

CHAPTER 12

SERVICING

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CHAPTER 12

SERVICING

12-10 Main Rotor Gearbox**WARNING**

Refer to appropriate Material Safety Data Sheet (MSDS) and take necessary safety precautions when working in proximity to hazardous materials.

12-11 Servicing**NOTE**

Inspect main rotor gearbox and gearbox lubrication system for leaks when "top off" is required.

NOTE

Verify aircraft is on level ground when evaluating gearbox oil level.

A. Draining Fluid

1. Refer to Figure 12-1. Disconnect chip detector wiring, as required. Remove chip detector from housing.
2. Refer to Figure 12-2. Insert MT054-1 drain assembly into chip detector housing. Position drain hose overboard into a suitable drain container. Jam wedge between support panel stiffener and drain assembly fitting to open valve.

B. Adding Fluid

1. Install chip detector per Section 12-13, if removed.
2. Refer to Figure 12-1. Remove gearbox filler-plug. Fill gearbox with A257-22 lubricant to center of sight glass.
3. Rotate rotor system by hand for several revolutions and pull down on tail rotor gearbox several times. Check gearbox oil level and adjust level as required.
4. Install filler-plug and special torque plug per Section 20-33.
5. Run-up helicopter approximately five minutes at 60-70% RPM per R66 Pilot's Operating Handbook (POH) Section 4.
6. Check gearbox oil level, and adjust level per steps 2 thru 6 as required.

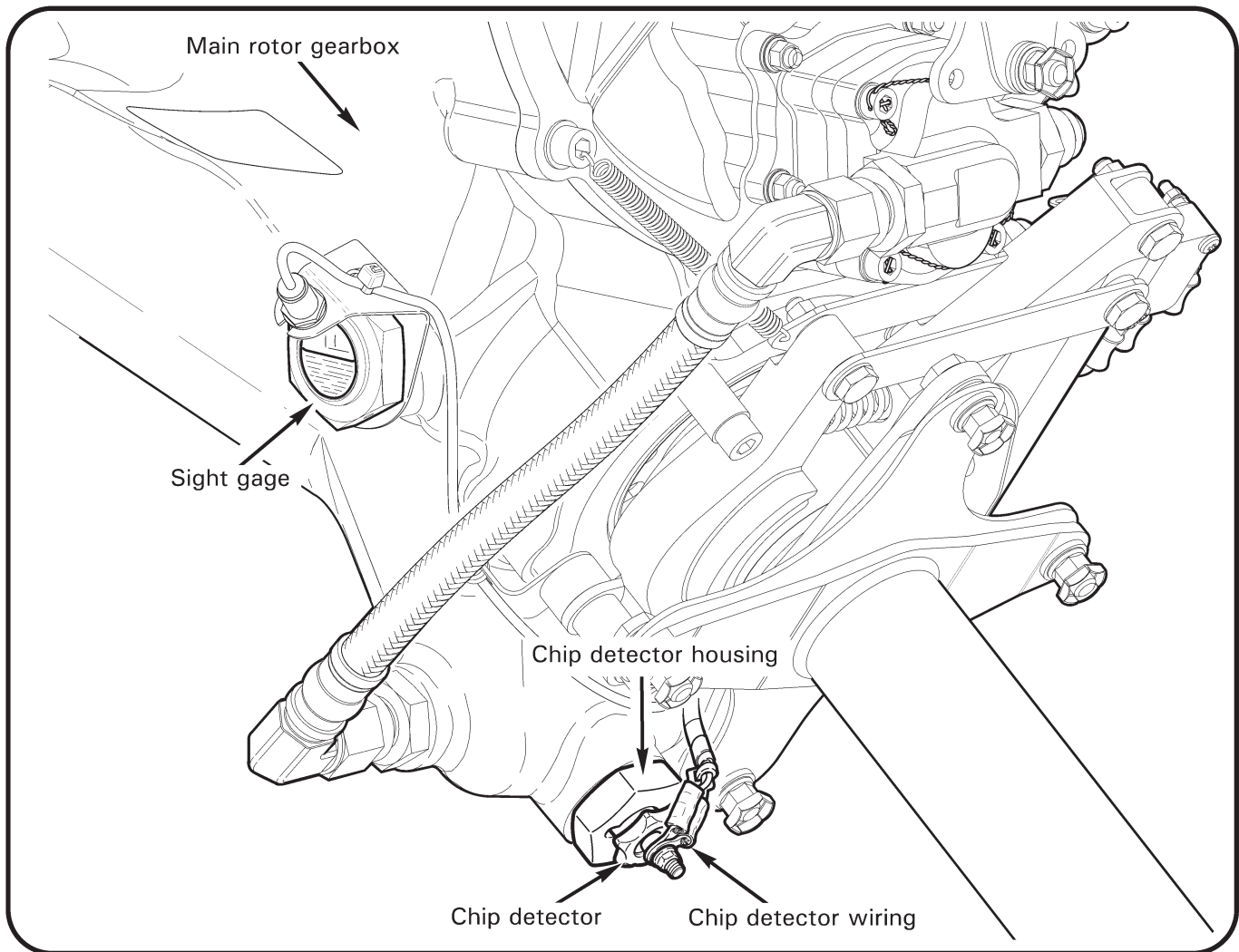
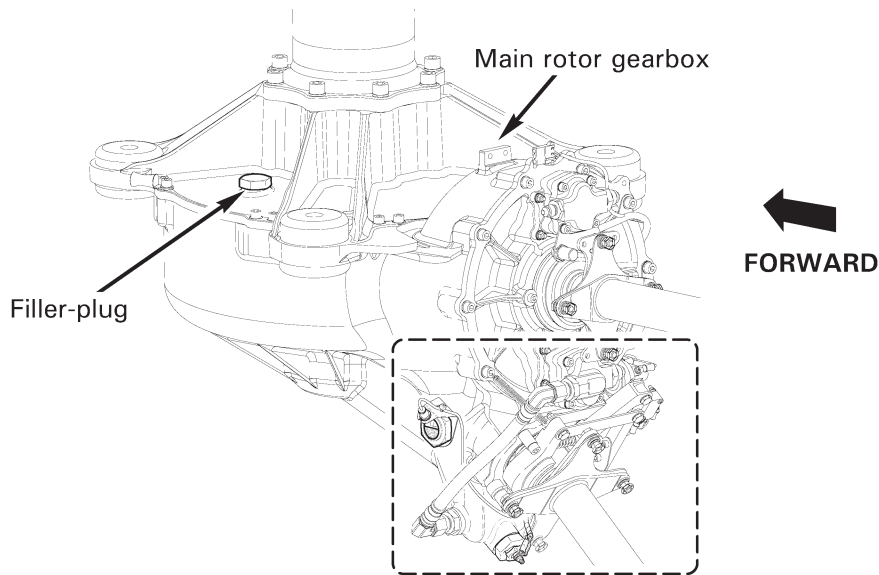


