Systems Operation

3044C Industrial Engine and Engines for Caterpillar Built Machines - RENR7578

- Basic Engine

C3.4 Engines for Caterpillar Built Machines - KENR6940

- Basic Engine

Testing and Adjusting

3044C Industrial Engine and Engines for Caterpillar Built Machines - RENR7578

- Finding Top Center Position for No. 1 Piston
- Fuel Injection Nozzle - Test
- Engine Crankcase Pressure (Blowby) - Test
- Compression - Test
- Engine Valve Lash - Inspect/Adjust
- Valve Depth - Inspect
- Valve Guide - Inspect
- Excessive Bearing Wear - Inspect
- Piston Ring Groove - Inspect
- Connecting Rod - Inspect
- Connecting Rod Bearings - Inspect
- Main Bearings - Inspect
- Cylinder Block - Inspect
- Cylinder Head - Inspect
- Piston Height - Inspect
- Flywheel - Inspect
- Flywheel Housing - Inspect
- Gear Group - Inspect

C3.4 Engines for Caterpillar Built Machines - KENR6940

- Finding Top Center Position for No. 1 Piston
- Fuel Injection Nozzle - Test
- Engine Crankcase Pressure (Blowby) - Test
- Compression - Test
- Engine Valve Lash - Inspect/Adjust
- Valve Depth - Inspect
- Valve Guide - Inspect
- Excessive Bearing Wear - Inspect
- Piston Ring Groove - Inspect
- Connecting Rod - Inspect

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i02667975

Air Cleaner - Remove and Install

SMCS - 1051-010

Removal Procedure

1. Tilt the radiator. Refer to Operation and Maintenance Manual, "Radiator Tilting".

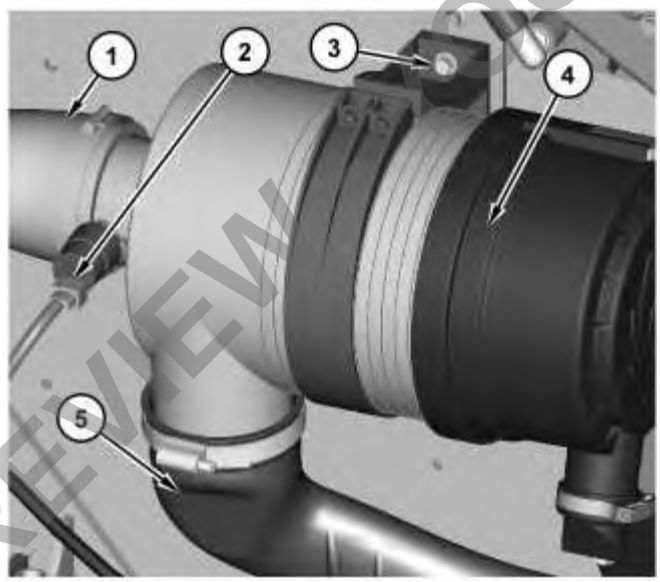


Illustration 1 g01340815

2. Disconnect harness assembly (2). Disconnect hoses (1) and (5). Remove bolts (3) and air cleaner (4) .

Installation Procedure

1. Tilt the radiator. Refer to Operation and Maintenance Manual, "Radiator Tilting".

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2. Measure the backlash of the gears. Refer to Specifications, "Gear Group (Front)" for the values of the backlash.

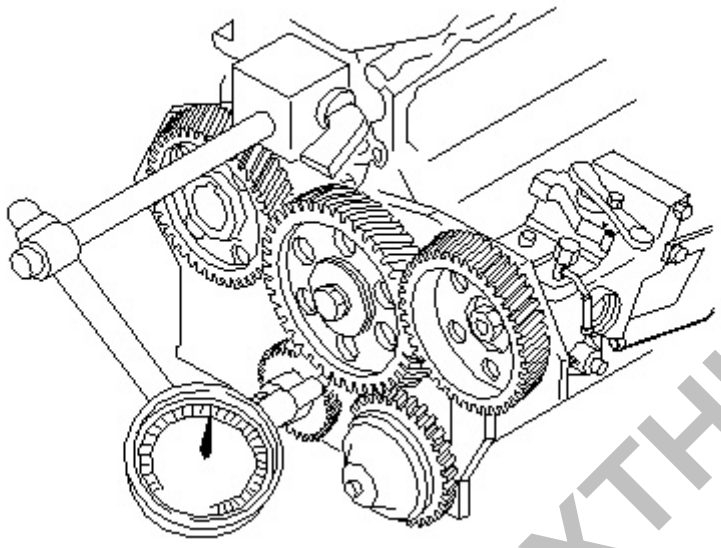
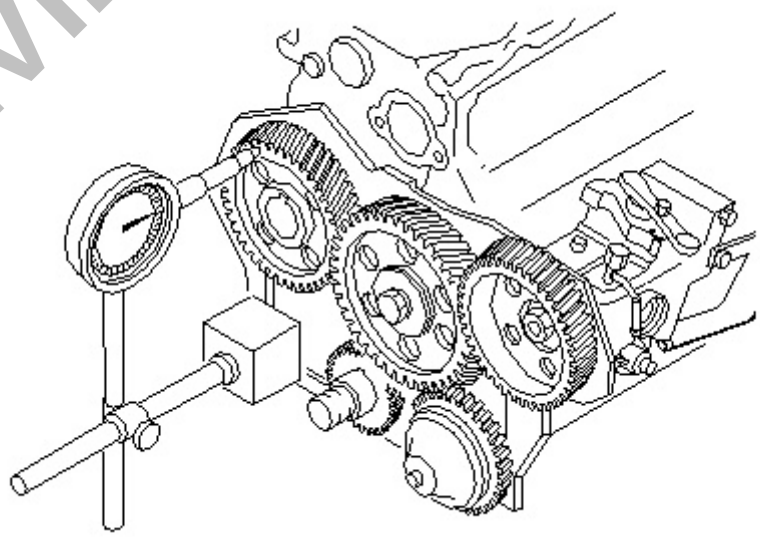


Illustration 3 g00987800

Measuring end play of the idler gear

1. Install the dial indicator in Illustration 3, as shown.
2. Measure the end play of the idler gear. Refer to Specifications, "Gear Group (Front)" for the values of the end play.



