

CHAPTER 28 — FUEL SYSTEM

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FUEL SYSTEM

28-1. GENERAL.

This chapter provides instructions for maintenance of the airframe-mounted fuel supply system. Refer to Chapter 76 for engine fuel system and control linkage.

INSTALLATION TO PREVENT DAMAGE TO CELLS. DO NOT ATTEMPT TO REMOVE, FOLD, OR INSTALL A CELL WHEN CELL TEMPERATURE IS BELOW 65°F (18°C).

28-2. SAFETY PRECAUTIONS.

WARNING

ONLY APPROVED, EXPLOSION PROOF TYPE LIGHTS ARE TO BE USED NEAR OPEN FUEL CELLS AND FUEL LINES.

CAUTION

HANDLE CELL WITH EXTREME CARE DURING REMOVAL AND

ALL FUELING AND DEFUELING OPERATIONS SHALL BE CONDUCTED IN AREAS WHERE FIRE HAZARDS ARE REDUCED TO A MINIMUM. FOR COMPLETE DEFUELING/REFUELING PROCEDURES READ AND FOLLOW INSTRUCTIONS CONTAINED IN CHAPTER 12 OF THIS MANUAL.

FUEL STORAGE AND DISTRIBUTION SYSTEM

28-3. FUEL STORAGE AND DISTRIBUTION SYSTEM.

28-4. DESCRIPTION AND OPERATION.

The following paragraphs provide a functional description of the components which store and deliver fuel to the engine power sections.

1. The fuel supply is contained in five separate cells (figures 28-1 and 28-2). The three aft cells supply fuel to two lower, independent, self-sealing cells which individually serve as supply sources for each power section. Each under-floor cell is equipped with a sump, a submerged electric motor-driven boost pump, a flow-actuated switch connected to a FUEL BOOST (ENG 1 or 2) caution panel segment to signal if pump is inoperative, a float switch connected to a FUEL LOW caution panel segment, a sump drain valve, a lateral baffle with a flapper valve allowing front-to-rear flow, and an ejector-type pump mounted on the front wall. A manual drain valve is also provided in the forward compartment.

2. The system filler cap is on the right aft cell. All cells are interconnected, but interconnect lines between under-floor tanks are normally kept closed by electrically-controlled valves. Defueling valves are provided on aft interconnect line below each under-floor tank sump. Vent lines from all cells are connected to a dual vent system equipped with siphon-breaker valves. Fuel quantity gage probes are located in center aft tank cell and in forward and rear compartments of both under-floor tanks. Capped connections, for use with either of two auxiliary fuel tank kits, are provided on system vent lines and on crossover fittings between forward and aft cells.

3. The fuel pressure line from each lower tank boost pump passes through a directional flow check valve and an electrically operated shutoff valve to power section located on same side of helicopter. Check valves and shutoff valves have internal bypass provisions

to relieve thermal expansion of trapped fuel. A pressure transmitter in each line serves the pressure gage for the engine system. A crossfeed line between the two pressure lines has an electrically controlled valve which remains closed in NORMAL position of the FUEL PUMP CROSSFEED switch, but will open automatically if one boost pump fails allowing remaining pump to supply both power sections. The fuel filter in each power section has internal bypass provisions to assure flow in event of clogging, and is connected to a FUEL FILTER caution panel segment for warning of an impending bypass condition. Governor bleed lines equipped with check valves return excess fuel from each power section fuel control to the aft center fuel cell.

4. All fuel supply system controls, valves, pumps, and caution panels are powered by 28 Vdc. The fuel pressure indicators require 26 Vac, and fuel quantity indicator requires 115 Vac power (Chapter 96). In normal operation, both BOOST PUMP switches are ON, both FUEL switches are ON to open shutoff valves, FUEL PUMP CROSSFEED switch and INTERCONNECT switch are placed to NORMAL (closed) positions. In this condition, fuel is being pumped from TANK 1 (left lower) to ENGINE 1 (left) and from TANK 2 (right lower) to ENGINE 2 (right). Gravity feed from aft tank cells is keeping both lower tanks full, but there is no crossflow between right and left systems and the two pressure gages will show independent readings. However, if flow from one boost pump drops off (by pump failure or by switching the pump OFF), the crossfeed valve will automatically open so remaining pump will feed both power sections. The FUEL PUMP CROSSFEED switch also has an OVERRIDE CLOSE position which will keep the valve closed in all conditions. Either shutoff valve can be closed by placing respective FUEL switch OFF and, if a FIRE PULL handle is used, the corresponding engine shutoff valve will be automatically closed. Either boost pump can be switched OFF or ON independently. While a pump is operating, regardless of shutoff

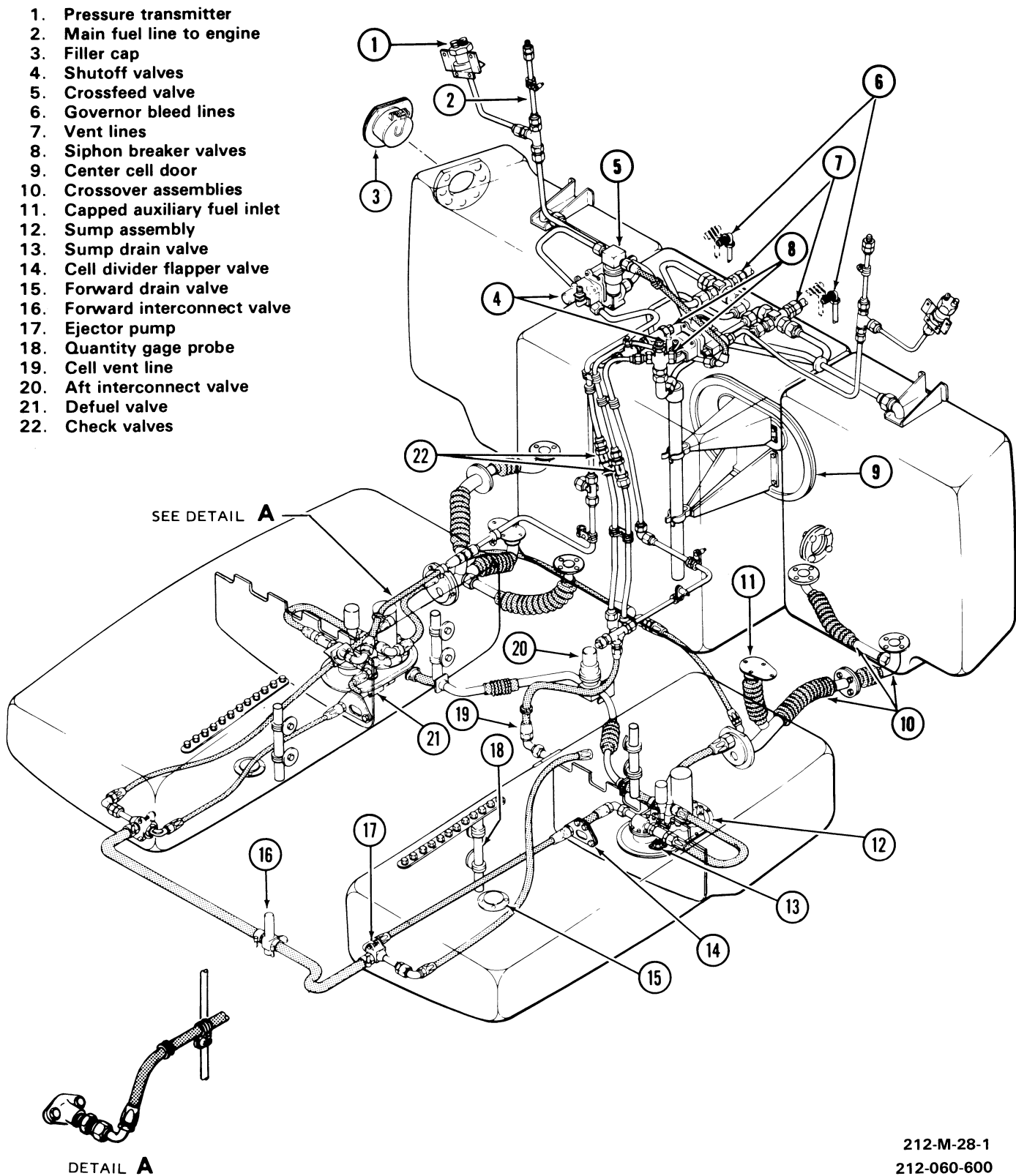
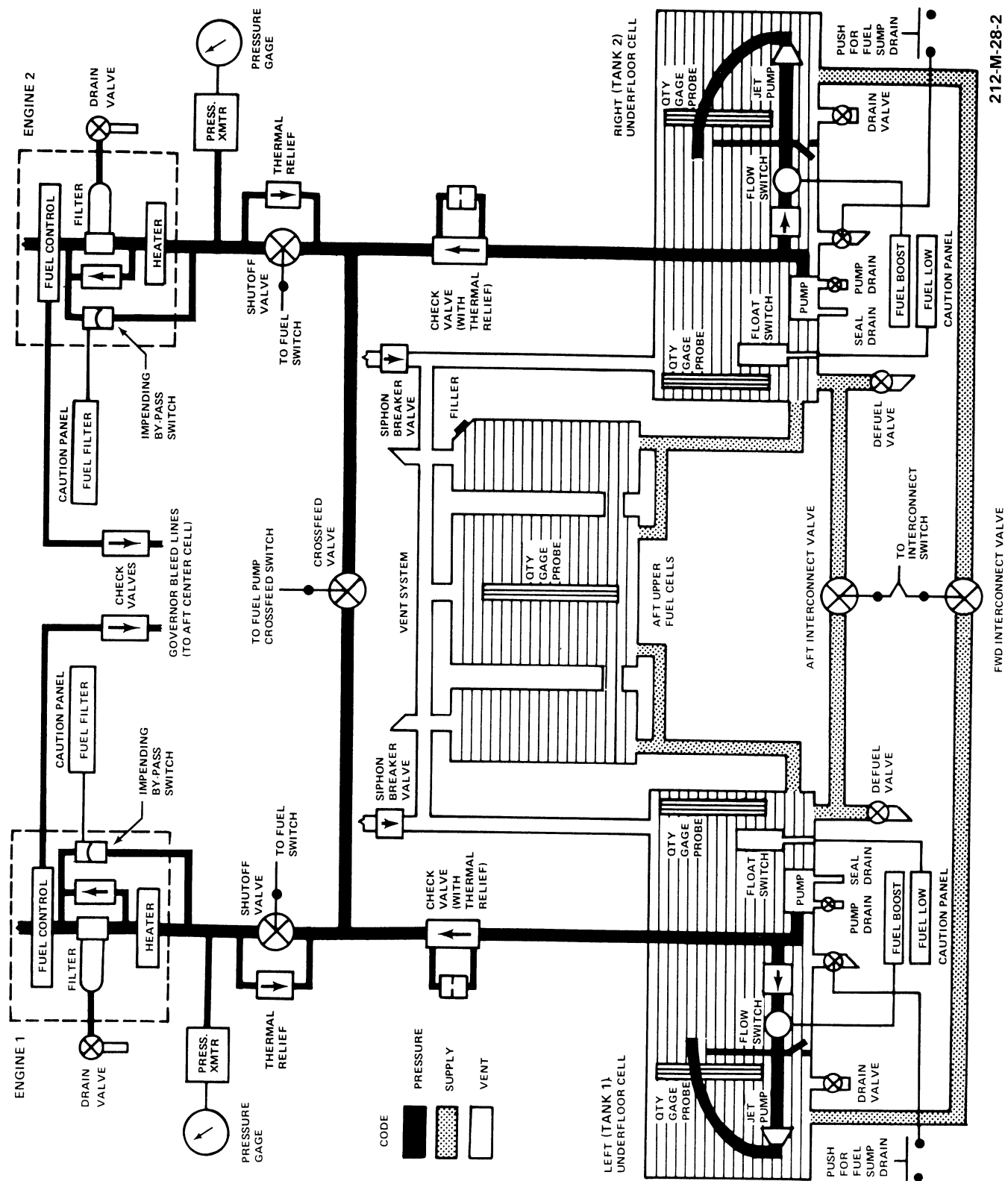


Figure 28-1. Fuel system



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FWD INTERCONNECT VALVE

Figure 28-2. Fuel system schematic

valve position, there will be output through its flow switch to prevent a false caution panel indication of pump failure.

5. While there is fuel in the aft cells, both lower tanks will be kept full by gravity feed. When aft cells are empty, fuel quantity gage readings will be from the lower tank probes, either as TOTAL or LEFT or RIGHT according to selected position of the switch at the gage. When the level in one lower cell drops below the float switch, the corresponding FUEL LOW caution panel segment will illuminate. When the INTERCONNECT switch is placed to OPEN, valves in the forward and aft interconnect lines will open to allow crossflow between lower cells.

6. Refer to Chapter 52 for locations of doors, panels, cowlings, and covers to be removed for access to fuel system components. Refer to Chapters 95, 96, and 98 for maintenance and testing of associated electrical systems.

28-5. TROUBLESHOOTING FUEL SYSTEM.

Refer to table 28-1.

Table 28-1. Troubleshooting fuel system.

INDICATION OF		
TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
FUEL FILTER caution panel segment illuminated.	Filter element clogged.	Remove and inspect filter element. Clean or replace filter element (refer to Pratt and Whitney Aircraft of Canada, Ltd PT6T-3 Series engine maintenance manual). Perform operational check.
FUEL BOOST caution panel segment illuminated.	Obstructed pump line through flow switch and ejector pump.	Clean screen in pump outlet fitting or replace flow switch or ejector pump or obstructed hoses.
	No electrical power to pump.	Repair wiring or replace faulty units in circuit.
	Defective boost pump.	Replace pump.
Shutoff valve inoperative.	Valve faulty or lacking electrical power.	Repair circuit or replace valve.
Interconnect valve (forward, aft, or crossfeed) inoperative.	Valve faulty or lacking electrical power.	Repair circuit or replace valve.

