

the turbine wheel (15) . Then, the exhaust gas flows out of the turbine housing (14) through the exhaust outlet (16) .

The turbine wheel and the compressor wheel (10) are installed on the same shaft. Therefore, the turbine wheel and the compressor wheel rotate at the same rpm. The compressor wheel is enclosed by the compressor housing (9) . The compressor wheel compresses the inlet air (8) . The inlet air flows into the engine cylinders through the inlet valves of the cylinders.

The oil from the main gallery of the cylinder block flows through the oil inlet port (12) in order to lubricate the turbocharger bearings (11) and (13) . The pressurized oil passes through the bearing housing of the turbocharger. The oil is returned through the oil outlet port (17) to the oil pan.

Some turbochargers have a wastegate. The wastegate is controlled by the boost pressure. This allows some of the exhaust to bypass the turbocharger at higher engine speeds. The wastegate is a type of flapper valve that automatically opens at a preset level of boost pressure in order to allow exhaust gas to flow around the turbine. The wastegate allows the design of the turbocharger to be more effective at lower engine speeds.

The wastegate is controlled by a diaphragm. One side of this diaphragm is open to the atmosphere. The other side of this diaphragm is open to the manifold pressure.

An air/fuel ratio control is installed between the turbocharger and the fuel injection pump. The air/fuel ratio control performs the following functions:

- The fuel is limited on acceleration in order to prevent an overspeed condition.
- The generation of black smoke is reduced.
- The fuel efficiency is improved and emissions are reduced at low boost when the fuel rack is limited for low power output.

The air/fuel ratio control is a nonserviceable part. Adjustment and repairs should only be done by a Caterpillar Dealer.

Cylinder Head And Valves

The valves and the valve mechanism control the flow of the air and the exhaust gases in the cylinder during engine operation. The cylinder head assembly has two valves for each cylinder. Each valve has one valve spring. The ports for the inlet valves are on the left side of the cylinder head. The ports for the exhaust valves are on the right side of the cylinder head. Steel valve seat inserts are installed in the cylinder head for both the inlet and the exhaust valves. The valve seat inserts can be replaced.

The valves move along valve guides. The valve guides can be replaced. The exhaust valve guide has a counterbore in order to prevent the seizure of the valve stem. The seizure of the valve stem is caused by a buildup of carbon under the head of the valve.

The inlet and the exhaust valves are opened and closed by the rotation and movement of the following components:

- Crankshaft
- Camshaft

Disassembly and Assembly 3054 Engine for Caterpillar Built Machines

Media Number -SEN6241-13

Publication Date -01/08/2008

Date Updated -04/08/2008

101605362

Crankshaft Rear Seal - Install

SMCS - 1161-012

Installation Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	9U-6205	Rear Seal Installer	1
	1P-0510	Driver Group	1
B	FT-2806	Alignment Tool	1

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

Engines with 14 Bolt Housing Assembly

1. Inspect the condition of the gasket. Replace the gasket, if necessary.
 2. Clean the areas of the parts that will contact each other.
-

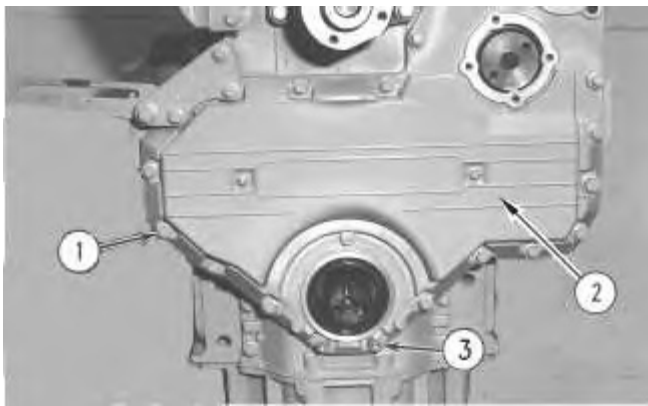


Illustration 1

g00640000



Illustration 2

g00546873

3. Install a new gasket and front cover (2) .
4. Install two bolts (1) in order to hold the gasket and the cover in place.
5. Use Tool (B) and the bolts for the crankshaft pulley in order to center the front cover.

NOTICE

The location of the front cover is critical. If the front cover is not centered, the backlash between the fuel injection pump gear and the water pump gear could be affected. This could result in damage to the fuel injection pump.

6. Install the remaining bolts (1) and the two nuts (3). Tighten the nuts and the bolts to a torque of 22 N·m (16 lb ft).

End By:

Note: After tightening nut (7), turn the nut (7) counterclockwise for one full turn before you tighten the nut (8) .

(8) Tighten the nut to the following torque. ... $67.5 \pm 7.5 \text{ N}\cdot\text{m}$ ($50.0 \pm 5.5 \text{ lb ft}$)

