

PRATT & WHITNEY CANADA
MAINTENANCE MANUAL
MANUAL PART NO. 3013242

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OIL DISTRIBUTION - DESCRIPTION AND OPERATION

1. Description and Operation (Ref. Fig. 1)

A. Oil Tank

The oil tank is an integral part of the compressor inlet case and is located in front of the accessory gearbox. The tank is provided with a filler neck and an integral quantity dipstick and cap located at the 11 o'clock position on the accessory gearbox housing. The cap and dipstick are fastened to the filler neck, which passes through the gearbox housing and accessory diaphragm and into the oil tank. The markings on the dipstick correspond to US quarts, and indicate the amount of oil required to fill the tank to the full mark. An anti-flooding device and breather arrangement, located at the 12 o'clock position on the compressor inlet case, prevents foaming when scavenged oil is returned to the tank during engine operation. The tank is vented to the top of the accessory gearbox, where the air/oil mist is passed through a centrifugal breather. The breather separates the oil from the air and returns the oil to the bottom of the accessory gearbox. The relatively oil free air is discharged overboard via a cored passage in the accessory diaphragm and transfer tube, to a breather boss located at the 2 o'clock position on the gearbox housing. Draining of the oil tank is done by removal of a plug located at the 6 o'clock position of the compressor inlet case (Ref. 72-00-00).

Refer to Chapter 72-00-00, DESCRIPTION AND OPERATION, Table 8 for oil tank data.

B. Oil Pump

Pressure oil is circulated from the integral oil tank and through the engine lubricating system by a self-contained gear-type pump mounted at the bottom of the oil tank. The oil pump consists of two gears contained in a cast housing bolted to the front of the AGB diaphragm. The pump gears are driven by an accessory gearshaft which also drives the internal scavenge pump. A removable inlet screen is fitted at the oil pump. The pump housing incorporates a support boss at the pump for the oil filter housing, and is counterbored to accommodate the check valve which is mounted at the inner end of the filter housing. The lubrication system pressure relief valve (Ref. 72-60-00) is installed on a pad located at the upper end of the housing. An internal cored passage connects the relief valve to pump outlet.

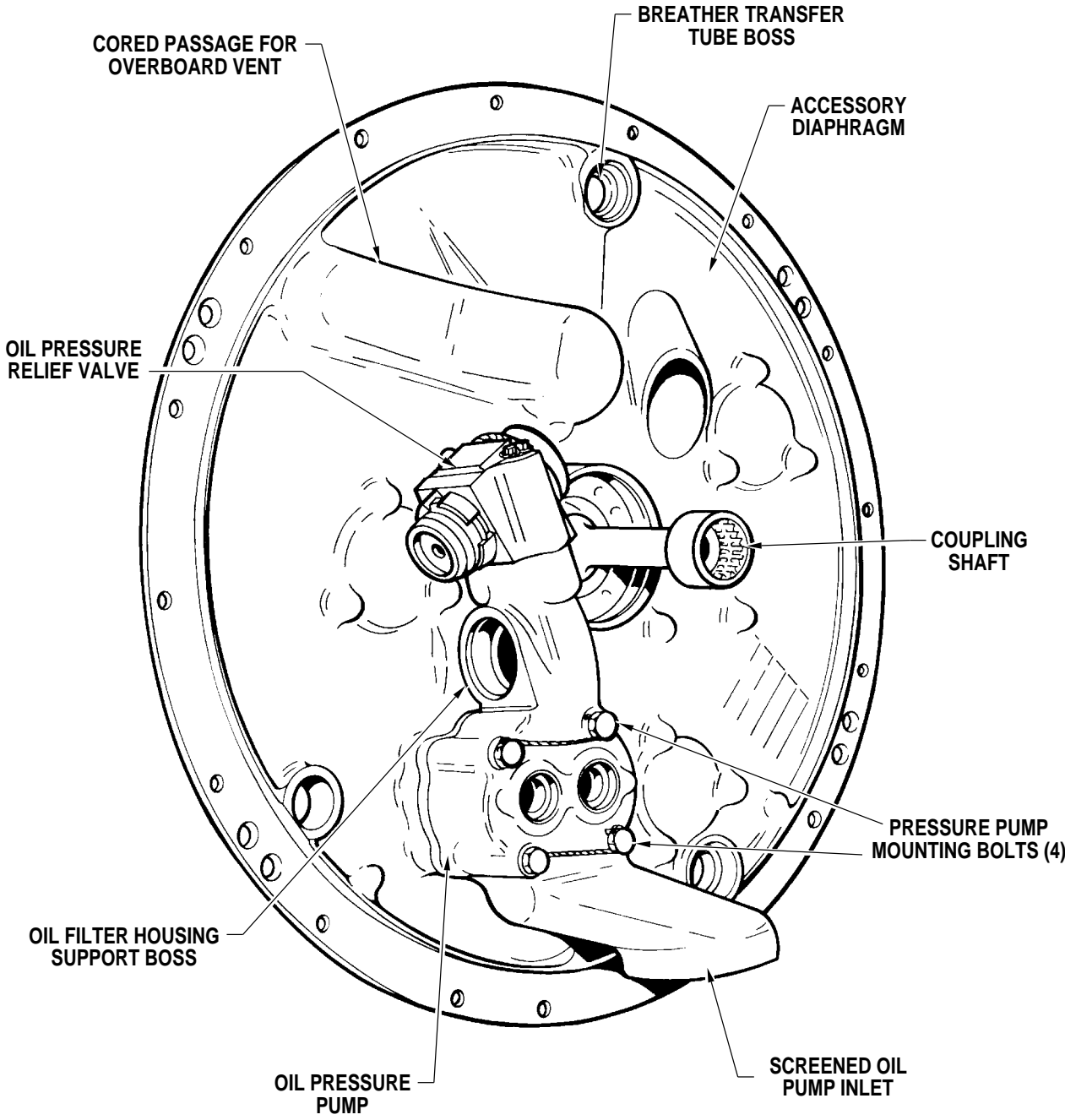
C. Oil Filter

The oil filter, installed in the pressure line downstream of the oil pump, consists of cartridge type filter element, a spring loaded bypass valve, and a check valve mounted in a removable alloy housing. Depending on installation requirements, the filter element may be of the cleanable (reusable) or non-cleanable (disposable) type.

D. Centrifugal Breather

The centrifugal breather consists of an aluminum alloy, shrouded impeller housing attached to the rear face of the starter generator gearshaft by a retaining ring. Rotational torque is transmitted from the gearshaft to the impeller by three equi-distant pins. Breather air flows radially inward through the rotating impeller housing where oil particles in the breather air are separated by centrifugal force, and drain freely into the gearbox sump. The relatively oil-free air passes inward and into the hollow rear section of the

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Accessory Gearbox Diaphragm and Oil Pump
Figure 1

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gearshaft. The air flows forward and into a cored passage in the accessory diaphragm. From the cored passage, the air passes through a transfer tube to a breather boss on the accessory gearbox housing at the 2 o'clock position.

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EXTERNAL OIL TUBES - DESCRIPTION AND OPERATION

1. Description and Operation

A. Pressure System

Pressure oil from the filter outlet is delivered to the engine bearing areas, the accessory and reduction gearboxes and to the oil-to-fuel heater circuit through internal cored passages and internal and external oil transfer tubes. Pressure oil is delivered to the No. 1 bearing and the accessory gearbox via cored passages and internal transfer tubes, while oil to Nos. 2, 3 and 4 bearings and reduction gearbox is passed through a cored passage to an elbow fitting at the 5 o'clock position on the compressor inlet case, then through an external transfer tube to a similar elbow fitting at the front end of the reduction gearbox. Oil is then delivered to the various areas within the gearbox by cored passages and transfer tubes. Oil to the No. 2 bearing is tapped off the external transfer tube and directed to the bearing area through internal piping.

B. Scavenge System

Scavenge oil from the No. 2 bearing area is directed through internal tubes to a port at the 7 o'clock position on the gas generator case. The flanged No. 2 bearing scavenge tube directs oil rearward to a boss at 6 o'clock on the compressor inlet case. The oil is then passed through internal transfer tubes to the front element of the internal scavenge pump which discharges the scavenged oil into the accessory gearbox sump.

Oil from the reduction gearbox and No. 3 and 4 bearing areas is returned through twin external tubes to respective scavenge pumps at the rear of the engine. The stainless steel scavenge tubes are connected to the respective ports on the reduction gearbox through short transfer tubes and a common twin-port adapter bolted to the front case of the gearbox. The scavenge tubes are supported by a flange-mounted coupling on flange C. The rear ends of the tubes fit into elbow extensions of the front and rear elements of the external scavenge pump. The No. 3 and 4 bearing oil is scavenged by the front element and discharged into the accessory gearbox sump, while the reduction gearbox oil is scavenged by the rear element which returns the oil to the oil tank via an airframe-mounted cooler (Ref. Aircraft Maintenance Manual).

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EXTERNAL OIL TUBES - MAINTENANCE PRACTICES

1. General

- A. Maintenance personnel should make reference to the INTRODUCTION section and Chapter 70-00-00 STANDARD PRACTICES of this manual to familiarize themselves with general procedures.
- B. Install suitable protective caps/covers over all disconnected tubes/lines and component openings.
- C. Lockwire used , unless otherwise specified, shall comply with specification AMS 5687, heat and corrosion resistant steel wire MS9226-03, 0.025 inch diameter, and will not be specified in instructions.

2. Consumable Materials

The consumable materials listed below are used in the following procedures.

<u>Item No.</u>	<u>Name</u>
PWC11-021	Compound, Carbon Remover
PWC11-027	Solvent, Petroleum
PWC11-031	Cleaner, Engine

3. Special Tools

Not Applicable

4. Fixtures, Equipment and Supplier Tools

Not Applicable

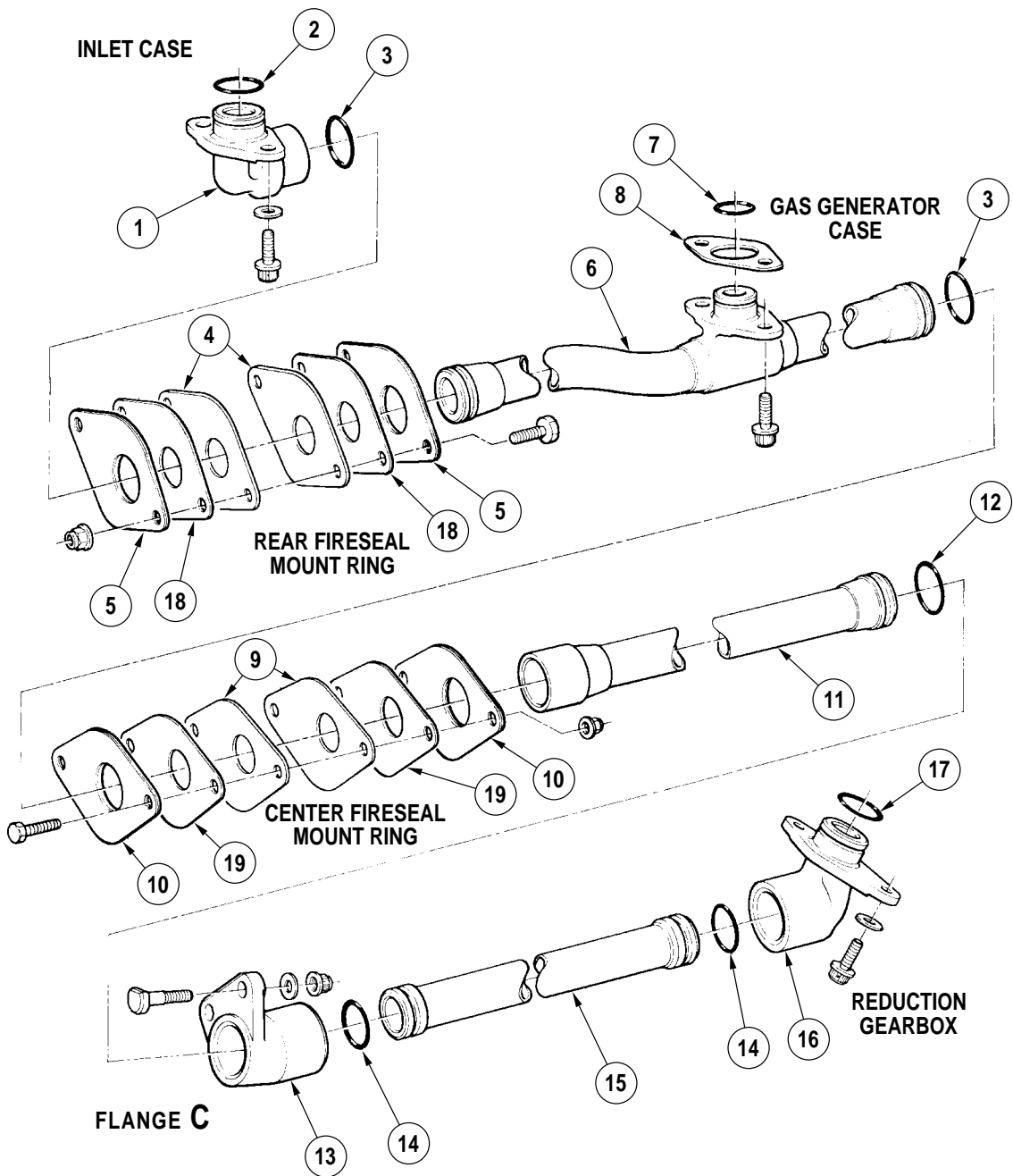
5. Removal/Installation

A. Removal of Pressure Oil Tube (Ref. Fig. 201)

NOTE: Early PT6A-27/-28 engines (Pre-SB1169) are fitted with a two-piece pressure oil line requiring alignment spacers for fitment of rear tube. All other engines (all Models) are of Post-SB1169 configuration, having a non-aligned three-piece oil line.

