**ON A/C ALL

79–20–00–001

OIL DISTRIBUTION SYSTEM

Introduction

The oil system supplies clean, filtered oil to the engine for lubrication of moving parts and removes any unwanted material.

General Description

Refer to Figures 1 , 2 and 3.

The oil system is a wet–sump system with the oil cooled by an aircraft mounted air–cooled oil cooler. The oil system supplies a constant flow of clean filtered oil to the turbomachine and reduction gearbox bearings to cool and lubricate the running shafts, gears and component surfaces. This flow of oil also carries away any contamination. Air that is trapped in the oil is removed from the system by a cyclonic de–aerator, located at the top of the oil pump pack. Filters in the pressure and scavenge systems remove contaminants from the oil. The filter housings contain impending bypass switches, which sense pressure differential. When a filter is becoming blocked, the switches send a signal to the related Full Authority Digital Electronic Control (FADEC) and the Engine Monitoring System (EMS) to warn of an impending bypass.

Detailed Description

The oil used in the system is contained in a tank that is integral to the LP compressor case. The tank has a sight glass, for viewing the oil quantity, and a filler neck and cap for replenishing the oil supply. A second, smaller, tank is located in the reduction gearbox. This tank is supplied with oil from the main tank. The oil pumps are assembled together as one unit and the entire assembly is installed in a bore located on the LP compressor case.

The Oil system consists of the three sub–systems that follow:

- Pressure system that supplies oil to the reduction gearbox and the turbomachinery
- Scavenge system that returns the used oil to the tank
- Vent and breather system that vents the bearing cavities and removes any air trapped in the scavenged oil.

Pressure System

Refer to Figure 1.

A vane type pressure pump is installed in a pack with the scavenge pumps, on the left side of the Low Pressure (LP) compressor case. Integral passages connect the oil tank to the inlet side of the pump. Oil, under pressure, flows from the pump to the Pressure Regulating Valve (PRV) and to the Air Cooled Oil Cooler (ACOC). A pressure relief valve (cold start valve) returns oil to the tank to prevent a pressure surge during cold engine starting.

The PRV consists of a piston valve and spring in a ported sleeve. The PRV keeps a constant oil pressure above and in relation to the air pressure from the bearing cavities. If oil pump output pressure overcomes the air pressure plus spring pressure, the valve opens a port. Oil is bled from the main pressure line through the port and returned to the inlet side of the pump, reducing the output pressure. Air pressure plus spring pressure overcomes the reduced oil pressure, closing the bleed port at the correct pump output pressure.

Airframe–supplied tubes connect the outlet to the airframe ACOC. From the oil–cooler the oil flows to the pressure oil filter.

On aircraft with ModSum 4–113604 incorporated, the concentric spool is added to the Pressure Regulating Valve (PRV). The PRV maintains the constant oil pressure even in the below zero gravity (g) condition. This is achieved through the concentric spool in the PRV interrupts the oil bypass flow at the above idle condition which eliminates the propeller oil pressure loss. The spring loaded piston at the end of the PRV casing actuates the spool.

The pressure filter removes contaminants from the oil and has a bypass valve to ensure adequate flow if the filter is blocked. From the filter the oil flows to the fuel heater, where it warms the fuel to prevent the formation of ice crystals. From the fuel heater the oil goes to the bearings, air intake anti–icing passages and to the Reduction Gearbox (RGB). Strainers located before the bearings collect any contaminants that may be present in the oil. Oil flows to the RGB auxiliary tank from the turbomachinery. The auxiliary tank is part of the RGB casting and is pressurized when the engine is running. This tank is always full of oil, even when the engine is not running.

Oil, from the auxiliary tank, is distributed through internal galleries to the reduction and accessory geartrains, bearings and to the ac generator, where it is used for cooling. Oil also flows, by internal passages and tubes, to the components that follow:

- Auxiliary feathering pump
- Overspeed governor
- Pitch Control Unit (PCU) pump

Scavenge System

Refer to Figure 2.

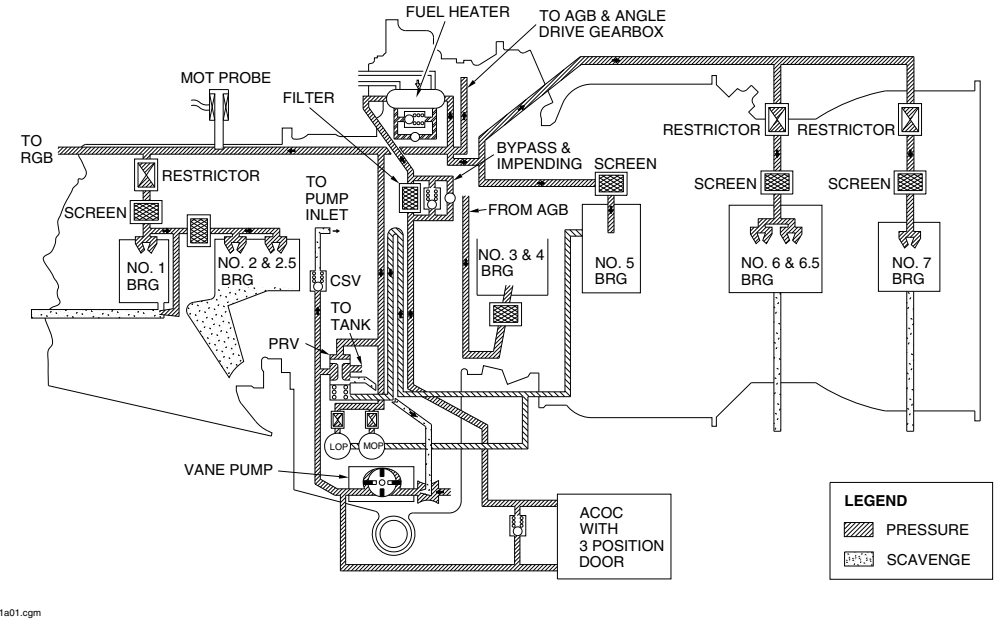
Oil from the No. 1 bearing is scavenged by gravity to the Reduction Gearbox (RGB) cavity. Bearings 2, 2.5, 3, 4, and 5 are scavenged by dedicated scavenge pumps through internal oil passages, while, bearings 6, 6.5 and 7 are scavenged by dedicated scavenge pumps through external oil tubes. Oil located in the Accessory Gearbox (AGB) geartrains and bearings is also scavenged by a dedicated pump. The scavenged oil is collected and sent to the cyclonic de–aerator located at the top of the pump pack. The oil then returns to the tank.

Scavenge oil from the RGB accessories, gears and bearings drains into a cavity in the bottom of the RGB rear housing. A chip detector is located in this cavity, and traps magnetic contaminants that can be used as an indication of RGB wear. From the RGB cavity, oil flows through the inlet duct lip for anti–icing of the intake and then to the RGB scavenge pump. Oil from the ac generator flows past another chip detector, through a screen and then to the ac scavenge pump, which is part of the pack on the turbomachinery. Oil from the ac and RGB scavenge pumps flows up through the scavenge filter to the cyclonic de–aerator and then back to the tank. The scavenge filter housing is equipped with a valve to bypass oil around the filter in the event of blockage . An indicator warns of an impending bypass.

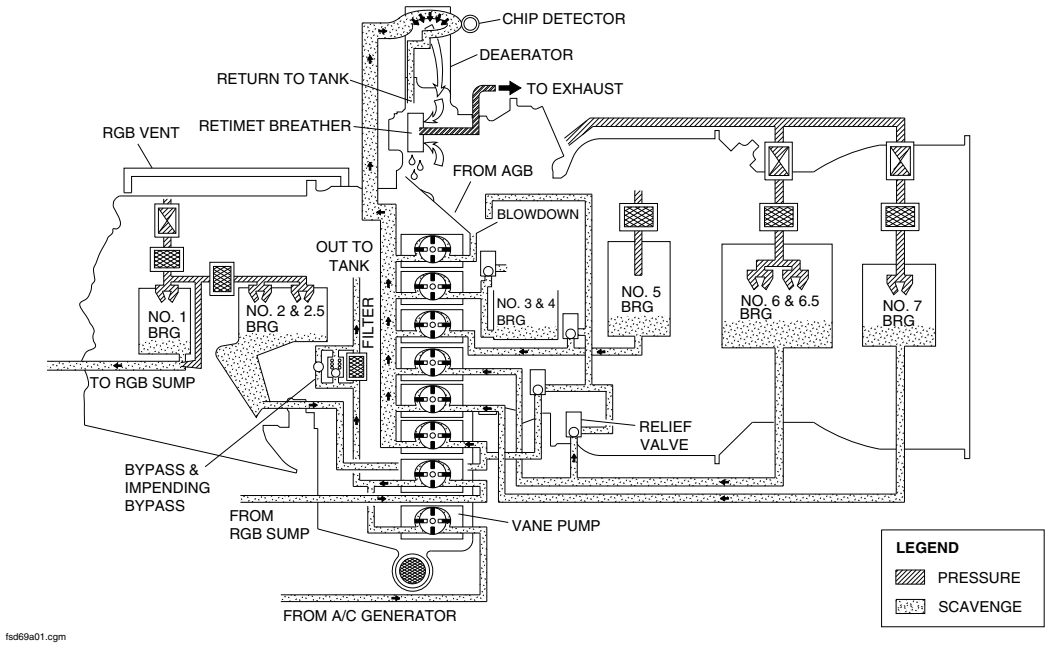
Vent and Breather System

Refer to Figure 3.A cyclonic de–aerator, located at the top of the pump pack, removes any air that is mixed in with the oil. Oil from the de–aerator drains into the AGB and then back to the oil tank. The cyclonic de–aerator housing contains a chip detector which traps

