1. Induction Baffle
2. Engine Firewall
*3. Intake Bellmouth
*4. Intake Screen
*5. Ice Detector
6. Pressure Switch
7. Upper Filter Assembly
8. Side Filter Assembly
9. Ring Assembly
10. Cabin Roof

Note

* These items removed on UH-1B and UH-1C helicopters when sand and dust separator system is installed.

205060-36A

Figure 5-30. Engine air inlet filter installation (Sheet 2 of 2)

b. Inspect engine inlet housing ducts carefully for signs of internal damage, oil streaks, and for accumulated dirt which may occur as a coating conforming to contour of air flow.

Note

In areas where operational experience shows grass and foliage accumulation to be a problem, it is recommended that this inspection be performed before each flight.

5-109. REPAIR OR REPLACEMENT - ENGINE AIR INTAKE. Replace damaged components.

5-110. INSTALLATION - AIR INTAKE BELLMOUTH, SCREEN AND BAFFLES. (See figure 5-30.)

a. Remove protective covers from engine inlet.

b. Place retainer ring, with plate nuts forward, on bellmouth ahead of slip-joint flange. Insert bellmouth through forward firewall from front, align to mating flange on engine inlet housing, and secure temporarily with V-band clamp. Be sure mounting hole and brackets for ice detector probe are at top.

c. Align bellmouth retainer ring to mounting holes of firewall. Install screws loosely, with thin washers under heads, from back of firewall. Tap with a soft mallet around V-band clamp from middle toward ends to seat securely, while tightening nut with 40 to 50 inch-pounds torque. Tighten retainer ring screws.

d. Install lower sections of induction baffle, omitting upper section of forward baffle.

e. Install intake screen, without removable section, on end of bellmouth with screws.

f. Install main drive shaft. (Refer to chapter 7.) Install remaining section of intake screen and forward baffle.

g. Install and connect ice detector probe. (Refer to paragraph 5-135.)

h. Install air inlet filters on fairing. Close engine cowling and transmission fairing.

5-111. AIR INDUCTION SYSTEM.

5-112. (Helicopters Serial No. 66-16868 and subsequent.) (See figures 5-31 and 5-32.) On these helicopters and on earlier serial numbered helicopters so modified, the engine inlet air section draws air in through three baffle screen filter sections. A sand and dust separator unit, mounted on the inlet housing, separates sand and dust particles from the air entering the engine. This reduces erosion of engine parts.

5-113. AIR INLET FILTER.

5-114. (Helicopters Serial No. 66-16868 and subsequent.) Refer to paragraph 5-98 through 5-103 for description, removal, cleaning, inspection, repair or replacement, and installation. (See figure 5-30.)

5-115. SAND AND DUST SEPARATOR.

5-116. The sand and dust separator is an inertial type particle separator made in two halves. Engine inlet air enters the separator through a curved, annular, radial inflow opening. Particles entering with the air are pulled out of the airstream, and follow along the curved inner wall. (See figure 5-31.) A lip extending into the airstream deflects the particle-laden air into a large chamber, where the air velocity decreases. The larger particles in the air settle in the chamber; fine particles are removed as the air is drawn through a 230-mesh screen on the filter assembly. Removed particles are held in box assemblies which contain porous

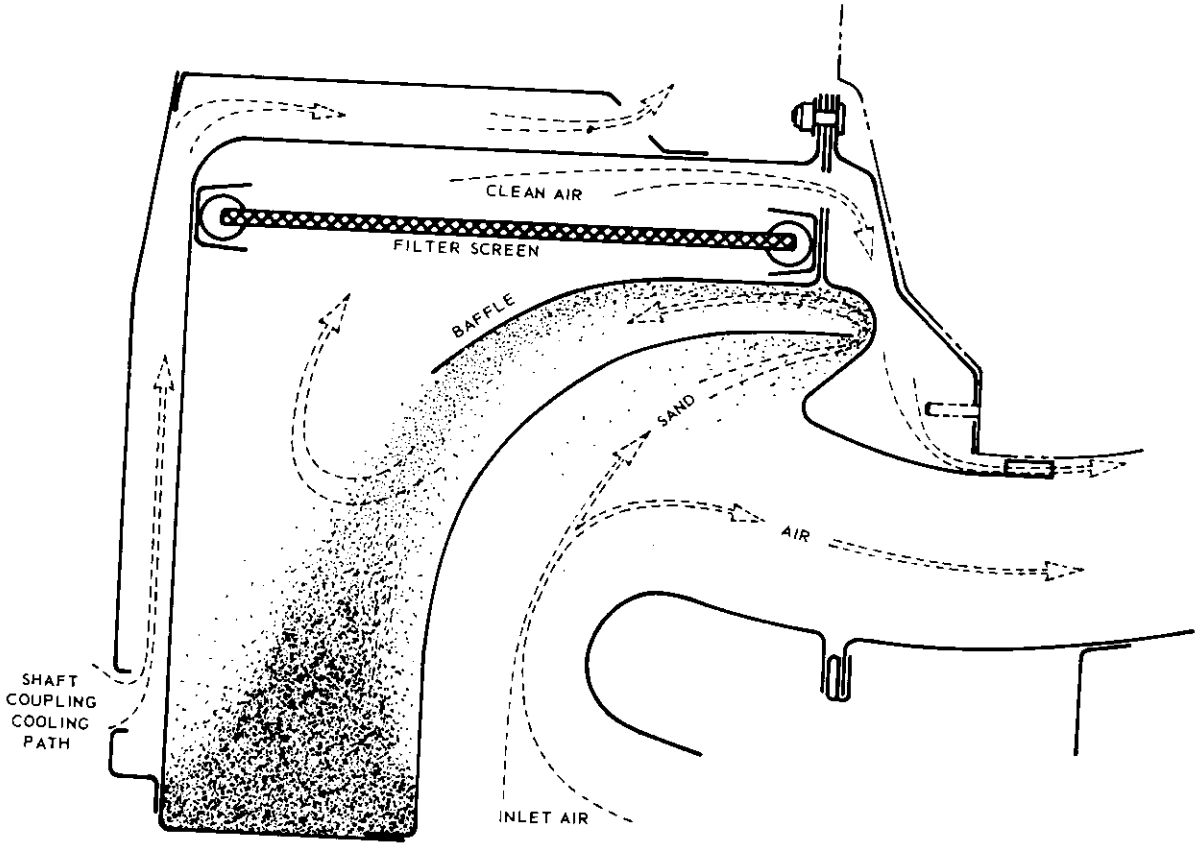

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Figure 5-31. Diagram of air flow paths

plastic foam inserts. The box assemblies can be easily removed and cleaned. Other components used with the sand and dust separator are ENG AIR FILTER CONT circuit breaker on overhead console, an engine air differential pressure switch on the firewall, and an ENGINE INLET AIR warning light on the instrument panel.

5-117. REMOVAL - SAND AND DUST SEPARATOR. Proceed as follows:

a. Remove stainless steel mesh filter screen if installed. Open transmission fairing and remove right and left access doors. Remove air inlet filter screens from fairing. (Refer to paragraph 5-99.)

b. Remove top section of forward induction baffle by releasing fasteners. (See figure 5-30.)

c. Remove remaining sections of induction baffle.

Caution

Do not attempt to open catch without holding safety latch.

d. Release latches (21 and 23, figure 5-32) on front and rear faces of air filters (1 and 19). Press safety latch up and hold before attempting to pull on release catch. (See View A.)

e. Release fasteners (6) at top of upper assembly air filter and remove assembly.

f. Remove gasket assemblies (10 and 11).

Caution

Filter assemblies shall be pulled vertically or inboard, maintaining form of curve. Pull on hard plastic tab provided at each end adjacent to screening. Handle assemblies with care to prevent damage to screen.

g. Remove filter assemblies (12). Push on one end while pulling at other end.

h. Using tab on box for fingerhold, remove box assemblies (13 through 16) from lower assembly air filter.

i. Remove main drive shaft as a complete assembly, and engine curvic coupling adapter from engine. (Refer to Chapter 7.)

j. Remove nuts (17) and washers (18). Remove lower assembly air filter (19) and deflector assembly (28).

k. Remove nuts (30), washers (31), and spacers (32). Remove ring assembly (33). Loosely install spacers, washers, and nuts on engine.

l. Remove washers and screws that secure split ring assembly to firewall and remove split ring assembly. Loosen V-band coupling clamp and remove flange assembly (34, figure 5-32).

m. Cover front of engine inlet housing to keep out dirt and foreign objects.

5-118. CLEANING - SAND AND DUST SEPARATOR.

a. Empty box assemblies (13 through 16, figure 5-32) of sediment and moisture. Wash mud from plastic box and foam insert with water. Shake off excess water. Allow to air-dry or wipe with clean cloth.

b. Remove any sand or water accumulation from well of lower assembly air filter (19). Wipe the well with a clean cloth. When filter assemblies (12) are in place, use care to prevent damage to the screen.

c. Shake filter assemblies (12) to remove loose dirt from screen. If necessary, wash in clean water, and scrub with soft-bristle brush. Shake off excess water; allow to air-dry or wipe with clean cloth.

d. If equipped with stainless steel mesh filter screens, use hot water solution of detergent soap to remove heavy contamination.

5-119. INSPECTION - SAND AND DUST SEPARATOR.

a. Inspect gasket assemblies (10 and 11, figure 5-32) for severe rubber separation from backing plate and for cuts.

b. Inspect gasket on mounting ring assembly (33) for cuts or looseness.

c. Inspect gasket (29) on deflector assembly for cuts or looseness.

d. Inspect filter assemblies (12) for tears in screen.

e. Inspect for loose rivets on air filters (1 and 19).

f. Inspect seal (35) on mounting flange assembly for cuts or looseness.

g. Inspect all metal parts for cracks and damage.

Note

Cracks in metal parts are acceptable provided there is no chance of fractured segments entering engine.

5-120. REPAIR OR REPLACEMENT - SAND AND DUST SEPARATOR. Replace all parts that do not meet inspection requirements.

5-121. INSTALLATION - SAND AND DUST SEPARATOR.

a. Remove cover from front of engine inlet housing.

b. Wipe engine inlet housing clean with cloth moistened with dry cleaning solvent (item 302, table 1-2).

c. Place ring assembly (9, figure 5-30) around flange assembly (34, figure 5-32) and install flange in position on inlet housing of engine. Secure loosely with V-band coupling clamp.

d. Using ring assembly (9, figure 5-30), position forward section of flange assembly to firewall. Install washers and screws from rear of firewall to secure ring.

e. Install mounting ring assembly (33, figure 5-32) on 24 studs of engine inlet housing so that the five studs on the ring assembly are at the bottom with center stud at 6 o'clock position. Secure with sleeve spacers (32), washers (31), and nuts (30). Torque nuts to 70 to 80 inch-pounds.

Caution

Carefully install deflector assembly to avoid cutting rubber seal of ring assembly.

f. Position deflector assembly (28) in place on the five ring assembly studs, and press in until firmly seated.

g. Position lower assembly air filter (19) on five studs of ring assembly. Secure with washers (18) and nuts (17). Torque nuts to 30 to 35 inch-pounds.

CH 5 - SEC III

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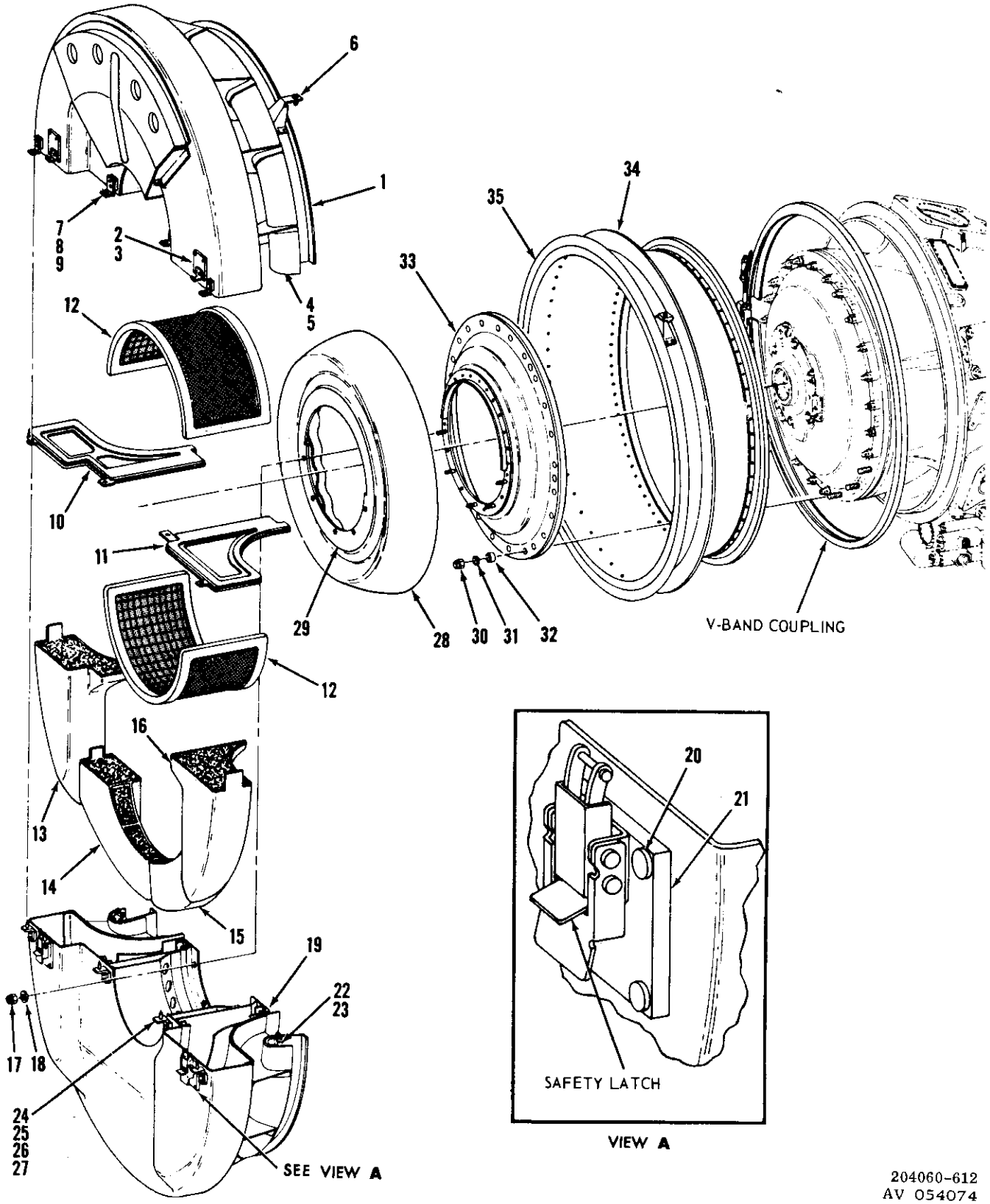

Figure 5-32. Sand and dust separator (Sheet 1 of 2)

1. Upper Assembly Air Filter
2. Rivet
3. Hook Assembly
4. Rivet
5. Hook
6. Fastener Assembly
7. Rivet
8. Angle Bracket
9. Spacer
10. Gasket Assembly
11. Gasket Assembly
12. Filter Assembly
13. Box Assembly
14. Box Assembly
15. Box Assembly
16. Box Assembly
17. Nut
18. Washer
19. Lower Assembly Air Filter
20. Rivet
21. Latch Assembly
22. Rivet
23. Latch
24. Rivet
25. Angle Bracket
26. Spacer
27. Positioning Pin
28. Deflector Assembly
29. Gasket
30. Nut
31. Washer
32. Sleeve Spacer
33. Mounting Ring Assembly
34. Flange Assembly
35. Seal

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Figure 5-32. Sand and dust separator (Sheet 2 of 2)

h. Position upper assembly air filter (1) on lower assembly.

Note

Do not install gasket assemblies (10 and 11) at this time.

i. Rotate mounting flange assembly (34) on inlet housing to align receptacles with fasteners (6) on filter assembly.

j. Secure flange assembly with V-band coupling. Torque coupling nut to 40 to 50 inch-pounds. Tap around coupling from middle toward each end with mallet to seat properly. Lock-wire nut.

k. Remove upper assembly air filter.

l. Install engine curvic coupling adapter in output shaft of engine. Torque bolt to 100 to 140 inch-pounds.

m. Install main drive shaft between engine and transmission. (Refer to Chapter 7.)

n. Install baffle panels. (Refer to paragraph 5-110.)

Caution

Do not use oil or grease in track when installing screen filter assemblies. Push from back end while pulling into position.

o. Install filter assemblies (12, figure 5-32) in upper and lower assembly air filters, with backing screen on inside diameter. The filters should protrude equally at each end. If necessary, lubricate tracks with trichloroethylene (item 300, table 1-2).

p. Install four box assemblies (13 through 16) into lower assembly air filter.

q. Position gasket assemblies (10 and 11) over pins on lower assembly air filter.

r. Position upper assembly air filter on lower assembly air filter. Tip top slightly forward to place on four positioning pins (27) first.

s. Secure air filter to flange assembly with fasteners (6) at top.

Caution

Secure front latches before securing rear latches.

t. Engage latches (21) on front face of air filters; then lock.

Caution

Ensure that safety latch on latches is engaged by exerting a slight pull on release catch. Catch will not open. (See View A, figure 5-32.)

u. Engage latches (23) at rear of filters; then lock.

v. Check for proper seating by appearance of seals. Approximately 0.125 inch of rubber on gasket assemblies will be uniformly exposed. Seal (35) on flange will be approximately half compressed.

w. Secure engine and transmission cowling.

x. Install stainless steel mesh filter screen, if so equipped.

5-122. SAND AND DUST SEPARATOR INLET SCREEN.

5-123. The sand and dust separator inlet screen is a stainless steel wire woven screen which covers the inlet area of the particle separator. The screen is comprised of two independent portions, each portion having a mesh size of 5-1/2 square per linear inch. The purpose of this inlet screen is to prevent engine damage from large foreign objects being injected into the engine intake.

5-124. REMOVAL - SAND AND DUST SEPARATOR INLET SCREEN.

a. Open right and left transmissions and engine cowl.

b. Remove baffle door. Remove top section of forward induction baffle by releasing fasteners.

c. Remove remaining sections of induction baffle.

d. Open latches located on left and right hand side of inlet screen.

e. Remove top screen.

f. Remove bottom screen.

5-125. INSTALLATION - SAND AND DUST SEPARATOR INLET SCREEN.

a. Open right and left transmissions and engine cowl.

b. Remove baffle door. Remove top section of forward induction baffle by releasing fasteners.

c. Remove remaining sections of induction baffle.

d. Install bottom screen sections with aft molding engaging filter split flange and butt molding engaging the adjacent filter inlet vanes.

e. Install top screen section with aft molding engaging filter split flange and cut out centered over filter latch at 12 o'clock position.

f. Secure screens section by latching. Latches located on left and right hand side.

g. Install induction baffle assembly and secure.

h. Install baffle door.

i. Close right and left transmission and engine cowl and secure.

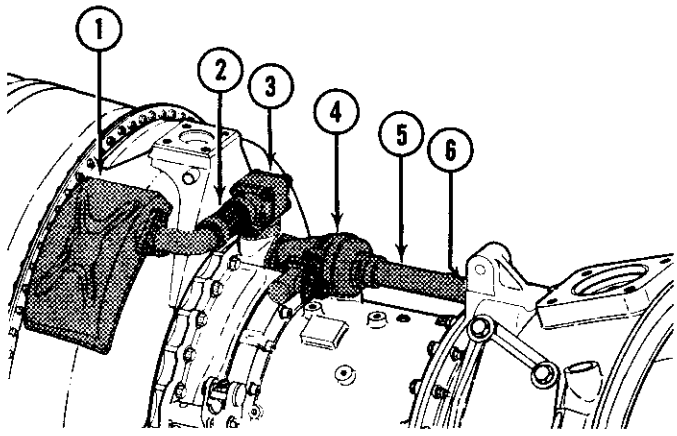
5-126. ENGINE ANTI-ICING.

5-127. Engine anti-icing system uses air heated by compression to prevent ice formation in air inlet passages during engine operation. On T53-L-9 engines, internal passages admit air from exit end of impeller into hollow impeller housing, from which it can be drawn off for anti-icing and for external system uses. On T53-L-9A, -11 series and -13 engines, air is taken from a collection chamber located at upper right on diffuser housing and is delivered into impeller housing through an external manifold and adapter, which also provides connection for external bleed air usage. (See figure 5-33.) On all engines, anti-icing air flows forward through a solenoid-operated valve and external tube to inlet housing. Internal passages direct air through all housing struts (except lower strut which is warmed by internal flow of scavenge oil), through hollow inlet guide vanes, and to mounting pad of fuel control temperature sensing element. Small holes through inlet housing provide air exit from each strut. (See figure 5-34.)

Note

The engine ice detector system is not operative with sand and dust separator installed, on UH-1D/H helicopters serial no. 66-16868 through 66-17144 and 66-8574 through 66-8577; and helicopters so modified.

