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MAINTENANCE INTERVALS

Operation and Maintenance
Manual Excerpt

CATERPILLAR®

CATERPILLAR®

SEBU7808-11
February 2011

Operation and Maintenance Manual

988H Wheel Loader

BXY1-3999 (988H)

i04147189

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 to 3000 hours. S·O·S services may extend the oil change even longer. Consult your Cat dealer for details.

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 or Monthly

Initial 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 3 Years After Date of Installation or Every 5 Years After Date of Manufacture

Every 4000 Service Hours or 2 Years

Every 6000 Service Hours or 3 Years

Every 12 000 Service Hours or 6 Years

i02154861

Alternator - Inspect

SMCS Code: 1405-040

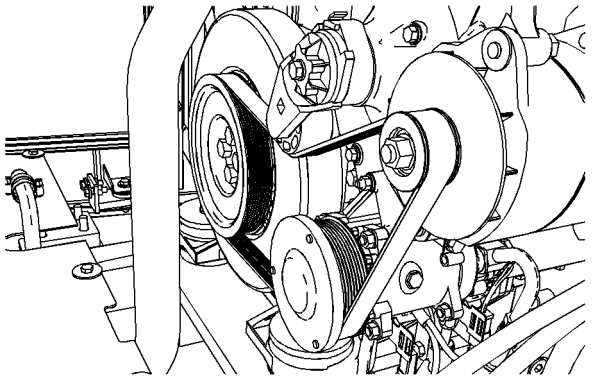

Illustration 92 g01092657

The alternator is located on the right side of the machine.

Caterpillar recommends a scheduled inspection of the alternator. Inspect the alternator for loose connections and for proper battery charging.

Keep the batteries fully charged.

Air temperature affects the cranking power of the batteries. Keep the batteries warm. The engine will not crank if the batteries are too cold. A warm engine will not crank if the batteries are too cold.

When the engine is operated for short periods of time, the batteries may not fully recharge. Make sure that the alternator is properly functioning. The alternator will charge the batteries.

Reference: For additional information, refer to the appropriate Service Manual for this machine.

i02147795

Articulation Bearings - Lubricate

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

Wipe off the fittings before any lubricant is applied.

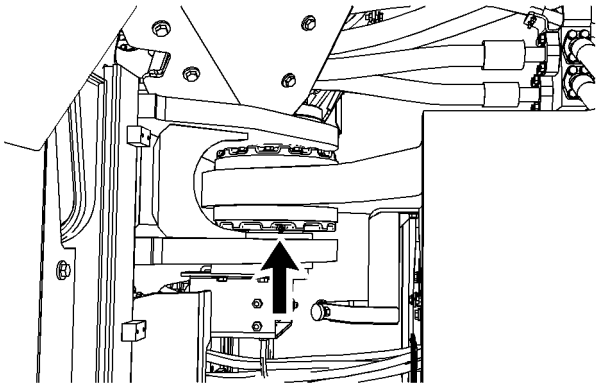

Illustration 93 g01092660

Apply grease through one fitting on the upper pivot bearing.

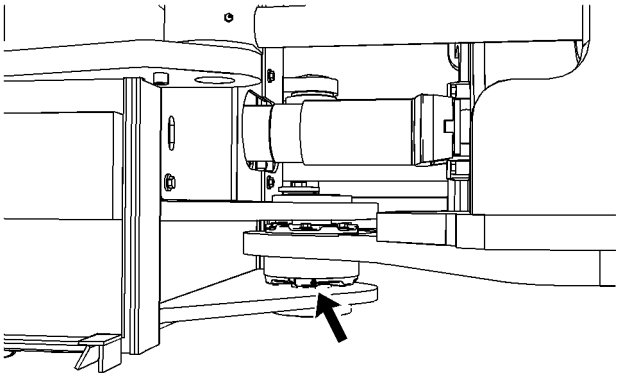

Illustration 94 g01092661

Apply grease through one fitting on the lower pivot bearing.

i02216552

Automatic Lubrication Grease Tank - Fill (If Equipped)

SMCS Code: 7540-544-TNK

⚠ 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.

The Centro-Matic Lubrication System

Reference: Before any service work is performed on the lubrication system, refer to Special Instructions, REHS1394 or consult your Caterpillar dealer.

Bulk Fill

1. In order to fill the reservoir, remove the lower and upper plugs from the side of the reservoir.
2. Attach the appropriate pump to the lower inlet.
3. Fill the reservoir until visual indicator on the lid of the tank indicates FULL or until the grease appears at the top vent port.

   Reference: For the correct type of grease, refer to Operation and Maintenance Manual, “Lubricant Viscosities”.
4. Remove the pump and replace both plugs.

The Quicklub Lubrication System

Reference: Before any service work is performed on the lubrication system, refer to Special Instructions, REHS1396 or consult your Caterpillar dealer.

Filling the Reservoir

1. Fill the reservoir through the grease fitting. The grease fitting is located at the base of the reservoir.

   Reference: For the correct type of grease, refer to Operation and Maintenance Manual, “Lubricant Viscosities”.
2. Refill the reservoir when the grease reaches the “MIN” mark on the reservoir.
3. Fill the reservoir to the “MAX” mark on the reservoir.

Priming the System

After the reservoir has been filled with the recommended lubricant, loosen the fitting to the supply line. Operate the pump until lubricant flows from the outlet. Then, tighten fitting.

i04164902

Automatic Lubrication System Components - Check (If Equipped)

SMCS Code: 7540-535

⚠ 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.

Reference: Before any service work is performed on the lubrication system, refer to Special Instructions, REHS1394 or consult your Cat dealer.

Autolube systems need to be adjusted before being put into use to ensure each joint gets the appropriate amount of grease. Different applications require frequency, volume, and proportioning adjustments from the recommended or factory settings.

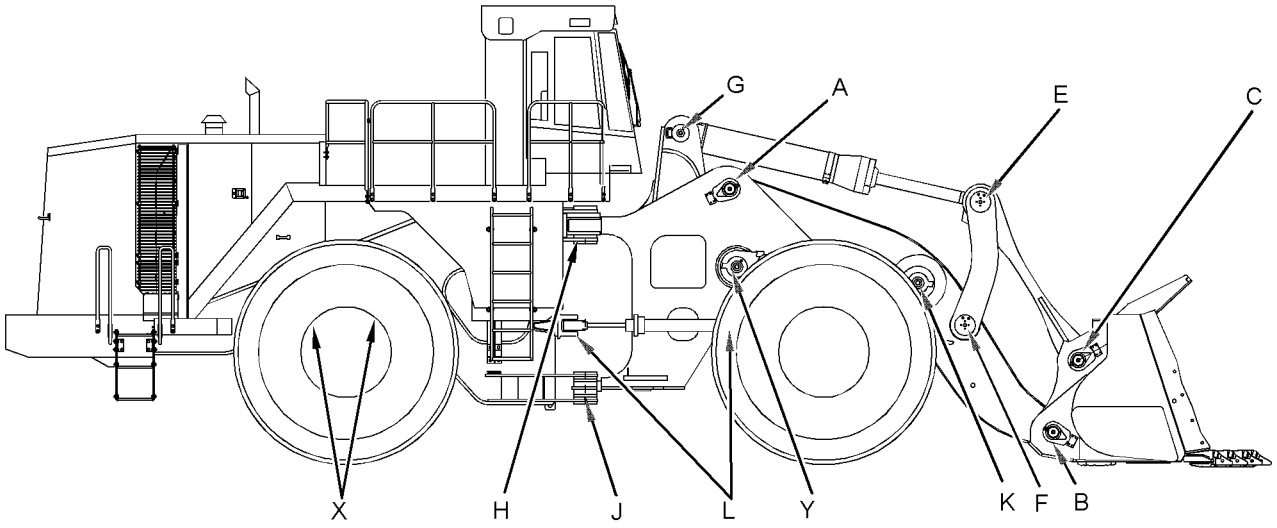

Illustration 95 g01032039

(A) A-Pin
(B) B-Pin
(C) C-Pin
(E) E-Pin
(F) F-Pin
(G) G-Pin
(H) Pin for Upper Articulation Joint
(J) Pin for Lower Articulation Joint
(K) K-Pin
(L) Steering Cylinder Pins
(X) Trunnions
(Y) Y-Pin

1. Remove any buildup of grease. Check that each pin joint is receiving a fresh supply of grease.

   Reference: If a fresh supply of grease is not present, refer to Special Instructions, REHS1394 for system troubleshooting procedures.

2. Check the grease level at the top vent port of the reservoir.

   Reference: For filling procedures, refer to Operation and Maintenance Manual, “Automatic Lubrication Grease Tank - Fill”.

Settings of the Injectors for the Autolube System

The controller of the autolube system is preset from the factory. The lubrication is dispensed at 15 minute intervals, and all of the injectors are preset at the full flow setting. There may be an excessive buildup of grease around some of the joints. As a result, the grease reservoir may need filling more frequently. The injectors for selected joints can be adjusted in order to reduce the flow of grease without adversely affecting the life of the pin. The injectors are set by the factory at the full flow setting. This setting is equivalent to 8 turns open. When the injectors are adjusted, the injectors should first be closed. Then, the injectors should be opened by the number of specified turns. The recommended settings for the injectors at each pin location are listed in Table 13.

Table 13

Pins	Qty (Injectors)	Settings (Turns)
A	0	8
B	2	
C	2	
E	3	5
F	2	2
G	1	8
H	1	2
J	1	
K	0	8
L	4	2
X	2	8
Y	0	8

Note: By using the above settings, the buildup of grease will be reduced. The interval between refills of the reservoir will be extended to approximately 250 hours. Grease levels in the reservoir must be checked in order to ensure an uninterrupted flow.

Timer Operation

Autolube systems must be adjusted before being put into use to ensure each joint gets the appropriate amount of grease. Different applications require frequency, volume, and proportioning adjustments from the recommended or factory settings.

Autolube settings must be monitored and adjusted as needed to account for changes in application, temperature, grease type, and NLGI grade.

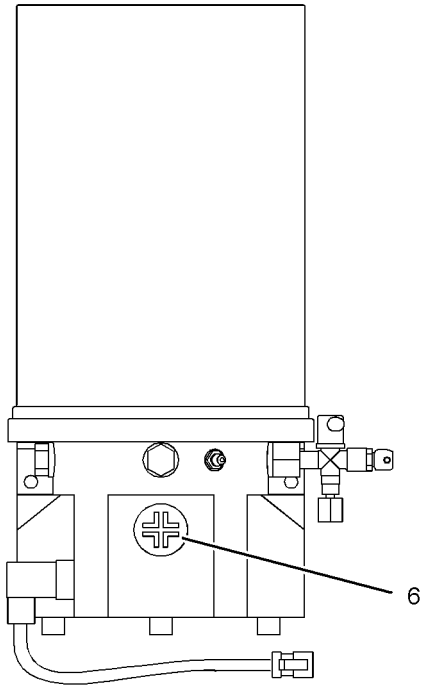

Illustration 96 g01239276

(6) Access plug

Remove access plug (6) on the front of the pump in order to access the timer control. The timer control group consists of the following:

- Manual lubrication switch
- OFF timer rotary switch
- ON timer rotary switch
- Power ON LED
- Pump ON LED

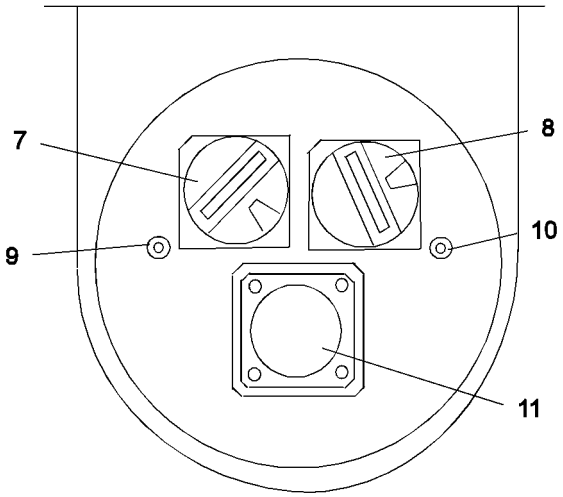

Illustration 97 g01238978

Timer control

(7) OFF timer switch
(8) ON timer switch
(9) Power ON LED.
(10) Pump motor ON LED
(11) Push button for manual lubrication

OFF timer switch (7) can be adjusted to 15 values. See Table 1 for the time interval for each value.

ON timer switch (8) can be adjusted to 15 values. See Table 1 for the time interval for each value.

LED (9) is marked “battery”. This LED will illuminate when power is sent to the pump control.

LED (10) is marked “motor”. This LED will illuminate when the pump is pumping lubricant.

Press push button (11) for 2 seconds. This process will initiate a manual lubrication cycle.

The OFF position of the timer begins accumulating time when the ignition switch closes. When the OFF position of the timer reaches the preset value, the pump will turn ON. The pump remains activated for the time period that is preset on the ON timer.

When the ignition is turned OFF, the used time is saved for an unlimited duration.

Turn the ignition to the ON position. The automatic lubrication operation will finish the cycle time.

Note: Do not use the zero setting that is located on the timer switches.

Note: The factory setting for the OFF position is “4” (16 minutes). The factory setting for the ON position is “2” (4 minutes).

