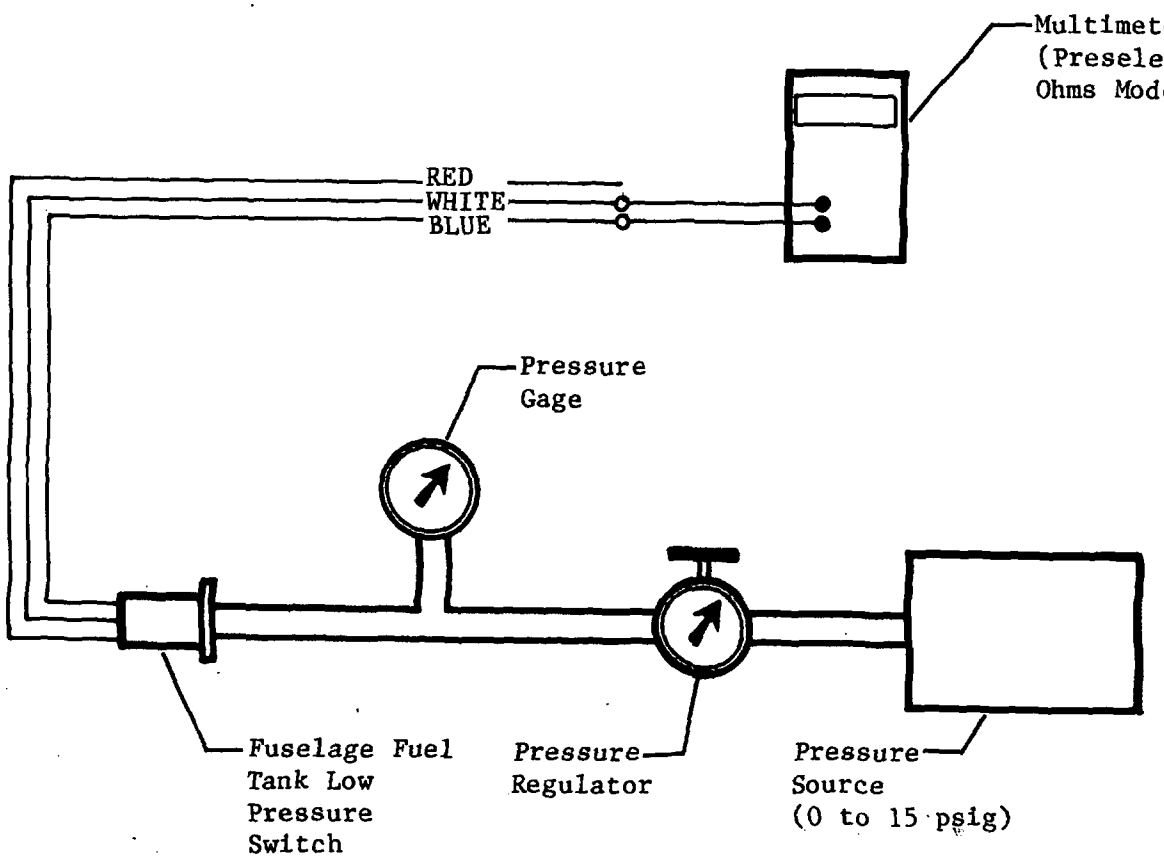
(7) Bleed pressure off to 0 psig. Remove pressure gage, pressure regulator, and pressure source from pressure switch.

(8) Remove multimeter probe from blue wire and connect to red wire of pressure switch. Verify that multimetr indicates continuity.

(9) Remove multimeter from pressure switch.

(10) If pressure switch failed any portion of this functional test, replace pressure switch.

(11) Install pressure switch in fuel transfer tube per procedures outlined in steps 1.B.



Fuselage Fuel Tank Low Pressure Functional Test
Figure 202

FUSELAGE FUEL TANK FLOAT SWITCH - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**

A. Remove Fuselage Fuel Tank Float Switch (Aircraft 36-002 and Subsequent)

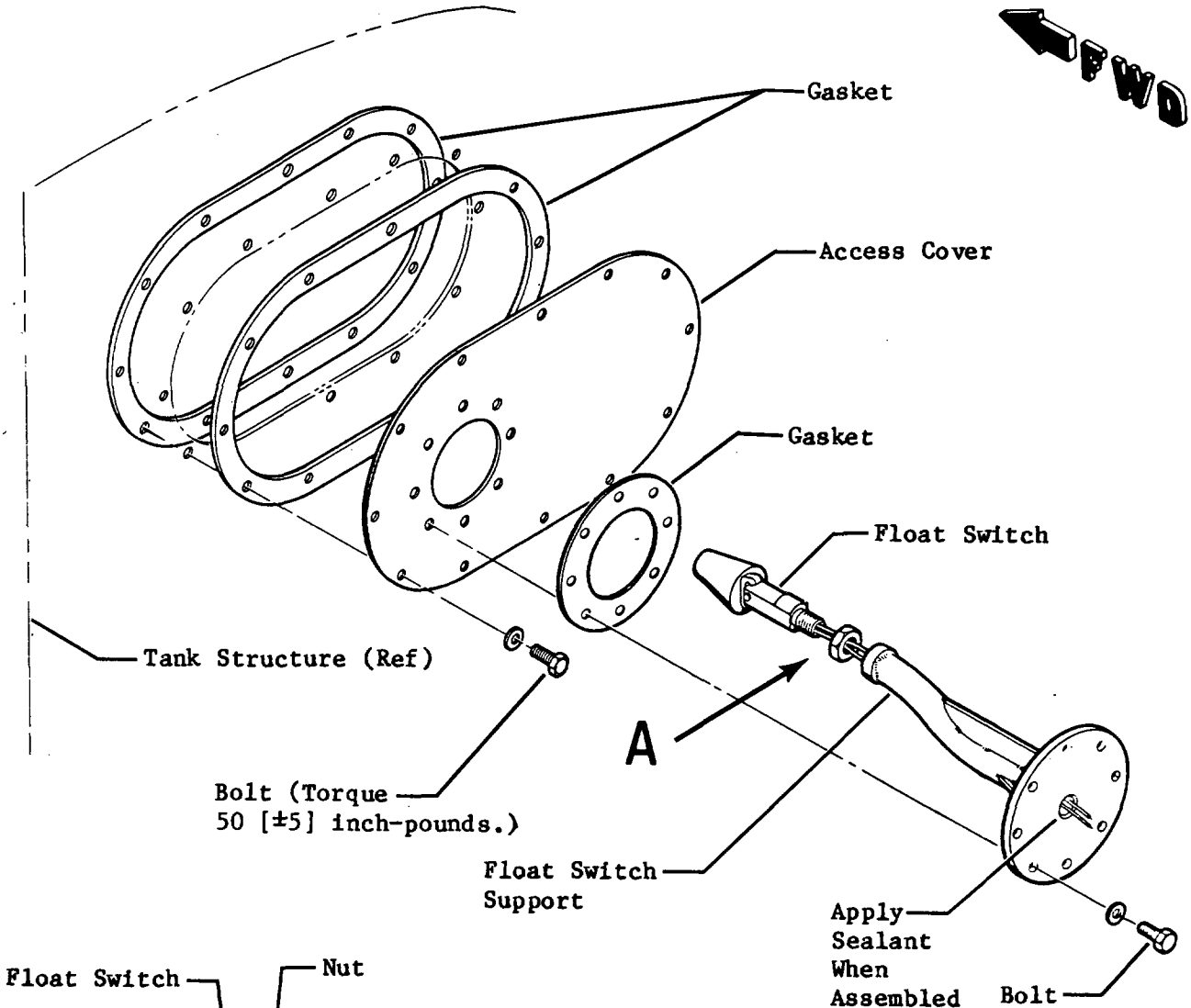
(See figure 201.)

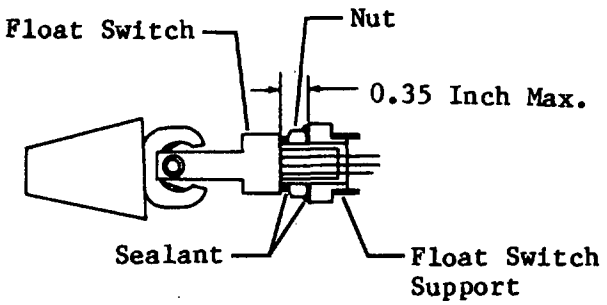
(1) Defuel fuselage fuel tank. (Refer to Chapter 12.)
(2) Lower tailcone access door and gain access to fuselage fuel tank.
(3) Remove electrical power from aircraft.
(4) Disconnect and identify float switch electrical wiring at splice.
(5) Loosen and remove bolts from float switch support.
(6) Remove float switch support and gasket from access cover.

B. Install Fuselage Fuel Tank Float Switch (Aircraft 36-002 and Subsequent)

(See figure 201)

(1) Remove sealant from float switch and nut. Remove float switch and nut from float switch support.
(2) Install float switch and nut. Position float switch float as shown and secure in place with nut.
(3) Apply sealant, in accordance with 28-10-00, and seal around perimeter of nut and float switch.
(4) Identify and connect float switch electrical wiring.
(5) Install gasket and float switch support on access cover.
(6) Secure float switch support with attaching parts.
(7) Restore electrical power to aircraft.
(8) Fill fuselage tank (refer to Chapter 12) and check for leaks.
(9) Raise and secure tailcone access door.
(10) Restore aircraft to normal.





Assembled

Detail A

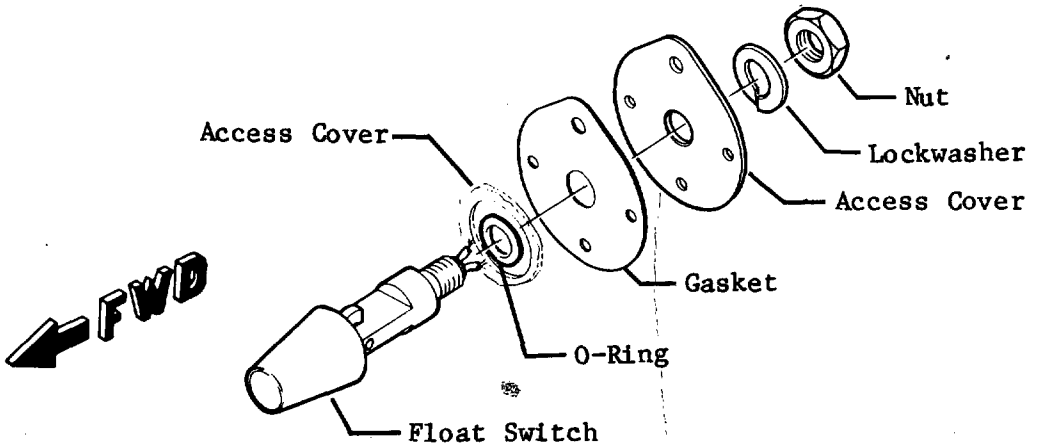
12-41C-1
12-67A

Fuselage Fuel Tank Float Switch Installation
Figure 201

EFFECTIVITY: 36-002 and Subsequent
MM-99
Disk 545

C. **Remove Fuselage Fuel Tank Float Switch** (Aircraft 35-002 and Subsequent)
(See figure 202.)
(1) Defuel fuselage tank. (Refer to Chapter 12.)
(2) Lower tailcone access door and gain access to fuselage fuel tank.
(3) Remove electrical power from aircraft.
(4) Disconnect and identify float switch electrical wiring at splice.
(5) Remove attaching parts, plate, gasket and float switch from access cover.

D. **Install Fuselage Fuel Tank Float Switch** (Aircraft 35-002 and Subsequent)
(See figure 202.)
(1) Install float switch with plate attached, gasket and secure with attaching parts.
(2) Identify and connect float switch electrical wiring.
(3) Restore electrical power to aircraft.
(4) Refuel fuselage tank (refer to Chapter 12) and check for leaks.
(5) Secure tailcone access door.
(6) Restore aircraft to normal.



Fuselage Fuel Tank Float Switch Installation
Figure 202

2. **ADJUSTMENT/TEST**

A. Perform Functional Test of Fuselage Fuel Tank Float Switch (See figure 203.)

(1) Remove float switch from fuselage fuel tank per applicable procedures outlined in steps 1.A. or 1.C.

(2) Orient float switch as shown in figure 203.

(3) Verify that float switch travel is smooth (without binding or hesitation) from its extreme up (or down) position to the extreme opposite position.

(4) Connect a multimeter (preselect ohms mode) to fuselage float switch as follows:

(a) Connect one multimeter probe to the center float switch wire lead.

(b) Connect other multimeter probe to an outer float switch wire lead.

(5) Move float, on float switch, up and then down. Verify multimeter indicates an open in one position (up or down) and continuity in the opposite position.

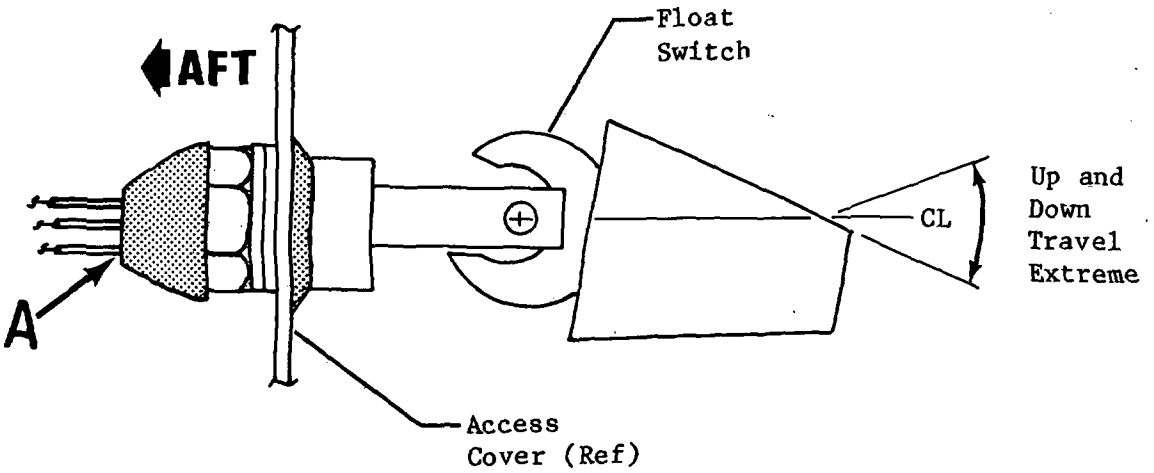
(6) Move multimeter probe from tester outer float switch wire lead to the other outer float switch wire lead.

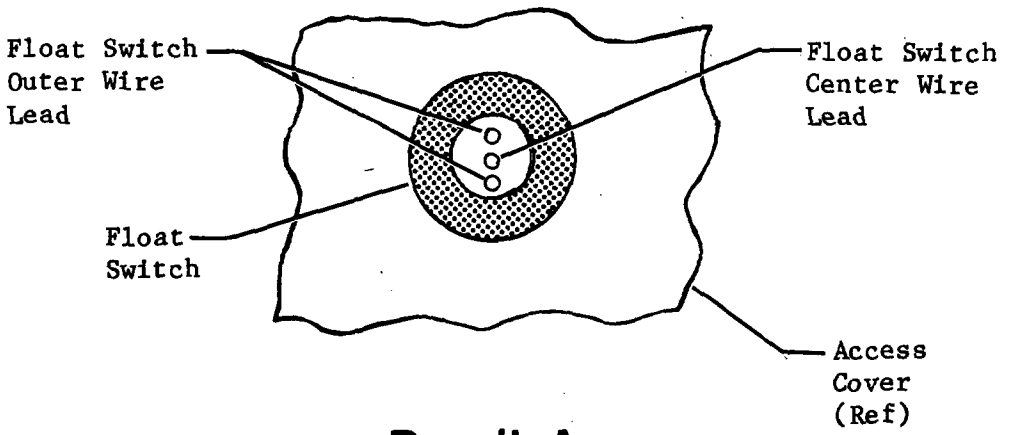
(7) Repeat step 2.A.(5).

(8) Remove multimeter from float switch.

(9) If float switch fails functional test, replace float switch.

(10) Install float switch in fuselage fuel tank per applicable procedures outlined in steps 1.B. or 1.C.





Detail A

Fuselage Fuel Tank Float Switch Test
Figure 203

FUSELAGE FUEL PUMP - MAINTENANCE PRACTICES

1. Removal/Installation

A. Removal of Fuselage Fuel Pump (See Figure 201.)

(1) Defuel the fuselage fuel tank. (Refer to Chapter 12.)
(2) Disconnect aircraft batteries.
(3) Remove lower fuselage access panels to gain access to fuselage fuel pump installation.
(4) Disconnect electrical wiring from fuselage fuel pump.

CAUTION: USE CARE NOT TO DAMAGE THE TAPE AND FILLET SEAL AROUND BLADDER NIPPLES WHEN REMOVING CROSSOVER TUBE. HOWEVER, DURING BLADDER REMOVAL, THE TAPE AND FILLET SEAL MUST BE REMOVED.

(5) Loosen clamps securing bladder nipples to crossover tube. Free crossover tube from nipples and remove from aircraft.
(6) Disconnect and remove fuel line between fuselage fuel pump and transfer valve.
(7) Disconnect drain line from fuselage fuel pump.
(8) Remove attaching parts and fuselage fuel pump from aircraft.

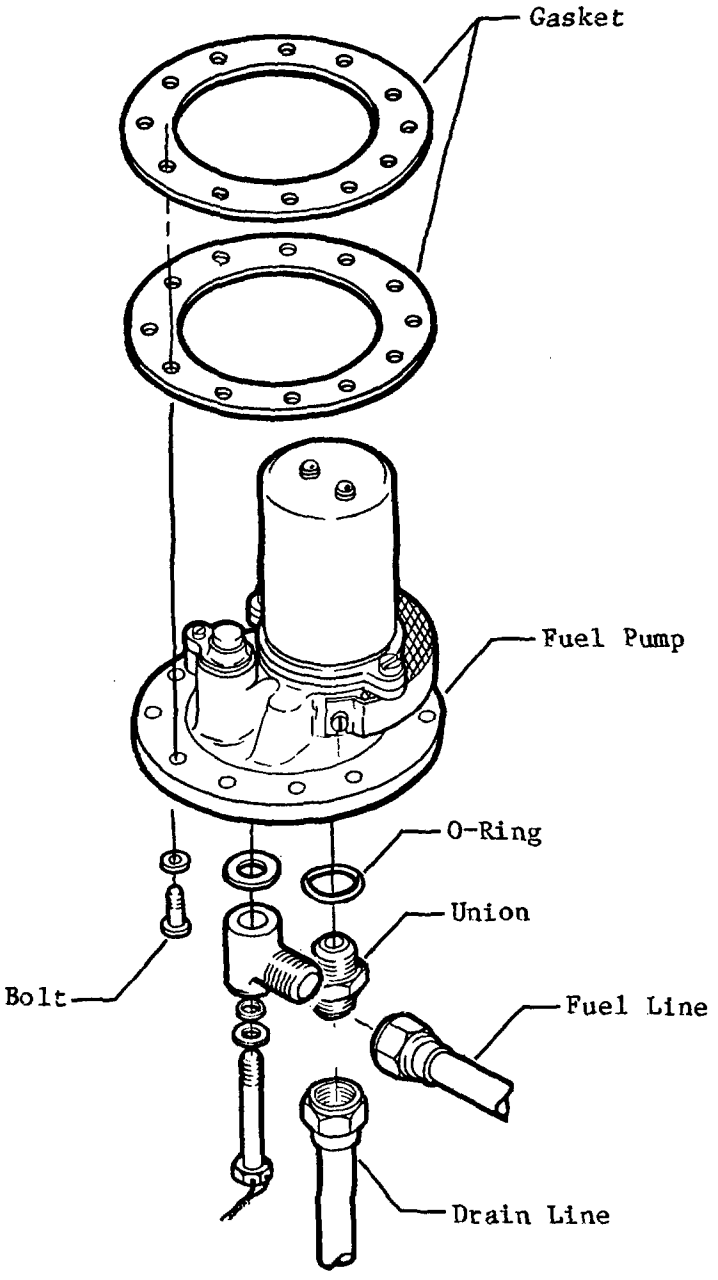
B. Installation of Fuselage Fuel Pump (See Figure 201.)

NOTE: Replace gaskets at each fuselage fuel pump installation.

(1) Position gasket between fuel cell fitting and fuel cell cavity floor.
(2) Place remaining gasket over mounting flange of fuselage fuel pump.
(3) Secure with attaching parts. Torque bolts 50 to 70 inch-pounds and safety wire.
(4) Connect fuel line between fuselage fuel pump and transfer valve.
(5) Install fuel tank crossover tube and secure with clamps.

NOTE: When installing drain line, ensure that scarf on tube is pointed aft.

(6) Connect drain line to fuselage fuel pump.
(7) Connect electrical wiring and battery quick disconnects.
(8) Fuel the fuselage tank (refer to Chapter 12) and inspect for leaks.
(9) Perform electrical bonding check of fuselage fuel pump case to wing structure. (Refer to Chapter 20 of the Wiring Manual.)
(10) Install lower access panels.

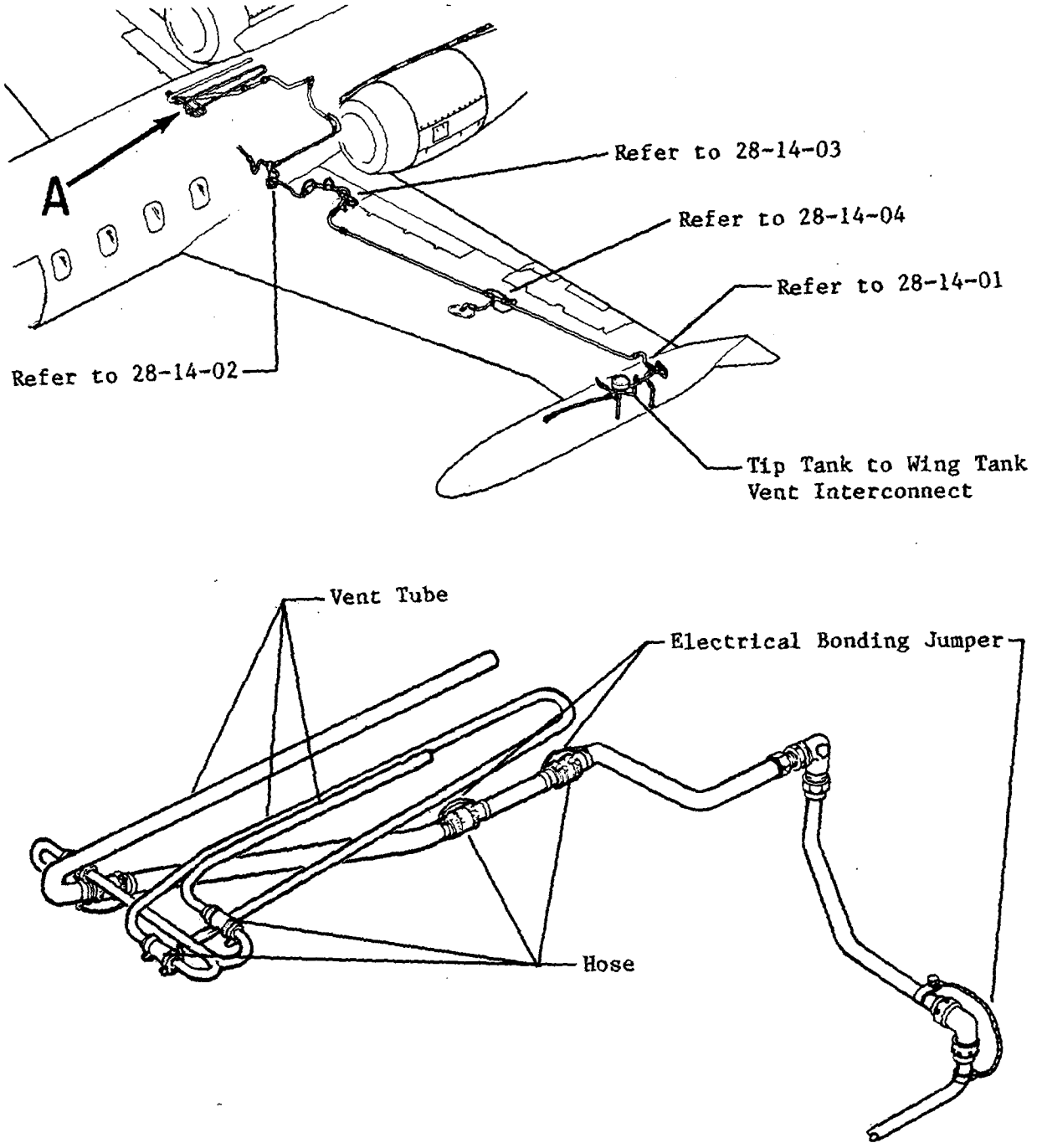


Fuselage Fuel Pump Installation
Figure 201

FUEL VENT SYSTEM - DESCRIPTION AND OPERATION

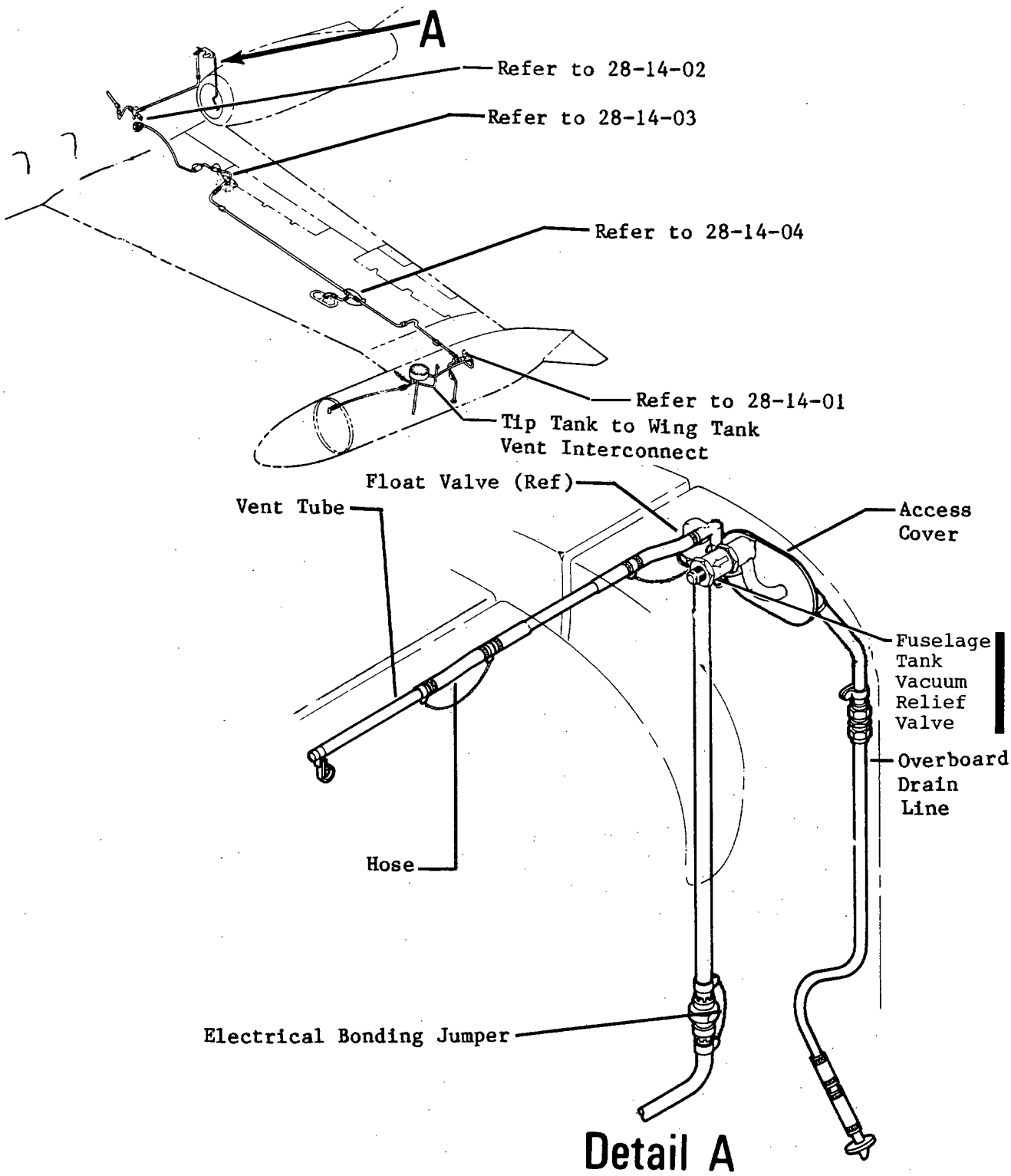
1. **Description** (See Figures 1 and 2.)
   A. The fuel vent system provides continuous ram air pressure to the tip tanks, wing tanks, and the fuselage tank while the aircraft is in flight. Components of the vent system are: float valves, pressure relief valves, sump assembly, drain valve, vacuum relief valve, ram airscoops, flame arrestors, and vent tubing.
   B. For removal and installation of pressure relief valves, refer to 28-11-03.
   C. For removal and installation of vacuum relief valves, refer to 28-11-04.
   D. Component Description
      (1) On *Aircraft 36-002 and Subsequent*, two float valves are located in each tip tank.
      (2) On *Aircraft 35-002 and Subsequent*, two float valves are located in each tip tank and one in the fuselage tank.
      (3) On Aircraft equipped with float valves, the float valve consists of a housing and a plunger and float assembly incorporating an O-ring. On Aircraft equipped with flapper type float valves, the float valve consists of a flapper and float assembly incorporating an O-ring. The plunger (flapper) and float are movable and as fuel level rises the plunger (flapper) and float move up, sealing the vent tube outlet. This prevents fuel from collecting in the vent system.
      (4) The sump assembly is installed in the aft portion of the keel beam. The sump is the lowest point in the vent system and collects any accumulation of moisture or fuel. The sump incorporates a manual drain valve to drain any accumulations of moisture or fuel.
      (5) The flame arrestor is installed in the fuel vent system at wing station 53 between spars 7 and 8. Access to the flame arrestor is through an access panel at the same location. The flame arrestor prevents ignition of fumes in the vent due to lightning following the overboard drain.
      (6) On *Aircraft 35-002 and Subsequent*, an additional flame arrestor is installed in the overboard vent tube on the fuselage fuel tank.
      (7) The airscoop is installed on the wing lower skin at wing station 139.57 between spars 4 and 5. The airscoop is secured to an access cover at the same location.

2. **Operation** (See Figures 3 and 4.)
   A. Fuel Tank Vent System Operation-
   In flight, air is admitted into the ram airscoops located under each wing through tubing and into the tip tanks and fuselage tank. Ram air pressure is vented to the wing tanks through the wing-to-tip interconnects. Float valves, located in the tip tanks and, on *Aircraft 35-002 and Subsequent*, the fuselage tank prevent fuel from entering the vent system when the fuel level reaches the vent ports. A vacuum relief valve and two pressure relief valves, located in each tip tank, provide a backup to the normal vent system. The vacuum relief valve opens and allows air to enter the tank when a vacuum condition occurs in the vent system. The two pressure relief valves, attached to the vacuum relief line, protect the tanks from excessive pressure due to thermal expansion. The pressure relief valves are set at 1.0 and 1.5 psi. A sump assembly and a drain valve located in each wing permit draining of moisture and/or fuel from the vent system. The flame arrestors, installed in the overboard vent line, prevent ignition of fumes in the vent system due to lightning strike.
   B. On *Aircraft 35-002 and Subsequent*, a fuel siphon vent line is installed in the tailcone section. The fuselage tank vacuum relief valve is located on the upper LH access cover. A flame arrestor is installed in the fuel siphon vent line.



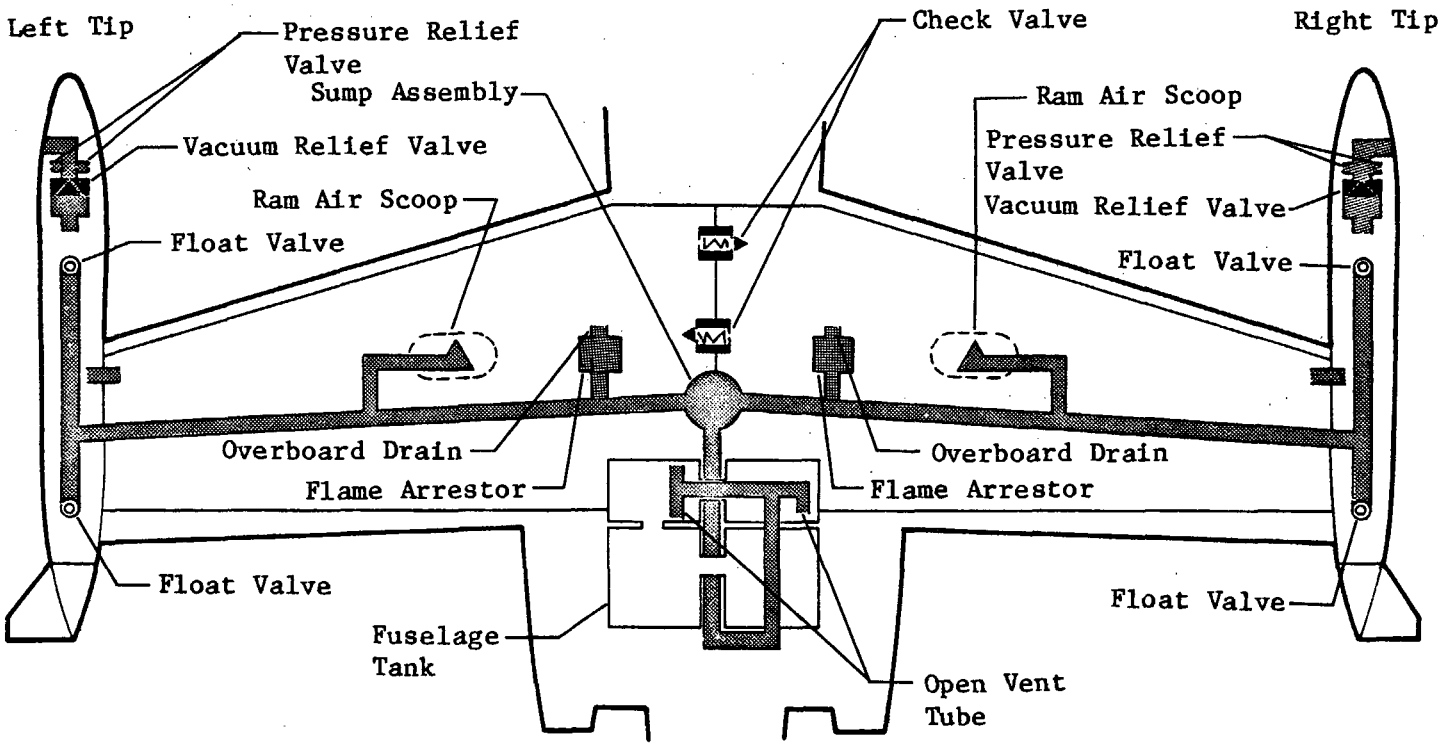
Detail A

Fuel Vent System Locator
Figure 1

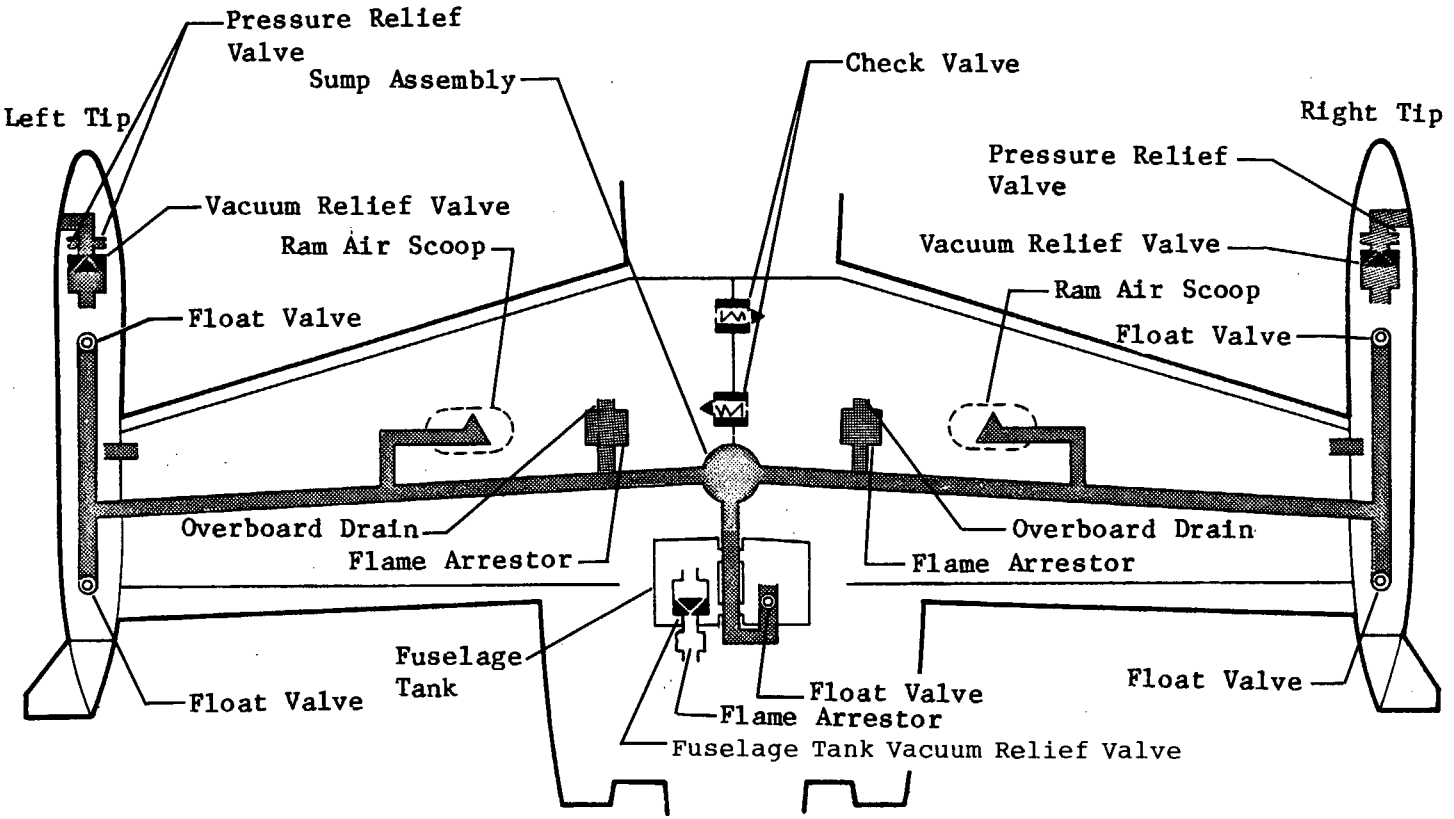


Fuel Vent System Locator
Figure 2

EFFECTIVITY: 36-002 AND SUBSEQUENT



Fuel Vent System Schematic
Figure 3



Fuel Vent System Schematic
Figure 4

1. Adjustment/Test

NOTE: Prior to performing maintenance practices on the aircraft fuel vent system, maintenance personnel should read, thoroughly understand, and carefully adhere to the safety practices as outlined in 28-00-00.

