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MAINTENANCE INTERVALS

Operation and Maintenance
Manual Excerpt

CATERPILLAR®

CATERPILLAR®

SEBU8079-11
April 2012

Operation and Maintenance Manual

938H Wheel Loader and IT38H Integrated Toolcarrier

JKM1-Up (938H)
LKM1-Up (938H)
MCC1-Up (938H)
MJC1-Up (938H)
JNJ1-Up (IT38H)

i04876454

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: The aftertreatment system can be expected to function properly for the useful life of the engine (emissions durability period), as defined by regulation. All prescribed maintenance requirements must be followed.

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 substantially. S·O·S services may extend the oil change even longer. Consult your Cat dealer for details.

The following guidlines shoud be followed if the service hours are not met:

Items listed between 10 and 100 service hours should be performed at least every 3 months.

Items listed between 250 and 500 service hours should be performed at least every 6 months.

Items listed between 1000 service hours and 2500 service hours should be performed at least every year.

When Required

Every 10 Service Hours or Daily

Every 50 Service Hours or Weekly

Every 100 Service Hours or 2 Weeks

Initial 250 Service Hours

Every 250 Service Hours

Every 250 Service Hours or Monthly

Every 250 Service Hours or 3 Months

Initial 500 Service Hours

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

Every 500 Service Hours

Every 500 Service Hours or 3 Months

Every 1000 Service Hours or 6 Months

Every 2000 Service Hours or 1 Year

Every 3000 Service Hours

Every 3 Years

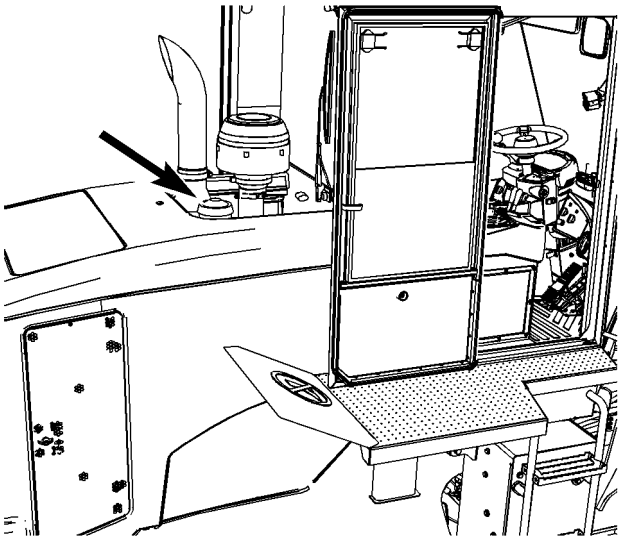
Every 6000 Service Hours or 3 Years

Every 12 000 Service Hours or 6 Years

i03348945

Alternator Air Vent Line and Screen - Clean

SMCS Code: 1071-070-Z3; 1405-070-VN

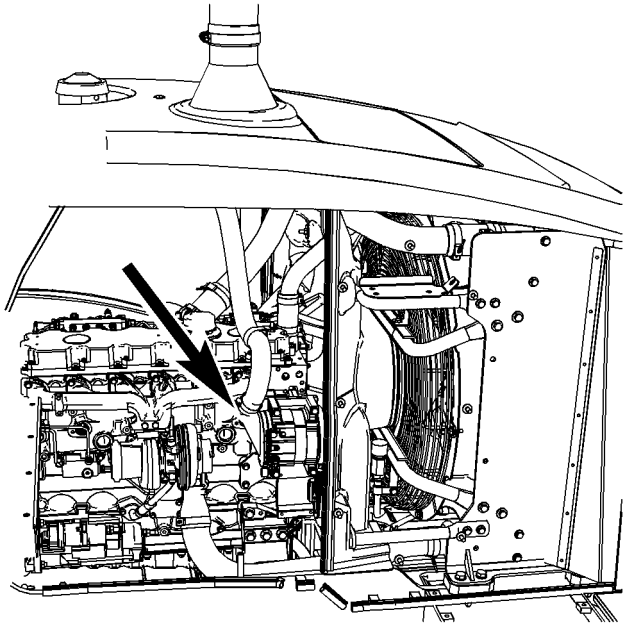


g01724456

Illustration 111

Air Inlet Screen

1. Inspect the air inlet screen for dirt and for trash.
2. Remove the plug in the screen. Loosen the hose clamp on the rain cap.
3. Remove the rain cap. Remove the screen.
4. Use low pressure air in order to clean debris from the screen.
5. Open the hood on the left side of the machine in order to access the alternator cover.



g01733717

Illustration 112

Alternator Cover

6. Remove the air supply line from the alternator cover. Use low pressure compressed air in order to clean any debris from the air supply line and the alternator cover.
7. Install the air supply line on the alternator cover.
8. Install the screen and the rain cap.
9. Install the plug in the screen.

NOTICE

Service the air screen only with the engine stopped. Alternator damage could result if the screen is serviced while the engine is running.

i02594009

Articulation Bearings - Lubricate

SMCS Code: 7057-086-BD; 7065-086-BD; 7066-086-BD

WARNING

Crushing Hazard. Insure that the machine ignition switch is in the OFF position and that the parking brake is engaged before entering the articulation area. Failure to do so could result in serious injury or death.

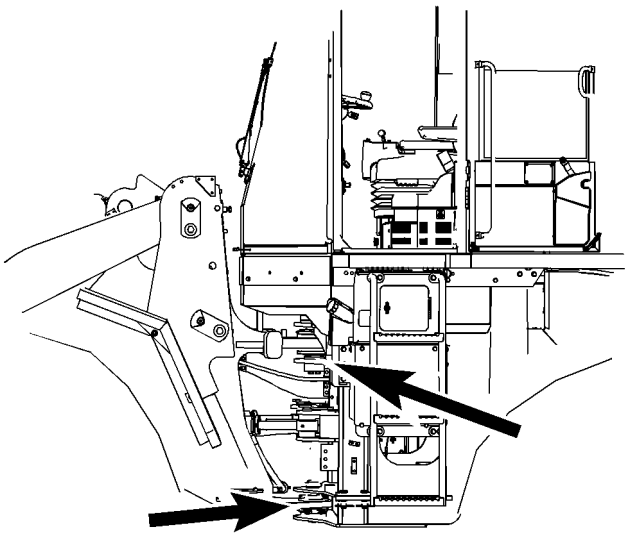


Illustration 113 g01300288

Note: On certain models, the fittings will be accessible from the left side of the machine.

Wipe off the fittings before any lubricant is applied.

Apply lubricant through fittings on the articulation hitches.

i04155776

Automatic Lubrication Grease Tank - Fill (Autolube - If Equipped)

SMCS Code: 7540-544-TNK

The Automatic TWIN Greasing System

Reference: Refer to System Operation, RENR 6331 for more information on the Automatic TWIN Greasing System.

WARNING

A pressure hazard is present. Severe personal injury or death can result from removing hoses or fittings that are under pressure. Relieve the pressure in the system before you remove hoses or fittings.

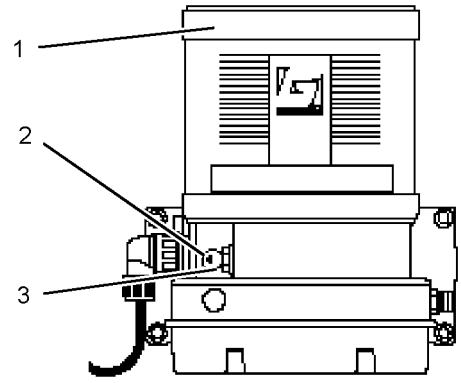


Illustration 114 g01068678

(1) Reservoir
(2) Dust Cap
(3) Fill Location

Grease reservoir (1) is located near the rear fender on the right side of the machine.

Filling the Reservoir

1. Remove the dust cap (2) from the grease reservoir (1).

2. Clean the filler tube assembly (3) and the coupling on the filler assembly. Clean the filter located behind the coupling. Refer to Operation and Maintenance Manual, “Automatic Lubrication Filler Filter - Clean”.

3. Install the filler assembly onto the filler tube assembly (3).

4. Fill the grease reservoir (1) with grease to the maximum level which is indicated on the grease reservoir (1).

   Reference: For the correct type of grease, refer to Operation and Maintenance Manual, “Lubricant Viscosities”.

Note: If a different brand of grease is used, check for combatability. If the new grease is not combatable with the grease in the reservoir, the system must be purged. Refer to System Operation, RENR 6331 for more information about purging the system.

5. Remove the filler assembly and install the dust cap (2).

i02593765

Axle Oil Cooler Magnetic Filter - Clean/Replace

SMCS Code: 3004-070-MGS; 3004-510-MGS

The magnetic filters are located on the right side of the machine.

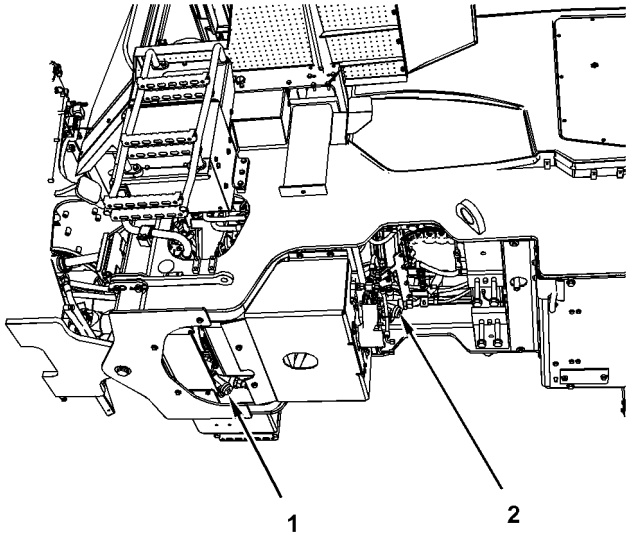


Illustration 115 g01384680

(1) Front Magnetic Oil Filter
(2) Rear Magnetic Oil Filter

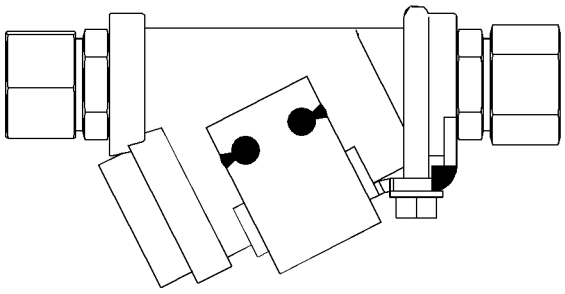


Illustration 116 g01448141

Magnetic Oil Filter

1. Remove the two magnetic filters from the axle oil cooler lines.

2. Wash the filters in a clean nonflammable solvent. Inspect the filters for damage. Replace the filters if the filters are damaged.

Note: If the oil samples for the differential oil show a particle count that is higher than normal, clean the filters for the axle oil cooler at an earlier interval.

3. Install the two filters for the axle oil cooler.

4. Close the engine hood.

5. Start the engine. Operate the machine in order to circulate the oil.

6. Stop the engine.

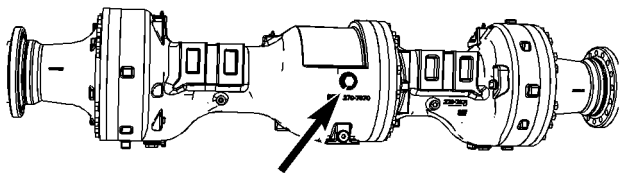


Illustration 117 g01264367

Front Differential and Final Drive Filler Plug

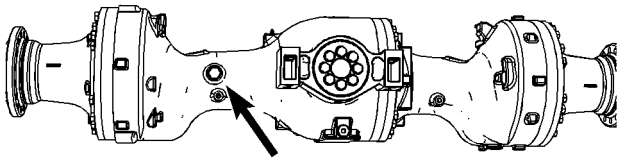


Illustration 118 g01264369

Rear Differential and Final Drive Filler Plug

Note: Wipe the covers and surfaces around openings before you remove the filler plug.

7. Remove the filler plugs for both differentials. Fill the differentials with oil. Maintain the oil level at the bottom of the filler plug hole.

8. Install the filler plugs for each differential. Operate the machine for a few minutes and allow the oil to flow completely through the axles. Remove the filler plugs and check the oil level. Add oil, if necessary.

   Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for the proper oil.

   Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill)” for the amount of oil.

9. Clean the filler plugs and install the filler plugs.

i02910320

Axle Oscillation Bearings - Lubricate

SMCS Code: 3268-086-BD; 3278-086-BD

⚠ WARNING

Crushing Hazard. Insure that the machine ignition switch is in the OFF position and that the parking brake is engaged before entering the articulation area. Failure to do so could result in serious injury or death.

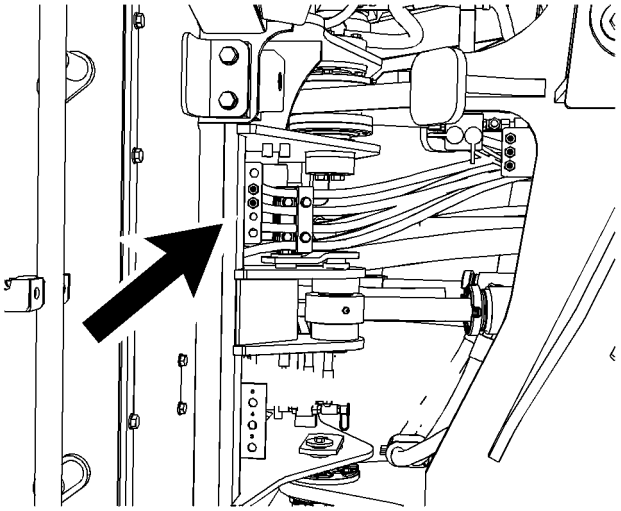


Illustration 119 g01448235

Wipe off the fittings before you apply any lubricant.

Apply lubricant through two remote fittings near the articulation hitch on the right side of the machine.

i01698523

Backup Alarm - Test

SMCS Code: 7406-081

Turn the engine start switch key to ON in order to perform the test.

Apply the service brake. Move the transmission direction control lever to REVERSE position.

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

The backup alarm is mounted in the back of the machine behind the rear grill.

i02926777

Battery - Clean

SMCS Code: 1401-070

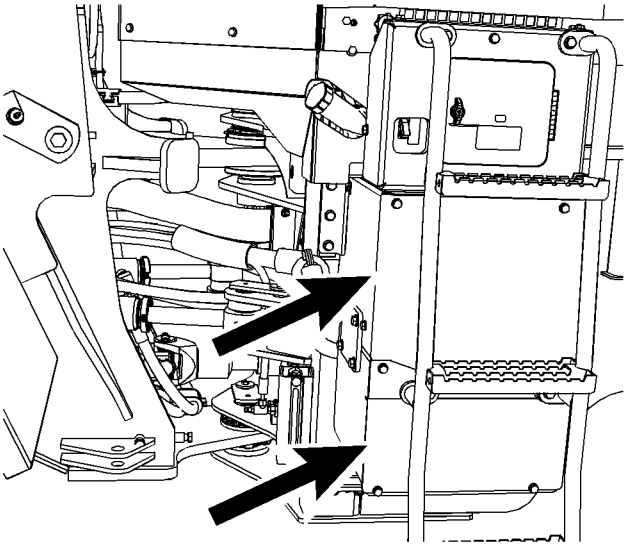


Illustration 120 g01452689

The batteries are located in the battery compartment on the left side of the machine.

Your machine may have a set of batteries that are located below the top compartment. If equipped, ensure that all batteries are cleaned.

Clean the battery surfaces with a clean cloth. Keep the terminals clean and keep the terminals coated with petroleum jelly. Install the post covers after you coat the terminal posts with petroleum jelly.

i02926778

Battery Hold-Down - Tighten

SMCS Code: 7257-527

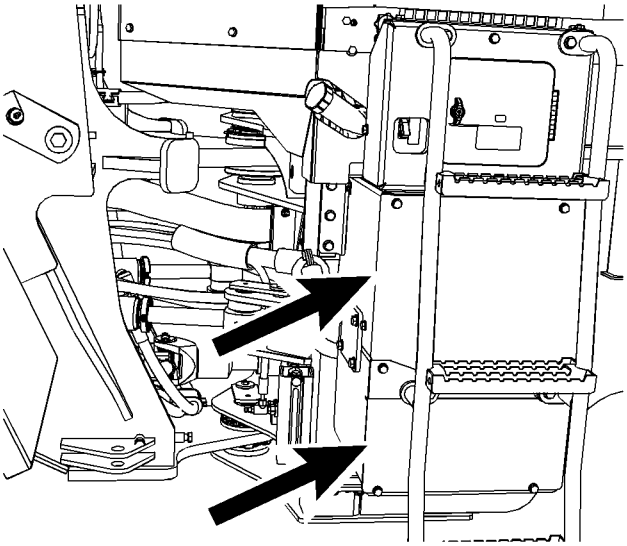


Illustration 121 g01452689

The batteries are located in the battery compartment on the left side of the machine.

Your machine may have a set of batteries that are located below the top compartment. If equipped, ensure that all batteries are checked.

Tighten the hold-downs for the battery in order to prevent the batteries from moving during machine operation.

i03657099

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401-040; 1401-510; 1402-040; 1402-510

⚠ WARNING

Personal injury may occur from failure to properly service the batteries.

Batteries give off flammable fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts the skin or eyes.

Prevent sparks near the batteries. Sparks could cause vapors to explode. Do not allow jumper cable ends to contact each other or the engine. Improper jumper cable connections can cause an explosion.

Always wear protective glasses when working with batteries.

1. Turn the engine start switch key OFF. Turn all of the switches OFF.
2. Turn the battery disconnect switch OFF. Remove the key.
3. Disconnect the negative battery cable from the disconnect switch.

Note: Do not allow the disconnected battery cable to contact the disconnect switch.

4. Disconnect the negative battery cable at the battery.
5. Disconnect the positive battery cable at the battery.
6. Inspect the battery terminals for corrosion. Inspect the battery cables for wear or damage.
7. Make any necessary repairs. If necessary, replace the battery cables or the battery.
8. Connect the positive battery cable at the battery.
9. Connect the negative battery cable at the battery.
10. Connect the battery cable at the battery disconnect switch.
11. Install the key and turn the battery disconnect switch ON.

Recycle the Battery

Always recycle a battery. Never discard a battery.

Always return used batteries to one of the following locations:

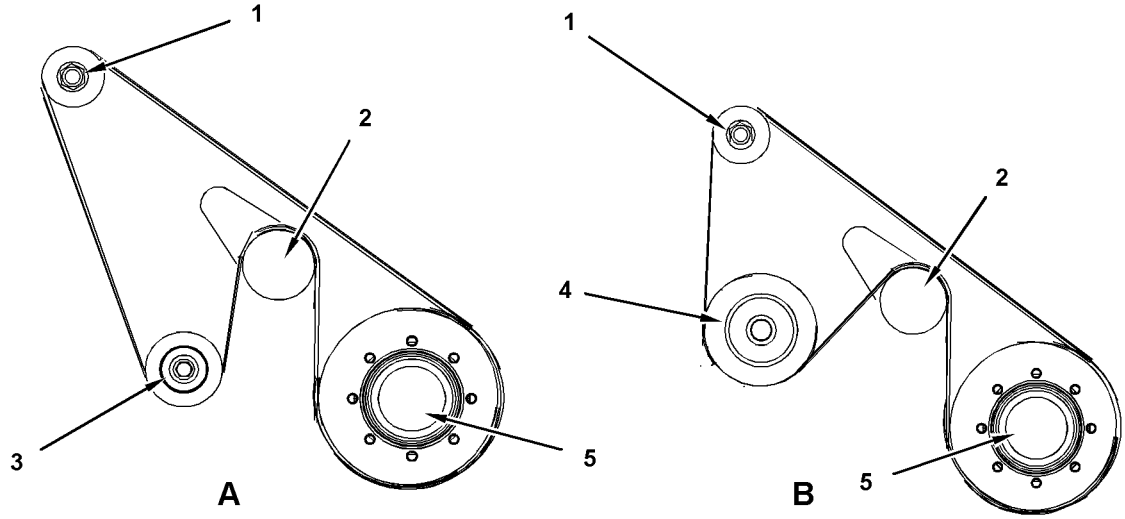
- A battery supplier
- An authorized battery collection facility
- Recycling facility

i02910353

Belt - Inspect/Adjust/Replace

SMCS Code: 1397-025; 1397-040; 1397-510

Your machine is equipped with a single serpentine belt. Stop the engine. Open the rear hood. The belt is located at the rear of the engine. Inspect the condition of the serpentine belt. Replace the belt if the belt is cracked or frayed.



g01448273

Illustration 122

View A is basic.

View B is with air conditioner.

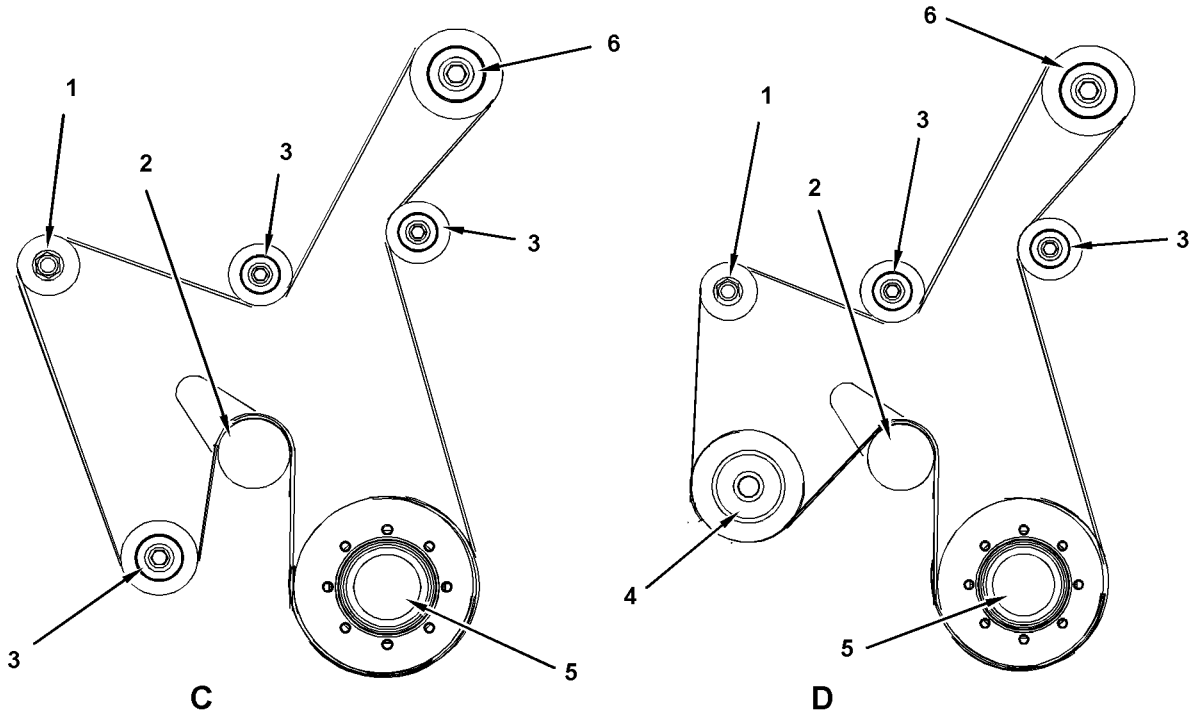
(1) Alternator
(2) Tensioner
(3) Idler pulley
(4) Air Conditioner Compressor (If Equipped)
(5) Crankshaft

A tensioner keeps the correct tension on the belt . Insert a ratchet with a square drive into the hole . Rotate the tensioner clockwise in order to relieve tension on the belt. Remove the belt.

Install the new belt. Be sure that the new belt is routed correctly, as shown. View (A) represents machines that are not equipped with an air conditioner. View (B) represents machines that are equipped with an air conditioner. Rotate the tensioner clockwise in order to install the new belt. Release the tensioner when the new belt is installed. The correct tension will automatically be applied.

Belt for the Axle Oil Cooler Pump (If Equipped)

Your machine is equipped with a single serpentine belt. Stop the engine. Open the rear hood. The belt is located at the rear of the engine. Inspect the condition of the serpentine belt. Replace the belt if the belt is cracked or frayed.



g01448276

Illustration 123

View C is basic.

View D is with air conditioner.

(1) Alternator
(2) Tensioner
(3) Idler pulley
(4) Air Conditioner Compressor (If Equipped)
(5) Crankshaft
(6) Axle Oil Cooler Pump

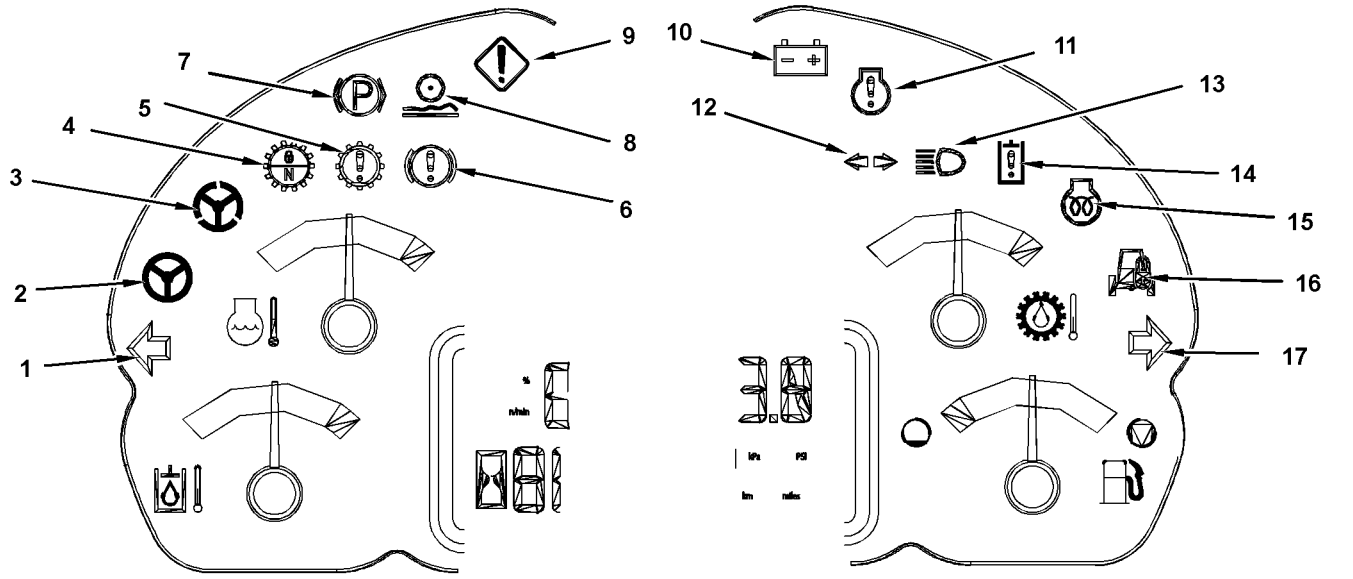
A tensioner keeps the correct tension on the belt . Insert a ratchet with a square drive into the hole . Rotate the tensioner clockwise in order to relieve tension on the belt. Remove the belt.

