**Systems Operation**
**3056 Engine for Caterpillar Built Machines**
**Media Number -SENR5025-01** **Publication Date -01/02/2002** **Date Updated -01/03/2002**

i01816510

# Air Inlet and Exhaust System

**SMCS -** 1050

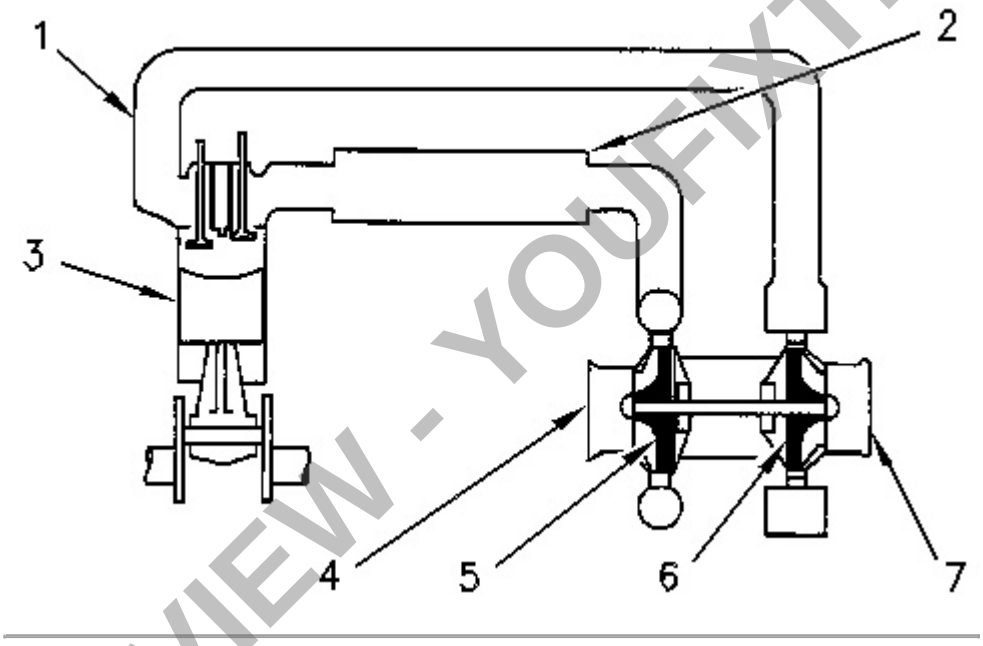



Illustration 1 g00281646

Air inlet and exhaust system (typical example)

(1) Exhaust manifold

(2) inlet manifold

(3) Engine cylinder

(4) Air inlet

(5) Turbocharger compressor wheel

(6) Turbocharger turbine wheel

(7) Exhaust outlet

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4. If a new camshaft gear is used, check the backlash of the camshaft gear. The minimum backlash for a new gear is 0.08 mm (0.003 inch).

**End By:**

a. Install the front cover. Refer to Disassembly and Assembly, "Front Cover - Install".
b. Install the fan. Refer to Disassembly and Assembly, "Fan - Remove and Install".

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Media Number -SENR5026-03 Publication Date -01/12/2001 Date Updated -01/12/2001

i01741450

# Flywheel Housing - Remove and Install

**SMCS -** 1157-010

## Removal Procedure

Table 1

| Required Tools | | | |
|---|---|---|---|
| **Tool** | **Part Number** | **Part Description** | **Qty** |
| **A** | 138-7574 | Link Bracket | 2 |

**Start By:**

A. Remove the electric starting motor. Refer to Disassembly and Assembly, "Electric Starting Motor - Remove and Install".
B. Remove the flywheel. Refer to Disassembly and Assembly, "Flywheel - Remove".

---

**NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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**NOTICE**

**Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.**

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i01698566

# Transmission Neutralizer Switches and Alert Indicator - Test

**SMCS -** 1408-081; 3191-081

**WARNING**

**Personal injury can result from hydraulic oil pressure and hot oil.**

**Hydraulic oil pressure can remain in the hydraulic system after the engine has been stopped. Serious injury can be caused if this pressure is not released before any service is done on the hydraulic system.**

**Make sure all of the work tools have been lowered to the ground, and the oil is cool before removing any components or lines. Remove the oil filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand.**

**WARNING**

**Sudden movement of the machine or release of oil under pressure can cause injury to persons on or near the machine.**

**To prevent possible injury, perform the procedure that follows before testing and adjusting the brake system.**

Test the machine on a dry, level surface. Make sure that the area around the machine is clear. Move the machine away from other operating machines and other personnel.