FIGURE 12-1 MAIN ROTOR GEARBOX SERVICING

12-12 Filter Replacement

Refer to R66 Illustrated Parts Catalog (IPC) Figure 63-13.

NOTE

Replace main rotor gearbox oil every 600 hours. When replacing a filter after new or overhauled main rotor gearbox has accumulated 100 hours, replacing oil is not required.

1. Drain main rotor gearbox oil per Section 12-11, if required.
2. Cut and discard safety wire securing bowl & indicator assembly to head assembly. Unscrew bowl and remove and discard element. Remove o-ring and back-up ring from head assembly.
3. Clean and dry bowl assembly; install new F651-3 seals kit and F651-2 element.
4. Hand-tighten bowl assembly until tight against head assembly. Install 0.032-inch diameter lockwire and safety bowl to head.
5. Service main rotor gearbox per Section 12-11.

12-13 Chip Detector and Sight Gage

A. Removal

1. Refer to Figure 12-1. Disconnect chip detector wiring, as required. Remove chip detector from housing.

NOTE

Remove chip detector housing and inspect for obvious damage if housing leaks.

2. Drain main rotor gearbox oil per Section 12-11, if removing chip detector housing or sight gage. Remove housing and/or gage as required.

B. Cleaning Chip Detector (and Housing)

1. Scrub chip detector (and housing, if applicable) with a toothbrush and approved solvent per Section 20-70. To remove debris, use compressed air or masking tape; do not use a magnet. Dry chip detector with compressed air or a lint-free cloth.
2. Refer to Figure 12-1. Connect chip detector electrical wiring and special torque terminal nut per Section 20-33. Turn BATTERY switch ON and ground detector's central magnetic probe to airframe. Verify appropriate CHIP warning segment illuminates. Turn BATTERY switch OFF.