A. Functional Test of Fuel Vent System Tip Tank Vacuum Relief Valves

NOTE: Perform Functional Test of Fuel Vent System Tip Tank Vacuum Relief Valves in accordance with the current inspection interval specified in Chapter 5.

(1) Blow through tip tank vacuum relief valve, assuring that vent line and vacuum relief valve is not plugged. This indicates that vacuum relief valve is opening properly.
(2) Apply vacuum to tip tank vacuum relief valve and ensure that airflow is stopped. This indicates vacuum relief valve is closing properly.
(3) If valve does not open or close properly, replace valve.

B. Functional Test of Fuel Vent System Tip Tank Pressure Relief Valves

NOTE: Perform Functional Test of Fuel Vent System Tip Tank Pressure Relief Valves in accordance with the current inspection interval specified in Chapter 5.

(1) Apply a vacuum (less than 1.0 psi) to the pressure relief valve. Ensure the pressure relief valve is closed and there is no airflow.
(2) Slowly increase vacuum. At approximately 1.0 psi, the vacuum shall drop, indicating the pressure relief valves have opened.
(3) If valve does not open or close properly, replace valve.

C. Functional Test of Fuselage Tank Vacuum Relief Valves (*Aircraft 35-002 and Subsequent.*)

NOTE: Perform Functional Test of Fuselage Tank Vacuum Relief Valves in accordance with the current inspection interval specified in Chapter 5.

(1) Blow through overboard vent line, assuring that vent line and vacuum relief valve are not plugged. This indicates vacuum relief valves are opening properly.
(2) Apply vacuum to fuselage vacuum relief valve and ensure that airflow is stopped. This indicates vacuum relief valve is closing properly.
(3) If valve does not open or close properly, replace valve.

FLOAT VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: The following procedures are applicable to either model.

A. Removal of Tip Tank Float Valves (See Figure 201.)
   (1) Defuel the tip tank. (Refer to 12-10-10.)
   (2) Remove access covers to gain access to float installation.
   (3) Loosen and remove float assembly.

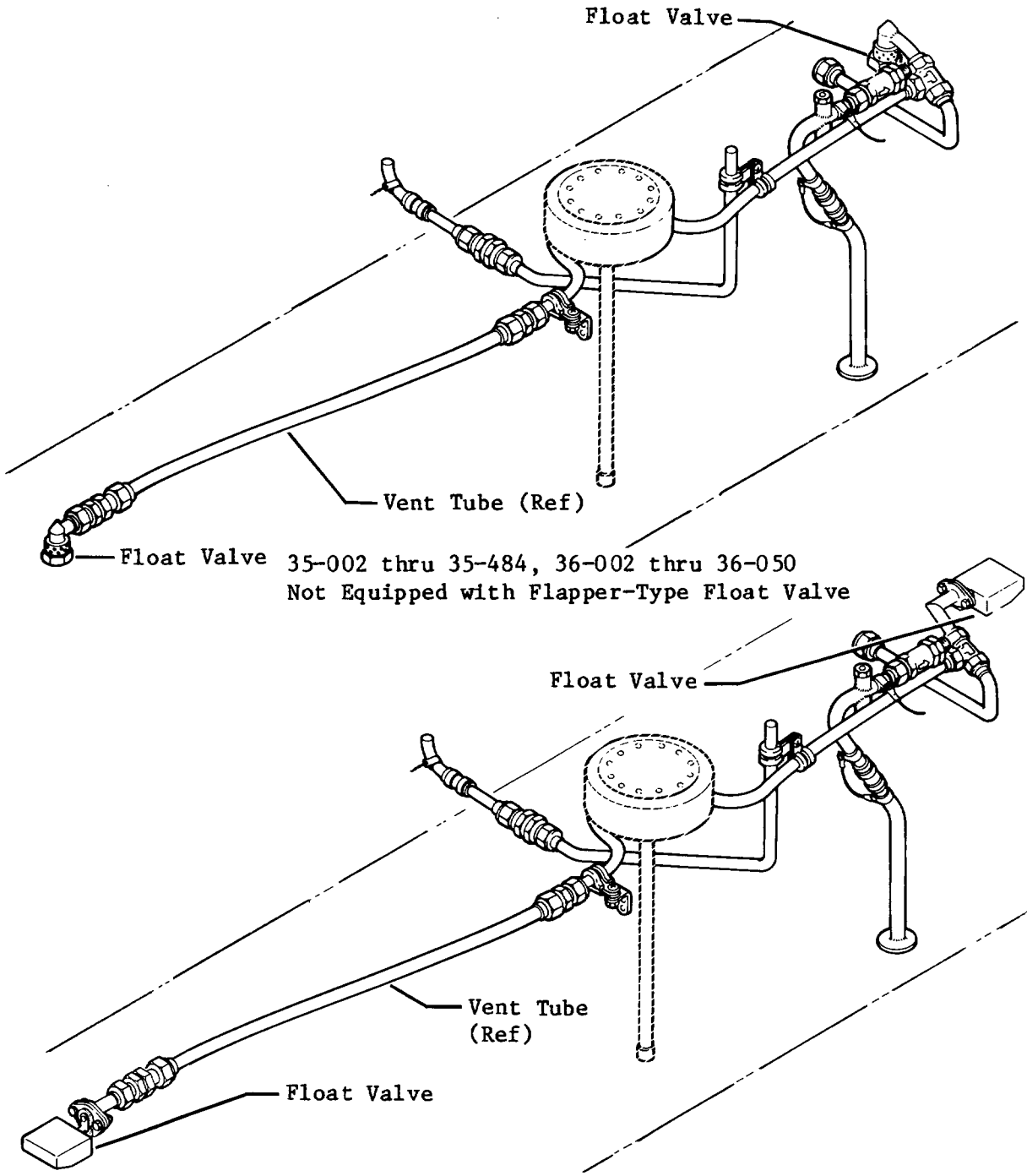
B. Installation of Tip Tank Float Valve (See Figure 201.)
   (1) Install float assembly.
   (2) Apply a thin coat of anti-corrosion grease to access covers. (Refer to 28-11-00, Figure 202.)
   (3) Install gaskets and access covers and secure with attaching parts.
   (4) Fuel aircraft. (Refer to 12-10-10.)

C. Removal of Fuselage Tank Float Valve *(Aircraft 35-002 and Subsequent)* (See Figure 202.)
   (1) Defuel the fuselage fuel tank. (Refer to 12-10-10.)
   (2) Lower tailcone access door.
   (3) Disconnect vent tube from upper LH access cover.
   (4) Disconnect fuel plumbing from equipment installed on large LH access panel.
   (5) Remove attaching parts and large LH access panel.
   (6) Loosen and remove float valve from vent line.

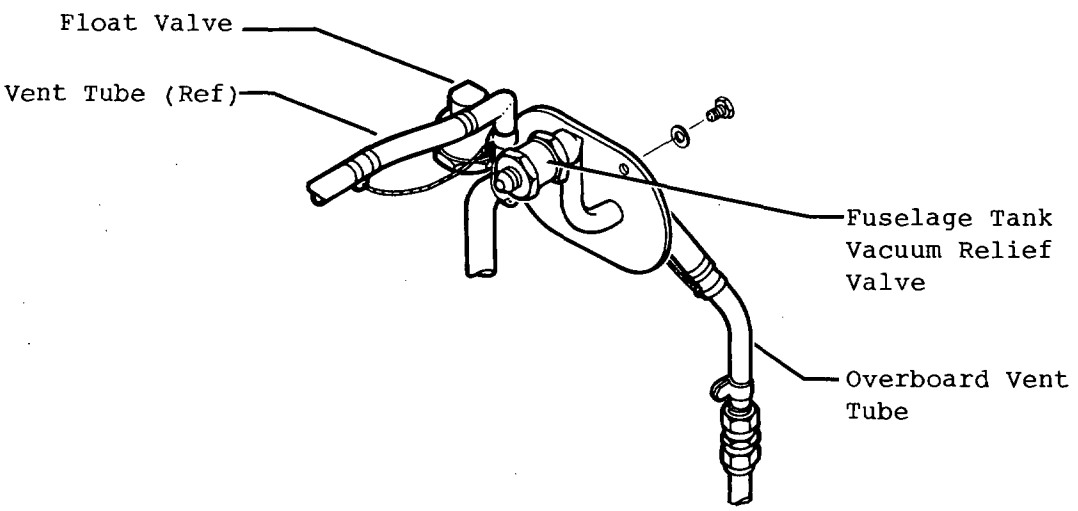
D. Installation of Fuselage Tank Float Valve *(Aircraft 35-002 and Subsequent)* (See Figure 202.)
   (1) Install float valve assembly on vent line.
   (2) Install upper LH access cover.
   (3) Connect plumbing to equipment previously removed from large LH access panel.
   (4) Connect vent tube to upper LH access cover.
   (5) Secure tailcone access door.
   (6) Fuel aircraft. (Refer to 12-10-10.)

2. Approved Repairs

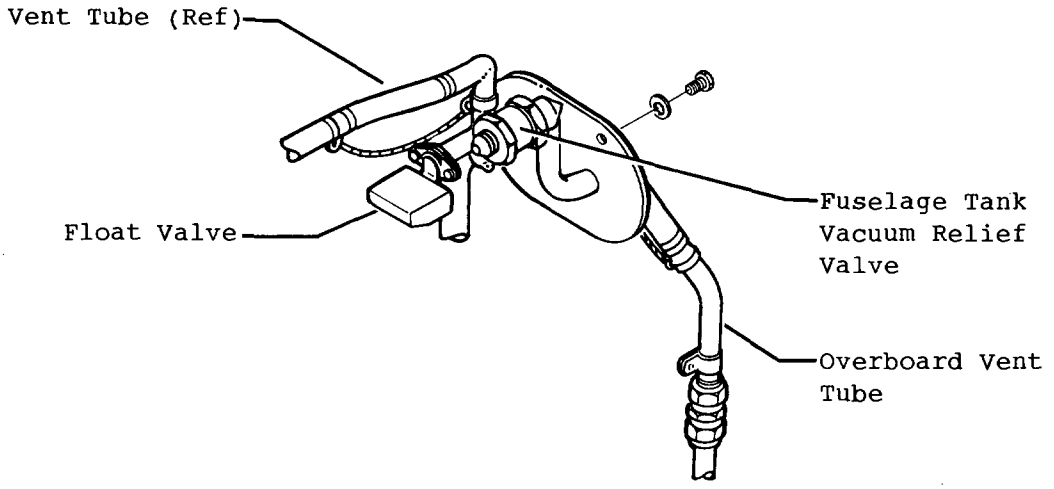
A. The Approved Repairs section has been removed from the manual. The part is no longer considered field repairable.



Tip Tank Float Valve Installation
Figure 201



Aircraft 35-002 thru 35-484, 36-002 thru 36-050
Not Equipped with Flapper-Type Float Valve

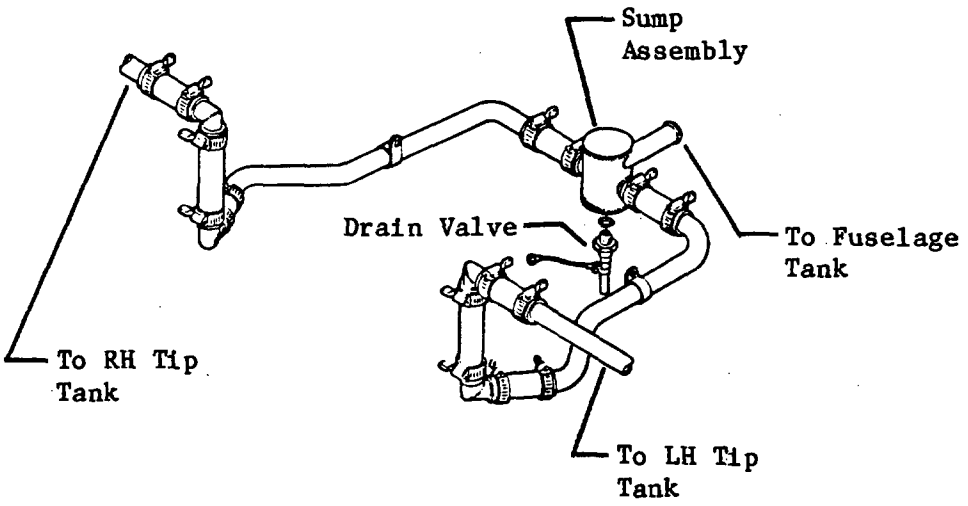


Aircraft 35-485 and Subsequent, 36-051 and Subsequent
and Prior Aircraft Equipped with Flapper-Type Float Valve

Fuselage Tank Float Valve Installation
Figure 202

SUMP ASSEMBLY - MAINTENANCE PRACTICES

1. **REMOVAL/INSTALLATION**
   - **A. Remove Sump Assembly** (See figure 201.)
     - (1) Remove lower fuselage access panel.
     - (2) Loosen clamps securing bonding jumpers and hoses.
     - (3) Remove sump assembly from aircraft.
   - **B. Install Sump Assembly** (See figure 201.)
     - (1) Install sump assembly.
     - (2) Connect hoses and bonding jumpers and secure with clamps.
     - (3) Install access cover.



Sump Assembly Installation
Figure 201

FLAME ARRESTOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Wing Flame Arrestor (See figure 201.)

NOTE: The following procedure is applicable to either wing-mounted flame arrestor.

(1) Remove access panel.
(2) Loosen and remove clamps, hoses, overboard drain line and flame arrestor from aircraft.

B. Install Wing Flame Arrestor (See figure 201.)

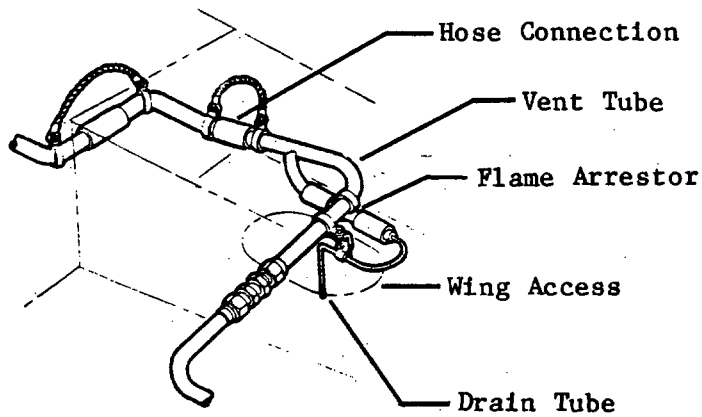
(1) Install flame arrestor and overboard drain line and secure with hoses and clamps. Assure that drain line protrudes past lower wing surface 1.00 (±0.06) inch.
(2) Install access cover.

C. Remove Fuselage Flame Arrestor (Aircraft 35-002 and Subsequent)

(1) Lower tailcone access door.
(2) Loosen and remove clamps, hoses, overboard vent tube, and flame arrestor from aircraft.

D. Install Fuselage Flame Arrestor (Aircraft 35-002 and Subsequent)

(1) Install flame arrestor and overboard vent tube, secure with hoses and clamps. Assure that the overboard vent tube is installed with the longer edge facing forward.
(2) Close and secure tailcone access door.



Flame Arrestor Installation
Figure 201

AIRSCOOP - MAINTENANCE PRACTICES

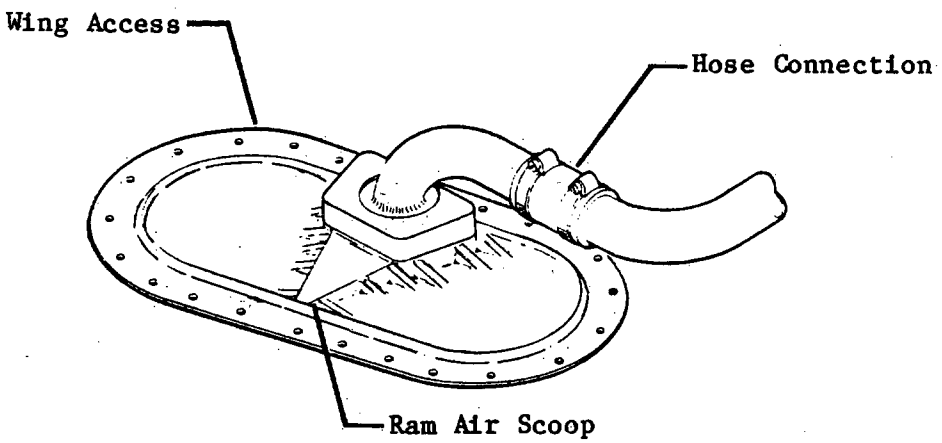
1. REMOVAL/INSTALLATION

A. Remove Airscoop (See figure 201.)

(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Remove screws securing airscoop to access cover.
(3) Remove attaching parts and access covers from wing.

B. Install Airscoop (See figure 201.)

(1) Apply lightning strike protective seal to access cover. (Refer to 28-12-00.)
(2) Secure gasket and airscoop to access panel.
(3) Install access cover and secure with attaching parts.
(4) Fuel the aircraft (refer to Chapter 12) and check for leaks.



Airscoop Installation
Figure 201

DISTRIBUTION - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The fuel distribution system consists of two independent systems, one for each engine. Each distribution system consists of a jet pump, an electric standby pump, a fuel filter, a shutoff valve, a motive flow valve, a pressure switch, a relief valve, relays in the fuel control relay panel, and fuel supply line check valves. Refer to 28-41-00 for further information on the fuel system pressure switch.

B. **Component Description**

(1) A jet pump is installed in each distribution system. The jet pump is located near rib 0.0 in the wing so that it will be submerged in fuel until the tanks are practically empty.

(2) An electric standby pump is installed in each distribution system. The pump is located adjacent to the jet pump. The standby pump is a submerged type with a maximum output of 18 psi. The standby pump is used for fuel crossflow, one wing to the other, fuselage fill operation, for engine starting, and as a standby should a jet pump failure occur.

(3) A low pressure fuel filter is installed in each main fuel line within the tailcone. The filter is equipped with either a disposable paper element or a cleanable metal element. The paper element consists of a single filter element and bypass valve designed to open at 2.25 psid. The metal element consists of a dual filter element with a primary and secondary bypass valve designed to open at 1.25 and 2.25 psid respectively.

(4) Each distribution system incorporates a fuel shutoff valve. The shutoff valves are located adjacent to the fuel filters. The shutoff valves are two-position (open and closed) ball-and-seat type and are electrically operated. Replace O-rings in the fuel supply shutoff valves when fuel is found to be leaking from the valve.

(5) Each distribution system incorporates a motive flow valve. The valve is installed on the aft fuselage fuel tank wall above the fuel filters. The valves are two-position (open and closed) rotary actuator type and are electrically operated. On Aircraft 35-349 and Subsequent, 36-046 and Subsequent, and prior aircraft modified per AMK 80-7 "Installation of Motive Flow Valve Shrouds and Drain Lines," the motive flow valve is mounted in an enclosure box assembly which is attached to an overboard drain line.

(6) On Aircraft 35-349 and Subsequent, 36-046 and Subsequent, and prior aircraft modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines," the motive flow valve enclosure box assembly is designed to catch fuel and dump it overboard in the event of a motive flow valve leak.

(7) Each high pressure relief valve is installed in the main fuel line adjacent to the shutoff valve. The valves are installed to relieve any pressure buildup caused by thermal expansion of trapped fuel when the engine is shut down. The relief valve opens at 75 psi and vents fuel overboard.

(8) The fuel control relay panel is located on the RH electrical equipment tray. The electrical equipment tray is located on the RH side of the tailcone.

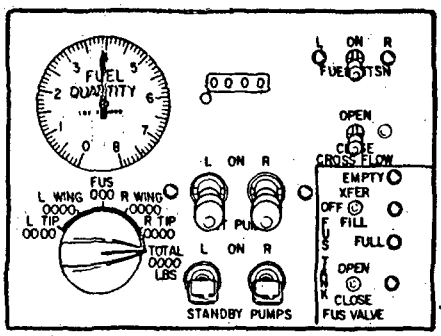
(9) A fuel supply line check valve is installed adjacent to, and downstream from each jet pump and standby pump in the wing. These check valves prevent fuel from being pumped backward through each pump by its adjacent pump. The check valves are flapper-type valves which have a small orifice in the flapper which allows fuel to drain back from the engines after engine shutdown. Inspect the fuel supply line check valves in accordance with the intervals specified in Chapter 5.

2. OPERATION

A. Fuel System Operation (Aircraft 36-002 and Subsequent and Model 35A Aircraft equipped with optional Gravity Fuel Transfer) (See figures 1 thru 4)

(1) On Aircraft 36-002 thru 36-017, during normal operation, the Jet Pump Switches are set to ON, the Crossflow Switch is set to CLOSE, and the Fuselage Transfer Switch is set to OFF. When the Starter-Generator Switch is set to START, the motive flow valve closes and the applicable standby pump is energized, supplying fuel for engine starting. When the Starter-Generator Switch is set to GEN, the standby pump is deenergized and the motive flow valve opens, allowing high pressure fuel to operate the jet pumps. Under these conditions, the tip tank jet pumps are transferring fuel into their respective wing tanks and the jet pumps are feeding fuel to their respective engines.

NOTE: During fuselage fill, fuselage transfer, or fuel crossflow operation, if the crossflow valve or fuselage tank valve indicator lights are lighted, the valves are not in the position selected by the switches. If the jet pump indicator lights are lighted, the motive flow valves are not in the position selected by the switches.



Effective on Aircraft 36-002 and Subsequent and 35A Aircraft equipped with optional Gravity Fuel Transfer

Fuel Control Panel
Figure 1

(2) On Aircraft 36-018 and Subsequent and Model 35A Aircraft equipped with optional Gravity Fuel Transfer, during normal operation, the Jet Pump Switches are set to ON, the Crossflow Switch is set to CLOSE, and the Fuselage Transfer Switch is set to OFF. When the Starter-Generator switch is set to START, the standby pump is energized, supplying the engine with a starting fuel pressure. When the Starter-Generator Switch is set to the GEN position, the standby pumps are deenergized and the jet pumps will then continue to furnish engine fuel pressure. The tip tank jet pumps will transfer fuel into the wing tanks.

NOTE: During fuselage fill, fuselage transfer, or fuel crossflow operation, if the crossflow valve or fuselage tank valve position lights are lighted, the valves are not in the position selected by the switches.

(3) Fuel crossflow, from one wing tank to the other, is accomplished by setting the Crossflow Switch to OPEN, the transferring standby pump to ON, and the opposite pump to OFF. During fuselage fuel transfer operation, setting the fuel Transfer Switch to XFER automatically energizes the fuselage fuel pump, opens the LH fuselage transfer valve and crossflow valve, and deenergizes the standby pumps if they were operating. When the fuselage tank is empty, a pressure switch in the LH fuselage tank transfer line will cause the fuselage tank EMPTY light to illuminate. The Transfer Switch must be set to OFF.

(4) In case of normal fuel transfer failure, the RH transfer valve can be opened by setting the Fus Valve Switch on the Fuel Control panel to OPEN allowing fuel to gravity flow from the fuselage tank to the wing tank. Gravity flow operation is stopped by setting the Fus Valve Switch to CLOSE. During fuselage tank fill operation, setting the Fuel Transfer Switch to FILL automatically energizes the standby pumps and opens the crossflow valve and the RH and LH fuselage tank transfer valves. When the fuselage tank is full, the FULL light will be lighted and the fill operation will automatically stop. The transfer switch should then be set to OFF.

(5) In case of jet pump failure, the pressure drop in the main fuel line to the engines will cause a pressure switch to energize the applicable indicator light (L FUEL PRESS or R FUEL PRESS). The applicable standby pump switch should immediately be set to ON to restore normal fuel system pressure.

B. **Fuel System Operation** (Aircraft 35-002 and Subsequent except Model 35A Aircraft equipped with optional Gravity Fuel Transfer) (See figures 1 and 5 thru 7.)

(1) On Aircraft 35-002 thru 35-057, during normal operation, the Jet Pump Switches are set to ON, the Crossflow Switch is set to CLOSE, and the Fuselage Transfer Switch is set to OFF. When the Starter-Generator Switch is set to START, the motive flow control valve closes and the standby pumps are energized, supplying fuel for engine starting.

When the Starter-Generator Switch is set to GEN, the standby pumps are deenergized and the motive flow valves are open, allowing high pressure fuel for jet pump operation. Under these conditions, the tip tank jet pumps are transferring fuel into their respective wing tanks and the jet pumps are feeding fuel to their respective engine.

NOTE: During fuselage fill, fuselage transfer, or fuel crossflow operation, if the crossflow valve or fuselage tank valve position lights are lighted, the valves are not in the position selected by the switches.

(2) On Aircraft 35-058 and Subsequent except 35A Aircraft equipped with optional Gravity Fuel Transfer, during normal operation, the Jet Pump Switches are set to ON, the Crossflow Switch is set to CLOSE, and the Fuselage Transfer Switch is set to OFF. When the Starter-Generator Switch is set to START, the standby pump is energized, supplying the engine with a starting fuel pressure. When the Starter-Generator Switch is set to the GEN position, the standby pumps are deenergized and the jet pumps will then continue to furnish engine fuel pressure. The tip tank jet pumps will transfer fuel into the wing tanks.

(3) Fuel transfer, from one wing tank to the other, is accomplished by setting the Crossflow Switch to OPEN, the transferring standby pump to ON, and the opposite standby pump to OFF. When transferring fuselage fuel, setting the Fuel Transfer Switch to XFER automatically energizes the fuselage transfer pump, opens the transfer valve and crossflow valve, and deenergizes the standby pumps if they are operating. When the fuselage tank is empty, the EMPTY light will illuminate and the Fuel Transfer Switch must be set to OFF. During fuselage tank fill operation, setting the Fuel Transfer Switch to FILL automatically the standby pumps and opens the crossflow valve and fuselage tank valve. When the fuselage tank is full, the FULL light will be illuminated and the fill operation will automatically stop. The Fuel Transfer Switch must then be set to OFF. In case of jet pump failure, the pressure drop in the main fuel line will cause a pressure sensing switch to illuminate the applicable indicator light (L FUEL PRESS or R FUEL PRESS). The applicable Standby Pump Switch should immediately be set to ON to restore normal fuel system pressure.

C. Component Operation

(1) On Aircraft 35-002 thru 35-057 and 36-002 thru 36-017, the jet pumps have no moving parts and operate on the venturi principle. When the Starter-Generator Switch is set to GEN position and the Jet Pump Switch is set to ON, the motive flow valve opens and high pressure fuel from the engine-driven fuel pump is directed through a nozzle in the jet pump, drawing fuel from the tank. The motive flow pressure ranges from approximately 300 psi during high fuel flow rates at 45,000 feet altitude to approximately 250 psi at low fuel flow rates at sea level when the engine rpm is at idle. Jet pump discharge pressure increases as engine fuel flow increases; for example, at idle rpm, the fuel flow is 150 pounds per hour and the jet pump discharge

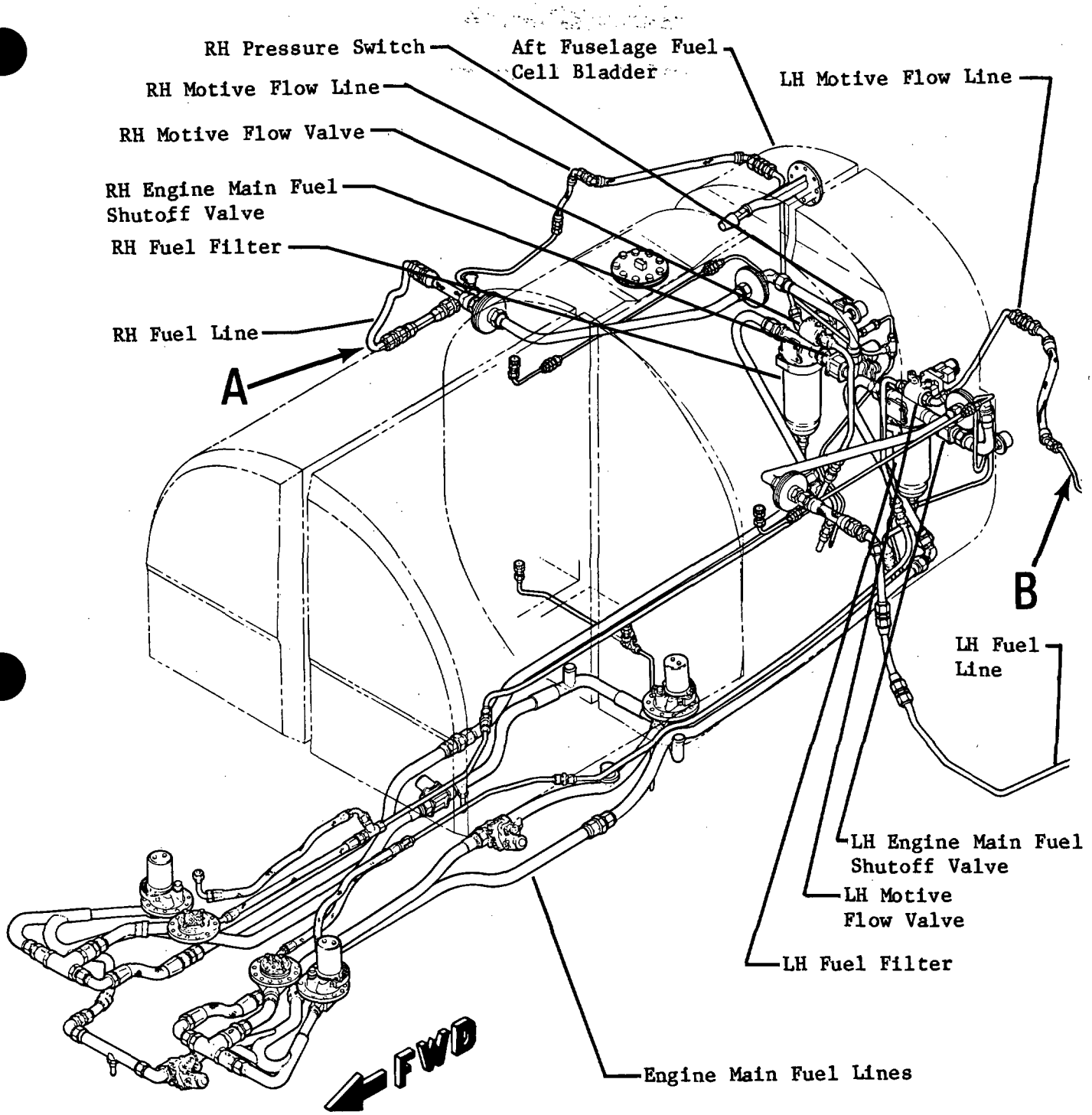
pressure is approximately 10 psi with a pump inlet pressure (motive flow) of approximately 250 psi. At full power settings (Standard Day Conditions), the fuel flow is approximately 1700 pounds per hour and the jet pump discharge pressure is approximately 12 psi with a pump inlet pressure (motive flow) of approximately 300 psi.

(2) On Aircraft 35-058 and Subsequent and 36-018 and Subsequent, the jet pumps (see figure 8) have no moving parts and operate on the venturi principle. When the Jet Pump Switch is set to ON, the motive flow valve opens and high pressure fuel from the engine-driven fuel pump is directed through a nozzle in the jet pump, drawing fuel from the tank. The motive flow pressure ranges from approximately 300 psi during high fuel flow rates at 45,000 feet altitude to approximately 250 psi at low fuel flow rates at sea level when the engine rpm is at idle. Jet pump discharge pressure increases as engine fuel flow increases; for example, at idle rpm, the fuel flow is 150 pounds per hour and the jet pump discharge pressure is approximately 10 psi with a pump inlet pressure (motive flow) of approximately 250 psi. At full power settings (Standard Day Conditions), the fuel flow is approximately 1700 punds per hour and the jet pump discharge pressure is approximately 12 psi with a pump inlet pressure (motive flow) of approximately 300 psi. For maintenance procedures on the engine-driven fuel pump, refer to Engine Maintenance Manual.

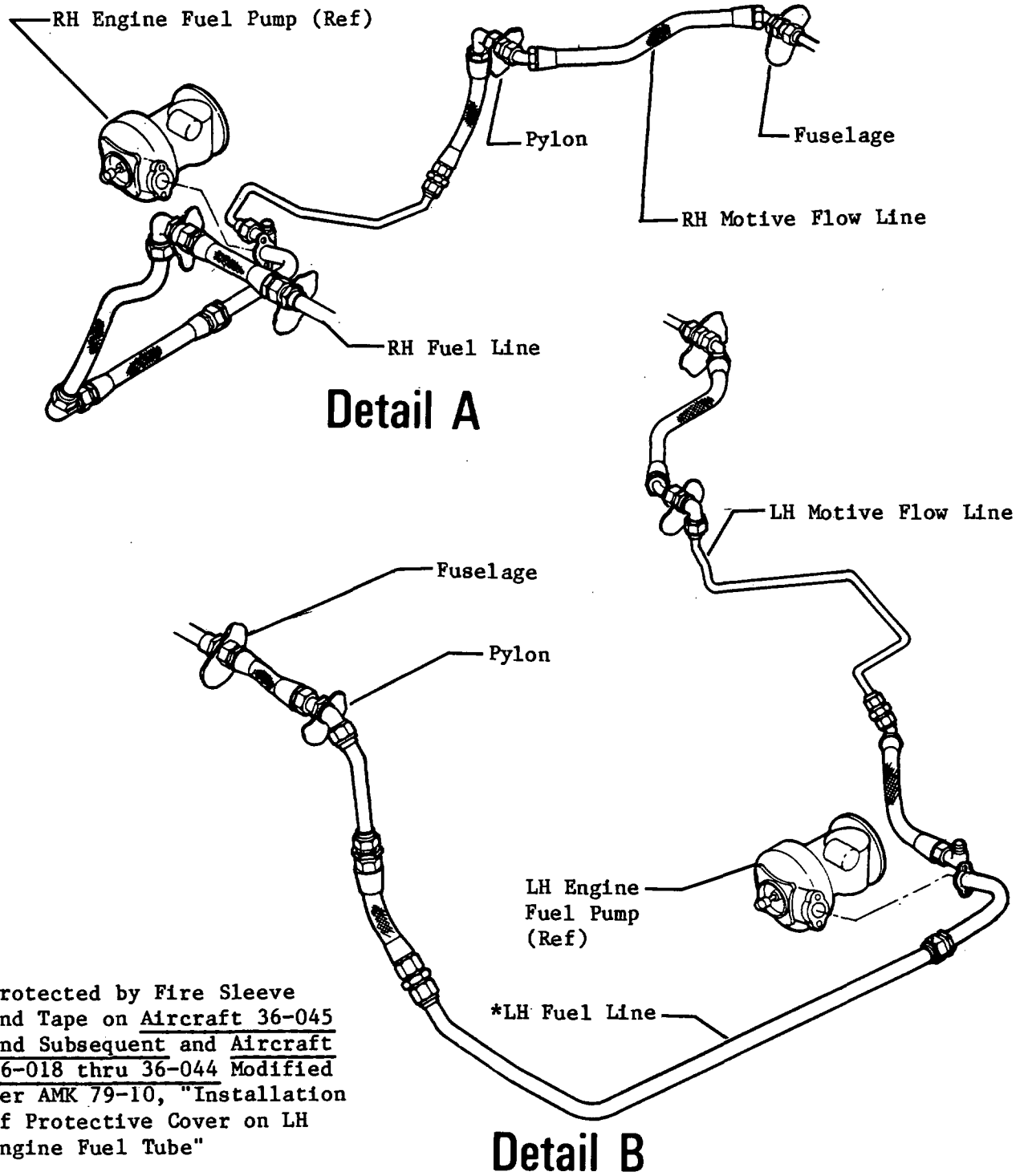
(3) A switch is incorporated in the head of the filter assembly (see figure 9) which illuminates FUEL FILTER caution light when a pressure differential of 1.25 (±0.25) psid (Dynamic Filters P/N 101 194) or 0.95 to 1.30 psid (Purolator Filters P/N 7577295) occurs. The caution light, when illuminated, indicates a clogged filter element. Remove, discard and replace paper filter elements after the first 30 operational hours on a new aircraft. Thereafter, replace paper elements after each 100 hours of operation. Remove and clean metal elements after the first 30 operational hours on a new aircraft. Thereafter, clean metal elements after each 100 hours of operation. When installing element and filter bowl, torque T-bolt 45 to 50 inch-pounds.

(4) The left engine main fuel shutoff valve controls fuel flow to the left engine and is closed only in case of fire in the left engine. Operation is controlled by the left FIRE switch on the glareshield. The right engine main fuel shutoff valve controls fuel flow to the right engine and is closed only in case of fire in the right engine. Operation is controlled by the right FIRE switch. The fuel crossflow shutoff valve controls fuel flow between the wing tanks.

(5) The left motive flow valve controls the fuel flow from the left engine-driven fuel pump to the left tip tank jet pump and left jet pump. The right motive flow valve controls the fuel flow from the right engine-driven fuel pump to the right tip tank jet pump and right jet pump. Operation is controlled by the Jet Pump Switches on the fuel control panel and, on Aircraft 35-002 thru 35-057 and 36-002 thru 36-017, by the left and right START-GENERATOR Switches on the power and ignition switch panel.