This section describes the troubleshooting procedure for the transmission neutralizer lockout switch and the transmission neutralizer lockout alert indicator. This procedure will determine if

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i01226563

# Radiator - Remove and Install

**SMCS -** 1353-010

# Removal Procedure

Table 1

| Required Tools | | | |
|---|---|---|---|
| **Tool** | **Part Number** | **Part Description** | **Qty** |
| **A** | 138-7575 | Link Bracket | 1 |

**Start By:**

A. Remove the hood. Refer to Disassembly and Assembly, "Hood - Remove" for the correct procedure.
B. Remove the hydraulic oil cooler. Refer to Disassembly and Assembly, RENR3513, "Hydraulic Oil Cooler - Remove and Install" for the correct procedure.
C. Remove the refrigerant condenser. Refer to Disassembly and Assembly, "Refrigerant Condenser- Remove and Install" for the correct procedure.
D. Drain the cooling system. Refer to Operation and Maintenance Manual, SEBU7265, "General Coolant Information" for the 924G Wheel Loader. Refer to Operation and Maintenance Manual, SEBU7266, "General Coolant Information" for the 924Gz Wheel Loader.

**WARNING**

**Personal injury can result from hot coolant, steam and alkali.**

**At operating temperature, engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot coolant or steam. Any contact can cause severe burns.**

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Media Number -RENR2462-17 Publication Date -01/05/2013 Date Updated -03/05/2013

i02163387

# Product Identification Number - Program

**SMCS -** 7631-591

This procedure allows you to input or change the Product Identification Number ("Product ID").

**Note:** If the correct "product ID" has not been entered into the MSS, you will be unable to obtain a factory password.

1. Connect a laptop computer with the Caterpillar ET to the machine via the communication adapter.
2. Place an electronic key with master level access in the key start switch.
3. Turn the electronic key to the "ON" position.
4. Start the Electronic Technician and establish communications with the MSS ECM.
5. Select the "Configuration" option from the "Service" Menu or press the "F5" key. This will display the "Configuration" screen.

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The resistance is less than 5 ohms.

**Results:**

- **YES -** The resistance is less than 5 ohms. The solenoid harness has a short.

  **Repair:** Repair the harness or replace the harness.

  **Stop.**

- **NO -** The resistance is NOT less than 5 ohms. The solenoid harness does not have a short. Inspect the harness connector and the contacts. Verify that the active fault is present. If the active fault is present the transmission electronic control module has failed.

  **Repair:** Replace the transmission electronic control module. Refer to Testing and Adjusting, "Electronic Control Module (ECM) - Replace".

  **Stop.**

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**Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.**

**Dispose of all fluids according to local regulations and mandates.**

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**NOTICE**

**Do not allow dirt to enter the fuel system. Thoroughly clean the area around a fuel system component that will be disconnected. Fit a suitable cover over disconnected fuel system component.**

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**NOTICE**

**Never turn the battery disconnect switch key to OFF with the engine running. Electrical system damage could result.**

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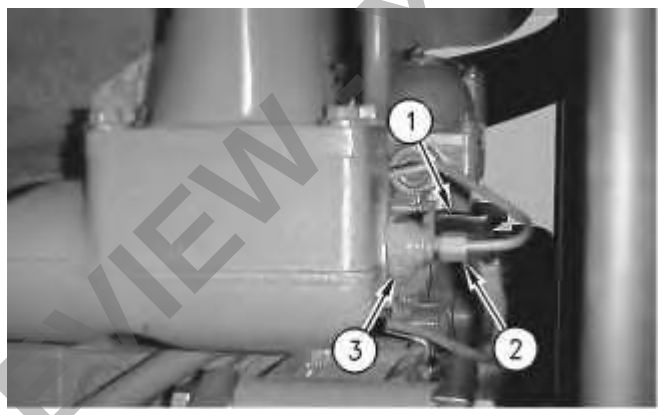