5-128. Anti-icing air valve is fail-safe loaded to OPEN position whenever solenoid is not electrically energized, for continuous air flow in event of electrical failure. Valve closes when electrical



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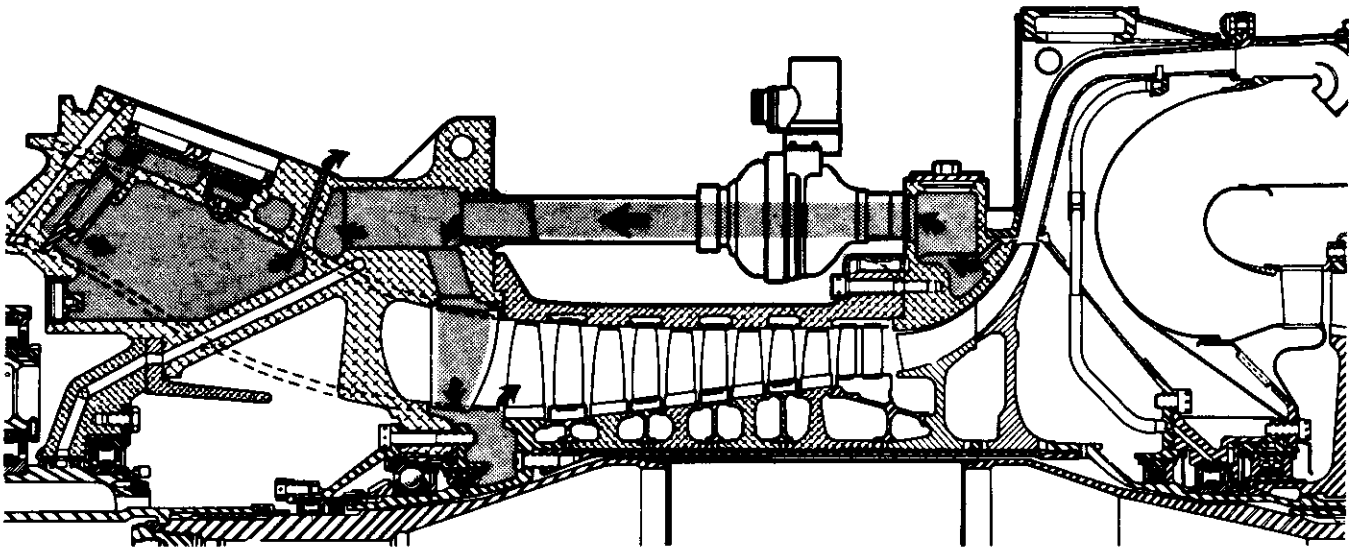
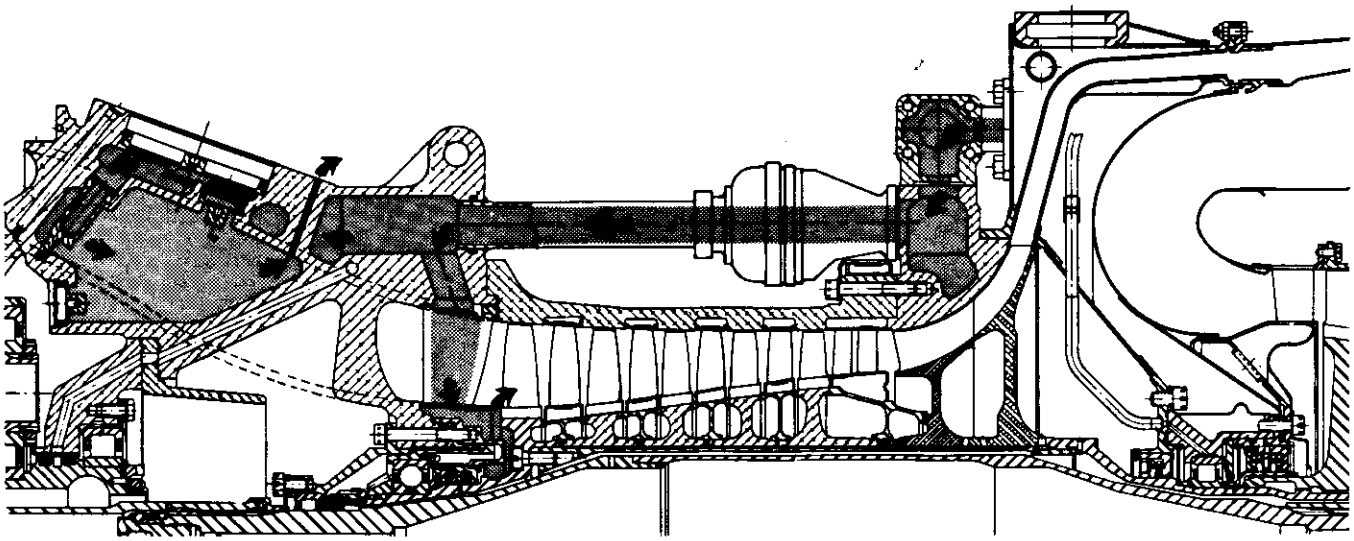
1. Bleed Air Chamber
2. Connecting Manifold
3. Bleed Air Adapter
4. Anti-Icing Valve
5. Tube
6. Inlet Housing Port

Figure 5-33. Anti-icing system components



T53-L-5, -9



T53-L-9A, -11, -11B

LEGEND

ANTI-ICING AIR

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Figure 5-34. Anti-icing air flow - T53-L-9A, -11 and -11B engines

power is applied to circuit. When ice detector probe in intake air stream senses ice forming on its upstream side, ENGINE ICING caution panel will be lighted until probe is rid of ice or clogging. Manual operation of a toggle switch is required for valve to open. A caution panel lettered ENGINE ICE DET will be lighted if detector circuit fails or circuit breaker is open.

5-129. REMOVAL - ANTI-ICING AIR VALVE.

a. Remove lockwire and disconnect electrical harness plug from connector of solenoid on valve (4, figure 5-33).

b. Remove two bolts with washers to detach rear flange of valve from impeller housing.

c. Spread retaining ring to disengage from groove at forward end of tube (5). Slide ring toward rear.

d. Push tube forward into inlet housing until free of valve.

e. Remove valve and gasket.

f. Remove tube.

g. Remove packing from valve and from inlet housing. Cover open ports.

5-130. CLEANING - ANTI-ICING AIR VALVE.

a. Remove corrosion with crocus cloth (item 510, table 1-2) and cleaning solvent (item 302, table 1-2). Do not submerge valve in cleaning solvent.

b. Rinse tube in dry cleaning solvent (item 302, table 1-2) and air dry.

5-131. INSPECTION - ANTI-ICING AIR VALVE.

a. Inspect electrical connector on solenoid valve for corrosion, damaged threads, cracked insulator, and bent or broken pins.

b. Inspect tube for cracks.

5-132. REPAIR OR REPLACEMENT - ANTI-ICING VALVE.

a. Replace valve if insulator is cracked or pins are bent or broken.

b. Replace tube if cracks are found.

5-133. INSTALLATION - ANTI-ICING AIR VALVE.

a. Insert a packing into inlet housing port, and another packing into forward port of valve (4, figure 5-33).

b. Place retaining ring loosely on tube (5). Insert large end of tube into inlet housing port. Push tube forward, with a twisting motion, far enough into housing to allow installation of valve.

c. Attach rear flange of valve, with gasket, to mounting pad on impeller housing with two bolts and washers.

d. Slide tube rearward, with twisting motion, into port of valve. Install retaining ring in groove at forward end of tube firmly against inlet housing Tighten and lock-wire bolts at rear flange of valve.

e. Connect electrical harness lead to valve solenoid connector. Secure with lockwire.

5-134. REMOVAL - ICE DETECTOR.

a. Open transmission fairing. Open or remove fairing over engine intake area.

b. Cut lockwire and disconnect electrical connector from ice detector, located at top of intake bellmouth ahead of firewall.

c. Remove lockwire and three bolts with washers which secure detector in bracket. Remove detector assembly and gasket.

5-135. INSTALLATION - ICE DETECTOR.

a. Place gasket over probe on ice detector. Insert probe through hole in top of intake bellmouth, and align detector in support bracket with electrical connector to left.

b. Install three bolts with thin washers. Lockwire bolt heads.

c. Connect and lock-wire electrical connector to detector.

d. Close or reinstall engine intake fairing. Close transmission fairing.

Note

Information on other units of engine anti-icing system will be found in electrical systems and wiring diagrams. (Refer to Chapters 12 and 13).

SECTION IV EXHAUST SYSTEM

5-136. EXHAUST SYSTEM.

5-137. DESCRIPTION - EXHAUST SYSTEM.

5-138. Engine exhaust diffuser has inner and outer housings, separated by hollow struts across exhaust passage. Inner housing, which supports power turbine assembly, is capped by a cover plate. A tailpipe, clamped on outer diffuser flange, directs hot exhaust gases aft and slightly up away from tail boom. Pipe has a drain hose from lowest point. A rigid harness with either three or six thermocouple probes attached and inserted through diffuser into the path of exhaust gases, is connected through flexible cable to cockpit exhaust gas temperature indicator. (See figure 5-35.) A support cone, around diffuser, provides mounting for rear firewall.

5-139. EXHAUST TAILPIPE.

5-140. Refer to paragraph 5-138 for description.

5-141. REMOVAL - EXHAUST TAILPIPE.

a. Open access door at lower left on tailpipe fairing, disconnect antenna and anti-collision light wiring at deck connectors. Open section of drive shaft access door which overlaps end of tailpipe fairing. Release fasteners and remove fairing.

b. Disconnect drain hose coupling.

c. Remove V-band clamp from mating flanges of engine exhaust diffuser and tailpipe. Lift off tailpipe.

d. To remove cover plate from inner housing flange, cut lockwire and remove eight bolts.

e. Protect exhaust diffuser opening with fabric cover normally used on tailpipe.

5-142. INSPECTION OF TAILPIPE. Inspect tailpipe for cracks, dents, burned out, or buckled areas.

5-143. REPAIR OR REPLACEMENT OF TAILPIPE. Shallow dents and scratches may be disregarded. Refer to TM 55-405-4 for repair of cracks. Large dents which cannot be straightened without deforming tailpipe contour, burned out areas, buckling, or similar damage is cause for replacement of tailpipe.

5-144. INSTALLATION - EXHAUST TAILPIPE.

a. Remove protective cover from engine exhaust diffuser.

b. Position cover plate over center opening of diffuser. Install eight bolts through cover into captive nuts of mounting flange, using anti-seize compound suitable for high temperatures. (Refer to paragraph 5-25.) Lock-wire bolt heads.

c. Position tailpipe on outer flange of diffuser, with drain fitting down and locating dowels engaged. Make sure inside of pipe is aligned with exhaust diffuser. Secure with V-band clamp around flanged joint. Seat clamp by tapping with soft mallet from middle toward ends, while tightening nuts on clamp bolts with 40 to 60 inch-pounds torque. Repeat this procedure at least twice to insure proper seat and torque application. Check torque again after test flight or engine ground check.

d. Connect drain hose from tailpipe to coupling on fuselage.

e. Install tailpipe fairing, connecting antenna and anti-collision light wiring at deck connectors. Close drive shaft access door.

f. Place protective cover on tailpipe.

5-145. EXHAUST THERMOCOUPLE.

5-146. Refer to paragraph 5-138 for description.

5-147. REMOVAL - EXHAUST THERMOCOUPLE ASSEMBLY.

a. Remove tailpipe fairing and tailpipe.

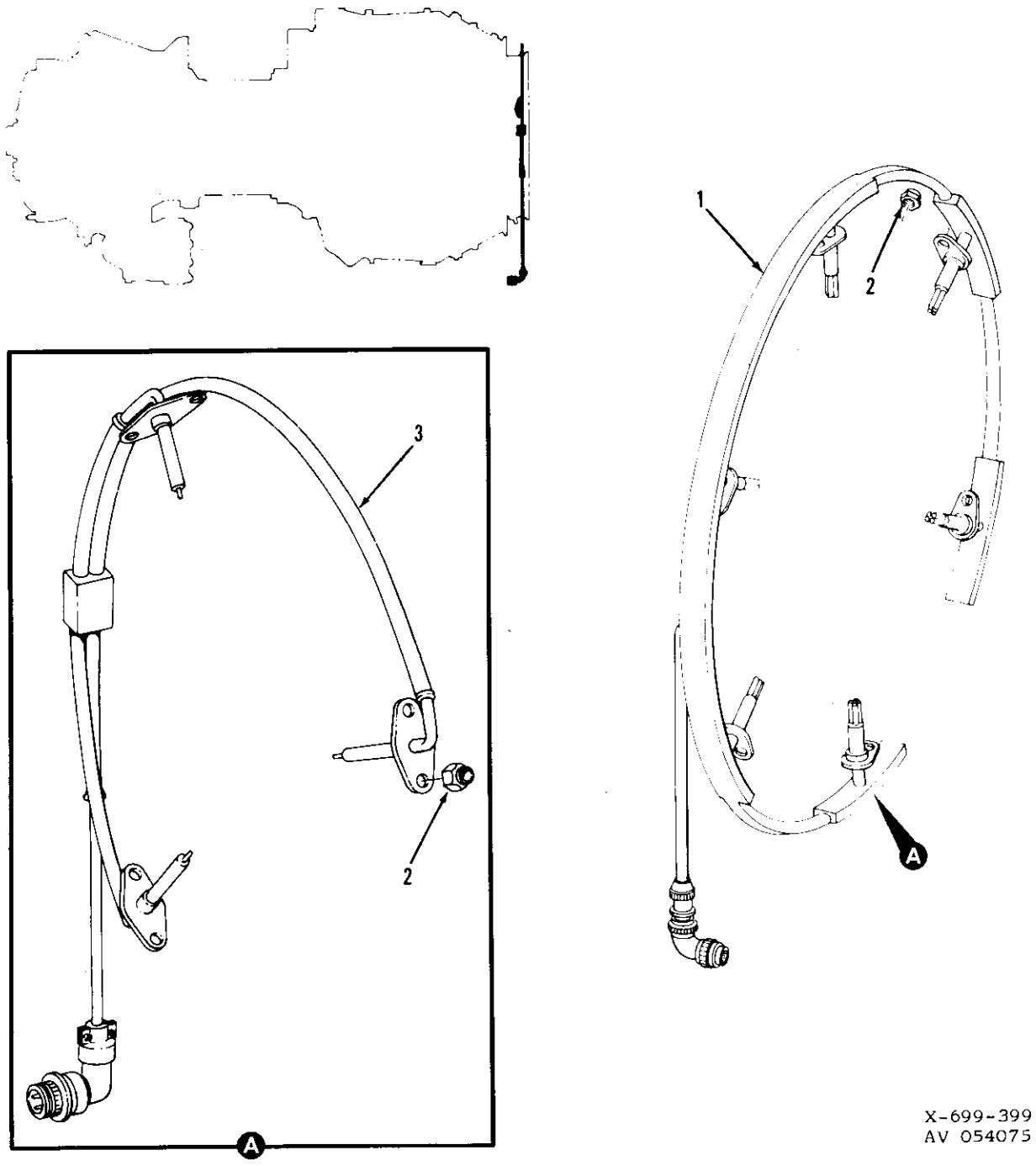
b. Remove upper section of rear firewall.

(1) Disconnect exhaust thermocouple harness lead from connector on right aft side of firewall, and indicator circuit leads from connector on front of firewall.

(2) Open engine upper cowling at both sides. Either remove upper cowling or place a suitable support block between top mount pad on engine diffuser section and underside of cowling support beam. Remove pin to detach aft end of beam from bracket at top of rear firewall. Secure upper cowling temporarily in place.

(3) Unlatch six fasteners which secure upper to lower section of rear firewall.

(4) Remove lockwire and open V-band clamp which secures firewall adapter ring to support cone flange of engine. Carefully remove firewall upper section from engine.



1. Exhaust Thermocouple Assembly (6 Probe)
2. Nut
3. Exhaust Thermocouple Assembly (3 Probe)

Figure 5-35. Exhaust thermocouple assembly and attaching parts

c. Remove nuts (2, figure 5-35) which secure flanges of thermocouple assembly (1 or 3) on exhaust diffuser studs.

d. Remove thermocouple assembly, working probes carefully out of exhaust diffuser with least possible flexing or bending of rigid conduit.

5-148. CLEANING AND INSPECTION - EXHAUST THERMOCOUPLE ASSEMBLY.

a. Inspect connector for damaged threads or cracked insulator.

b. Inspect thermocouple for wear, fraying, and loose connector.

c. Inspect connector for corrosion. Remove corrosion using crocus cloth (item 510, table 1-2) and dry cleaning solvent (item 302, table 1-2).

d. Check thermocouple for continuity and resistance. (Request assistance from Direct Support Maintenance.)

e. Inspect thermocouple ends for bending.

5-149. REPLACEMENT - EXHAUST THERMOCOUPLE. Replace complete thermocouple assembly when unserviceable. Request assistance from Direct Support Maintenance for testing thermocouple assembly.

5-150. INSTALLATION - EXHAUST THERMOCOUPLE ASSEMBLY.

a. Install three probe exhaust thermocouple assembly (3, figure 5-35) as follows:

(1) Insert thermocouple ends into exhaust diffuser studs at 2-, 4-, and 10-o'clock position with thermocouple connector to right of engine.

Caution

When installing the thermocouples, do not damage the ends. Flex or bend the harness only as necessary.

(2) Apply Ease-Off 990 (item 19, table 1-2) or Molykote anti-seize thread compound (item 20, table 1-2) to nuts (2) and secure exhaust thermocouple assembly to exhaust diffuser with nuts. Tighten nuts to 35 to 45 pound-inches torque.

b. Install six probe exhaust thermocouple assembly (1) as follows:

(1) Insert thermocouple ends into exhaust diffuser studs at the 12-, 2-, 4-, 6-, 8-, and 10-o'clock positions with thermocouple connector to right of engine.

Caution

When installing the thermocouples, do not damage the ends. Flex or bend the harness only as necessary.

(2) Apply Ease-Off 990 (item 19, table 1-2) or Molykote anti-seize thread compound (item 20, table 1-2) to nuts (2) and secure exhaust thermocouple assembly to exhaust diffuser with nuts. Tighten nuts to 35 to 45 pound-inches torque.

c. Reinstall upper section of rear firewall.

(1) Place V-band clamp on exhaust diffuser support cone.

(2) Place upper firewall assembly over end of exhaust diffuser. Seat clamp over mating flanges of support cone and firewall adapter ring, securing clamp bolts temporarily.

(3) Secure upper to lower firewall with six fasteners.

(4) Reinstall upper engine cowling, or attach aft end of support beam to bracket at top of rear firewall with pin.

(5) Loosen screws around firewall adapter ring to permit alignment. Position V-band clamp so that end loops will not touch ends of screws or fuel manifolds. Seat clamp securely by tapping from middle of each section toward ends, while tightening nuts to a torque of 40 to 50 inch-pounds. Lockwire. Tighten screws around adapter ring.

d. Connect and lock-wire exhaust temperature indicator circuit leads on thermocouple harness lead at connectors on right side of upper rear firewall.

e. Install exhaust tailpipe and fairing. (Refer to paragraph 5-144.)

SECTION V FUEL SYSTEM

5-151. FUEL SYSTEM.

5-152. DESCRIPTION - FUEL SYSTEM.

5-153. Fuel supply is contained in five cells interconnected to act as a single tank. (See figures 5-36 and 5-37.) Three cells are located across fuselage below engine deck, with system filler cap on right-hand cell. Two forward cells, located under cabin floor and gravity fed from aft cells, are each provided with a fuel boost pump. Right pump is electrically operated; left pump is driven by bleed air from engine compressor. Fuel under pressure is delivered from pumps through separate lines to a check valve manifold on front of engine forward firewall. Passing through two check valves and single outlet of manifold, fuel flows through an electrically controlled shutoff valve to main fuel strainer in engine compartment, for delivery to engine through fuel control inlet hose. Fuel shutoff valve and each check valve of manifold have internal bypass valves, to relieve thermal expansion of trapped fuel when system is inoperative. Transmitter for fuel pressure gage is connected to a tap on check valve manifold.

5-154. On Model UH-1D/H, each forward cell is divided into compartments by a lateral baffle fitted with a flapper valve to allow fuel flow from front to rear. (See figure 5-30.) Boost pump is mounted on a sump assembly near aft end of cell, connected by hose to pressure line outlet. Part of pump output is diverted forward by a tee fitting through a check valve, a flow switch and hose to ejector type pumps at front of cells. Induced flow of ejector continuously sends fuel through a hose back over top of baffle into rear compartment of cell, so that no significant quantity of fuel will be unusable in any flight position. Flow switches are electrically connected to caution panels for warning of failure of either boost pump. A float switch, for 20 MINUTE FUEL caution panel circuit, is on left cell sump. Right cell has two quantity gage tank units, interconnected with another located in center aft cell. A defueling valve is provided on crossover fitting at rear of left forward cell, with an access cover on lower skin. Each forward cell has two drain valves, for sump and for forward compartment. On model YUH-1D, boost pumps and sumps are near front of forward fuel cells. (See figure 5-36.) Each pump has a drain valve, and a defueling valve is provided on forward crossover line between sumps. Right cell sump has float switch for 20 MINUTE FUEL caution panel. Fuel quantity gage tank units are in both forward cells and in center aft cell, interconnected through a monitor unit in left forward cell. Two pressure switches, in caution panel circuits, are connected at taps on check valve manifold to provide warning of failure of either boost pump.

5-155. GENERAL MAINTENANCE - FUEL SYSTEM.

5-156. Organizational maintenance will consist of visual inspections, ground operational checks, cleaning of filter and strainers, specified adjustment of control linkage systems and fuel control unit as required, and replacements of piping, fittings, seals, and units which are accessible without extensive disassembly. Observe general notes and precautions below, and procedures for replacement or adjustment of principal components in subsequent paragraphs.

a. Conduct any defueling or drainage of fuel in accordance with applicable directives, and with extreme care to avoid fire hazards.

b. Before removing any line or hose, be sure it is properly identified and its route understood for replacement in same manner.

c. Cap or cover any open lines, fittings, or exposed opening in units (other than normal vents and drains) to protect fuel system from contamination. Be sure vent lines are not obstructed.

d. For electrical circuits of boost pump, shutoff valve, fuel quantity gage system, pressure transmitter, pressure or flow switches, and float switches, see applicable wiring diagrams. (Refer to Chapter 13.) Special tools required to perform the following maintenance functions on the engine fuel manifolds are listed below in table 5-2.

TABLE 5-2. SPECIAL TOOLS

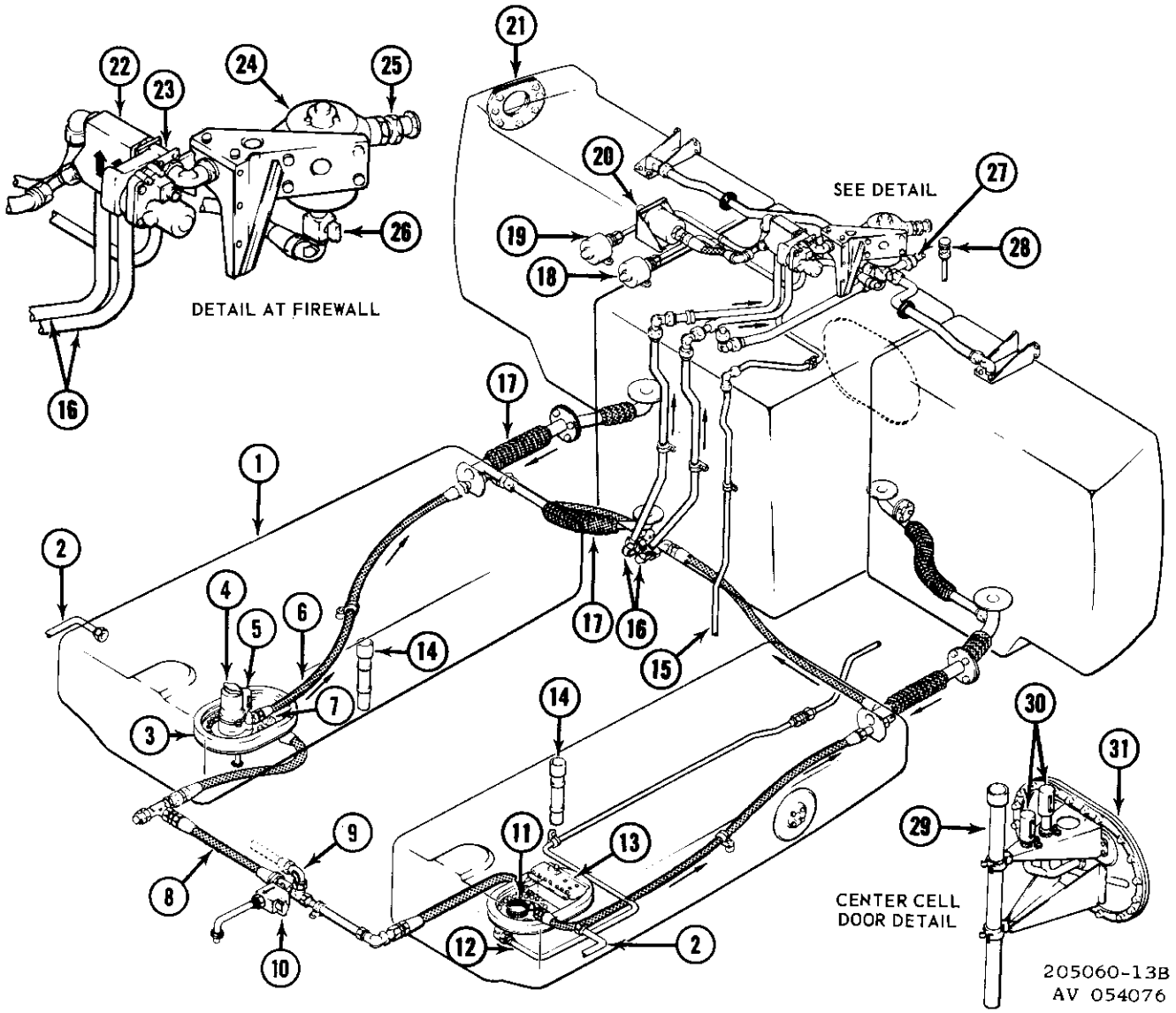
PART NUMBER	NOMENCLATURE
[D] LTCT2051	Fuel harness wrench
[H] LTCT4174	Alignment fixture

5-157. FUEL CELL FITTINGS.

