

# SAFETY.CAT.COM™

## **BEFORE OPERATION**

Operation and Maintenance  
Manual Excerpt



# Operation and Maintenance Manual

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## **D9T Track-Type Tractor**

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TWG1-Up (Machine)

i04209341

## Maintenance Interval Schedule

**SMCS Code:** 7000

Ensure that all safety information, warnings, and instructions are read and understood before any operation or any maintenance procedures are performed.

The user is responsible for the performance of maintenance. All adjustments, the use of proper lubricants, fluids, filters, and the replacement of components due to normal wear and aging are included. Failure to adhere to proper maintenance intervals and procedures may result in diminished performance of the product and/or accelerated wear of components.

Use mileage, fuel consumption, service hours, or calendar time, **WHICH EVER OCCURS FIRST**, in order to determine the maintenance intervals. Products that operate in severe operating conditions may require more frequent maintenance. Refer to the maintenance procedure for any other exceptions that may change the maintenance intervals.

**Note:** Before each consecutive interval is performed, all maintenance from the previous interval must be performed.

**Note:** If Cat HYDO Advanced hydraulic oils are used, the hydraulic oil change interval is extended to 3000 hours. S-O-S services may extend the oil change even longer. Consult your Cat dealer for details.

### When Required

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| Battery, Battery Cable or Battery Disconnect Switch - Replace ..... | 136 |
| Camera - Clean/Adjust .....                                         | 140 |
| Cooler Cores and A/C Condenser - Clean .....                        | 141 |
| Cutting Edges and End Bits - Inspect/Replace ...                    | 149 |
| Engine Air Cleaner Element (Dual Element/Box Type) - Replace .....  | 149 |
| Engine Air Precleaner - Clean .....                                 | 152 |
| Equalizer Bar Center Pin - Measure .....                            | 161 |
| Equalizer Bar End Pins - Measure .....                              | 161 |
| Ether Starting Aid Cylinder - Replace .....                         | 163 |
| Fuel System - Prime .....                                           | 168 |
| Fuses and Circuit Breakers - Replace/Reset .....                    | 173 |
| Hydraulic System Filter Screens - Clean .....                       | 174 |
| Oil Filter - Inspect .....                                          | 181 |
| Power Train Scavenge Screen - Clean .....                           | 186 |
| Radiator Core - Clean .....                                         | 191 |
| Radiator Pressure Cap - Clean/Replace .....                         | 191 |
| Ripper Tip and Shank Protector - Inspect/Replace .....              | 194 |
| Torque Converter Scavenge Screen - Clean .....                      | 197 |
| Winch Wire Rope - Install .....                                     | 202 |
| Window Washer Reservoir - Fill .....                                | 203 |

|                                       |     |
|---------------------------------------|-----|
| Window Wipers - Inspect/Replace ..... | 203 |
| Windows - Clean .....                 | 203 |

### Every 10 Service Hours or Daily

|                                                            |     |
|------------------------------------------------------------|-----|
| Backup Alarm - Test .....                                  | 136 |
| Braking System - Test .....                                | 138 |
| Cab Filter (Fresh Air) - Clean/Inspect/Replace ...         | 139 |
| Cooling System Coolant Level - Check .....                 | 147 |
| Engine Oil Level - Check .....                             | 155 |
| Fuel System Primary Filter (Water Separator) - Drain ..... | 168 |
| Fuel Tank Water and Sediment - Drain .....                 | 172 |
| Horn - Test .....                                          | 174 |
| Hydraulic System Oil Level - Check .....                   | 178 |
| Indicators and Gauges - Test .....                         | 179 |
| Pivot Shaft Oil Level - Check .....                        | 181 |
| Power Train System Oil Level - Check .....                 | 189 |
| Seat Belt - Inspect .....                                  | 195 |
| Walk-Around Inspection .....                               | 200 |

### Every 50 Service Hours

|                                                           |     |
|-----------------------------------------------------------|-----|
| Bulldozer Tilt Brace and Tilt Cylinders - Lubricate ..... | 139 |
| Cab Filter (Recirculation) - Clean/Inspect/Replace .....  | 140 |
| Lift Cylinder Yoke Bearings - Lubricate .....             | 180 |
| Ripper Linkage and Cylinder Bearings - Lubricate .....    | 194 |
| Track Pins - Inspect .....                                | 199 |

### Every 250 Service Hours

|                                                |     |
|------------------------------------------------|-----|
| Belt - Inspect/Adjust/Replace .....            | 137 |
| Engine Oil Sample - Obtain .....               | 156 |
| Engine Oil and Filter - Change .....           | 156 |
| Equalizer Bar End Pins Oil Level - Check ..... | 162 |
| Final Drive Oil Level - Check .....            | 164 |
| Track - Check/Adjust .....                     | 197 |
| Winch Fairlead Rollers - Lubricate .....       | 200 |
| Winch Oil Level - Check .....                  | 201 |

### Initial 500 Hours (for New Systems, Refilled Systems, and Converted Systems)

|                                                        |     |
|--------------------------------------------------------|-----|
| Cooling System Coolant Sample (Level 2) - Obtain ..... | 147 |
| Electronic Unit Injector - Inspect/Adjust .....        | 149 |
| Engine Valve Lash - Check/Adjust .....                 | 160 |
| Engine Valve Rotators - Inspect .....                  | 160 |
| Winch Oil and Breather - Change/Clean .....            | 201 |

### Every 500 Service Hours

|                                                         |     |
|---------------------------------------------------------|-----|
| Final Drive Oil Sample - Obtain .....                   | 164 |
| Final Drive Seal Guard - Inspect/Clean .....            | 165 |
| Fuel System Primary Filter - Clean/Replace .....        | 169 |
| Fuel System Secondary Filter - Replace .....            | 170 |
| Fuel Tank Cap Filter and Strainer - Replace/Clean ..... | 172 |
| Hydraulic System Oil Filter - Replace .....             | 177 |

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|                                                 |     |
|-------------------------------------------------|-----|
| Hydraulic System Oil Sample - Obtain .....      | 179 |
| Power Train Breather - Clean .....              | 182 |
| Power Train Oil Filters - Replace .....         | 185 |
| Power Train System Oil Sample - Obtain .....    | 190 |
| Recoil Spring Compartment Oil Level - Check ... | 192 |
| Steering Charge Filter - Replace .....          | 196 |

### **Every 1000 Service Hours or 6 Months**

|                                                            |     |
|------------------------------------------------------------|-----|
| Battery - Inspect .....                                    | 136 |
| Power Train Oil - Change .....                             | 182 |
| Power Train System Oil And Screens -<br>Change/Clean ..... | 187 |
| Rollover Protective Structure (ROPS) - Inspect ..          | 195 |
| Winch Oil and Breather - Change/Clean .....                | 201 |

### **Every 2000 Service Hours or 1 Year**

|                                                 |     |
|-------------------------------------------------|-----|
| Engine Mounts and Equalizer Bar - Inspect ..... | 153 |
| Final Drive Oil - Change .....                  | 163 |
| Final Drive Seal Guard Packing - Replace .....  | 166 |
| Hydraulic System Oil - Change .....             | 176 |
| Track Roller Frame - Inspect .....              | 199 |
| Track Roller Frame Guides - Inspect .....       | 199 |

### **Every Year**

|                                   |     |
|-----------------------------------|-----|
| Refrigerant Dryer - Replace ..... | 193 |
|-----------------------------------|-----|

### **Every 3 Years After Date of Installation or Every 5 Years After Date of Manufacture**

|                           |     |
|---------------------------|-----|
| Seat Belt - Replace ..... | 195 |
|---------------------------|-----|

### **Every 4000 Service Hours**

|                                                                  |     |
|------------------------------------------------------------------|-----|
| Electronic Unit Injector - Inspect/Adjust .....                  | 149 |
| Engine Mounts and Crankshaft Vibration Damper -<br>Inspect ..... | 152 |
| Engine Valve Lash - Check/Adjust .....                           | 160 |
| Engine Valve Rotators - Inspect .....                            | 160 |

### **Every 6000 Service Hours or 3 Years**

|                                                               |     |
|---------------------------------------------------------------|-----|
| Cooling System Coolant Extender (ELC) - Add ..                | 146 |
| Cooling System Water Temperature Regulator -<br>Replace ..... | 148 |

### **Every 12 000 Service Hours or 6 Years**

|                                             |     |
|---------------------------------------------|-----|
| Cooling System Coolant (ELC) - Change ..... | 144 |
|---------------------------------------------|-----|

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## Backup Alarm - Test

**SMCS Code:** 7406-081

In order to test the alarm for proper functioning, turn the engine start switch to the ON position.

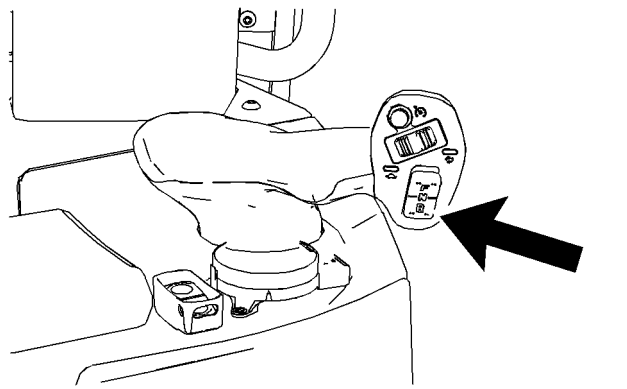


Illustration 176

g02509537

Direction control switch located on steering control

Apply the service brake. Release the parking brake. Move the direction control switch to the REVERSE position.

The backup alarm should start to sound immediately. The backup alarm will continue to sound until the direction control switch is moved to the NEUTRAL position or to the FORWARD position.

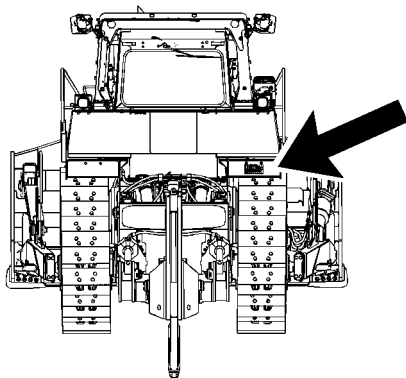


Illustration 177

g02509637

Location of backup alarm

The backup alarm is on the rear of the machine.

The nonadjustable backup alarm is set at the appropriate sound level when the machine is shipped from the factory.

## Battery - Inspect

**SMCS Code:** 1401-040

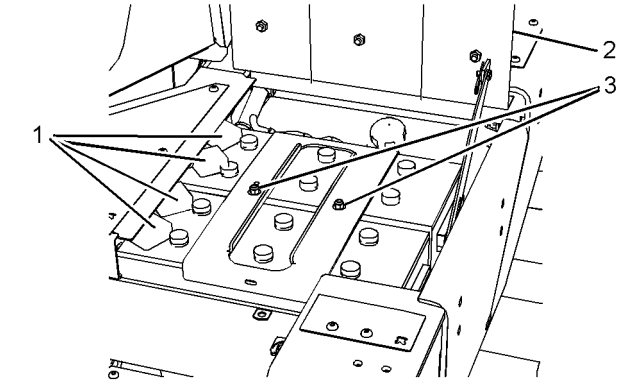


Illustration 178

g02510279

Left-hand battery and window washer fluid reservoir compartment (Left-hand guard rail assembly removed for illustration)

- (1) Battery terminals and terminal covers
- (2) Compartment access cover (in opened position)
- (3) Retainers

**Note:** Perform the following procedures at every 1000 hour interval. Check the following areas more often, as required.

1. Open the battery access cover (2). The battery access cover is on the left side of the machine next to the operator compartment.
  2. Tighten retainers (3) on the batteries at every 1000 hour interval.
  3. Clean the top of the batteries with a clean cloth. Keep terminals (1) clean and coat the terminals with petroleum jelly. Install the terminal covers after you coat the terminals.
1. Close the battery access cover.

i04355610

## Battery, Battery Cable or Battery Disconnect Switch - Replace

**SMCS Code:** 1401-510; 1402-510; 1411-510

1. Turn the engine start switch key to the OFF position. Turn all of the switches to the OFF position.

i04355655

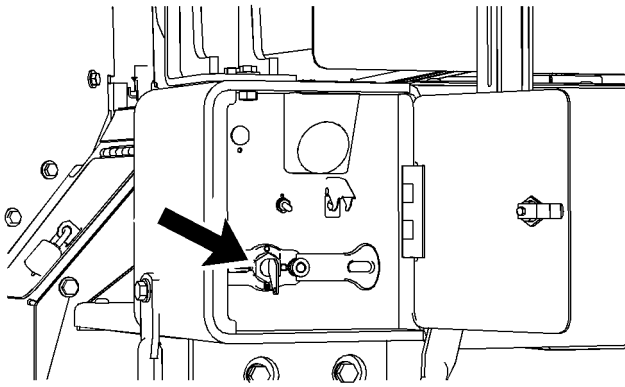


Illustration 179

g02510540

2. Locate the battery disconnect switch. The battery disconnect switch is contained in the ground level service center which is located at the front of the left-hand fender. Turn the battery disconnect switch to the OFF position. Remove the key.
3. Disconnect the battery cable at the battery disconnect switch.
4. Disconnect the negative battery cable at the battery.
5. Replace the disconnect switch, the battery cables, or the batteries, as required.
6. Connect the negative battery cable at the battery.
7. Connect the negative battery cable at the battery disconnect switch.
8. Install the key and turn the battery disconnect switch to the ON position.

## Battery Recycle

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

- A battery supplier
- An authorized battery collection facility
- Recycling facility

## Belt - Inspect/Adjust/Replace

**SMCS Code:** 1357-025; 1357-040; 1357-510

This engine is equipped with a serpentine belt that drives the alternator and the air conditioner compressor.

The belt tightener on this engine automatically adjusts the serpentine belt to the correct tension.

### Inspect

1. Park the machine on level ground. Lower the dozer blade to the ground. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Turn the battery disconnect switch to the OFF position.
3. Open both the right-hand and left-hand engine access doors.

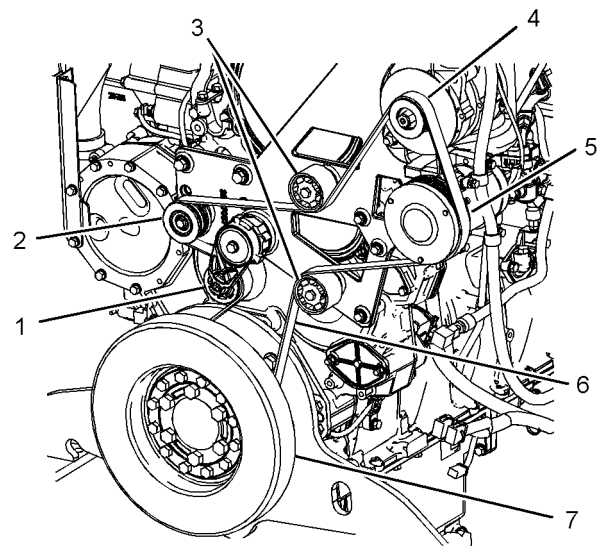


Illustration 180

g02510641

Engine front left view

- (1) Belt tensioner
- (2) Idler pulley (grooved)
- (3) Idler pulleys (smooth)
- (4) Alternator pulley
- (5) Air conditioner compressor pulley
- (6) Serpentine belt
- (7) Crankshaft drive pulley (hidden from view behind crankshaft damper)

4. Inspect the condition of serpentine belt (6). Replace the serpentine belt if excessive wear or cracking has occurred. Wear due to belt slippage indicates that the belt tensioner possibly needs to be replaced.

5. Close both the right-hand and left-hand engine access doors.
6. Turn the battery disconnect switch to the ON position.

## Replace

1. Park the machine on level ground. Lower the dozer blade to the ground. Move the transmission control to the NEUTRAL position and engage the parking brake. Shut off the engine.
2. Turn the battery disconnect switch to the OFF position.
3. Open both the right-hand and left-hand engine access doors.
4. Rotate belt tensioner (1) clockwise in order to release the tension from the belt with a 12.7 mm (0.5 inch) square drive tool.
5. Remove the belt.
6. Install the new belt. Be certain that the belt is properly aligned in the grooves of crankshaft drive pulley (7), idler pulley (2), alternator pulley (4), and air conditioner compressor pulley (5).
7. Allow the belt tensioner to rotate counterclockwise against the belt in order to provide proper tension.
8. Close the engine access doors.
9. Turn the battery disconnect switch to the ON position.

i04045481

## Braking System - Test

**SMCS Code:** 4100-081; 4267-081

### WARNING

**If the machine moves during the test, reduce the engine speed immediately, and engage the parking brake.**

**If the machine moved while testing the brakes, consult your Caterpillar dealer for brake inspection and repair. Damaged brakes must be repaired before returning the machine to operation.**

**Note:** The machine can drive through the brakes in first gear.

Make sure that the area around the machine is clear of personnel and clear of obstacles.

Test the brakes on a dry, level surface.

Fasten the seat belt before you test the brakes.

1. Disable EAS.

**Reference:** See the Operation and Maintenance Manual, "Operator Controls", and refer to section "Enhanced Auto Shift (EAS)" for more information.

2. Start the engine.
3. Raise all attachments.

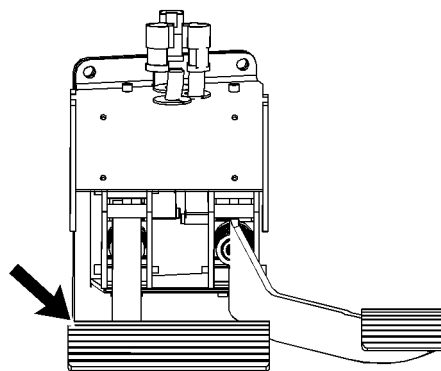


Illustration 181

g02281993

4. Depress the service brake pedal.
5. Release the parking brake.
6. While the service brake pedal is depressed, move the directional control to the SECOND SPEED FORWARD position.
7. Gradually increase the engine speed to full load speed. The machine should not move.
8. Move the directional control to the NEUTRAL position.
9. Reduce the engine speed to LOW IDLE. Engage the parking brake. Lower all attachments to the ground. Apply a slight down pressure. Stop the engine.

### NOTICE

If the machine moved while testing the brakes, contact your Caterpillar dealer. Have the dealer inspect and, if necessary, repair the service brake before returning the machine to operation.

i02229253

i04316512

## Bulldozer Tilt Brace and Tilt Cylinders - Lubricate

**SMCS Code:** 6050-086

Lubricate the two fittings with CAT multipurpose type grease with molybdenum disulfide (MPGM).

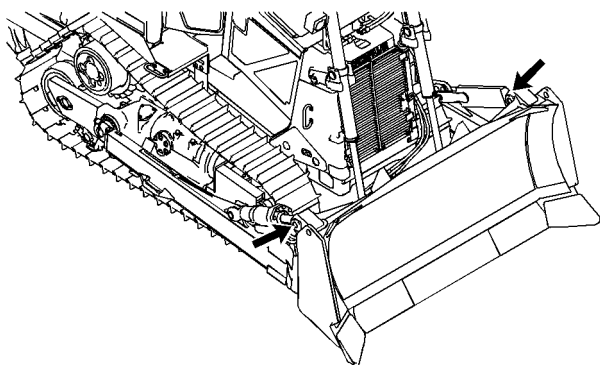


Illustration 182

g01117177

One fitting is located at the left front brace assembly or left tilt cylinder (if equipped).

The other fitting is located at the rod end of the right tilt cylinder.

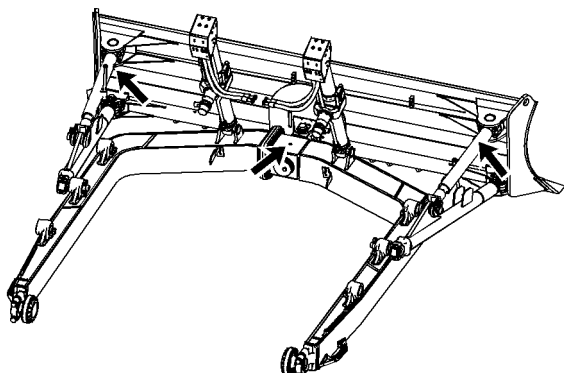


Illustration 183

g01117220

All of the locations for the grease fittings on the angle blade are shown here.

The angle blade has an additional grease fitting that needs to be greased with MPGM.

Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" for more information about MPGM.

## Cab Filter (Fresh Air) - Clean/Inspect/Replace

**SMCS Code:** 7342-040; 7342-070; 7342-510

### Cab Filter (Fresh Air)

#### Clean/Inspect/Replace

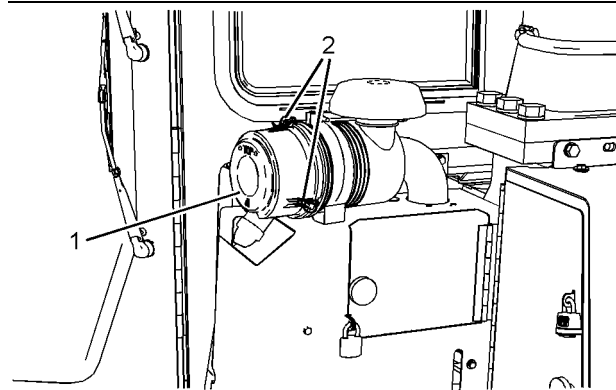


Illustration 184

g02476319

Cab Fresh Air Filter Assembly

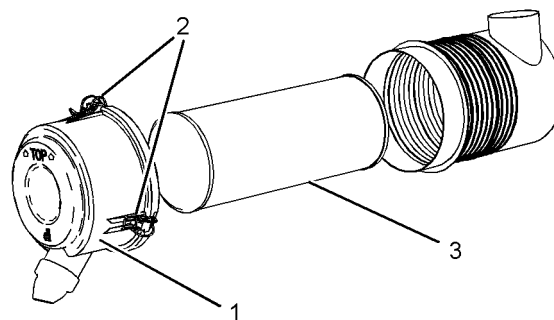


Illustration 185

g02476391

Expanded View of Filter Assembly Components

**Note:** Use three points of contact when you access the cab filter (fresh air).

**Reference:** See Operation and Maintenance Manual, "Mounting and Dismounting" for more information.

This filter assembly is located outside of the left-hand cab window.

1. The filter cover (1) is located at the front end of the filter assembly. Release three clamps (2) and remove the filter cover .
2. Remove filter element (3).



**⚠ WARNING**

**Personal injury can result from air pressure.**

**Personal injury can result without following proper procedure. When using pressurized air, wear a protective face shield and protective clothing.**

**Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.**

3. The filter element can be cleaned by using pressurized air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
4. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
5. Install filter element (3) and install filter cover (1). Fasten three clamps (2).

**Note:** Use three points of contact when you install the cab filter (fresh air).

**Note:** Clean the filters more often in dusty conditions.

i04317289

## Cab Filter (Recirculation) - Clean/Inspect/Replace

**SMCS Code:** 7342-040; 7342-070; 7342-510

The recirculation filter is positioned to the left of the operator seat base in the cab.

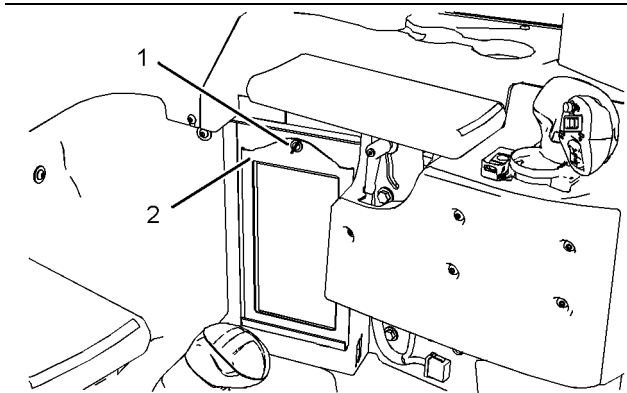


Illustration 186

g02476617

Area to left of operator seat base. Seat assembly removed to enhance visibility.

1. Unscrew fastener (1) to cover of recirculation filter (2) and remove the cover. Remove the recirculation filter element. Access to the filter can be improved by sliding the seat fully forward.

**⚠ WARNING**

**Personal injury can result from air pressure.**

**Personal injury can result without following proper procedure. When using pressurized air, wear a protective face shield and protective clothing.**

**Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.**

2. The recirculation filter element can be cleaned by using pressurized air. Use a maximum air pressure of 205 kPa (30 psi). Direct the air from the clean side to the dirty side.
3. Look through the filter toward a bright light. Inspect the element for damage. Inspect the gaskets for damage. Replace damaged filters.
4. Install the recirculation filter element. Make sure that the filter element is centered. If the filter is not centered, the system will not function properly.
5. Install the filter cover and secure with the fastener.

**Note:** Clean the filters more often in dusty conditions.

i03680600

## Camera - Clean/Adjust (WAVS (If Equipped))

**SMCS Code:** 7348

In order to maintain sufficient vision, keep the Work Area Vision System (WAVS) camera lens and the display clean.

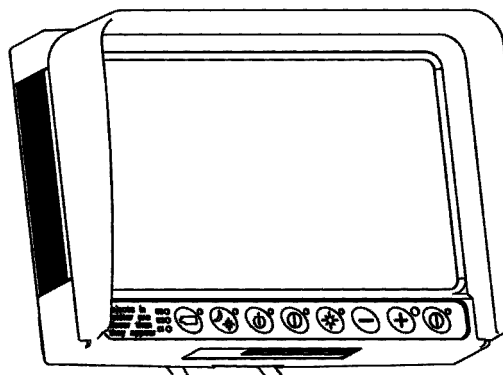


Illustration 187

g01223034

The WAVS display is located in the operator station.

Use a soft, damp cloth in order to clean the display. The display has a soft plastic surface that can be easily damaged by an abrasive material. **The display is not sealed. Do not immerse the display with liquid.**

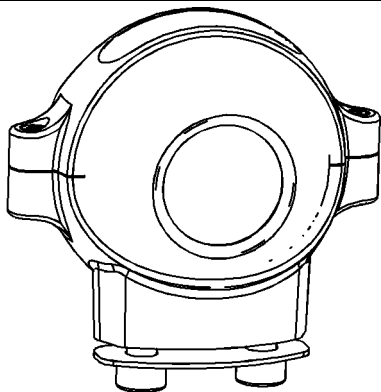


Illustration 188

g01223051

A WAVS camera is located on the rear of the machine, mounted on top of the ROPS, or mounted on the fuel tank.

Use a damp cloth or water spray in order to clean the camera lens. The camera is a sealed unit. The camera is not affected by high pressure spray.

**Note:** The camera is equipped with an internal heater to help counteract the effects of condensation, snow, or ice.

For more information on WAVS, refer to Operation and Maintenance Manual, SEBU8157, "Work Area Vision System".

i04317415

## Cooler Cores and A/C Condenser - Clean

**SMCS Code:** 1064-070; 1353-070; 1374-070; 7320-070

### Cooler Cores

The following cooler cores are cooled by the hydraulic fan that is located in the radiator guard at the front of the track-type tractor.

**Aftercooler core** – The aftercooler core cools the inlet manifold air to the engine.

**Hydraulic oil cooler core** – The hydraulic oil cooler core cools hydraulic oil.

**Radiator core** – The radiator core cools the engine coolant.

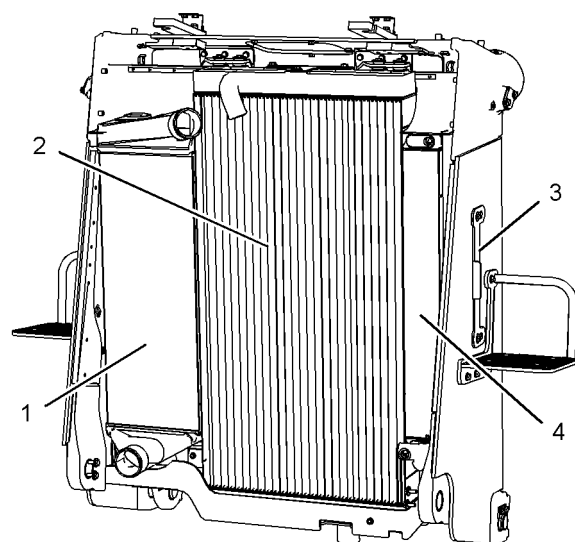


Illustration 189

g02476735

- (1) Aftercooler Core
- (2) Radiator Core
- (3) Cleanout Slot Located Behind Access Cover
- (4) Hydraulic Oil Cooler Core

### Radiator Core

You can use compressed air, high-pressure water, or steam to remove dust and other debris from the radiator core. However, the use of compressed air is preferred.

See Special Publication, SEBD0518, "Know Your Cooling System" for the complete procedure for cleaning the radiator core.

### Remote Air Conditioner (A/C) Condenser Core

In this machine arrangement, the a/c condenser core is remotely located. A remote mounted a/c condenser core is cooled by fans with electric drive.