Illustration 1 g00656613

1. Disconnect wire (1) .
2. Disconnect nut (2) and the fuel line.
3. Remove air inlet heater (3) .

## Installation Procedure

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| | | |
|---|---|---|
| correctly. Make sure that the bottom of the threaded ports are clean and free of debris. Make sure that the bottom of the threaded ports do not contain extra gaskets. | | **Result:** The fuel injection nozzles are operating correctly.<br><br>Proceed to Test Step 3. |
| **3. Inspect the Operation of the Fuel Injection Pump**<br><br>A. Check the timing of the fuel injection pump. Adjust the timing or replace the fuel injection pump. Refer to the Specifications Module, "Fuel Injection Pump" topic for additional information. The fuel injection pump must be repaired or replaced.<br><br>B. Make sure that the linkage of the fuel rack operates correctly.<br><br>C. Make sure that the high pressure fuel lines are connected to the fuel injection nozzles in the correct order.<br><br>D. Make sure that the mounting bolts of the fuel injection pump are tightened to the correct torque. Inspect the fuel lines for leaks or for restrictions. The damaged fuel lines or fittings must be repaired or replaced. | Fuel Injection Pump | **Result:** The operation of the fuel injection pump is not correct.<br><br>Make the necessary repairs.<br><br>Verify that the problem is resolved.<br><br>**Result:** The operation of the fuel injection pump is correct.<br><br>Proceed to Test Step 4. |
| **4. Inspect the Air Inlet System**<br><br>A. Check the air cleaner for restrictions. | Restriction | **Result:** There is a restriction in the air inlet system.<br><br>The air cleaner must be cleaned or replaced.<br><br>Verify that the problem is resolved. |

## The engine exhaust has too much white smoke or too much blue smoke.

### Probable Cause

Table 39

| Troubleshooting Test Steps | Values | Results |
|---|---|---|
| | | |

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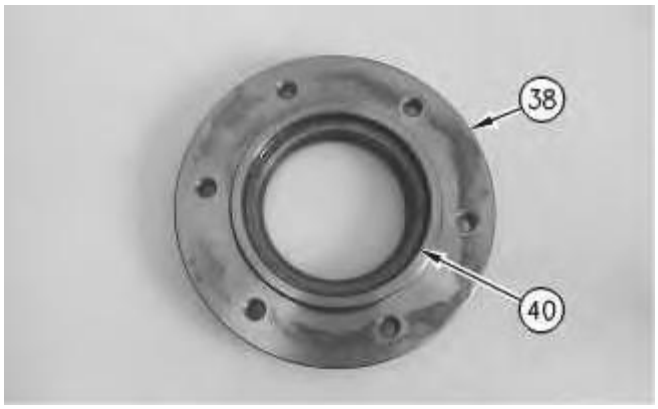



Illustration 10 g01003568

16. Lubricate lip seal (40) with Tooling (J) and install lip seal (40) into lower cap (38) .

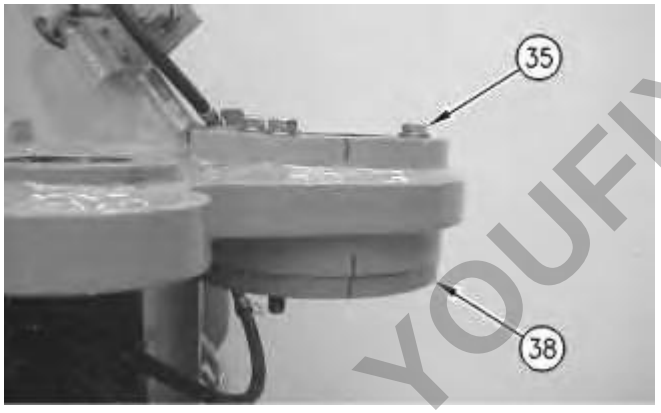



Illustration 11 g01004364

17. Coat the bore of the upper hitch with Tooling (K) .
18. Place lower cap (38) in position.
19. Install three bolts (35) , as shown.