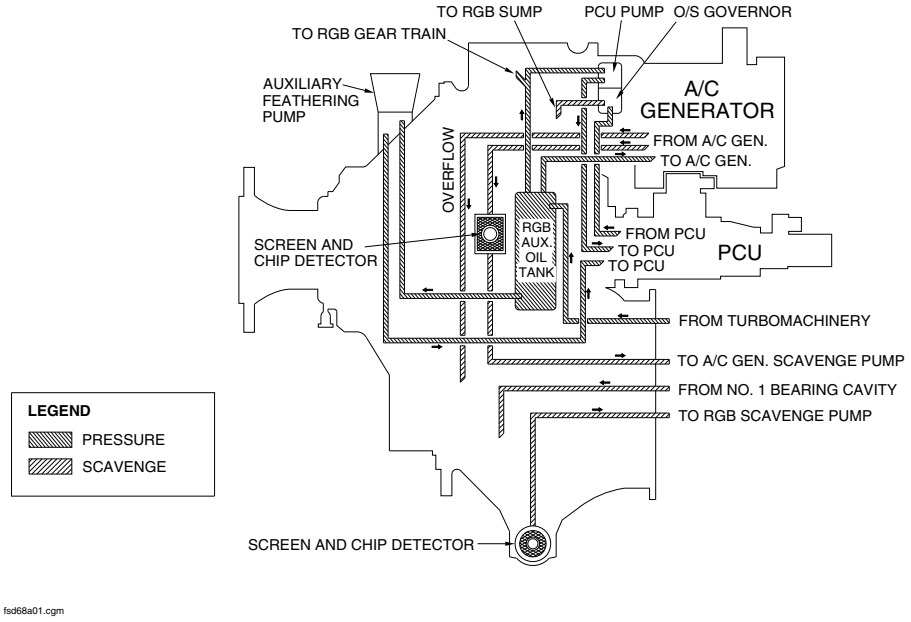
magnetic contaminants. These contaminants can be used as an indication of engine wear.



Oil Pressure System
Figure 1



Scavenge System
Figure 2



Vent and Breather System
Figure 3

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**ON A/C ALL

79–21–00–001

OIL COOLER

Introduction

The oil cooler system keeps the engine oil temperature within limits.

General Description

Refer to Figure 1.

The oil cooler is installed in the oil pressure circuit of the PW150A engines. The assembly is made from the oil cooler unit, the bypass valve, the air inlet duct, and the exit duct. The oil cooler system has the components that follow:

- Oil Cooler (79–21–01)
- Oil Cooler Bypass Valve (79–21–06)
- Exit Duct (79–21–11)
- Oil Cooler Ejector (79–21–16)
- Oil Cooler Ejector Valve (79–21–21)
- Oil Cooler Air Outlet Flap (79–21–26)
- Oil Cooler Air Outlet Flap Actuator (79–21–31).

Detailed Description

The oil cooler uses the air from the engine air intake to decrease the heat in the oil, which then releases to the atmosphere.

The air inlet duct is welded to the oil cooler and is shaped to let the airflow go through it. The exit duct is not part of the assembly, but is supplied with bolts and anchor nuts to attach it. The oil cooler is attached with a twelve bolt/anchor nut configuration between two brackets at the engine firewall structure.

Oil Cooler

Refer to Figures 1 and 2.

The oil cooler unit is a brazed aluminum plate and corrugated fin assembly. There is a small dimension of 1 mm between the fins to keep to a minimum possible blockage caused by contamination. The external parts of the oil cooler are aluminum alloy. A drain plug is installed at the lowest point on the oil cooler.

The oil cooler has the environmental limits that follow:

- Altitude (–1000 to 30000 ft) (–304.8 to 9144 m)
- Ambient Temperature (–65°F to +130 °F) (–54 to 55 °C)
- Oil Temperature (–65°F to +300°F) (–54 to 149 °C)
- System Pressure (375 psig max.) (2586 psig).

Oil Cooler Bypass Valve

The oil cooler bypass valve is installed in the left side and does the functions that follow:

- A thermal function lets the engine oil fully bypass the oil cooler at temperatures below 170°F (77 °C) (above 185°F (85.0 °C) the engine oil continues to go through the oil cooler)

– A pressure relief function lets the engine oil release if the oil cooler becomes blocked during cold oil operation. The pressure relief operates at 23 psid (158.6 kPad).

Exit Duct

The exit duct is attached with a ten–bolt/anchor nut configuration at the rear of the oil cooler. It is also attached with an eight–bolt/anchor nut configuration at the engine firewall structure. The exit duct is a sheet metal component in a shape satisfactory for airflow. It is also a housing for the oil cooler ejector.

Oil Cooler Ejector

Refer to Figure 3.

The body of the oil cooler ejector is made of stainless steel and has 22 holes along its length. It is installed in the exit duct, aft of the oil cooler. The oil cooler ejector operates when the aircraft is on the ground. It uses bleed air from downstream of the precooler to eject at high pressure through the 22 holes. This causes air in the nacelle to be pulled through the oil cooler heat–exchanger.

Oil Cooler Ejector Valve

Refer to Figure 4.

The oil cooler ejector valve is installed on the forward face of the engine firewall. A spring holds it in the closed position when the aircraft is on the ground. An energized solenoid causes the spring to compress and opens the oil cooler ejector valve when the aircraft is on ground. When the aircraft is airborne a de–energized solenoid causes the spring to retract and closes the oil cooler ejector valve.

Oil Cooler Air Outlet Flap

Refer to Figures 5 and 6.

The oil cooler air outlet flap is in the bottom surface of the nacelle, aft of the engine firewall. It is hinged at its forward end and is operated by an actuator. The oil cooler air outlet flap is fully closed when the engine oil bypasses the oil cooler. When it is necessary for the engine oil to be cooled the oil cooler air outlet flap is open at one of three positions. This lets the necessary airflow release to the atmosphere.

When the oil temperature is more than the limit on the ground, the oil cooler air outlet flap is fully open at 32 degrees. The oil cooler air outlet flap is fully closed when the oil temperature is less than the limit on the ground. When the oil temperature is more than the limit when airborne, the oil cooler air outlet flap is open at 5 degrees. When the engine operation conditions are unusual when airborne and the oil temperature is more than the limit, the oil cooler air outlet flap is open at 10 degrees.

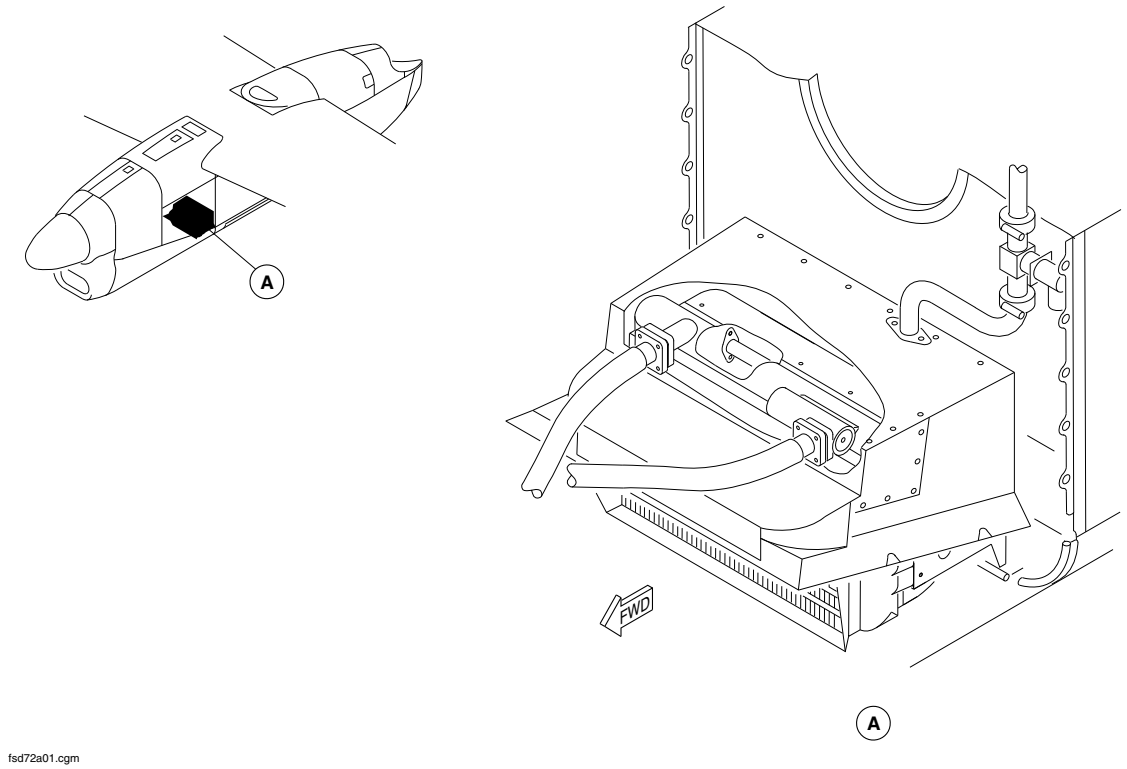
Oil Cooler Air Outlet Flap Actuator

The oil cooler air outlet flap actuator is attached to the nacelle structure and the oil cooler air outlet flap. It receives signals from the Full Authority Digital Engine Computer (FADEC), through the Engine Control Interface Unit (ECIU). The signals give instruction to fully open or close the oil cooler air outlet flap (with two open positions between, if necessary). The time for the travel of the oil cooler air outlet flap actuator with a voltage supply of 26 Vdc is as follows:

– From 0 to 32 degrees on the ground (5 to 8 sec.)

– From 0 to 5 degrees when airborne (1.5 to 3 sec.)

- From 5 to 10 degrees when airborne (1.5 to 3 sec.)
- From 0 to 10 degrees when airborne (3 to 6 sec.)
- From 32 to 0 degrees when airborne (less than 8 sec.).



