Systems Operation
3114 , 3116 and 3126 Engines for Caterpillar Built Machines
Media Number -SENR3583-13 **Publication Date -01/10/2008** **Date Updated -31/10/2008**

i01684169

Air Inlet and Exhaust System

SMCS - 1050

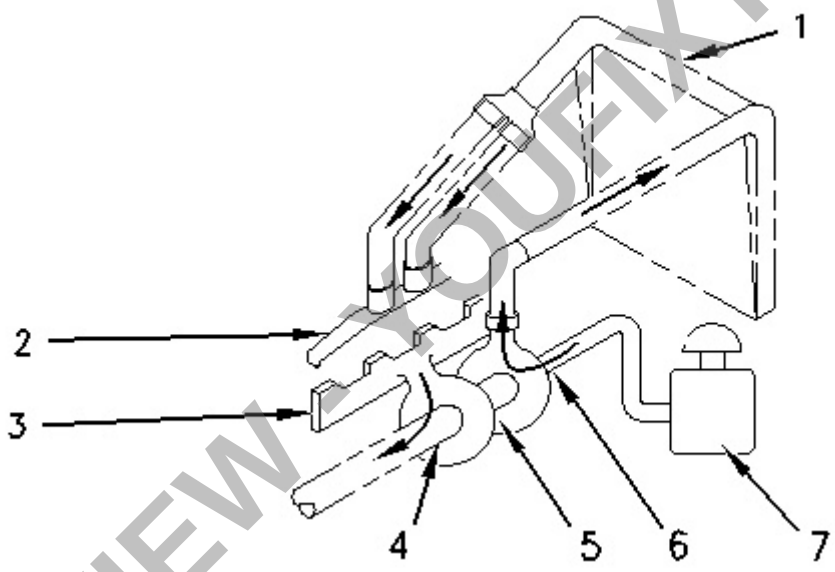


Illustration 1 g00692826

Air Inlet And Exhaust System Schematic

(1) Aftercooler (aftercooled engines)

(2) Air inlet manifold

(3) Exhaust manifold

(4) Exhaust outlet

(5) Turbocharger

(6) Air inlet

(7) Air cleaner

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Systems Operation
3114 , 3116 and 3126 Engines for Caterpillar Built Machines
Media Number -SENR3583-13 **Publication Date -01/10/2008** **Date Updated -31/10/2008**

i01613617

Basic Engine

SMCS - 1200

Cylinder Block and Head

The cylinder block for the four cylinder engine has five main bearings that support the crankshaft. The cylinder block for the six cylinder engine has seven main bearings that support the crankshaft. The main bearing caps are fastened to the cylinder block with two bolts per cap.

The removal of the oil pan allows access to the following components:

- Crankshaft
- Main bearing caps
- Piston cooling jets
- Oil pump

The compartment for the camshaft is accessible through covers on the left side of the cylinder block. These side covers also support the pushrod lifters. The camshaft is supported by bearings that are pressed into the cylinder block. There are five camshaft bearings for the four cylinder engine and there are seven camshaft bearings for the six cylinder engine.

The cylinder head is separated from the cylinder block by a gasket that is made of steel and non-asbestos fiber. Coolant flows out of the cylinder block through gasket openings and into the cylinder head. The gasket also seals the oil supply and the drain passages between the cylinder head and the cylinder block. The air inlet ports are located on the top of the cylinder head. The exhaust ports are located on the right side of the cylinder head. There is one intake and one exhaust valve for each cylinder. Valve guides are pressed into the cylinder head. The fuel injector is located between the two valves. Fuel is injected directly into the cylinders at very high pressure. A system with pushrods and with rocker arms is used in order to control the valves and the fuel injectors.

Pistons, Rings, and Connecting Rods

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i01624735

Cooling System

SMCS - 1350

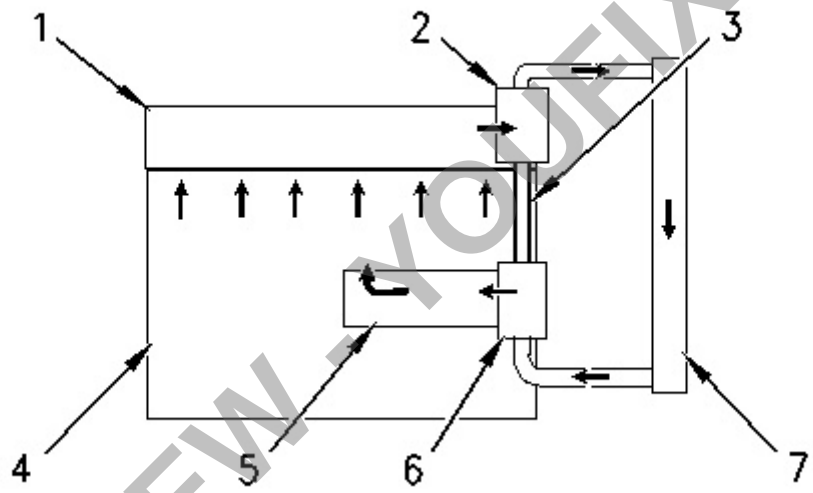


Illustration 1 g00697237

Cooling System Schematic

(1) Cylinder head

(2) Water temperature regulator housing

(3) Bypass hose

(4) Cylinder block

(5) Oil cooler

(6) Water pump

(7) Radiator

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3114 , 3116 and 3126 Engines for Caterpillar Built Machines
Media Number -SENR3583-13 **Publication Date -01/10/2008** **Date Updated -31/10/2008**

i01582838

Electrical System

SMCS - 1400; 1550; 1900

Engine Electrical System

The electrical system has two separate circuits.