- (1) Drain engine oil (Ref. 72-00-00, SERVICING).
- (2) For Pre-SB1169 PT6A-27/-28Engines:
 - (a) Remove self-locking nuts and bolts fastening the retaining plates (5 and 10), insulation (18) (if fitted) and seals (4 and 9) from respective fireseal mount ring.
 - (b) Remove bolts and washers from elbow (1) from compressor inlet case.
 - (c) Remove bolts from flange of rear tube (6) from gas generator case.

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Removal/Installation of Pressure Oil Tubes
 Figure 201

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Key to Figure 201

1. Elbow (Rear)
2. Preformed Packing
3. Preformed Packing
4. Seal
5. Retaining Plate
6. Rear Tube
7. Preformed Packing
8. Alignment Spacer (if fitted) (Pre-SB1169)
9. Seal
10. Retaining Plate
11. Center Tube (Post-SB1169)
12. Preformed Packing(Post-SB1169)
13. Coupling
14. Preformed Packing
15. Front Tube
16. Elbow (Front)
17. Preformed Packing
18. Insulation

- (d) Simultaneously withdraw elbow from inlet case, and tube (6) from gas generator case.
 - (e) Remove rear tube (6) by withdrawing from the coupling (13) at flange C and from the center and rear fireseal mount rings, remove the sealing components and alignment spacers (8) (if fitted).
 - (f) Remove elbow (1) and preformed packings (2, 3 and 7).
 - (g) Remove bolts, washers and elbow (16) from reduction gearbox.
 - (h) Remove the front tube (15) by withdrawing the elbow (16) from the reduction gearbox, and the tube from the coupling (13). Remove the elbow and preformed packings (14 and 17).
- (3) For PT6A-27/-28 Post-SB1169, and PT6A-21 Engines:
- (a) Remove self-locking nuts and bolts fastening the retaining plates (5 and 10), insulation (18) (if fitted) and seals (4 and 9) from respective fireseal mount ring.
 - (b) Remove bolts and washers from elbow (1) from compressor inlet case.
 - (c) Remove bolts from flange of rear tube (6) from gas generator case.

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- (d) Simultaneously withdraw elbow (1) from inlet case, and tube (6) from gas generator case; pull rearward and withdraw the rear tube from the center tube (11).
- (e) Remove rear tube (6) from the center and rear fireseal mount rings, remove the sealing components.
- (f) Remove elbow (1) and preformed packings (2, 3 and 7).
- (g) Remove center tube (11) from the coupling (13) at flange C and remove the preformed packing (12).
- (h) Remove bolts, washers and elbow (16) from reduction gearbox.

B. Removal of No. 2 Bearing Scavenge Oil Tube (Ref. Fig. 202)

- (1) Drain engine oil system (Ref. 72-00-00, SERVICING0).
- (2) Provide suitable drip pan for residual oil spillage.
- (3) Remove self-locking nuts and bolts securing sealing components (1), to rear fireseal mount ring and remove retaining plates.
- (4) Remove two bolts securing flange of rear elbow of scavenge tube (7) to boss on gas generator case.
- (5) Remove two bolts securing flange of rear elbow of scavenge tube to boss on compressor inlet case.
- (6) Withdraw elbows of scavenge tube from respective case and remove tube from rear fireseal mount ring.
- (7) Remove gasket (6), preformed packing (5), and sealing components (1).

C. Removal of External Scavenge Oil Tube (Ref. Fig. 203)

CAUTION: DO NOT SUBJECT EXTERNAL OIL SCAVENGE TUBES TO BENDING OR COMPRESSION STRESSES DURING REMOVAL OR INSTALLATION.

- (1) Drain engine oil system (Ref. 72-00-00, SERVICING).
- (2) Provide suitable drip pans for residual oil spillage.
- (3) Remove bolts and washers securing dual elbow (10) to propeller reduction gearbox.
- (4) Remove Tee-head bolts, washers and self-locking nuts securing dual coupling (15) to flange C.
- (5) Remove bolt and self-locking nuts securing seals (5) and retaining plates (4) to center and rear fireseal mount rings.

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- (6) Withdraw dual elbow (10) from reduction gearbox and remove from transfer tube (13) and front tubes (14). Remove preformed packing (8) and sealing sleeve (9) from elbow.
- (7) Withdraw transfer tube (13) from reduction gearbox and remove preformed packings (12) from tube.
- (8) Withdraw front tubes (14) from dual coupling (15) and remove preformed packings (11) from tubes.
- (9) Remove dual coupling from rear tubes (7).
- (10) Remove rear tubes (7) from ports in scavenge pump, and carefully remove tubes from center and rear fireseal mount rings; remove seals and retaining plates during withdrawal of tubes from fireseal mount rings.
- (11) Remove preformed packings (6) from rear tubes.

CAUTION: PROVIDE SUITABLE SUPPORT FOR STARTING FLOW CONTROL (PT6A-27/-28) TO PREVENT STRAIN ON REMOVAL OF SUPPORT BRACKET.

- (12) Remove two bolts securing support bracket (3) and flanged elbow of scavenge hose (1) to accessory gearbox.
- (13) For PT6A-27/-28 Engines: Remove bolt securing support bracket (3) to top of starting flow control. Remove bracket.
- (14) Disconnect hose (1) from fitting on scavenge pump; remove hose by withdrawing elbow from accessory gearbox.

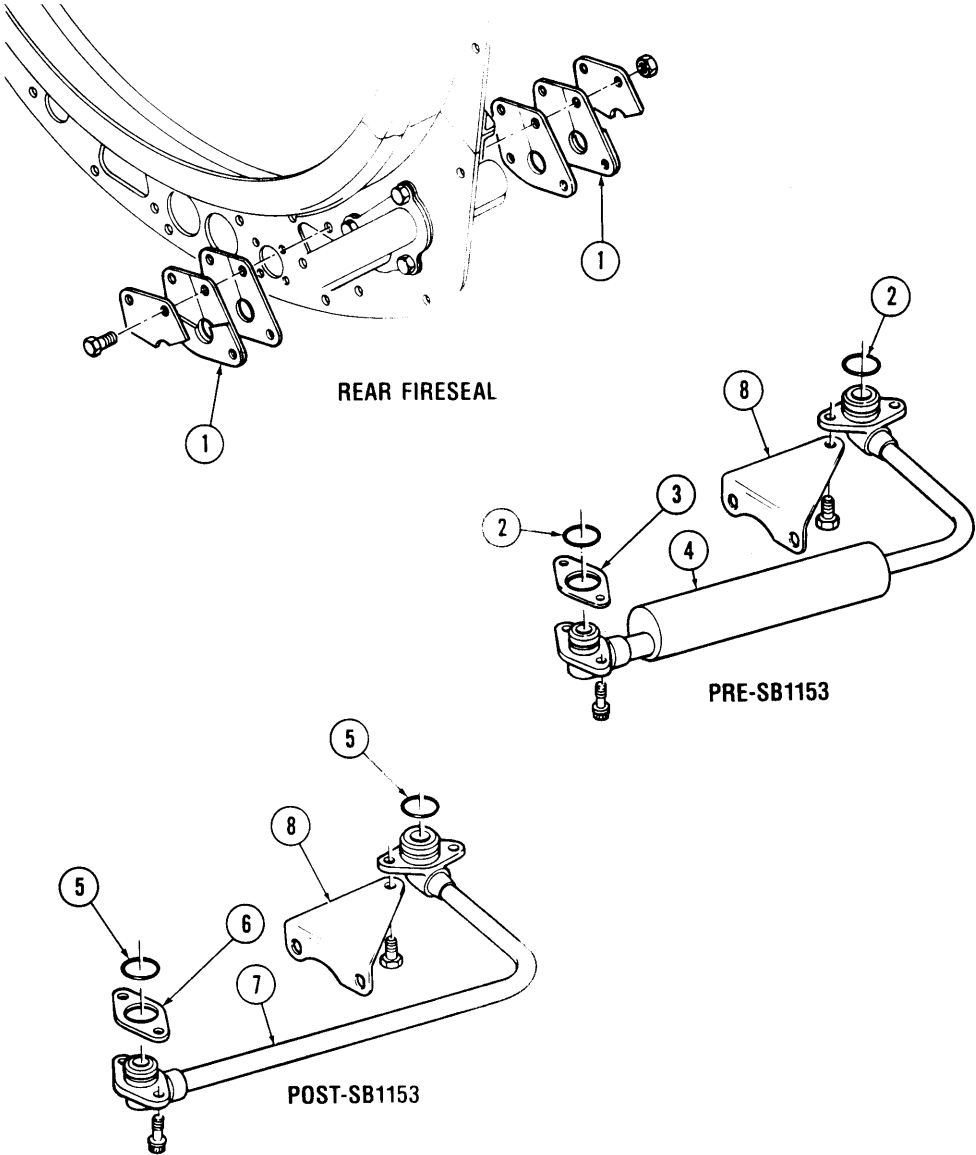
NOTE: Configuration of hose depends on actual fitting installed at scavenge pump.

- (15) Remove preformed packing (2) from elbow of scavenge hose.
- (16) Cap ports in scavenge pump and open boss in reduction gearbox.

D. Installation of Pressure Oil Tube (Ref. Fig. 201)

- (1) For Pre-SB1169 PT6A-27/-28 Engines:
 - (a) Install rear tube (6) with sequential assembly of seals (4), insulation (18) (Ref. IPC) and retaining plates (5) at rear fireseal mount ring, and seals (9), insulation (18) (Ref. IPC) and retaining plates (10) at center fireseal mount ring.
 - (b) Install preformed packings (3) on each end of the rear tube.
 - (c) Install preformed packing (2) on elbow (1) and install the elbow on the rear tube.