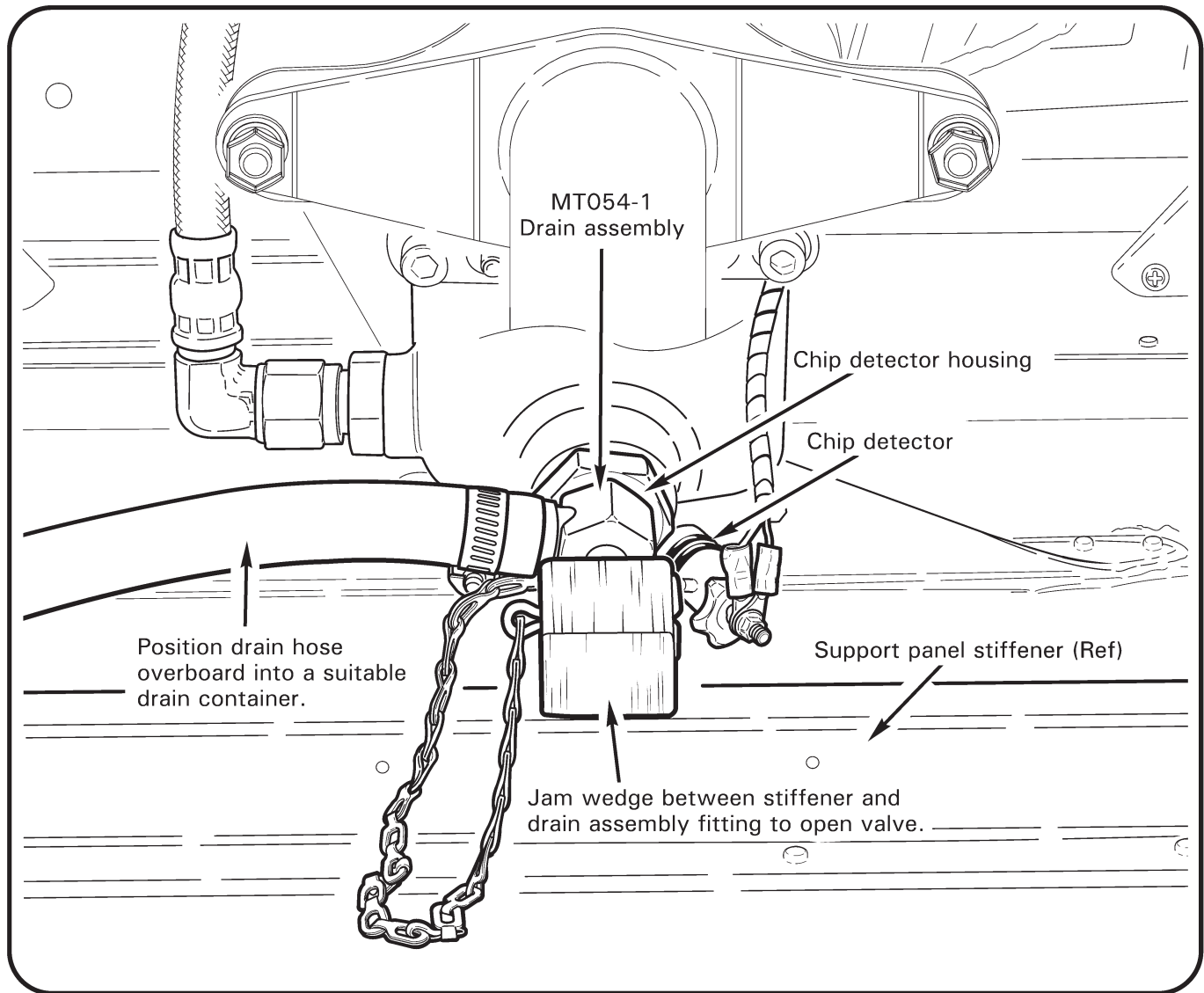
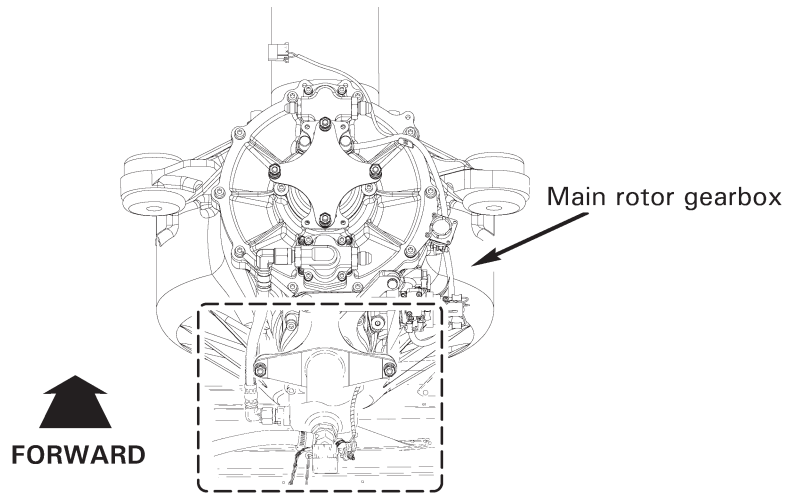


FIGURE 12-2 DRAINING MAIN ROTOR GEARBOX OIL

12-13 Chip Detector and Sight Gage (continued)**C. Installation**

1. Refer to Figure 12-1. Verify cleanliness and clarity of sight gage. As required, remove sight gage per Part A and clean with approved solvent per Section 20-70. Install sight gage and special torque per Section 20-33.
2. Verify cleanliness of chip detector and housing. As required, remove and clean chip detector and housing per Parts A and B. Install housing and special torque per Section 20-33. Install chip detector.
3. Turn BATTERY switch ON. Verify MR CHIP warning segment illuminates when test button is depressed. Turn BATTERY switch OFF.