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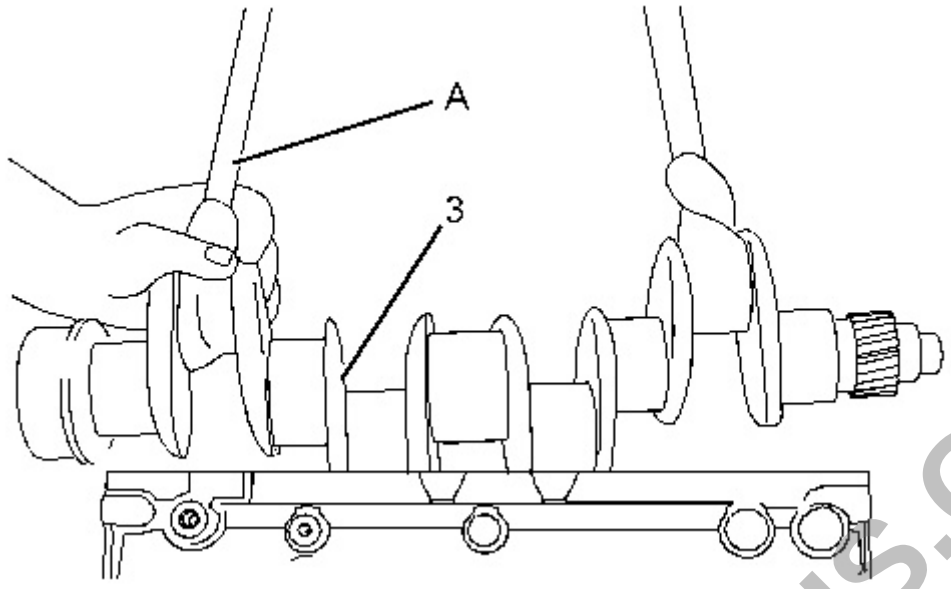


Illustration 2 g01359996

Typical example

8. Attach Tooling (A) and a suitable lifting device to crankshaft (3) . Carefully lift the crankshaft into the cylinder block. The weight of the crankshaft is approximately 32 kg (70 lb). Remove Tooling (A) .

   Note: Do not damage any of the finished surfaces on the crankshaft. Do not damage the bearings.

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Illustration 1 g01034497

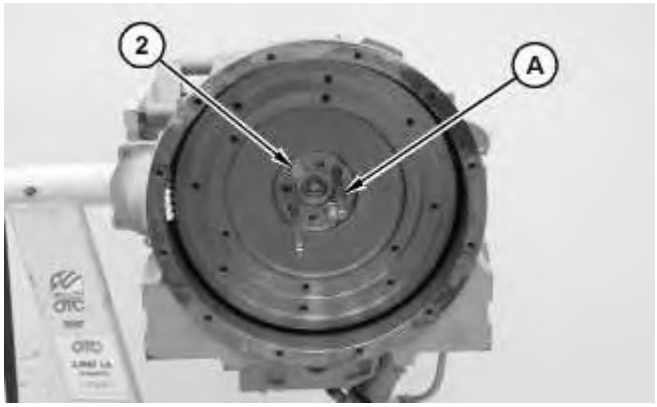


Illustration 2 g01034498

1. Remove bolts (1) and install Tooling (A) .

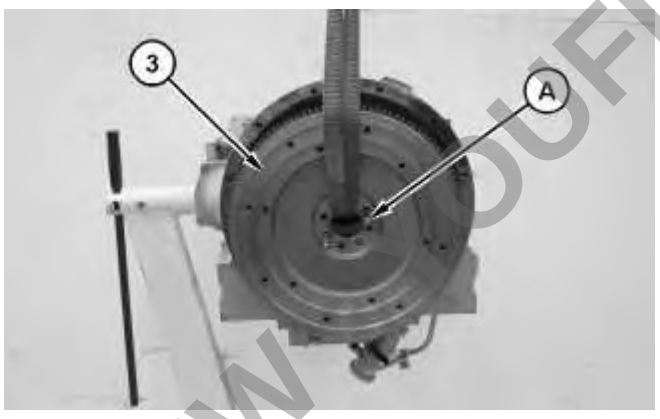


Illustration 3 g01034499

2. Remove bolts (2). Attach a suitable lifting device to flywheel (3). Remove flywheel (3). The weight of the flywheel is approximately 23 kg (50 lb).

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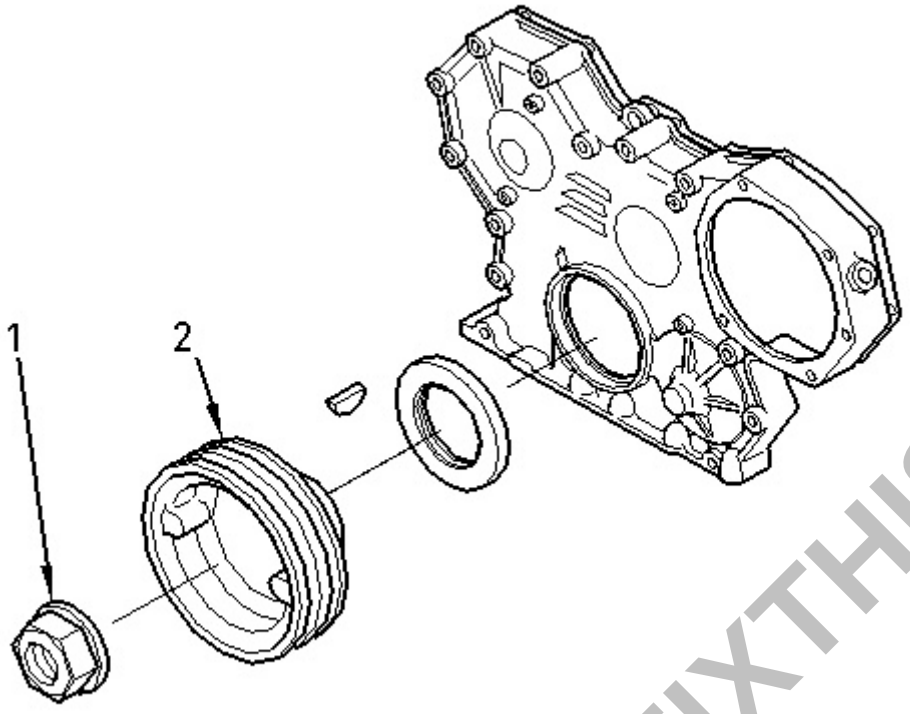


Illustration 1 g00988100

Note: Apply Tooling (A) to the threads of the crankshaft before the pulley nut is installed.