- the charging circuit
- the starting circuit

Some of the electrical system components are used in more than one circuit. The following items are common in each of the circuits:

- The battery
- The circuit breaker
- The cables
- The wires for the battery

The charging circuit is in operation when the engine is running. An alternator makes electricity for the charging circuit. A voltage regulator in the circuit controls the electrical output in order to keep the battery at full charge.

NOTICE

The disconnect switch, if so equipped, must be in the ON position to let the electrical system function. There will be damage to some of the charging circuit components if the engine runs with the disconnect with in the OFF position.

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Engine & Hydraulic Pump

SMCS - 1000; 5070; 5073-010

Remove & Install Engine & Hydraulic Pump

NOTE: The hydraulic pump can be removed from the engine separately. The engine does not have to be removed in order to remove the hydraulic pump.

1. Close the fuel tank supply valve if so equipped.

WARNING

At operating temperature, the hydraulic oil tank is hot and under pressure. Hot oil can cause burns. Remove the fill plug only when the engine is stopped, and the fill plug is cool enough to touch with your bare hand.

2. Release the pressure in the hydraulic system by slowly loosening the fill cap located on top of the hydraulic oil tank.

3. Remove the cover from under the hydraulic oil tank to gain access to the drain plug; then drain the hydraulic oil tank. The capacity of the hydraulic oil tank is 303 liters (80 U.S. gal).

WARNING

At operating temperature, the engine coolant is hot and under pressure. Steam can cause personal injury. Check the coolant level only after the engine has been stopped, and the fill plug is cool enough to touch with your bare hand. Remove the fill cap slowly to relieve pressure. Cooling system conditioner contains alkali. Avoid contact with skin and eyes to prevent personal injury.

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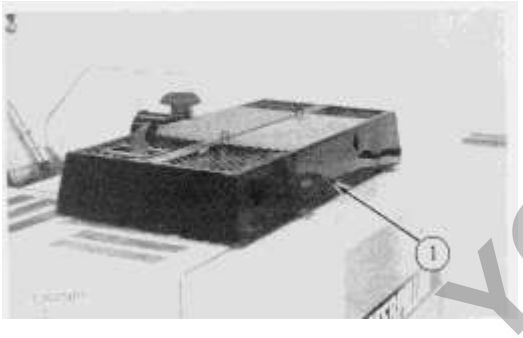
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SENR48440009

Counterweight

SMCS - 7056-010

Remove & Install Counterweight



1. Remove hood (1) from the machine. The weight of the hood is **68 kg (150 lb).**



2. Fasten a hoist to counterweight (2) as shown. Remove the four bolts and spacers that hold the counterweight to the frame of the machine. Remove counterweight (2). The weight of the counterweight is **4536 kg (10000 lb).**

NOTE: The following steps are for the installation of the counterweight.

3. Fasten a hoist to counterweight (2), and put it in position on the frame of the machine. Do not remove the hoist until the bolts and spacers which hold the counterweight to the frame have been installed.

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i01664183

Fuel System

SMCS - 1250

Fuel System

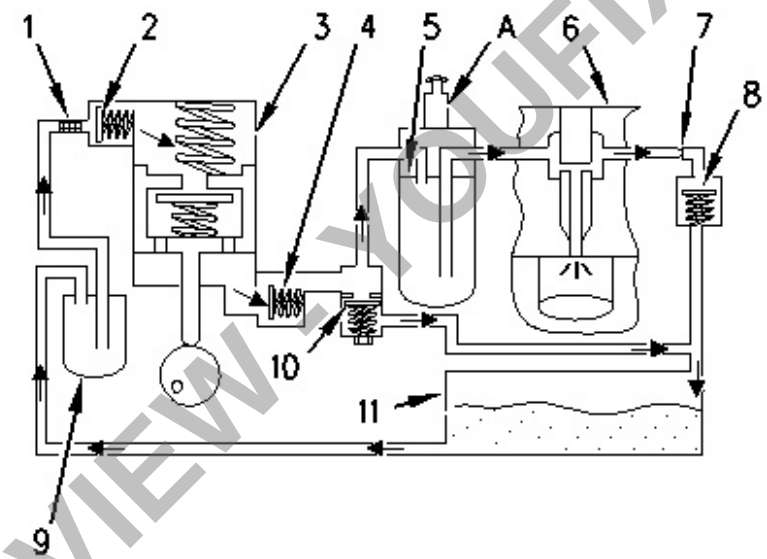


Illustration 1 g00690661

Fuel System Schematic

(A) Fuel priming pump (if equipped)

(1) Screen (if equipped)

(2) Inlet check valve

(3) Fuel transfer pump that is integral with the governor

(4) Outlet check valve

(5) Fuel filter

(6) Cylinder head

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Systems Operation
E240B AND EL240B EXCAVATORS HYDRAULIC SYSTEM
Media Number -SENR4875-00 **Publication Date -01/01/1991** **Date Updated -11/10/2001**

Systems Operation

Introduction

Reference: For Systems Operation of the electronic controller, make reference to Systems Operation E240B and EL240B Excavators Electronic Controller, Form No. SENR4874.

Testing And Adjusting

Reference: For Testing And Adjusting of the hydraulic and electronics systems, make reference to Testing And Adjusting For E240B and EL240B Excavators Hydraulic And Electronic Systems, Form No. SENR4876.

Specifications

Reference: For illustrated Specifications, make reference to Form No. SENR4873, Specifications.