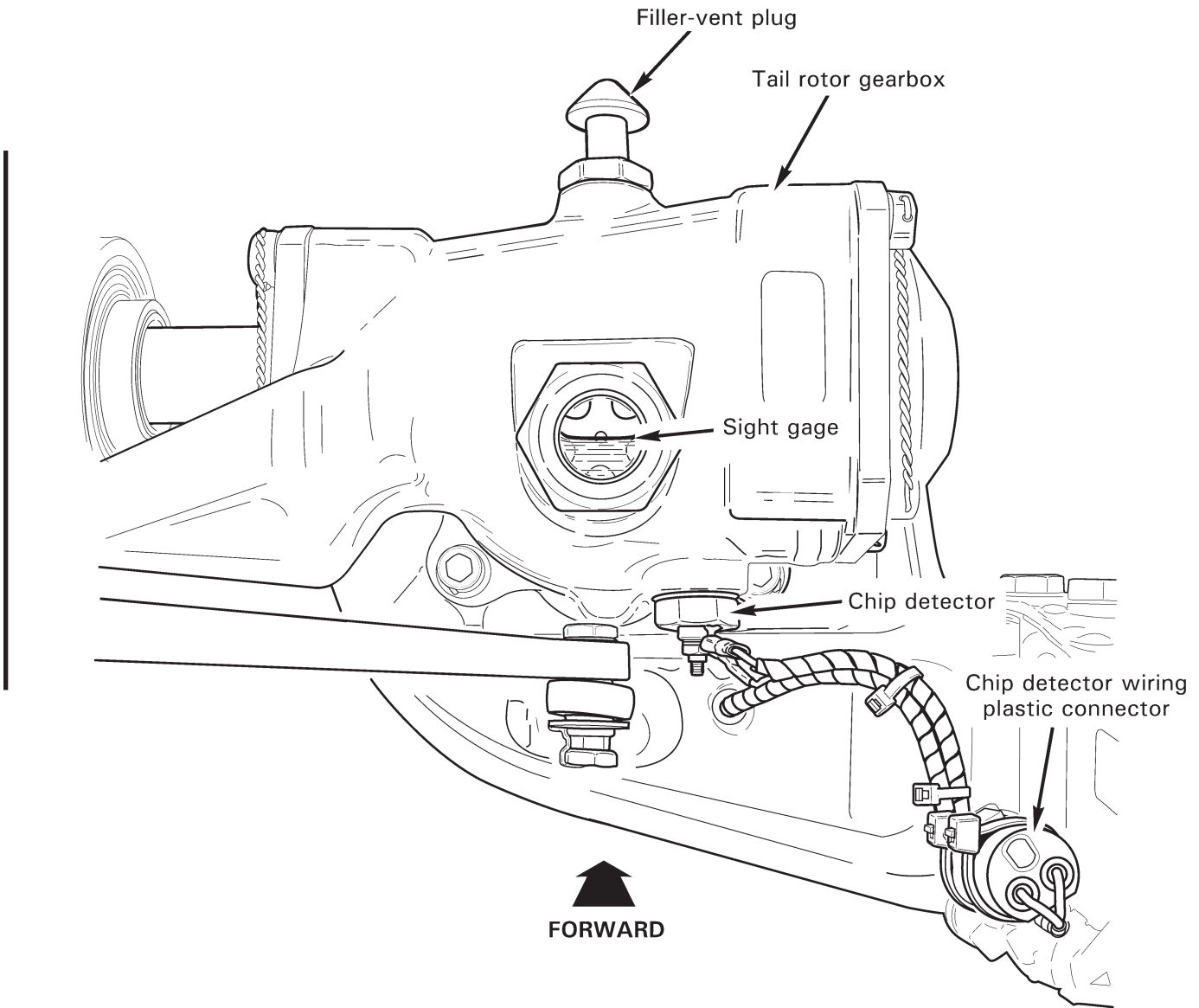


FIGURE 12-3 TAIL ROTOR GEARBOX

12-20 Tail Rotor Gearbox**WARNING**

Refer to appropriate Material Safety Data Sheet (MSDS) and take necessary safety precautions when working in proximity to hazardous materials.

12-21 Servicing**NOTE**

Inspect tail rotor gearbox for leaks when "top off" is required.

NOTE

Verify aircraft is on level ground when evaluating gearbox oil level.

A. Draining Fluid

1. Refer to Figure 12-3. Cut and discard ty-raps as required and disconnect chip detector wiring from airframe harness at connectors.
2. Place a suitable drain container under gearbox to catch oil, then remove chip detector.

B. Adding Fluid

1. Install chip detector per Section 12-22.
2. Refer to Figure 12-3. Remove filler-vent plug and fill gearbox with A257-22 lubricant to center of sight glass.
3. Install plug and special torque per Section 20-33.

12-22 Chip Detector and Sight Gage

A. Removal

1. Drain tail rotor gearbox oil per Section 12-21.
2. Remove sight gage, as required.

B. Cleaning Chip Detector

1. Clean chip detector per Section 12-13 Part B (main rotor gearbox).

C. Installation

1. Refer to Figure 12-3. Verify cleanliness and clarity of sight gage. As required, remove sight gage per Part A and clean with approved solvent per Section 20-70. Install sight gage and special torque per Section 20-33.
2. Verify cleanliness of chip detector. As required, clean chip detector per Section 12-13 Part B (main rotor gearbox). Install chip detector and special torque per Section 20-33.
3. Connect chip detector wiring and install ty-raps, as required. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
4. Turn BATTERY switch ON. Verify TR CHIP warning segment illuminates when test button is depressed. Turn BATTERY switch OFF.
5. Service tail rotor gearbox per Section 12-21.

12-23 Drain and Flush

1. Drain tail rotor gearbox oil per Section 12-21.
2. Install chip detector and special torque per Section 20-33.
3. Remove filler-vent plug and add approximately five ounces of SAE30, SAE40, SAE50, or SAE20W50 straight mineral engine oil to gearbox. Install plug and special torque per Section 20-33.
4. Run-up helicopter approximately five minutes at 60-70% RPM per R66 Pilot's Operating Handbook (POH) Section 4.
5. Drain tail rotor gearbox oil (mineral oil) per Section 12-21.
6. Clean and install chip detector per Section 12-22 Parts B and C.

12-30 Hydraulic System**CAUTION**

Do not contaminate hydraulic fluid. Service hydraulic system with clean fluid from sealed containers, using clean tools.

WARNING

Refer to appropriate Material Safety Data Sheet (MSDS) and take necessary safety precautions when working in proximity to hazardous materials.

12-31 Servicing**A. Draining Fluid**

1. Perform drain and flush per Section 12-33.

B. Adding Fluid**NOTE**

Inspect hydraulic system for leaks when "top off" is required.

1. Refer to Figure 12-4. Remove filler-vent plug. With system filled and bled, fill hydraulic reservoir to center of sight glass with new A257-15 fluid.
2. Install filler-vent plug and special torque per Section 20-33.

12-32 Filter Replacement

1. Refer to Figure 12-4. Remove D516-1 cap and filter and visually inspect element for contaminants. If element is clear, proceed to step 3. If metal contamination is found, use a magnet to determine if metal is ferrous. If metal is ferrous, perform the following:
 - a. Install new filter per steps 3 thru 5.
 - b. After one flight-hour, remove filter and inspect for ferrous metal. If ferrous metal is found upon second inspection, replace hydraulic pump per Section 67-50, then drain and flush hydraulic system per Section 12-33.
2. Discard cap packing. Clean cap with approved solvent per Section 20-70, and dry cap with compressed air or a lint-free cloth. Lubricate new packing with A257-15 fluid and install on cap.
3. Lubricate packing inside new filter with A257-15 fluid and install filter in reservoir. Install cap and special torque per Section 20-33.
4. Service hydraulic reservoir per Section 12-31.