Table 28-1. Troubleshooting fuel system. (Cont)

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
FUEL LOW caution panel segment when fuel is not low or fails to illuminate when fuel is low	Defective float switch or wiring.	Replace float switch. Repair wiring.

28-6. OPERATIONAL CHECK.

For operational check of fuel system components and indicators, refer to Chapter 96.

28-7. PRESSURE TESTING.

1. Cap main fuel line and vent connections.



ENSURE FUEL CELL ACCESS PANELS ARE INSTALLED PRIOR TO APPLYING INFLATION PRESSURE.

2. Use regulated low-pressure, filtered, compressed air source or nitrogen with manometer or accurate pressure gage and a shutoff valve.



DO NOT APPLY MORE THAN 1.0 PSIG (6.9 kPa) PRESSURE TO FUEL SYSTEM. SEVERE DAMAGE TO CELL AND STRUCTURE MAY RESULT.

3. Apply pressure until gage indicates 0.5 to 1.0 psig (3.5 to 6.9 kPa) in cells and crossover tubes. Shut off air source. Verify pressure does not decrease after 15 minutes.

4. If leakage is detected, apply a soap and water solution to all repaired areas and to any other areas suspected of leaking. Repair leaks and repeat pressure test until no leaks are indicated.

5. Upon satisfactory completion of tests, remove all soap residue and remove all caps and plugs used to close off system if test results are satisfactory.

28-8. FORWARD FUEL CELLS.

Two fuel cells are located under the cabin floor outboard of B.L. 14 main longitudinal beams, between F.S. 102 and 155. Cells are laminated fabric and rubber self-sealing type, with molded-type metal fittings at openings, and passages for internal components and hoses. Each cell has a vent port on upper inboard side, interconnection ports on forward and aft ends, a drain port, and a large opening for sump assembly on lower side. A baffle divides each cell into forward and aft compartments and has a directional flow flapper valve. The sump opening provides access to the aft compartment. A slit in upper surface may be used for access to the forward compartment. Cells are suspended in fuselage cavities by nylon cord laced between hangers on cells and on structure. Each cell has threaded inserts on inboard wall for attachment of two fuel quantity gage probes.

Each sump assembly is equipped with an electrically operated boost pump, an outlet cross-fitting, check valve, flow-actuated switch, drain valve, defueling valve, low-level float switch, and connectors for fuel quantity gage probes.

28-9. Removal.

NOTE

Removal procedure is same for either left or right forward fuel cell.



DO NOT HANDLE CELL WHEN
CELL TEMPERATURE IS BELOW
65°F (18°C).

1. Disconnect and remove all electrical power from helicopter.
2. Defuel and purge system (Chapter 12).
3. Remove cabin floor panels and lower skin doors for access to forward fuel cell cavities and connections.
4. Disconnect electrical wiring between cabin structure and fuel cell sump components: Boost pump, flow switch, sump drain valve, and quantity gage circuit connectors.
5. Disconnect defueling valve crossover (18, figure 28-3) at flange.
6. Remove 12 bolts around base plate of sump assembly (19). Lower sump base enough to reach through opening. Disconnect hoses at inboard sides of pump (17) outlet cross fitting and flow switch (20). Disconnect quantity probe wires from connectors on inside of sump assembly (19). Remove sump assembly and packing.
7. Disconnect fuel pressure hose (8) at outlet elbow on crossover assembly at aft end of cell. Disconnect crossover tubes (12) at F.S. 166 bulkhead and at clamped connection to capped auxiliary fuel provision (10). Remove bolts to detach flange of crossover assembly (9) from cell port. Remove crossover assembly with fuel pressure hose attached on inner side.

8. Remove bolts to detach forward drain valve and plate assembly and packing.

9. Disconnect hose from vent fitting (4). Remove nuts, two bolts, vent fitting, and packing.

10. Remove two pairs of bolts from inboard side of B.L. 14 beam at F.S. 119.82 and 144.82.

11. Remove 12 bolts and access bar (2) to open access slit in top of forward compartment of cell.

12. Remove two bolts to detach ejector pump (23) from crossfeed port in forward end of cell.

13. At front of F.S. 102 bulkhead, loosen clamp and detach hose from crossfeed fitting. Disconnect forward interconnect tube from fitting. Remove nut, washer, packing, and fitting.

14. Remove support cord from hangers around top of cell and cavity.

NOTE

Steps 15. and 16. can optionally be postponed until after removal of cell, or omitted if cell is not to be replaced.

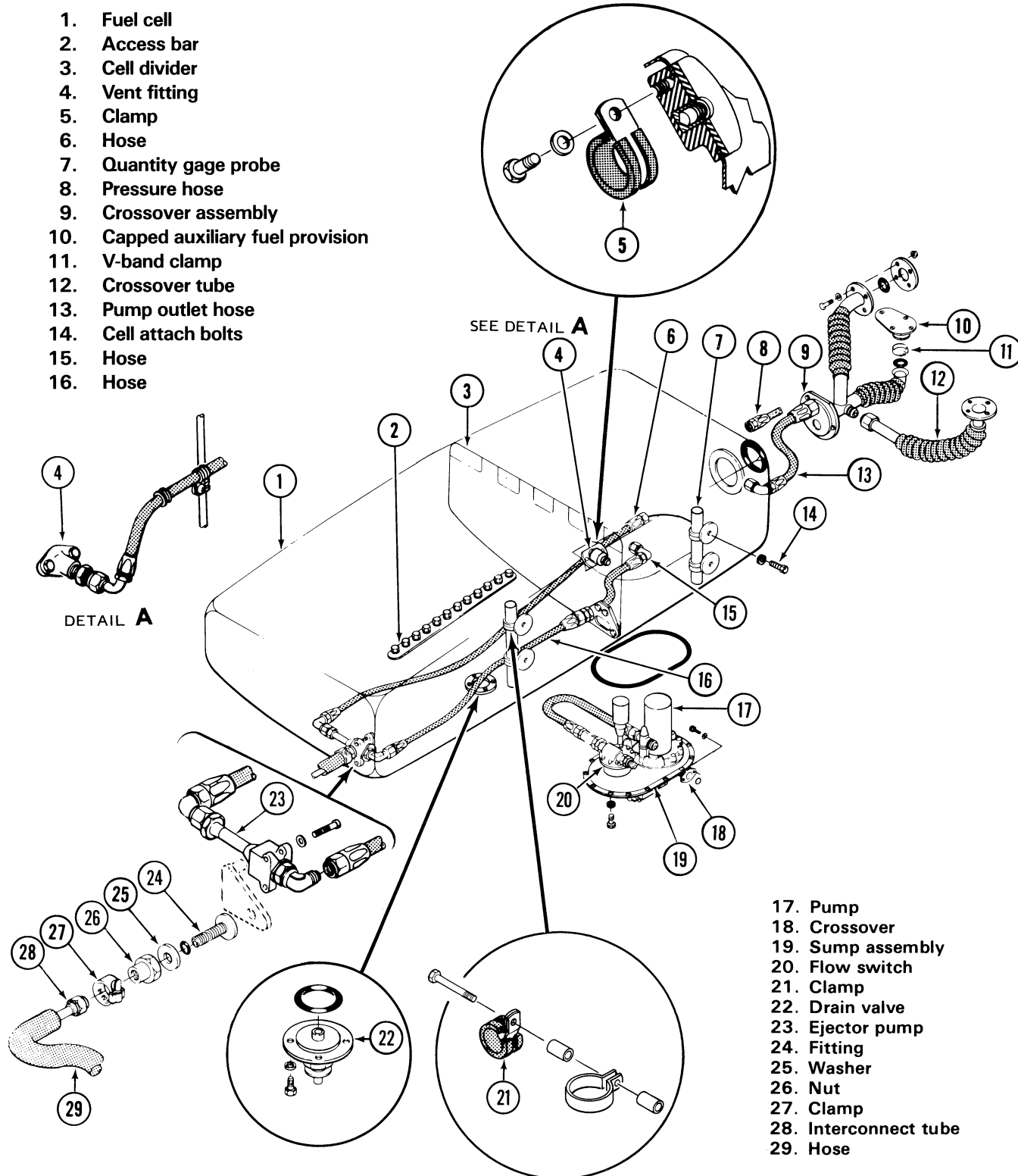
15. Disconnect hose (16) at union on front of cell divider. Detach hose support clamps at quantity gage probe and in vent port. Remove ejector pump (23) with attached hoses.

16. Remove two quantity gage probes (7) with attaching clamps and bolts.

17. Lift fuel cell (1) from cavity.

18. Remove flapper valve (paragraph 28-43).

19. Install protective caps plugs in open fuel lines and over cell openings.



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 212-060-600

Figure 28-3. Forward fuel cell

28-10. Cleaning.**MATERIALS REQUIRED**

NUMBER	NOMENCLATURE
C-302	Methyl Alcohol



WHEN USING HOT WATER TO CLEAN FUEL CELL, WATER TEMPERATURE SHALL BE LIMITED TO 160°F (71°C). DO NOT USE SOAPS OR STRONG DETERGENTS WHEN CLEANING CELL. SOAPS CAN REACT WITH FUEL TO FORM A COMPOUND WHICH TENDS TO PLUG FILTERS. DO NOT USE METHYL-ETHYL-KETONE (MEK) OR SIMILAR SOLVENTS FOR CLEANING CELLS.

1. Remove all fungus growth from cell by hand or with soft scrub brush using warm or hot water.
2. If fungus is observed in cell cavity, wipe cavity with clean cloths moistened with methyl alcohol (C-302).
3. Inspect other cells for presence of fungus growth. Remove any affected cell and clean as required.

28-11. Inspection.

1. Inspect cells for cracks, scuffing, and general condition.
2. Inspect threaded inserts for serviceability. Inserts with thread damage which can be detected visually shall be replaced.
3. Check drain valves for evidence of leaks.
4. Check electrical connections for conditions.

5. Inspect hoses for damage and deterioration. Hoses exhibiting damage or deterioration which can be detected visually shall be replaced.

6. Inspect any removed components for serviceability.

28-12. INSTALLATION.**MATERIALS REQUIRED**

NUMBER	NOMENCLATURE
C-311	Adhesive
C-408	Talcum Powder
C-480	Nylon Cord

Leave fuel cell in original shipping container until ready to install in helicopter.



DO NOT HANDLE FUEL CELLS WHEN TEMPERATURE OF CELL IS BELOW 65°F (18°C).

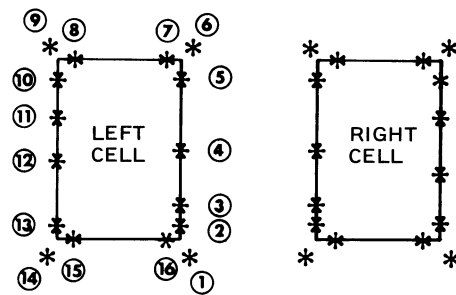
1. Inspect cell cavity for clean, smooth condition of surfaces.
2. Liberally apply talcum powder (C-408) to cavity surfaces.
3. Remove protective caps, plugs, and covers.

NOTE

Installation procedure is same for either left or right forward fuel cell. Steps 4. through 7. for installation of internal components may optionally be postponed until after cell is placed in cavity.

4. Install flapper valve, if removed (paragraph 28-46).

- 5.** Place ejector pump (23, figure 28-3), with attached hoses, into forward compartment of cell (1) with hose (6) outboard. Connect hose (15) to union on flapper valve assembly. Insert end of hose (6) through opening above cell divider at inboard side and attach hose support clamp with bolt and thin aluminum alloy washer to threaded insert at cell vent port.
- 6.** Position quantity gage probe (7) with support clamps to threaded inserts on inboard wall of forward compartment. Secure lower clamp with bolt and thin aluminum washer. Install upper bolt through support clamp on hose (6), and through spacer and probe clamp to cell inserts.
- 7.** Position quantity gage probe (7) with support clamps to threaded inserts on inboard wall of rear compartment. Secure lower clamp with bolt and thin aluminum alloy washer. Install upper bolt through a thin aluminum washer, probe clamp, and spacer to cell insert.
- 8.** Inspect cavity under cabin floor for clean, smooth condition of surfaces. Brush talcum powder (C-408) to cavity surface to prevent cell adhesion.
- 9.** Place packings in grooves around sump port, aft outlet port, and forward drain port. Use adhesive (C-311) as required to hold packings in place during cell installation.
- 10.** Place fuel cell (1) into cavity.
- 11.** Align forward drain port to mounting holes. With packing in place, install drain valve and plate assembly with four bolts and thin aluminum washers. Torque bolts 40 to 50 in.lbs. (4.52 to 5.65 Nm).
- 12.** Align two pairs of threaded inserts on inboard side of cell to mounting holes through B.L. 14 beam at F.S. 119.82 and 144.82. Install bolts, with thin aluminum washers, from inboard side of beam.
- 13.** Install fitting and packing on cell vent port with two bolts and thin aluminum washers. Insert through beam and install nut. Connect vent hose.
- 14.** Align forward crossfeed port of cell to hole in F.S. 102 bulkhead. Insert fitting from inside cell, and install packing, washer, and nut at front of bulkhead. Connect forward interconnect tube to fitting. Attach hose on nut with clamp.
- 15.** Position ejector pump (23) over inner end of crossfeed fitting. Install two bolts, with washers under heads, through pump housing into threaded inserts of cell.
- 16.** Install crossover assembly (9) to aft outlet port of cell as follows:
 - a.** Check boost pump outlet hose (13) connected on inner side of crossover.
 - b.** Align cell aft outlet port to mounting holes of cavity aft bulkhead, with packing in place.
 - c.** Insert hose into cell, position crossover mounting flange, and install six bolts with thin aluminum washers. Torque bolts 40 to 50 in.lbs. (4.52 to 5.65 Nm).
 - d.** Connect auxiliary fuel line to capped fitting with packing and V-band clamp.
 - e.** Connect main fuel hose to below on crossover.
 - f.** Connect aft cell line at F.S. 166 bulkhead with packing and four bolts with thin aluminum washers.
 - g.** On right cell, also connect center cell crossover and check installation of cap on upper and lower inboard fittings of crossover assembly.
- 17.** Install access bar (2) and twelve bolts with thin aluminum washers to close access slit on upper surface of cell.
- 18.** Lace and tie a single length of nylon cord (C-480) between hangers around top of cell and cavity (figure 28-4).
- 19.** Install sump assembly (19, figure 28-3) as follows:



LACE EACH CELL WITH SINGLE LENGTH OF NYLON CORD IN SEQUENCE SHOWN. TIE AT EACH * SYMBOL.