Hydraulic Schematic

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SENR48440008

Boom

SMCS - 6501-010

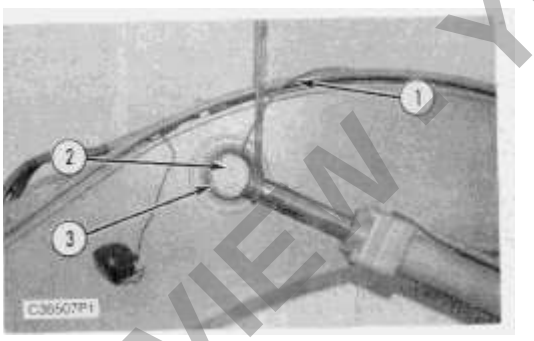
Remove & Install Boom

Start By:

a. remove stick

1. Start the machine, and lower the boom to the floor.

2. Retract the stick cylinder. Tie the rod of the cylinder back so it can not extend.



3. Disconnect lubrication hoses (1) from each boom cylinder.

NOTE: The support pin for the boom cylinders does not have to be completely removed from the boom in order to disconnect the cylinders from the boom.

4. Fasten a hoist to the boom cylinder on the left side of the machine as shown. Remove two bolts (2) and plate (3) from each side of the boom cylinder support pin. Push the support pin out of the cylinder rod and into the boom until the cylinder is free. Lower the cylinder down as far as it can go.

5. Fasten a hoist to the boom cylinder on the right side of the machine. Push the support pin out of the cylinder rod and into the boom until the cylinder is free. Lower the cylinder down as far as it can go. If pin removal is necessary, fasten a hoist to the support pin, and remove it. The weight of the support pin is **41 kg (90 lb).**

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Systems Operation
3114 , 3116 and 3126 Engines for Caterpillar Built Machines
Media Number -SENR3583-13 **Publication Date -01/10/2008** **Date Updated -31/10/2008**

i01310427

Lubrication System

SMCS - 1300

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SENR48440013

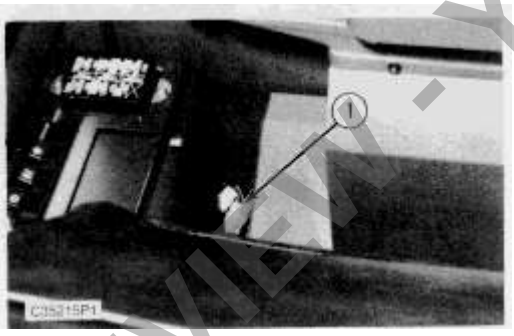
Cab

SMCS - 7301-010

Remove & Install Cab

Tools Needed	A
6V2157 Link Bracket	2

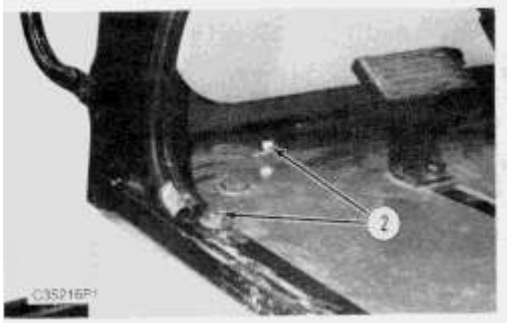
1. Remove the rubber floor mat from the cab.



2. Disconnect two wiring harnesses (1) located behind the seat.

3. Disconnect the radio antenna if so equipped.

4. Disconnect the hose from the windshield wiper reservoir.



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SENR48440001

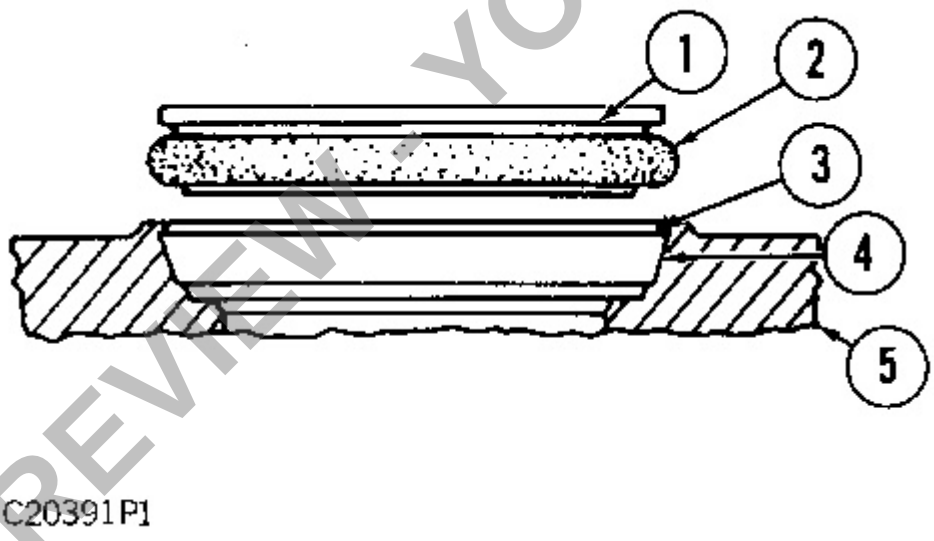
Duo-Cone Seals

SMCS - 7561-012; 7561-016

Assembly And Installation Of Conventional Duo-Cone Seals

This instruction gives the procedure for installing Conventional Duo-Cone Seals.

It is most important that correct assembly and installation procedures are followed when Duo-Cone Seals are used. Many of the Duo-Cone Seal failures are the direct result of one or more mistakes made during assembly or installation of the seal components.