(1) Tighten the nut that fastens the crankshaft pulley to the crankshaft to the following torque. ... 480 to 500 N·m (354 to 369 lb ft)

(2) Crankshaft pulley

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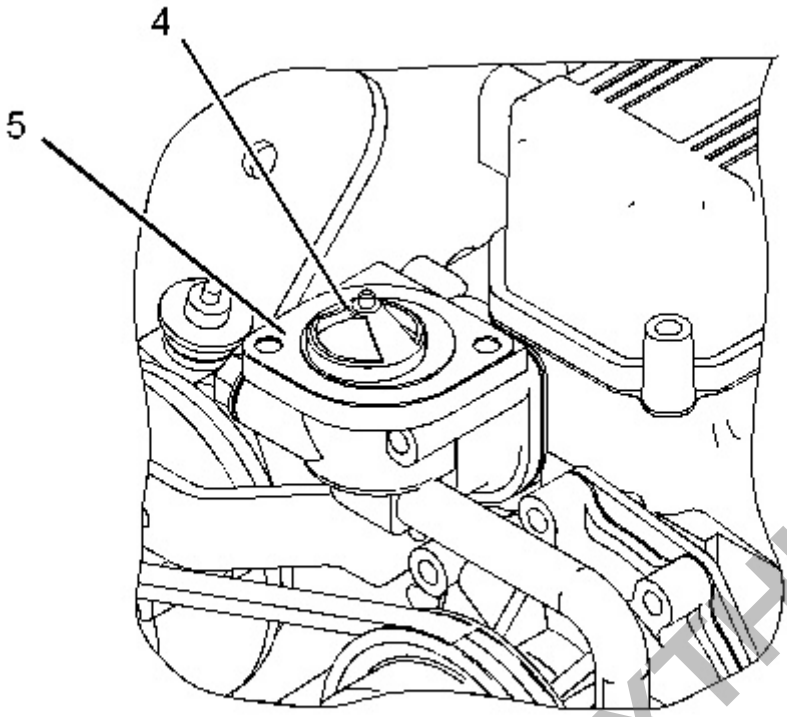


Illustration 2 g01038135

3. Observe the orientation of the pin on the water temperature regulator (4) for reassembly. Remove gasket (5) and remove water temperature regulator (4) .

Installation Procedure

1. Clean all mating surfaces.

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View Checklists	Repair History
View Parts lists	Refueling History
Order Parts [1]	**Manage Exiting User**
Major Repair	Dealer User or Admin Level
Request Quote	Customer User or Admin Level
View Planner	**Time and Geo. Fence Descriptions**
Mark Repair Complete	Inclusive / Exclusive Descriptions
View History Details	Time Based Descriptions
Fuel Information	**Manage Planned Maintenance**
View Fuel Level History	Customize PM Intervals
View Fuel Level Graph	Edit PM Check List
View Fuel History	Customize PM Schedule
View Status History	General
Update Fuel Level Status	Search
Fault Codes	Export
View Fault Code History	Preferences
Update Fault Code Status	Equipment Details
View Status History	Registration Details
View Troubleshooting Procedures [2]	Manage Subscriptions
Reports	
View Product Usage Report	
View Product Monitoring Report	
View OM&M [2]	
View Equipment Usage Summary	

[1] Contingent on Partstore access

[2] Contingent on SIS access

A user role may only be given to another user by a user that is equal or higher than the user that is being assigned. For example, a Dealer Administrator may create another Dealer Administrator, but a dealer user cannot create a "Dealer Administrator".

Use the following procedure in order to create a new user:

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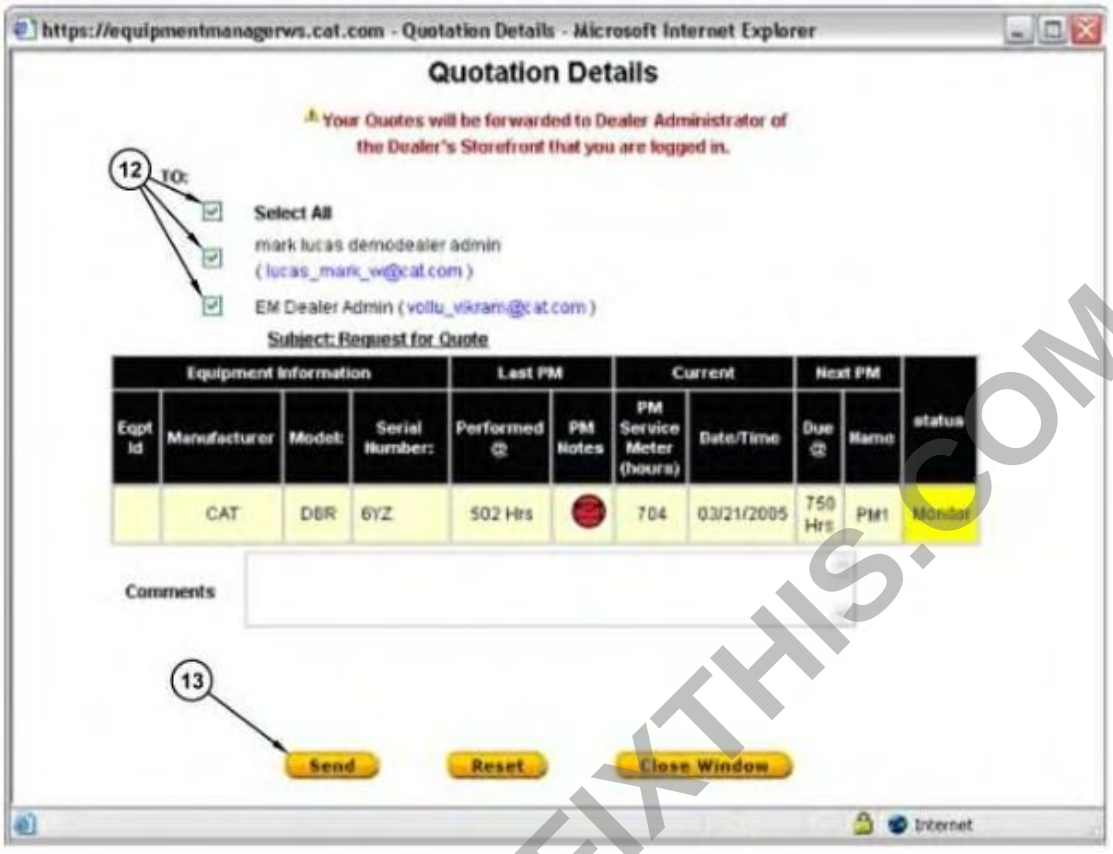


Illustration 10 g01716421

Requesting a PM Quote

(12) Check boxes

(13) "Send" button

3. In order to send a request to multiple Dealer Administrators, select the check boxes (12) next to any of the Dealer Administrator.
4. In order to send a comment to the selected Dealer Administrator, enter the comments in the "Comments" text field.
5. Click the "Send" button (13) . The "Mail Successfully Delivered" screen will be displayed.