Table 14

OFF TIME Rotary Switch Setting	Interval Between Cycles	ON TIME Rotary Switch Setting	Cycle Time of the Pump
0	0 minutes	0	0 minutes
1	4 minutes	1	2 minutes
2	8 minutes	2	4 minutes
3	12 minutes	3	6 minutes
4	16 minutes	4	8 minutes
5	20 minutes	5	10 minutes
6	24 minutes	6	12 minutes
7	28 minutes	7	14 minutes
8	32 minutes	8	16 minutes
9	36 minutes	9	18 minutes
A	40 minutes	A	20 minutes
B	44 minutes	B	22 minutes
C	48 minutes	C	24 minutes
D	52 minutes	D	26 minutes
E	56 minutes	E	28 minutes
F	60 minutes	F	30 minutes

Note: If the Lincoln 94824 Pump or the printed circuit board are replaced in the field, contact Lincoln Technical Service Department at 314-679-4200 ext. 4782 for instructions on special jumper pin setting for timer operation prior to installation and start up.

i02610378

Axle Oil Cooler Filter - Replace

SMCS Code: 3004-510-AOC

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.

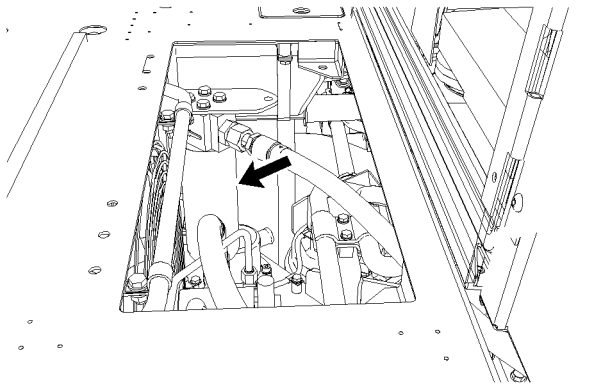

Illustration 98 g01092743

Front Filter

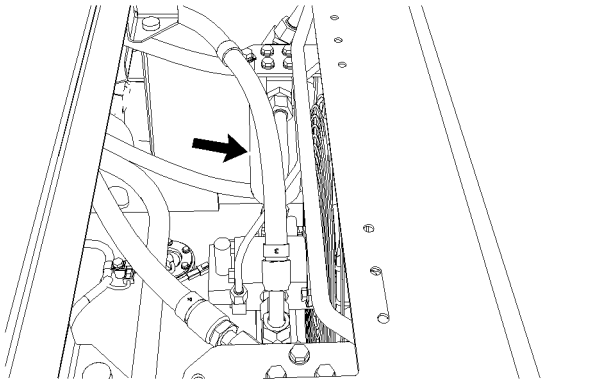

Illustration 99 g01092745

Rear Filter

The filters are located under the access door on the left cab platform.

1. Stop the engine.
2. Use a strap type wrench to remove the filters. Dispose of the used filters properly.
3. Clean the filter mounting bases. Make sure that all of the used seal is removed from each filter mounting base.

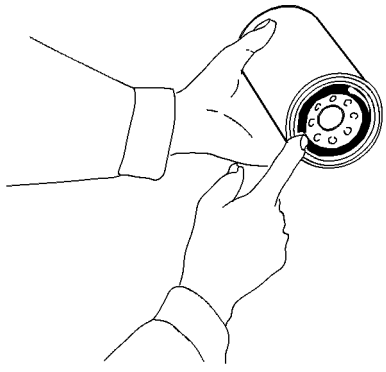

Illustration 100 g00101318

4. Apply a thin coat of clean differential oil to the seal of each new oil filter. Install each new oil filter hand tight until the seal of the oil filter contacts the base. Note the position of each index mark on each filter in relation to a fixed point on each filter base.

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

5. 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.

6. Start the engine and run the engine at low idle. Check for leaks.

7. Check the level of the differential oil.

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

i03506621

Axle Oscillation Bearings - Lubricate

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

Wipe off the fittings before any lubricant is applied.

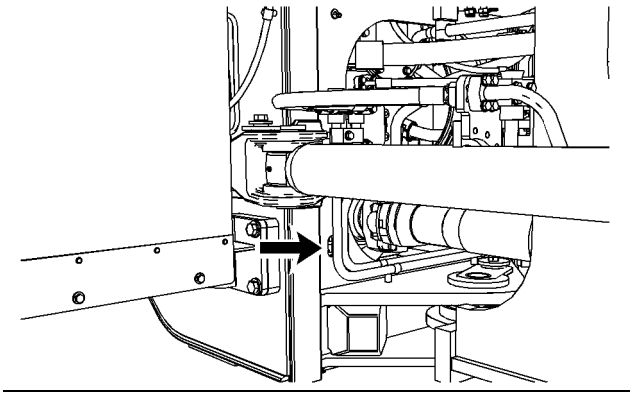

Illustration 101 g01841714

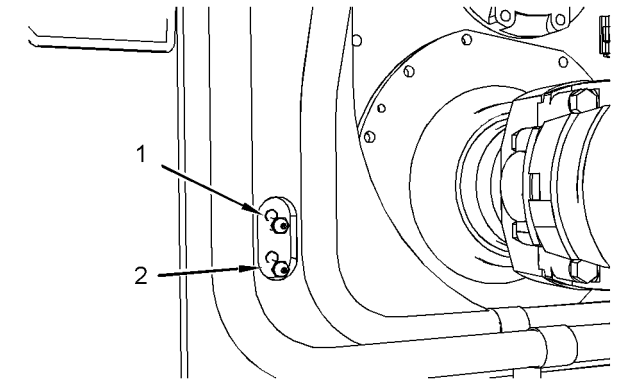

Illustration 102 g01841715

Apply lubricant through the two remote fittings on the right side of the machine. Fitting (1) applies grease to the rear axle oscillation bearing. Fitting (2) applies grease to the front axle oscillation bearing.

i02319912

Backup Alarm - Test

SMCS Code: 7406-081

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

Apply the service brake.

Move the transmission direction control lever to the REVERSE position.

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

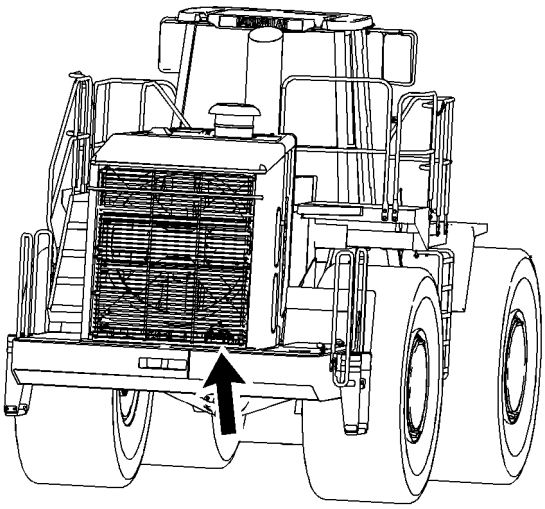

Illustration 103 g01091949

The backup alarm is located behind the rear grill.

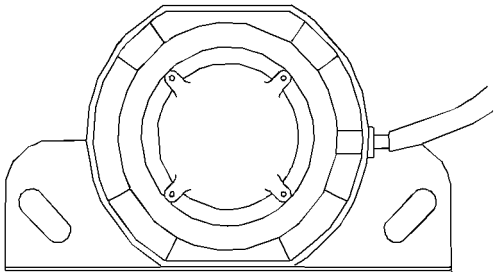

Illustration 104 g01117861

The volume for the backup alarm is nonadjustable.

i02155427

Battery - Clean

SMCS Code: 1401-070

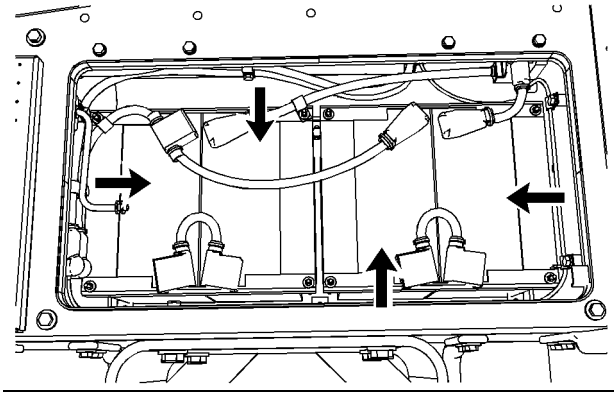

Illustration 105 g01093084

Open the battery compartment on the right rear side of the machine.

Clean the battery terminals and the surfaces of the batteries with a clean cloth. Coat the battery terminals with petroleum jelly. Make sure that the battery cables are installed securely.

i02155501

Battery Hold-Down - Tighten

SMCS Code: 7257-527

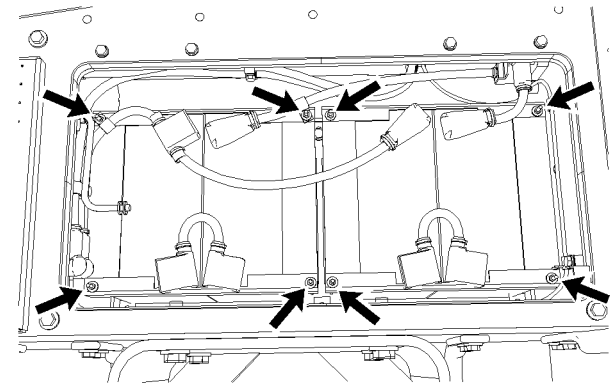

Illustration 106 g01093110

Open the battery compartment on the right rear side of the machine.

Over time, the vibration of an operating machine can cause the battery hold-downs to loosen. To help to prevent loose batteries and the possibility of loose cable connections, tighten the eight nuts on the two hold-downs to a torque of 2.50 ± 0.25 N·m (22 ± 2 lb in).

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

i01832060

Belts - Inspect/Adjust/Replace

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

Note: The alternator and the refrigerant compressor are driven by a single serpentine belt.

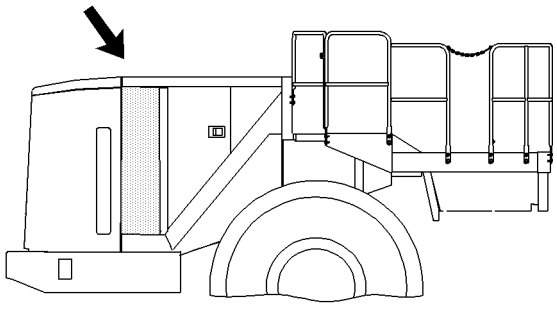

Illustration 107 g00935723

1. Stop the engine. Access the belt from the right side of the machine.

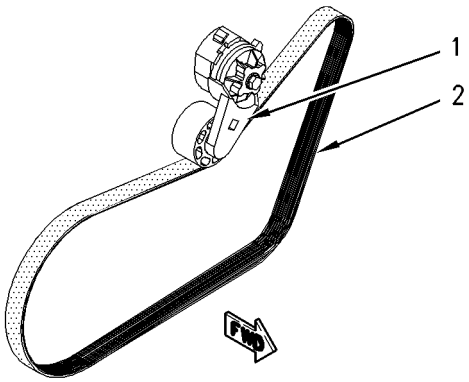

Illustration 108 g00935724

Note: The belt can be serviced via the engine access door or the vent and the firewall can be removed for easier access.

2. Inspect the condition of belt (2). If the belt is cracked or frayed, replace the belt.

3. Use a ratchet with a square head to loosen belt tensioner (1) during replacement. Make sure that the belt is installed in the correct pattern, as shown.

i02215711

Brake Accumulator - Check

SMCS Code: 4263-535

1. Turn the engine start switch to the ON position. The alert indicator for brake oil pressure should come on if the braking system is not at normal operating pressure. Refer to Operation and Maintenance Manual, “Monitoring System” for the location of the alert indicators.

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

3. Stop the engine. Apply the service brake pedal and release the service brake pedal. The rate for this process is 1 second on and 1 second off. Do this process 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 with new discs. The number of applications could be as low as three when the lining material on the brake discs is at replacement thickness.

4. If the alert indicator comes on after less than 3 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.

   Reference: Refer to Testing and Adjusting, RENR6365, “834H/836H Tier 3 Braking System”, “Accumulator Charging Valve (Brake)-Test and Adjust”for the correct procedure.

i01739721

Braking System - Test

SMCS Code: 4251-081; 4267-081

- Fasten the seat belt before you test the brakes.
- 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.

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. Move the transmission control to THIRD SPEED FORWARD while the service brakes are applied. Make sure that the autoshift control is in the OFF position.

3. Gradually increase the engine speed to high idle. The machine should not move.

4. 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. Move the transmission control to THIRD SPEED FORWARD. Make sure that the autoshift control is in the OFF position.

   The parking brake indicator light should come on.
3. Gradually increase the engine speed to high idle. The machine should not move.
4. 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.

i01548255

Bucket Cutting Edges - Inspect/Replace

SMCS Code: 6801-040; 6801-510

⚠ WARNING

Personal injury or death can result, if the bucket is not blocked up. Block the bucket before changing cutting edge.