(1) Seal (2) Rubber Toric Ring (3) Housing Retaining Lip (4) Housing Ramp (5) Seal Ring Housing

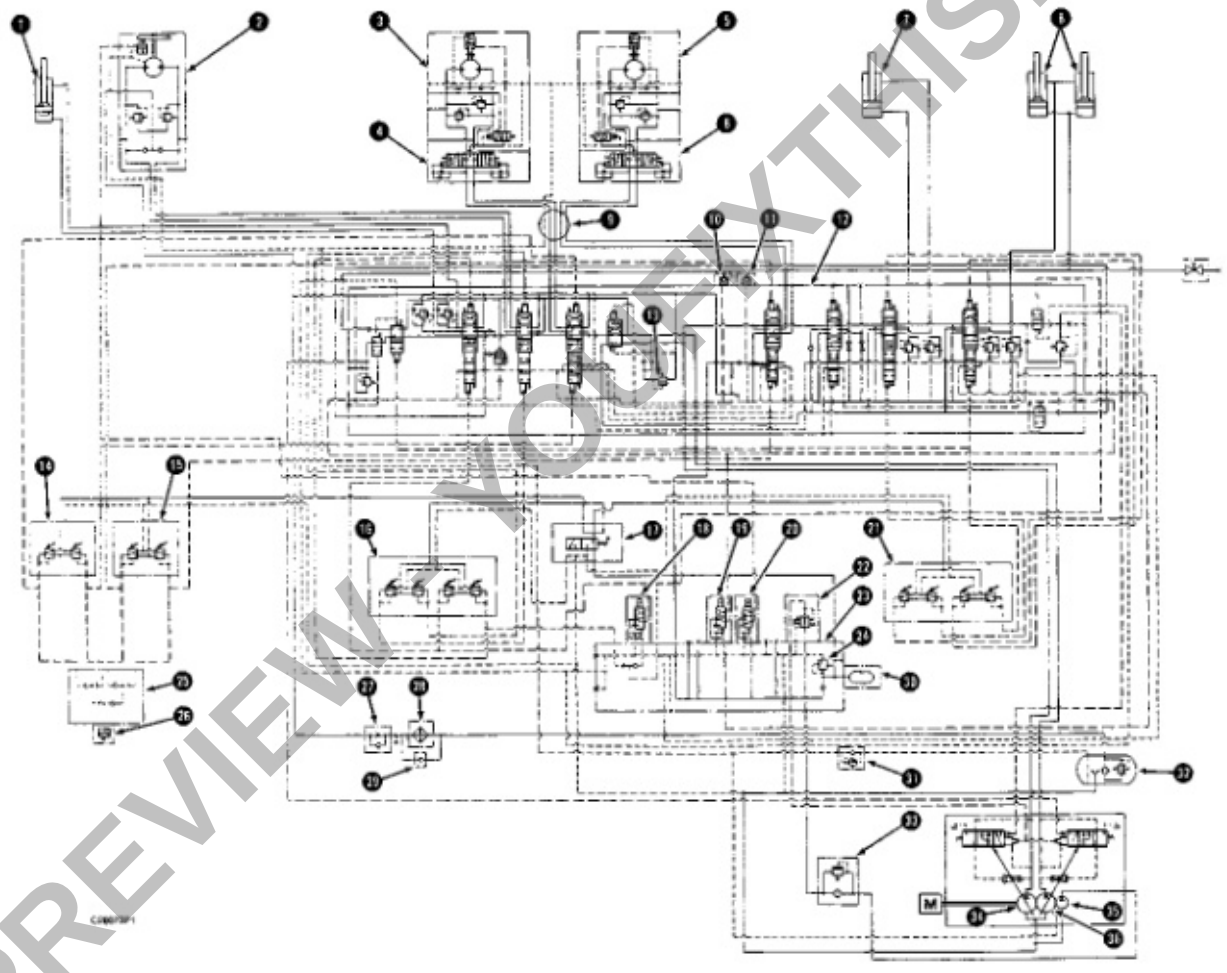
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Schematic
E240B AND EL240B EXCAVATORS HYDRAULIC SYSTEM
Media Number -SENR4884-00 **Publication Date -01/12/1990** **Date Updated -11/10/2001**

Schematic

SMCS - 7566



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Torque Specifications

Torque Specifications

Media Number -SENR3130-14 **Publication Date -01/01/2013** **Date Updated -09/01/2013**

i02357647

General Information

SMCS - 7553

WARNING

Mismatched or incorrect fasteners can result in damage or malfunction, or personal injury.

Take care to avoid mixing metric dimensioned fasteners and inch dimensioned fasteners.

Introduction to Torque

"Torque" is measured in terms of force and distance. Force is the amount of pushing or pulling applied at the end of the lever. Distance is the length of the lever that is being used. Torque values are given in the following units: NEWTON meters (N·m), pound inches (lb in) and pound feet (lb ft)

This manual is intended to provide the operator with a reference. This manual will provide the standard torque settings for the following: bolts, nuts, plugs, fittings and clamps.

Exceptions to these torques are given in the Service Manual, if necessary.

Be sure to use a torque wrench that has the proper range. Torque wrenches must be used properly in order to ensure that the correct torque is applied. Always use a smooth pull for torque wrenches. Do not jerk a torque wrench. Do not use adapters that change the length of the torque wrench. For the correct use of your torque wrench, refer to the instructions that were packaged with your torque wrench. For more information on the correct use of torque wrenches, refer to Special Publication, SEBV0516, "An Introduction to Torque".

Prior to installation of any hardware, ensure that components are in near new condition. Bolts and threads must not be worn or damaged. Threads must not have burrs or nicks. Hardware must be free of rust and corrosion. Clean reused fasteners with a noncorrosive cleaner. Lightly lubricate the threads of reused fasteners. Lightly lubricate the mating surface of the head of reused fasteners. Other applications for lubricating fasteners may also be specified in the Service Manual. The Service Manual may also specify the use of sealants and compounds.