Install the new belt. Be sure that the new belt is routed correctly, as shown. View (C) represents machines that are not equipped with an air conditioner. View (D) represents machines that are equipped with an air conditioner. Rotate the tensioner clockwise in order to install the new belt. Release the tensioner when the new belt is installed. The correct tension will automatically be applied.

i02837923

Brake Accumulator - Check

SMCS Code: 4263-535



g01413930

Illustration 124

(1) Left Turn Signal
(2) Primary Steering
(3) Secondary Steering (If Equipped)
(4) Applied Transmission Neutralizer
(5) Transmission
(6) Service Brake
(7) Parking Brake
(8) Applied Ride Control (If Equipped)
(9) Action Lamp
(10) Electrical
(11) Engine
(12) Turn Signal for Bucket
(13) High Beam
(14) Hydraulic
(15) Starting Aid
(16) Machine Security System (If Equipped)
(17) Right Turn signal

1. Turn the engine start switch to the ON position. The alert indicator (9) should come on if the braking system is not at normal operating pressure.

2. Start the engine. Run the engine at half speed for two minutes in order to increase the accumulator pressure. The alert indicator (9) should go off.

3. Stop the engine. Apply the service brake pedal and release the service brake pedal until the alert indicator for brake oil pressure comes on. This will decrease the accumulator pressure. A minimum of five applications of the service brake pedal are required.

Note: The parking brake indicator light (7) will be on when the alert indicator for brake oil pressure comes on.

4. If the alert indicator comes on after less than five applications of the brake, measure the accumulator precharge pressure. An authorized Caterpillar dealer can measure the nitrogen gas pressure in the accumulator. Use only dry nitrogen gas for recharging.

i01732078

Brake Discs - Check

SMCS Code: 4255-535

Reference: For the correct procedure, refer to the Testing and Adjusting Service Manual of the braking system for your machine or consult your Caterpillar dealer.

i02880091

Braking System - Test

SMCS Code: 4251-081; 4267-081

- Park the machine on a dry, level surface.
- Check the area around the machine. Make sure that the machine is clear of personnel and clear of obstacles.
- Make sure that the steering frame lock is in the unlocked position.
- Fasten the seat belt before you test the brakes.

The following tests are used to determine whether the braking system is functional. These tests are not intended to measure the maximum brake holding effort. The required brake holding effort for sustaining a machine at a specific engine rpm varies from one machine to another machine. The variations include differences in the engine setting, the power train efficiency, the brake holding ability, etc.

Service Brake Holding Ability Test

⚠ WARNING

Personal injury can result if the machine moves while testing.

If the machine begins to move during test, reduce the engine speed immediately and engage the parking brake.

1. Start the engine. Raise the implement slightly. Apply the service brake. Release the parking brake.
2. In the Messenger, enable the override for the transmission neutralizer.
3. Make sure that the autoshift control is in the OFF position.
4. Move the transmission control to THIRD SPEED FORWARD while the service brakes are applied.
5. Gradually increase the engine speed to high idle. The machine should not move.
6. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Engage the parking brake. Lower the implement to the ground. Stop the engine.

If the machine moved during the test, consult your Caterpillar dealer for a brake inspection. Make any necessary repairs before the machine is returned to operation.

Parking Brake Holding Ability Test

⚠ WARNING

Personal injury can result if the machine moves while testing.

If the machine begins to move, reduce the engine speed immediately and apply the service brake pedal.

This test is performed when the parking brake is engaged. If the machine begins to move, compare the engine rpm to the engine rpm of a prior test. This will indicate the amount of system deterioration.

1. Start the engine. Raise the implement slightly. Engage the parking brake.
2. Make sure that the autoshift control is in the OFF position.
3. Move the transmission control to THIRD SPEED FORWARD. Then, move the transmission control to NEUTRAL and back to THIRD SPEED FORWARD. This will override the transmission neutralizer.

   The parking brake indicator light should come on.
4. Gradually increase the engine speed to high idle. The machine should not move.
5. Reduce the engine speed to low idle. Move the transmission direction control to the NEUTRAL position. Lower the implement to the ground. Stop the engine.

If the machine moved during the test, consult your Caterpillar dealer for a brake inspection. Make any necessary repairs before the machine is returned to operation.

i03657238

Bucket Cutting Edges - Inspect/Replace

SMCS Code: 6801-040; 6801-510

⚠ WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket cutting edges.

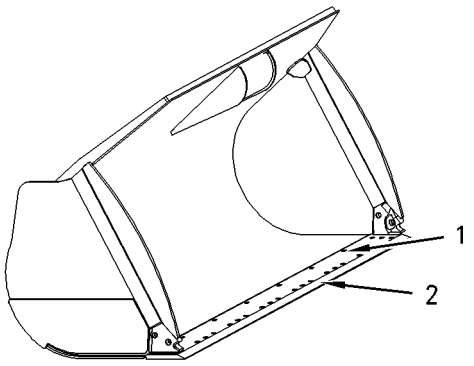


Illustration 125 g00764365

(1) Bolts for Cutting Edge
(2) Cutting Edge

Check the cutting edges and the end bits for wear and for damage. Use the following procedure to service the cutting edges and the end bits:

1. Raise the bucket and place blocking under the bucket.
2. Lower the bucket onto the blocking. Stop the engine.
3. Remove bolts (1), cutting edge (2) and the end bits.
4. Clean all contact surfaces.
5. If the opposite side of the cutting edge is not worn, use the opposite side of the cutting edge. The end bits are not reversible.

   If both sides are worn, install a new cutting edge.
6. Install bolts (1). Tighten the bolts to the specified torque.

   Reference: Refer to Specifications, SENR3130, “Ground Engaging Tool (G.E.T.) Fasteners”.
7. Start the engine. Raise the bucket and remove the blocking. Lower the bucket to the ground.
8. After a few hours of operation, check the bolts for proper torque.

Bucket Wear Plates

⚠ WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket wear plates.

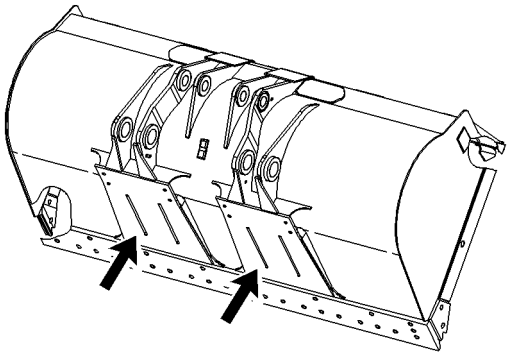


Illustration 126 g00879740

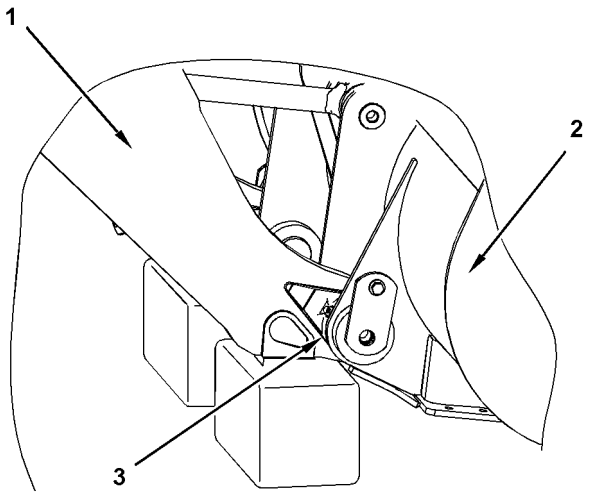
Inspect the wear plates. Replace the wear plates before damage to the bottom of the bucket occurs. Consult your Caterpillar dealer for replacement of wear plates.

i04878904

Bucket Hinge and Lift Arm Clearance Shims - Inspect/Adjust/Replace

SMCS Code: 6001-025-CLR; 6001-040-CLR; 6001-510-Z4; 6119-025-CLR; 6119-040-CLR; 6119-510-Z4

Inspect the Linkage



g03003577

Illustration 127

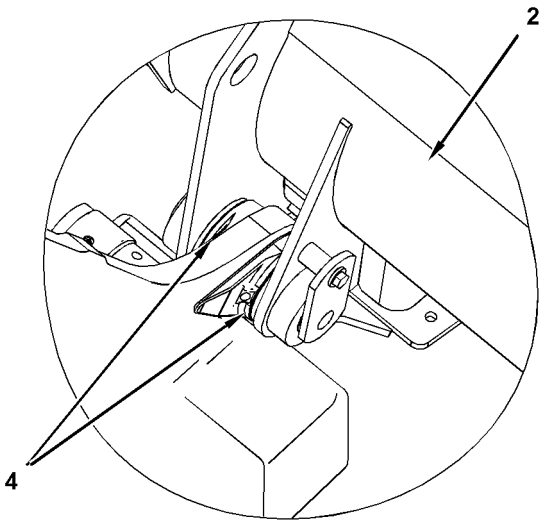
(1) Lift Arm
(2) Bucket
(3) Inspection Points for the Bucket Hinge.

Periodically inspect the bucket linkage. The gap between the bucket and the linkage should not exceed the thinnest shim that is available for the bucket assembly.

1. Lower the lift arm assembly (1) to suitable blocking. Rest the bucket (2) on the ground.
2. Use a gauge to measure the gap at the hinge.
3. If the measurement exceeds the required amount, new shims must be installed.

Installing Shims for the Hinge on the Bucket

Note: Refer to the Disassembly and Assembly Manual, “Bucket - Remove” for the correct procedure for removing the pins in the linkage.



g01345720

Illustration 128

(2) Bucket
(4) Install washers on lift arm.

Install washers and pin assembly to the bucket. When possible, use washers on both sides of the lift arm to reduce the gap between the lift arm and the hinges on the bucket.

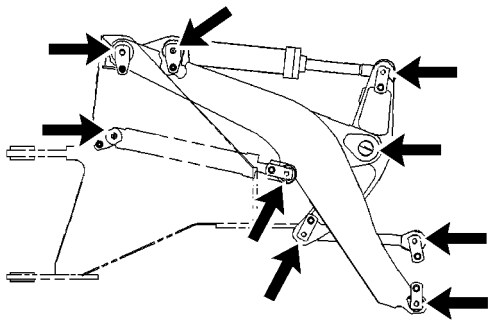
Note: Refer to the Disassembly and Assembly Manual, “Bucket - Install” for the correct procedure for installing the pins in the linkage.

i01940922

Bucket Linkage and Loader Cylinder Bearings - Lubricate

SMCS Code: 5102-086-BD; 5104-086-BD; 6107-086-BD

Wheel Loader



g00873076

Illustration 129

1. Wipe off the fittings before you apply lubricant.
2. Apply lubricant to the grease fittings.

Integrated Toolcarrier

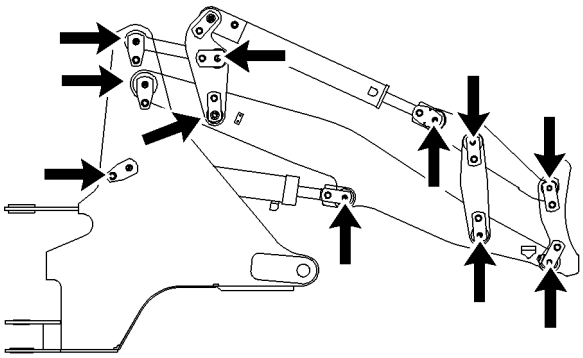


Illustration 130 g00923459

1. Wipe off the fittings before you apply lubricant.
2. Apply lubricant to the grease fittings.

i01889917

Bucket Lower Pivot Bearings - Lubricate

SMCS Code: 6101-086-BD; 6107-086-BD

1. Wipe off the fittings before you apply any lubricant.

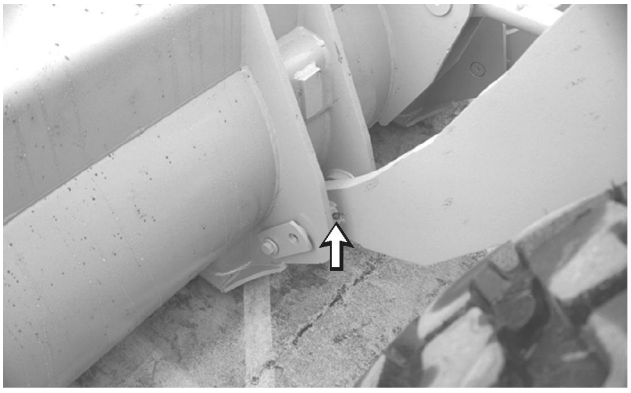


Illustration 131 g00554957

2. Apply lubricant through the fitting on each lower pivot bearing.

i03657242

Bucket Tips - Inspect/Replace

SMCS Code: 6805-040; 6805-510

⚠ WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket tips.

Bucket Tips

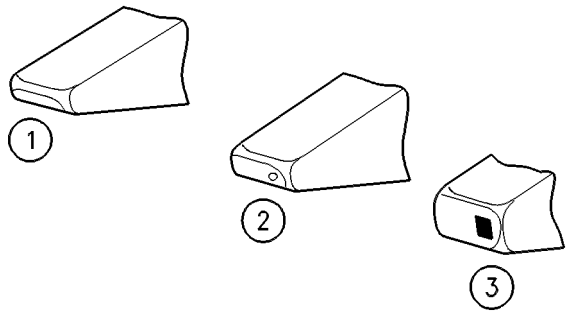


Illustration 132 g00101352

(1) Usable
(2) Replace the tip.
(3) Replace the tip.

Check the bucket tips for wear. If the bucket tip has a hole, replace the bucket tip.

1. Remove the pin from the bucket tip. The pin can be removed by one of the following methods.
   - Use a hammer and a punch from the retainer side of the bucket to drive out the pin.
   - Use a Pin-Master. Follow Step 1.a through Step 1.c for the procedure.

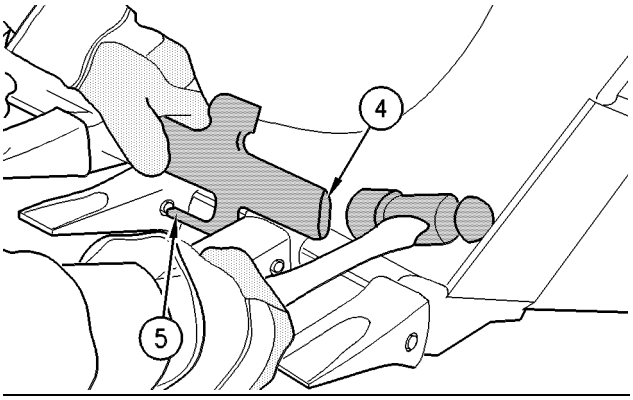


Illustration 133 g00590670

(4) Back of Pin-Master
(5) Extractor

a. Place the Pin-Master on the bucket tooth.

b. Align extractor (5) with the pin.

c. Strike the Pin-Master at the back of the tool (4) and remove the pin.

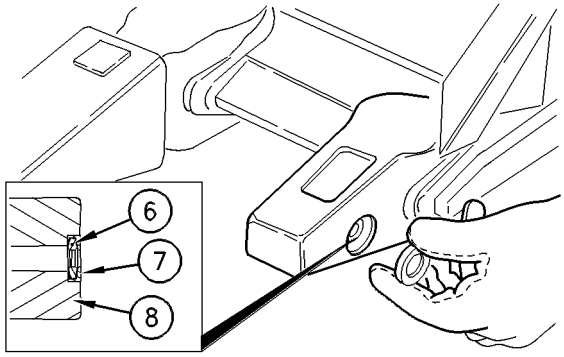


Illustration 134 g00590819

(6) Retainer
(7) Retaining washer
(8) Adapter

2. Clean the adapter and the pin.

3. Fit retainer (6) into retaining washer (7). Install this assembly into the groove that is in the side of adapter (8).

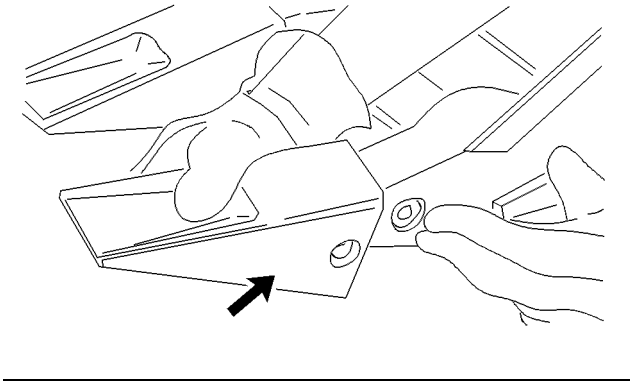


Illustration 135 g00101359

4. Install the new bucket tip onto the adapter.

Note: The bucket tip can be rotated by 180 degrees in order to allow greater penetration or less penetration.

5. Drive the pin through the bucket tip. The pin can be installed by using one of the following methods:

- From the other side of the retainer, drive the pin through the bucket tip, the adapter, and the retainer.
- Use a Pin-Master. Follow Step 5.a through Step 5.e for the procedure.

Note: To correctly install the pin into the retainer, the pin must be driven in from the right side of the tooth. Improper installation of the pin can result in the loss of the bucket tip.

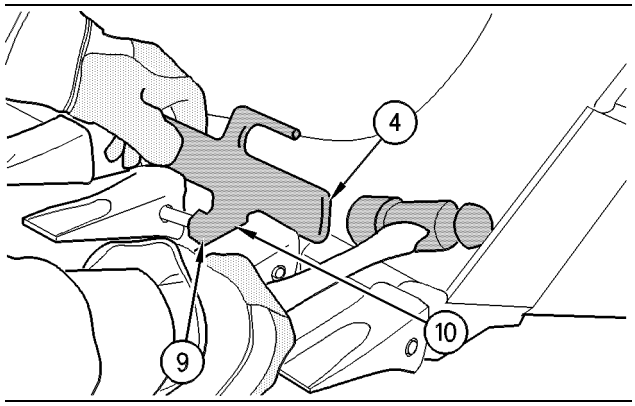


Illustration 136 g00590666

(4) Back of Pin-Master
(9) Pin setter
(10) Pin holder

a. Insert the pin through the bucket tooth.

b. Place the Pin-Master over the bucket tooth and locate the pin in the hole of holder (10).

c. Strike the tool with a hammer at the back of the tool (4) in order to start the pin.

d. Slide pin holder (10) away from the pin and rotate the tool slightly in order to align pin setter (9) with the pin.

e. Strike the end of the tool until the pin is fully inserted.

6. After you drive the pin, make sure that the retainer fits snugly into the pin groove.

K-Series Tip

Removal

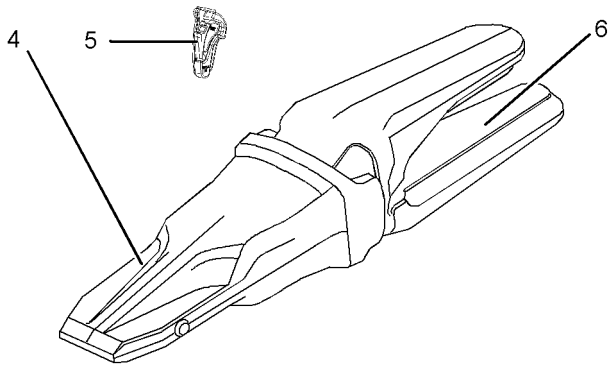


Illustration 137 g01389463

Note: Retainers are often damaged during the removal process. Caterpillar recommends the installation of a new retainer when bucket tips are rotated or replaced.

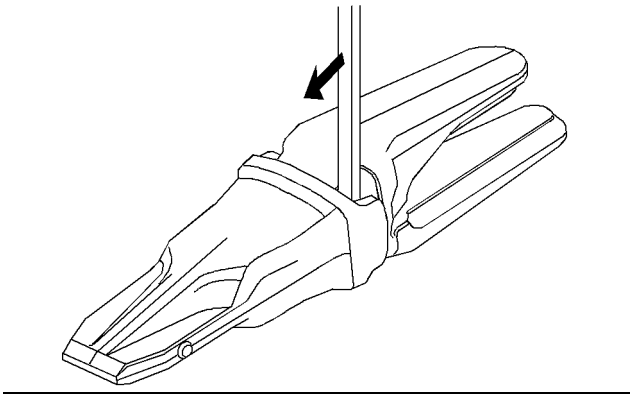


Illustration 138 g01175361

1. Use a pry bar in order to disengage retainer (5).

2. Use the pry bar in order to remove retainer (5) from bucket tip (4).

3. Remove bucket tip (4) from adapter (6) with a slight counterclockwise rotation.

4. Clean adapter (6).

Installation

1. Clean the adapter and the area around the latch, if necessary.

2. Install the new bucket tip onto the adapter with a slight clockwise rotation.

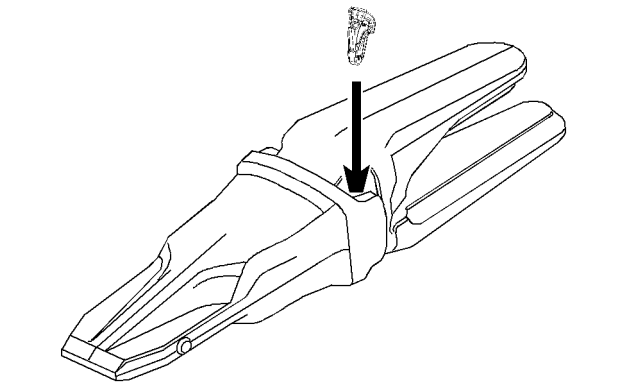


Illustration 139 g01124736

3. Install the retainer. Make sure that the retainer's latch catches under the tip pocket.

4. Make sure that the latch is properly seated by trying to remove the bucket tip.

i01889915

Bucket Upper Pivot Bearings - Lubricate

SMCS Code: 6101-086-BD; 6107-086-BD

1. Wipe off the fitting before you apply any lubricant.

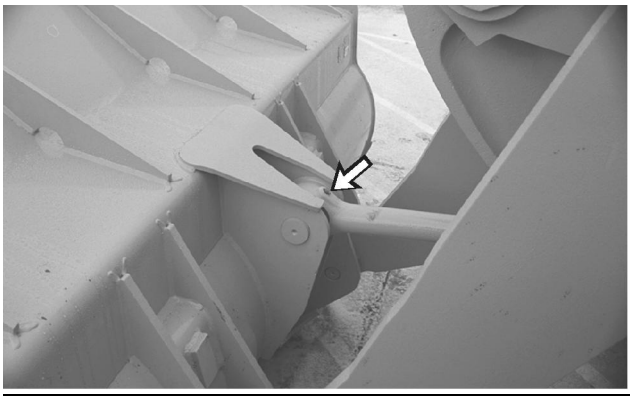


Illustration 140 g00554978

2. Apply lubricant through the fitting on the upper pivot bearing.

i01709216

Bucket Wear Plates - Inspect/Replace

SMCS Code: 6120-040; 6120-510

⚠ WARNING

Personal injury or death can result from the bucket falling.

Block the bucket before changing bucket wear plates.

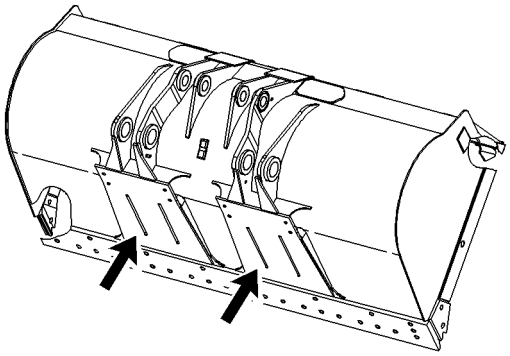


Illustration 141 g00879740

Inspect the wear plates. Replace the wear plates before damage to the bottom of the bucket occurs. Consult your Caterpillar dealer for replacement of wear plates.

i02593767

Cab Air Filter - Clean/Replace

SMCS Code: 7342-070; 7342-510

Note: Clean the filter elements more often in dusty conditions. If there is a noticeable reduction in the air flow from the air vents, check the filter elements.

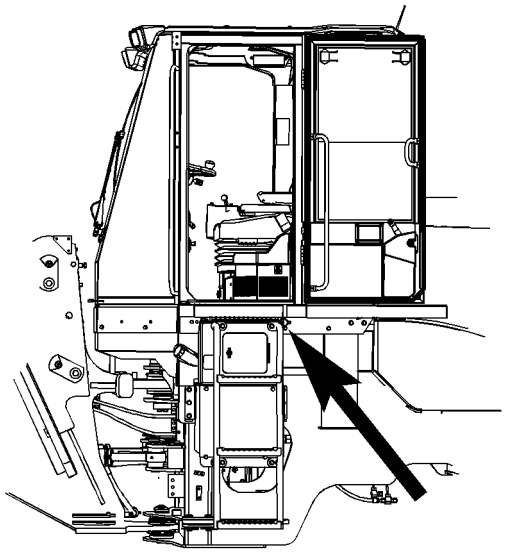


Illustration 142 g01300450

1. Remove the filter cover under the platform on the left side of the operator compartment. Remove the filter elements. Do not wash the filter elements while the filter elements are installed on the machine.

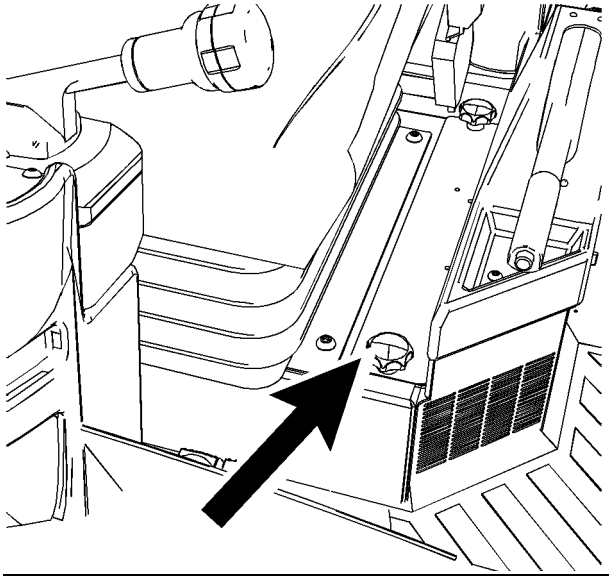


Illustration 143 g01417275

2. Raise the seat. Remove the filter cover on the left side of the seat.

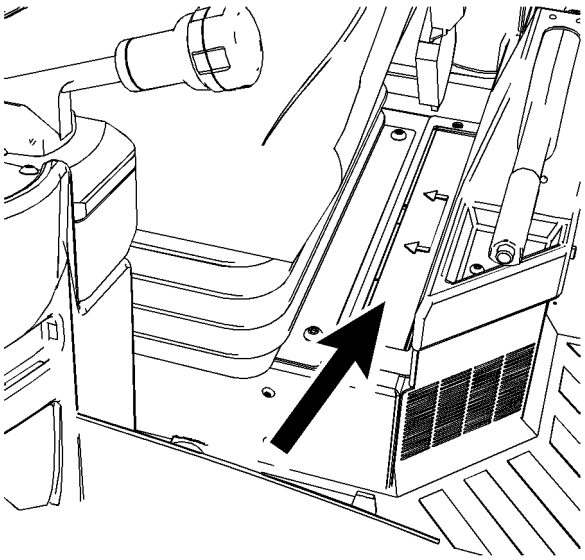


Illustration 144 g01417276

3. Remove the filter element.

4. Clean the filter elements with compressed air.

   You can also wash the filter elements in a solution of warm water with a nonsudsing household detergent. Rinse the filter elements in clean water. Air dry the filter elements thoroughly.