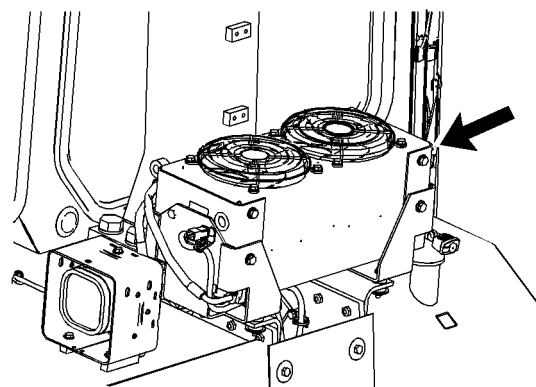


Illustration 190

g02511127

Air conditioner condenser unit outside of the right-hand cab window

## Inspect

**Note:** Adjust the frequency of inspection according to the effects of the operating environment.

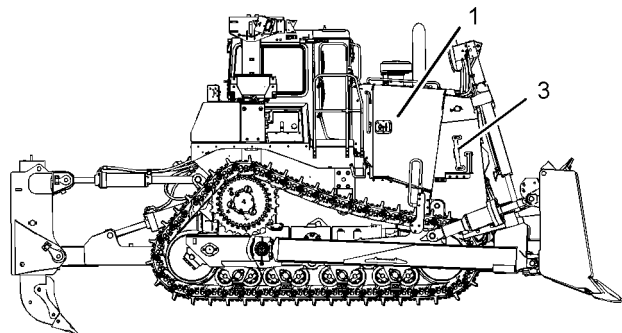


Illustration 191

g02476830

- (1) Right-hand Engine Access Door  
(3) Cleanout Slot Located Behind Access Cover

Turn off the engine.

Open both engine access doors (1).

Inspect the cooling system for the following conditions: coolant leaks, oil leaks, damaged fins, and tubes. Inspect the following parts of the cooling systems: air lines, connections, and clamps for damage. Make repairs for damage, if necessary.

**Note:** If parts of the aftercooler system appear to be damaged or if parts of the aftercooler system are repaired, a leak test is highly recommended. Refer to Special Instruction, SEHS8622, "Using the FT1984 Air-to-Air Aftercooler Leak Test Group". The FT - 1984 Aftercooler Testing Group can be used for aftercoolers that have hoses with an inside diameter of 102 mm (4.00 inch) or 114 mm (4.50 inch).

For more detailed information on testing and inspection, see Special Publication, SEBD0518, "Know Your Cooling System".

## Clean

### WARNING

**Personal injury can result from air pressure.**

**Personal injury can result without following proper procedure. When using pressure air, wear a protective face shield and protective clothing.**

**Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.**

Radiator cores, aftercooler cores, hydraulic oil cooler cores, and a/c condenser cores needed to be cleaned regularly. Adjust the frequency of cleaning according to the effects of the operating environment.

## Cooler Cores

All machine arrangements have a remote mounted a/c condenser core, and a single plane of the following cores: hydraulic oil cooler core, radiator core, and aftercooler core. Additionally, these arrangements may have a hydraulic fan that reverses the direction of air flow in order to purge debris.

## Clean

### WARNING

**Personal injury can result from air pressure.**

**Personal injury can result without following proper procedure. When using pressurized air, wear a protective face shield and protective clothing.**

**Maximum air pressure at the nozzle must be less than 205 kPa (30 psi) for cleaning purposes.**

### NOTICE

Pressurized air: To avoid possible engine damage, shut off engine before performing maintenance to clean the cooling system. Install air nozzle into access slot before starting air supply. Read and understand Operation and Maintenance Manual.

In applications with high levels of airborne debris, a regular schedule for cleaning the cooling cores must be established. The frequency of cleaning and the method of cleaning must be tailored to the specific debris accumulation on the job site. In order to maintain clean cores, the cleaning will need to be done at least daily. Cleaning may be needed on a more frequent basis. The clean out schedule must be followed even when ambient temperatures are low. This schedule will prevent debris accumulation in the cores and future plugging.

Access to the cores can be made through the engine access doors from the rear of the cores. Access from this direction results in blowing air in the same direction as the normal air flow through the fan. All machine arrangements offer two options for blowing air in the opposite direction of normal fan air flow. First, the reverse fan function has a continuous reverse mode. This mode allows prolonged periods of the reverse flow while the machine is parked. Next, slots (3) are provided in both sides of the radiator guard for use with a 307 - 6728 Air Nozzle which concentrates air flow backward through the cores.

Blow out the cores with compressed air. Move the air nozzle in a systematic pattern so that the air flow covers the whole core that includes the areas in the corners. Do not use steam or high-pressure water for cleaning frequently. If steam or high-pressure water is required to dislodge any debris that is held deep in the cores, make sure that the cleaning is thorough. This cleaning may require opening radiator doors and removing debris guards for access. Incomplete cleaning with water may cause remaining debris to harden in place. Use lights and wire probes in order to ensure that the cleaning is thorough and complete. If the debris has hardened in the center of the cores, these cores may need removed from the machine for thorough cleaning. If steam or water pressure is used to clean the cores, make sure that the pressure is controlled in order to prevent the fins from bending.

If you use a degreaser or special cleaning agents, wash the core with detergent and hot water. Thoroughly rinse the core with clean water. Dry the cores completely before operating the machine in the work mode.

## Dry

If steam or water is used to clean the cores, make sure that the cores are dried completely before the track-type tractor is put back to work.

Use compressed air to blow dry the wet cores, the engine, engine access doors, and the hood.

Close both engine access doors.

If the machine is in a clean environment, start the engine and allow the fan to run continuously in the reverse mode until the cooling system has dried completely. Allow the machine to sit overnight before operating the machine in the work mode.

## Typical Cleaning Procedure That Uses Compressed Air

All machine arrangements may have special cleaning features.

- continuous reverse fan function
- 307 - 6728 Air Nozzle in access slots in the radiator guard

These tools can be used to develop a cleaning procedure that best suits your application. One possible sequence for cleaning is outlined below.

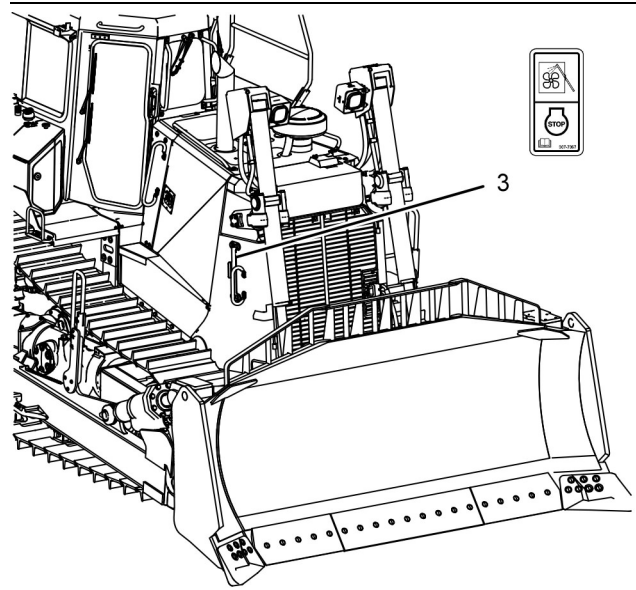


Illustration 192

g02477310

(3) Cleanout Slot Behind Access Cover

1. At the proper cleaning area, park the machine in NEUTRAL and engage the parking brake.
2. Depress the fan control switch and hold for 3 seconds in order to enter the continuous reverse mode. Run the fan in the reverse mode continuously for 2 minutes.
3. Turn off the engine. Make sure that the fan has stopped rotation.
4. Open both engine access doors. Use a regular air nozzle to clean the cores from the rear side. Blow off the hood, engine access doors, and the entire engine compartment. On machines that are equipped with the woodchip arrangement, open the grill doors and blow off the shelf of the radiator guard.
5. Open the cover to access slot (3) on both sides of the radiator guard. Insert the 307 - 6728 Air Nozzle into the access slot on the right side of the machine in order to clean the cores on the left side of the machine.

**Note:** Cleaning the cores from the opposite side of the machine allows better cleaning in the corners.

6. Turn on the air supply.

**Note:** Do not activate the air supply until you have inserted the air nozzle into the access slot. Use the work tool safely.

7. Move the air nozzle in a pattern in order to clean the cores from the front side of the cores. Blow out the cores on the left side of the cooling system.

8. Turn off the air supply when the nozzle cleaning of the left side cores is completed.
9. Remove the air nozzle from the access slot. Close the access cover.
10. Repeat Steps 5 through 9 from the left side of the machine in order to clean the cores on the right side of the machine.
11. Use a regular air nozzle in order to blow off the cores from the rear and clean the entire engine compartment.
12. Close both of the engine access doors.
13. Restart the engine. Operate the fan in the forward direction continuously for 2 minutes.
14. Reverse the air flow. Operate the fan in the reverse mode continuously for 2 minutes.
15. Return to operating the machine in work mode.

**Note:** Adjust the frequency of cleaning according to the effects of the operating environment. Modify the typical cleaning procedure above for optimal results, as needed.

i04321556

## Cooling System Coolant (ELC) - Change

**SMCS Code:** 1395-044

For information about adding an extender to your cooling system, see the Topic "Cooling System Coolant Extender (ELC) - Add" in this manual or consult your Caterpillar dealer.

### NOTICE

Make sure you read and understand the information in the topics Safety and Cooling System Specifications for all information pertaining to water, antifreeze and supplemental coolant additive requirements before you proceed with maintenance of the cooling system.

## To Drain the Cooling System

The filler cap is located beneath the access cover on top of the hood, forward of the engine air precleaner.

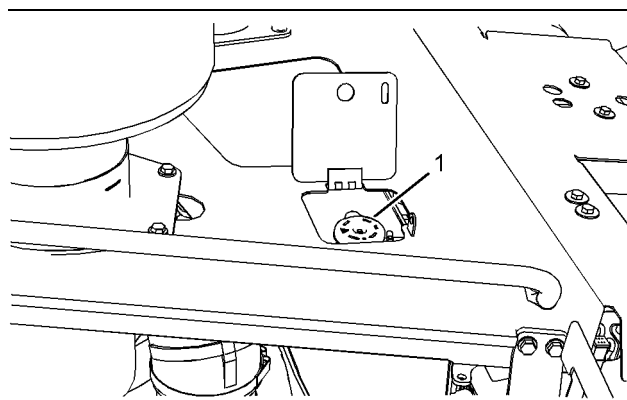


Illustration 193

g02477447

1. Put the machine on a hard level surface, set the parking brake, and turn off the engine.

### **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.**

**Remove filler cap slowly to relieve pressure only when engine is stopped and radiator cap is cool enough to touch with your bare hand.**

**Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.**

2. Slowly loosen filler cap (1) in order to relieve system pressure. Remove the filler cap.

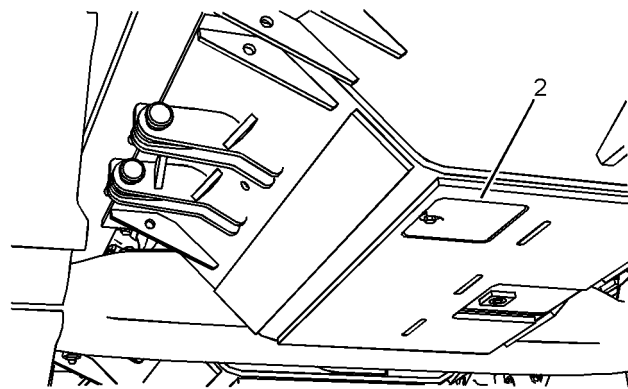


Illustration 194

g02477496

3. Remove access cover (2) for the coolant drain. The cover is located on the right side near the front of the bottom engine guard.

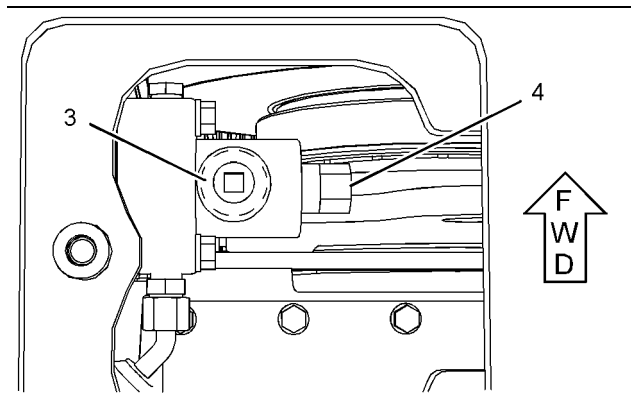


Illustration 195

g02477560

Coolant drain valve viewed through access hole in bottom engine guard

4. Remove plug (3) from the drain valve. Install a 12.7 mm (.5 inch) drain pipe into the drain valve. The pipe must have 1/2 - 14 NPTF threads. Clamp a hose to the pipe in order to direct the coolant into a suitable container.
5. Open drain valve (4). Allow the coolant to drain into a suitable container.
6. Flush the system with water. Flush the system until the draining water is clear.

**Note:** If the cooling system is already using ELC, cleaning agents are not required at the specified coolant change interval. Cleaning agents are only required if the system has been contaminated by the addition of some other type of coolant or by cooling system damage. Clean water is the only cleaning agent that is required when ELC is drained from the cooling system.

**Note:** If you change to ELC from another type of coolant, use a Caterpillar cleaning agent to flush the cooling system. After you drain the cooling system, thoroughly flush the cooling system with clean water. **All of the cleaning agent must be removed from the cooling system.** Refer to the Topic "Cat Extended Life Coolant (ELC)" in Operation and Maintenance Manual, SEBU6250.

7. Close drain valve (4), then remove the drain pipe if previously installed. Install plug (3).
8. Replace access cover (2).
9. Add the ELC solution. See the following topics in this publication:
  - Cooling System Specifications
  - Capacities (Refill)

**Note:** Caterpillar antifreeze contains additives. If you are using Caterpillar antifreeze, do not add the supplemental coolant additive at this time. Also, do not change the supplemental coolant additive element at this time.

10. After the cooling system has been filled, perform the following procedures during initial start-up:

- a. Start the engine without the filler cap.
- b. Run the engine at low idle for 10 minutes.
- c. Then, increase the engine speed to a high idle until the thermostat is open and the coolant level is stabilized.
- d. Maintain the coolant at the proper level as the thermostat opens, and air is purged from the system. Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check".

11. Stop the engine.

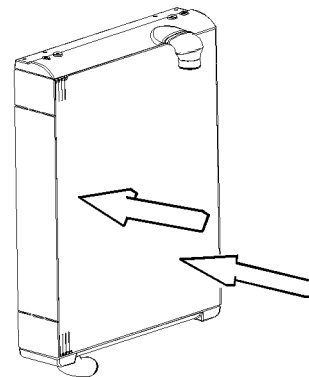


Illustration 196

g02071339

12. Clean the radiator core with compressed air. You may need to use water in order to remove debris.
13. Allow the radiator core to dry completely before operating the machine in the work mode.

**Reference:** See Operation and Maintenance Manual, "Cooling Cores- Clean" for information on a typical cleaning procedure.

For additional information about the cooling system coolant, see Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations", "Cat Extended Life Coolant (ELC)" or consult your Caterpillar dealer.

i04321966

## Cooling System Coolant Extender (ELC) - Add

**SMCS Code:** 1395-538

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

When a Caterpillar Extended Life Coolant (ELC) is used, an extender must be added to the cooling system. See the Operation and Maintenance Manual, "Maintenance Interval Schedule" for the proper service interval. The amount of extender is determined by the cooling system capacity.

For additional information about adding an extender, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

## Extended Life Coolant (ELC) Extender

Use a 8T-5296 Coolant Conditioner Test Kit to check the concentration of the coolant.

### **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.**

**Remove filler cap slowly to relieve pressure only when engine is stopped and radiator cap is cool enough to touch with your bare hand.**

**Cooling System Conditioner contains alkali. Avoid contact with skin and eyes.**

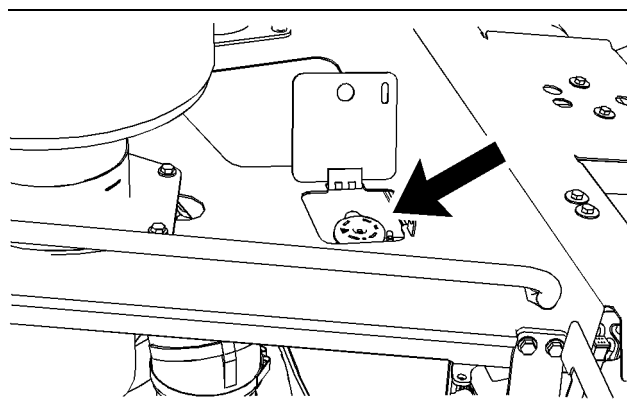


Illustration 197

g02478039

1. The filler cap is located beneath the access cover on top of the hood, forward of the engine air precleaner. Loosen the radiator cap slowly in order to relieve pressure. Remove the radiator cap.
2. Draining some coolant from the radiator may be necessary so that Extender can be added to the cooling system.

**Note:** Always discard drained fluids according to local regulations.

### NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

3. Add proper mixture of Extender to the cooling system.
4. Start the engine. Run the engine without the filler cap until the thermostat opens and the coolant level stabilizes. Check for leaks.
5. Maintain the coolant at the proper level as the thermostat opens, and air is purged from the system. Refer to Operation and Maintenance Manual, "Cooling System Coolant Level - Check".
6. Inspect the radiator cap for any signs of damage. Replace if necessary. Install the radiator cap.

i04322138

## Cooling System Coolant Level - Check

**SMCS Code:** 1353-535-FLV; 1395-535-FLV

### **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 cap 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 the skin and eyes to prevent personal injury.

The machine cooling system has a surge tank. There is no top tank on the radiator. The surge tank has a filler cap and a sight glass. The removal of the filler cap is not necessary in order to check the coolant level. The sight glass is inside the engine access door on the right-hand side of the machine. The filler cap is beneath the access cover on top of the hood, forward of the engine air precleaner.

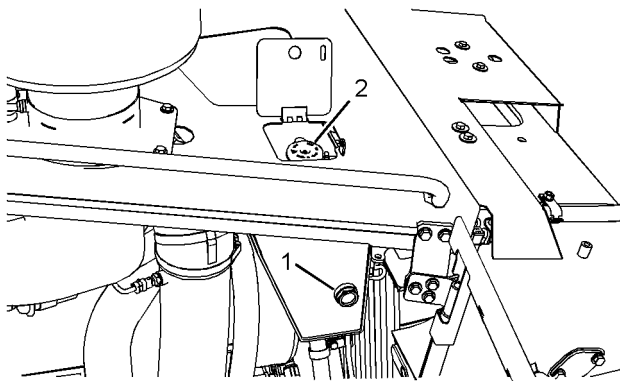


Illustration 198

g02478193

1. Observe sight glass (1) in order to verify the level of the coolant. If the coolant completely covers the sight glass, the coolant level is okay. If no coolant is present in the sight glass, the coolant is low. If the coolant level line is visible in the sight glass, the coolant is low. Add coolant in order to fill the system.
2. If necessary to add coolant, remove filler cap (2) slowly in order to relieve the pressure.

**Note:** The factory fill is Extended Life Coolant (ELC). Refer to Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" for additional information. Maintaining the system as ELC is preferred. See the sections "Coolant Recommendations" and "ELC Cooling System Maintenance".

3. Inspect the filler cap and the filler cap seal for debris, for foreign material, or for damage. Clean the filler cap with a clean cloth. Replace the radiator cap if the filler cap is damaged.
4. Install the filler cap.
5. Inspect the radiator core for debris. Clean the radiator core, if necessary.

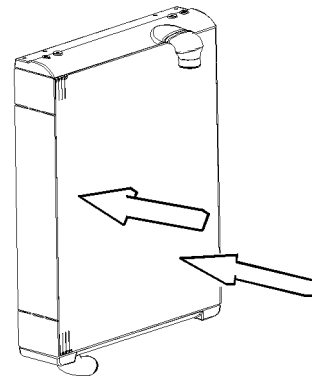


Illustration 199

g02071339

Use compressed air, high-pressure water, or steam to remove dust and debris from the radiator core. However, the use of compressed air is preferred.

Allow the radiator core to dry completely before operating the machine in the work mode.

i04320903

## Cooling System Coolant Sample (Level 2) - Obtain

**SMCS Code:** 1350-008; 1395-008; 1395-554; 7542

### Level 2 Analysis

#### NOTICE

Always use a designated pump for oil sampling, and use a separate designated pump for coolant sampling. Using the same pump for both types of samples may contaminate the samples that are being drawn. This contaminate may cause a false analysis and an incorrect interpretation that could lead to concerns by both dealers and customers.



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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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

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Testing the coolant can be done at your Caterpillar dealer. Caterpillar S·O·S Coolant Analysis is the best way to monitor the condition of your coolant and your cooling system. S·O·S Coolant Analysis is a program that is based on periodic samples. See Operation and Maintenance Manual, SEBU6250, "Cooling System Specifications", "General Coolant Information" for more information.

Perform a Coolant Analysis (Level 2) at initial 500 hours for systems that contain extended life coolant (ELC). Perform the analysis yearly after the initial 500 hours.

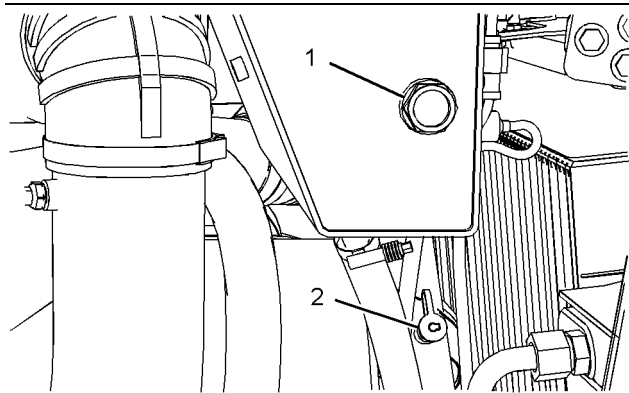


Illustration 200

g02477345

- (1) Coolant Level Sight Glass  
(2) Coolant Sampling Valve

1. Park the machine on a hard, level surface. Set the engine at low idle speed. Set the parking brake
2. Open the right-hand side engine access door. Use the location of the coolant tank and Coolant Level Sight Glass (1) for reference. Locate Coolant Sampling Valve (2) and remove the protective cap.

3. Obtain a coolant sample while the engine is running and at the correct operating temperature. For additional information about coolant analysis, see Operation and Maintenance Manual, SEBU6250, "Cooling System Specifications", "General Coolant Information" or consult your Caterpillar dealer.
4. Replace the protective cap. Close the right-hand side engine access door.

Submit the sample for Level 2 analysis.

i01958847

## Cooling System Water Temperature Regulator - Replace

**SMCS Code:** 1355-510

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#### NOTICE

Failure to replace the engine's thermostat on a regularly scheduled basis could cause severe engine damage.

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#### NOTICE

Replace the thermostat on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system.

A new thermostat should be installed after the cooling system has been cleaned. Install the thermostat while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

---

#### NOTICE

Since Caterpillar engines incorporate a shunt design cooling system, it is mandatory to always operate the engine with a thermostat.

Depending on load, failure to operate with a thermostat could result in either an overheating or an overcooling condition.

---

**Reference:** Refer to Disassembly and Assembly, "Water Temperature Regulator - Remove" and Disassembly and Assembly, "Water Temperature Regulator - Install" for more information. Fill the engine cooling system. Refer to Operation and Maintenance Manual, "Caterpillar Machine Fluids Recommendations" and Operation and Maintenance Manual, "Capacities (Refill)".

i04322329

## Cutting Edges and End Bits - Inspect/Replace

**SMCS Code:** 6801-040; 6801-510; 6804-040; 6804-510

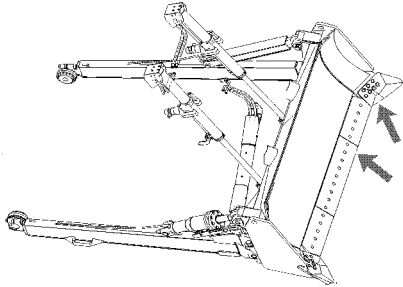


Illustration 201

g01041644

1. Raise the bulldozer blade and block up the bulldozer blade. When you remove the cutting edges and the end bits, maintain the bulldozer blade at a minimum height.
2. Remove the bolts. Then remove the cutting edge and the end bits.
3. Thoroughly clean all contact surfaces.
4. Inspect the opposite side of the cutting edge. If the opposite side of the cutting edge is not worn, turn the opposite side of the cutting edge downward and install the cutting edge.
5. If both sides of the cutting edge are worn, install a new cutting edge section.

**Note:** When the cutting edge is within 10 mm (0.4 inch) of the bottom of the support, change the cutting edge. **Do not allow wear to occur on the support.**

6. If the bottom edge or the outside edge of the end bit is worn, install a new end bit.

**Note:** When the end bit is within 10 mm (0.4 inch) of the bottom of the support, change the end bit. When the end bit is within 10 mm (0.4 inch) of the outside edge of the support, change the end bit. **Do not allow any wear to occur on the support.**

7. Install all bolts and tighten the bolts to a torque of  $1150 \pm 150$  N·m ( $850 \pm 110$  lb ft). Refer to Specifications, SENR3130, "Torque Specifications", "Ground Engaging Tool (G.E.T.) Fasteners".

8. Raise the bulldozer blade and remove the blocking. Lower the bulldozer blade to the ground.
9. After you operate the machine for a few hours, check all bolts for proper torque.

i02061807

## Electronic Unit Injector - Inspect/Adjust

**SMCS Code:** 1290-025; 1290-040

### WARNING

The Electronic Control module produces high voltage. To prevent personal injury make sure the Electronic Control Module is not powered and the unit injector solenoids are disconnected.

### NOTICE

The camshafts must be correctly timed with the crankshaft before an adjustment of the unit injector lash is made. The timing pins must be removed from the camshafts before the crankshaft is turned or damage to the cylinder block will be the result.

The operation of Caterpillar engines with improper adjustments of the electronic unit injector can reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

Adjust the electronic unit injector at the same interval as the valve lash adjustment.

Refer to your machine's Service Manual or your Caterpillar dealer for the complete adjustment procedure.

i04316216

## Engine Air Cleaner Element (Dual Element/Box Type) - Replace

**SMCS Code:** 1054-510

### Primary Filter

### NOTICE

Service the primary filter element only when the alert indicator for the intake air filter is flashing. Do not open the filter compartment unless it is time for service. Opening the filter compartment can cause dirt to get into the clean side of the filter housing.

---

**NOTICE**

Extremely short air filter life can result if the precleaner system malfunctions. If air filter life is drastically reduced from typical for the operating conditions, consult your Caterpillar Dealer. The exhaust system dust ejector for the strata tube precleaner must pull a minimum vacuum of 508 mm (20 inch) of water.

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**NOTICE**

Service the engine air filters with the engine stopped. Engine damage could result.

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**NOTICE**

Do not use the filter for longer than one year.

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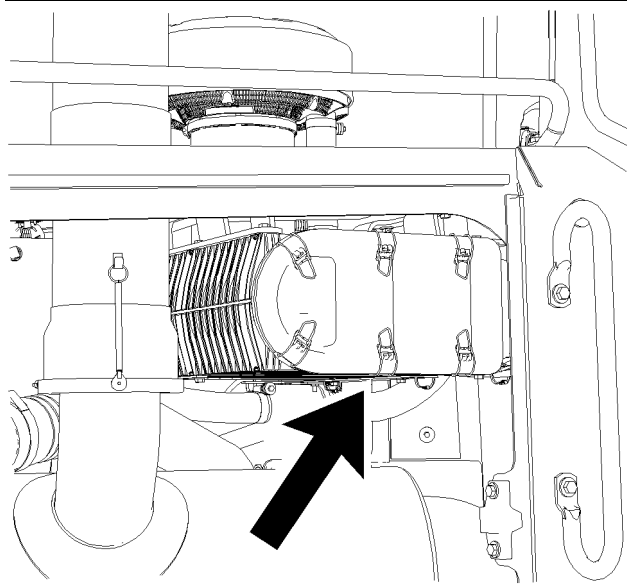


Illustration 202  
Box Type Engine Air Cleaner

1. Open the engine access door on the left-hand side of the machine.

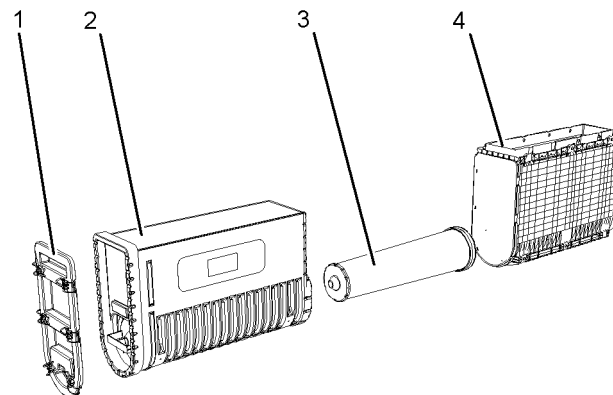


Illustration 203

g02105115

2. Remove the air cleaner housing cover (1).
3. Remove the primary filter element (2) from the air cleaner housing (4).
4. Mark the secondary filter element (3) in order to show that the primary filter element has been serviced. The secondary filter element should be replaced when the primary filter element is serviced for the third time. Refer to the section "Secondary Filter".
5. Clean the inside of the air cleaner housing (4). Keep the secondary filter element in place while you clean the housing.
6. Install a new primary air filter.