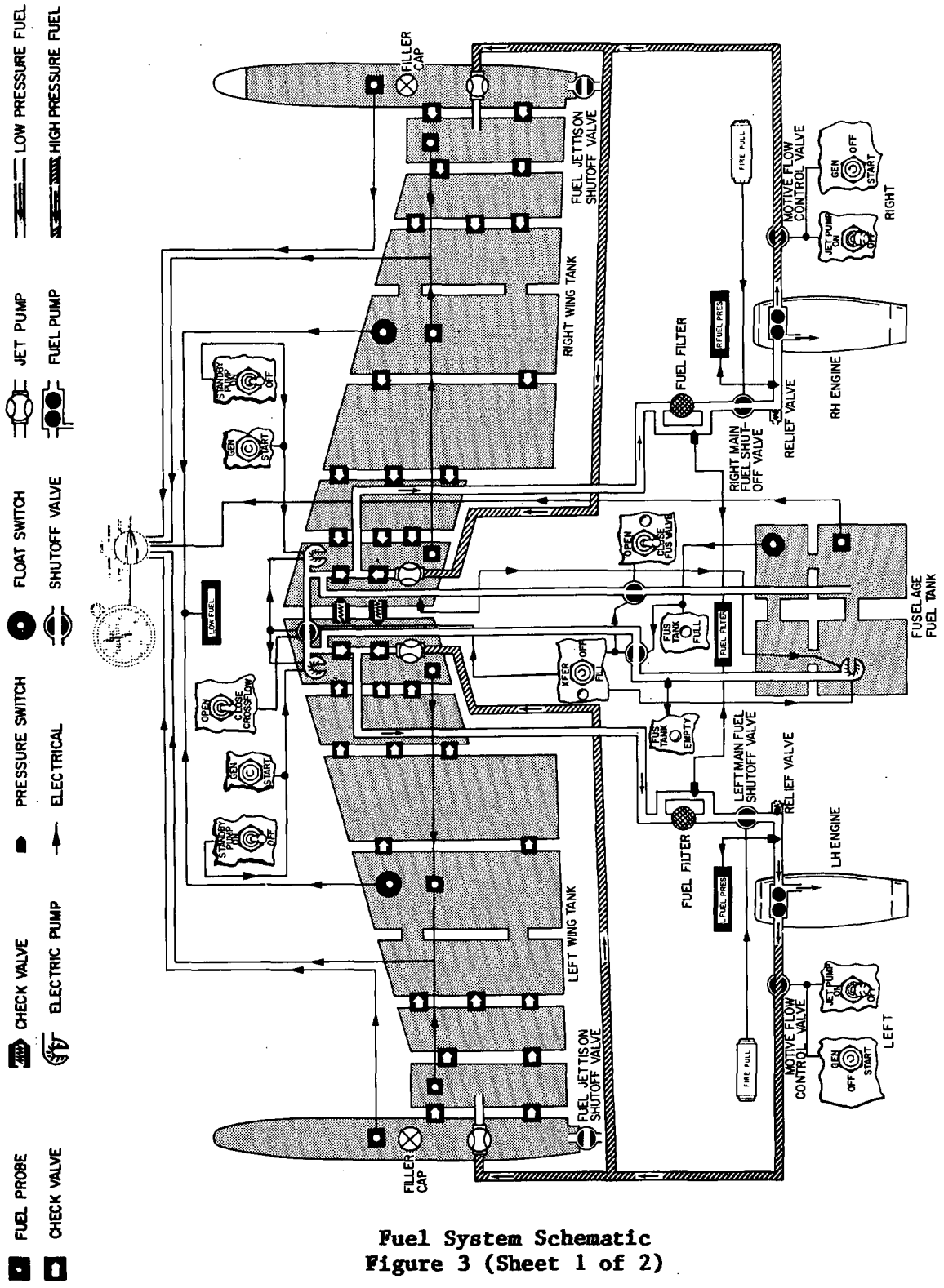
Distribution System Locator
Figure 2 (Sheet 1 of 2)



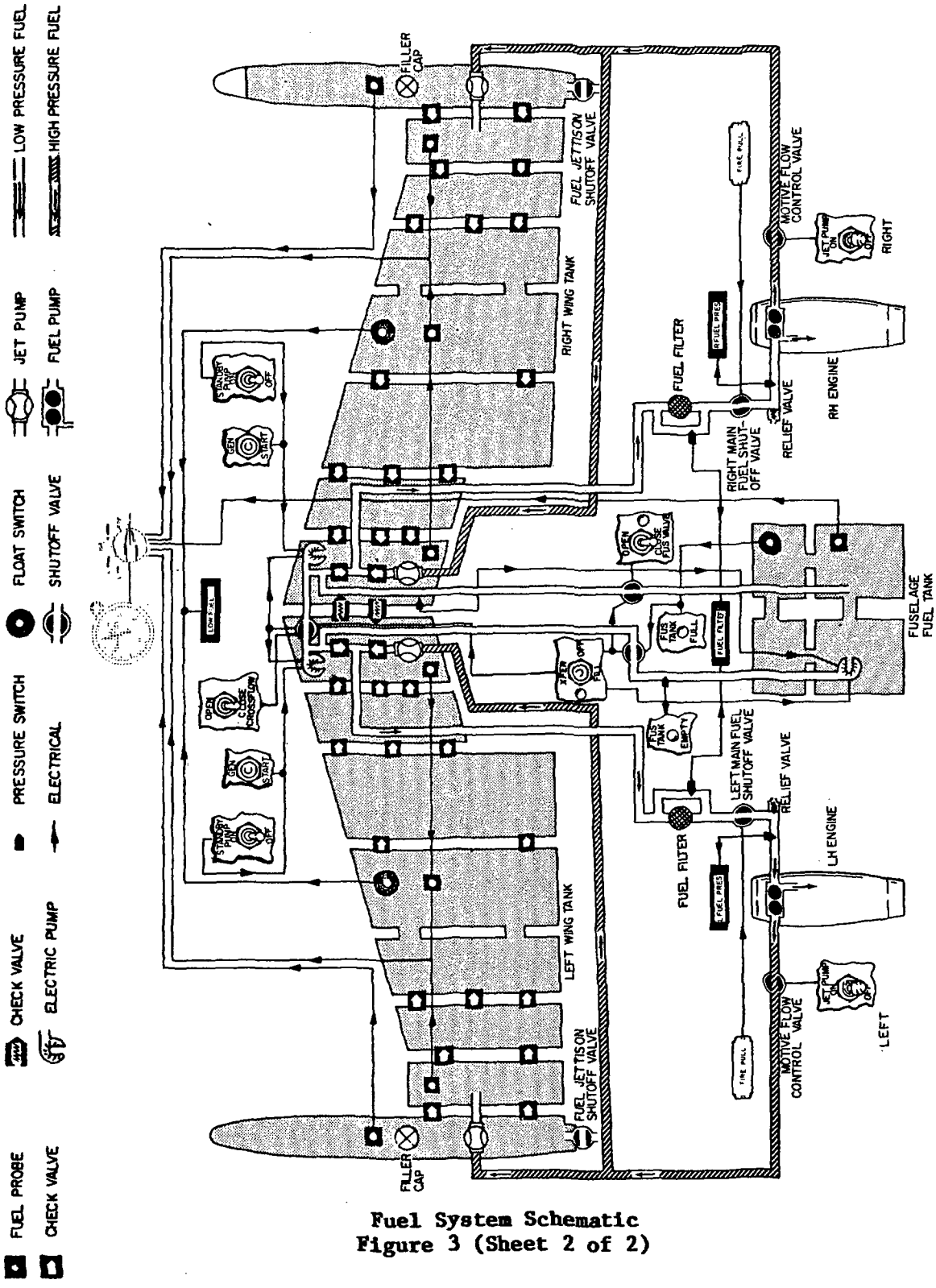
*Protected by Fire Sleeve and Tape on Aircraft 36-045 and Subsequent and Aircraft 36-018 thru 36-044 Modified per AMK 79-10, "Installation of Protective Cover on LH Engine Fuel Tube"

Distribution System Locator
Figure 2 (Sheet 2 of 2)

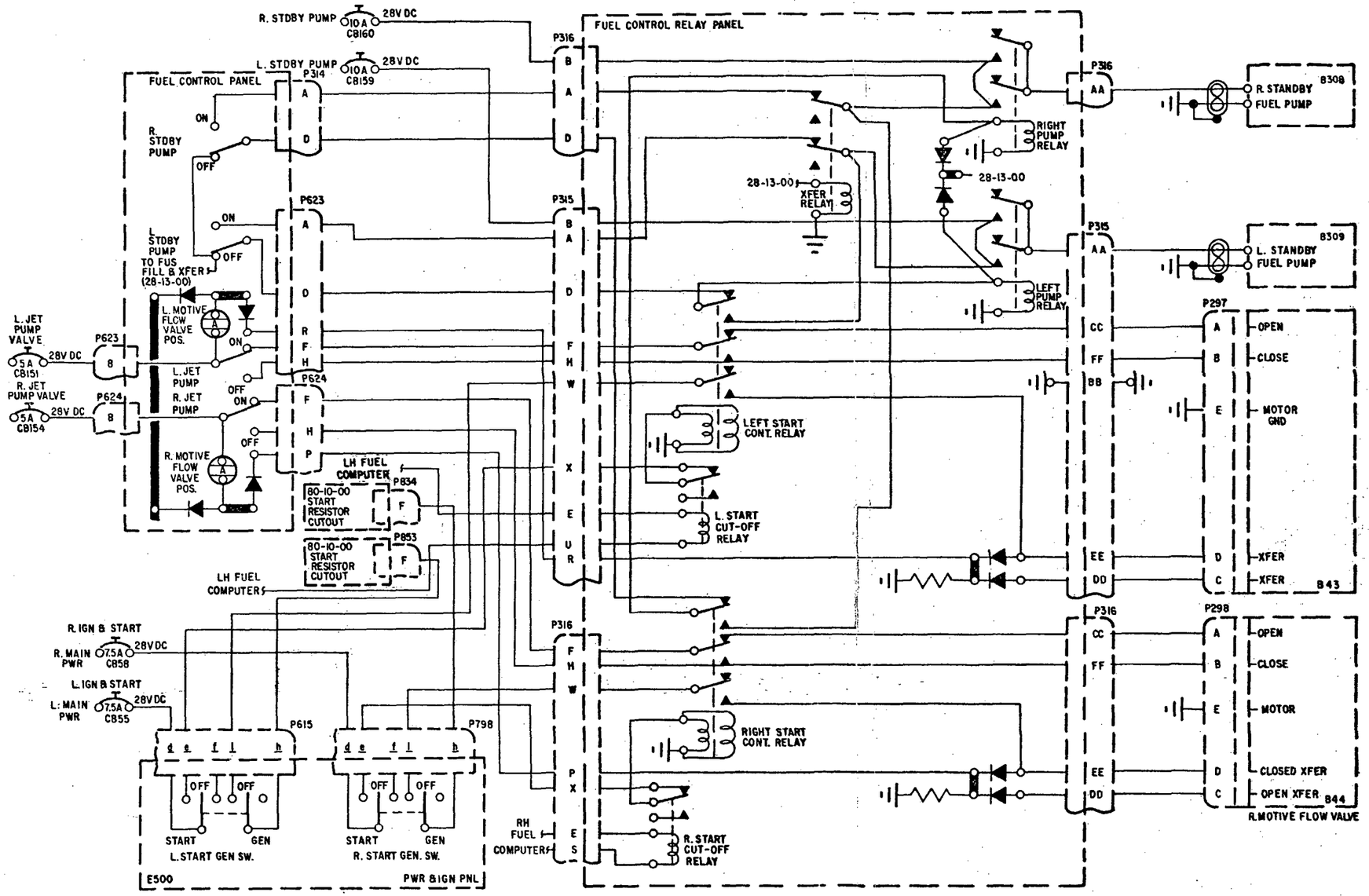
12-79C



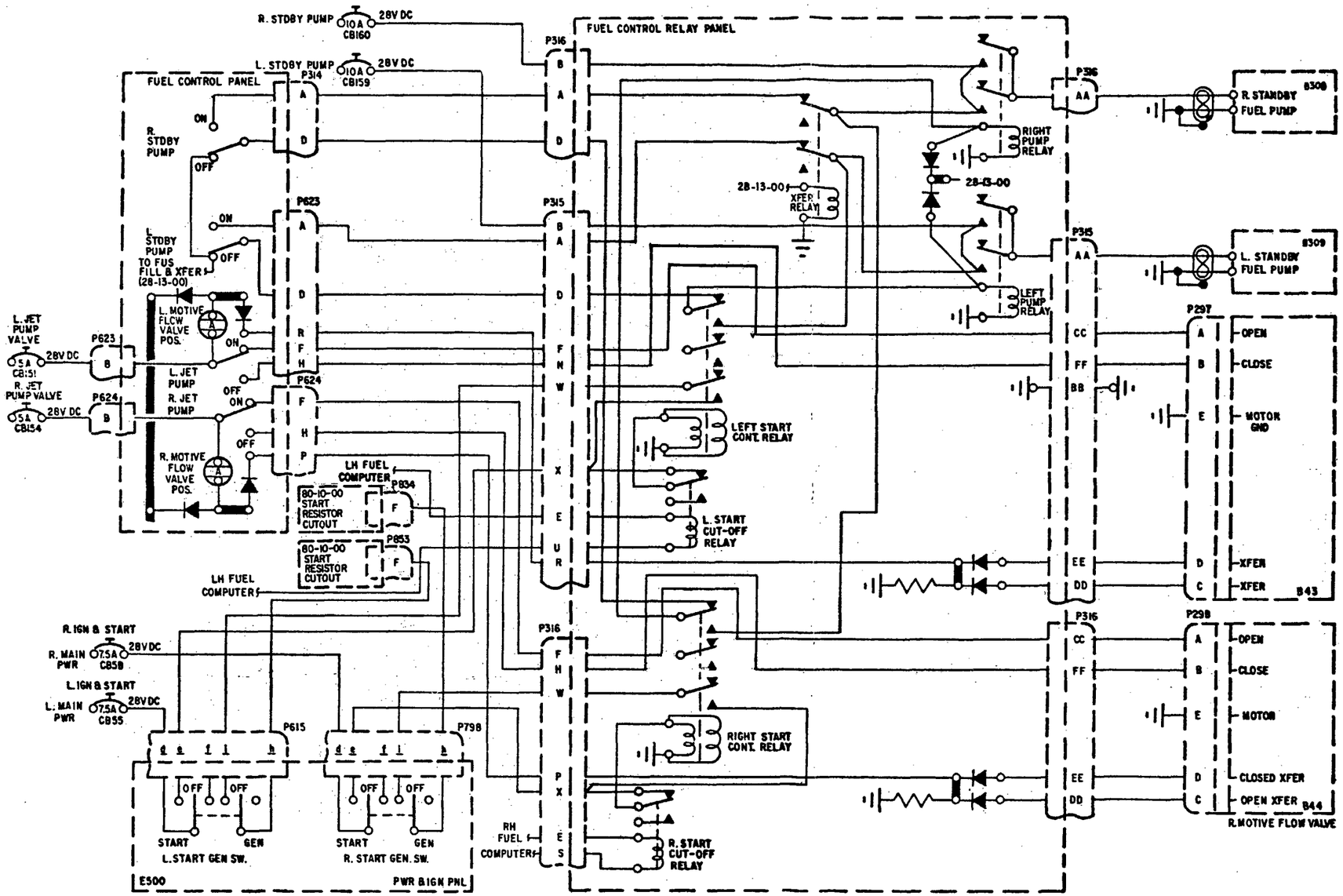
Fuel System Schematic
Figure 3 (Sheet 1 of 2)



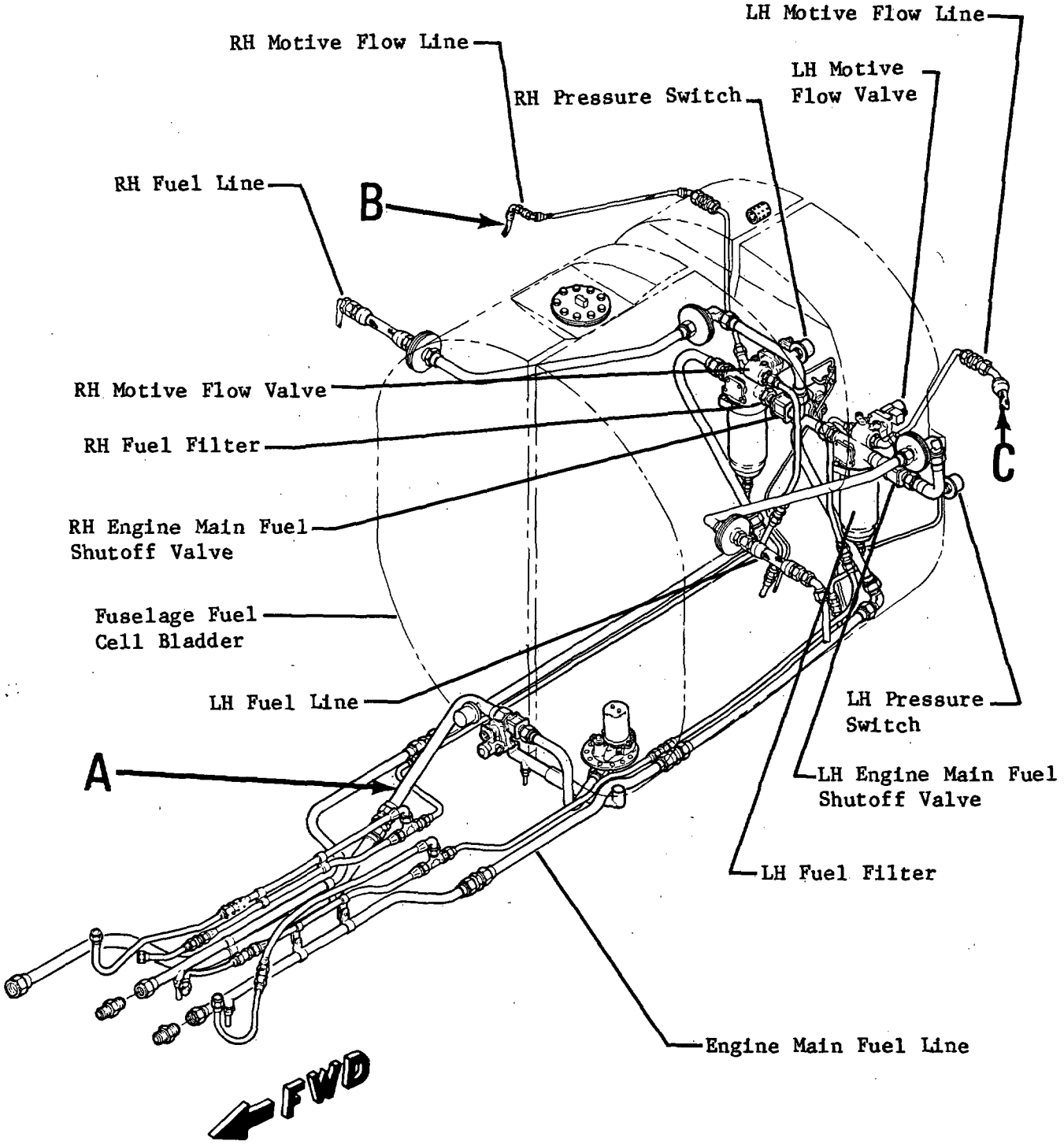
Fuel System Schematic
Figure 3 (Sheet 2 of 2)



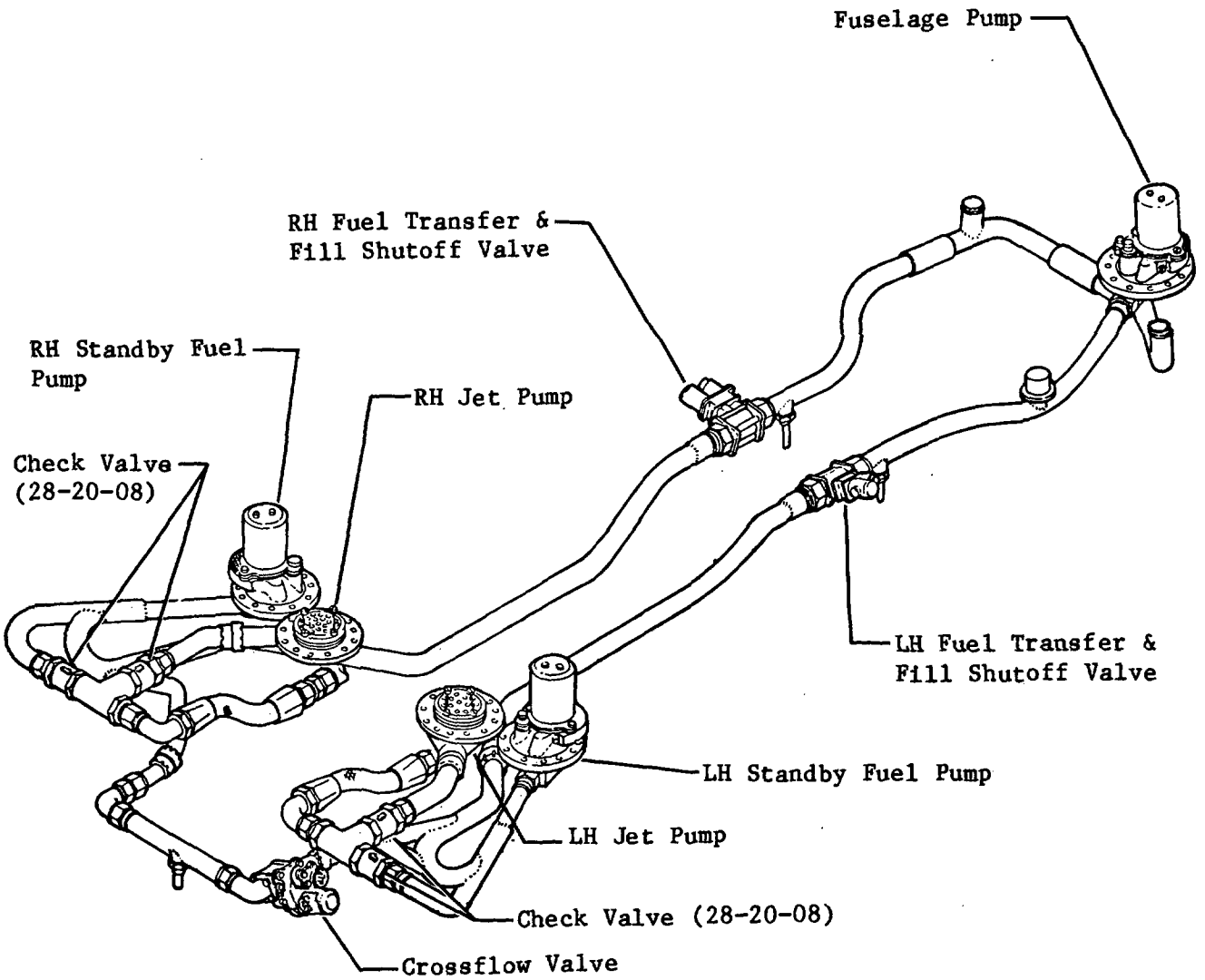
Starting Fuel Electrical Control Schematic
Figure 4 (Sheet 1 of 2)



Starting Fuel Electrical Control Schematic
Figure 4 (Sheet 2 of 2)

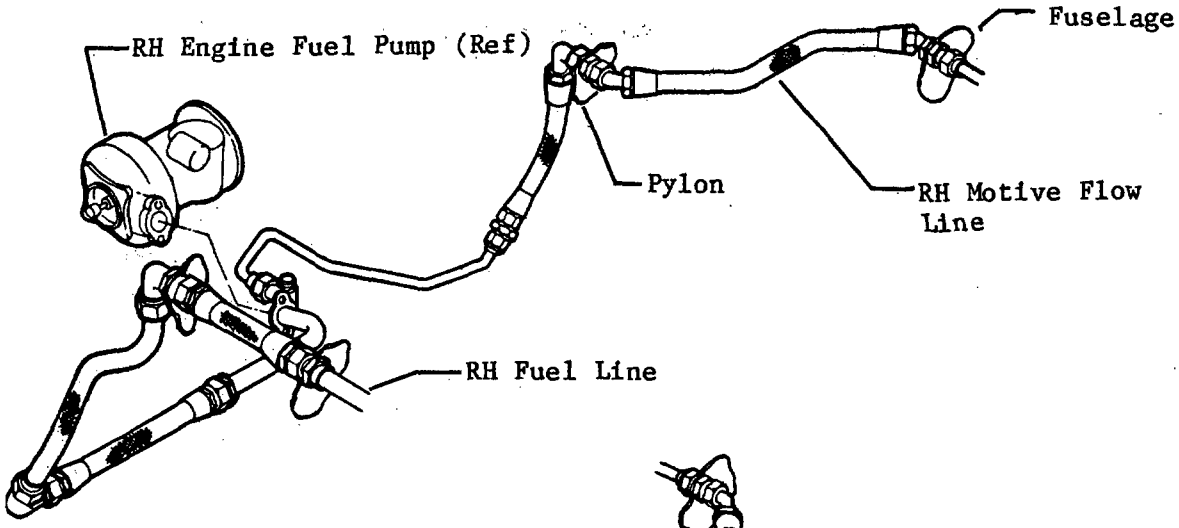


Distribution System Locator
Figure 5 (Sheet 1 of 3)

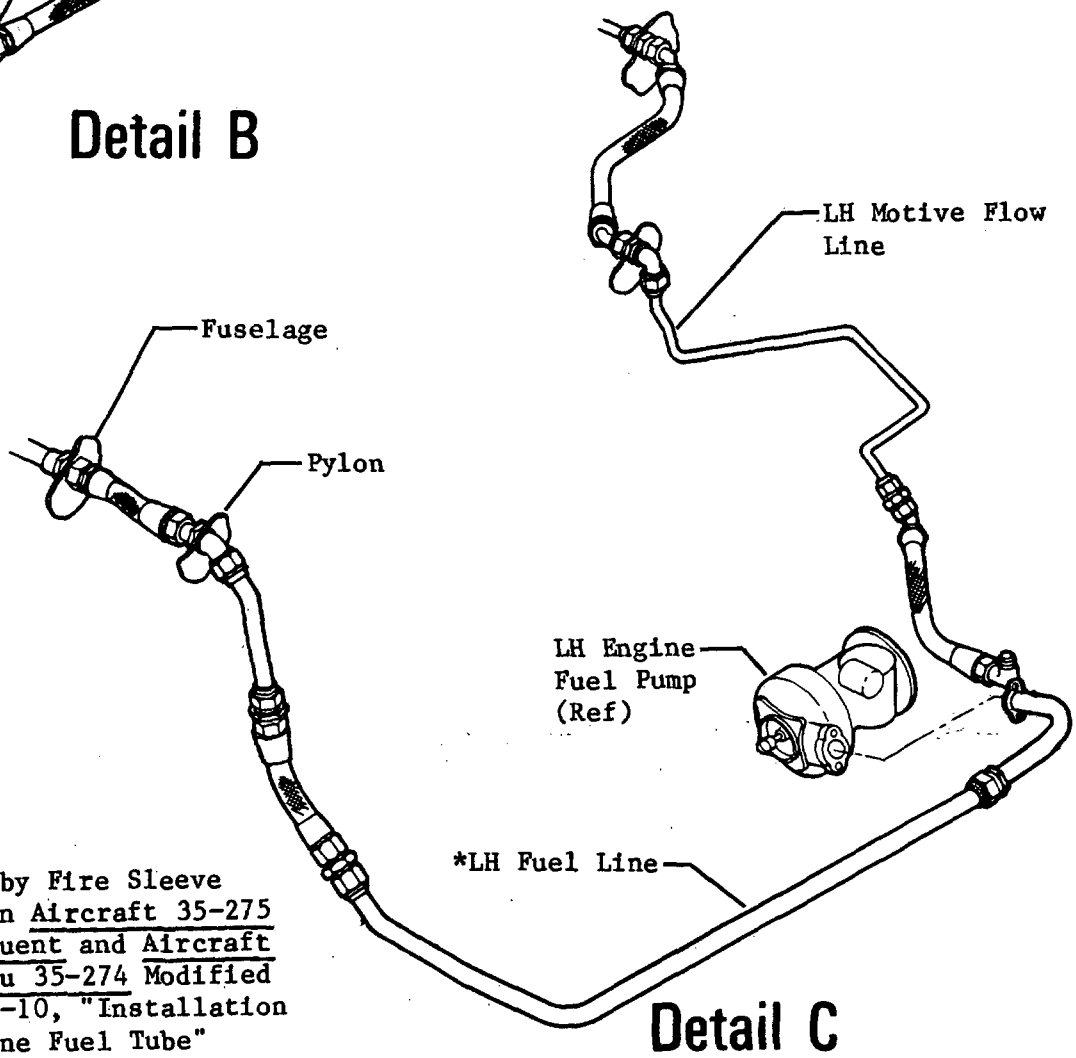


Detail A

Distribution System Locator
Figure 5 (Sheet 2 of 3)



Detail B

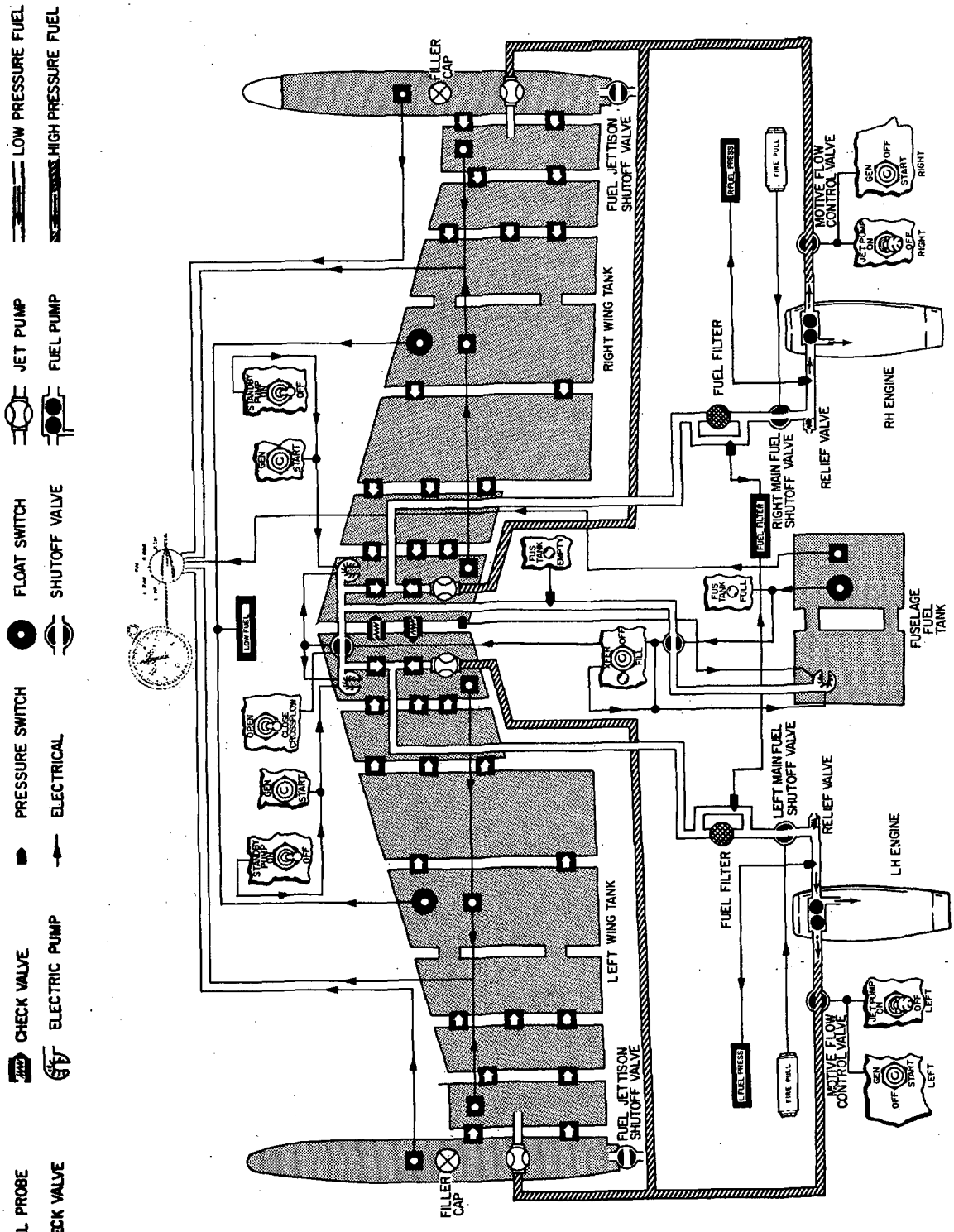


*Protected by Fire Sleeve and Tape on Aircraft 35-275 and Subsequent and Aircraft 35-066 thru 35-274 Modified per AMK 79-10, "Installation of LH Engine Fuel Tube"

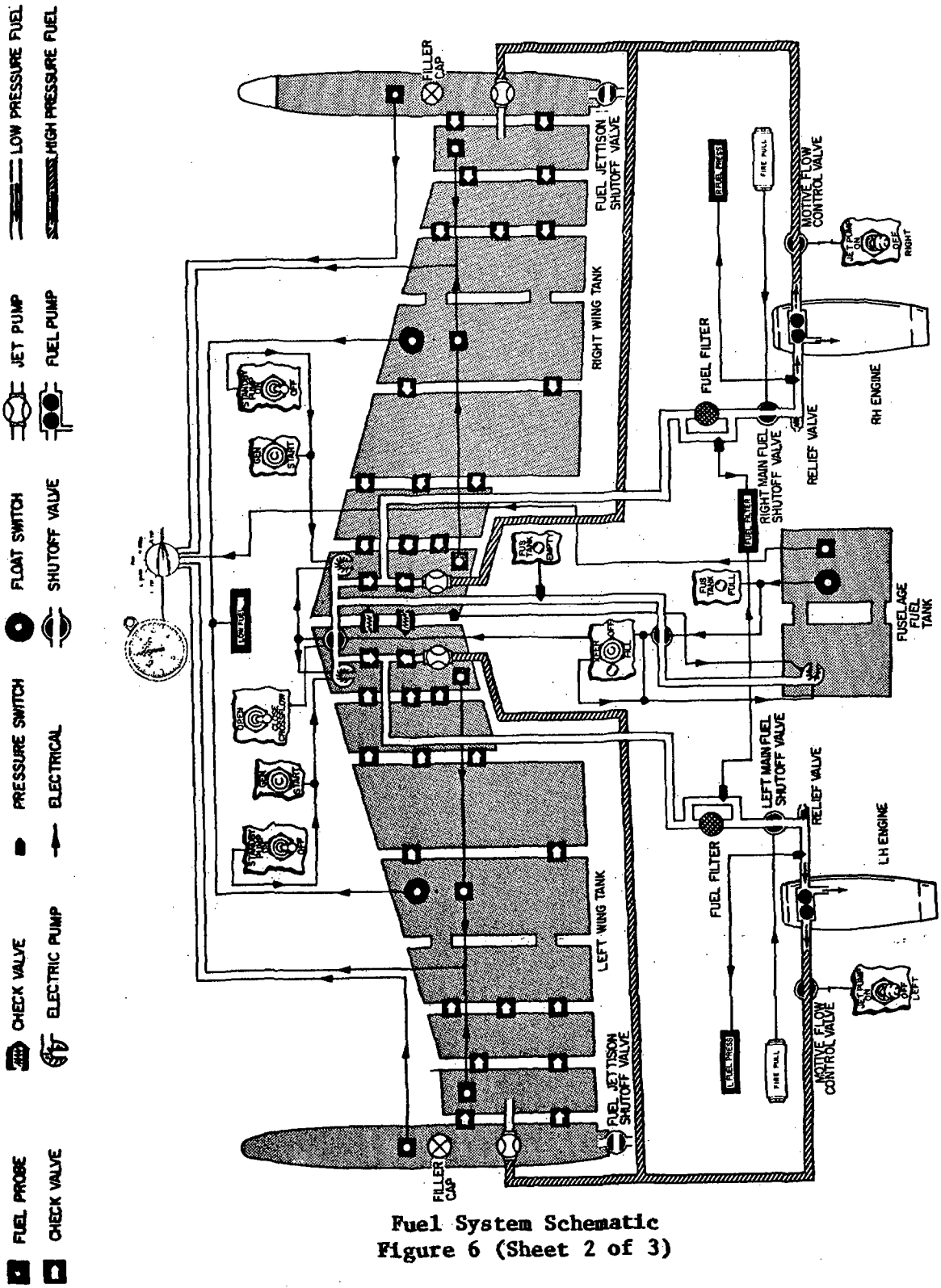
Detail C

Distribution System Locator
Figure 5 (Sheet 3 of 3)

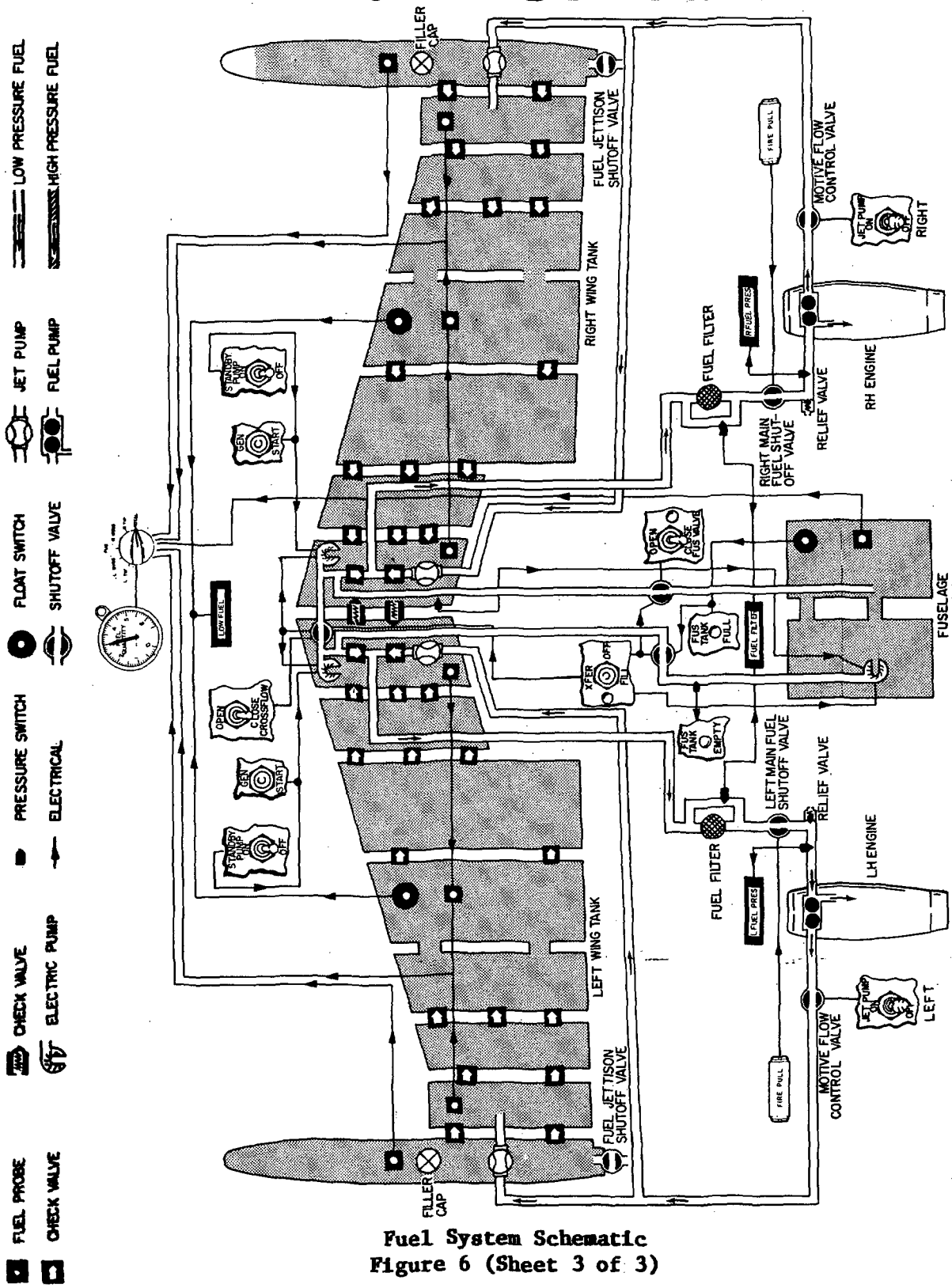
12-79C



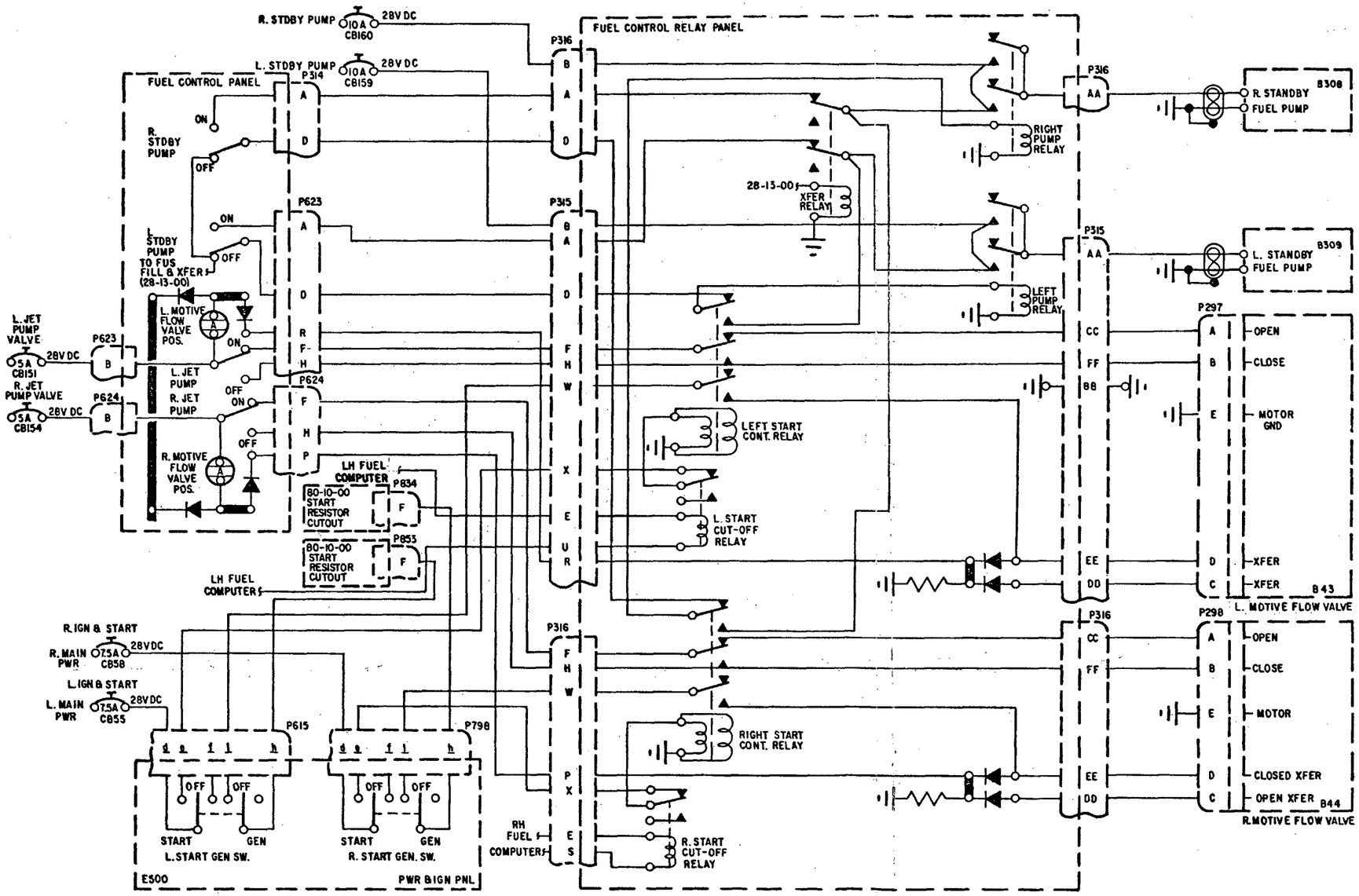
Fuel System Schematic
Figure 6 (Sheet 1 of 3)