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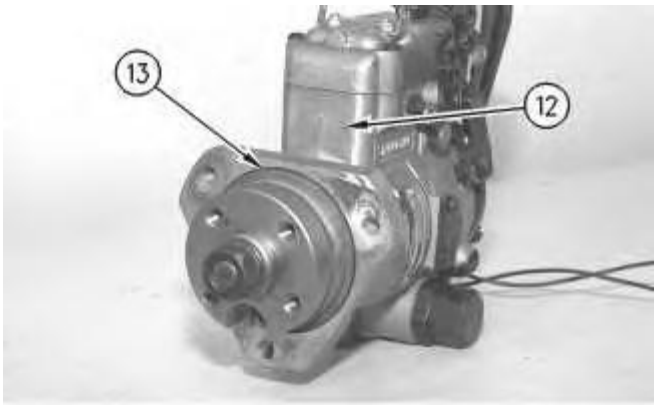



Illustration 1 g00808386

Typical example

1. Check the condition of O-ring seal (13) on fuel injection pump (12). If the seal is worn or damaged, use a new part for replacement.
2. Lightly lubricate O-ring seal (13) with clean engine oil. Install O-ring seal (13) on fuel injection pump (12) .

**NOTICE**

**The No. 1 cylinder must be at the top center position on the compression stroke before the fuel injection pump is installed. If the crankshaft needs to be rotated, the fuel injection pump must be mounted temporarily or the loose gear could cause damage to the front housing.**

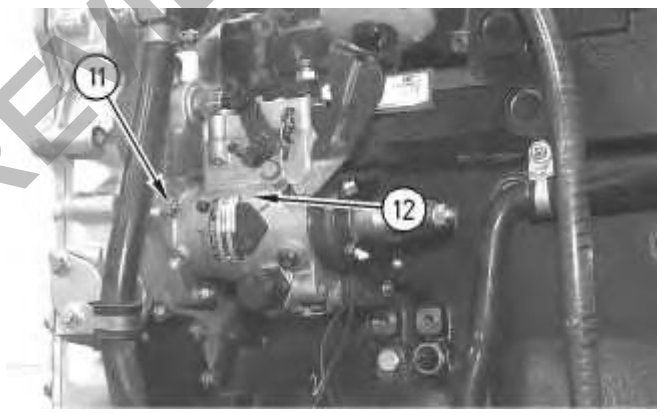



Illustration 2 g00808376

Typical example

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When the lift control valve is in the HOLD position and the ride control switch is in the ON position, the solenoid (1) is energized. The solenoid moves. The spring in the solenoid compresses. Hydraulic oil from the pilot oil supply line (A) flows to the solenoid valve. Then, the pilot supply oil flows through the solenoid valve.

The pilot supply oil flows through the orifice. Some of the oil flows to the check valve (5) in the hydraulic line from the rod end of the lift cylinders. The pilot oil moves the check valve off the check valve seat. Then, the hydraulic oil in the rod end of the cylinder flows to the tank (7). Most of the pilot supply oil flows to the resolver.

Then, the hydraulic oil flows to the cartridge assembly (4). When the hydraulic oil overcomes the force of the spring, the cartridge assembly moves. The spring in the cartridge assembly compresses.

Hydraulic oil can flow in two directions. The hydraulic oil can flow from the accumulator to the head end of the lift cylinders. Also, the hydraulic oil can flow from the head end of the lift cylinders to the accumulator.

The cylinder of ride control accumulator (2) has a nitrogen precharge. The piston resists the oil flow and the piston acts as a shock absorber.

As the machine travels across rough terrain with a loaded implement, the pitching of the load acts against lift cylinders (3). When the load acts against the head end of lift cylinders, the head end oil flows through accumulator valve (4) and into ride control accumulator (2). When the load acts against the rod end of lift cylinders, the rod end oil flows through check valve (5) to the tank. The hydraulic oil can move from the rod end to the tank, or from the tank to the rod end.

When you place the pilot valve in the RAISE position, hydraulic oil enters the resolver from line (B). The pilot oil moves the resolver and flows to the cartridge assembly (4). When the pilot oil pressure overcomes the force of the spring in the cartridge assembly, the cartridge assembly moves. Hydraulic oil from the lines to the lift cylinders can now flow to the accumulator.

When the tilt cylinder is in the TILT BACK position, pressure switch (8) prevents the lift arms from raising. Move the lift arms near the ground and place the tilt circuit in the TILT BACK position. As the tilt cylinder nears the bottom of the stroke, the linkages between the tilt cylinder and the bucket are fully extended.

Pilot supply oil in line (A) holds check valve (5) off the seat. Hydraulic oil from the rod end of the lift cylinders flows through check valve (5) to the tank. The linkages between the tilt cylinder and the bucket are fully extended. The rod on the tilt cylinder is not fully retracted. As the rod retracts, the rod and the linkages pulls the lift arms upward quickly.