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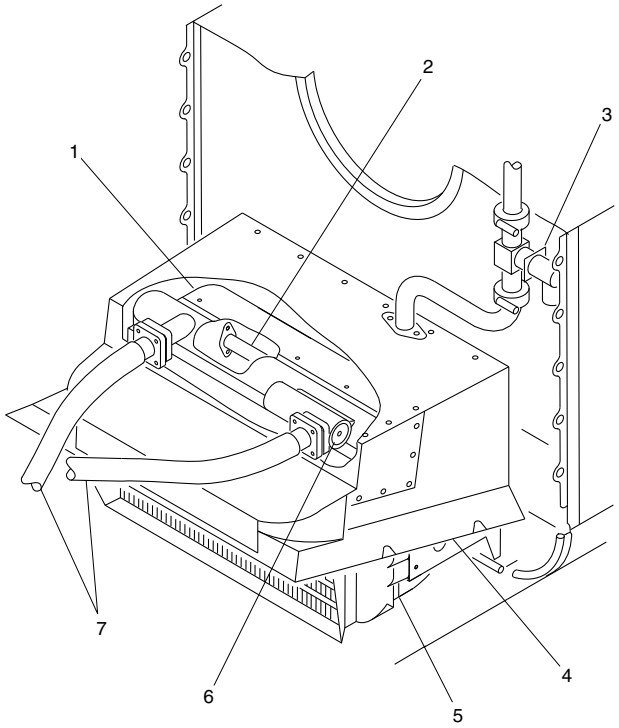
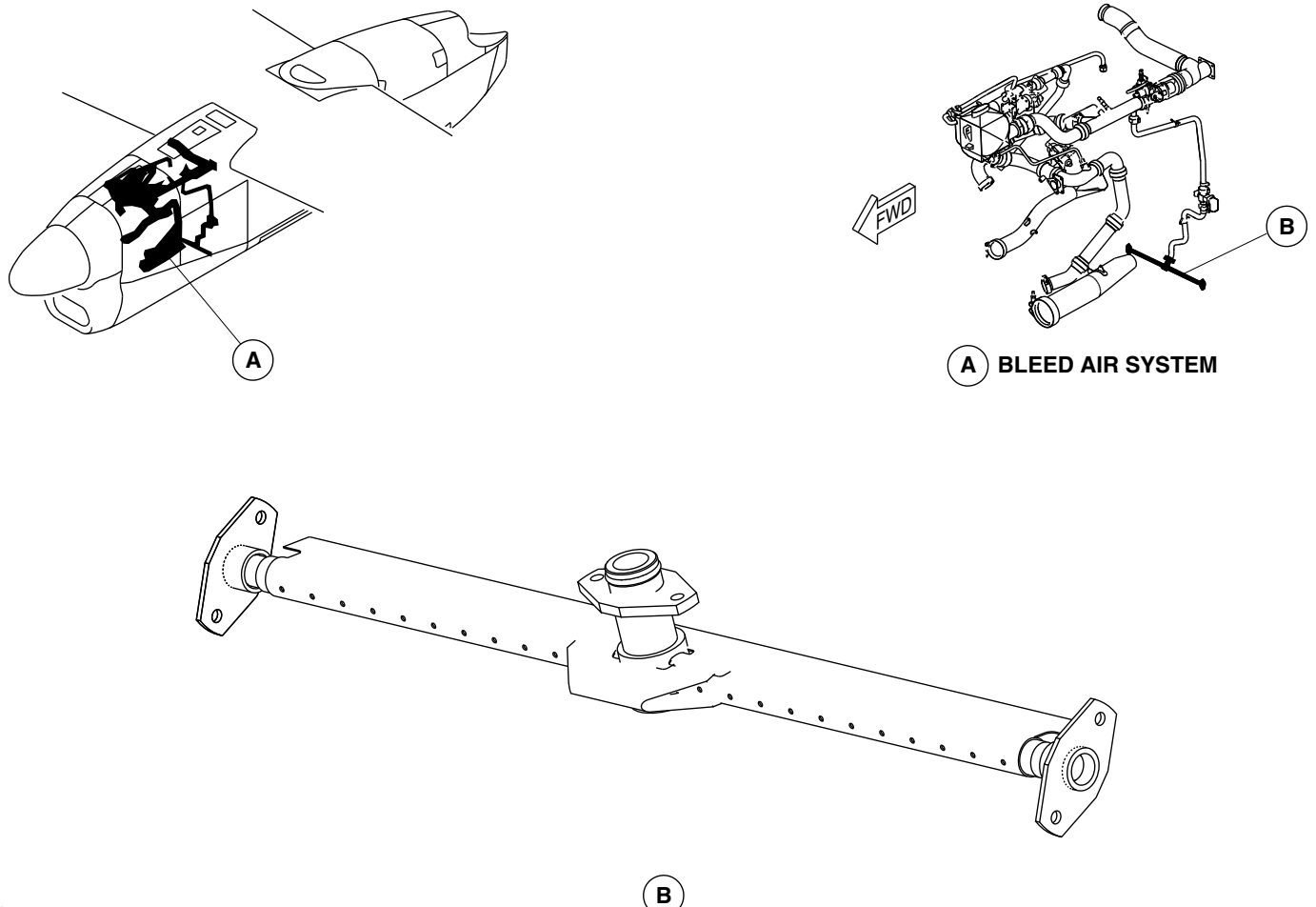
Oil Cooler Locator
Figure 1



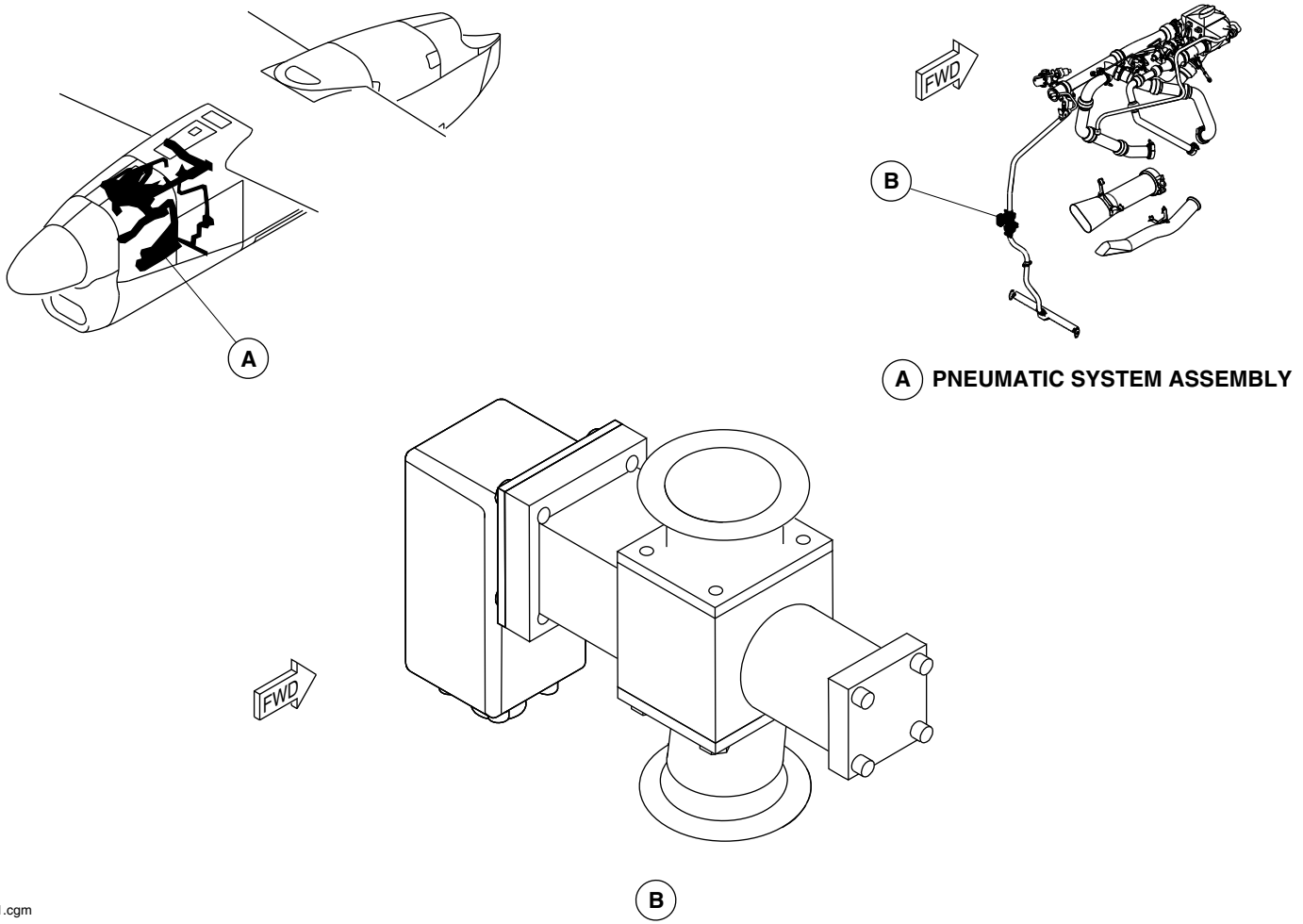
LEGEND

1. Exit Duct.
2. Oil Cooler Ejector.
3. Oil Cooler Ejector Valve.
4. Oil Cooler Cover.
5. Oil Cooler.
6. Oil Cooler Bypass Valve.
7. Hose Assemblies.