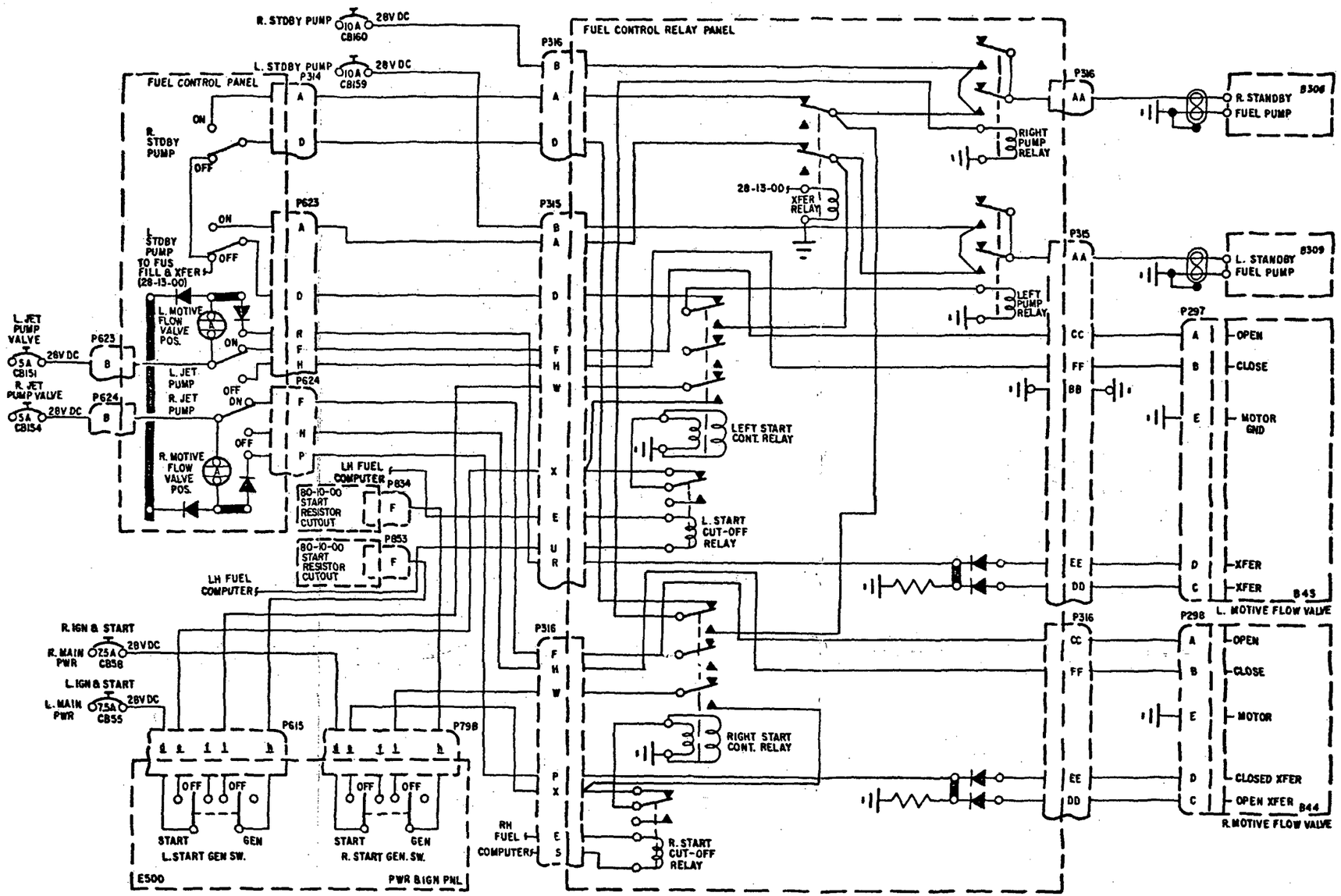
Fuel System Schematic
Figure 6 (Sheet 2 of 3)



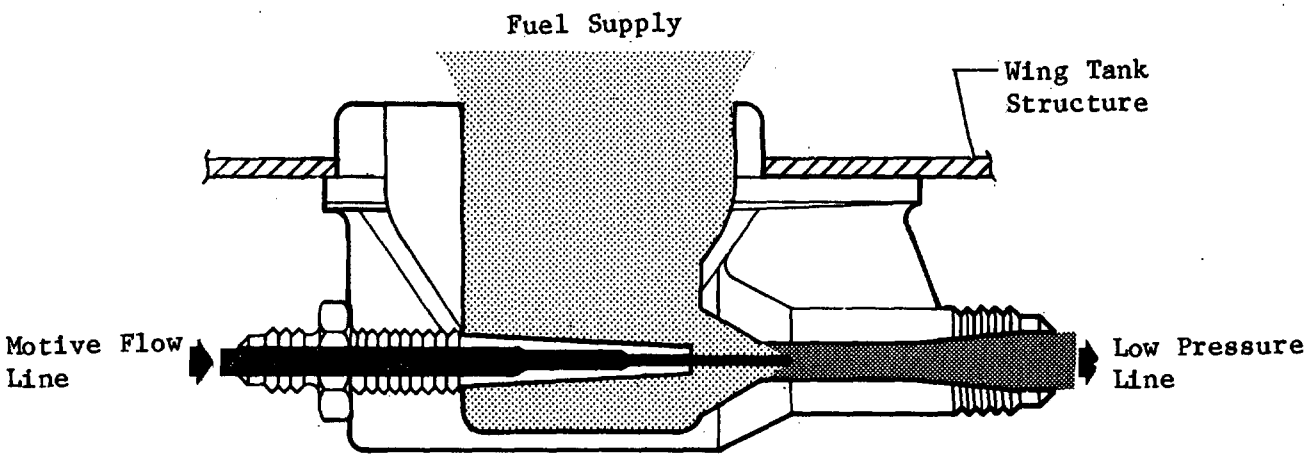
Fuel System Schematic
Figure 6 (Sheet 3 of 3)



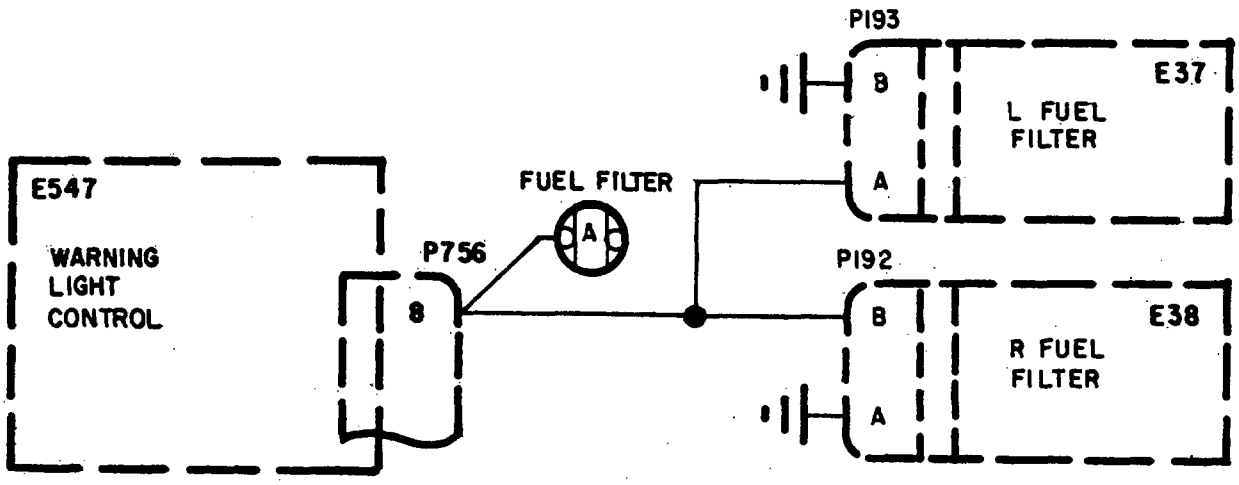
Starting Fuel Electrical Control Schematic
Figure 7 (Sheet 1 of 2)



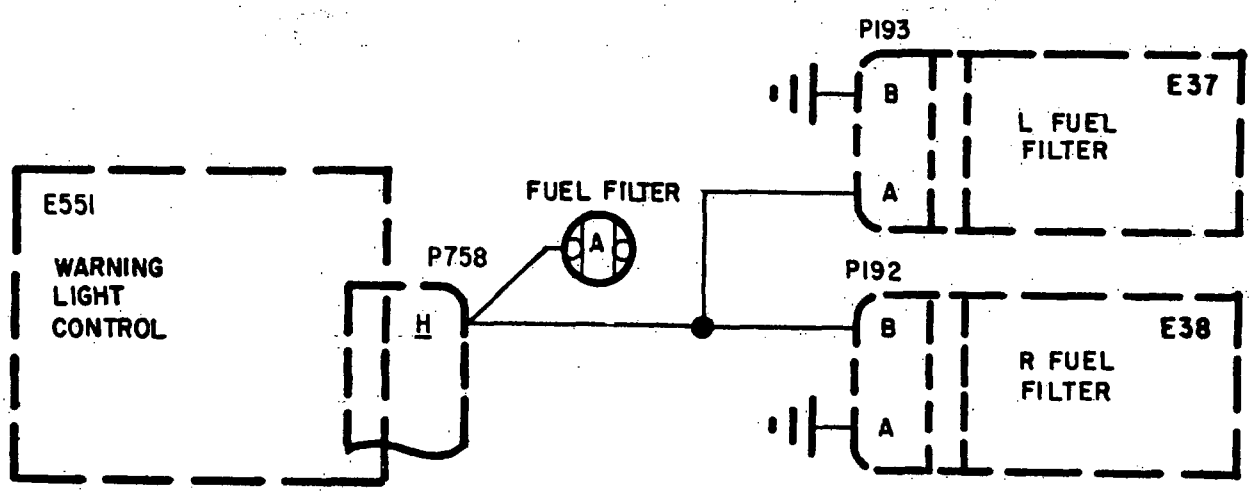
Starting Fuel Electrical Control Schematic
Figure 7 (Sheet 2 of 2)



Jet Pump Schematic
Figure 8

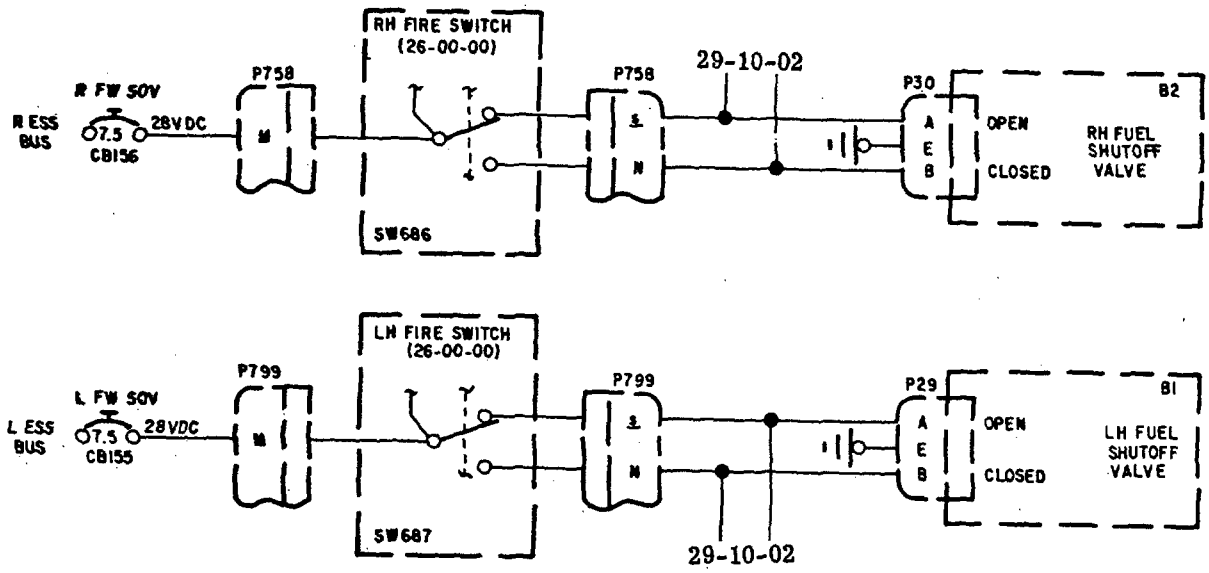


Aircraft 35-002, 35-003, 35-004 and 36-002



Aircraft 35-005 and Subsequent and 36-003 and Subsequent

Fuel Filter Caution Light Electrical Control Schematic
Figure 9



Fuel Supply Shutoff Valve Electrical Control Schematic
Figure 10

DISTRIBUTION - MAINTENANCE PRACTICES

1. ADJUSTMENT/TEST

A. Test Engine Fuel Flow System

(1) Set Battery Switches to ON.
(2) Set Crossflow Switch to OPEN.
(3) Set L Standby Pump Switch to ON. L & R FUEL PRESS lights will go out.
(4) Set L Jet Pump Switch to OFF; then to ON. Indicator light will momentarily illuminate then go out after each setting of the switch. This indicates the motive flow valve has moved to correspond with the switch setting.
(5) Set Crossflow Switch to CLOSED. R FUEL PRESS light will illuminate and L FUEL PRESS light will remain out.
(6) Set L Standby Pump Switch to OFF and Crossflow Switch to OPEN.
(7) Set R Standby Pump Switch to ON. L & R FUEL PRESS lights will go out.
(8) Set R Jet Pump Switch to OFF; then to ON. Indicator light will momentarily illuminate then go out after each switch setting. This indicates the motive flow valve has moved to correspond with the switch setting.
(9) Set Crossflow Switch to CLOSED. L FUEL PRESS light will illuminate and R FUEL PRESS light will remain out.
(10) Set R Standby Pump Switch to OFF and Battery Switches to OFF.

2. FUEL PLUMBING CONNECTORS

WARNING: CONNECTORS INSIDE OF FUEL TANKS SHALL NOT BE SAFETY WIRED.

A. All Wiggins connectors (W901 and 3600 series) installed in the under wing and tailcone fuel plumbing (exterior of tanks) shall be safety wired after installation. Use safety wire P/N MS20995C20 on W901 series connectors and safety wire P/N MS20995C25 on 3600 series connectors.

JET PUMP - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The following procedures are applicable for either the LH or RH jet pump.

A. Remove Jet Pump (See figure 201.)

(1) Defuel aircraft. (Refer to Chapter 12.)
(2) Remove lower fuselage access panels to gain access to the jet pump installation.
(3) Disconnect safety wire and fuel plumbing lines from jet pump.

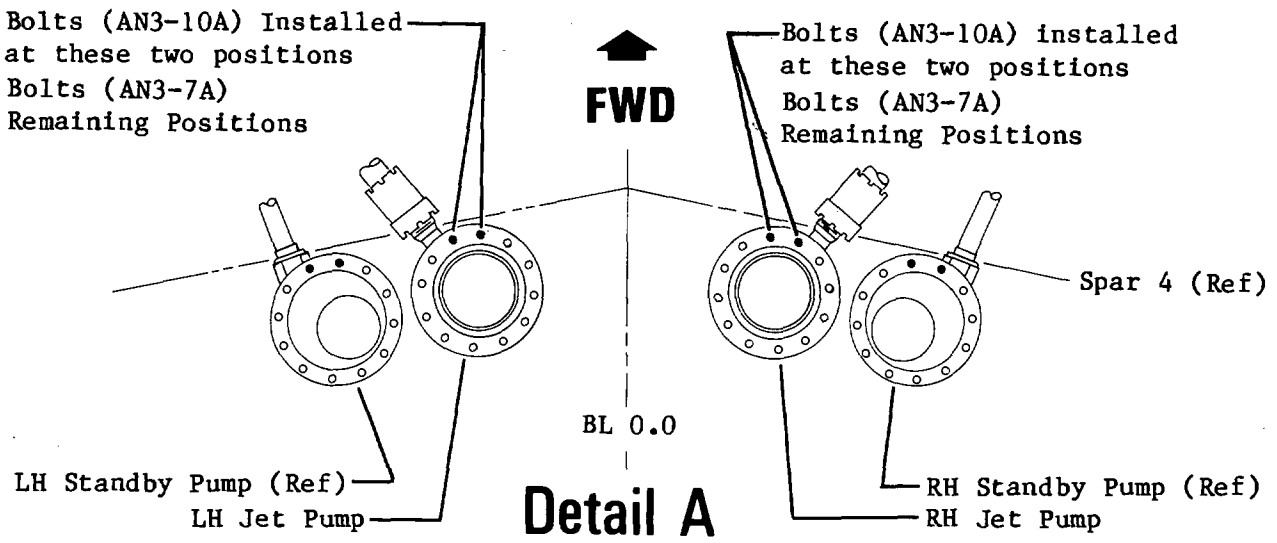
CAUTION: MARK POSITION OF AN3-10A BOLTS AS ATTACHING PARTS ARE REMOVED.

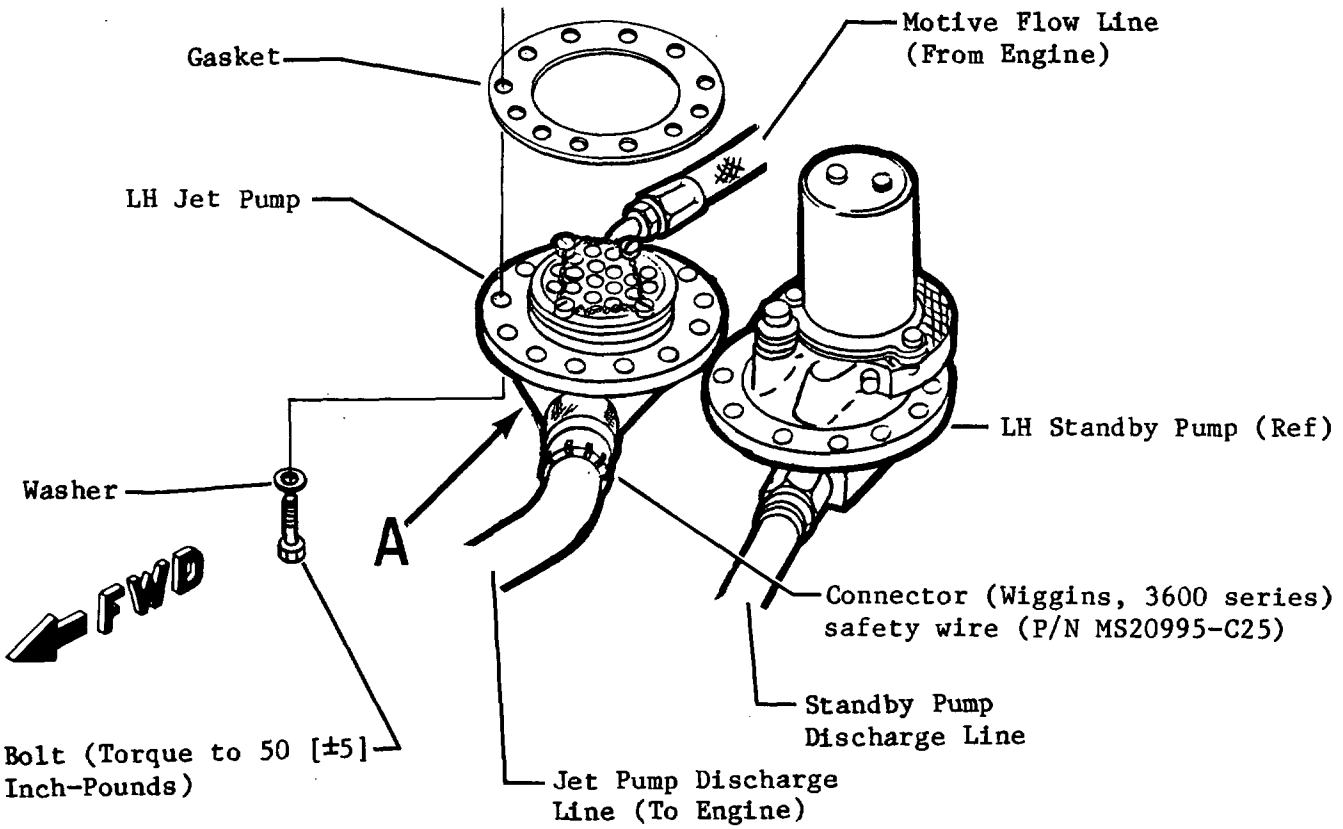
(4) Remove attaching parts and pump from aircraft.

B. Install Jet Pump (See figure 201.)

CAUTION: ASSURE THAT AN3-10A BOLTS ARE INSTALLED IN CORRECT POSITION.

(1) Position gasket and jet pump on wing opening. Secure with attaching parts.
(2) Torque bolts to 50 (±5) inch-pounds.
(3) Connect fuel plumbing to pump. Safety wire Wiggins connector.
(4) Refuel aircraft and check for leaks. (Refer to Chapter 12.)
(5) Install lower fuselage access panels.





Jet Pump Installation
Figure 201

STANDBY PUMP - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: The following procedures are applicable for either the LH or RH standby pump.

A. Removal of Standby Pump (See Figure 201.)
   (1) Defuel aircraft. (Refer to Chapter 12.)
   (2) Remove lower fuselage access covers to gain access to standby fuel pump installation.
   (3) Disconnect electrical wiring from standby pump.
   (4) Disconnect fuel plumbing from standby pump.

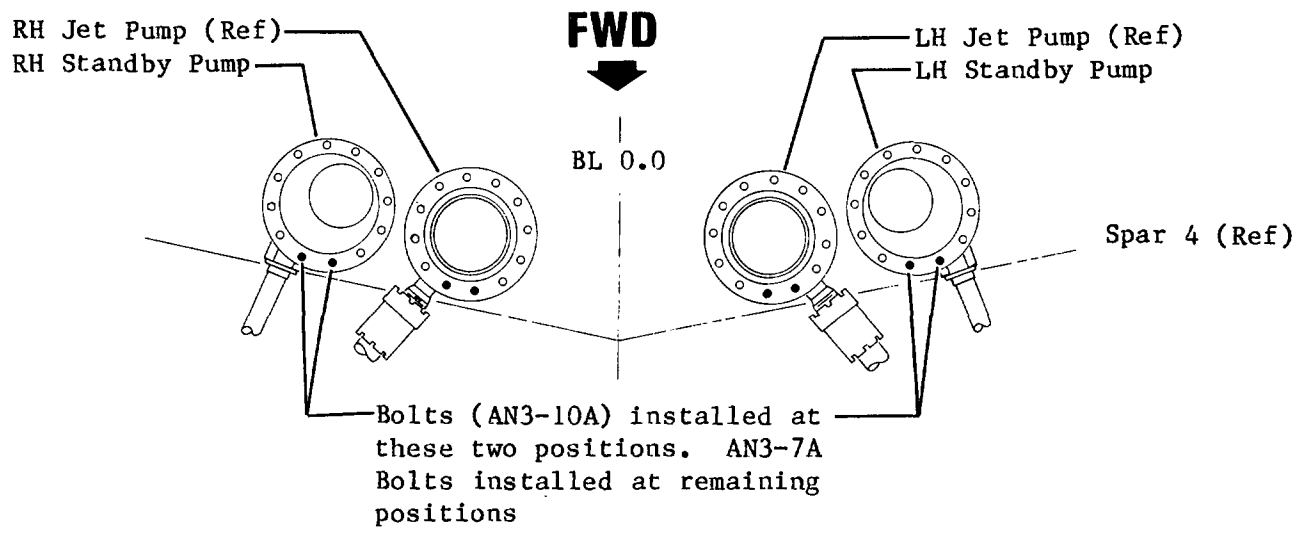
CAUTION: MARK POSITION OF AN3-10A BOLTS AS ATTACHING PARTS ARE REMOVED.

   (5) Remove attaching parts and standby pump from aircraft.

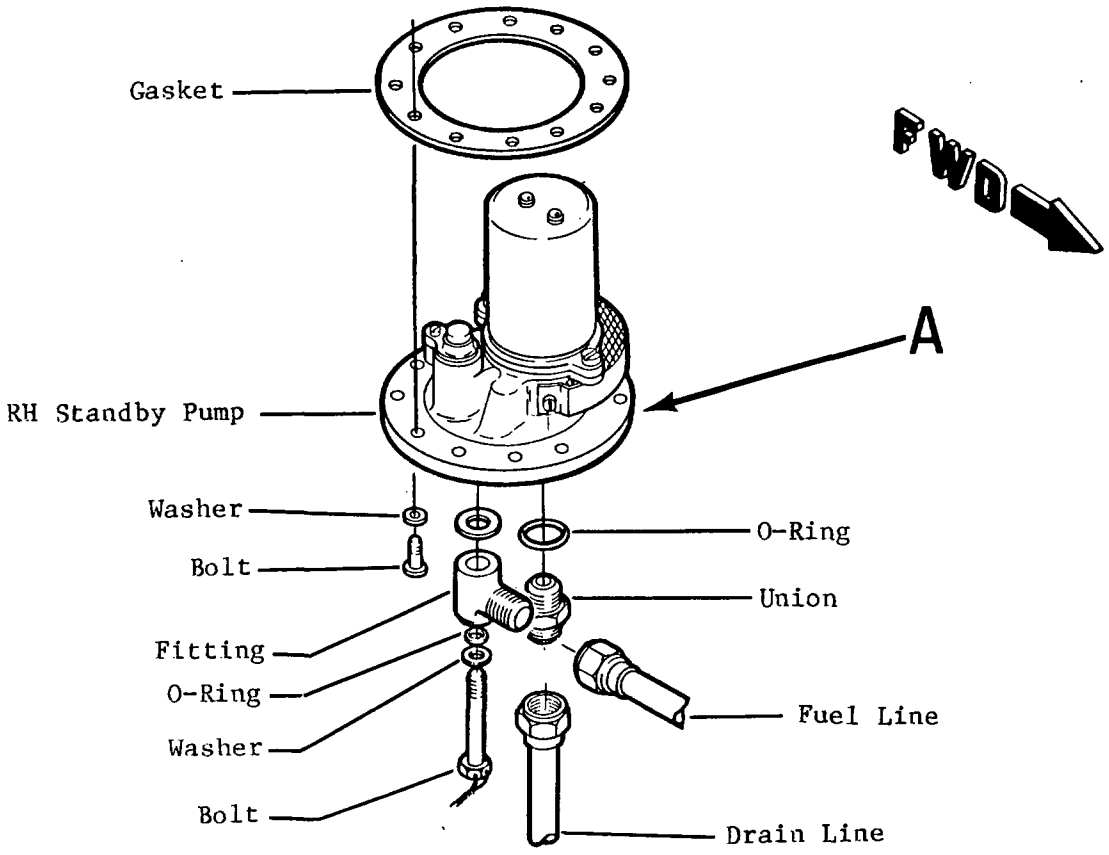
B. Installation of Standby Pump (See Figure 201.)

CAUTION: ASSURE THAT AN3-10A BOLTS ARE INSTALLED IN CORRECT POSITION.

   (1) Position gasket and standby pump on wing opening. Secure with attaching parts.
   (2) Torque bolts 50 (±5) inch-pounds [5.65 (±0.56) Nm].
   (3) Connect fuel plumbing to standby pump.
   (4) Refuel aircraft and check for leaks. (Refer to Chapter 12.)
   (5) Perform electrical bonding check of standby fuel pump case to wing structure. (Refer to Chapter 20 of the Wiring Manual.)
   (6) Install lower fuselage access panels.



Detail A



Standby Pump Installation
Figure 201

FUEL FILTER - MAINTENANCE PRACTICES

1. General

A. Maintenance practices consist of removal and installation of filter assembly and replacement of filter element on aircraft equipped with paper element.

2. Removal/Installation

A. Remove Fuel Filter Assembly (See figure 201.)
   (1) Lower tailcone access door.
   (2) Disconnect and remove aircraft batteries. (Refer to Chapter 24.)
   (3) Drain fuel filter using overboard drain valve.
   (4) Disconnect electrical plug from filter head.
   (5) Disconnect fuel plumbing and overboard drain line.
   (6) Remove attaching parts and filter assembly from aircraft.

B. Install Fuel Filter Assembly (See figure 201.)
   (1) Install fuel filter assembly and secure with attaching parts.
   (2) Connect fuel plumbing and overboard drain line. Safety wire Wiggins Connectors when used.
   (3) Connect electrical plug to filter head.
   (4) Install aircraft batteries. (Refer to 24-32-01.)
   (5) Check filters for leaks using either standby boost pump.
   (6) Secure tailcone access door.

C. Remove *Dynamic or Purolator* Filter Element (See figure 201.)
   (1) Lower tailcone access door.
   (2) Disconnect and remove aircraft batteries. (Refer to Chapter 24.)
   (3) Drain fuel filter using overboard drain valve.
   (4) Loosen T-bolt clamp and remove filter bowl and filter element from head.
   (5) On *Aircraft equipped with cleanable elements*, the upper gasket is epoxied to the filter head. Do not remove gasket unless gasket is loose or shows signs of deterioration.
   (6) On *Aircraft equipped with cleanable elements*, the lower gasket is epoxied to the primary bypass valve. Do not remove gasket unless gasket is loose or shows signs of deterioration.
   (7) On *Aircraft equipped with cleanable elements*, clean filter element and secondary bypass valve assembly. (Refer to Cleaning/Painting.)

D. Install *Dynamic or Purolator* Filter Element (See figure 201.)

   NOTE:
   - When replacing the upper or lower gasket, epoxy gasket into place using resin CB-1078 with reactor 2100 (John C. Dolph Co., Monmouth Junction, N. J.) or equivalent.
   - If O-ring and gaskets are replaced, the date on the assembly date plate must be changed.

   (1) On cleanable filters, assemble primary bypass valve, filter element and secondary bypass valve assembly and O-ring on filter bowl.
   (2) On paper filters, assemble relief valve, filter element and O-ring on filter bowl.
   (3) Install bowl and secure with T-bolt clamp. Torque T-bolt clamp to 45 to 50 inch-pounds.
   (4) Install aircraft batteries. (Refer to Chapter 24.)
   (5) Check filters for leaks using either standby boost pump.
   (6) Secure tailcone access door.

E. Remove *Facet* Filter Element (See figure 201.)
   (1) Lower tailcone access door.
   (2) Disconnect and remove aircraft batteries. (Refer to Chapter 24.)
   (3) Drain fuel filter using overboard drain valve.
   (4) Remove safety wire from filter post assembly and filter bowl.
   (5) Remove filter post with filter bowl and filter from filter head.

(6) Remove filter element from filter bowl.
(7) Discard paper filter element.

F. Install *Facet* Filter Element (See figure 201.)

NOTE: Inspect O-ring for signs of wear, abuse, or cuts and replace if required.

(1) Position filter element in filter bowl.
(2) Install O-ring on filter bowl.
(3) Position bowl assembly on filter head and secure with post assembly. Do not rotate bowl while inserting it into filter head. Torque post assembly 20 to 40 inch-pounds. Safety wire post to bowl.
(4) Install drain line on post assembly.
(5) Install aircraft batteries. (Refer to Chapter 24.)
(6) Check filters for leaks using either standby boost pump.
(7) Secure tailcone access door.

3. **Adjustment/Test**

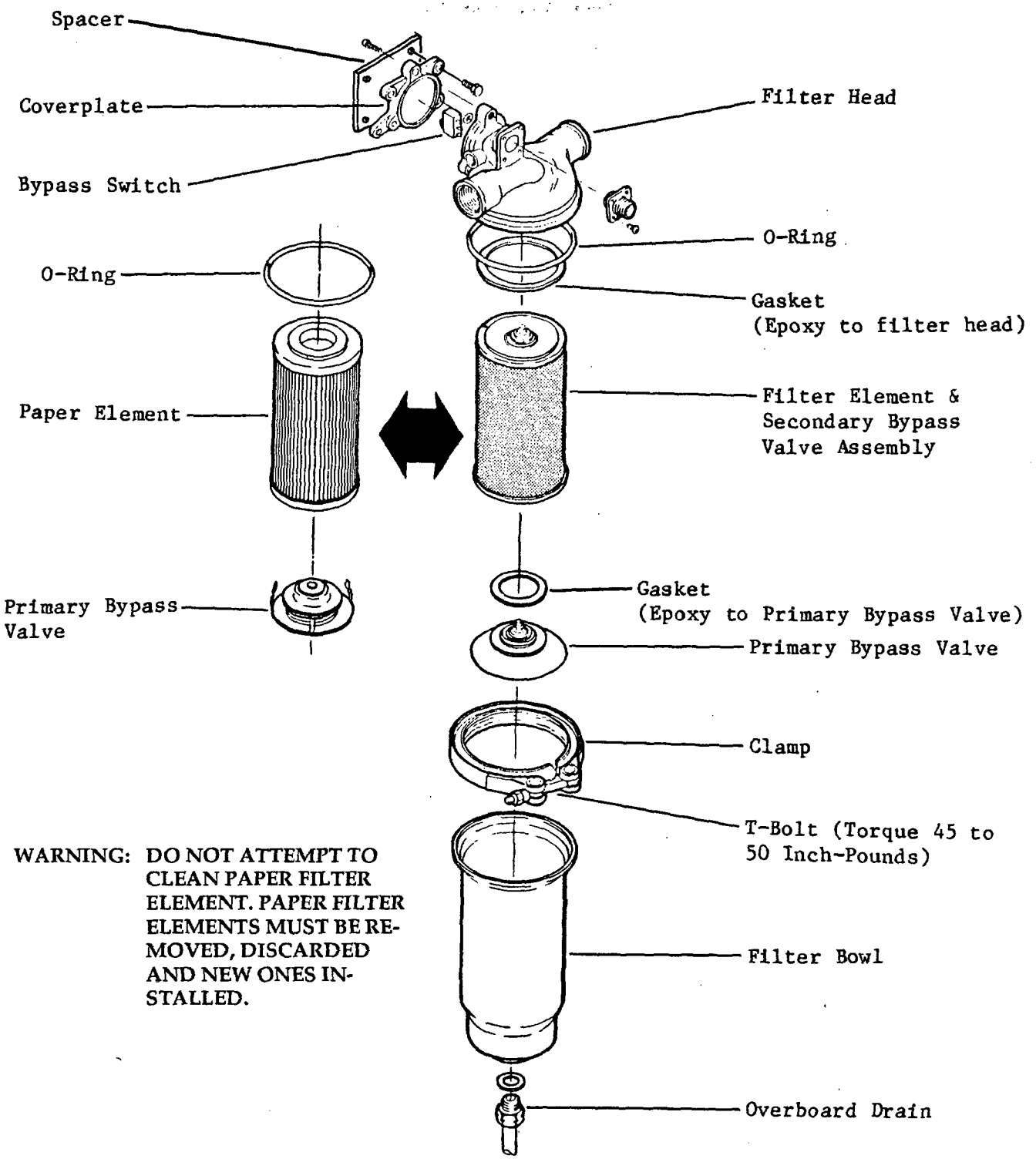
A. Test *Dynamic* Fuel Filter Bypass Switch
(1) Remove filter element. (Refer to "Remove Fuel Filter Element.")
(2) Install plastic plug where filter element was removed.
(3) Disconnect fuel plumbing from fuel filter inlet and outlet ports.
(4) Connect pressure source, pressure regulator, and pressure gauge to filter inlet port.
(5) Disconnect electrical connector from filter.
(6) Connect an ohmmeter across pins of filter receptacle.
(7) Switch should close at 1.25 (±0.25) psi.
(8) Disconnect ohmmeter, pressure source, pressure regulator, and pressure gauge and remove plastic plug.
(9) Install filter element (Refer to "Install Fuel Filter Element") and connect electrical connector.