---

**NOTICE**

Do not clean the filter elements by bumping or tapping them. Do not use filter elements with damaged pleats, gaskets, or seals. Do not wash the filter elements.

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7. Push the filter element firmly in order to properly seat the element. Write the date on the element, if the primary element is replaced.
8. Install the air cleaner cover.
9. Close the engine access door.

## Secondary Filter

### NOTICE

Always replace the secondary filter element. Never attempt to reuse the filter by cleaning.

The secondary filter element should be replaced at the time the primary element is serviced for the third time.

### NOTICE

The filter should be kept in service for no longer than 1 year.

### NOTICE

Always leave the secondary filter element in place while you clean the air cleaner housing.

1. Open the engine access door.

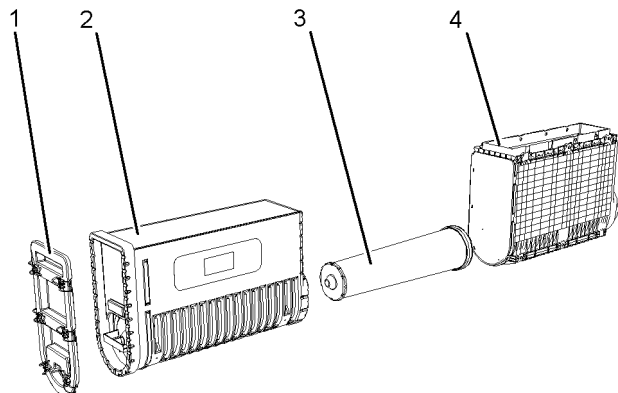


Illustration 204

g02105115

2. Remove the air cleaner housing cover (1).
3. Remove the primary filter element (2). Refer to the section "Primary Filter".
4. Clean the inside of the air cleaner housing (4).
5. Remove the secondary filter element (3). Pull out in order to remove the element.
6. Install a new secondary filter element. Push the element firmly in order to properly seat the element. Write the date on the element, if the element is replaced.
7. Install the primary filter element and the air cleaner housing cover.

8. Close the engine access door.

i04323137

## Engine Air Precleaner - Clean

SMCS Code: 1050-070

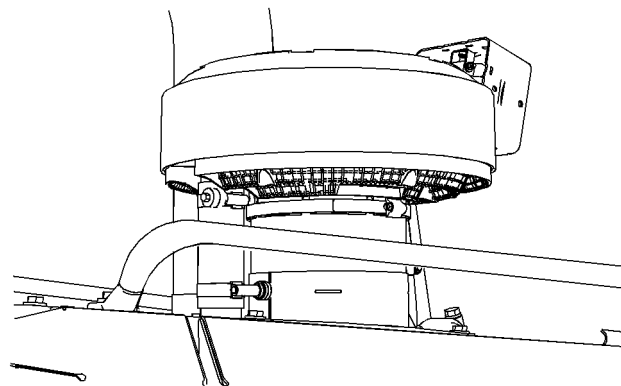


Illustration 205

g02479240

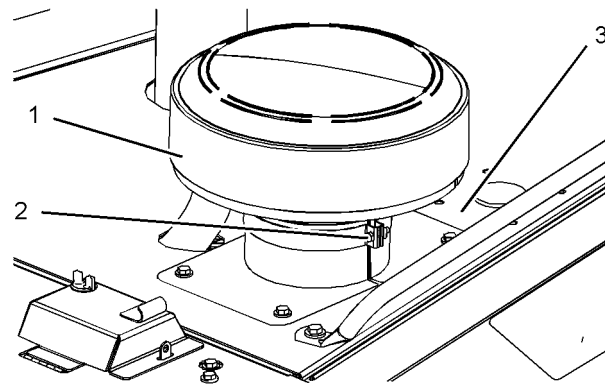


Illustration 206

g02280221

1. Inspect the screen in engine air pre-cleaner (1) that sits above engine hood (3) for dirt accumulation.
2. Loosen retainer (2) and remove the screen.
3. Clean the screen with compressed air or water.
4. Replace the screen.

i02014977

## Engine Air Precleaner - Clean

**SMCS Code:** 1050-070

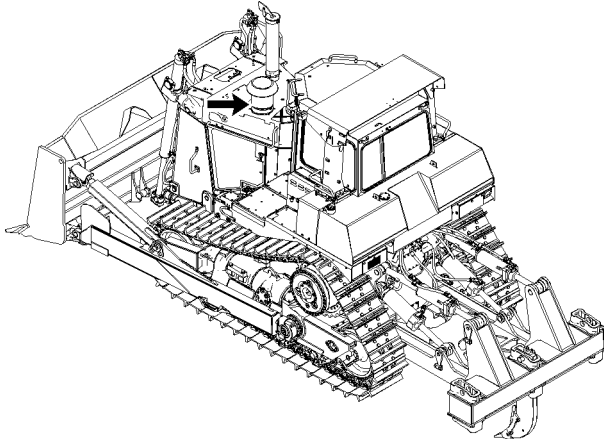


Illustration 207

g01041703

1. Inspect the air inlet screen for dirt and for trash.
2. Remove the screen. Clean the screen if the screen is dirty.
3. Inspect the precleaner tubes for dirt and for dust.
4. Use pressure air to clean the tubes. Put the tubes on a flat surface. Direct the pressurized air into the tubes from the top. This loosens up the dirt. Install the screens.

### NOTICE

Service the air cleaner only with the engine stopped. Engine damage could result.

i02091921

## Engine Mounts and Crankshaft Vibration Damper - Inspect

**SMCS Code:** 1152-040; 1205-040

Damage to the vibration damper or failure of the vibration damper will increase torsional vibrations. These vibrations will result in damage to the crankshaft and in damage to the other engine components. A deteriorating vibration damper will cause excessive gear train noise at variable points in the speed range.

See the Service Manual, "Engine Disassembly and Assembly" for the procedure to install a new damper.

Caterpillar recommends replacing the damper for any of the following reasons:

- The engine has had a failure because of a broken crankshaft.

The damper can be used again if none of the above conditions are found. The damper can be used if the damper is not damaged.

In the damper, a wobble can occur on the outer ring. Some of the wobble of the outer ring is normal. If a wobble is present, replacement of the damper is not necessary. You can confirm an acceptable wobble by seeing the Service Manual, "Engine Disassembly and Assembly" for the procedure to check the damper.

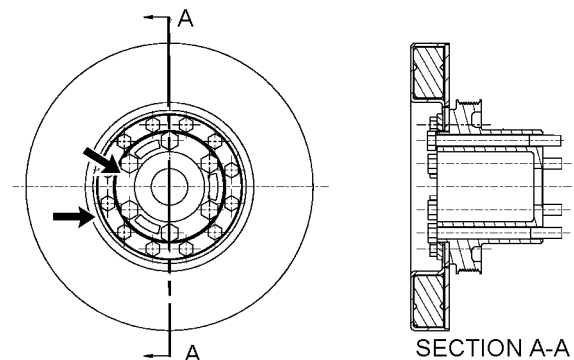


Illustration 208

g01066628

Marks of the damper are on the hub and on the ring. These marks will indicate the condition of the vibration damper. If the marks are not in alignment, the rubber seal between the ring and the hub has separated from the ring and/or from the hub. Install a new damper if the marks are not in alignment .

**Note:** Refer to the Service Manual, "Engine Disassembly and Assembly" for the necessary replacement procedure.

Caterpillar recommends checking the engine mounts for deterioration. This will prevent excessive engine vibration that is caused from improper mounting.

i04045624

## Engine Mounts and Equalizer Bar - Inspect

**SMCS Code:** 1152-040; 7206-040

### Engine Mounts

Caterpillar recommends checking the engine mounts for deterioration. This recommendation will prevent excessive engine vibration that is caused from improper mounting.

### Equalizer Bar End Pins

#### **WARNING**

Personal injury or death can occur from not following the proper procedure or the recommended tooling.

To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.

#### NOTICE

The machine must be parked on a level surface to perform this procedure.

**Note:** All the weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

To check the equalizer bar end pin for movement and unusual wear, perform the following steps.

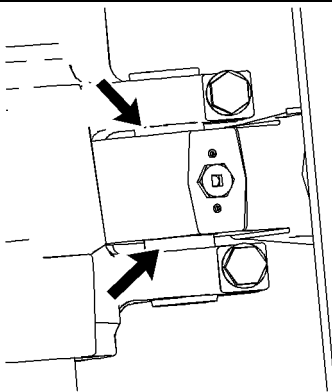


Illustration 209

g01108793

1. Clean the areas that are around the end pin with a high-pressure wash. Inspect the condition of the seal.

2. Check the area for oil leakage and a neutral seal position.
3. Check the oil in both end pin joints.

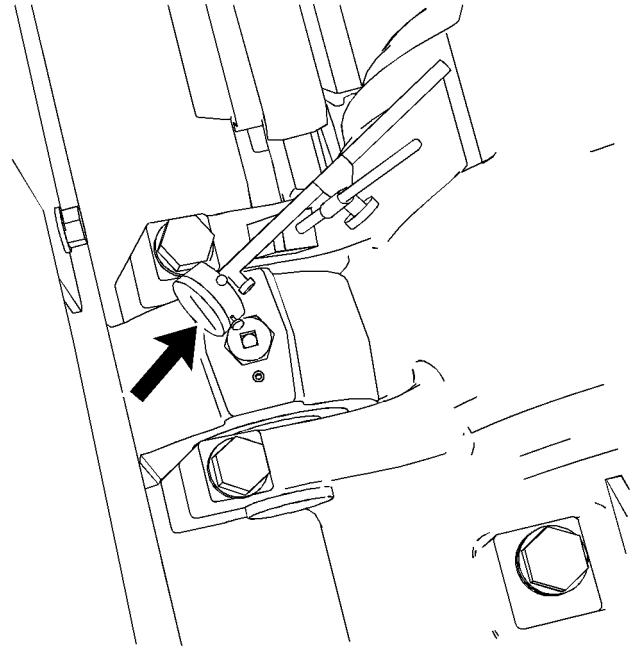


Illustration 210

g01108795

4. Position a dial indicator on the bracket for the pin on the roller frame. Set the dial indicator probe on top of the equalizer bar. Set the dial indicator to zero.

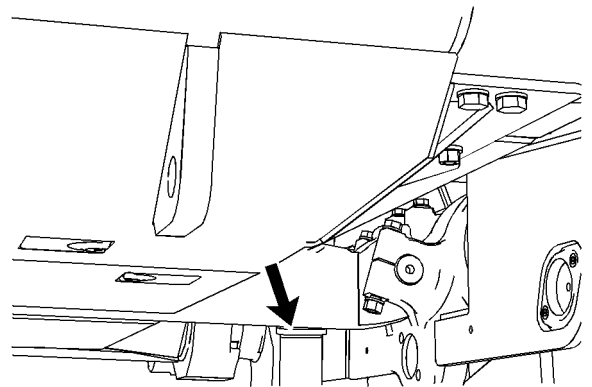


Illustration 211

g01108798

5. Put a 55 ton hydraulic jack in position under the end of the equalizer bar.
6. Jack up the equalizer bar and take a reading on the dial indicator in order to determine the amount of wear.

**Note:** Schedule the end pin joint for repair if the reading on the dial indicator exceeds 1.50 mm (.059 inch).

7. Repeat the inspection and the measurement procedure for the other end of the equalizer bar and end pin.

Consult your Caterpillar dealer for an inspection and for repair instructions.

## Equalizer Bar Center Pin

### **WARNING**

**Personal injury or death can occur from not following the proper procedure or the recommended tooling.**

**To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.**

### **NOTICE**

The machine must be parked on a level surface to perform this procedure.

### **WARNING**

**Personal injury or death can occur from not following the proper procedure or the recommended tooling.**

**To prevent the possibility of injury or death, follow the established procedure using the recommended tooling.**

### **NOTICE**

The machine must be parked on a level surface to perform this procedure.

**Note:** All the weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

To check the equalizer bar center pin for looseness and for unusual wear, perform the following steps.

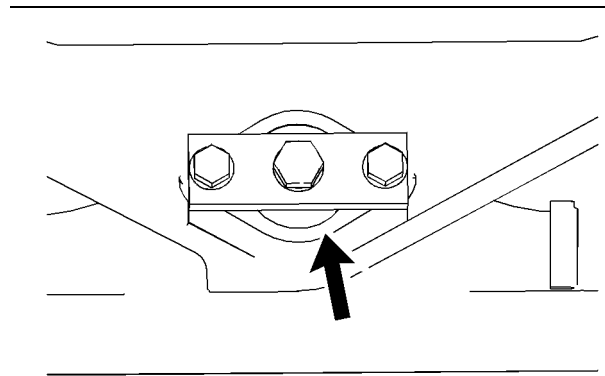


Illustration 212

g01108801

1. Clean the areas that are around the center pin and equalizer bar.

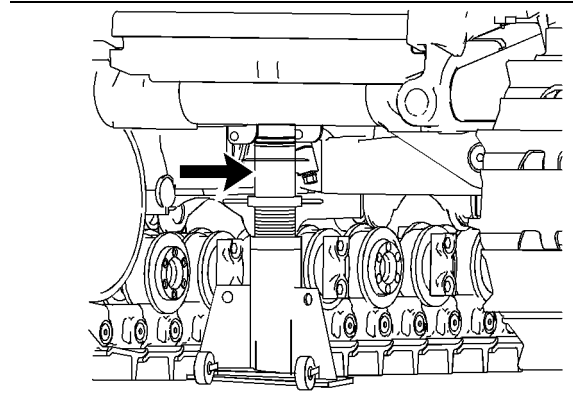


Illustration 213

g01108803

2. Put a 55 ton hydraulic jack in position under the main frame, as shown.

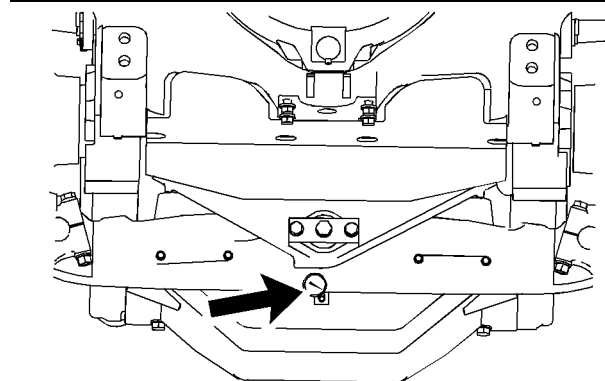


Illustration 214

g01108804

3. Position a dial indicator on the equalizer bar and place the probe of the dial indicator under the center of the frame for the pin. Set the dial indicator to zero.

4. Jack up the front of the machine until the weight of the roller frames are supported by the equalizer bar.
5. Take a reading of the dial indicator in order to determine the amount of wear on the pin and bearing.

**Note:** Schedule the center pin joint for repair if movement exceeds 2.54 mm (.100 inch).

Consult your Caterpillar dealer for an inspection and for repair instructions.

## Equalizer Bar Pads

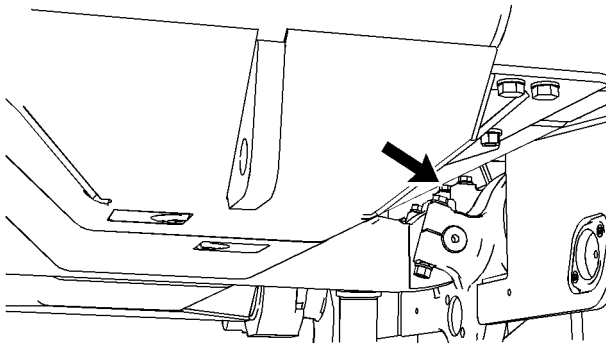


Illustration 215

g01108806

The equalizer bar pads are under the front guard, which is underneath the machine. Inspect the equalizer bar pads for cracked rubber and for missing portions of rubber. Consult your Caterpillar dealer for replacement parts and for replacement instructions.

i04324335

## Engine Oil Level - Check

**SMCS Code:** 1302-535-FLV; 1326-535-FLV

### **WARNING**

Hot oil and components can cause personal injury.

**Do not allow hot oil or components to contact skin.**

### NOTICE

Do not under fill or overfill engine crankcase with oil. Either condition can cause engine damage.

1. Park the machine on level ground.

2. Open the engine access door on the left-hand side of the machine.

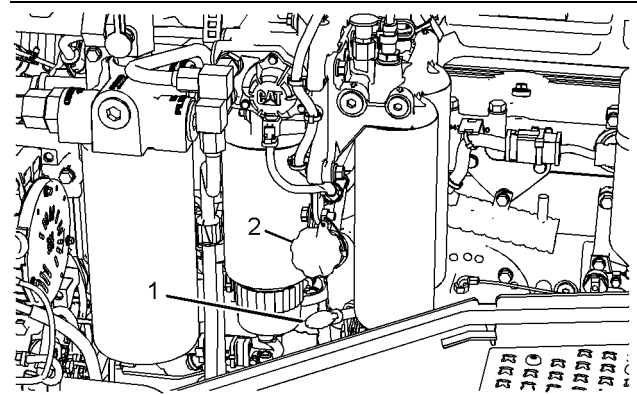


Illustration 216

g02480336

3. Remove engine oil level gauge (1). Examine the oil level gauge in order to determine the engine oil level. The gauge can be read on both sides. One side is marked "ENGINE STOPPED". The other side is marked "ENGINE LOW IDLE".

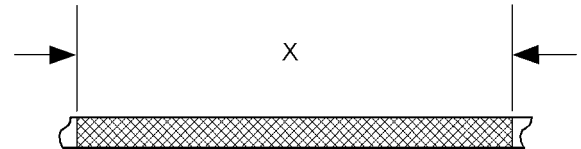


Illustration 217

g01423532

4. Maintain the oil level within operating range (X), between the "ADD" mark and the "FULL" mark on the oil level gauge.
  - a. When the engine is stopped and the oil is cold (ambient temperature), maintain the oil level on the "ENGINE STOPPED" side of the oil level gauge. This method should be used as reference only, before the engine is started.
  - b. When the engine is running and the oil is warm (operating temperature), maintain the oil level on the "ENGINE LOW IDLE" side of the oil level gauge. This procedure is the only accurate way to check the oil level.

**Note:** When you operate the machine on severe slopes, the oil level in the engine crankcase must be at the "FULL" mark. Check the level on the "ENGINE LOW IDLE" side of oil level gauge(1).

5. If necessary, remove the oil filler cap (2) and add oil. Clean the filler cap and install the filler cap.
6. Close the engine access door.



i04327029

## Engine Oil Sample - Obtain

**SMCS Code:** 1348-554-SM; 1348; 7542

### **WARNING**

**Hot oil and components can cause personal injury.**

**Do not allow hot oil or components to contact skin.**

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Obtain the sample of the engine oil as close as possible to the recommended sampling interval. In order to receive the full effect of S-O-S oil analysis, establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

1. Before you obtain an oil sample, operate the machine until the oil is warm and circulated.
2. Open the engine access door on the left-hand side of the machine.

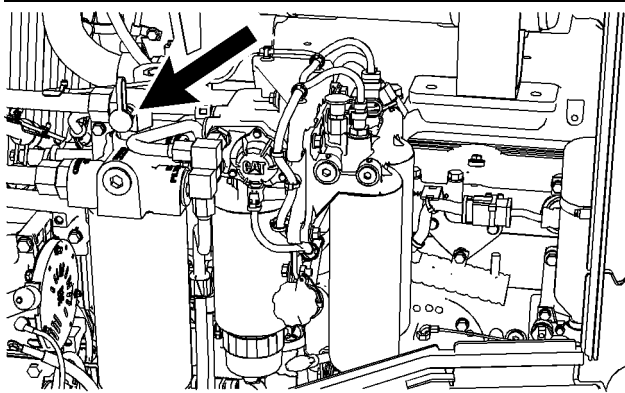


Illustration 218

g02482356

Engine oil sampling valve

3. Remove the protective cap.

4. Obtain a sample of the engine oil from the engine oil sampling valve. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations", "S-O-S Services Oil Analysis" for information that pertains to obtaining a sample of the engine oil. Refer to Special Publication, PEHP6001, "How To Take A Good Oil Sample" for more information about obtaining a sample of the engine oil.

**Note:** In order to obtain an oil sample from the engine compartment, increasing the engine speed may be necessary. Normally, the oil sample is taken at low idle. If the flow rate is too low, increase engine speed to high idle in order to obtain the oil sample.

5. Replace the protective cap.
6. Close the engine access door.

For additional information about oil sampling consult your Cat dealer.

i04327550

## Engine Oil and Filter - Change

**SMCS Code:** 1308; 1318-510

### Selection of the Oil Change Interval

#### NOTICE

This machine is equipped with an engine that meets EPA Tier III, Euro Stage II, or MOC Step 2 emission regulations. A 500 hour engine oil change interval is available, if operating conditions and recommended multigrade oil types are met. When these requirements are not met, shorten the oil change interval to 250 hours, or use an S-O-S oil sampling and analysis program to determine an acceptable oil change interval.

If you select an interval for oil and filter change that is too long, you may damage the engine.

CAT oil filters are recommended.

Recommended multigrade oil types are listed in Table 25. Do not use single grade oils.

Abnormally harsh operating cycles or harsh environments can shorten the service life of the engine oil. Arctic temperatures, corrosive environments, or extremely dusty conditions may require a reduction in engine oil change intervals from the recommendations in Table 25. Also refer to Manual, SEBU5898, "Cold Weather Recommendations". Poor maintenance of air filters or of fuel filters requires reduced oil change intervals. See your Caterpillar dealer for more information if this product will experience abnormally harsh operating cycles or harsh environments.

Table 25

| <b>D9T Series<br/>Engine Oil Change Interval<sup>(1)</sup></b> |                             |                                               |                                                          |                                                    |
|----------------------------------------------------------------|-----------------------------|-----------------------------------------------|----------------------------------------------------------|----------------------------------------------------|
| <b>Multigrade<br/>Oil Type</b>                                 | <b>Operating Conditions</b> |                                               |                                                          |                                                    |
|                                                                | <b>Normal<sup>(2)</sup></b> | <b>High<br/>Load<br/>Factor<sup>(3)</sup></b> | <b>Severe</b>                                            |                                                    |
|                                                                |                             |                                               | <b>Fuel<br/>Sulfur<br/>from<br/>0.3%<br/>to<br/>0.5%</b> | <b>Altitude<br/>above<br/>1830 m<br/>(6000 ft)</b> |
| Cat DEO Preferred                                              | 500 hr                      | 500 hr                                        | 500 hr                                                   | 250 hr <sup>(5)</sup>                              |
| ECF-1<br>10.0<br>minimum<br>TBN <sup>(3)</sup><br>Preferred    | 500 hr                      | 500 hr                                        | 500 hr                                                   | 250 hr <sup>(5)</sup>                              |
| ECF-1<br>TBN <sup>(4)</sup><br>below 10.0                      | 500 hr                      | 500 hr                                        | 250<br>hr <sup>(4)</sup>                                 | 250 hr <sup>(5)</sup>                              |
| API CG-4                                                       | 500 hr                      | 250 hr <sup>(4)</sup>                         | 250<br>hr <sup>(4)</sup>                                 | 250 hr <sup>(5)</sup>                              |

<sup>(1)</sup> The standard oil change interval for the D9T is every 500 hours. If the operating conditions, fuel rates, and recommended oil types for your engine are listed in the table 25 are met. The traditional oil change interval for engines is 250 hours. The standard oil change interval in this machine is 500 hours, if the operating conditions and recommended oil types that are listed in this table are met. Improvements in the engine allow this engine oil change interval. This new standard interval is not permitted for other machines. Refer to the applicable Operation and Maintenance Manuals for the other machines.

<sup>(2)</sup> Normal conditions include these factors: Fuel sulfur below 0.5%, altitude below 1830 m (6000 ft), and good air filter and fuel filter maintenance. Normal conditions do not include high load factor, harsh operating cycles, or harsh environments.

<sup>(3)</sup> Load factors are defined as a function of fuel consumption rate. High load factors can shorten the service life of your engine oil. Continuous heavy load cycles and very little idle time result in increased fuel consumption and oil contamination. These factors deplete the oil additives more rapidly. If the average fuel consumption of your D9T exceeds 51 L (13.5 US gal) per hour, follow the "High Load Factor" recommendations in Table 25. To determine average fuel consumption, measure average fuel consumption for a period of 50 to 100 hours. If the application of the machine is changed, the average fuel consumption may change.

<sup>(4)</sup> In order to verify an oil change interval of 500 hours, refer to "Program A" below.

<sup>(5)</sup> Use "Program B" below to determine an appropriate interval.

## Adjustment of the Oil Change Interval

**Note:** Your Caterpillar dealer has additional information on these programs.

### Program A

Verification for an Oil Change Interval of 500 Hours

This program consists of three oil change intervals of 500 hours. Oil sampling and analysis are done at 250 hours and 500 hours for each of the three intervals for a total of six oil samples. The analysis includes oil viscosity and infrared (IR) analysis of the oil. If all of the results are satisfactory, the 500 hour oil change interval is acceptable for the machine in that application. Repeat Program A if you change the application of the machine.

If a sample does not pass the oil analysis, take one of these actions:

- Shorten the oil change interval to 250 hours.
- Proceed to Program B.
- Change to a preferred oil type in Table 25.

### Program B

#### Optimizing Oil Change Intervals

Begin with a 250 hour oil change interval. The oil change intervals are adjusted by increments. Each interval is adjusted an additional 50 hours. Periodic oil sampling and analysis are done during each interval. The analysis includes oil viscosity and infrared (IR) analysis of the oil. Repeat Program B if you change the application of the machine.

If an oil sample does not pass the analysis, shorten the oil change interval, or change to a preferred multigrade oil type in the listing above.

### References

**Reference:** Form, PEDP7035, "Optimizing Oil Change Intervals"

**Reference:** Form, PEDP7036, "S·O·S Fluid Analysis"

**Reference:** Form, PEHP7076, "Understanding the S·O·S Oil Analysis Tests"

## Procedure for Changing the Engine Oil and Filter



### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

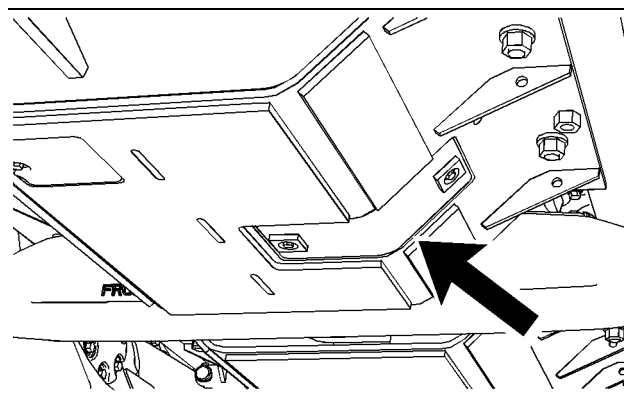


Illustration 219

g02483077

Crankcase drain access cover on left-hand side of bottom engine guard

1. Remove two bolts in order to remove the crankcase drain access cover. The drain access cover is located on the left-hand side of the bottom engine guard.

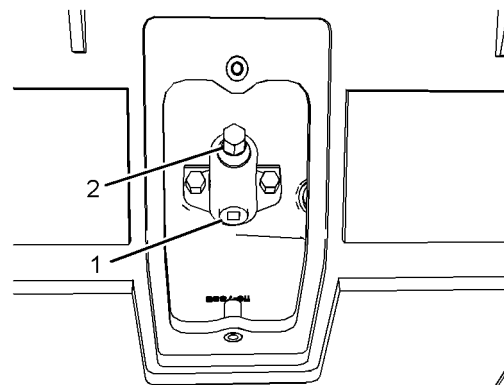


Illustration 220

g02485637

Engine oil drain adapter and drain valve behind crankcase drain access cover

2. Remove drain plug (1) from the drain adapter.

3. Install a 25.4 mm (1.00 inch) pipe into the drain adapter. The pipe requires a 1-11 1/2 NPTF pipe thread. A drain hose may be attached to the pipe to aid in draining.
4. Open the drain valve (2). Allow the oil to drain into a suitable container.
5. When the oil has completed draining from the crankcase, close the drain valve (2). Remove the pipe. Install the drain plug (1). Install the access cover.