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Figure 28-4. Forward fuel cell lacing

a. With packing in place, hold sump assembly slightly below cell port.

b. Connect hose (15) from union on flapper valve plate to outlet elbow on flow switch (20).

c. Connect pump outlet hose (13) from aft outlet crossover to inboard elbow on boost pump outlet cross fitting.

d. Connect wires from forward and aft quantity gage probes to connectors on inside of sump base plate.

e. Raise sump assembly (19) to position. Install twelve bolts with thin aluminum washers. Torque bolts 40 to 50 in.lbs. (4.52 to 5.65 Nm).

f. Connect electrical wires to terminal block and quantity gage circuit connectors.

g. Connect crossover (18) at mating flange of aft crossover hose with packing, two bolts, and thin aluminum washers.

20. Install deck panels and access doors.

21. Pressure test system per paragraph 28-7.

28-13. AFT FUEL CELLS.

Three aft cells are located in fuselage cavities aft of pylon support between engine deck and cabin floor levels. The center cell is inside the two B.L. 14 main structural beams, between bulkheads at F.S. 155 and 178. The left and right cells are outboard of the main beams, between F.S. 166 and 178. Cells are bladder type, of laminated fabric and synthetic rubber, with inserted metal flange-type fittings at openings and integral hangers around upper ends of nylon cord suspension in cavities. Side cells have interconnection ports on bottom and lower inboard sides, and a vent port on the top. The right cell has a filler port. The center cell has interconnection ports on bottom and lower outboard sides, and a large access door opening on the aft side. The access door provides mounting and electrical connections for fuel quantity gage

probe, and has inlet fittings and check valves for engine governor bleed lines.

Refer to Auxiliary Fuel Tank Kits ([BHT-212-SI-12](#)) for complete information on seat type or extended range auxiliary fuel kits.

28-14. Aft Outboard Fuel Cells

28-15. Aft Outboard Fuel Cells — Removal

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-016	Lubricating Oil
C-428	Caps and/or Plugs

CAUTION

DO NOT HANDLE FUEL CELL WHEN CELL TEMPERATURE IS BELOW 65°F (18°C).

NOTE

When a cell, which has contained fuel, is to remain empty for more than 3 days, fog inner surface of cell with lubricating oil ([C-016](#)) to prevent deterioration caused by drying out. Do not leave cell collapsed. If cell is not to be replaced in the helicopter immediately, place cell in a stand or a container such as is normally used for shipping. Restore cell to normal shape.

1. Disconnect and remove all electrical power from helicopter.

2. Remove aft outboard left cell as follows:

a. Defuel and purge system ([Chapter 12](#)).

b. Remove deck panel above left cell (17, [Figure 28-5](#)).

c. Disconnect vent line (14) from reducer tee (8) and from cross fitting in center cell cavity. Detach grommet (15) from beam and move vent line clear of side cell cavity.

d. Remove four bolts and washers to detach elbow (5), plate (6), and packing (7) from vent port of left cell. Remove four screws and washers to detach bracket (16) from aft bulkhead of compartment.

e. At underside of cell, remove bolts and washers to detach crossover fitting (25) and packing from cell port.

f. Remove door (20) as follows:

(1) Disconnect two governor bleed lines (22) from check valves (21) on door (20) and from fittings at underside of engine deck. Cap fittings.

(2) Disconnect electrical wiring from two quantity gauge connectors (23) and terminal block (24) on door.

(3) Remove bolts and washers around edge of door (20). Carefully remove door, packing (19), and quantity gauge probe (18).

g. Remove interconnect fitting (26).

h. Remove cord lacing around top of cell.

i. Lift cell from cavity.

j. Cover cell openings and cap open lines with caps and/or plugs ([C-428](#)).

3. Remove aft outboard right cell as follows:

a. Ensure that [step 2, substep a](#) has been accomplished. Remove deck lid above right fuel cell.

b. Remove cap and adapter (1) from filler port.

c. Disconnect vent line (9) from reducer tee (8) and from cross fitting in center cell cavity. Remove grommet (10) from beam and move vent line clear of fuel cell cavity.

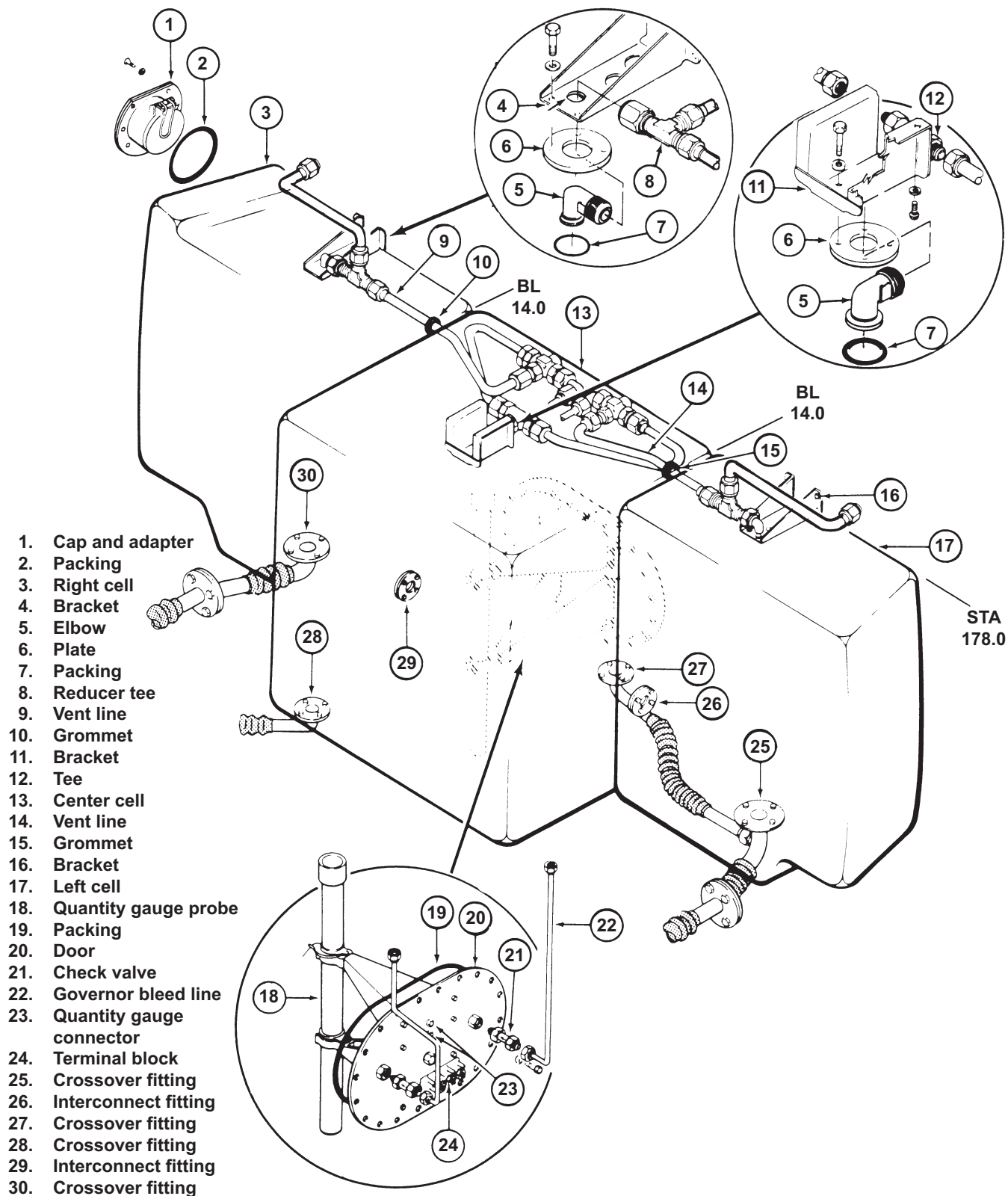


Figure 28-5. Aft Fuel Cell

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d. Remove four bolts and washers to detach elbow (5), plate (6), and packing (7) from vent port. Discard packing.

e. At underside of cell, remove bolts and washers and remove crossover fitting (30) and packing from fuel cell port. Discard packing.

f. Remove door (20) per [step 2, substep f](#).

g. Remove interconnect fitting (29).

h. Remove cord lacing around top of fuel cell.

i. Lift cell from cavity.

j. Cover cell openings and cap open lines with caps and/or plugs ([C-428](#)).

28-16. Aft Outboard Fuel Cells — Cleaning

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-339	Ethyl Alcohol

CAUTION

WHEN USING HOT WATER TO CLEAN FUEL CELL, WATER TEMPERATURE SHALL BE LIMITED TO 160°F (71°C). DO NOT USE SOAPS OR STRONG DETERGENTS WHEN CLEANING CELL. SOAPS CAN REACT WITH FUEL TO FORM A COMPOUND, WHICH TENDS TO PLUG FILTERS. DO NOT USE MEK OR SIMILAR SOLVENTS FOR CLEANING CELLS.

1. Remove all fungus growth from cell by hand or with soft scrub brush using warm or hot water.
2. If fungus is observed in cell cavity, wipe cavity with clean cloths moistened with ethyl alcohol ([C-339](#)).
3. Inspect other cells for presence of fungus growth. Remove any affected cell and clean as required.

28-17. Aft Outboard Fuel Cells — Inspection

1. Inspect fuel cell for cracks and scuffing. Replace cells if unserviceable.
2. Inspect all fittings and ensure serviceability of threaded inserts. Replace if unserviceable.

28-18. Aft Outboard Fuel Cells — Installation

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-311	Adhesive
C-408	Talcum Powder
C-471	Lacing Cord

CAUTION

DO NOT HANDLE FUEL CELL WHEN CELL TEMPERATURE IS BELOW 65°F (18°C).

LEAVE FUEL CELL IN ORIGINAL SHIPPING CONTAINER UNTIL READY TO INSTALL IN HELICOPTER.

NOTE

Workaids to align fuel cell fittings during installation may be fabricated by cutting off heads of two AN4 bolts approximately 6 inches (15.24 cm) long. Grind cutoff ends to bullet shape, removing any burrs. Install workaids in two nutplates of fuel cell port being attached, and use workaids to hold alignment with mating parts while starting prescribed attaching bolts into remaining nutplates. Make sure attaching bolts are correct thread size and length: bolts too short will not have enough thread engagement; bolts too long will bottom out and cause incorrect torque, possible damage to nutplate, and fuel leakage.

NOTE

Fuel cells 212-360-602-101 (left side) and 212-360-602-102 (right side) do not have lacing rings. Existing vent, interconnect, and filler fittings attachment will support cell into position inside airframe structure after installation.

1. Remove caps and/or plugs from lines and openings.
2. Inspect fuel cell cavity for cleanliness and smooth condition of all interior surfaces. Apply talcum powder (C-408) to cavity to prevent cell adhesion.
3. Install aft outboard left cell as follows:

a. Place packings in grooves of interconnect, crossover, and vent port fittings. Secure packings in place with a fuel soluble adhesive (C-311) or equivalent.

b. Insert fuel cell into cavity. Use care to avoid damage to fuel cell.

NOTE

Fuel tank assemblies 212-360-602-101 (left side) and 212-360-602-102 (right side) do not have lacing rings. Vent, interconnect, and filler fitting attachments will support tank position in airframe structure after installation.

c. Lace fuel cell in position using a single length of lacing cord (C-471). Lace as shown in Figure 28-6.

d. Align bottom ports of cells to mounting points in floors of cavities using workaids, as required. With packings in place, attach crossover fitting (25, Figure 28-5) with four bolts and thin aluminum washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

e. At top of left aft cell, assemble packing (7), plate (6), and elbow (5) pointing inboard, and bracket (16) with attachment legs aft, with four bolts and thin aluminum washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm). Attach each bracket to aft bulkhead inserts with four screws and thin aluminum washers.

f. Connect vent line (14), between reducer tee (8) and aft nipples of cross fittings in top of center cell cavity, using grommet (15) where vent line passes through BL 14.0 beam.

g. Place packings in grooves of interconnect fitting (26) using fuel soluble adhesive (C-311) to keep packing in place. Make sure packings are also in place on mating fitting. Using workaids as required, align interconnect fitting, and secure with bolts and thin aluminum washers installed from inside of center cell. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

h. Install deck above fuel cell.

i. Pressure test system per paragraph 28-7.

4. Install aft outboard right cell as follows:

a. Place packings in grooves of interconnect, crossover, vent, and fuel filler port fittings. Secure packings in place with a fuel soluble adhesive (C-311) or equivalent.

b. Insert fuel cell into cavity. Use care to avoid damage to fuel cell.