B. Test *Purolator* Fuel Filter Bypass Switch
(1) Remove filter element (Refer to "Remove Fuel Filter Element".)
(2) Install plastic plug.
(3) Disconnect fuel plumbing from fuel filter inlet and outlet ports.
(4) Connect pressure sources, pressure regulators, and pressure gauges to filter inlet and outlet ports.
(5) Remove electrical connector from filter.
(6) Connect an ohmmeter across pins of filter receptacle.
(7) Apply 10 psi pressure to inlet and outlet ports.
(8) Decrease pressure at outlet port to 9.1 psi while maintaining inlet pressure at 10 psi to create a pressure differential of 0.9 psid across bypass switch.
(9) There should be no electrical continuity across the pins of the filter receptacle.
(10) Gradually decrease pressure at outlet port. Continuity shall occur between 0.95 to 1.30 psid.
(11) Release all pressure at inlet and outlet port.
(12) Disconnect pressure sources, pressure regulators, pressure gauges, and ohmmeter and remove plastic plug.
(13) Install filter (Refer to "Fuel Filter Element") and connect electrical connector.

4. **Cleaning/Painting**

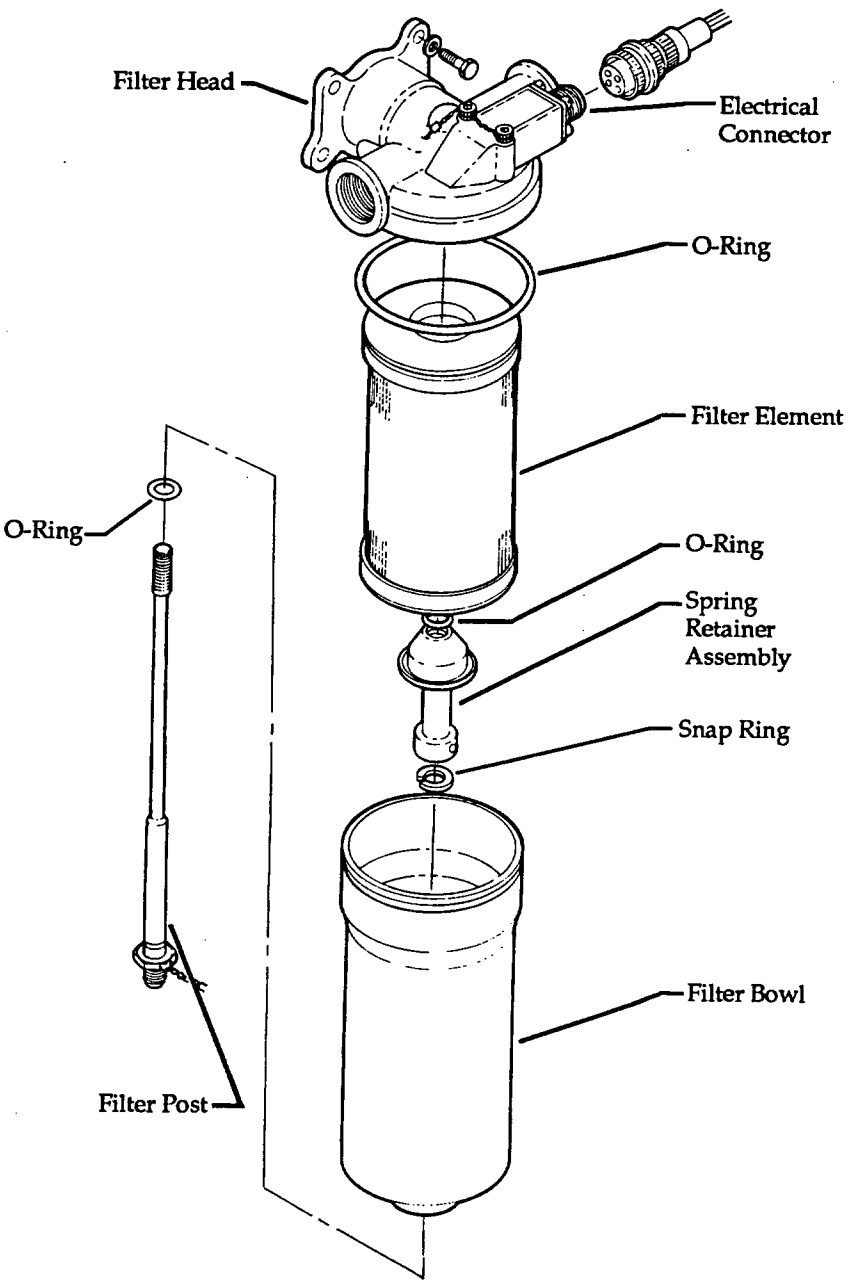
A. Clean Metal Filter Element

WARNING: DO NOT ATTEMPT TO CLEAN PAPER FILTER ELEMENT. PAPER FILTER ELEMENTS MUST BE REMOVED, DISCARDED AND NEW ONES INSTALLED.



Fuel Filter Assembly
Figure 201 (Sheet 1 of 2)

EFFECTIVITY: AIRCRAFT EQUIPPED WITH DYNAMIC OR PUROLATOR FILTERS



WARNING: DO NOT ATTEMPT TO CLEAN PAPER FILTER ELEMENT. PAPER FILTER ELEMENTS MUST BE REMOVED, DISCARDED AND NEW ONES INSTALLED.

Fuel Filter Assembly
Figure 201 (Sheet 2 of 2)

EFFECTIVITY: AIRCRAFT EQUIPPED WITH FACET FILTERS

(1) Remove bulk of dirt by vapor degreasing filter element and secondary bypass valve assembly in trichloroethane for ten (10) minutes.
(2) Sonic clean filter element and secondary bypass valve assembly in mild detergent (MIL-D-16791, Type 1) or equivalent for 20 to 30 minutes.
(3) Rinse in hot water (130 to 200°F) for 20 minutes.

CAUTION: DO NOT BLOW ACROSS SCREEN WITH SHOP AIR. ELEMENT MUST BE ALLOWED TO AIR DRY.

(4) Allow to air dry, or dry in oven at 100 to 200°F.
(5) Examine filter. If any contaminant is still visible, repeat cleaning procedure.

FUEL SUPPLY SHUTOFF VALVE - MAINTENANCE PRACTICES

1. **Removal/Installation**
   A. Remove Shutoff Valve (See figure 201.)
      (1) Open tailcone access door.
      (2) Remove aircraft batteries. (Refer to Chapter 24.)
      (3) Disconnect fuel plumbing and electrical connector from shutoff valve.
      (4) Remove nuts, washers, and bolts installed through shutoff valve flange. Remove shutoff valve, adapter, and flange from the aircraft.
   B. Install Shutoff Valve (See figure 201.)

      CAUTION: THE MOTORIZED FUEL SHUTOFF VALVES INCORPORATE TWO TEFLON SEALS, ONE BLACK AND ONE WHITE, AGAINST THE BALL VALVES. THE BLACK SEALS INCORPORATE A SMALL ORIFICE TO RELIEVE SYSTEM PRESSURE. THEREFORE, WHEN INSTALLING THE MOTORIZED FUEL SHUTOFF VALVES, ALWAYS POSITION THE VALVE WITH THE BLACK SEAL TO THE PRESSURE SIDE (NEAREST THE PUMP). WHERE PRESSURE IS EXERTED ON BOTH SIDES, SUCH AS THE CROSSFLOW AND TRANSFER VALVES, POSITION THE BLACK SEAL TO THE SIDE WITH THE GREATEST PRESSURE (NEAREST THE PUMP).

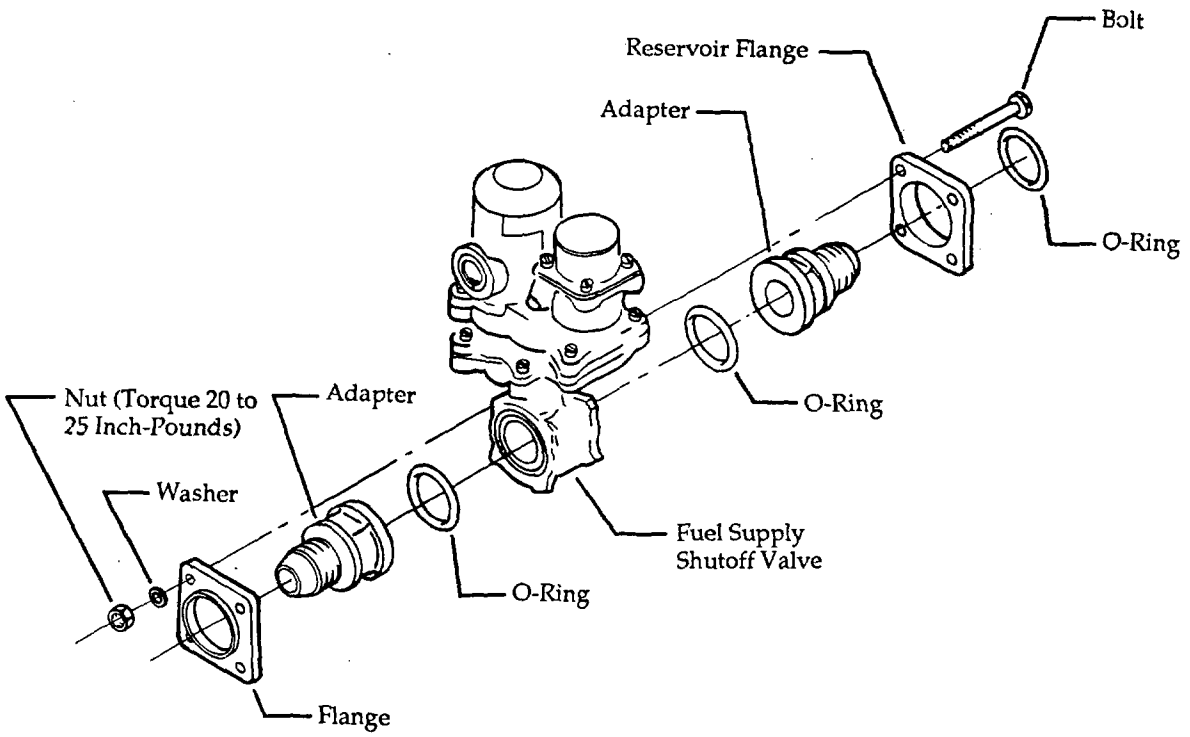
      (1) Install O-ring, shutoff valve, adapter, and valve flange on valve flange still connected to fuel filter.
      (2) Secure with attaching bolts, washers, and nuts. Torque nuts 20 to 25 inch-pounds.
      (3) Connect electrical connector to shutoff valve.
      (4) Install aircraft batteries. (Refer to Chapter 24.)
      (5) Check shutoff valve for leaks using applicable standby pump.
      (6) Install tailcone access door.

2. **Adjustment/Test**
   A. Functional Test of Fuel Supply Shutoff Valve.

      CAUTION: DO NOT DEPRESS FIRE EXTINGUISHER SWITCHES (ARMED SWITCHES) WHEN PERFORMING THIS CHECK AS THE SYSTEM IS ARMED WHEN THE FIREWALL VALVES ARE CLOSED.

      NOTE:
      - Perform functional test of fuel supply shutoff valve in accordance with the current inspection interval specified in Chapter 5.
      - Two mechanics are required to perform this check; one in the cockpit operating the valve switch and one in the tailcone observing valve operation.

      (1) Set Battery Switch to ON and close left firewall shutoff valve. This can be determined by visually checking the valve pointer. The fire extinguisher ARMED lights shall illuminate.
      (2) Open the left firewall shutoff valve. Visually check pointer on shutoff valve. Check that the shutoff valve indicator light and ARMED lights shall extinguish.
      (3) Cycle the valve three times by pulling and pushing the LH FIRE PULL T-handle to insure proper valve operation.
      (4) Perform steps (1), (2) and (3) for the RH shutoff valve.
      (5) Return system to normal by pushing in FIRE PULL T-handle and setting Battery Switch to OFF.



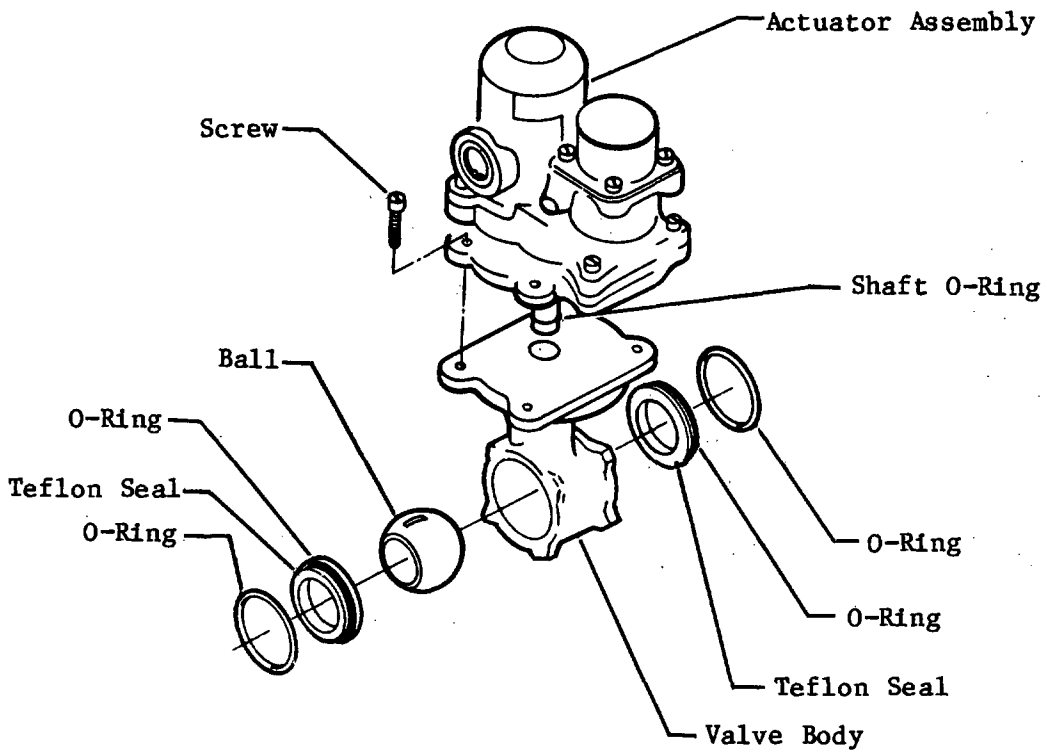
Fuel Supply Shutoff Valve Installation
Figure 201

3. **APPROVED REPAIRS**

A. O-Ring Replacement (See figure 202.)

NOTE: It is important to note the position of each O-ring to ensure that each new O-ring is installed in its proper position.

(1) Remove fuel supply valve from aircraft as described in paragraph 2.A.
(2) Remove outer O-rings, teflon seals, and ball.
(3) Remove safety wire and remove screws which attach valve body to actuator assembly. Remove actuator assembly from valve body to expose shaft O-ring.
(4) Remove old O-ring from actuator shaft. Lubricate a new O-ring on shaft. Ensure that O-ring is not twisted and is properly installed on shaft.
(5) Apply a light coating of petroleum jelly to shaft O-ring and insert shaft into valve body. Secure valve body to actuator assembly with attaching screws and safety wire.
(6) Align groove of ball with actuating shaft which protrudes into valve body and install ball.
(7) Remove old O-rings from teflon seals. Lubricate new O-rings with petroleum jelly and install O-rings on teflon seals. Ensure that O-rings are not twisted and are properly installed on teflon seals.
(8) Apply a light coating of petroleum jelly to O-rings installed on teflon seals and install teflon seals in valve body.
(9) Lubricate outer O-rings with petroleum jelly and install in valve body.
(10) Install adapter on valve and install this assembly in aircraft as described in paragraph 2.B.



Fuel Supply Shutoff Valve O-Ring Replacement
Figure 202

1. **Removal/Installation**
   A. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Sealant	Pro-Seal 890	Essex Chemical Corp. Compton, CA 90221	Seal bolts and gaskets

B. Remove Motive Flow Fuel Shutoff Valve Assembly.
   (1) Set Battery Switches off. Ensure that external power source is disconnected.
   (2) Lower tailcone access door.
   (3) If desired, remove aircraft batteries for improved access to valves. (Refer to Chapter 24.)
   (4) Disconnect motive flow lines from both sides of valve.
   (5) Disconnect drain line from valve enclosure box.
   (6) Disconnect electrical connector from valve.
   (7) Scrape sealant from attaching bolts. Remove attaching bolts and washers securing enclosure box to fuel cell access cover. Remove valve and enclosure box from aircraft.
   (8) Remove valve from enclosure box assembly (if necessary). *(Aircraft 35-002 thru 35-348, 36-002 thru 36-045 modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines and not per SSK 997, "Replacement of Motive Flow Valve Shroud Covers, and 35-349 thru 35-609, 36-046 thru 36-053 and 36-055 not modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers")* (See Figure 201.)
      (a) Scrape sealant off mating surfaces between enclosure box and motive flow valve, motive flow lines and valve fittings, and attaching bolts at top and bottom of motive flow valve and enclosure box.
      (b) Remove motive flow lines from valve fittings.
      (c) Remove bolts and washers which attach retainer, inspection plate, coverplate, and gasket.
      (d) Remove retainer, inspection plate, coverplate and gasket.
      (e) Remove fittings which are attached to motive flow valve and protrude from enclosure box.
      (f) Remove safety wire from attaching bolts at top and bottom of motive flow valve. Remove attaching bolts and washers and motive flow valve.
   (9) Remove valve from enclosure box assembly (if necessary). *(Aircraft 35-002 thru 35-348, 36-002 thru 36-045 modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines and per SSK 997, "Replacement of Motive Flow Valve Shroud Covers; 35-349 thru 35-609, 36-046 thru 36-053 and 36-055 modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers"; and 35-610 and Subsequent, 36-054, 36-056 and Subsequent)* (See Figure 202.)
      (a) Remove sealant from bolt heads, fittings, valve and cover.
      (b) Remove attaching parts and cover from enclosure box.
      (c) Remove seal plates from enclosure box at valve fittings.

      NOTE: Faying surface seal is applied between seal plate and enclosure box.

      (d) Remove fittings from motive flow valve.
      (e) Remove safety wire and attaching parts securing valve to enclosure box. Remove valve from enclosure box.
      (f) Remove attaching parts and angle bracket from enclosure box.
      (g) On *Aircraft 35-610 thru 35-659 and 36-054, 36-056 thru 36-063 not modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers,"* remove gasket.

C. Install Motive Flow Fuel Shutoff Valve Assembly.

(1) If motive flow fuel shutoff valve has been removed from enclosure box assembly, install valve in enclosure box. *(Aircraft 35-002 thru 35-348, 36-002 thru 36-045 modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines and not per SSK 997, "Replacement of Motive Flow Valve Shroud Covers"; and 35-349 thru 35-609, 36-046 thru 36-053 and 36-055 not modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers.")*

(a) Place motive flow fuel shutoff valve in enclosure box and secure with bolts, washers, and safety wire.

(b) Using Pro-Seal 890 sealant, form a faying seal between bolt heads and enclosure box.

(c) Install new O-rings and install fittings which protrude through enclosure box. Using Pro-Seal 890 sealant, form a seal around openings of enclosure box where motive flow line enters and exits.

(d) Install a new gasket. Apply Pro-Seal 890 sealant sparingly around perimeter of gasket and install inspection plate, coverplate, and retainer. Secure with attaching bolts and washers. Wipe away excess sealant.

CAUTION: **WHEN FORMING A FAYING SEAL AROUND THE VALVE BODY, ENSURE THAT THE VALVE INDICATOR POINTER REMAINS FREE TO MOVE WITH THE INTERNAL VALVE AND THAT SEALANT PENETRATION INTO THE ENCLOSURE BOX IS MINIMAL.**

(e) Using Pro-Seal 890 sealant, form a seal where valve body mates with inspection plate and coverplate. Ensure that motive flow indicator pointer remains free to move with internal valve and that sealant penetration into enclosure box is minimal.

(2) If motive flow fuel shutoff valve has been removed from enclosure box assembly, install valve in enclosure box. *(Aircraft 35-002 thru 35-348, 36-002 thru 36-045 modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines and per SSK 997, "Replacement of Motive Flow Valve Shroud Covers; 35-349 thru 35-609, 36-046 thru 36-053 and 36-055 modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers; and 35-610 and Subsequent, 36-054, 36-056 and Subsequent)*

(a) Clean all parts of old sealant.

(b) Install valve in enclosure box and secure with attaching parts. Safety wire bolts. Apply a fillet seal around bolt heads.

NOTE:
- Ensure that directional arrow, on valve, points inboard.
- Several different valve and cover combinations are used in the manufacture of these aircraft. If replacement valve has a part number different than was removed, the old cover must be replaced with a cover compatible with the new valve. Refer to the Illustrated Parts Catalog for compatible valve/cover combinations.

(c) Install fittings in valve. Use new O-rings lubricated with petroleum jelly or jet fuel.

NOTE: Orient elbow fitting so that it will align with motive flow line when installed in the aircraft. Secure elbow fitting with jam nut.

(d) On *Aircraft 35-610 thru 35-659 and 36-054, 36-056 thru 36-063 not modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers,* apply a faying surface seal to both sides of a new gasket and position gasket on enclosure box.

(e) Install angle bracket and secure with attaching parts. Apply a fillet seal around bolt heads.

(f) Install cover on enclosure box and secure with attaching parts.

CAUTION: AVOID THE USE OF EXCESSIVE SEALANT AND GUN APPLICATION METHODS. ENSURE SEALANT DOES NOT INTERFERE WITH MOVEMENT OF THE VALVE INDICATOR ARM.

(g) Apply a fillet seal to the following areas:
  1) Cover-to-valve gap.
  2) Cover-to-enclosure box gap (outboard edge of box).
  3) Bolt and retainer at outboard end of cover.

(h) Tape over the open end and threads of the valve fittings to avoid contamination of the fittings with sealant.

(i) Apply a faying surface seal to the seal plates and install seal plates on enclosure box. Apply a fillet seal around the fittings and hole in seal plates.

(j) Remove tape from fittings.

(3) Position enclosure box assembly between mounting brackets and ensure that flow arrow on valve indicates proper position. Secure enclosure box assembly in place with attaching hardware.

CAUTION: WHEN FORMING A SEAL AROUND THE HEAD OF EACH BOLT, ENSURE THAT SEALANT PENETRATION INTO THE ENCLOSURE BOX IS MINIMAL.

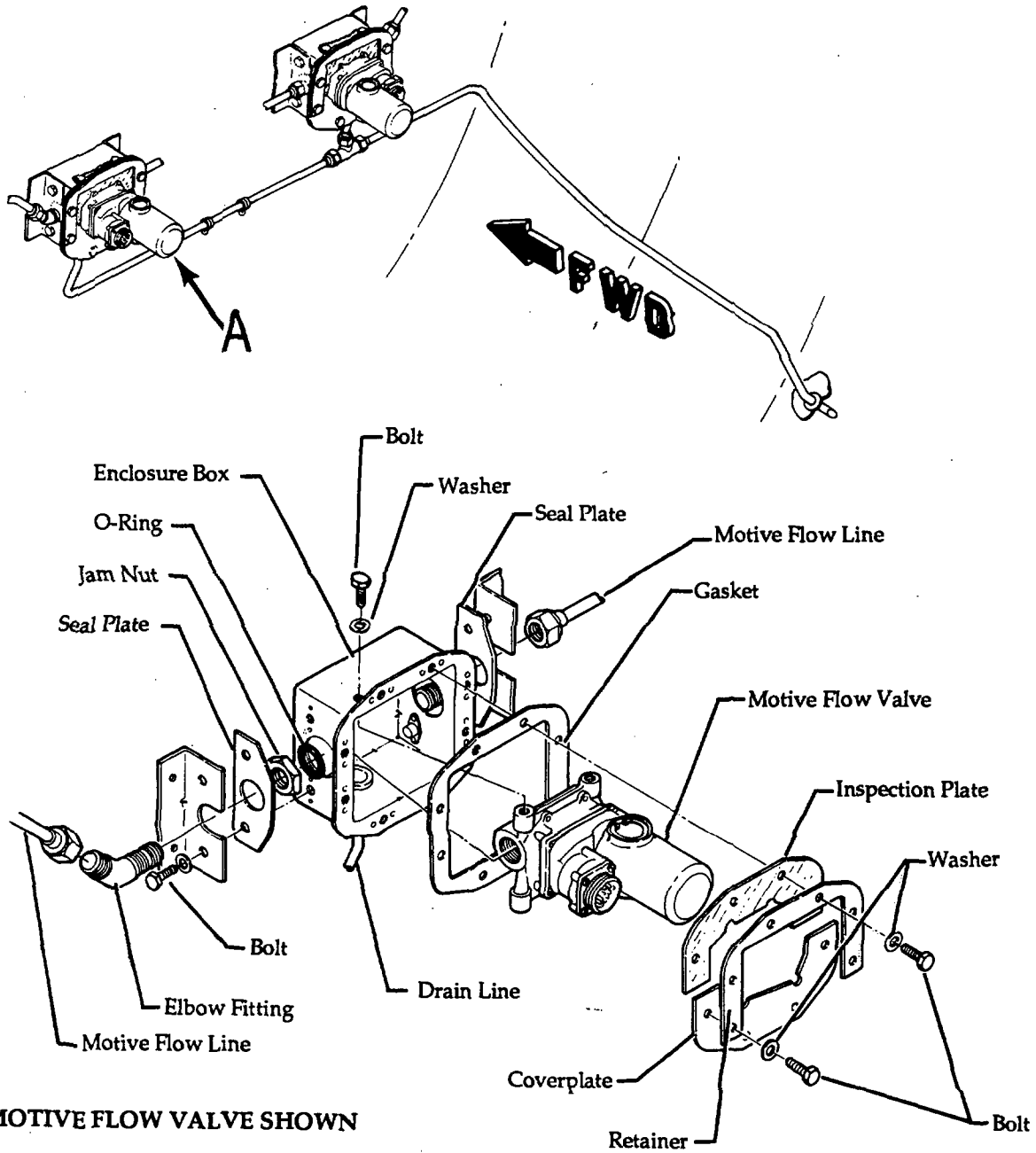
(4) Using Pro-Seal 890 sealant, form a seal around head of each attaching bolt.
(5) Connect electrical connector to valve.
(6) Connect drain line to enclosure box.
(7) Connect motive flow lines to both sides of the valve.
(8) If removed, install aircraft batteries. (Refer to Chapter 24.)
(9) Restore electrical power to aircraft.
(10) Perform operational check of valve.
(11) Start and operate respective engine per the FAA Approved Airplane Flight Manual.
(12) Switch fuel flow to jet pump operation and check for fuel leaks at motive flow fuel shutoff valve outside drain line.
(13) Shut down engines in accordance with the FAA Approved Airplane Flight Manual.
(14) Raise and secure tailcone access door.

2. Inspection/Check

A. Operational Check Motive Flow Fuel Shutoff Valve.

NOTE: The following procedure is applicable to either LH or RH valve.

(1) Lower tailcone access door.
(2) Set Battery Switches on.
(3) Set JET PUMPS Switch off; then on. In-transit annunciator, adjacent to switch, shall illuminate momentarily then extinguish after each setting of the switch. Using the indicator arm on the motive flow fuel shutoff valve, verify the valve is open when the respective JET PUMPS Switch is on and closed when the JET PUMPS Switch is off.
(4) Repeat step (3) twice more to verify proper valve operation.
(5) Set Battery Switches off.
(6) Raise and secure tailcone access door.



LH MOTIVE FLOW VALVE SHOWN

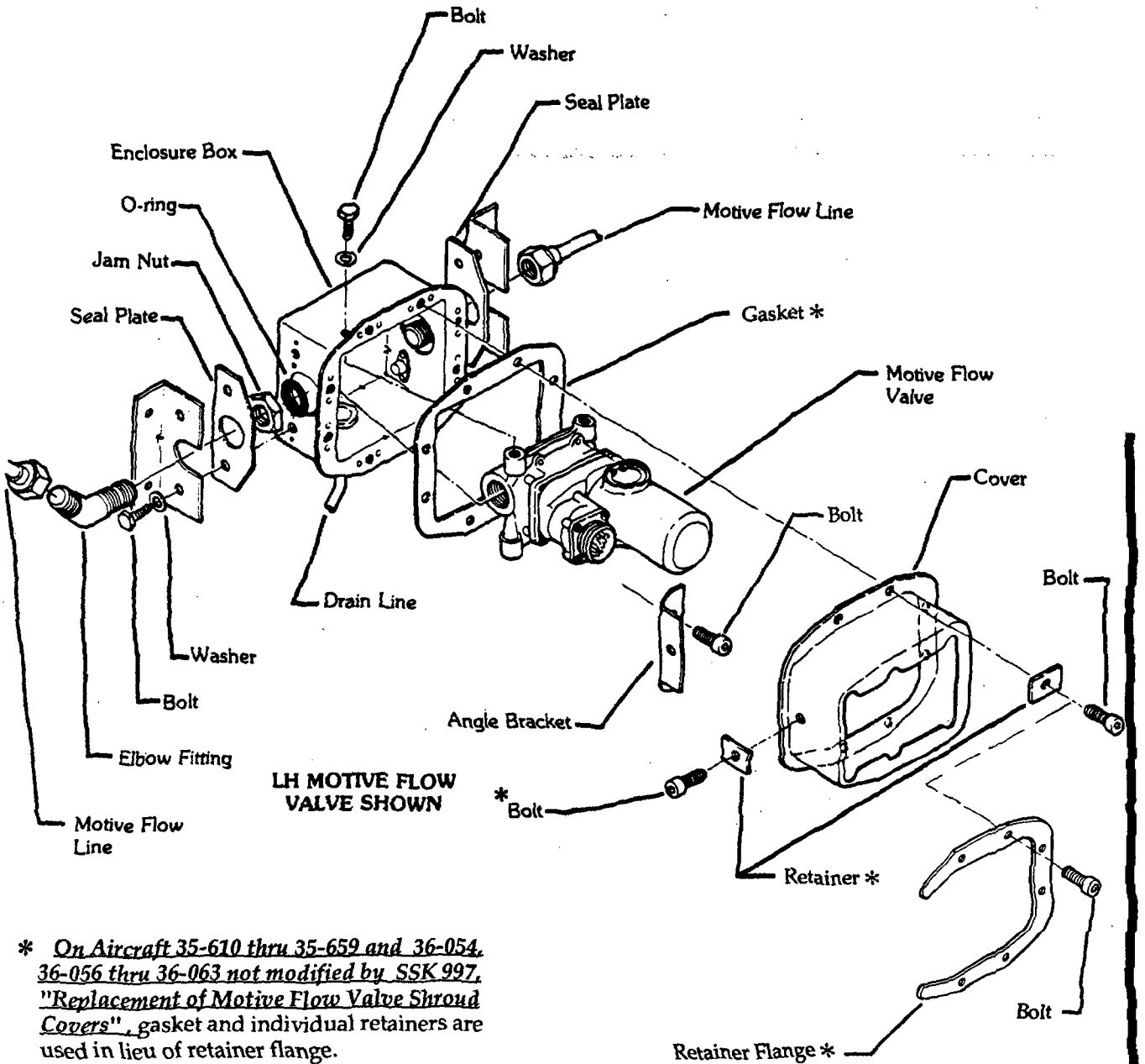
35-002 thru 35-348, 36-002 thru 36-045 modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines" and not per SSK 997, "Replacement of Motive Flow Valve Shroud Covers" and 35-349 thru 35-609, 36-046 thru 36-053, and 36-055 not modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers"

Detail A

12-92B-1
A12-92B

Motive Flow Fuel Shutoff Valve Installation
Figure 201 (Sheet 1 of 2)

EFFECTIVITY: NOTED



* *On Aircraft 35-610 thru 35-659 and 36-054, 36-056 thru 36-063 not modified by SSK 997, "Replacement of Motive Flow Valve Shroud Covers"*, gasket and individual retainers are used in lieu of retainer flange.

35-002 thru 35-348, 36-002 thru 36-045 modified per AMK 80-7, "Installation of Motive Flow Valve Shrouds and Drain Lines" and per SSK 997, "Replacement of Motive Flow Valve Shroud Covers"; 35-349 thru 35-609, 36-046 thru 36-053, and 36-055 modified per SSK 997, "Replacement of Motive Flow Valve Shroud Covers" ; and 35-610 and Subsequent and 36-054, 36-056 and Subsequent.

Detail A

A12-92B-1
A12-92B-4

Motive Flow Fuel Shutoff Valve Installation
Figure 201 (Sheet 2 of 2)

EFFECTIVITY: NOTED

RELIEF VALVE - MAINTENANCE PRACTICES

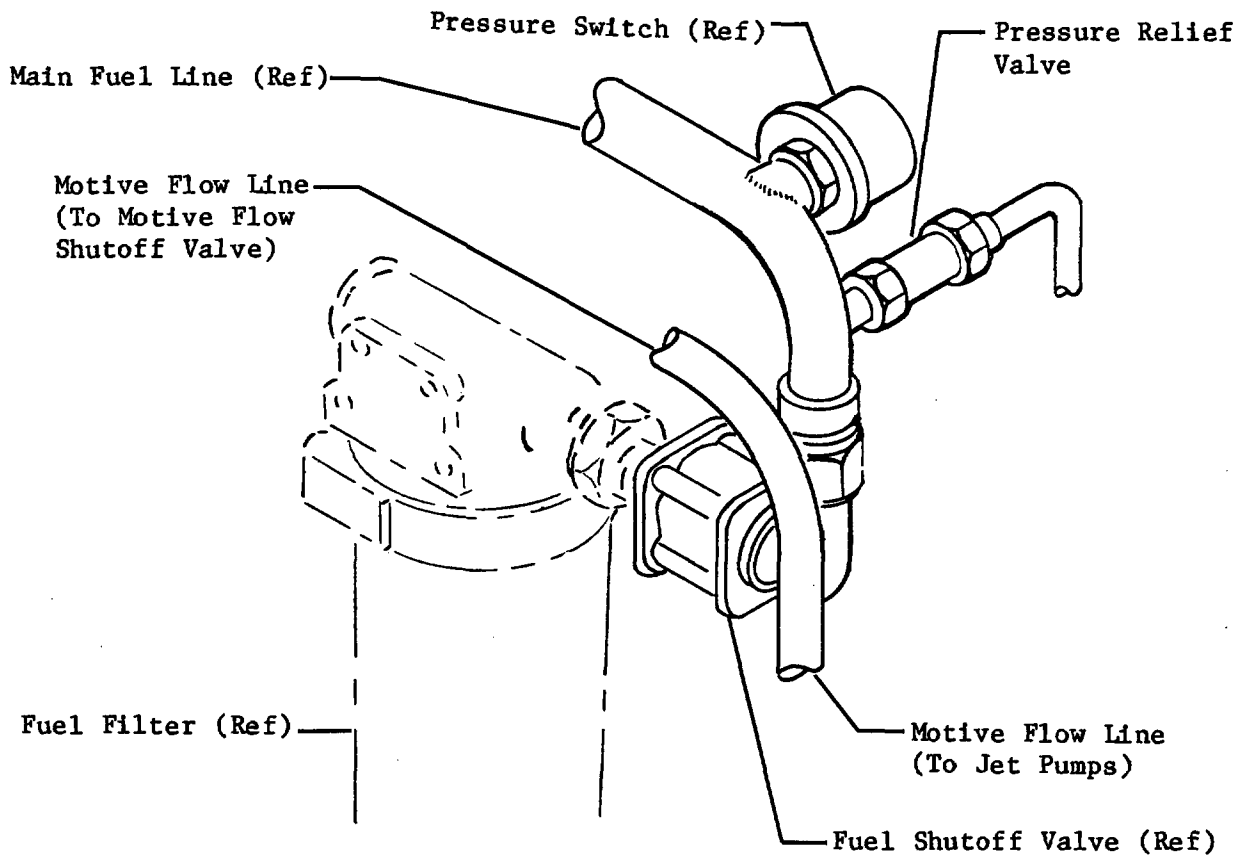
1. REMOVAL/INSTALLATION

A. Remove Relief Valve (See figure 201.)

(1) Lower tailcone access door.
(2) Disconnect drain line.
(3) Remove relief valve and O-ring from main fuel line.

B. Install Relief Valve (See figure 201.)

(1) Install O-ring and relief valve in main fuel line.
(2) Connect drain line.
(3) Secure tailcone access door.



Relief Valve Installation
Figure 201

FUEL CONTROL RELAY PANEL - MAINTENANCE PRACTICES

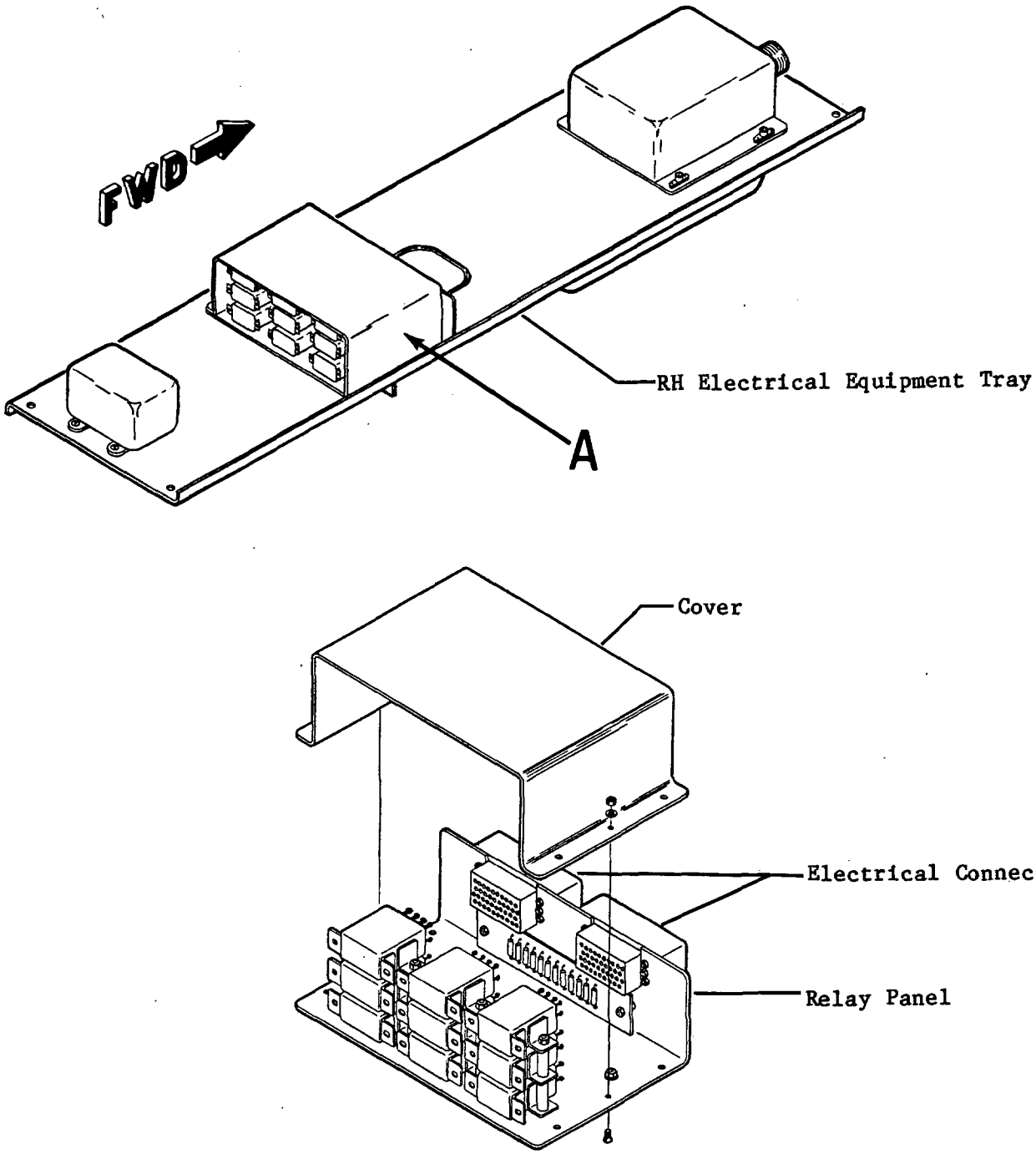
1. **REMOVAL/INSTALLATION**

   A. Remove Fuel Control Relay Panel (See figure 201.)

   (1) Lower tailcone access door.
   (2) Disconnect aircraft batteries.
   (3) Disconnect electrical connectors from fuel control relay panel.
   (4) Loosen and remove attaching parts and fuel control relay panel from electrical equipment tray.