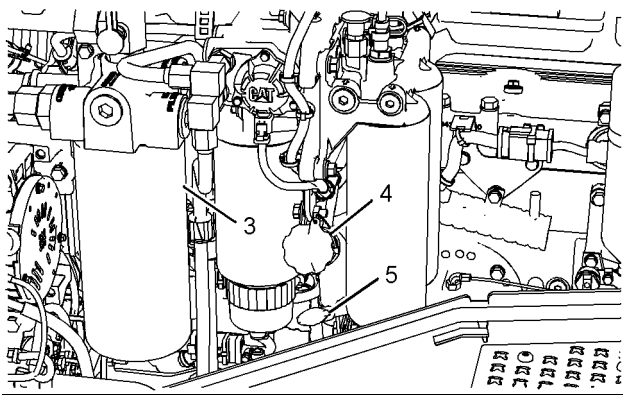


Illustration 221

g02484276

6. Open the engine access door on the left-hand side of the machine. Remove engine oil filter element (3) and discard the engine oil filter element properly. Make certain that all of the old filter seal is removed from the filter base.
7. Apply a thin coat of oil to the seal on the new filter. Install the new engine oil filter element by hand. When the gasket contacts the filter base, tighten the filter element by an additional 3/4 turn (270 degrees). Rotation index marks are on the new filter element. These rotation index marks are spaced at 90 degree intervals. Use these rotation index marks as a guide for proper tightening.
8. Remove oil filler cap (4). Fill the crankcase with new oil. See the topic Operation and Maintenance Manual, "Capacities (Refill)" in this manual. Clean oil filler cap (4) and install the oil filler cap.
9. To ensure that the correct amount of oil was added, always measure the oil level with the engine oil level gauge (5).
10. Remove engine oil level gauge (5). Examine the oil level gauge in order to determine the engine oil level. The gauge can be read on both sides. One side is marked "ENGINE STOPPED". The other side is marked "ENGINE LOW IDLE".

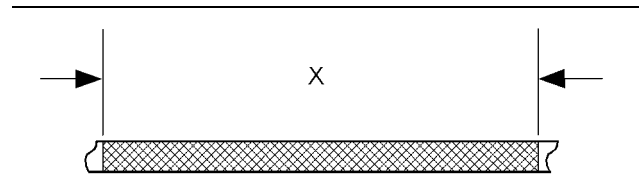


Illustration 222

g01423532

11. Maintain the oil level within operating range (X), between the "ADD" mark and the "FULL" mark on the oil level gauge.
  - a. When the engine is stopped and the oil is cold (ambient temperature), maintain the oil level on the "ENGINE STOPPED" side of the oil level gauge. This method should be used as reference only, before the engine is started.
  - b. When the engine is running and the oil is warm (operating temperature), maintain the oil level on the "ENGINE LOW IDLE" side of the oil level gauge. This procedure is the only accurate way to check the oil level.

**Note:** When you operate the machine on severe slopes, the oil level in the engine crankcase must be at the "FULL" mark. Check the level on the "ENGINE LOW IDLE" side of oil level gauge(5).

12. If necessary, remove the oil filler cap (4) and add oil. Clean the filler cap and install the filler cap.

For additional information about oil types, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

### High Speed Oil Change (If Equipped)

Open the engine access door on the left-hand side of the machine. Swing up the lower guard assembly to reveal the high speed oil change connection fittings.

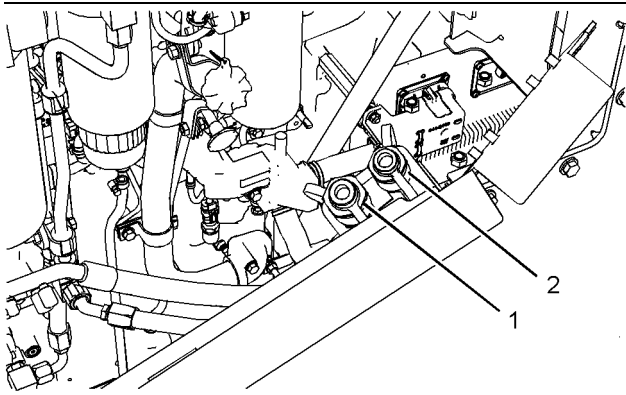


Illustration 223

g02486238

- (1) Engine high speed oil change connection fitting (if equipped)  
(2) Power train high speed oil change connection fitting (if equipped, reference only)

Engine high speed oil change connection fitting (if equipped) (1) can be used with additional equipment to change the engine oil. The filter will still need changed as described previously.

i02092049

## Engine Valve Lash - Check/Adjust

SMCS Code: 1102-025; 1102

### WARNING

To prevent possible injury, do not use the starter motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring valve clearance.

### WARNING

Electrical shock hazard. The electronic unit injector system uses 90-120 volts.

### NOTICE

Operation of Caterpillar engines with improper valve adjustments will reduce engine efficiency. This reduced efficiency could result in excessive fuel usage and/or shortened engine component life.

### NOTICE

Measure the valve clearance with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the valves to cool to engine cylinder head and engine block temperature.

Check the valve bridge before setting the valve lash. Ensure that the valve bridge is seated equally on both valve stems.

Refer to your machine's Service Manual or your Caterpillar dealer for the complete valve adjustment procedure.

i02092057

## Engine Valve Rotators - Inspect

SMCS Code: 1109-040

### WARNING

When inspecting the valve rotators, protective glasses or face shield and protective clothing must be worn, to prevent being burned by hot oil or spray.

### WARNING

Electrical shock hazard. The electronic unit injector system uses 90-120 volts.

### WARNING

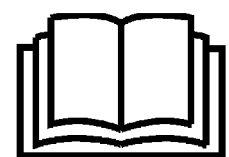


Illustration 224

g00941949

1. Start the engine. Run the engine at low idle.

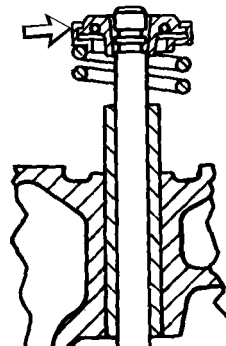


Illustration 225

g00038585

2. Watch the top surface of each valve rotator. Whenever an inlet valve closes or an exhaust valve closes, each valve rotator should turn.
3. If a valve rotator fails to rotate, consult your Caterpillar dealer for service.

**Note:** Caterpillar recommends replacing valve rotators that are operating improperly. An improperly operating valve rotator will shorten valve life because of accelerated wear on the valves.

**Note:** If a damaged valve rotator is not replaced, some valve face guttering could result. Metal particles from the valve could fall into the cylinder. This could cause damage to the piston head and to the cylinder head.

i02092065

## Equalizer Bar Center Pin - Measure

**SMCS Code:** 7206-040-PN; 7206-082; 7207-086-PN

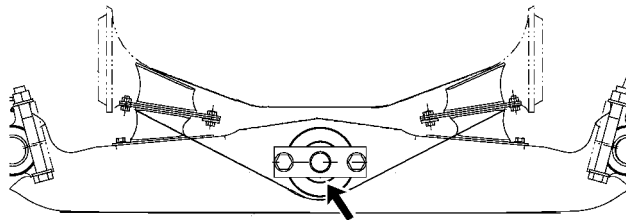


Illustration 226

g01066674

Rear view

To check the equalizer bar center pin for looseness and for unusual wear, perform the following steps.

**Note:** All the weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

1. Clean the areas that are around the center pin with a high pressure wash.

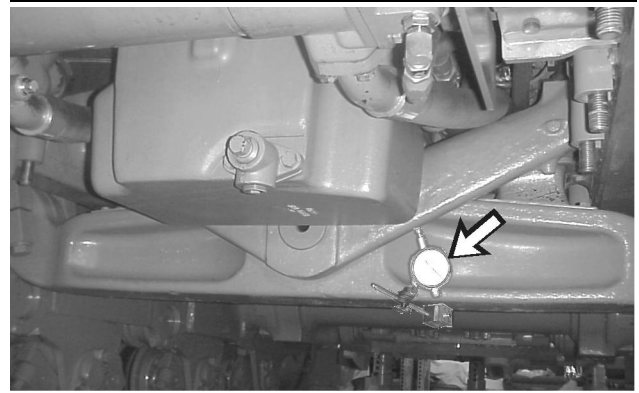


Illustration 227

g00736127

Front view

2. Install a dial indicator and measure the vertical play in the center pin joint.

**Note:** Schedule the center pin joint for repair if movement exceeds 2.54 mm (.100 inch).

Consult your Caterpillar dealer for an inspection and for repair instructions.

i02093902

## Equalizer Bar End Pins - Measure

**SMCS Code:** 7206-082

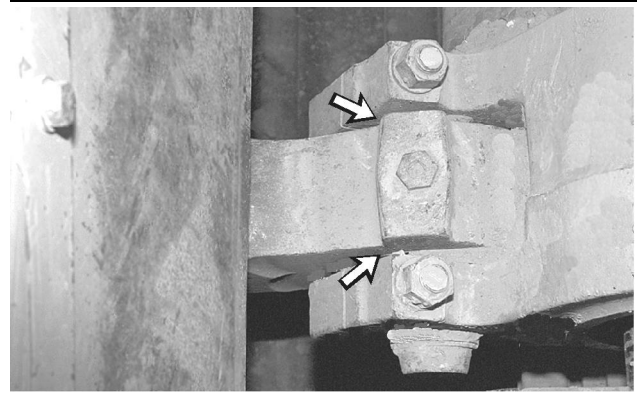


Illustration 228

g00517058

To check the equalizer bar end pin for movement and unusual wear, perform the following steps.

**Note:** All weight of the machine must be removed from the equalizer bar. Equalizer bar must have free movement in order to be measured.

1. Clean the areas that are around the end pin with a high pressure wash. Inspect the condition of the seal.

2. Check the area for oil leakage and a neutral seal position.
3. Install a dial indicator and measure the vertical play at both end pin joints.
4. Check the oil in both end pin joints.

**Note: Schedule the end pin joint for repair if movement exceeds 1.50 mm (.059 inch).**

Consult your Caterpillar dealer for an inspection and for repair instructions.

i02777398

## Equalizer Bar End Pins Oil Level - Check

**SMCS Code:** 7206-535

### NOTICE

Apply gear oil through the fittings with a hand operated lubrication pump or a suitable grease gun. Use of pressure operated lubricating equipment damages the seals.

### NOTICE

Before and after the equalizer bar end pin is filled with gear oil, seal (1) must be flush with the equalizer bar. If the seals are not flush, damage to the seals can result by overfilling.



Illustration 229

g00586840

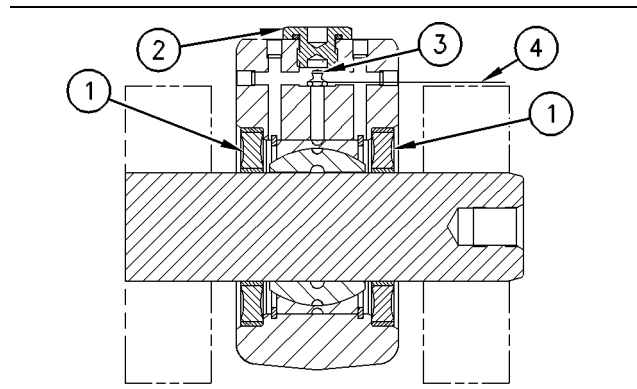


Illustration 230

g00586858

1. Clean the areas that are around the end pin with a high pressure wash. Inspect the condition of the seal (1).
2. Check the area for oil leakage. Be sure that the seal is in a neutral position.
3. Remove plug (2).
4. Check the oil level. Oil level (4) should be at the top of the hex head on the fitting.
5. If the oil level is low, apply the gear oil through fitting (3) until the gear oil reaches oil level (4) at the top of the hex head on the fitting. Remove any excess oil. This will maintain a volume of air. The gear oil must be applied with a 7H-1680 Lubrication Pump or a suitable grease gun. Use the recommended gear oils that are listed in the table for "Lubricant Viscosities for Ambient Temperatures" in this manual.
6. Be sure that seals (1) are not pushed out. Push back the seals if the seals are pushed out.
7. Install plug (2).

**Note: MPGM GREASE IS ALLOWED ONLY FOR A FAILED SEAL. THE SEAL SHOULD BE REPLACED AS SOON AS POSSIBLE. THE COMBINATION OF GEAR OIL AND MPGM IS NOT HARMFUL TO THE MACHINE.**

When you operate the machine in arctic conditions, lubricate the equalizer bar with EMGARD EP 75W90 gear lubricant. EMGARD EP 75W90 gear lubricant is a synthetic lubricant. This lubricant is available from Hudson Corporation.

See Operation and Maintenance Manual, "Lubricant Viscosities" for more information.

i04331692

i04333268

## Ether Starting Aid Cylinder - Replace

SMCS Code: 1456-510-CD

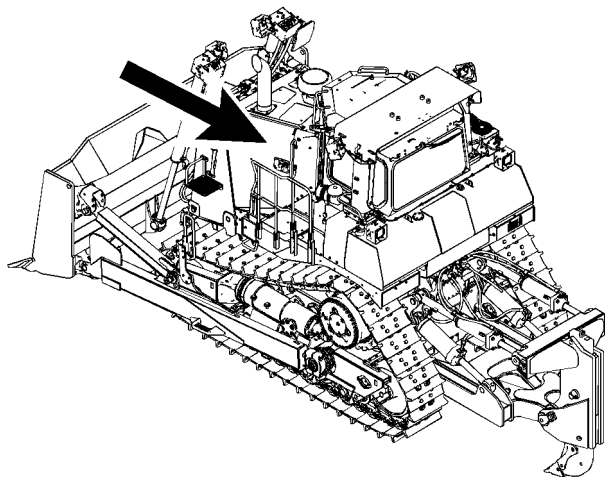


Illustration 231

g02487356

1. Open the left-hand engine access door of the machine. The ether canister is mounted inside the compartment on the side of the engine.

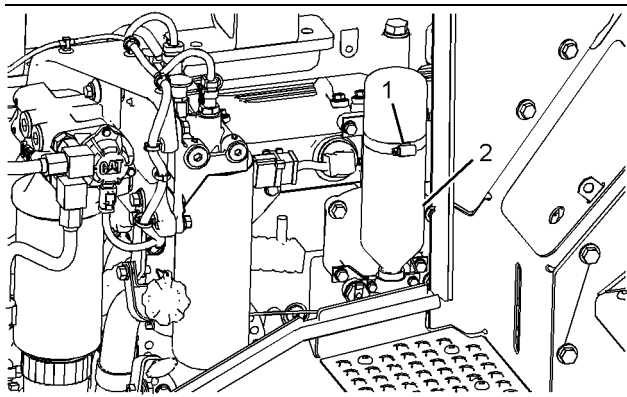


Illustration 232

g02488766

2. Loosen retaining clamp (1). Remove old canister (2) by turning the canister counterclockwise.
3. Remove the old gasket. Install the new gasket.
4. Install the new canister. Turn the canister clockwise. Hand tighten the canister. Tighten the clamp around the canister.
5. Close the engine access door.

## Final Drive Oil - Change

SMCS Code: 4050-535-FLV

### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

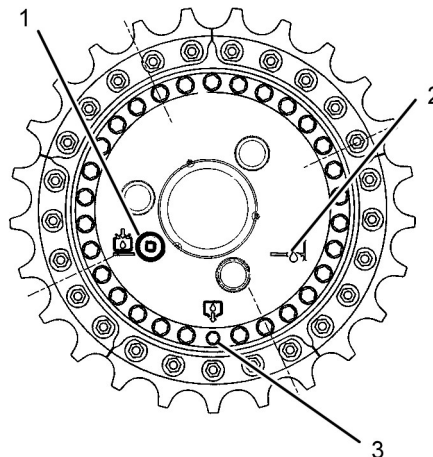


Illustration 233

g01394195

1. Position one final drive so that oil level mark (1) is horizontal. The drain plug (3) will point downward.
2. Remove oil filler plug (2).
3. Remove drain plug (3). Allow the oil to drain into a suitable container.



4. Inspect the drain plug seal. Replace the drain plug seal if the drain plug seal is damaged.
5. Clean the drain plug and install the drain plug.
6. Fill the final drive with oil to the bottom of the filler plug opening. See Operation and Maintenance Manual, "Capacities (Refill)".
7. Inspect the condition of the seal of the filler plug. Replace the plug seal if the plug seal is damaged. Wipe the magnet in order to clean the plug. Install the plug.
8. Repeat Step 1 to Step 7 in order to change the oil in the other final drive.

For additional information about final drive oil, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

i02790608

## Final Drive Oil Level - Check

**SMCS Code:** 4050-535-FLV

### WARNING

**Hot oil and components can cause personal injury.**

**Do not allow hot oil or components to contact skin.**

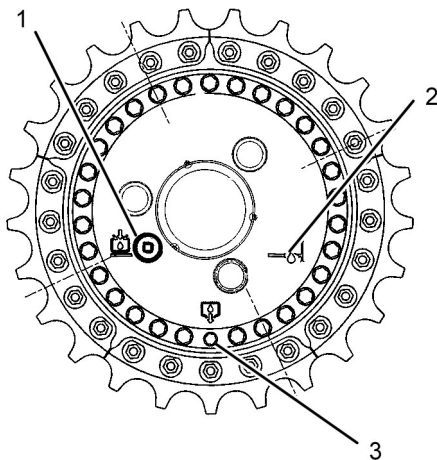


Illustration 234

g01394195

1. Position one final drive so that oil level mark (2) is horizontal with the oil filler plug (1).

2. Remove oil filler plug (1).
3. The oil level should be at the bottom of the filler plug opening. Add oil, if necessary.
4. Wipe the magnet in order to clean the plug.
5. Install oil filler plug (1).
6. Repeat Step 1 to Step 5 in order to check the oil level in the other final drive.

i04356911

## Final Drive Oil Sample - Obtain

**SMCS Code:** 3258-008; 4011-008; 4050-008;  
4050-SM; 4070-008; 4070-554-SM; 7542-008

### WARNING

**Hot oil and components can cause personal injury.**

**Do not allow hot oil or components to contact skin.**

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Obtain the sample of final drive oil as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S-O-S oil analysis, a consistent trend of data is important to establishing a pertinent data history. Perform consistent oil samplings that are evenly spaced.

**If the machine is operated under a high load and/or under high temperature conditions, sample all fluids at the 250 hour interval.**

1. Run the machine until operating temperature has been reached. The sample must be at operating temperature in order to take an accurate sample.

i02211034

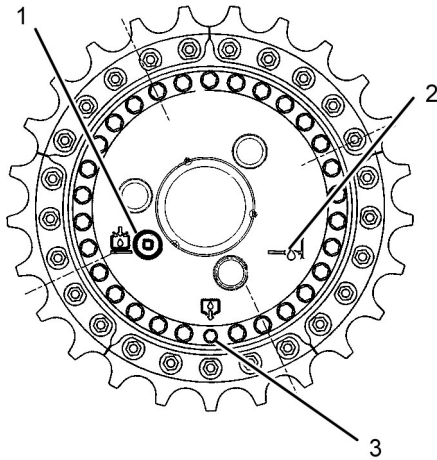


Illustration 235

g01394195

2. Position one final drive so that oil level mark (2) is horizontal with the oil filler plug (1).
  3. Remove oil filler plug.
  4. The oil level should be at the bottom of the filler plug opening. Obtain an oil sample. The use of a sampling gun that is inserted into the sump is the preferred method for obtaining a sample.
- Note:** Do not use the drain stream method from oil drain plug (3) to obtain a sample of the final drive oil. A stream of dirty oil from the bottom of the compartment will contaminate the sample. Likewise, never dip an oil sample from an oil container or pour a sample from a used filter.
5. Wipe the magnet in order to clean the plug.
  6. Install oil filler plug.
  7. Repeat Step 2 to Step 6 in order to sample the oil level in the other final drive.

**Reference:** Refer to, "Lubricant Viscosities" in the Maintenance Section of this manual for the correct fluid for your machine.

**Reference:** Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations", "S·O·S Oil Analysis" for information that pertains to obtaining a sample of the final drive oil. Refer to Special Publication, PEHP6001, "How To Take A Good Oil Sample" for more information about obtaining a sample of the final drive oil.

## Final Drive Seal Guard - Inspect/Clean (If Equipped)

**SMCS Code:** 4052-040; 4052-070

**Note:** The final drive seal guards may need to be inspected more frequently than the standard 500 service hour interval when the machine is operated in very severe applications. Adjust the interval, if necessary.

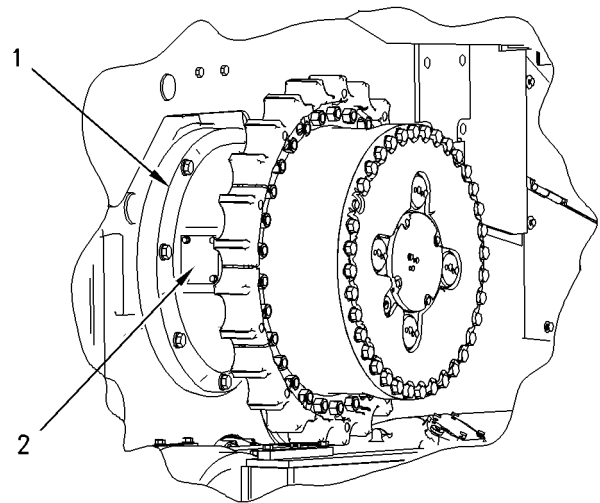


Illustration 236

g00941487

- (1) Guard  
(2) Inspection cover

1. Remove the inspection cover (2) on the guard (1).
2. Inspect the condition of the final drive underneath the guard. Inspect the final drive for debris or abrasive substances that are wrapped around the final drive such as cable or wire.
3. If the area inside the guard is packed with debris or abrasive substances, remove guard (1) and clean the debris or abrasive substances from the guard and the final drive.
4. Install the guard (1) onto the final drive.
5. Install the inspection cover (2) on the guard (1).

**Reference:** Refer to Operation and Maintenance Manual, "Final Drive Seal Guard Packing - Replace (If Equipped)" for more information on the procedure to replace the packing.

i02777624

# Final Drive Seal Guard Packing - Replace (If Equipped)

SMCS Code: 4052-510

The design of the seal guard has a packing that prevents debris from entering the area of the Duo-Cone Seal Gp. The close fit and tolerances limit the size of the debris that can enter the labyrinth seal to 2 mm (0.079 inch). The labyrinth seal changes the direction of the debris four times. Contact may be made at the packing after the fourth time. The packing material is impregnated with silicone oil. Therefore, it is not necessary to fill the cavity for the packing with grease. The packing is held in place by retainers that can be removed. This allows the replacement of the packing without removing the final drive. The packing has a split that allows the packing to be placed over the spindle.

## Replacement of the Packing

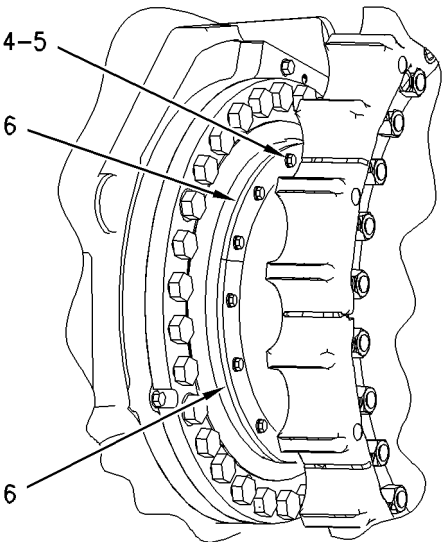


Illustration 237

g00939700

- (4) Bolt
- (5) Washer
- (6) Retainer

1. Remove bolts (4) and washers (5). Remove retainers (6).

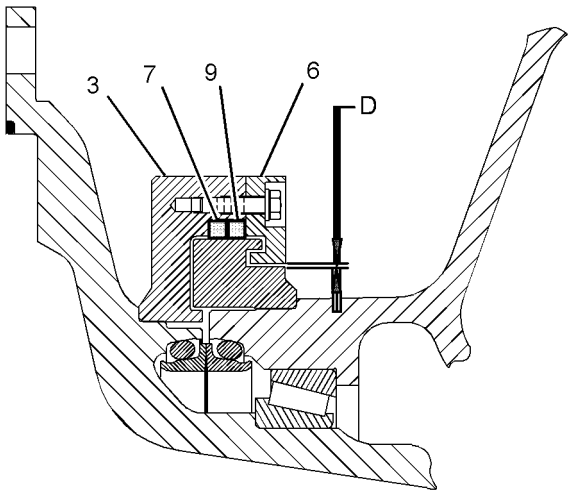


Illustration 238

g01387828

Cross section view of seal guard

- (3) Seal guard
- (6) Retainer
- (7) Inner packing
- (9) Outer packing
- (D) 2 mm (0.079 inch)

2. Inspect the packing and the seal guard for evidence of leaking through the packing. Remove packing (7) and (9) from seal guard (3). **Oil leakage through the packing would indicate leakage of the Duo-Cone Seal Gp in the final drive. Inspect the Final Drive for oil leakage through the Duo-Cone Seal Gp. If oil is leaking through the seal, replace the Duo-Cone Seal Gp. Refer to the Service Manual.**

Table 26

| Required Parts |     |                |
|----------------|-----|----------------|
| Part Number    | Qty | Description    |
| 189 - 6244     | 2   | Seal (packing) |
| 129 - 1928     | 1   | Grease         |

**Note:** Each final drive seal guard requires two 189 - 6244 Seals (packing). The sections of packing are installed on top of each other in the groove of the seal guard.

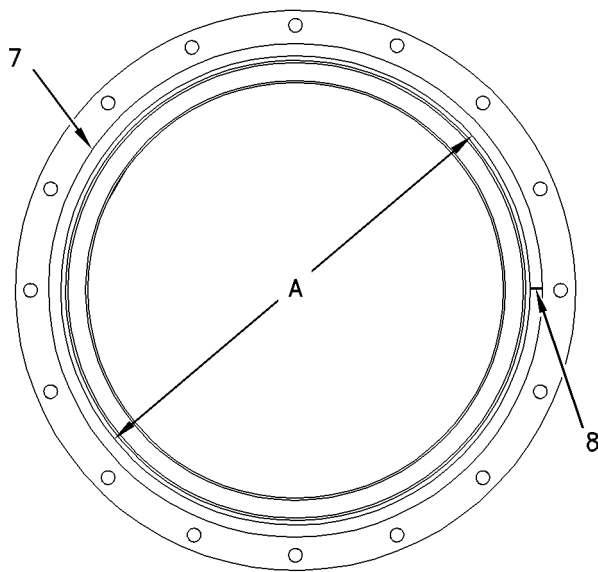


Illustration 239

g00941695

- (7) Inner packing  
(8) Joint in the inner packing  
(A) Diameter (A)

3. Install inner packing (7). Place a thin film of 129 - 1928 Grease on diameter (A). Stretch the packing during installation. Smooth the packing and keep the packing uniform. Minimize the joint (8) at the ends of the inner packing (7).

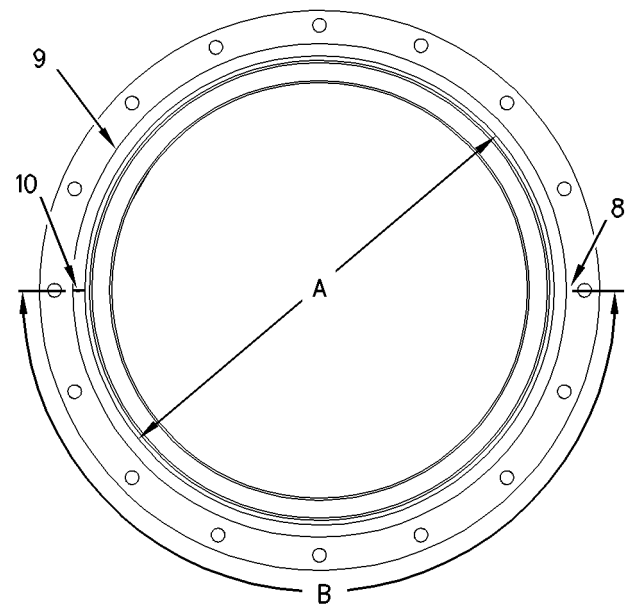


Illustration 240

g00940433

- (9) Outer packing  
(10) Joint in the outer packing  
(A) Diameter (A)  
(B) 180 degrees

4. Install the outer packing (9). **Offset the joint in the inner packing (8) and the outer packing (10) at 180 degrees.** Stretch the packing during installation. Smooth the packing and keep the packing uniform. Minimize the joint (10) at the ends of the outer packing (9).

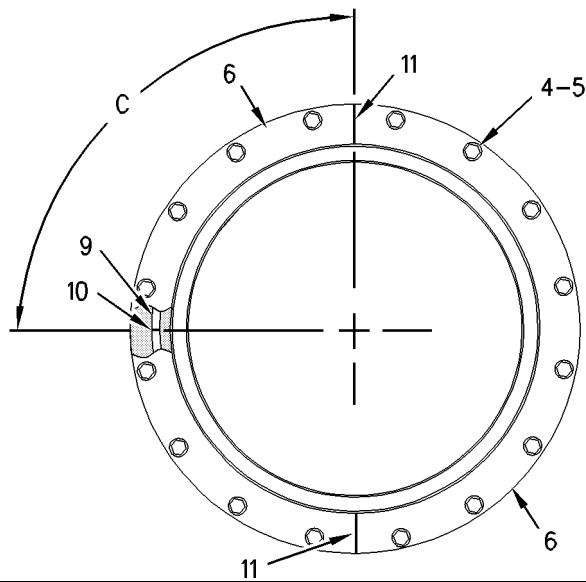


Illustration 241

g00939660

- (4) Bolt
- (5) Washer
- (6) Retainer
- (9) Outer packing
- (10) Joint in outer packing
- (11) Joint in retainers
- (C) 90 Degrees from joint in outer packing to joint in retainers

**Note:** The joint (10) in the outer packing (9) must be offset 90 degrees (C) to the joints (11) in the retainers (6).

5. Assemble retainers (6) to seal guard (3) with washers (4) and bolts (5). The clearance at area (D) should be 2 mm (0.079 inch).
6. Repeat steps 3 through 5 in order to replace the packing on the other final drive, if necessary.

i04338609

## Fuel System - Prime

**SMCS Code:** 1250-548; 1258

If the engine does not start, air may be trapped in the fuel lines to the engine. Use the following procedure in order to purge air from the fuel lines.