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Removal/Installation of No. 2 Bearing Scavenge Tube
Figure 202

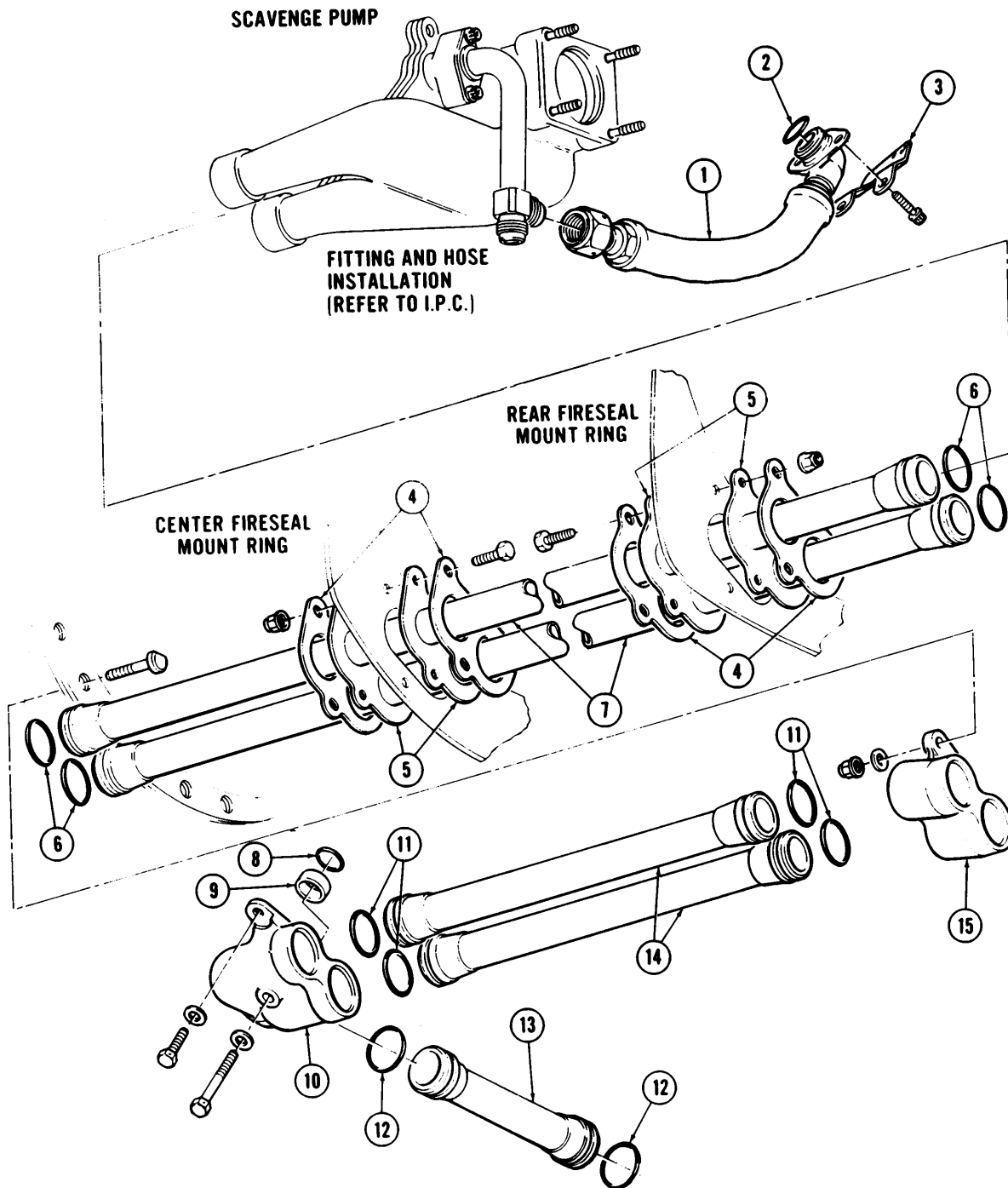
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Key to Figure 202

1. Seals and Seal Retaining Plates
2. Preformed Packing
3. Gasket
4. Tube and Sump Assembly (PT6A-27/-28, Pre-SB1153)
5. Preformed Packing
6. Gasket
7. Oil Scavenge Tube (PT6A-27/-28, Post-SB1153)
8. Rear Fireseal Support Bracket

- (d) Insert the front end of the rear tube (6) into the coupling (13) at flange C and simultaneously insert the flange of the tube into the boss in the gas generator case and elbow (1) into the boss in the inlet case.
- (e) Ascertain the quantity of the alignment spacers (8) to be installed between the flange adapter of the rear tube and boss on the gas generator case as follows:
 - 1 Using a feeler gage, measure and record gap between flange of adapter and boss. Make sure a uniform gap exists.
 - 2 Remove the elbow from the air inlet case and withdraw tube from boss and coupling at flange C. Allow tube to rest on fireseals.
 - 3 Install alignment spacers (8), of class determined from measurement obtained in step 1, on the flange followed by the preformed packing (7) on the adapter.
- (f) Install rear tube by simultaneously inserting the tube into the coupling (13), the adapter of the tube into the gas generator case and the elbow into the inlet case.
- (g) Install the elbow with washers and bolts to the flange with the bolts. Tighten the bolts 26 to 40 lb.in., and fasten with lockwire.
- (h) Install the sealing components at the center and rear fireseal mount rings with bolts (heads on the air inlet side of the fireseals) and self-locking nuts. Tighten the nuts until firm contact is obtained, plus 180 degrees.
- (i) Install the preformed packings (14) on the front tube (15) and the preformed packing (17) on the elbow (16).
- (j) Install the elbow (16) on the front tube (15).
- (k) Install the front tube by simultaneously inserting the tube into the coupling (13) at flange C and the elbow into the boss on the reduction gearbox.
- (l) Secure the elbow (16) with two washers and bolts. Tighten the bolts 36 to 40 lb.in., and fasten with lockwire.
- (m) Replenish the engine lubrication system (Ref. 72-00-00, SERVICING).

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Removal/Installation of Scavenge Oil Tubes and Hose
Figure 203

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Key to Figure 203

1. Scavenge Oil Hose
2. Preformed Packing
3. Support Bracket (PT6A-27/-28)
4. Retaining Plates
5. Seals
6. Preformed Packing
7. Scavenge Oil Rear Tubes
8. Preformed Packing
9. Sealing Sleeve
10. Dual Elbow
11. Preformed Packings
12. Preformed Packings
13. Transfer Tube
14. Scavenge Oil Front Tubes
15. Dual Coupling

- (n) Check for oil leaks during engine test run (Ref. 71-00-00, ADJUSTMENT/TEST).
- (2) For PT6A-27/-28 Post-SB1169, and PT6A-21 Engines:
- (a) Install rear tube (6) with sequential assembly of seals (4), insulation (18) (Ref. IPC) and retaining plates (5) at rear fireseal mount ring, and seals (9), insulation (18) (Ref. IPC) and retaining plates (10) at center fireseal mount ring.
 - (b) Install preformed packings (3) on each end of the rear tube and preformed packing (7) on the flanged adapter of the tube.
 - (c) Install preformed packing (12) on the center tube (11), and insert the tube into the coupling (13) at flange C.
 - (d) Mate the rear tube (6) with the center tube (11) and simultaneously insert the flanged adapter of the rear tube into the boss in the gas generator case and the elbow (1) into the boss in the compressor inlet case.
 - (e) Secure the flanged adapter to the gas generator case with two bolts and the elbow to the inlet case with two washers and bolts. Tighten the bolts 36 to 40 lb.in., and fasten with lockwire.
 - (f) Install the sealing components at the center and rear fireseal mount rings with bolts (heads on the air inlet side of the fireseals) and self-locking nuts. Tighten the nuts until firm contact is obtained, plus 180 degrees.
 - (g) Install the preformed packings (14) on the front tube (15) and the preformed packing (17) on the elbow (16).
 - (h) Install the elbow (16) on the front tube (15).

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- (i) Install the front tube by simultaneously inserting the tube into the coupling (13) at flange C and the elbow into the boss on the reduction gearbox.
- (j) Replenish the engine lubrication system (Ref. 72-00-00, SERVICING).
- (k) Check for oil leaks during engine test run (Ref. 71-00-00, ADJUSTMENT/TEST).

E. Installation of No. 2 Bearing Scavenge Oil Tube (Ref. Fig. 202)

- (1) Pass No. 2 bearing scavenge tube (7) through rear fireseal mount ring with sequential assembly of seals and retaining plate assemblies (1).
- (2) Install preformed packings (5) on elbows of scavenge tube.
- (3) Locate gasket (6) on front elbow of tube; insert front elbow into boss on gas generator case and rear tube into boss on compressor inlet case.
- (4) Secure support bracket and rear elbow to inlet case with two bolts, and front elbow to gas generator case with two bolts. Tighten bolts, torque to 36 to 40 lb.in., and lockwire.
- (5) Locate retaining plates on face of respective plate assembly (2), and secure sealing components to rear fireseal mount plate with four bolts (heads to be on air inlet side of fireseal) and self-locking nuts. Tighten nuts until firm contact is obtained plus 180 degrees.
- (6) Replenish engine lubrication system (Ref. 72-00-00, SERVICING).
- (7) Check for oil leaks during engine test run (Ref. 71-00-00).

F. Installation of External Scavenge Oil Tube (Ref. Fig. 203)

- (1) Install preformed packings (6) on each end of rear tubes (7).
- (2) Install rear tubes through center and rear fireseals with sequential assembly of seals (5) and retaining plates (4) at each fireseal mount ring. Loosely secure sealing components with three bolts and self-locking nuts at each location.
- (3) Insert rear tubes (7) into respective port in scavenge pump.
- (4) Locate dual coupling (15) at flange C and mate with rear tubes (7). Secure coupling to flange with three Tee-head bolts, washers and self-locking nuts. Tighten nuts and torque 36 to 40 lb.in.
- (5) Install preformed packings (11) on each end of front tubes (14) and preformed packings (12) on transfer tube (13).
- (6) Insert front tubes (14) into dual coupling (15).
- (7) Insert transfer tube (13) into port in reduction gearbox.
- (8) Insert sealing sleeve (9) into port in mounting face of dual elbow (10) and install preformed packing (8) on spigot.

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- (9) Install dual elbow by mating with transfer tube (13) and front tubes (14) and simultaneously inserting elbow into boss in reduction gearbox.
- (10) Secure dual elbow with three washers, two short bolts and one long bolt. Tighten bolts, torque 36 to 40 lb.in., and lockwire.
- (11) Tighten self-locking nuts, at center and rear fireseal mount rings until firm contact is obtained plus 180 degrees.
- (12) Install preformed packing (2) on flanged elbow of scavenge hose (1).
- (13) Install scavenge hose (1) by inserting elbow into boss in accessory gearbox and connecting hose to fitting on scavenge pump.

NOTE: Configuration of hose depends on actual fitting installed on scavenge pump (Ref. IPC for part and model usage).

- (14) Locate support bracket (3) on flange of elbow, and secure bracket and elbow to gearbox with two bolts. Tighten bolts, torque 36 to 40 lb.in., and lockwire.
- (15) Tighten coupling nut of scavenge hose to fitting on pump. Torque 450 to 500 lb.in., and lockwire.
- (16) Secure starting flow control to support bracket (3) with one bolt. Tighten bolt, torque 36 to 40 lb.in., and lockwire.
- (17) Replenish engine oil system (Ref. 72-00-00, SERVICING).
- (18) Check for oil leaks at engine test run (Ref. 71-00-00).

6. Cleaning/Painting

A. Cleaning of Tubes

- (1) Soak tubes in cold carbon remover (PWC11-021) for two hours at room temperature.
- (2) Remove tube from solvent and pull a suitable sized swab, or lint-free cloth through tube.

CAUTION: MAKE SURE NO PART OF SWAB OR CLOTH REMAINS IN OIL TUBE; OTHERWISE, OIL FLOW WILL BE RESTRICTED.

- (3) Rinse tube exterior and pressure flush tube bore with solvent (PWC11-027) or (PWC11-031).
- (4) Dry interior and exterior with dry, compressed air.

7. Inspection/Check

A. Inspection of Tubes

- (1) Cracked tubing must be replaced. No repair is permitted.

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- (2) Dented tubing must be replaced if any of the following conditions apply:
 - (a) If dent has sharp corners.
 - (b) If dent length and depth exceed 10 percent of tube outside diameter.
 - (c) If more than one dent exists per 12 inch length.
 - (d) If dent is within one inch of ferrule scarf-welds or bend.
- (3) Light scratching of no appreciable depth is acceptable. Tubes must be replaced if scratches, nicks, pitting or chafing cannot be smoothed out within $\frac{1}{2}$ square inch, to maximum 0.0085 inch deep (Ref. 70-00-00, REPAIR). Any number of such blended areas are permitted provided they are separated by at least $\frac{1}{2}$ inch of undamaged material.
- (4) Pitting: Tubes must be replaced if pitting cannot be blended out within an area of $\frac{1}{2}$ square inch, to a maximum depth of $\frac{1}{4}$ of original tube thickness. Any number of such blended areas are permitted, provided they are separated by at least $\frac{1}{2}$ inch of undamaged material.
- (5) Corrosion: Rust and stains are acceptable if they can be removed by light polishing with fine abrasive cloth, otherwise step (4) applies.

8. Adjustment/Test

Start engine and do checks associated with Installation/Replacement of External Oil Tubes (Ref. 71-00-00, ADJUSTMENT/TEST).