   B. Install Fuel Control Relay Panel (See figure 201.)

   (1) Install fuel control relay panel and secure with attaching parts.
   (2) Connect electrical connectors to relay panel
   (3) Connect aircraft batteries.
   (4) Raise and secure tailcone access door.



Detail A

Fuel Control Relay Panel
Figure 201

FUEL SUPPLY LINE CHECK VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove the Fuel Supply Line Check Valve as follows:

NOTE: Removal and installation of the fuel supply line check valves are identical except for location.

(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Remove lower fuselage access panels to gain access to the fuel supply line check valves.
(3) Disconnect plumbing from check valves and remove check valves from tee.

CAUTION: PROTECTIVE CAPS MUST BE INSTALLED TO PREVENT SYSTEM CONTAMINATION.

(4) Install protective caps on fuel lines to protect system from contamination.

B. Install the Fuel Supply Line Check Valve as follows:

(1) Install check valves in tee using a new O-ring.
(2) Remove protective caps from fuel supply lines and connect fuel supply line plumbing to fuel supply line check valve.
(3) Install lower fuselage access panels.
(4) Fuel the aircraft. (Refer to Chapter 12.)

2. INSPECTION/CHECK

A. Inspect the Fuel Supply Line Check Valves in accordance with the intervals described in Chapter 5.

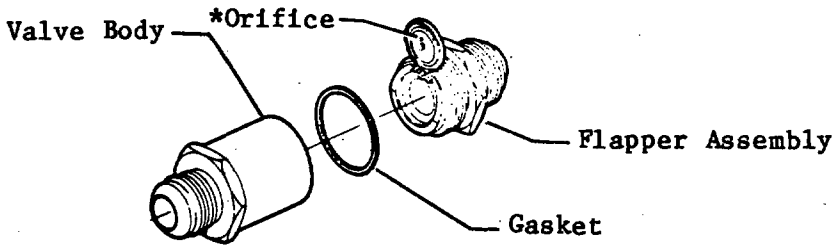
(1) Remove the fuel supply line check valves in accordance with paragraph 2.A.

NOTE: Disassembly of the check valve is not normally required unless the check valve is extremely contaminated. If valve must be disassembled, it must be reassembled using a new gasket. (See figure 201.)

(2) Hold valve assembly next to a light source and look through the center of the valve to assure that the orifice is not obstructed. If necessary, clean orifice and thoroughly flush valve using kerosene.

NOTE: The orifice in the flapper is either next to the rivet or through the rivet.

(3) Inspect flapper to ensure proper movement. Flush or clean flapper hinge with kerosene as required to ensure proper movement.
(4) Install fuel supply line check valve in accordance with paragraph 2.B.



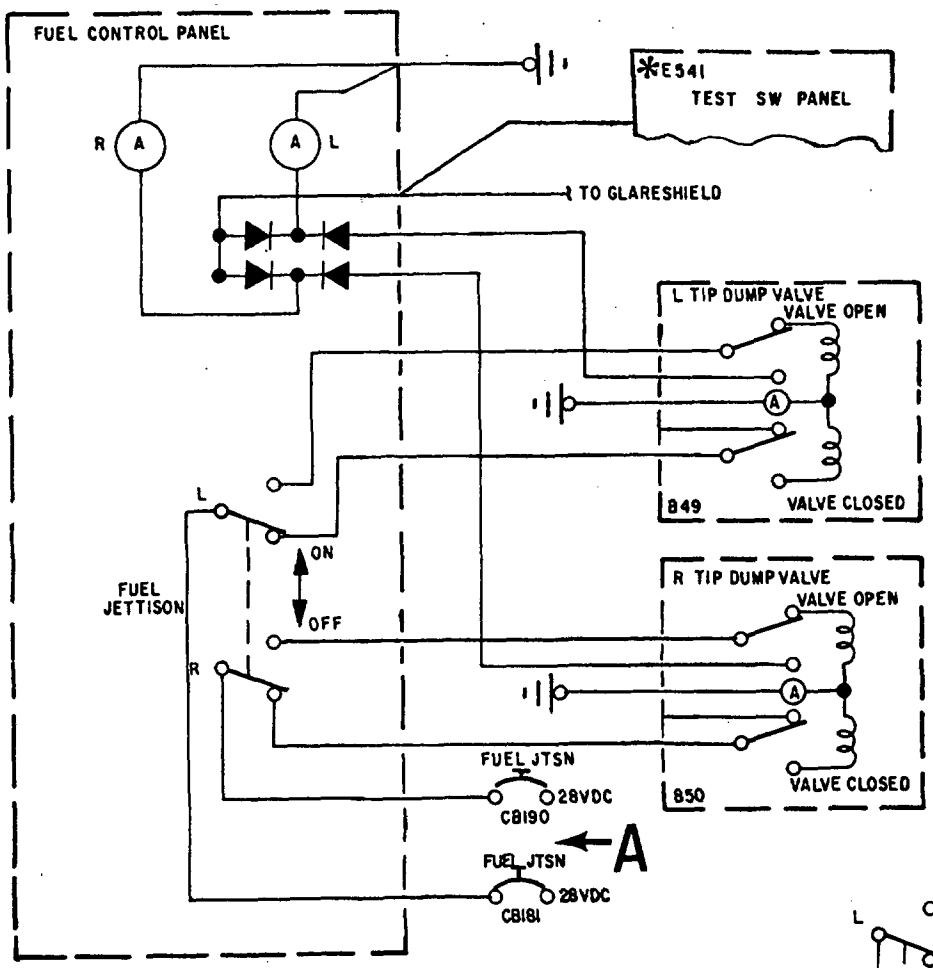
*Orifice may be located through center of rivet in lieu of location shown.

Fuel Supply Line Check Valve
Figure 201

FUEL JETTISON - DESCRIPTION AND OPERATION

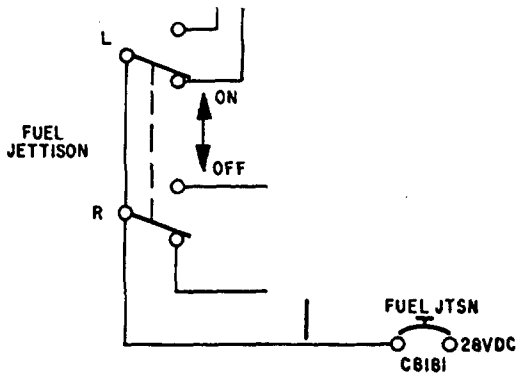
1. **DESCRIPTION**
   A. On Aircraft 35-002 thru 35-032, 35-035 and 36-002 thru 36-013, 36-015, 36-016 not modified by AMK 75-5A, "Installation of Separate Fuel Jettison Circuits," the fuel jettison system consists of two (amber) indicator lights, a system switch, a shutoff valve in each tip tank, and a circuit breaker.
   B. On Aircraft 35-033, 35-034, 35-036 and 36-017 and prior aircraft modified per AMK 75-5A, "Installation of Separate Fuel Jettison Circuits," the system consists of two (amber) indicator lights, a system switch, a shutoff valve in each tip tank, and two circuit breakers.
   C. On Aircraft 35-148 thru 35-369, 35-371 thru 35-389 and 36-036 thru 36-047, the fuel jettison system is provided with a test circuit which enables the operator to test the system indicator lights.

2. **OPERATION** (See figure 1.)
   A. Setting the Fuel Jettison Switch on the fuel control panel to ON applies 28 vdc power to open the shutoff valves in each tip tank. This allows the fuel to gravity flow from each tip tank. When the shutoff valves are in the open position, the two indicator lights adjacent to the switch will illuminate, giving a positive indication of system operation.



*Aircraft 35-148 thru 35-369, 35-371 thru 35-389 and 36-036 thru 36-047.

Aircraft 35-033, 35-034, 35-036 and Subsequent and 36-014, 36-017 and Subsequent and prior aircraft modified per AMK 75-5A, "Installation of Separate Fuel Jettison Circuits"



Aircraft 35-002 thru 35-032, 35-035 and 36-002 thru 36-013, 36-015, 36-016 not modified per AMK 75-5A, "Installation of Separate Fuel Jettison Circuits"

Detail A

Fuel Jettison Electrical Control Schematic
Figure 1

FUEL JETTISON SHUTOFF VALVE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

NOTE: The following procedure is applicable to either fuel jettison system.

A. Remove Fuel Jettison Shutoff Valve (See figure 201.)

(1) Drain tip tank. (Refer to Chapter 12.)
(2) Remove tip tank tailcone access cover.
(3) Disconnect wiring from flux valve. Tag wiring.
(4) Remove attaching parts and flux valve from bracket.
(5) Remove tip tank tailcone. (Refer to 28-11-05.)
(6) Disconnect electrical connector from shutoff valve.
(7) Remove attaching parts and shutoff valve from tip tank.

B. Install Fuel Jettison Shutoff Valve (See figure 201.)

(1) Install O-rings, shutoff valve, and tube assembly and secure with attaching parts.
(2) Connect electrical connector to shutoff valve.
(3) Install tip tank tailcone. (Refer to 28-11-05.)
(4) Install flux valve on bracket and secure with attaching parts.
(5) Connect wiring to flux valve.
(6) Calibrate flux valve. (Refer to Chapter 34.)
(7) Apply a thin continuous coat of anti-corrosion grease to access cover. (Refer to 28-11-00.) Install access cover.
(8) Perform Inspection/Check of shutoff valve.
(9) Fuel tip tank and check for leaks. (Refer to Chapter 12.)

2. INSPECTION/CHECK

A. Operationally Check Fuel Jettison Shutoff Valve

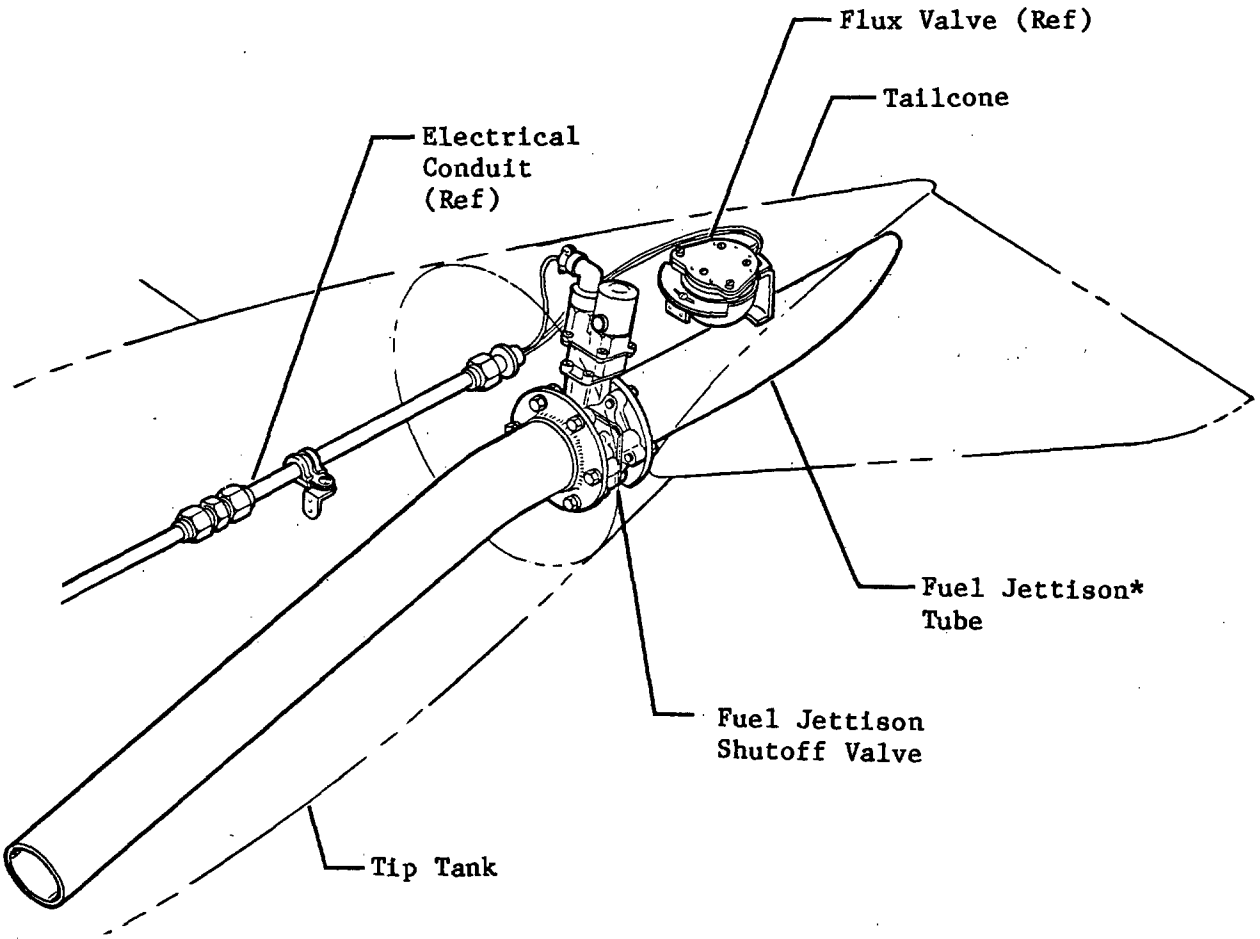
(1) Defuel the tip tanks.

NOTE: The following instructions are applicable to both fuel jettison shutoff valves.

(2) Using a flashlight, inspect fuel jettison shutoff valve and inside of jettison tube for foreign material, grit, and dust. Clean as required. (See figure 201.)
(3) Set Battery Switches to BAT 1 and BAT 2.
(4) Position an observer at tip tank tailcone.

CAUTION: THE FUEL JETTISON SHUTOFF VALVE SHOULD OPEN WITHIN 3 SECONDS. IF VALVE FAILS TO OPEN WITHIN 3 SECONDS, IMMEDIATELY SET SWITCH TO CLOSE. THIS IS TO PREVENT BURNING OUT THE VALVE MOTOR.

*Inspect valve and tube for foreign material and grit. Observe valve position through this tube.



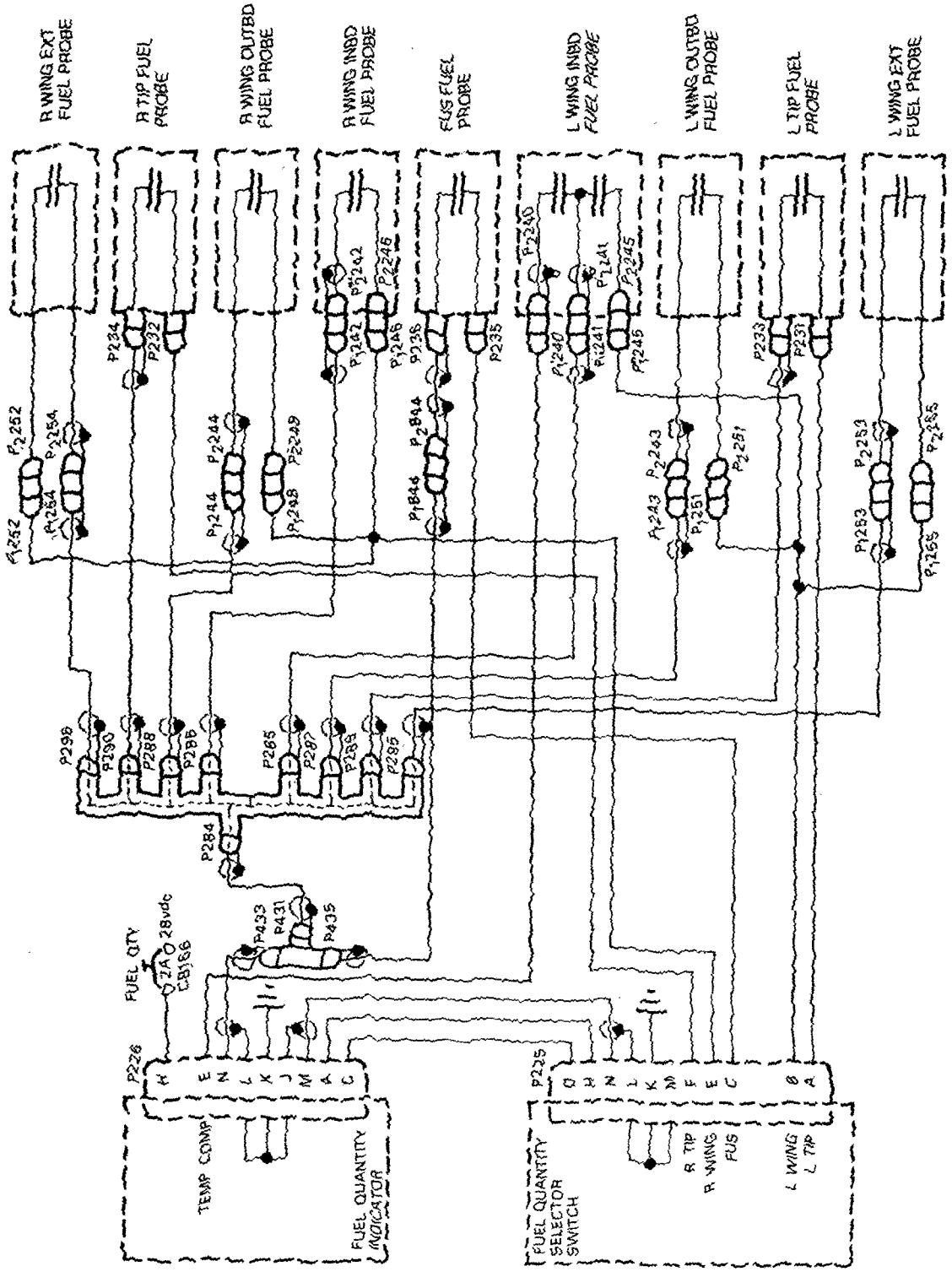
Fuel Jettison System Installation - (Typical)
Figure 201

12-13D-1

(5) Set Jettison Switch to OPEN; observe that valve opens and panel indicator light illuminates. If the valve fails to operate, troubleshoot the valve electrical circuit. If there are no electrical faults, replace the valve.
(6) Set Jettison Switch to CLOSE. Observe that valve closes and indicator light extinguishes.
(7) At the next refueling operation, check fuel jettison shutoff valves for fuel leaks. If a leak is found, defuel tip tank and open fuel jettison shutoff valve. Clean valve sealing surfaces of all foreign material. Close valve and recheck for fuel leaks.
(8) Set Battery Switches to OFF.

INDICATING - DESCRIPTION AND OPERATION

1. Description
   A. A capacitance-type fuel quantity indicating system is installed in the aircraft. The system components consist of an indicator and a selector switch on the fuel control panel and nine tank unit probes.
   B. The fuel quantity indicating system consists of five individual probe circuits with output signals being applied to the fuel quantity indicator through the fuel quantity selector switch.
      (1) The three RH wing tank fuel probes are connected in parallel with the resultant output signal applied to the selector switch.
      (2) The three LH wing tank fuel probes are connected in parallel with the resultant output signal applied to the selector switch.
      (3) The fuselage, RH tip tank and LH tip tank fuel probes form separate individual circuits with output signals applied to the selector switch.
      (4) The fuel probes are variable capacitors located in each fuel tank to sense fuel quantity. Each fuel probe consists of two concentric electrodes which are rigidly spaced at intervals throughout their length by insulating centering spacers. The inner electrode consists of a main body of insulating material with two separate insulating conducting surfaces around its outside face. One conducting surface is connected to the amplifier common output and the other is connected to the amplifier high input of the system bridge circuit located in the indicator. The outer electrode is an aluminum tube coated on the outside with insulating materials. Openings in the probes permit fuel to flow between the electrodes to the same level as that in the tank. Electrical connectors to the fuel probes are made through quick-disconnect electrical connectors. The fuel is the variable dielectric factor of the capacitor. Capacitance of the fuel probes provides a continuous signal to the fuel quantity indicator. The fuel probes are part of the system bridge circuit which receives power from the secondary winding of the power transformer located in the fuel quantity indicator.
      (5) A total of six fuel probes are located throughout the integral wing tanks. Two probes (one LH and one RH) are located at WS 193 between spars 3 and 4. Two probes (one LH and one RH) are located at WS 108 between spars 4 and 5. The remaining probes (one LH and one RH) are located near wing centerline between spars 3 and 5. The probes are mounted on the wing access panels. Electrical connections to the outboard probes are made at spar 7. The inboard probe electrical connections are made at the wing access cover.
      (6) A fuel probe is installed in each tip tank junction box. Access to the fuel probe installation is gained by removal of the junction box access cover.
      (7) A fuel probe is installed in the right side of the fuselage tank. Access to the fuel probe is gained through the top of the fuselage.
   C. The indicator basically consists of a hermetically sealed combination transistor power unit and indicator. Its function is to amplify a signal caused by inbalance in a bridge circuit and to convert this signal into a visual indication of fuel quantity in pounds. The unit, of subminiature construction, includes a self-balancing bridge circuit, amplifier stages, motor, gear train, and an indication dial. Electrical connection is made through a single multipin connection on the back of the unit. FULL and EMPTY adjustment screws are located on the back of the indicator.
   D. The switch is a cylindrical-shaped, six-position rotary unit located adjacent to the fuel quantity indicator. It permits reading of each tank quantity separately as well as the total quantity of the system. On *Aircraft 35-511 and Subsequent*, the fuel selector switch includes five zero adjustment potentiometers accessible on the back of the switch.



Fuel Quantity Indicating Electrical Schematic
Figure 1

INDICATING - TROUBLE SHOOTING

1. TROUBLE SHOOTING

NOTE: ° Fuel quantity indicating errors can be attributed to a number of causes.

° The fuel quantity indicating system is a capacitance system that uses the fuel as the dielectric to vary the capacitance of the probe. This is a comparison between a full tank of fuel and an empty tank. The capacitance signal is directed to a self-balancing bridge circuit contained within the indicator.

° Also, the differences in fuels affect the accuracy in the system.

° Fuel quantity indicating errors are overcome by using a compensating probe in the LH inboard tank position. The compensating probe is similar to the uncompensated probes except it has an additional plate at the bottom end of the probe. The compensating plate measures the fuel density and directs a correcting signal in the balancing bridge circuit within the indicator. For example: a fuselage tank is filled with fuel but the compensating probe in the left wing tank is not covered with fuel. The fuel quantity reading will be in error because the compensator is unable to correct for the difference in fuel. This can be remedied by fueling the left wing tank.

° The most common causes of fuel quantity indicating errors are defective connectors where the wires are loose, broken, or shorted. Shorting or grounding the shielding will also result in quantity indicator errors. The shielding is grounded in the indicator only.

A. Visually inspect the system for loose, broken, or shorted wires; connectors and probes for proper installation; indicator and selector switch for proper installation, and shorts or grounding wire shields. If, after correcting all of the preceding probable causes of trouble, the system is not operating properly, perform the functional test of the system.

1. ADJUSTMENT/TEST

NOTE: One of the following functional tests (utilizing the TF-20 or 2548-( ) test sets) is to be used if extensive work has been accomplished on the fuel gaging system and/or as a trouble shooting guide.

A. Tools and Equipment

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

NAME	PART NUMBER	MANUFACTURER	USE
Liquid Quantity Test Set or	Model TF-20	Consolidated Airborne Systems Inc. 900 Third Avenue New Hyde Park, L.I., N.Y.	Functional test of fuel gaging system.
Test Set	Model 2548-( )	Barfield Instrument Corp. P.O. Box 420537 Miami, FL 33242-0537	Functional test of fuel gaging system.
Adapter Harness	101-00438	Barfield Instrument Corp.	
Coaxial Cables (1 ea. Red, White, & Blue)	101-01008	Barfield Instrument Corp.	
VOM	260	Simpson	Resistance measurements

B. Functionally Test Fuel Gaging System using TF-20 Test Set (*Aircraft 35-002 thru 35-510, 36-002 thru 36-055*) (See figures 201 and 202.)
   (1) Defuel the aircraft. (Refer to Chapter 12.)
   (2) Connect TF-20 test set to aircraft 115 vac power source and connect TF-20 test set ground binding post to the aircraft ground.

   NOTE: All calibrations and checks of fuel quantity system must be made with 28.0 to 28.5 volts DC available at the generator control panel battery charging bus. One hundred fifteen (115) vac is provided by disconnecting the Primary Vertical Gyro electrical connector and inserting TF-20 power lead into the receptacle providing 115 vac. (Refer to applicable avionics wiring diagrams.)

   (3) Set Battery and Inverter Switches on.
   (4) Set TF-20 ON-OFF Switch ON and allow warm-up time of at least 5 minutes.
   (5) Set ZERO ADJ controls as follows:
      (a) Rotate FUNCTIONAL SELECTOR to CAP IND-ZERO CAL and CAP-RES CHECK SELECTOR to CAP.
      (b) Rotate capacitance RANGE SELECTOR to x 1.
      (c) Check that both pointers on CAPACITANCE UUF dial are on their respective zero index marks.

(d) If not on zero, remove protective cover from front panel ZERO ADJ control and, using a screwdriver, vary adjustments as required to zero the indicators.
(e) Rotate RANGE SELECTOR to x 3, x 10, and x 50. Check that pointers do not shift from zero.

(6) Set HIGH ADJ controls as follows:
(a) Rotate FUNCTION SELECTOR TO CAP IND - HIGH CAL.
(b) Check value of capacitance shown on front panel metal strip for STANDARD CAPACITANCE MMF designation.
(c) Set RANGE SELECTOR to lowest multiplier that will permit reading STANDARD CAPACITANCE UUF value on CAPACITANCE UUF dial.

Example: If the metal strip shows a value of 968.9, rotate RANGE SELECTOR to x 10 position to permit reading this value on CAPACITANCE UUF dial.

(d) The CAPACITANCE UUF pointer should now deflect to calibrating value shown on metal strip. If dial pointers fail to deflect to this value, remove protective cover from front panel HIGH ADJ control. Using a screwdriver, adjust controls to obtain required capacitance indication on CAPACITANCE UUF dial.

(7) Repeat steps (5) and (6) to assure that calibration of one control has not affected the other.

(8) Calibrate megohmmeter as follows:
(a) Rotate megohmmeter RANGE SELECTOR to ZERO CAL.
(b) Check that pointer deflects to ZERO CALIBRATION. If not on zero, remove cover from front panel ZERO ADJ control. Using a screw-driver, adjust controls until pointer indicates ZERO CALIBRATION.
(c) With CAP-RES CHECK switch in any position except CAP, rotate megohmmeter RANGE SELECTOR to MIDSCALE CAL.
(d) The megohmmeter pointers will deflect to MIDSCALE CALIBRATE index line. If pointer is not on index line, remove cover from MIDSCALE ADJ. Using screwdriver, adjust controls until pointer is on index line.

(9) Repeat step (8) to assure that calibration of one control has not affected the other.

(10) Remove attaching parts, disconnect electrical connector from fuel quantity indicator and remove fuel control panel sufficiently to rest fuel control panel on pedestal.

(11) Connect one multi-pin connector from TF-20 adapter harness (indicator side) to the receptacle at rear of fuel quantity indicator. Connect second multi-pin from TF-20 adapter harness (tank unit side) to aircraft wiring. (See figure 201.)

(12) Connect two branch groups of leads to proper receptacle on TF-20 test unit as follows:
(a) Connect three leads in branch marked (TANK UNIT) to the appropriate TANK UNIT COMP-COAX-UNSH receptacles at the top center of the test unit.

NOTE: A fourth lead is supplied for grounding purposes; connect this lead to the "GND" terminal (upper left side of test unit). Remove ground previously attached in step B.(2).

(b) Connect three leads in the second branch marked (INDICATOR) to the appropriate TEST IND "COAX" - "UNSH" - "COMP" receptacles (lower right side of test unit).

(13) Check fuel probe resistance as follows (fuel tanks must be empty):
(a) Rotate FUNCTION SELECTOR to TANK UNIT TEST-UNSH position and rotate CAP-RES CHECK Switch to A-B (lower set of symbols).

NOTE: In measuring resistances of the probes, always set megohmmeter RANGE SELECTOR to the multiplier factor where the pointer of the MEGOHMS meter deflects close to mid-scale.

(b) Rotate Fuel Quantity Selector Switch to each tank position and check for allowable leakage resistance tolerance of 50 megohms minimum. This check measures resistance between probe elements.

(c) Rotate CAP-RES CHECK Switch to A-GRD. Rotate Fuel Quantity Selector Switch to each tank position and check for minimum resistance of 30 megohms. This check measures resistance between center conductor of the coaxial probe and chassis ground.

(d) Set CAP-RES CHECK Switch to B-GRD. Rotate Fuel Quantity Selector Switch to each tank position and check for minimum resistance of 30 megohms. This check measures the resistance between unshielded lead and chassis ground.

(14) Check fuel probe capacitance as follows:

(a) With FUNCTION SELECTOR rotated to TANK UNIT TEST-UNSH, rotate CAP-RES CHECK Switch to CAP.

(b) Rotate Fuel Quantity Selector Switch to each tank position and check capacitance reading. (Refer to Table 201.)

EMPTY	35/35A	36/36A
L. Wing Tip	27.7 (±0.67)	27.7 (±0.67)
Left Wing	22.4 (±0.67)	22.4 (±0.67)
Fuselage	26.4 (±0.67)	48.2 (±0.67)
Right Wing	22.4 (±0.67)	22.4 (±0.67)
R. Wing Tip	27.7 (±0.67)	27.7 (±0.67)

Fuel Probe Capacitance Reading - MMF

Table 201

(15) Check the compensator (left wing inboard probe) by rotating FUNCTION SELECTOR to TANK UNIT TEST-COMP and check for capacitance of 30.3 (±0.7) UUF (fuel sump dry). If wet, capacitance is 63.5 (±0.7) UUF.

(16) Disconnect test unit electrical connectors from fuel quantity indicator and aircraft wiring. Connect electrical connector (P226) to fuel quantity indicator.

(17) Rotate Fuel Quantity Selector Switch to TOTAL and adjust empty potentiometer "E" on back of fuel quantity indicator for zero pounds indication.

(18) Connect TF-20 test unit to aircraft wiring per figure 201.

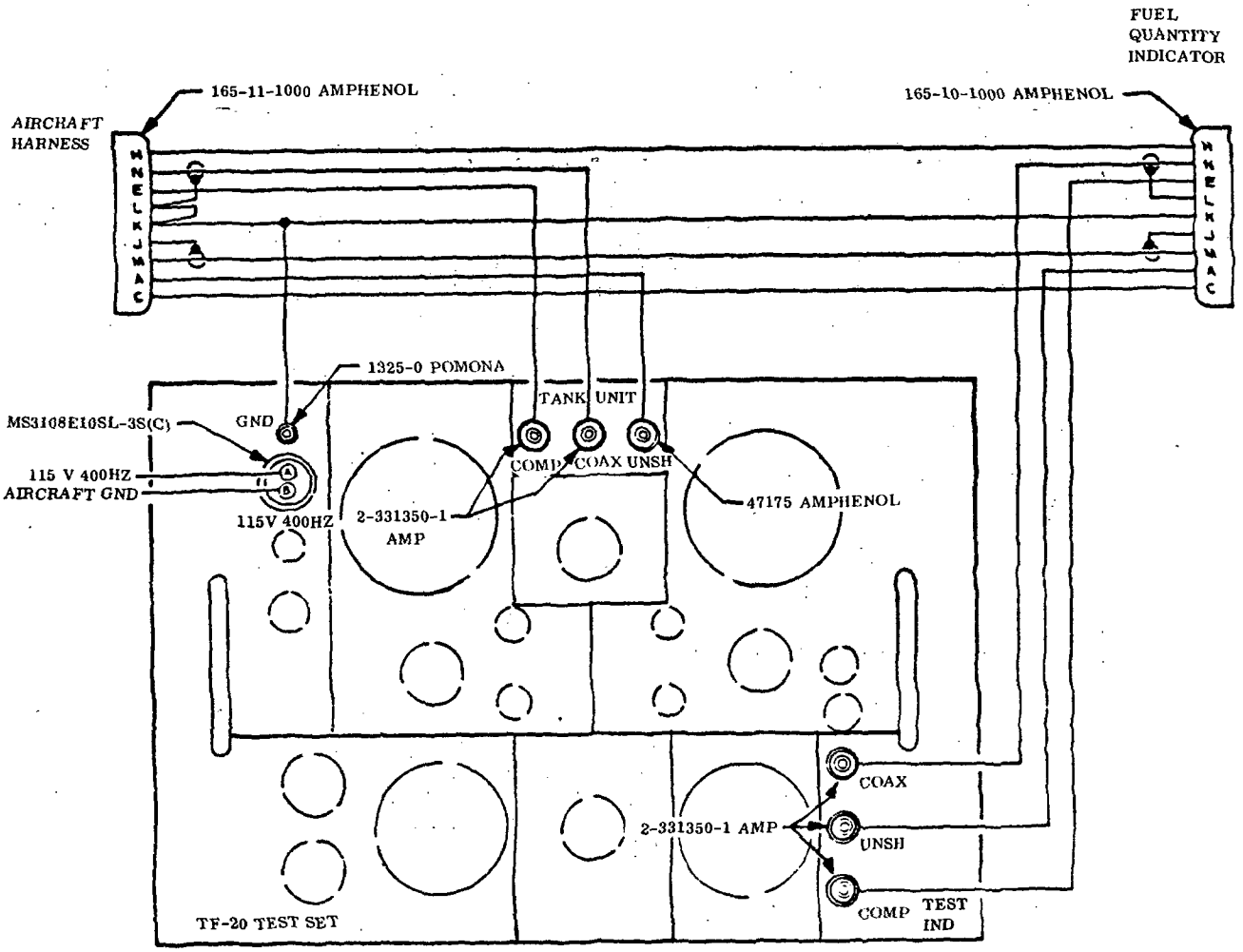
CAUTION: CHECK SELECTOR SWITCH AND FUEL QUANTITY INDICATOR PART NUMBERS. *ON AIRCRAFT 35-002 THRU 35-510*, FUEL QUANTITY SELECTOR SWITCH RG55B125 MUST NOT BE INSTALLED WITH JG911A7 FUEL QUANTITY INDICATOR AND *ON AIRCRAFT 36-002 THRU 36-055*, FUEL QUANTITY SELECTOR SWITCH RG55B124 MUST NOT BE INSTALLED WITH JG911A6 FUEL QUANTITY INDICATOR. SEE TABLE 202 FOR ALLOWABLE COMBINATIONS OF FUEL QUANTITY SELECTOR SWITCHES AND INDICATORS.

NOTE: Ensure that the TF-20 test unit is warmed up and zeroed per steps B.(2) thru B.(9).

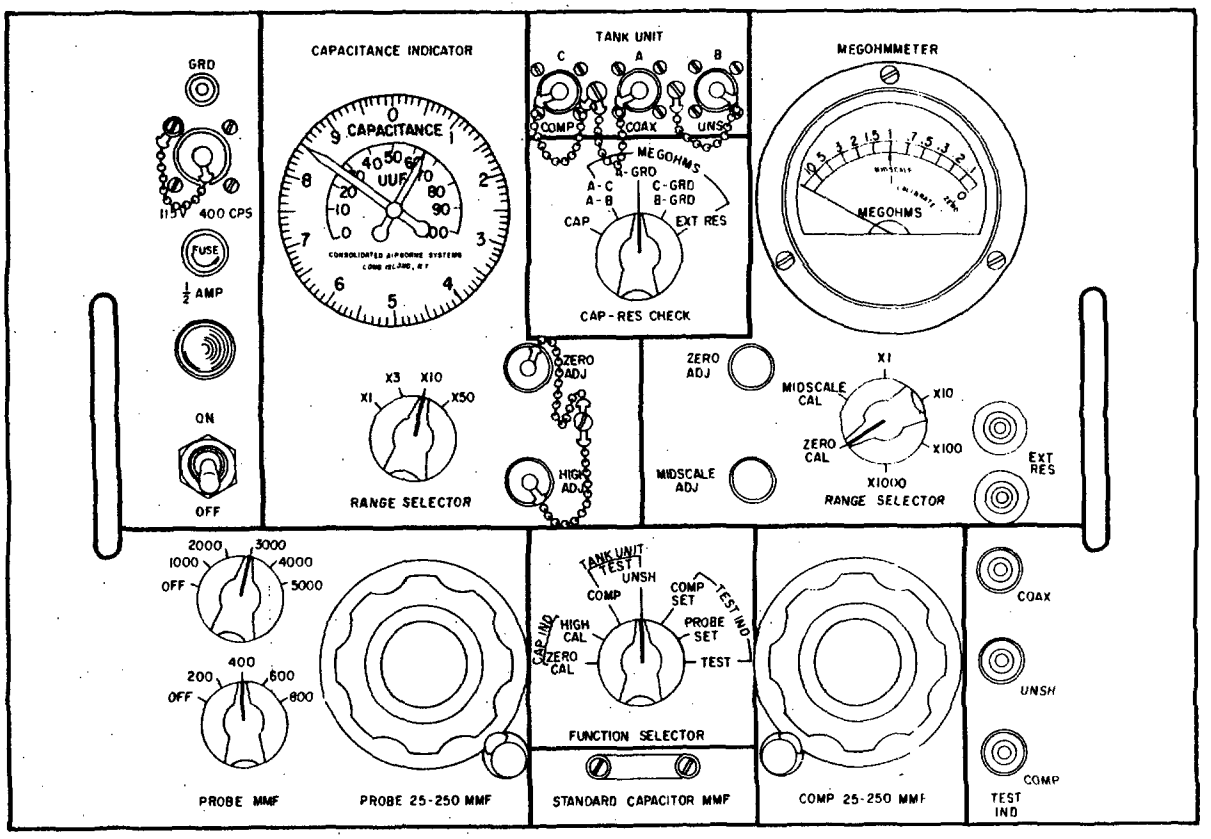
(19) Rotate CAP-RES CHECK Switch to CAP and rotate FUNCTION SELECTOR to TEST-IND-COMP SET.