5-158. Externally accessible fittings on fuel cells include filler cap adapter, two crossover tubes, and tank outlet. Each cell port has an integral fitting with an O-ring seal groove and threaded inserts for attachment bolts.

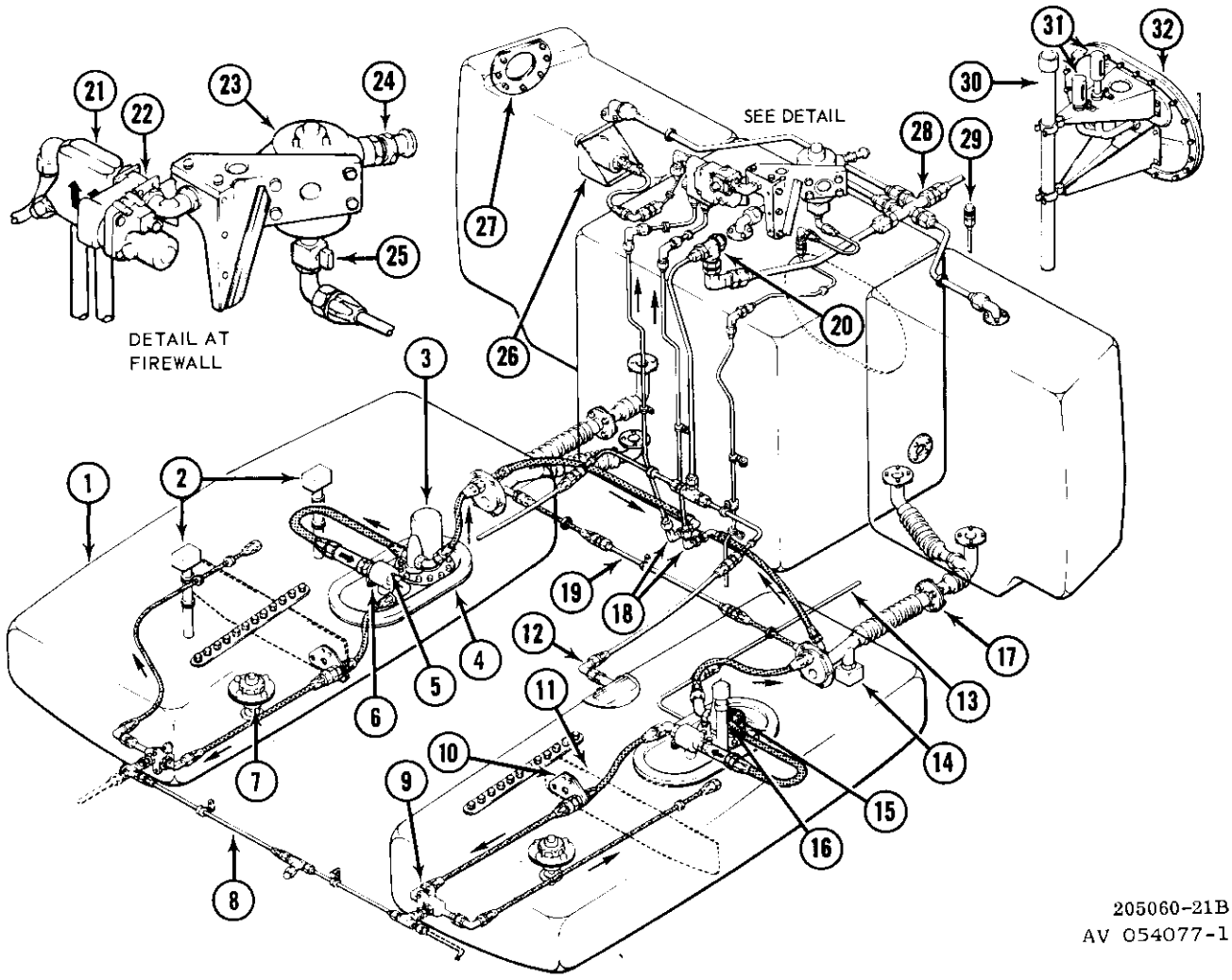
5-159. INSPECTION - FUEL CELL FITTINGS.

a. Inspect fuel cell fittings for defective and leaking O-ring seals.



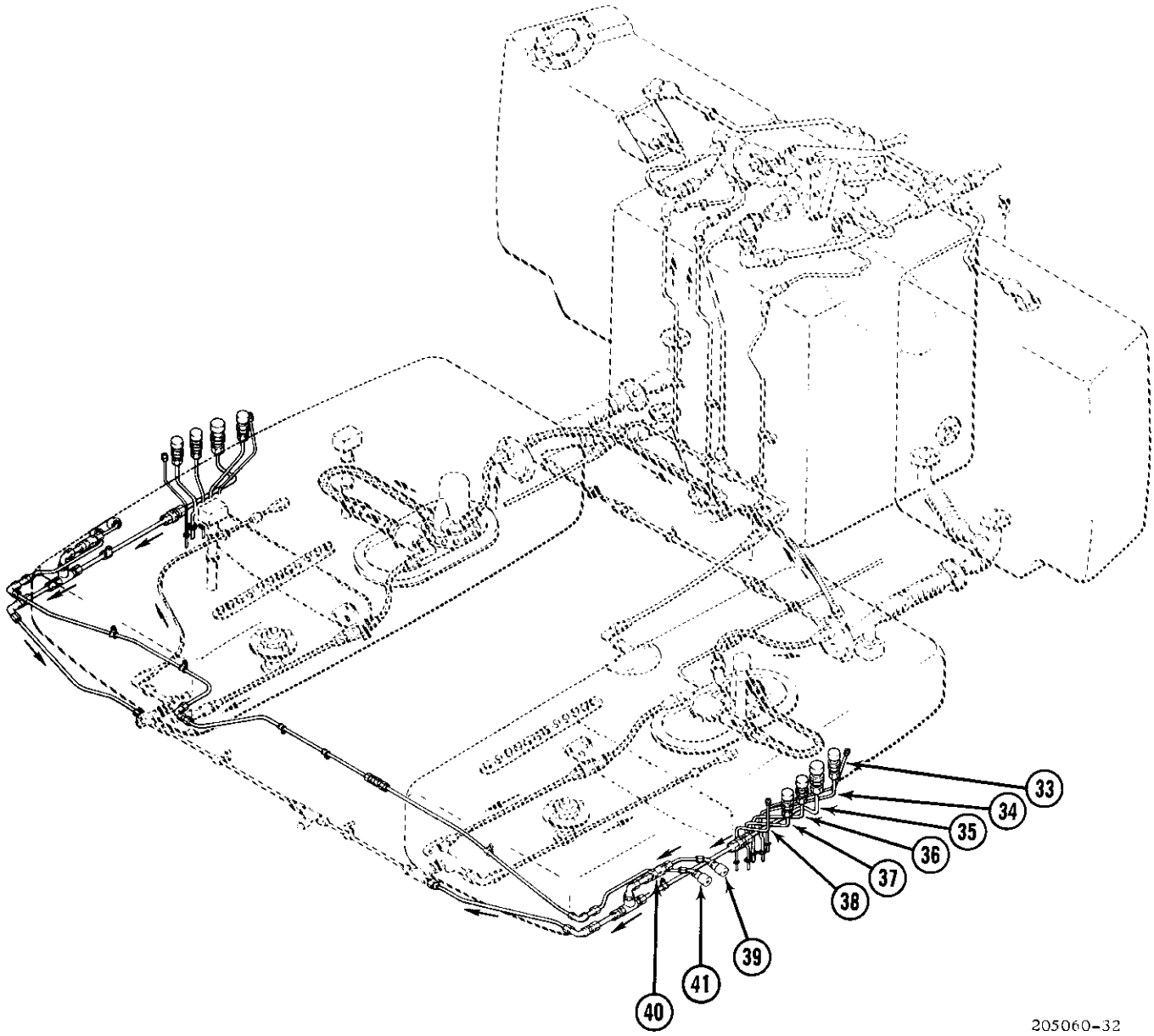
1. Forward Cell
2. Vent Line
3. Sump Assembly
4. Electric Boost Pump
5. Float Switch (20 MINUTE FUEL)
6. Pump Outlet Hose
7. Sump Drain Valve
8. Cross Feed Line
9. Heater Fuel Connection
10. Defuel Valve
11. Air Driven Boost Pump
12. Bleed Air Line From Engine
13. Fuel Quantity Tank Units
14. Fuel Quantity Tank Units
15. Strainer Drain Line
16. Fuel Lines - Tanks to Valve Manifold
17. Crossovers
18. Pressure Switch (RIGHT FUEL BOOST)
19. Pressure Switch (LEFT FUEL BOOST).
20. Pressure Gage Transmitter
21. Filler Cap
22. Check Valve Manifold
23. Fuel Shutoff Valve
24. Main Fuel Strainer
25. Coupling for Engine Fuel Hose
26. Strainer Drain Valve
27. Vent Manifold
28. Fuel Control Vent Line
29. Fuel Quantity Tank Unit
30. Float Switches - Auxiliary Fuel Transfer Pump Control
31. Cell Access Door

Figure 5-36. Fuel supply system - YUH-1D typical



1. Forward Cell
2. Fuel Quantity Transmitters
3. Electric Boost Pump
4. Sump Assembly
5. Flow Switch with Check Valve
6. Sump Drain Valve
7. Drain Valve
8. Crossfeed Line
9. Ejector Pump
10. Flapper Valve
11. Baffle
12. Vent Line
13. Bleed Air Line from Engine
14. Defuel Valve
15. Air Driven Boost Pump
16. Float Switch
17. Crossovers
18. Fuel Lines - Tanks to Valve Manifold
19. Crossfeed Line
20. Siphon Breaker Valve
21. Check Valve Manifold
22. Fuel Shut-off Valve
23. Main Fuel Strainer
24. Coupling for Engine Fuel Hose
25. Strainer Drain Valve
26. Pressure Gage Transmitter
27. Filler Cap
28. Vent Manifold
29. Fuel Control Vent Line
30. Fuel Quantity Transmitter
31. Float Switches - Auxiliary Fuel Transfer Pump Control
32. Center Cell Access Door

Figure 5-37. Fuel supply system - UH-1D/H typical (Sheet 1 of 2)



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AUXILIARY INTERNAL FUEL TANK CONNECTIONS:

33. Scupper Drain Line
34. Tank Drain Line
35. Fuel Line
36. Tank Vent Line
37. Pump Seal Drain Line
38. Scupper Drain Line

AUXILIARY EXTERNAL FUEL TANK CONNECTIONS:

39. Fuel Line
40. Check Valve
41. Pressure Balance Line

Figure 5-37. Fuel supply system - UH-1D/H typical (Sheet 2 of 2)

b. Inspect fittings and access covers for corrosion.

5-160. REPLACEMENT - SEALS AT FUEL CELL FITTINGS.

a. Replace defective O-ring seal under any fuel cell port fitting by general procedure outlined below.

b. Drain fuel to level below cellport to be opened.

c. Disconnect attached lines or clamps to allow fitting to be moved enough to expose O-ring.

d. Remove O-ring. Check that seal groove and mating face of fitting are clean and free of burrs or nicks.

e. Install serviceable O-ring in seal groove.

f. Reinstall fitting. Tighten bolts evenly with 45 to 50 inch-pounds torque.

5-161. MAIN FUEL STRAINER, MECHANICAL BYPASS INDICATOR TYPE.

5-162. A main fuel strainer equipped with a mechanical bypass indicator is used on YUH-1D helicopters Serial No. 60-6028 through 60-6034, and is mounted on a bracket aft or forward firewall in left side of engine compartment. (Exception: On YUH-1D Serial No. 60-6028 through 60-6030, strainer is at front of firewall in pylon support compartment.) Strainer is a cylindrical unit, with a detachable sump bowl connected to a drain line through a manual valve. In normal flow, fuel enters inlet from shutoff valve and passes through a stainless steel wire cloth screen element before delivery through outlet coupling to fuel control inlet hose. (See figure 5-38.) If strainer element becomes clogged, flow is through an internal bypass valve which pushes a red indicator up into a transparent dome for visual warning of faulty condition. Bypass indicator can be manually reset only when strainer element is removed for cleaning.

5-163. REMOVAL - FUEL STRAINER, MECHANICAL BYPASS INDICATOR TYPE.

a. Disconnect fuel control inlet hose at strainer outlet coupling. Drain strainer by opening valve. (See figure 5-38.)

Note

Use a suitable tool to depress self-closing valve in outlet coupling of strainer, to admit some air and allow drainage.

b. Remove V-band clamp to detach sump bowl, with O-ring from strainer. Either place sump out of way on deck with drain hose attached, or disconnect.

c. Remove three screws and withdraw screen element, with bypass valve, from strainer body.

Caution

Do not attempt to change setting of bypass valve.

5-164. CLEANING - FUEL STRAINER MECHANICAL BYPASS INDICATOR TYPE.

a. Clean strainer when scheduled by inspection requirements and at any time red bypass indicator appears in strainer dome, using following procedure. (See figure 5-38.)

b. Wash strainer element, bypass valve, and sump bowl with dry cleaning solvent, (item 302, table 1-2). Use soft bristle brush as necessary. Drain and dry parts thoroughly.

5-165. REPAIR OR REPLACEMENT - FUEL STRAINER MECHANICAL BYPASS INDICATOR TYPE. Replace unserviceable parts.

5-166. INSTALLATION - FUEL STRAINER MECHANICAL BYPASS INDICATOR TYPE.

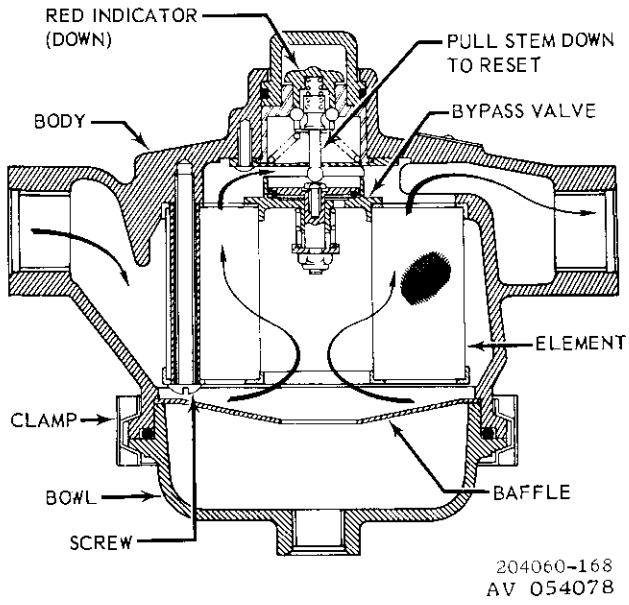


Figure 5-38. Main fuel strainer cross section

a. Reset bypass indicator by reaching through bottom of strainer body to pull down indicator stem nder dome.

b. Insert element, with bypass valve up, into strainer body. Secure with three screws. Check that bypass indicator remains down in normal posi- on.

c. Place new O-ring on lip of sump. Seat sump in bottom of strainer body and secure with V-band clamp. Lock-wire clamp.

d. Connect drain hose, if detached. Connect fuel control inlet hose to strainer outlet coupling.

5-167. FUEL CHECK VALVE MANIFOLD.

5-168. A valve manifold, located at left front of engine forward firewall, is connected into fuel pressure lines ahead of shutoff valve. Manifold contains two separate valve elements at inlet ports, each consisting of a check valve which prevents reverse flow except through its thermal relief bypass of trapped fuel. Manifold also has an outlet port and a tap for fuel pressure gage transmitter at outlet side of check valves. Two taps on inlet side of check valves are plugged on UH-1D/H, but are used on YUH-1D for connection of pressure switches in RIGHT FUEL BOOST and LEFT FUEL BOOST caution panel circuits.

5-169. REMOVAL - FUEL CHECK VALVE MANIFOLD.

a. Remove fuel shutoff valve. (Refer to paragraph 5-186.)

b. Disconnect fuel line tubes from fittings on valve manifold. Cap open lines and fittings.

c. Remove nuts from two bolts through valve body. Remove valve assembly. Reinstall nuts to keep bolts, spacers, and washers in place as sets.

5-170. REPLACEMENT - FUEL CHECK VALVE MANIFOLD. Transfer all fittings to replacement manifold.

a. Attach manifold to firewall with two bolts, spacers, washers, and nuts.

b. Connect fuel line tubes to fittings on manifold as follows:

(1) Fuel line tubes from forward cells to two inlet fittings at bottom of manifold.

(2) Pressure gage transmitter line tube to bow fittings, equipped with restrictor plug, at pper right on manifold.

(3) On YUH-1D only, connect tube from nearest pressure switch at lower right manifold fitting, and tube from outboard pressure switch at lower left fitting.

c. Install fuel shutoff valve. (Refer to paragraph 5-187.)

5-171. STARTING FUEL SOLENOID VALVE.

5-172. An electrically operated solenoid valve on left side of engine compressor housing is connected in starting fuel line between fuel control and starting fuel manifold.

5-173. REMOVAL - STARTING FUEL SOLENOID VALVE.

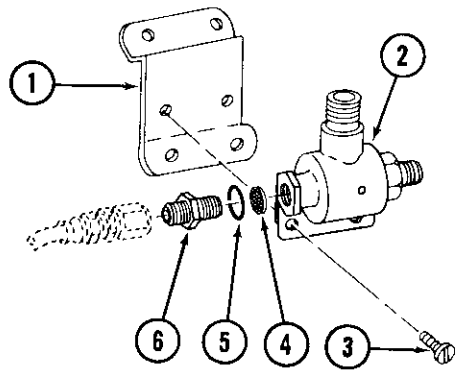
a. Disconnect electrical harness connector from valve (2, figure 5-39).

b. Disconnect fuel lines from valve fittings. Cap open lines and fittings.

c. Remove screws (3) to detach valve from mounting bracket (1). Remove solenoid valve, leaving bracket on compressor housing.

d. Remove union (6) and packing (5).

5-174. INSPECTION - STARTING FUEL SOLENOID VALVE. Inspect inlet port of solenoid valve to ensure that filter screen (4, figure 5-39) has been thoroughly cleaned and is not damaged.



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1. Bracket
2. Solenoid Valve
3. Screw
4. Filter Screen
5. Packing
6. Union

Figure 5-39. Installation - starting fuel solenoid valve - typical

5-175. REPAIR AND REPLACEMENT - STARTING FUEL SOLENOID VALVE. Replace filter screen if damaged or unserviceable. Use rubber eraser end of a pencil to insert new filter screen.

5-176. INSTALLATION - STARTING FUEL SOLENOID VALVE.

a. Install new packing (5, figure 5-39) and union (6) (T53-L-9/9A modified) on inlet port of solenoid valve.

b. Secure starting fuel solenoid valve to bracket (1) with screws (3). Lock-wire screws.

c. Connect starting fuel hoses to solenoid valve (2). Tighten hose connectors 70 to 120 inch-pounds torque.

d. Connect wiring harness connector to solenoid valve. Tighten and lock-wire.

5-177. MAIN FUEL FILTER, ELECTRICAL BYPASS INDICATOR TYPE.

5-178. On UH-1D/H helicopters main fuel filter has a micronic type element and electrical means of indicating any impending bypass condition which may occur. Filter is a cylindrical unit, horizontally mounted on forward firewall in left side of engine compartment. (See figure 5-40.) Piping connections to filter head are, an inlet line from shutoff valve of supply system, a drain line with manual valve and an outlet coupling for engine fuel control hose. Filter element and other parts, except head assembly, are interchangeable with those used in external filter of transmission oil system. If a clogging condition should develop in filter element a normally-open switch would be closed by differential pressure, lighting FUEL FILTER caution panel as warning that further clogging may cause fuel to flow through bypass valve without filtration.

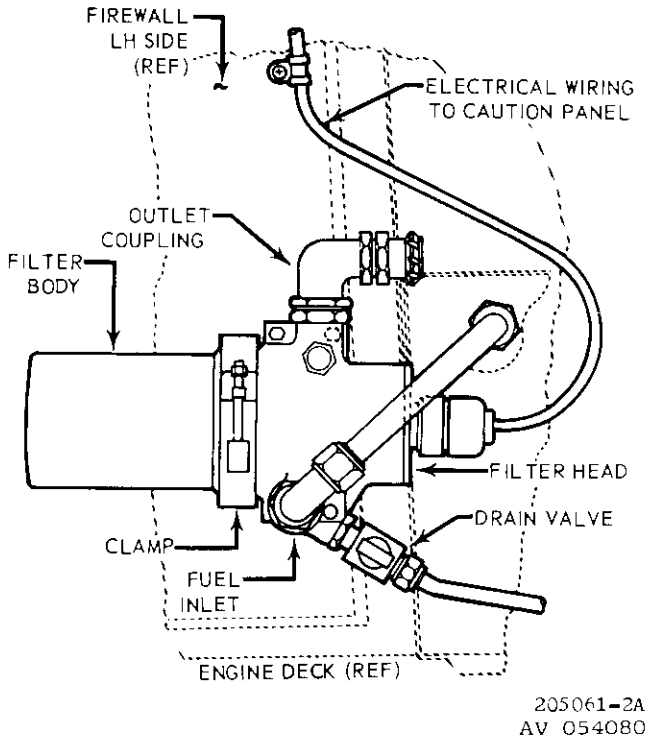


Figure 5-40. Fuel filter with electrical bypass indicator

5-179. REMOVAL - FUEL FILTER, ELECTRICAL BYPASS INDICATOR TYPE.

a. Open engine compartment cowling at left side.

b. Disconnect fuel hose from outlet coupling on filter. (See figure 5-40.) Drain fuel from filter by opening valve located under head.

Note

Use suitable tool to depress self-closing valve in filter outlet coupling, to admit some air and allow drainage.

c. Remove filter element for inspection and replacement as follows:

(1) Open V-band clamp.

(2) Remove filter body and element from head assembly.

(3) Separate element and O-rings from filter body.

(4) Filter head will normally remain in place but can be removed when necessary by disconnecting electrical cable plug, fuel line and drain line, and removing four bolts with washers which secure head to firewall.

5-180. CLEANING - FUEL FILTER, ELECTRICAL BYPASS INDICATOR TYPE. Clean filter body and head as necessary with cleaning solvent, (item 302, table 1-2). Protect electrical connections when cleaning head.

5-181. INSPECTION - FUEL FILTER, ELECTRICAL BYPASS INDICATOR TYPE. Inspect filter element for contamination to determine if any corrective action is needed beyond replacement of element and O-ring.

5-182. REPAIR OR REPLACEMENT - FUEL FILTER, ELECTRICAL BYPASS INDICATOR TYPE. Replace element if unserviceable or damaged.

5-183. INSTALLATION - FUEL FILTER, ELECTRICAL BYPASS INDICATOR TYPE.

a. If removed, reinstall filter head. Secure to firewall with four bolts and washers. Lock-wire bolt heads. Connect fuel line tube to filter inlet fitting, and drain line to valve at bottom of filter head. Connect and lock-wire electrical cable plug.

b. Install filter element and body.

(1) Place new O-ring on boss in bottom of filter body.

(2) Place clean filter element in body, seated firmly on boss.

(3) Install new O-ring around upper lip of filter body, next to flange.

(4) Place new O-ring around center boss in filter head.

(5) Install body assembly into filter head, pressing firmly to seat.

(6) Install V-band clamp around mating flanges of filter head and body. Tighten nut to a torque of 50 inch-pounds.

c. Connect hose from engine fuel control inlet to outlet coupling on filter.

d. During next ground run-up, check fuel filter and connections for leaks. Also check that FUEL FILTER caution panel does not light.

5-184. FUEL SHUTOFF VALVE.