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Illustration 1 g01710930

"Exception Dashboard"

(1) "Event Summary" section

(2) "Status" levels

(3) "Equipment Search" section

The default home screen of EquipmentManager is known as the "Exception Dashboard". Refer to Illustration 1. This screen features the following two sections:

- "Event Summary" section (1)
- "Equipment Search" section (3)

"Event Summary"

EquipmentManager allows you to manage your equipment by an exception. There are three "Status" levels (2) of events:

Action (red) - The "Action" status indicates an event that is deemed of the highest importance. "Action" events should be given the most attention and "Action" events should be resolved first.

Monitor (yellow) - The "Monitor" status indicates an event that should have attention, but this event does not require immediate resolution.

Normal (green) - The "Normal" status indicates an event that is deemed of the least importance of the actions that require attention or resolution.

Search Using "Event Summary"

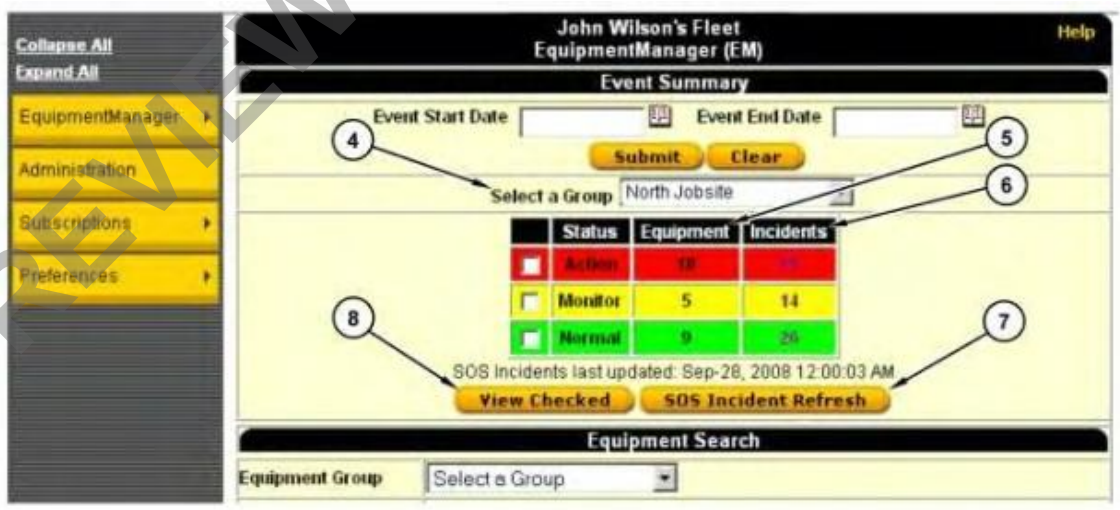


Illustration 2 g01710926

"Event Summary" search with popup text

(4) "Select a Group" drop-down menu

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i02510616

Wiring Harness (Open Circuit) - Test

SMCS - 1408-081

An open is a failure of an electrical circuit that results in no flow of electrical current. An open circuit is usually caused by failed electrical wires or a poor connection of electrical connectors. If an electrical wire or a connection is broken, the flow of electrical current through the circuit is interrupted. A normally closed circuit will have less than 5 ohms of resistance. The following procedure explains the test for an open circuit:

ReferenceFor a complete electrical schematic, refer to Electrical System Schematic for the machine that is being serviced.

TEST FOR AN OPEN CIRCUIT.

1. Identify the connectors and the wire numbers of the suspect circuits. Use the Electrical System Schematic of the machine to identify the circuits.
2. Turn the key start switch and the disconnect switch to the OFF position.
3. Disconnect the component and the ECM from the wiring harness.
4. At one of the disconnected harness connections, place a jumper wire from the contact of the suspect wire to frame ground.
5. At the other connector of the machine harness, use the multimeter probes to measure the resistance from the contact of the suspect wire to frame ground.

   Expected Result: The resistance is less than 5 ohms.

   OK - The resistance is less than 5 ohms. The harness circuit is correct.

   Stop.

   NOT OK - The resistance is greater than 5000 ohms. There is an open in the machine harness.

   Repair: Repair the machine harness or replace the machine harness.

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A. Turn the key start switch to the OFF position.

B. Remove the floorplate in order to get to the ECM.

C. Disconnect the wire harness from the ECM.

D. Disconnect the harness connector from the solenoid connector.

E. At the harness connector for the Aux Hydaulic controlfor the Machine ECM, measure the resistance from the sensor signal contact (wire P978-GN) to all of the other contacts that are used on the Aux Hydaulic connectors for the ECM .

Expected Result:

The resistances should be greater than 5000 Ohms.

Results:

- **OK -** The resistances were greater than 5000 Ohms.

  Repair: The ECM is very unlikely to have failed. Reconnect all connections and visually inspect the wire harness. Verify that the values that are present on the machine configuration screen match the machine's options. Verify that the values that are present on the machine configuration screen are installed correctly. Verify that the diagnostic code still exists. If the diagnostic code still exists perform the test steps again.Replace the ECM, if the cause of the diagnostic code was not found after the second attempt. See Testing and Adjusting, "Electronic Control Module (ECM) - Replace".

  STOP

- **NOT OK -** The resistances were less than 5000 Ohms on one of the readings.

  Repair: There is a short in the wire harness. Locate the short. Repair the wire harness or replace the wire harness.