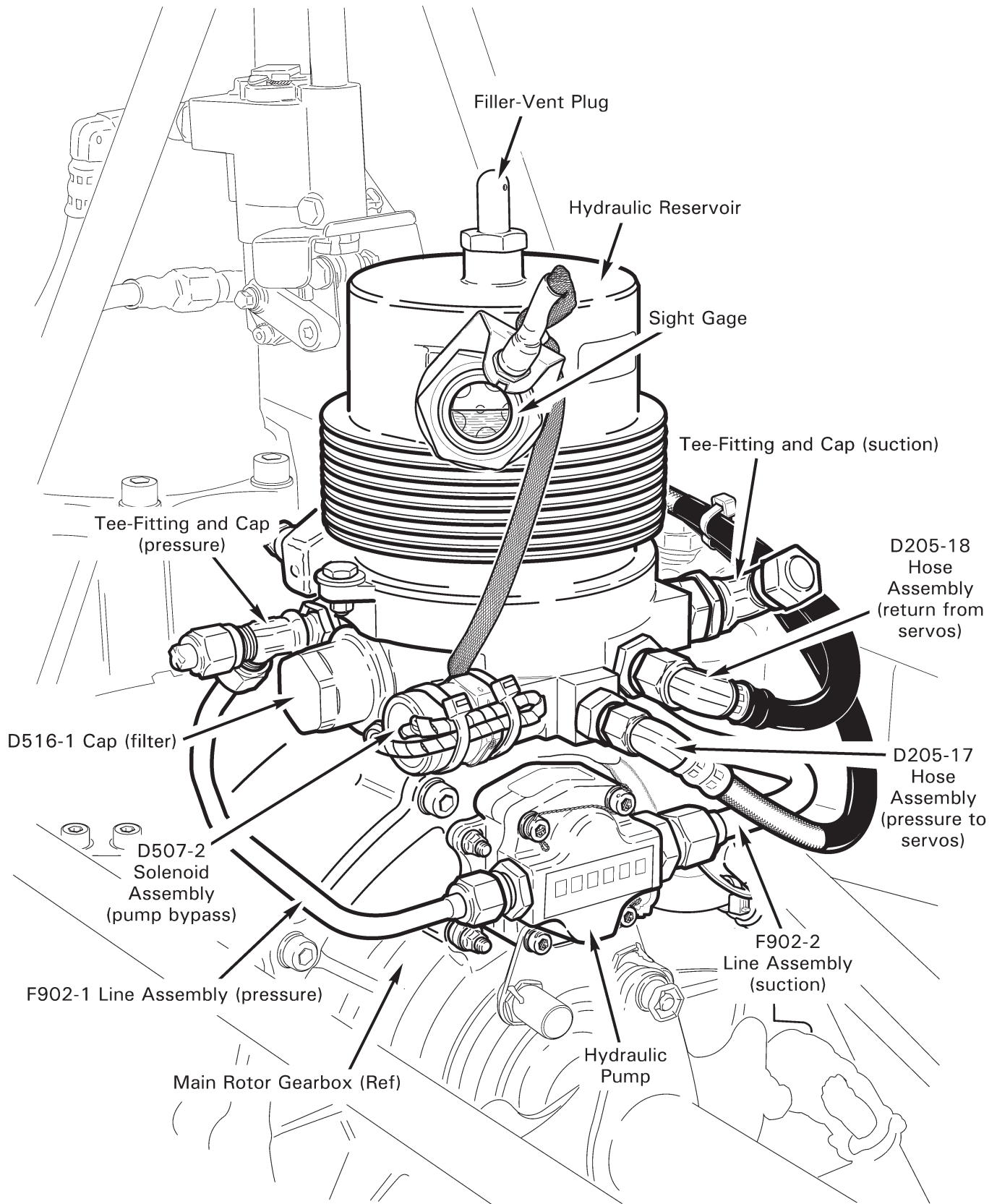


FIGURE 12-4 HYDRAULIC SYSTEM

12-33 Drain and Flush**NOTE**

Drain and flush hydraulic system if oil turns dark or emits bad odor.

WARNING

Keep limbs clear of flight controls when operating test pump. Hydraulic forces can cause injury.

1. Refer to Figure 12-4. Remove filler-vent plug. Place a suitable drain container under F902-1 (pressure) and F902-2 (suction) line assembly T-fittings, and remove caps. Pour small amount of new A257-15 fluid into hydraulic reservoir to purge suction line. Pressure line will drain in following step, when D516-1 cap is removed.
2. Replace filter per Section 12-32.
3. Connect MT384 (or equivalent) 0.8-1.2 gpm hydraulic test pump assembly to T-fittings. (Pressure and suction fittings are different sizes to ensure correct connection.)
4. Service hydraulic reservoir per Section 12-31.
5. Disconnect D205-18 hose assembly (return) from reservoir. Place line into drain container; cap union with a T-fitting cap.
6. Activate test pump and inspect hydraulic system for leaks.
7. Simultaneously fully raise collective and move cyclic fully forward then simultaneously fully lower collective and move cyclic fully aft. Monitor reservoir fluid level and fill as required. Repeat procedure until return line fluid is clean.
8. Simultaneously fully raise collective and move cyclic fully aft then simultaneously fully lower collective and move cyclic fully forward. Monitor reservoir fluid level and fill as required. Repeat procedure until return line fluid is clean.
9. Turn off test pump and disconnect equipment. Remove cap and connect hose assembly (return) to reservoir. Using back-up wrench, standard torque hose nut per Section 20-32 and torque stripe per Figure 5-1. Install caps on T-fittings, special torque caps per Section 20-33, and torque stripe per Figure 5-1.
10. Bleed hydraulic system per Section 12-34.
11. Remove cap and filter and visually inspect element for contaminants. If debris is found, repeat drain and flush procedure. If filter is clean, install filter & cap and special torque cap per Section 20-33.
12. Service hydraulic reservoir per Section 12-31.