Oil Cooler Detail
Figure 2

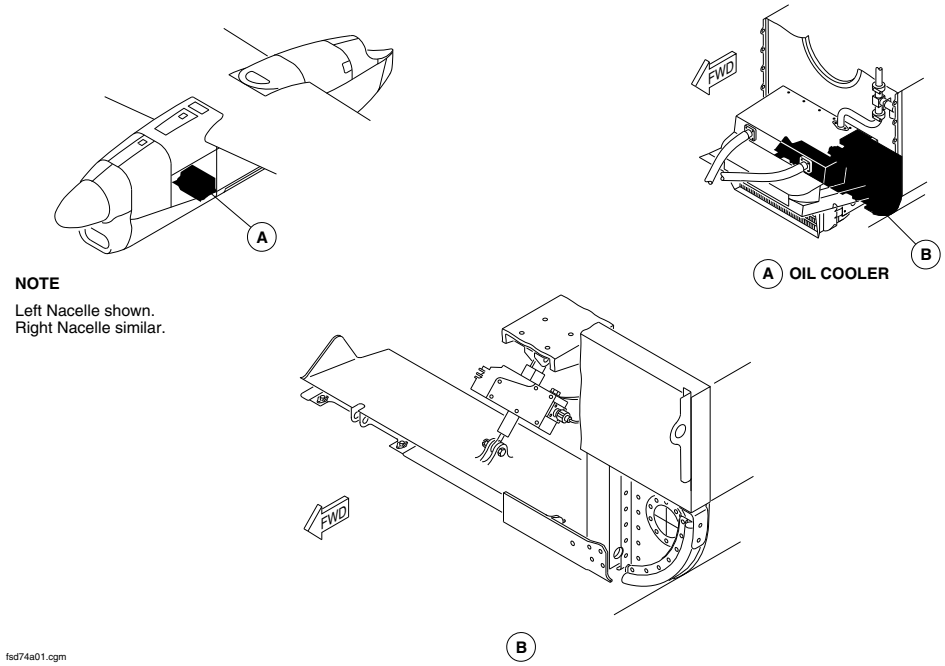


Oil Cooler Ejector
Figure 3

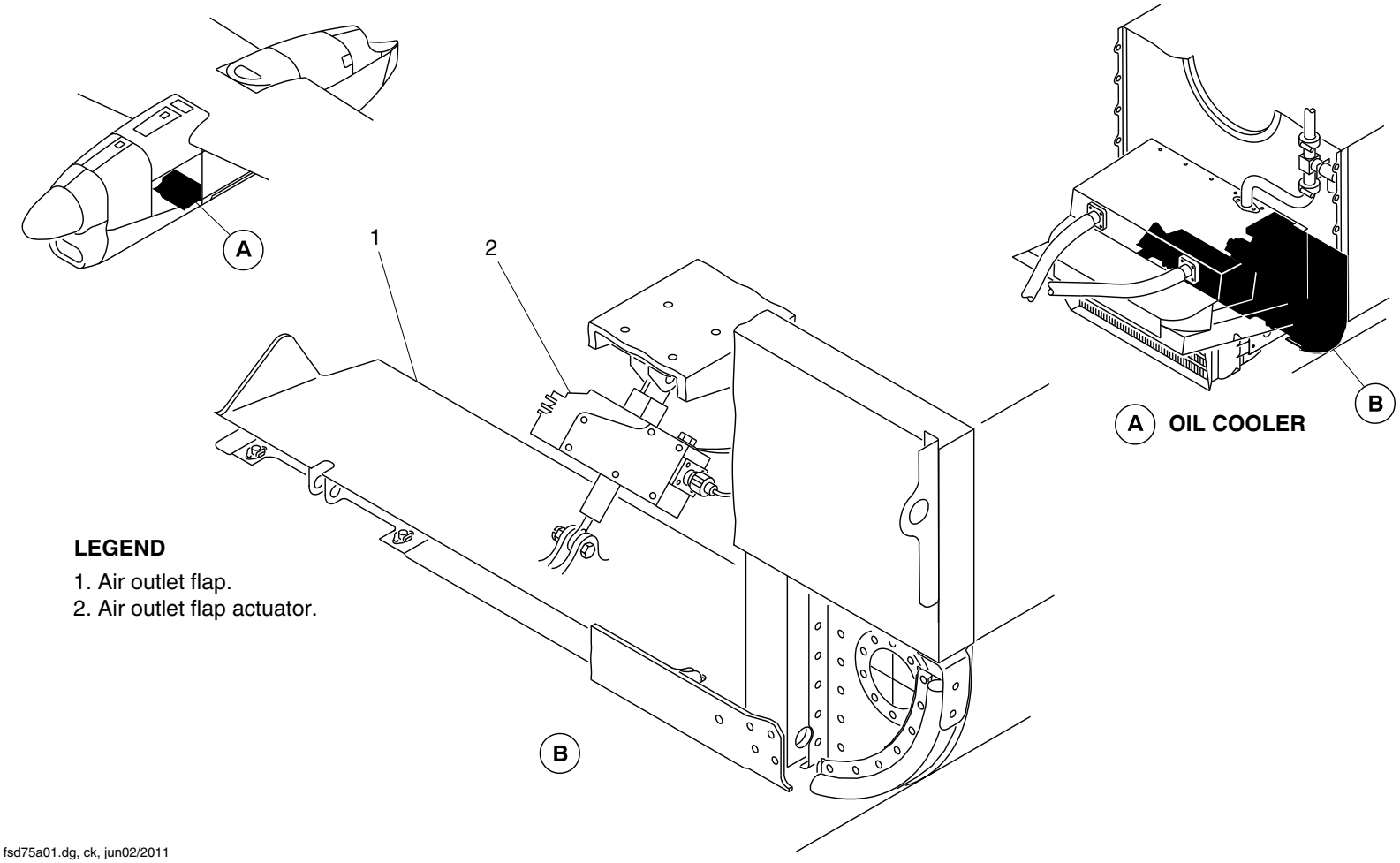


A PNEUMATIC SYSTEM ASSEMBLY

Oil Cooler Ejector Valve
Figure 4



Oil Cooler Air Outlet Flap Locator
Figure 5



LEGEND

1. Air outlet flap.
2. Air outlet flap actuator.

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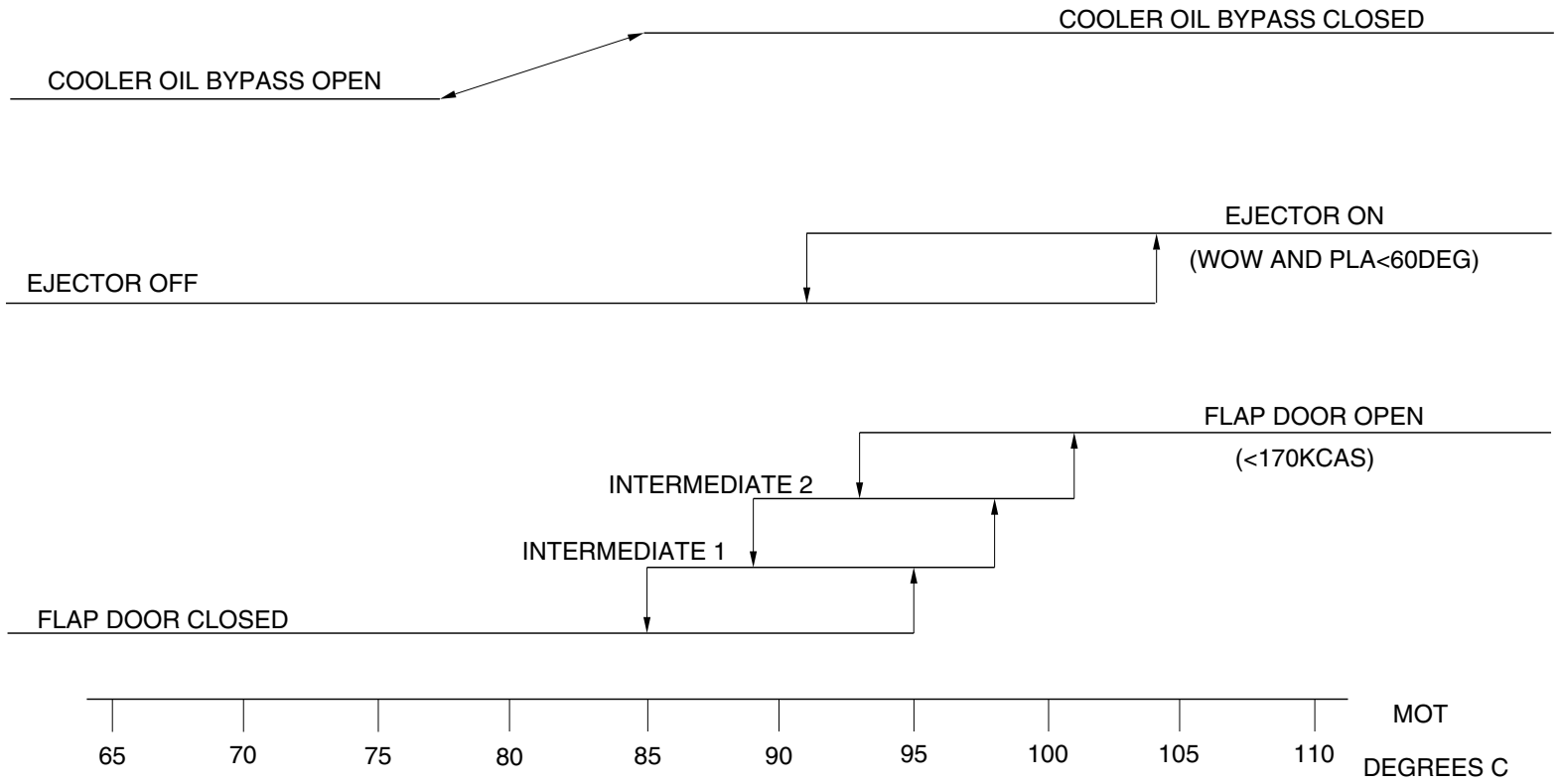
Oil Cooler Air Outlet Flap Detail
Figure 6 (Sheet 1 of 2)



OIL TEMPERATURE CONTROL CHART

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Oil Cooler Air Outlet Flap Detail
Figure 6 (Sheet 2 of 2)

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**ON A/C ALL

79–30–00–001

OIL INDICATING SYSTEM

Remote Oil Level Indication System (Optional)

Refer to Figure 1.

The remote oil level indication system is installed on the Dash 8–400 as an option under CR812CH00006 (written as “system” in this description procedure). The system is non–essential for the operation of the aircraft.

The system gives indication that there is approximately 10 flying hours or less of engine oil (based on normal oil consumption).

The Aircraft Maintenance Manual (AMM) still requires the oil level check using the sight glass and low oil level indicator.

System Description

The system cockpit display consists of two green lights (one for each engine as indicated) and a system interrogation switch with three positions, OFF, LAMP TEST AND LEVEL CHECK. The control panel is located on the pilot’s forward side console.

When the system interrogation switch is selected to “LAMP TEST,” the ENG 1 and ENG 2 has a steady light.