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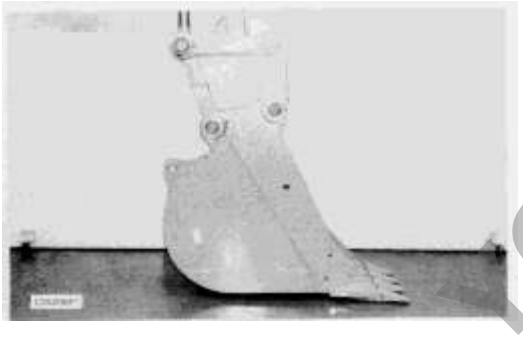
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SENR48440002

Bucket

SMCS - 6101-010

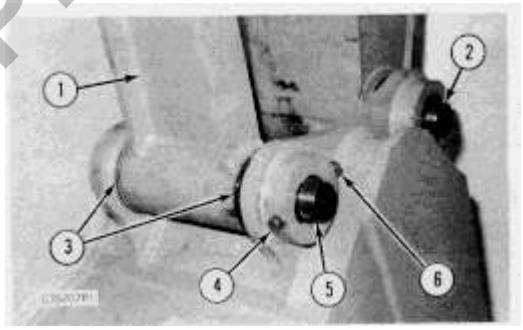
Remove & Install Bucket



NOTICE

To facilitate removal of the bucket pins without causing damage to the pins, bushings and/or o-ring seals, put the bucket flat on the floor and the stick in a vertical position as shown.

1. Start the machine, and position the bucket, stick and rod links as shown.



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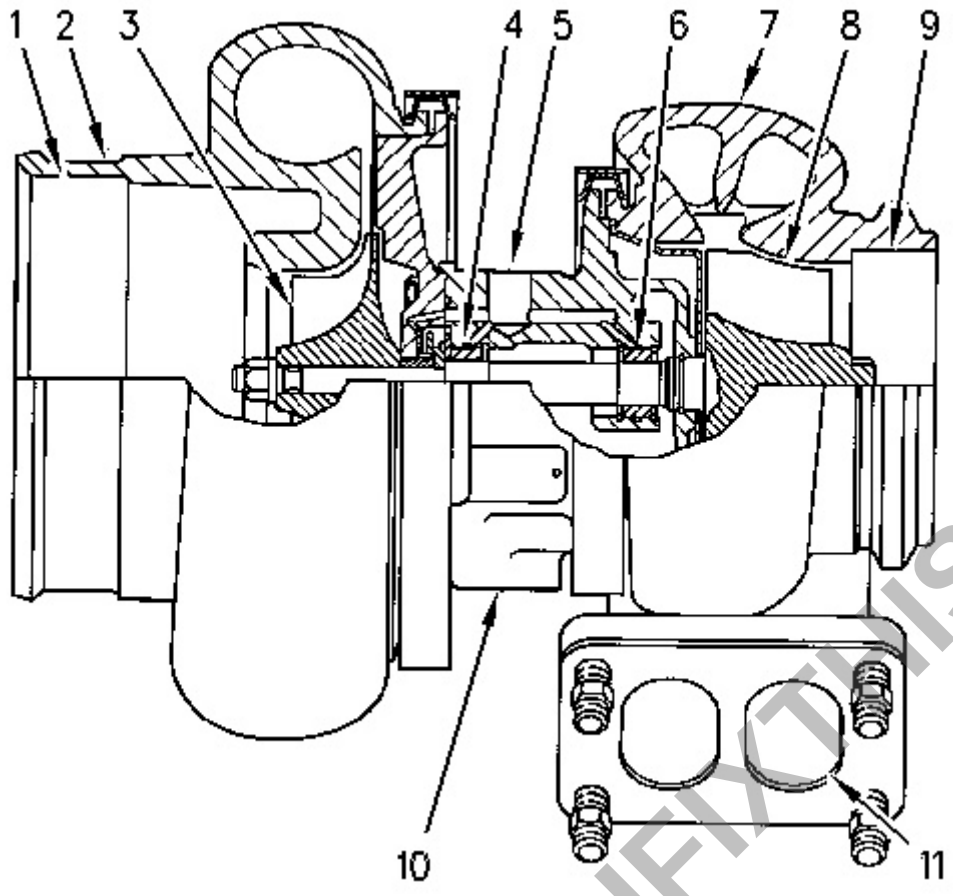


Illustration 3 g00294193

Turbocharger

(1) Air inlet

(2) Compressor housing

(3) Compressor wheel

(4) Bearing

(5) Oil Inlet port

(6) Bearing

(7) Turbine housing

(8) Turbine wheel

(9) Exhaust outlet

(10) Oil outlet port

(11) Exhaust inlet

The turbocharger is installed on the center section of the exhaust manifold. All the exhaust gases from the engine go through the turbocharger. The compressor side of the turbocharger is connected to the aftercooler by pipe.