5. Install the filter element and the filter cover. Replace any filter elements that are worn or damaged.

Note: Make sure that the seals on the filter elements next to the seat are facing toward the parking brake lever when you install the filter elements.

i02816405

Camera - Clean (If Equipped)

SMCS Code: 7348-070

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

Display

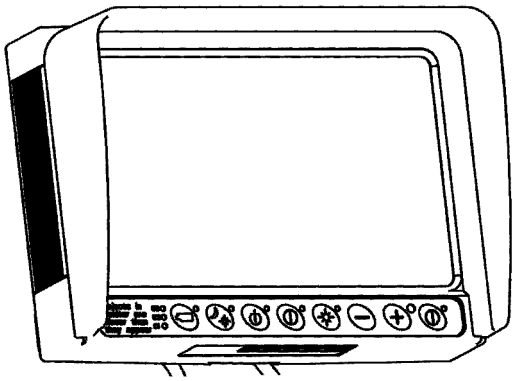


Illustration 145 g01223034

WAVS display

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.**

Camera

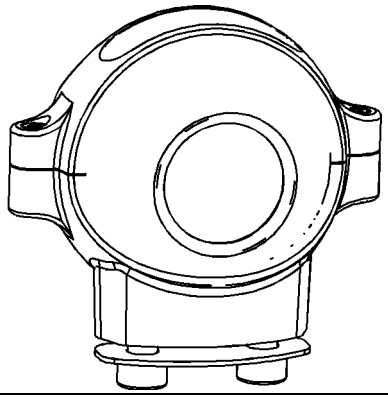


Illustration 146 g01223051

The WAVS camera is located on the rear of the machine in the center of the fan guard.

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.

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

Note: For more information on WAVS, refer to Operation and Maintenance Manual, SEBU8157, “Work Area Vision System”.

i02884329

Circuit Breakers - Reset

SMCS Code: 1420-529

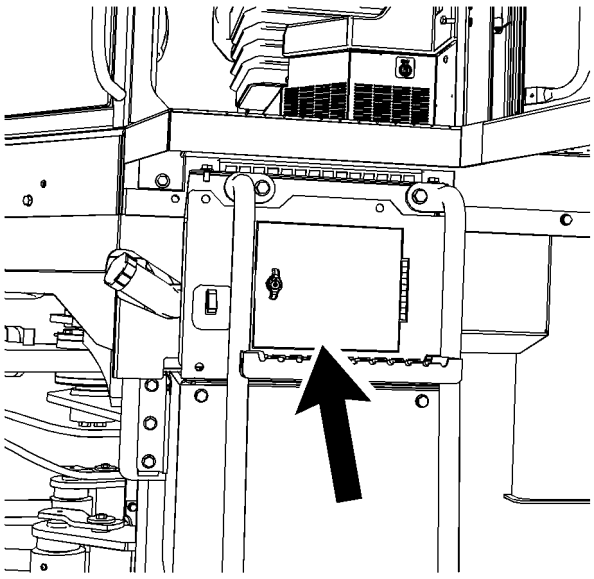


Illustration 147 g01436009

Open the access door (A) on the left side of the machine.

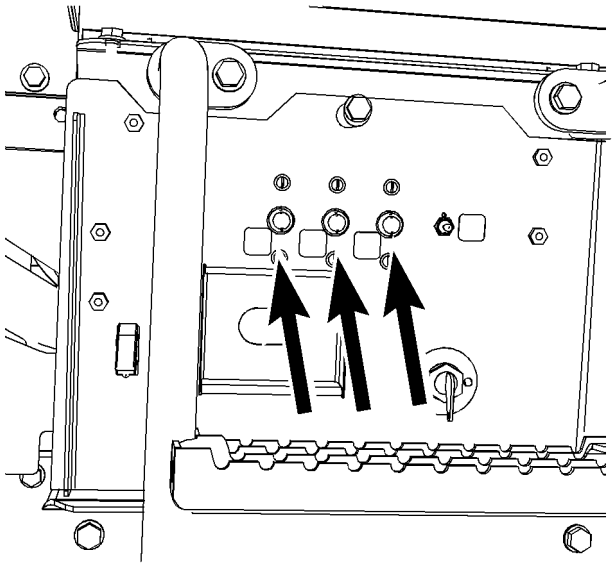


Illustration 148 g01436010

Circuit Breaker Reset – Push the button in order to reset the circuit breaker. The button will stay depressed if the circuit is working properly. Check the appropriate electrical circuit if the button does not stay depressed.

i02594018

Cooling System Coolant (ELC) - Change

SMCS Code: 1350-044-NL

⚠ 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.

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.

NOTICE

Topping off or mixing Cat ELC with other products that do not meet Caterpillar EC-1 specifications reduces the effectiveness of the coolant, shortens coolant service life, and may cause premature wear to components.

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

Reference: For information about adding Extender to the cooling system, refer to Operation and Maintenance Manual, “Cooling System Coolant Extender (ELC) - Add” or consult your Caterpillar dealer.

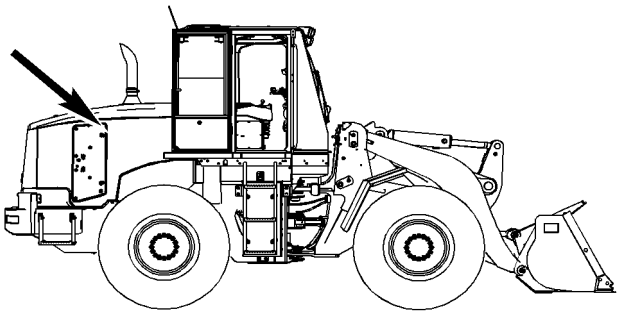


Illustration 149 g01300560

The cooling system pressure cap is located under the engine hood at the rear of the machine.

1. Open the engine hood. Slowly loosen cooling system pressure cap in order to relieve any system pressure. Remove the cooling system pressure cap.

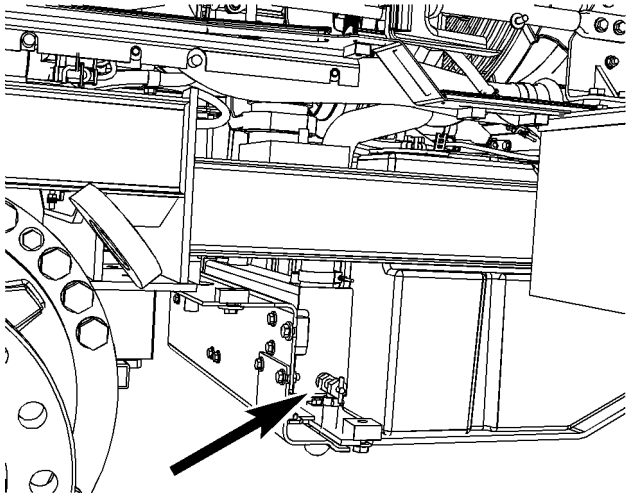


Illustration 150 g01310342

Coolant drain valve

The side frame and the tire are not shown for clarity.

2. The drain valve is located on the bottom of the transmission cooler on the left side of the machine. Open the drain valve. Allow the coolant to drain into a suitable container.

3. If an Extended Life Coolant (ELC) was previously used, flush the cooling system with clean water and close the drain valve. No other cleaning agents are required.

   If you change from another type of coolant to an Extended Life Coolant, close the drain valve. Fill the cooling system with a solution that consists of water with a 6 to 10 percent concentration of Caterpillar cleaning agent. Run the engine for 90 minutes. Then, drain the solution. After you drain the solution, thoroughly flush the cooling system with clean water. **All of the cleaning agent must be removed from the cooling system.**

4. Replace the water temperature regulator.

   Reference: Refer to Operation and Maintenance Manual, “Cooling System Water Temperature Regulator - Replace” for the correct procedure.

5. Add the Extended Life Coolant.

   Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill)” for the proper amount.

6. Start the engine. Run the engine without the cooling system pressure cap until the thermostat opens and the coolant level stabilizes.

7. Stop the engine. Maintain the coolant level in gauge on the coolant overflow reservoir.

8. Inspect the cooling system pressure cap and the cap seal. Clean the cooling system pressure cap with a clean cloth. If necessary, replace the cooling system pressure cap.

9. Install the cooling system pressure cap. Close the engine hood.

i02594021

Cooling System Coolant Extender (ELC) - Add

SMCS Code: 1352-544-NL

⚠ WARNING

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

NOTICE
Topping off or mixing Cat ELC with other products that do not meet Caterpillar EC-1 specifications reduces the effectiveness of the coolant, shortens coolant service life, and may cause premature wear to components.

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

When a Caterpillar Extended Life Coolant (ELC) is used, an Extender must be added to the cooling system.

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

Reference: For additional information about adding Extender, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Caterpillar dealer.

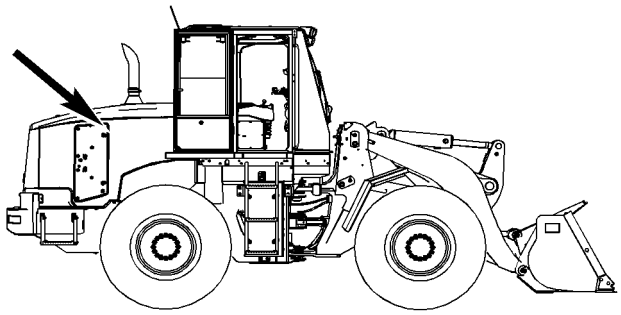


Illustration 151 g01300560

The cooling system pressure cap is located under the engine hood at the rear of the machine.

1. Open the engine hood. Slowly loosen cooling system pressure cap in order to relieve any system pressure. Remove the cooling system pressure cap.
2. If necessary, drain enough coolant from the cooling system in order to allow the addition of the Extender.
3. Add one bottle of 111-2372 (ELC) Extender to the coolant system.
4. Maintain the coolant level in the gauge on the coolant overflow reservoir.
5. Install the cooling system pressure cap. Close the engine hood.

i02594046

Cooling System Coolant Level - Check

SMCS Code: 1350-535-FLV

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.

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.

NOTICE
Topping off or mixing Cat ELC with other products that do not meet Caterpillar EC-1 specifications reduces the effectiveness of the coolant and shortens coolant service life.

Use only Caterpillar products or commercial products that have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants. Use only Extender with Cat ELC.

Failure to follow these recommendations can result in shortened cooling system component life.

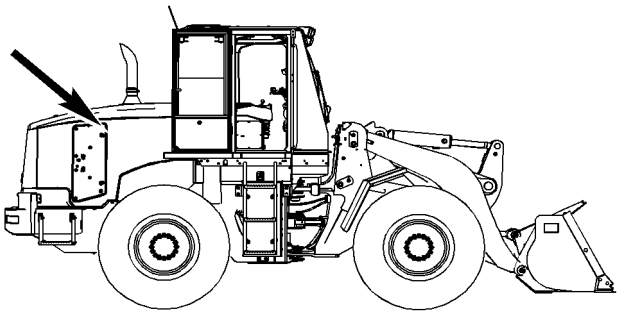


Illustration 152 g01300560

The sight gauge is located on the right side of the machine.

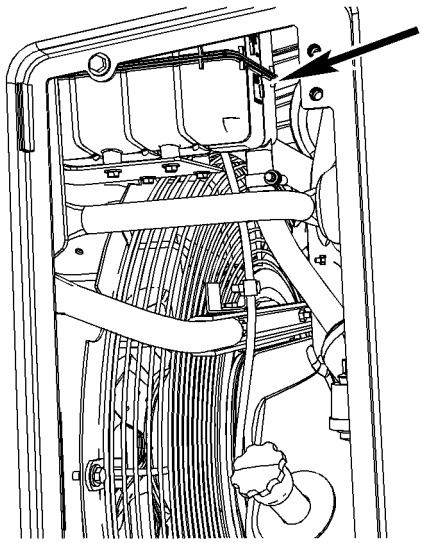


Illustration 153 g01447051

1. Maintain the coolant level within the gauge on the side of the coolant reservoir.

2. If the coolant level is low, slowly remove cooling system pressure cap.

3. Add the required coolant in order to maintain the coolant level within the sight gauge.

Note: If it is necessary to add coolant daily, check for leaks.

4. Inspect the cooling system pressure cap and the cap seal. Clean the cap and install the cap. If the cap is damaged, install a new cooling system pressure cap.

5. Inspect the radiator core for debris. Clean the radiator core, if necessary.

   Reference: Refer to Operation and Maintenance Manual, “Radiator Core - Clean” for more information.

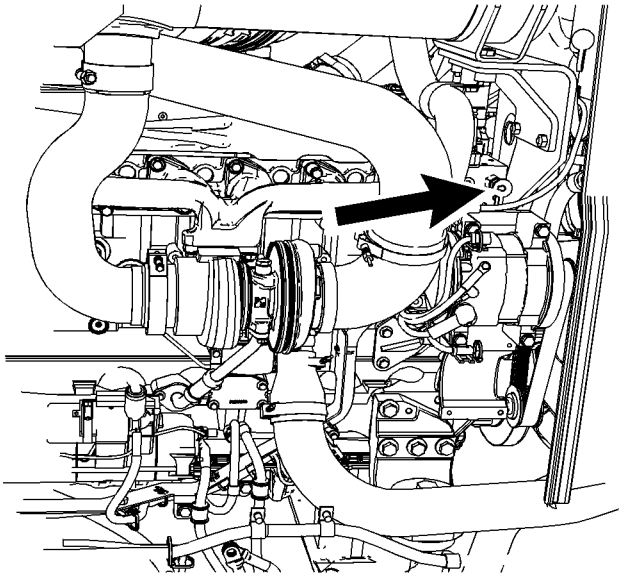
i02908607

Cooling System Coolant Sample (Level 1) - Obtain

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

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.

Note: Level 1 results may indicate a need for Level 2 Analysis.



g01447361

Illustration 154

Coolant Sample Port Above Alternator

Obtain the sample of the coolant as close as possible to the recommended sampling interval. In order to receive the full effect of S·O·S analysis, you must establish a consistent trend of data. In order to establish a pertinent history of data, perform consistent samplings that are evenly spaced. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Use the following guidelines for proper sampling of the coolant:

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Keep the unused sampling bottles stored in plastic bags.
- Obtain coolant samples directly from the coolant sample port. You should not obtain the samples from any other location.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.

Submit the sample for Level 1 analysis.

For additional information about coolant analysis, see Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Caterpillar dealer.

i02911182

Cooling System Coolant Sample (Level 2) - Obtain

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

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.

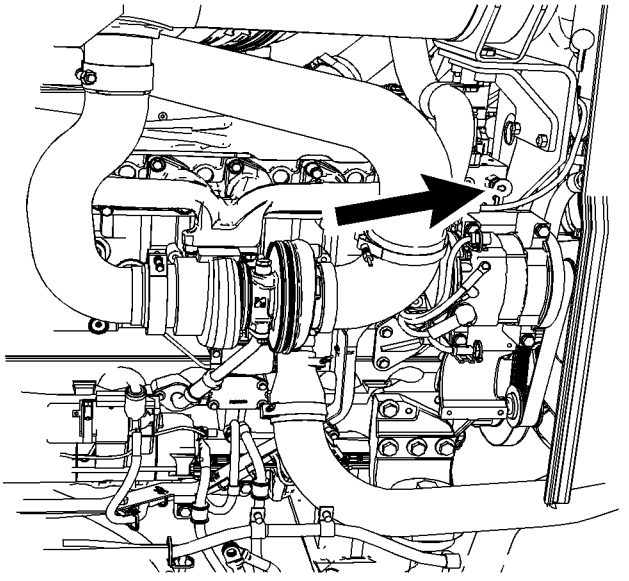


Illustration 155

g01447361

Obtain the sample of the coolant as close as possible to the recommended sampling interval. Supplies for collecting samples can be obtained from your Caterpillar dealer.

Refer to Operation and Maintenance Manual, “Cooling System Coolant Sample (Level 1) - Obtain” for the guidelines for proper sampling of the coolant.

Submit the sample for Level 2 analysis.

Reference: For additional information about coolant analysis, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” or consult your Caterpillar dealer.

i04606857

Cooling System Water Temperature Regulator - Replace

SMCS Code: 1355-510; 1393-010

⚠ 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.

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.

Replace the water temperature regulator (thermostat) according to the Maintenance Interval Schedule.

The thermostat should be replaced after the cooling system has been cleaned. Replace the thermostat and seals while the cooling system is drained.

Note: If you are only replacing the thermostat, drain the cooling system coolant to a level that is below the thermostat housing.

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

Reference: For information on replacing the water temperature regulator, refer to the Service Manual, “Disassembly and Assembly”.

i02767684

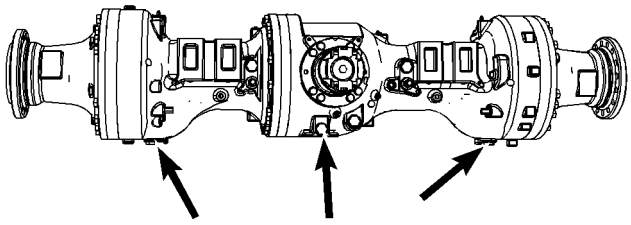
Differential and Final Drive Oil - Change

SMCS Code: 3278-044; 4011-044

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.



g01264364

Illustration 156
Front differential and final drive drain plugs

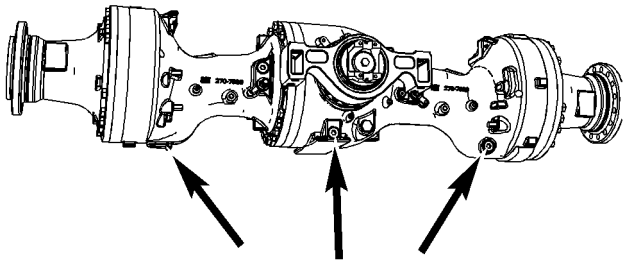


Illustration 157 g01433537

Rear differential and final drive drain plugs

1. Remove the drain plugs for both differentials. Allow the oil to drain into a suitable container.

2. Clean the drain plugs and install the drain plugs.

Note: If your machine is equipped with the axle oil cooler, there are 2 magnetic filters that need to be cleaned. If your machine is not equipped with the axle oil cooler, skip the next step.

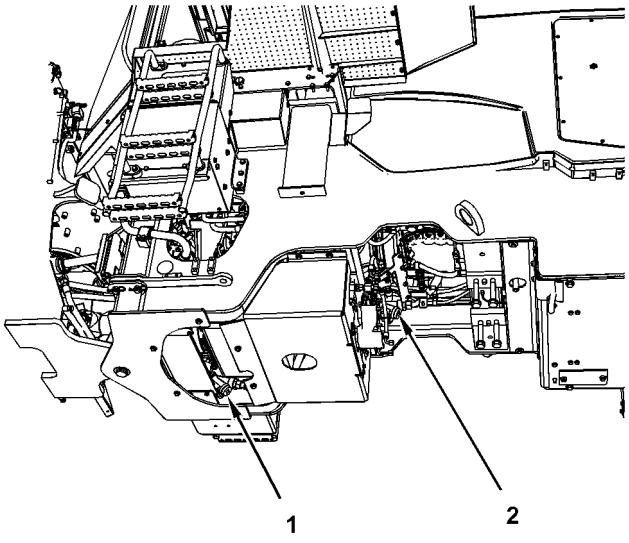


Illustration 158 g01384680

Note that parts are removed for clarity.

(1) Front Magnetic Oil Filter
(2) Rear Magnetic Oil Filter

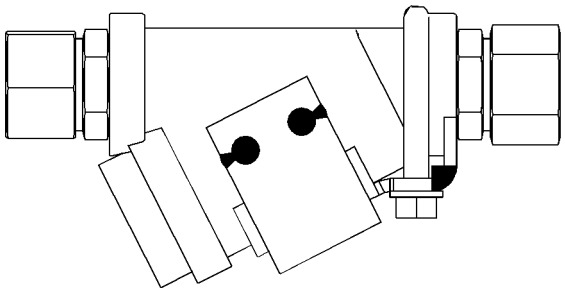


Illustration 159 g01448141

3. Remove the magnetic plug on the front filter. Clean the magnetic plug with a clean nonflammable solvent. Install the magnetic plug. Repeat the process for the rear magnetic filter.

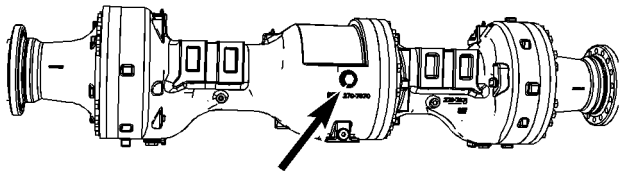


Illustration 160 g01264367

Front differential and final drive filler plug

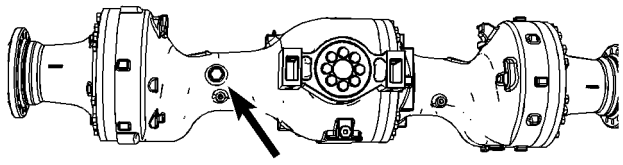


Illustration 161 g01264369

Rear differential and final drive filler plug

Note: Wipe the covers and surfaces around openings before you remove the filler plug.

4. Remove the filler plugs for both differentials. Fill the differentials with oil. Maintain the oil level at the bottom of the filler plug hole.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for the proper oil.

Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill)” for the amount of oil.

5. Install the filler plugs for each differential. Operate the machine for a few minutes and allow the oil to flow completely through the axles. Remove the filler plugs and check the oil level. Add oil, if necessary.

6. Clean the filler plugs and install the filler plugs.

i02527321

Differential and Final Drive Oil Level - Check

SMCS Code: 3278-535-FLV; 4011-535-FLV

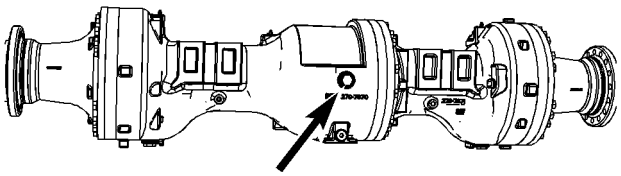
NOTICE
Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

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.

1. Operate the machine for a few minutes. This will allow all of the oil to reach a common level.

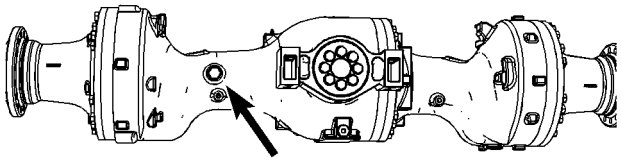
2. Park the machine on level ground. Lower the attachment and apply slight downward pressure. Engage the parking brake. Stop the machine.



g01264367

Illustration 162

Front differential and final drive filler plug



g01264369

Illustration 163

Rear differential and final drive filler plug

3. Remove the filler plug for the differential. Maintain the oil level at the bottom of the filler plug hole. Add oil, if necessary.

4. Install the filler plug.

i02527335

Differential and Final Drive Oil Sample - Obtain

SMCS Code: 3278-008; 4011-008; 4070-008; 7542

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.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the differential oil for a more accurate sample.

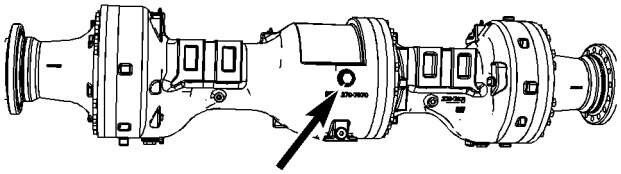


Illustration 164 g01264367

Front differential and final drive filler plug

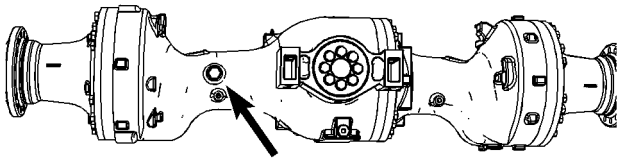


Illustration 165 g01264369

Rear differential and final drive filler plug

2. The differential and final drives are not equipped with sampling valves. Obtaining an oil sample will require the use of a vacuum pump or equivalent in order to extract the oil from the component. Extract the oil through the filler openings on the differential and final drives.

3. Complete any additional required work. Fill the differential and final drives with oil, as required. Install the dipstick/fill plugs.

Reference: For more information, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i02926782

Drive Shaft Spline - Lubricate

SMCS Code: 3253-086-SN

Note: For better access, fully articulate the machine to the right or to the left. Because the steering frame lock cannot be connected, remove the engine start switch key and turn the battery disconnect switch to the OFF position in order to keep the machine from being articulated.

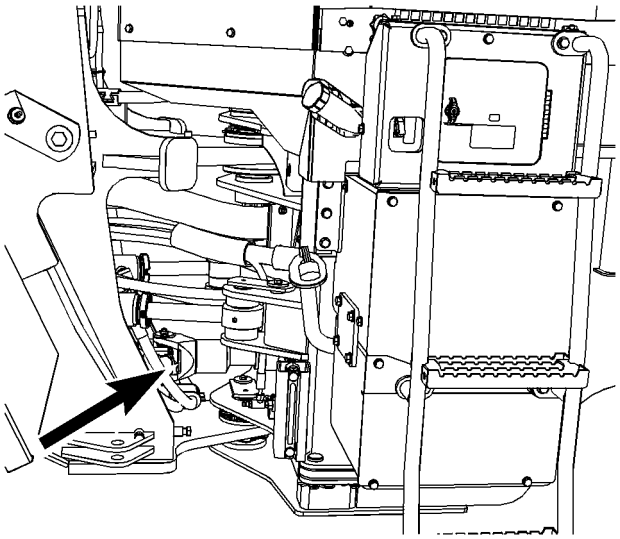


Illustration 166 g01453068

Wipe off the fitting before any lubricant is applied. Lubricate all the splines on the drive shaft.

Apply lubricant through the fittings on the drive shaft spline. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for the proper grease.

i02926787

Drive Shaft Support Bearing - Lubricate

SMCS Code: 3267-086-BD

Note: For better access, articulate the machine to the right or to the left. Because the steering frame lock cannot be connected, remove the engine start switch key and turn the battery disconnect switch to the OFF position in order to keep the machine from being articulated.