5-185. A motor-operated pullout type gate valve, in main fuel line before strainer, is mounted on front of engine forward firewall and is accessible through a door on left side of pylon structural island. Valve is controlled by MAIN FUEL switch, and has a manual override handle which also serves as a visual position indicator. A thermal relief valve allows internal bypass of fuel trapped on outlet side of shutoff valve, being set to crack at 90 to 120 psig and to reseat at 80 psig minimum.

5-186. REMOVAL - FUEL SHUTOFF VALVE.

a. Open left engine cowl door and disconnect engine fuel inlet hose from coupling on main strainer.

b. Remove access door at left side of pylon sland in cabin. Manually open shutoff valve. Also open strainer drain valve to release trapped fuel. Close both valves after short period of drainage.

c. Disconnect electrical wiring plug from connector on shutoff valve.

d. Remove two upper bolts through retaining flanges of valve inlet and outlet fittings. Loosen two lower bolts. Remove screw which secures forward end of bracket to valve. Lift valve out of bracket. Reinstall screw in valve. Cover open valve ports and fittings.

5-187. INSTALLATION - FUEL SHUTOFF VALVE.

a. Be sure valve handle is at closed position. Remove covers from valve ports and from fittings in mounting bracket.

b. Position valve, with O-rings in ports, between fittings in bracket with motor to left. Attach forward end of bracket on existing screw of valve, install two upper bolts through retaining flanges of fittings and tighten to two lower bolts.

c. Connect and lock-wire electrical cable plug to connector on valve.

5-188. FORWARD FUEL TANK SUMP ASSEMBLY.

5-189. Fuel cell sump assemblies are mounted in openings on the underside of each forward fuel tank. Removal of the sump assemblies from the tanks permits access for maintenance and replacement of the boost pump, flow switch, check valve, cross fitting, and sump drain valve. (See figures 5-36, 5-37, and 5-41.)

5-190. REMOVAL - FUEL CELL SUMP ASSEMBLY.

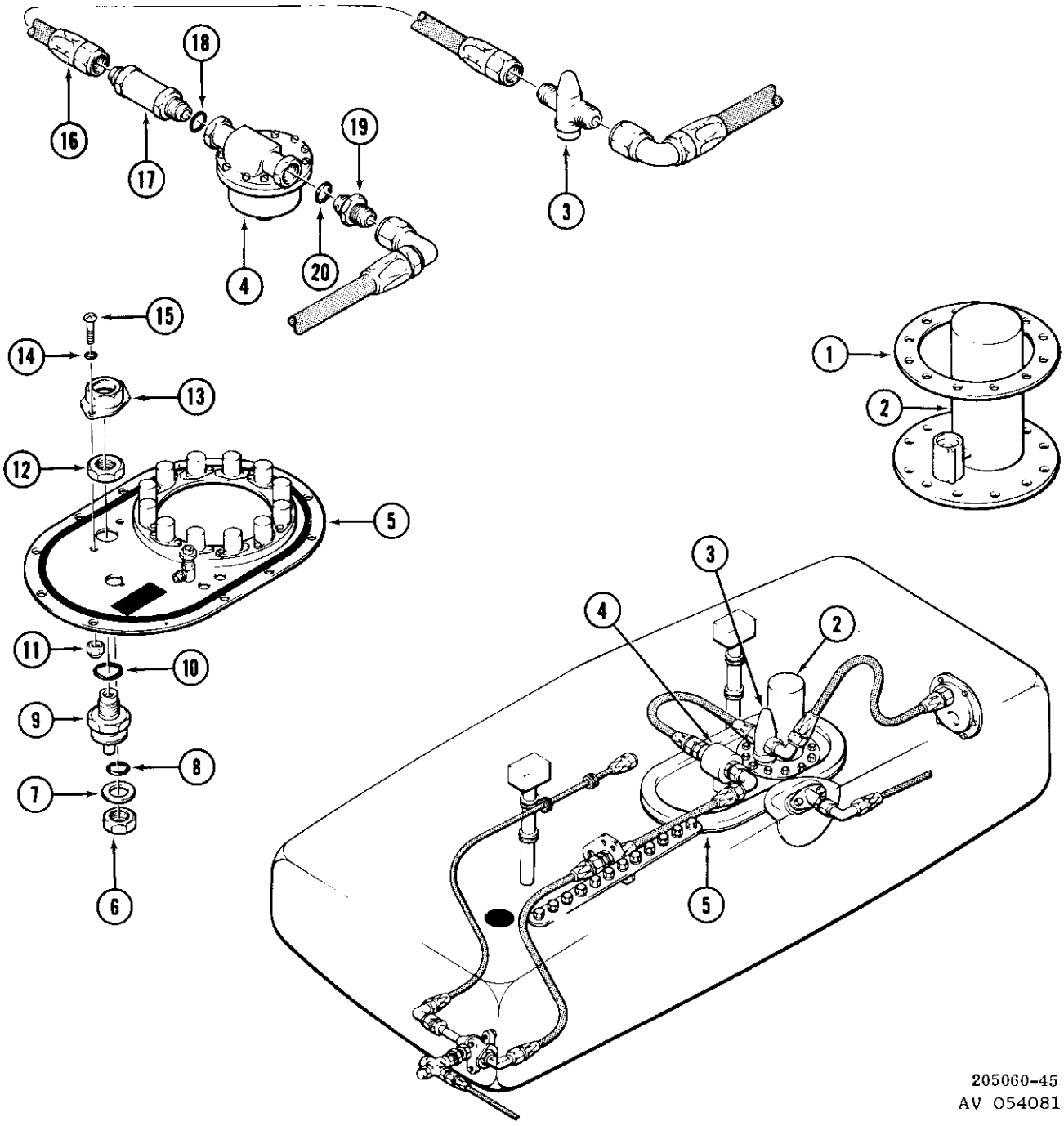
a. Disconnect battery and any external power source. Defuel system. (Refer to paragraph 5-156, step a.)

b. Remove sump access panel from underside of cabin by removing screws. Mark access panel so it can be installed in same position.

c. Open sump drain valve (9, figure 5-41) to drain trapped fuel into suitable container. On right-hand cell only drain sump through valve provided.

d. Disconnect tubes and electrical leads of units attached to sump (5).

e. Remove 12 bolts and 12 washers around sump plate. Lower sump assembly (5) and support it below mounting port. Reach through opening to disconnect hoses from boost pump (2) outlet, flow switch (4) outlet, and disconnect fuel quantity gage tank unit electrical leads as necessary.



1. Gasket
2. Boost Pump
3. Cross Fitting
4. Flow Switch
5. Sump Assembly
6. Nut
7. Washer
8. Packing
9. Drain Valve
10. Packing
11. Nut
12. Nut
13. Nut Retainer
14. Washer
15. Screw
16. Connector
17. Check Valve
18. Packing
19. Nipple Tube
20. Packing

Figure 5-41. Forward fuel cell sump assembly

f. Remove sump assembly (5). Remove O-ring seal from groove around cell opening. Cover opening immediately to prevent entry of foreign matter.

5-191. INSPECTION - FUEL CELL SUMP ASSEMBLIES.

a. Inspect drain valve for leaking O-ring or seal washers. (See figure 5-41.)

b. Inspect flow switch, flow switch gaskets, and O-rings for evidence of leakage.

c. Inspect fuel quantity gage electrical connectors or monitor (YUH-1D) for damage.

5-192. REPAIR OR REPLACEMENT - FUEL CELL SUMP ASSEMBLY.

a. Replace unserviceable drain valve (9, figure 5-41), O-ring, or seal washers as necessary to prevent leakage.

b. Replace flow switch (4), flow switch gaskets, or O-rings on units if leaking.

c. Replace fuel quantity gage electrical connectors or monitor (YUH-1D) in case of damage or malfunction.

d. Check interior of cell for clean condition and for properly installed internally mounted parts.

e. Replace sump O-ring at reinstallation.

f. Check sump assembly (5) for clean condition and proper assembly.

5-193. INSTALLATION - FUEL CELL SUMP ASSEMBLY.

a. Check free ends of boost pump (2, figure 5-41), outlet hose, flow switch (4), outlet hose, and fuel quantity tank unit leads (if so equipped) in easy reach.

b. Install O-ring in groove around cell opening.

c. Position clean, properly assembled sump assembly, with boost pump (2), flow switch (4), check valve (17), cross fitting (3), and sump drain valve (9) properly installed, slightly below opening. Reach inside and connect outlet hose to pump fitting. Connect outlet hose to flow switch (4) and cross fitting (3) and attach fuel quantity tank unit leads to connectors.

d. Raise sump plate to normal position and secure with 12 bolts and 12 washers. Tighten bolts evenly to a torque of 40 to 50 inch-pounds.

e. Connect external lines and electrical leads of pump and other units of sump assembly.

f. Check for leaks and for proper functioning of indicators when system is being refilled.

g. Reinstall access panel.

5-194. ELECTRIC FUEL BOOST PUMP.

5-195. An electrically operated fuel boost pump is mounted on a plate on the sump assembly in the right hand forward fuel cell. (See figure 5-41.)

5-196. TROUBLE SHOOTING - FUEL BOOST PUMP.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Right-hand boost pump warning light illuminated, no pressure indicated on fuel pressure gage.	Electrical boost pump inoperative	Replace fuel pump.
Right-hand boost pump warning light illuminated, pressure indicated on fuel pressure gage.	Ejector pump malfunction.	Clean foreign material from ejector pump and/or hoses
	Check valve malfunction.	Replace check valve.
	Flow switch malfunction.	Replace flow switch.
	Cross fitting screen clogged with foreign material.	Replace cross fitting.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Left-hand boost pump warning light illuminated, fuel pressure low or zero.	Bleed air fuel boost pump is inoperative.	Replace fuel pump.
Left-hand boost pump warning light illuminated, pressure normal on fuel pressure gage.	Ejector pump malfunction.	Clean foreign material from ejector pump and/or hoses
	Check valve malfunction.	Replace check valve.
	Flow switch malfunction.	Replace flow switch.
	Cross fitting screen clogged with foreign material.	Replace cross fitting.

5-197. REMOVAL - FUEL BOOST PUMP.

a. Remove fuel cell sump assembly (5, figure 5-41). (Refer to paragraph 5-190.)

Note

Mark position of fuel boost pump before removal to aid in reassembly.

b. Disconnect flow switch hose from pump fitting.

c. Remove 12 bolts and 12 washers to detach boost pump (2) mounting flange and gasket from sump plate.

5-198. REPAIR OR REPLACEMENT - FUEL BOOST PUMP.

a. Replace boost pump (2, figure 5-41) as an assembly, if malfunctioning.

b. Replace gasket, unserviceable fittings, O-ring seals, or attaching parts.

5-199. INSTALLATION - FUEL BOOST PUMP.

a. Install fittings on replacement fuel boost pump (2, figure 5-41).

b. Position boost pump (2) in mounting port of sump plate and with gasket in place secure boost pump to sump plate with 12 bolts and 12 washers.

c. Connect flow switch (4) hose to pump fitting.

d. Replace cross fitting (3) with new cross fitting. (Refer to paragraphs 5-202 through 5-205.)

5-200. FUNCTIONAL CHECK - FUEL PUMP AND EJECTOR SYSTEM.

a. Right hand fuel pump.

(1) Turn electrical power ON.

(2) Turn main fuel switch ON.

(3) Activate fuel boost circuit breaker.

(4) If right hand fuel boost light is on, check fuel pressure gage for correct pressure.

(a) If pressure is not indicated, electric boost pump is inoperative.

(b) If pressure is indicated, check for malfunction of ejector pump, check valve flow switch, or clogged cross fitting screen.

b. Left hand fuel pump.

(1) Ground run helicopter engine.

(2) Turn right hand electrical fuel boost pump circuit breaker to "OFF" position.

(3) If left fuel boost light is illuminated, check fuel pressure gage for correct pressure.

(a) If pressure is low or zero, the bleed air fuel boost pump is inoperative.

(b) If pressure is normal, the ejector pump is malfunctioning; check valve or flow switch is inoperative, or cross fitting screen is clogged with foreign material.

5-201. CROSS FITTING.

5-202. The cross fitting (3, figure 5-41) is mounted on the forward fuel tank sump assembly.

5-203. REMOVAL - CROSS FITTING.

a. Remove the fuel tank sump assembly (5, figure 5-41). (Refer to paragraph 5-190.)

b. Disconnect the fuel lines from inlet and outlet ports of cross fitting (3).

c. Cut lockwire and remove bolt securing cross fitting to boost pump flange.

d. Remove rubber plugs from lower end of cross fitting.

5-204. REPAIR OR REPLACEMENT - CROSS FITTING.

a. Replace cross fitting (3, figure 5-41) if screen is clogged or at any time it is necessary to replace fuel boost pump.

b. Install new rubber plug and two new "O" rings in bottom of cross fitting at reassembly.

5-205. INSTALLATION - CROSS FITTING.

a. Install bolt previously removed through boost pump (2, figure 5-41) flange into cross fitting (3) and secure fitting to boost pump. Lock-wire bolt.

b. Connect fuel lines to each side of cross fitting.

c. Replace forward fuel tank sump assembly (5). (Refer to paragraph 5-193.)

5-206. FLOW SWITCH.

5-207. The flow switch (4, figure 5-41) is attached to the sump plate on the underside of each forward fuel tank.

5-208. REMOVAL - FLOW SWITCH.

a. Remove sump assembly (5, figure 5-41). (Refer to paragraph 5-190.)

b. Disconnect fuel line from check valve (17) and fuel line from outlet of flow switch (4).

c. Disconnect electrical terminals and cover ends with tape.

d. Cut lockwire and remove nut and washer securing flow switch (4) to sump plate; remove flow switch (4), and check valve (17) from sump plate.

e. Remove check valve (17) from flow switch (4).

f. Remove "O" ring from flow switch electrical inlet.

5-209. REPAIR OR REPLACEMENT - FLOW SWITCH.

a. Replace flow switch (4, figure 5-41) if malfunctioning.

b. Replace "O" ring with like serviceable item.

5-210. INSTALLATION - FLOW SWITCH.

a. Install check valve (17, figure 5-41) in inlet port of the flow switch (4).

b. Install new "O" ring on electrical outlet.

c. Position flow switch (4) and check valve (17) on sump plate with electrical inlet projecting through plate.

d. Install washer on electrical outlet and secure flow switch to sump plate with nut previously removed. Lock-wire nut.

e. Connect electrical terminals.

f. Replace sump assembly (5). (Refer to paragraph 5-193.)

5-211. CHECK VALVE.

5-212. The check valve (17, figure 5-41) is installed in the inlet port of the flow switch (4).

5-213. REMOVAL - CHECK VALVE.

a. Remove sump assembly (5, figure 5-41). (Refer to paragraph 5-190.)

b. Disconnect hose from inlet port of check valve (17).

c. Unscrew check valve (17) from inlet port of flow switch (4).

d. Remove gasket between flow switch (4) and check valve (17).

5-214. REPAIR OR REPLACEMENT - CHECK VALVE.

a. Replace check valve (17, figure 5-41) if malfunctioning.

b. Replace gasket between flow switch (4) and check valve (17) with like serviceable item.

5-215. INSTALLATION - CHECK VALVE.

a. Install new gasket between check valve (17, figure 5-41) and flow switch (4).

b. Install check valve (17) in inlet port of flow switch with direction of flow toward flow switch (4).

c. Connect hose to inlet port of check valve (17).

d. Replace sump assembly (5). (Refer to paragraph 5-193.)

5-216. 20 MINUTE FUEL SYSTEM.

5-217. A float switch (16, figure 5-37), located on the left fuel cell sump assembly, activates the system which illuminates the 20 MINUTE FUEL panel in the pedestal mounted caution panel. Should the system activate with higher than normal or desired quantity of fuel remaining in the fuel cells, inspect the flapper valve installation in the left forward fuel cell. If the system activates with a lower than normal quantity of fuel remaining, inspect the flapper valve installation in the right forward fuel cell.

5-218. INSPECTION - FUEL CELL FLAPPER VALVES.

a. Remove left or right forward fuel cell sump assembly as indicated above. (Refer to paragraph 5-190.)

b. Using a suitable explosion-proof light and inspection mirror, actuate flapper valve (10, figure 5-37). Valve must close and provide an even sealing surface with no pressure applied to the valve.

c. Replace flapper valves if not sealing properly. (Request assistance from Direct Support Maintenance.)

d. Replace forward fuel cell assembly (Refer to paragraph 5-193.)

5-219. ENGINE FUEL MANIFOLDS, STRAINER, AND STARTING NOZZLES - T53-L-9/-9A/-11.

5-220. Starting and main fuel manifolds are bracketed together and mounted around the exhaust diffuser ahead of the rear firewall. The main manifold delivers fuel to eleven vaporizer tubes, and has a strainer at its inlet on T53-L-9/-9A engine. On T53-L-11 series engine, a larger strainer with bypass provisions is located in the main fuel line ahead of the manifold inlet. The starting fuel manifold is made of smaller diameter tubing and serves the starting fuel (igniter) nozzles.

5-221. REMOVAL - FUEL MANIFOLD STRAINER OR BYPASS STRAINER. Strainer elements can be removed, for inspection and cleaning, without other disassembly of engine. Use applicable procedure below.

a. On T53-L-9 or -9A engine: Remove strainer plug (8, figure 5-42), with packing and attached metal mesh strainer element, from main fuel manifold near inlet.

Note

Hold adapter, using slip-joint pliers with taped jaws.

b. On T53-L-11 series engine: Remove plug, packing, spring and metal mesh element from bypass type strainer (10, figure 5-42) in fuel line ahead of manifold inlet.

5-222. CLEANING - FUEL MANIFOLD STRAINER OR BYPASS STRAINER.

a. On T53-L-9/-9A engine, wash strainer in solvent (item 302, table 1-2).

b. On T53-L-11 series engines, wash bypass strainer in clean fuel (item 1, table 1-2) and air-dry.

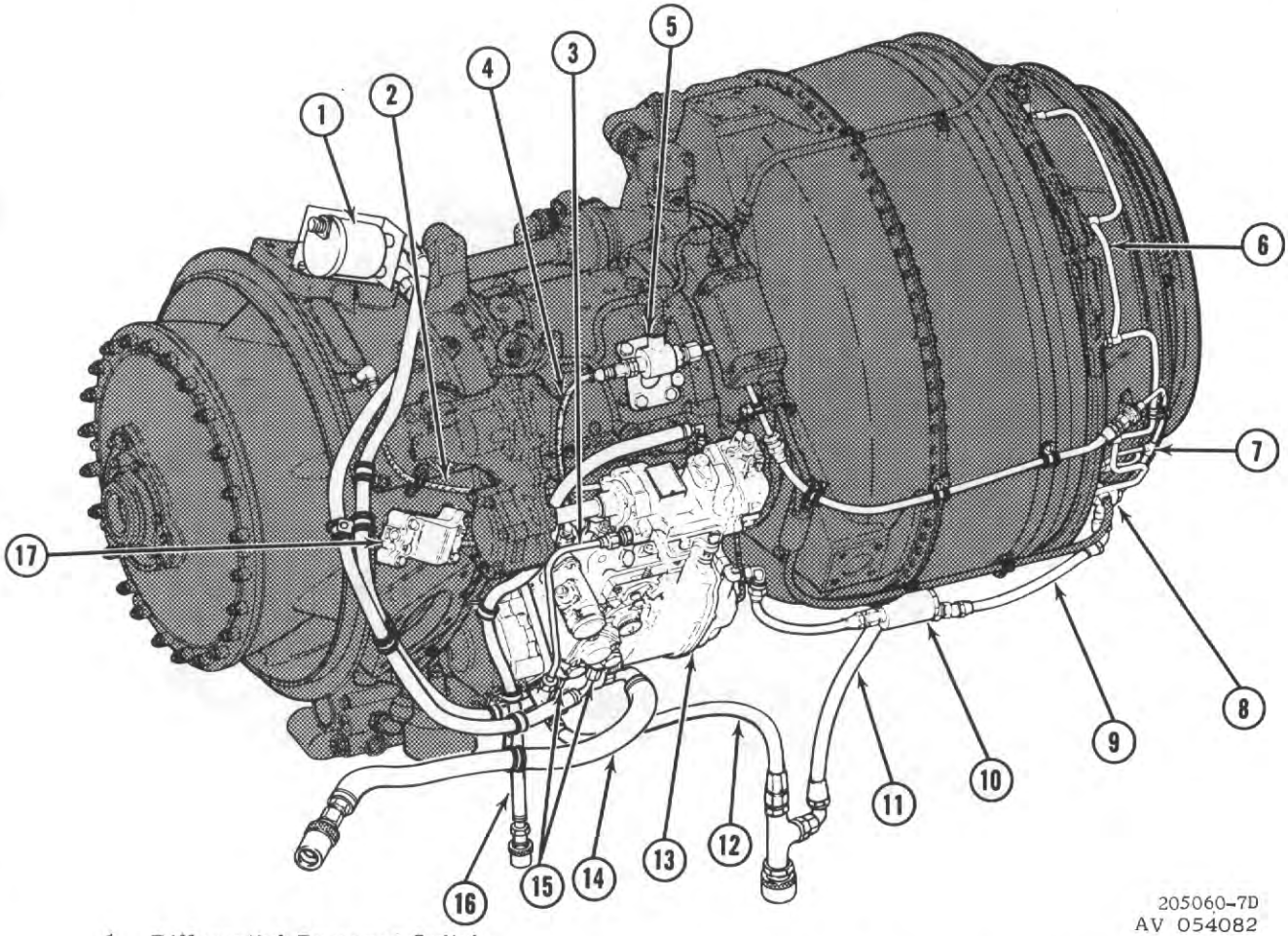
5-223. INSPECTION - FUEL MANIFOLD STRAINER OR BYPASS STRAINER. Inspect strainer for condition and cleanliness as scheduled in Inspection Requirements or whenever contaminated or restricted fuel flow is suspected.

5-224. REPAIR OR REPLACEMENT - FUEL MANIFOLD STRAINER OR BYPASS STRAINER. Replace strainer if damaged or unable to clean.

5-225. INSTALLATION - FUEL MANIFOLD STRAINER OR BYPASS STRAINER.

a. On T53-L-9/-9A engine: Coat a new packing with petrolatum (item 13, table 1-2) and place on strainer. Thread strainer plug (8, figure 5-42) into main fuel manifold, tighten plug 115 to 125 inch-pounds torque, and lock-wire.

b. On T53-L-11 series engines: Coat a new packing with petrolatum (item 13, table 1-2) and place on strainer plug. Insert element, spring, and plug to strainer housing (10, figure 5-42). Tighten plug with 100 to 125 inch-pounds torque and secure with lockwire.



1. Differential Pressure Switch
2. Inlet Air Pressure Sensing Line
3. Governor Seal Drain Line
4. Starting Fuel Line
5. Solenoid Valve
6. Main Fuel Manifold
7. Starting Fuel Manifold
8. Main Fuel Manifold Strainer (T53-L-9)
9. Main Fuel Line
10. Main Fuel Line Strainer (T53-L-11)
11. Combustor Drain Hose
12. Fuel Control Seal Drain Hose
13. Fuel Control Assembly
14. Fuel Inlet Hose
15. Pump Tap Restrictor Fittings
16. Fuel Control Vent Hose
17. Temperature Sensing Element

Figure 5-42. Fuel system components on engine - typical T53-L-9/-9A/-11 series

5-226. REMOVAL - FUEL MANIFOLDS AND IGNITER, OR STARTING FUEL NOZZLES.

a. Remove upper section of rear firewall from engine. (Refer to paragraph 5-147.)

b. On T53-L-9 and -9A (with scoop type combustors).

(1) Disconnect main fuel hose assembly (16, figure 5-43) from main fuel manifold (13).