1. Turn the key to the ON position. The electric fuel priming pump is activated in this way.
2. Leave the key in the ON position for 2 minutes. This action allows the system to fully prime.

### NOTICE

Do not crank the engine continuously for more than 30 seconds. Allow the starting motor to cool for two minutes before cranking the engine again.

3. Start the engine. If you cannot start the engine, the engine needs more priming. If the engine continues to misfire or to smoke, more priming is necessary.
4. The fuel system will need to be primed when the fuel filters are replaced or fuel has been lost in the fuel supply system.

i04339009

## Fuel System Primary Filter (Water Separator) - Drain

**SMCS Code:** 1263-543

### WARNING

**Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire. To help prevent possible injury, turn the start switch off when changing fuel filters or water separator elements. Clean up fuel spills immediately.**

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

### 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.

i04339453

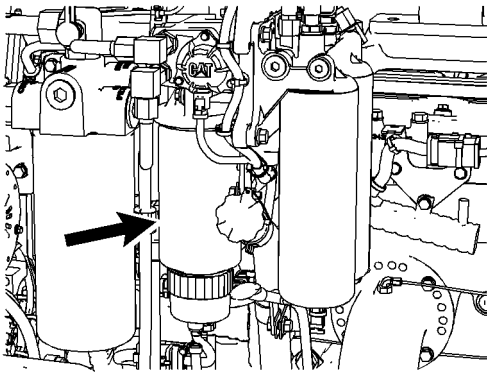


Illustration 242

g02494956

Electric Fuel Priming Pump, Primary Fuel Filter, and Water Separator Assembly

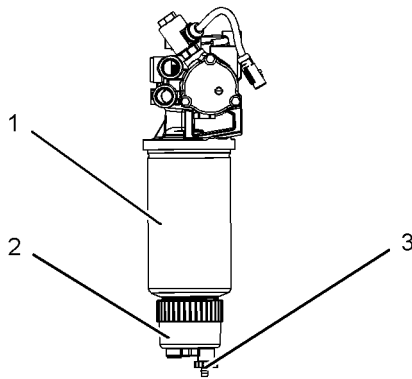


Illustration 243

g02116797

- (1) Element  
(2) Bowl  
(3) Drain

Bowl (2) should be monitored daily for signs of water. If water is present, drain the water from the bowl.

1. Open drain (3). The drain is a self-ventilated drain. Catch the draining water in a suitable container. Dispose of the water properly.
2. Close drain (3).

#### NOTICE

The water separator is under suction during normal engine operation. Ensure that the drain valve is tightened securely to help prevent air from entering the fuel system.

## Fuel System Primary Filter - Clean/Replace

SMCS Code: 1260-070; 1260-510

### WARNING

Personal injury or death can result from a fire.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

#### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

#### NOTICE

Do not fill fuel filter with fuel before installing the fuel filter. Contaminated fuel causes accelerated wear to fuel system parts.

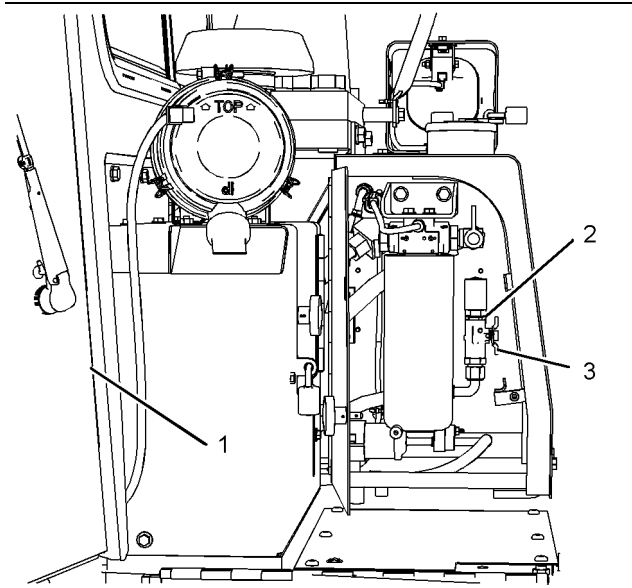


Illustration 244

g02495496

- (1) Left-hand cab entry door (reference only)
- (2) Fuel shutoff valve
- (3) Fuel shutoff valve handle

1. Locate fuel shutoff valve (2). The valve is inside the enclosed compartment above the fender, forward and below the fuel tank fill cap on the left-hand side of the machine.
2. Turn red-colored handle (3) to close valve.
3. Open left-hand engine access door.

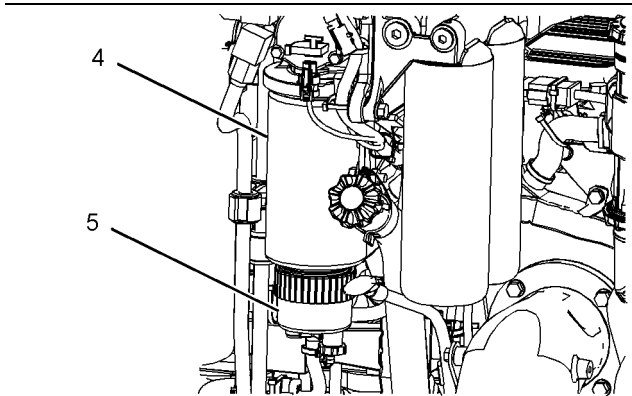


Illustration 245

g02495717

4. Drain water separator bowl (5) into a suitable container and remove the bowl from the bottom of the filter element. Clean the water separator bowl and inspect the seal. If the seal is worn or damaged, install a new seal.
5. Remove filter element (4). Properly discard the filter element.
6. Clean the filter base. Be sure that all of the old seal is removed.

7. Coat the seal of the new filter element with clean diesel fuel.
8. Install the new filter element hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

**Note:** There are rotation index marks on the filter that are spaced 90 degrees or 1/4 of a turn away from each other. When you tighten the filter, use the rotation index marks as a guide.

**Note:** Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide. For non-Caterpillar filters, use the instructions that are provided with the filter.

**Note:** A Caterpillar strap wrench, or another suitable tool, may be needed to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

9. Coat the seal of the water separator bowl with clean diesel fuel. Install the water separator bowl to the filter element.
10. Turn red-colored handle (3) in order to open the fuel valve.
11. After the fuel filter is replaced, turn the key to the ON position. Leave the key in the ON position for 2 minutes. This action allows the system to fully prime.
12. Start the engine and run the engine. Check filter (4) and water separator bowl (5) for leaks.
13. Close the engine access door.

i04340112

## Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

### WARNING

**Personal injury or death can result from a fire.**

**Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.**

**Clean up all leaked or spilled fuel. Do not smoke while working on the fuel system.**

**Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.**

**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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

**NOTICE**

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

Before you replace the secondary fuel filter element, replace the primary fuel filter element. See the Topic "Fuel System Primary Filter - Replace" in this manual.

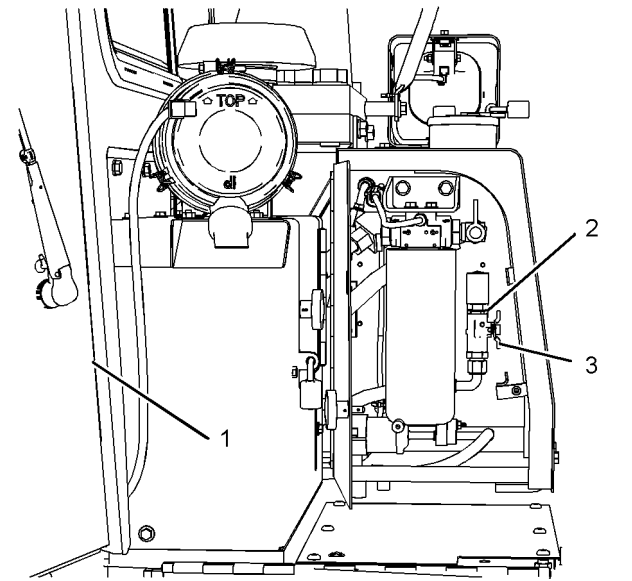


Illustration 246

g02495496

- (1) Left-hand cab entry door (reference only)
- (2) Fuel shutoff valve
- (3) Fuel shutoff valve handle

1. Locate fuel shutoff valve (2). The valve is inside the enclosed compartment above the fender, forward and below the fuel tank fill cap on the left-hand side of the machine .
2. Turn red-colored handle (3) to close valve.
3. Open left-hand engine access door.

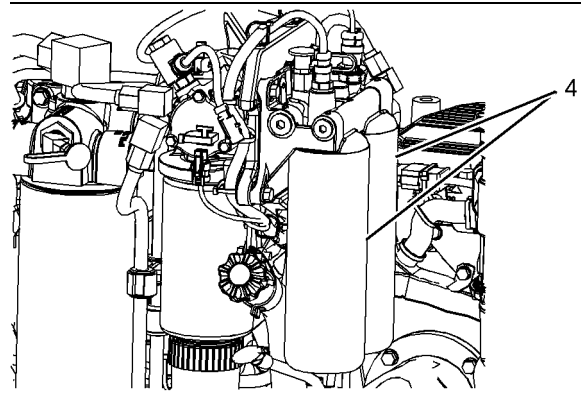


Illustration 247

g02496276

4. Remove the secondary filter and the tertiary filter (4). Discard the fuel filters properly.
  5. Clean the filter bases. Make sure that all of the old seals are removed.
  6. Install the new filters. Coat the seals of the new filters with clean diesel fuel.
  7. Install the new filters by hand. When the seals contact the base, tighten the filters according to the instructions on the filters.
- Rotation index marks are positioned on the filters at 90 degree intervals. Use these rotation index marks as a guide when you tighten the filters.
8. Turn red-colored handle (3) in order to open the fuel valve.
  9. After the fuel filters are replaced, turn the key to the ON position. Leave the key in the ON position for 2 minutes. This action allows the system to fully prime.
  10. Start the engine and run the engine. Check filters (4) for leaks.
  11. Close the engine access door.



i04341911

## Fuel Tank Cap Filter and Strainer - Replace/Clean

**SMCS Code:** 1273-070-STR; 1273-070-Z2

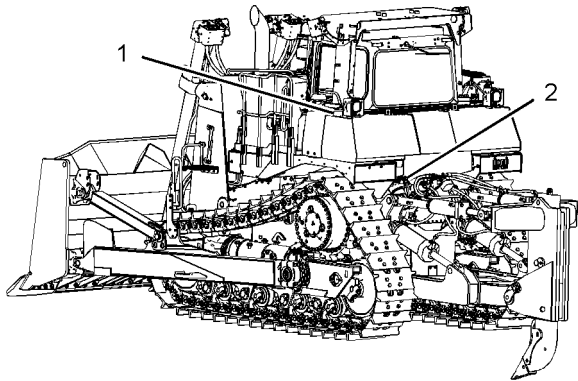


Illustration 248

g02498142

- (1) Fuel tank cap with filter and strainer  
(2) Fast fill adapter connection fitting

The fuel tank is located on the rear of the machine. The filler cap (1) is on the left side of the machine next to the ROPS.

5. Inspect the tank cap seal. If the seal is damaged, replace the seal.
6. Replace the filter assembly, the valve, the gaskets, and the screws. Use a 9X-2205 Cap Filter Kit.
7. Install the strainer.
8. Install the fuel cap. Rotate the fuel cap clockwise until three tabs (7) drop into the slots in the adapter. Rotate lever (5) clockwise until the lever stops. Lower lever (5) over locking tab (6).

### Fast Fill Fuel Adapter (If Equipped)

See illustration 248.

Machines that are equipped with a fast fill fuel adapter (2) have identical fuel caps as systems without a fast fill fuel adapter. Use the same procedure for changing the filter in the two systems.

i04342173

## Fuel Tank Water and Sediment - Drain

**SMCS Code:** 1273-543-M&S

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

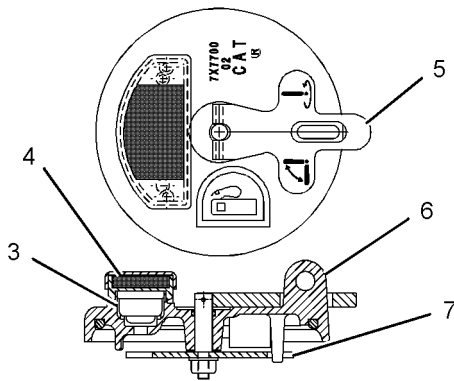


Illustration 249

g01110732

Detailed view of fuel tank cap components

1. Lift lever (5) in order to remove the fuel tank filler cap. Turn the lever counterclockwise until the lever stops. Lift the cap straight up in order to remove the cap.
2. Remove the fuel strainer from the filler neck.
3. In order to replace the filter assembly, remove two screws that secure filter assembly (4) to the fuel cap. Remove filter assembly (4), valve (3), and the gaskets.
4. Wash the cap and the strainer in a clean, nonflammable solvent.

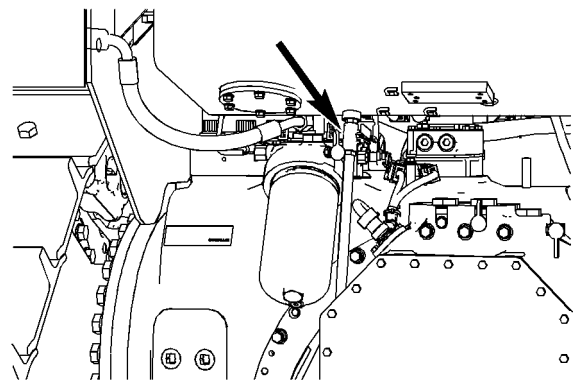


Illustration 250

g02498496

The drain valve is under the fuel tank at the rear of the machine.

1. Open the drain valve. Allow the water and the sediment to drain into a suitable container.
2. Close the drain valve.

i04357075

## Fuses and Circuit Breakers - Replace/Reset

**SMCS Code:** 1417-510; 1420-529; 1420



**Fuses** – These fuses protect the electrical system from damage that is caused by overloaded circuits. Replace a fuse if the element separates. The circuit should be checked and repaired if the element separates with a new fuse. The fuses are in the operator compartment.

**NOTICE**

Replace the fuses with the same type and size only. Otherwise, electrical damage can result.

If it is necessary to replace fuses frequently, an electrical problem may exist. Contact your Caterpillar dealer

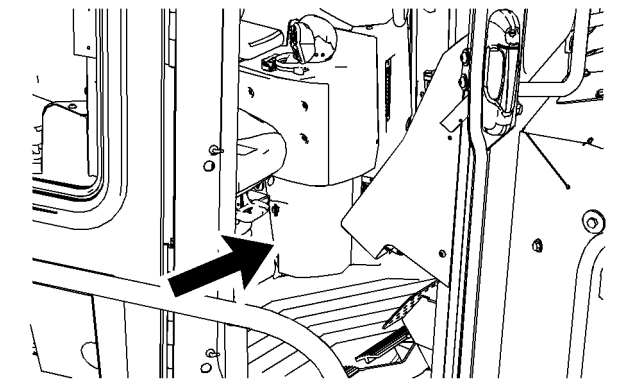


Illustration 251

g02511219

The fuse panel is behind the access cover that is below the left armrest of the operator seat.

|    | A                                                                                                | B                                                                                                    | C                                                                                                | D                                                                                                     |
|----|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 1  | F9<br>10A     | F4<br>15A <br>AUX | F3<br>15A     | F2<br>15A <br>AUX  |
| 2  | F6<br>10A     | F7<br>15A         | F12<br>10A    | F11<br>20A         |
| 3  | F38<br>15A    | <br>R6            |                                                                                                  | <br>R11            |
| 4  | CB4<br>15A    |                                                                                                      |                                                                                                  |                                                                                                       |
| 5  | F1<br>15A     | F8<br>15A         | F13<br>15A    | F18<br>15A         |
| 6  | CB1<br>15A    | F5<br>15A         | F10<br>10A    | F14<br>15A <br>AUX |
| 7  | F31<br>10A    | <br>R8            |                                                                                                  | <br>R7             |
| 8  | CB3<br>15A    |                                                                                                      |                                                                                                  |                                                                                                       |
| 9  | F25<br>10A   | <br>R2          |                                                                                                  | <br>R3           |
| 10 | F16<br>15A  |                                                                                                      |                                                                                                  |                                                                                                       |
| 11 | F19<br>15A  | <br>R4          |                                                                                                  | <br>R5           |
| 12 | F15<br>15A  |                                                                                                      |                                                                                                  |                                                                                                       |
| 13 | F27<br>15A  | F17<br>10A      | F23<br>15A  | F34<br>15A       |
| 14 | F35<br>20A  | F21<br>15A      | F24<br>15A  | F33<br>15A       |
| 15 | F36<br>15A  | F22<br>15A      | F28<br>15A  | CB5<br>15A       |
| 16 | F37<br>15A  | F20<br>15A      | F29<br>15A  | F30<br>10A       |

Illustration 252

g02163853

Table 27

i02054663

| Primary Fuse Panel |                      |                            |                     |                            |
|--------------------|----------------------|----------------------------|---------------------|----------------------------|
|                    | A                    | B                          | C                   | D                          |
| 1                  | Second Brake 10A     | Auxiliary Power 15A        | Power train ECM 15A | Imp ECM 15A                |
| 2                  | Prod Link 10A        | Engine ECM 15A             | Navigator 10A       | Conv Power 20A             |
| 3                  | Fender Floods 15A    | Fuel Prime Relay           | Fender Floods Relay |                            |
| 4                  | 15A                  |                            |                     |                            |
| 5                  | Rip/Impl Control 15A | Fuel Tank Ripper Flood 15A | R ROPS/HID 15A      | Accugrade 15A              |
| 6                  | Blower 15A           | Wipers 15A                 | Volt Monitor 10A    | Wakeup Auxiliary Power 15A |
| 7                  | 10A                  | Spare Relay                | Dual Starter Relay  |                            |
| 8                  | 15A                  |                            |                     |                            |
|                    |                      |                            |                     |                            |
| 9                  | Cab Pressure 10A     | Cyclinder Floods Relay     | Pressurizer Relay   |                            |
| 10                 | Cyl Floods 15A       |                            |                     |                            |
| 11                 | ROPS Floods 15A      | FWD ROPS Floods Relay      | Ingress Relay       |                            |
| 12                 | Horn 10A             |                            |                     |                            |
| 13                 | Seat 15A             | KeySW 10A                  | Remote Control 15A  | Spare 15A                  |
| 14                 | Nozzle Heat 15A      | Advis/Instr Cluster 15A    | Spare 15A           | 10A Converter 15A          |
| 15                 | Condns2 15A          | Accug2 15A                 | Engine ECM 15A      | Spare 15A                  |
| 16                 | Condns1 15A          | Eng/Xmsn/Monitor 10A       | Spare 15A           | Spare                      |

## Horn - Test

**SMCS Code:** 7402-081

Test the horn on a daily basis. Press downward on the horn button in order to sound the horn. If the horn does not sound, make the necessary repairs before you operate the machine.

i04343851

## Hydraulic System Filter Screens - Clean

**SMCS Code:** 5068

The screen should be cleaned especially when one of the following situations have occurred:

- Cleaning of the Hydraulic Tank
  - Failure of the Fan Motor
  - Failure of the Fan Pump
  - Failure of the Implement Pump
  - Failure of the Steering Motor
  - Failure of the Steering Pump
  - PCR (Engine Overhaul)
1. Park the machine on a level surface. Lower the work tool to the ground. Engage the parking brake.
  2. Turn the engine start switch key to ON.
  3. Move the hydraulic control levers through all of the positions in order to release pressure.
  4. Turn the engine start switch key to OFF.

**⚠ WARNING**

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Before removing the filler cap, press the valve relief button on the hydraulic tank in order to relieve the tank pressure.

Remove the filler cap only when the engine is stopped and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve any remaining pressure.

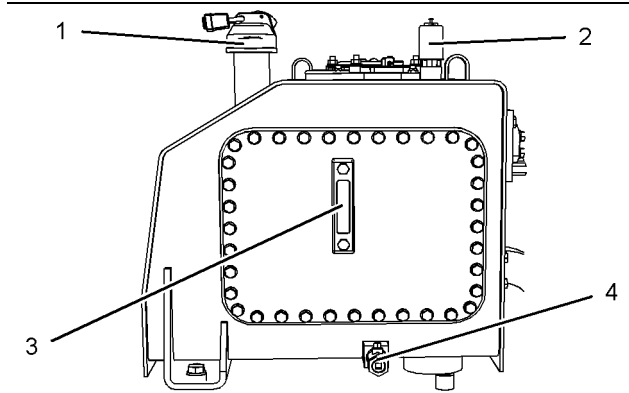


Illustration 253

g01943757

Front view of the hydraulic tank

- (1) Filler cap
- (2) Pressure/vacuum breaker valve
- (3) Oil level sight gauge
- (4) Drain plug

5. Press the button on pressure/vacuum breaker valve (2) in order to relieve any tank pressure. Slowly remove filler cap (1).

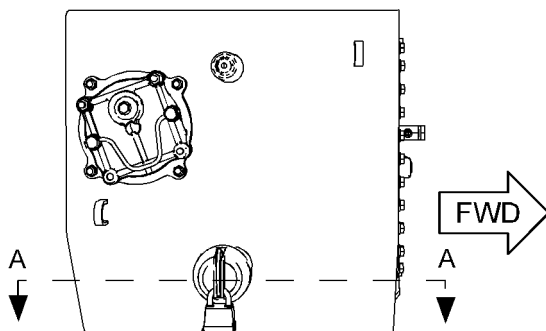


Illustration 254

g01943758

Top view of the hydraulic tank

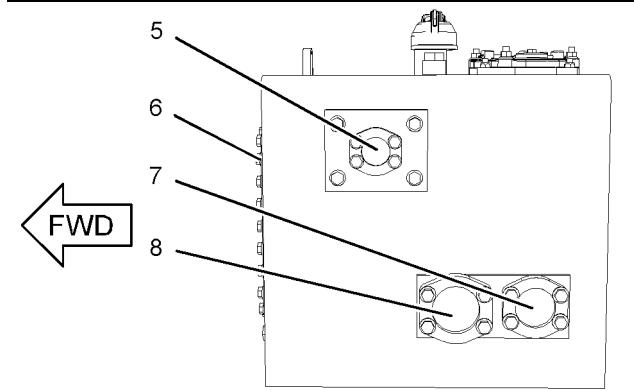


Illustration 255

g01943759

Left-hand (inboard) view of the hydraulic tank

- (5) Implement return port
- (6) Hydraulic tank access cover
- (7) Case drain return port
- (8) Suction port

6. Drain the hydraulic oil tank at drain (4).

**Reference:** For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil - Change".

7. Unbolt hydraulic tank access cover (6).

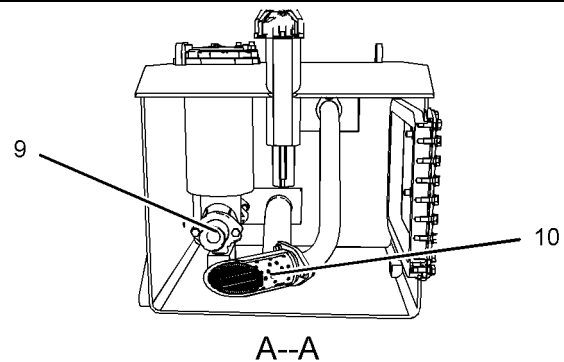


Illustration 256

g01943760

Cutaway view of interior of hydraulic tank

- (9) Case drain return bypass valve and screen assembly
- (10) Implement return screen

8. Remove implement return screen (10). Clean the screen with clean, nonflammable solvent.

9. Remove case drain return bypass valve and screen assembly (9). A spring and valve mechanism are housed within the screen. Take care to remove all components for cleaning and inspection. Clean all components with clean, nonflammable solvent.

10. Install the case drain valve mechanism, spring, and screen being careful that components are installed properly. Make certain that the valve mechanism is seated properly, and that the valve mechanism and spring are not bound up and can operate freely.
11. Install the implement return screen.
12. Replace hydraulic tank access cover (6).
13. Fill the hydraulic tank.

**Reference:** For the correct procedure, refer to Operation and Maintenance Manual, "Hydraulic System Oil - Change".

14. Replace filler cap (1).

i04345029

## Hydraulic System Oil - Change

SMCS Code: 5050-044

### WARNING

**At operating temperature, the hydraulic tank is hot and under pressure.**

**Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.**

**Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly to relieve pressure.**

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the oil.

Park the machine on level ground. Lower the bulldozer blade and the ripper to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

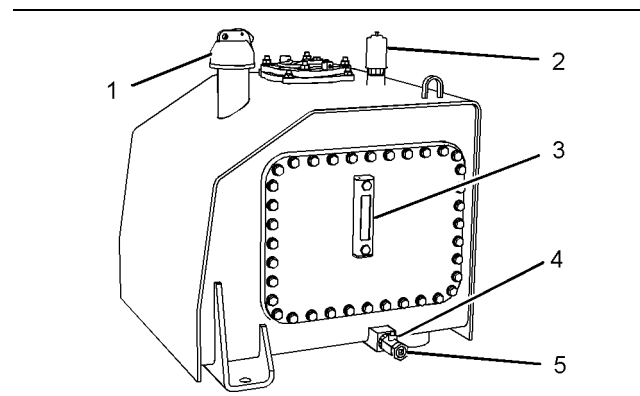


Illustration 257

g02500237

Hydraulic oil tank located above right-hand fender

- (1) Filler cap
- (2) Pressure/vacuum breaker valve
- (3) Oil level sight gauge
- (4) Drain valve
- (5) Pipe plug

1. Press the button on pressure/vacuum breaker valve (2) in order to relieve any tank pressure. Slowly remove filler cap (1).
2. Remove pipe plug (5) that is screwed into drain valve (4). Hold the drain valve with a wrench, if necessary, to keep the valve from turning while removing the pipe plug.
3. Install a 12.7 mm (0.5 inch) drain pipe into the drain valve. The pipe must have 1/2 - 14 NPTF threads. Clamp a hose to the pipe in order to direct the oil into a suitable container.
4. Open the drain valve by turning the square stem that is on top of the valve. The notch found in the stem is a reference that is aligned with the internal opening of the valve ball. Allow the oil to drain into a suitable container.
5. Remove the filler strainer inside the filler tube. Wash the filler strainer and the filler cap in clean nonflammable solvent. Install the filler strainer inside the filler tube.
6. Close the drain valve. Remove the drain pipe and drain hose from the valve. Clean the pipe plug and install the pipe plug.
7. Change the hydraulic system filter. See the Operation and Maintenance Manual, "Hydraulic System Oil Filter - Replace".
8. Fill the hydraulic oil tank. See the Operation and Maintenance Manual, "Capacities (Refill)" in order to determine the amount of hydraulic oil that is needed to fill the hydraulic oil tank.

9. Inspect the filler cap gasket. Replace the gasket if damage or wear is evident.
10. Install the filler cap.
11. Start the engine. Run the engine for a few minutes.

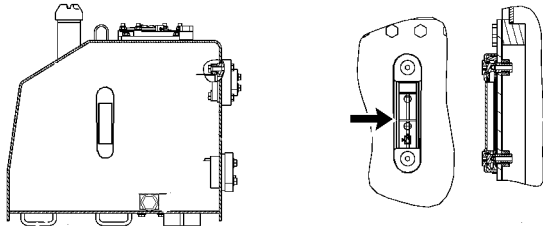


Illustration 258

g01387544

12. Maintain the oil level to the "FULL" mark in sight gauge (3). Check with the attachments on the ground and with oil cold (ambient temperature). Add oil, if necessary.
13. Stop the engine.