  STOP

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Diagnostic Code List

SMCS - 7569

Table 1

Module Identifier 161 Diagnostic Codes [1]	
CID 0168 Electrical System	
FMI 00	Voltage above normal
FMI 01	Voltage below normal
CID 0254 Electronic Control Module	
FMI 04	Voltage below normal
FMI 12	Failed Module
CID 1250 Remote Communication Module	
FMI 09	Unable to establish communication
CID 1251 Alternator R-Terminal	
FMI 03	Voltage above normal
CID 1888Local GPS Antenna [2]	
FMI 14	GPS Antenna not present
CID 3766 Subscriber Identity Module (SIM) Card	
FMI 14	SIM Card not detected

[1] For troubleshooting, see the procedure with the same CID FMI.

[2] For troubleshooting information refer to the, "Position Reports Not Available" section of this book

Note: A machine ECM will self-erase a diagnostic if the diagnostic does not reappear after 100 operating hours. The event history screen in the VisionLink application will show a code that

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10. Excessive dirt exists in the compressor housing.

    Clean the compressor housing.

11. Carbon has collected behind the rotor of the turbine.

    Remove the carbon.

12. The fuel injection pump is not operating correctly.

    The fuel injection pump must be repaired or replaced.

13. The fuel injection nozzles are worn or damaged.

    The fuel injection nozzles must be repaired or replaced.

14. The inlet valves and the exhaust valves are burned.

    Replace the inlet valves and the exhaust valves. Determine the cause of the damage to the valves.

15. The piston rings are worn.

    Replace the piston rings.

The engine exhaust has excessive black smoke.

Probable Cause

1. The air filter element is dirty.

   The air filter element must be cleaned or replaced.

2. A restriction exists in the tube between the air filter and the turbocharger.

   The component must be repaired or replaced.

3. The turbocharger is loose or the clamps and bolts on the turbocharger are loose.

   Correctly position the turbocharger and tighten the clamps and bolts.

4. The inlet manifold is cracked, loose or the flange is distorted.

   The inlet manifold must be repaired or replaced.

5. The drain tube for the lubricating oil is restricted.

   The drain tube must be repaired or replaced.

6. Air or combustion gas is leaking through the seals of the turbocharger.

   Replace the turbocharger.

7. The bearings of the turbocharger are worn.

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Specifications
236B2 and 252B2 Skid Steer Loaders Machine Systems
Media Number -KENR8821-00 **Publication Date -01/02/2008** **Date Updated -18/02/2008**

i02865358

Lift Arm Cylinder and Mounting

SMCS - 5102-MT; 5102; 5104-MT; 5104; 6119-S/C

S/N - HEN6750-UP

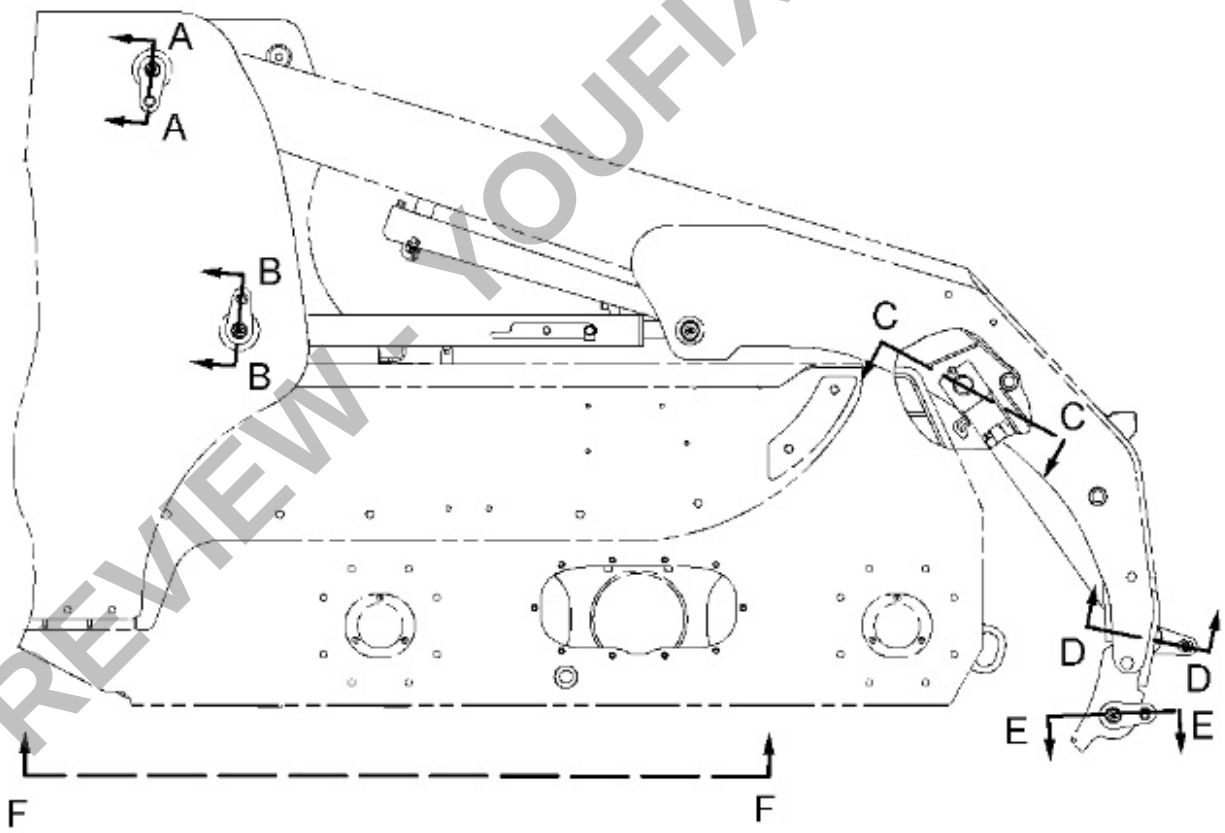


Illustration 1 g01020905

Note: Before assembly, all pins, bores and bearings must be clean. All pins, bores and bearings must be lubricated with the lubricant that is being sealed. Lubricate the entire cylindrical surface of all pins.