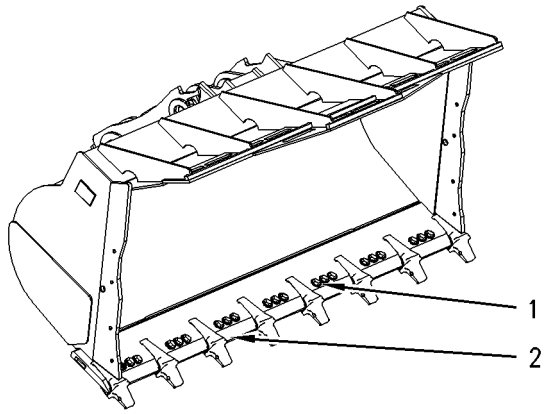

Illustration 109 g00804790

Check for bolts that are missing or loose. Replace any missing bolts and tighten any loose bolts.

Reference: Refer to Operation and Maintenance Manual, “Torques for Ground Engaging Tool Bolts” for the correct torque.

Inspect the cutting edges and the end bits. If wear or damage is evident, use the following procedure to replace the components.

1. Raise the bucket and place blocking under the bucket. Lower the bucket onto the blocking.

Note: Do not block up the bucket too high. Block up the bucket enough for removing the cutting edges and the end bits.

2. Remove bolts (1). Remove cutting edges (2) and the end bits.
3. Clean the contact surfaces. Inspect the cutting edges and install the cutting edges.

   If the opposite side of the cutting edge is not worn, use that side. If both sides of the cutting edge are worn, install a new cutting edge.
4. Install bolts (1). Tighten the bolts to the specified torque.
5. Raise the bucket and remove the blocking. Lower the bucket to the ground.
6. After a few hours of operation, check the bolts for proper torque.

i01923042

Bucket Lift and Bucket Tilt Control - Inspect/Clean

SMCS Code: 5258-571; 5702-571

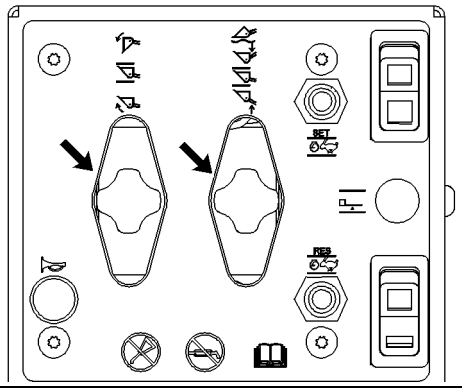

Illustration 110 g01000783

Note: Do not use any lubricants on any part of this control. The moving parts of this control are self−lubricated.

Use the following procedure in order to clean the control levers.

1. Disconnect the wiring from the controls.
2. Disassemble the controls.
3. Wash the parts with warm soapy water.
4. Rinse the parts thoroughly with water.
5. Dry the parts thoroughly.
6. Reassemble the controls.
7. Reconnect the wiring to the controls.

i02612625

Bucket Stops - Inspect/Replace

SMCS Code: 6001-040-SQ; 6001-510-SQ; 6102-040-SQ; 6102-510-SQ

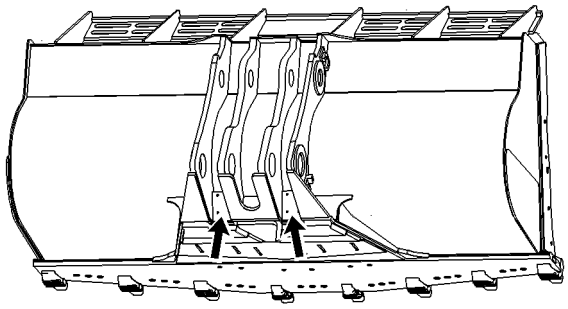

Illustration 111 g00554961

Check for bucket stops that are damaged or missing. Replace the bucket stops, if necessary.

Note: Recalibrate the tilt position sensor after you recalibrate the bucket stops. Consult your Caterpillar dealer for more information on calibrating the tilt position sensor.

i03574841

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.

Note: In order to maximize the life of the bucket tip and the penetration of the bucket tip, the bucket tip can be rotated.

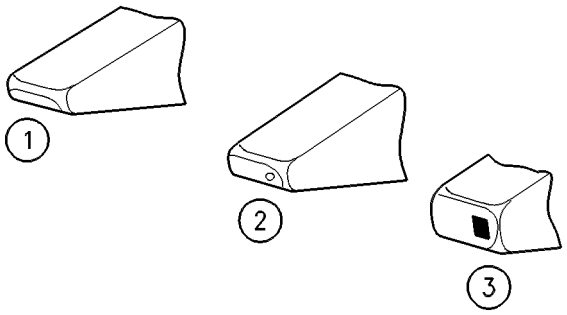

Illustration 112 g00101352

(1) Usable
(2) Replace
(3) Overworn

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

Removal

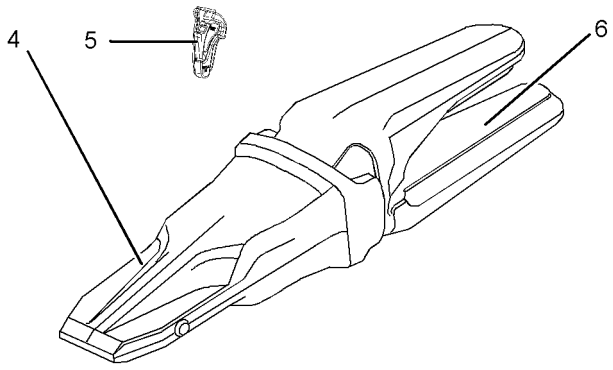

Illustration 113 g01389463

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

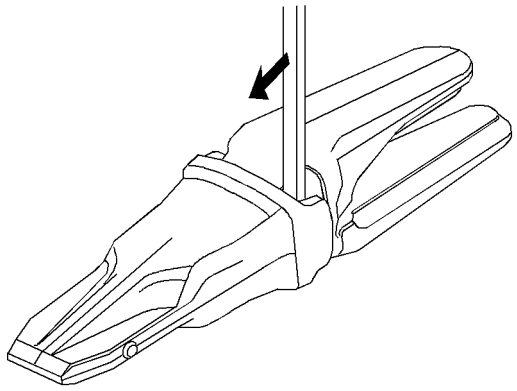

Illustration 114 g01175361

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.

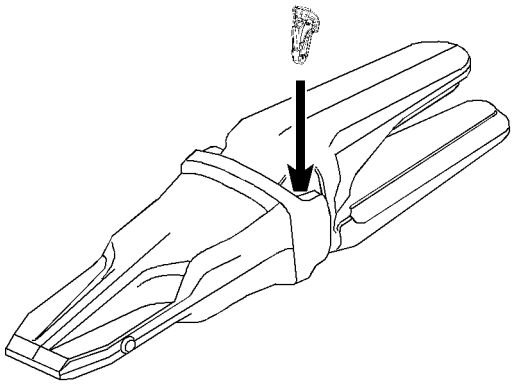

Illustration 115 g01124736

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.

Side Cutters (If Equipped)

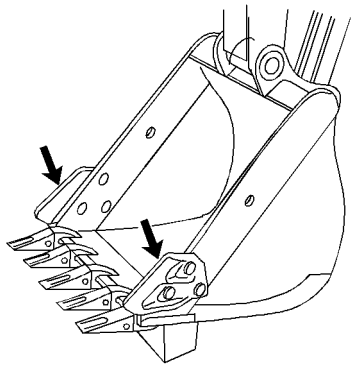

Illustration 116 g01389740

Bucket with side cutters
Side cutters

1. Remove the mounting bolts and the side cutters.

2. Clean the mounting surface of the side plate on the bucket and of the side cutter. Remove any burrs or protrusions on the mating surfaces.

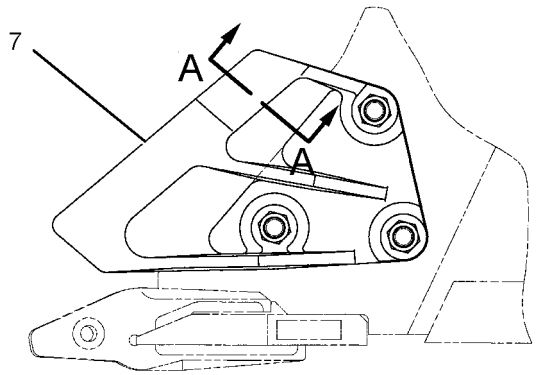

Illustration 117 g01389456

(7) Side cutter

Note: Some side cutters may be rotated for additional wear.

3. Install the side cutter.

Note: Certain bolts may require thread compound.

4. Hand tighten the bolts.

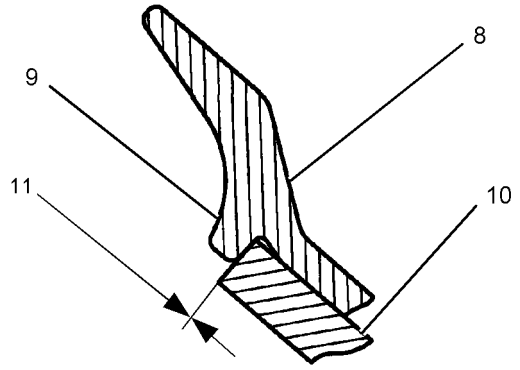

Illustration 118 g01389457

Section A-A From Illustration 117

(8) Side cutter
(9) Shear ledge on a side cutter
(10) Side plate on a bucket
(11) 0.0 mm (0.0 inch)

5. Make sure that there is not a gap between the side plate on the bucket and the shear ledge on the side cutter.

6. Torque the mounting bolts to the correct specification.

Side Protectors (If Equipped)

Inspect the wear of the side protector. When too much wear is present, replace the protector.

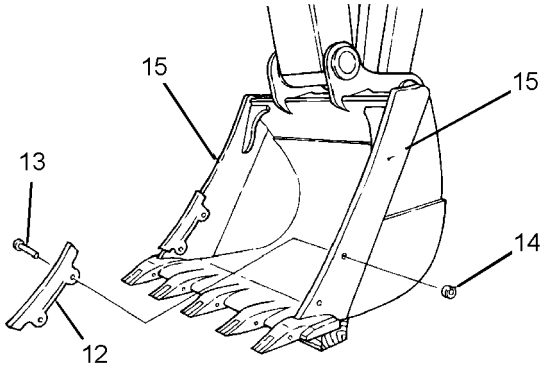

Illustration 119 g01389458

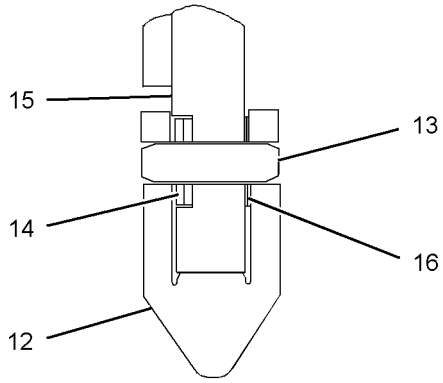

Illustration 120 g01903698

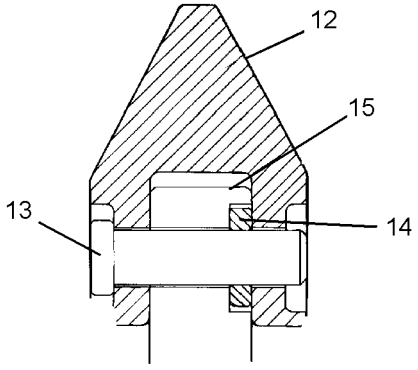

Illustration 121 g01389459

(12) Side protector
(13) Pin
(14) Retainer
(15) Side plate
(16) Shim

1. Hit pin (13) from the side of the bucket without the retainer in order to remove side protector (12) from side plate (15).

2. Clean side protector (12), pin (13), retainer (14) and side plate (15) before installation.

Note: Lateral clearance between the side plate and the side protector should not exceed 1 mm (0.04 inch). Shims (16) may be required in order to decrease the lateral clearance which will decrease movement. Install the shims(16) between the side plate and the side protector on the opposite side of the retainer.

3. Put retainer (14) in side plate (15).

4. Align two pin holes of the new protector and the side plate. Hit the pin from the retainer side of the bucket.

Note: If the pin and/or the retainer are worn, replace the pin and/or the retainer.

i01098709

Bucket Wear Plates - Inspect/Replace

SMCS Code: 6120-040; 6120-510

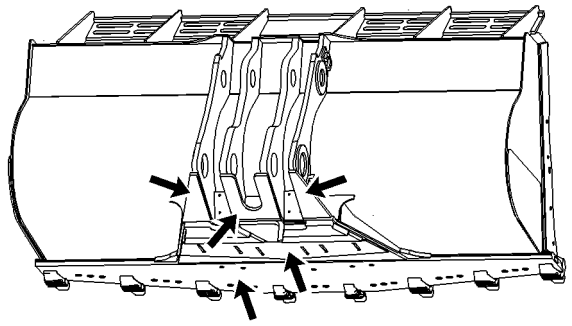

Illustration 122 g00577650

Before damage to the bottom of the bucket occurs, repair damaged bucket wear plates or replace damaged bucket wear plates.

Consult your Caterpillar dealer for the procedures.

i01908538

Cab Air Filter - Clean/Replace

SMCS Code: 7342-070; 7342-510

Note: Clean the cab air filters more often if the machine is being operated in dusty conditions.