For additional information about hydraulic system oil, see Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

i04348189

## Hydraulic System Oil Filter - Replace

SMCS Code: 5068-510

### WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly to relieve pressure.

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

## Case Drain Oil Filter

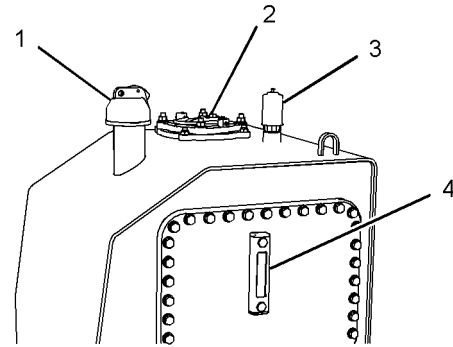


Illustration 259

g02503797

Front angle view of hydraulic tank

- (1) Filler cap
- (2) Filter element assembly
- (3) Pressure/vacuum breaker valve
- (4) Oil level sight gauge

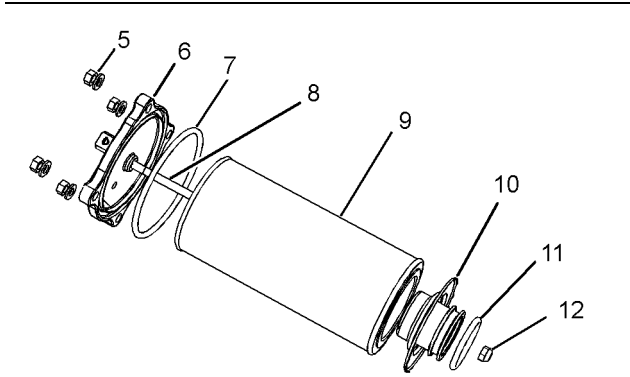


Illustration 260

g02503136

Filter element assembly removed from tank and disassembled

- (5) Cover retaining nut and washer (four sets)
- (6) Filter cover
- (7) Cover o-ring seal
- (8) Retaining stud
- (9) Filter element
- (10) Filter retainer
- (11) Filter retainer o-ring seal
- (12) Locknut

1. Press the button on pressure/vacuum breaker valve (3) on top of hydraulic oil tank in order to relieve any tank pressure. Slowly remove filler cap (1).
2. Remove filter cover retaining nuts and washers (5).
3. Remove filter element assembly (2).
4. Remove locknut (12) and retainer (10) from stud (8). Filter retainer o-ring seal (11) will remain installed in the retainer groove. The seal is shown as removed from the retainer for clarity of illustration only.
5. Remove filter element (9). Properly discard the filter element.
6. If stud (8) was loosened from cover (6) during the removal of the retaining nut, tighten the stud to a torque of  $35 \pm 7 \text{ N}\cdot\text{m}$  ( $25.9 \pm 4 \text{ lb ft}$ ).
7. Wash the cover and the retainer in clean, nonflammable solvent.
8. Inspect cover seal (7) and filter retainer seal (11). Replace the seals if the seals are damaged.
9. Install a new filter element (9).
10. Install the clean retainer and the locknut. Tighten the locknut to a torque of  $10 \pm 1.5 \text{ N}\cdot\text{m}$  ( $7 \pm 1 \text{ lb ft}$ ).
11. Install the filter assembly. Tighten the cover retaining nuts to a torque of  $45 \pm 7 \text{ N}\cdot\text{m}$  ( $32 \pm 5 \text{ lb ft}$ ).

12. Maintain the hydraulic oil to the "FULL" mark in the oil level sight gauge (4).

13. Install the hydraulic tank filler cap.

i04349199

## Hydraulic System Oil Level - Check

SMCS Code: 5056-535-FLV; 7479

### WARNING

**At operating temperature, the hydraulic tank is hot and under pressure.**

**Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.**

**Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly in order to relieve pressure.**

Lower the bulldozer and the ripper to the ground. Place the ripper shanks in the vertical position.

The hydraulic tank is on the right-hand side of the machine above the fender.

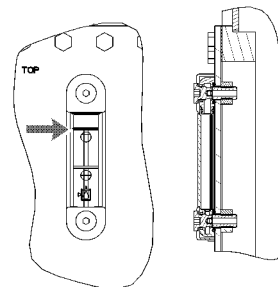


Illustration 261

g01042594

Oil level sight gauge located on front of hydraulic oil tank

1. Maintain the oil level to the "FULL" mark in the sight gauge. Check the oil level when the oil is cold (ambient temperature). Verify that the oil level is below the "FULL" mark before you remove the filler cap.
2. If the hydraulic system requires additional hydraulic oil, press the button on the pressure/vacuum breaker valve to relieve any tank pressure. Slowly remove the filler cap. Add oil through the filler tube.

3. Clean the filler cap and install the filler cap.

i04347509

## Hydraulic System Oil Sample - Obtain

**SMCS Code:** 5095-008

### **WARNING**

**Hot oil and components can cause personal injury.**

**Do not allow hot oil or components to contact skin.**

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Obtain a sample of the hydraulic oil from sampling valve (2). The sampling valve is located on the base of the steering charge filter (3). The filter is inside the enclosed compartment forward and below the fuel tank fill cap on the left-hand side of the machine above the fender. Remove the protective cap from the oil sampling valve that is above the steering charge filter. Refer to Special Publication, SEBU6250, "S·O·S Oil Analysis" for information that pertains to obtaining a sample of the oil. Refer to Special Publication, PEHP6001, "How To Take A Good Oil Sample" for more information about obtaining a sample of the oil.

For additional information about hydraulic system oil, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

i02776749

## Indicators and Gauges - Test

**SMCS Code:** 7450-081; 7490-081

### **WARNING**

**If the action alarm does not sound during this test or machine monitoring displays are not functioning, do not operate the machine until the cause has been corrected. Machine operation with faulty action alarms or displays could result in injury or death as any Warning Category 3 notifications will not be relayed to the operator.**

Check the operation of the Monitoring System. Observe the self test when you start the engine.

The system performs an automatic self test when you turn the engine start switch to the ON position.

The self test verifies that the monitoring panel and the display modules are operating properly. The self testing feature verifies that the display module is properly operating.

The internal circuits, the indicators, and the gauges are automatically checked.

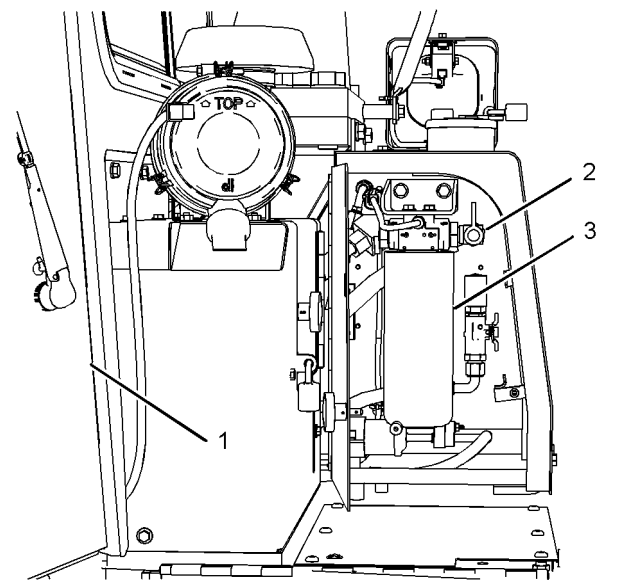


Illustration 262

g02502498

- (1) Left-hand cab entry door (reference only)
- (2) Hydraulic oil sampling valve
- (3) Steering charge filter (reference only)



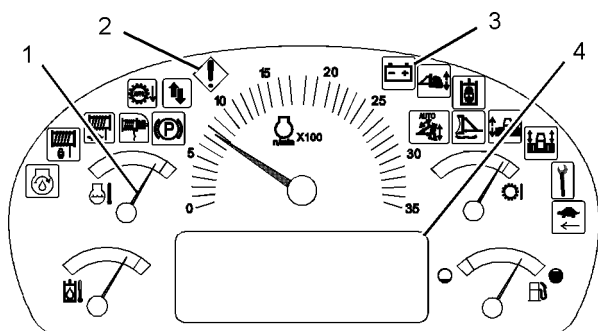


Illustration 263

g01113652

Instrument module

The operator must observe the indicators and the gauges in order to determine whether gauge module (1), action light (2), alert indicators (3), and the LCD display (4) are operating properly. The self test lasts for approximately three seconds.

During the self test, all status indicators on the instrument module light.

The digital display shows the following readouts:

- Initial part number of the instrument module
- All indicators of units (Deg C, kPa, rpm, and liters)
- "X10" readout
- Symbol for the hour meter
- "8.8.8.X.8.8" readout

The pointers in the quad gauge point upward. Then, the pointers point to the left. Then, the pointers point to the right. Then, the pointers point to the final position.

- The readout of the gear shows "\*\*\*".
- The speed readout shows "888", "MPH", and "km/h".
- The rear action light "ON then OFF"
- The forward action light stays illuminated.
- The action alarm sounds once.

The monitoring panel is then in the normal operating mode.

If the above tests are not correctly completed, the system will not function in the normal operating mode. Consult your Caterpillar dealer for an electrical system check. Any repairs must be made before you start the engine.

Turn on all of the machine lights. Check for proper operation. Sound the forward horn.

Stop the engine.

Make any necessary repairs before you operate the machine.

i04349450

## Lift Cylinder Yoke Bearings - Lubricate

**SMCS Code:** 5102-086-BD

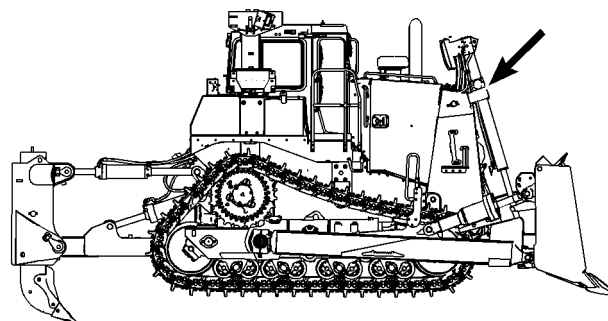


Illustration 264

g02504616

The grease fittings are located on the left front side of the machine and on the right front side of the machine. Lubricate the bearings by applying grease to the two fittings. Use MPM Grease.

i02106227

i04337689

## Oil Filter - Inspect

**SMCS Code:** 1318-507; 3067-507; 5068-507

### Inspect a Used Filter for Debris

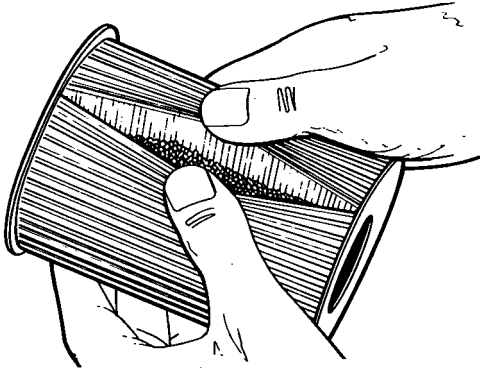


Illustration 265

g00100013

The element is shown with debris.

Use a filter cutter to cut the filter element open. Spread apart the pleats and inspect the element for metal and for other debris. An excessive amount of debris in the filter element can indicate a possible failure.

If metals are found in the filter element, a magnet can be used to differentiate between ferrous metals and nonferrous metals.

Ferrous metals can indicate wear on steel parts and on cast iron parts.

Nonferrous metals can indicate wear on the aluminum parts of the engine such as main bearings, rod bearings, or turbocharger bearings.

Small amounts of debris may be found in the filter element. This could be caused by friction and by normal wear. Consult your Caterpillar dealer in order to arrange for further analysis if an excessive amount of debris is found.

Using an oil filter element that is not recommended by Caterpillar can result in severe engine damage to engine bearings, to the crankshaft, and to other parts. This can result in larger particles in unfiltered oil. The particles could enter the lubricating system and the particles could cause damage.

## Pivot Shaft Oil Level - Check

**SMCS Code:** 4153-535-FLV

### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

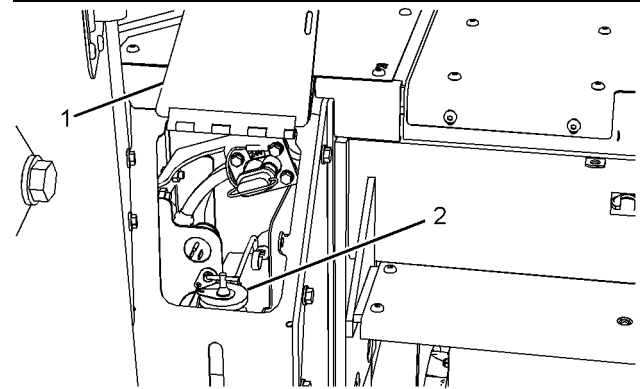


Illustration 266

g02493356

Pivot shaft oil level reservoir cap and oil level gauge

1. Open angled access cover (1) that is rearward of the left-hand engine access door.
2. Loosen cap/oil level gauge (2) by turning the handle counter-clockwise enough to lift out.
3. Proper reservoir oil level is maintained by adding oil through the reservoir opening. Maintain the oil level to the FULL mark on oil level gauge (2). Do not overfill. Overfilling can cause hot oil to overflow the reservoir.
4. Install the cap/oil level gauge in the reservoir opening and tighten by turning clockwise until snug.

**Note:** The initial fill of pivot shaft may trap air in the tube. The level of the oil may fall as air escapes. The reservoir must be filled several times to remain consistently full.

i04349897

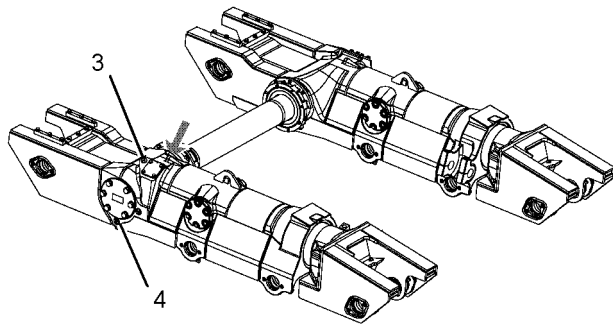


Illustration 267

g01434353

- (3) Filler plug for pivot shaft compartment  
(4) Drain plug for pivot shaft compartment

Check for seal leakage at the pivot shaft retainer. The pivot shaft retainer is located on the main frame case. If there is any sign of seal leakage, refer to the appropriate Service Manual or consult your Caterpillar dealer for repairs.

**Note:** If disassembly is required, fill at filler plug (3), and at the oil reservoir after completion of repair.

i03649020

## Power Train Breather - Clean

**SMCS Code:** 3030-070-BRE

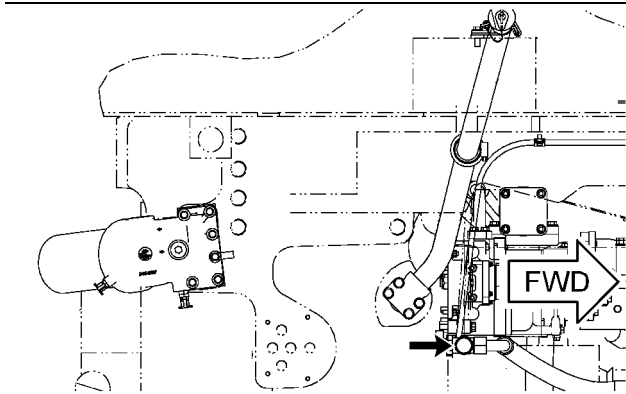


Illustration 268

g01387604

Top view

Some components are removed for clarity.

1. Open the floorplate that is inside of the cab. The breather attaches to the tube from the torque converter to the transmission case. Unscrew and remove the breather.
2. Clean the breather in clean, nonflammable solvent.
3. Install the breather and close the cover.

## Power Train Oil - Change

**SMCS Code:** 4000-044-OC

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

### **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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Operate the machine in order to warm the power train oil. The machine must be level. Lower the attachments with slight down pressure.

Engage the parking brake switch. Stop the engine.

1. Power train oil is drained from beneath the machine.

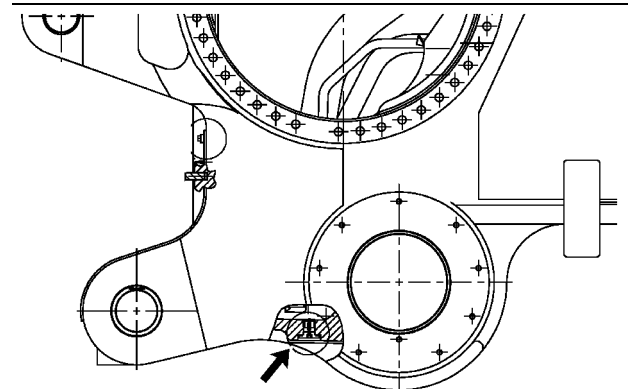


Illustration 269

g01181288

Right-hand side view

2. Remove the plug from the drain in the bevel gear case. Install a 4C-8563 Swivel into the valve. Clamp a hose to the swivel. A 25.4 mm (1 inch) pipe and hose can be used. Use a 25.4 mm (1 inch) pipe with 1-11 1/2 NPTF threads. Turn the pipe, if used, by hand only.
3. Turn the swivel or pipe clockwise in order to open the internal drain valve. Allow the oil to drain into a suitable container.

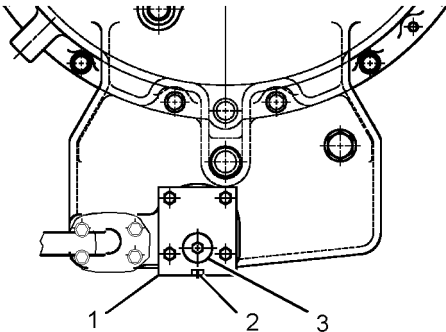


Illustration 270

g02505276

- (1) Drain valve body  
(2) Pipe plug  
(3) Drain valve

4. Remove the middle bottom guard to access the torque converter drain. Remove pipe plug (2) from the bottom of drain valve body (1) on the torque converter. Install a 12.7 mm (0.5 inch) pipe into the drain valve. Use a 12.7 mm (0.5 inch) pipe with 1/2-14 NPTF threads.
5. Clamp a hose to the pipe in order to direct the oil into a suitable container.
6. Open drain valve (3) and drain the oil into a suitable container.

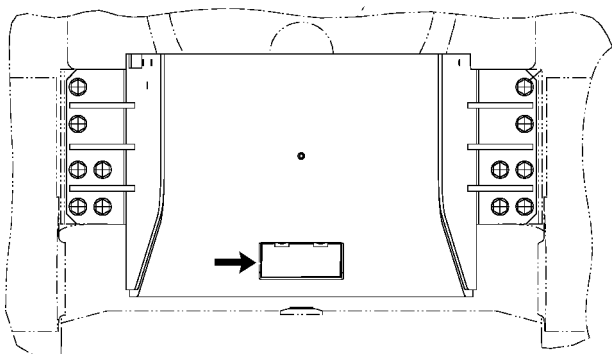


Illustration 271

g01181367

Transmission drain access cover at rear of machine

7. Remove the access cover for the transmission drain plug. The access cover is found at the rear of the machine.

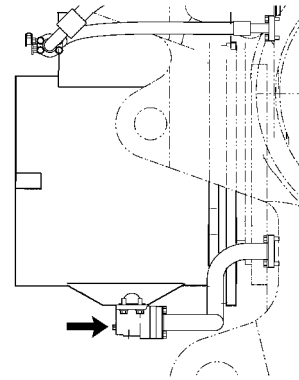


Illustration 272

g01181338

Right side view

8. The transmission drain valve is the same type as the torque converter drain valve. Remove the pipe plug from the drain valve body of the transmission. Install a 12.7 mm (0.5 inch) pipe into the transmission drain valve body. Use a 12.7 mm (0.5 inch) pipe with 1/2-14 NPTF threads.
9. Clamp a hose to the pipe in order to direct the oil into a suitable container.
10. Open the transmission drain valve and drain the oil into a suitable container.
11. Close the drain valve on the torque converter. Close the drain valve on the transmission.
12. Remove the hoses and remove the pipes from the drains. Clean the oil drain pipe plugs and install the oil drain pipe plugs.
13. Remove the swivel or remove the pipe from the drain in the bevel gear case. The drain valve will close. Clean the oil drain plug and install the oil drain plug.
14. Change the filter elements. See Operation and Maintenance Manual, "Power Train Oil Filter - Replace".

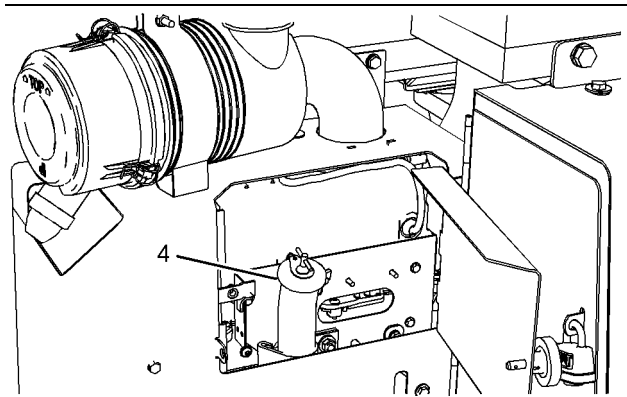


Illustration 273

g02505777

Power train oil filler cap

15. Locate power train oil filler (4) cap. The power train filler cap is in the compartment below the cab fresh air filter on the left-hand side of the machine.
16. Remove the power train oil filler cap.
17. Add oil. To determine the correct amount of oil, see Operation and Maintenance Manual, "Capacities (Refill)".
18. Clean the power train oil filler cap and install the power train oil filler cap.

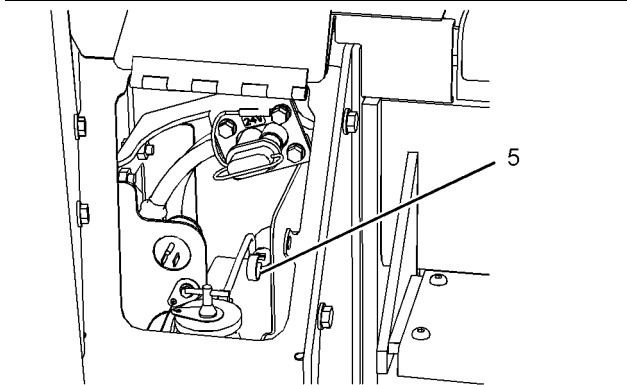


Illustration 274

g02505876

19. Locate power train oil level gauge (5). The power train oil level gauge is located behind the angled access cover that is rearward of the left-hand engine access door.

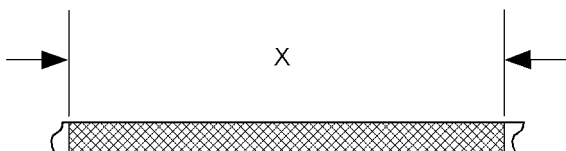


Illustration 275

g01423532

20. Maintain the oil level within operating range (X), between the "ADD" mark and the "FULL" mark on the oil level gauge.

- a. When the engine is stopped and the oil is cold (ambient temperature), maintain the oil level on the "ENGINE STOPPED COLD OIL" side of the oil level gauge.
- b. When the engine is running and the oil is hot (operating temperature), maintain the oil level on the "ENGINE LOW IDLE HOT OIL" side of the oil level gauge.

## High Speed Oil Change (If Equipped)

Open the engine access door on the left-hand side of the machine. Swing up the lower guard assembly to reveal the high speed oil change connection fittings.

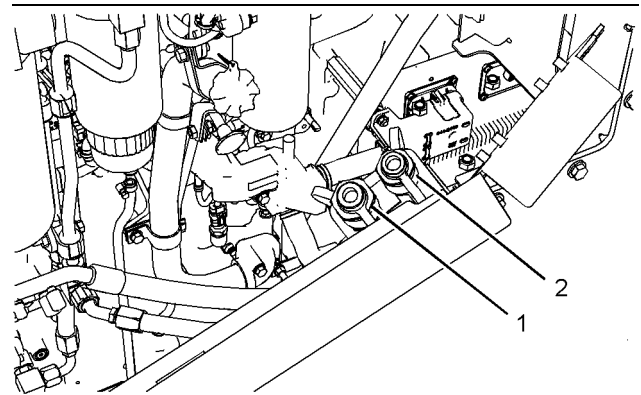


Illustration 276

g02486238

- (1) Engine high speed oil change connection fitting (if equipped, reference only)
- (2) Power train high speed oil change connection fitting (if equipped)

Power train high speed oil change connection fitting (if equipped) (2) can be used with additional equipment to change the power train oil. The high speed oil change removes oil only from the sump in the bevel gear case. The high speed oil change does not remove oil from the torque converter or from the transmission case. The filters will still need changed. See Operation and Maintenance Manual, "Power Train Oil Filter - Replace".

i04357412

## Power Train Oil Filters - Replace

**SMCS Code:** 3067-510

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

Two filters are located under the fuel tank. The fuel tank is on the rear of the machine. There is one filter under each side of the fuel tank.

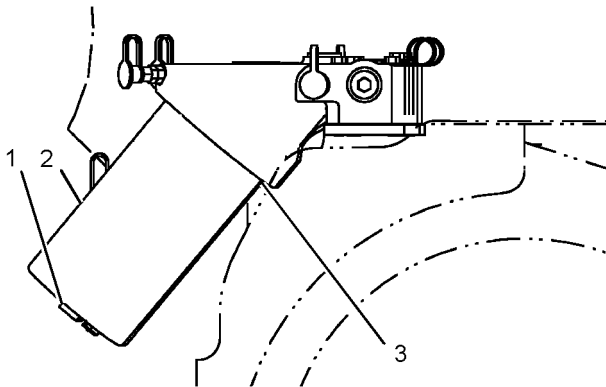


Illustration 277

g01387583

1. Remove drain plug (1) in order to remove a small amount of oil from each filter housing (2). Use a wrench in order to remove the filter housings.
2. Remove the filter elements. Properly discard the filter elements.
3. Clean the filter element housings and clean the filter bases (3) with a clean cloth.

4. Inspect the seals. If the seals are damaged, replace the seals.
5. Install the new filter elements. Install the filter element housings. Install the filter housing drain plugs.
6. Start the engine.

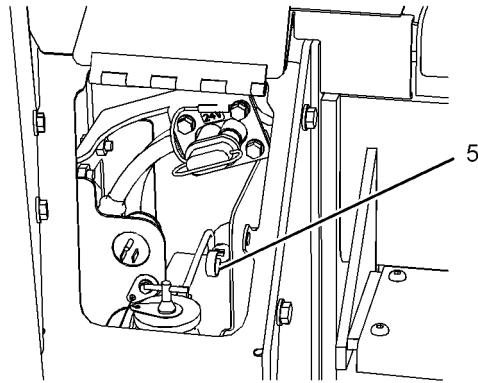


Illustration 278

g02505876

7. Locate power train oil level gauge (5). The power train oil level gauge is located behind the angled access cover that is rearward of the left-hand engine access door.

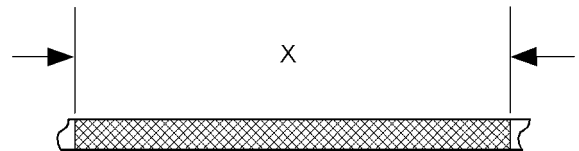


Illustration 279

g01423532

8. Maintain the oil level within operating range (X), between the "ADD" mark and the "FULL" mark on the oil level gauge.
  - a. When the engine is stopped and the oil is cold (ambient temperature), maintain the oil level on the "ENGINE STOPPED COLD OIL" side of the oil level gauge. This method should be used as reference only, before the engine is started.
  - b. When the engine is running and the oil is hot (operating temperature), maintain the oil level on the "ENGINE LOW IDLE HOT OIL" side of the oil level gauge. This procedure is the only accurate way to check the oil level.

**Note:** When you are operating the machine on severe slopes, the quantity of oil in the power train can be increased up to 10 percent. When you are operating with the increased oil quantity, prolonged operation in some machines can cause high power train oil temperatures. After the work on the severe slopes has been completed, drain the excessive oil quantity from the bevel gear case.

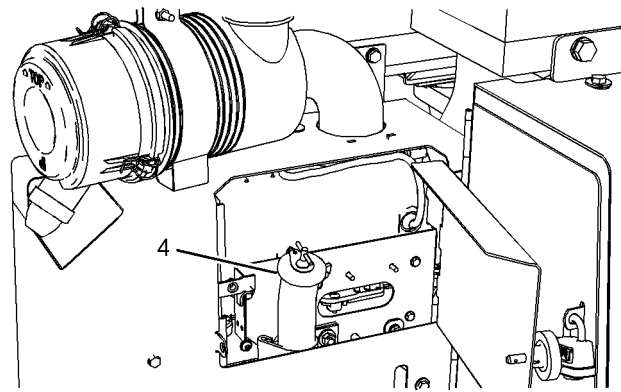


Illustration 280

g02505777

Power train oil filler cap

9. Locate power train oil filler cap (4). The power train filler cap is in the compartment below the cab fresh air filter on the left-hand side of the machine.
10. If necessary, remove the power train oil filler cap and add oil.
11. Clean the power train oil filler cap and install the power train oil filler cap.

i03656528

## Power Train Scavenge Screen - Clean

SMCS Code: 3030-070-MGS

### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

When you change the transmission oil, clean the scavenge screen. **Drain the oil before you remove any screens.**

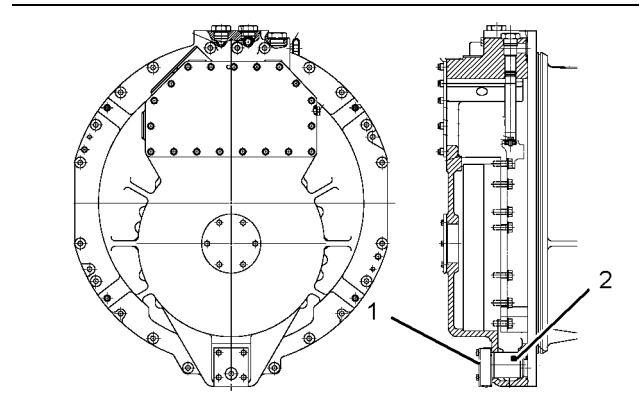


Illustration 281

g01067695

**Note:** Ecology drains have been provided. An ecology drain drains off the oil from the sump of the planetary transmission. Remove the bottom plug. Install a pipe with 1/2-14 NPTF threads and a rubber hose. Drain the sump by backing out the valve until the oil begins to drain.