113-2552 Parking Brake Control for All Wheel Steer Machines

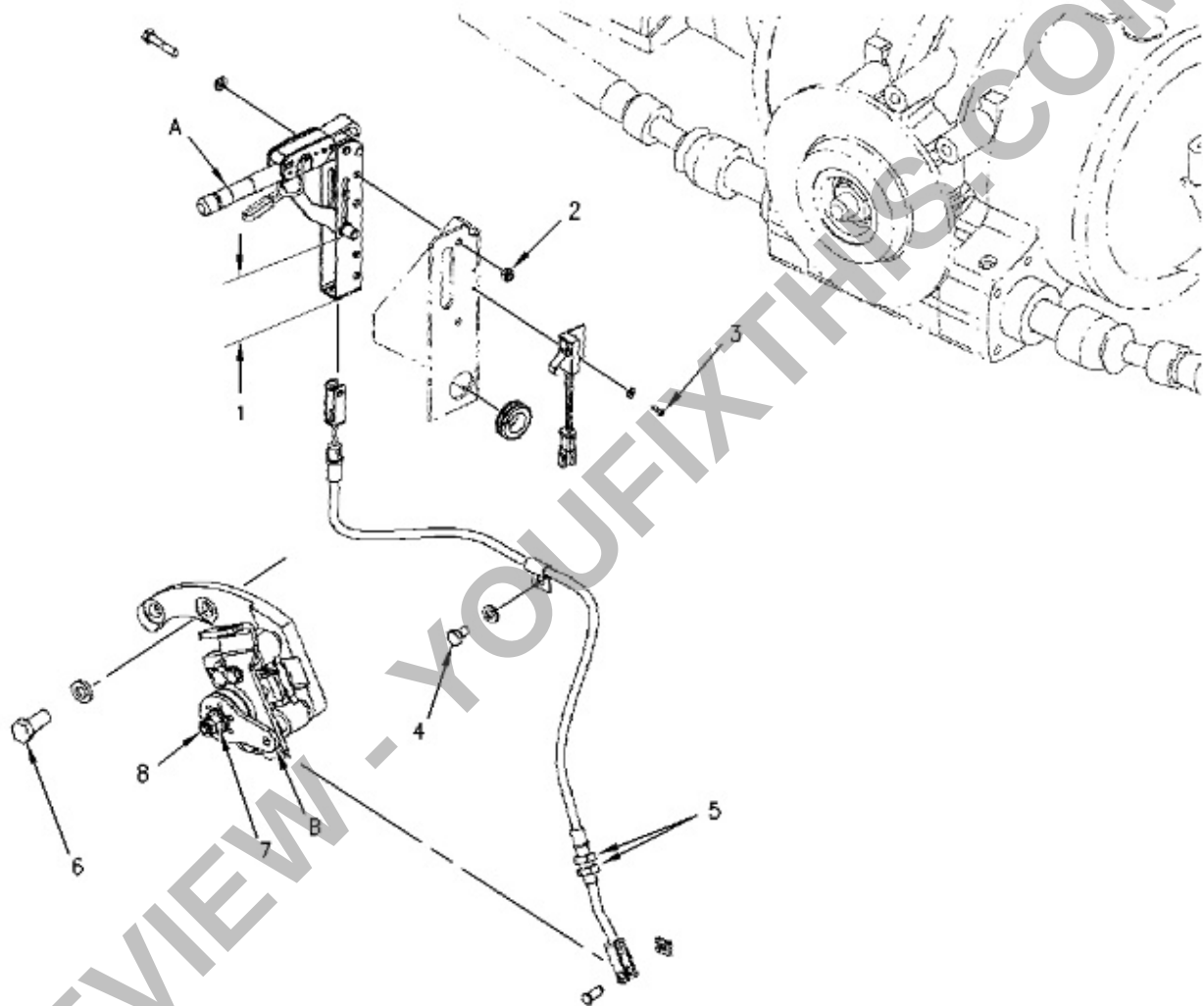


Illustration 2

g00290573

Note: The dimension for callout (1) is measured with the handle (A) in the engaged position. This is an initial adjustment.

(1) The distance from the bottom of the pin to the bottom surface of the assembly ... $115 \pm 3 \text{ mm}$ ($4.5 \pm 0.1 \text{ inch}$)

(2) Tighten the two **6V-9189** Locknuts to the following torque. ... $28 \pm 7 \text{ N}\cdot\text{m}$ ($20.7 \pm 5.2 \text{ lb ft}$)

(3) Tighten the two **8T-3998** Bolts to the following torque. ... $1.7 \pm 0.25 \text{ N}\cdot\text{m}$ ($15 \pm 2 \text{ lb in}$)

(4) Tighten the **8T-4136** Bolt to the following torque. ... $55 \pm 10 \text{ N}\cdot\text{m}$ ($41 \pm 7 \text{ lb ft}$)

(6) "Group Name" drop-down menu

2. Select the name of the equipment group from which you wish to create a subgroup from the "Group Name" drop-down menu (6) . The "Create Equipment Subgroup" screen is displayed with the "Subgroup Information" section and the "Equipment List".

View: --Create Equipment Sub Group

Create Equipment Subgroup

Select equipment from group equipment

Subgroup Information

Group Name: Test Group A0

Group Description: Test Group

Subgroup Name: Non A's

Subgroup Description: Serial #s without A

Equipment List

Select	Unit ID #	Manufacturer	Product Model	Serial Number
☒		CAT	950H	KSHQ
☐		CAT	320C L	ANB0
☐		CAT	6210	ALFO
☐		CAT	385B L	ANS0
☒		CAT	D6R	6VZ0
☐		CAT	740	AZZ0
☐	Select All			

Reset Create Subgroup

Illustration 13

g01730049

"Create Equipment Subgroup" screen

(2) Check box

(10) "Subgroup Name" field

(11) "Subgroup Description" field

(12) "Create Subgroup" button

3. In the "Subgroup Information" section, enter a name for the new subgroup in the "Subgroup Name" field (10) .
4. In the "Subgroup Information" section, enter a description for the new subgroup in the "Subgroup Description" field (11) .
5. In the "Equipment List" section, select the check box (2) next to each piece of equipment in the group that you wish to be added to the new subgroup.
6. Click the "Create Subgroup" button (12) . The "Create Equipment Subgroup Confirmation" screen will be displayed.

Fuel Results

SMCS - 7600; 7606

The EquipmentManager software is able to collect data regarding the fuel consumption of your equipment. This data includes the following: fuel level, fuel usage and the history for refueling.

Note: The results that are displayed using "Fuel Results" are not results that are measured. The information that is viewed on the "Fuel Results" screen is calculated information. The calculations are based on the performance maps of the machine. The performance maps define specific performance characteristics of the machine. These characteristics determine the calculated fuel usage at different loading conditions. The result is the cumulative fuel consumption.

In order to view the fuel information for a specific machine, use the following procedure:

4. Click the "OK" button at the very bottom of the screen. Your preferences will be saved and the "Set Your Preferences" screen will be displayed.

Available Preference Values

The following table lists the available values for each of the preferences that appear on the "Set Your Preferences" screen.