When the pilot oil pressure reaches 255 kPa (37.0 psi), switch (8) turns off the ride control system. Solenoid (1) moves to the OFF position. This causes check valve (5) to seat. Hydraulic oil from the rod end of the lift cylinders cannot drain to the tank. The hydraulic oil in the lift cylinders is trapped. The lift arms will not move upward.

When the pilot valve is released, the pilot oil pressure drops. Switch (8) deactivates. The ride control system is active again.

## AUTO Position

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i02246877

# Kickout and Positioner - Remove and Install

**SMCS -** 5109-010; 5112-010

**S/N -** 3PZ1-UP

**S/N -** 9SW1-UP

**S/N -** AAN1-UP

## Removal Procedure

**Start By:**

A. Connect the steering frame lock. Refer to Disassembly and Assembly, "Steering Frame Lock - Separate and Connect".

## Bucket Positioner Control

**WARNING**

**Use caution to avoid possible personal injury when adjusting the bucket positioner.**

**Stop the engine and lower all equipment to relieve the hydraulic pressure.**

**Engage the parking brake and block the tires to prevent sudden movement of the machine.**

**Keep unauthorized personnel off the machine.**

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(22) Valve for lowering the lift arms with a dead engine

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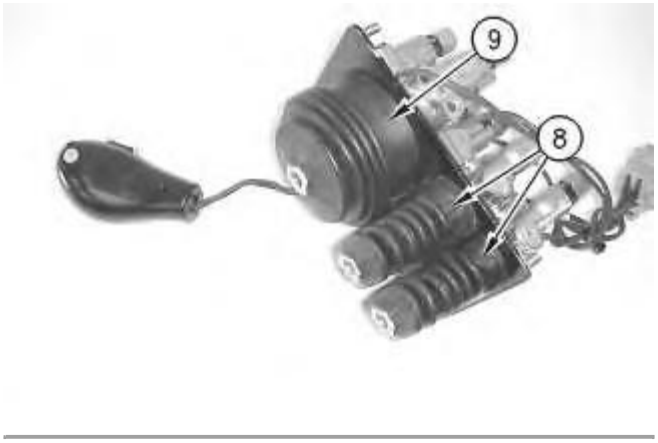



Illustration 32 g00629963

45. Install boots (8) . Slide boot (9) onto the bottom retainer.

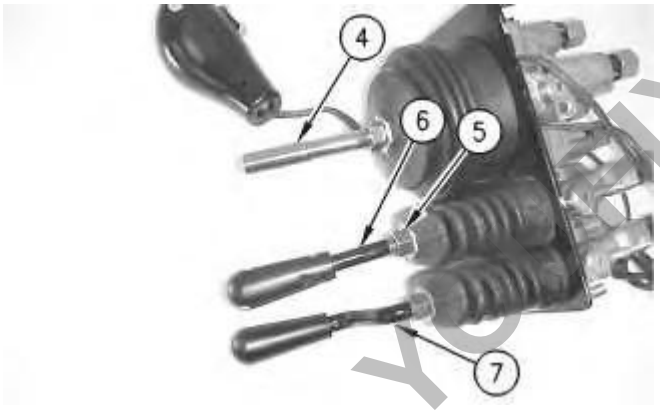
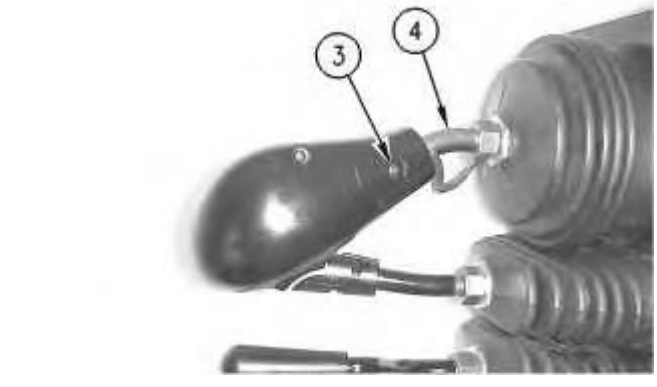