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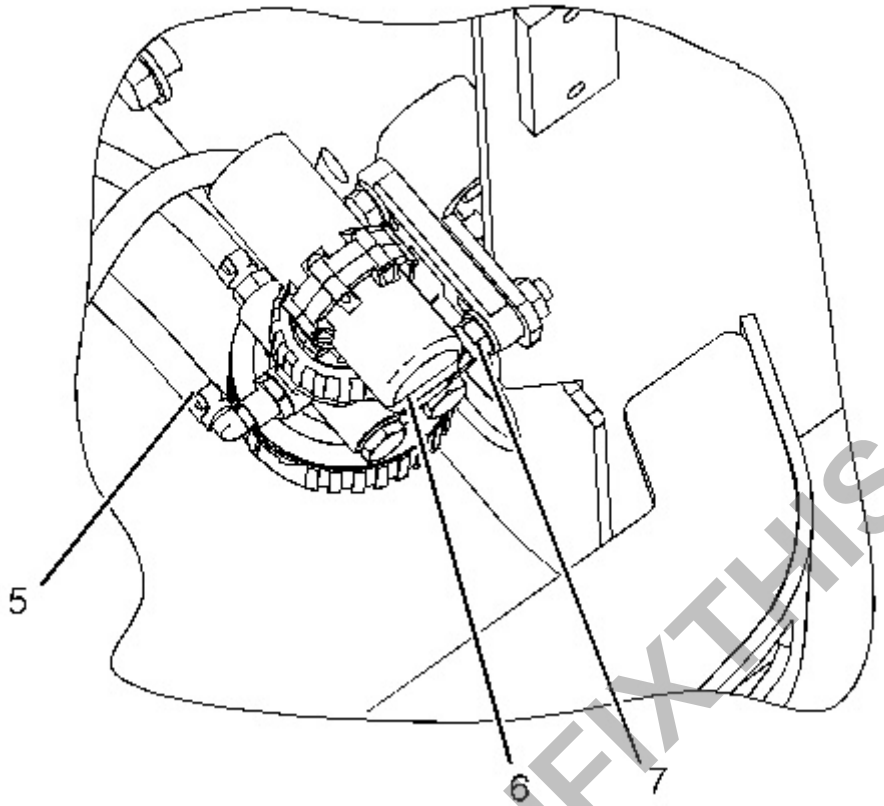


Illustration 3 g01041458

1. Install fuel priming pump (6). Install bolts (7) and connect three hoses (5).

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The machine has poor hydraulic performance when the engine is at high idle.

Probable Cause

1. The setting for the corresponding line relief valve or for the main relief valve may be incorrect.
2. The gear pump may be worn.
3. The pilot pressure is low.
4. The cylinder may have internal leaks.

Problem 20

The line relief valves are noisy.

Probable Cause

1. The line relief valve is adjusted too low or the line relief valve is damaged.
2. The main relief valve is set too high.

Problem 21

There is instability in the hydraulic system.

Probable Cause

1. The diverter valve (if equipped) is damaged or worn.
2. The hydraulic oil is aerated.
3. The gear pump has excessive wear.

Problem 22

The diverter valve (if equipped) is not functioning properly.

Probable Cause

1. The electrical connection between the machine and the diverter valve has been broken.
2. The solenoid on the diverter valve is not functioning.
3. The spool in the diverter valve is stuck in the OPEN position.
4. The cylinder may have internal leaks.

Problem 23

The diverter valve (if equipped) is not making the bucket level with the ground.

Probable Cause

1. The diverter valve is out of adjustment.

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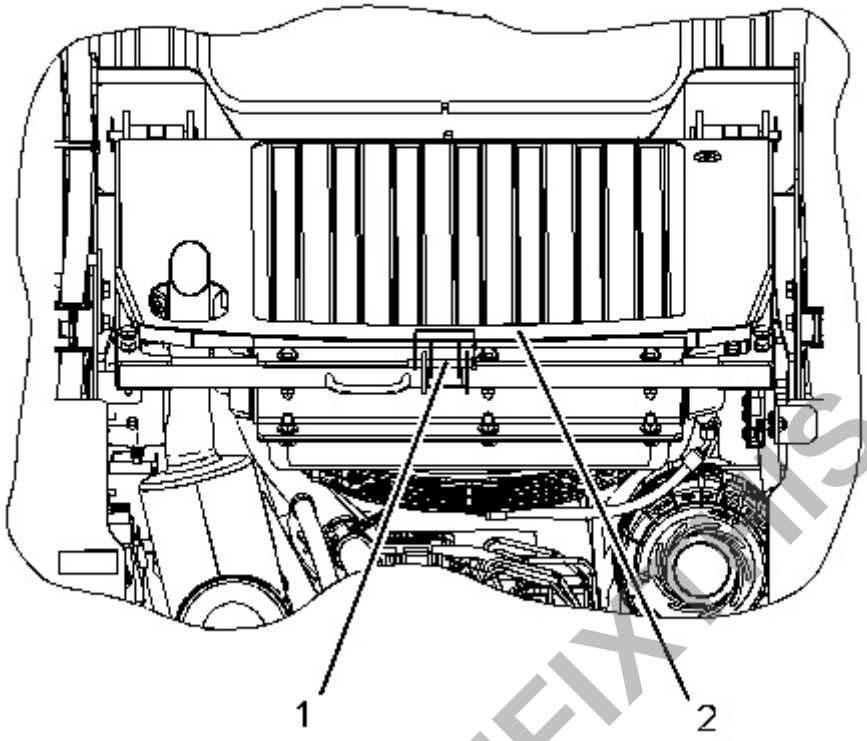


Illustration 10 g01042083

10. Lower radiator guard (2) and install pin (1) .

11. Fill the coolant from the cooling system. Refer to Operation and Maintenance Manual, "Cooling System Coolant (ELC) - Change".

12. Check the level of the hydraulic oil system. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check".

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Illustration 2 g00902740

2. Remove O-ring seal (4). Remove O-ring seal (5). Remove O-ring seal (6) from solenoid (1) .

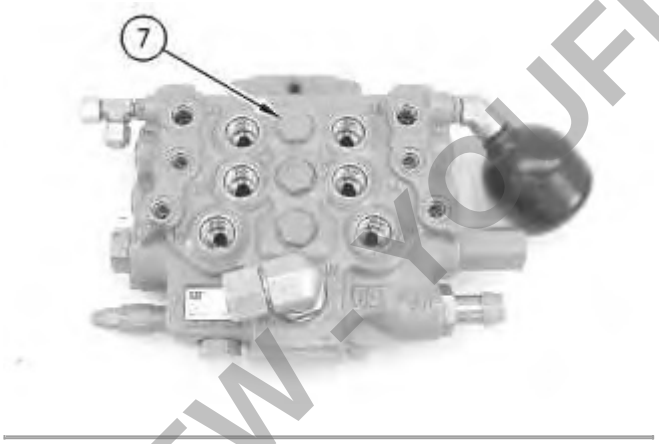


Illustration 3 g00902556

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.