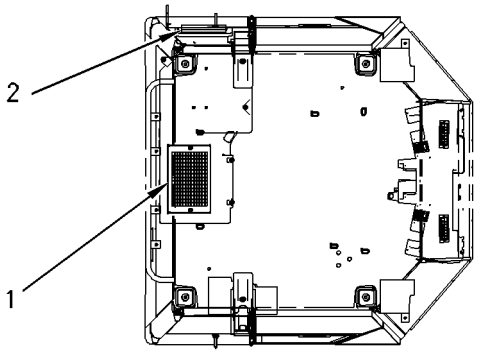

Illustration 123 g00994599

1. Remove the filter cover behind the seat. Remove the filter element.

2. Open the access door on the left side of the cab. Remove the filter element.

3. Clean the filter elements with pressure air or wash the filter elements in warm water with a nonsudsing household detergent.

4. If water and detergent are used to clean the filter elements, rinse the filter elements in clean water and allow the filter elements to air dry thoroughly.

Note: If either filter element is damaged, install a new filter element.

5. Install the filter elements. Install the filter cover and close the access door.

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

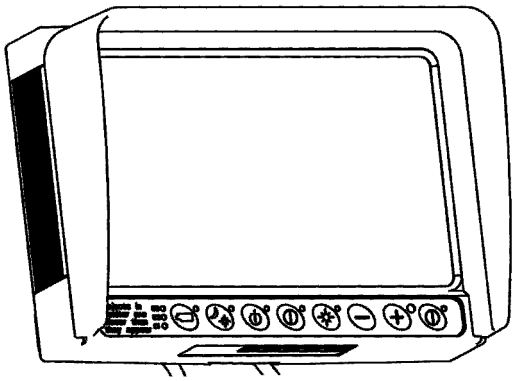

Illustration 124 g01223034

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

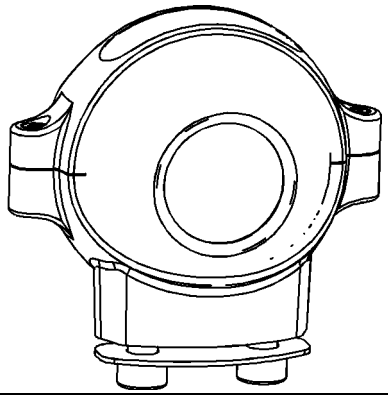

Illustration 125 g01223051

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”.

i01543124

Case Drain Oil Filters - Replace (If Equipped)

SMCS Code: 5091-510

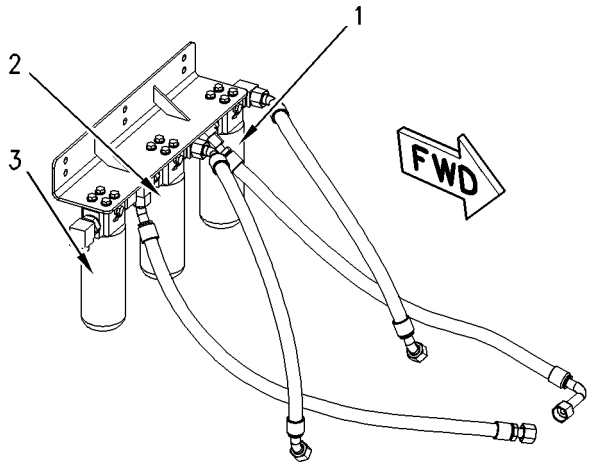

Illustration 126 g00801622

(1) Case drain filter for the steering pump. (2) Case drain filter for the implement pump. (3) Case drain filter for the fan motor.

The case drain filters are located under the access door in the platform behind the cab.

1. Stop the engine.
2. Use a strap type wrench to remove the filter element. Dispose of the used filter element properly.
3. Clean the filter mounting base. Make sure that all of the used gasket is removed from the filter mounting base.
4. Lubricate the gasket of a new filter element with clean hydraulic oil.
5. Install the new filter element by hand. When the gasket contacts the filter mounting base, tighten the filter element by an additional 3/4 turn.
6. Repeat the above steps for the other two case drain filters.
7. Start the engine and run the engine at low idle. Operate the steering, the brakes, and the implement.
8. Stop the engine. Inspect the filters for leaks. Make any necessary repairs.

i02155537

Circuit Breakers - Reset

SMCS Code: 1420-529

Circuit Breakers – Depress the button in order to reset the circuit breaker. If the circuit is functioning properly, the button will remain depressed. If the button will not remain depressed, check the appropriate electrical circuit.

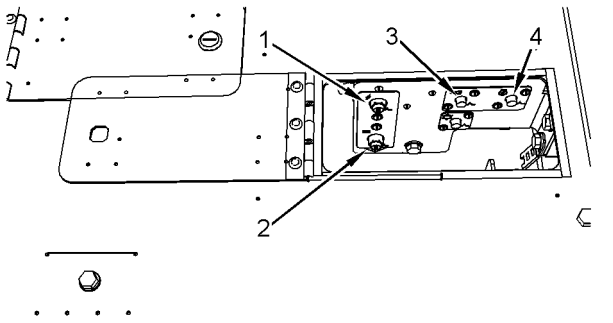

Illustration 127 g01093167

The circuit breakers are located under a small access door on the right cab platform.

Main Circuit (1) – 105 amp

Alternator (2) – 105 amp

Engine Start Switch (3) – 10 amp

Electronic Control Module (ECM) (4) – 15 amp

i02156049

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 Tools and Shop Products Guide” 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.

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

If you change the coolant of a machine to Extended Life Coolant from another type of coolant, use a Caterpillar cleaning agent to flush the cooling system. After you drain the cooling system, thoroughly flush the cooling system with clean water. **All of the cleaning agent must be removed from the cooling system.**

If an Extended Life Coolant was previously used, flush the cooling system with clean water. No other cleaning agents are required. Use the following procedure to change the cooling system coolant (ELC).

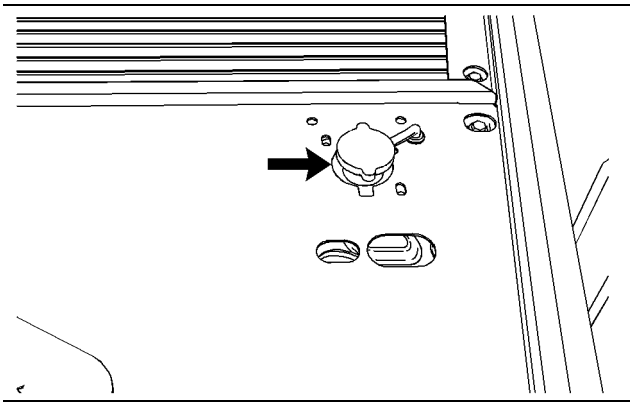

Illustration 128 g01093449

The cooling system pressure cap is located on the left side of the machine on the top of the radiator.

1. Slowly loosen the cooling system pressure cap in order to relieve system pressure. Remove the cooling system pressure cap.

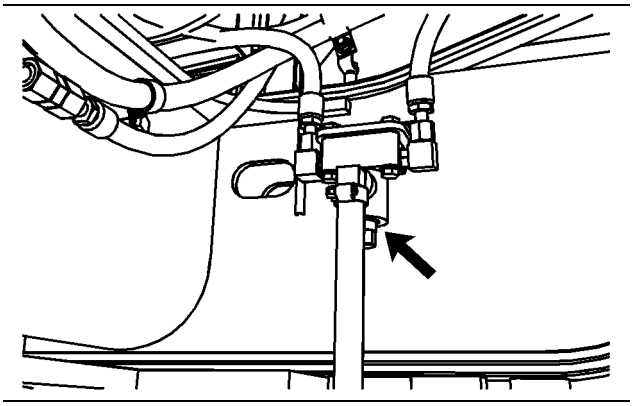

Illustration 129 g01093450

The drain valve is located at the rear of the machine under the engine compartment.

2. If equipped, remove the bottom guard in order to access the coolant drain valve.
3. Open the drain valve. Allow the coolant to drain into a suitable container.
4. Flush the cooling system with clean water until the draining water is transparent.
5. Close the drain valve. Replace the bottom guard, if equipped.
6. Replace the water temperature regulator.

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

   Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill) ” for the capacity of the cooling system.
8. Start the engine. Run the engine without the cooling system pressure cap until the water temperature regulator opens and the coolant level stabilizes.
9. Check the coolant level.

   Reference: Refer to Operation and Maintenance Manual, “Cooling System Level - Check” for the correct procedure.
10. Install the cooling system pressure cap. Stop the engine.

i02156106

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 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 Tools and Shop Products Guide” 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.

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

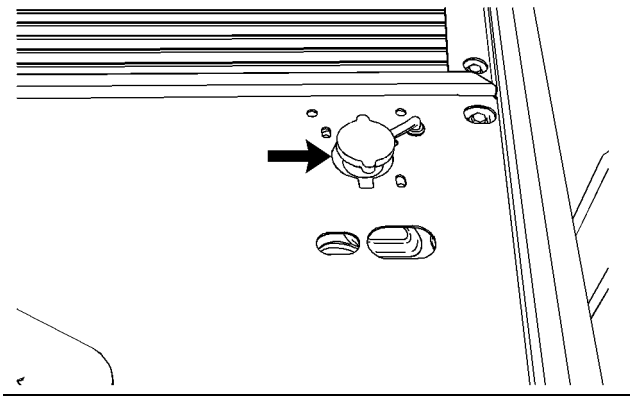

Illustration 130 g01093449

The cooling system pressure cap is located on the left side of the machine on the top of the radiator.

1. Slowly loosen the cooling system pressure cap in order to relieve system pressure. Remove the cooling system pressure cap.

2. Use a 8T-5296 Coolant Test Kit to check the concentration of the coolant. If it is necessary, adjust the concentration of the coolant.

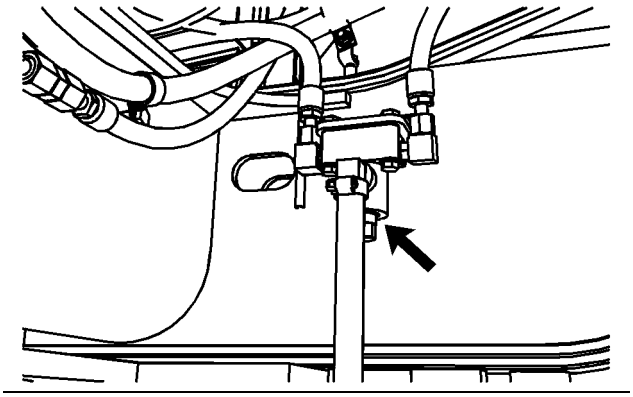

Illustration 131 g01093450

3. If necessary, drain enough coolant from the radiator in order to allow the addition of the Extender. The coolant drain valve is located at the rear of the machine under the engine compartment.

4. Add 3 L (100 fl oz) of Extender to the cooling system.

5. Check the coolant level.

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

6. Install the cooling system pressure cap.

i02156161

Cooling System Coolant Level - Check

SMCS Code: 1350-535-FLV

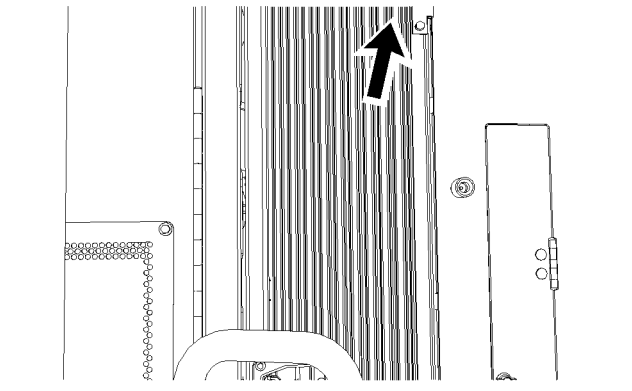

Illustration 132 g01093538

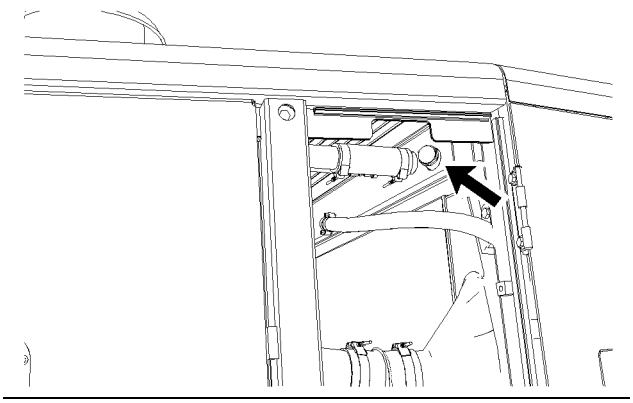

Illustration 133 g01093541

The sight gauge is located on the left side of the machine. The sight gauge can be viewed through the vents on the left side of the machine.

1. Maintain the coolant level within the sight gauge.

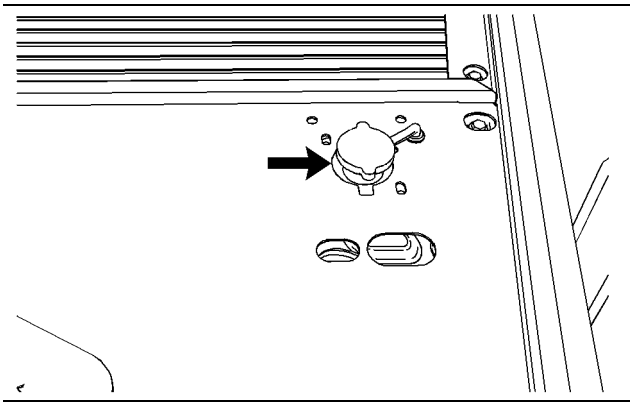

Illustration 134 g01093449

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.