When the system interrogation switch is selected to “LEVEL CHECK,” the ENG 1 and ENG 2 oil level indications are as follows:

- Light steady, oil level is good.
- Light off, low oil level or 10 hours (or less) flight time remaining.
- Light flashing, no valid reading or EMU is being interrogated by the Central Diagnostic System (CDS).

The standard engine oil filler cap/dipstick is replaced by an oil filler cap/sensor assembly. The sensor is a reed type sensor switch set at 10 hours above the oil level where the loss of oil pressure may occur if operating at the top of the engine limits.

FADEC software monitors the oil level reed switch and sends oil level condition to the Engine Monitoring Unit (EMU).

The EMU performs the required logic, verification and monitoring of the engine operation to determine the oil level status.

The EMU checks for oil level status:

- 10 seconds after electrical power up of the FADEC and EMU.
- 60 seconds after engine shutdown.

At electrical power up, EMU oil level status is updated if both:

- Oil temperatures is less than 88°C.
- Reed switch position has been stable for 10 seconds.

At engine shut down, oil level status is updated:

- When engine is running for longer than 15 minutes.
- When the engine is operated between Disc and Flight Idle for more than 2 minutes before shut down (allow for full oil scavenging).
- When the engine has been shut down for 1 to 15 minutes (electrical power to FADEC is “ON”).

– Main oil temperature (MOT) is less than 88°C.

– Reed switch position is stable for a minimum 10 seconds.

The EMU will allow for an update of the switch status if it has changed from open to close indicating that the oil tank has been replenished with the engine running, stabilized idle and shutdown time requirements are ignored.

A flashing indicator lamp means the EMU has been unable to achieve a successful update of the switch position after more than 2.5 hours of engine running time since the last update or the EMU is being interrogated through the CDS.

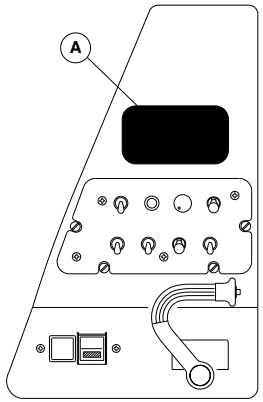
The EMU Oil Level Status is stored in the EMU so that the Oil Level Indicating System can be retrieved at any time (even in–flight) and the control panel is placarded “FOR GROUND TEST ONLY/ENG OFF.”

Any of the following indications is given when the system interrogation switch is selected to “LEVEL CHECK.”

Condition	Flight Compartment Display
Oil level OK	Steady green light
Oil level low	No light
No valid reading	Flashing green light
EMU switch fail	No light
FADEC channel failed	No light

NOTE

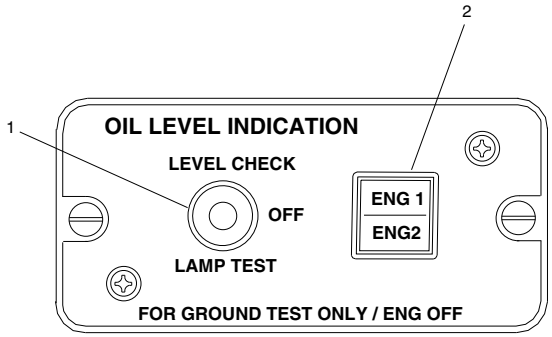
No light indicates that maintenance action is required.



LEFT SIDE CONSOLE

LEGEND

1. LEVEL CHECK / LAMP TEST Toggle Switch.
2. ENG 1 / ENG 2 Annunciator light.



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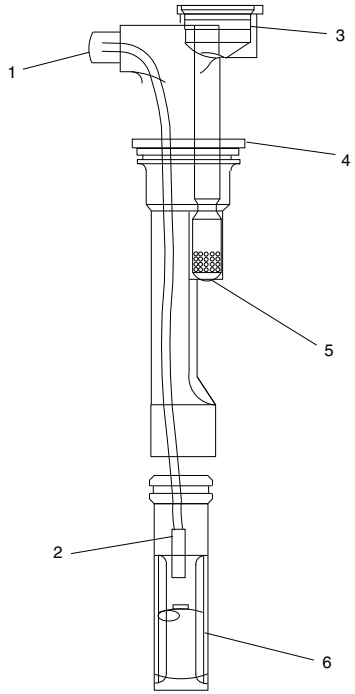
Remote Oil Level Indication System
Figure 1 (Sheet 1 of 3)



LEGEND

1. Electrical connector.
2. Reed switch.
3. Oil cap location.
4. Oil tank mating flange.
5. Ball check valve (Secondary sealing).
6. Float.

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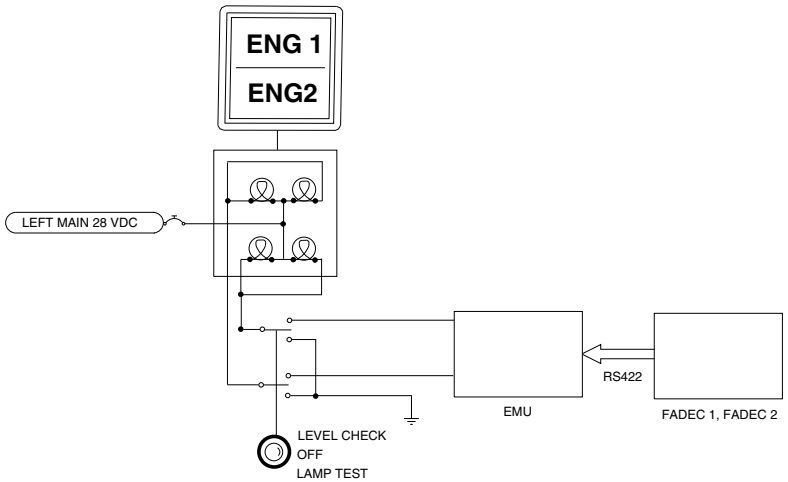
Remote Oil Level Indication System
Figure 1 (Sheet 2 of 3)



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Remote Oil Level Indication System
Figure 1 (Sheet 3 of 3)

**ON A/C ALL

79–31–00–001

OIL PRESSURE INDICATING

Introduction

The purpose of the Oil Pressure Indicating System is to provide the oil pressure status to the flight compartment.

General Description

Refer to Figure 1.

The Oil Pressure Indicating System uses a transducer to determine and transmit the engine oil pressure status to the flight compartment.

Detailed Description

Refer to Figure 1.

The Oil Pressure Indicating System uses a transducer to convert the oil pressure into an electrical signal and compare it to the No. 5 bearing cavity air pressure. An electrical circuit in the transducer outputs a signal to the flight compartment

Oil Pressure Transducer

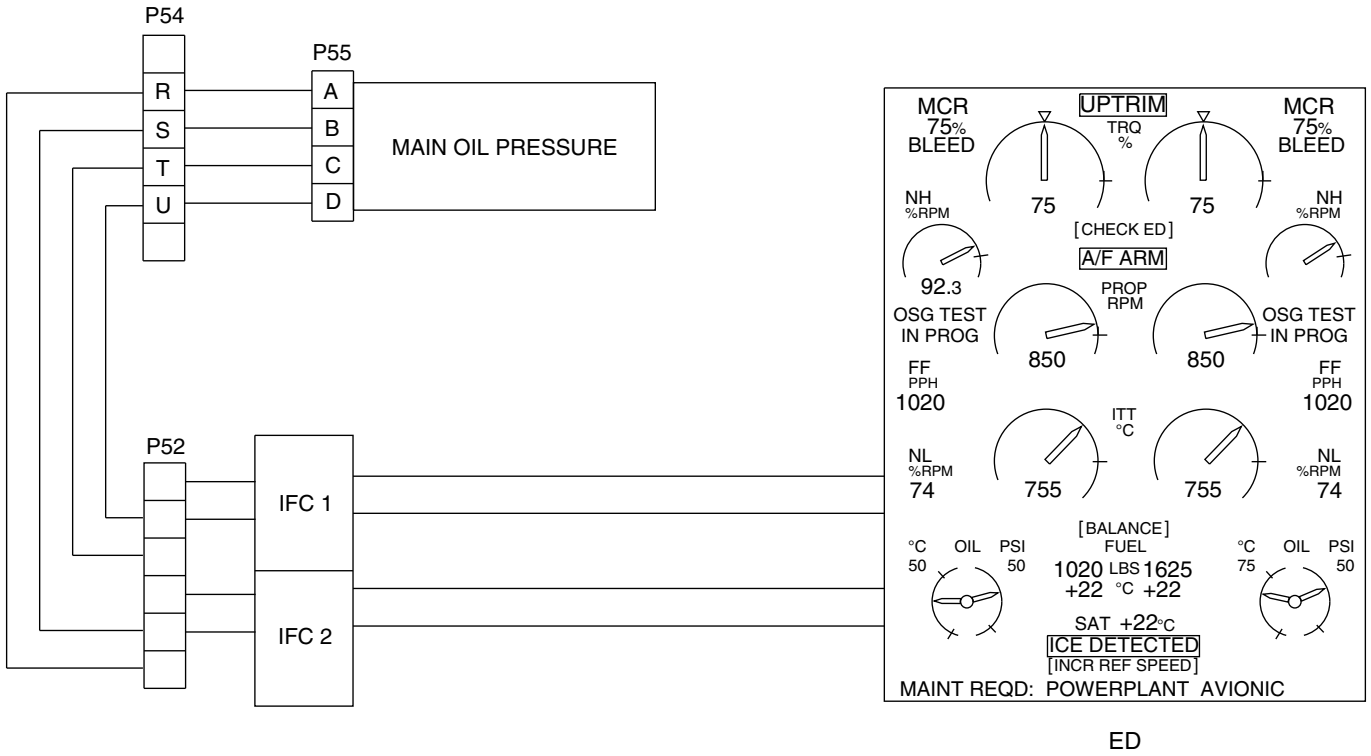
Refer to Figures 2 and 3.