3. Remove the plug (7) and the O-ring seal .

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i01996283

Engine Oil Relief Valve - Remove and Install

SMCS - 1315-010

Removal Procedure

Table 1

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	185-3630	Strap Wrench As	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.



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11 °C (52.0 °F)	328 kPa (47.5 psi)
12 °C (53.0 °F)	336 kPa (48.7 psi)
12 °C (54.0 °F)	344 kPa (49.9 psi)
13 °C (55.0 °F)	352 kPa (51.0 psi)
13 °C (56.0 °F)	360 kPa (52.2 psi)
14 °C (57.0 °F)	369 kPa (53.5 psi)
14 °C (58.0 °F)	377 kPa (54.7 psi)
15 °C (59.0 °F)	385 kPa (55.9 psi)
16 °C (60.0 °F)	394 kPa (57.2 psi)
16 °C (61.0 °F)	403 kPa (58.2 psi)
17 °C (62.0 °F)	412 kPa (59.8 psi)
17 °C (63.0 °F)	421 kPa (61.1 psi)
18 °C (64.0 °F)	430 kPa (62.4 psi)
18 °C (65.0 °F)	440 kPa (63.8 psi)
19 °C (66.0 °F)	450 kPa (65.2 psi)
19 °C (67.0 °F)	459 kPa (66.8 psi)
20 °C (68.0 °F)	469 kPa (68.0 psi)
21 °C (69.0 °F)	478 kPa (69.4 psi)
21 °C (70.0 °F)	488 kPa (70.8 psi)

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following items must be wound tightly with **5P-7070** Strip Insulation : the clip, the sensing bulb and the outlet pipe. There should be no insulation between the bulb and the outlet pipe.

- In order to ensure that the system operates correctly, perform a performance check. Refer to Service Manual, SENR5664, "Air Conditioning Performance - Test".

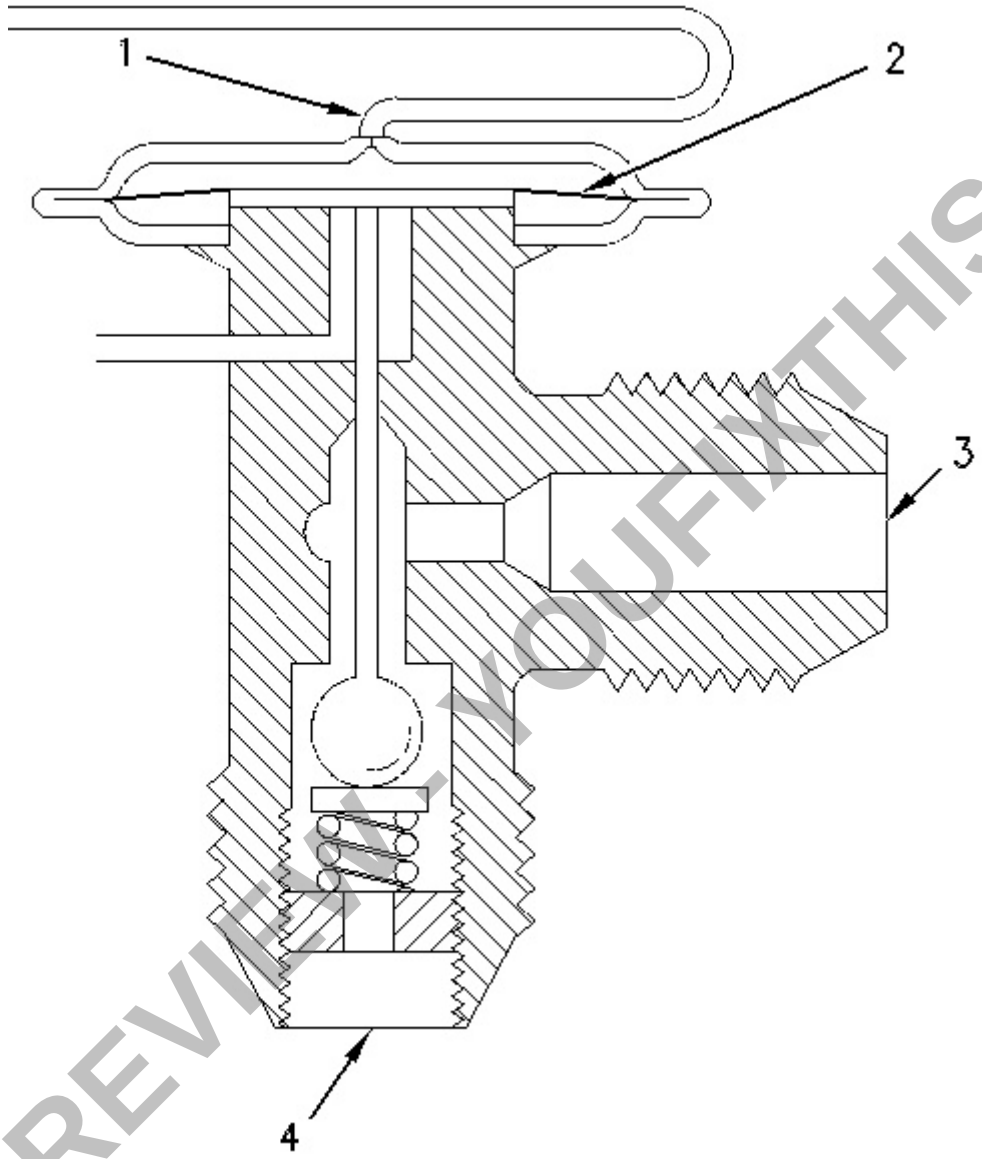


Illustration 1 g00409166

Expansion valve in the open position (Typical Example)