2. If the coolant level is low, slowly remove the cooling system pressure cap on the top left side of the machine and 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.

3. 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.

4. 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.

i02279462

Cooling System Coolant Sample (Level 1) - Obtain

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

Note: It is not necessary to obtain a Coolant Sample (Level 1) if the cooling system is filled with Cat ELC (Extended Life Coolant). Cooling systems that are filled with Cat ELC should have a Coolant Sample (Level 2) that is obtained at the recommended interval that is stated in the Maintenance Interval Schedule.

Note: Obtain a Coolant Sample (Level 1) if the cooling system is filled with any other coolant instead of Cat ELC. This includes the following types of coolants.

- Commercial long life coolants that meet the Caterpillar Engine Coolant Specification -1 (Caterpillar EC-1)
- Cat Diesel Engine Antifreeze/Coolant (DEAC)
- Commercial heavy-duty coolant/antifreeze

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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

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

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.

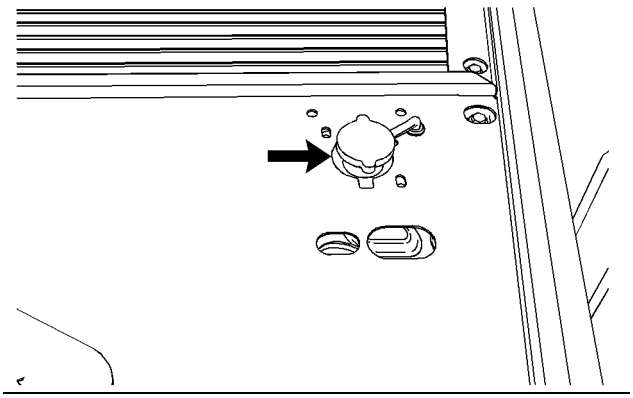

Illustration 135 g01093449

Slowly remove the cooling system pressure cap.

Open the left side engine access door.

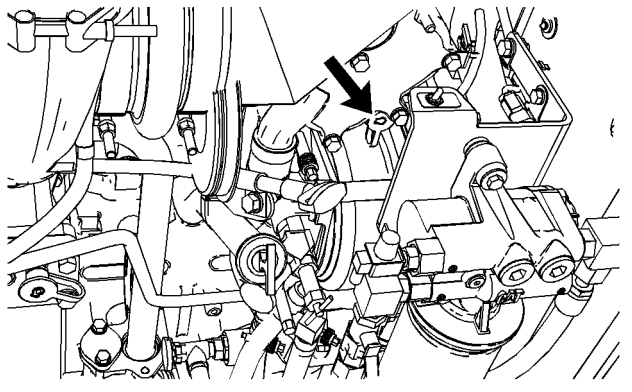

Illustration 136 g01120387

Remove the cap over the coolant sample port.

Attach a hose to a couple. Install the threaded end of the coupling into the drain valve in order to unseat the internal drain valve.

Close the engine access door and return the pressure cap.

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.

i02156175

Cooling System Coolant Sample (Level 2) - Obtain

SMCS Code: 1350-008; 1395-008; 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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

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

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.
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- 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.
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- Never collect samples from expansion bottles.
- Never collect samples from the drain for a system.

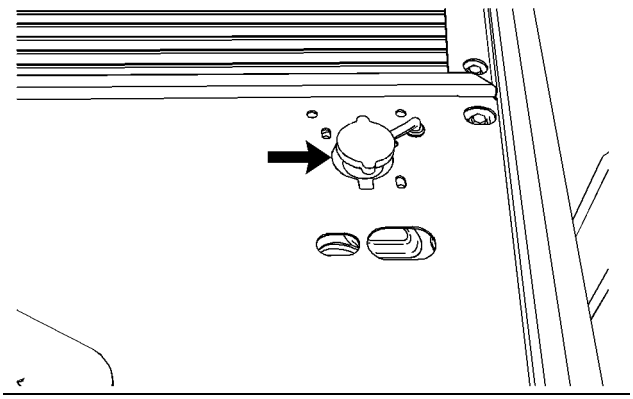


Illustration 137 g01093449

Slowly remove the cooling system pressure cap.

Open the left side engine access door.

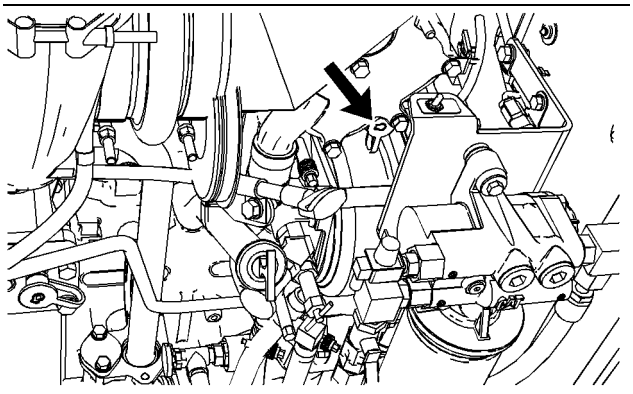


Illustration 138 g01120387

Remove the cap over the coolant sample port.

Attach a hose to a couple. Install the threaded end of the coupling into the drain valve in order to unseat the internal drain valve.

Close the engine access door and return the pressure cap.

Submit the sample for level 2 analysis.

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

i01925931

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.

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

The water temperature regulator should be replaced after the cooling system has been cleaned. Replace the water temperature regulator and replace the seals while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the water temperature regulator housing.

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

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

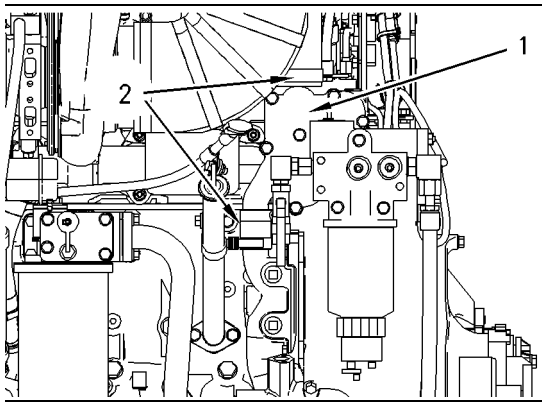


Illustration 139 g01002350

The water temperature regulator is located on the left side of the engine near the primary fuel filter.

1. Remove the bolts that secure the regulator housing (1). Loosen the hose clamps (2).

2. Remove the regulator housing. Remove all of the used gasket from the housing.

NOTICE
Caterpillar engines incorporate a shunt design cooling system and require operating the engine with a thermostat installed.

If the thermostat is installed wrong, it will cause the engine to overheat. Inspect gaskets before assembly and replace if worn or damaged.

3. Install a new gasket on the regulator housing. Install a new water temperature regulator.

4. Install the bolts and the cover.

5. Tighten the hose clamps.

6. Refill the cooling system.

i01923122

Crankshaft Vibration Damper - Inspect

SMCS Code: 1205-040

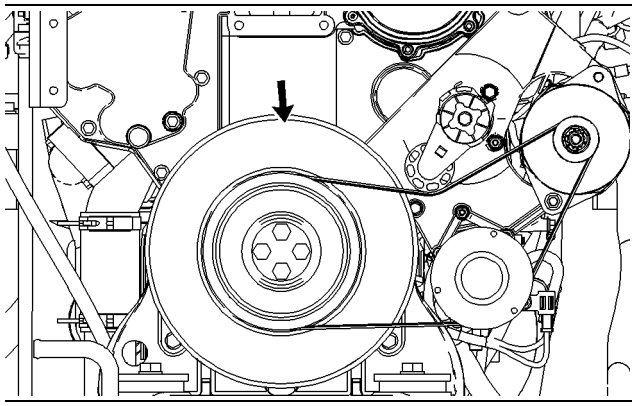


Illustration 140 g01000821

The crankshaft vibration damper is located at the rear end of the engine compartment.

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

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

- The engine has had a failure because of a broken crankshaft.
- The S·O·S oil analysis detected a worn crankshaft front bearing.
- The S·O·S oil analysis detected a large amount of gear train wear that is not caused by a lack of oil.

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

Inspect the vibration damper for dents in the outer case. Dents in the outer case may cause failure of the damper. Install a new vibration damper if the damper is damaged.

Reference: Refer to the Disassembly and Assembly manual for your machine's engine for the necessary replacement procedure.

i03879434

Differential and Final Drive Oil - Change

SMCS Code: 3278-044; 4050-044

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.

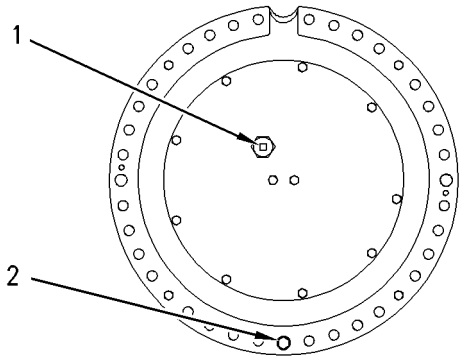


Illustration 141 g00801038
Final Drive

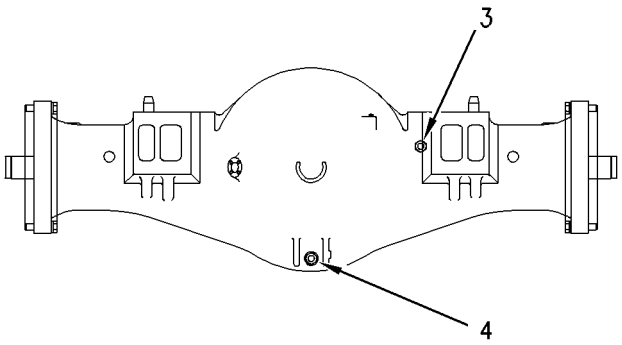


Illustration 142 g00840713
Front Differential

1. Position the wheels so that the front final drive drain plugs (2) are facing downward. Remove the front final drive drain plugs (2) and the front differential drain plug (4). Allow the oil to drain into a suitable container.

2. Remove the front final drive filler plugs (1) and the front differential filler plug (3).

3. After the oil has drained, clean the drain plugs and install the drain plugs.

4. Fill the final drives to the bottom of the filler plug openings.

   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.

5. Add three 1 L (1.1 qt) bottles of 1U-9891 Hydraulic Oil Additive to the differential.

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

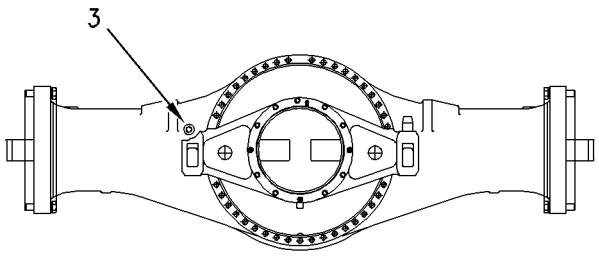


Illustration 143 g00840708
Rear Differential Filler Plug (3)

7. Repeat steps 2 through 6 for the rear final drives and the rear differential.

Note: Some machines require no 1U-9891 Hydraulic Oil Additive to the rear differential, since those machines are without a rear brake system.

   Reference: Refer to Operation and Maintenance Manual, “Capacities (Refill)” for the correct requirements of the additive to the differential.

8. If the specified amount of oil will not fit in the final drives, install the final drive filler plugs. Operate the machine on level ground for a few minutes in order to equalize the oil level in the axles.

9. Remove the final drive filler plugs and add the remaining oil. The oil level should reach the bottom of the filler plug opening.

Note: If the oil level is higher than the filler plug opening, do not allow the oil to drain to the proper level. Install the filler plug.

i01624405

Differential and Final Drive Oil Level - Check

SMCS Code: 3278-535-FLV; 4050-535-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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

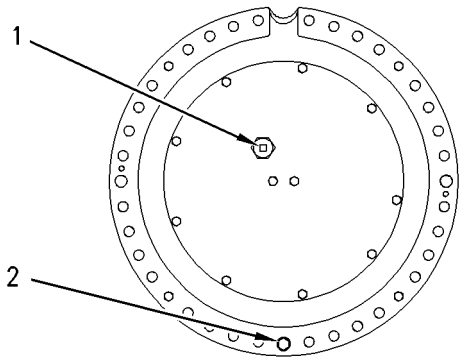


Illustration 144 g00801038

1. Position the wheels so that final drive drain plug (2) is facing downward. Remove oil filler plug (1). The oil level should be at the bottom of the filler plug opening. Add oil, if necessary.

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

If the oil level is higher than the filler plug opening, do not allow the oil to drain to the proper level. Install the filler plug.