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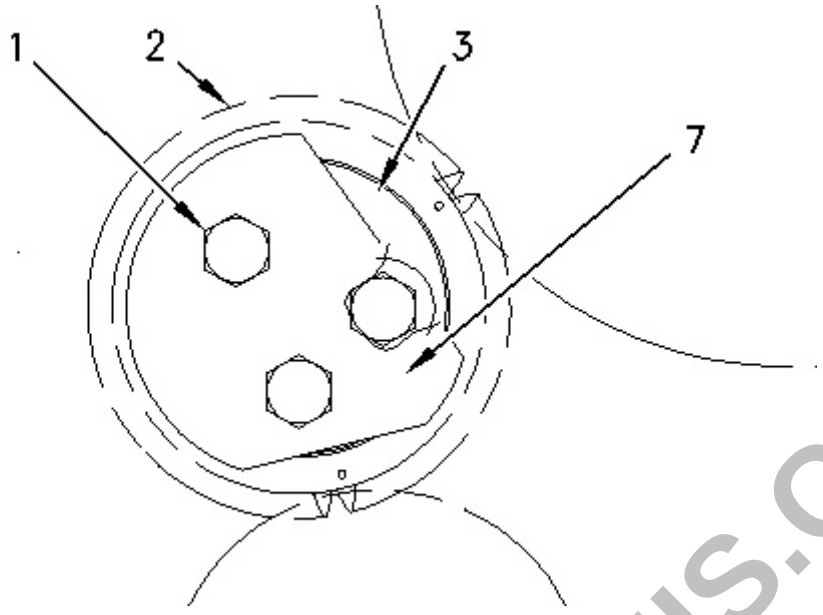


Illustration 1 g01005265

2. Identify the type of idler gear on the engine. Remove bolts (1) that hold the idler gear to the block. Remove plate (7) .

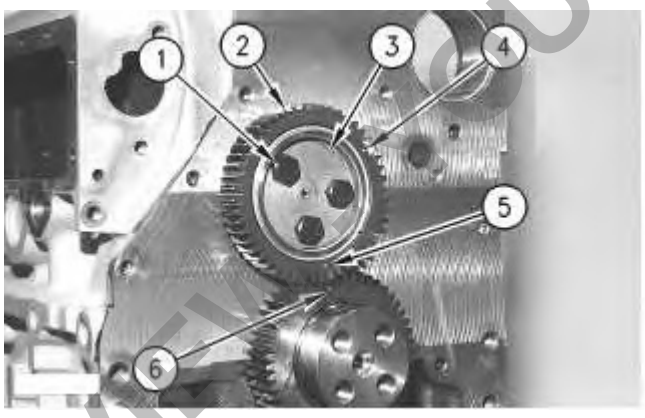


Illustration 2 g00677884

3. Identify the location of timing marks (4) and (5) on the camshaft idler gear. Identify the location of timing mark (6) on the crankshaft drive gear.

4. Remove idler shaft (3) and camshaft idler gear (2). Separate idler gear (2) from idler shaft (3) and remove the sleeve bearing from the camshaft idler gear.

5. Use Tooling (A) and a press to remove the bearing.

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Illustration 12 g01244850

Subscription message for prerequisite

If an attempt is made to activate a subscription for Maintenance Watch or Health Watch on a machine with a PLM without a subscription to Asset Watch, the message in Illustration 12 will appear.

Click on "OK" in order to check the Asset Watch check box. This will also add a subscription to Asset Watch in addition to the other subscriptions activated. If you click on "Cancel", no subscriptions will be added.



Illustration 13 g01244851

Subscription message for downgrading a prerequisite

If an attempt is made to deactivate a subscription for Asset Watch while subscriptions to Maintenance Watch and/or Health Watch still exist, the message in Illustration 13 will appear.

Click on "OK" in order to automatically unselect the Health Watch and/or Maintenance Watch check boxes. This will also deactivate the subscriptions and the Asset Watch subscription. If you click on "Cancel" no subscriptions will be changed.

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Note: If you need to delete parts, click the blue "Delete Parts" button (14) .



Illustration 14 g01732840

Attaching a new step to a PM

(15) Check box

(16) "Save" button

4. Once you have added all desired steps and parts, click the "Save" button (16) . The "Higher PM details" window will be displayed.
5. The new steps you added will be added to the planned maintenance that you selected from the drop-down menu, but you can also add these steps to other PMs. Select the check box (15) next to all of the PMs to which you wish to add the new steps.
6. Click the "Save" button. The new steps are added to the planned maintenance.



Illustration 15 g01250153

Confirmation message for no additional PM's being attached

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i04905744

Wiring Harness (Short Circuit) - Test

SMCS - 1408-081

A short circuit is a failure of an electrical circuit that results in undesired electrical current. Usually, a short circuit is a bypass of the circuit across a load. For example, a short across the wires in a circuit for a lamp produces too much current in the wires but no current is felt at the lamp. The lamp is shorted out. The resistance in a normal circuit can vary, but the resistance between a particular circuit and other unrelated circuits is always greater than 5000 ohms. The following procedure explains the test for a short circuit:

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

TEST FOR A SHORT 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 the machine harness connector for the ECM, place one of the multimeter probes on the contact of the suspect wire.

5. Use the other multimeter probe to check the resistance across all other contacts in the connector(s) of the ECM and frame ground.

   Expected Result: The resistance is greater than 5000 ohms for all the measurements.

   OK - The resistance is greater than 5000 ohms for all the measurements. The harness circuits are correct.

   Stop.

   NOT OK - The resistance is less than 5 ohms. There is a short in the machine harness. The short is between the suspected wire and the wire with the lowest resistance measurement.