Table 1

Name of Preference	Available Values
"Default Group In Event Summary Page"	"All Equipment" (Equipment Groups you created) (Equipment Groups you have been assigned)
"Date Format"	"MM/DD/YYYY " "DD/MM/YYYY" "DD-MON-YY" "DD-MON-YYYY" "MON-DD,YYYY"
"Time Format"	"12 Hr Format" "24 Hour (Military Time)" "12 Hr with AM/PM"
"Time Zone"	(A list of all time zones appears in the drop-down menu)
"Daylight Savings"	"Observe Daylight Savings Time" "Ignore Daylight Savings Time"
"Location Display"	"Nearest City" "Latitude/Longitude (Deg/Min/Sec)" "Latitude/Longitude (Delorme Decimal)"
"Records Per Page"	"10 records" "20 records" "50 records" "100 records"
"History Details Shown"	"3 Months" "6 Months" "9 Months" "1 Year" "2 Years" "3 Years" "5 Years"
"Distance Unit"	"Miles" "Kilometers"
"Fuel Unit"	"Gallons" "Liters"
"Unit ID Display"	"Unit ID" "Equipment ID"
"Country"	(A list of over 240 countries appears in the list box)

2 m (6.6 ft) PL121SR Radio Harness

- (1) 12-pin plug connector (P1)
- (2) 2-pin receptacle connector (J2)
- (3) 12-pin receptacle connector (J1)

ECM Harness

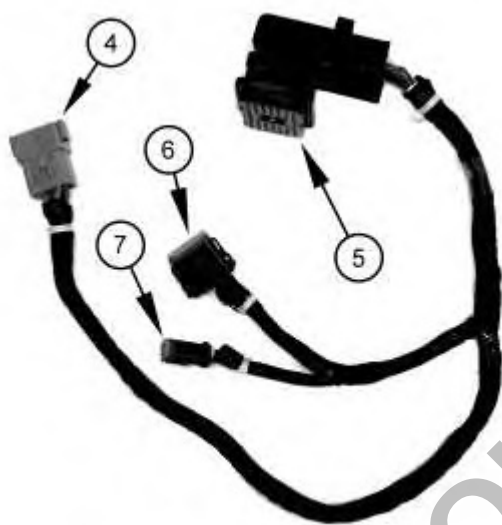


Illustration 5

g01336465

- (4) 12-pin receptacle connector (J1)
- (5) 70-pin plug connector (P1)
- (6) 12-pin plug connector (P2)
- (7) 2-pin plug connector (P3)

Conversion Harness

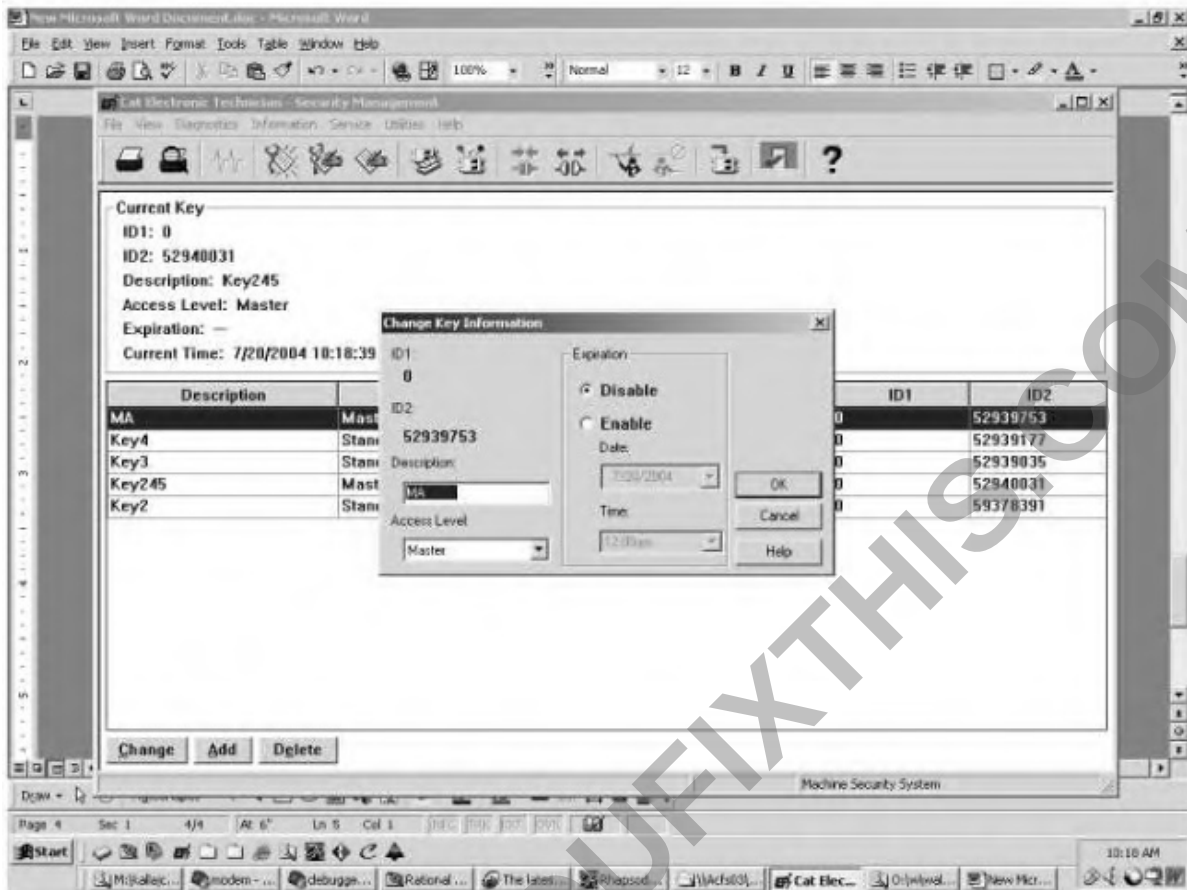


Illustration 3

g01097373

Change key information

The "Change" push button allows you to change the "Description", "Access Level" or "Expiration" of a key. ID1 and ID2 cannot be changed.

Note: The "Change" push button is disabled until a key is selected from the authorized list.

Note: When a function requires a factory level security password, the "Enter Factory Passwords" dialog box is displayed.

Note: Changing Keys requires a key with the master access level or a factory password.