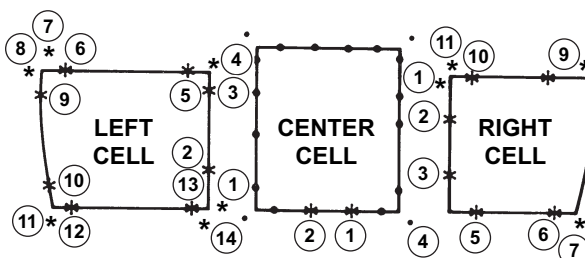
NOTE

Fuel tank assemblies 212-360-602-101 (left side) and 212-360-602-102 (right side) do not have lacing rings. Vent, interconnect, and filler fitting attachments will support tank position in airframe structure after installation.

c. Lace fuel cell in position using a single length of lacing cord (C-471). Lace as shown in Figure 28-6.

d. Align bottom ports of cells to mounting points in floors of cavities using workaids, as required. With packings in place, attach each crossover fitting (30, Figure 28-5) with four bolts and thin aluminum washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

e. At top of right aft cell, assemble packing (7), plate (6), and elbow (5) pointing inboard, and bracket (4) with attachment legs aft, with four bolts and thin aluminum washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm). Attach each bracket to aft bulkhead inserts with four screws and thin aluminum washers.



LACE EACH CELL WITH SINGLE LENGTH OF NYLON CORD IN SEQUENCE SHOWN. TIE AT EACH * SYMBOL.

NOTE

Lacing does not apply to fuel tank assemblies 212-360-602 and 212-360-603.

212_MM_28_0006

Figure 28-6. Tying Sequence — Aft Fuel Cell

f. Connect vent line (9), between elbow and aft nipples of cross fittings in top of center cell cavity, using grommet (10) where vent line passes through BL 14.0 beam.

g. Place packings in grooves of interconnect fittings (29) using fuel soluble adhesive (C-311) to keep packings in place. Make sure packings are also in place on mating fittings of right and left aft cells. Using workaids as required, align each interconnect fitting and secure with bolts and thin aluminum washers installed from inside of center cell. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

h. Align filler port to mounting point of outer skin panel. With packing (2) in place, position cap and adapter (1) with trimmed edge up. Install bolts with thin aluminum washers, picking up riveted ground strip on forward upper bolt. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

i. Install deck above fuel cell.

j. Pressure test fuel system per [paragraph 28-7](#).

5. Place packing (19) in groove around center cell access port. Hold door (20) near opening, with brackets extending into cell. Position quantity gauge probe (18) in clips on brackets, securing with tie at upper clip. Connect probe electrical leads to connectors on inside of door. Align door and install

20 bolts with thin aluminum alloy washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

28-19. Aft Center Fuel Cell

28-20. Aft Center Fuel Cell — Removal

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-016	Lubricating Oil
C-428	Caps and/or Plugs



DO NOT HANDLE FUEL CELL WHEN CELL TEMPERATURE IS BELOW 65°F (18°C).

NOTE

When a cell, which has contained fuel, is to remain empty for more than 3 days, lightly fog inner surface with lubricating oil (C-016) to prevent deterioration caused by drying

out. Do not leave the cell collapsed. If cell is not to be replaced in helicopter immediately, install cell in a stand or a container such as is normally used for shipping. Restore cell to normal shape.

1. Defuel and purge system ([Chapter 12](#)).
2. Disconnect and remove all electrical power from helicopter.
3. Disconnect two governor bleed lines (22, [Figure 28-5](#)) from check valves (21) on door (20) and from fittings at underside of engine deck. Cap fittings.
4. Disconnect electrical wiring from two quantity gauge connectors (23) and terminal block (24) on door.
5. Remove bolts and washers around edge of door (20). Carefully remove door, packing (19), and quantity gauge probe (18).
6. Working from inside center cell (13), remove bolts and washers to detach both interconnect fittings (26 and 29).
7. Untie and unlace support cord from hangers around aft upper edge of center cell to allow access to vent connections above cell.
8. Disconnect vent lines from tee (12). Remove four screws and washers to detach bracket (11) from underside of engine deck. Remove four bolts and washers to detach bracket, elbow (5), plate (6), and packing (7) from vent port of center cell.
9. At underside of center cell cavity, remove bolts and washers to detach crossover fittings (27 and 28) and packings from ports of center cell.
10. Remove cord lacing and collapse center cell folding and securing with suitable webbing straps into a bundle, and withdraw cell aft through door opening. Restore cell to normal shape after removal.
11. Cover cell openings and cap open lines with caps and/or plugs ([C-428](#)).

28-21. Aft Center Fuel Cell — Cleaning

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-339	Ethyl Alcohol



WHEN USING HOT WATER TO CLEAN FUEL CELL, WATER TEMPERATURE SHALL BE LIMITED TO 160°F (71°C). DO NOT USE SOAPS OR STRONG DETERGENTS WHEN CLEANING CELL. SOAPS CAN REACT WITH FUEL TO FORM A COMPOUND, WHICH TENDS TO PLUG FILTERS. DO NOT USE MEK OR SIMILAR SOLVENTS FOR CLEANING CELLS.

1. Remove all fungus growth from cell by hand or with soft scrub brush using warm or hot water.
2. If fungus is observed in cell cavity, wipe cavity with clean cloths moistened with ethyl alcohol ([C-339](#)).
3. Inspect other cells for presence of fungus growth. Remove any affected cell and clean as required.

28-22. Aft Center Fuel Cell — Inspection

1. Inspect fuel cell for cracks and scuffing. Replace cell if unserviceable.
2. Inspect threaded inserts for damaged threads. Damage that can be detected visually is not acceptable. Replace insert if unserviceable.

28-23. Aft Center Fuel Cell — Installation

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-311	Adhesive

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-408	Talcum Powder
C-471	Lacing Cord



DO NOT HANDLE FUEL CELL WHEN CELL TEMPERATURE IS BELOW 65°F (18°C).

LEAVE FUEL CELL IN ORIGINAL SHIPPING CONTAINER UNTIL READY TO INSTALL IN HELICOPTER.

NOTE

Workaids to align fuel cell fittings during installation may be fabricated by cutting off heads of two AN4 bolts approximately 6 inches (15.24 mm) long. Grind cutoff ends to bullet shape, removing any burrs. Install workaids in two nutplates of fuel cell port being attached, and use workaids to hold alignment with mating parts while starting prescribed attaching bolts into remaining nutplates. Make sure attaching bolts are correct head size and length: bolts that are too short will not have enough thread engagement; bolts that are too long will bottom out and cause incorrect torque, possible damage to nutplate, and fuel leakage.

NOTE

Fuel cell 212-360-603-101 (center aft) does not have lacing rings. Existing vent and interconnect fittings attachment will support cell into position inside airframe structure after installation.

1. Remove caps or plugs from lines and openings.
2. Inspect fuel cell cavity for cleanliness and smooth condition of all interior surfaces. Apply talcum powder ([C-408](#)) to cavity to prevent cell adhesion.

3. Collapse center fuel cell, folding and securing with suitable webbing straps into a bundle that can pass through rear access door of cavity. Carefully insert cell into cavity, remove straps, and arrange in approximate position.

4. Place packings in grooves of two crossover ports in bottom of center cell, using fuel soluble adhesive ([C-311](#)), or equivalent, to hold packings in place. Using workaids as required, position each port to mounting point in floor of cavity and attach crossover fittings (27 and 28, [Figure 28-5](#)) with bolts and thin aluminum washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

5. Place packings in grooves of interconnect fittings (26 and 29) using adhesive ([C-311](#)) to keep packings in place. Make sure packings are also in place on mating fittings of right and left aft cells. Using workaids as required, align each interconnect fitting and secure with bolts and thin aluminum washers installed from inside cell. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

6. At vent port fitting in top of center cell, assemble packing (7), plate (6), elbow (5) with attached tee (12), and bracket (11) with four bolts and thin aluminum washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

NOTE

Fuel tank assembly 212-360-603-101 (center aft) does not have lacing rings. Vent and interconnect fitting attachments will support tank to position in airframe structure after installation.

7. Lace single length of lacing cord ([C-471](#)) through hangers around upper forward area of center cell and cavity ([Figure 28-6](#)). Temporarily secure ends of cord, leaving enough slack for access to top of cell.

8. Align vent bracket (11, [Figure 28-5](#)) to inserts in top of cavity. Install four screws with thin aluminum washers. Connect vent tubes from two cross fittings to tee (12).

9. Complete lacing of support cord around top of center cell, and tie securely.

10. Place packing (19) in groove around center cell access port. Hold door (20) near opening, with brackets extending into cell. Position quantity gauge probe (18) in clips on brackets securing with tie at upper clip. Connect probe electrical leads to connectors on inside of door. Align door and install 20 bolts with thin aluminum alloy washers. Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).

11. Connect two governor bleed lines (22) from fittings under deck to check valves (21) on door. Connect electrical wiring to quantity gauge connectors (23) and to terminal block (24) on door.

12. Install access panels and covers.

13. Perform pressure test of fuel system ([paragraph 28-7](#)).

28-24. FUEL SUMP ASSEMBLY

Fuel cell sump assemblies are mounted in openings on the underside of each forward fuel tank. Removal of sump assemblies from the cells permits access for maintenance and replacement of the boost pump, flow switch, low fuel level warning switch, check valve, cross fitting, and sump drain valve. The boost pump and sump drain valves may be removed without removing sump assembly.

NOTE

Maintenance procedures are the same for both sump assemblies.

28-25. Fuel Sump Assembly — Removal

1. Defuel and purge system ([Chapter 12](#)).
2. Disconnect electrical power.
3. Remove sump access door from fuselage lower skin.
4. Disconnect electrical leads at terminal block (22, [Figure 28-7](#)) and quantity gauge connectors on sump base.
5. Disconnect crossover assembly (2) at flange secured by two bolts.

6. Remove 12 bolts around edge of sump base (3). Lower sump assembly enough to reach through opening. Disconnect hoses (5 and 13) from inboard side of pump outlet (8) and from union (12) in outlet of flow switch (11). Disconnect quantity probe wires from connectors (14). Remove sump assembly.

7. Cover fuel cell sump opening.

28-26. Fuel Sump Assembly — Inspection

1. Inspect area where sump mates with cell for damage and cleanliness. Inspect packing groove.
2. Inspect components for security of mounting.
3. Inspect hoses, unions, and fittings for contamination and thread damage. Thread damage that can be detected visually is not acceptable. Replace unserviceable part.
4. Inspect electrical leads and connectors for condition.

28-27. Fuel Sump Assembly — Installation

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-024	Assembly Fluid

1. Remove protective covering from cell sump opening.
2. Place packing in groove around sump port of cell, using assembly fluid ([C-024](#)) to hold packing in place during installation.
3. Hold sump assembly slightly below cell port.
4. Connect hose (13, [Figure 28-7](#)) to union (12) in outlet of flow switch (11).
5. Connect pressure hose (5) to inboard nipple of pump outlet (8).
6. Connect quantity probe wires to connectors (14).

7. Raise sump assembly to position. Install 12 bolts with thin aluminum washers. Torque bolts 40 to 50 in.lbs. (4.52 to 5.65 Nm).

8. Connect crossover assembly (2) to mating flange of aft crossover hose with packing and two bolts with thin aluminum washers.

9. Connect electrical wires at terminal block and quantity probe connectors on sump base (3).

10. Perform pressure test (paragraph 28-7).

11. Install sump access door to fuselage lower skin.

12. Perform operational check of fuel quantity indicating system before servicing system (Chapters 95 and 96).

13. Service fuel system (Chapter 12).

14. Check area for leaks.

28-28. FLOW SWITCHES.

Switches actuated by outlet flow from each boost pump are connected to caution panel lights to provide warning of interruption of pump output. A directional flow check valve is installed in each flow switch inlet, and the switch outlet is connected to the jet pump in forward end of cell.

28-29. Removal.

1. Remove sump assembly (paragraph 28-25).

2. Disconnect flow switch (11, figure 28-7) electrical leads from terminal block (22).

3. Disconnect flow line hose (9) from check valve (10), and flow hose (13) from union (12).

4. Remove retaining nut, washer, flow switch (11), and packing from sump base (3).

5. When flow switch (11) is being replaced, remove check valve (10), union (12), and packings. Cover open ports.

28-30. Installation.

1. If installing a replacement flow switch (11, figure 28-7) remove shipping plugs and install check valve (10) with packing in switch inlet, and union (12) with packing in outlet.

2. Assemble flow switch (11) to sump base (3) with packing, nut, and washer. Torque bolts 40 to 50 in.lbs. (4.52 to 5.65 Nm).

3. Connect flow line hose (9) to check valve (10), and flow hose (13) to union (12).

4. Connect switch electrical leads to terminal block.

5. Install sump assembly (paragraph 28-27).

6. Pressure test fuel system (paragraph 28-7).

7. Perform operational check of fuel quantity indicating system before servicing system (Chapters 95 and 96).

28-31. FUEL BOOST PUMPS.

The boost pumps are electrically operated by 28 Vdc circuits controlled by separate switches. Each pump is installed with a drain valve, a seal drain, and an outlet cross fitting.

28-32. Removal.

1. Remove sump assembly (paragraph 28-25).

2. Disconnect fuel line hose (9, figure 28-7) from pump outlet (8).

3. Disconnect pump electrical leads from terminal block (22). Drain trapped fuel through pump drain valve (20) or pump outlet (8).

4. Remove 12 bolts around mounting flange and pull boost pump (16) and gasket (15) from sump base (3).

5. When replacing pump: Remove seal drain adapter (18) with nut packing, pump outlet (8), and pump outlet plug (19) with bolt,

washer, and packings, and pump drain valve (20) with packing.

6. Cover pump openings

28-33. Installation.

NOTE

The screen in S2490 pump outlet (8, figure 28-7) is to be removed prior to installing fitting on pump.

1. If installing a replacement boost pump (16), remove shipping plugs and install adapting parts as follows:

- a. Install pump drain valve (20) with packing in pump (16).

- b. Install seal drain adapter (18) with nut and packing in seal drain port.

- c. Insert pump outlet (8) in top of pump outlet, and pump outlet plug (19) with packings, bolt and washer in lower end of outlet. Tighten bolt but omit lockwire until after hoses are connected to fitting during sump installation.