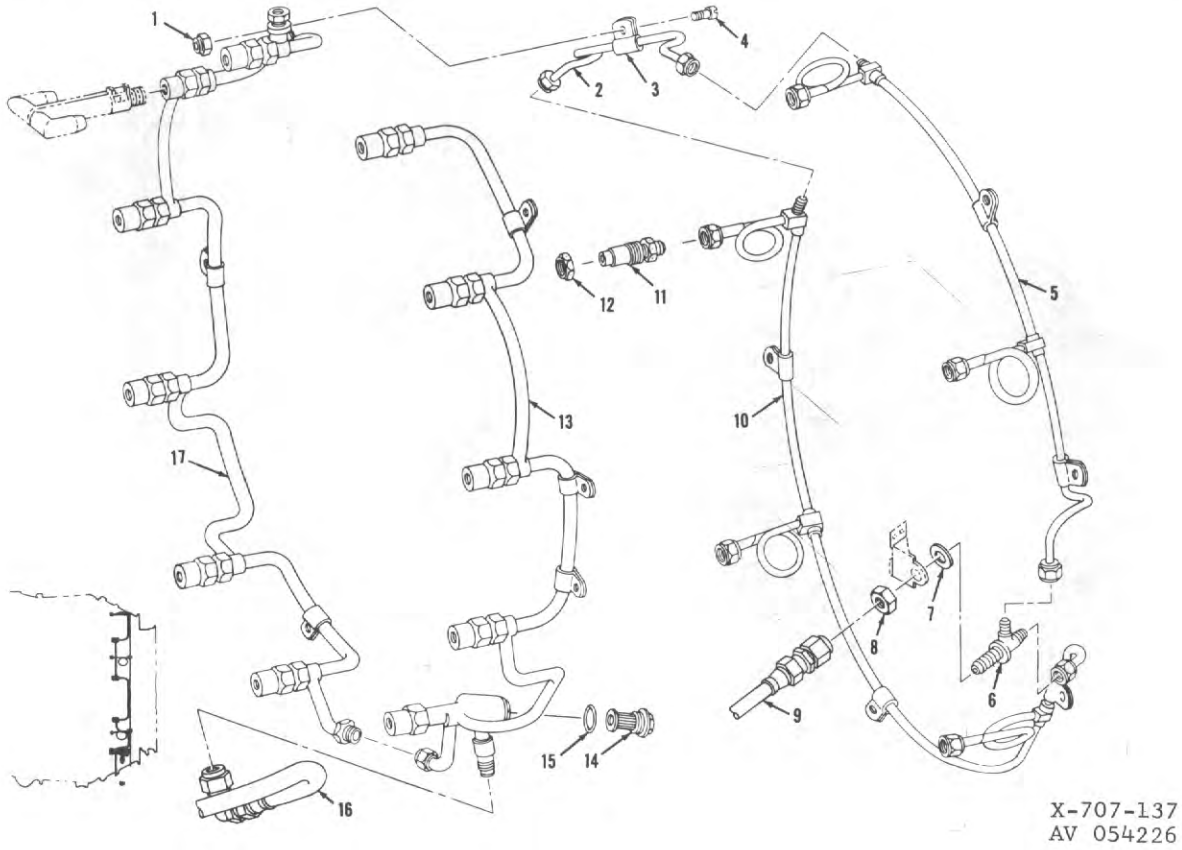
(2) Disconnect main fuel manifolds (13 and 17) from fuel vaporizers.

Note

Hold manifold fittings with one wrench while loosening connectors with second wrench. When loosening the connector at the 7-o'clock position (fuel strainer housing), hold housing, using slip-joint pliers with taped jaws.

(3) Disconnect starting fuel manifold connectors from tee (6).

(4) Disconnect starting fuel manifold connectors from nozzles (11).



1. Nut (Typical)
2. Support Tube
3. Clamp (Typical)
4. Screw (Typical)
5. Starting Fuel Manifold (LH)
6. Tee
7. Washer
8. Nut
9. Starting Fuel Hose Assembly
10. Starting Fuel Manifold (RH)
11. Igniter Nozzle
12. Nut
13. Main Fuel Manifold (LH)
14. Fuel Filter
15. Packing
16. Main Fuel Hose Assembly
17. Main Fuel Manifold (RH)

Figure 5-43. Fuel manifolds, igniter, nozzles, and attaching parts (model T53-9 and -9A engines with scoop type combustors)

Caution

To prevent disassembly of fuel nozzle, hold nozzle retainer with a suitable wrench while loosening connector nut.

(5) Carefully lift off, as a unit, bracketed main and starting fuel manifold.

Caution

Immediately cap manifolds and fuel vaporizers and cover all exposed openings.

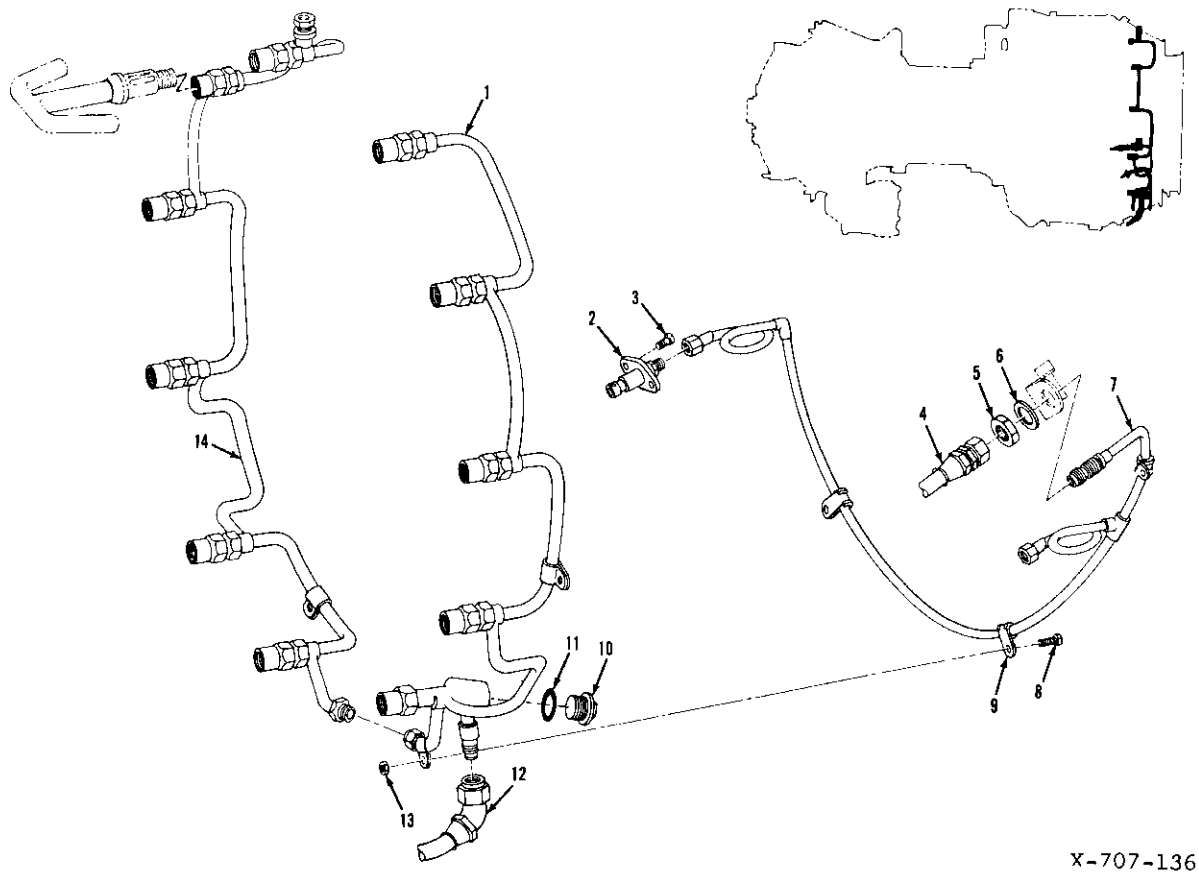
(6) If necessary, separate support tube (2) and starting fuel manifold (5 and 10) from main fuel manifold (13 and 17) by removing screws (4) and nuts (1) that secure clamps (3).

(7) Remove igniter nozzles (11) and nuts (12).

c. On T53-L-11 series engines (and engines modified with scoopless combustors.)

(1) Disconnect main fuel hose assembly (12, figure 5-44) from main fuel manifold (1).

(2) Disconnect main fuel manifolds (1 and 14) from fuel vaporizers.



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1. Main Fuel Manifold (Left Side)
2. Starting Fuel Nozzle Assembly
3. Screw
4. Starting Fuel Hose Assembly
5. Nut
6. Washer
7. Starting Fuel Manifold
8. Screw
9. Clamp
10. Plug
11. Packing
12. Main Fuel Hose Assembly
13. Nut
14. Main Fuel Manifold (Right Side)

Figure 5-44. Fuel manifolds, starting fuel nozzles, and attaching parts (T53-L-11 series and modified -9 and -9A engines with scoopless combustors)

Note

Hold manifold fittings with one wrench while loosening connectors with second wrench. When loosening connector at the 7 o'clock position (fuel strainer housing), hold housing, using slip-joint pliers with taped jaws.

(3) Disconnect starting fuel hose assembly (4) from starting fuel manifold (7). Remove nut (5) and washer (6).

(4) Disconnect starting fuel manifold connectors from nozzle assemblies (2).

Caution

To prevent disassembly of fuel nozzle assembly, hold nozzle retainer with a suitable wrench while loosening connector nut.

(5) Carefully lift off, as a unit, bracketed main starting fuel manifold.

Caution

Immediately cap manifolds and fuel vaporizers and cover all exposed openings.

(6) If necessary, separate starting fuel manifold (7) from main fuel manifold (1 and 14) by removing screws (8) and nuts (13) that secure clamps (9).

(7) Remove screws (3) and withdraw starting fuel nozzle assemblies (2).

(8) Remove plug (10) and packing (11) from main fuel manifold (1).

5-227. CLEANING - FUEL MANIFOLDS AND IGNITER, OR STARTING FUEL NOZZLES.

a. Clean fuel manifolds and associated lines with solvent (item 302, table 1-2).

b. Clean clogged igniter, or starting fuel nozzles with a soft wire brush.

5-228. INSPECTION - FUEL MANIFOLDS AND IGNITER, OR STARTING FUEL NOZZLES.

a. Inspect fuel manifolds and associated lines for cracks or other damage.

b. Use a pressure source of dry filtered air to check starting fuel nozzles for clogged condition.

5-229. REPAIR OR REPLACEMENT - FUEL MANIFOLDS AND IGNITER, OR STARTING FUEL NOZZLES.

a. Replace any damaged or unserviceable parts of fuel manifolds and associated lines.

b. Replace starting fuel nozzles which remain clogged after cleaning.

5-230. INSTALLATION - FUEL MANIFOLDS AND IGNITER, OR STARTING FUEL NOZZLES.

a. On T53-L-9 and -9A engines (with scoop type combustors)

(1) Thread nuts (12, figure 5-43) on three igniter nozzles (11). Install nozzles into combustion chamber at 10, 12, and 2 o'clock positions. Tighten nuts and nozzles. Install two remaining igniter nozzles, without nuts, at 4 and 8 o'clock positions. Tighten nozzles. Lockwire all nozzles and nuts.

(2) If support tube (2) or starting fuel manifold (5 and 10) has been separated from main fuel manifold (13 and 17), bracket manifolds together by securing clamps (3) with screws (4) and nuts (1).

(3) If tee (6) has been removed, install washer (7) on tee and secure tee to bracket with nut (8). Connect starting fuel hose assembly (9) to tee.

(4) Place bracketed starting and main fuel manifolds in position over rear support cone.

Note

Remove coverings from manifolds and inspect openings to ensure cleanliness.

(5) Connect starting fuel manifold connectors to tee (6) on support cone bracket (two places).

(6) Connect starting fuel manifold connectors to igniter nozzles. Tighten connectors.

(7) Using fuel harness wrench, LTCT2051, connect main fuel manifold connectors to fuel vaporizers as follows:

(a) Tighten connector nuts by hand.

(b) Starting with connector nut at the 7 o'clock position (fuel strainer housing), sequentially tighten nuts by wrench in 180 degree opposite pairs until snug.

Note

Hold strainer housing, using slip-joint pliers with taped jaws.

(c) Starting with the nut at fuel strainer housing (7 o'clock position), tighten nuts to a final torque of 350 to 400 pound-inches in 180 degree opposite pairs.

Caution

When tightening connector nut, hold manifold leg securely. If manifold leg is allowed to turn with the connector nut, unnecessarily high stresses are created.

(d) Lockwire connector nuts.

(8) Connect main fuel hose assembly (16) to left main fuel manifold (13).

b. On T53-L-11 series engines (and engines modified with scoopless combustors.)

(1) Install packing (11, figure 5-44) on plug (10) and install in manifold (1).

(2) Secure starting nozzle assemblies (2) to fireshield, at 4 and 8 o'clock positions, with screws (3). Lockwire screws.

(3) If starting fuel manifold (7) has been separated from main fuel manifold (1 and 14), bracket manifolds together by securing clamps (9) with screws (8) and nuts (13).

(4) Place bracketed starting and main fuel manifolds in position over rear support cone.

Note

Remove coverings from manifolds and inspect openings to ensure cleanliness.

(5) Secure starting fuel manifold (7) to support cone bracket with washer (6) and nut (5). Tighten nut. Connect starting fuel hose assembly (4) to starting fuel manifold.

(6) Connect starting fuel manifold connectors to starting fuel nozzles. Tighten connectors.

(7) Using fuel harness wrench, LTCT2051, connect main fuel manifold connectors to fuel vaporizers as follows:

(a) Tighten connector nuts by hand.

(b) Starting with connector nut at the 7 o'clock position (fuel strainer housing), sequentially tighten nuts by wrench in 180 degree opposite pairs until snug.

Note

Hold strainer housing, using slip-joint pliers with taped jaws.

(c) Starting with the nut at fuel strainer housing (7 o'clock position), tighten nuts to a final torque of 350 to 400 pound-inches in 180 degree opposite pairs.

Note

Hold fuel strainer housing, using slip-joint pliers with taped jaws.

Caution

When tightening connector nut, hold manifold leg securely. If manifold leg is allowed to turn with the connector nut, unnecessarily high stresses are created.

(d) Lockwire connector nuts.

(8) Connect main fuel hose assembly (12) to left main fuel manifold.

c. Check installation for chafing or rubbing of main and starting fuel manifold tubes.

d. Install upper section of rear firewall. (Refer to paragraph 5-150 step c.)

e. Check for fuel leaks during next ground operation of engine.

5-231. STARTING FUEL MANIFOLD AND NOZZLES - T53-L-13 ENGINE.

5-232. The starting fuel manifold (6, figure 5-45) on T53-L-13 engine is secured on the support cone behind the combustion chamber housing. Fuel supplied through a hose (4) from the starting fuel solenoid valve (3) is delivered by the manifold to four starting nozzles installed at 2, 4, 8, and 10 o-clock positions in rear of combustion chamber.

5-233. REMOVAL - STARTING FUEL MANIFOLD AND NOZZLES - T53-L-13.

a. Disconnect starting fuel hose (4, figure 5-45) from tee at top of starting fuel manifold (6). Cap end of hose.

b. Remove nut and washer from nipple of manifold tee at front of support cone bracket.

c. Remove screws that secure four clamps of starting fuel manifold to support cone.

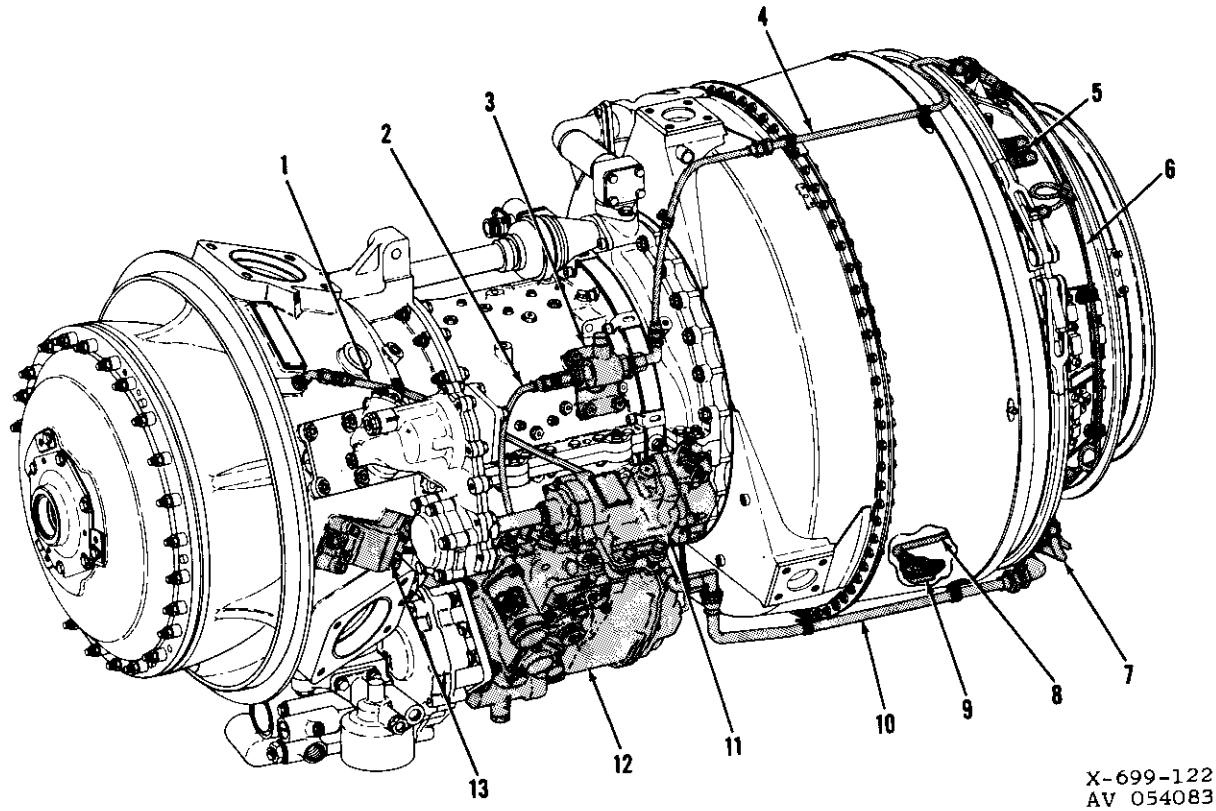
d. Loosen connector nuts evenly to detach manifold from four starting nozzles.

Note

If rear firewall is not in place, starting fuel manifold can now be removed rearward without further disassembly. If firewall is in place, perform step e. below.

e. Remove either right-hand or left-hand manifold section by detaching connector from tee fitting. Pull tee aft out of bracket and remove remaining section with tee attached. Remove washer from tee. Cap all openings.

f. Remove each of four starting nozzles by removing screw and withdrawing nozzle from combustion chamber. Remove sealing gasket and cover openings.



1. Air Pressure Sensing Hose
2. Starting Fuel Solenoid Valve
3. Starting Fuel Solenoid Valve
4. Starting Fuel Hose
5. Main Fuel Manifold
6. Starting Fuel Manifold
7. Flow Divider and Dump Valve
8. Flow Divider Drain Hose
9. Combustion Chamber Drain Valve
10. Main Fuel Hose
11. Overspeed Governor
12. Fuel Control
13. Temperature Sensing Element

Figure 5-45. Fuel system components on engine - T53-L-13

5-234. CLEANING - STARTING FUEL MANIFOLD AND NOZZLES - T53-L-13.

a. Clean starting fuel manifolds, inside and out, with dry cleaning solvent (item 302, table 1-2) and soft bristle brush.

Caution

To avoid enlarging holes in starting fuel nozzles, use brush with wire no larger than 0.010 inch diameter.

b. Clean starting fuel nozzles with dry cleaning solvent and a soft wire brush.

5-235. INSPECTION - STARTING FUEL MANIFOLD AND NOZZLES - T53-L-13.

a. Inspect manifold sections for cracks and dents, connector nuts and tee for stripped or damaged threads.

b. Inspect starting fuel nozzles for clogging or damage.

5-236. REPAIR OR REPLACEMENT - STARTING FUEL MANIFOLD AND NOZZLES - T53-L-13.

a. Replace manifold sections found to have defect. Replace tee or attaching parts if damaged.

b. Replace nozzles if damaged or if clogging cannot be removed.

5-237. INSTALLATION - STARTING FUEL MANIFOLDS AND NOZZLES - T53-L-13.

a. Install starting fuel nozzles into mounting pads located at approximately 2, 4, 8, and 10 o'clock positions in rear of combustion chamber housing. At each location: Uncover mounting pad, insert and align nozzle, install attaching screw, tighten and lock-wire screw.

b. Disconnect and lay aside one section of starting fuel manifold (6, figure 5-45) from tee fitting. Place a washer over forward nipple of tee. Position assembly on support cone, with tee nipple through bracket at top of cone. Align manifold connector nuts with two starting nozzles and hand-tighten nuts. Install washer and nut on tee at front of bracket.

c. Position remaining section of manifold on opposite side of support cone. Hand tighten manifold connector nuts on tee fitting and two starting nozzles.

d. Tighten all connector nuts and nut attaching tee to bracket with 35 to 50 inch-pounds torque.

e. Install screws to attach four manifold clamps to support cone. Tighten and lock-wire screws.

f. Connect hose (4) from starting fuel solenoid valve (3) to tee on starting fuel manifold (6). Tighten connector with 70 to 120 inch-pounds torque.

5-238. MAIN FUEL MANIFOLD, FLOW DIVIDER, AND ASSOCIATED PARTS - T53-L-13 ENGINE.

5-239. The main fuel system on T53-L-13 engine consists of a hose (10, figure 5-45) from the fuel control (12), a flow divider and dump valve assembly (7) with connecting hoses, and two semicircular sections of main fuel manifold (5) equipped with twenty-two atomizers mounted in rear of the combustion chamber housing. Each dual-orifice atomizer has two separate passages connecting to corresponding passages in the manifold. At low nI speeds (beginning at 8 to 13 percent rpm) the flow divider sends fuel through the primary system of the manifold. As fuel pressure increases with higher nI speed, the flow divider opens ports to the secondary system of the manifold. After engine shutdown, the flow divider dump valve drains fuel from the manifold through a hose connected to the combustion chamber drain valve.

Note

Hoses and adapting parts used to connect the engine to the airframe fuel system are not shown on figure 5-45, but are similar to those on preceding engine models. (See figure 5-42, items 1, 11, 12, 14, 15, and 16.)

5-240. REMOVAL - MAIN FUEL MANIFOLD, FLOW DIVIDER AND ASSOCIATED PARTS - T53-L-13.

Note

Neither the main fuel manifold assembly nor the flow divider and dump valve assembly shall be removed unless replacement is intended. Hoses can be disconnected and removed as necessary in maintenance.

Caution

Immediately cap flow divider fuel manifold ports, and fuel hoses.

a. Disconnect main fuel hose (10, figure 5-45) from flow divider.

b. Disconnect and remove hoses (1, 2, 7 and 8, figure 5-46) between flow divider assembly (6) and main fuel manifold. Disconnect and remove hose (13) between flow divider and combustion chamber drain valve (12).

c. Remove screws (3, 4, and 5) to detach flow divider and dump valve assembly and spacer (9) from exhaust diffuser support cone.

d. Disconnect ignition leads from igniter plugs and from clamps securing leads to support cone.