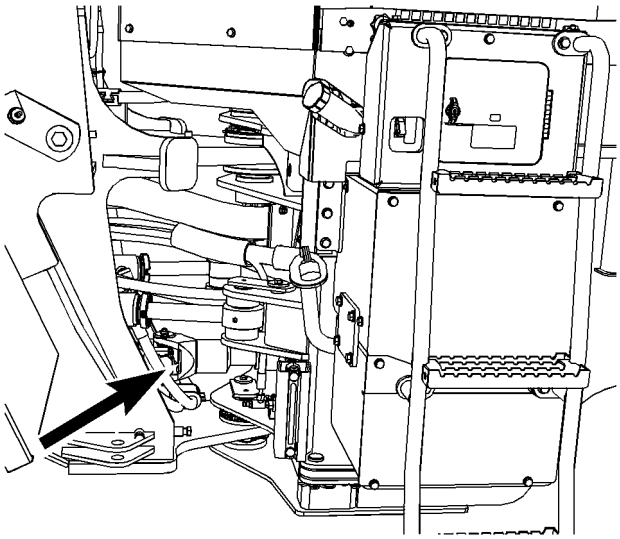


Illustration 167 g01453068

Wipe off the fitting before any lubricant is applied.

Apply lubricant through the fitting on the drive shaft support bearing. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for the proper grease.

i02880032

Drive Shaft Universal Joints - Lubricate

SMCS Code: 3251-086

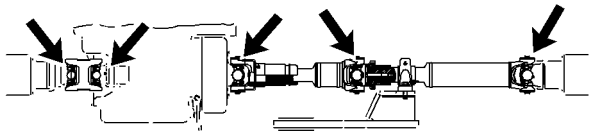


Illustration 168 g01433505

1. Wipe off the grease fittings before lubricating.
2. Lubricate all grease fittings on the universal joints. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for the proper grease.

i02926789

Engine Air Filter Primary Element - Clean/Replace

SMCS Code: 1054-070-PY; 1054-510-PY

⚠ WARNING

To avoid personal injury, always wear eye and face protection when using pressurized air.

NOTICE

Caterpillar recommends certified air filter cleaning services that are available at Caterpillar dealers. The Caterpillar cleaning process uses proven procedures to assure consistent quality and sufficient filter life.

Observe the following guidelines if you attempt to clean the filter element:

Do not tap or strike the filter element in order to remove dust.

Do not wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 207 kPa (30 psi). Direct the air flow up the pleats and down the pleats from the inside of the filter element. Take extreme care in order to avoid damage to the pleats.

Do not use air filters with damaged pleats, gaskets, or seals. Dirt entering the engine will cause damage to engine components.

Clean the engine air filter primary element when the clogged air filter indicator is displayed on the Caterpillar controller. Clean the engine air filter primary element as soon as convenient.

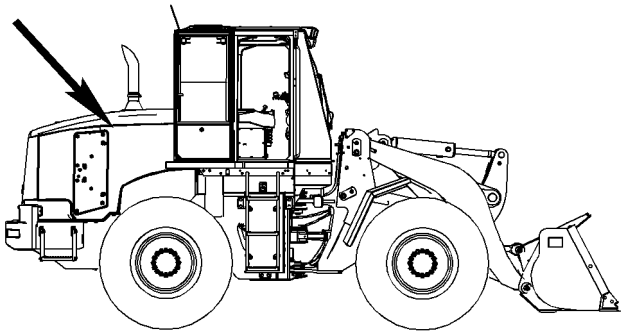


Illustration 169 g01300434

1. Open the engine hood. The air cleaner is located on the right side of the engine compartment.

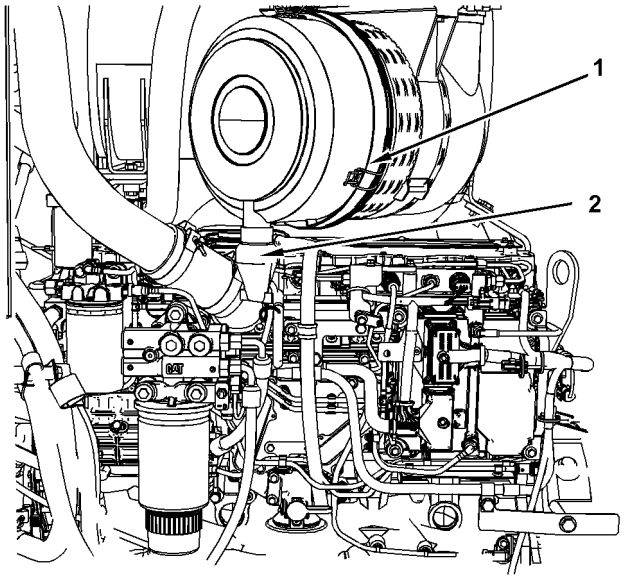


Illustration 170 g01453793

(1) Cover Latches for the Air Cleaner
(2) Vacuator Valve

2. Empty the dirt from the vacuator valve (2). Loosen the cover latches (1) and remove the air cleaner cover.

Note: The latches for the air cleaner housing may snap open when you release the latches.

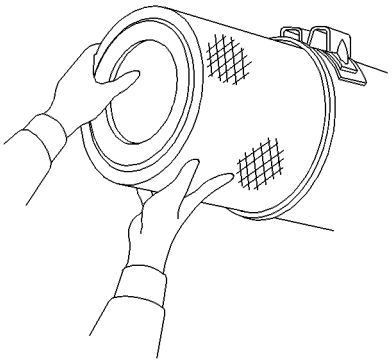


Illustration 171 g00101415

3. Remove the primary filter element from the air cleaner housing. In order to remove the engine air filter primary element, pull the element outward. While you pull the element outward, rock the element.

Use Steps 4 **through** 6 **in order to clean the primary element:**

4. Inspect the primary element. If the pleats, the gaskets, or the seals are damaged, discard the element. Replace a damaged primary element with a clean primary element.

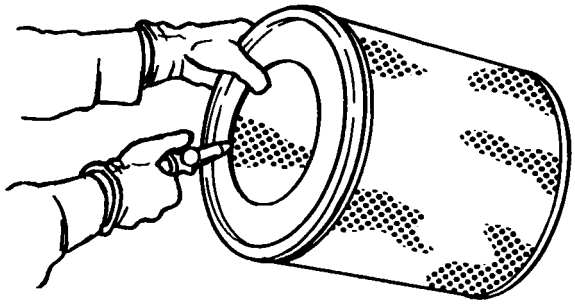


Illustration 172 g00328468

5. If the primary element is not damaged, clean the primary element.

Pressurized air can be used to clean a primary element that has not been cleaned more than two times. Use filtered, dry air at a maximum pressure of 207 kPa (30 psi).

Note: Pressurized air will not remove deposits of carbon and oil.

6. When you clean the primary element, always begin in the inside of the element (clean side). This will force dirt particles toward the outside of the element (dirty side).

Direct the air along the length (inside) of the filter. This will help prevent damage to the paper pleats.

Note: Do not aim the stream of air directly at the primary element. Dirt could be forced further into the pleats.

Use Steps 7 **through** 10 **in order to inspect the primary element:**

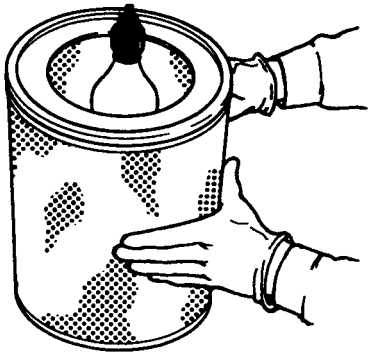


Illustration 173 g00328470

7. Place a light bulb inside the filter element. Use a 60 watt blue light in a dark room or in a similar facility. Inspect the primary element for light that may show through the filter material.

8. Inspect the primary element while you rotate the element. Inspect the primary element for tears and/or holes. Do not use a primary element that has any tears and/or holes in the filter material. Do not use a primary element with damaged pleats, gaskets, or seals.

9. If it is necessary, compare the primary element to a new primary element. Use a new primary element that has the same part number. This may be necessary in order to confirm the results of the inspection.

10. Discard a damaged primary element.

Use Steps 11 **through** 14 **to install a clean primary element:**

NOTICE
Do not use a filter if the pleats, the gaskets or the seals are damaged.

11. Install a clean primary filter element over the engine air filter secondary element. Apply firm pressure to the end of the primary element as you gently rock the filter element. This seats the primary element.

12. Clean the cover for the air cleaner housing. Align the slot on the cover with the pin on the air cleaner housing. Install the cover.

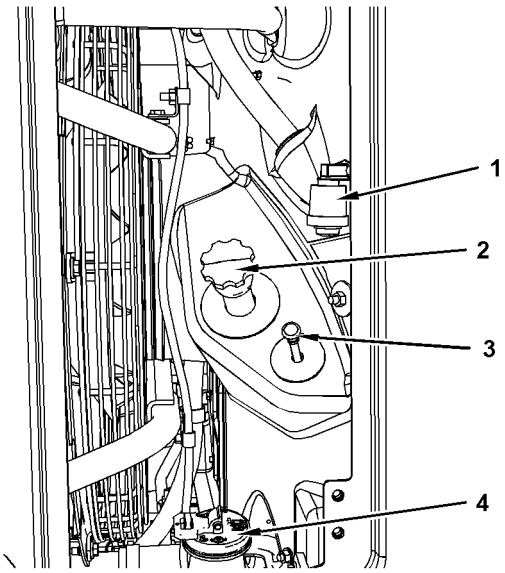


Illustration 174 g01246185

(1) Air Filter Service Indicator
(2) Engine Oil Filler
(3) Engine oil Dipstick
(4) Fuel Filler

13. Reset the air filter service indicator (1), if necessary.

14. Close the engine hood.

i01702009

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

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

NOTICE
Always replace the secondary element. Do not attempt to reuse it by cleaning. Engine damage could result.

Note: Replace the secondary element when you service the primary element for the third time. If a clean primary element has been installed and a warning for the air filter still occurs, replace the secondary element. Also if the exhaust smoke remains black and a clean primary element has been installed, replace the secondary element.

1. Remove the primary element.

   Reference: Refer to Operation and Maintenance Manual, “Engine Air Filter Primary Element - Clean/Replace” for the correct procedure.

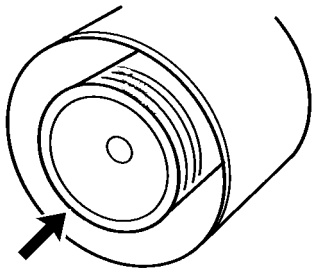


Illustration 175 g00845406

2. Remove the secondary element.
3. Cover the air inlet opening. Clean the inside of the air cleaner housing.
4. Inspect the gasket between the air inlet pipe and the air cleaner housing. Replace the gasket if the gasket is damaged.
5. Uncover the air inlet opening. Install a new secondary element.
6. Install a clean primary element and the cover for the air cleaner housing.
7. Close the access door.

i02594033

Engine Air Filter Service Indicator - Inspect

SMCS Code: 7452-040

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

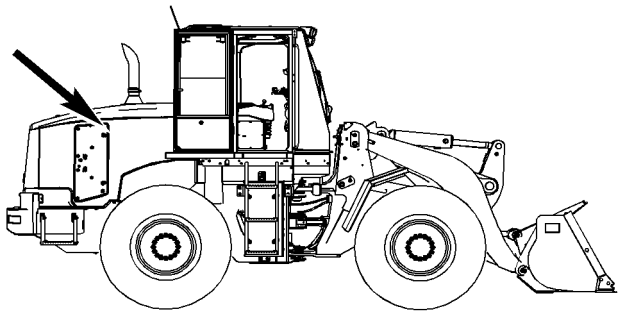


Illustration 176 g01300560

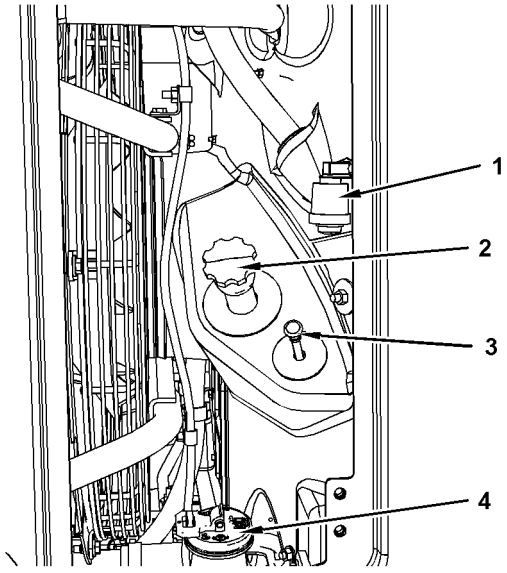


Illustration 177 g01246185

(1) Air Filter Service Indicator
(2) Engine Oil Filler
(3) Engine oil Dipstick
(4) Fuel Filler

1. Open the access door on the right side of the machine. The air filter service indicator (1) is located in the engine compartment on the right side of the machine.
2. If the yellow piston in the air filter service indicator enters the red zone, service the air cleaner.
3. Check the condition of the air filter service indicator. If the air filter service indicator is damaged, then replace the air filter service indicator.

4. Close the access door.

i02594029

Engine Air Filter Service Indicator - Inspect/Replace

SMCS Code: 7452-040; 7452-510

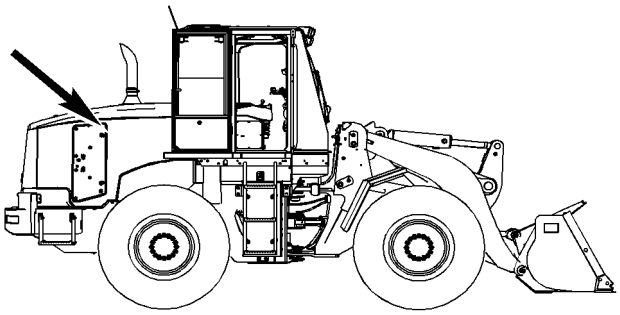


Illustration 178 g01300560

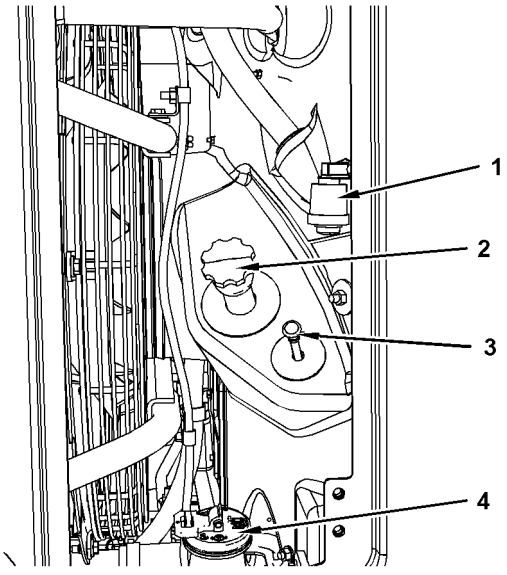


Illustration 179 g01246185

(1) Air Filter Service Indicator
(2) Engine Oil Filler
(3) Engine oil Dipstick
(4) Fuel Filler

To check the condition of the service indicator (1), try resetting the service indicator. This should require less than three pushes of the reset button.

Next, check the movement of the yellow piston in the service indicator. Start the engine and accelerate the engine to high idle for a few seconds. After the governor control pedal is released, the yellow piston should remain at the highest position that was achieved during acceleration.

If either of these conditions are not met, replace the service indicator.

i04796938

Engine Crankcase Breather - Clean (If Equipped)

SMCS Code: 1317-070

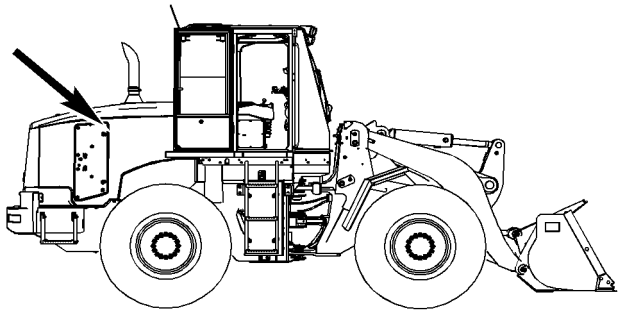


Illustration 180 g01300560

Open the engine hood. The crankcase breather is located on the top of the engine.

Note: If the engine is equipped with a fumes disposal filter, refer to Operation and Maintenance Manual, “Open Crankcase Ventilation (OCV) Fumes Disposal Filter - Replace” for details about replacing the filter.

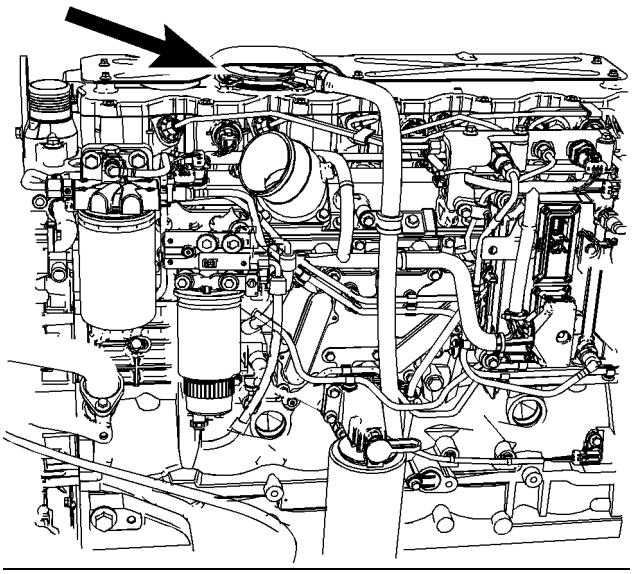


Illustration 181 g01453119

1. Remove the heat shield from the top of the engine.
2. Loosen the breather outlet hose clamp . Remove the breather hose from the breather cover.
3. Remove the breather element cover assembly .
4. Check the condition of the cover seal. If the used seal is damaged, replace the seal with a new seal.
5. Wash the element and the cover assembly in clean, nonflammable solvent.
6. To dry the element, shake the element or use air pressure.
7. Inspect the breather hose for damage. Replace the breather hose, if necessary.
8. Install the breather element. Install the breather element cover assembly.
9. Install the breather hose and breather outlet hose clamp.
10. Install the heat shield on the top of the engine.
11. Close the engine hood.

i02594048

Engine Oil Level - Check

SMCS Code: 1000-535-FLV

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.

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

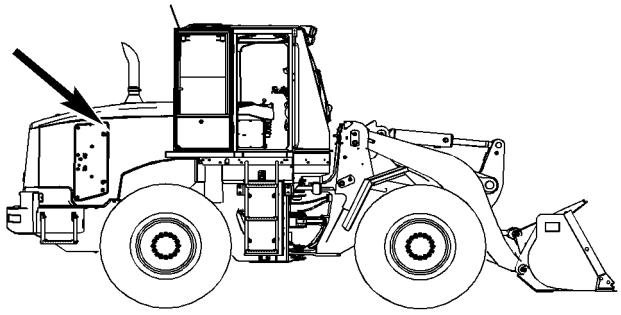


Illustration 182 g01300560

1. Open the access door on the right side of the machine.

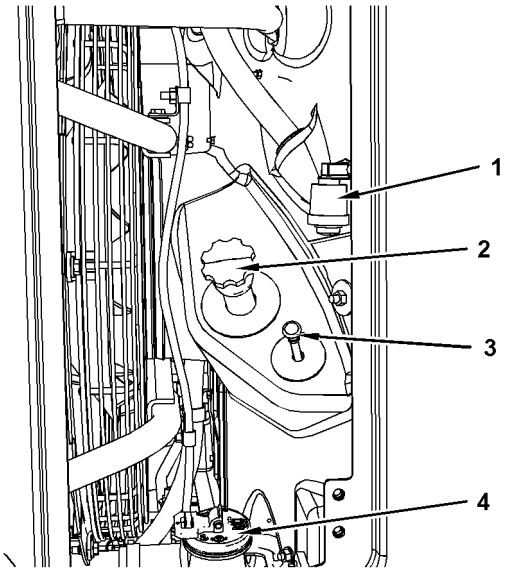


Illustration 183 g01246185

(1) Air Filter Service Indicator
(2) Engine Oil Filler
(3) Engine oil Dipstick
(4) Fuel Filler

2. The engine oil dipstick (3) is located on the right side of the machine. While the engine is stopped, maintain the oil level at the “FULL” mark on the engine oil dipstick.

3. If necessary, remove the engine oil filler cap (2) and add oil.

4. Clean the engine oil filler cap and install the engine oil filler cap.

5. Close the access door.

i02926794

Engine Oil Sample - Obtain

SMCS Code: 1348-008; 7542

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.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the engine oil for a more accurate sample.

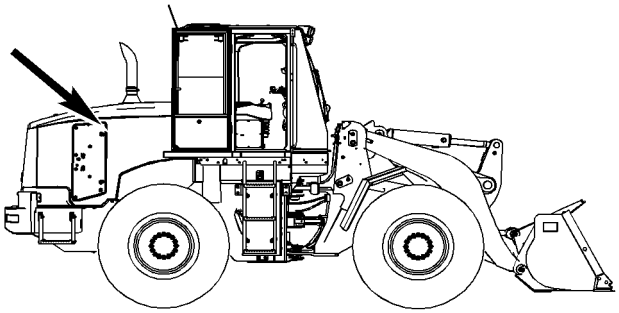


Illustration 184 g01300560

2. Open the engine hood.

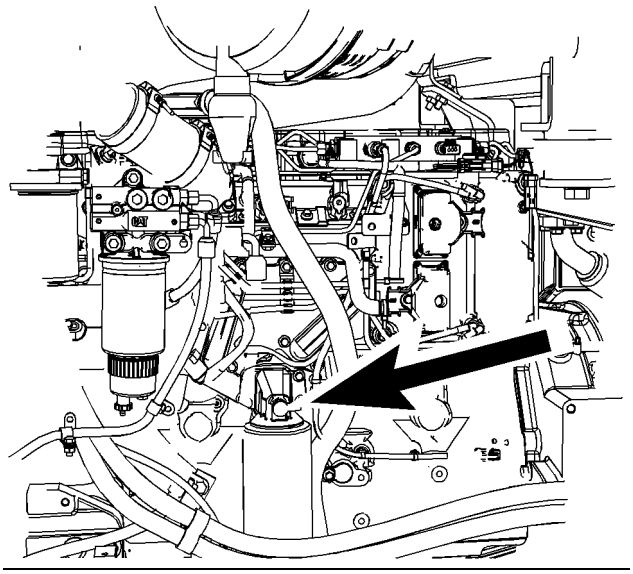


Illustration 185 g01453124

3. Use the sampling valve in order to obtain a sample of engine oil.

   The sampling valve is located on the engine oil filter base on the right side of the engine.

4. Close the engine hood.

Reference: For more information, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i03650025

Engine Oil and Filter - Change

SMCS Code: 1318-510

Selection of the Oil Change Interval

NOTICE
A 500 hour engine oil change interval is available, provided that the 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 Services 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.

The normal engine oil change interval is listed in this Operation and Maintenance Manual, “Maintenance Interval Schedule”.

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. Also refer to Special Publication, SEBU5898, “Cold Weather Recommendations for All Caterpillar Machines”. Poor maintenance of air filters or of fuel filters requires reduced oil change intervals. Consult your Caterpillar dealer for more information if this product will experience abnormally harsh operating cycles or harsh environments.

Adjustment of the Oil Change Interval

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

Cat oil filters are recommended.

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 is 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 the “Lubricant Viscosities for Ambient Temperatures” Table in this Operation and Maintenance Manual

Program B

Optimizing Oil Change Intervals

Begin with a 250 hour oil change interval. The oil change intervals are adjusted by increments. Each increment is an additional 50 hours. Periodic oil sampling and analysis is 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: Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”

Reference: Special Publication, SEBU5898, “Cold Weather Recommendations for All Caterpillar Machines”

Reference: Special Publication, PEDP7035, “Optimizing Oil Change Intervals”

Reference: Special Publication, PEDP7036, “S·O·S Fluid Analysis”

Reference: Special Publication, PEDP7076, “Understanding the S·O·S Oil Analysis Tests”

Procedure for Changing the Engine Oil and Filter

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.

1. Open the engine hood.

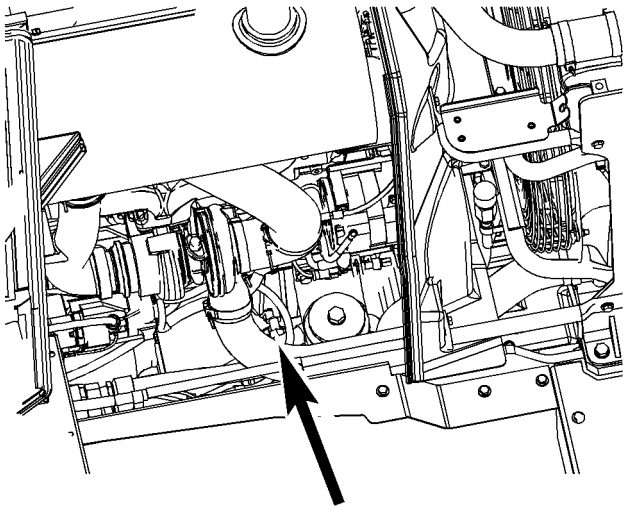


Illustration 186 g01308805

Oil drain on the left side

2. The crankcase drain valve is on the left side of the oil pan. Open the crankcase drain valve. Allow the oil to drain into a suitable container. Close the drain valve.

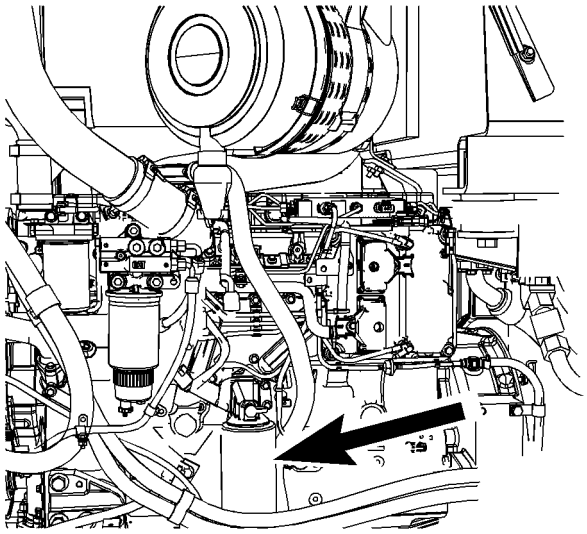


Illustration 187 g01453122

3. Remove the filter element with a strap type wrench.

Reference: Refer to Operation and Maintenance Manual, “Oil Filter - Inspect” for information about inspecting used filter elements for metal and for other debris.

4. Clean the filter housing base. Make sure that the used filter gasket is completely removed.

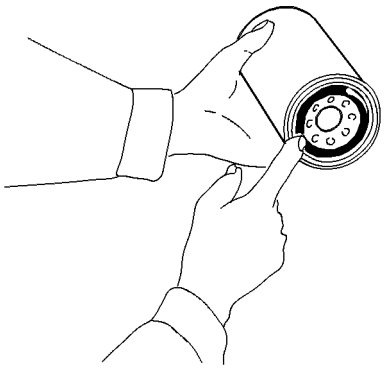


Illustration 188 g00101318

5. Apply a thin coat of clean engine oil to the seal on the new filter. Install a new engine oil filter hand tight until the seal of the engine oil 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 engine oil filter that are spaced 90 degrees or 1/4 or a turn away from each other. When you tighten the engine oil filter, use the rotation index marks as a guide.