The oil pressure transducer is located at the bottom of the low pressure compressor case on the left side of the engine. It is installed in an oil wetted cavity and is held in place with two bolts and sealed with preformed packings. The P55 wiring harness connector is connected to the transducer. This connector transmits the transducer signal to the flightdeck through the wiring harness. A ground strap connects the housing of the transducer to the low pressure compressor case.

Refer to Figure 4.

The oil pressure transducer has a housing, an inlet port and a reference port, two pressure sensing elements, an electrical circuit board and a connector. The elements have two channels to provide for a backup if one channel fails. The interior of the transducer is filled with foam to prevent moisture ingress. The transducer is a welded assembly and cannot be disassembled in the field.

During engine operation, oil enters the inlet port and pushes on the pressure sensing element. The element converts the oil pressure to an electrical signal. Air from the No. 5 bearing cavity enters the reference port and pushes on the second pressure sensing element. This element converts the air pressure to an electrical signal. The two electrical signals are processed by the electrical circuitry and a signal is output and transmitted through the electrical wiring harness to the flightdeck.



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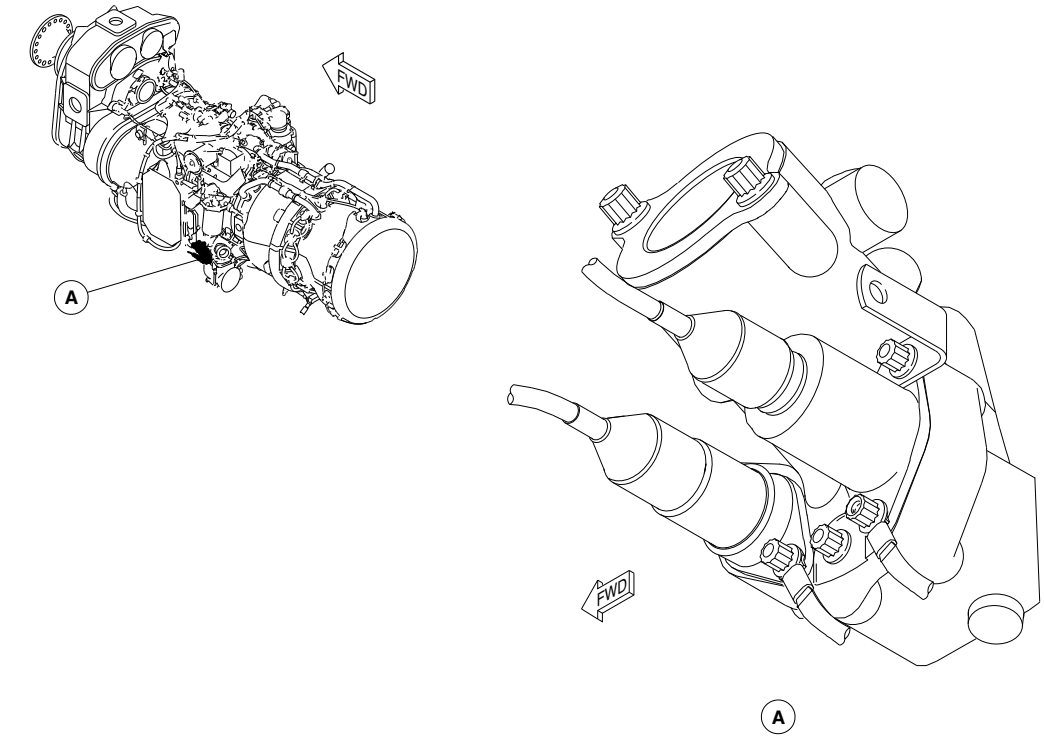
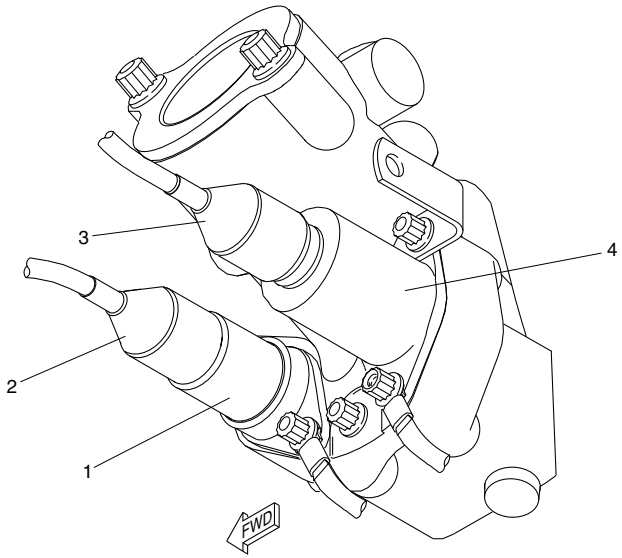
Oil Pressure Indicating System Schematic
Figure 1



MOP and LOP Sensor Locator
Figure 2



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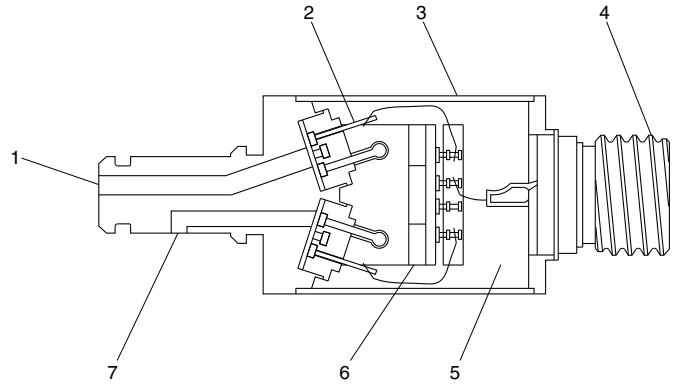
LEGEND

1. LOP Sensor.
2. P46 Connector.
3. P55 Connector.
4. MOP Sensor.

MOP and LOP Sensor Detail
Figure 3



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LEGEND

1. Inlet Port.
2. Pressure Sensing Elements.
3. Housing.
4. Connector Threads.
5. Internal Cavity Foam Filled.
6. Circuit Board.
7. Reference Port.

Oil Pressure Transducer Cross–section
Figure 4

**ON A/C ALL

79–32–00–001

OIL TEMPERATURE INDICATING SYSTEM

Introduction

The Oil Temperature Indicating System supplies oil temperature status to the Full Authority Digital Electronic Control (FADEC).

General Description

The Oil Temperature Indicating System uses a bi–metallic junction sensor to convert the oil temperature and Indicated Turbine Temperature (ITT) into electrical signals and transmit these signals to the FADEC.

Detailed Description

Refer to Figures 1 and 2.

The Oil Temperature Indicating System uses a Main Oil Temperature (MOT) sensor to determine and transmit engine oil temperature signals to the FADEC. The FADEC processes these signals and outputs an indication to the flight compartment. The FADEC also uses these signals, and the signal from the thermocouples, to calculate the ITT temperature.

In normal conditions, the green band on the oil temperature indication at the engine instrument panel, shows a temperature of 0–107 °C (32–225 °F). In icing conditions, when the prop de–ice switch is on, the green band contracts and it shows a temperature range of 65–107 °C (149–225 °F).

Oil Temperature Sensor

Refer to Figures 3 and 4.

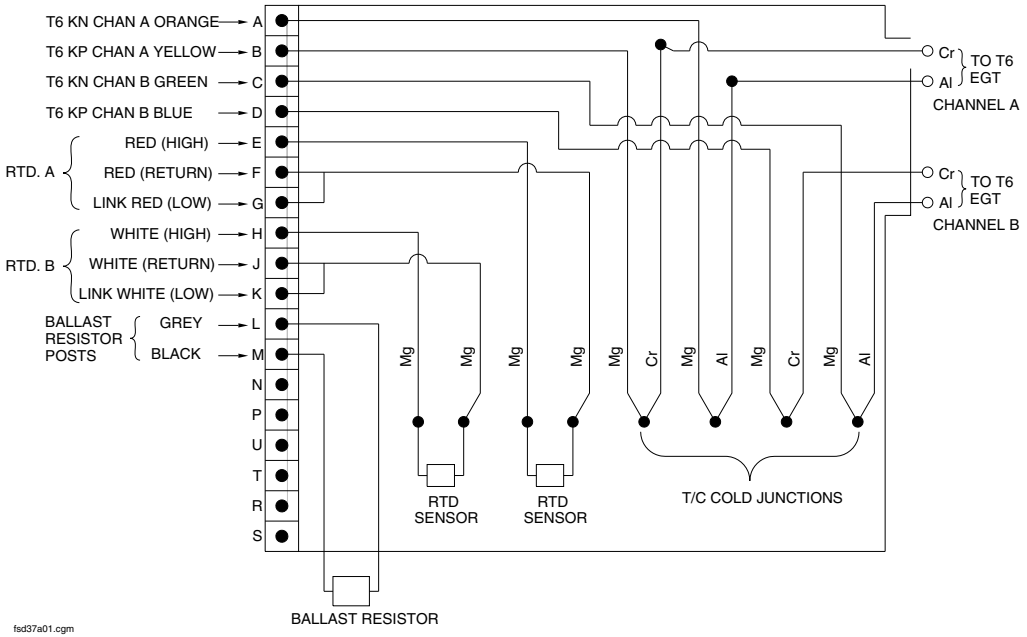
The oil temperature sensor is located on the top of the air inlet case. It is installed in an oil wetted cavity and is held in place with two bolts and sealed with a preformed packing. The P16 wiring harness connector is connected to a receptacle mounted on the sensor. This connector transmits the sensor signals to the FADEC through the wiring harness. A ground strap connects the housing of the sensor to the air inlet case.

The sensor has a housing, and four conductors of different material, two Chromel and two Alumel, that are joined at one end (bimetal junction). This gives the sensor two channels to provide for a backup if one channel fails.