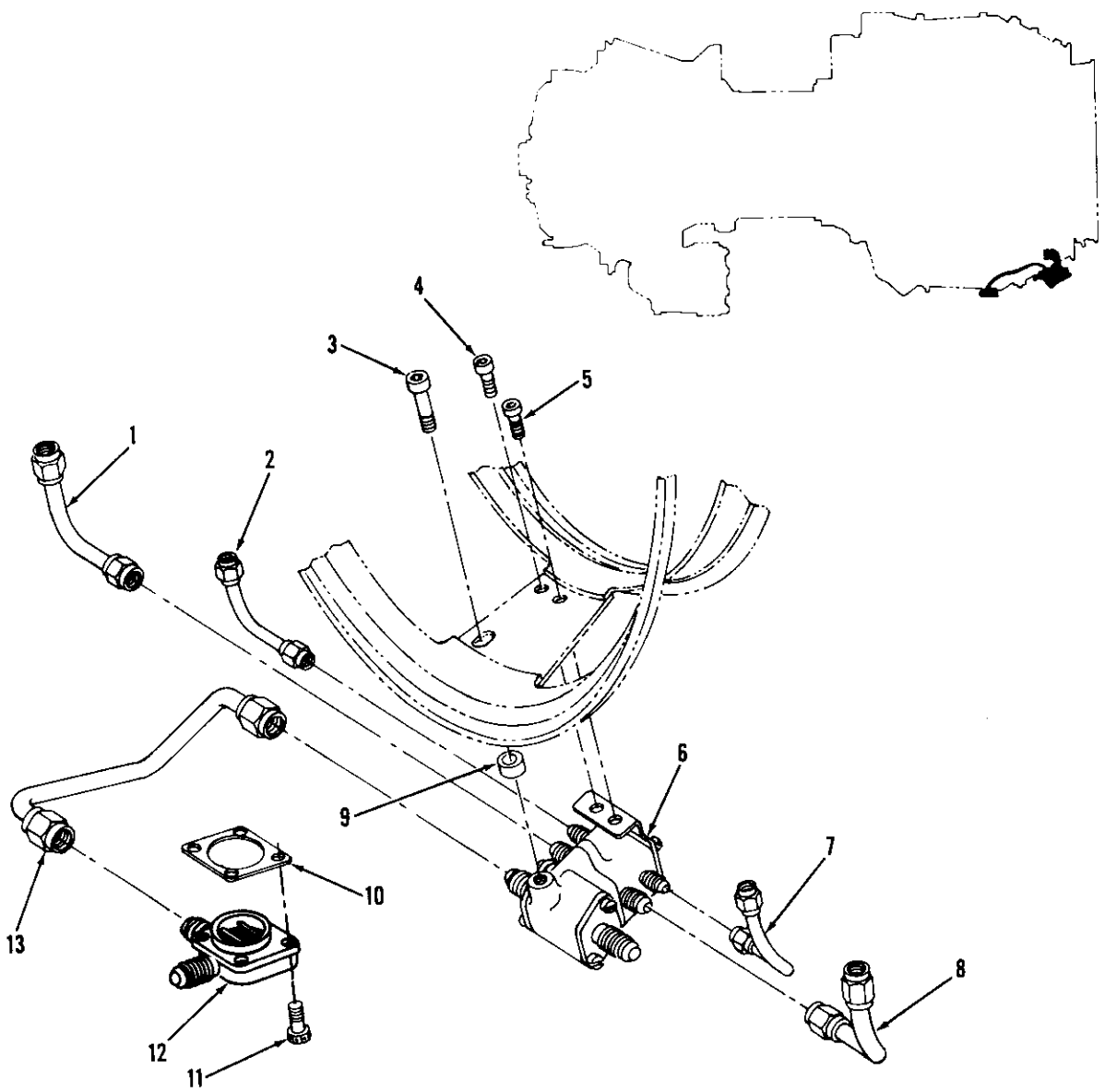
e. Remove starting fuel manifold. (Refer to paragraph 5-233.)

f. Remove bolts (12, 13, 17 and 19, figure 5-47) and retainers (10, 11, 16, and 20) that secure support assemblies (14 and 21) to support cone.

g. Withdraw pins (15 and 18) and support assemblies from support cone.

h. Remove bolts (4) that secure fuel manifold assembly (5) to rear face of combustion chamber housing. Carefully withdraw manifold assembly from combustion chamber to avoid damage to parts. Cover open combustion chamber ports.

i. Remove caps (2 and 3) from manifold and packings (1) from atomizers.



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1. Hose
2. Hose
3. Screw
4. Screw
5. Screw
6. Flow Divider and Dump Valve
7. Hose
8. Hose
9. Spacer
10. Gasket
11. Bolt
12. Combustion Chamber Drain Valve
13. Hose

Figure 5-46. Flow divider, dump valve (T53-L-13) and combustion chamber drain valve - all engines

j. Remove screws (7) securing gaskets (6) to manifold. Remove gaskets.

k. Remove opposite section of fuel manifold in the same manner.

5-241. CLEANING - FLOW DIVIDER HOSES - T53-L-13. Clean hose assemblies with trichloroethylene (item 300, table 1-2).

5-242. INSPECTION - MAIN FUEL MANIFOLD, FLOW DIVIDER AND ASSOCIATED PARTS - T53-L-13.

a. Inspect hose assemblies for fraying, chafing, cuts, and stripped or damaged threads.

Note

Inspect fuel manifold and flow divider while they are installed.

b. Inspect fuel manifold for leakage, cracks or damage.

c. Inspect flow divider for leakage and damage.

5-243. REPAIR OR REPLACEMENT - MAIN FUEL MANIFOLD, FLOW DIVIDER AND ASSOCIATED PARTS - T53-L-13.

a. Repair minor fraying and chafing in localized areas and minor cuts in braided area of hose assemblies by cleaning surface with trichloroethylene (item 300, table 1-2), drying thoroughly, and wrapping damaged area with tape (item 400, table 1-2).

b. Replace hose assembly if cuts are other than minor or if leakage occurs.

c. Replace fuel manifold if leakage, cracks or damage occur.

d. Replace flow divider if leakage or damage occurs.

5-244. INSTALLATION - MAIN FUEL MANIFOLD, FLOW DIVIDER AND ASSOCIATED PARTS - T53-L-13.

Note

A complete replacement fuel manifold assembly together with all necessary gaskets, seals, and filters is provided in field fuel manifold kit (1-200-070-80).

a. Position gaskets (6, figure 5-47) on fuel manifold at 2-, 4-, and 10-o'clock positions and secure with screws (7). Tighten screws as required.

b. Position packing (1) on each atomizer. Install caps (2 and 3) over unused ports on manifold.

Note

Manifold assemblies can be used interchangeably on either right or left side of engine.

c. Using alignment fixture (LTCT4174), align atomizer ports on combustion liner and ports on combustion chamber housing. Remove fixture.

d. Align primary ports of manifold (5) with primary ports of flow divider and dump valve on rear face of combustion chamber housing. Secure manifold assembly to housing with bolts (4). Tighten bolts as required and lockwire.

e. Position support assemblies (14 and 21) on support cone and install pins (15 and 18). Secure support assemblies to support cone with retainers (10, 11, 16 and 20) and bolts (12, 13, 17 and 19). Tighten and lock-wire bolts.

f. Install opposite manifold assembly in the same manner.

g. Position spacer (9, figure 5-46) and flow divider and dump valve assembly (6) against exhaust diffuser support cone.

h. Secure flow divider with screws (3, 4 and 5). Tighten and lock-wire screws.

i. Connect hose assemblies (1, 2, 7 and 8) between flow divider and fuel manifold, and drain hose (13) between flow divider and combustion chamber drain valve. Tighten connectors with 70 to 120 inch-pounds torque.

j. Connect hose (10, figure 5-45) from fuel control to flow divider inlet. Tighten hose connector with 100 to 250 inch-pounds torque.

k. Connect ignition leads to igniter nozzles.

l. Install starting fuel manifold. (Refer to paragraph 5-237.)

5-245. AUXILIARY FUEL PROVISIONS.

5-246. Permanently installed provisions for use of auxiliary fuel tanks include drain, vent, and fuel transfer connections and a stowed transfer pump

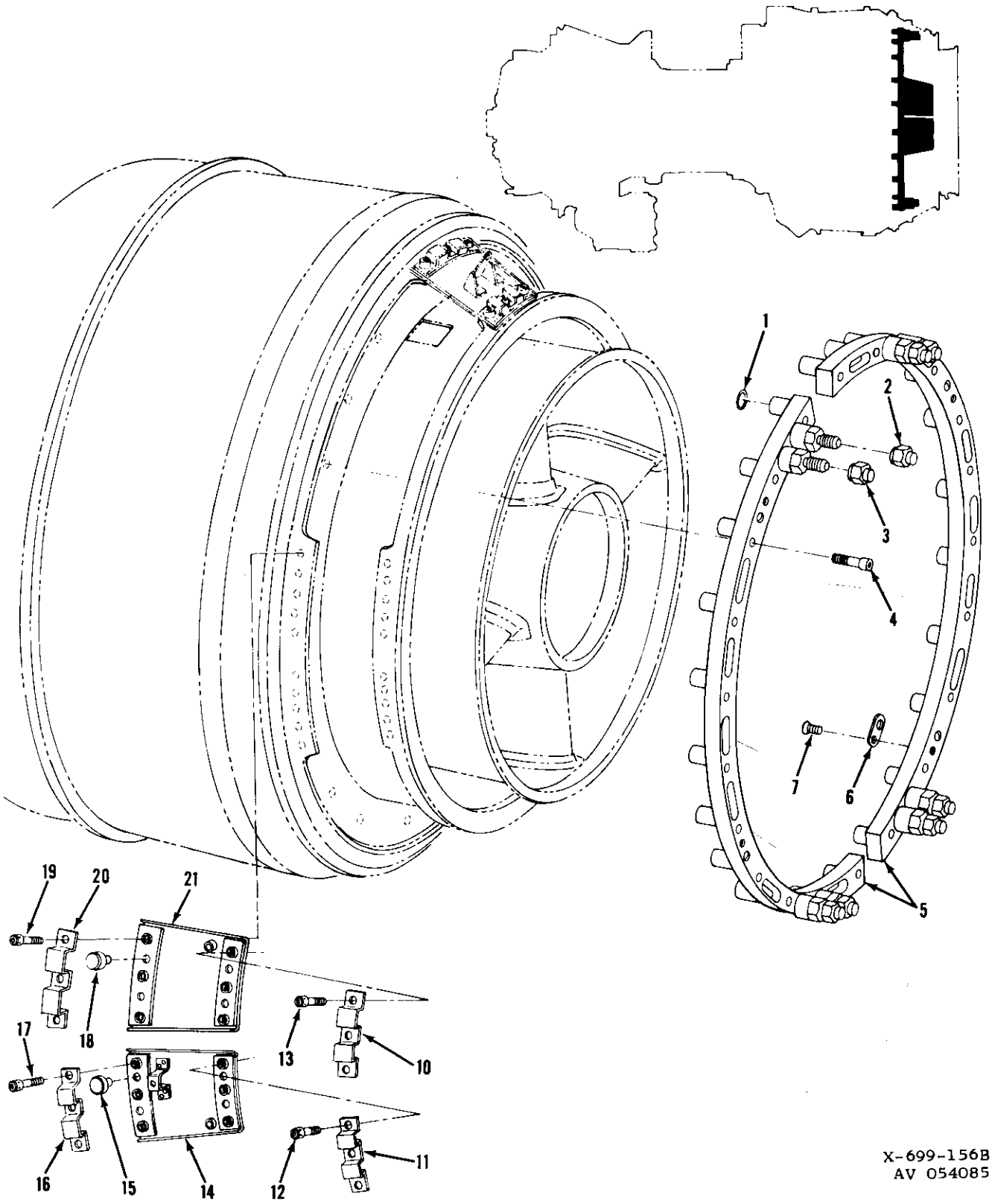

Figure 5-47. Main fuel manifold assembly and attaching parts - T53-L-13 engine (Sheet 1 of 2)

1. Seal
2. Cap
3. Cap
4. Bolt
5. Fuel Manifold Assembly
6. Retainer
7. Retainer
8. Bolt
9. Bolt
10. Support Assembly
11. Pin
12. Retainer
13. Bolt
14. Pin
15. Bolt
16. Retainer
17. Support Assembly

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Figure 5-47. Main fuel manifold assembly and attaching parts - T53-L-13 engine (Sheet 2 of 2)

relay circuit, with two float switches in center aft fuel cell, to limit fuel level during transfer. Complete instructions for auxiliary fuel tank installation will be found under Utility Systems. (Refer to Chapter 11.)

SECTION VI OIL SYSTEM

5-247. OIL SYSTEM.

5-248. DESCRIPTION - ENGINE OIL SYSTEM.

5-249. Oil is supplied from a tank mounted on forward firewall at right side of engine compartment, the oil flowing through a quick-disconnect hose to inlet of engine-driven dual-element pump on front of accessory gear box. Pump, which is equipped with a pressure relief valve and a thermobulb for oil-in temperature gage, delivers oil through internal passages to a filter on left side of accessory gear box, for distribution through engine lubrication system. Oil pressure gage transmitter and pressure switch, for ENG OIL PRESS LOW caution panel light, are mounted at top of engine inlet housing and connected by external hose to pressure tap on filter. (See figure 5-48.) Special tools required to perform the following maintenance functions on the oil system are listed below in table 5-3.

TABLE 5-3. SPECIAL TOOLS

PART NUMBER	NOMENCLATURE
SPT 107	Cleaning fixture, oil filter
LTCT215	Socket wrench

5-250. ENGINE OIL DISTRIBUTION.

5-251. Filtered oil is distributed through internal passages and transfer tubes to lubricate gears and bearings at forward end of engine, and through external hoses and oil manifold to strainers lubricating main bearings at aft end of engine. (See figure 5-49 and 5-50.) Main bearings areas are provided with carbon seals and paddle-pump slingers to assist oil scavenge.

5-252. TORQUEMETER PRESSURE SYSTEM.

5-253. The torquemeter, incorporated in reduction gearing to provide continuous gage readings of engine output torque, requires oil at higher than normal pressure. A boost pump, on overspeed governor and tachometer drive gear box, supplies oil to torquemeter through internal passages at 150 (±10) psig, regulated by an adjustable bypass valve. A second element of boost pump scavenges oil from governor drive assembly. Torque gage transmitter, mounted at top of inlet housing, has two hose connections: From pressure port of transmitter to torquemeter tap above right mount pad of inlet housing; from vent port to a tap on cover of an unused drive pad at right front on accessory drive gear box.

5-254. OIL SCAVENGE AND RETURN.

5-255. Scavenge oil drains into accessory drive gear box from inlet housing and through external lines from aft end of engine, passing through a screen and transfer tube into gear box. Scavenge element of engine-drive pump circulates this oil through external lines to a thermal bypass valve and oil cooler, in fuselage compartments below deck, and returns it to supply tank. Separate drain lines, with manual valves, are provided at cooler outlet and at supply tank. A breather hose from right side of accessory drive gear box is vented into tank through a quick-disconnect coupling. A chip-detector type drain plug is located at lower right on accessory gear box.

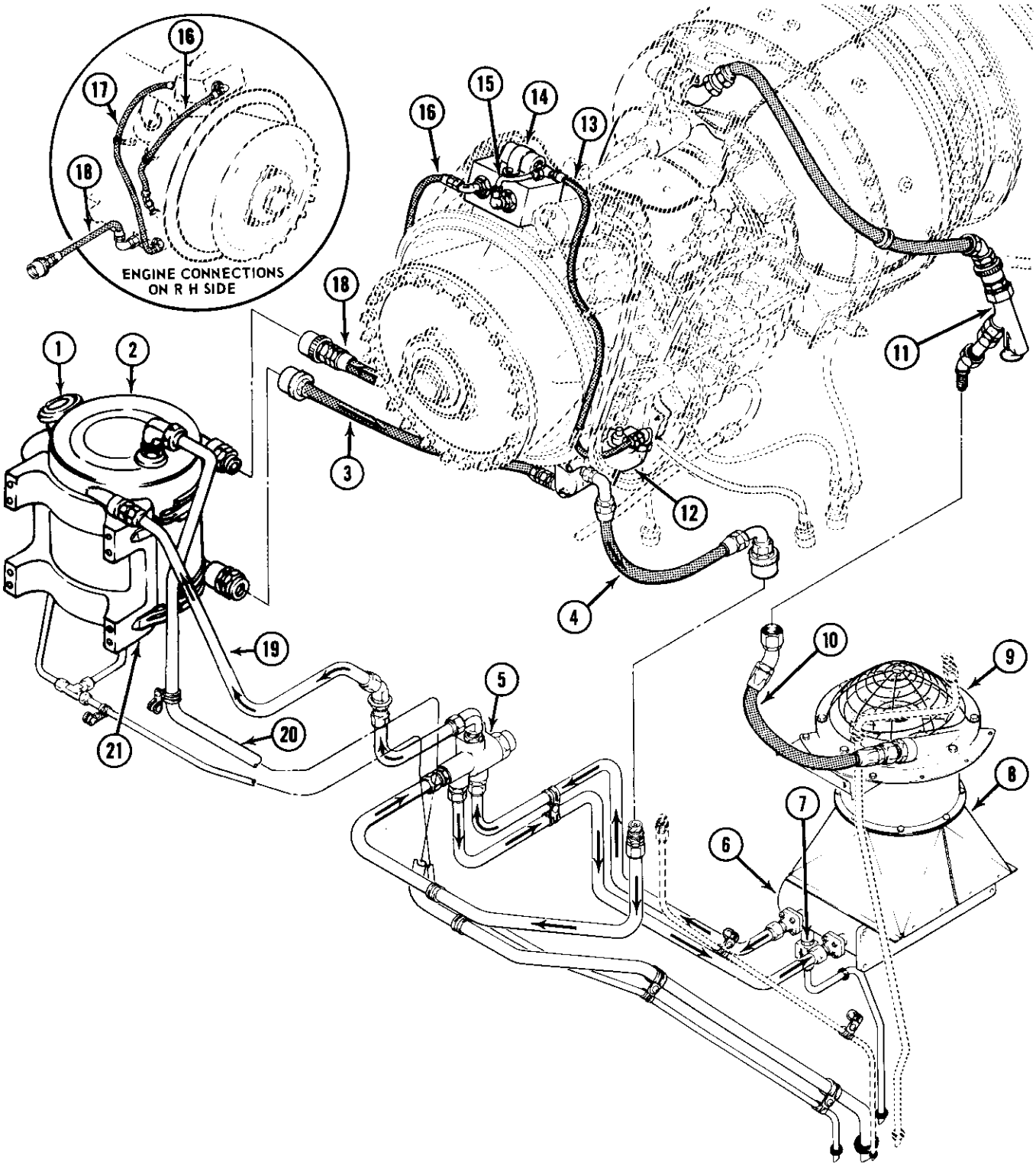

Figure 5-48. Oil supply and external lines diagram (Sheet 1 of 2)

1. Filler Cap
2. Oil Tank
3. Pump Inlet Hose
4. Scavenge Pump Outlet Hose
5. Thermal Bypass Valve
6. Oil Cooler
7. Cooler Drain Valve
8. Duct
9. Turbo Blower
10. Blower Air Inlet Hose
11. Engine Bleed Air Valve
12. Engine Oil Filter
13. Pressure Tap Hose
14. Oil Pressure Switch
15. Oil Pressure Transmitter Tube
16. Torque Transmitter Pressure Hose
17. Torque Transmitter Vent Hose
18. Engine Breather Hose
19. Tank Return Oil Line
20. Tank Vent Line
21. Tank Drain Valve

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Figure 5-48. Oil supply and external lines diagram (Sheet 2 of 2)

5-256. GENERAL MAINTENANCE OF OIL SYSTEM.

a. Replace any unserviceable external lines, hoses, fittings, units, gaskets, and seals which are accessible without unauthorized disassembly.

b. Before removing any tube or hose, be sure it is properly identified and its route understood for replacement in same manner. When possible, leave supporting brackets in place to simplify reinstallation.

c. Cap or cover openings immediately when disconnected, and take all possible precautions to prevent contamination or dirt from entering oil system.

d. Follow procedures below for replacement and adjustment of units in oil system. (See wiring data, Chapter 13 for electrical and instrument circuits.)

e. Follow schedules in Inspection Requirements for inspection and cleaning of filter and strainers. (Refer to Chapter 3.)

5-257. CHANGING FROM MIL-L-7808 to MIL-L-23699 LUBRICATING OIL.

Warning

Prolonged contact with lubricating oil (item 2 or 3, table 1-2) may cause a skin rash. Those areas of skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be adequately ventilated to keep mist and fumes to a minimum.

Caution

Lubricating oil (item 2 or 3, table 1-2) may soften paint upon contact. If lubricating oil is spilled on painted surfaces, these surfaces should be thoroughly washed.

a. Drain MIL-L-7808 lubricating oil from the engine oil tank, oil cooler, and accessory drive gearbox. (Refer to paragraphs 5-72, 5-262 and 5-270.)

b. Inspect and clean all engine oil strainers and filter. (Refer to paragraphs 5-284 through 5-290 and 5-305 through 5-311.)

c. Fill the engine oil system with MIL-L-23699 lubricating oil and operate engine for 30 minutes to 1 hour to heat oil to operating temperature which will promote dislodging residual MIL-L-7808 carbon and lacquer deposits.

d. Shut down engine and inspect, clean, and reinstall engine oil filter and strainers.

(1) If heavy contamination of filter and strainers is present, proceed with steps e. and subsequent below.

(2) If little or no contamination of filter and strainers is present, release helicopter for service use and comply with steps g., h., and i. below.

e. Drain all oil from engine oil system and dispose of oil.

f. Fill engine oil system with new MIL-L-23699 oil and release helicopter for service use.

g. After 5 hours of operation, inspect and clean all engine oil strainers and filter.