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OIL FILTER, HOUSING AND CHECK VALVE - DESCRIPTION AND OPERATION

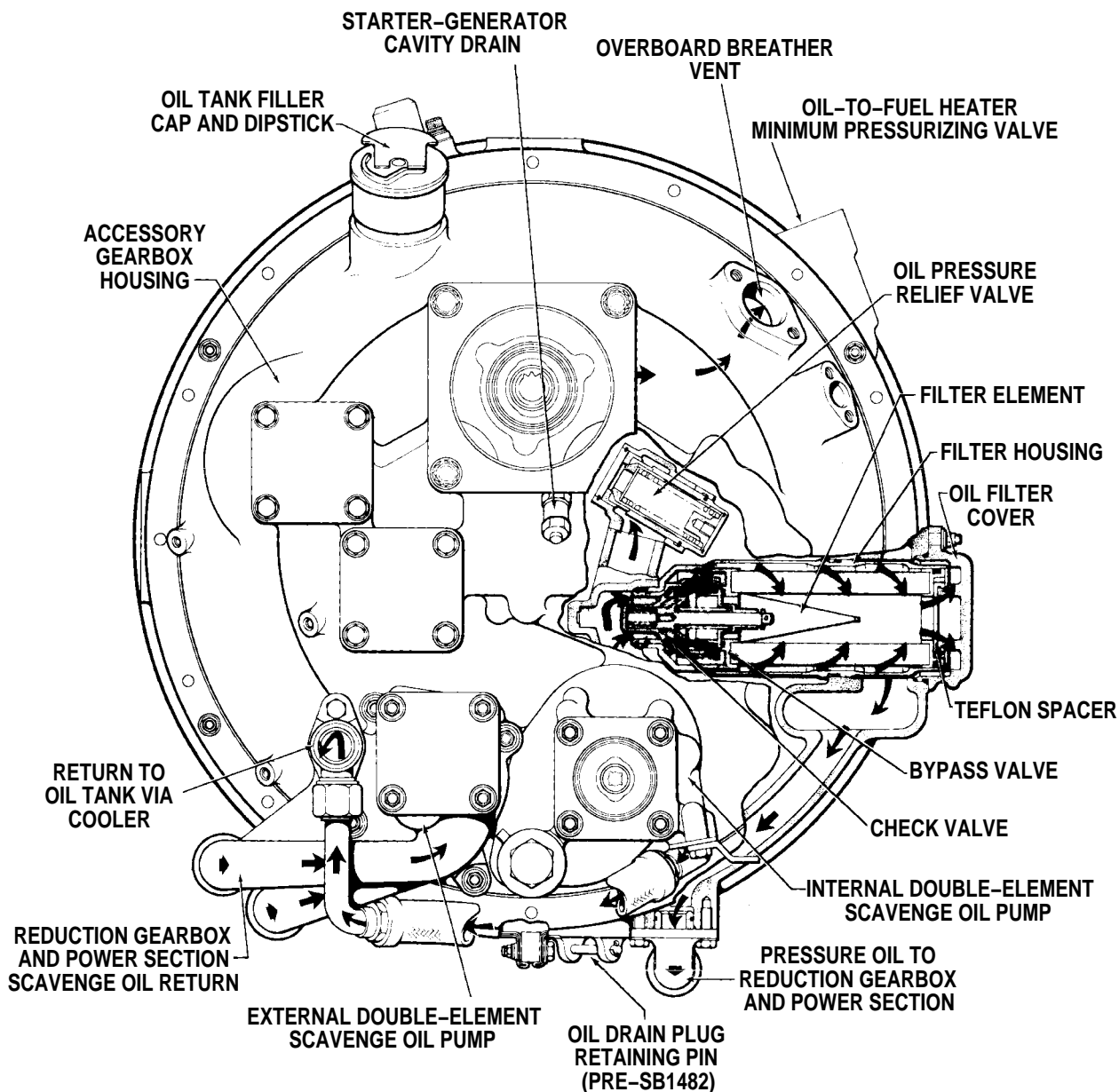
1. Description and Operation (Ref. Fig. 1)

The oil filter assembly consists of a removable alloy filter housing containing either a disposable cartridge-type filter element or a permanent cleanable element, a spring-loaded bypass valve and a check valve. The oil filter assembly and filter housing is located in the compressor air inlet case at the 3 o'clock position and retained by the filter cover; the cover is fastened to the inlet case by self-locking nuts. The inner end of the filter housing locates in the oil pump support boss and is sealed by a preformed packing.

Pressure oil from the oil pump passes through holes in the housing, lifts the check valve off its seat and flows into the filter housing. Oil then filtrates through the filter element into the center core and out into cored passages in the inlet case. Any extraneous foreign matter in the pressure oil is deposited on the outer face of the filter element. The check valve closes under the influence of a spring to prevent gravity oil flow into the engine after shutdown and also facilitates filter element replacement without having to drain the oil tank.

A filter bypass is provided by a spring-loaded valve piston installed between the check valve and the inner end of the filter element. The bypass valve is normally closed and sealed from the element core. In the event of a filter blockage, increased pressure overcomes the bypass valve spring and moves the valve piston, enabling oil to flow directly into the center core of the filter element. On some filter elements, a coarse hat-type screen attached to the inner end of the filter element partially filters the bypass oil before entering the engine.

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C424G

Oil Filter and Pressure Relief Valve
 Figure 1

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OIL FILTER, HOUSING AND CHECK VALVE - MAINTENANCE PRACTICES

1. General

- A. Maintenance personnel should make reference to the INTRODUCTION section and Chapter 70-00-00 STANDARD PRACTICES of this manual to familiarize themselves with general procedures.
- B. Install suitable protective caps/covers over all disconnected tubes/lines and component openings.
- C. Lockwire used shall, unless otherwise specified, comply with specification AMS 5687, heat and corrosion resistant steel wire MS9226-03, which is 0.025 inch diameter, and will not be specified in instructions.

2. Consumable Materials

The consumable materials listed below are used in the following procedures.

<u>Item No.</u>	<u>Name</u>
PWC05-019	Compound, Lapping
PWC05-064	Solution, Anodize Touch-up
PWC05-145	(Use PWC05-019)
PWC11-002	(Use PWC11-014)
PWC11-014	Alcohol, Isopropyl
PWC11-027	Solvent, Petroleum
PWC11-031	Cleaner, Engine

3. Special Tools

The special tools listed below are used in the following procedures.

<u>Tool No.</u>	<u>Name</u>
PWC30328	Puller
PWC30556	Puller

4. Fixtures, Equipment and Supplier Tools

The fixtures, equipment and supplier tools listed below are used in the following procedures.

<u>Name</u>	<u>Remarks</u>
Cleaner, Electrosonic	
Vacuum Pump	Oil Filter Element Rinsing and Debris Apparatus Kit

5. Servicing

For oil system servicing and inspection criteria, refer to Chapter 72-00-00, SERVICING and INSPECTION, respectively.

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6. Removal/Installation

A. Removal of Oil Filter Element (Ref. Fig. 201 and 202)

- (1) Remove self-locking nuts and plain washers fastening oil filter cover to compressor inlet case.
- (2) Remove cover from case, complete with preformed packing and teflon spacer in-situ. Discard preformed packing.

NOTE: Do not remove teflon spacer from cover unless damaged.

- (3) Withdraw filter element from oil filter housing using puller (PWC30556):
 - (a) Unscrew knurled nut to end of thread on rod.
 - (b) Screw rod into collet assembly until enlarged end of rod clears collet teeth.
 - (c) Install puller over filter housing, so the end of the housing seats on the counterbore of puller.
 - (d) Push rod inward until collet teeth engage behind inner bore of filter element end cover.
 - (e) Carefully unscrew rod to lock collet teeth in position.

NOTE: Do not over expand collet teeth, as teeth may contact and damage center support tube of filter element.

- (f) Screw in knurled nut to withdraw filter element.
- (g) Remove puller and element from filter housing, then remove puller from element.
- (4) Discard preformed packings from element.

B. Removal of Oil Filter Housing (Ref. Fig. 203)

- (1) Drain engine oil (Ref. 72-00-00, SERVICING).
- (2) Remove oil filter element (Ref. Para. A.).
- (3) Withdraw oil filter housing assembly (3), from compressor inlet case with puller (PWC30328).
- (4) Remove preformed packings and plastic ring from housing.

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C. Removal of Oil Filter Check/Bypass Valve Assembly (Pre-SB1247) (Ref. Fig. 201)

- (1) With housing help vertically (check the valve spring (6) downward), compress the spring and remove the lockpin (8) and spring retainer collar (7), spring (6) and repair washer (22), if fitted.

NOTE: If repair washer (11) is fitted and housing is serviceable, tag the housing as a repaired item and retain the washer for reinstallation. If the housing is to be replaced, discard the repair washer.

- (2) Invert the housing to facilitate the check and bypass valve assembly (2 and 10 through 14) removal. Care must be exercised to prevent damage to the valve seat.
- (3) If a new check valve and/or bypass valve is to be installed or check valve seating requires lapping (Ref. Para. 9.A. and B.), disassemble the check and bypass valve assembly as follows:
 - (a) Remove the cotterpin (14), washer (13), bypass valve piston (12), packing (11) and bypass valve spring (10) from the check valve (2).

D. Removal of Oil Filter Check/Bypass Valve Assembly (Post-SB1247) and (Post-SB1379) (Ref. Fig. 202)

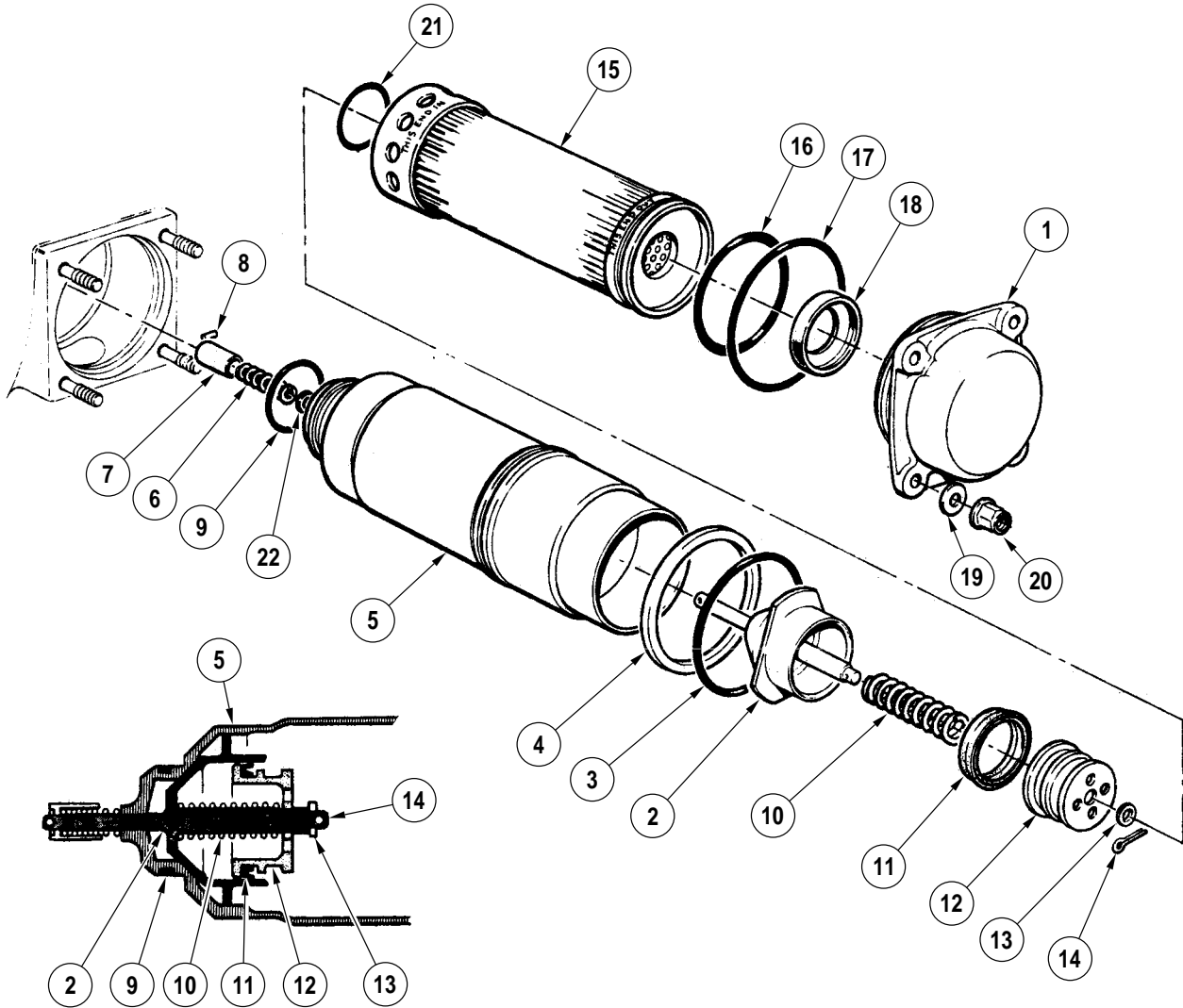
- (1) Drain engine oil (Ref. 72-00-00, SERVICING).
- (2) Remove oil filter element (Ref. Para. A.).
- (3) Exercising care, remove the retaining ring (7) and withdraw the check/bypass valve assembly from the filter housing (9).
- (4) Remove the preformed packing (12) from the check valve seat (13).
- (5) Remove the retaining ring (19) and separate the bypass valve guide (17) from the valve seat (13). Exercise care when removing the check valve (15) as it is spring loaded to the valve guide.
- (6) Remove the check valve (15) and spring (16) from the valve seat.
- (7) Remove the preformed packing (14) if applicable, from the valve (15).