6. 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: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

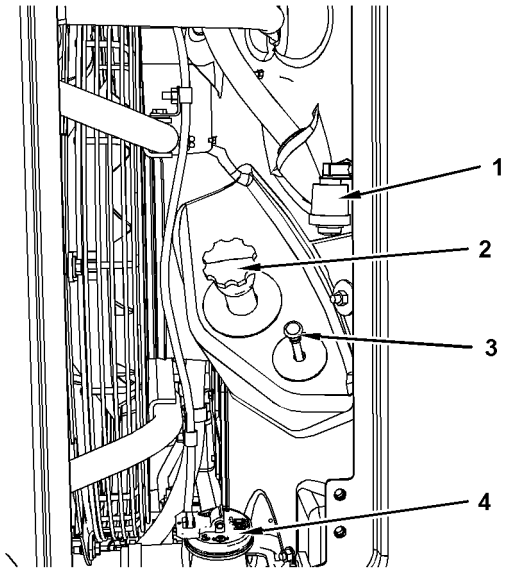


Illustration 189 g01246185

(1) Air Filter Service Indicator
(2) Engine Oil Filler
(3) Engine oil Dipstick
(4) Fuel Filler

Note: The oil filler cap (2) and the dipstick (3) are on the right side of the machine.

7. Remove oil filler cap (2). Fill the crankcase with new oil. Clean the filler cap and install the filler cap.

   Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill)” in order to determine the correct amount of oil.

8. Start the engine and allow the oil to warm. Check the engine for leaks.

9. While the engine is running, check the “LOW IDLE” side of dipstick (3). Maintain the oil between the “ADD” mark and the “FULL” mark. If necessary, add oil.

10. Close the engine hood and stop the engine.

i04538255

Engine Valve Lash - Check

SMCS Code: 1105-535

In order to perform the valve lash adjustment, refer to Systems Operation, Testing and Adjusting, “Engine Valve Lash - Inspect/Adjust”.

Note: A qualified mechanic should adjust the engine valve lash because special tools and training are required.

i02926773

Ether Starting Aid Cylinder - Replace (If Equipped)

SMCS Code: 1456-510-CD

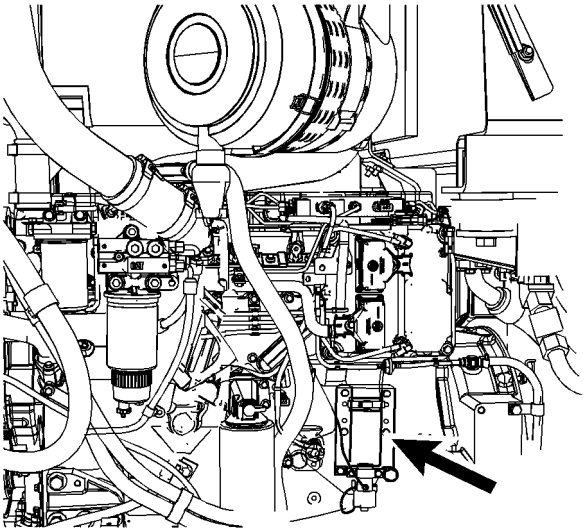


Illustration 190 g01453126

1. Open the engine hood. The ether starting aid cylinder is mounted on the right side of the engine below the ECM module.
2. Loosen retaining clamp (1) and unscrew ether starting aid cylinder (2).
3. Remove the gasket. Install the new gasket that is provided with each new ether starting aid cylinder.
4. Install new ether starting aid cylinder (2) hand tight. Tighten retaining clamp (1) securely.
5. Close the engine hood.

i03900803

Fuel System - Prime

SMCS Code: 1250-548

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.

Note: The volume of air in the water separator is small. Usually, it is not necessary to prime the fuel system if only the water separator element has been changed.

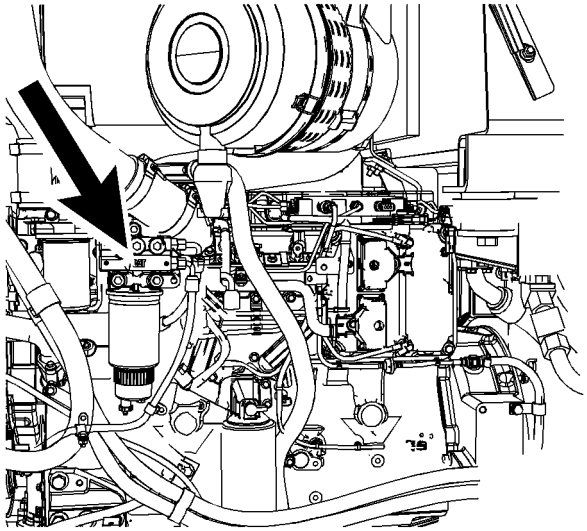


Illustration 191 g01453131

1. Stop the engine and open the engine hood. The fuel priming pump is located above the primary fuel filter on the right side of the machine. This machine is equipped with an electric fuel priming pump. The toggle switch for the pump is located on the filter base. Operate the fuel pump for approximately 60 seconds.
2. Start the engine.

Note: Additional priming may be needed if you are priming because of the following circumstances:

- The engine will not start.
- The engine starts but the engine continues to misfire.
- The engine starts but the engine continues to emit smoke.
- The engine has run out of fuel.
- The fuel injectors have been removed from the engine.

Operate an electric fuel pump for approximately 30 seconds for this additional priming.

i02926798

Fuel System Primary Filter (Water Separator) - Drain

SMCS Code: 1263-543

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.

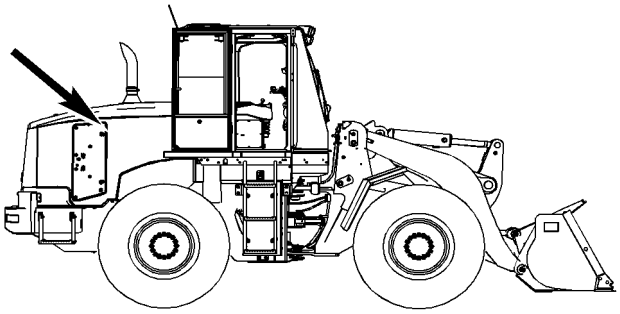


Illustration 192 g01300560

The water separator is located in the engine compartment on the right side of the machine.

1. Open the engine hood.

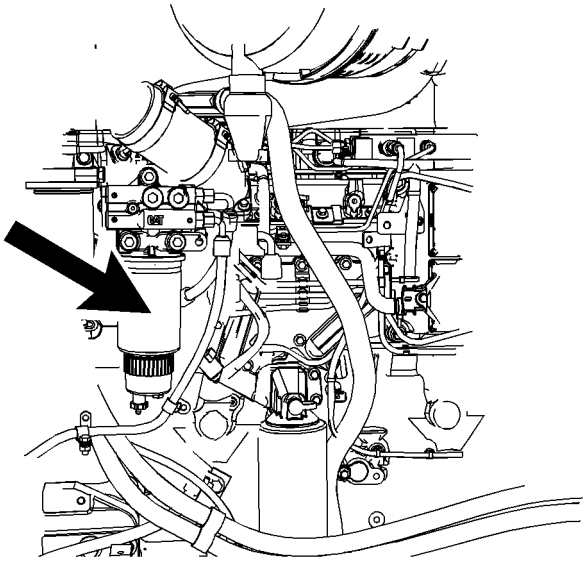


Illustration 193 g01453559

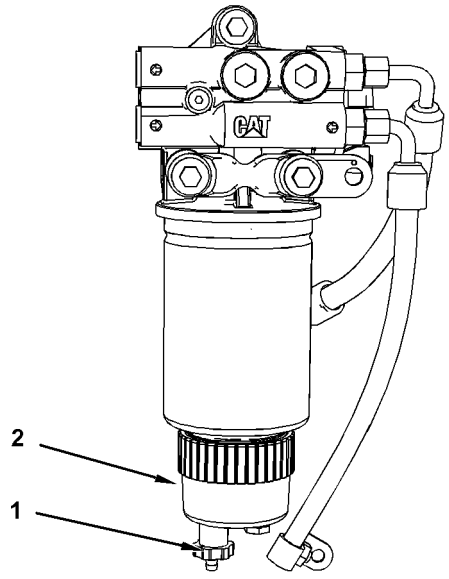


Illustration 194 g01309761

(1) Drain Valve
(2) Water Separator

2. Loosen the drain valve (1) on the bottom of the water separator (2). Allow the water and the sediment to drain into a suitable container.

3. Tighten the drain valve.

Note: The water separator is under suction during normal engine operation. Tighten the drain valve in order to prevent air leakage into the fuel system.

4. If the engine fails to start, change the fuel filter. If there is a power loss, change the fuel filter.

5. Close the engine hood.

i02926799

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1260-510; 1263-510-FQ

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.

NOTICE
Do not fill fuel filters with fuel before installing them. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts. The fuel system should be primed prior to starting the engine.

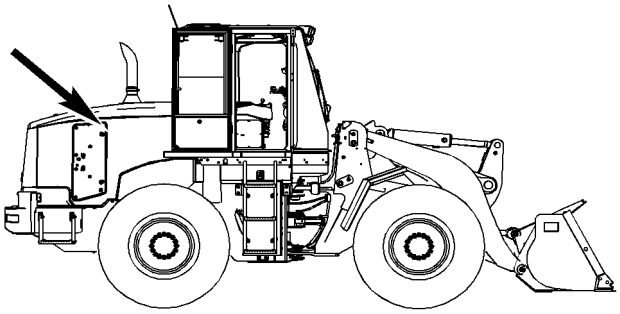


Illustration 195 g01300560

The water separator element is located in the engine compartment on the right side of the machine.

1. Open the engine hood.

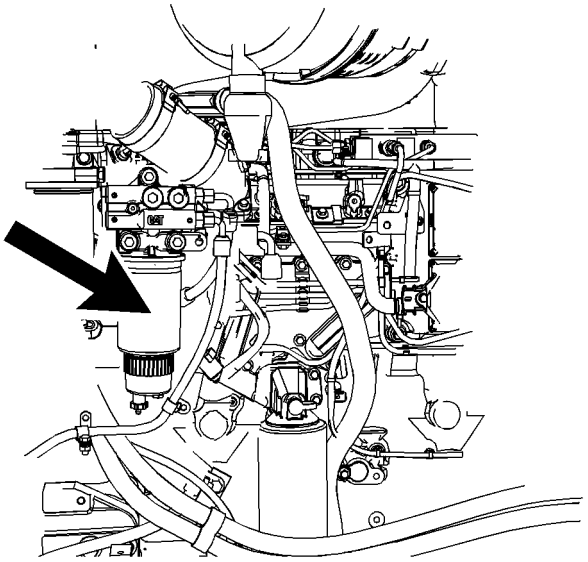


Illustration 196 g01453559

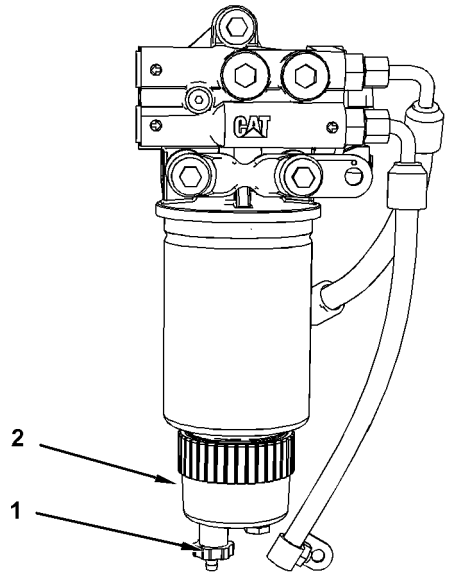


Illustration 197 g01309761

(1) Drain Valve
(2) Water Separator

2. Open the drain valve (1) on the water separator bowl (2). Allow the water and fuel to drain into a suitable container.

3. Support the water separator element and rotate the filter counterclockwise. Remove the filter.

4. Remove the water separator bowl (2) from the filter element. Clean the water separator bowl and clean the O-ring groove.

Note: The water separator bowl (2) is reusable. Do not discard the water separator bowl.

5. Inspect the O-ring seal of the water separator bowl for damage. Replace the O-ring seal, if necessary.

6. Lubricate the O-ring seal with clean diesel fuel or lubricate the O-ring seal with motor oil. Place the O-ring seal in the water separator bowl.

7. Install the water separator bowl onto the new filter element by hand until the filter element is snug. Do not use tools to tighten the filter element.

8. Install the new filter assembly. Rotate the filter clockwise in order to fasten the filter to the mounting base.

9. Tighten the drain valve (1) on the water separator bowl.

Note: The water separator element is under suction during normal engine operation. Tighten drain valve in order to prevent air leakage into the fuel system.

10. Prime the fuel system in order to fill the water separator element with fuel. Refer to Operation and Maintenance Manual, “Fuel System Prime”.

11. Close the engine hood.

i02926797

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

⚠ WARNING

Personal injury or death may result from failure to adhere to the following procedures.

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, “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.

NOTICE

Do not fill the fuel filters with fuel before installing the fuel filters. The fuel will not be filtered and could be contaminated. Contaminated fuel will cause accelerated wear to fuel system parts.

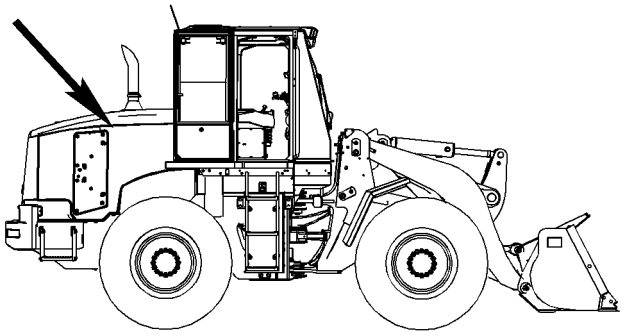


Illustration 198 g01300434

Open the engine hood. The secondary fuel filter is located on the right side of the machine.

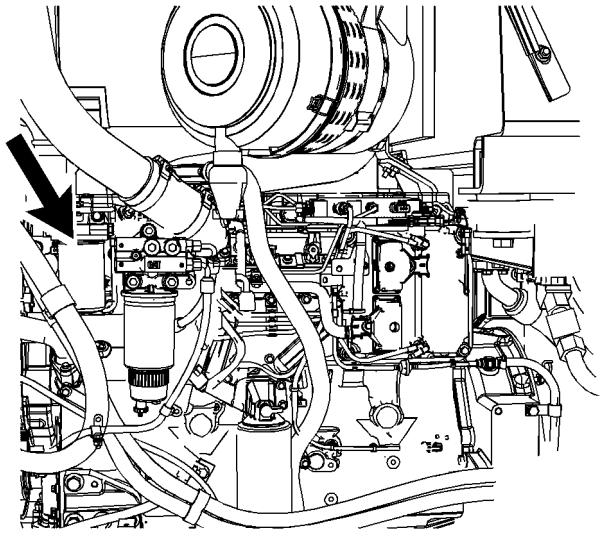


Illustration 199 g01453467

1. Place a suitable container under the drain valves. Open a drain valve. Drain the fuel into a suitable container. When the fuel stops draining, keep the drain valve open. As the filter is loosened, additional fuel may drain from the drain valve. When the fuel stops draining, loosen the filter for an additional 1/4 turn. Close the drain valves. Properly dispose of the fuel.
2. Remove the filter.
3. Inspect the fuel filter element for debris by cutting the filter open. Discard the used fuel filter element properly.
4. Clean the mounting base of the fuel filter. Make sure that all of the old seal is removed from the mounting base of the fuel filter.

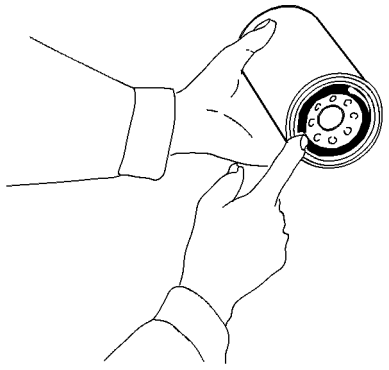


Illustration 200 g00101318

5. Apply a thin coat of clean diesel fuel to the sealing surface of the new fuel filter element. Install a new fuel filter hand tight until the seal of the fuel 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 fuel filter, use the rotation index marks as a guide.

6. 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.

   You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.
7. Prime the fuel system.

   Reference: For more information, refer to Operation and Maintenance Manual, “Fuel System - Prime”.
8. Close the engine hood.

i02837651

Fuel Tank Cap and Strainer - Clean

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

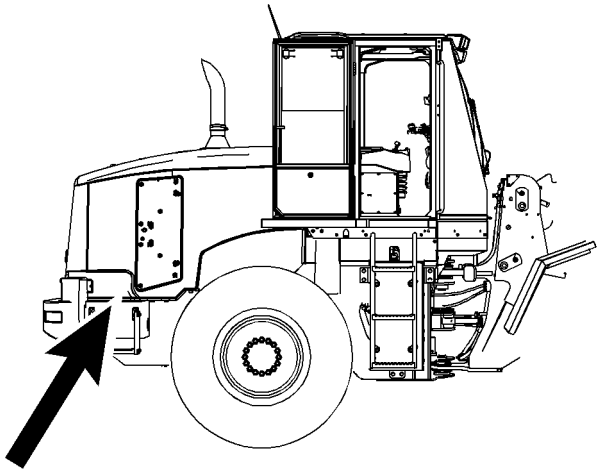


Illustration 201 g01414869

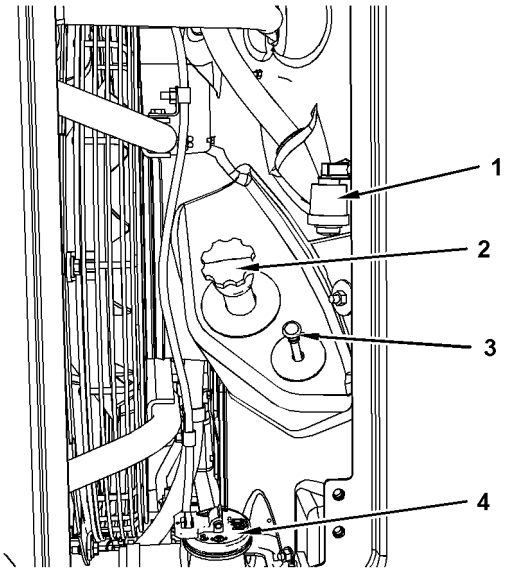


Illustration 202 g01246185

(1) Air Filter Service Indicator
(2) Engine Oil Filler
(3) Engine oil Dipstick
(4) Fuel Filler

The fuel cap (4) is located at the rear of the machine on the right side.

1. Open the engine access door on the right side of the engine. Lift the lever and turn the lever counterclockwise until the lever stops. Remove the cap.
2. Remove the seal from the cap. Inspect the seal for damage.
3. Remove the strainer from the fuel tank.
4. Wash the strainer and the fuel tank cap in a clean, nonflammable solvent.
5. Install the strainer into the filler opening.
6. Replace the seal, if necessary.
7. Install the fuel tank cap. Close the engine access door.

i02593877

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, “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.

Note: If the water separator bowl is full on a daily basis, drain the fuel tank on a daily basis.

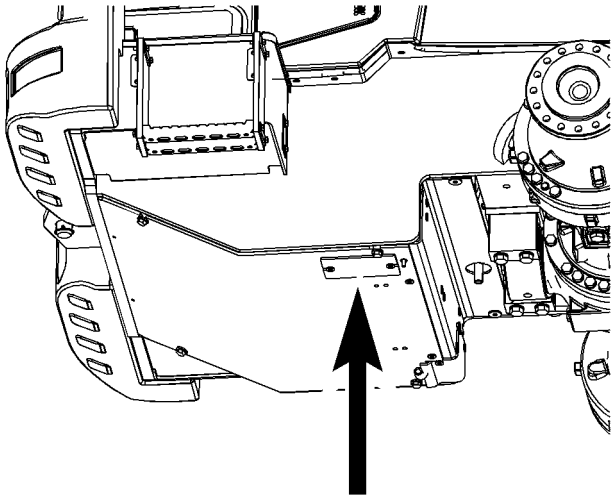


Illustration 203 g01309452

Location of the fuel tank drain valve

The right rear wheel has been removed for clarity.

The fuel tank drain valve is located under the rear of the machine on the right side.

Slowly remove the fuel tank cap in order to relieve pressure.

Remove the cover plate.

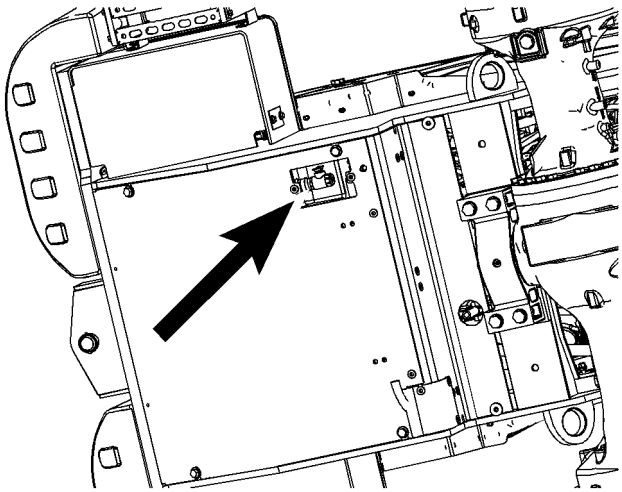


Illustration 204 g01309448

Open the fuel tank drain valve. Allow the water and sediment to drain into a suitable container.

Close the fuel tank drain valve.

Install the cover plate.

i02833606

Fuses - Replace

SMCS Code: 1417-510

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

Fuses protect the electrical system from damage that is caused by overloaded circuits.

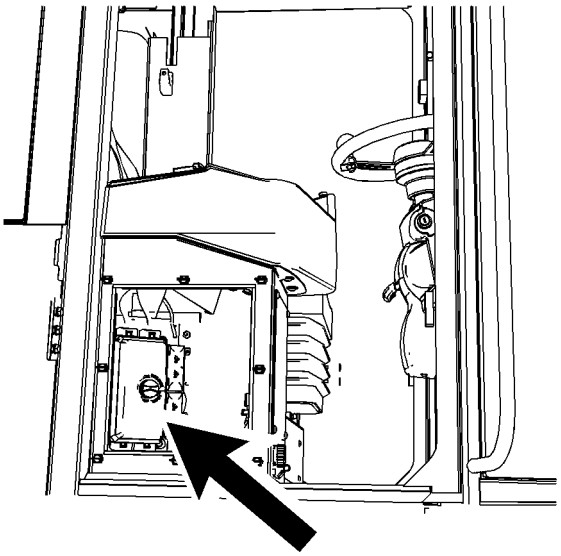
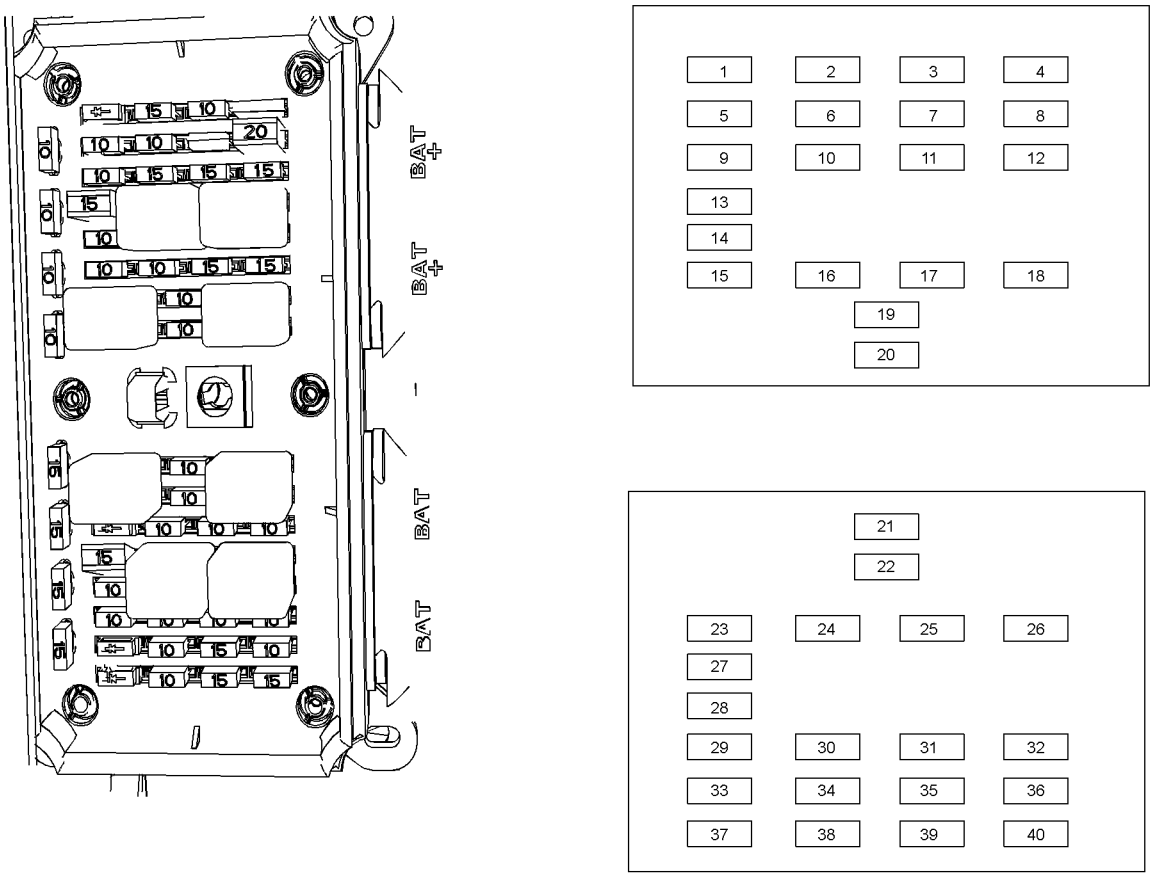


Illustration 205 g01414881

Open the cab door on the right side of the machine in order to access the fuse panel.



g01414515

Illustration 206

(1) Backlight Diode
(2) Transmission ECM
(3) Converter Circuit (“STD”)
(4) Unused
(5) Left Hand Tail Light
(6) Forward Horn
(7) Unused
(8) Hood Actuator
(9) Right Hand Tail Light
(10) Spare
(11) Spare
(12) Front Lights
(13) Running Lamps
(14) AUTOLUBE
(15) Tilt Hood Actuator Switch
(16) Ignition Switch
(17) Engine ECM
(18) Rear Lights
(19) Stop Lights and Start Relay
(20) Forward Horn
(21) Axle Oil Cooler
(22) Shifter, Brake Pedal Sensor, and Articulation Angle Sensor
(23) Hazard Flashers
(24) Hazard Flashers
(25) Beacon and Heated Mirrors
(26) Secondary Steering and Autolube
(27) Breaker for the HVAC Blower
(28) Implement Lockout and Quick Coupler
(29) MSS and Product Link
(30) Messenger
(31) Radio
(32) Reversing Fan
(33) Spare
(34) Payload Control System
(35) Window Wipers
(36) Spare
(37) Backlight Diode
(37) Right Hand Turn Signal
(38) ECM
(39) Seat
(40) Spare

Replace the fuse if the element separates. Use a fuse of the same size. If the element of a new fuse separates, check the circuit. Repair the circuit, if necessary.

i02245859

High Intensity Discharge Lamp (HID) - Replace (If Equipped)

SMCS Code: 1434-510

⚠ WARNING

HID lamps operate at very high voltages. To avoid electrical shock and personal injury, disconnect power before servicing HID lamps.