2. Position gasket (15) and pump to sump base (3). Install mounting bolts with thin aluminum washers. Attach ground jumper (17) on center aft bolt. Torque bolts 50 to 100 in.lbs. (5.65 to 11.3 Nm).

3. Connect pump electrical lead to terminal block (22) on sump base.

4. Install sump assembly (paragraph 28-27).

5. Pressure test system (paragraph 28-7).

6. Service fuel system.

7. Perform boost pump operational check (chapter 96)

28-34. CANNISTER TYPE BOOST PUMP CARTRIDGE.

The cannister type boost pump incorporates an integral cartridge pumping element.

Replacement of element reduces damage to fuel cell components and eliminates need to break cell-to-pump seal during routine maintenance.

28-35. Removal.

1. Disconnect and remove all electrical power from helicopter .

2. Remove allen screw (2, figure 28-8) from valve locking bar (1). Rotate bar clear of cartridge (3).

NOTE

Removal of allen screw will disconnect white electrical negative (-) lead (4) and will allow valve locking bar to extend, closing off fuel supply to cartridge.

3. Disconnect black electrical positive (+) lead (7) from cartridge terminal and move wiring clear of cartridge area.

4. Remove drain valve (6) from cartridge center drain port. Allow trapped fuel to drain.

5. Remove retaining ring (5) securing cartridge (3) in pump housing.

6. Install special cartridge removal tool (8), or equivalent, in cartridge drain port and secure with check nut. Using weight, impact cartridge from pump housing. Remove tool from cartridge.

7. Remove and discard packings (9 and 10).

28-36. Cleaning.

Clean all foreign matter from cartridge bore and retaining ring groove in pump housing and from retaining ring.

28-37. Repair.

For cartridge repair, return cartridge to:

Airborne Aviation Products Group
711 Taylor St.
Elyria, Ohio 44035

28-38. Installation.**MATERIALS REQUIRED**

NUMBER	NOMENCLATURE
C-008	Petrolatum
C-405	Lockwire

1. Lubricate packings (9 and 10, figure 28-8) (furnished with new cartridge) with petrolatum (C-008).

2. Using hand pressure, install cartridge in pump housing with arrows aligned on flanges (within $\pm 3^\circ$).

NOTE

Special cartridge removal tool, P/N E2-10-1, may be used as a work aid during installation. Do not impact cartridge for damage to parts may result.

3. Secure cartridge in pump housing with retaining ring (5).

4. Install drain valve (6) in cartridge boss with retaining ring (5).

5. Rotate valve locking bar (1) over cartridge and in line with negative (-) terminal.

6. Insert white negative (-) lead terminal under bar and secure both with allen screw (2).

7. Connect black positive (+) lead terminal to positive (+) terminal on cartridge; do not overtorque.

8. Secure drain valve (6) to allen screw (2) with lockwire (C-405).

9. Pressure test system per paragraph 28-7.

10. Connect battery.



CARTRIDGE PUMPS ARE COOLED AND LUBRICATED BY FUEL WHICH EXITS THROUGH TOP UMBRELLA CHECK VALVE ON PUMP/CARTRIDGE HOUSING. DO NOT RUN DRY.

11. Perform fuel boost pump operational check as follows:

a. Ensure both boost pumps are covered with fuel. Refuel helicopter as required.

b. Connect battery and/or external power supply.

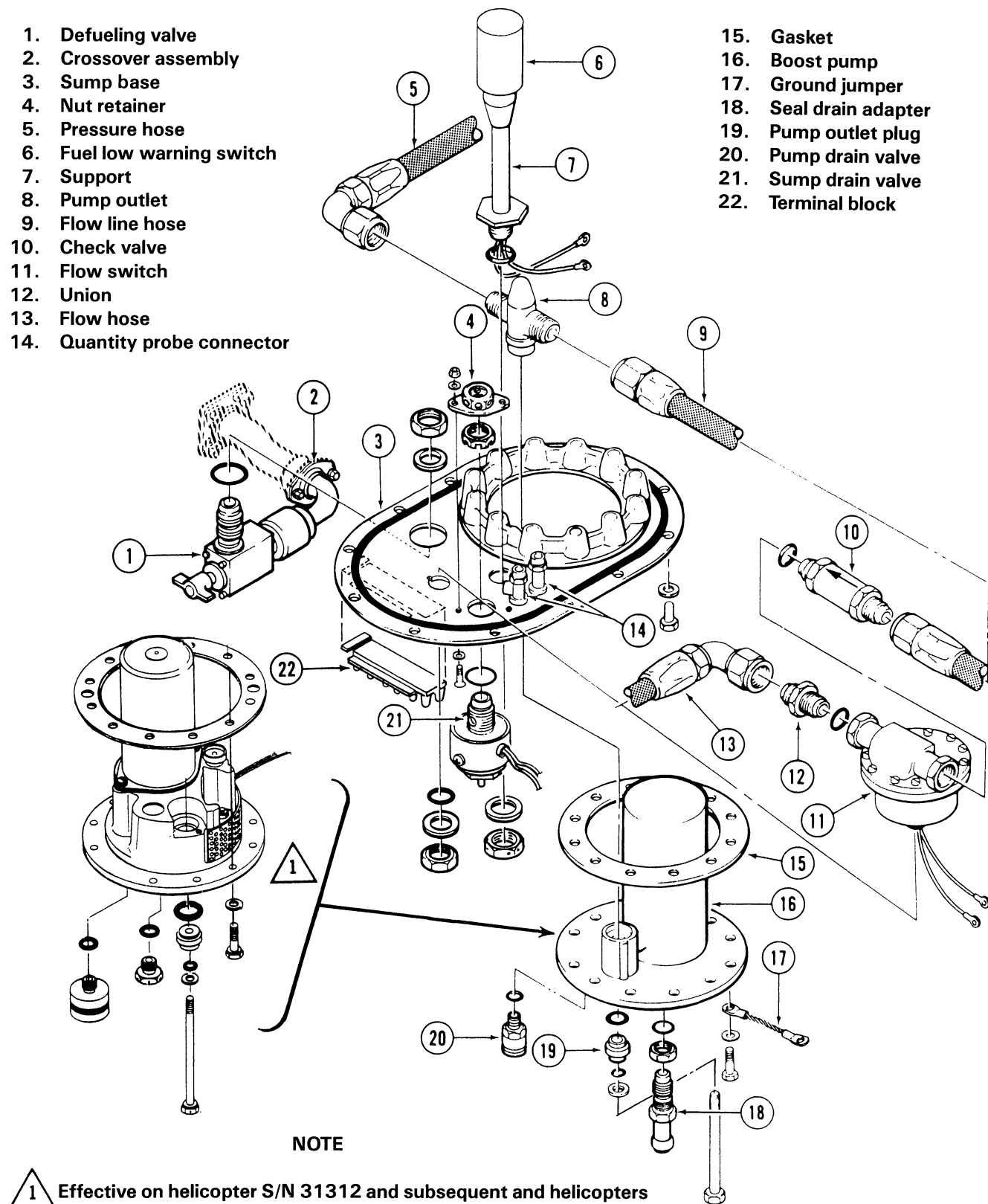
c. Turn BATTERY BUS 1 and BATTERY BUS 2 switches ON (BHT-212-FM) and close FUEL BOOST pump circuit breaker. Check gage for adequate pressure from pump under test with remaining pump inoperative (paragraph 28-3).

d. Check exterior of boost pumps for evidence of leakage.

e. Turn BATTERY BUS 1 and BATTERY BUS 2 switches OFF.

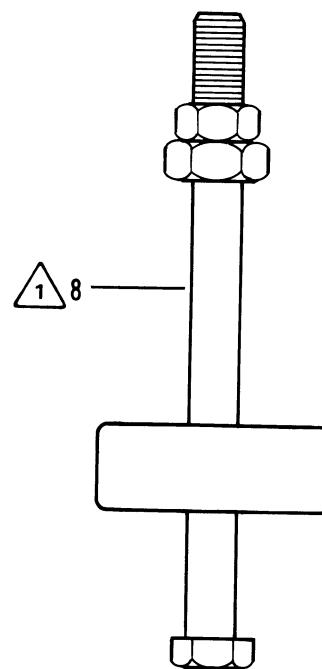
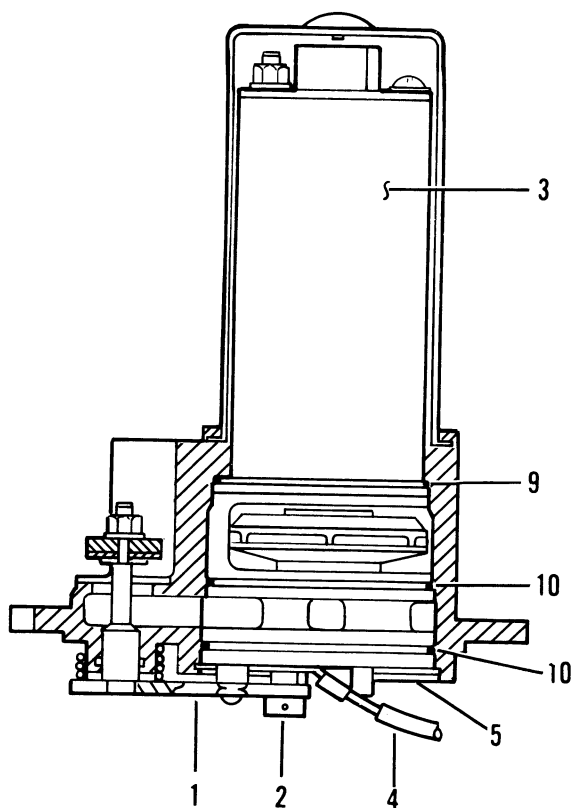
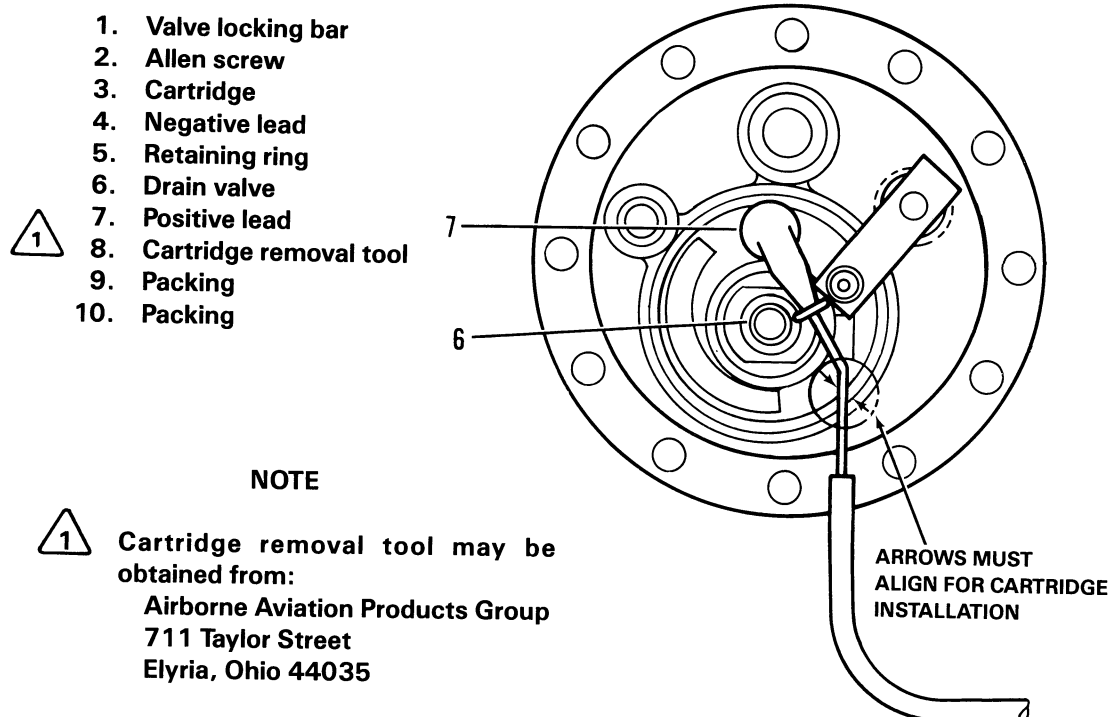
28-39. EJECTOR PUMP.

An ejector pump (figure 28-9) is mounted in each forward fuel cell. The ejector pump is operated by fuel delivered through a hose from the electric boost pump. The ejector pump draws fuel from the forward compartment and interconnect line and continuously returns fuel to the rear compartment of forward cell, so fuel is usable in any flight attitude.



212-M-28-7

Figure 28-7. Fuel cell sump (left side typical)



212-M-28-8

Figure 28-8. Fuel boost pump cartridge replacement

NOTE

Maintenance for left and right ejector pumps is the same.

28-40. Ejector Pump — Removal

1. Defuel and purge system ([Chapter 12](#)).
2. Disconnect battery.
3. Remove floor panel from top of fuel cell.
4. Remove bolts (1, [Figure 28-9](#)) and remove access bar (3).
5. Disconnect hoses from ejector pump (16) and elbow (11).
6. Remove two washers (15) and bolts (14). Remove ejector pump (16).
7. If ejector pump (16) is to be replaced, remove elbow (11), nut (12), and packing (13) from pump. Discard packing.
8. Install protective cover over cell opening.

28-41. Ejector Pump — Cleaning**MATERIALS REQUIRED**

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-405	Lockwire

1. Remove any obstructions from opening of pump using compressed air.
2. If necessary, clean nozzle opening of pump using lockwire ([C-405](#)). Do not enlarge nozzle in cleaning process.

28-42. Ejector Pump — Installation

1. Remove protective cover from cell opening.
2. If removed, install elbow (11, [Figure 28-9](#)) with nut (12) and new packing (13) in ejector pump (16).