Perform these steps in order to change the information regarding a particular key:

1. Choose a key and highlight that key in the list. Press the "Change" push button. The "Change Key Information" dialog box is displayed.

OR

Double click on the key you want to change. The "Change Key Information" dialog box is displayed.

2. Enter the changes in the key information. See "Adding Key Information" for more detail.

Deleting Key Information

- The sequence of events prior to the failure (order of the occurrences)
- The troubleshooting steps that have been taken
- The history of repairs of the machine
- The preventive maintenance of the machine
- Related service information about current problems that affect the serial number of the machine
- Inspect the Machine. Look for problems. Notice any unusual odors in the air. Listen for unusual noises.

Verify the Symptom

When possible, attempt to duplicate the symptom. Operate the machine and repeat the conditions that caused the failure. Check the gauges inside the cab. Notice any unusual odors in the air. Listen for unusual noises.

Determine if the electronic control module (ECM) has detected any faults. A diagnostic code is used to specify each detected fault.

Determine Possible Causes

Use the information from the operator and your inspection. Attempt to identify a common cause if there is more than one symptom.

Test and Repair the System

Use the tests and procedures in this manual to verify the cause of the symptom. Once the cause has been identified, repair the failure. Then, test the system again to verify that the symptom is resolved.

Provide Feedback to Caterpillar

Share your troubleshooting information. Provide Caterpillar feedback after the correct repair has been performed. Use the form in SISweb or CBT feedback to write a brief description about the symptom, testing, and repair of the machine. Include your phone number or your e-mail address so that you can be contacted. This feedback information helps Caterpillar improve service information.

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Troubleshooting Product Link 121S/300

Media Number -REN7911-10

Publication Date -01/06/2013

Date Updated -27/06/2013

104906983

Reporting Interval Erratic

SMCS - 7606-038-RPT

System Operation Description:

There are problems that could be reported with the Product Link system but the problems are not caused by the Product Link system. The problem can be described as the intervals between reports are erratic. This section contains steps that are used to determine the possible cause. Check for active diagnostic codes for the Product Link. Correct any diagnostic codes before proceeding. The following items should be visually inspected for damage: PL121SR radio, module, antenna and cables. Verify that there are no loose connections.

The Product Link system depends on several communication links in order to transfer data from the machine to the office. The following procedures assume that these communication links are operating properly. The proper communication links are listed below:

- The satellite network for VHF communications is operational in the geographic area of concern. The network is operational when messages can travel to the satellite and the messages can travel to the earth and Caterpillar.
- The Product Link system is correctly configured to communicate on the network for VHF communications.
- The worldwide network of Caterpillar's computers is passing messages to software for the Caterpillar Equipmentmanager (EM).
- The Caterpillar Electronic Technician (Cat ET) is configured properly and the software is functioning.

The PL300 module or the PL121SR radio should not be replaced without verifying that these issues have been investigated. Contact your Caterpillar Technical Communicator for aid in resolving these issues.

Test Step 1. ACCESS THE PRODUCT LINK THROUGH THE CAT ET SERVICE TOOL.

- A. Connect the Cat ET service tool to the machine.
- B. Verify that the ECM (Product Link) is available.

5. The incorrect type of lubricating oil is installed.

Drain the lubricating oil. Replace the oil filter. Install the correct type of lubricating oil.

6. The oil supply line from the oil pan is restricted.

The oil supply line must be repaired or replaced.

7. The incorrect type of lubricating oil is installed.

Drain the lubricating oil. Replace the oil filter. Install the correct type of lubricating oil.

8. The oil supply line from the oil pan is restricted.

The oil supply line must be repaired or replaced.

9. The turbine housing is damaged or restricted.

The turbine housing must be repaired or replaced.

10. The turbocharger bearings are worn.

Replace the bearings.

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

Remove the carbon.

12. The engine rpm increases too rapidly when the engine is started.

Check the fuel injection pump for correct operation and settings.

13. The period of time at high idle is insufficient.

Check the fuel injection pump for correct operation and settings.

14. The fuel injection pump is not operating correctly.

The fuel injection pump must be repaired or replaced.

15. 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.

16. Lubricating oil is leaking from the oil supply line.

The oil supply line must be repaired or replaced.

17. A restriction exists in the bearing housing of the turbocharger.

The bearing housing must be repaired or replaced.

18. A restriction exists in the lubricating oil filter.

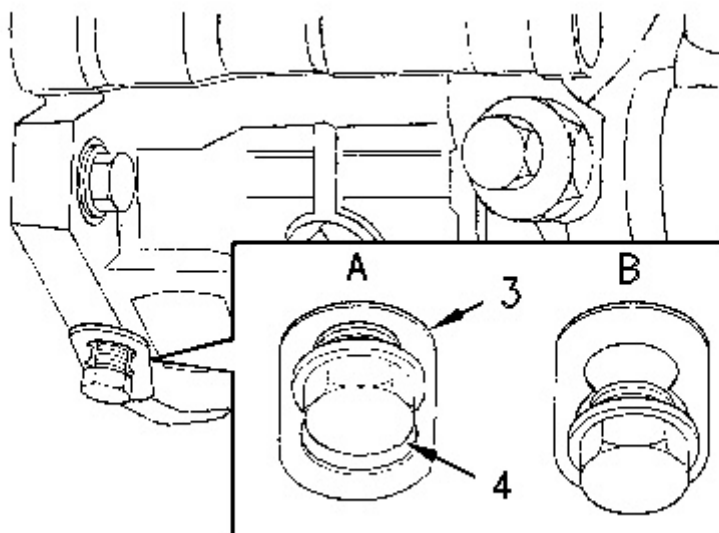


Illustration 6

g00292837

Before the crankshaft is turned or the fuel injection pump is installed, move the locking spacer (3) under the locking screw (4). Refer to position (A) that is in Illustration 6. This position ensures that the pump drive shaft is released.