⚠ WARNING

HID bulbs become very hot during operation. Before servicing, remove power from lamp for at least five minutes to ensure lamp is cool.

NOTICE
Although HID bulb materials may change over time, HID bulbs produced at the time of the printing of this manual contain mercury. When disposing of this component, or any waste that contains mercury, please use caution and comply with any applicable laws.

1. Remove the electrical power from the high intensity discharge lamp (HID). The electrical power must be removed from the HID lamp for at least five minutes, in order to ensure that the bulb is cool.

2. Disassemble the housing for the HID lamp in order to have access to the bulb.

Note: On some HID lamps, the bulb is an integral part of the lens assembly. The bulb is not removed separately from the lens assembly. Replace the entire lens assembly on these HID lamps.

3. Remove the bulb from the HID lamp.

4. Install the replacement bulb in the HID lamp.

   If the bulb is an integral part of the lens assembly, install the replacement lens assembly in the HID lamp.

Note: In order to avoid failure to the bulb that is premature, avoid touching the bulb's surface with your bare hands. Clean any fingerprints from the bulb with alcohol prior to operation.

5. Reassemble the housing for the HID lamp. Ensure that any printing on the lens is oriented correctly with respect to the HID lamp's mounting position on the machine.

6. Reattach the electrical power to the HID lamp.

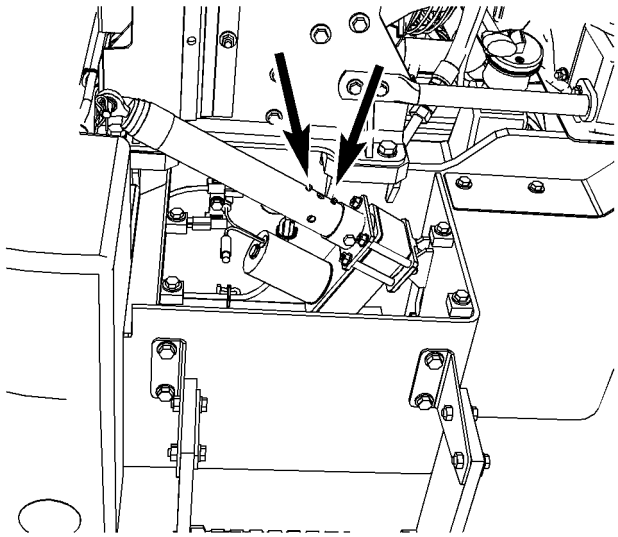
7. Check the HID lamp for proper operation.

Note: Consult your Caterpillar dealer for additional information on HID lamps.

i02926770

Hood Tilt Actuator - Lubricate

SMCS Code: 7275-086



g01453083

Illustration 207

Hood Tilt Actuator

Please note that some parts are removed for clarity.

1. Raise the engine hood. The hood tilt actuator is located on the right side of the machine.

2. Fully extend the cylinder and wipe off the inner post with a clean cloth. Then, lubricate the entire length of the inner post.

3. Wipe off both fittings on the cylinder. Then, apply lubricant through the two fittings until the lubricant escapes back through each fitting.

4. Close the engine hood.

i03657272

Hydraulic System Biodegradable Oil Filter Element - Replace (If Equipped)

SMCS Code: 5068-510

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, “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.

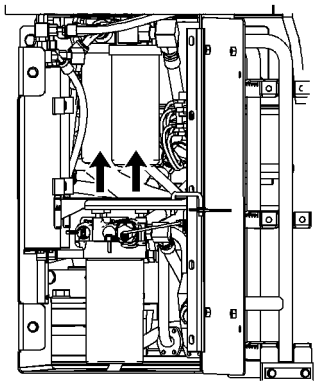


Illustration 208 g01108153

The hydraulic filters are located on the right side of the machine under the platform. There are two hydraulic oil filters. Each filter must be replaced during this procedure.

1. Use a strap type wrench to remove each filter element. Dispose of the used filter elements properly.

2. Clean the filter mounting bases. Make sure that all of the used seals are completely removed.

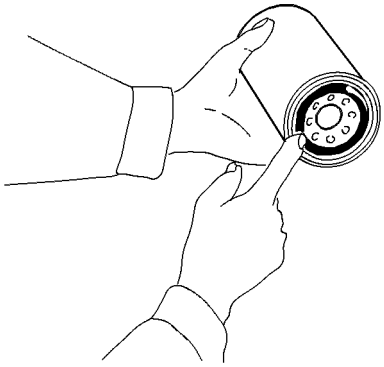


Illustration 209 g00101318

3. Apply a thin coat of hydraulic oil to the seals on the new filters. Install each new hydraulic oil filter hand tight until the seals of the hydraulic oil filters contact each filter base. Note the position of the index marks on each filter in relation to a fixed point on each filter base.

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

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

Note: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

5. Start the engine and run the engine at low idle. Inspect the hydraulic system for leaks.

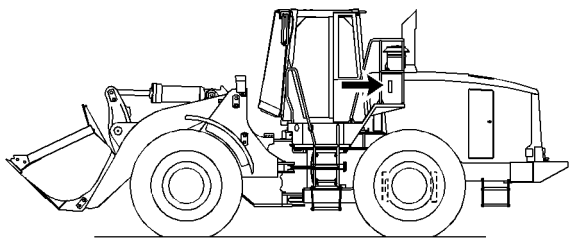


Illustration 210 g01185406

6. Maintain the oil level above the “ADD COLD” mark on the sight gauge. Add hydraulic oil, if necessary.

i03296763

Hydraulic System Oil - Change

SMCS Code: 5056-044

Selection of the Oil Change Interval

Your machine may be able to use a 4000 hour interval for the hydraulic oil. The hydraulic oil is in the system that is not integral to the service brakes, the clutches, the final drives, or the differentials. The standard change interval is 2000 hours. The oil should be monitored during intervals of 500 hours. The extended 4000 hour interval can be used if the following criteria are met.

HYDO Advanced 10

Cat HYDO Advanced 10 is the preferred oil for use in most Caterpillar machine hydraulic and hydrostatic transmission systems when ambient temperature is between −20 °C (−4 °F) and 40 °C (104 °F). Cat HYDO Advanced 10 has an SAE viscosity grade of 10W. **Cat HYDO Advanced 10 has a 50% increase in the standard oil drain interval** (up to 3000 hours) for machine hydraulic systems over second and third choice oils when you follow the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual. 6000 hour oil drain intervals are possible when using S·O·S Services oil analysis. When you switch to Cat HYDO Advanced 10, cross contamination with the previous oil should be kept to less than 10%. Consult your Cat dealer for details about the benefits from the improved performance designed into Cat HYDO Advanced 10.

Oil Filters

Caterpillar oil filters are recommended. The interval for changing the oil filter should be 500 hours.

Oil

The 6000 hour interval for changing the oil is specific to HYDO Advance 10.

The 4000 hour interval for changing the oil is for the following oil types.

- Caterpillar Hydraulic Oil (HYDO)
- Caterpillar Transmission and Drive Train Oil (TDTO)
- Caterpillar TDTO-TMS
- Caterpillar Diesel Engine Oil
- Caterpillar Biodegradable Hydraulic Oils (HEES)
- Caterpillar Multipurpose Tractor Oil (MTO)
- Heavy-duty diesel engine oils with a minimum zinc content of 900 ppm

If Caterpillar oils cannot be used, use heavy-duty oils with the following classification: Caterpillar ECF-1, API CG-4, API CF, and TO-4. These oils must have a minimum zinc additive of 0.09 percent (900 ppm).

Note: Industrial hydraulic oils are not recommended in Caterpillar hydraulic systems.

Monitoring the Condition of the Oil

The oil should be monitored during intervals of 500 hours. Caterpillar's standard SOS Fluids Analysis or an equivalent oil sampling program should be used.

The current guidelines for cleanliness of the oil should be observed. Refer to “Measured Data”.

If an oil sampling program is not available, the standard 2000 oil change interval should be used.

Measured Data

The following information should be monitored through sampling of the oil:

- Significant changes in wear metals should be monitored. These metals include iron, copper, chromium, lead, aluminum, and tin.
- Significant changes in the following additives should be monitored: zinc, calcium, magnesium, and phosphorus.
- Contaminants should not be present. These contaminants include fuel and antifreeze. Water content should be .5 percent or less.
- The silicon level should not exceed 15 parts per million for new oil. The particle counts should be monitored.
- The recommended level of cleanliness for Caterpillar machines that are operated in the field is ISO 18/15 or cleaner. The cleanliness should be monitored by particle count analysis. The levels of contamination should not exceed the normal by more than two ISO codes. Action should be taken in order to determine the cause of the contamination. The system should be returned to the original levels of contamination.
- There should not be significant changes in sodium, silicon, copper, and potassium.

- The allowable level of oxidation is 40 percent (0.12 Abs units).
- The kinematic viscosity of 100 °C (212 °F) oil should not exceed a change of more than 2 cSt from new oil.

Procedure for Changing the Hydraulic Oil

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.

Operate the machine for a few minutes in order to warm the hydraulic system oil.

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

The hydraulic tank filler cap is located behind the cab on the top of the engine compartment. Use the steps and the handholds in order to reach the hydraulic tank filler cap. The steps and handholds are located on both sides of the machine.

1. Remove the hydraulic tank filler cap.

2. The hydraulic tank drain valve is located on the right side of the machine in the hydraulic service center.

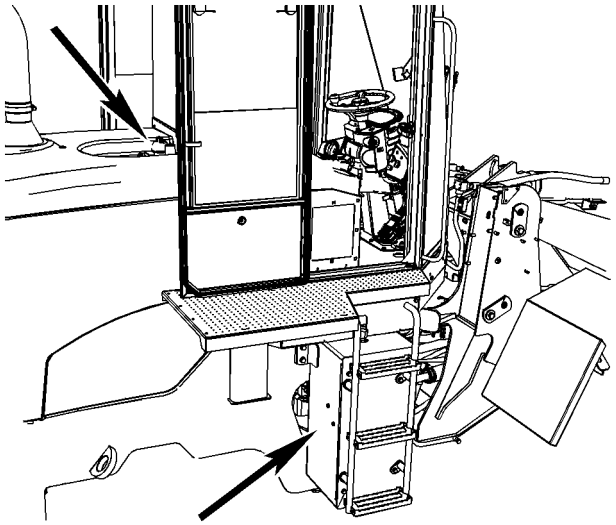


Illustration 211 g01245845

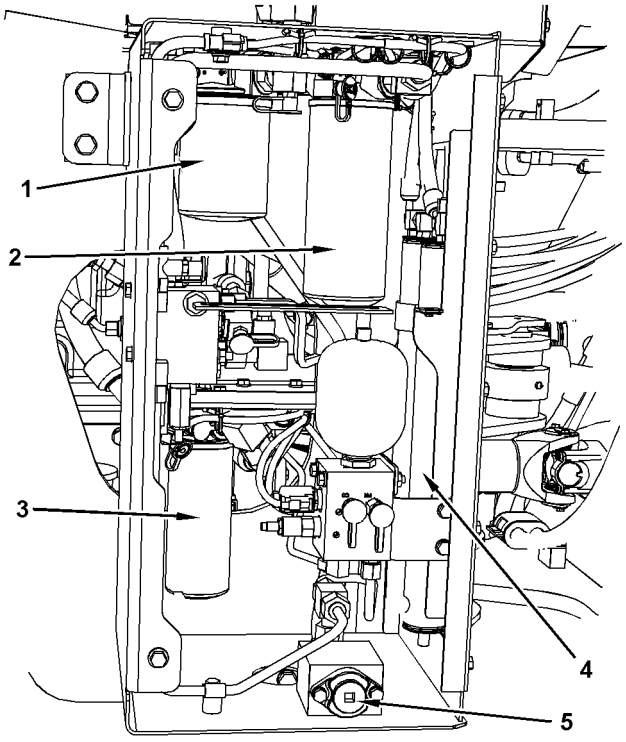


Illustration 212 g01418755

(1) Hydraulic Case Drain Filter
(2) Hydraulic System Filter
(3) Transmission Oil Filter
(4) Brake Accumulator
(5) Hydraulic Oil Tank Drain

3. Open the drain valve (5) and allow the hydraulic oil to drain into a suitable container.

NOTICE
Never start the engine while the hydraulic oil tank is being drained or while the hydraulic oil tank is empty. Excessive wear and damage to the hydraulic components can occur.

4. Close the drain valve.

5. Replace the case drain filter (1). Replace the hydraulic system filter (2). Refer to Operation and Maintenance Manual, “Hydraulic System Oil Filter - Replace”.

6. Fill the hydraulic system oil tank. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” and Operation and Maintenance Manual, “Capacities (Refill) ”.

7. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the gasket, if necessary.

8. Install the hydraulic tank filler cap.

9. Start the engine and run the engine at low idle for ten to fifteen seconds.

10. Shut off the engine.

11. Refill the hydraulic tank to the full mark on the sight gauge.

12. Restart the engine and run the engine at low idle. Cycle all the implements until all the systems are refilled.

Note: If the warning light for a low oil level comes on during the cycling, stop the engine immediately and refill the hydraulic tank. If the filling procedure is done correctly, the warning light should never come on.

13. After you have cycled the implements again, stop the engine and refill the hydraulic tank to the full mark on the sight gauge. Refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check”.

Note: The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps.

14. If necessary, tighten any loose clamps and any loose connections. Replace any damaged hoses.

15. Close the service center.

i02845357

Hydraulic System Oil Filter - Replace

SMCS Code: 5068-510

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, “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.

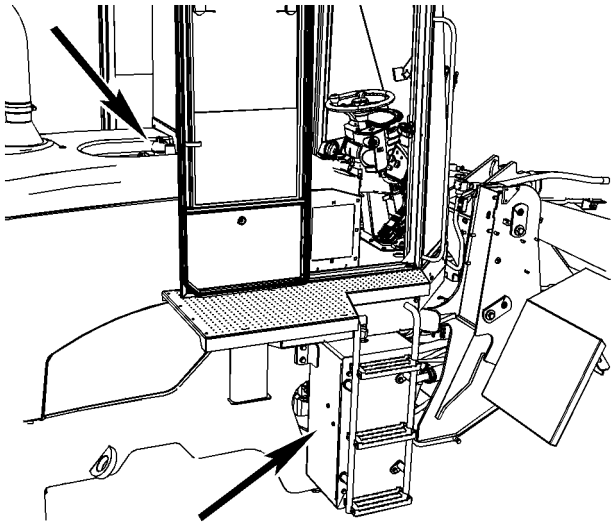
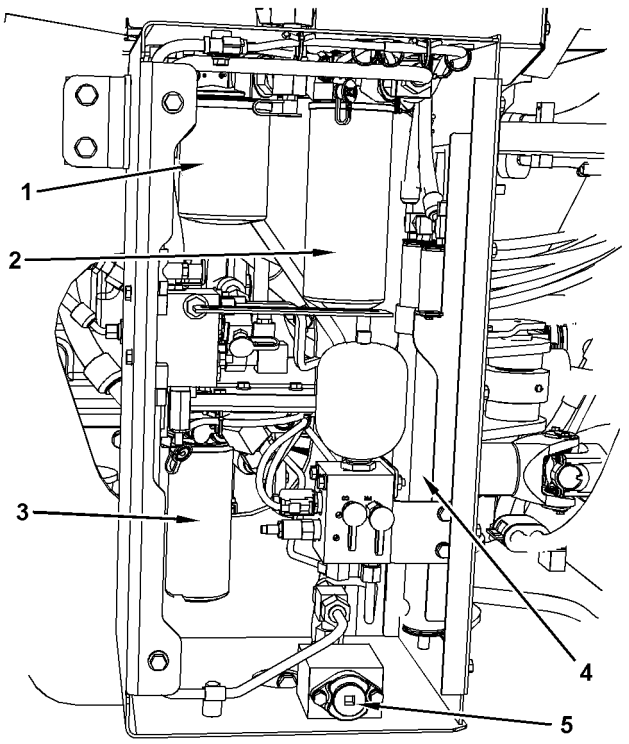


Illustration 213 g01245845

1. Remove hydraulic tank filler cap that is located behind the cab on the top of the engine compartment. Use the steps and handholds that are located on the right side of the machine in order to reach the hydraulic tank filler cap.

   All hydraulic filters are located in the hydraulic service center on the right side of the machine behind the ladder.



g01418755

Illustration 214

(1) Hydraulic Case Drain Filter
(2) Hydraulic System Filter
(3) Transmission Oil Filter
(4) Brake Accumulator
(5) Hydraulic Oil Tank Drain

2. Remove the case drain filter (1). Remove the system filter (2). Discard the filter elements.

3. Install the new filter elements.

4. Check the hydraulic oil level. Refer to Operation and Maintenance Manual, “Hydraulic Syatem Oil Level - Check” for more details about the hydraulic oil level.

i02896159

Hydraulic System Oil Level - Check

SMCS Code: 5056-535-FLV

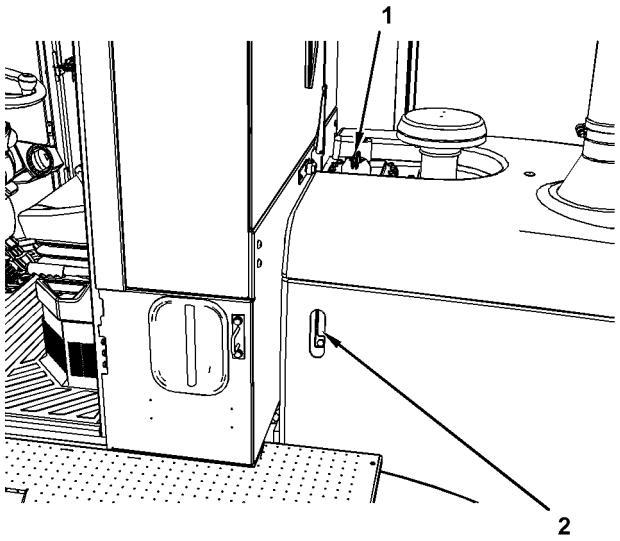
NOTICE

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.

Note: Check the hydraulic system oil level while the machine is on a level surface.



g01245607

Illustration 215

(1) Hydraulic Oil Filler Cap
(2) Hydraulic Sight Gauge

The hydraulic oil tank and the filler cap (1) are located behind the cab on the engine compartment. The sight gauge (2) is located on the left side of the hydraulic oil tank behind the cab.

1. Maintain the hydraulic oil level above the “ADD COLD” mark on the sight gauge.

2. Remove the hydraulic tank filler cap and add hydraulic oil, if necessary.

3. Clean the hydraulic tank filler cap. Install the hydraulic tank filler cap.

i02492082

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008; 5056-008; 7542

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.

1. Operate the machine for a few minutes before obtaining the oil sample. Operate the hydraulic controls. This will thoroughly mix the hydraulic oil for a more accurate sample.

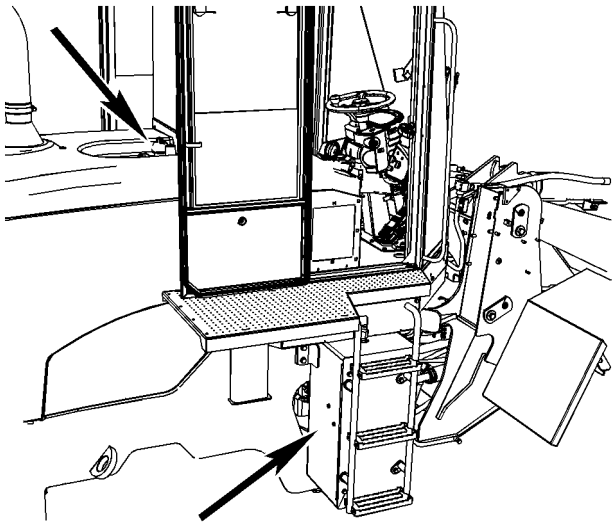


Illustration 216 g01245845

2. Open the door for the hydraulic service center on the right side of the machine. The sampling valve is located on the base of the hydraulic system filter.

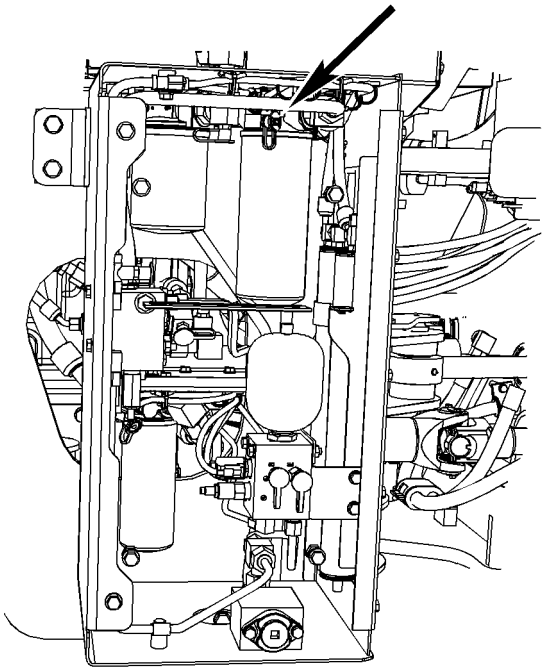


Illustration 217 g01246554

3. Use the sampling valve in order to obtain a sample of hydraulic oil.

4. Close the door for the hydraulic service center.

i02615782

Hydraulic Tank Breaker Relief Valve - Clean

SMCS Code: 5118-070

The hydraulic tank breaker relief valve is located on the hydraulic tank. The hydraulic tank is located behind the cab. Use the steps and the handholds in order to reach the hydraulic tank breaker relief valve. The steps and handholds are located on the left side of the machine.

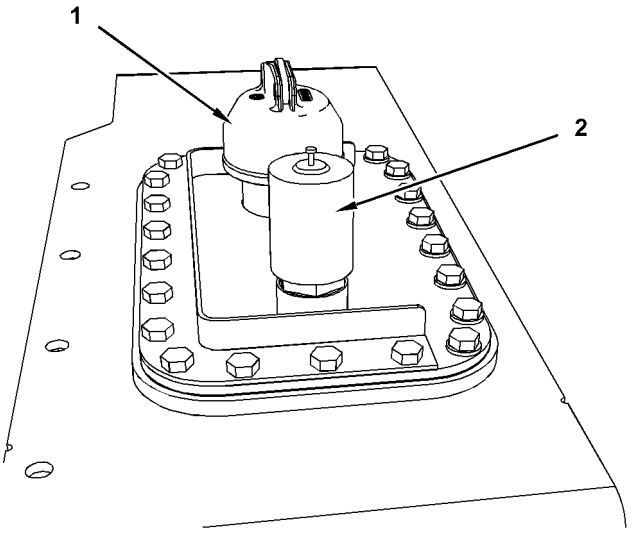


Illustration 218 g01309730

(1) Hydraulic tank cap
(2) Hydraulic tank breaker relief valve

1. Relieve the pressure in the hydraulic tank by pressing the button on the top of the hydraulic breaker. Remove the hydraulic tank breaker relief valve.

2. Clean the hydraulic tank breaker relief valve in a clean, nonflammable solvent. Shake dry or use pressure air.

3. Install the hydraulic tank breaker relief valve.

i02106227

Oil Filter - Inspect

SMCS Code: 1308-507; 3004-507; 3067-507; 5068-507

Inspect a Used Filter for Debris

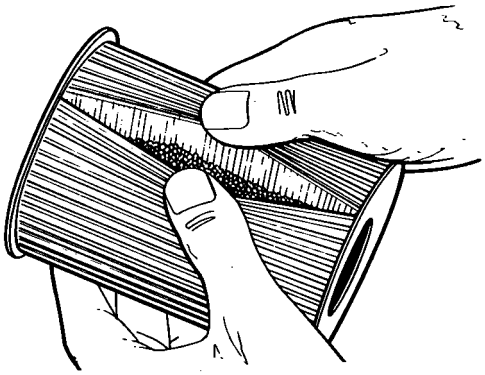


Illustration 219 g00100013

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.

i04796940

Open Crankcase Ventilation (OCV) Fumes Disposal Filter - Replace (If Equipped)

SMCS Code: 1317-510-FI

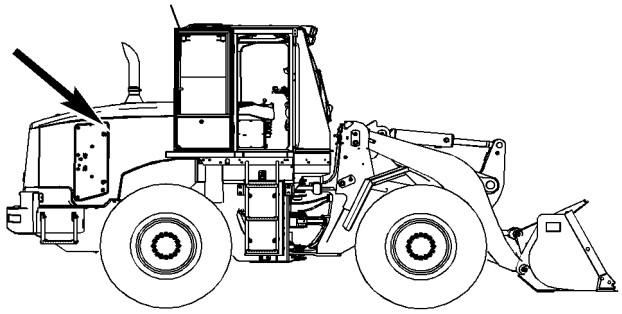


Illustration 220 g01300560

Open the hood on the rear of machine in order to access the engine compartment. The Open Crankcase Ventilation (OCV) is located on the right side of the engine.

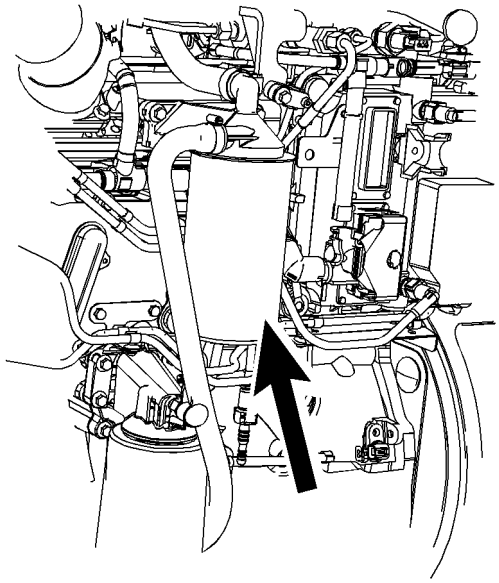


Illustration 221 g02914977

1. Remove the OCV filter. Use a Cat strap wrench to loosen the filter.
2. Replace the OCV filter. Follow the installation instructions on the filter.
3. Check the condition of the hoses. Make sure that the inside of the hose is unobstructed. Replace the hose if a hose is damaged.
4. Close the access door and the hood.

i04004068

Pallet Fork - Inspect

SMCS Code: 6136-040

Descriptions of the Fork Tine

Parts

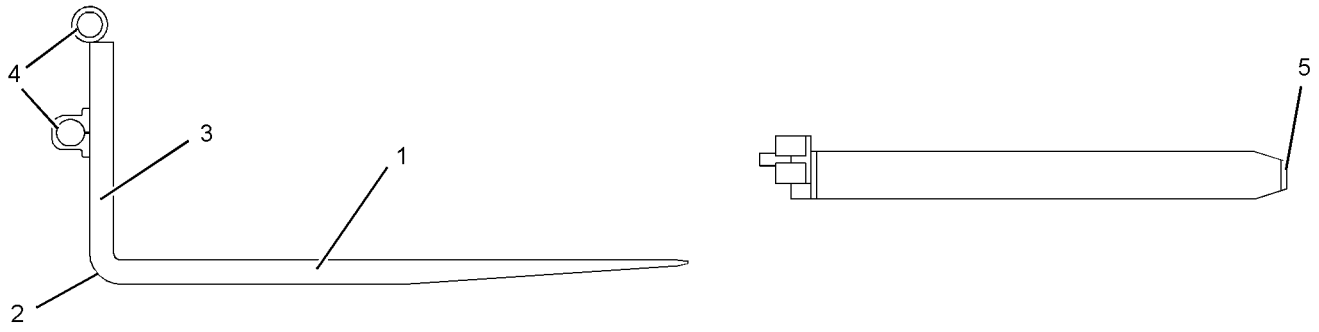


Illustration 222 g01598401

(1) Blade – The horizontal part of the fork tine that supports the load

(2) Heel – The radius on the fork tine that connects the blade to the shank

(3) Shank – The vertical part of the fork tine that has the hooks that support the fork tines attached.