12-34 Bleeding**WARNING**

Keep limbs clear of flight controls when operating test pump. Hydraulic forces can cause injury.

1. Remove F902-1 (pressure) line assembly T-fitting cap. Connect MT384 (or equivalent) 0.8-1.2 gpm hydraulic test pump pressure line to T-fitting. (Pressure and suction fittings are different sizes to ensure correct connection.)
2. Remove filler-vent plug and cover hydraulic reservoir hole with finger to prevent fluid loss (until suction line is connected). Remove F902-2 (suction) line assembly T-fitting cap. Connect test pump suction line to T-fitting. Service reservoir with new A257-15 fluid, as required.
3. Activate test pump and inspect hydraulic system for leaks.
4. Simultaneously fully raise collective and move cyclic fully forward then simultaneously fully lower collective and move cyclic fully aft. Repeat procedure ten times.
5. Simultaneously fully raise collective and move cyclic fully aft then simultaneously fully lower collective and move cyclic fully forward. Repeat procedure ten times.
6. Turn off test pump and verify no leaks in hydraulic system.
7. Cover reservoir hole with finger (until suction line T-fitting is capped). Disconnect test pump suction line from suction line T-fitting and install cap.
8. Disconnect test pump pressure line from pressure line T-fitting and install cap. Special torque caps per Section 20-33 and torque stripe per Figure 5-1.
9. Service hydraulic reservoir per Section 12-31.

12-40 Fuel System**WARNING**

Refer to appropriate Material Safety Data Sheet (MSDS) and take necessary safety precautions when working in proximity to hazardous materials.

WARNING

Always fuel helicopter in a well-ventilated area. No smoking within 100 feet of aircraft during fueling.

12-41 Fueling

1. Turn battery switch off.
2. a. **Main Fuel System:** Ground helicopter and ground fuel vehicle. Open fueling cowl door and connect fuel vehicle ground cable to helicopter at location identified by decal.
b. **Auxiliary Fuel System:** Ground helicopter and ground fuel vehicle. Open baggage compartment door and connect fuel vehicle ground cable to aux fuel tank at location identified by decal.
3. Verify proper grade of aviation fuel. See R66 Pilot's Operating Handbook (POH) Section 2 for approved fuel grades and instructions for use of anti-ice additive.
4. Remove fuel cap and fuel helicopter as required.

NOTE

If auxiliary fuel system is installed, press QUANTITY button on aux fuel control panel for aux tank quantity, displayed on fuel quantity gage.

5. a. **Main Fuel System:** Install fuel cap, remove grounding equipment, and close and secure cowl door.
b. **Auxiliary Fuel System:** Install fuel cap, remove grounding equipment, and close and secure baggage compartment door.

12-42 Defueling**A. Main Fuel System**

1. Remove engine cowling per § 53-21.
2. Turn battery switch off. Pull fuel valve control to Off position.
3. Disconnect B283-12 hose at engine and install cap on engine inlet fitting.
4. Position hose into a suitable, grounded drain container.

NOTE

If desired, perform low-fuel switch assembly check per § 28-22.

5. Push fuel valve control into On position and drain fuel; drain residual fuel via sump valve. Pull fuel valve control to Off position. Perform maintenance tasks as required.
6. Add minimum 5 gallons fuel per § 12-41. Push fuel valve control into On position until fuel flows thru hose without bubbles. Pull fuel valve control to Off position.
7. Remove cap from engine fuel inlet fitting. Connect B283-12 hose, special torque hose nut per § 20-33, and torque stripe per Figure 5-1.
8. Defuel engine as required per RR300 Series Operation and Maintenance Manual (OMM).

B. Auxiliary Fuel System

1. Turn battery switch off. Open baggage compartment door.
2. Release D205-35 (drain) hose assembly from tab. Position hose overboard into a suitable, grounded drain container.
3. Open locking drain valve and drain fuel as required.
4. Close drain valve and secure hose near drain valve at tab. Secure baggage compartment door.

NOTE

Alternately, and depending on projected operations and main fuel system quantity, fuel may be transferred from the auxiliary fuel tank to the main bladder using the auxiliary fuel pump (use of external power is recommended).