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

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(5) Motor terminal nut

Tighten the nut on the motor terminal to the following torque. ... 30.5 ± 3.5 N·m (23 ± 3 lb ft)

(6) Motor frame nut

Tighten the nut on the motor frame to the following torque. ... 8 ± 3 N·m (71 ± 27 lb in)

Clearance (X) between the pinion and the housing ... 9.1 mm (0.36 inch)

Solenoid

Current draw at 20 Volt and 25 °C (77 °F)

Pull-in windings ... 56.5 ± 4.5 Amp

Hold-in windings ... 14.6 Amp

6V-5821 Electric Starting Motor

9X-4507 Electric Starting Motor

8C-4090 Electric Starting Motor

When the electric starting motor is viewed from the pinion end, the motor rotates in the following direction. ... Clockwise

No load conditions at 25 °C (77 °F)

Speed ... 7643 ± 1683 rpm
Current draw ... 67.5 ± 7.5 Amp
Voltage ... 23 Volt

(1) Battery terminal nut

Tighten the nut on the battery terminal to the following torque. ... 30.5 ± 3.5 N·m (23 ± 3 lb ft)

(2) Ground terminal nut

Tighten the nut on the ground terminal to the following torque. ... 30.5 ± 3.5 N·m (23 ± 3 lb ft)

(3) Ground terminal nut

Tighten the nut on the ground terminal to the following torque. ... 2.25 ± 0.25 N·m (20 ± 2 lb in)

(4) Switch terminal

Tighten the nut on the switch terminal to the following torque. ... 2.25 ± 0.25 N·m (20 ± 2 lb in)

(5) Motor terminal nut

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Make sure to wear all necessary protective equipment.

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

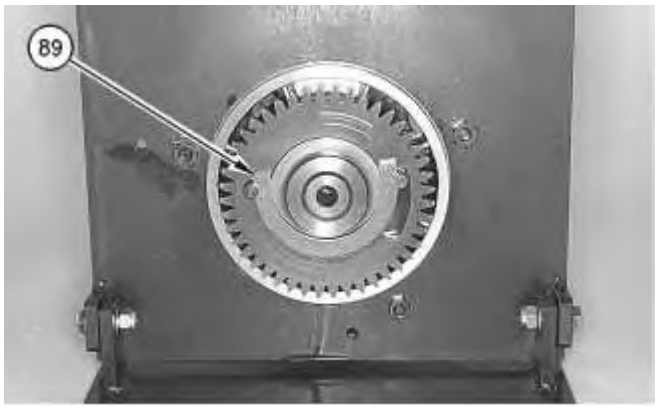


Illustration 53 g00523198

55. Remove C spring (89) carefully in order to avoid personal injury.



Illustration 54 g00523199

56. Remove drive gear (90) .

Note: Inspect the cam on the fuel transfer pump. If the cam has excessive wear, it will be necessary to replace the entire drive assembly.

Note: Inspect all of the parts of the governor upon disassembly. For information on reusability of components in the governor, refer to Guideline For Reusable Parts And Salvage Operations, SEBF8434, "3100 Governor Inspection and General Information for Mechanical Governor Groups Used in 3114, 3116, and 3126 Engines Equipped with Mechanical Unit Injectors (MUI)".

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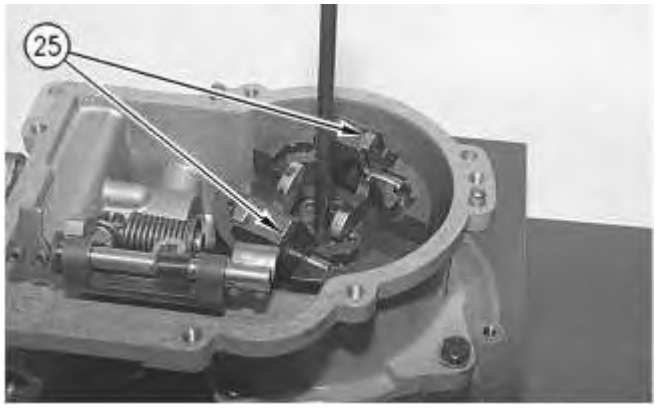