NOTE: Check valves for Post-SB1379 engines differ from the previous check valves, in that the preformed packing has been deleted.

CAUTION: EXERCISE CARE DURING THIS OPERATION, AS PARTS ARE SPRING LOADED.

- (8) Apply light pressure to the bypass valve (21) and remove the cotterpin (23) and washer (22). Separate the assembly.
- (9) Remove the spring (18) from the shaft of the guide and the preformed packing from the valve (21).

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DETAIL A
 INSTALLATION OF VEE PACKING

Pre-SB1247

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Removal/Installation of Oil Filter Element, Housing and Bypass/Check Valve
 Figure 201

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OIL FILTER, HOUSING AND CHECK VALVE - MAINTENANCE PRACTICES

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Key to Figure 201

1. Oil Filter Cover
2. Check Valve
3. Preformed Packing
4. Plastic Ring
5. Oil Filter Housing
6. Check Valve Spring
7. Spring Retainer Collar
8. Lockpin
9. Preformed Packing
10. Bypass Valve Spring
11. Packing
12. Bypass Valve Piston
13. Washer
14. Cotterpin
15. Oil Filter Element
16. Preformed Packing
17. Preformed Packing
18. Teflon Spacer
19. Washer
20. Nut
21. Preformed Packing
22. Repair Washer (if fitted)

E. Installation of Oil Filter Element (Ref. Figs. 201 and 202)

- (1) Install new preformed packings on the filter element (3).
- (2) Install filter element, perforated flanged end first, into the filter housing in the compressor inlet case.

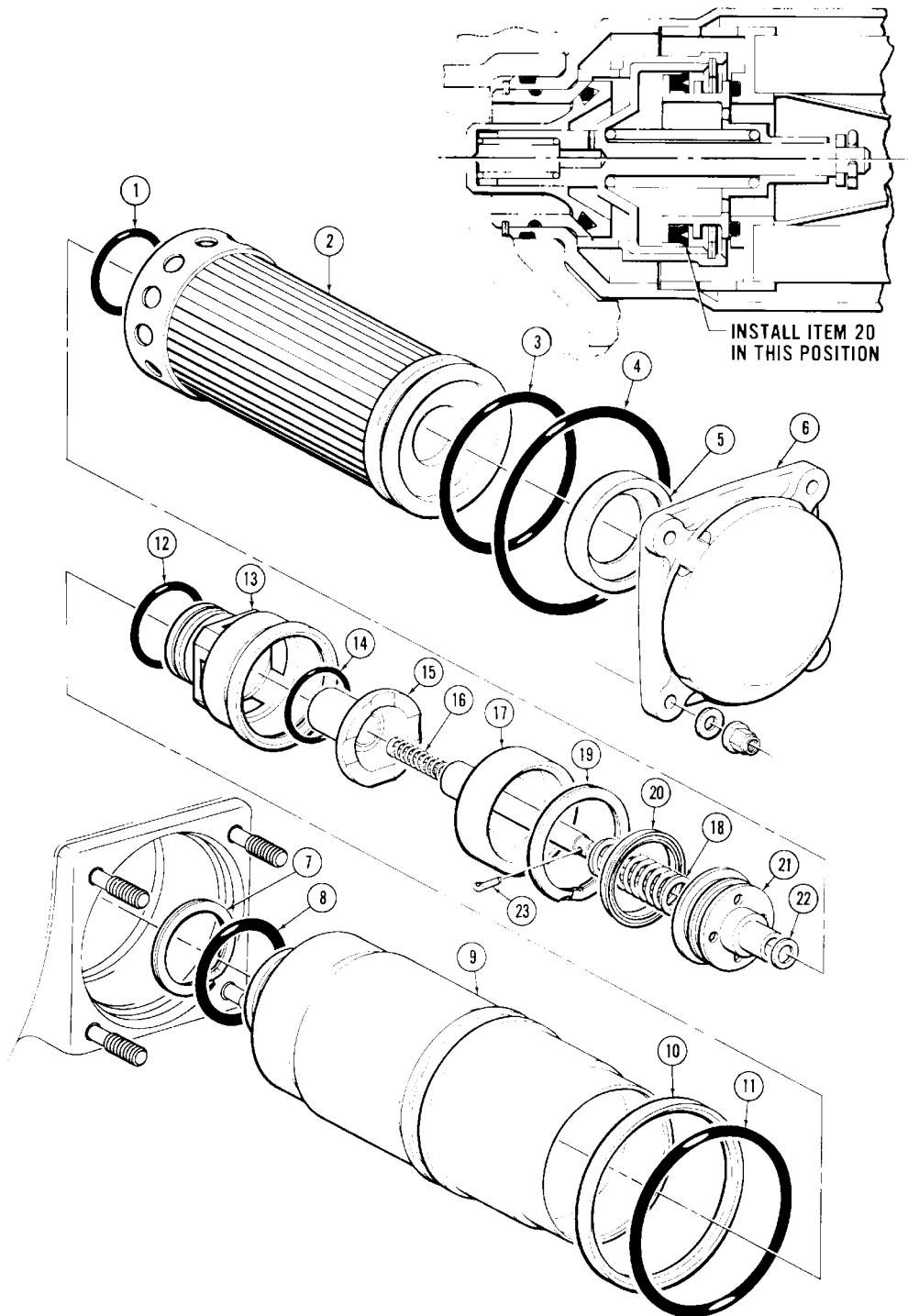
NOTE: The ends of the filter element Post-SB1215 are marked respectively "THIS END IN" and "THIS END OUT".

- (3) Install a new lubricated preformed packing on the filter cover.

NOTE: Make sure the teflon spacer is in position on the lugs of the filter cover.

- (4) Install the filter cover on the compressor inlet case with washers and self-locking nuts. Tighten nuts 32 to 36 lb.in.
- (5) Start engine and do checks associated with Installation/Replacement of Oil Filter, Housing, and Check Valve (Ref. 71-00-00, ADJUSTMENT/TEST, Table 501).

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Post-SB1247 and Post-SB1379

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Removal/Installation of Oil Filter Element, Housing and Bypass/Check Valve - Post-SB1247
 Figure 202

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OIL FILTER, HOUSING AND CHECK VALVE - MAINTENANCE PRACTICES

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Key to Figure 202

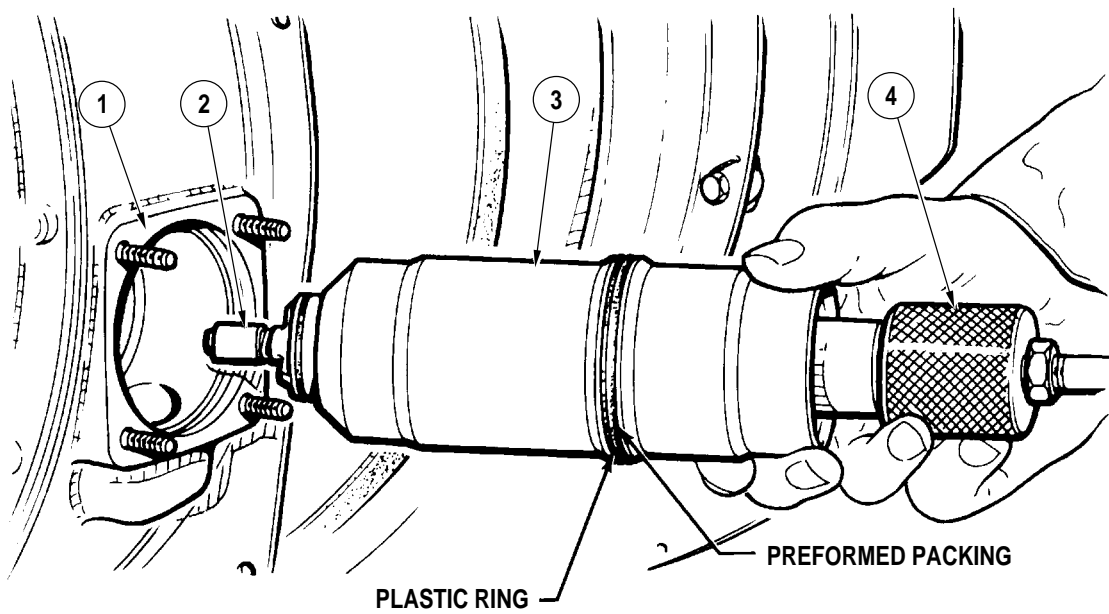
1. Preformed Packing
2. Check Valve
3. Preformed Packing
4. Preformed Packing
5. Teflon Spacer
6. Oil Filter Cover
7. Retaining Ring
8. Preformed Packing
9. Oil Filter Housing
10. Plastic Ring
11. Preformed Packing
12. Preformed Packing
13. Valve Housing
14. Preformed Packing Engines)
15. Check Valve
16. Check Valve Spring
17. Bypass Valve Guide
18. Spring
19. Retaining Ring
20. Preformed Packing (V-type)
21. Bypass Valve
22. Washer
23. Cotterpin

F. Installation of Oil Filter Housing (Ref. Figs. 201 and Fig. 202)

- (1) Install a new preformed packing in the groove at the inner end of the oil filter housing.
- (2) Install a plastic ring in the inner section of the groove at the center of the housing.
- (3) Install a preformed packing in the outer section of the groove and butt against the plastic ring.
- (4) Insert the filter housing assembly into the compressor inlet case and, using hand pressure, push the assembly until firmly seated.

NOTE: Do not apply side loads on the housing while it is being pressed into the inlet case.

- (5) Install the oil filter element (Ref. Para. E.).
- (6) Fill the oil tank (Ref. 72-00-00, SERVICING).



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Removal/Installation of Oil Filter Housing - Typical
Figure 203

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Key to Figure 203

1. Oil Filter Cover Mount Pad
2. Check Valve Collar
3. Oil Filter Housing
4. Oil Filter Housing Puller

(7) Start the engine and do the checks associated with Installation/Replacement of Oil Filter, Housing, and Check Valve (Ref. 71-00-00, ADJUSTMENT/TEST, Table 501).

G. Installation of Oil Filter Check/Bypass Valve Assembly (Pre-SB1247) (Ref. Fig. 201)

- (1) If a new check valve and/or bypass valve is to be installed or if the check valve seat has been re-lapped, proceed as follows:
 - (a) Install the bypass valve spring (10) over the stem on the check valve (2).
 - (b) Install the packing (11) in the inner groove of the bypass valve piston (12), with the open end of the packing facing the outer groove of the piston (Detail A).
 - (c) Install the bypass valve piston over the spring (10) and into the centerbore of the check valve (2).
 - (d) Compress the spring until the stem protrudes from the end of the piston and secure the piston on the stem with a washer (13) and cotterpin (14).
- (2) Make sure the inside of the oil filter housing is clean of all residue.
- (3) Slide the check and bypass valve assembly into the filter housing until seated.
- (4) Hold the valve assembly in position with a suitable fiber drift and install the check valve spring (6) and spring retaining collar (7) on the protruding section of the check valve stem.

NOTE: If a repaired filter housing (Ref. Para. C.) is being reinstalled, make sure the repair washer (22) is installed between the shoulder on the housing and check valve spring.

- (5) Compress the spring with the collar and insert the lockpin (8) through the hole in the valve stem. Release the spring and allow the collar to slip over the lockpin. Make sure the lockpin is completely covered by the retaining collar.
- (6) Carry out a static leak test (Ref. Para. 9.D.).

H. Installation of Oil Filter Check/Bypass Valve Assembly (Post-SB1247) and (Post-SB1379) (Ref. Fig. 202)

- (1) Install the V-type preformed packing (10) on the bypass valve (21). Make sure the packing is installed with the open end of the V facing the outwards as shown.

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- (2) Install the spring (18) on the internal shaft of the bypass valve guide (17). Locate the bypass valve (21) over the shaft and compress the spring to that the shaft protrudes from the end of the valve. Secure the assembly with the washer (22) and cotterpin (23).
- (3) Install the Pre-SB1379 preformed packing (14) on the seat of the check valve (15).
- (4) To improve the oil filter housing check valve sealing, the Pre-SB1379 check valve is replaced with a new Post-SB1379 check valve having no preformed packing groove. Prior to installation, a new check valve and/or seat must be lapped (Ref. Para. 9.B.).
- (5) Install spring (16) in the recess in the external shaft of the bypass valve guide (17). Install the complete assembly in the valve seat (13) and secure with a retaining ring (19).
- (6) Install a preformed packing (12) on the valve seat (13).