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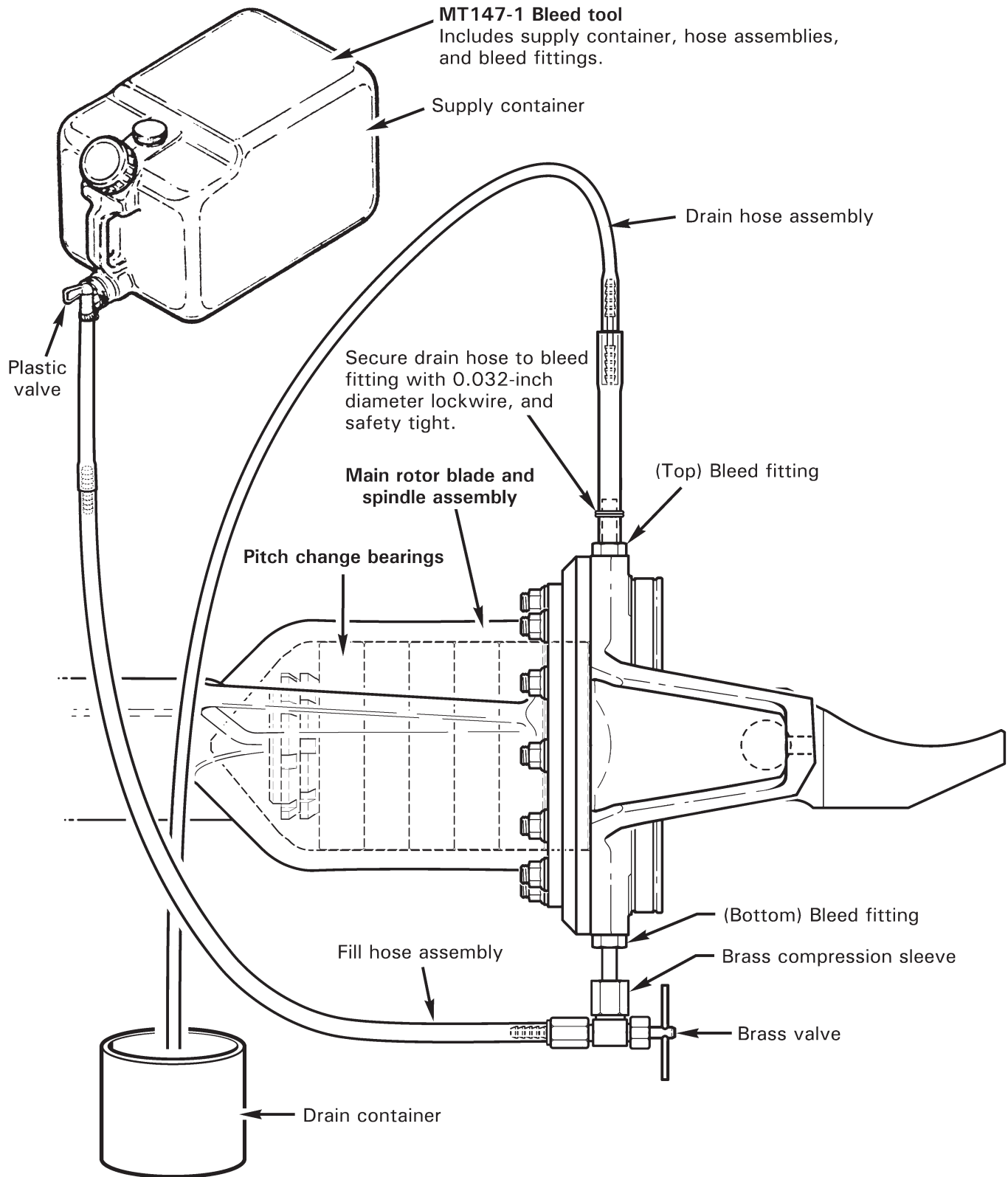


FIGURE 12-5 MAIN ROTOR BLADE PITCH BEARING HOUSING

12-50 Main Rotor Blades**WARNING**

Refer to appropriate Material Safety Data Sheet (MSDS) and take necessary safety precautions when working in proximity to hazardous materials.

12-51 Pitch Bearing Housing**NOTE**

MT147-1 Main rotor blade spindle air bleed tool includes supply container, hose assemblies, and bleed fittings.

A. Servicing

1. Remove main rotor blades per § 62-10.
2. Refer to Figure 12-5. Place a suitable drain container below main rotor blade spindle assembly. Remove two B289-2 bolts and drain fluid.
3. Install MT147-1 bleed tool fittings into ports. Attach drain hose assembly to (top) bleed fitting, secure with two wraps 0.032-inch diameter lockwire, and safety tight. Position drain hose into drain container.
4. Place supply container with sufficient A257-4 fluid approximately 3 feet above spindle. Route fill hose assembly into drain container and open brass valve. Open supply container plastic valve and purge air from hose. Close valves.
5. Connect brass valve to (bottom) bleed fitting by tightening brass compression sleeve.
6. Open valves and fill spindle housing until no air bubbles are visible in drain hose assembly. Massage spindle boot, "pitch" blade up & down, and raise blade tip up & down to remove trapped air.
7. Remove drain hose assembly and (top) bleed fitting, and install B289-2 bolt. Roll the blade over. After five minutes, inspect the boot for leaks. If no leaks are found, close valves, remove fill hose assembly brass valve and (bottom) bleed fitting, and install other bolt.
8. Torque B289-2 bolts per § 20-33 and torque stripe per Figure 5-1.
9. Repeat steps for opposite blade.

12-60 Engine Oil Servicing**A. Draining Fluid**

1. As required, run-up helicopter two to five minutes at 60-70% RPM per R66 Pilot's Operating Handbook (POH) Section 4 to warm engine oil.
2. Remove engine cowling per § 53-21.
3. Place a suitable drain container below B289-2 bolt in bend of F723-1 line assembly, and below AS5169D04 (drain) fitting in F649-1 oil cooler assembly.
4. Remove line assembly bolt and oil cooler assembly (drain) fitting and drain oil.
5. Service the engine oil system per RR300 Series Operation and Maintenance Manual (OMM).

B. Adding Fluid**NOTE**

Do not contaminate engine oil. Service engine oil system with clean fluid from sealed containers, using clean tools.

NOTE

When servicing airframe oil tank, full oil quantity is six quarts; minimum quantity for takeoff is four quarts.

Six quart indication is top of knurled section of dipstick. Four quart indication is bottom of knurled section of dipstick or center of oil tank sight gage.