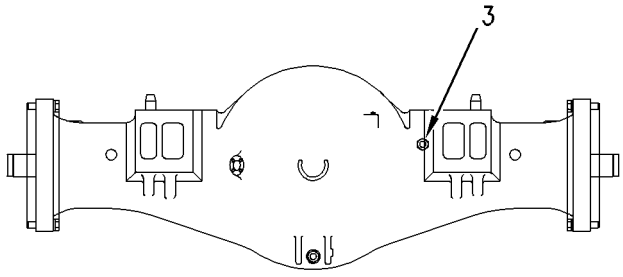


Illustration 145 g00801039
Front Differential

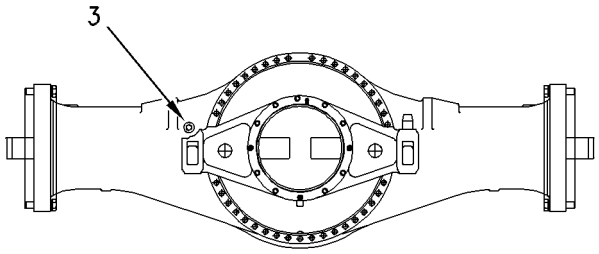


Illustration 146 g00840708
Rear Differential

2. Remove differential filler plug (3). The oil level should be at the bottom of the filler plug opening. Add oil, if necessary.

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

If the oil level is higher than filler plug opening, do not allow the oil to drain to the proper level. Install filler plug (3).

i02339342

Differential and Final Drive Oil Sample - Obtain

SMCS Code: 3278-008; 4050-008; 4070-008; 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.

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 Tools and Shop Products Guide” 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 oil for a more accurate sample.

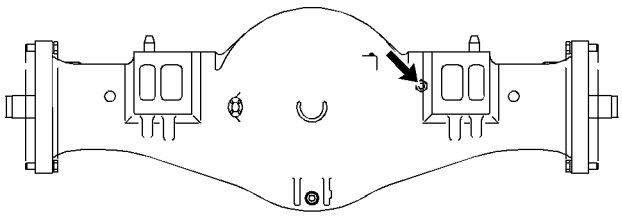


Illustration 147 g01167372
Differential Filler Plug

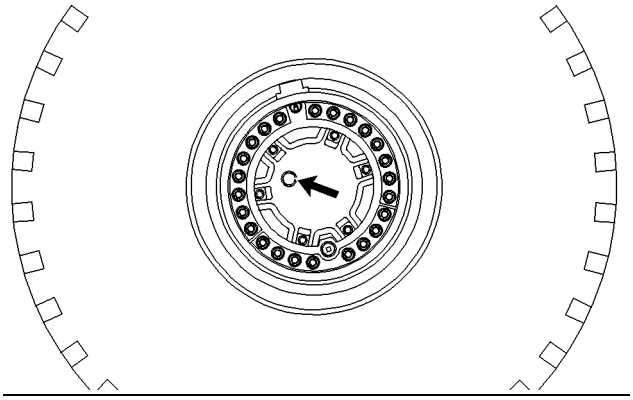


Illustration 148 g00760182
Final Drive Filler Plug

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.

Note: This procedure requires a sample for each final drive and each differential. There will be a total of three samples per axle and six samples for this procedure in total. Make sure that you properly record the location of each oil sample.

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

i03947685

Drive Shaft Spline (Center) - Lubricate

SMCS Code: 3253-086; 3253-086-SN; 3253

NOTICE
To prevent damage to the seal, fully articulate the machine to the right or to the left, before lubricating the spline.

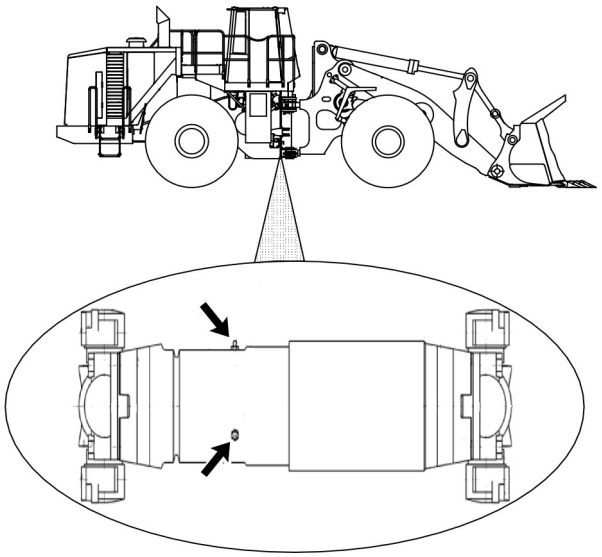


Illustration 149 g02157619

Wipe all fittings before applying lubricant.

Apply lubricant through one fitting on the drive shaft spline.

i03715441

Drive Shaft Support Bearing - Lubricate

SMCS Code: 3267-086-BD

Wipe off the fitting before any lubricant is applied.

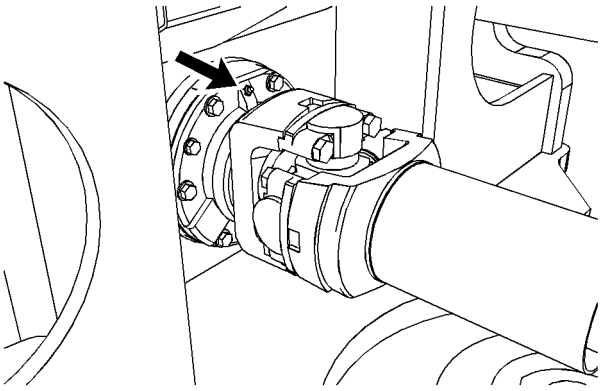


Illustration 150 g01093575

Center Drive Shaft

The fitting for the drive shaft support bearing is located toward the front of the articulation joint.

Apply lubricant through one or two fittings.

i02061807

Electronic Unit Injector - Inspect/Adjust

SMCS Code: 1251-025; 1251-040; 1290-025; 1290-040

⚠ WARNING

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

NOTICE

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

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

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

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

i01902270

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.

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

1. Open the engine compartment. The air filter is located on the right side of the machine.

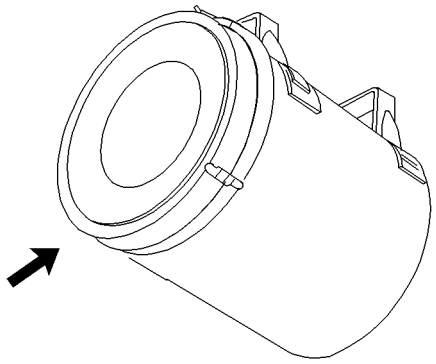


Illustration 151 g00845360

2. Loosen the cover latches and remove the air cleaner cover.

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

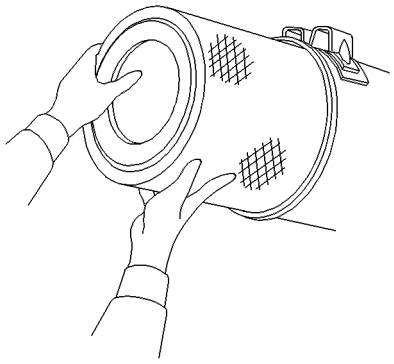


Illustration 152 g00101415

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.

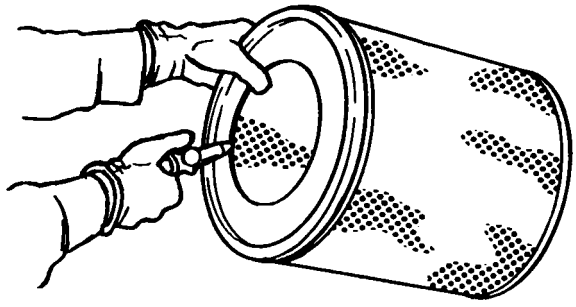


Illustration 153 g00328468

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:**

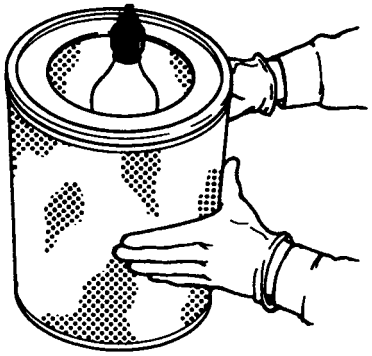


Illustration 154 g00328470

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** 13 **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.

13. Close the engine.

i01625408

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 but a warning for the air filter still occurs, replace the secondary element. Also replace the secondary element if the exhaust smoke remains black after installation of a clean primary element.

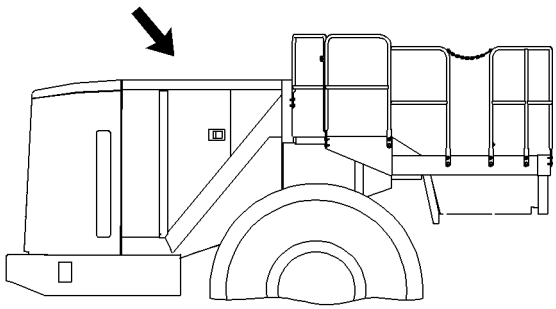


Illustration 155 g00841360

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

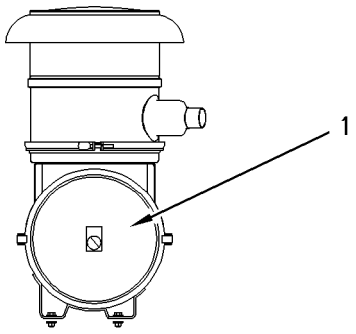


Illustration 156 g00804954

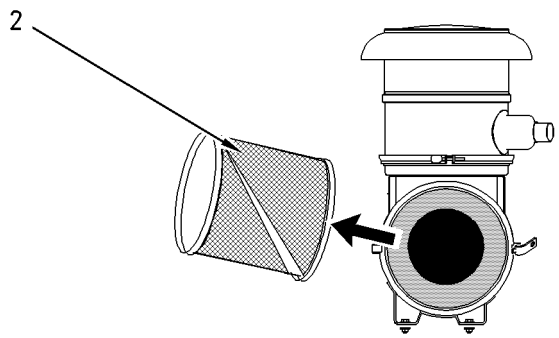


Illustration 157 g00804960

2. Remove cover (1) and primary element (2).

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

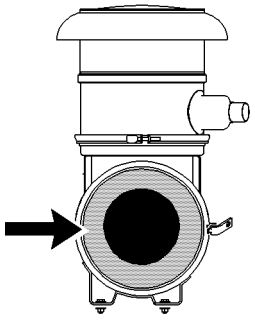


Illustration 158 g00805000

3. Remove the secondary filter element.

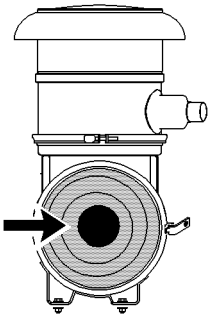


Illustration 159 g00841372

4. Cover the air inlet opening. Clean the inside of the air filter housing.

5. Inspect the gasket between the air inlet pipe and the air cleaner housing. Replace the gasket if the gasket is damaged.

6. Uncover the air inlet opening. Install a new secondary filter element.

7. Install a clean primary element and install the cover on the air filter housing. Fasten the clips in order to secure the cover.

8. Close the engine access door.

i01549255

Engine Air Filter Service Indicator - Inspect

SMCS Code: 7452-040

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

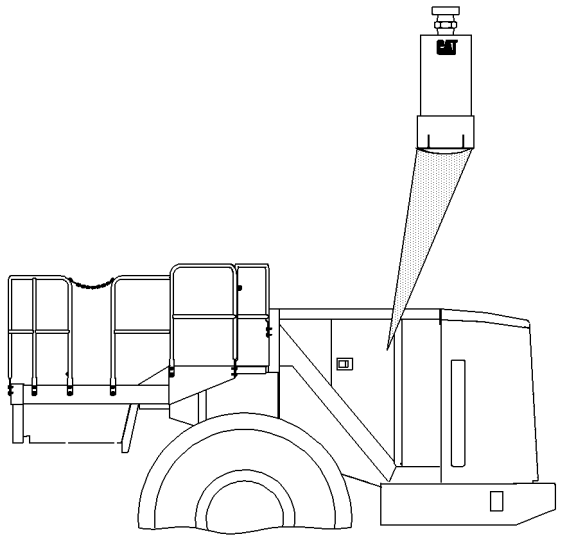


Illustration 160 g00804672

Open the engine access door on the left side of the machine.

The air filter service indicator is located on the air inlet line.

If the yellow piston in the filter service indicator is in the red zone, service the air cleaner.

i01548088

Engine Air Filter Service Indicator - Inspect/Replace

SMCS Code: 7452-040; 7452-510

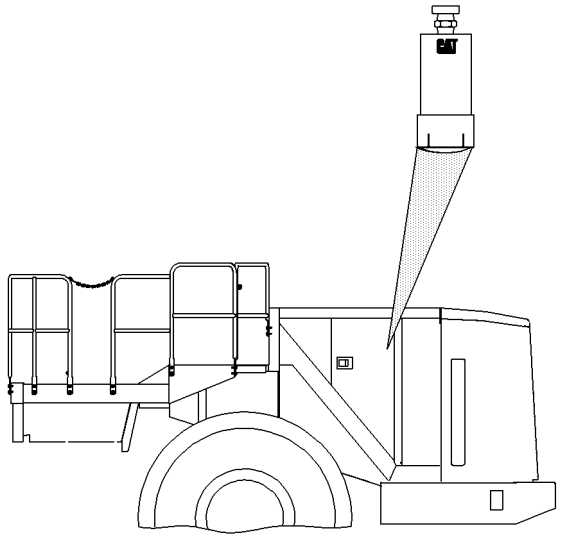


Illustration 161 g00804672

Open the access door on the left side of the machine.