1. Remove cover (1), the seal, and transmission scavenge screen (2) from the bottom of the transmission.
2. Wash the screen in a clean, nonflammable solvent.
3. Inspect the seal. If the seal is damaged, replace the seal.
4. Install transmission scavenge screen (2), the seal and cover (1) on the transmission.
5. Install the bottom guard.

**Reference:** See Operation and Maintenance Manual, "Power Train System Oil and Screens - Change/Clean" in order to fill with oil.

i03649114

## Power Train System Oil And Screens - Change/Clean

**SMCS Code:** 3067-070; 3067-510

### **WARNING**

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Remove the filler cap only when the engine is stopped, and the filler cap is cool enough to touch with your bare hand. Remove the filler cap slowly to relieve pressure.

### **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.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

## Drain the Oil and Change the Transmission Oil Filter Elements

Operate the machine in order to warm the power train oil. The machine must be level. Lower the attachments with slight down pressure.

See the Operation and Maintenance Manual, "Power Train Oil Filter - Replace" in this manual for the procedure to change the transmission filters.

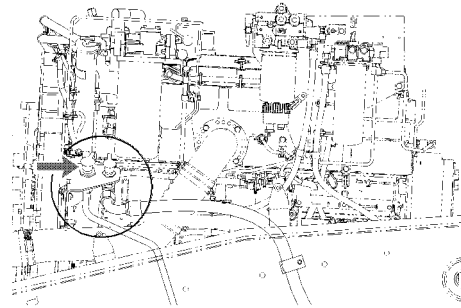


Illustration 282

g01043089

Open the left engine compartment in order to locate the high speed oil change arrangement.

Use a 126-7538 Nozzle if the machine is equipped with the high speed oil change arrangement. This arrangement removes oil from the sump in the bevel gear case. The high speed oil change does not remove oil from the torque converter or from the transmission case.

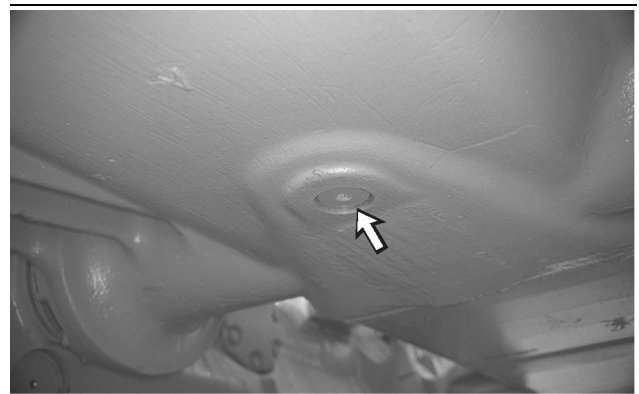


Illustration 283

g00484767

1. Remove the plug from the drain in the bevel gear case. Install a 4C-8563 Swivel into the valve. Clamp a hose to the swivel. A 25.4 mm (1 inch) pipe and hose can be used. Use a 25.4 mm (1 inch) pipe with 1-11 1/2 NPTF threads. Do not tighten the pipe.
2. Turn the swivel or pipe clockwise in order to open the internal drain valve. Allow the oil to drain into a suitable container.
3. Remove the rear bottom guard.



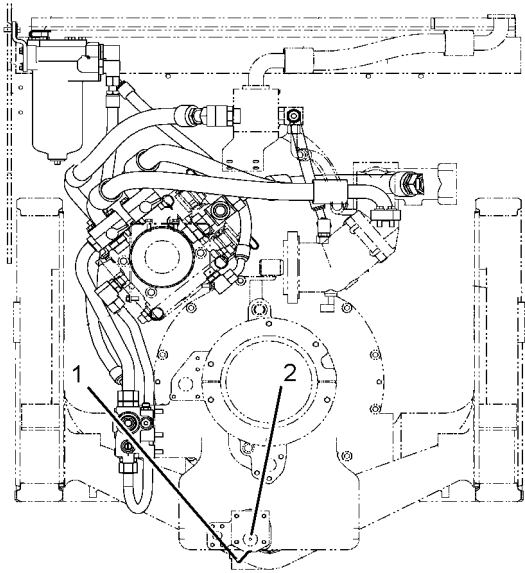


Illustration 284

g01051888

Rear view

4. Remove plug (1) from the drain valve in the torque converter. Install a 12.7 mm (.5 inch) pipe into the drain valve. Use a 12.7 mm (0.50 inch) pipe with 1/2-14 NPTF threads.
5. Clamp a hose to the pipe in order to drain the oil into a suitable container.
6. Open drain valve (2) and drain the oil into a suitable container.

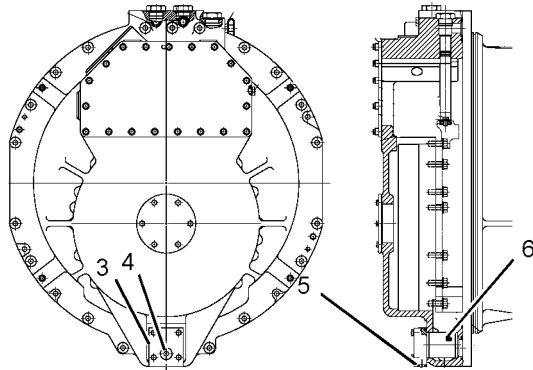


Illustration 285

g01043086

Rear view

7. Access drain valve body (3) for the transmission at the rear of the machine, as shown.
8. Remove plug (5) from the bottom of drain valve body in the transmission. Install a 12.7 mm (.5 inch) pipe into the drain valve body. Use a 12.7 mm (0.50 inch) pipe with 1/2-14 NPTF threads. Clamp a hose to the pipe in order to drain the oil into a suitable container.

9. Open drain valve (4) and drain the oil into a suitable container.
10. Change the filter element in the transmission oil filters that are located at the rear of the machine. See the Topic "Transmission System Oil Filter-Replace" in this manual.
11. Close the drain valve in the torque converter. Close the drain valve in the transmission case.
12. Remove the hoses and remove the pipes from the drains.
13. Remove the swivel or remove the pipe from the drain in the bevel gear case. The drain valve will close.
14. Clean the oil drain plugs and install the oil drain plugs.

## Clean Screens

Screens should be removed and cleaned when the oil is drained.

1. Drain the oil into a suitable container before removing any screen.
2. Remove the covers. Remove the screens.
3. Clean the three screens in clean, nonflammable solvent.
4. Install the screens. Install the covers.

## Torque Converter

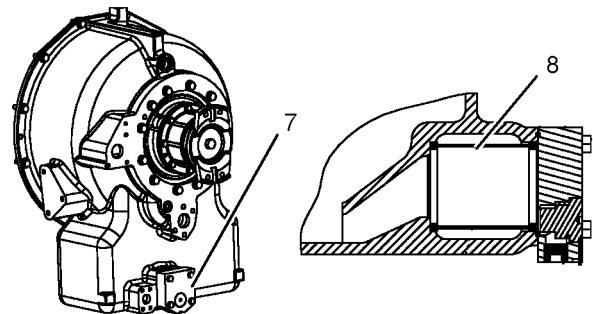


Illustration 286

g01051956

Remove the bolts and drain valve body (7) from the torque converter, as shown. Remove torque converter screen (8).

## Suction Screen

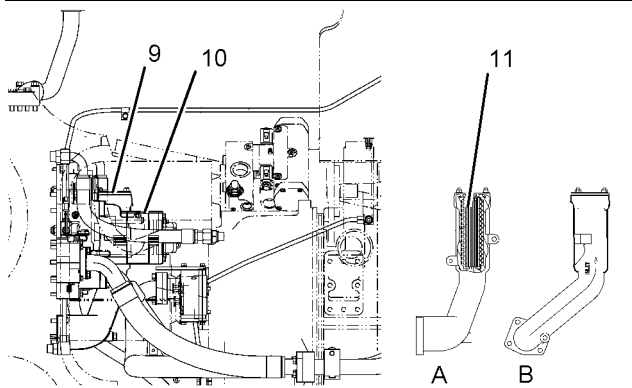


Illustration 287

g01052024

(A) Right side view  
(B) Front view

Remove cover (9) from the main suction line that is next to the power train oil pump (10). Remove screen (11) from the main suction line.

## Transmission Scavenge Screen

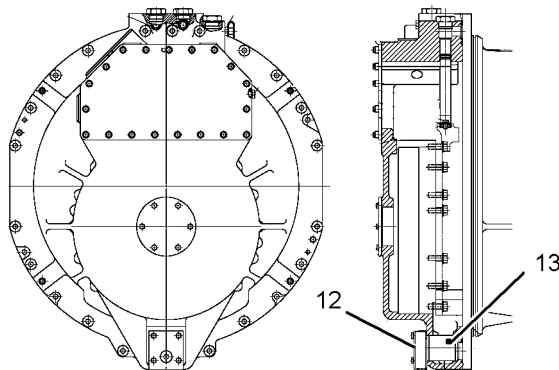


Illustration 288

g01043087

Remove drain valve body (12) from the transmission. Remove the transmission scavenge screen (13).

## Fill With Oil

1. Open access door (16) for the filler cap. The filler cap is located on the left side of the machine and outside of the heater (14) above fender (18).

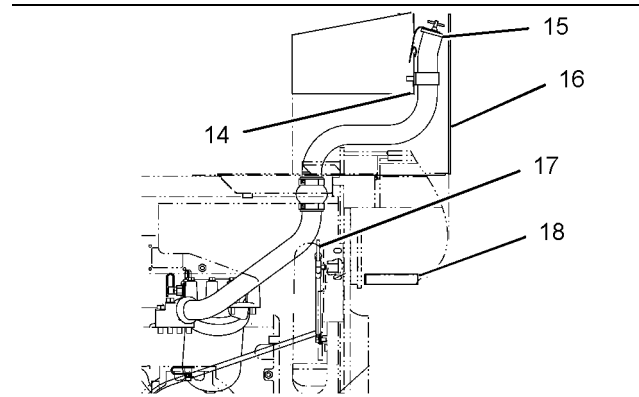


Illustration 289

g01043088

2. Remove oil fill cap (15).
3. Fill the bevel gear case with oil. See Operation and Maintenance Manual, "Capacities (Refill)".
4. Always measure the oil with the dipstick (17).
5. Maintain the oil level within the "OPR ZONE 16L" marks on the dipstick. The engine should be running at low idle. The power train should be at operating temperature. See Operation and Maintenance Manual, "Power Train System Oil Level - Check" for more information.
6. Clean oil filler cap (15). Install the oil filler cap.
7. Install the rear bottom guard.

For additional information about transmission system oil, see Operation and Maintenance Manual, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

i04352037

## Power Train System Oil Level - Check

SMCS Code: 3030-535-FLV

### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

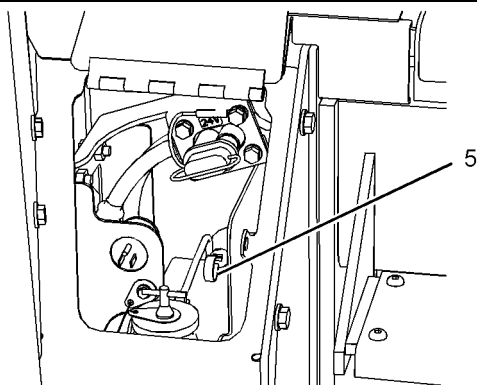


Illustration 290

g02505876

1. Locate power train oil level gauge (5). The power train oil level gauge is located behind the angled access cover that is rearward of the left-hand engine access door.

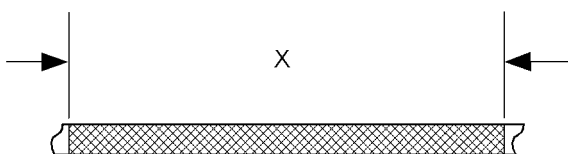


Illustration 291

g01423532

2. Maintain the oil level within operating range (X), between the "ADD" mark and the "FULL" mark on the oil level gauge.
  - a. When the engine is stopped and the oil is cold (ambient temperature), maintain the oil level on the "ENGINE STOPPED COLD OIL" side of the oil level gauge. This method should be used as reference only, before the engine is started.
  - b. When the engine is running and the oil is hot (operating temperature), maintain the oil level on the "ENGINE LOW IDLE HOT OIL" side of the oil level gauge. This procedure is the only accurate way to check the oil level.

**Note:** When you are operating the machine on severe slopes, the quantity of oil in the power train can be increased up to 10 percent. When you are operating with the increased oil quantity, prolonged operation in some machines can cause high power train oil temperatures. After the work on the severe slopes has been completed, drain the excessive oil quantity from the bevel gear case.

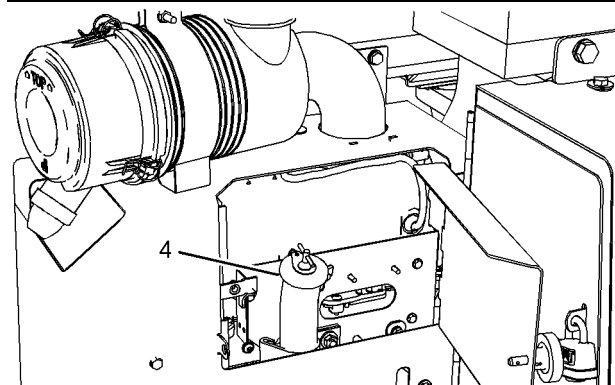


Illustration 292

g02505777

Power train oil filler cap

3. Locate power train oil filler cap (4). The power train filler cap is in the compartment below the cab fresh air filter on the left-hand side of the machine.
4. If necessary, remove the power train oil filler cap and add oil.
5. Clean the power train oil filler cap and install the power train oil filler cap.

i04352389

## Power Train System Oil Sample - Obtain

SMCS Code: 3080-008

### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

i02612642

Obtain the sample of the power train oil as close as possible to the recommended sampling interval. The recommended sampling interval is every 500 service hours. In order to receive the full effect of S·O·S oil analysis, a consistent trend of data must be established. In order to establish a pertinent history of data, perform consistent oil samplings that are evenly spaced.

1. Start the engine. Park the machine on level ground. Engage the parking brake.
2. Lower all implements to the ground. After lowering all implements to the ground, deactivate the implement controls with the implement lockout switch.
3. Locate the power train oil sampling valve. The sampling valve is located below the fuel tank at the rear of the machine on the left-hand power train oil filter base .

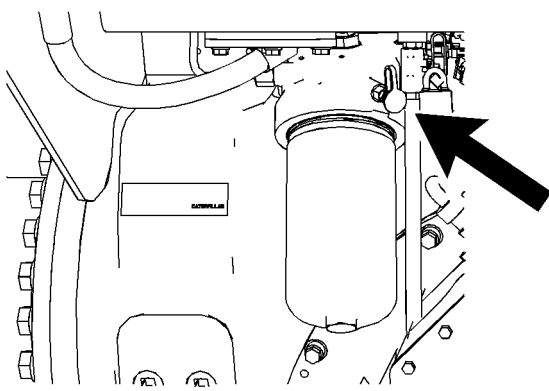


Illustration 293

g02507837

Power train oil sampling valve

4. Remove the protective cap from the sampling valve.
5. Obtain a sample of transmission oil. Refer to Special Publication, SEBU6250, "S·O·S Oil Analysis" for information that pertains to obtaining a sample of the transmission oil.
6. After you take a sample, remove the cap with the tube and the probe from the bottle. Properly dispose of the cap with the tube and the probe. Install the sealing cap that is provided with 169-8373 Fluid Sampling Bottle.
7. Replace the protective cap on the oil sampling valve.
8. Stop the engine.

For additional information about transmission system oil, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations" or consult your Caterpillar dealer.

## Radiator Core - Clean

**SMCS Code:** 1353-070; 1805-070; 1810-070

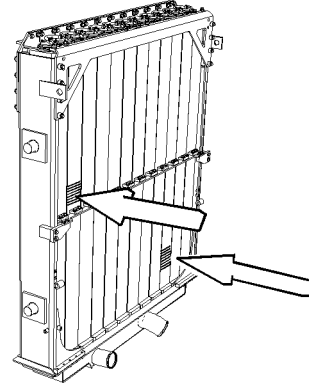


Illustration 294

g01307600

You can use compressed air, high pressure water, or steam to remove dust and other debris from the radiator core. However, the use of compressed air is preferred.

See Special Publication, SEBD0518, "Know Your Cooling System" for the complete procedure for cleaning the radiator core.

i04352773

## Radiator Pressure Cap - Clean/Replace

**SMCS Code:** 1353-070-Z2; 1353-510-Z2

### **WARNING**

**Pressurized system: Hot coolant can cause serious burn. To open cap, stop engine, wait until radiator is cool. Then loosen cap slowly to relieve the pressure.**

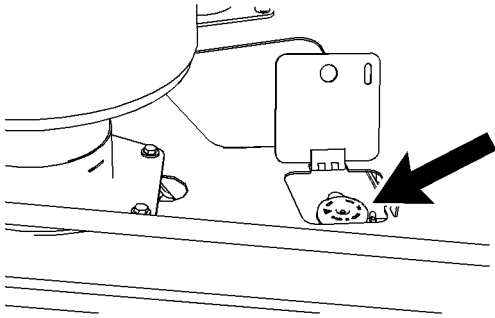


Illustration 295

g02508236

Coolant filler cap

1. The coolant filler cap is located beneath the access cover on top of the hood, forward of the engine air precleaner. Open the cover on top of the hood to access the filler cap.
2. Slowly remove the filler cap in order to relieve system pressure.
3. Inspect the filler cap for damage, for deposits, or for foreign material. Clean the filler cap with a clean cloth. Replace the filler cap if the filler cap is damaged.
4. Install the filler cap.

i02017071

## Recoil Spring Compartment Oil Level - Check

SMCS Code: 4158-535-OC

### WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

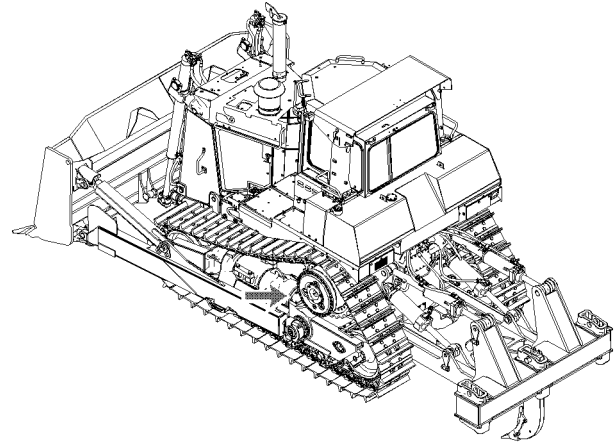


Illustration 296

g01042644

1. Remove all of the debris around the cover plate on the top of the track roller frame.
2. Remove the cover plate for the oil filler. Observe the level of the oil.

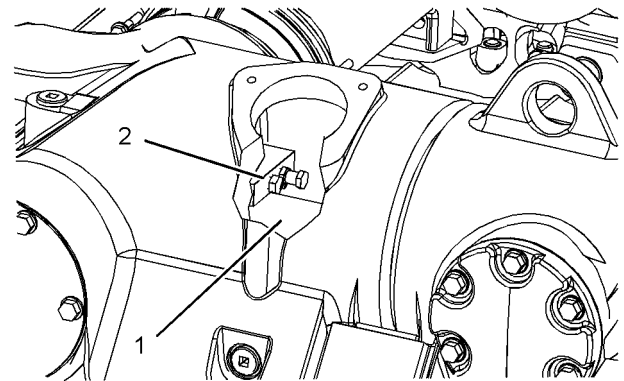


Illustration 297

g01110810

3. Maintain the oil level above the top of the track adjusting cylinder (1). Do not fill the oil above the track adjustment valve (2).
4. Install the cover plate.
5. Repeat the procedure for the other recoil compartment.

i04353272

## Refrigerant Dryer - Replace

SMCS Code: 7322-510; 7322-535

### WARNING

Personal injury can result from contact with refrigerant.

Contact with refrigerant can cause frost bite. Keep face and hands away to help prevent injury.

Protective goggles must always be worn when refrigerant lines are opened, even if the gauges indicate the system is empty of refrigerant.

Always use precaution when a fitting is removed. Slowly loosen the fitting. If the system is still under pressure, release it slowly in a well ventilated area.

Personal injury or death can result from inhaling refrigerant through a lit cigarette.

Inhaling air conditioner refrigerant gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting air conditioner refrigerant gas, can cause bodily harm or death.

Do not smoke when servicing air conditioners or wherever refrigerant gas may be present.

Use a certified recovery and recycling cart to properly remove the refrigerant from the air conditioning system.

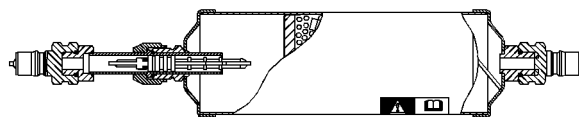


Illustration 299

g01017640

**Note:** The “R-134a” refrigerant dryer should be replaced annually. Extremely humid operating conditions may require more frequent replacement of the dryer. The dryer should also be replaced if the air conditioning system has been leaking or if the system has been opened for service repair.

**Reference:** For the correct procedure, refer to Air Conditioning and Heating Service Manual, SENR5664 or the Disassembly and Assembly Manual for your machine.

**Note:** A qualified mechanic should replace the components of the refrigerant system since special tooling and training are required.

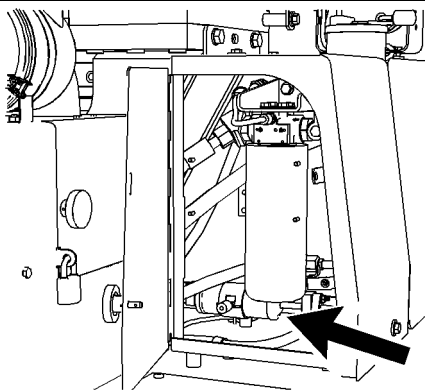


Illustration 298

g02508540

Refrigerant dryer

The refrigerant dryer is located inside the enclosed compartment with the fuel shutoff valve and the steering charge filter. This compartment is above the fender, forward and below the fuel tank fill cap on the left-hand side of the machine.

i01286780

## Ripper Linkage and Cylinder Bearings - Lubricate

**SMCS Code:** 6313-086-BD, L4

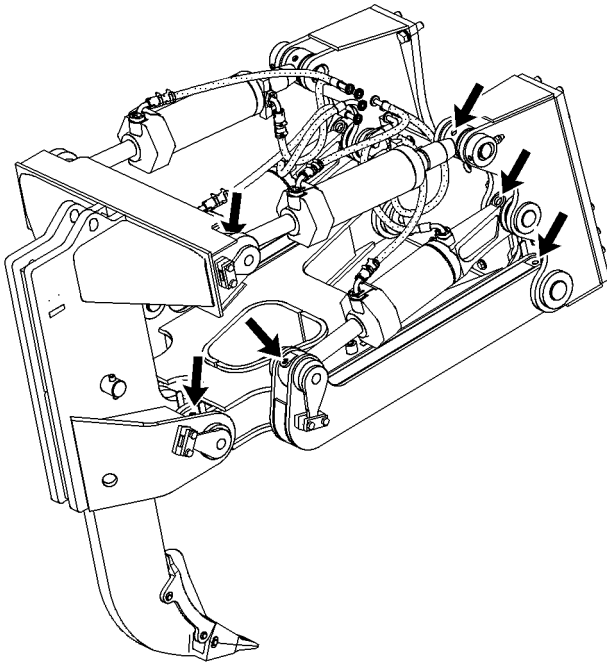


Illustration 300

g00681900

Lubricate twelve grease fittings (six per side). Use MPGM Grease.

i00925689

## Ripper Tip and Shank Protector - Inspect/Replace

**SMCS Code:** 6808-040; 6808-510; 6810; 6812-040; 6812-510

**If equipped:**

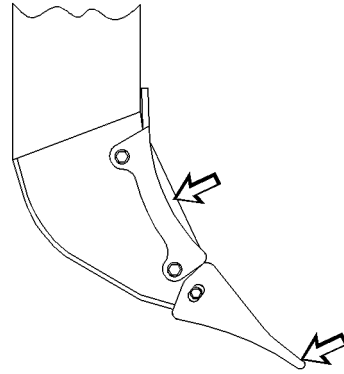


Illustration 301

g00550432

When the ripper tip is worn close to the shank, replace the ripper tip. When the shank protector is worn close to the shank, replace the shank protector. If the tip is too blunt, the tip will not penetrate properly.

1. Raise the ripper. Place blocking under the ripper. Lower the ripper onto the blocking. The ripper should be high enough so that the ripper tip or the shank protector can be removed. Do not place the ripper too high.
2. If the ripper tip is worn, drive out the pin. Remove the tip and the shank pin retainer.
3. Clean the shank pin retainer and the pin.
4. Install the new tip and the retainer.
5. Install the pin from the opposite side of the retainer.
6. If the shank protector is worn, drive out the pins. Remove the shank protector.
7. Clean the pin retainers and the pins.
8. Install the new shank protector and the retainers.
9. Install the pins from the opposite side of the retainer.
10. Raise the ripper and remove the blocking.
11. Lower the ripper to the ground.

i02016045

## Rollover Protective Structure (ROPS) - Inspect

**SMCS Code:** 7325-040



Illustration 302

g01042319

Front view

Inspect both sides of the Rollover Protective Structure (ROPS) for bolts that are loose or damaged. Replace any damaged bolts and any missing bolts with original replacement parts only. Tighten the ROPS bolts to a torque of  $1800 \pm 200 \text{ N}\cdot\text{m}$  ( $1330 \pm 148 \text{ lb ft}$ ).

**Note:** Apply oil to all bolt threads for the ROPS before you install the ROPS bolts.

Do not weld reinforcement plates to the ROPS in order to straighten the ROPS. Do not weld reinforcement plates to the ROPS in order to repair the ROPS.

If the ROPS has any cracks in the welds, in the castings, or in any metal section, consult your Caterpillar dealer for repairs.

i02429589

## Seat Belt - Inspect

**SMCS Code:** 7327-040

Always check the condition of the seat belt and the condition of the seat belt mounting hardware before you operate the machine. Replace any parts that are damaged or worn before you operate the machine.

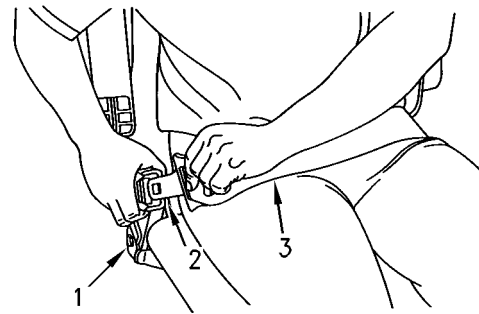


Illustration 303

g00932801

Typical example

Check the seat belt mounting hardware (1) for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

Check buckle (2) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect the seat belt (3) for webbing that is worn or frayed. Replace the seat belt if the seat belt is worn or frayed.

Consult your Caterpillar dealer for the replacement of the seat belt and the mounting hardware.

**Note:** Within three years of the date of installation or within five years of the date of manufacture, replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.

If your machine is equipped with a seat belt extension, also perform this inspection procedure for the seat belt extension.

i04270251

## Seat Belt - Replace

**SMCS Code:** 7327-510

Within 3 years of the date of installation or within 5 years of the date of manufacture, Caterpillar recommends replacing the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to the seat belt, the seat belt buckle, and the seat belt retractor.



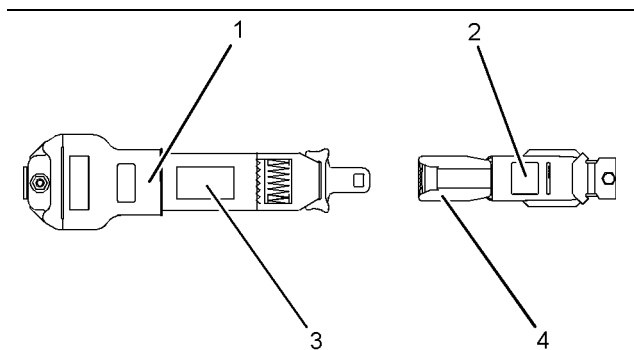


Illustration 304

g01152685

- (1) Date of installation (retractor)
- (2) Date of installation (buckle)
- (3) Date of manufacture (tag) (fully extended Web)
- (4) Date of manufacture (underside) (buckle)

Consult your Cat dealer for the replacement of the seat belt and the mounting hardware.