(20) Loosen COMP capacitor knob clamp and rotate knob to obtain the desired reading on the CAPACITANCE UUF dial. (Refer to table 202 for desired reading.)

(21) Tighten clamp to lock COMP capacitor knob in place.



Fuel Quantity Probe Test Setup
Figure 201



Fuel Quantity Test Box
Figure 202

Step	Model	Req'd Range Selector Switch Position	*See Part Numbers Below		**See Part Numbers Below		Full Scale Ind. (lbs)
			UUF Indicator Reading for x 3 Position	Full Scale Capacitance	UUF Indicator Reading for x 3 Position	Full Scale Capacitance	
(20)	35/36	N/A	63.5 MMF	N/A	62.9 MMF	N/A	N/A
(24)	36	x 3	101.6 UUF	304.9 UUF	103.2 UUF	309.6 UUF	8000
(24)	35	x 3	87.83 UUF	263.5 UUF	90.2 UUF	270.6 UUF	7000

*35-002 thru 35-510 - RG55B125 Selector Switch with JG911A107 or JG911A207 Indicator.
*36-002 thru 36-055 - RG55B124 Selector Switch with JG911A106 or JG911A206 Indicator.
**35-002 thru 35-510 - RG55B25 Selector Switch with JG911A7, JG911A107, or JG911A207 Indicator.
**36-002 thru 36-055 - RG55B24 Selector Switch with JG911A6, JG911A106, or JG911A206 Indicator.

Full Scale Capacitance Reading

Table 202

NOTE: Rotate RANGE SELECTOR to the lowest multiplier factor that will permit an accurate reading of the CAPACITANCE UUF dial.

(22) Rotate FUNCTION SELECTOR to TEST IND PROBE SET.
(23) Rotate "MMF in hundreds" switch to 200 MMF and rotate "MMF in thousands" switch to OFF.
(24) Loosen PROBE capacitor knob clamp and rotate knob to obtain the desired reading of main probe capacitance on CAPACITANCE UUF dial. (Refer to table 202 for desired reading.)
(25) Rotate FUNCTION SELECTOR to TEST IND TEST. This applies capacitance to the indicator; the indicator should register a full-scale reading, indicating the fuel tanks are full.
(26) If the indicator does not have a full-scale deflection, adjust full potentiometer "F" on back of fuel quantity indicator for a full scale deflection.
(27) Rotate FUNCTION SELECTOR to PROBE SET and check Fuel Quantity Indicator empty "E" setting. (Refer to steps B.(16) and B.(17).)
(28) Remove power from test setup and disconnect test leads from aircraft.
(29) Verify fuel quantity functional test. (Refer to Inspection/Check, this section.)
(30) Return aircraft to service.

C. Functionally Test Fuel Gaging System using Model 2548-( ) Test Set (*Aircraft 35-002 thru 35-510, 36-002 thru 36-055*) (See figures 203 and 204.)
(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Zero test set meter as folows:
(a) Set TANK CAP, thumbwheels to 62.9 pf.
(b) With test set OFF, set TEST FUNCTION to CAP BRIDGE.
(c) Turn test set ON; depress BATT TEST button. Meter pointer should read above BAT OK radial line.
(d) Press COMP CAL, and adjust COMP SIM for a zero reading on uA scale.
(e) Turn test set off.

NOTE:
- All tester functions are powered by self-contained standard alkaline batteries. The On/Off Switch controls battery power for all test functions and is switched off when the carrying case lid is closed. Battery life should be conserved by turning the switch off when test set power is not required.
- Aircraft inverters should be off during test set capacitance measurements.

(3) Measure adapter harness capacitance.
  (a) Pull FUEL QTY circuit breaker and connect adapter harness to test set per figure 204, detail D, except do not connect P226.
  (b) Set test set TEST FUNCTION to CAP BRIDGE.
  (c) Turn test set ON.
  (d) Depress PRESS TO MEASURE and adjust TANK CAP pf. for panel meter minimum reading. Value obtained on thumbwheels is adapter harness capacitance.

NOTE: Subtract adapter harness capacitance from all other capacitance measurements.

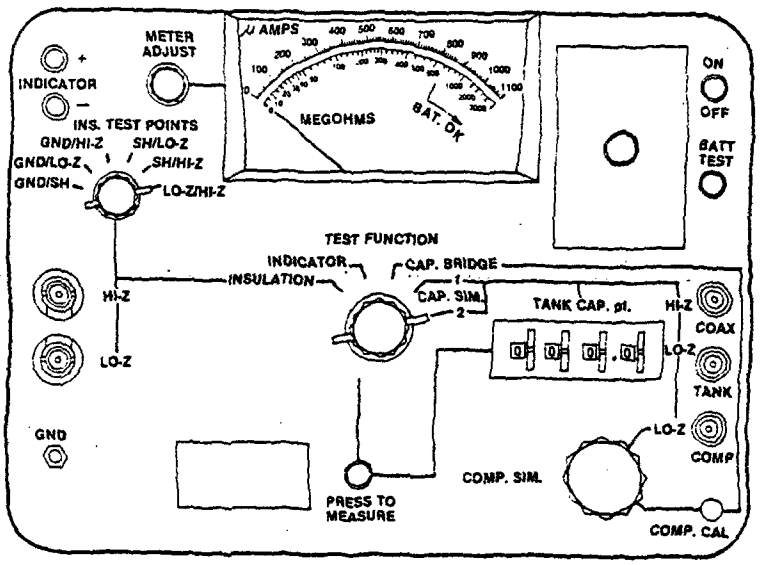
(4) Pull FUEL QTY circuit breaker and connect test set and adapter per figure 204, detail A.
(5) Test Fuel Quantity Indicator as follows.
  (a) Set TANK CAP to 126.4 pf. (35/35A) or 148.2 pf. (36/36A).
  (b) Set TEST FUNCTION to CAP SIM-1.
  (c) Depress FUEL QTY circuit breaker and turn test set ON.
  (d) Adjust empty potentiometer "E" on Fuel Quantity Indicator to bring pointer to zero graduation.
  (e) Reset TANK CAP pf. to FULL value 256.2 pf. (35/35A) or 305.6 pf. (36/36A) and adjust full potentiometer "F" on Fuel Quantity Indicator for FULL POUNDS indication - 6,600 pounds (35/35A) or 8,000 (36/36A).
  (f) Reset TANK CAP pf. for 126.4 pf. (35/35A) or 148.2 pf. (36/36A) and indicator value should return to zero.
  (g) If Fuel Quantity Indicator does not return to zero repeat steps (a) to (f). If unable to successfully complete these steps, replace defective Fuel Quantity Indicator.
  (h) Pull FUEL QTY circuit breaker and turn test set OFF.
(6) Test system insulation as follows:
  (a) Disconnect red, white, and blue coax cables from test set.
  (b) Set TEST FUNCTION to INSULATION and turn test set ON.
  (c) Turn METER ADJUST to set meter pointer to full scale infinity mark on MEGOHMS scale.
  (d) Turn test set OFF and connect test set and adapter per figure 204, detail B.
  (e) Turn test set ON.
  (f) Set INS TEST POINTS to each of the positions in table 203, switching the Fuel Quantity Selector Switch through each of its positions.

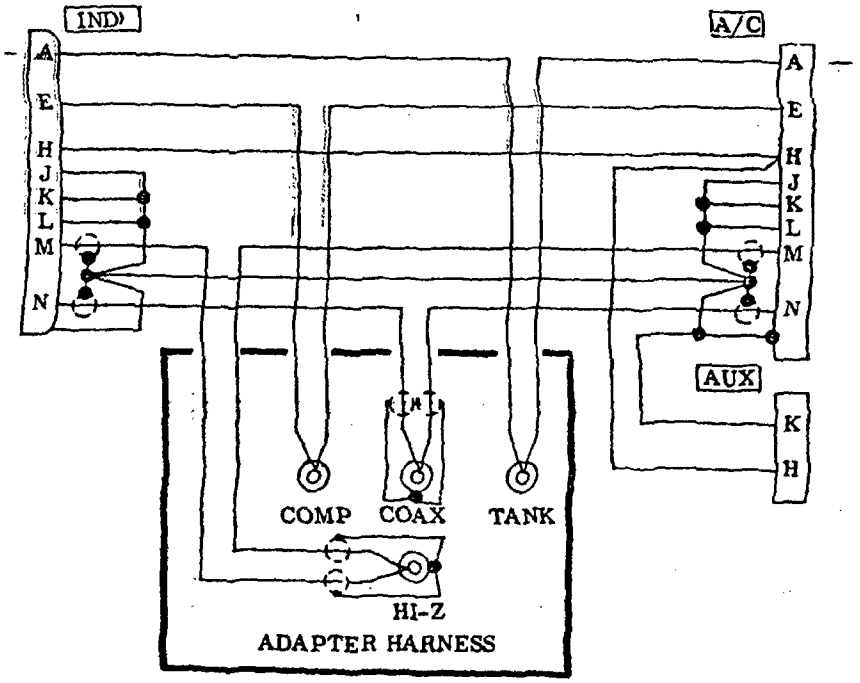
NOTE: Meter may drift after initial setting. Wait for steady reading or until reading exceeds minimum resistant allowable for each of the insulation tests.

TEST POINTS	MEGOHMS MINIMUM
GND/LO-Z	10
GND/HI-Z	10
SH/LO-Z	10
SH/HI-Z	10
LO-Z/HI-Z	100

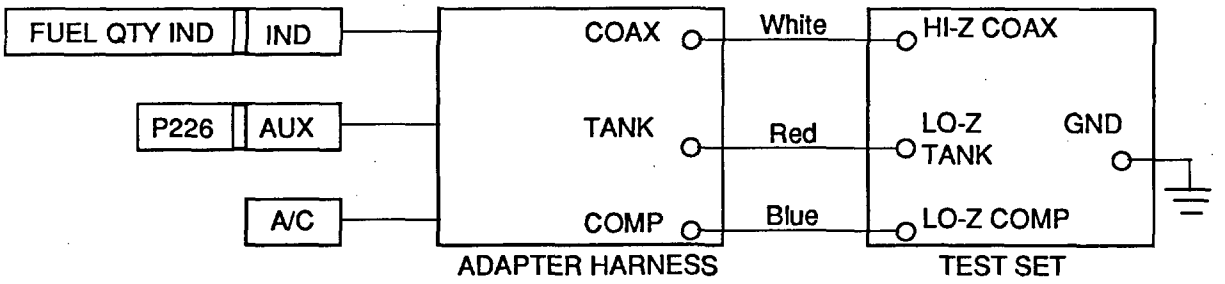
Table 203

  (g) Turn test set OFF and connect red coded coax to COMP of adapter harness and repeat steps (6)(e) and (6)(f).
(7) Test Fuel Quantity Selector Switch insulation as follows:
  (a) Turn test set OFF and connect test set and adapter harness per figure 204, detail C.
  (b) Perform steps (6)(e) and (6)(f).

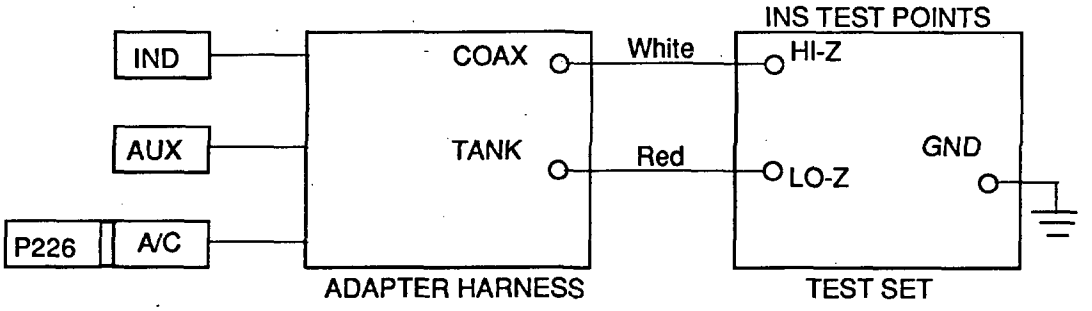




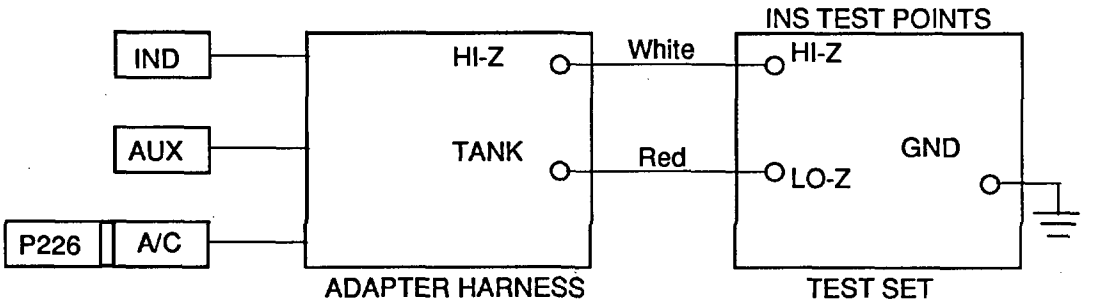
Test Set and Adapter Harness
Figure 203



Detail A

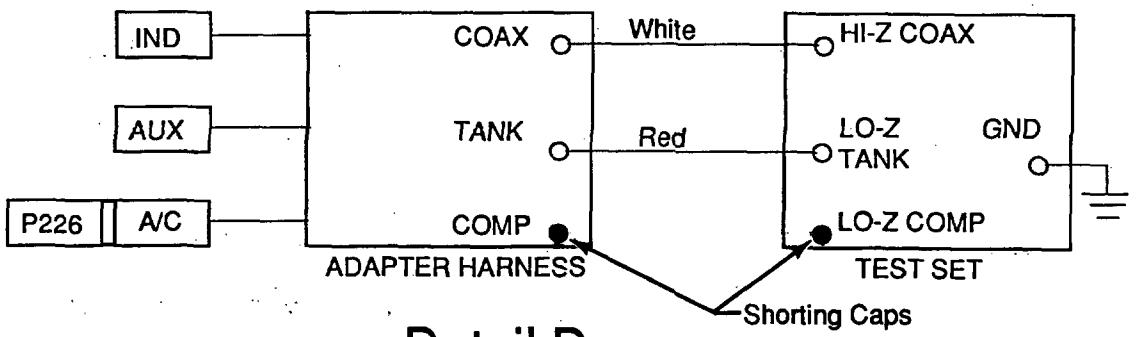


Detail B

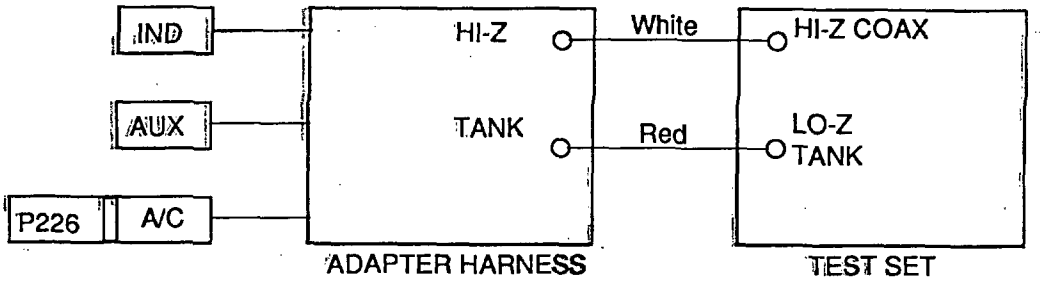


Detail C

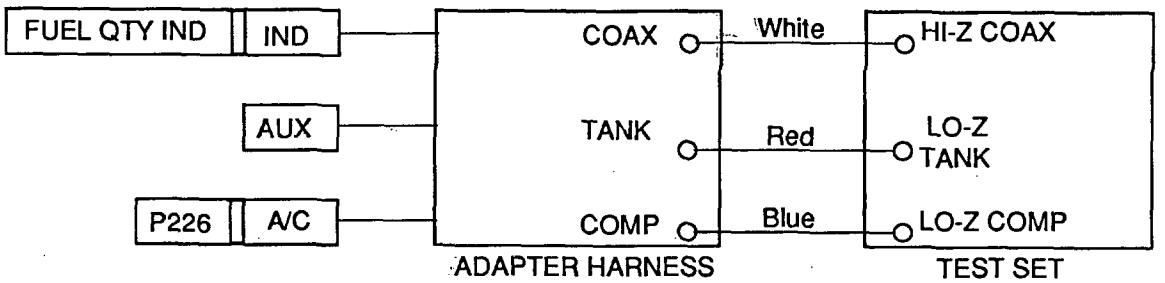
Test Set and Adapter Connections
Figure 204 (Sheet 1 of 2)



Detail D



Detail E



Detail F

Test Set and Adapter Connections
Figure 204 (Sheet 2 of 2)

(8) Test tank unit probe as follows:
(a) Turn test set OFF and connect test set and adapter harness per figure 204, detail D.
(b) Set Fuel Quantity Selector Switch to desired position per table 204.

MODEL	FUEL SELECTOR	NOM. CAP (pf)
35/35A	L & R Tip	27.7 (±0.5)
	L & R Wing	22.3 (±0.5)
	Fuselage	26.4 (±0.5)
	Total	126.4 (±0.5)
36/36A	L & R Tip	28.55 ±1.25
	L & R Wing	23.95 ±1.95
	Fuselage	49.15 ±1.15
	Total	150.5 ±2.5

Table 204

(c) Set TANK CAP pf. thumbwheels to corresponding pf. value.
(d) Set test set TEST FUNCTION to CAP BRIDGE.
(e) Turn test set ON, push PRESS TO MEASURE, and adjust TANK CAP pf. for panel meter null of 100 microamps or less. (A very low reading indicates an open, unable to null indicates a short, and 200 microamps or more indicates a high resistance connection.)

NOTE: Thumbwheel readings should be ±0.5 pf.

(f) Repeat steps (c), (d), and (e) at all Fuel Quantity Selector Switch positions.
(g) Turn test set OFF.

(9) Measure compensator capacitance as follows:
(a) Interchange the red coded coax and the shorting plug on the COMP and TANK jacks of the adapter harness.
(b) Turn test set ON.
(c) Set thumbwheels to 30.3 pf.
(d) Push PRESS TO MEASURE and adjust thumbwheels for a null of 100 microamps or less.
(e) Compensator should read 30.3 ±0.5 pf.
(f) Turn test set OFF.

(10) Measure Fuel Quantity Selector Switch capacitance as follows:
(a) Turn test set OFF and connect test set and adapter harness per figure 204, detail E.
(b) Set Fuel Quantity Selector Switch to desired position per table 205.
(c) Set TANK CAP pf. thumbwheel to corresponding pf. value.
(d) Set test set TEST FUNCTION to CAP BRIDGE.
(e) Turn test set ON.
(f) Push PRESS TO MEASURE and adjust TANK CAP pf. for panel meter null of 100 microamps or less. (A very low reading indicates an open, unable to null indicates a short, and 200 microamps or more indicates a high resistance connection.)

NOTE: Thumbwheel readings should be ±0.5 pf.

(g) Repeat steps (c), (d), (e), and (f) at all Fuel Quantity Selector Switch positions.
(h) Turn test set OFF.

MODEL	FUEL SELECTOR	NOM. CAP (pf)	
		SERIES 1*	SERIES 2*
35/35A	L & R Tip	98.9	99.9
	L & R Wing	104.1	105.1
	Fuselage	100.0	101.0
36/36A	L & R Tip	120.5	
	L & R Wing	125.9	
	Fuselage	100.0	

* Selector Switch ID placards are marked with either Series 1 or 2.

Table 205

(11) Connect adapter harness IND plug to Fuel Quantity Indicator, and A/C receptacle to indicator plug.
(12) Set TEST FUNCTION to CAP BRIDGE.
(13) Set TANK CAP pf. to 32.6, and turn test set ON.
(14) Press COMP CAL and adjust COMP SIM for minimum meter reading.
(15) Turn test set OFF.
(16) Connect color coded coax per figure 204, detail F.
(17) Set TANK CAP pf. to 000.0 and TEST FUNCTION to CAP SIM 1.
(18) Set Fuel Quantity Selector Switch to TOTAL.
(19) Engage FUEL QTY circuit breaker and set empty potentiometer "E" to zero. (Test set OFF.)

MODEL	ADD FOR FULL	FULL POUNDS
35/35A	129.8 pf.	6,600
36/36A	157.4 pf.	8,000

Table 206

(20) Set TANK CAP pf. to ADD FOR FULL value listed in table 206.
(21) Turn test set ON, and adjust FULL potentiometer "F" on indicator to bring pointer to FULL POUNDS value listed in table 206.
(22) Turn test set OFF. Fuel Quantity Indicator should return to zero. If not, repeat steps (17) through (21) until no further improvement can be made.
(23) Disengage FUEL QTY circuit breaker.
(24) Disconnect test set and adapter harness from airplane, and connect aircraft connector to indicator.
(25) Engage FUEL QTY circuit breaker.
(26) Verify fuel quantity functional test. (Refer to Inspection/Check, this section.)
(27) Return aircraft to service.

D. Functionally Test Fuel Gaging System Using Model 2548-( ) Test Set *(Aircraft 35-511 and Subsequent, 36-056 and Subsequent)* (See figure 203, 205, and 206.)
(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Zero test set meter as follows:
(a) Set TANK CAP, thumbwheels to 62.9 pf.
(b) With test set OFF, set TEST FUNCTION to CAP BRIDGE.

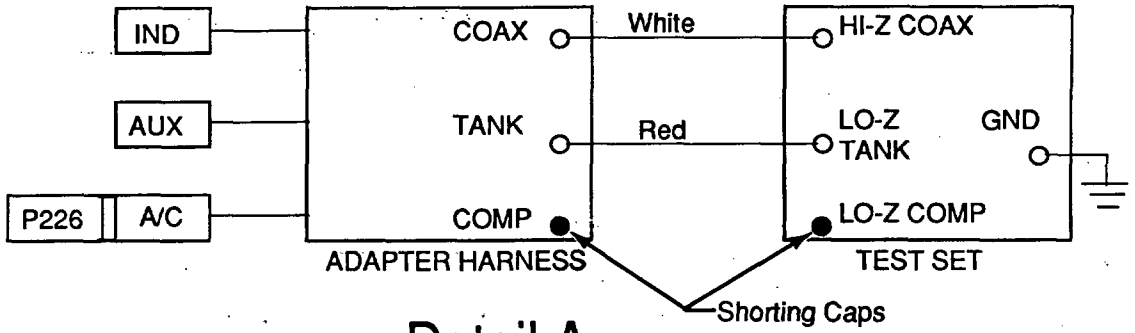
(c) Turn test set ON; depress BATT TEST button. Meter pointer should read above BAT OK radial line.
(d) Press COMP CAL, and adjust COMP SIM for a zero reading on uA scale.
(e) Turn test set off.

NOTE:
- All tester functions are powered by self-contained standard alkaline batteries. The On/Off Switch controls battery power for all test functions and is switched off when the carrying case lid is closed. Battery life should be conserved by turning the switch off when test set power is not required.
- Aircraft Inverters should be off during test set capacitance measurements.
- If capacitance measurements exceed specified tolerances, perform step 1.E. to isolate excessive stray capacitance.

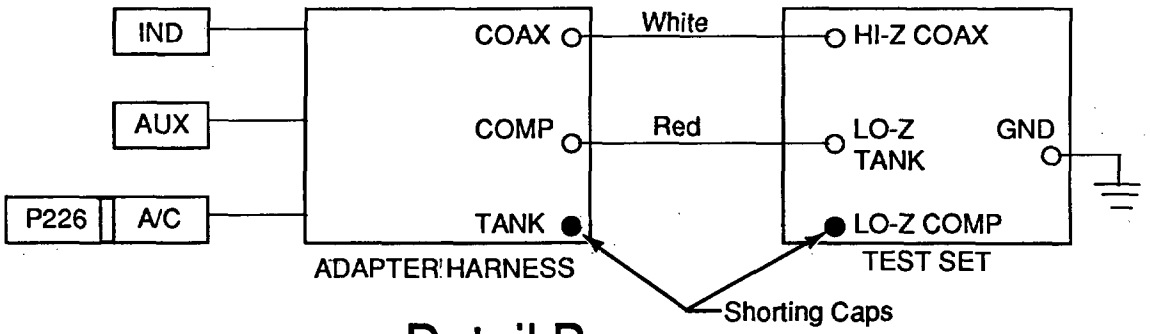
(3) Measure adapter harness capacitance.
(a) Pull FUEL QTY circuit breaker and connect adapter harness to test set per figure 205, detail A, except do not connect P226.
(b) Set test set TEST FUNCTION to CAP BRIDGE.
(c) Turn test set ON.
(d) Depress PRESS TO MEASURE and adjust TANK CAP pf. for panel meter minimum reading. Value obtained on thumbwheels is adapter harness capacitance.

NOTE: Subtract adapter harness capacitance from all other capacitance measurements.

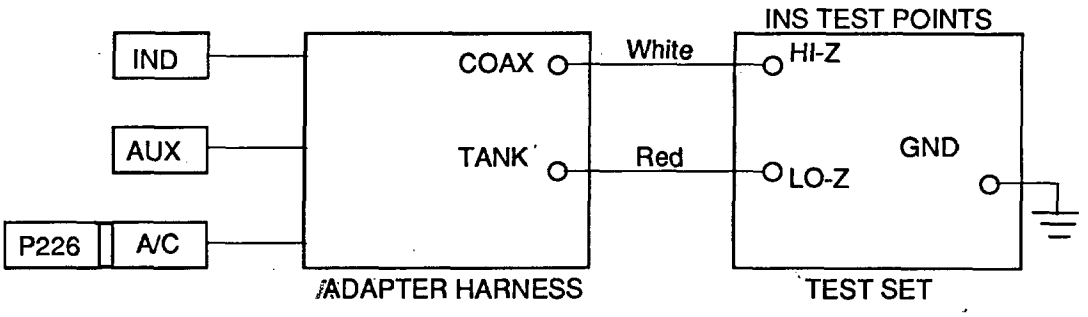
(4) Connect test set and adapter harness per figure 205, detail A.
(5) Set Fuel Quantity Selector Switch to TOTAL.
(6) Disconnect TED connectors in aircraft wiring as follows: P435, P296, P290, P288, P286, P285, P295, P287, P289. (Refer to Wiring Manual, 28-40-00.)
(7) Measure capacitance of connected aircraft wiring as follows:
(a) Set TEST FUNCTION to CAP BRIDGE.
(b) Turn test set ON.
(c) Depress PRESS TO MEASURE and adjust TANK CAP pf. for a panel meter minimum reading which must be less than 100 microamps.
(d) Value shall be less than 1.5 pf. Record in table 207.
(8) Measure capacitance of RH tip tank as follows:
(a) Connect P290.
(b) Repeat step (7)(c).
(c) Value shall be 27.3 to 29.8 pf. Record in table 207.
(d) Disconnect P290.
(9) Measure capacitance of RH wing as follows:
(a) Connect P288, P286, and P296.
(b) Repeat step (7)(c).
(c) Value shall be 22.0 to 25.9 pf. Record in table 207.
(d) Disconnect P288, P286, and P296.
(10) Measure capacitance of LH tip tank as follows:
(a) Connect P289.
(b) Repeat step (7)(c).
(c) Value shall be 27.3 to 29.8 pf. Record in table 207.
(d) Disconnect P289.



Detail A

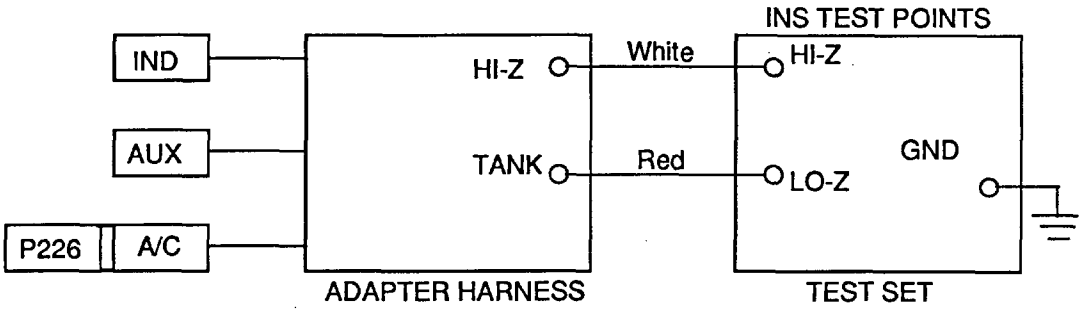


Detail B

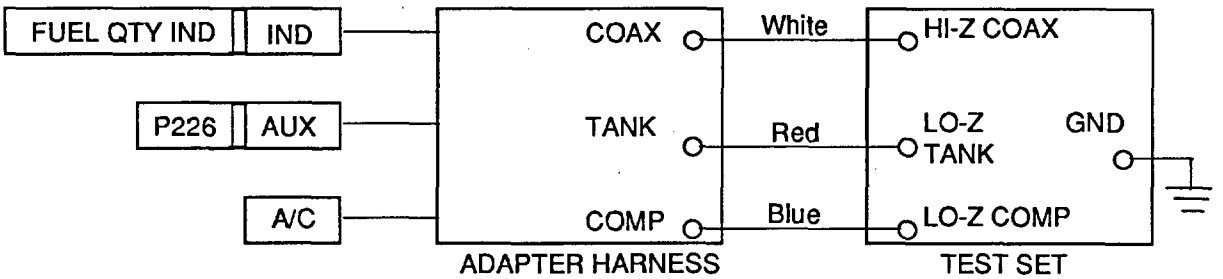


Detail C

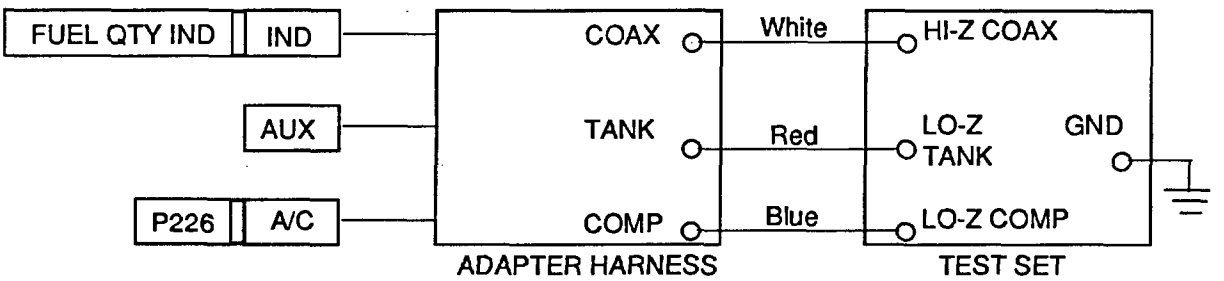
Fuel Quantity Test Set Connections
Figure 205 (Sheet 1 of 2)



Detail D



Detail E



Detail F

Fuel Quantity Test Set Connections
Figure 205 (Sheet 2 of 2)

(11) Measure capacitance of LH wing as follows:
- (a) Connect P285, P287, and P295.
- (b) Repeat step (7)(c).
- (c) Value shall be 22.0 to 25.9 pf. Record in table 207.
- (d) Disconnect P285, P287, and P295.

(12) Measure capacitance of fuselage tank as follows:
- (a) Connect P435.
- (b) Repeat step (7)(c).
- (c) Value shall be 26.0 to 29.0 pf. (35A), or 48.0 to 51.0 pf. (36A). Record in table 207.
- (d) Disconnect P435.

(13) Measure total system capacitance as follows:
- (a) Connect all connectors listed in step (6).
- (b) Repeat step (7)(c).
- (c) Value shall be 125.0 to 130.0 pf. (35A), or 147.5 to 152.7 (pf. (36A). Record in table 207.
- (d) Turn test set OFF.

(14) Measure compensator capacitance as follows:
- (a) Connect test set and adapter harness per figure 205, detail B.
- (b) Turn test set ON.
- (c) Depress PRESS TO MEASURE and adjust thumbwheels for null of 100 microamps or less.
- (d) Value shall be 30.0 to 31.3 pf. Record in table 207.
- (e) Turn test set OFF.

Step No.		Required Value	Measured Value
1.D. (7) (d)	Partial stray capacitance	less than 1.5 pf.	_____
1.D. (8) (c)	RH Tip Tank	27.3 to 29.8 pf.	_____
1.D. (9) (c)	RH Wing	22.0 to 25.9 pf.	_____
1.D. (10) (c)	LH Tip Tank	27.3 to 29.8 pf.	_____
1.D. (11) (c)	LH Wing	22.0 to 25.9 pf.	_____
1.D. (12) (c)	Fuselage Tank	26.0 to 29.0 pf. (35A)	_____
		48.0 to 51.0 pf. (36A)	_____
1.D. (13) (c)	Total Capacitance	125.0 to 130.0 pf. (35A)	_____
		147.5 to 152.7 pf. (36A)	_____
1.D. (14) (d)	Compensator Capacitance	30.0 to 31.3 pf.	_____
1.D. (15) (f)	Resistance Check		_____(Pass)
1.D. (16) (b)	Resistance Check		_____(Pass)
1.D. (17) (a)	Resistance Check		_____(Pass)
1.D. (18) (c)	Selector Switch Test		_____(Pass)

Table 207

(15) Test system insulation as follows:
- (a) Disconnect red, white, and blue coax cables from test set.
- (b) Set TEST FUNCTION to INSULATION and turn test set ON.
- (c) Rotate METER ADJUST to set meter pointer to full scale infinity mark on MEGOHMS scale.
- (d) Turn test set OFF and connect test set and adapter harness per figure 205, detail C.
- (e) Set Fuel Quantity Selector Switch to TOTAL.

(f) Turn test set ON and set INS TEST POINT Switch to each position in table 208.

NOTE: Meter pointer may drift slowly after initial setting. Wait for steady reading or until reading exceeds minimum resistance allowable for each insulation test.

(g) Turn test set OFF.

(16) Test shield-to-ground resistance as follows:
(a) Disconnect electrical connector from Fuel Quantity Selector Switch (P225) and Fuel Quantity Indicator (P226).
(b) Using a volt-ohmmeter, check shield-to-ground resistance by attaching meter leads to either P225 pins K and L or P226 pins J and K. Resistance value shall be 10 megohms or more.
(c) Connect electrical connectors to Fuel Quantity Selector Switch and Fuel Quantity Indicator.

(17) Test compensator insulation as follows:
(a) Connect red coax cable to COMP JACK of adapter harness and set INS TEST POINTS Switch to each position in table 208.

(18) Test Fuel Quantity Selector Switch insulation as follows:
(a) Connect test set and adapter harness per figure 205, detail D.
(b) Set Fuel Quantity Selector Switch to TOTAL.
(c) Turn test set ON and set INS TEST POINT Switch to each position in table 208.

TEST POINTS	MEGOHMS MINIMUM
GND/HI-Z	10
SH/HI-Z	10
LO-Z/HI-Z	100

Table 208

(19) Test Fuel Quantity Indicator as follows:
(a) Zero test set meter per step (2).
(b) Connect test set and adapter harness per figure 205, detail E.
(c) Set TANK CAP to 126.2 pf. (35A), or 148.2 pf. (36A).
(d) Set TEST FUNCTION to CAP SIM-1, depress FUEL QTY circuit breaker, and turn test set ON.
(e) Set Fuel Quantity Selector Switch to TOTAL.
(f) Adjust empty potentiometer "E" on Fuel Quantity Indicator to bring pointer to zero graduation.

(20) Check potentiometer adjustment as follows:
(a) Reset TANK CAP to 256.4 pf. (35A), or 305.6 pf. (36A).
(b) For Model 35A, adjust full potentiometer "F" on Fuel Quantity Indicator for 6600 pounds.
1) Reset TANK CAP to empty value (126.2 pf.) Indicator shall return to zero.
(c) For Model 36A, adjust full potentiometer "F" on Fuel Quantity Indicator for 8,000 pounds.
1) Reset TANK CAP to empty value (148.2 pf.). Indicator shall return to zero.
(d) Pull FUEL QTY circuit breaker and turn test set OFF.

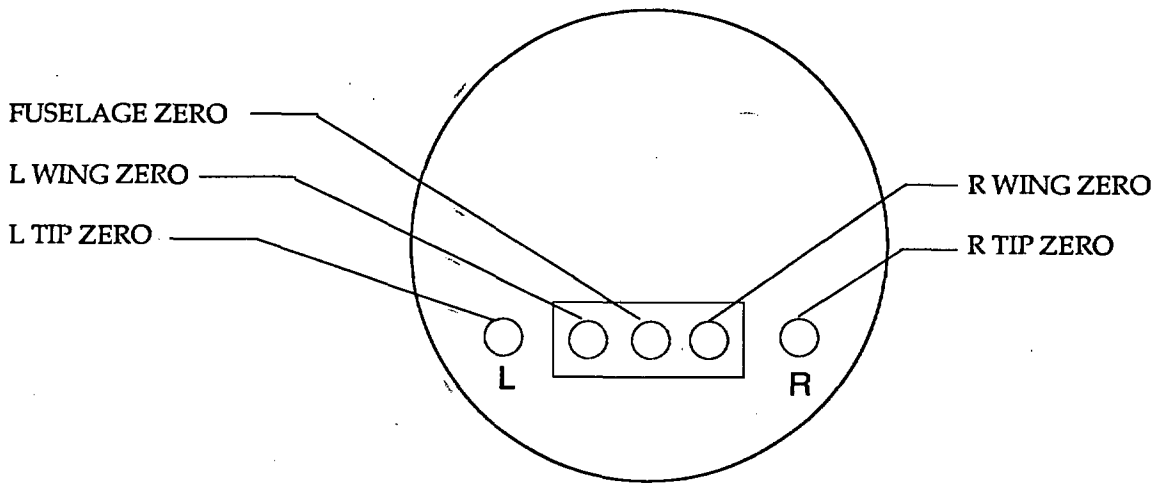
(21) Calibrate Fuel Quantity Indicator as follows:
(a) Connect aircraft electrical connector to Fuel Quantity Selector Switch.
(b) Connect adapter harness IND connector to Fuel Quantity Indicator and A/C connector to indicator plug (P226).
(c) Set Fuel Quantity Selector Switch to TOTAL.
(d) Connect red, white, and blue coax cables per figure 205, detail F, and disconnect GND lead between test set and airframe ground.