(5) Tighten the fitting for the fuel return line connection to the following torque. ... 5 to 6 N·m (44 to 53 lb in)

(6) Tighten the adjustment screw for low idle to the following torque. ... 4 to 4.5 N·m (35 to 40 lb in)

(7) Tighten the adjustment screw for high idle to the following torque. ... 4 to 4.5 N·m (35 to 40 lb in)

(8) Electrical connection for the stop solenoid

(9) Tighten the fitting for the fuel supply connection to the following torque. ... 22 N·m (16 lb ft)

(10) Tighten the nuts for the fuel line to the following torque. ... 22 N·m (16 lb ft)

(11) Tighten the flange nuts to the following torque. ... 22 N·m (16 lb ft)

(12) Electrical connection for cold starting aid

(13) Tighten the fittings for the fuel discharge lines to the following torque. ... 70.5 to 81.4 N·m (52 to 60 lb ft)

Timing Information for the Delphi Fuel Injection Pump

Table 3

Delphi Fuel Injection Pump		
Code that is on the Fuel Injection Pump	Engine Check Angle (degrees)	Fuel Injection Pump Mark Angle (degrees)

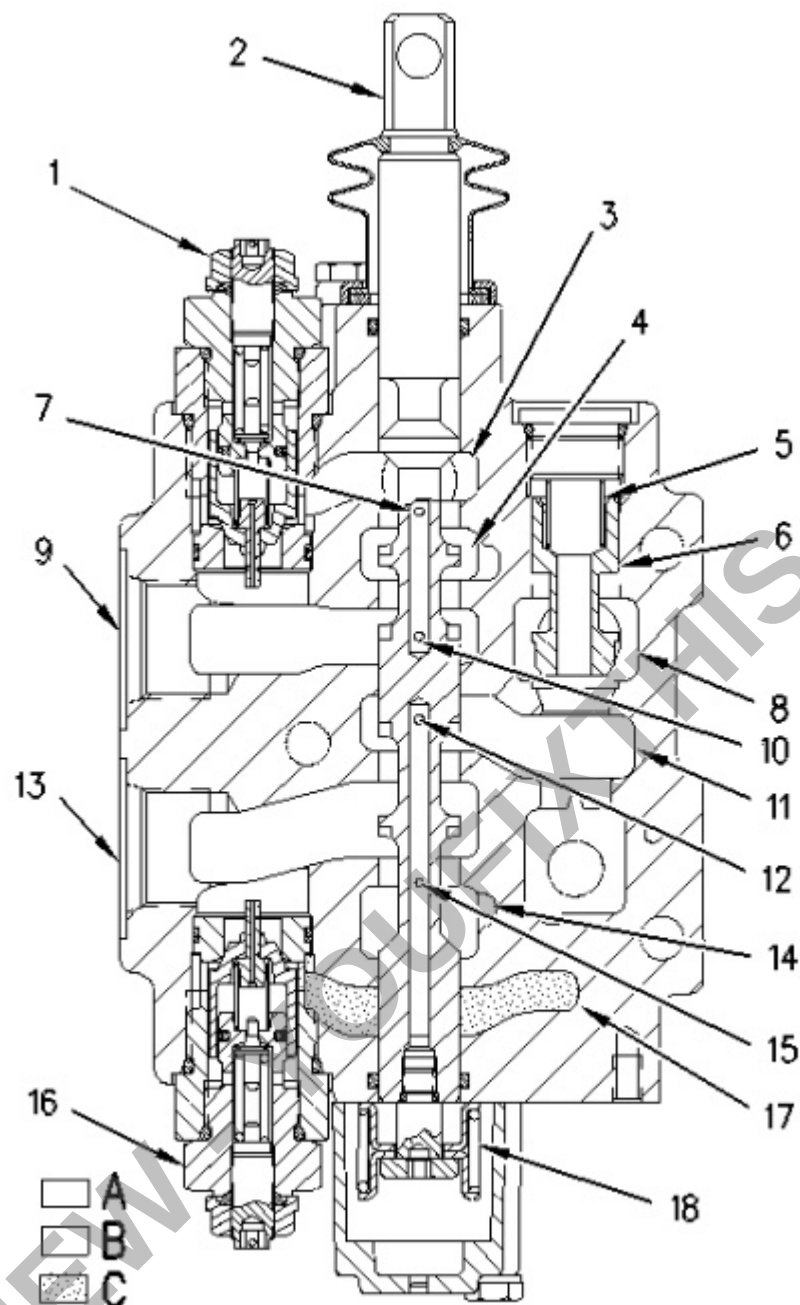


Illustration 4

g00560286

RAISE Position for the Boom Valve

(1) Head end line relief valve, (2) Spool, (3) Passage to tank, (4) Signal passage, (5) Spring, (6) Load check valve, (7) Signal hole, (8) Pump passage, (9) Port to head end, (10) Signal hole, (11) Passage, (12) Signal hole, (13) Port to rod end, (14) Signal passage, (15) Signal hole, (16) Rod end line relief valve, (17) Passage to tank, (18) , (A) Pump oil, (B) Return oil and (C) Blocked oil

Note: Machines that are equipped with boom lock valves do not have signal holes (7) and signal holes (10). Machines that are equipped with boom lock valves do not have an advanced signal passage for the boom LOWER.

When the operator places the control lever in the RAISE position, spool (2) is moved upward. As the spool starts to move, pump oil flows into hole (12). The oil flows up the advanced signal

with the skin and eyes and do not drink. Allow cooling system components to cool before draining.



WARNING

Effective July 1, 1992 regulations prohibit the venting of any refrigerant into the atmosphere. Refer to Caterpillar publication SENR5664 and NEDG5065 for the proper procedure, equipment and tools to reclaim refrigerant from any Caterpillar machine.



WARNING

Always wear goggles when working on air conditioning systems. The system is under pressure at all times, engine running or not. Escaping refrigerant R-134A can cause freezing of human flesh.

Do not smoke while working on air conditioning systems. **INHALING REFRIGERANT 134A THROUGH ANY SMOKING MATERIAL, ALTHOUGH NOT TOXIC OR FLAMMABLE, CAN GENERATE LETHAL PHOSGENE GAS AND CAUSE VIOLENT ILLNESS OR DEATH. ALSO, HEAT MUST NEVER BE APPLIED TO A CHARGED SYSTEM.** See Air Conditioning And Heating Service Manual, Form number SENR5664, for more information on removal and installation of lines and refrigerant from the system.