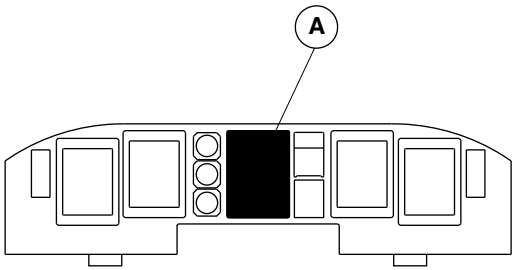
The other ends of the four Chromel and Alumel conductors, are connected to the receptacle and to a flexible cable that goes out of the sensor. The other end of the cable connects to the ITT thermocouple wiring harness with four terminals that have an anti–rotation property.

On the outside of the sensor are two mounting studs. These studs hold the ITT Trim Resistor. The FADEC uses the resistor to trim the ITT signal to compensate for engine to engine differences in measured ITT and to keep all engines within a small ITT window.

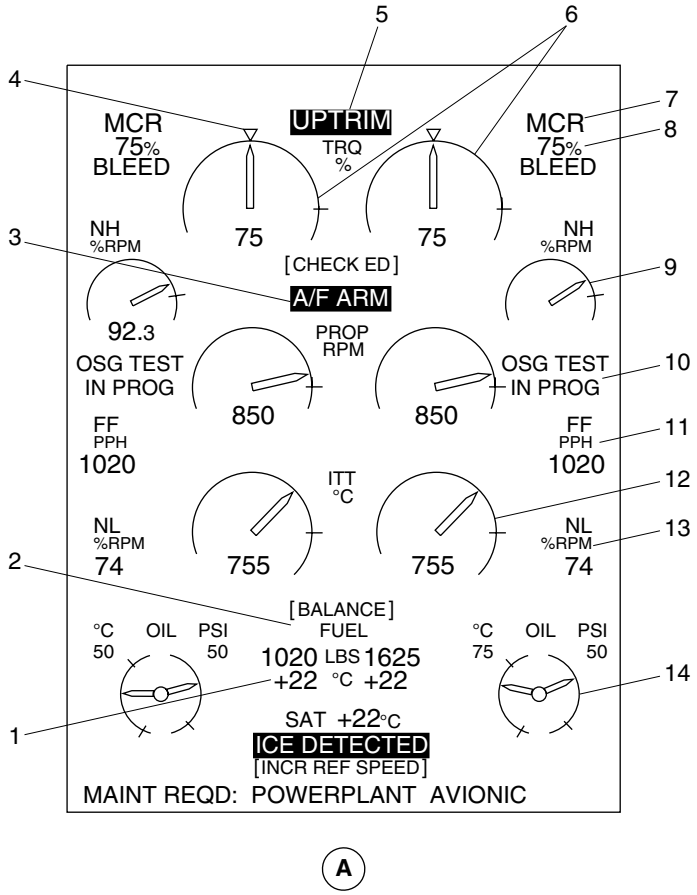
The sensor is a welded assembly and cannot be disassembled in the field.



Oil Temperature Indicating System Schematic
Figure 1



MAIN INSTRUMENT PANEL



LEGEND

1. Fuel Quantity and Fuel Temperature Indications.
2. Balance Message Indicating Fuel Imbalance.
3. Autofeather Armed Indication.
4. Torque Bug.
5. Uptrim In Operation.
6. Left/Right Torque Indication.
7. Engine Mode Indication.
8. Torque Bug Digital Readout.
9. High Pressure Gas Generator Speed.
10. Overspeed Governor Test In Progress.
11. Fuel Flow In Pounds Per Hour.
12. Indicated Turbine Temperature.
13. Low Pressure Gas Generator Speed.
14. Oil Pressure and Temperature Indications.

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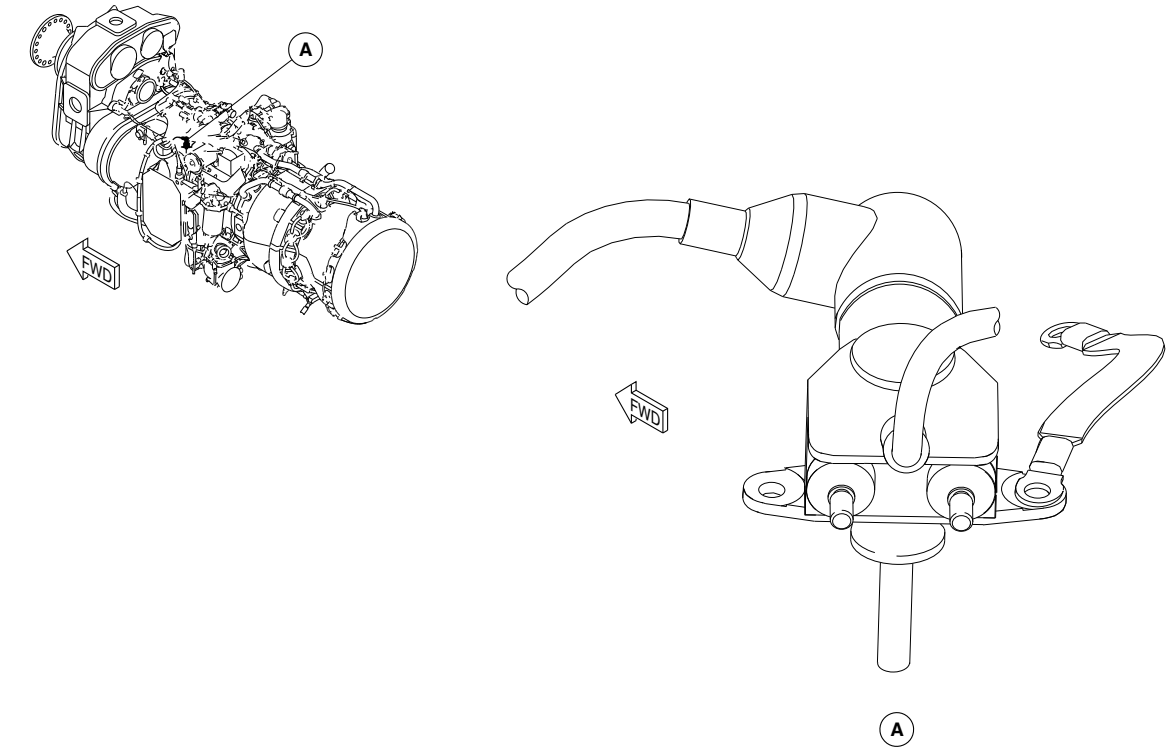
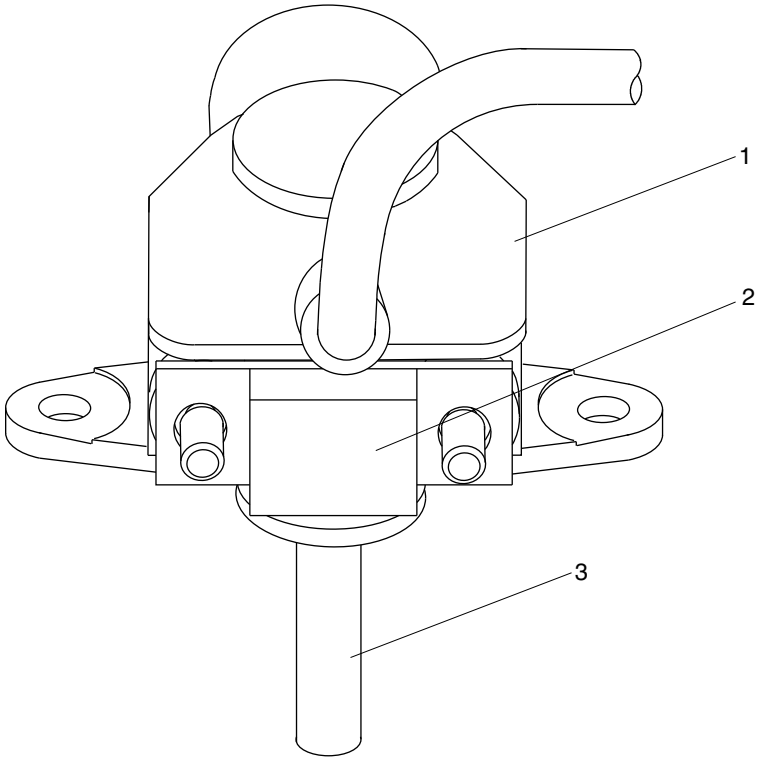
Oil Temperature Indication
Figure 2



Oil Temperature Sensor Locator
Figure 3



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LEGEND

1. Main Oil Temperature (MOT) Sensor.
2. ITT Trim Resistor.
3. MOT Sensor Probe.

Oil Temperature Sensor Detail
Figure 4

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LOW OIL PRESSURE WARNING

Introduction

The Low Oil Pressure Warning System supplies a low oil pressure warning signal to the Full Authority Digital Electronic Control (FADEC).

General Description

The Low Oil Pressure Warning System uses a switch to determine a low oil pressure condition.

Detailed Description

Refer to Figure 1.

The Low Oil Pressure Warning System uses a switch to convert the low oil pressure into an electrical signal. This signal is sent to the FADEC which then sends an electrical signal to the flight compartment and the Engine Monitoring System (EMS).

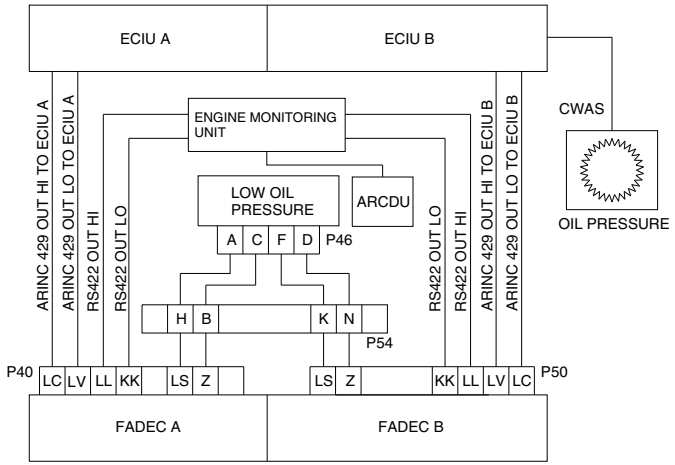
Low Oil Pressure Switch

Refer to Figures 2 and 3.