(e) Depress FUEL QTY circuit breaker and adjust empty potentiometer "E" on indicator so that indicator reads zero.
(f) Set TEST FUNCTION to CAP BRIDGE and set TANK CAP to 32.6 pf.
(g) Turn test set ON, depress COMP CAL, and adjust COM SIM for minimum meter reading.
(h) For *Model 35A*, set TEST FUNCTION to CAP SIM, set TANK CAP to 129.8 pf. and adjust full potentiometer "F" on Fuel Quantity Indicator to move pointer to 6,600 pounds.
(i) Turn test set OFF. Fuel Quantity Indicator shall return to zero. If indicator does not return to zero, adjust empty potentiometer "E" so that indicator does read zero. Turn test set on and repeat steps (21)(g, h, and i).
(j) For *Model 36A*, set TEST FUNCTION to CAP SIM, set TANK CAP to 157.4 pf. and adjust full potentiometer "F" on Fuel Quantity Indicator to move pointer to 8000 pounds.
(k) Turn test set OFF. Fuel Quantity Indicator shall return to zero. If indicator does not return to zero, adjust empty potentiometer "E" so that indicator does read zero. Turn test set on and repeat steps (21)(g, j, and k).
(l) Set TANK CAP to 49.2 pf. and turn test set ON. Indicator shall read 2500 (±100) pounds.
(m) Set TANK CAP to 78.7 pf. Indicator shall read 4000 (±100) pounds.

(22) Adjust Fuel Quantity Selector Switch to zero as follows:
(a) Pull FUEL QTY circuit breaker and turn test set OFF.
(b) Disconnect test set and reconnect aircraft electrical connector to Fuel Quantity Indicator.
(c) Depress FUEL QTY circuit breaker.
(d) Set Fuel Quantity Selector Switch to each position, assuring that Fuel Quantity Indicator reads zero ±20 lbs. at each position. If necessary, adjust each position to zero ±20 lbs. by means of adjusting screws on back of Fuel Quantity Selector Switch as shown in figure 206.
(e) Check TOTAL zero to verify a reading of zero ±20 lbs.

(23) Verify fuel quantity functional test. (Refer to Inspection/Check, this section.)
(24) Return aircraft to service.

E. Functionally Test for Excess Stray Capacitance Using Model 2548-( ) Test Set *(Aircraft 35-511 and Subsequent, 36-056 and Subsequent)* (See figure 207.)
(1) Values listed in table 209 are for individual fuel probes. Probes and some wires may have to be tested separately to try to isolate excessive stray capacitance.
(2) Isolate stray capacitance in any portion of wire by removing all other wires from the circuit (disconnect selected TED connectors) and measuring capacitance of the circuit to the individual probe. (Refer to Wiring Manual, 28-40-00.)



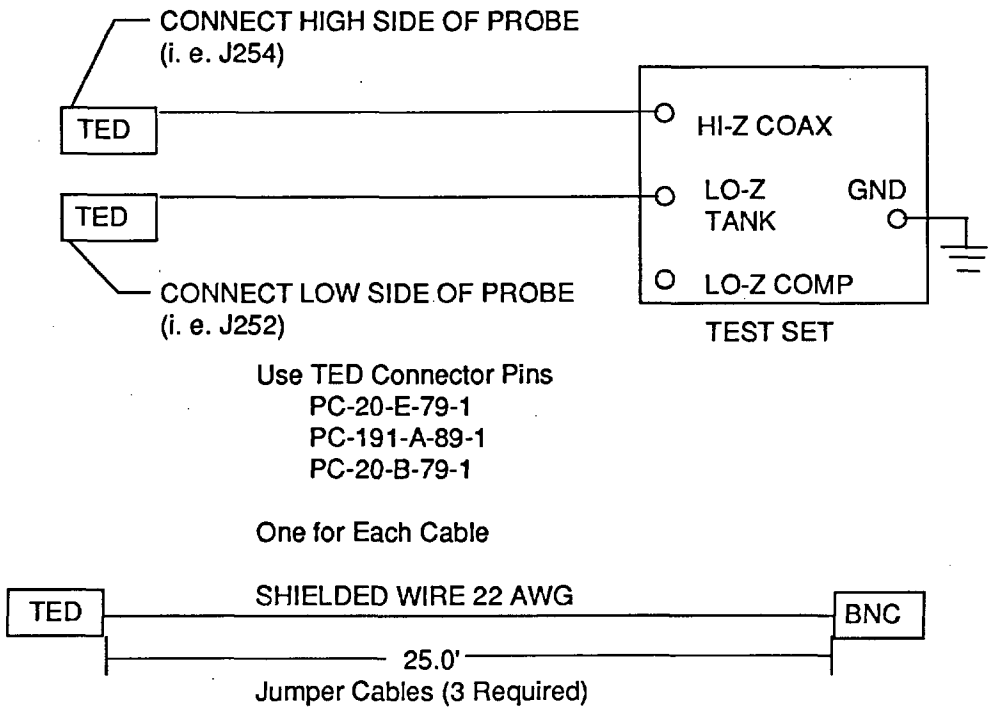
Fuel Quantity Selector Switch Zero Adjustment Potentiometers
Figure 206

NOTE:
- Jumper cables as shown in figure 207 will be required to measure probe capacitance.
- Aircraft inverters must be off during capacitance measurements.

(3) Measure probe capacitance.
(a) Connect test set to fuel probe as shown in figure 207.
(b) Set TEST FUNCTION to CAP BRIDGE.
(c) Turn test set ON.
(d) Depress PRESS TO MEASURE and adjust TANK CAP pf. for panel meter minimum reading (must be less than 100 microamps.)
(e) Value shall be per table 209.

Location	Dry Capacitance Value (±0.5 pf)
Tip Tank	27.7
Wing Ext.	1.9
Wing Outboard	13.3
Wing Inboard	7.2
Compensator	30.3
Fuselage	26.4 (35A) 48.2 (36A)

Table 209



Probe Capacitance Test Connections and Jumper Cables
Figure 207

(4) Determine stray capacitance by subtracting actual probe capacitance (measured at probe connectors) from total circuit capacitance.
(5) Stray capacitance to a probe shall not exceed 1.5 pf.

2. INSPECTION/CHECK

A. Operationally Check Fuel Gaging System

NOTE: The following operational check is to be used to verify that the fuel gaging system functions properly after any system component has been replaced.

(1) Defuel the aircraft. (Refer to Chapter 12.) Remaining fuel must also be drained from sumps and siphoned from tip tanks.
(2) Set Battery Switches on, set Fuel Quantity Selector Switch to TOTAL, and allow system to warm up.
(3) Rotate Fuel Quantity Selector Switch to each individual tank position. The Fuel Quantity Indicator must read zero (±20) pounds at each tank position.
(4) Set Fuel Quantity Selector Switch to TOTAL. The Fuel Quantity Indicator must read zero. If necessary adjust the EMPTY pot on the Fuel Quantity Indicator for zero with the Fuel Quantity Selector Switch set to TOTAL.
(5) Fuel the aircraft. (Refer to Chapter 12.)
(6) Rotate Fuel Quantity Selector Switch to each individual tank position. The Fuel Quantity Indicator must read within ±100 pounds of each tank per Table 210.
(7) If any individual tank reading is out of tolerance, perform functional test of fuel gaging system. (Refer to Adjustment/Check, this section.)
(8) If individual tank readings are within tolerance, install and secure fuel control panel.
(9) Set Fuel Quantity Selector Switch to TOTAL. Check indicator for TOTAL pounds indication. If necessary adjust the FULL pot on the Fuel Quantity Indicator for the required full indication with the Fuel Quantity Selector Switch set to TOTAL.
(10) Set Battery Switches off.

INDICATED FULL WEIGHT (lbs)			
Left Tip w/o Recognition Light	1215	Left Tip with Recognition Light	1175
Left Wing	1254	Fuselage 35/35A	1340
Fuselage 36/36A	2542	Right Wing	1254
Right Tip	1175	Total 35/35A with LH Recog. Lt.	6198
Total 35/35A w/o LH Recog. Lt.	6238	Total 36/36A with LH Recog. Lt.	7400
Total 36/36A w/o LH Recog. Lt.	7440		

Table 210

B. Field Functional Check of Fuel Quantity System

NOTE:
- The following functional check may be used by field personnel to determine if the fuel quantity indicating system is fully functional or whether maintenance or calibration is required.
- Most fuel quantity problems are caused by defective TED connectors.
- The tolerance on individual tank quantities and aircraft total fuel quantity is ±100 pounds. A value of one (1) picofarad (pf) equals approximately 50 pounds of fuel.

(1) Empty fuselage fuel tank and fully service LH and RH wing and tip tanks with fuel.
(2) Set Battery Switches on and depress FUEL QTY circuit breaker.
(3) Set Fuel Quantity Selector Switch to TOTAL and allow the system to warm up.
(4) Calculate total fuel quantity by subtracting FUSELAGE quantity from aircraft TOTAL quantity as indicated on Fuel Control Panel.
(5) Rotate Fuel Quantity Selector Switch through LH and RH wing and tip tank positions and check for correct full quantities. Record gage readings.
(6) Rotate Fuel Quantity Selector Switch to FUSELAGE and check Fuel Quantity Indicator for a zero indication. If zero indication is incorrect, adjust the empty potentiometer "E" on the Fuel Quantity Indicator for a zero indication.

NOTE: Check all positions of Fuel Quantity Selector Switch before adjusting indicator.

(7) Set Fuel Quantity Selector Switch to TOTAL and check for total quantity as calculated in step 4. If total quantity is incorrect, adjust the full potentiometer "F" on the Fuel Quantity Indicator for a correct indication.
(8) Repeat steps 5 through 7 and verify that fuel quantity indications are within tolerance.

CAUTION: ENSURE THAT FUSELAGE TAILSTAND IS INSTALLED BEFORE BEGINNING FUEL TRANSFER OPERATION.

(9) Ensure that FUS VALVE Switch is off.
(10) Set Fuselage Tank Transfer/Fill Switch to FILL. (The crossflow valve and fuselage tank fuel valve are opened and both standby pumps are energized when Fuselage Tank Transfer/Fill Switch is set to FILL.) Monitor fuselage tank FULL light to ensure that valves close automatically when tank is full. Set Fuselage Tank Transfer/Fill Switch to OFF.
(11) Set Fuel Quantity Selector Switch to FUS and verify that fuel quantity indication is within tolerance and that TOTAL quantity has not changed.
(12) Set Battery Switches off.

NOTE:
- An incorrect zero indication with correct individual tank full indications may be caused by a defective fuselage tank probe, selector switch or indicator.
- A good zero indication with an incorrect individual tank full indication may be caused by a defective tank probe or selector switch.
- If all individual tank totals are out of tolerance the Selector Switch, compensator probe or Fuel Quantity Indicator may be defective or out of calibration.

INDICATED FULL WEIGHT (lbs)			
Left Tip w/o Recognition Light	1215	Left Tip with Recognition Light	1175
Left Wing	1254	Fuselage 35/35A	1340
Fuselage 36/36A	2542	Right Wing	1254
Right Tip	1175	Total 35/35A with LH Recog. Lt.	6198
Total 35/35A w/o LH Recog. Lt.	6238	Total 36/36A with LH Recog. Lt.	7400
Total 36/36A w/o LH Recog. Lt.	7440		
Total 35/35A/36/36A w/o LH Recog. Lt. Minus Fuselage Tank			4898
Total 35/35A/36/36A with LH Recog. Lt. Minus Fuselage Tank			4858

Table 211

FUEL QUANTITY INDICATOR - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Fuel Quantity Indicator and Fuel Selector Switch (See figure 201.)

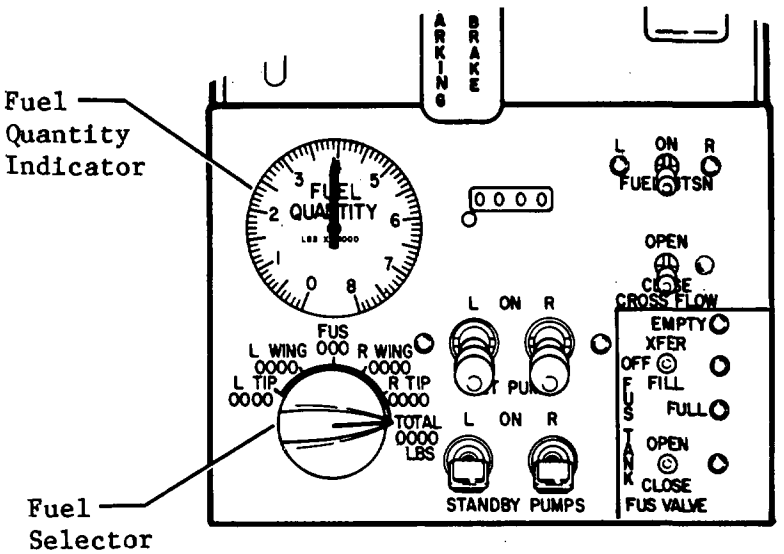
(1) Remove attaching parts and fuel control panel from pedestal.
(2) Disconnect electrical connector from fuel control panel.
(3) Disconnect electrical connectors from selector switch and indicator.
(4) Remove attaching parts and selector switch and fuel quantity indicator from fuel control panel.

B. Install Fuel Quantity Indicator and Fuel Selector Switch (See figure 201.)

(1) Install selector switch and fuel quantity indicator and secure with attaching parts.
(2) Connect electrical connectors.
(3) Install fuel control panel in pedestal.
(4) Fuel the aircraft. (Refer to Chapter 12.)
(5) Rotate the Fuel Quantity Selector Switch to each tank position. The fuel quantity indicator must read within ±100 pounds of each tank value as shown on fuel control panel. TOTAL value must be within ±100 pounds.

2. ADJUSTMENT/TEST

A. On Aircraft 35-511 and Subsequent, refer to Fuel Gaging System Functional Test for test and calibration of the indicator.



Fuel Control Panel
Figure 201

FUEL PROBE - MAINTENANCE PRACTICES

1. REMOVAL/INSTALLATION

A. Remove Wing Fuel Probes (Typical Outboard Wing) (See figure 201.)

(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Disconnect electrical connector from probe receptacle at spar 7.
(3) Remove attaching parts and two access covers aft of fuel probe access cover.
(4) Remove electrical connectors from electrical receptacles at spar 7.
(5) Remove attaching parts and clamps securing probe wiring at spars 4, 5, and 6.
(6) Remove attaching parts and probe access cover from aircraft.
(7) Remove attaching parts and probe from access cover.

B. Install Wing Fuel Probe (Typical Outboard Wing) (See figure 201.)

(1) Install replacement probe on access cover using existing attaching parts.
(2) Apply lightning strike protective seal to access cover. (Refer to 28-12-00.)
(3) Apply parting agent around that part of perimeter of access cover which will contact sealant applied in step (2).
(4) Route probe wiring through spars 4, 5, and 6 and install fuel probe access cover.
(5) Secure probe wiring with clamps on spars 4, 5, and 6.
(6) Connect electrical connectors to electrical receptacles at spar 7.
(7) Apply lightning strike protective seal to access covers. (Refer to 28-12-00.) Install access covers.
(8) Perform fuel gaging system operational check. (Refer to 28-40-00.)

C. Remove Fuel Probe (Inboard Wing) (See figure 201.)

NOTE: Removal and installation procedures for the LH and RH fuel probes are identical, except LH fuel probe has three electrical connectors connected to the access cover whereas the RH fuel probe has only two.

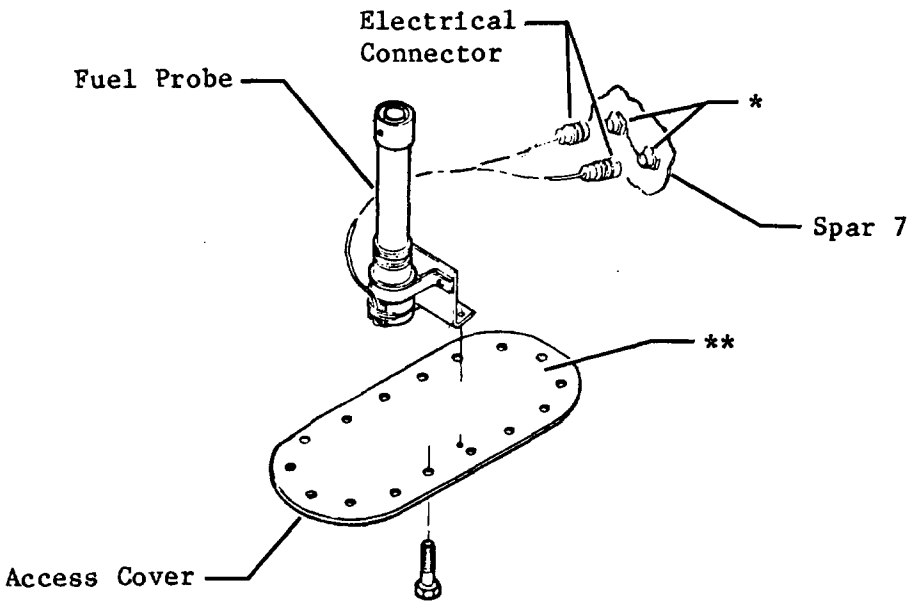
(1) Defuel the aircraft. (Refer to Chapter 12.)
(2) Remove lower fuselage access covers to gain access to fuel probe installation.
(3) Disconnect electrical connectors from access covers.
(4) Remove attaching parts and access cover from wing.
(5) Remove attaching parts and probe receptacles from access cover.
(6) Remove attaching parts and probe from access cover.

D. Install Fuel Probe (Inboard Wing) (See figure 201.)

(1) Install replacement probe on access cover and secure with existing attaching parts. Safety wire receptacle nuts on outside of access cover.
(2) Install gasket and access cover and secure with attaching parts.
(3) Connect electrical connectors to probe receptacles.
(4) Perform fuel gaging system operational check. (Refer to 28-40-00.)
(5) Install lower fuselage access covers.

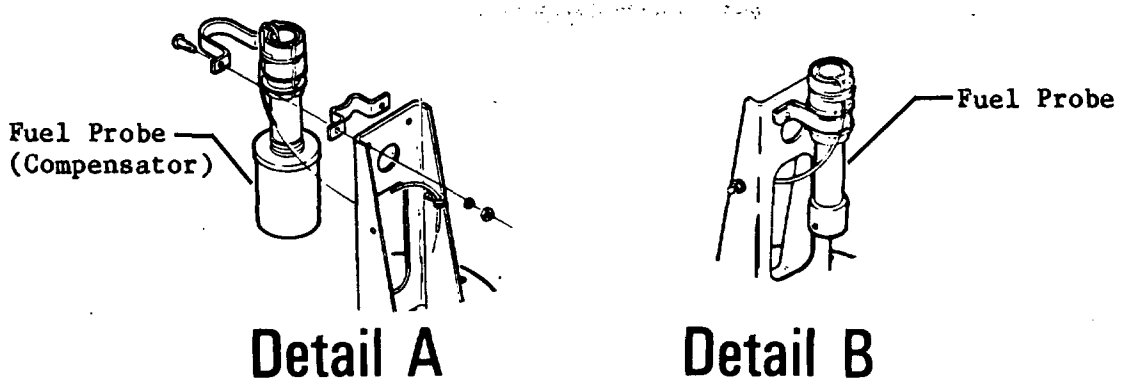
* Safety Wire Nuts on Receptacles on Spar 7 Outboard of Fuel Area.

** Apply Parting Agent Around Perimeter of Access Cover.

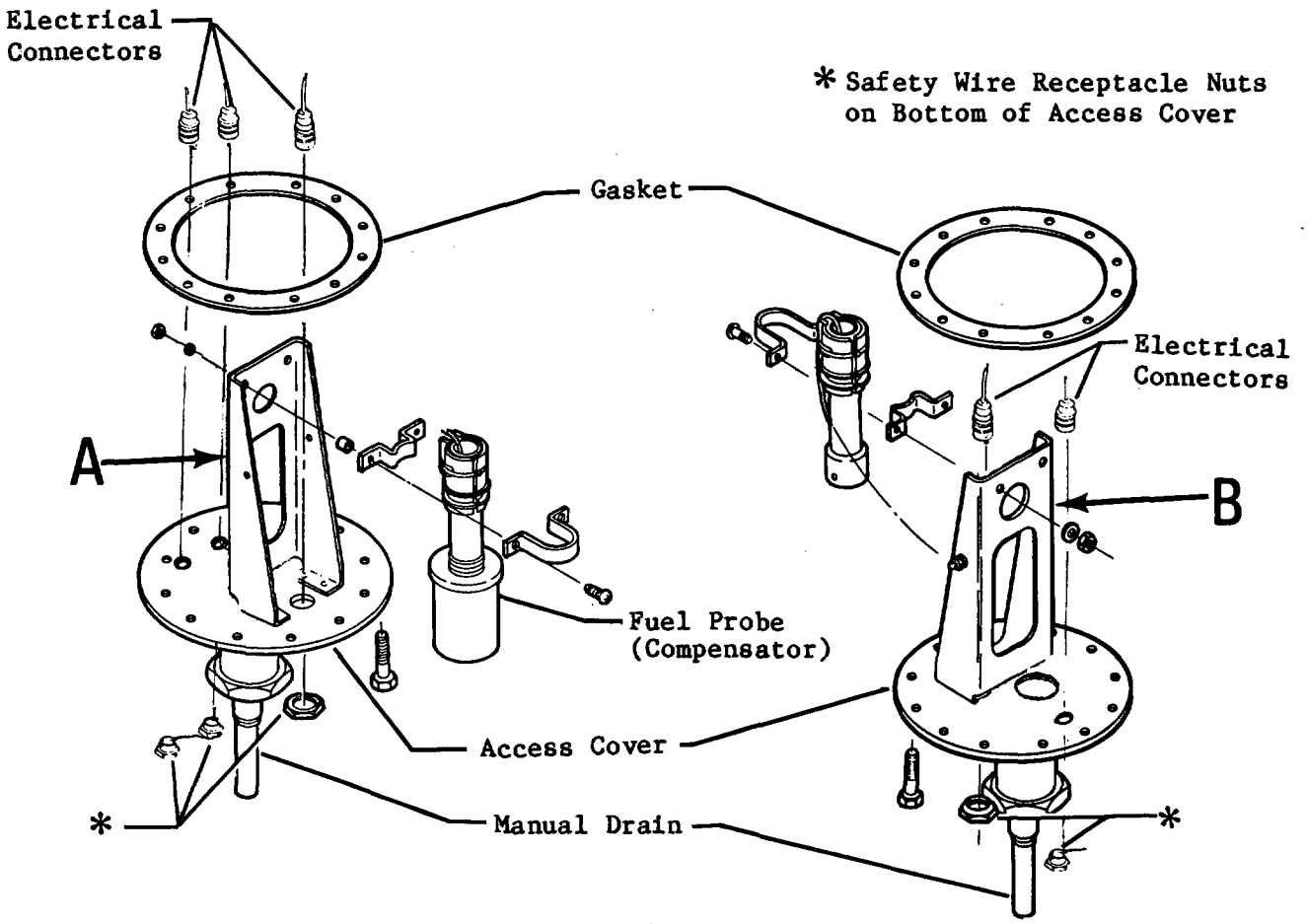


WING TANK FUEL PROBE - OUTBOARD
(TYPICAL LH AND RH)

Wing Fuel Probe Installation
Figure 201 (Sheet 1 of 2)



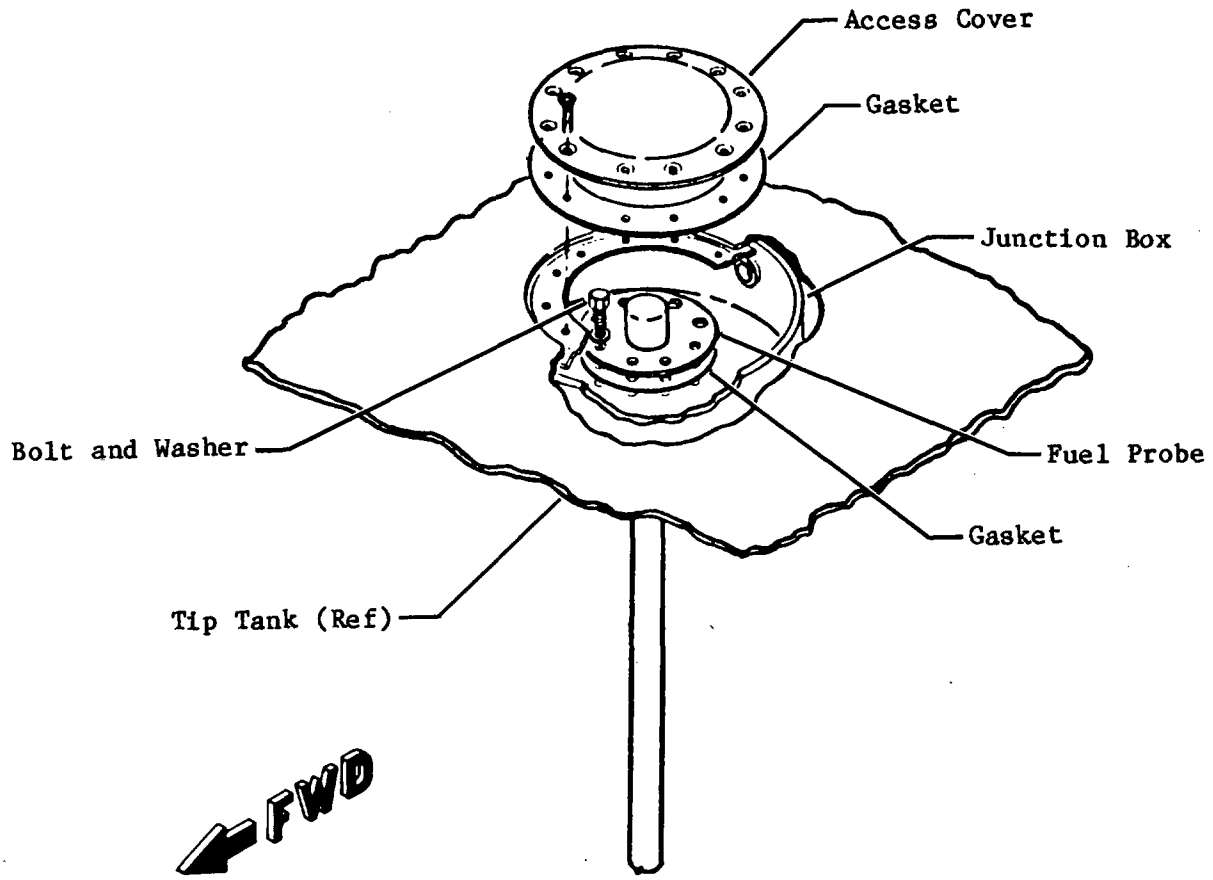
Aircraft 35-002 and 36-002



Aircraft 35-003 and Subsequent
and 36-003 and Subsequent

LH WING TANK FUEL PROBE - INBD **RH WING TANK FUEL PROBE - INBD**

Wing Fuel Probe Installation
Figure 201 (Sheet 2 of 2)



Tip Tank Fuel Probe Installation
Figure 202

G. Remove Fuselage Fuel Probe (See figure 203.)

(1) Defuel fuselage tank.
(2) Remove access cover from top of aircraft.
(3) Disconnect electrical connectors.
(4) Remove attaching parts and fuel probe from tank.

NOTE: Lower fuel probe fitting need not be removed unless replacement is required.

H. Install Fuselage Fuel Probe (See figure 203.)

(1) Install fuel probe and secure with attaching parts. Torque attaching bolts to 50 (±5) inch-pounds. Assure that bonding jumper is secure.
(2) Connect electrical connectors.
(3) Fuel the fuselage tank (refer to Chapter 12) and check for leaks.
(4) Install access cover and secure with attaching parts.
(5) Perform fuel gaging system operational check. (Refer to 28-40-00.)

2. INSPECTION/CHECK

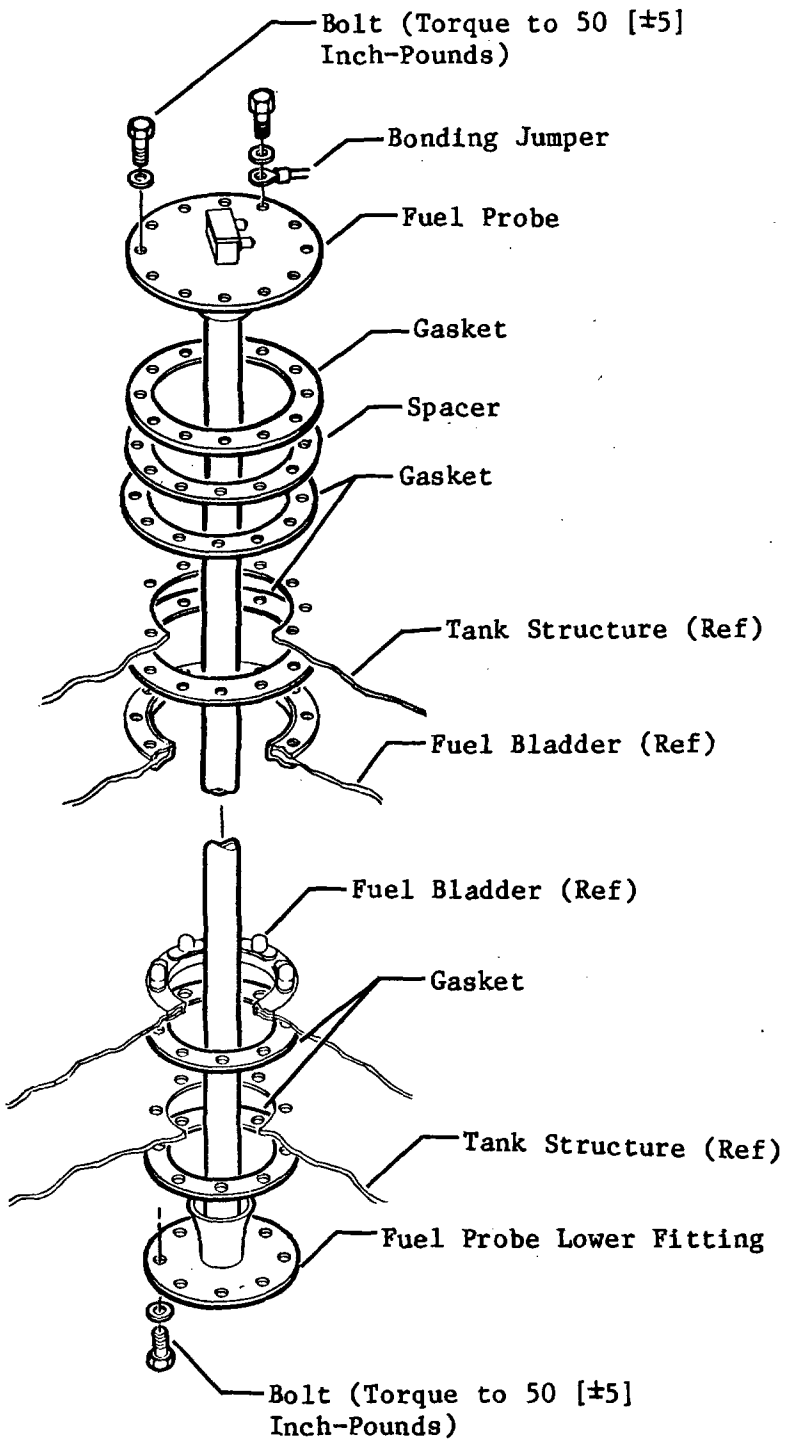
A. Inspect Fuel Probe

(1) Visually inspect outer electrode for small nicks or scratches in protective insulating coating.
(2) Check all parts for evidence of physical damage, distortion, and deterioration.

3. CLEANING/PAINTING

A. Clean Fuel Probe

(1) Mix solution of 5 percent by volume of liquid detergent (such as Joy) and water at a temperature of 140°F.
(2) Imerse probe in detergent solution for one hour. Maintain temperature and agitate probe occasionally.
(3) Rinse probe thoroughly in clean water.
(4) Dry probe for one hour in oven at 140° (±10°) F.



Fuselage Fuel Probe Installation
Figure 203

12-12C-1

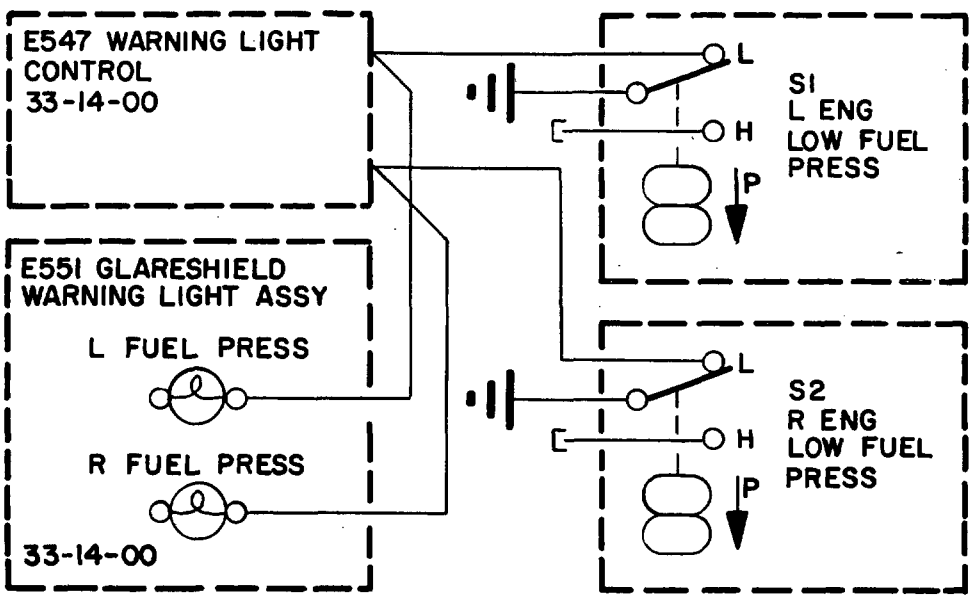
PRESSURE SWITCH - DESCRIPTION AND OPERATION

1. DESCRIPTION

A. The switches are located between the relief valve and the engine in the engine main fuel lines (RH and LH). Access to the switches is gained through the tailcone access door.

2. OPERATION

A. The engine low fuel pressure switches are installed to alert the pilot of jet pump failure. The function of an engine low fuel pressure switch is to sense pressure from the main fuel line and energize either the R or L FUEL PRESS indicator light on the glareshield. The switch closes to energize the light when fuel pressure drops below 0.25 psi and reopens at 1.0 psi.



Engine Fuel Pressure Warning Light Electrical Control Schematic
Figure 1

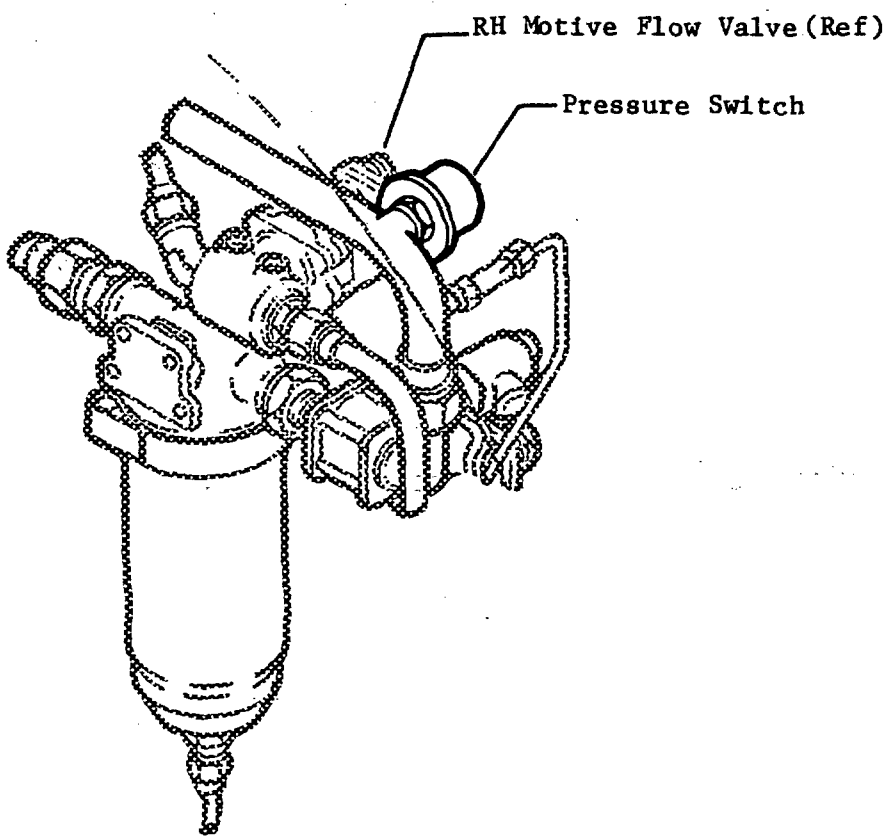
PRESSURE SWITCH - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: Remove and installation procedures for both pressure switches are identical.

A. Remove Pressure Switch (See figure 201.)
   (1) Lower tailcone access door.
   (2) Remove electrical power from aircraft.
   (3) Disconnect and identify pressure switch wiring leads at splices.
   (4) Remove pressure switch and O-ring from main fuel line.

B. Install Pressure Switch (See figure 201.)
   (1) Install O-ring and pressure switch in main fuel line.
   (2) Identify and connect electrical wiring leads at splices.
   (3) Restore electrical power to aircraft.
   (4) Check pressure switch using applicable standby pump.
   (5) Restore aircraft to normal.



Pressure Switch Installation
Figure 201

2. Adjustment/Test

B. Perform Functional Test of Pressure Switch.

CAUTION: ENSURE BOTH WINGS CONTAIN FUEL LEVEL SUFFICIENT TO OPERATE FUEL STANDBY PUMPS

(1) Connect external electrical power source to aircraft.
(2) Set Battery Switches on. Ensure L and R FUEL PRESS annunciators are illuminated.
(3) Place L STANDBY PUMP Switch ON. L FUEL PRESS annunciator shall extinguish.
(4) Place L STANDBY PUMP Switch OFF. L FUEL PRESS annunciator shall illuminate.
(5) Place R STANDBY PUMP Switch ON. R FUEL PRESS annunciator shall extinguish.
(6) Place R STANDBY PUMP Switch OFF. R FUEL PRESS annunciator shall illuminate.
(7) Disconnect external electrical power source.
(8) Set Battery Switches off.
(9) Restore aircraft to normal.

FUEL COUNTER SYSTEM - DESCRIPTION AND OPERATION

1. Description
   A. The fuel counter system consists of an indicator on the fuel control panel and utilizes an output from the fuel monitor computer.
   B. The fuel counter is an electromechanical device that indicates total pounds of fuel used. The counter can be reset by depressing the small button adjacent to the indicator.

2. Operation
   A. The engine fuel flowmeters suppy an alternating voltage to the fuel monitor computer which is converted into DC electrical signals. These DC electrical signals are applied to the fuel flow indicators. (Refer to Chapter 73.)