Illustration 33 g00629902

46. Install rod and knob assembly (7) .
47. Connect rod (6) and tighten nut (5) .
48. Install rod (4) .




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Illustration 3 g01186742

Table 6

| Thread Size mm | Torque |
|---|---|
| M3 | .6 ± .1 N·m (5 ± 0.9 lb in) |
| M4 | 2 ± .3 N·m (18 ± 3 lb in) |
| M5 | 4 ± .5 N·m (35 ± 4 lb in) |
| M6 | 6 ± 1 N·m (55 ± 9 lb in) |
| M8 | 15 ± 2 N·m (135 ± 18 lb in) |
| M10 | 30 ± 7 N·m (265 ± 62 lb in) |
| M12 | 50 ± 10 N·m (37 ± 7 lb ft) |
| M14 | 80 ± 15 N·m (60 ± 11 lb ft) |
| M16 | 125 ± 20 N·m (90 ± 15 lb ft) |
| M20 | 250 ± 40 N·m (185 ± 30 lb ft) |
| M24 | 425 ± 50 N·m (310 ± 37 lb ft) |
| M30 | 850 ± 100 N·m (620 ± 75 lb ft) |
| M36 | 1500 ± 200 N·m (1100 ± 150 lb ft) |

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| | |
|---|---|
| Actuation Pressure [4] | 2400 ± 140 kPa (348 ± 20 psi) |
| Deactuation Pressure [5] | 1725 ± 100 kPa (250 ± 15 psi) |

[4] Open when pressure increases.

[5] Close when pressure decreases.

**Note:** A pressure switch that is NORMALLY CLOSED will open when the system pressure increases. The pressure switch will close when the system pressure decreases.

Use the following procedures in order to test the pressure switch:

1. Disconnect the pressure switch from the machine harness.
2. Connect the **146-4080** Digital Multimeter to the two connector pins. Set the multimeter to the OHMS test mode.
3. Measure the resistance of the pressure switch.
4. If the system pressure is below 2400 ± 140 kPa (348 ± 20 psi), the multimeter will display less than 1 ohm.
5. If the resistance that is displayed is a value of OL (high resistance), and the system pressure is not above the acceptable limit, replace the pressure switch.
6. When the pressure switch fails, test the arc suppressor for proper operation.
7. If the pressure switch is removed, make sure that the wires on the new pressure switch are tie-wrapped. Securing the pressure switch prevents damage that may be caused by vibration.

**Note:** The multimeter may display OL if the contacts on the pressure switch are dirty. The contacts on the pressure switch can become dirty if the arc suppressor is no longer functioning.

**Note:** The multimeter will display OL if the pressure switch is not threaded into the air conditioning system.

### 7X-1076 High Pressure Switch (NORMALLY CLOSED)

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**S/N** - CES1-UP

**S/N** - CEX1-UP

**S/N** - CFK1-UP

**S/N** - CFP1-UP

**S/N** - CFX1-UP

**S/N** - CKT1-UP

**S/N** - CLR1-UP

**S/N** - CMK1-UP

**S/N** - CNG1-UP

**S/N** - CNN1-UP

**S/N** - CNT1-UP

**S/N** - CNX1-UP

**S/N** - CXM1-UP

**S/N** - CXR1-UP

**S/N** - CYE1-UP

**S/N** - CZZ1-UP

**S/N** - D2W1-UP

**S/N** - D3X1-UP

**S/N** - D6W1-UP

**S/N** - D8W1-UP

**S/N** - D9X1-UP

**S/N** - DAC1-UP

**S/N** - DAD1-UP

**S/N** - DAE1-UP

**S/N** - DAG1-UP

**S/N** - DAJ1-UP

**S/N** - DAK1-UP

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9. Remove pilot operated hydraulic control assembly (13) .

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(13) Passage

(14) Load piston springs

(15) Load piston spring cavity

(16) Passage

(17) Load piston

(18) Passage

(19) Passage

(20) Passage

(21) Dump valve

(22) Converter backflow check valve

(23) Selector spool and slug for the first speed clutch

(24) First speed solenoid

(25) Load piston cavity

(26) Screen orifice

(27) Selector spool and slug for the second speed clutch

(28) Selector spool and slug for the third speed clutch

(29) Third speed solenoid

(30) Second speed solenoid

(A) Forward low clutch

(B) Forward high clutch

(C) Reverse clutch

(D) Second speed clutch

(E) Third speed clutch

(F) First speed clutch

(AA) P1 speed clutch pressure

(BB) P2 direction clutch pressure

(CC) P3 converter inlet pressure

(DD) Load piston pressure

(EE) Drain

When the engine is started, oil from the oil pump flows through the oil filter and back to the flow control valve (33) in the transmission case. The flow control valve (33) directs 23 L (6 US gal) of oil to the transmission control valve. The flow control valve allows the remainder of the oil to go to the torque converter circuit.