(4) Hook or Hanger – Carriers that mount the fork tines to the carriage

(5) Tip – The free end of the blade

Surfaces

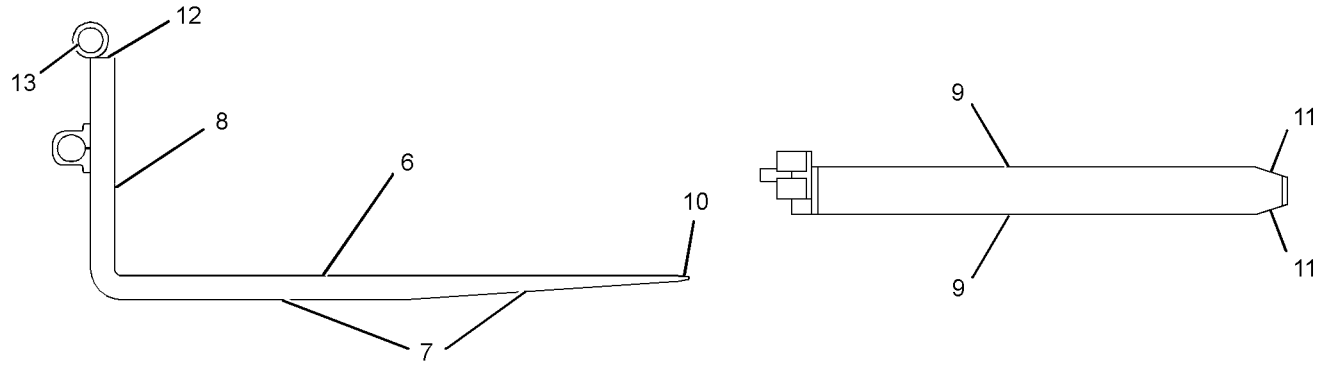


Illustration 223 g01598403

(6) Upper Face of the Blade – The upper surface of the blade that carries the load

(7) Bottom of Heel – The lower surface of the blade that includes the tapers

(8) Front Face of Shank – The distance for the load center is measured from the front face of the shank and the face of the shank contacts the load.

(9) Flanks – The side faces of the blade and the shank.

(10) Blade Bevel – The upper and lower surfaces of the tip on the blade that are tapered for easy insertion of the fork tines

(11) Tip Flanks – The side surfaces of the tip on the blade that are tapered for easy insertion of the fork tines

(12) Top of Shank – The upper surface on the shank

(13) Shaft – The tubes that are mounted on the fork tines for mounting the fork tines to the carriage

Dimensions

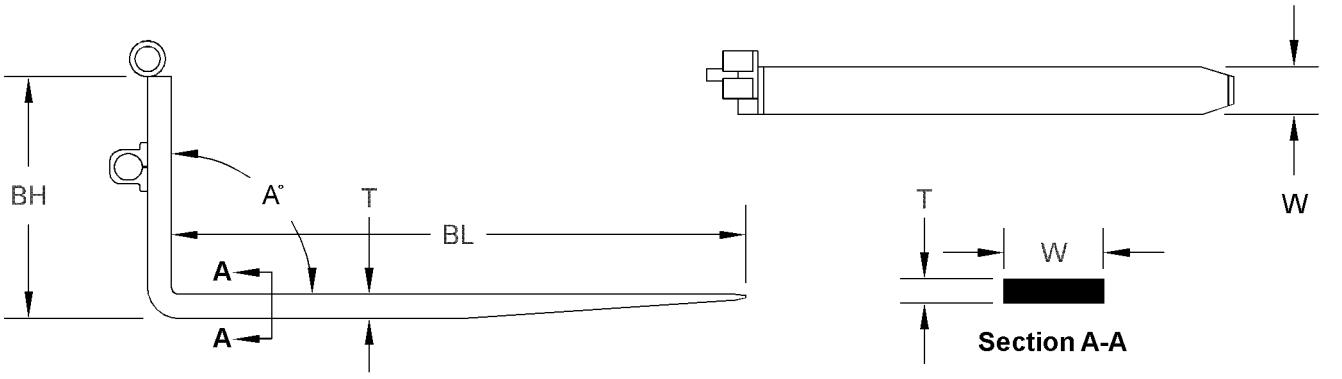


Illustration 224 g01598405

(T) Thickness – The thickness of the blade at the closest point to the heel

(W) Width – The width of the blade at the closest point to the heel

(BH) Back Height – The distance from the bottom of the blade to the top of the shank

(BL) Length – The length of the blade is measured from the front face on the shank to the tip on the blade.

(A) Angle – The angle from the upper surface of the blade to the front face of the shank.

Inspection of the Fork Tines

Check the fork tines daily for any twisting or bending of the fork tines. If any twisting or bending is observed, the fork tines should be changed prior to any lifting operation. If the fork tines are damaged, consult your Cat dealer.

Check the fork tines for wear or for damage. Inspect the welds, the locks, the shafts, and the fork tines for damage. If the components are damaged, consult your Cat dealer. Refer to , “Daily Inspection” for additional information.

Blade Thickness

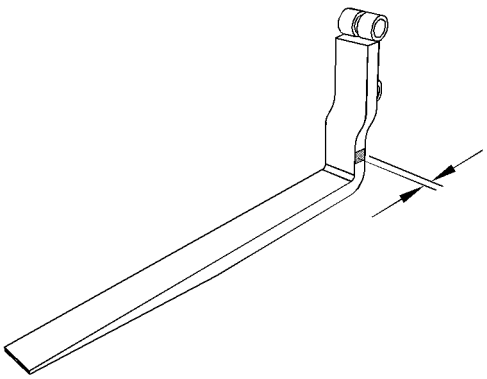


Illustration 225 g01600073

1. Measure the thickness of the shank. Ensure that the measuring device is held square across the shank in order to acquire an accurate measurement.

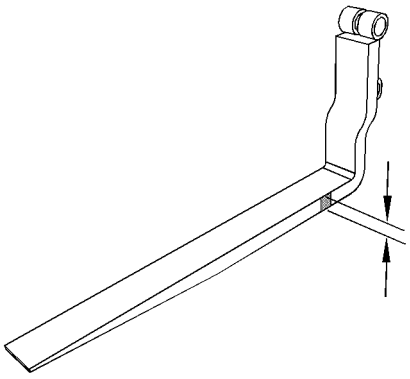


Illustration 226 g01600074

2. Measure the blade of the fork tine near the heel. Ensure that the measuring device is held square across the blade in order to acquire an accurate measurement.

3. Compare the measurement of the blade and the measurement of the shank.

4. If the difference in measurements is less than 10%, the fork tine can remain in service.

5. If the difference in measurements is greater than 10%, the fork tine must be taken out of service. Fork tine wear that is greater than 10%, represents a 20% reduction in the capacity of the fork tine.

Consult your Cat dealer for additional information.

Angle of the Heel

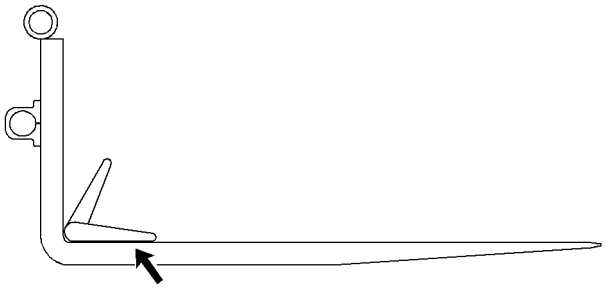


Illustration 227 g01600075

1. Place a measuring device in the top inside area of the heel on top of the blade. Ensure that the measuring device is held flat against the blade in order to acquire an accurate measurement.

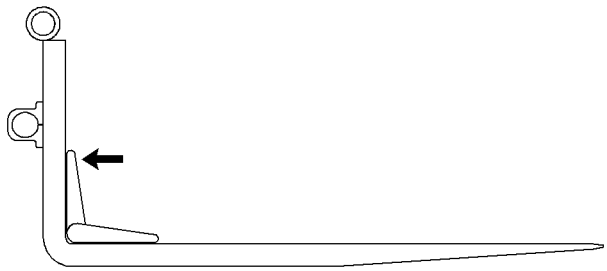


Illustration 228 g01600076

2. Move the upper arm of the measuring device toward the face of the shank. Ensure that the measuring device is held flat against the face of the shank in order to acquire an accurate measurement.

3. Check the angle that was measured with the device for the angle of the heel.

4. If the angle is between 87 degrees and 93 degrees, the fork tine can remain in service.

5. If the angle is less than 87 degrees or greater than 93 degrees, the fork tine must be taken out of service. The fork tines must be inspected for the following conditions:

   - permanent deformation
   - stress cracks
   - other defects

Consult your Cat dealer for additional information.

i03082842

Pallet Fork - Lubricate

SMCS Code: 6136-086

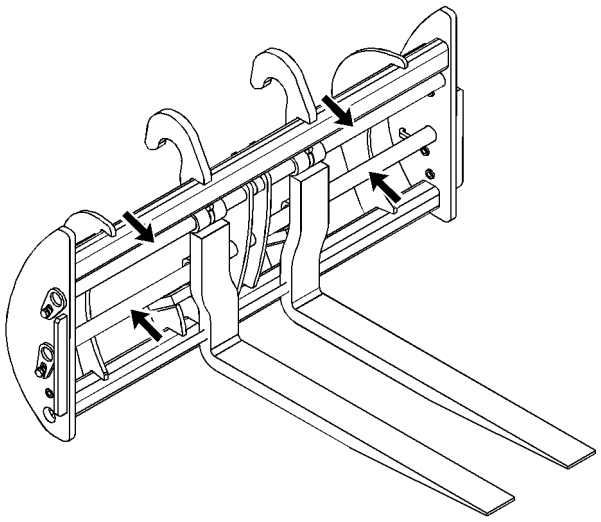


Illustration 229 g01563105
typical example

1. Coat the shafts with grease.

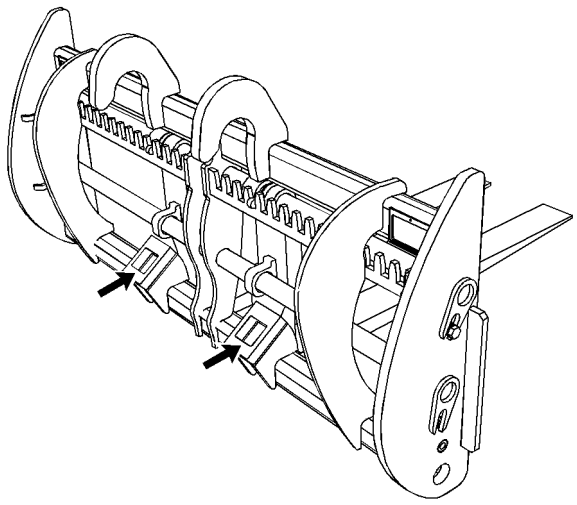


Illustration 230 g01563115
typical example

2. Coat the mounting holes for the quick coupler with grease.

Reference: Refer to Operation and Maintenance Manual, SEBU6250, “Caterpillar Machine Lubricant Recommendations” for information on lubricants.

i01362822

Quick Coupler - Check

SMCS Code: 6129-535

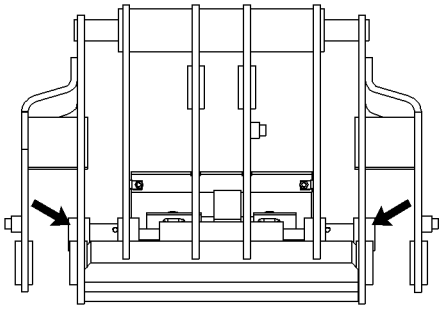


Illustration 231 g00718871

When you install a work tool on the quick coupler, inspect the engagement of the coupler pins. If there is play between the coupler pins and the corresponding bores, inspect the coupler pins and the bores for damage or wear.

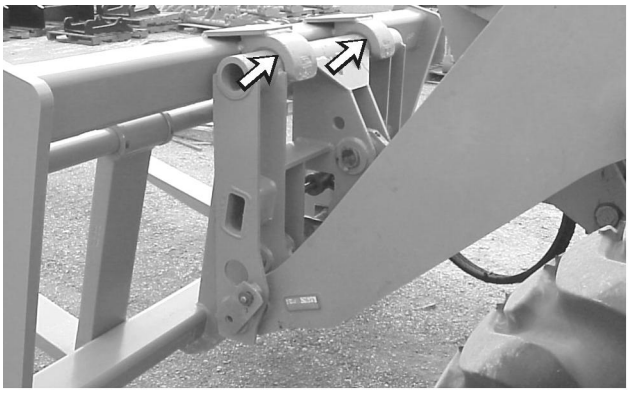


Illustration 232 g00718876

If there is play between the quick coupler and the hooks of the work tool, inspect the quick coupler and the hooks for wear or for damage.

Make any necessary repairs before you operate the work tool.

i01362849

Quick Coupler - Lubricate

SMCS Code: 6129-086

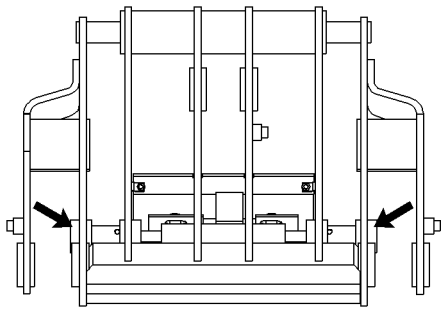


Illustration 233 g00718871

Wipe off the coupler pins. Coat the coupler pins with new grease.

i04039330

Radiator Core - Clean

SMCS Code: 1353-070-KO

Ensure that the engine is off before you perform this procedure.

1. Open the radiator grill.

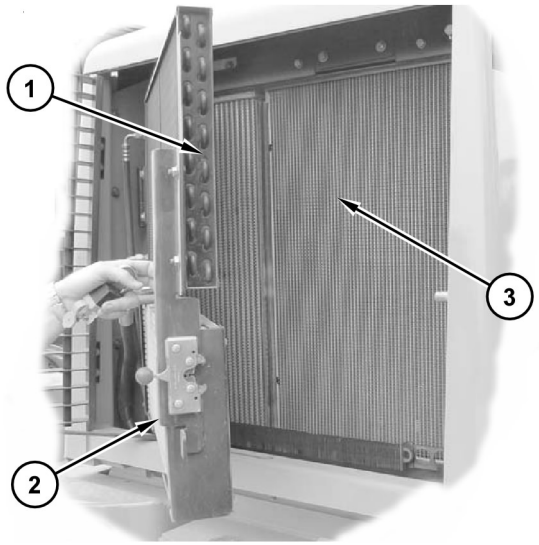


Illustration 234 g01447729

(1) Air Conditioner Condenser
(2) Hydraulic Oil Cooler
(3) Radiator Core

2. Open the latch and swing the air conditioner condenser (1) and hydraulic oil cooler (2) away from the radiator (3).

3. You can use compressed air, high-pressure water, or steam to remove dust and other debris from the radiator fins. The maximum air pressure for cleaning purposes must be reduced to 205 kPa (30 psi). The maximum water pressure for cleaning purposes must be below 275 kPa (40 psi). However, the use of compressed air is preferred. Refer to Operation and Maintenance Manual, “General Hazard Information” for Safety information about using pressurized air and water.

4. Swing the condenser and the cooler into position.

5. Open the engine hood.

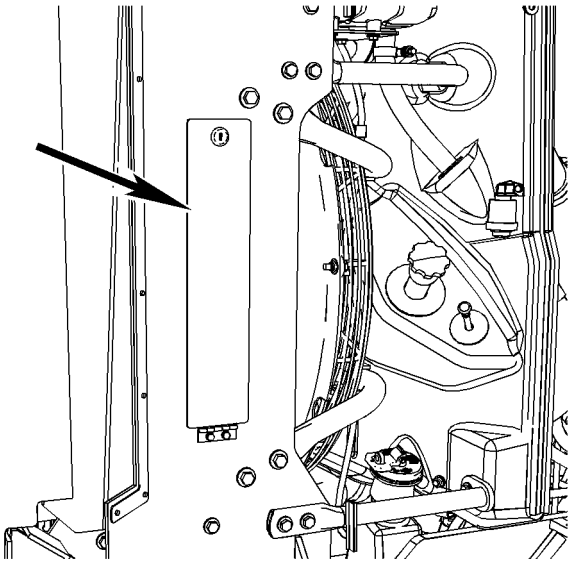


Illustration 235 g01447730

6. Open the access panels on both sides in order to clean the front face of the radiator.

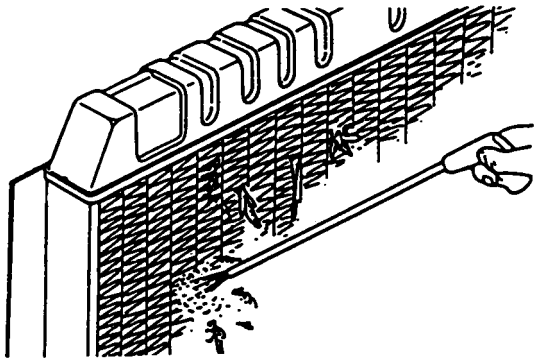


Illustration 236 g00101939

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

8. Close the access panels.

9. Close the engine hood.

i01708690

Refrigerant Accumulator (With Desiccant) - Replace

SMCS Code: 7322-510-DSS

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.

i01699743

Ride Control Accumulator - Check

SMCS Code: 5077-535-R6

The ride control accumulator reduces the pitching of the machine. If the machine seems to be bouncing excessively, check the charge in the ride control accumulator.

Note: Special tools and equipment are required to test the accumulator.

Reference: For more information, refer to Testing and Adjusting, RENR6078, “938G Series II Wheel Loader and IT38 Integrated Toolcarrier Hydraulic System” or consult your Caterpillar dealer.

i03657286

Roading Fender Hinges - Lubricate (If Equipped)

SMCS Code: 7252-086-HNG

Wipe off the fitting before any lubricant is applied.

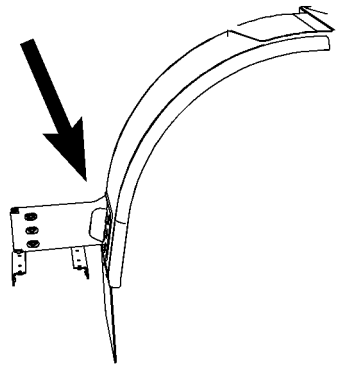


Illustration 237 g01963400

Open the roading fender. Apply lubricant through one fitting on the hinge. There is one hinge on each side of the machine.

i01886437

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7323-040; 7325-040

1. Inspect the ROPS for bolts that are loose or damaged. Use original equipment parts only to replace bolts that are damaged or missing.

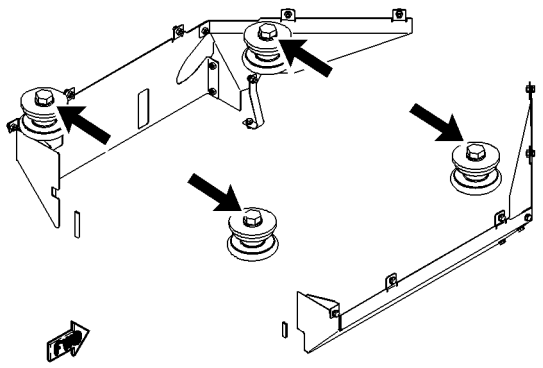


Illustration 238 g00979102

2. Tighten the four cab mounting bolts to a torque of 850 ± 100 N·m (629 ± 74 lb ft).

Note: Apply oil to all bolt threads before installation. Failure to apply oil can result in improper bolt torque.

Do not repair the ROPS by welding reinforcement plates to the ROPS. Consult your Caterpillar dealer for repair of cracks in any welds, in any castings, or in any metal section of the ROPS.

i04423622

Seat Belt - Inspect

SMCS Code: 7327-040

Always inspect 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.

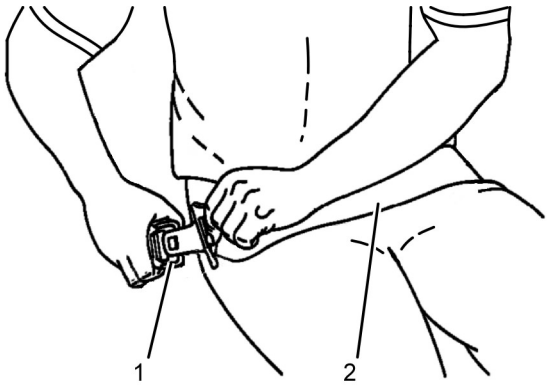


Illustration 239 g02620101

Typical example

Inspect buckle (1) for wear or for damage. If the buckle is worn or damaged, replace the seat belt.

Inspect seat belt (2) for webbing that is worn or frayed. Replace the seat belt if the webbing is worn or frayed.

Inspect all seat belt mounting hardware for wear or for damage. Replace any mounting hardware that is worn or damaged. Make sure that the mounting bolts are tight.

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

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

Note: The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

i04421974

Seat Belt - Replace

SMCS Code: 7327-510

The seat belt should be replaced within 3 years of the date of installation. A date of installation label is attached to the seat belt retractor and buckle. If the date of installation label is missing, replace belt within 3 years from the year of manufacture as indicated on belt webbing label, buckle housing, or installation tags (non-retractable belts).

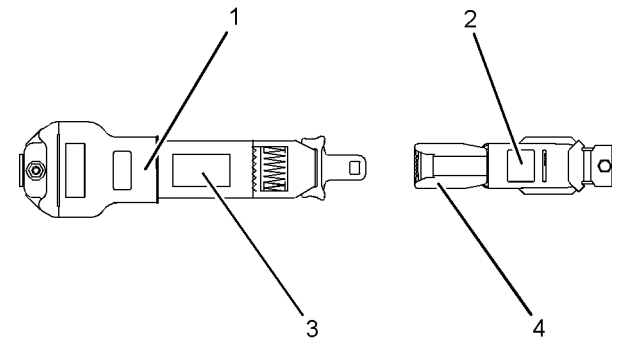


Illustration 240 g01152685

Typical Example

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

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

Determine age of new seat belt before installing on seat. A manufacture label is on belt webbing and imprinted on belt buckle. Do not exceed install by date on label.

Complete seat belt system should be installed with new mounting hardware.

Date of installation labels should be marked and affixed to the seat belt retractor and buckle.

Note: Date of installation labels should be permanently marked by punch (retractable belt) or stamp (non-retractable belt).

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

i03694709

Secondary Steering - Test

SMCS Code: 4300-081-SE; 4300-081-SST; 4324-081; 4324

⚠ WARNING

The service brake must be checked in order to ensure proper operation before you test the supplemental steering system.

Personal injury, death, or property damage could occur if the supplemental steering system is tested and the service brake is not operational.

Test the service brake before you test the supplemental steering system.

Perform the following procedure if your machine is equipped with a ground driven supplemental steering and if the procedure is required by local regulations.

Ensure that there are no hazards in the test area. The test area must be unobstructed and level. Operate the machine in second gear.

Ensure that all air tanks and accumulators are properly charged. Ensure that there is no load in the work tool. Position the machine with the bucket or the work tool in the carry position with the machine in neutral. Release the parking brake. Apply the service brakes and put the engine at low idle. Ensure that The area around the machine is clear of personnel. Shift the transmission to second gear forward and slowly release the service brakes. Moderately increase the engine speed to high idle. Shift the transmission to neutral. Turn the ignition to the OFF position. Allow the machine to coast.

While the machine is in motion, turn the machine to the left and to the right. If the machine responds to the steering input, the supplemental steering system is operating. Stop the machine with the service brakes. Apply the parking brake. The machine can then be returned to normal operation.

If there is no response to the steering input, the supplemental steering system is not operating. Stop the machine immediately. Repair the supplemental steering system before returning the machine to service.

i01801632

Service Brake Wear Indicator - Check

SMCS Code: 4255-535

Reference: For information about checking the service brake wear indicator, refer to Testing and Adjusting, “Braking System” for the machine that is being serviced or consult your Caterpillar dealer.

i03589859

Steering Column Play - Check

SMCS Code: 4310-535; 4338-535

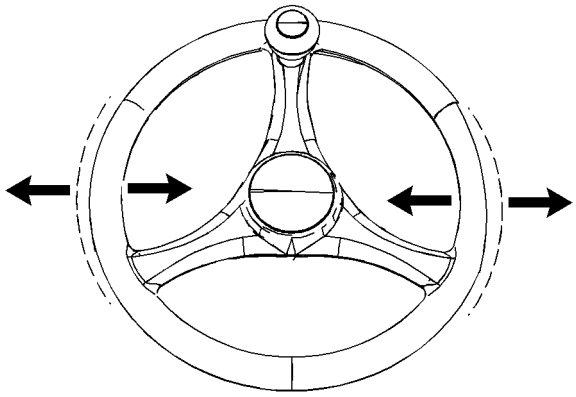


Illustration 241 g01408466

1. Hold the steering wheel with both hands.
2. Try to move the steering wheel from one side to the other side. The maximum allowed movement in the steering column should not exceed 25 mm (1.0 inch). If the value is not within the limit, perform the following steps:
   a. Inspect the pivot joint for loose bolts.
   b. Tighten the bolts if the bolts are loose.

Note: Apply 9S-3263 Thread Lock Compound to the bolts before tightening.

   c. Inspect the pivot joint for excessive wear.
   d. Replace the bushings if there is excessive wear.

⚠ WARNING

Failure to perform this inspection and repair may cause loss of steering control, which may result in personal injury or death.

Do not operate the machine until the inspection and repair are completed.