NOTE: For purging and charging the air conditioning system, refer to the Air Conditioning And Heating Service Manual SENR5664.



1. Remove four bolts (1) and two bumpers (2). Remove screw (3) and grill (4).

Specifications

416C, 426C, 428C, 436C and 438C Backhoe Loaders Hydraulic and Steering System

Media Number -SEN1207-05

Publication Date -01/08/2001

Date Updated -09/10/2001

i01004152

Hydraulic Tank and Mounting

SMCS - 5056

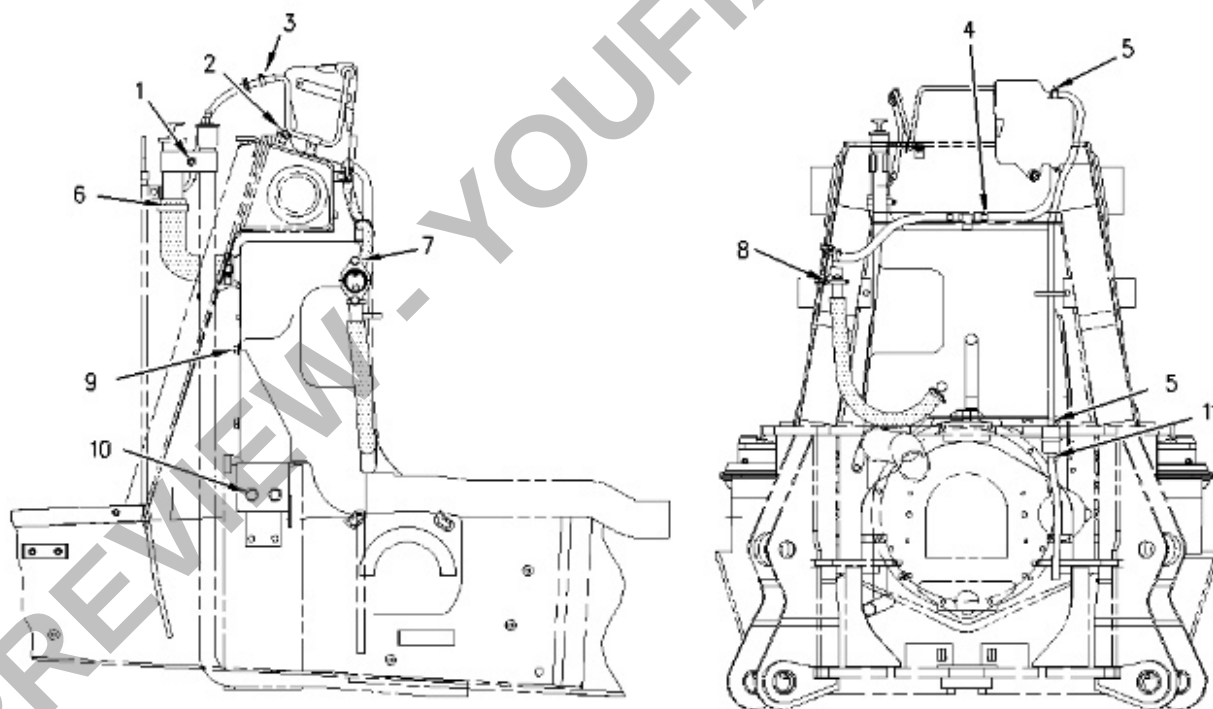
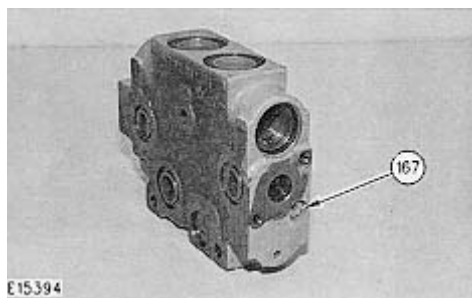
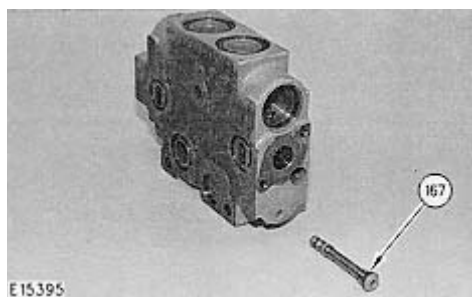


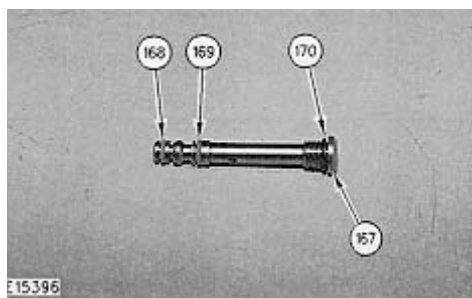
Illustration 1

g00305343

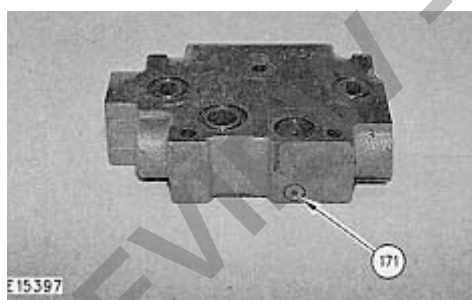
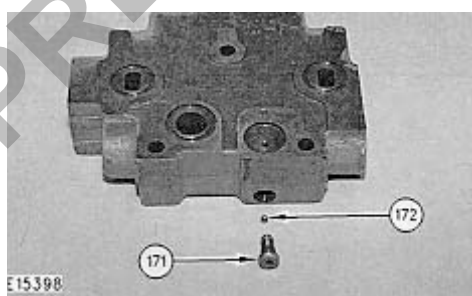
- (1) Torque for the clamp bolt ... $28 \pm 7 \text{ N}\cdot\text{m}$ ($20 \pm 5 \text{ lb ft}$)
- (2) Torque for the two bolts for the expansion tank ... $20 \pm .5 \text{ N}\cdot\text{m}$ ($15 \pm 0.4 \text{ lb ft}$)
- (3) Torque for the two retaining clamps ... $0.9 \pm 0.2 \text{ N}\cdot\text{m}$ ($0.7 \pm 0.1 \text{ lb ft}$)