The Low Oil Pressure Switch is located at the bottom of the low pressure compressor case on the port side of the engine. It is installed in an oil wetted cavity and is held in place with two bolts and sealed with preformed packings. The P46 wiring harness connector is connected to the switch. This connector transmits the switch signal to the FADEC through the wiring harness. A ground strap connects the housing of the switch to the low pressure compressor case.

The Low Oil Pressure Switch has a housing, an inlet port and a reference port, a mechanical switch, and a connector. The switch has two channels to provide for a backup if one channel fails. The switch is a welded assembly and cannot be disassembled in the field.

During engine operation, oil enters the inlet port and holds the dual channel pressure switch open. If the oil pressure decreases to 44 ± 3 psi (303 ±21 kPa) the switch will close and a signal is sent to the FADEC. The FADEC then sends a signal to the flight compartment and the EMS.



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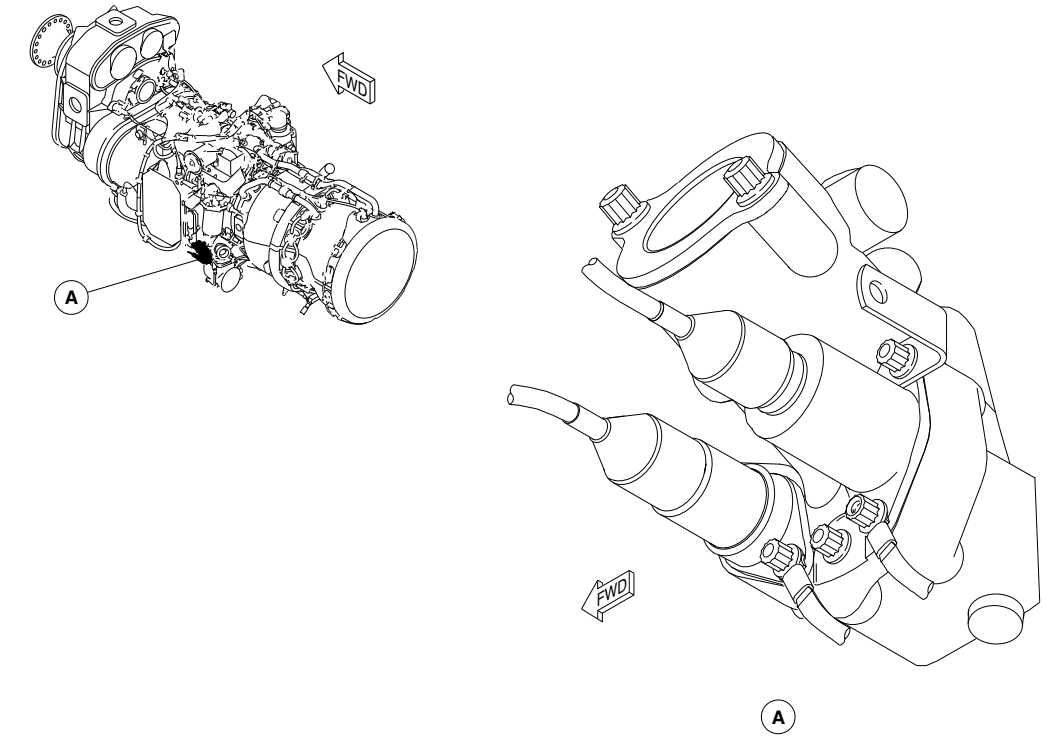
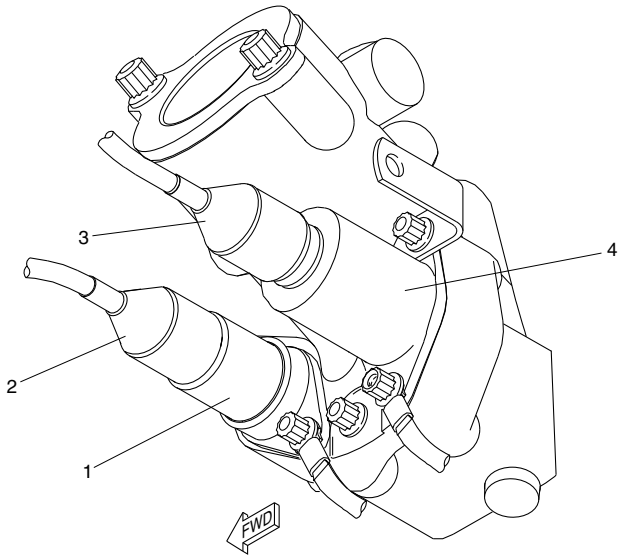
Low Oil Pressure Warning System Schematic
Figure 1



Low Oil Pressure Sensor Locator
Figure 2



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LEGEND

1. LOP Sensor.
2. P46 Connector.
3. P55 Connector.
4. MOP Sensor.

Low Oil Pressure Sensor Detail
Figure 3

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OIL QUANTITY INDICATING

Introduction

Refer to Figure 1.

On the engine, the quantity of oil that is in the tank is measured with three components:.

- a calibrated dipstick
- an oil level indicator sightglass
- a low oil level indicator.

These three quantity–indicating components are located near each other, on the oil tank, on the left side of the engine.

General Description

During normal engine operation, oil is consumed and must be replaced during the next servicing period. Since not all the oil is consumed, the maintenance crew needs to know how much oil to add to the oil tank. The oil quantity can be determined with a calibrated dipstick, an oil level indicator sightglass and a low oil level indicator glass.

Calibrated Dipstick

The calibrated dipstick is attached to the oil filler cap. The calibrated markings give indications on the quantity of oil that is to be added to the oil tank. These marked calibrations are shown as follows:

- ADD 1 LTR
- ADD 2 LTR
- ADD 3 LTR
- MIN HOT.

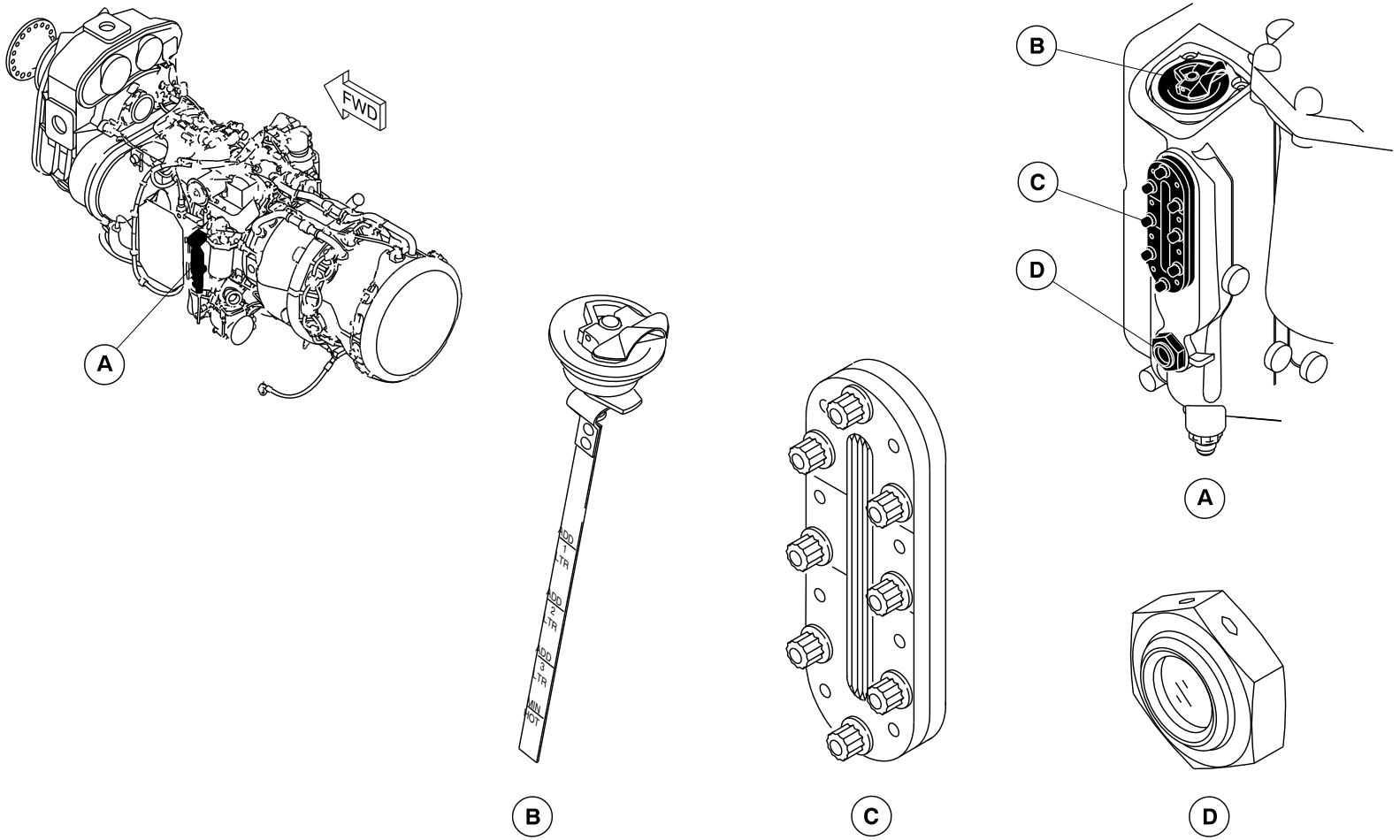
Oil Level Indicator Sightglass

The oil level indicator sightglass is attached to the oil tank with two bolts and sealed with preformed packings. The indicator sightglass has calibrated markings to give indications of the quantity of oil that is to be added to the oil tank. These marked calibrations are shown as follows:

- MAX HOT
- OIL
- ADD 1 US QT
- ADD 1 LTR

Low Oil Level Indicator Glass

The low oil level indicator glass is located below the oil level indicator sightglass. The low oil level indicator glass is threaded into the oil tank and is sealed with a preformed packing. This indicator gives a visual indication that the quantity level of oil in the tank is in a low condition.



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Oil Quantity Indication
Figure 1