3. Position ejector pump (16) in fuel cell. Install two bolts (14) and washers (15).

4. Connect hoses (4 and 5) to ejector pump (16) and elbow (11).

5. Install access bar (3) and 12 bolts (1) with thin aluminum washers (2).

6. Pressure test system ([paragraph 28-7](#)).

7. Install floor panel over top of fuel cell.

8. Service fuel system ([Chapter 12](#)).

28-43. FLAPPER VALVE

A flapper valve is installed in each forward fuel cell and is located on the aft side of the fuel cell baffle. The flapper valve and flapper valve plates allow fuel to be transferred from forward compartment to aft compartment of forward fuel cells.

NOTE

Maintenance for both flapper valves is the same.

28-44. Flapper Valve — Removal

1. Defuel and purge system ([Chapter 12](#)).
2. Remove floor section directly above forward fuel cell. Remove bolts (18, [Figure 28-10](#)), washers (19), and access bar (17).
3. Remove cover to fuel cell sump assembly and remove sump assembly ([paragraph 28-25](#)).
4. Remove nuts (3), washers (2), and bolts (13 and 16) from flapper valve (1). Remove flapper valve.
5. Disconnect hoses (4 and 15) from union (14) and remove nut (5) and union.
6. Remove nut (7), washer (8), and bolts (12).
7. Remove flapper valve plates (9 and 11).
8. Install protective cover over cell openings.

28-45. Flapper Valve — Inspection

1. Inspect flapper valve (1, [Figure 28-10](#)) for deterioration, cracks, and condition. Replace valve if deteriorated, nicked, cracked, or in unserviceable condition.
2. Inspect plates (9 and 11) for cracks, corrosion, and mechanical damage. Mechanical damage in excess of superficial and/or any corrosion damage is unacceptable. Replace plates if required.

28-46. Flapper Valve — Installation

1. Remove protective covers from cell openings.
2. Position plate (11, [Figure 28-10](#)) on forward side of cell baffle (10).
3. Place plate (9) on aft side of cell baffle.
4. With heads forward, insert bolts (12, 13, and 16) through plates and baffle. Install washer (8) and nut (7) on bolt (12). Install washer (6) on aft side of plate (9) and install flapper valve (1). Install washers (2) and nuts (3). Torque nuts (3 and 7) 50 to 70 inch-pounds (5.65 to 7.91 Nm). Adjust the quantity of washers (6) between plate and flapper valve to ensure flapper works freely and centers over opening in plate and closes correctly.
5. Insert union (14) from forward side through plates and baffle. Install and tighten nut (5) on union.
6. Connect hoses (4 and 15) to union (14) and tighten.
7. Install access bar (17) with bolts (18) and washers (2). Torque bolts 40 to 50 inch-pounds (4.52 to 5.65 Nm).
8. Install sump assembly ([paragraph 28-27](#)).
9. Pressure test fuel system ([paragraph 28-7](#)).
10. Install floor section.

28-47. LOW FUEL LEVEL WARNING SWITCHES

Float actuated low fuel level warning switches are connected to a FUEL LOW caution panel segment. The switches are installed on a support on each sump assembly.

NOTE

Maintenance procedures for both switches are the same.

28-48. Low Fuel Level Warning Switches — Removal

1. Remove sump assembly ([paragraph 28-25](#)).
2. Disconnect electrical leads of fuel low warning switch (6, [Figure 28-7](#)) from terminal block (22).
3. To remove switch, hold support (7) and unscrew switch (6) fully. Carefully pull switch wires out of support. Remove and discard packing.
4. To remove switch support, remove retaining nut and washer from lower side of sump base (3). Lift support (7) and packing from upper side.

28-49. Low Fuel Level Warning Switches — Installation

1. Place new packing on fuel low warning switch (6, [Figure 28-7](#)). Thread wires through support (7). Start and tighten switch.
2. If support (7) was removed, assemble with packing to sump base (3) and secure with washer and retaining nut. Torque nut 25 inch-pounds (2.83 Nm) maximum.
3. Connect fuel low warning switch electrical leads to terminal block (22).
4. Install sump assembly (20) ([paragraph 28-27](#)).
5. Pressure test system ([paragraph 28-7](#)).

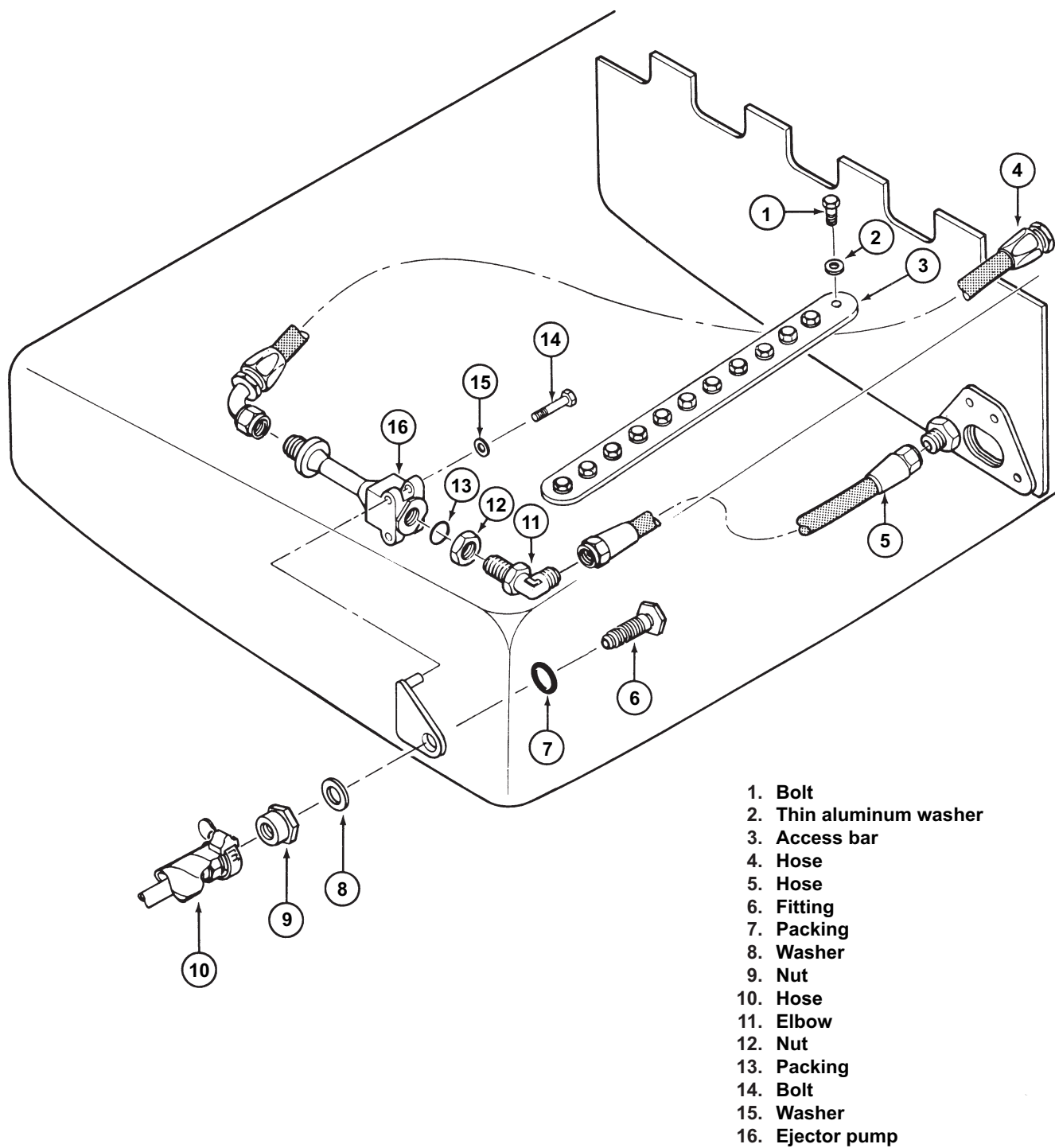
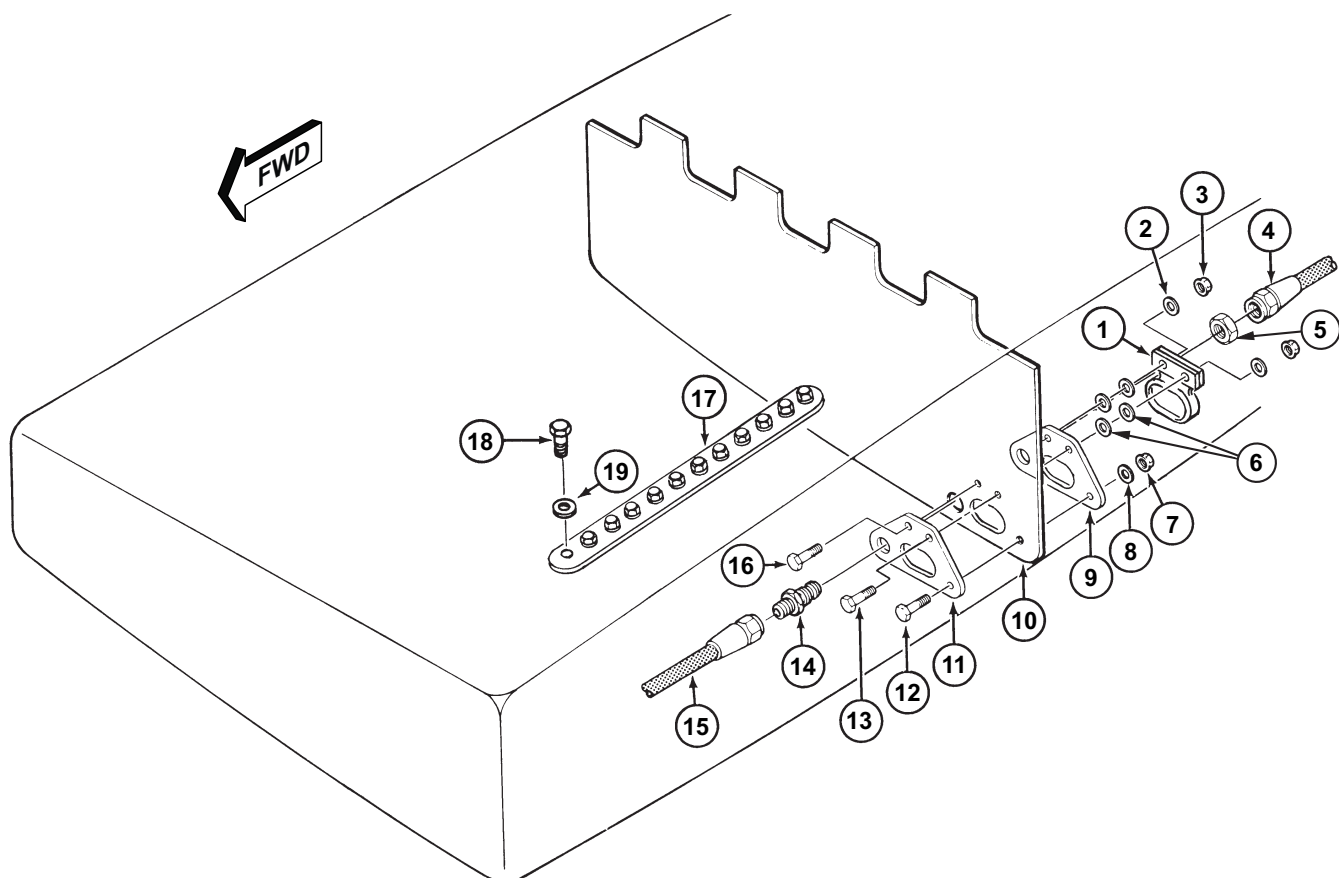


Figure 28-9. Ejector Pump

212_MM_28_0009



1. Flapper valve
2. Washer
3. Nut
4. Hose
5. Nut
6. Washer (as required)
7. Nut
8. Washer
9. Plate
10. Cell baffle
11. Plate
12. Bolt
13. Bolt
14. Union
15. Hose
16. Bolt
17. Access bar
18. Bolt
19. Thin aluminum washer

212_MM_28_0010

Figure 28-10. Flapper Valve

28-50. FORWARD CELL FUEL QUANTITY PROBES.

Five electronic transmitter probes of the fuel quantity gage system are mounted in fuel cells; two in forward and rear compartments of each forward cell, and one in the center aft cell.

NOTE

Maintenance procedures for forward left and right cell quantity probes are the same.

28-51. Removal.

1. Defuel and purge system (Chapter 12)
2. Remove screws and remove left or right cabin floor panel as applicable.
3. Remove bolts and remove access bar (1, figure 28-11) on top of fuel quantity probe (9).
4. Remove two clamps (7 and 8) by removing bolt, washers, and spacers.
5. Disconnect electrical leads from sump assembly (5) and remove fuel quantity probe (9).
6. Remove two clamps (2 and 4) by removing bolts, washers, and spacers.
7. Remove fuel quantity probe (3).

28-52. Installation.

1. Position fuel quantity probe (9, figure 28-11) in forward section of fuel cell and install clamps (7 and 8) using washers, spacers, and bolts. Torque bolts 15 to 25 in.lbs. (1.69 to 2.82 Nm).
2. Install access bar (1) with bolts. Torque 40 to 50 in.lbs. (4.52 to 5.65 Nm).
3. Position fuel quantity probe (3) in aft section of fuel cell and install clamps (2 and 4) using bolts, washers, and spacers. Torque bolts 15 to 25 in.lbs. (1.69 to 2.82 Nm).

4. Connect electrical leads from sump assembly to fuel quantity probe.
5. Install sump assembly (paragraph 28-27).
6. Install cabin floor panel.
7. Service fuel system (Chapter 12).
8. Perform operational check (Chapter 96).

28-53. AFT FUEL QUANTITY PROBE.