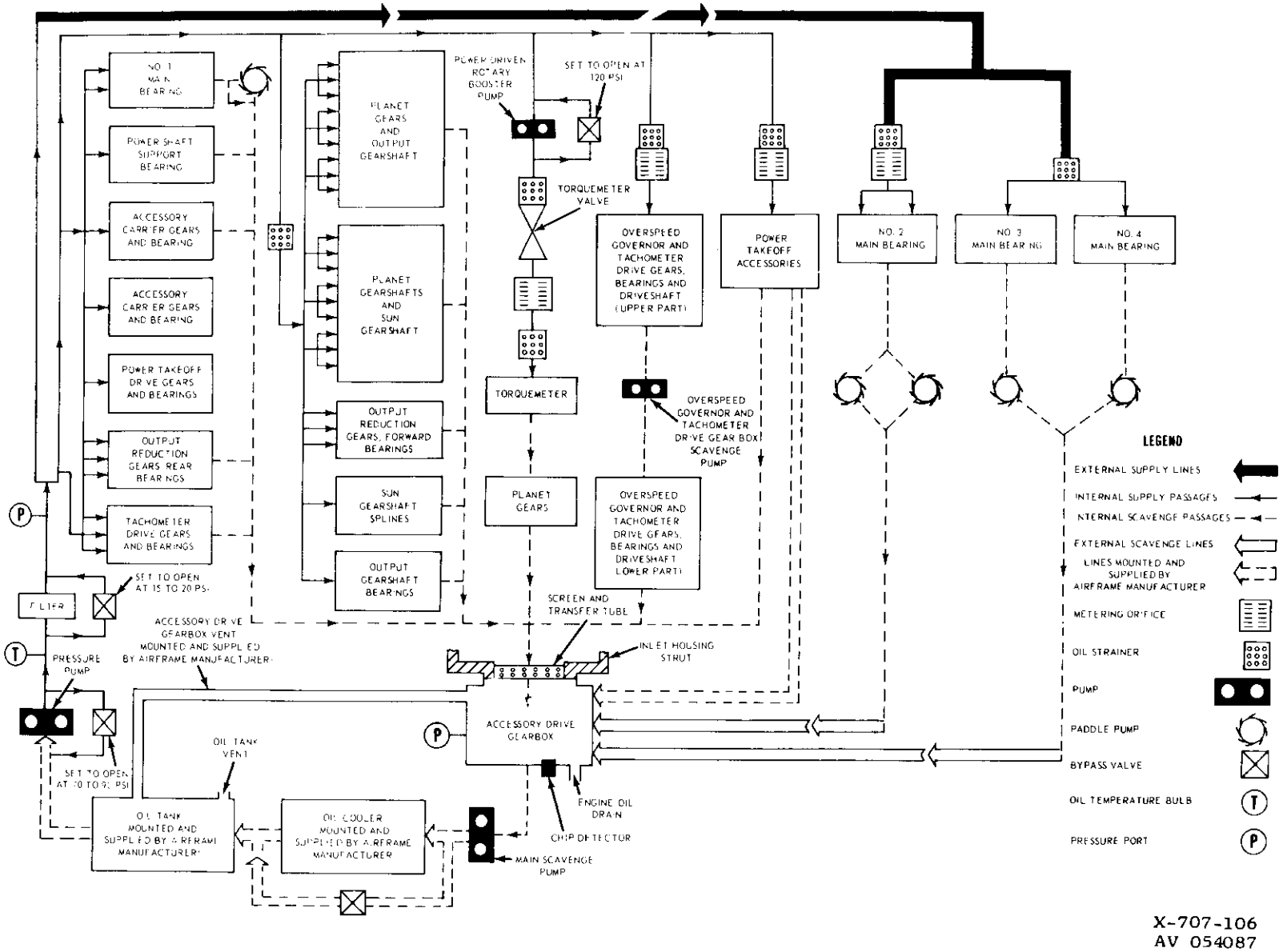


Figure 5-49. Engine internal lubrication - T53-L-9/-9A/-11 series

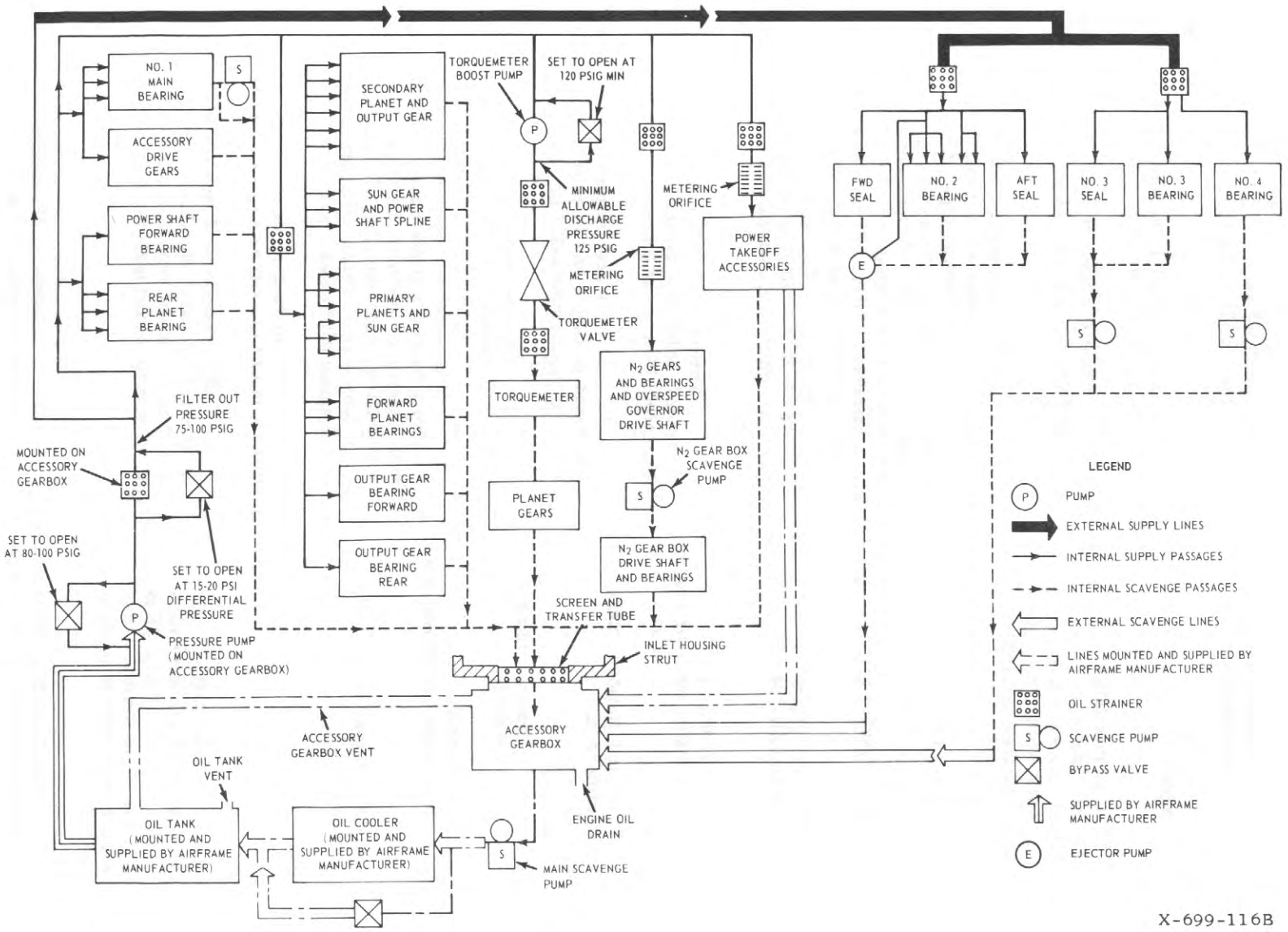


Figure 5-50. Engine internal lubrication - T53-L-13

h. After 15 hours of operation since last oil change, inspect and clean all engine oil strainers and filter.

i. Revert to normal scheduled interval of inspection for engine oil strainers and filter.

Note

It is not advisable to mix MIL-L-23699 and MIL-L-7808 oil except in cases of emergency. If this becomes necessary, it is required that the system be drained within 6 hours of operation according to steps a. through f. above.

5-258. CHANGING FROM MIL-L-23699 to MIL-L-7808 LUBRICATING OIL.

a. Drain MIL-L-23699 lubricating oil from the engine oil system.

b. Inspect and clean all engine oil strainers and filter. (Refer to paragraphs 5-284 through 5-290 and 5-305 through 5-311.)

c. Fill the engine oil system with MIL-L-7808 lubricating oil and operate engine until oil reaches operating temperature.

d. Shut down engine and inspect, clean, and reinstall engine oil strainers and filter. Release helicopter for service use.

e. After 5 hours of operation, inspect and clean all engine oil strainers and filter.

f. After 15 hours of operation since last oil change, inspect and clean engine oil strainers and filter.

g. Revert to normal interval of inspection for engine oil strainers and filter.

Note

It is not advisable to mix MIL-L-7808 and MIL-L-23699 except in cases of emergency. If this becomes necessary, it is required that the system be drained within 6 hours of operating according to steps a. through d. above.

5-259. LUBRICATION SYSTEM CONTAMINATION TROUBLE SHOOTING PROCEDURE. If an excessive amount of chips are found on the engine oil filter element and/or chip detector, but the output reduction carrier and gear assembly has freedom of movement and emits no unusual noises, proceed as outlined in steps a. through j. If contamination is caused by carbon particles, refer to following step k.

a. Remove chips from oil filter element and retain for analysis. Clean filter element and reinstall.

b. Drain all oil from accessory drive gearbox, oil tank and oil cooler.

c. Remove chips, if any, from chip detector and retain for analysis. Clean chip detector and reinstall.

d. Remove and inspect strainer for number 2 bearing and strainer for numbers 3 and 4 bearings for presence of metal chips. If chips are present, request assistance from Direct Support Maintenance; remove and inspect three reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil throttle strainer. Forward engine to overhaul if metal chips have clogged more than one third of the flow area of any one of the strainers. If the amount of metal chips is not excessive, clean and reinstall strainers and proceed to step e.

e. Presence of chips in previously mentioned strainers indicates bypass of the oil filter has occurred. Proceed as follows:

(1) Remove and disassemble oil filter. Flush parts and passages and inspect for wear or damage. (Refer to paragraphs 5-307 through 5-313.)

(2) Replace parts as required, reassemble and install oil filter.

f. Disconnect oil scavenge hose assembly for number 2 bearing and for numbers 3 and 4 bearings and determine whether residual oil in the hose assemblies is contaminated with chips. If so, request assistance from Direct Support Maintenance for replacement of affected bearings.

g. Fill oil tank to capacity with new oil (item 2 or 3, table 1-2). (Refer to paragraph 1-72.)

h. Start engine and run at flight idle until temperatures have stabilized. Check instruments for proper engine operation. Increase speed to 70 to 80 percent nI and maintain for 5 minutes.

Caution

Any oil pressure fluctuation in excess of plus or minus 5 psi, or any rapid rise in oil temperature at any preset power setting, is cause for immediate engine shut-down.

i. Shut down engine and again inspect oil filter elements, chip detector and strainers.

j. If quantity of chips remains the same after second engine run, do not clean filter, strainers or chip detector. Request assistance from Direct Support Maintenance and forward engine, oil tank and oil cooler to next higher maintenance echelon for additional inspection. Flush all airframe mounted engine oil lines.

Note

Chips in oil filter may come from oil tank; chips on chip detector come from engine.

k. If amount of carbon particles found on filter element is in excess of that shown in figure 5-51, proceed as follows:

(1) Drain all oil from accessory drive gearbox, oil tank and oil cooler.

(2) Remove and inspect oil strainers for number 2 bearing and for numbers 3 and 4 bearings. If carbon particles are present the oil filter has bypassed. Request assistance from Direct Support Maintenance and remove, clean, and reinstall reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil throttle strainer. Clean and reinstall number 2 and numbers 3 and 4 bearing strainers.

(3) Clean and reinstall engine oil filter assembly in accordance with step e. above.

(4) Replenish engine oil system.

(5) Start engine and run at 70 to 80 percent nI RPM for 15 minutes.

(6) Shut down engine. Remove, inspect, clean and reinstall oil filters and strainers.

(7) If contamination is excessive, repeat procedure until filter is clean after run.

5-260. ENGINE OIL TANK.

5-261. Engine oil supply tank is a welded metal container equipped with filler neck and cap, two oil level sight plugs, a scupper with drain, and fittings for connection of outlet, return, vent, drain, and engine breather lines. Filler neck and vent have internal screens, and oil return port has an internal baffle. Tank is secured by straps in a padded support on right side of forward firewall.

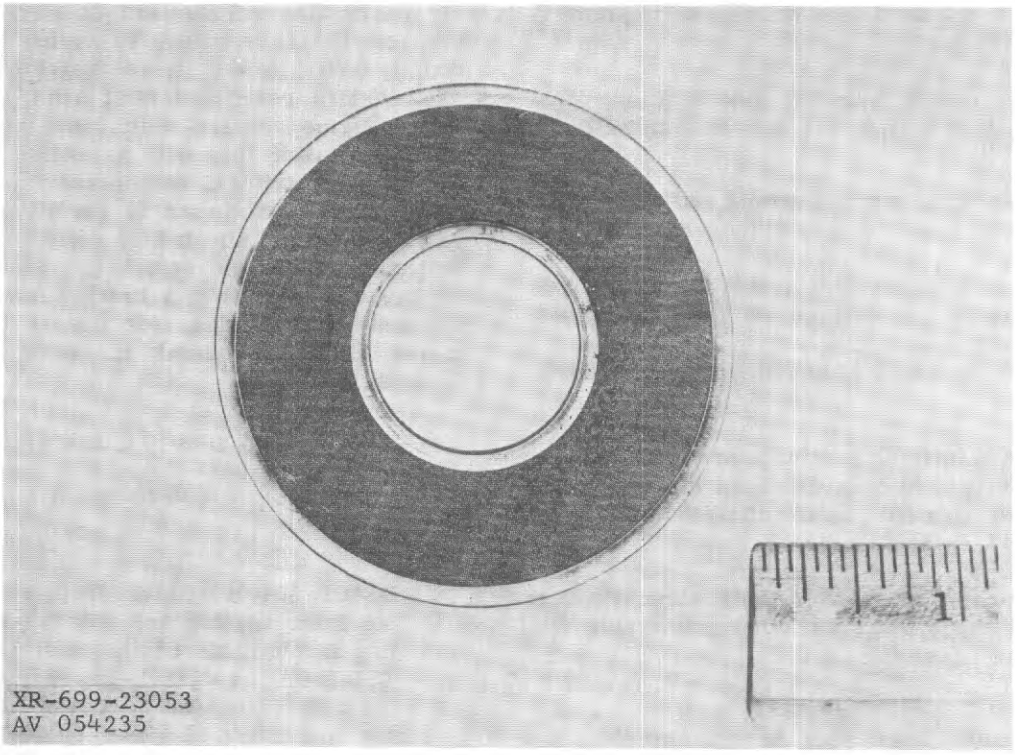


Figure 5-51. Oil filter element contamination

5-262. REMOVAL - ENGINE OIL TANK.

a. Open right engine cowling. Drain tank by opening valve (below tank) in drain line which discharges at left aft side of fuselage.

b. Disconnect all lines from tank. Cap or cover openings.

c. Cut lockwire, loosen tank strap turnbuckles, and remove tank from support.

5-263. CLEANING - ENGINE OIL TANK. Flush out tank with cleaning solvent, (item 302, table 1-2), removing cap and fittings as necessary. Be sure screens in filler neck and vent port are clean and undamaged. Drain thoroughly. Filtered compressed air may be used for drying.

5-264. INSPECTION - ENGINE OIL TANK.

a. Inspect tank for the following:

(1) Punctures or leaks.

(2) Torn or punctured internal screens.

(3) Damaged threads in fittings.

(4) Damage which affects capacity or function.

(5) Inspect for loose, missing or improperly installed hardware.

b. Inspect sight plugs for discoloration, damage and proper safetying. Inspect removable fittings for damage.

c. Inspect tank support straps and strap pads for damage.

d. Inspect tank support (removed from firewall) for cracks or damage at mounting points.

5-265. REPAIR OR REPLACEMENT - ENGINE OIL TANK.

a. Replace tank for punctures or leaks, torn or punctured internal screens, damaged threads in fittings, or any damage which affects capacity or function.

b. Replace O-rings at reinstallation. Replace any damaged sight plugs or other removable fittings.

Note

Tighten top sight plug to 150 to 175 inch-pounds torque. Tighten bottom sight gage plug to 100 to 125 inch-pounds torque.

c. Replace unserviceable pads on tank straps and support. Replace support assembly if straps are unserviceable.

5-266. INSTALLATION - ENGINE OIL TANK.

a. Check that pads are in place on tank support and straps. Open straps to place tank in support, with filler neck to right. Connect straps around tank, with turnbuckles loose enough to permit alignment.

b. Install fittings and connect tubes to tank ports.

c. Tighten tank strap turnbuckles to a torque of 10 to 14 inch-pounds and install lockwire.

5-267. ENGINE OIL COOLER INSTALLATION.

5-268. A cooler for engine oil is mounted in bottom of fuselage behind engine, and is connected into oil return line through a thermal bypass valve. Cooling air flow is provided by a turbo blower driven by bleed air taken from engine centrifugal compressor housing (on T53-L-9 engine) or from engine diffuser housing (on T53-L-9A, -11 series, and -13 engines). Another cooler, for transmission oil, is mounted side by side with engine oil cooler, but there is no functional connection between these two oil systems. Bleed air source on T53-L-9A, T53-L-11 series, and -13 engine provides compressed air in greater volume and at higher temperature than on T53-L-9 engine. To avoid overspeed of oil cooler turbo blower, it is therefore necessary to use a more restricted inlet fitting on blower with those engine models which take air from engine diffuser housing than with an engine which supplies air from centrifugal compressor housing. A similar situation exists as to the fitting on selector valve of bleed air heater-defroster system. On helicopters through serial no. 65-9604, alternate fittings are stowed in a bracket on engine forward firewall at left side, for use in event of engine model change. A decal at the bracket reads as follows:

Warning

Install 204-060-494-1 fittings in turbo fan inlet housing and 205-060-494-1 fitting in bleed air heater valve outlet with T53-L-9A or T53-L-11 engine. Install 919-23D fitting in turbo fan inlet housing and 205-060-409-1 fitting in bleed air heater valve outlet with T53-L-9 engine installation. Stow removed fittings in clip provided.

5-269. REMOVAL - TURBO BLOWER AND DUCT.

a. Open access door at right side of fuselage below engine tailpipe.

b. Remove blower screen.

c. Disconnect air hose from blower inlet fittings.

d. Remove three bolts, with nuts and washers, to detach blower from support bracket on fuselage bulkhead.

e. Remove eight bolts and washers to detach blower from duct. Remove blower assembly.

f. Remove eight bolts and washers which secure upper flanges of cooler and mount to sides of duct. Remove duct.

5-270. REMOVAL - ENGINE OIL COOLER.

a. Drain cooler and connected oil lines by opening valve below cooler outlet.

b. Disconnect inlet, outlet, and drain tubes from cooler fittings and valve.

c. Remove four bolts and washers at lower side flange to detach engine cooler from support. Remove bolts securing two coolers together. Remove oil cooler.

5-271. REMOVAL - ENGINE OIL THERMAL VALVE.

a. Be sure lower part of oil system has been drained through valve at engine oil cooler outlet.

b. Enter compartment under engine deck through access opening in bottom of fuselage.

c. Disconnect four oil tubes from fittings on valve body, located on beam at right side of compartment.

d. Remove two screws and washers to detach valve assembly from structural beam.

5-272. INSPECTION - ENGINE OIL COOLER.

a. Inspect oil cooler for unserviceable or damaged fittings, gaskets, O-rings, tubes, support clamps and bracket.

b. Inspect blower, screen, thermal valve for damage or malfunction.

c. Inspect oil cooler for cleanliness of air passages.

5-273. REPAIR OR REPLACEMENT - ENGINE OIL COOLER INSTALLATION.

a. Replace unserviceable fittings, O-ring packings, tubes, and support clamps or bracket as required.

b. Replace blower, screen, duct, oil cooler, or thermal valve, each as an assembly, for malfunction or excessive damage. In event of engine internal failure, replace cooler and flush out all connecting lines and fittings before reinstallation.

c. Inspect and clean air passages of oil cooler in accordance with inspection requirements, or as frequently as operating conditions warrant.

5-274. INSTALLATION - ENGINE OIL THERMAL VALVE.

a. Check for proper assembly.

(1) Valve installed or lock-wired in largest port of body.

(2) Reducers with O-rings in two ports on same side of body, and inlet at opposite end from valve.

(3) Elbow with O-ring and nut in remaining side port of body, with open end of elbow facing away from valve.

b. Enter compartment below engine deck through access hole in lower skin of fuselage.

c. Hold valve assembly with valve end aft and two reducer fittings downward. Align two mounting holes of valve body with threaded inserts on right beam, approximately ten inches below deck and midway between lateral bulkheads. Install two screws with washers.

d. Connect four oil tubes to fittings on valve body:

(1) Oil-in from engine scavenge pump to fitting on front end.

(2) Valve-to-cooler tube on forward lower fitting.

(3) Cooler-to-valve tube on aft lower fitting.

(4) Valve-to-tank tube on upper elbow fitting.

5-275. INSTALLATION - ENGINE OIL COOLER.

a. Assemble gasket and fitting on cooler inlet, secured by nuts and washers on four studs. Assemble

fitting on cooler outlet in same manner. Install drain valve, with O-ring and nut, in port below cooler outlet.

b. Position cooler assembly, with inlet and outlet forward, in support at bottom of fuselage compartment below engine tailpipe. Install bolts, with thin aluminum alloy washers under heads, through slotted holes in lower side flanges of cooler into plate-nuts of support.

c. Install bolts through mating flanges of engine and transmission oil coolers.

d. Connect oil tubes to cooler inlet and outlet fittings, and connect drain tube to valve.

e. Position duct between upper flanges of cooler and mount. Install eight bolts, with thin aluminum alloy washers under heads, through mounting flanges into plate-nuts of duct.

5-276. INSTALLATION - TURBO BLOWER.

a. Install reducer, with O-ring in blower inlet. (Refer to paragraph 5-268.)

b. Check that support bracket is secured with three screws and washers on fuselage bulkhead above oil cooler location.

c. Position blower assembly, with inlet pointing forward at left side, to align mounting holes with duct flange and support bracket.

d. Attach blower to duct with eight bolts and thin aluminum alloy washers.

e. Attach blower to support bracket with three bolts, using thin aluminum alloy washer under each bolt head and nut.

f. Connect hose from bleed air valve line to blower inlet.

g. Install screen on blower flange with bolts, washers, grommets, and nuts.

5-277. CHIP DETECTOR.

5-278. A chip detector is mounted on the bottom side of the accessory drive gear box. On serial no. 66-746 and subsequent this unit is wired into the caution panel.

5-279. REMOVAL - CHIP DETECTOR.

a. If installed, disconnect electrical wiring from chip detector.

b. Unscrew and remove chip detector and packing. Discard packing.

5-280. INSPECTION - CHIP DETECTOR. Inspect threads for damage and for contamination in accordance with Inspection Requirements. (Refer to Chapter 3.)

Note

If contamination is evident upon removal of chip detector, record type and amount on the engine historical record. Determine source of contamination.

5-281. CLEANING - CHIP DETECTOR. Clean with dry-cleaning solvent, (item 302, table 1-2).

5-282. REPAIR OR REPLACEMENT - CHIP DETECTOR. Replace chip detector if damaged. Torque to 90 to 100 inch-pounds and lock-wire.

5-283. INSTALLATION - CHIP DETECTOR.

a. Place packing on chip detector. Install chip detector in accessory drive gear box. Torque 90 to 100 inch-pounds and lock-wire.

b. Connect electrical wiring, if so equipped.

5-284. ENGINE OIL STRAINERS.

5-285. Two oil strainers in the engine assembly can be inspected and cleaned in Organizational Maintenance. The rear bearing housing oil strainer is located in a fitting on lower right side of the engine diffuser housing, at the pressure oil inlet to No. 2 main bearing. The power turbine oil strainer is located in a fitting at top left on the engine exhaust section, at the pressure oil inlet to No. 3 and 4 main bearings.

5-286. REMOVAL - ENGINE OIL STRAINERS.

a. Cut lockwire from hexagon head of rear (No. 2) bearing housing oil strainer (19, figure 5-52; or similar location on T53-L-13). Unscrew and remove strainer and gasket. Remove packing from strainer. Cover opening.

b. Disconnect pressure oil hose (22, figure 5-52, or 1, figure 5-53) from power turbine oil strainer housing.

c. Unscrew and remove housing and strainer. Cover opening. Remove packing and strainer from housing (on T53-L-13 only, strainer must be unscrewed from housing adapter).

5-287. CLEANING - ENGINE OIL STRAINERS. Clean strainers and attaching parts with a fine wire brush. Rinse with dry cleaning solvent (item 302, table 1-2.)

5-288. INSPECTION - ENGINE OIL STRAINERS. Inspect strainers for clogging or damage. Inspect housing adapter for stripped or damaged threads.

5-289. REPAIR OR REPLACEMENT - ENGINE OIL STRAINERS. Replace strainers if clogging cannot be removed, or if damaged. Replace housing adapter if damaged.

5-290. INSTALLATION - ENGINE OIL STRAINERS.

a. Uncover mounting port for rear (No. 2) bearing housing oil strainer (19, figure 5-52). Place gasket and packing on strainer. Screw strainer into diffuser housing, tighten with 80 to 100 inch-pounds torque and lock-wire.

b. Uncover mounting port for power turbine (No. 3 and 4 bearing) oil strainer. Place packing on strainer housing. Insert strainer into adapter (on T53-L-13 only, screw strainer into housing adapter).

c. Install strainer housing, tighten with 80 to 100 inch-pounds torque, and lock-wire (on T53-L-9/-9A/-11 series engines, hold lower adapter with wrench while tightening strainer housing).

d. Connect pressure oil line (22, figure 5-52, or 1, figure 5-53) to oil strainer housing. Tighten connector with 50 to 75 inch-pounds torque.