Contact your Caterpillar dealer for any other required service.

i02837728

Steering Column Spline (HMU Steering) - Lubricate

SMCS Code: 4310-086-SN; 4343-086-SN

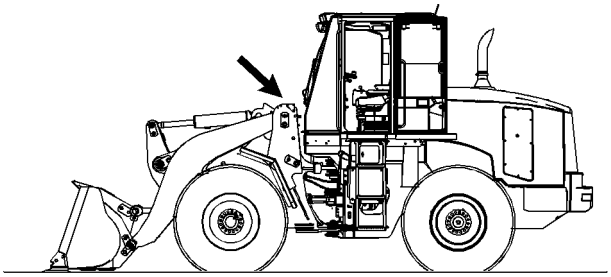


Illustration 242 g01414912

The metering pump is located under the front of the cab.

⚠ WARNING

Crushing Hazard. Connect the steering frame lock between front and rear frames before servicing the machine in the articulation area. Disconnect the steering frame lock and secure it in the stored position before resuming operation. Failure to do so could result in serious injury or death.

Refer to Operation and Maintenance Manual, “Steering Frame Lock” before entering the articulation joint.

Note: Do not disconnect any hydraulic lines from the metering pump.

Use the following steps to lubricate the splines on the steering column:

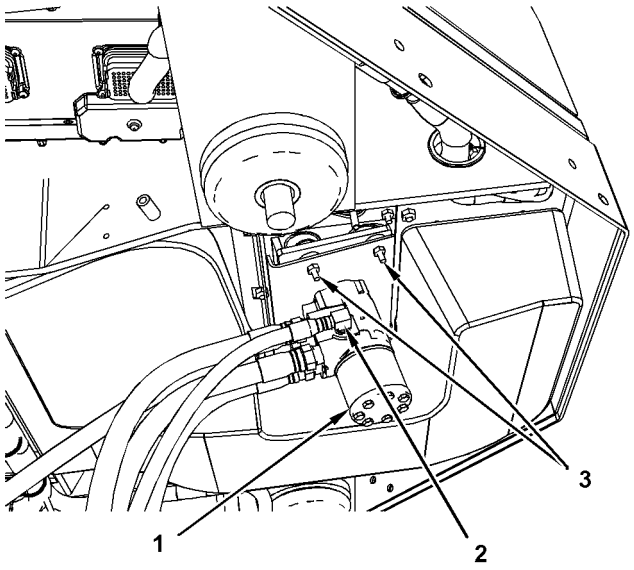


Illustration 243 g01311462

(1) Metering Pump
(2) Hose Coupling
(3) Bolts

1. Support the metering pump (1). Loosen the four bolts (3) that hold the pump. Do not loosen the hose couplings (2).

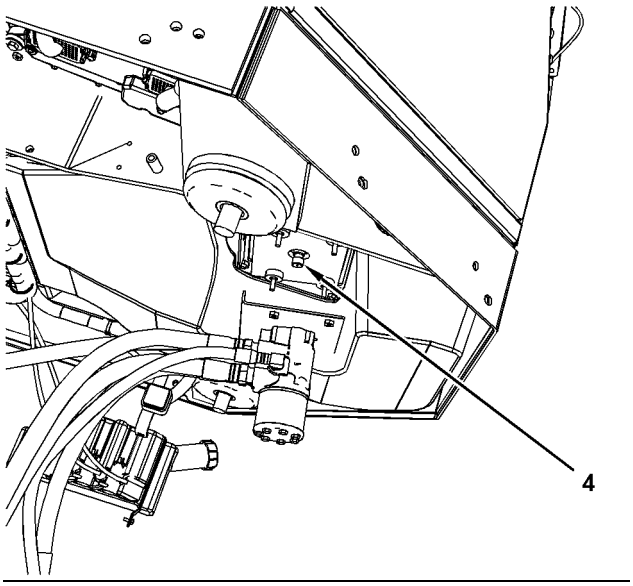


Illustration 244 g01311464

(4) Splines

2. Lower the pump in order to expose the splines (4).

3. Clean the male splines on the steering column. Clean the female splines in the pump.

4. Apply proper grease to the splines. Refer to Operation and Maintenance Manual, “Lubricant Viscosities” for selecting the proper grease.

5. Push the pump into position.

6. Tighten the four bolts that hold the pump.

7. Test the steering system.

i02926801

Steering Cylinder Bearings - Lubricate

SMCS Code: 4303-086-BD

⚠ WARNING

Crushing Hazard. Insure that the machine ignition switch is in the OFF position and that the parking brake is engaged before entering the articulation area. Failure to do so could result in serious injury or death.

Wipe off the fittings before you apply any lubricant.

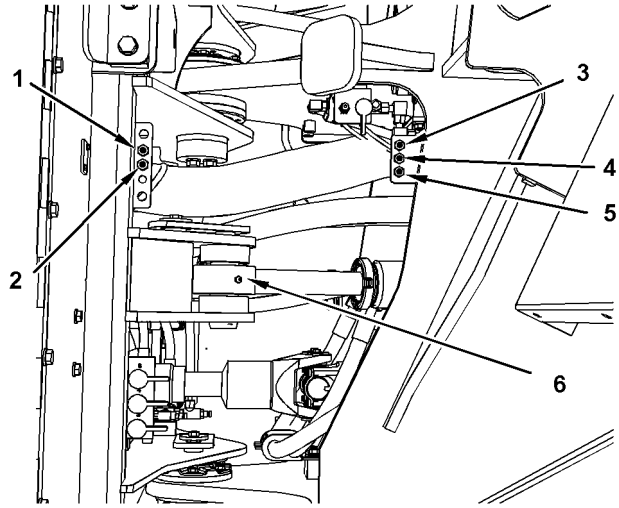


Illustration 245 g01453090

(1) Rear Trunnion
(2) Front Trunnion
(3) Tilt Cylinder
(4) Head End of the Left Steering Cylinder
(5) Head End of the Right Steering Cylinder
(6) Rod End of Steering Cylinder

Apply lubricant through the remote fittings for the head end of the steering cylinders. The remote fittings are located in the articulation joint on the right side of the machine.

Apply lubricant through one fitting on the rod end (6) of each steering cylinder.

i02305841

Tire Inflation - Check

SMCS Code: 4203-535-AI

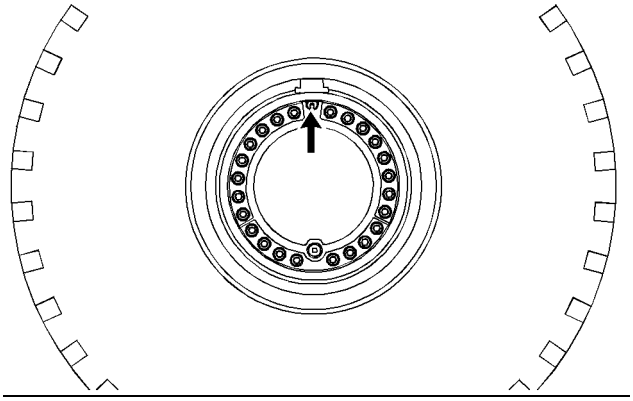


Illustration 246 g01160201

Always obtain proper tire inflation pressures and maintenance recommendations for the tires on your machine from your tire supplier. Measure the tire pressure on each tire.

Inflate the tires with nitrogen , if necessary.

Reference: Refer to the “Tire Inflation Information” section of the Operation and Maintenance Manual for more information.

i02926803

Transmission Oil - Change

SMCS Code: 3030-044

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.

1. Operate the machine for a few minutes in order to warm the transmission oil.

2. Park the machine on level ground. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake and stop the engine.

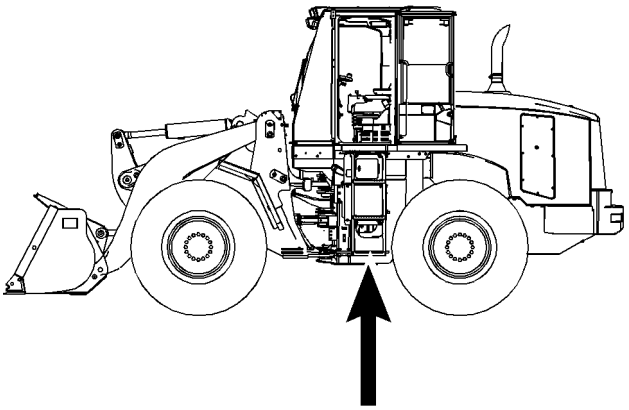


Illustration 247 g01301886

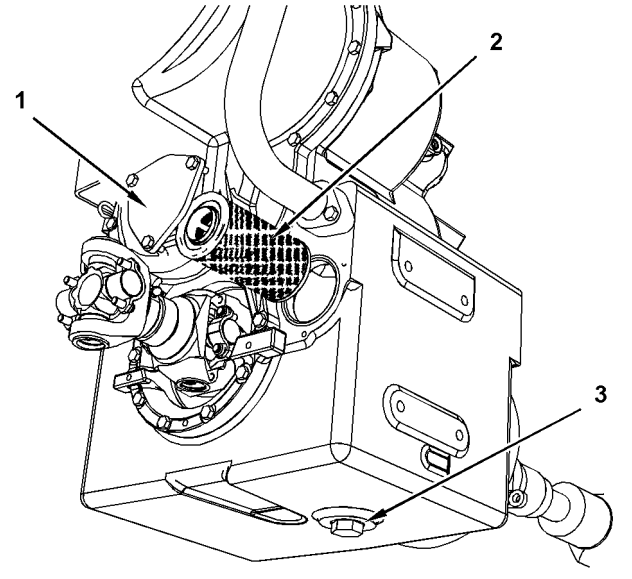


Illustration 248 g01453626

(1) Magnetic Strainer Cover
(2) Magnets, Tube, and Screen
(3) Drain Plug

3. Remove the transmission oil drain plug. Allow the transmission oil to drain into a suitable container. Clean the drain plug and install the drain plug.

4. Replace the transmission oil filter.

Reference: Refer to Operation and Maintenance Manual, “Transmission Oil Filter - Replace” for the correct procedure.

5. Remove the magnetic strainer cover on the rear of the housing. Remove the magnets, the tube, and the screen from the housing.

NOTICE
Do not drop or rap the magnets against any hard objects. Replace any damaged magnets.

6. Wash the tube and the screen in a clean, nonflammable solvent. Use a cloth, a stiff bristle brush, or pressure air to clean the magnets.

7. Install the magnets and the tube into the screen. Install the magnetic screen.

8. Clean the magnetic strainer cover and inspect the seal. Replace the seal if the seal is damaged. Install the magnetic strainer cover and tighten the bolts.

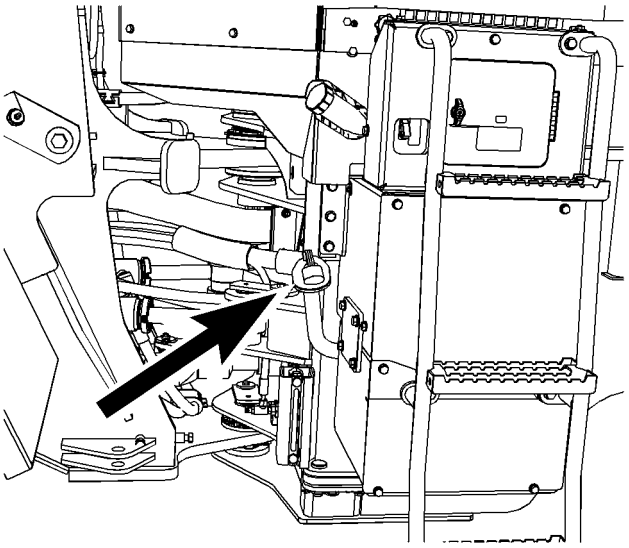


Illustration 249 g01453622

9. Remove the filler cap and fill the transmission with transmission oil.

Reference: Refer to Operation and Maintenance Manual, “Lubricant Viscosities and Refill Capacities” for the correct type of oil and for the correct amount of oil.

10. Install the filler cap.

11. Start the engine and run the engine at low idle. Apply the service brake. Slowly operate the transmission control in order to circulate the oil.

12. Move the transmission control lever to the NEUTRAL position. Inspect the transmission for leaks.

13. Check the transmission oil level.

Reference: Refer to Operation and Maintenance Manual, “Transmission Oil Level - Check” for the correct procedure.

i02845173

Transmission Oil Filter - Replace

SMCS Code: 3067-510

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, “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.

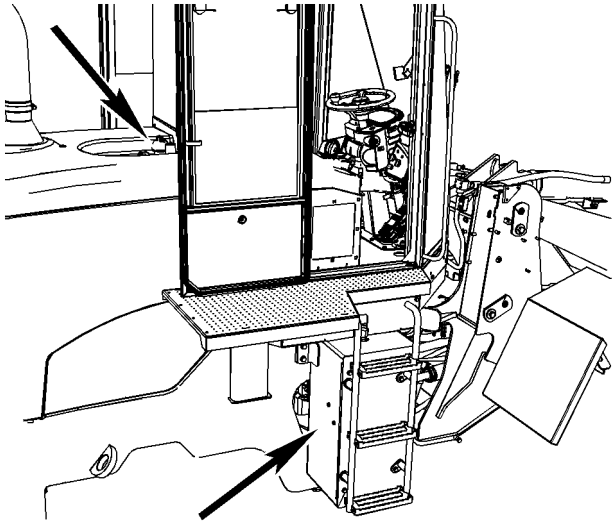


Illustration 250 g01245845

The transmission oil filter is located in the hydraulic service center on the right side of the machine.

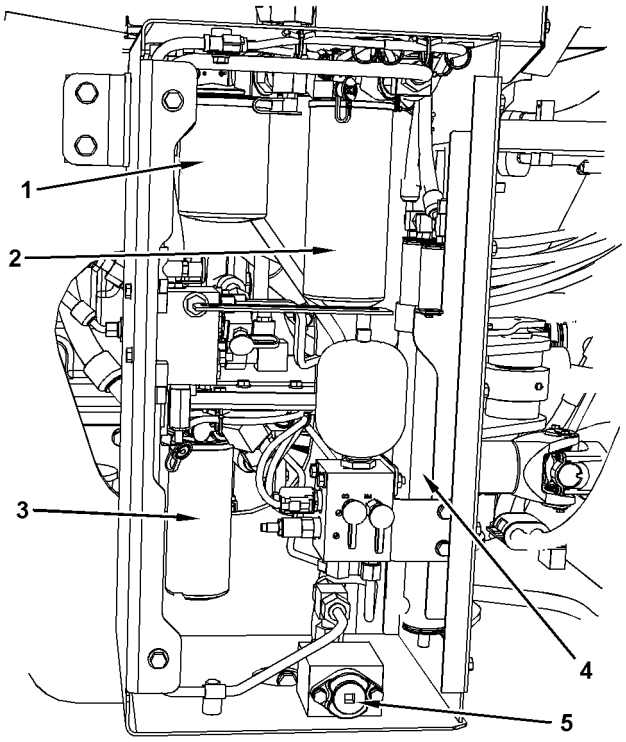


Illustration 251 g01418755

(1) Hydraulic Case Drain Filter
(2) Hydraulic System Filter
(3) Transmission Oil Filter
(4) Brake Accumulator
(5) Hydraulic Oil Tank Drain

1. Use a strap type wrench to remove the filter element (3). Dispose of the used filter element properly.

2. Clean the filter mounting base. Make sure that all of the used gasket is completely removed.

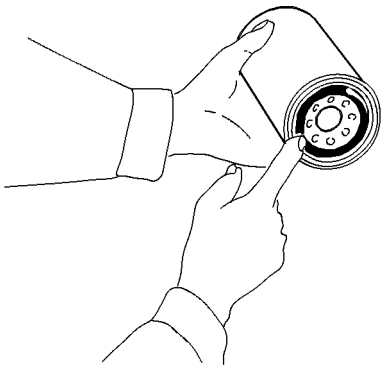


Illustration 252 g00101318

3. Apply a light coat of clean transmission oil to the seal of the new filter element. Install a new transmission oil filter hand tight until the seal of the transmission oil 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 transmission oil filter that are spaced 90 degrees or 1/4 or a turn away from each other. When you tighten the transmission oil filter, use the rotation index marks as a guide.

4. 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: You may need to use a Caterpillar strap wrench, or another suitable tool, in order to turn the filter to the amount that is required for final installation. Make sure that the installation tool does not damage the filter.

5. Start the engine and apply the service brake. Slowly operate the transmission controls in order to circulate the transmission oil.

6. Move the transmission control to the NEUTRAL position and engage the parking brake. Inspect the transmission oil filter for leaks.

7. Check the transmission oil level.

   Reference: Refer to Operation and Maintenance Manual, “Transmission Oil Level - Check” for the correct procedure.

i03652442

Transmission Oil Level - Check

SMCS Code: 3030-535-FLV

Operate the machine for a few minutes in order to warm the transmission oil. Park the machine on level ground.

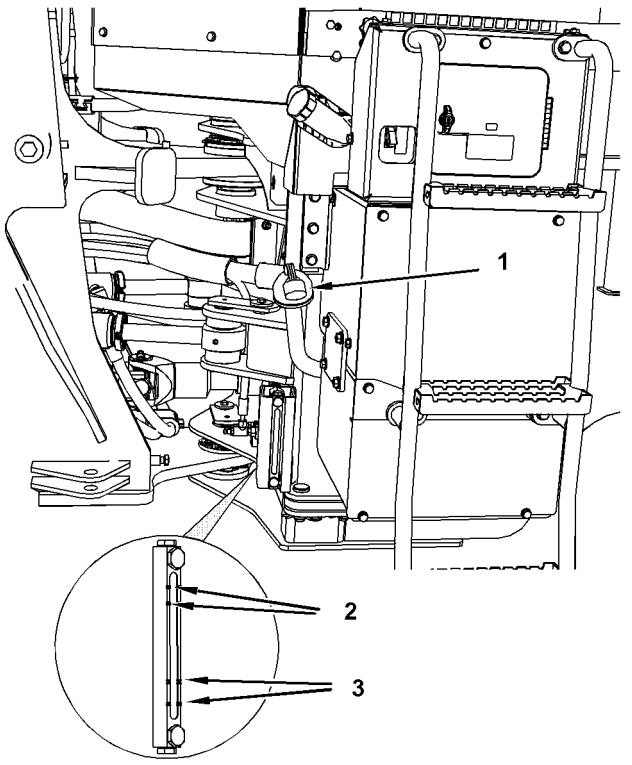


Illustration 253 g01959954

(1) Filler Cap
(2) Cold transmission oil level
(3) Warm transmission oil level and the engine at low idle

The sight gauge for the transmission oil level is located on the left side of the machine near the articulation joint.

Note: Before the machine is started, the transmission oil level should be above “MIN START” mark (2) on the upper end of the sight gauge.

1. Operate the machine for a few minutes in order to warm the transmission oil.

2. Park the machine on a hard, level surface. Put the transmission control into the NEUTRAL position. Lower the bucket to the ground with a slight downward pressure. Engage the parking brake.

3. Check the oil level while the engine is running at low idle.

   While the engine is running at low idle, the transmission oil level should be between the “MIN” mark and the “MAX” mark (3).

4. If necessary, remove the filler cap and add oil.

i02845175

Transmission Oil Sample - Obtain

SMCS Code: 3080-008; 7542

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.

1. Operate the machine for a few minutes before obtaining the oil sample. This will thoroughly mix the transmission oil for a more accurate sample.

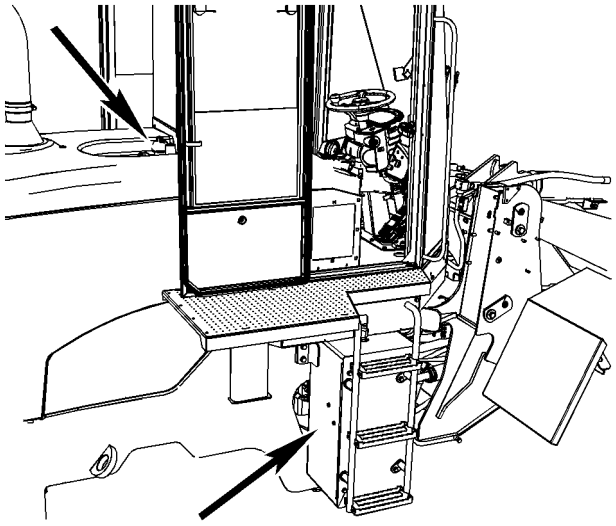


Illustration 254 g01245845

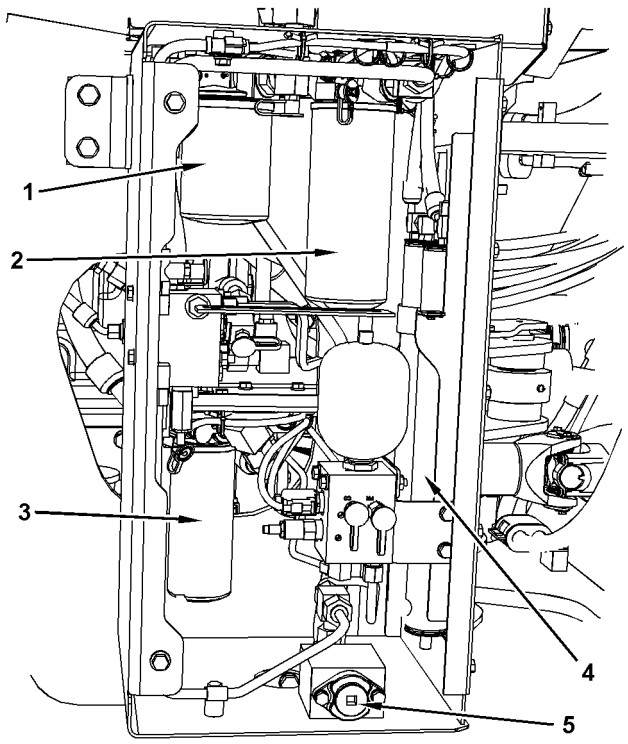


Illustration 255 g01418755

(1) Hydraulic Case Drain Filter
(2) Hydraulic System Filter
(3) Transmission Oil Filter
(4) Brake Accumulator
(5) Hydraulic Oil Tank Drain

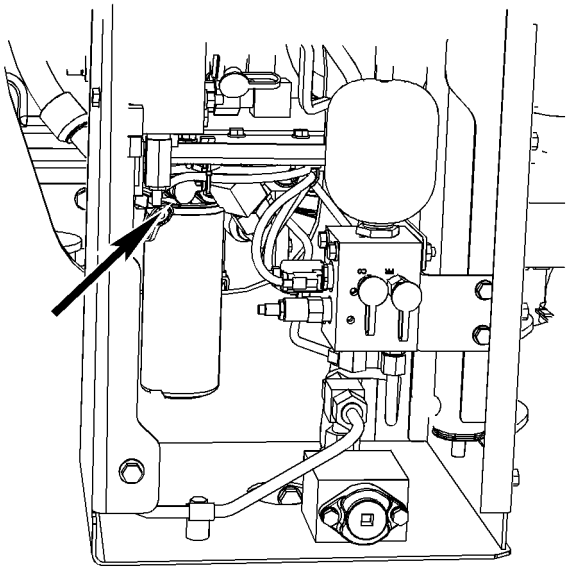


Illustration 256 g01246739

The sampling valve is located on the top of the transmission oil filter in the hydraulic service center on the right side of the machine.

2. Use the sampling valve in order to obtain a sample of transmission oil.

Reference: For more information, refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations” and Special Publication, PEHP6001, “How To Take A Good Oil Sample”.

i02594042

Window Washer Reservoir - Fill

SMCS Code: 7306-544

NOTICE
When operating in freezing temperatures, use Caterpillar nonfreezing window washer solvent or equivalent. System damage can result from freezing.

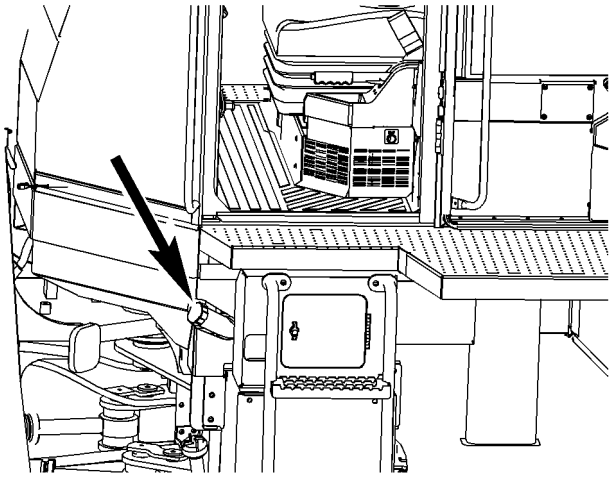


Illustration 257 g01308848

The window washer reservoir is located on the left side of the machine under the cab.

Fill the reservoir with window washer solvent.

i02837739

Window Wiper - Inspect/Replace

SMCS Code: 7305-040; 7305-510

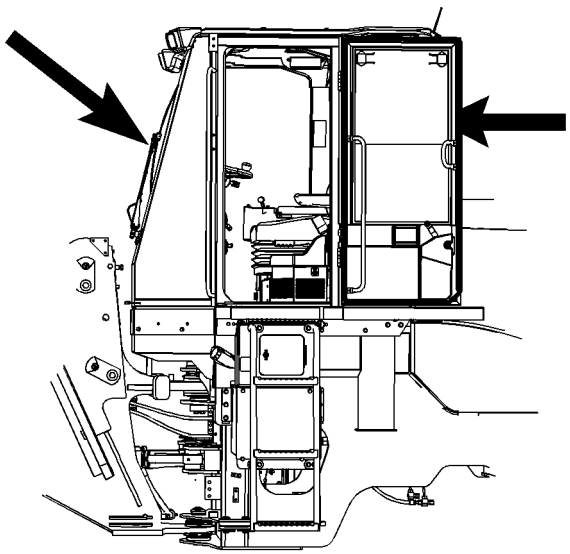


Illustration 258 g01414919

Inspect the condition of the wiper blades. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

i04412316

Windows - Clean

SMCS Code: 7310-070

Clean the outside of the windows from the ground, unless handholds are available.

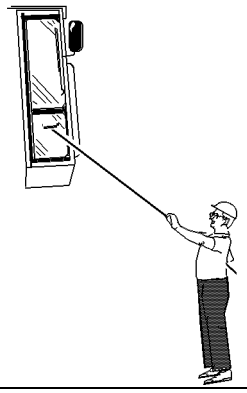


Illustration 259 g00566124
Typical example

Cleaning Methods

Commercial Window Cleaner

Apply the cleaner with a soft cloth. Rub the window with moderate pressure until all the dirt is removed. Allow the cleaner to dry. Wipe off the cleaner with a clean soft cloth.

Soap and Water

Use a clean sponge or a soft cloth. Wash the windows with a mild soap or with a mild detergent. Also use plenty of lukewarm water. Rinse the windows thoroughly. Dry the windows with a moist chamois or with a moist cellulose sponge.

Stubborn Dirt and Grease

Wash the windows with a good grade of naphtha, of isopropyl alcohol, or of Butyl Cellosolve. Then, wash the windows with soap and with water.

Polycarbonate Windows (If equipped)

Wash polycarbonate windows with a mild soap or detergent. Never use a cleaning solvent on polycarbonate windows.

Wash polycarbonate windows with warm water and a soft sponge, or damp cloth. Never use a dry cloth or paper towels on polycarbonate windows.

Rinse the windows with a sufficient amount of clean water.