CAUTION: PRIOR TO INSERTION OF THE VALVE ASSEMBLY INTO THE HOUSING, MAKE SURE THE PREFORMED PACKING (12) IS CORRECTLY SEATED ON THE VALVE SEAT AND IS NOT DISTORTED.

- (7) Make sure the inside of the oil filter housing is clean of all residue.
- (8) Install the complete assembly of the check/bypass valve in the oil filter housing and secure with retaining ring (7).
- (9) Do a static leak test (Ref. Para. 9.D.).

7. Cleaning

A. General

For periodic cleaning requirements, refer to Chapter 72-00-00.

B. Cleaning of Oil Filter Element (Pre-SB1215)

- (1) If this method of cleaning the filter element, or the method detailed in Para. D. proves to be ineffective, Pre-SB1215 elements may be ultrasonically cleaned at an overhaul facility.
 - (a) Seal central tube opening at both ends of oil filter element with suitable sized rubber plugs.
 - (b) Agitate element for five minutes in clean, unused solvent (PWC11-027) or (PWC11-031).
 - (c) Dry element with clean, dry compressed air or allow the element to stand in a clean environment until dry.
 - (d) Inspect element (Ref. Inspection/Check).

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- (e) Repeat cleaning and inspection, if required, until element is considered serviceable.

NOTE: Use clean, unused solvent for each repeated cleaning operation.

C. Cleaning of Oil Filter Element (Post-SB1215 and Post-SB1282)

CAUTION: DO NOT ULTRASONICALLY CLEAN, PRESSURE FLUSH OR DRY ELEMENT WITH COMPRESSED AIR. SUCH CLEANING AND DRYING WOULD CAUSE DAMAGE TO THE FILTER MEDIA.

NOTE: If this method of cleaning filter element proves ineffective, the alternate method detailed in Para. D. may be used.

- (1) Gently agitate the element in unused petroleum solvent (PWC11-027) or (PWC11-031).
- (2) Allow the element to stand in a clean environment until dry.
- (3) Inspect element (Ref. Inspection/Check).

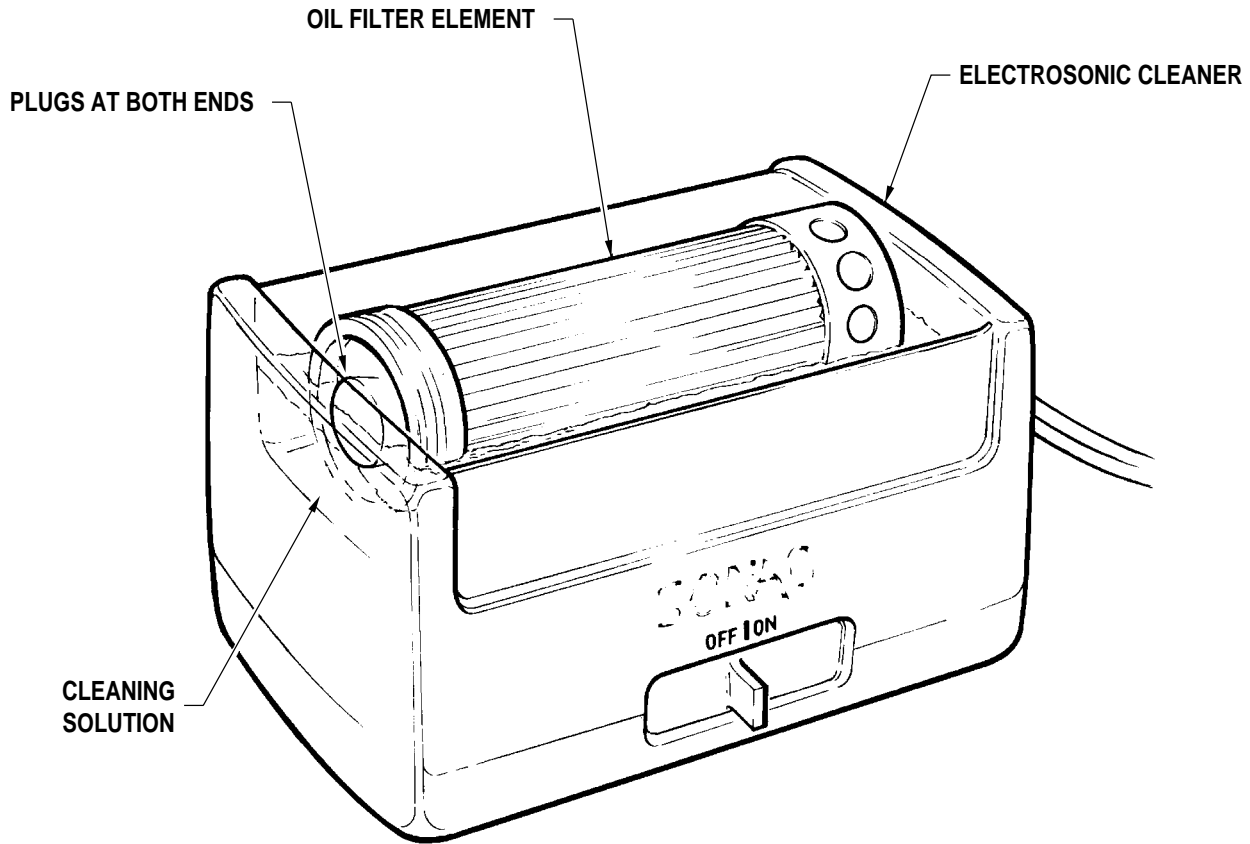
D. Electrosonic Wash (Ref. Fig. 204)

- (1) Plug openings at each end of filter element with suitable plastic or rubber plugs.
- (2) Place element in cleaning tank of electrosonic cleaner.
- (3) Pour sufficient quantity of solvent (PWC11-002) or (PWC11-014) in tank to a level approximately $\frac{1}{4}$ inch below top.
- (4) Operate unit for 10 minutes.
- (5) Rotate element 180 degrees (end-to-end) in tank and reoperate unit for 10 minutes.

NOTE: Cleaning duration should be adjusted depending on condition of element. However, for optimum results, cleaning solvent should be replaced every 20 minutes.

- (6) Using clean, lint-free gloves, remove element from tank and remove plugs.
- (7) Allow element to stand in clean environment until dry.
- (8) Vibropeen cleaning date on end cap.
- (9) Inspect element (Ref. Inspection/Check).

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Electrosonic Cleaner - Oil Filter Element
Figure 204

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8. Inspection/Check

A. Main Oil Filter Contamination and Chip Detector Circuit Completion

- (1) After an engine/module change due to bearing, gear or bronze bushing distress, it is recommended that the replacement engine have an oil filter patch-check (Ref. Para. B.) after 50 hours. This is to make sure the debris from the original failure has not contaminated the replacement engine, due to incomplete flushing of the airframe/propeller oil system(s).
- (2) If magnetic or bronze material is found, as a contaminant, repeat patch check after 50 hours. If the amount of debris has reduced, repeat patch check at 50 hour intervals until no debris (traces are acceptable, except bearing material) is found.
- (3) The time between patch checks should revert to standard maintenance intervals after the second consecutive clean patch check. If the amount of magnetic/bronze material increases or if magnetic/bronze material is found, as a major or minor contaminant, after the second clean patch check, the maintenance action required for debris in oil system must be carried out.
- (4) In all instances when engine generated metal contamination requiring engine removal occurs and the main oil filter is bypassed, the airframe oil cooler must be replaced, (Ref. Aircraft Maintenance Manual) and airframe oil tubes and hoses flushed. Failure to do so will cause contamination of the replacement engine.
- (5) Chip detector circuit completion with main oil filter bypass requires engine removal.

NOTE: An assessment of the amount of contamination can indicate whether a main oil filter bypass has actually occurred. If the main oil filter is cleaned or replaced at regular intervals as recommended by P&WC and debris is deposited on most of the surface of filter element and associated housing, it can be considered that a bypass has occurred.

- (6) Chip detector circuit completion not with main oil filter bypass requires removal and inspection of the chip detector and associated strainers and main oil filter. Do patch-making procedure on main oil filter and transfer any debris from chip detector (Ref. Subpara. B.).
- (7) Inspect chip detector and/or main oil filter debris using a magnifying glass and/or microscope
- (8) After inspection is complete, all debris collected from chip detector and oil filter may be sent to a laboratory for analysis (Ref. 70-00-00, MAINTENANCE PRACTICES).
- (9) Record engine TSN, cycles, category, type and origin of debris for trend monitoring purposes.

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- (10) An operator has the option of doing the filter patch-check or sending the filter to a laboratory for analysis. However, an inspection of the collected debris must be done as quickly as possible to determine the required maintenance action. Keeping a debris generating engine/module in service while removal is planned may substantially increase the cost of repair/refurbishment due to further debris damage.
- (11) Allowable Debris
- (a) Small quantity of hair-like filaments (fuzz) or powder (including bronze particles), spiral curls (machining swarf) and silver plating.
 - (b) If silver plating is found, proceed as follows:
 - 1 If the main oil filter contains a large quantity (15 or more) of silver flakes, the engine oil system must be flushed (Ref. Chapter 72-00-00 SERVICING).
 - 2 If silver flakes greater than 0.080 inch are found in the main oil filter, the AGB internal scavenge pump screen must be inspected (Ref. Chapter 72-60-00, INSPECTION and CLEANING). The engine oil system must be flushed (Ref. Chapter 72-00-00 SERVICING).
 - 3 In both cases after performing the above, the engine may be returned to service, and the oil filter reinspected at the next scheduled inspection (Ref. Chapter 72-00-00, INSPECTION).
 - (c) Collect allowable debris, clean and reinstall main oil filter, strainer, chip detector strainer(s) and chip detector. The engine may be returned to normal operation and oil filter and chip detector inspection to periodic inspection intervals.
- (12) Non-allowable Debris
- (a) Category 1:
 - 1 (Identifiable fragments i.e., keywasher keys, tooth segments, etc.). If non-allowable Category 1 debris is found, replace affected module.
 - (b) Category 2:
 - 1 Large quantities of hair-like filaments (fuzz) or powder (including bronze particles).
 - NOTE: Large quantity is defined as sufficient fuzz and/or powder filaments to completely cover the chip detector magnetic poles or more than 40 particles on a filter.
 - (c) Category 3:
 - 1 Dark irregular magnetic chips (minimum dimension 0.010 in.).

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- 2 Small clusters of magnetic flakes (three or more).

NOTE: Thin, shiny rolled flakes with feathered edges and more than 0.020 in. in size are generated when bearing surfaces break down due to excessive load (spalling). The outer surface of the flakes is highly polished and may show parallel impressions. The inner surface has a rough wavy or granular texture. After the bearing surface breaks down, the underlying material disintegrates and chips with dark, coarse and irregular shapes are produced.

- (13) If non-allowable Category 2 or 3 debris is found and engine/module has no history of generating debris (within 400 hours), proceed as follows:
- (a) Clean and install chip detectors, strainers and main oil filter (Ref. Removal/Installation).
 - (b) Start engine (Ref. 71-00-00, ADJUSTMENT/TEST) and run at 80% T.O. power for 10 minutes .
 - (c) Remove and inspect chip detector, associated strainers and main oil filter (Ref. Removal/Installation).
 - (d) If no debris is found, clean and reinstall chip detector, strainer and main oil filter.
 - (e) Return engine to service. Check chip detector and main oil filter after 10 hours, and providing no debris is found, after 50 hours. If no debris is found at 50 hours, return oil filter and chip detector inspection to periodic inspection intervals.
 - (f) If debris is found, flush engine (Ref. 72-00-00, SERVICING) and powerplant oil system (Ref. Aircraft Maintenance Manual). Install clean chip detector, strainers and main oil filter (Ref. Removal/Installation).
 - (g) Fill engine (Ref. 72-00-00, SERVICING) and powerplant oil system (Ref. Aircraft Maintenance Manual).
 - (h) Start engine (Ref. 71-00-00, ADJUSTMENT/TEST) and run at 80% T.O. power for 10 minutes.
 - (i) Remove and inspect chip detector, strainers and main oil filter.
- NOTE: It is possible that debris originating from power section module is generated by the propeller governor and/or overspeed governor (O/S governor). To determine the actual source of the debris, remove these components individually. Determine the source of debris within 50 hours.
- (j) If no debris is found, install chip detector, strainers and main oil filter. Check chip detector and main oil filter after 10 hours and providing no debris is found, after 50 hours. If no debris is found at 50 hours, return to standard periodic inspection interval.
 - (k) If category 2 or 3 non-allowable debris is found, replace module/engine.