Oil at P1 pressure from the flow control valve (33) goes through the transmission control valve to differential valve (11), and the differential relief valve (12). Oil at P1 pressure from the flow control valve (33) goes through the transmission control valve to the speed clutch solenoids (24), (29), and

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Media Number -SENR1218-05 Publication Date -01/10/2001 Date Updated -25/10/2001

i01379530

# MID 081 - CID 0642 - FMI 06

**SMCS** - 3174-038

**Conditions Which Generate This Code:**

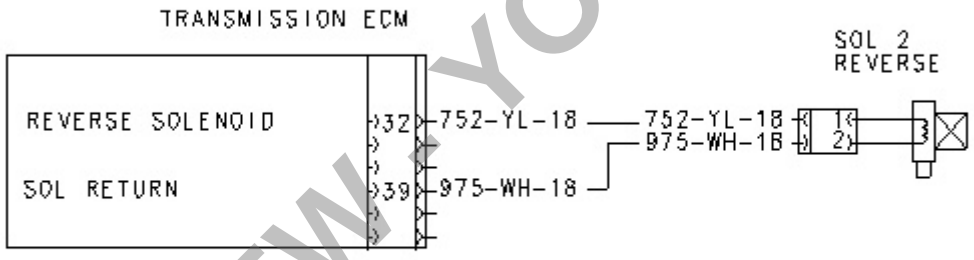



Illustration 1 g00728261

Schematic of solenoid 2

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6. Repeat for the remainder of the spider and gear assembly.