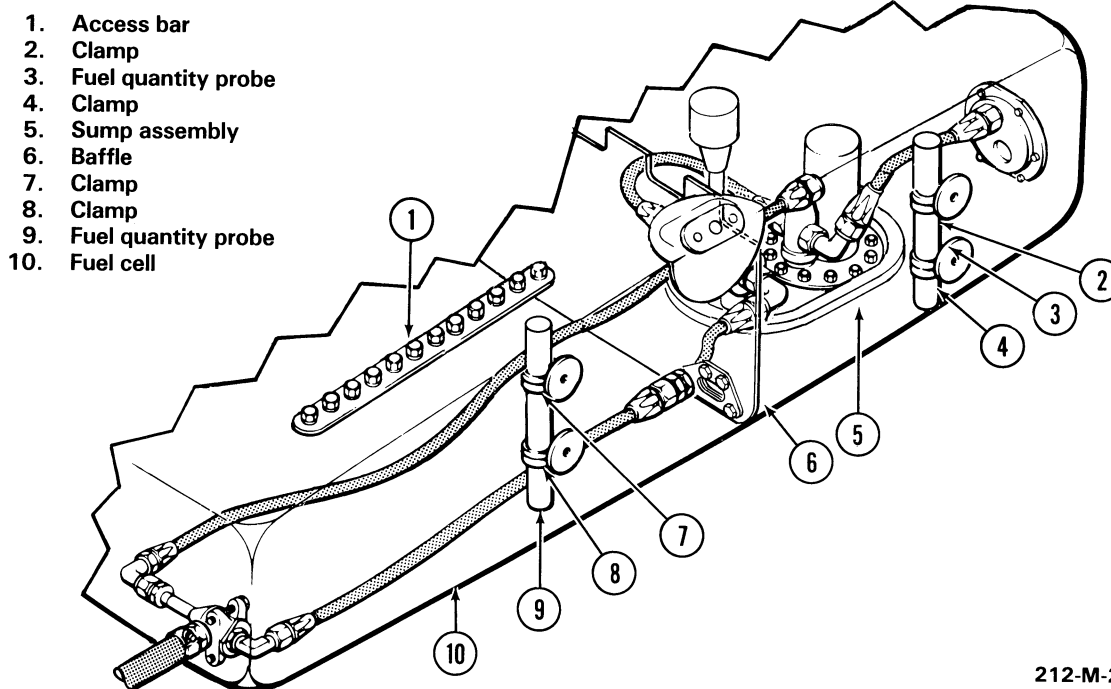
Aft fuel quantity probe is mounted on brackets which are attached to back of aft center fuel cell. The probe electrically transmits fuel quantity to the fuel gage on instrument panel.

28-54. Removal.

1. Disconnect two governor bleed lines (5, figure 28-12) from check valves (4) on access door (2) and from fittings at underside of engine deck. Cap fittings.
2. Disconnect electrical wiring from two quantity gage connectors (6) and terminal block (7) on door.
3. Remove bolts and washers around edge of access door (2). Carefully remove door, packing (1), and quantity gage probe (10).

28-55. Installation.

1. Place packing (1, figure 28-12) in groove around center cell access port.
2. Hold access door (2) near opening, with brackets extending into cell. Position quantity gage probe (10) in clips on brackets, securing with tie at upper clip.
3. Connect probe electrical leads to connectors on inside of door.
4. Align door and install twenty bolts with thin aluminum washers. Torque bolts 40 to 50 in.lbs. (4.52 to 5.65 Nm).
5. Connect two governor bleed line tubes (5) from fittings under deck to check valves (4) on access door.



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Figure 28-11. Fuel quantity probes — forward fuel cell

6. Connect electrical wiring to quantity gage connectors (6) and to terminal block (7) on door.

7. Perform pressure test of fuel system (paragraph 28-7).

8. Perform functional check of quantity indicating system (Chapter 96).

3. Remove nuts, washers, screws, nut retainer (4), and two Lock-O-Seals from sump base (3).

4. Remove retaining nut, packing, and drain valve.

28-58. Installation.**28-56. SUMP DRAIN VALVE.**

Each sump is provided with a drain valve which can be operated manually, or electrically by use of a push-button switch, to drain off possible accumulation of water or other fuel contamination.

28-57. Removal.

1. Remove fuel sump assembly (paragraph 28-25).

2. Disconnect electrical leads of sump drain valve (21, figure 28-7) from terminal block (22).

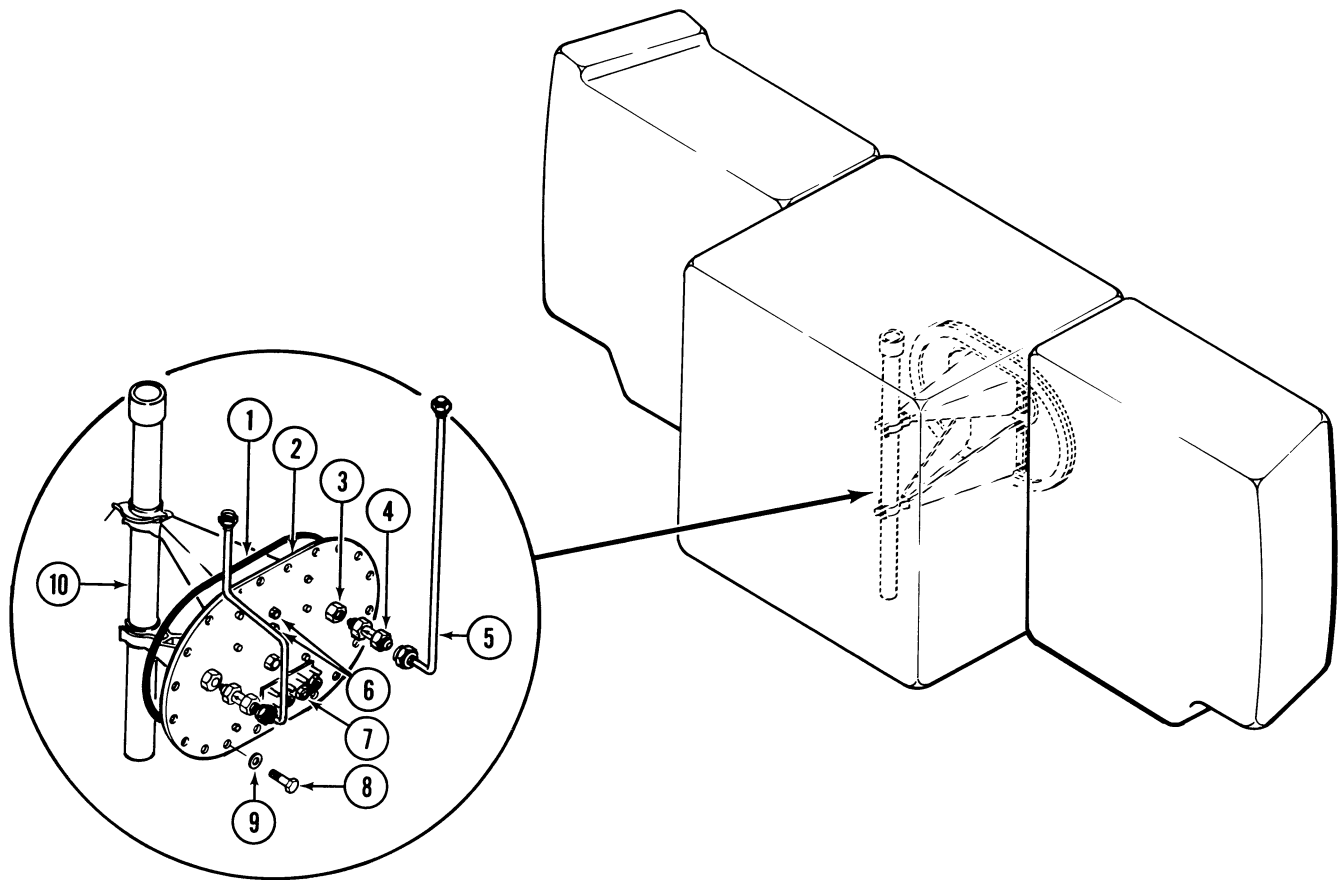
MATERIALS REQUIRED

NUMBER	NOMENCLATURE
C-405	Lockwire

1. Assemble sump drain valve (21, figure 28-7) to sump base (3) with packing and nut.

2. Insert two countersunk screws through sump base (3) from below. Assemble two Lock-O-Seals, nut retainer (4), and nuts with thin aluminum washers on screws.

3. Tighten valve. Secure with lockwire (C-405).



1. Packing
2. Access door
3. Bushing
4. Check valve
5. Governor bleed line

6. Quantity gage connector
7. Terminal block
8. Bolt
9. Washer
10. Quantity gage probe

212-M-28-12

Figure 28-12. Aft center fuel cell access door

4. Connect electrical leads of valve to terminal block (22).

5. Install sump assembly ([paragraph 28-27](#)).

28-59. INTERCONNECT VALVES

Two motor-operated valves are connected in the two interconnect lines between forward fuel cells, and are controlled by the INTERCONNECT switch. The aft interconnect valve, which is like the system crossfeed valve, is located in the cargo hook compartment. The forward interconnect valve is located on front of FS 102 bulkhead below the cabin deck.

28-60. FORWARD INTERCONNECT VALVE

28-61. Forward Interconnect Valve — Removal

1. Defuel and purge system ([Chapter 12](#)).
2. Remove cabin deck panel for access to area forward of FS 102 bulkhead and between BL 14 beams.
3. Disconnect electrical leads from forward interconnect valve (16, [Figure 28-1](#)) on forward interconnect tube/hose.
4. Remove two clamps to detach cover hoses from each side of valve.
5. Disconnect fuel tube and hose from valve fittings.
6. Remove three nuts, screws, and washers to detach valve from FS 102 bulkhead.
7. Remove valve upward from grommet in fuselage lower skin. If replacing valve, remove drain plug and packing and install a shipping plug.

28-62. Forward Interconnect Valve — Installation

1. If replacing valve, remove shipping plug and install plug with packing.

2. Insert lower end of valve through grommet in lower skin at BL 4.80 left.

3. Align valve legs to mounting holes in FS 102 bulkhead, and install three screws with thin aluminum washers under heads, secured by nuts at aft side of bulkhead.

4. Connect fuel tube and hose to valve fittings.

5. Position cover hoses on each side of valve and secure with clamps. Position clamps so that adjusting screw is toward bottom of valve.

6. Connect electrical leads to valve.

7. Pressure test system ([paragraph 28-7](#)).

8. Install cabin deck panel.

28-63. AFT INTERCONNECT VALVE

28-64. Aft Interconnect Valve — Removal

1. Defuel and purge system ([Chapter 12](#)).
2. Disconnect electrical connector from valve in aft interconnect tube.
3. Remove four nuts, screws, and washers to detach aft interconnect valve (20, [Figure 28-2](#)) from bracket and flanges of crossover assemblies. Remove valve.

28-65. Aft Interconnect Valve — Installation

1. Position aft interconnect valve (20, [Figure 28-2](#)) between flanges of crossover assemblies, and align three mounting holes to bracket on bulkhead.
2. Install four screws, with thin aluminum washers under heads, and nuts.
3. Connect electrical connector to valve.
4. Pressure test system ([paragraph 28-7](#)).

28-66. DEFUEL VALVES.

Manual valves are incorporated in both ends of the aft interconnect tube, below the inboard side of each forward cell sump.

28-67. Removal.

1. Remove sump assembly (paragraph 28-25).
2. Remove retaining nut, washer, packing, and defueling valve (1, figure 28-7) with attached crossover assembly (2) from sump base (3).
3. When required, remove four screws and washers to separate crossover assembly from valve.

28-68. Installation.

MATERIALS REQUIRED

NUMBER	NOMENCLATURE
C-405	Lockwire

1. Assemble crossover assembly (2, figure 28-7), if removed, to defueling valve (1) with four screws and thin aluminum washers. Secure screws with lockwire (C-405).
2. Position valve on sump base (3). Install packing, washer, and retaining nut.
3. Install sump assembly (paragraph 28-27). During installation, attach crossover assembly (2) to mating flange of aft interconnect hose with packing and two bolts with thin aluminum washers.

28-69. SIPHON BREAKER VALVES.

Two siphon-breaker valves are mounted in vent tube tees above the engine deck, near the left fuel shutoff valve.

28-70. Removal.

1. Remove door on left side of pylon support in cabin for access to engine deck area ahead of forward engine firewall.
2. Remove siphon breaker valve (8, figure 28-2) with packing from bushing in aft end of tee where vent tube passes down through deck. One tee is located at B.L. 5.9 and F.S. 157; the other is at B.L. 2.5 and F.S. 160.

28-71. Installation.

1. Install siphon breaker valve (8, figure 28-2) with packing into bushing in vent tube tee.
2. Install access door.

28-72. FUEL SHUTOFF VALVES.

Two motor-operated shutoff valves (4, figure 28-2), connected in main fuel pressure lines to engine power sections, are located on front of lower forward engine firewall. The valves are electrically controlled by ENGINE 1 and ENGINE 2 FUEL switches, and have manual override handles which are also position indicators. Thermal relief valves are incorporated for internal bypass of trapped fuel when system is inoperative.

28-73. Removal.

1. Open engine cowling and remove door on side of pylon support in cabin for access to front and rear of lower forward engine firewall.
2. Disconnect electrical connector from fuel shutoff valve (6, figure 28-13).
3. Provide suitable container to catch fuel and disconnect fuel tubes 1, 9, and 13) from special fitting (2) on forward side of valve. Cap or cover open lines to prevent entry of foreign material.
4. Remove four screws (12), and four washers (11) and detach fuel shutoff valve (6) from firewall and mounting bracket (4).
5. Remove connector (5) and special fitting (2) from valve (6).

6. Remove packings (7) and (10).

28-74. Installation.

MATERIALS REQUIRED

NUMBER	NOMENCLATURE
C-008	Petrolatum

1. Lubricate packings (7 and 10, figure 28-13) with petrolatum (C-008). Ensure packings are installed on both sides of fuel shutoff valve prior to positioning valve assembly on mounting bracket. Use extreme care when installing valve to prevent packing from falling out.