5-291. ENGINE OIL PUMP.

5-292. The gear-driven oil pump, mounted on front of accessory drive gear box, has pressure and scavenge elements on same drive shaft. External features on pump are inlet and outlet hose connections, pressure relief valve adjustment screw and lock-nut, and oil temperature bulb for oil temperature indicator. (See figures 5-52 and 5-53.)

5-293. REMOVAL - ENGINE OIL PUMP.

a. Disconnect oil temperature bulb electrical connector from oil temperature bulb.

b. Disconnect hoses from pump inlet reducer and outlet elbow fitting. Remove fittings and gaskets when necessary.

c. Support pump in position against mounting pad. Remove lockwire, mounting bolts (22 and 23, figure 5-23) and washers (21 and 24) that secure pump to gearbox.

d. Carefully pull pump directly from mounting pad. Use care not to damage drive shaft (19).

e. Remove drive shaft and packings (16, 17, and 18.) Cover openings to prevent contamination.

Note

If installation of a new pump is necessary remove temperature bulb and packing from oil pump housing.

5-294. CLEANING - ENGINE OIL PUMP. Clean pump assembly and drive shaft with dry cleaning solvent (item 302, table 1-2).

5-295. INSPECTION - ENGINE OIL PUMP.

a. Inspect pump for damaged threads and cracked flanges.

b. Inspect drive shaft for worn or chipped splines.

5-296. INSTALLATION - ENGINE OIL PUMP.

a. Carefully install drive shaft (19, figure 5-23) into gearbox. Make sure that external splines on drive shaft mate with internal splines in gearbox.

b. Place new packings (16, 17, and 18) over correct ports on mounting face of gearbox.

c. Carefully position pump on mounting face of gearbox, making certain that shaft of pump mates into drive shaft (19) internal splines.

d. Secure pump to gearbox with washers (21 and 24) and bolts (22 and 23). Lock-wire bolts.

e. Install reducer fitting, with new gasket, in pump inlet port. Connect hose.

f. Install elbow fitting and new gasket in pump outlet port. Align elbow to point straight down. Tighten fitting with 300 to 325 inch-pounds torque and secure with lock-nut. Connect hose assembly. Torque hose assembly nut with 750 to 850 inch-pounds torque.

g. Install oil temperature bulb, with new gasket, in port on pump housing. Connect electrical harness to temperature bulb. Secure with lockwire.

5-297. ADJUSTMENT - ENGINE OIL PUMP PRESSURE.

a. Before making any oil pump pressure adjustment, thoroughly check other elements of oil system, including pressure indication system.

(1) Oil pressure should not change during normal engine service.

(2) Check oil filter for cleanliness, since dirty filter disc can cause low oil pressure.

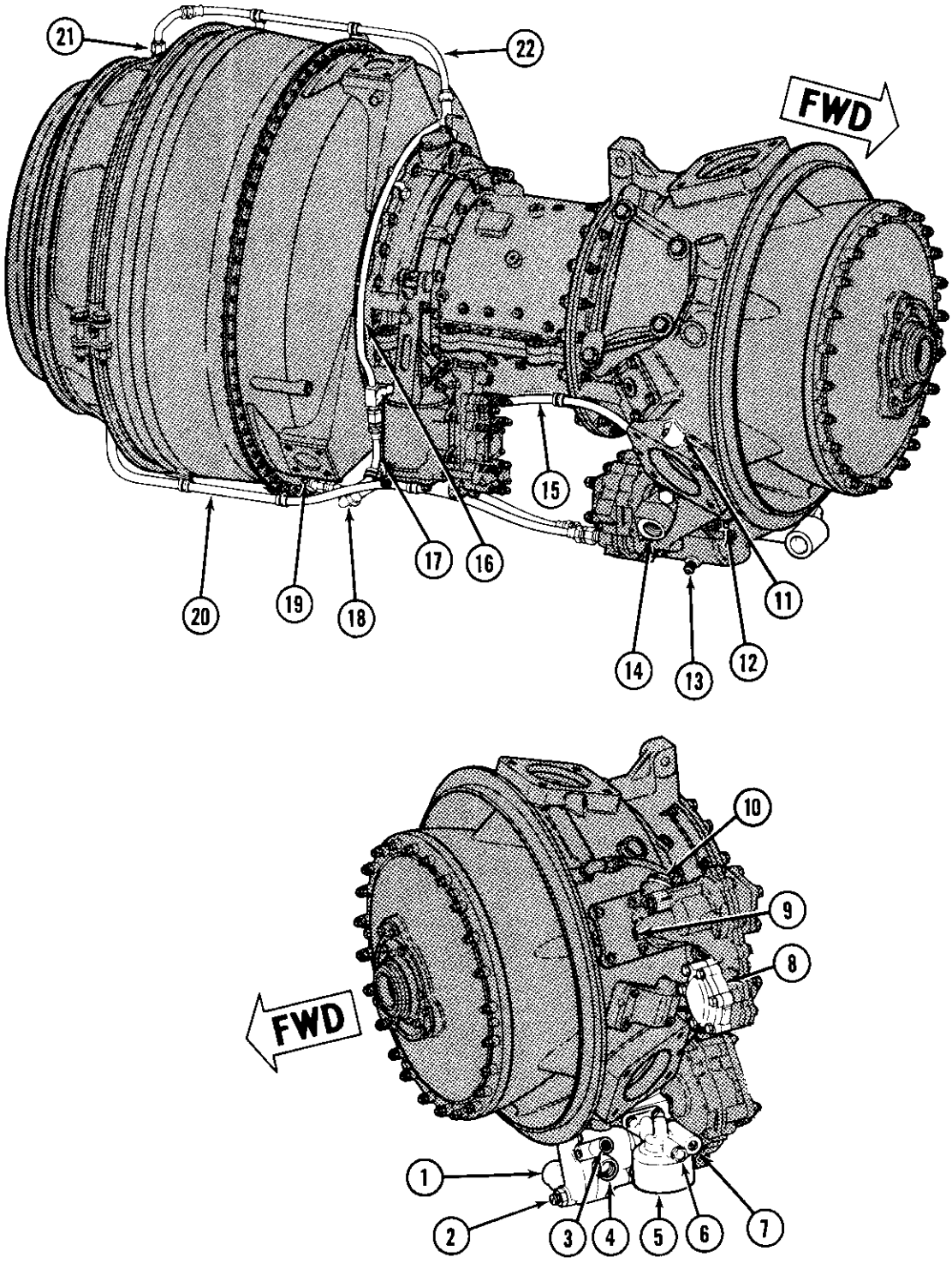


Figure 5-52. Oil system components on engine - typical T53-L-9/-9A/-11 series (Sheet 1 of 2)

1. Pressure Pump Inlet
2. Pressure Relief Valve Adjustment
3. Thermobulb Location
4. Scavenge Pump Outlet
5. Main Filter
6. Oil Pressure Tap
7. Filter By-Pass Valve
8. Torquemeter Boost Pump
9. Test Gage Connection
10. Boost Pump Pressure Adjustment
11. Torquemeter Pressure Tap
12. Accessory Gear Box Pressure Tap
13. Magnetic Chip Detector Plug
14. Accessory Gear Box Breather Port
15. Pressure Oil Line
16. Oil Manifold
17. Oil Line to No. 2 Bearing
18. Scavenge Line - No. 2 Bearing
19. Inlet Strainer - No. 2 Bearing
20. Scavenge Line - No. 3 and 4 Bearings
21. Inlet Strainer - No. 3 and 4 Bearings
22. Pressure Oil Line

204060-40A

Figure 5-52. Oil system components on engine - typical T53-L-9/-9A/-11 series (Sheet 2 of 2)

(3) Be sure operating checks of oil pressure are made according to normal procedures of engine operation, with oil temperature stabilized in normal range. (Refer to TM 55-1520-210-10.)

Caution

Do not make pressure adjustments during engine operation.

b. Adjust engine oil pressure, when necessary, at adjusting screw on front of oil pump housing. (See figure 5-54.)

(1) Loosen adjusting screw locknut.

(2) Turn adjusting screw clockwise to increase oil pressure or counterclockwise to reduce pressure. One full turn will change oil pressure approximately 8 psig. Tighten locknut.

(3) Torque adjusting screw locknut to 95 to 110 inch-pounds and lock-wire.

(4) Recheck indicated oil pressure during engine operation.

5-298. TORQUEMETER ROTARY PUMP.

5-299. A dual element pump is mounted on front of overspeed governor drive gearbox. (See figure 5-52 or 5-53.) Pressure element supplies oil to torquemeter at 140 to 160 psig, regulated by an adjustable bypass valve. Other element of pump aids circulation and scavenging of oil in governor drive gear box.

5-300. REMOVAL - TORQUEMETER ROTARY PUMP. Remove bolts and washers that secure pump to overspeed governor and tachometer drive assembly.

5-301. INSPECTION - TORQUEMETER ROTARY PUMP.

a. Inspect bolts for damage or crossed threads.

b. Inspect pump for cracks or distortion and leakage around seal.

5-302. REPAIR OR REPLACEMENT - TORQUEMETER ROTARY PUMP.

a. Replace gasket or seals which are accessible without disassembly of pump or valve.

b. Replace pump assembly or bypass relief valve in event of malfunction. Carefully note mounting position of pump when removing bolts. Align pump ports to internal passages of mounting pad when reinstalling.

5-303. INSTALLATION - TORQUEMETER ROTARY PUMP. Install new packing and pump. Secure with bolts and washers. Lock-wire bolts.

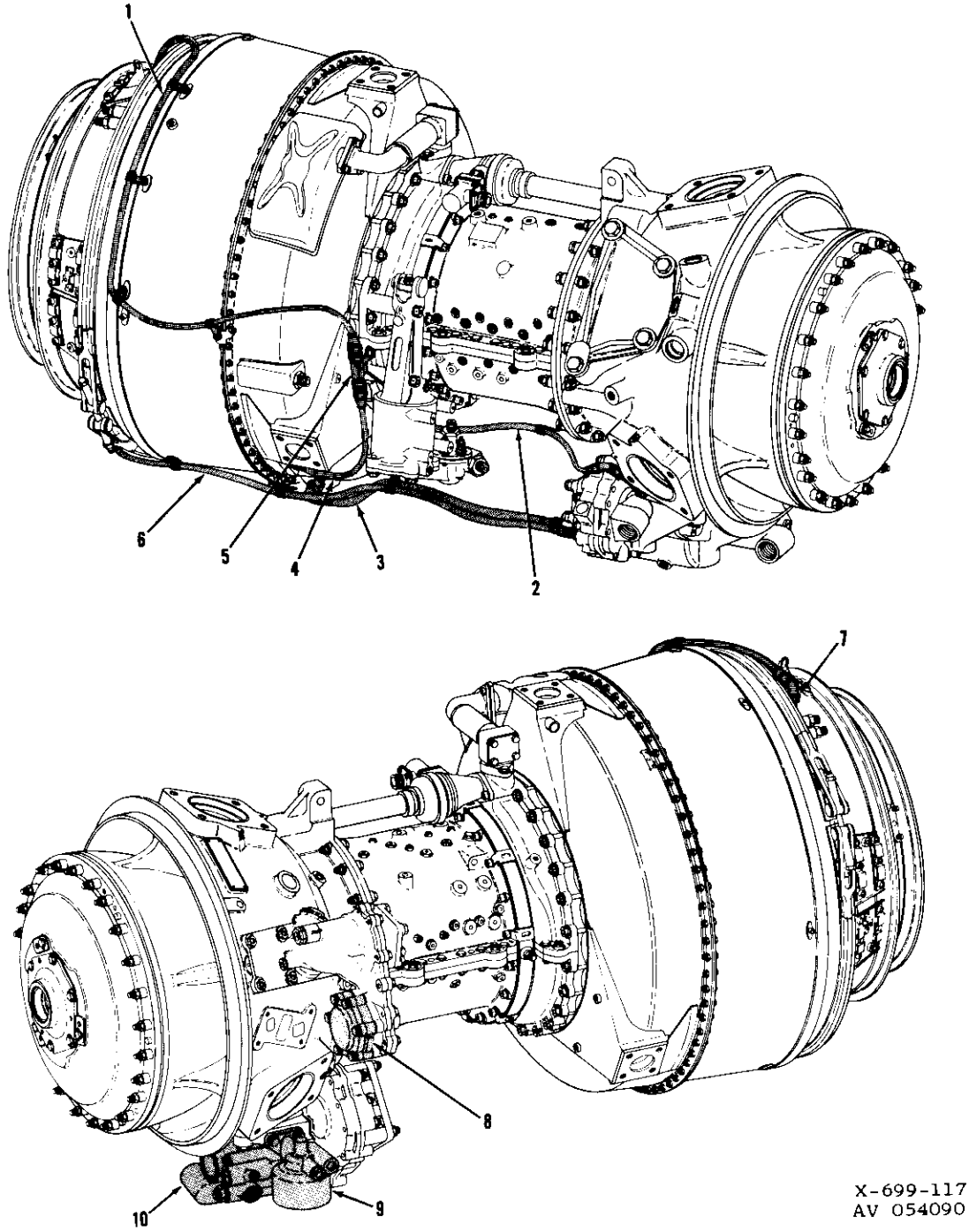
5-304. ADJUSTMENT - TORQUEMETER OIL PRESSURE.

a. Remove test gage connection plug (9, figure 5-52) from governor drive gearbox. Install a pressure gage that is graduated from 0 to 200 psig.

b. Operate engine and check torquemeter oil pressure.

Note

Normal pressure at test connection should be 120 psi minimum at normal rated power and above. The readings should be taken after the oil pressure and temperature have stabilized.



1. No. 3 and 4 Bearing Pressure Line
2. Pressure Line to Manifold
3. No. 2 Bearing Scavenge Line
4. No. 2 Bearing Pressure Line
5. Pressure Manifold
6. No. 3 and 4 Bearing Scavenge Line
7. No. 3 and 4 Bearing Inlet Strainer
8. Torquemeter Boost Pump
9. Main Oil Filter
10. Oil Pump

Figure 5-53. Oil system components on engine - T53-L-13

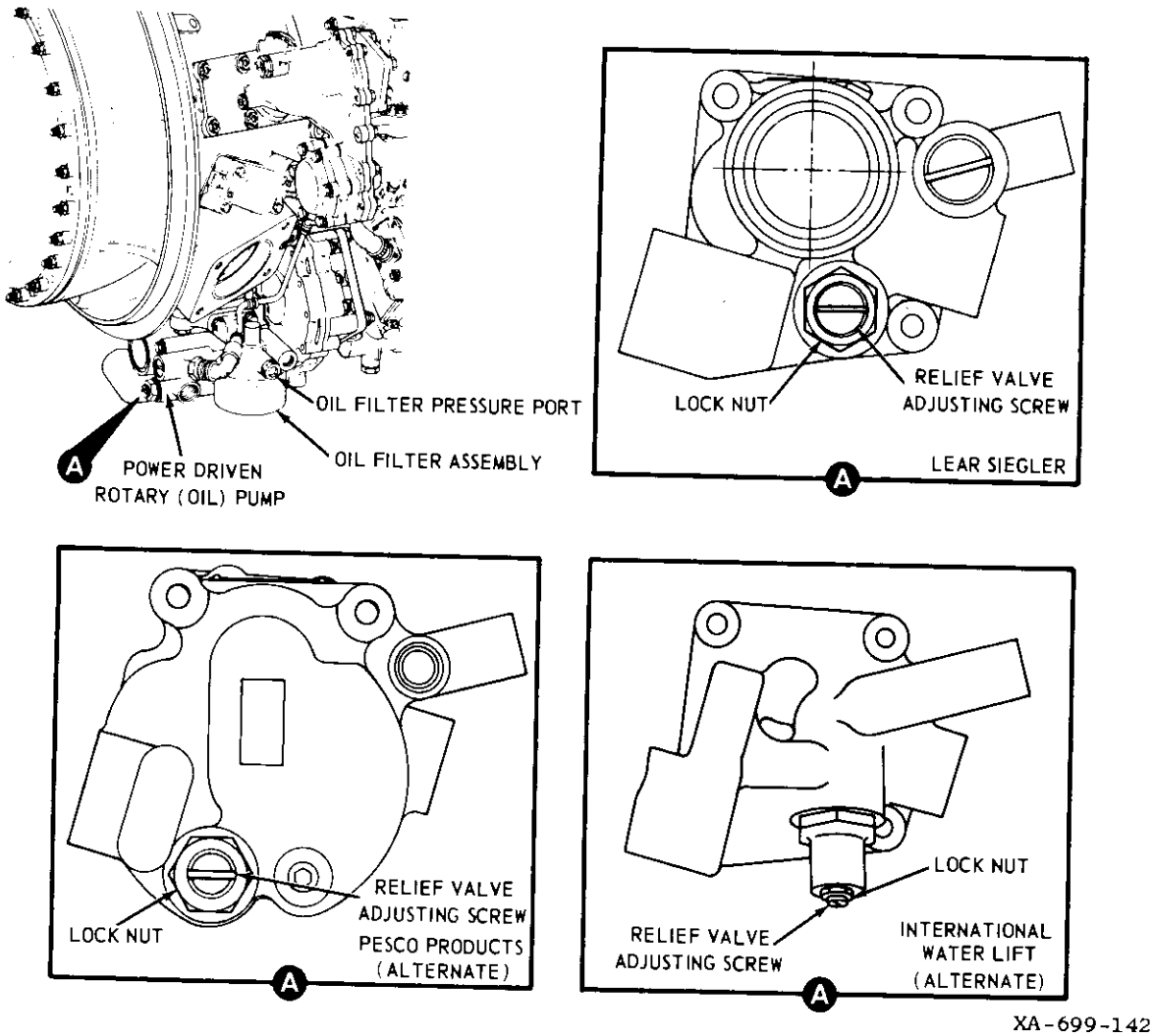


Figure 5-54. Engine oil pump adjustment

c. Should oil pressure require adjustment, proceed as follows:

(1) Shut down engine.

(2) Straighten tang of keywasher on boost pump pressure adjusting screw lock-nut (10) at top of governor drive gear box.

(3) Using wrench LTCT215, loosen adjusting screw lock-nut.

(4) Turn adjusting screw clockwise to increase pressure, counterclockwise to reduce pressure. One full turn will change pressure approximately 10 psig.

(5) Tighten adjusting screw lock-nut to a torque of 70 to 80 inch-pounds.

(6) Restart engine. Recheck oil pressure. Report adjustment necessary. When pressure is satisfactory, bend one tang of key-washer against locknut and one tang against valve body.

d. Remove pressure gage and reinstall plug.

5-305. ENGINE OIL FILTER.

5-306. The oil filter is located at left side of engine inlet housing. (See figure 5-52 or 5-53.) Filter element is reusable wafer disc type, enclosed in a cylindrical housing equipped with a bypass valve preset to open at 15 to 20 psi differential pressure for continued flow if filter screens should become clogged. Flow to and from filter is through internal passages. A pressure line from a tap on filter housing connects to oil pressure gage transmitter and pressure switch for caution panel light.

5-307. REMOVAL - ENGINE OIL FILTER.

a. Open cowling at left-hand side of engine. Position suitable container to catch oil.

Warning

Do not allow oil to remain on skin any longer than necessary, since it contains a toxic additive which is readily absorbed through skin.

b. Disconnect oil lines and cap or cover openings.

c. Remove bolts, washers, tab washers and connecting link attaching filter to engine and lift filter and packings from engine. Discard packings and tab washers.

5-308. DISASSEMBLY - ENGINE OIL FILTER.

a. Remove retaining ring (1, figure 5-55).

b. Use 1/4-28 screw to remove plug (2) from housing. Remove packing (3).

c. Carefully remove spring (4) and relief valve (5).

d. Cut lockwire and loosen bolt (6) that secures cover assembly (7) to housing (8) and withdraw cover assembly from housing. Remove packing (9).

e. Remove retaining ring (10) and end plate (11).

f. Carefully lift filter elements (12) from cover (13).

g. Using two suitable wrenches hold nut (14) and turn bolt (6) until nut is free.

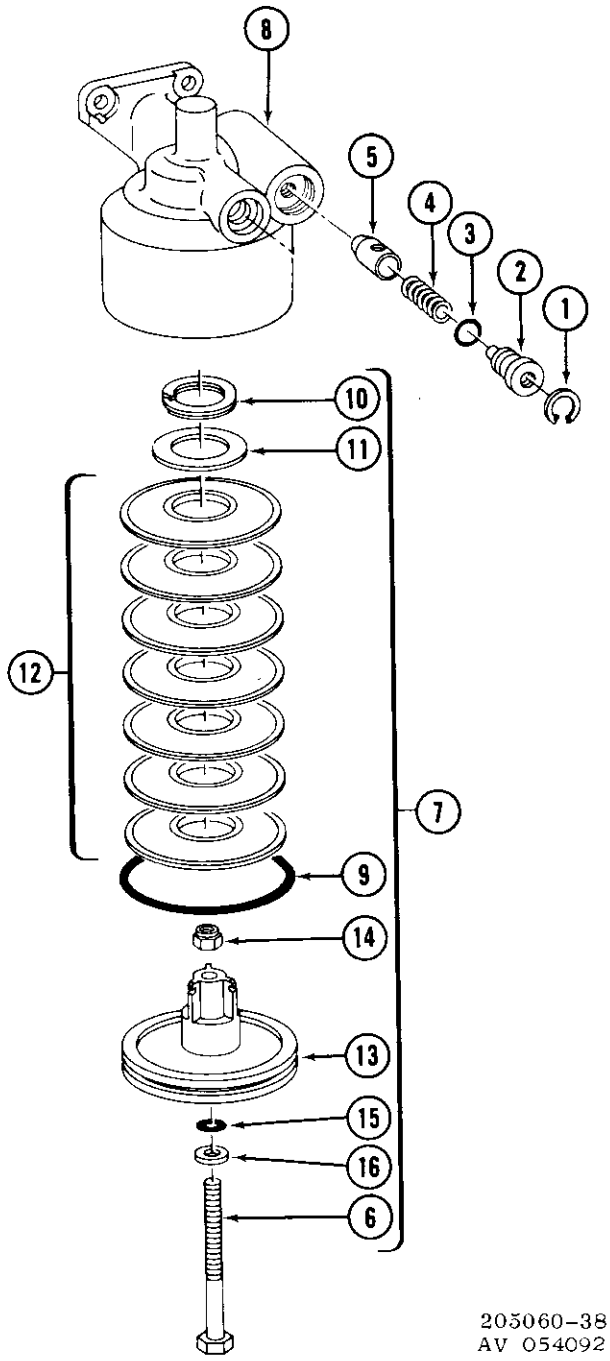
h. Remove nut (14), bolt (6), packing (15) and washer (16) from cover (13).

5-309. CLEANING - ENGINE OIL FILTER. Engine oil filter shall be cleaned after initial installation of an engine and after first ground run-up.

a. The following procedure may be used for cleaning engine oil filter without removing entire unit from engine.

(1) Open cowling at left-hand side of engine. Position suitable container to catch oil.

(2) Loosen bolt (6, figure 5-55) that secures cover assembly (7) to housing (8) and withdraw cover assembly from housing.



1. Retaining Ring
2. Plug
3. Packing
4. Spring
5. Relief Valve
6. Bolt
7. Cover Assembly
8. Housing
9. Packing
10. Retaining Ring
11. End Plate
12. Filter Elements
13. Cover
14. Nut
15. Packing
16. Washer

Figure 5-55. Engine oil filter assembly