(1) Capillary tube

(2) Expansion valve diaphragm chamber

(3) Inlet

(4) Outlet

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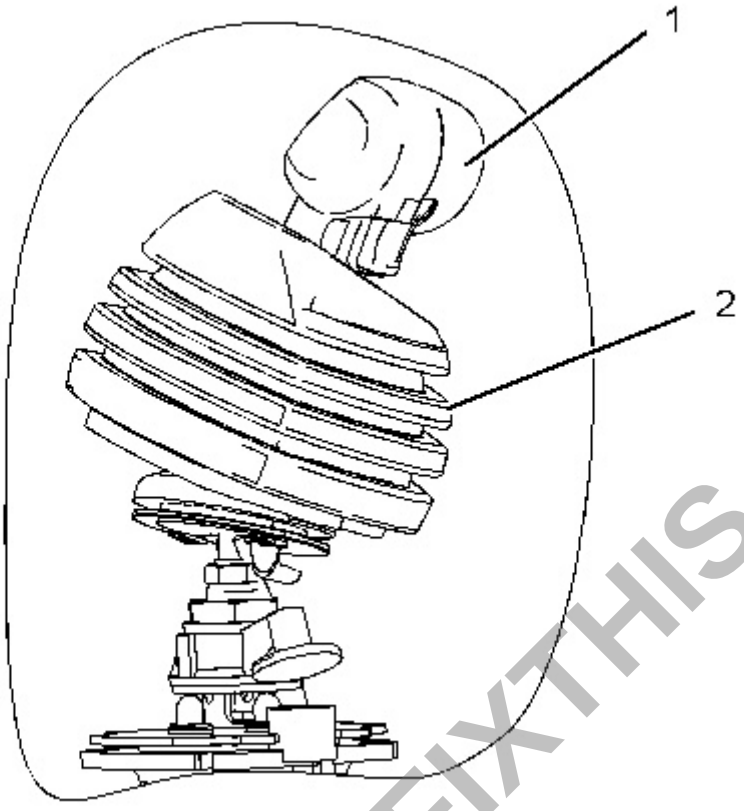


Illustration 2 g01078512

2. Install rubber boot (2) onto the joystick. Install the joystick handle (1). Install the screws on the side of joystick handle.

End By: Install the pilot operated hydraulic control. Refer to Disassembly and Assembly, "Pilot Operated Hydraulic Control - Install".

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Note: Perform the test on rotating group 2 of the piston pump first. Rotating group 2 powers the piston motor which is on the right side of the machine. Rotating group 2 is farthest from the engine.

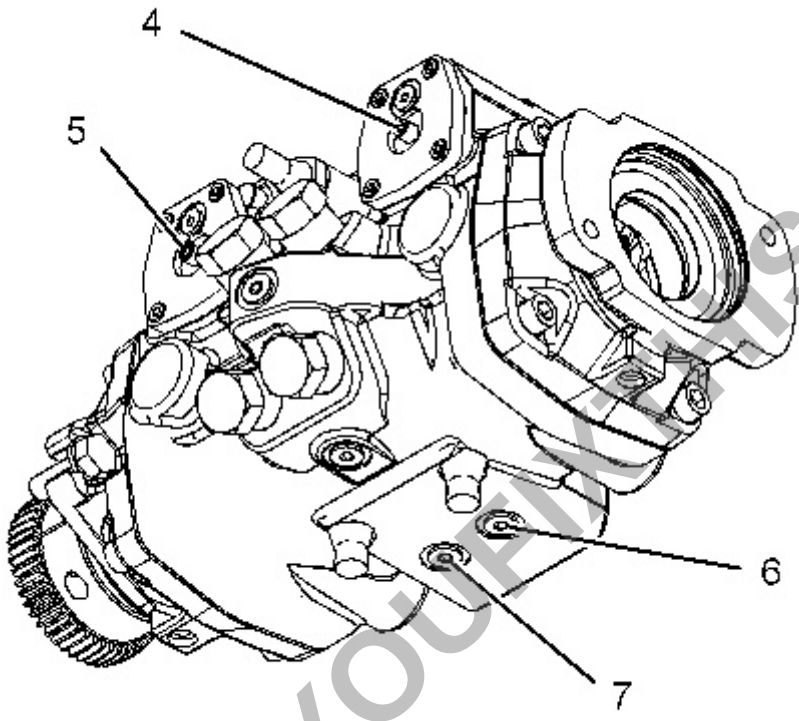


Illustration 7 g01116389

(4) Neutral adjusting bolt for rotating group 2

(5) Neutral adjusting bolt for rotating group 1

(6) MA Port for rotating group 2

(7) MA Port for rotating group 1

6. Remove the plug from the MA port for rotating group 2 (6). Install **6V-3965** Fitting with **3J-1907** O-Ring Seal into the MA port for rotating group 2 (6). Install **8T-0860** Pressure Gauge (0 to 40000 kPa) to the MA port for rotating group 2 (6) with the following items: **6V-3989** Fitting, two **6V-4143** Quick Connect Couplers and **177-7860** Hose .

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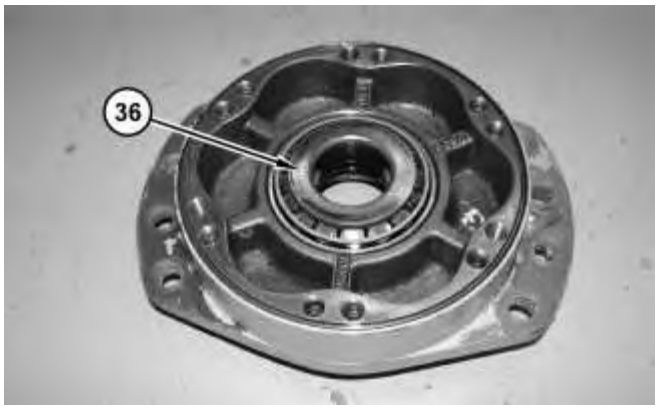


Illustration 21 g01408524

18. Remove bearing cone (36) .



Illustration 22 g01409611

19. Remove bearing cup (37) and seal (38) .

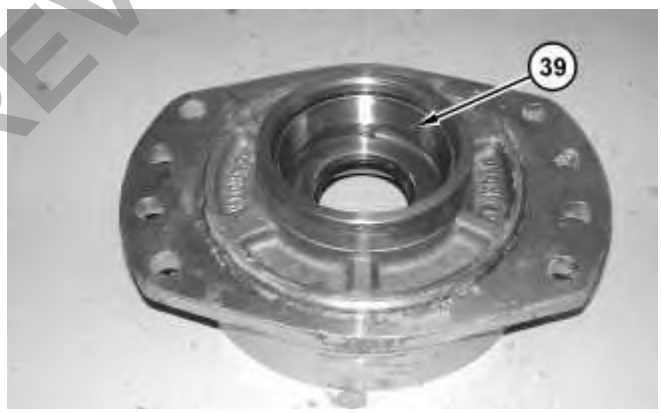


Illustration 23 g01409613

20. Remove bearing cup (39) .

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