86. Remove valve (167).



87. Remove O-ring seals (168), (169), and (170) from valve (167).



88. Remove seat (171) and ball (172).

Systems Operation

All Products Air Conditioning and Heating R134a for All Caterpillar Machines

Media Number -SEN5664-22

Publication Date -01/08/2012

Date Updated -13/08/2012

102998460

Refrigerant Compressor

SMCS - 1802

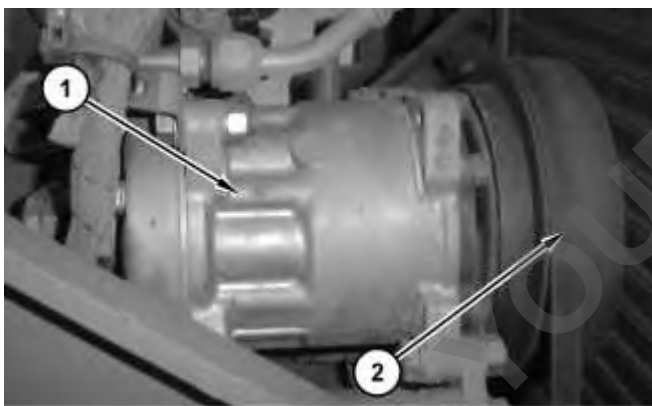


Illustration 1

g01257036

(1) Compressor

(2) Magnetic clutch and pulley assembly

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Testing and Adjusting

416C, 426C, 428C, 436C and 438C Backhoe Loaders Axles, Differential and Brakes

Media Number -SEN1259-01

Publication Date -01/02/1999

Date Updated -09/10/2001

i00750909

Axle (Front) - Adjust

SMCS - 4208-025; 4303-025; 4318-025

S/N - 1WR1-8116

S/N - 1XR1-2184

S/N - 1YR1-1517

S/N - 1ZR1-926

S/N - 2AR1-1604

S/N - 2BR1-911

S/N - 2CR1-16212

S/N - 4ZN1-16044

S/N - 5YN1-15148

S/N - 6XN1-3616

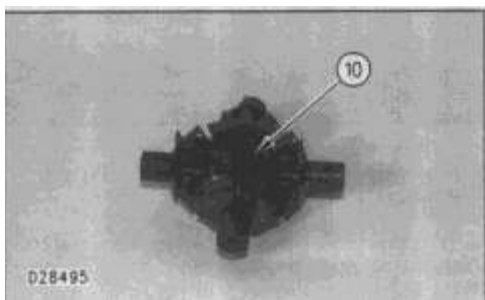
S/N - 7WN1-939

S/N - 8RN1-4089

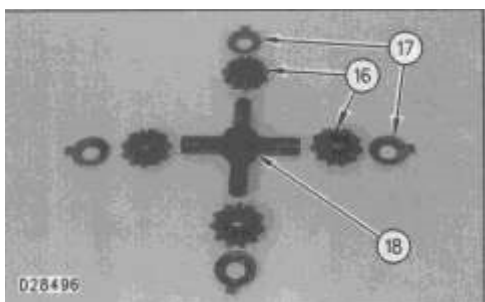
S/N - 8TN1-925

S/N - 9JN1-884

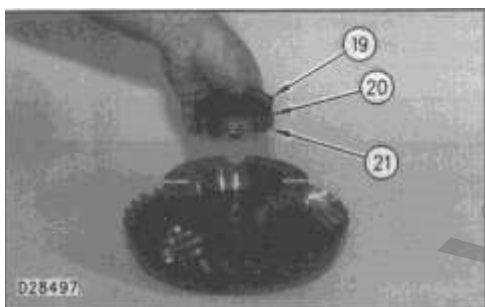
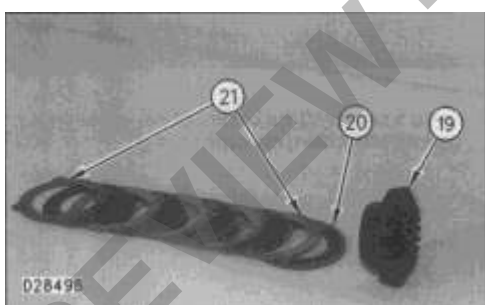
Adjustment Procedure For The Wheel Bearings



b. Remove spider assembly (10) as a unit.

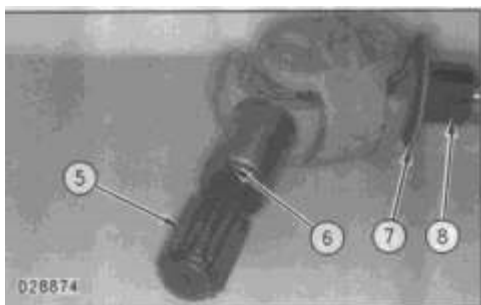
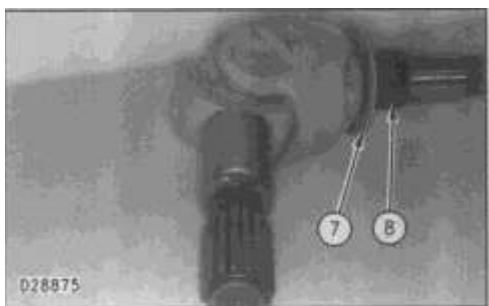
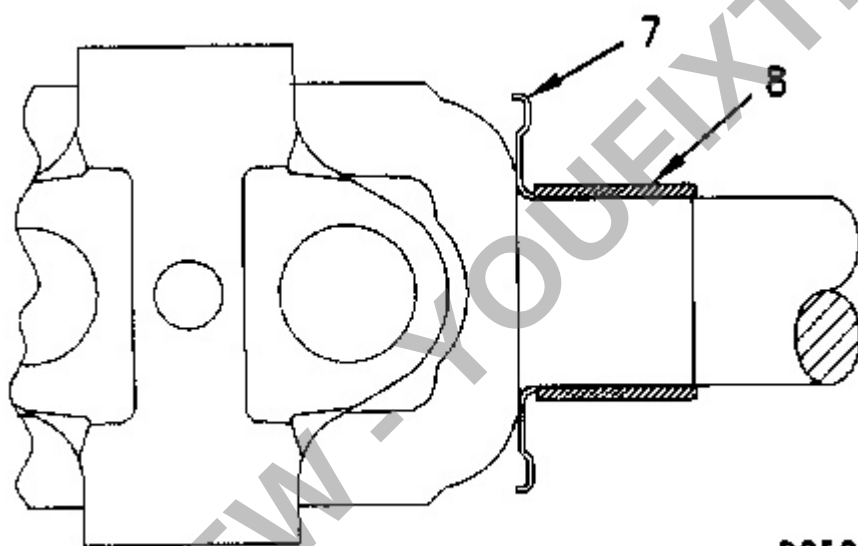