If your machine is equipped with a seat belt extension, also perform this replacement procedure for the seat belt extension.

i04346782

## Steering Charge Filter - Replace

**SMCS Code:** 431F-510

### 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.

Refer to Special Publication, NENG2500, "Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Cat products.

Dispose of all fluids according to local regulations and mandates.

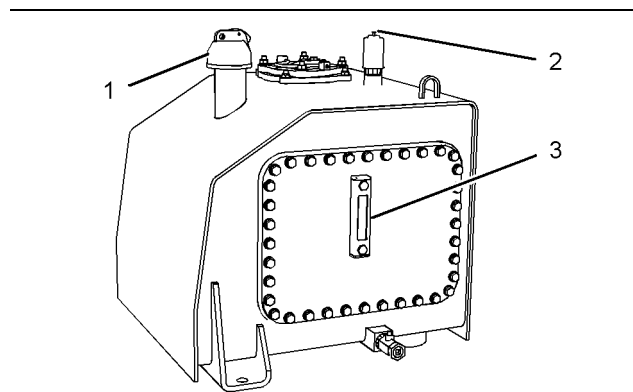


Illustration 305

g02501857

Hydraulic oil tank located above right-hand fender

- (1) Hydraulic tank filler cap
- (2) Pressure relief check valve
- (3) Oil level sight gauge

1. Remove any built up pressure in the hydraulic tank. Depress check valve (2) on top of the tank.

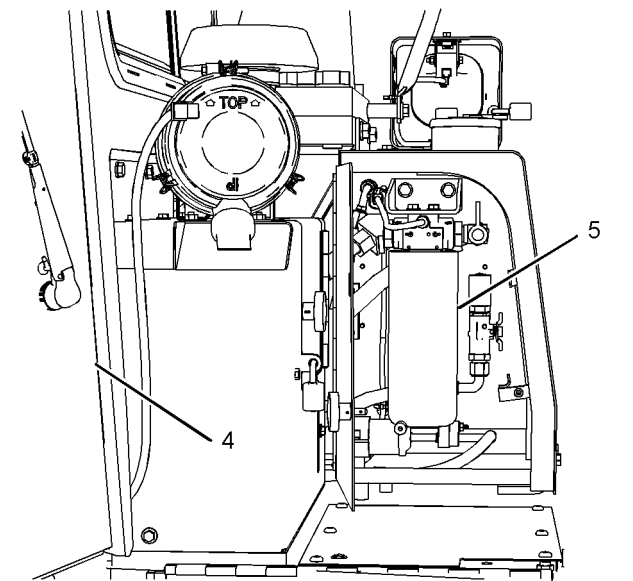


Illustration 306

g02501916

- (4) Left-hand cab entry door (reference only)
- (5) Steering charge filter element

2. Locate steering charge filter element (5). The filter is inside the enclosed compartment forward and below the fuel tank fill cap on the left-hand side of the machine above the fender.
3. Remove the filter element. Discard the used filter element properly. Make sure that all of the old filter seal is removed from the filter base.
4. Clean the filter base with a clean cloth.
5. Apply a thin coat of oil to the seal on the new filter. Install the new filter element by hand.

Instructions for the installation of the filter are printed on the side of each Caterpillar spin-on filter. For non-Caterpillar filters, refer to the installation instructions that are provided by the supplier of the filter.

i03967449

## Torque Converter Scavenge Screen - Clean

**SMCS Code:** 3101-070-MGS; 3105

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

After a major power train component failure, clean the torque converter scavenge screen.

1. Remove the bottom guard in order to gain access to the torque converter.

**Note:** Drain all fluids into a suitable container.

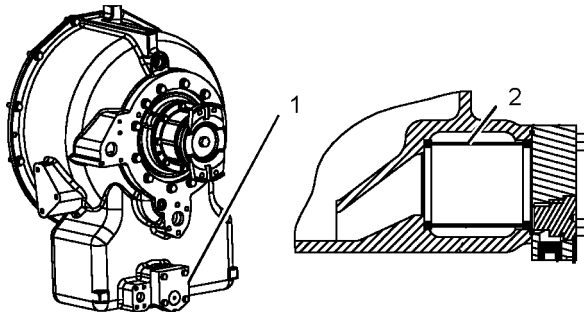


Illustration 307

g01387611

2. Remove the bolts and drain valve body (1) from the torque converter, as shown.
3. Remove torque converter scavenge screen (2) from the torque converter housing.
4. Wash the screen in a clean, nonflammable solvent.
5. Install torque converter scavenge screen (2) in the torque converter housing. Install the bolts and drain valve body (1).
6. Install the bottom guard.

**Reference:** See Operation and Maintenance Manual, "Power Train System Oil Level - Check" in order to fill with oil.

i02796323

## Track - Check/Adjust

**SMCS Code:** 4170-036

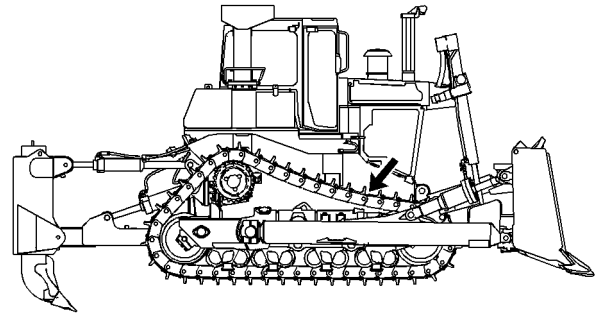


Illustration 308

g01125194

Check the track adjustment. Check the track for wear and for excessive dirt buildup.

### **WARNING**

Grease is under high pressure.

Grease coming out of the relief valve under pressure can penetrate the body causing injury or death.

Do not watch the relief valve to see if grease is escaping. Watch the track or track adjustment cylinder to see if the track is being loosened.

Loosen the relief valve only one turn.

1. Move the machine forward. Allow the machine to coast to a stop without the use of the service brakes. Adjust the tracks while you are in the machine's typical operating conditions. If packing conditions prevail on the workplace, the tracks should be adjusted without removing the packed material.
2. To measure the sag in the track, stretch a string over the grousers that are between the sprocket and the front idler. Take the measurement from the string to the top of the grouser at the maximum measurement. Dimension (A) is the maximum distance between the string and the grouser.

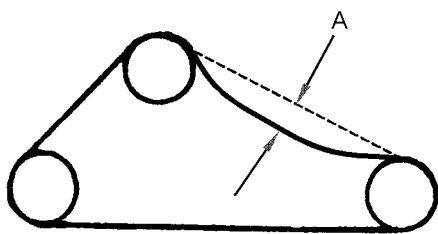


Illustration 309

g01109482

If a machine does not have carrier rollers, the sag in the track is measured between the sprocket and the front idler. The correct adjustment of dimension (A) is  $130 \pm 10$  mm ( $5.12 \pm 0.4$  inch).

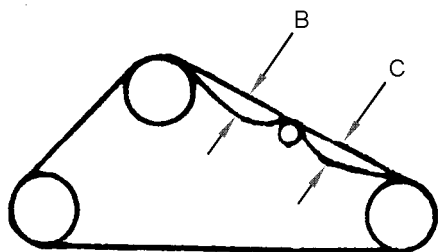


Illustration 310

g01118207

If the machine is equipped with a carrier roller, calculate the average of dimension (B) and dimension (C). The correct average value is  $65 \pm 10$  mm ( $2.6 \pm 0.4$  inch).

## Loose Track Adjustment

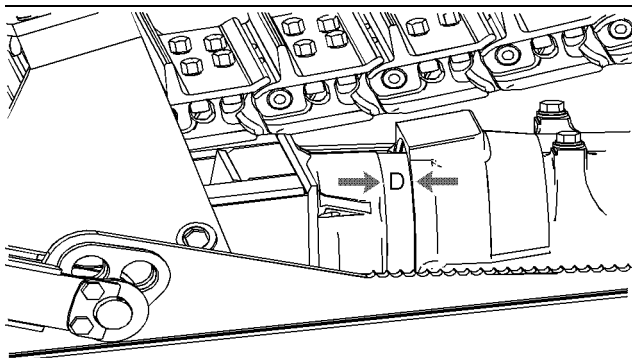


Illustration 311

g01019107

See the following Notice for maximum dimension (D).

### NOTICE

Do not attempt to tighten track when the dimension between the front edge of the wear sleeve on the front track roller frame and the edge of the track roller frame support is 189 mm (7.4 inch) or more. Contact your Caterpillar dealer for track service or instructions.

1. Remove the access cover.

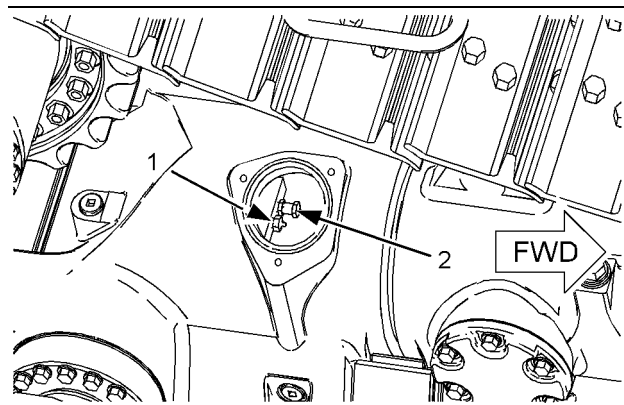


Illustration 312

g01019116

2. Add multipurpose grease (MPGM) through track adjustment valve (1). Add the MPGM until dimension (A, B, C) is correct.
3. Operate the machine back and forth in order to equalize the pressure. Allow the machine to coast to a complete stop. Do not use the brakes.
4. Remeasure dimension (D).

## Tight Track Adjustment

1. Loosen relief valve (2) by one turn of 360 degrees. Allow the grease to escape.
2. Close the relief valve.
3. Add MPGM through track adjustment valve (1). Add grease until dimension (A, B, C) is correct.
4. Install the access cover.

## Bolt Torque for Track Shoes

The torque requirement for track shoe bolts is  $870 \pm 90$  N·m ( $650 \pm 65$  lb ft). Tighten the bolts for an additional 120 degrees. If you are using bolts with a master link, tighten the bolts to a torque of  $870 \pm 90$  N·m ( $650 \pm 65$  lb ft). Then, tighten the bolts for an additional 120 degrees.

i01967541

i02039992

## Track Pins - Inspect

SMCS Code: 4175-040-PN

### WARNING

Fingers can be burned from hot pins and bushings.

The pins and bushings in a dry joint can become very hot. It is possible to burn the fingers if there is more than brief contact with these components.

Use the recommendations in order to extend the life of the undercarriage. Use the recommendations in order to avoid excessive downtime.

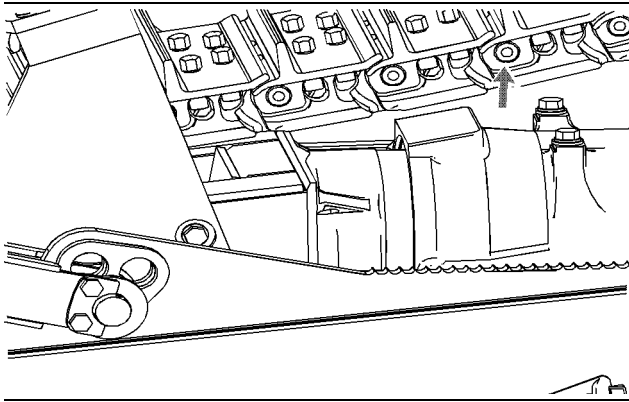


Illustration 313

g01021628

1. During the machine operation, listen for unusual squeaking and for unusual squealing. This can indicate a dry joint.
2. Check the machine for dry joints weekly. Check for dry joints immediately after machine operation. After machine operation, lightly touch the end of each track pin or bushing. Touch the track pin or the track bushing with the back of your hand. Make a mark on any dry track pin joint that is very hot to the touch.
3. Do not hit the ends of the track pins with a sledge hammer in order to loosen the track joints.

### NOTICE

Striking the end of a track pin introduces a significant amount of end play into the track joint and can result in early failures.

Consult your Caterpillar dealer's Custom Track Service expert if you detect dry joints or leaks. Your Caterpillar dealer's Custom Track Service expert can perform track inspection.

## Track Roller Frame - Inspect

SMCS Code: 4151-040

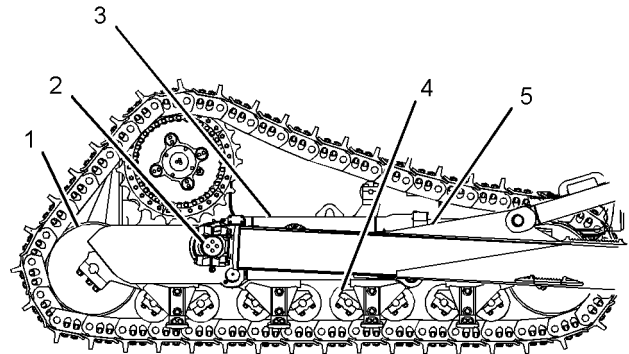


Illustration 314

g01049034

Inspect the track roller frame (3) for leaks. Check the seal for the pivot shaft (2) for oil leaks. Check the idlers (1) and track rollers (4) for leaks. Inspect the seal for the recoil spring (5) for oil leaks.

i01967485

## Track Roller Frame Guides - Inspect

SMCS Code: 4177-040

Measure the rotational movement of the front roller frame relative to the rear roller frame.

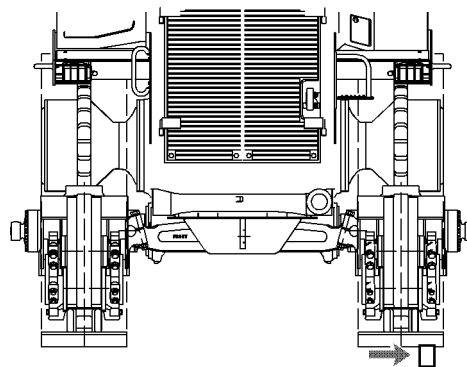


Illustration 315

g01021588

Some components are removed for clarity.

1. Raise the front of the machine with the hydraulics of the dozer. Place a 100 mm (4 inch) block under the outside edge of a track grouser. Place the block near the track idler. Lower the machine onto the block.

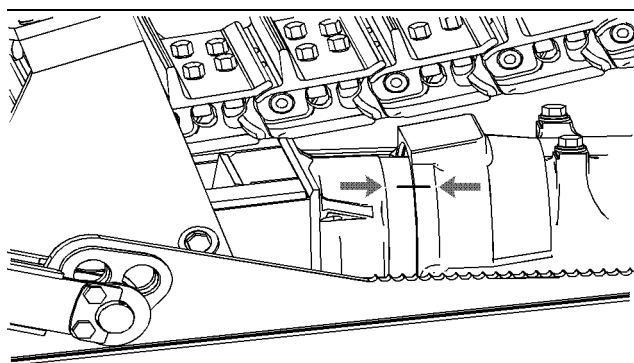


Illustration 316

g01021579

2. Use a grease pencil to make a mark on the tubular section of the front roller frame. Make a mark on the rear of the roller frame. This mark should correspond with the mark that is on the tubular section.

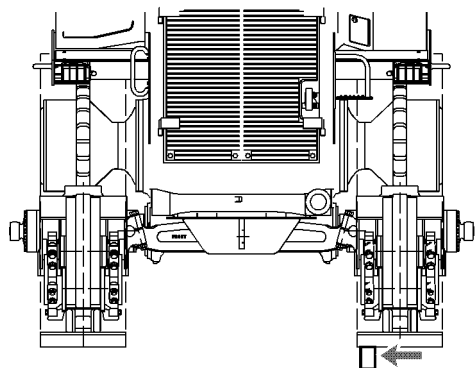


Illustration 317

g01021605

Some components are removed for clarity.

3. Raise the front of the machine with the hydraulics of the dozer. Place the block under the inside edge of the same track grouser. Lower the machine onto the block.

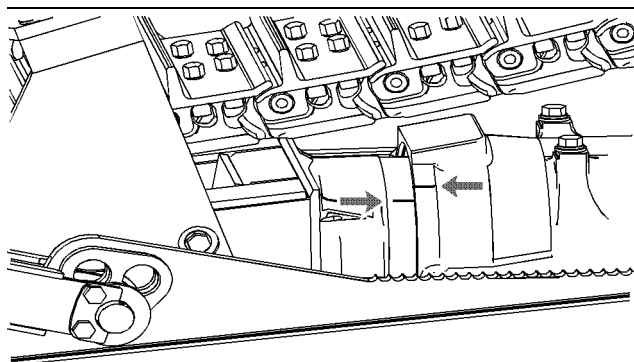


Illustration 318

g01021583

4. Put a mark on the tubular section of the front roller frame. This mark should correspond with the mark on the rear roller frame. Measure the distance between the two marks on the front roller frame.

If the distance between the two marks is greater than 4.5 mm (.18 inch), inspect the track roller frame guides for wear.

Repeat the entire procedure for the other side of the machine.

#### NOTICE

Never build up the track roller frame guides with hard-face welding. This will cause serious wear damage to the guide slots in the front track roller frame.

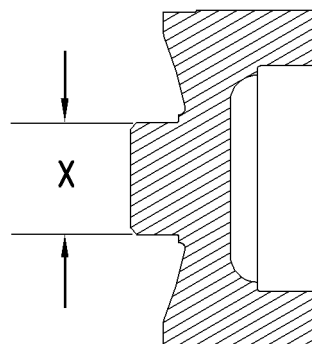


Illustration 319

g00785460

If dimension (X) is less than 45.3 mm (1.78 inch), replace the track roller frame guides. Consult your Caterpillar dealer for information or for service.

i03409088

## Walk-Around Inspection

**SMCS Code:** 1000; 7000

**Reference:** See Operation and Maintenance Manual, "Daily Inspection" for more information.

i02775471

## Winch Fairlead Rollers - Lubricate

**SMCS Code:** 5163-086

**If equipped:**

i01369498

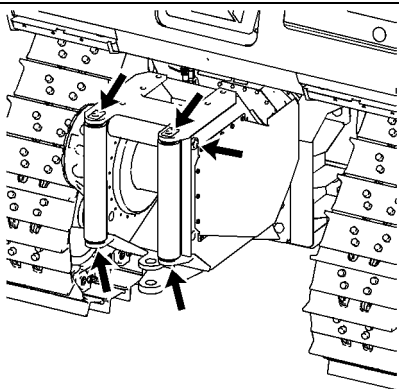


Illustration 320

g01387081

Lubricate the five fittings. Use MPGM Grease.

i02775441

## Winch Oil Level - Check

SMCS Code: 5163-535-FLV

If equipped:

**PA140VS**

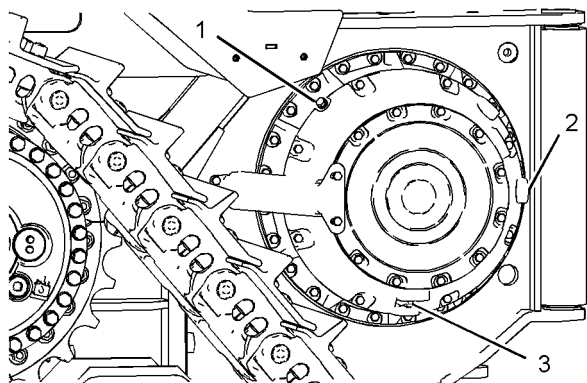


Illustration 321

g01387065

1. Remove the oil level plug (2) in order to check the oil level. The oil level should be maintained to the bottom of the level plug hole.
2. If necessary, remove oil filler plug (1) and add oil.

Check for oil leaks around the covers and around the hoses. Repair any oil leaks.

## Winch Oil and Breather - Change/Clean

SMCS Code: 5163-044

If equipped:

### **WARNING**

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

## PA59HS

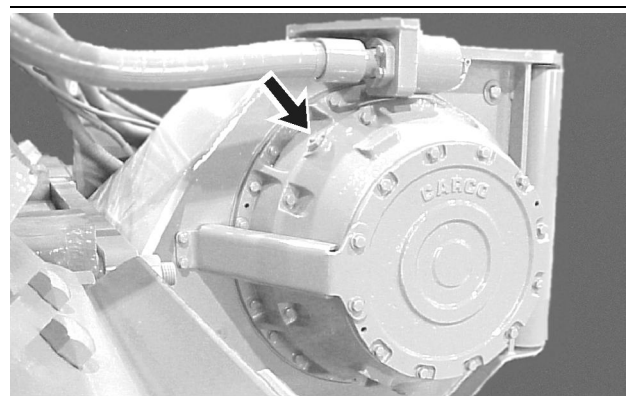


Illustration 322

g00722366

1. Remove the oil filler plug.

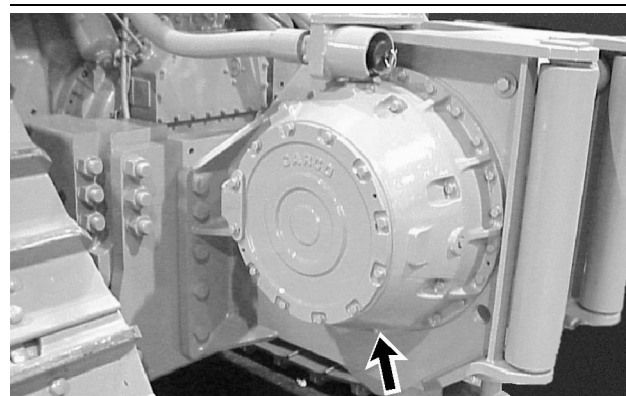


Illustration 323

g00722380

2. Remove the drain plug on the bottom of the winch. Allow the oil to drain into a suitable container.
3. Inspect the plug seal. If necessary, replace the plug seal.
4. Clean the drain plug and install the drain plug.

i02094238

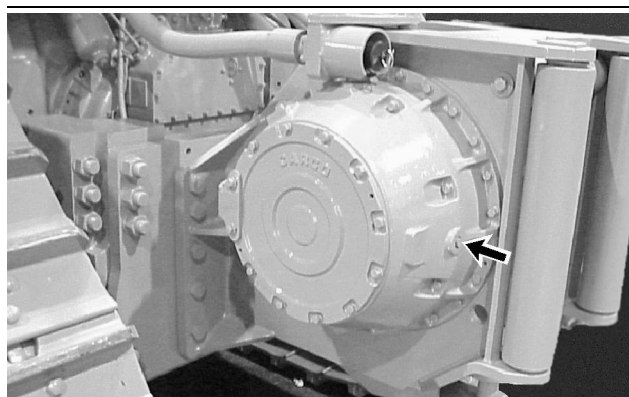


Illustration 324

g00722361

5. Remove the oil level plug.
6. Fill the oil compartment until oil is visible at the bottom of the opening for the oil level plug. See Operation and Maintenance Manual, "Refill Capacities".

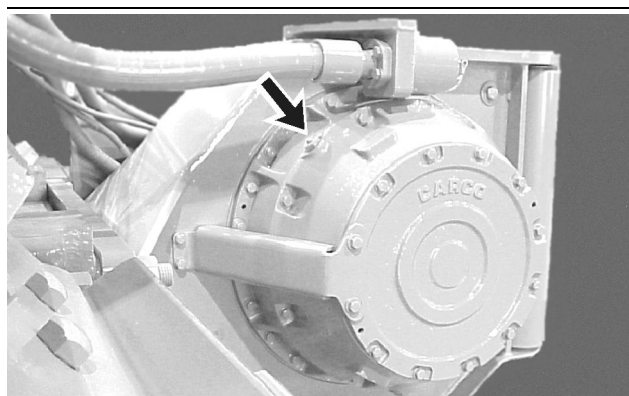


Illustration 325

g00722366

7. Clean the vent plug that is in the filler plug. Use a clean nonflammable solvent.
8. Install the oil filler plug.
9. Run the engine at low idle. Maintain the oil level so that the oil level is visible at the bottom of the opening for the oil level plug.
10. Install the oil level plug.

## Winch Wire Rope - Install (If Equipped)

SMCS Code: 5154-012; 5163-012

### WARNING

Personal injury or death can result from worn wire rope cable.

Worn or frayed cable could break causing injury.

Check the wire rope cable. If cable is worn or is frayed install a new cable.

## PA140VS

The cable is attached to the drum on the winch with a cable ferrule. The ferrule is placed into a socket on the drum.

Use the following table to order the cable.

Table 28

| Wire Cable         |                     |                  |
|--------------------|---------------------|------------------|
| Wire Rope Diameter | Recommended Ferrule | Holding Capacity |
| 25 mm (1 inch)     | L-8                 | 91 m (300 ft)    |
| 29 mm (1.13 inch)  | J-9                 | 84 m (276 ft)    |
| 32 mm (1.25 inch)  | J-10                | 59 m (193 ft)    |

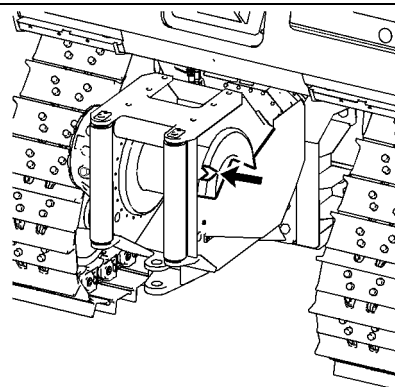


Illustration 326

g01076208

1. Put the cable in a straight line behind the tractor.
2. Install the ferrule end into the socket.
3. Reel in the cable.

i04357730

## Window Washer Reservoir - Fill (If Equipped)

SMCS Code: 7306-544

### NOTICE

When operating in freezing temperatures, use Caterpillar or any commercially available nonfreezing window washer solvent.

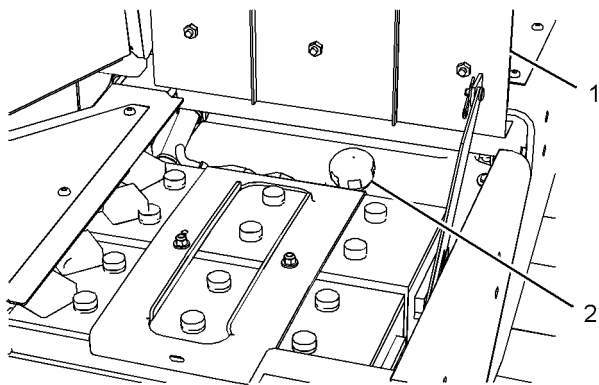


Illustration 327

g02511337

Left-hand battery and window washer fluid reservoir compartment (Left-hand guard rail assembly removed for illustration)

- (1) Compartment access cover (in opened position)
- (2) Window washer fluid reservoir filler cap



**Window Washer** – The window washer fluid reservoir is located in the compartment with the batteries on the left-hand side of the machine. Access cover (1) is on the left-hand side of the machine next to the operator compartment. Remove window washer fluid reservoir filler cap (2) in order to fill the window washer fluid reservoir.

i04358049

## Window Wipers - Inspect/Replace (If Equipped)

SMCS Code: 7305-040; 7305-510

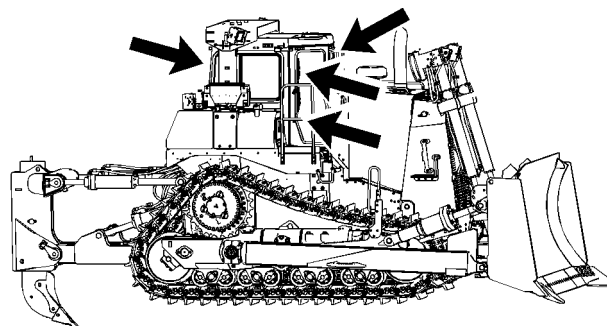


Illustration 328

g02511477

Inspect the front window wiper blade, the right-hand door window wiper blades, the left-hand door window wiper blades, and the rear window wiper blade. Replace any wiper blades that are damaged or worn. Replace any wiper blades that streak the windows.

i04066452

## Windows - Clean

SMCS Code: 7310-070; 7340-070

### If equipped:

Use commercially available window cleaning solutions to clean the windows.

One wiper blade is used to clean the rear window. In order to clean the outside of the rear window from the ground, use a long pole.

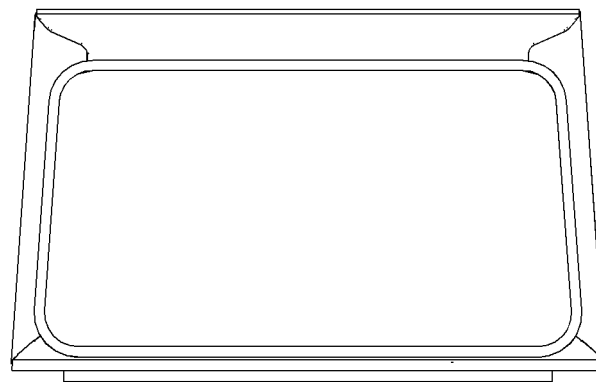


Illustration 329

g02107477