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- (14) If non-allowable Category 2 (not bronze) or Category 3 debris is found and the engine has a history of generating debris (within 400 hours), proceed as follows:
- (a) Review the results of last laboratory analysis.
 - (b) If results showed bearing material and origin was from the engine and not the propeller interface unit or permanent magnetic alternator, then engine should be removed.
 - (c) If results were not bearing material and quantity of debris is not increasing or engine is not consistently generating debris, install chip detector, strainers and main oil filter. Return engine to service. Check chip detector and main oil filter after approximately 10 hours and providing no debris is found, after 50 hours. If no debris is found at 50 hours, return oil filter and chip detector inspection to standard periodic inspection intervals.
- NOTE: Results and origin of debris should be determined within 50 flight hours of original detection of debris.
- (d) If results were not bearing material or results of last sample are still unknown, and quantity of debris is same or increasing and engine is consistently generating debris, replace module/engine at first opportunity within 10 hours of current report of debris.
- (15) If non-allowable category 2 (bronze) debris is found and the RGB has a history of generating similar bronze debris (within 400 hours), proceed as follows:
- (a) If the RGB/power section is confirmed to be a replacement for one removed (within 100 hours) due to bronze bushing distress, clean and reinstall, main oil filter and strainers. Return the engine to service. Check chip detector and main oil filter after 10 hours and providing no debris is found, 50 hours. If no debris is found at 50 hours, return oil filter and chip detector to standard periodic inspection intervals.
 - (b) If the RGB/power section is not a replacement for one removed due to bronze bushing distress and the quantity of bronze debris has not increased, clean and reinstall chip detector, main oil filter and strainers. Return engine to service. Check chip detector and main oil filter after 10 hours and providing no debris (major or minor contaminant) is found at 50 hours, return oil filter and chip detector inspections to operator's standard periodic inspection intervals.
 - (c) If the RGB/power section is not a replacement for one removed due to bronze bushing distress and the quantity of bronze debris is the same or has increased, replace the power section within 10 hours of current report of debris.
- (16) Laboratory report covering analysis of debris (filter patch or chip detector collected). The amount of individual constituents in oil filter patch debris after analysis is:
- (a) Major - when weight of the constituent is more than 50% of the total debris weight.

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- (b) Minor - when weight of the constituent is less than 50% but more than 5% of the total debris weight.
 - (c) Traces - when weight of the constituent is less than 5% of total debris weight.
 - (d) The engine must be replaced if bearing material AMS 6440/6444 or AMS 6490/6491 was found in the debris providing no propeller governor or O/S governor failure , if applicable occurred prior to the generation of debris (i.e., the engine is the source of debris).
 - (e) The engine may remain in service if bearing material AMS 6440/6444 or AMS 6490/6491 was found in the debris and it was confirmed a propeller governor or O/S governor failure occurred prior to the generation of debris (within 100 hours). A chip detector and main oil filter check must be carried out after 10 hours, and providing no debris is found, after 50 hours. If no debris is found at 50 hours, return oil filter and chip detector to standard periodic inspection intervals. If category 2 or 3 non-allowable debris is found, repeat steps (14) and (15).
 - (f) The engine may remain in service if no bearing material (AMS 6444 or AMS 6491) is found and debris is allowable.
- (17) Inspect the following components when gear material is found in non-allowable category 2 and 3 debris.
- (a) Power Section
 - (b) First and Second-stage Planet Gears and Sun Gear
 - (c) Gas Generator
 - (d) Accessory Drive Gears
 - (e) If debris found during inspection is within limits, engine may remain in service providing a chip detector and main oil filter check is carried out after 10 hours and providing no debris is found, 50 hours. If no debris is found at 50 hours, return oil filter and chip detector to standard periodic inspection intervals. If category 2 or 3 non-allowable debris is found, do the maintenance actions steps (14) or (15) as applicable. If defects found are outside limits, replace the affected module within 10 flight hours.

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- (18) The engine may remain in service if any other types of category 2 or 3 debris is found as a major or minor filter contaminant. Check chip detector and main oil filter check after 10 hours and providing no debris is found, 50 hours. If no debris is found at 50 hours, return chip detector and oil filter inspection to standard periodic inspection interval. If category 2 or 3 non-allowable debris is found, do the maintenance actions in steps (14) or (15) as applicable.

NOTE: Air seal material found as a major and minor contaminant when carrying out the first oil filter patch check after installation of a new or overhauled engine is acceptable. However, engine generating seal material (AMS 4117, AMS 4127, AMS 4150, AMS 5613, AMS 5671 or Molybdenum) at a later stage may have had a heavy landing or a defect causing high unbalance (e.g., blade airfoil damage) which can produce seal rub.

B. Patch Making and Chip Detector Debris Transfer

- (1) Remove filter element from engine (Ref. Removal/Installation).
- (2) Using suitable tapered rubber plugs, seal inner cavity of filter element.
- (3) Place filter in cylindrical container.
- (4) Fill container with solvent (PWC11-027) or (PWC11-031) to cover filter element leaving a space for liquid movement when shaking. Install cover.

CAUTION: DO NOT USE ULTRASONIC EQUIPMENT.

- (5) Shake container for about three minutes manually or 30 seconds in a vibrator. Remove cover.

NOTE: Make sure there are no deposits left on filter. If yes, install container cover and continue shaking.

- (6) Use vacuum pump and pour liquid contents of container into the filter holder.

NOTE: Make sure filter holder has new filter paper.

- (7) Flush out all possible loose particles which may still be in container by pouring solvent (PWC11-027) or (PWC11-031) into it, shaking, then emptying into filter holder. Remove filter element from container.
- (8) Remove filter paper from filter holder and place in receptacle. Identify sample with type of filter, engine number and TSN.
- (9) Send sample to laboratory for material spectrographic analysis.
- (10) Remove RGB chip detector (Ref. 72-10-00).
- (11) Dip magnet end in solvent (PWC11-027) or (PWC11-031) to remove oil.
- (12) Transfer debris at magnet end to clear adhesive tape and identify with engine S/N, and TSN or TSO.

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(13) Install chip detector (Ref. 72-10-00).

C. Alternative Patch-Making Procedure

CAUTION: DO NOT USE PATCH-MAKING PROCEDURE AS A CLEANING PROCEDURE FOR FILTER ELEMENTS.

- (1) Remove filter element from engine (Ref. Removal/Installation).
- (2) Using suitable tapered plugs, seal inner cavity of filter element.
- (3) Place filter in cylindrical container.

WARNING: REFER TO MANUFACTURER'S MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIALS INFORMATION SUCH AS: HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES.

- (4) Fill container with teksol (PWC11-048), enough to cover filter element but leaving a space for liquid movement when shaking. Secure cover.
- (5) Shake container for about three minutes manually or 30 seconds in a vibrator. Remove cover.

NOTE: Ensure there are no deposits left on filter. If there is, secure container cover and continue shaking.

- (6) Install new filter patch (PWC05-190) in filter patch holder and place over a suitable container (2 liters or 1/2 gal. min.).
- (7) Remove filter element from container.
- (8) Pour liquid contents of container into filter patch holder.
- (9) Flush out all possible loose particles which may still be in container by pouring some teksol (PWC11-048) into it, shaking, then emptying into filter patch holder.
- (10) Remove filter patch from filter patch holder and place in patch receptacle. Identify sample with type of filter, engine serial number and hours run.
- (11) If any debris is found (particles large enough to be trapped by filter patch), send sample to laboratory for material spectrographic analysis.

NOTE: Some operators retain the filter patches to establish a visual coloration trend. Operators doing this, need to build up their own experience for patch coloration trend evaluation because trends may vary from one engine to another and may be affected by the operating environment and maintenance practices.

- (12) Remove plugs from filter element (ensure the preformed packing does not drop inside the element).

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WARNING: WHEN USING COMPRESSED AIR FOR DRYING, REGULATE TO 29 psig (200 kPa) OR LESS. WEAR GOGGLES OR FACE SHIELD TO PROTECT EYES.

(13) Dry filter element using clean compressed air at 29 psig (200 kPa).

(14) Install filter element on engine (Ref. Removal/Installation).

D. Oil Filter Housing (Pre-SB1247) (Ref. Fig. 205)

- (1) If check valve/housing seating is suspect (Ref. Fig. 205, Face C), inspect both seating surfaces for scoring, scratches, nicks, burrs and foreign matter. No damage is acceptable. Damaged seatings should be lapped (Ref. Para. 9.A.).
- (2) Inspect check valve spring/filter housing mating face (Ref. Fig. 205, Face A) for pitting, scoring and other damage. Scratches and nicks are acceptable up to 0.005 inch deep. Housings with damage in excess of 0.005 inch deep, must be repaired, and a repair washer installed (Ref. Para. 9.C.).

E. Oil Filter Housing(Post-SB1247)

- (1) Inspect check valve preformed packing (14, Fig. 202) for condition by removing the retaining ring (7) and withdrawing the valve assembly from the filter housing. The condition of the packing can be observed by depressing the bypass valve guide (17) and viewing through the windows in the valve housing (13).
- (2) No damage is acceptable; replace preformed packing if necessary (Ref. Para. 6.H.).

F. Oil Filter Housing (Post-SB1379)

- (1) If check valve/housing seating is suspect, inspect both seating surfaces for scoring, scratches, nicks, burrs and foreign matter. No damage is acceptable. Damaged seatings should be lapped (Ref. Para. 9. B.).

9. Approved Repairs

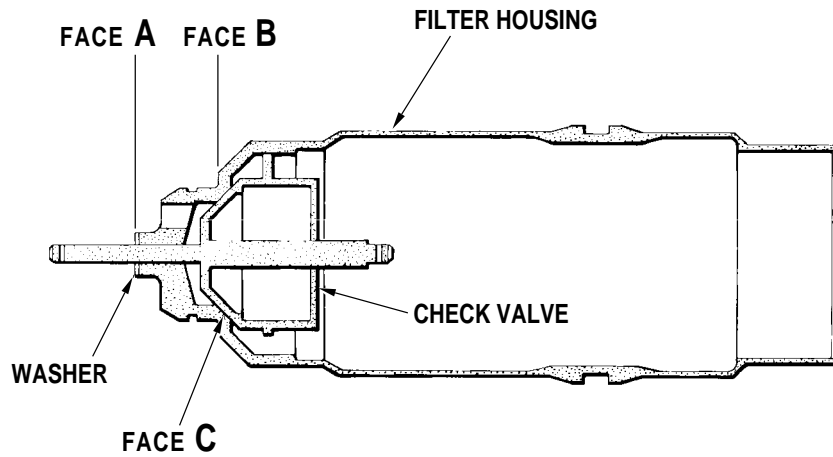
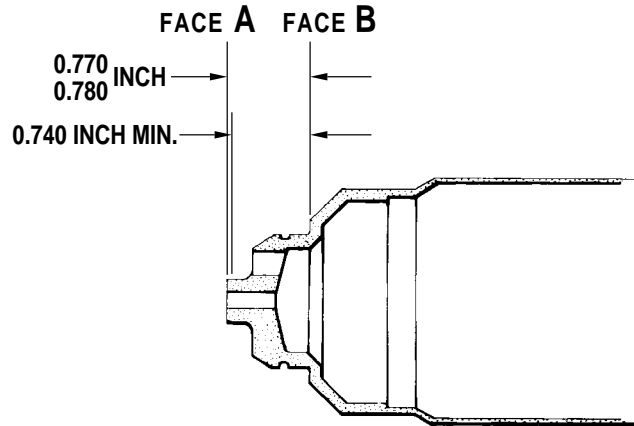
A. Lapping Oil Filter Check Valve (Pre-SB1247)

- (1) Lap face C of the check valve in the filter housing sufficiently to give full 360-degree surface contact; use lapping compound (PWC05-145).
- (2) After lapping, thoroughly wash the check valve and filter housing in petroleum solvent (PWC11-027) or (PWC11-031) to remove all traces of lapping compound.
- (3) If the check valve is to be installed immediately, reference Para. 6.. If not, store in a suitable polyethylene bag.