c. Remove four washers (17), and four spider gears (16) from spider (18).

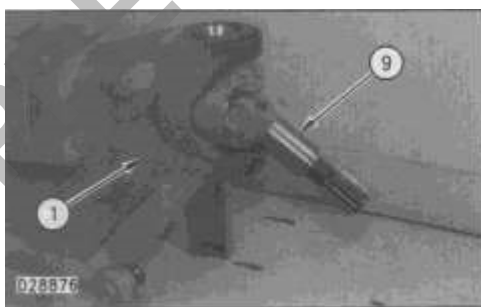


d. Remove differential gear (19), thrust washer (20) and limited slip plates and discs (21) from the other side.

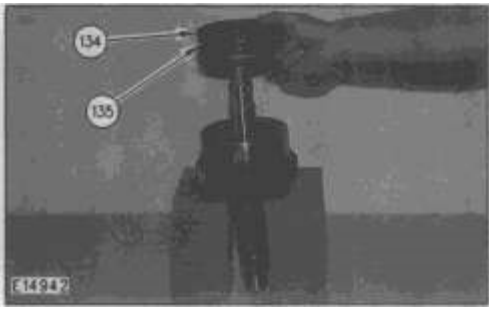




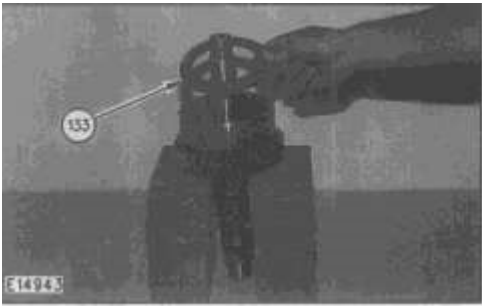
5. Install dust shield (7) and bushing (8) to the axle shaft.



6. Install axle shaft (9) into axle housing (1).



123. Install eight friction discs (134) and eight plates (135).



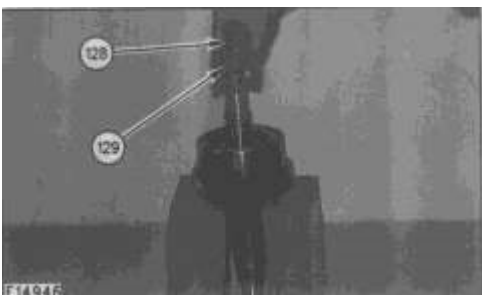
124. Install end plate (133).



125. Install retaining ring (132).



126. Install washer (131) and needle thrust bearing (130).



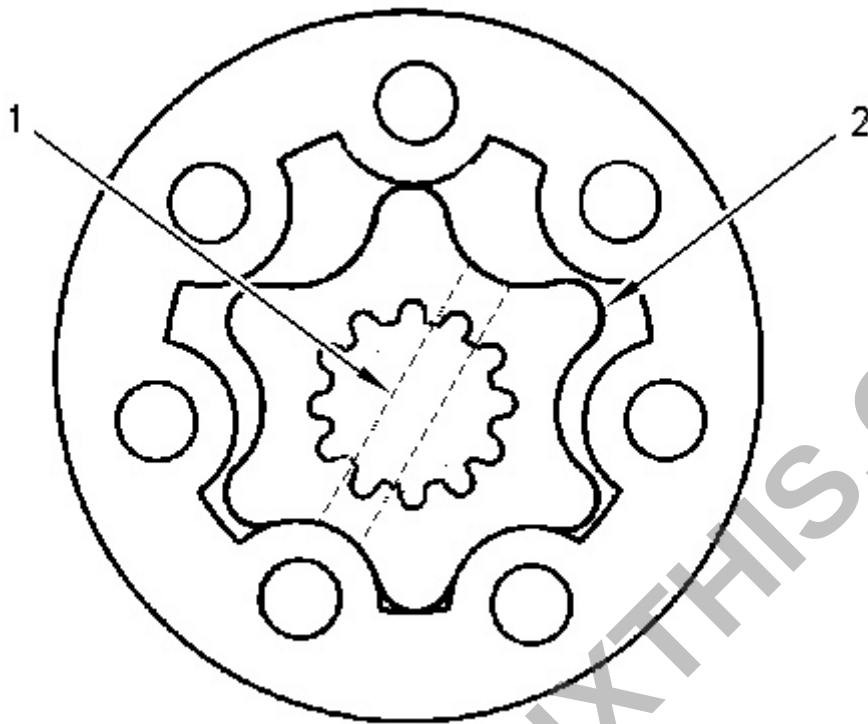


Illustration 1

g00552777

(1) Pin. (2) Internal pump gear.

3. The timing of the drive for the metering pump is not correct. Pin (1) must align with the valley of the internal pump gear (2) .

Problem 5

The steering oil pressure is too high.

Probable Cause

1. The relief valve for steering is not adjusted to the specification.

Problem 6

The steering oil pressure is too low.

Probable Cause

1. The relief valve for steering is not adjusted to the specification.
2. There is a leak in the final resolver.
3. The crossover relief valve is set too low.

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Caterpillar 416C, 426C, 428C, 436C, 438C repair



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