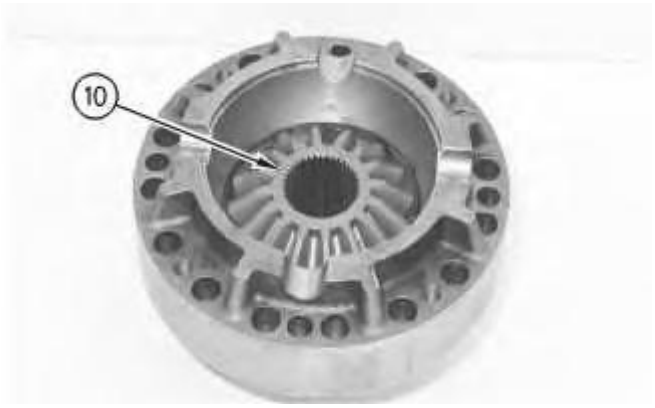



Illustration 5 g00664326

7. Remove bevel gear (10) .

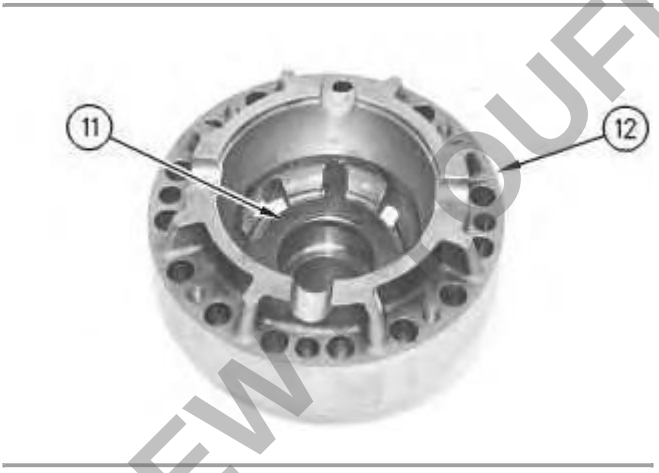



Illustration 6 g00891755

8. Remove thrust washer (11) from case assembly (12) .

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Illustration 12 g00654711

12. Loosen hose clamp (20) and disconnect hose (21) .
13. Disconnect hydraulic lines (22), (23) and (24) .

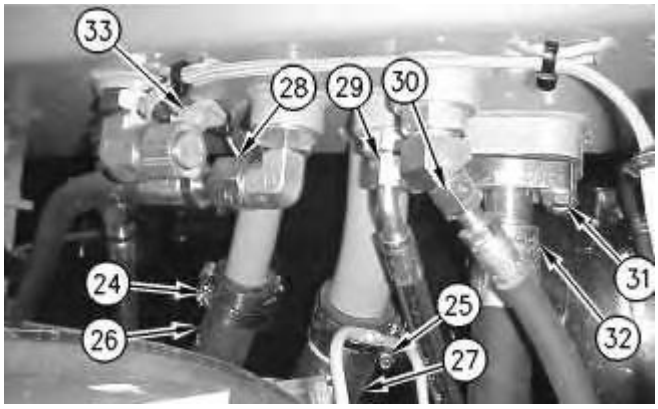



Illustration 13 g00654717

14. Loosen hose clamps (24) and (25). Disconnect two hoses (26) and (27) .
15. Disconnect three hydraulic lines (28), (29) and (30) .
16. Remove four bolts (31) in order to disconnect hydraulic line (32) .
17. Disconnect wire harness connector (33) and cut the tie-wraps in order to move the wiring aside.

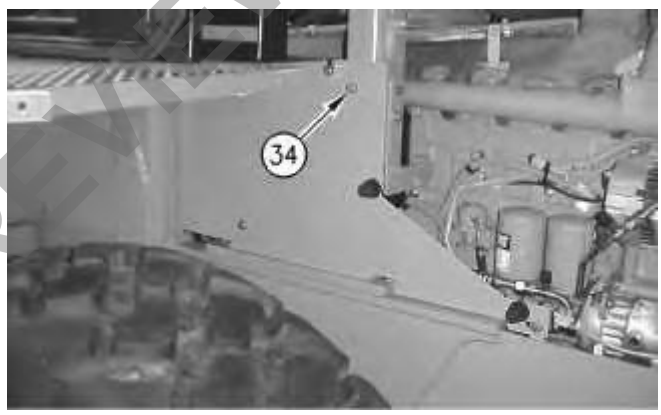



Illustration 14 g00665080

18. Remove six bolts (34) in order to remove the panel.

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Illustration 9 g00663999

**WARNING**

**Personal injury can result from being struck by parts propelled by a released spring force.**

**Make sure to wear all necessary protective equipment.**

**Follow the recommended procedure and use all recommended tooling to release the spring force.**

1. Install spring (9) in valve body (5) .

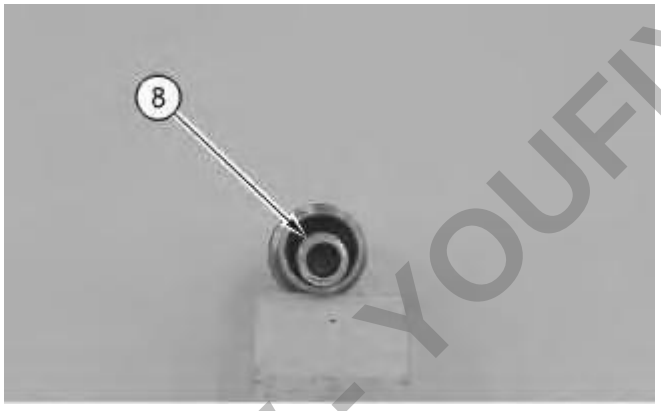



Illustration 10 g00663972

2. Install screen (8) .

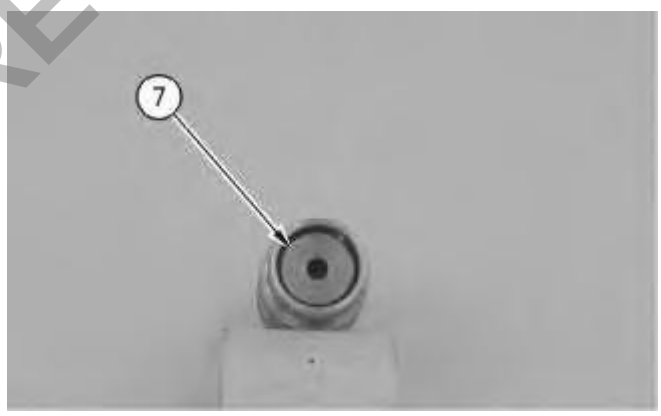



Illustration 11 g00663965

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7. Install cover (1) .

**End By:** Separate the steering frame lock. Refer to Disassembly and Assembly, "Steering Frame Lock - Separate and Connect".

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