B. Lapping Oil Filter Check Valve (Post-SB1379)

- (1) If either or both mating surfaces of the check valve and check valve seat are damaged, or if a new part is to be installed, proceed as follows:

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Pre-SB1247

C101

Oil Filter Housing Repair
Figure 205

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- (a) Lap the check valve in the check valve seat, sufficiently to give a 0.050 to 0.060 contact band width over the full 360 degree surface contact, using lapping compound (PWC05-145).
 - (b) After lapping, thoroughly wash the check valve and valve seat in petroleum solvent (PWC11-027) or (PWC11-031) to remove all traces of lapping compound.
 - (2) If the check valve is to be installed immediately, reference Para. 6.H.. If not, store in a suitable polyethylene bag.
- C. Oil Filter Housing Repair (Pre-SB1247) (Ref. Fig. 205)
- (1) In the event of damage to the front face of the housing (Ref. Fig. 205, Face A), proceed as follows:
 - (a) Machine face A, parallel to face B, to a minimum of 0.750 inch from face B.
NOTE: If damage is still evident below this minimum dimension, reject the housing and install a new filter housing.
 - (b) Apply alodine touch-up solution (PWC05-064) to the machined area.
 - (c) In order to restore the original dimensions, face A to face B, of 0.770 to 0.780 inch, a repair washer (22, Fig. 201) must be fitted during the installation of the check valve.
 - (d) At the completion of the repair, tag the filter housing to specify that the fitting of a repair washer is required at installation.
- D. Static Leak Test, Oil Filter Check Valve
- (1) Install the oil filter housing in the compressor inlet case (Ref. Para. 6.E.).
 - (2) Fill the oil tank (Ref. 72-00-00, SERVICING).
 - (3) Do the static leak test:
 - (a) Let the engine stand for two hours. Monitor the oil leakage into the oil filter housing; the maximum leakage permitted is 0.5 cc/hour.
 - (b) If the leakage exceeds the limit, verify the condition of the following preformed packings:
 - 1 Pre-SB1247, item 9, Fig. 201.
 - 2 Post-SB1247/Pre-SB1379, item 14, Fig. 202.
 - 3 Post-SB1247/Post-SB1379, item 8 and/or 12, Fig. 202.
 - (4) If necessary, replace the preformed packings(s) and repeat step (3).

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- (5) If the leakage persists, replace part(s) as necessary and/or repeat the appropriate lapping procedure (Ref. Para. A.) or (Ref. Para. B.).
- (6) Install the oil filter element into the housing (Ref. Para. 6.E.).

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OIL-TO-FUEL HEATER CHECK VALVE - DESCRIPTION AND OPERATION

1. Description and Operation

Two check valves are provided for the oil-to-fuel heater. One valve (minimum pressurizing) is fitted in a ported well at the 2 o'clock position on the compressor inlet case, and is interconnected to the oil inlet side of the heater by a steel tube assembly. This valve, which closes at approximately 40 psig, prevents flow of oil to the heater when the engine is shut down in flight with the propeller windmilling.

The second, the oil return check valve (Ref. 73-10-01), is encased in a tubular housing, and is mated to the oil outlet port of the oil-to-fuel heater and bolted to an adapter elbow at the 12 o'clock position on the air inlet case.

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OIL-TO-FUEL HEATER CHECK VALVE - MAINTENANCE PRACTICES

1. General

- A. Maintenance personnel should make reference to the INTRODUCTION section and Chapter 70-00-00 STANDARD PRACTICES of this manual to familiarize themselves with general procedures.
- B. Install suitable protective caps/covers over all disconnected tubes/lines and component openings.
- C. DELETED.

2. Consumable Materials

The consumable materials listed below are used in the following procedures.

<u>Item No.</u>	<u>Name</u>
PWC11-027	Solvent, Petroleum
PWC11-031	Cleaner, Engine

3. Special Tools

The special tools listed below are used in the following procedures.

<u>Tool No.</u>	<u>Name</u>
PWC30518	Puller

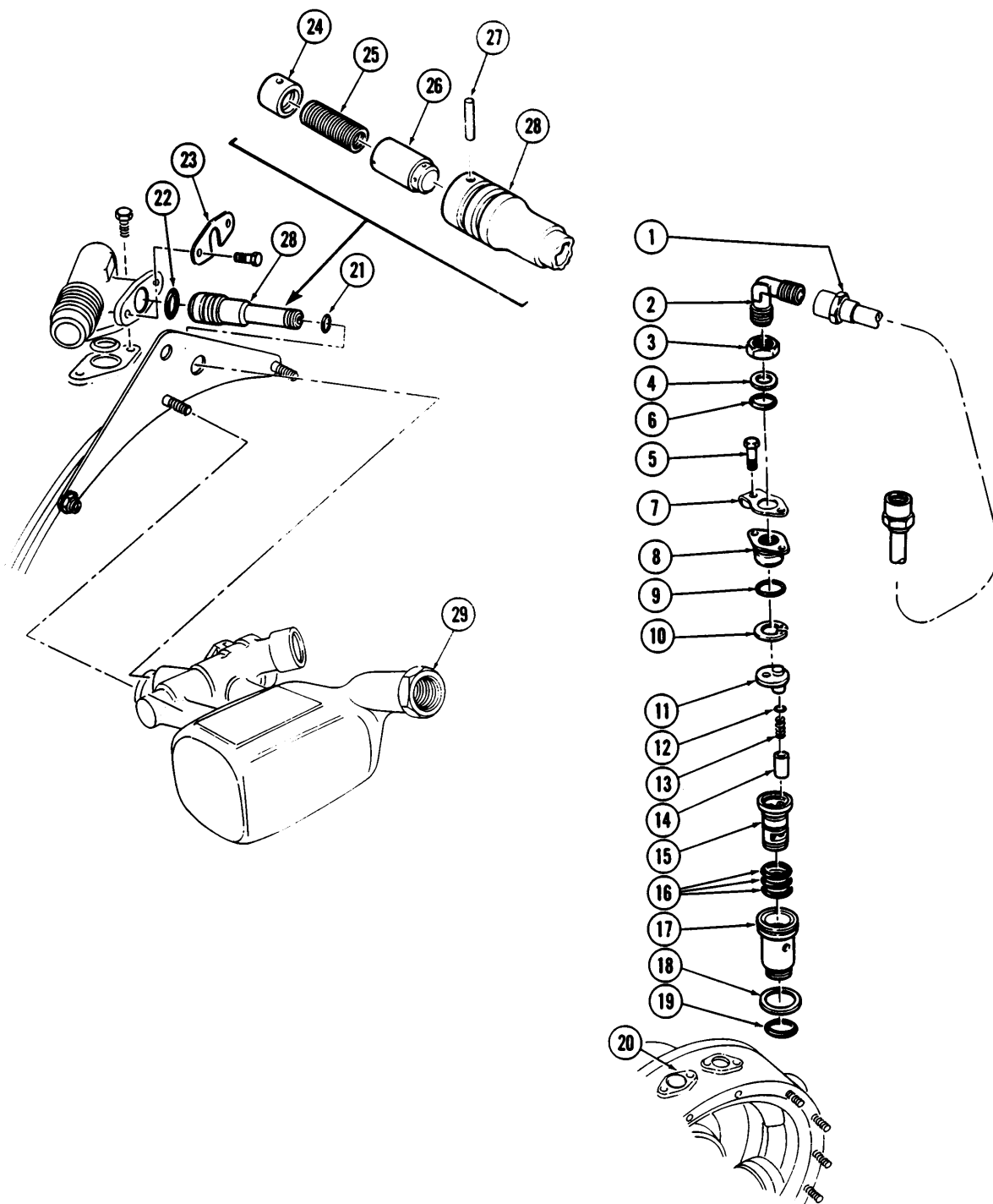
4. Fixtures, Equipment and Supplier Tools

Not Applicable

5. Removal/Installation

- A. Removal of Oil-to-Fuel Heater Check Valve (Ref. Fig. 201)
 - (1) Remove oil inlet tube (1) and oil-to-fuel heater (Ref. 73-10-01).
 - (2) Remove two bolts and remove retaining plate (23) from adapter elbow at top of compressor inlet case.
 - (3) Withdraw check valve housing (28) from adapter elbow and remove preformed packings (21 and 22) from housing.
 - (4) Disassemble oil return check valve assembly:
 - (a) Remove spring pin (27) from valve housing (28).
 - (b) Remove spring seat (24), spring (25) and check valve (26) from housing (28).
 - (5) Remove elbow (2) and locknut (3) from adapter (8) at 2 o'clock position on inlet case. Discard preformed packing (6) and back-up ring (4).

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Removal/Installation of Oil-to-Fuel Heater Check Valve
Figure 201

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Key to Figure 201

1. Oil Inlet Tube
2. Elbow
3. Locknut
4. Back-up Ring
5. Bolt
6. Preformed Packing
7. Fireseal Support Bracket
8. Adapter
9. Preformed Packing
10. Retaining Ring
11. Spring Seat
12. Preformed Packing
13. Spring
14. Check Valve (Minimum Pressurizing)
15. Valve Sleeve
16. Preformed Packings
17. Valve Housing
18. Preformed Packing
19. Preformed Packing
20. Compressor Inlet Case
21. Preformed Packing
22. Preformed Packing
23. Retaining Plate
24. Spring Seat
25. Spring
26. Check Valve (Oil Return)
27. Spring Pin
28. Valve Housing
29. Oil-to-Fuel Heater

CAUTION: TAPE NUT TO FIRESEAL TO MAKE SURE THAT FRONT LOCKNUT SETTING IS NOT DISTURBED. THIS WILL AVOID READJUSTMENT OF REVERSING LINKAGE.

- (6) Release rear locknut securing rear swivel joint and rear fireseal support bracket (7) to fireseal mount ring.
- (7) Remove two bolts (5) and pivot support bracket outwards from engine.
- (8) Remove adapter (8). Discard preformed packing (9).
- (9) Remove retaining ring (10) and remove spring seat (11), spring (13) and check valve (14) from valve sleeve (15). Discard preformed packing (12).

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- (10) Using puller tool, remove valve housing (17) from compressor inlet case.
 - (11) Remove sleeve (15) from valve housing (17), remove preformed packings (16) from valve sleeve, and preformed packings (18 and 19) from valve housing.
- B. Installation of Oil-to-Fuel Heater Check Valve (Ref. Fig. 201)
- (1) Assemble and install minimum pressurizing check valve:
 - (a) Install preformed packing (12) on spring seat (11).
 - (b) Insert check valve (14), spring (13) and spring seat (11) into valve sleeve (15). Secure assembly with retaining ring (10).
 - (c) Install three preformed packings (16) on valve sleeve (15) and insert sleeve in valve housing (17).
 - (d) Install preformed packings (18 and 19) on valve housing (17).
 - (e) Install complete assembly of check valve in ported well on right-hand side of inlet case (20). Ensure assembly is fully bottomed.
 - (f) Install preformed packing (9) on adapter (8). Locate adapter in ported well and align mounting holes.
 - (g) Pivot rear fireseal support bracket (7) inward over adapter (8). Secure adapter and bracket with two bolts (5). Tighten bolts, torque 36 to 40 lb.in., and lockwire.
 - (h) Install elbow (2), locknut (3), back-up ring (4) and preformed packing (6) on adapter (8) (Ref. 70-00-00, REMOVAL/INSTALLATION). Do not final torque locknut (3) until angle of elbow has been established (Ref. Subpara. (3)).
 - (2) Assemble and install oil return check valve:
 - (a) Insert check valve (26), spring (25) and spring seat (24) into valve housing (28). Align holes in seat and housing, and secure assembly with spring pin (27).
 - (b) Install preformed packing (22) on housing (28) and insert complete check valve assembly into elbow adapter at top of inlet case.
 - (c) Secure valve assembly in elbow adapter with retaining plate (23) and two bolts. Tighten bolts, torque 32 to 36 lb.in., and lockwire.
 - (3) Install preformed packing (21) on valve housing (28), and install oil-to-fuel heater (29) and oil inlet tube (1) (Ref. 73-10-01). At installation of tube (1), final torque locknut (3) on elbow (2) 38 to 42 lb.in., and lockwire.
 - (4) Replenish oil tank (Ref. 72-00-00, SERVICING).
 - (5) Check for oil leaks at engine test run (Ref. 71-00-00).

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6. Cleaning/Painting

A. Clean Check Valve

- (1) Clean all components of the minimum pressurizing check valve with petroleum solvent (PWC11-027) or (PWC11-031). Make sure the check valve and interior surface of the respective housings are completely clean.

7. Inspection/Check

A. Inspect Check Valve

- (1) Examine oil return check valve housing for general condition. Raised metal may be removed by light buffing, especially in areas of mating ends.
- (2) Examine the elbow of the minimum pressurizing check valve for the condition of the threads. Light damage may be cleaned up by chasing.