Illustration 16 g00522537

15. Remove flyweights (25) .

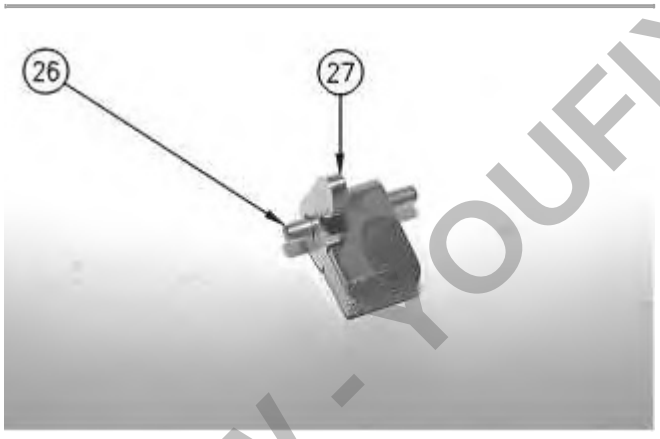


Illustration 17 g00522574

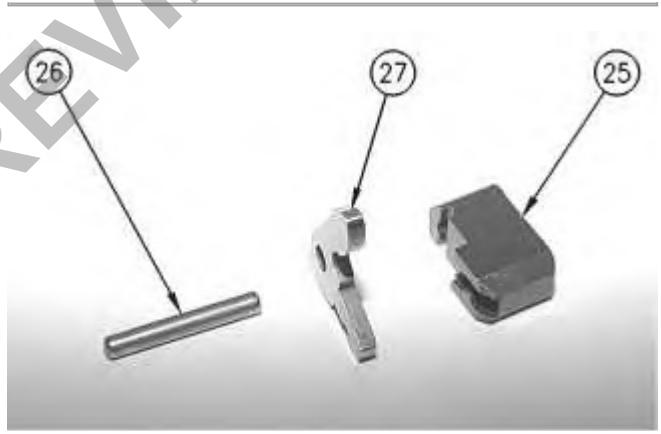
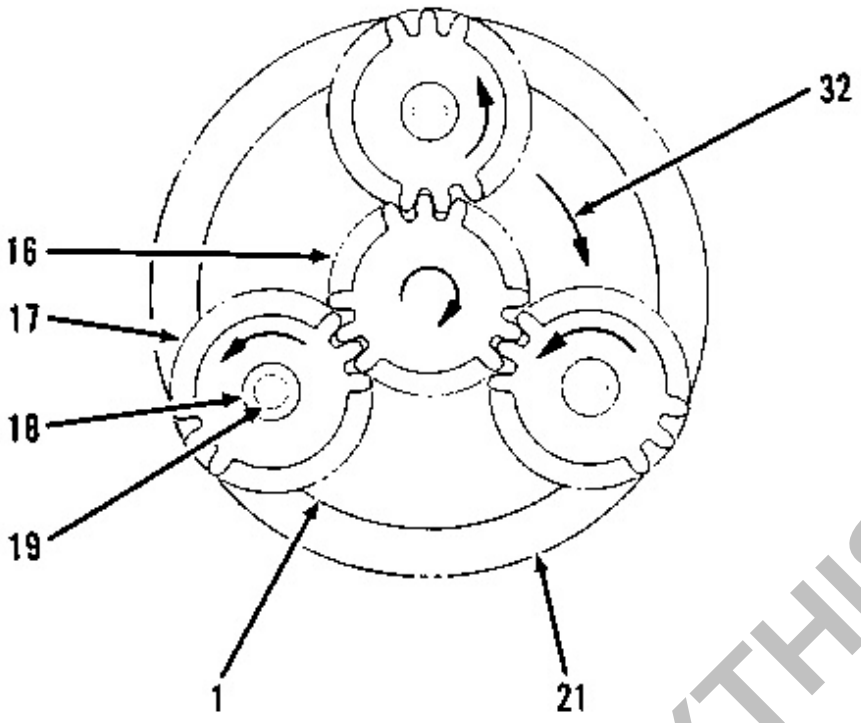


Illustration 18 g00522576

16. Remove flyweight pin (26). Inspect the flyweight pin for wear or for damage.

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EB4820030

First Stage Reduction Section
(1) 1st stage carrier. (16) 1st stage sun gear. (17) 1st stage planetary gear. (18) 1st stage needle bearing. (19) 1st stage planetary shaft. (21) 1st stage ring gear. (32) Rotating direction of 1st stage reduction group.

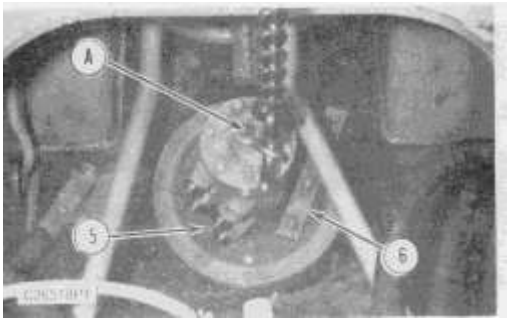
The first stage reduction group consists of sun gear (16), planetary gears (17), ring gear (21), carrier (1), planetary shafts (19) and needle bearings (18). Planetary gears (17) are in mesh with sun gear (16). Clockwise rotation of sun gear (16) causes gears (17) to rotate counterclockwise. Since gears (17) are also in mesh with ring gear (21), they "walk" around the teeth of ring gear (21). As they rotate, they circle around sun gear (16) clockwise. Planetary gears (17) are mounted to carrier (1) by planetary shafts (19) and needle bearings (18). As a result, the assembly of carrier (1) rotates clockwise.

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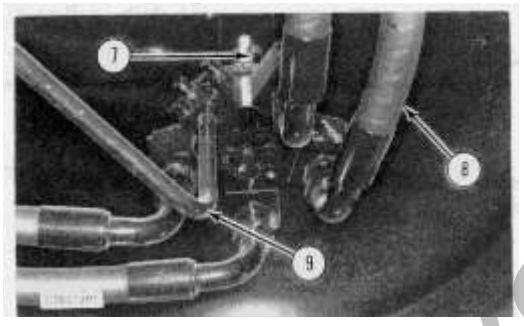
3. Put identification marks on four hoses (3) as to their location on rotary joint (1). Disconnect the four hoses from the rotary joint. Disconnect hose (4) from the rotary joint. Put plugs in the ends of the hoses to keep dirt and debris out of the hydraulic system.

4. Remove 90° elbow (2) from the top of the rotary joint.



5. Remove bolts (5) and the nuts that hold setting plate (6).

6. Fasten tool (A) and a hoist to the top of the rotary joint as shown.



View From Under machine

7. Put identification marks on four hoses (8) as to their location on the bottom of the rotary joint. Disconnect the four hoses from the bottom of the rotary joint. Disconnect pipe (9) from the bottom of the rotary joint. Put plugs in the hoses and pipe to keep dirt and debris out of the hydraulic system.

8. Cover the ports in the bottom of the rotary joint with tape to keep dirt and debris out of the unit.

9. Remove four bolts (7). Remove rotary joint (1) from the swing frame. The weight of the rotary joint is 36 kg (80 lb).

NOTE: The following steps are for the installation of the rotary joint.

10. Be sure the threaded mounting holes in the swing frame for mounting the rotary joint are clean and free of dirt and debris.

11. Apply a bead of **3S6252 RTV Silicone Adhesive/Sealant** to the surface of the swing frame on which the rotary joint is installed.

12. Fasten a hoist to rotary joint (1), and put it in its original position in the swing frame. Be sure the identification mark on the bottom face of the rotary joint is facing toward the front of the machine.

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