1. Install B289-2 bolt in bend of F723-1 line assembly and special torque per § 20-33.
2. Install AS5169D04 (drain) fitting in F649-1 oil cooler assembly and special torque per § 20-33.
3. Install engine cowling per § 53-21.
4. Open access door, remove dipstick, and service airframe oil tank using approved turbine engine oil per R66 Pilot's Operating Handbook (POH) Section 8.
5. Install dipstick and close access door.
6. Perform engine test per RR300 Series Operation and Maintenance Manual (OMM) as required.

12-70 (Engine) Compressor Rinse and Wash

Refer to R66 Illustrated Parts Catalog (IPC) Figure 71-9.

CAUTION

See RR300 Series Operation and Maintenance Manual (OMM) requirements for compressor rinse and wash intervals.

CAUTION

Always perform compressor rinse or wash with sufficient clearance for possible rotor system rotation.

1. Remove engine cowling per § 53-21.
2. Open access door and remove (engine) compressor fluid-delivery tube cap.
3. Refer to RR300 Series Operation and Maintenance Manual (OMM) for equipment and material requirements. Operate compressor cleaning system per manufacturer's instructions.
4. Connect appropriate cleaning system hose to delivery tube.
5. Refer to RR300 Series OMM for compressor rinse and wash procedures.

To motor engine without ignition system:

- a. Release rotor brake.
 - b. Turn BATTERY switch ON.
 - c. Verify fuel cutoff pulled OFF. Verify igniter (key) switched OFF.
 - d. Verify area is clear.
 - e. Close throttle.
 - f. Push and release start button as required to maintain N1 speed for required interval.
6. Disconnect cleaning system hose from delivery tube. Install delivery tube cap and standard torque per § 20-32. Close access door.
 7. Refer to RR300 Series OMM for returning engine to service.

To perform ground run:

- a. Refer to R66 Pilot's Operating Handbook (POH) Section 4 for run-up and shutdown procedures.
8. Install engine cowling per § 53-21.

12-80 Air Conditioning System12-81 Refrigerant Recovery and System Charging**NOTE**

In the United States, only personnel with EPA certification under Section 609 of the Clean Air Act may charge the system with refrigerant or work on the refrigerant system once it has been charged. Different requirements may apply in countries other than the United States.

Automotive-style air conditioning service equipment, compatible with R134a refrigerant, is required to recover and charge the system with refrigerant. This equipment is available from many manufacturers in varying levels of automation and complexity. Minimum components include a vacuum pump, pressure pump, refrigerant supply, scale to measure refrigerant charge, pressure/vacuum gage, and appropriate lines and fittings.

Ensure that the technician performing the task is appropriately qualified.

A. Refrigerant Recovery**NOTE**

If a leak or other service problem is encountered after system is charged with refrigerant, refrigerant must be recovered before work on system can proceed.

1. Remove tailcone cowling per § 53-23.
2. Automotive-style high- and low-side system service ports are located on G794 hose assemblies where they mount to the compressor assembly. Connect service equipment to system quick-disconnect ports and recover refrigerant per equipment manufacturer's instructions.

B. System Charging**CAUTION**

Do not overcharge system. Perform leak detection per Section 12-83 if a leak is suspected, then use correct charge.

1. Remove tailcone cowling per § 53-23.
2. Automotive-style high- and low-side system service ports are located on G794 hose assemblies where they mount to the compressor assembly. Connect service equipment to system quick-disconnect ports.
3. Replace desiccant per § 12-82. Vacuum system, then charge with R134a refrigerant per equipment manufacturer's instructions. Correct charge is 2.25 lb (36 oz) refrigerant.
4. Install tailcone cowling per § 53-23.

12-82 Desiccant Replacement

Refer to R66 Illustrated Parts Catalog (IPC) Figure 21-7.

NOTE

Replace desiccant when condenser or refrigerant system is exposed to air. To eliminate moisture, replace desiccant, then immediately vacuum system for charging per Section 12-81.

1. Remove engine cowling per Section 53-21.
2. Recover refrigerant per Section 12-81, if not previously accomplished. Remove condenser cap and replace desiccant.
3. Install cap, special torque cap per Section 20-33, and torque stripe.
4. Charge system with refrigerant per Section 12-81.

12-83 Leak Detection

Leaks may be detected using several techniques, depending on equipment available. Leak detection should not be attempted with the aircraft/system running. In addition to safety hazards, leaks are more difficult to detect with the varying pressures and temperatures of an operating system.

An empty system should hold full vacuum (27 to 29 inches mercury vacuum at sea level) with no assistance from the vacuum pump for 20 minutes minimum. If a vacuumed system creeps up in pressure, a leak may be present. The technician should be thoroughly familiar with vacuum equipment to ensure leak is in aircraft system and not in vacuum equipment or connections.

Leaks in a charged system may be detected using a mild soap and water solution applied to lines and fittings in suspected leak areas (bubbles indicate leaks) or using commercially available electronic refrigerant detectors. Follow detector manufacturer's instructions. Large leaks may be detected audibly if area is quiet or by formation of frost in area of leak.

NOTE

Frost does not necessarily indicate a leak. Normal system operation and/or charging procedures can cause frost to accumulate on some components.

NOTE

System pressure is not a reliable indicator of charge state or the presence of leaks. Because R134a is a liquid/vapor mixture with the system at rest, pressure will remain constant as more liquid vaporizes until majority of charge is lost.

Very small leaks can be detected by charging the system with helium gas. Helium molecules are smaller than R134a molecules and will leak more quickly. Charge system to 200 psi maximum. Use commercially available electronic helium detector or soap and water solution to locate leaks.

Leaks are most likely to occur at fittings and crimped transitions between hard line and flexible hose. Concentrate initial leak detection efforts in these areas.

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