To check the condition of the service indicator, 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.

i01625411

Engine Air Precleaner - Clean

SMCS Code: 1055-070

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

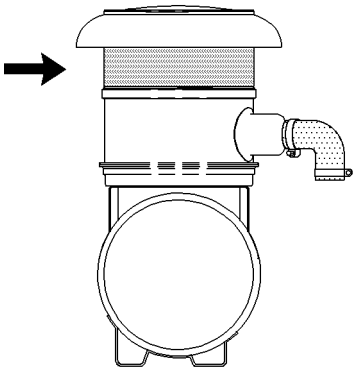


Illustration 162 g00841375

1. Remove the precleaner.
2. Inspect the air inlet screen for dirt and for trash. Remove the screen. Clean the screen if the screen is dirty.
3. Inspect the precleaner tube openings. Remove dirt and debris.
4. Clean the precleaner with compressed air or wash the precleaner in warm water. Dry all the parts.
5. Install the precleaner screen.

i01923427

Engine Mounts - Inspect

SMCS Code: 1152-040

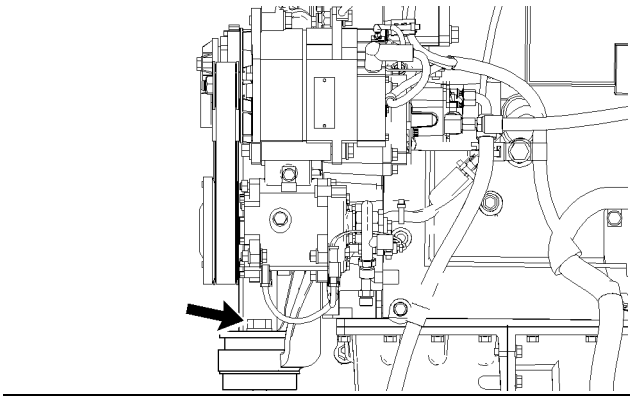


Illustration 163 g01000916

Caterpillar recommends checking the engine mounts for deterioration. Checking the engine mounts will ensure that the bolts have the proper torque. This will prevent excessive engine vibration that is caused from improper mounting.

Reference: For the proper bolt torques, refer to the Specifications manual for your machine's engine.

i03649497

Engine Oil (High Speed) and Oil Filter - Change (If Equipped)

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

⚠ WARNING

Hot oil and components can cause personal injury.

Do not allow hot oil or components to contact skin.

NOTICE

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

Refer to Special Publication, NENG2500, “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.

Your machine may be equipped with a high speed arrangement for changing the engine oil. The high speed arrangement allows the engine oil to be changed faster than the conventional method.

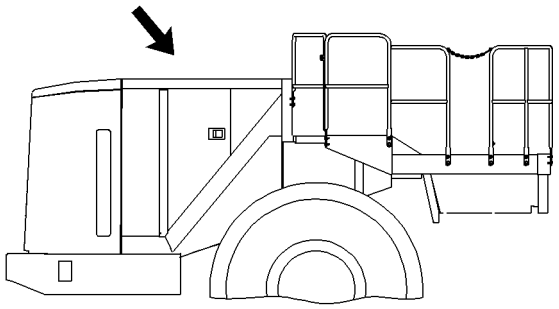


Illustration 164 g00841360

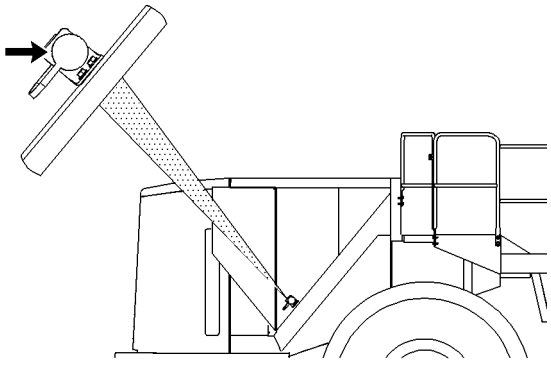


Illustration 165 g01000950

1. Open the engine access door on the right side of the machine. The high speed arrangement is located on the right side of the engine compartment.

2. Remove the cap that protects the male coupler. Connect an oil pump to the male coupler. Turn on the oil pump and withdraw the engine oil.

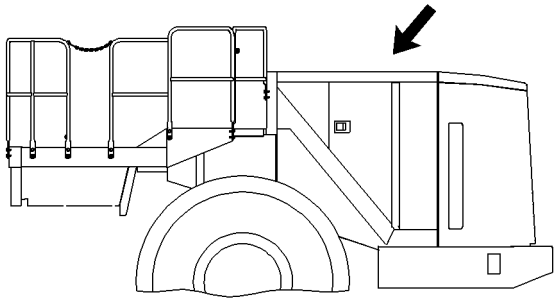


Illustration 166 g00841382

3. Open the engine access door on the left side of the machine.

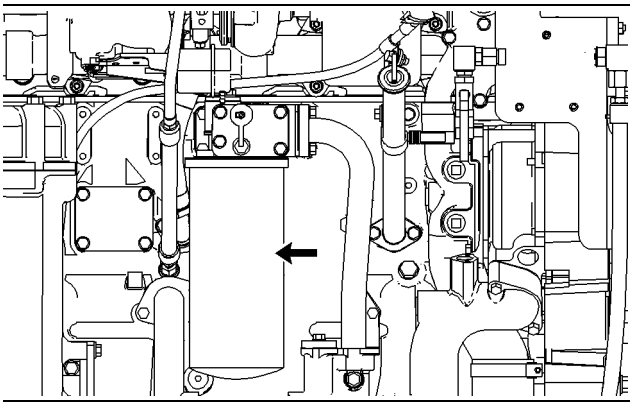


Illustration 167 g01001013

4. Use a strap type wrench to remove the engine oil filter. Dispose of the used filter properly.

5. Clean the filter mounting base. Make sure that the used seal is completely removed.

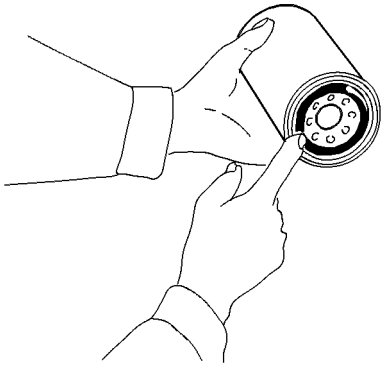


Illustration 168 g00101318

6. Apply a thin film of clean engine oil to the seal on the new filter element. 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 of a turn away from each other. When you tighten the engine oil filter, use the rotation index marks as a guide.

7. 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.

8. Clean the end of the male coupler for the high speed arrangement. Connect an oil pump to the male coupler for the high speed arrangement. Fill the crankcase with oil.

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

9. Clean the end of the male coupler for the high speed arrangement. Clean the cap that covers the male coupler and install the cap.

10. Start the engine and allow the oil to circulate. Check for leaks.

11. Check the engine oil level.

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

12. Close the engine access doors.

i01923584

Engine Oil Level - Check

SMCS Code: 1000-535-FLV

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

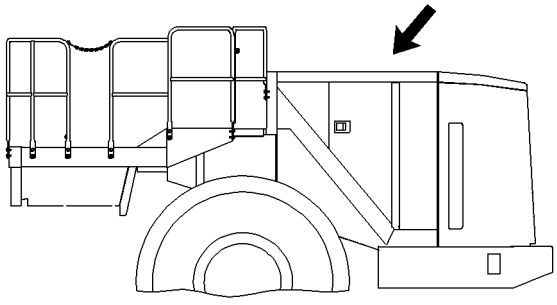


Illustration 169 g00841382

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

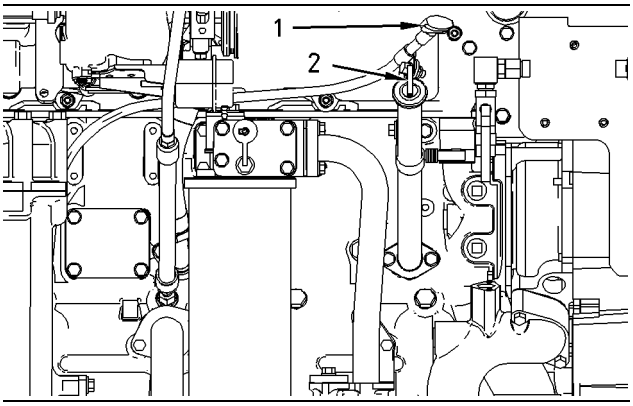


Illustration 170 g01001056

2. Remove engine oil dipstick (1) and wipe the dipstick with a clean cloth. Then, insert the dipstick and remove the dipstick again. This will ensure a more accurate measurement of the engine oil level.

Illustration 171 g00999790

3.

When the engine is stopped, maintain the oil level within crosshatched region (A) of the dipstick. This region of the dipstick is marked “Safe Starting Range”.

4. If necessary, remove oil filler cap (2) and add oil. Clean the oil filler cap and install the oil filler cap.

5. Close the engine access door.

i01908025

Engine Oil Sample - Obtain

SMCS Code: 1348-008; 7542

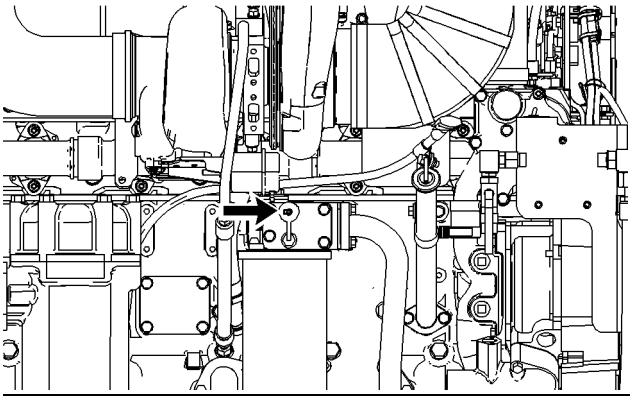


Illustration 172 g01001331

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

i03711621

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.

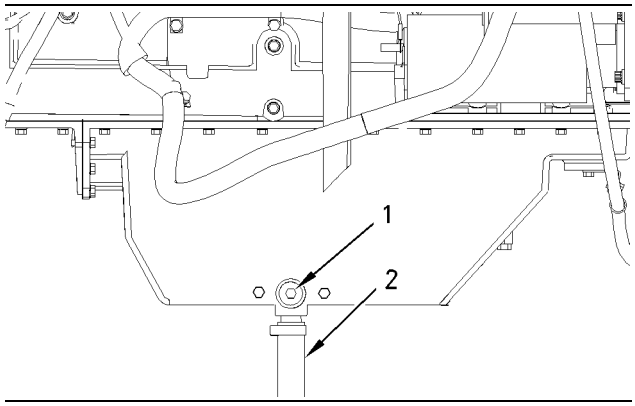


Illustration 173 g01001064

1. Lower the bottom guard. Open the crankcase drain valve (1) and allow the oil to drain into a suitable container.

   Reference: Refer to Operation and Maintenance Manual, “ Power Guard Control” for the proper removal of bottom guard.

2. Close the drain valve (1). Raise the bottom guard.

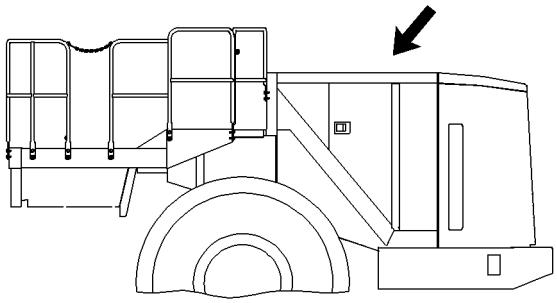


Illustration 174 g00841382

3. Open the engine access door on the left side of the machine.

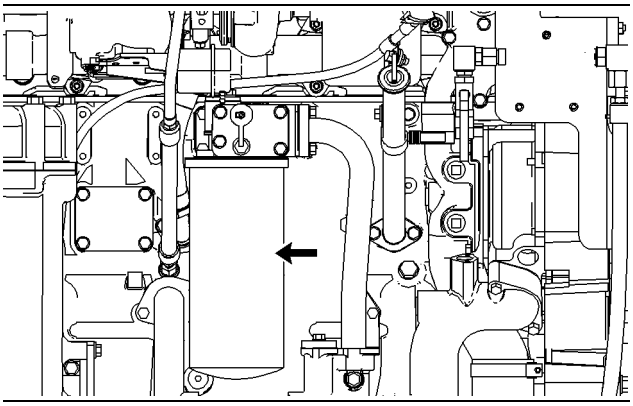


Illustration 175 g01001013

4. Use a strap type wrench to remove the engine oil filter. Dispose of the used filter properly.

5. Clean the filter mounting base. Make sure that the used gasket is completely removed.

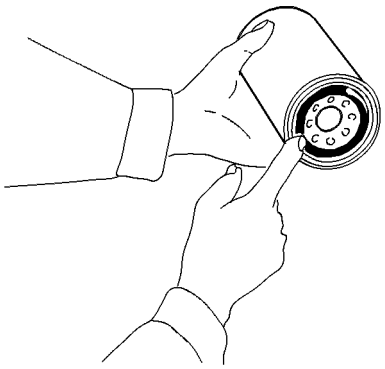


Illustration 176 g00101318

6. Apply a thin film of clean engine oil to the seal on the new filter element. 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 of a turn away from each other. When you tighten the engine oil filter, use the rotation index marks as a guide.