2. Place lubricated packings in each side of fuel shutoff valve (6). Position special fitting (2) and connector (5) to forward side of fuel shutoff valve (6) and slide assembly into position between connector (8) and mounting bracket (4).

3. Start two lower screws (12) through mounting bracket (4), connectors (5 and 8), and firewall with thin aluminum washers (11) under screw. Install two upper screws (12) through connectors and firewall with thin aluminum washers (11) under screw. Torque screw (12) 25 to 30 in.lbs (2.82 to 3.39 Nm).

4. Connect tube (1 and 13) to special fitting (2). Connect tube (9) to connector (8). Torque B-nut (3) and B-nuts to tubes (1, 9 and 13) 200 to 350 in.lbs (22.60 to 39.54 Nm).

5. Connect electrical connector to fuel valve and safety.

6. Turn BATTERY BUS 1 and BATTERY BUS 2 switches ON, INV switch to MAIN, generator switches to OFF, and FUEL CONT switch ON. Check all disturbed points for fuel leaks. Observe manual override handle on fuel shutoff valve moves to open position. Move FUEL CONT switch to OFF and observe manual override handle moves to closed position. Turn BATTERY BUS 1 and 2 switches OFF.

7. Close engine cowling.

28-75. CROSSFEED VALVE.

A motor-operated ball valve, connected between the main fuel pressure lines to engine power sections, is located on front of lower forward engine firewall above the shutoff valves. The valve is electrically controlled by the FUEL PUMP CROSSFEED switch.

28-76. Removal.

1. Remove door on left side of pylon support in cabin for access to front of lower forward engine firewall.

2. Disconnect electrical connector from system crossfeed valve (5, figure 28-2).

3. Disconnect tube from valve fittings. Cap openings.

4. Remove two nuts, screws, and washers to detach valve and two connectors from bracket.

5. Remove remaining two nuts, screws, and washers to separate valve and connectors.

28-77. Installation.

1. Assemble two flanged connectors on crossfeed valve (5, figure 28-2). Insert two screws, with thin aluminum washers under heads through mounting holes at forward side (as installed) and secure with nuts.

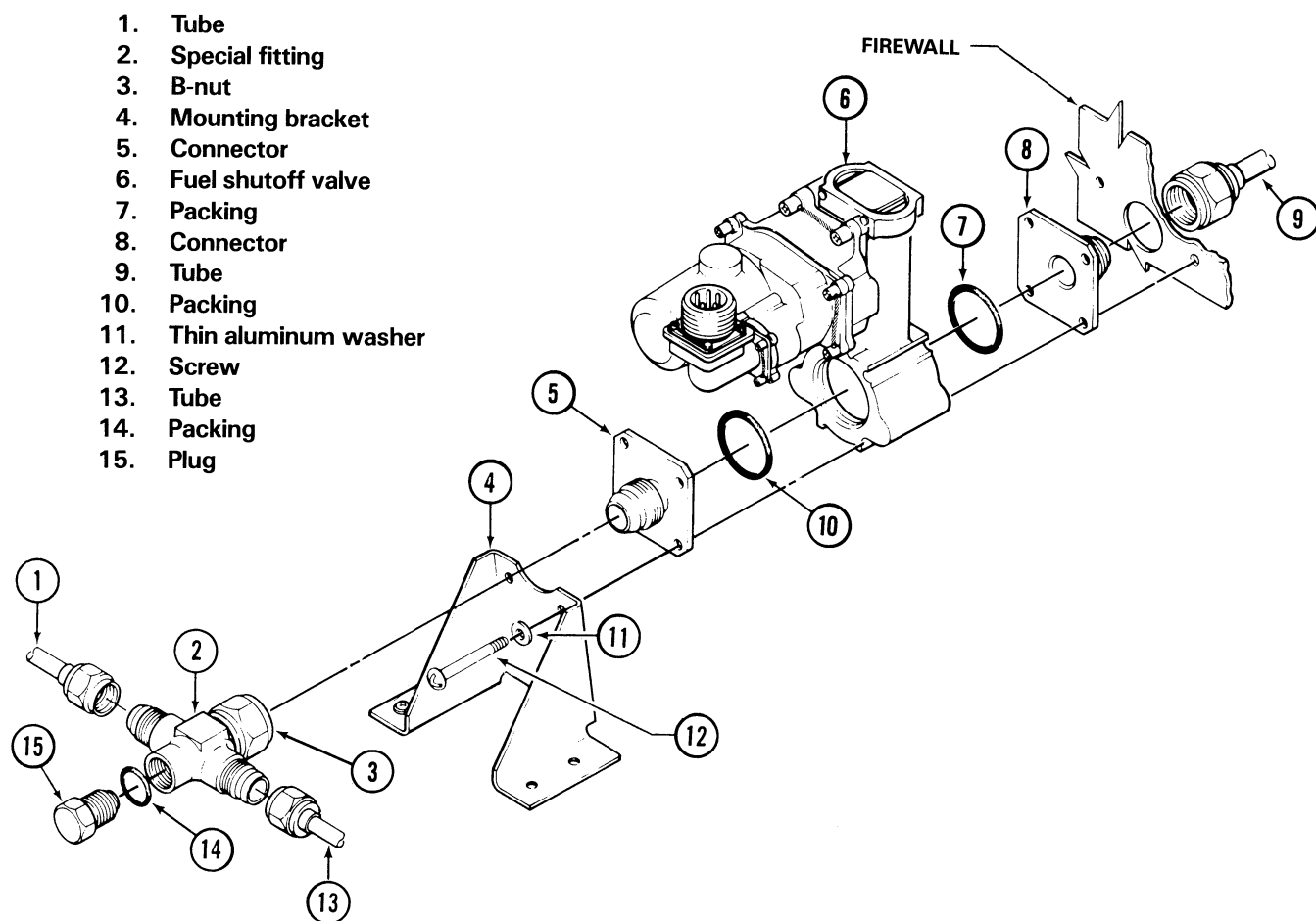
2. Position valve assembly with aft mounting holes aligned in bracket. Install screws, washers, and nuts.

3. Connect tube to valve fittings.

4. Connect electrical connector.

28-78. PRESSURE TRANSMITTERS.

Two electrical transmitters of the fuel pressure gage system, mounted on left and right rear sides of the forward engine firewall,



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Figure 28-13. Fuel shutoff valve

are connected to main fuel tubes to engine power section.

28-79. Pressure Transmitters — Removal

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-428	Caps and/or Plugs

1. Disconnect electrical power.
2. Open engine cowl for access to rear side of aft cabin bulkhead.
3. Disconnect electrical connector (1, [Figure 28-14](#)) from pressure transmitter (4).
4. Disconnect tube (12) from union (11).
5. Remove union (11) and packing (10). Discard packing.
6. Remove nut (9) and washer (8).
7. Remove pressure transmitter (4). If applicable, remove plug (2) and packing (3). Discard packing.
8. Cover openings with caps and/or plugs ([C-428](#)).
9. If required, remove screws (5) and washers (6) to detach bracket (7) from aft cabin bulkhead.

28-80. Pressure Transmitters — Installation

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-008	Petrolatum

1. If removed, install screws (5, [Figure 28-14](#)) and washers (6) to attach bracket (7) to aft cabin bulkhead.

2. If applicable, apply petrolatum ([C-008](#)) to packing (3).

3. Remove protective caps and/or plugs. If applicable, install plug (2) and packing (3).

4. Position pressure transmitter (4) on bracket (7). Install washer (8) and nut (9).

5. Apply petrolatum ([C-008](#)) to packing (10). Install packing and union (11).

6. Connect tube (12).

7. Connect electrical connector (1).

8. Perform fuel system pressure test ([paragraph 28-5](#)).

9. Service fuel system ([Chapter 12](#)).

10. Perform operational check ([Chapter 96](#)).

11. Check area for leaks.

12. Close engine cowl.

28-81. GOVERNOR BLEED LINE CHECK VALVES

28-82. Governor Bleed Line Check Valves — Removal

MATERIALS REQUIRED

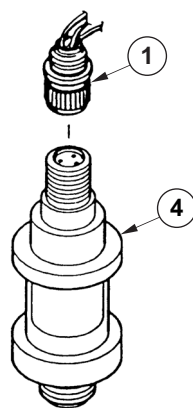
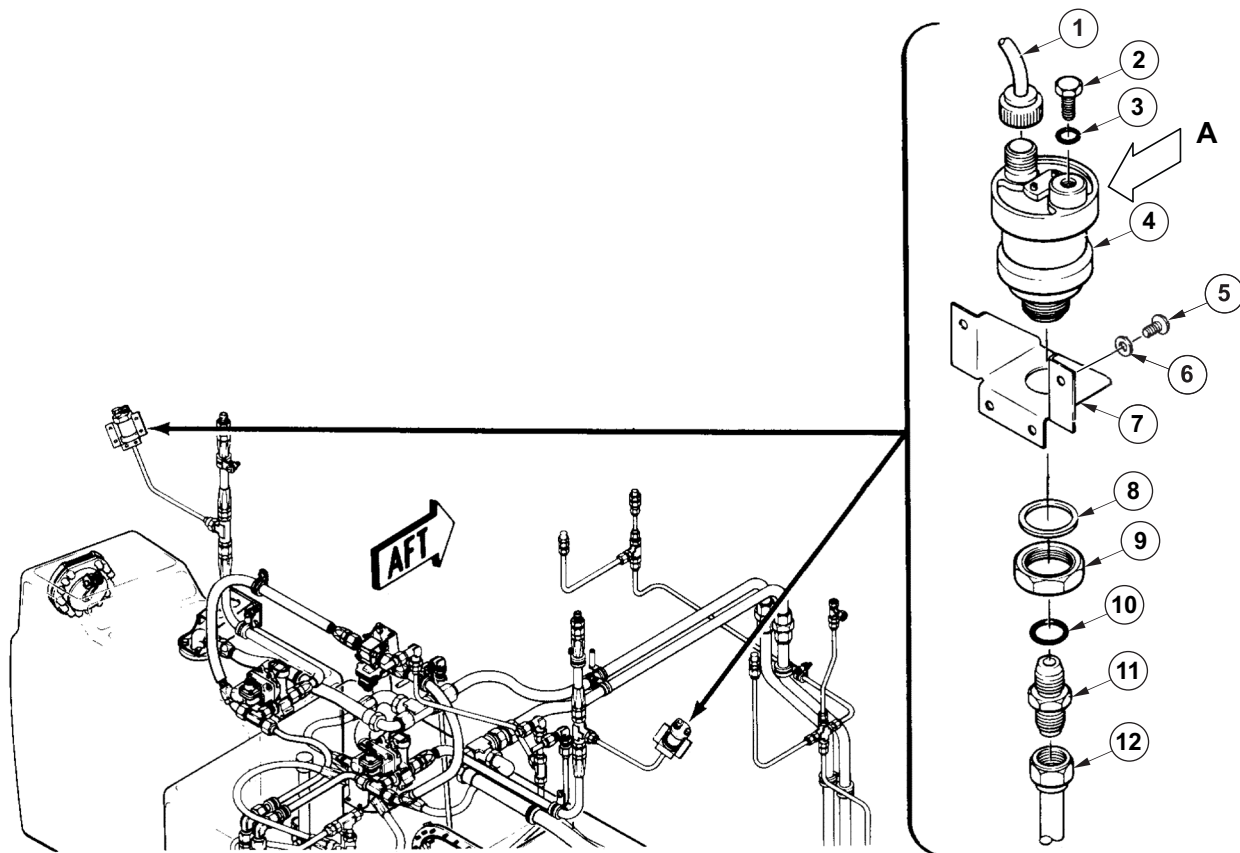
Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-428	Caps and/or Plugs

1. Defuel system until fuel level in aft cells is below half full ([Chapter 12](#)).

2. Gain access through door on bottom of fuselage to area aft of FS 178.

3. Using a suitable vessel to catch trapped fuel, disconnect governor bleed tube (5, [Figure 28-12](#)) from check valve (4) on center fuel cell access door. Cap open line with caps and/or plugs ([C-428](#)).



DETAIL A
ALTERNATE CONFIGURATION

1. Electrical connector
2. Plug
3. Packing
4. Pressure transmitter
5. Screw
6. Thin aluminum washer
7. Bracket
8. Corrosion resistant steel washer
9. Aluminum alloy nut
10. Packing
11. Union
12. Tube

212_MM_28_0028

Figure 28-14. Fuel Pressure Transmitter

4. Hold bushing (3) with wrench while removing check valve (4) with packing. Cover opening to keep out contamination.

28-83. Governor Bleed Line Check Valves — Installation

1. Uncover bushing at center cell access door.
2. Remove caps and/or plugs.
3. Install check valve (4, [Figure 28-12](#)), with arrow pointing forward and with packing on inner end, into bushing (3). Hold bushing with wrench while tightening valve.
4. Connect governor bleed tube (5) to check valve.
5. Check for leaks during next servicing and operation of systems.

28-84. MAIN FUEL LINE CHECK VALVES

Two directional flow check valves (22, [Figure 28-2](#)), with internal orifices for thermal relief, are installed in main fuel lines and are located on aft bulkhead of pylon support structure.

28-85. Main Fuel Line Check Valves — Removal

MATERIALS REQUIRED

Refer to [BHT-ALL-SPM](#) for specifications.

NUMBER	NOMENCLATURE
C-428	Caps and/or Plugs

1. Gain access through cargo hook opening to main fuel lines on aft bulkhead of pylon support structure.
2. Using a suitable vessel to catch trapped fuel, disconnect fuel tubes from check valve (22, [Figure 28-2](#)). Cap open lines with caps and/or plugs ([C-428](#)).

28-86. Main Fuel Line Check Valves — Installation

1. Position check valve (22, [Figure 28-2](#)) with arrow mark pointing upward.
2. Remove caps and/or plugs.
3. Connect fuel tubes to valve.
4. Check for leaks during next operation of system.