7. 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 Cat 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.

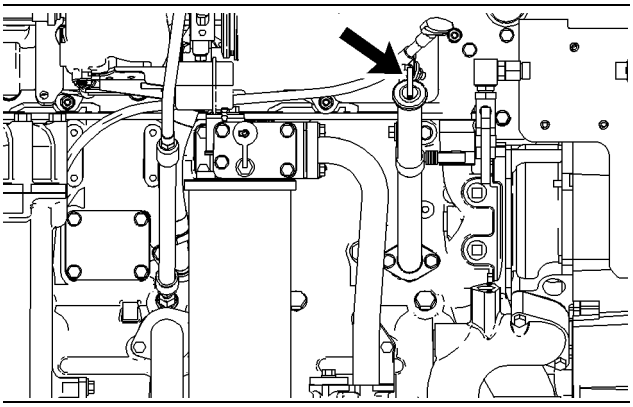


Illustration 177 g01001078

8. Remove the engine oil filler cap and fill the engine crankcase with oil.

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

9. Clean the oil filler cap and install the oil filler cap.

10. Start the engine and allow the oil to circulate. Check for leaks.

11. Check the engine oil level.

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

i01923706

Engine Valve Lash - Check

SMCS Code: 1105-535

For the correct procedure, refer to the appropriate Service Manual module for your machine's engine or consult your Caterpillar dealer.

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

Note: The engine crankcase breather is located inside the valve cover. This breather does not require a maintenance interval. Caterpillar recommends replacing the crankcase breather during an engine overhaul. In order to replace the breather element, the valve cover will need to be replaced.

NOTICE
Attempts to clean the engine crankcase breather may cause damage to the element.

i03952000

Engine Valve Rotators - Inspect

SMCS Code: 1109-040

⚠ WARNING

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

Caterpillar recommends replacing valve rotators that are operating improperly. An improperly operating valve rotator will shorten valve life because of accelerated wear on the valves. Also, metal particles from a damaged valve rotator could fall into the cylinder and damage to the piston head and to the cylinder head may result.

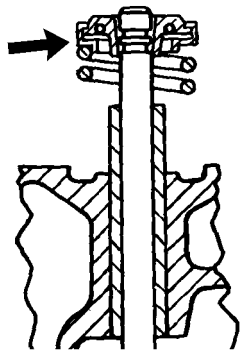


Illustration 178 g00882731

Start the engine and run the engine at low idle. Watch the top surface of each valve rotator. Whenever an inlet valve closes or an exhaust valve closes, each valve rotator should turn.

If a valve rotator fails to turn, consult your Cat dealer for service.

i01394313

Engine Water Pump - Inspect

SMCS Code: 1361-040

Failure of the engine water pump may cause severe engine overheating problems such as cracks in the cylinder head or piston seizure.

Visually inspect the water pump for leaks. If you find leaks, all of the seals on the water pump must be replaced.

Note: For more information, refer to the appropriate Disassembly and Assembly manual for your machine's engine.

i01548876

Ether Starting Aid Cylinder - Replace (If Equipped)

SMCS Code: 1456-510-CD

⚠ WARNING

Ether is poisonous and flammable.

Breathing ether vapors or repeated contact of ether with skin can cause personal injury.

Use ether only in well ventilated areas.

Do not smoke while changing ether cylinders.

Use ether with care to avoid fires.

Do not store replacement ether cylinders in living areas or in the operator's compartment.

Do not store ether cylinders in direct sunlight or at temperatures above 49 °C (120 °F).

Discard cylinders in a safe place. Do not puncture or burn cylinders.

Keep ether cylinders out of the reach of unauthorized personnel.

To avoid possible injury, be sure the brakes are applied and all controls are in Hold or Neutral when starting the engine.

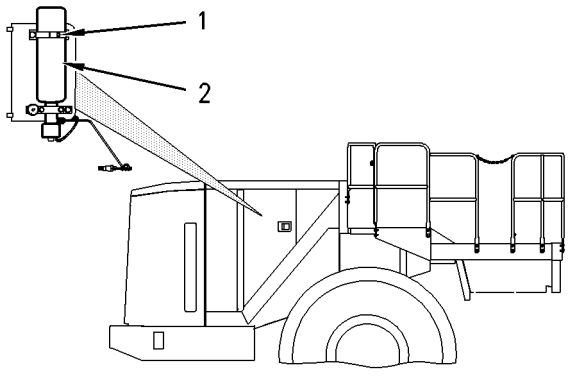


Illustration 179 g00805191

1. Open the engine access door on the right side of the machine.
2. Loosen cylinder retaining clamp (1). Remove empty ether starting aid cylinder (2) and discard the empty ether starting aid cylinder.
3. Remove the used gasket. Install the new gasket that is provided with every new ether starting aid cylinder.
4. Install new ether starting aid cylinder. Tighten the ether starting aid cylinder hand tight. Tighten the cylinder retaining clamp securely.
5. Close the engine access door.

i02236759

Fuel System - Prime

SMCS Code: 1250-548

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

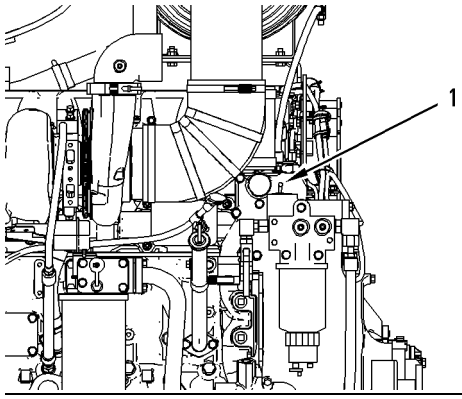


Illustration 180 g01002079

2. Attach a piece of bulk hose to a sampling probe. Install the sampling probe with the piece of bulk hose onto the valve assembly.

Note: Consult your Caterpillar dealer for the proper tooling or refer to the parts manual for your machine.

3. Position a suitable container under the hose.
4. Turn the toggle switch (1) to the ON position. Toggle switch (1) is for the fuel priming pump.
5. Allow the air/fuel mixture to flow into the suitable container until the fuel flows in a steady stream.
6. Turn the toggle switch (1) to the OFF position.
7. Remove the sampling probe with the piece of bulk hose from the valve assembly.
8. Start the engine. The engine should start. The engine should run smoothly. If the engine does not start or the engine misfires, further priming is necessary.

Note: Failure to tighten fittings could result in fuel leaks.

9. Clean residual fuel from the engine components.

10. Close the engine access door on the left side of the machine.

i02962202

Fuel System Primary Filter (Water Separator) - Check/Drain

SMCS Code: 1263-535; 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.

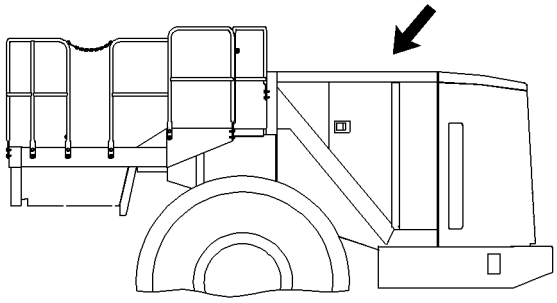


Illustration 181 g00841382

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

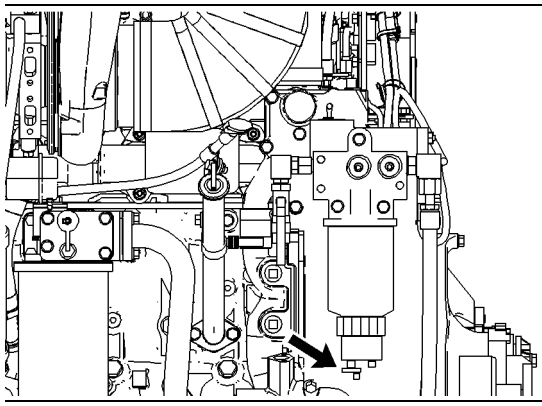


Illustration 182 g01002112
Type 1

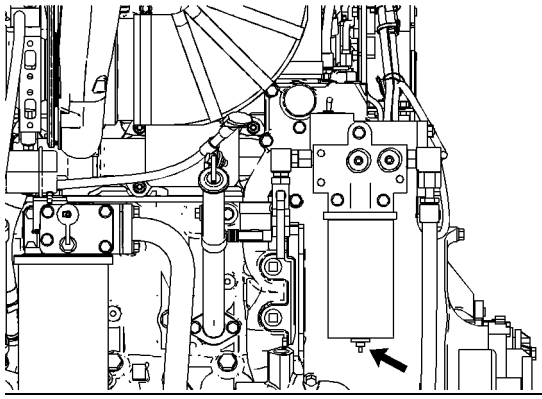


Illustration 183 g01482573
Type 2

2. The water separator is located on the bottom of the primary fuel filter. Open the drain valve on the bottom of the water separator bowl. Allow the water and the fuel to drain into a suitable container.

3. Tighten the drain valve.

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

4. Close the engine access door.

i03355824

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.

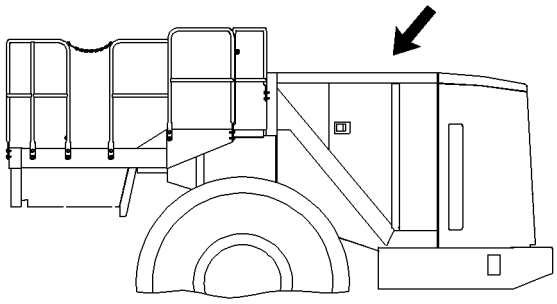


Illustration 184 g00841382

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

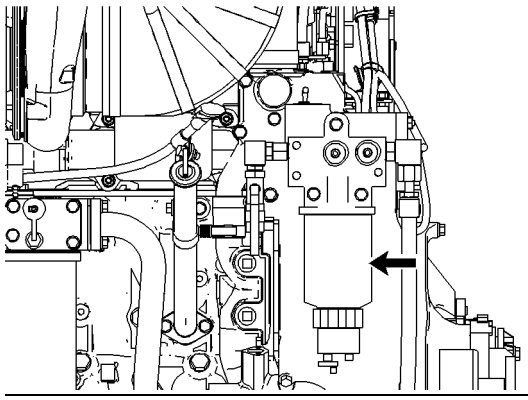


Illustration 185 g01002123
Type 1

2. The water separator is located on the bottom of the primary fuel filter. Open the drain valve on the water separator bowl. Allow the water and the fuel to drain into a suitable container.

3. Use a strap type wrench to remove the filter from the filter mounting base.

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

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

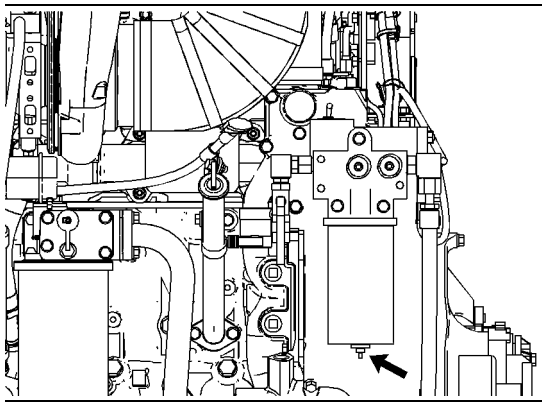


Illustration 186 g01482573
Type 2

   a. The steel fuel filter (Type 2) is not reusable.

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

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

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

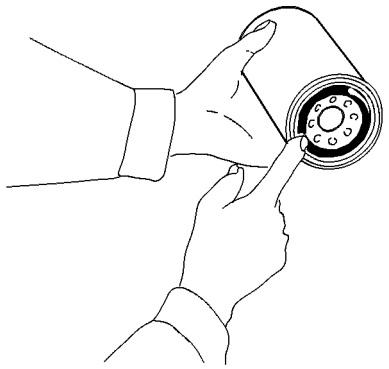


Illustration 187 g00101318

8. Apply a thin coat of oil to the seal on the new filter. Install the new 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 fuel 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.

9. 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.

10. Tighten the drain valve on the water separator bowl.

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

11. Prime the fuel system in order to fill the filter element with fuel.

    Reference: Refer to Operation and Maintenance Manual, “Fuel System Prime” for the correct procedure.

i02301079

Fuel System Secondary Filter - Replace

SMCS Code: 1261-510-SE

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 Tools and Shop Products Guide” 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.

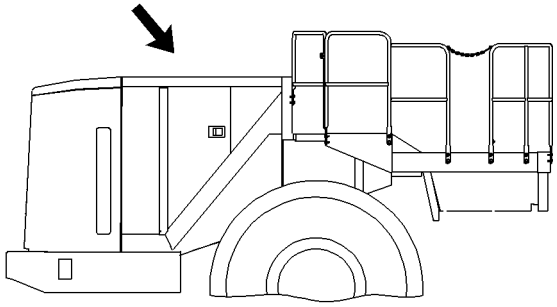


Illustration 188 g00841360

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

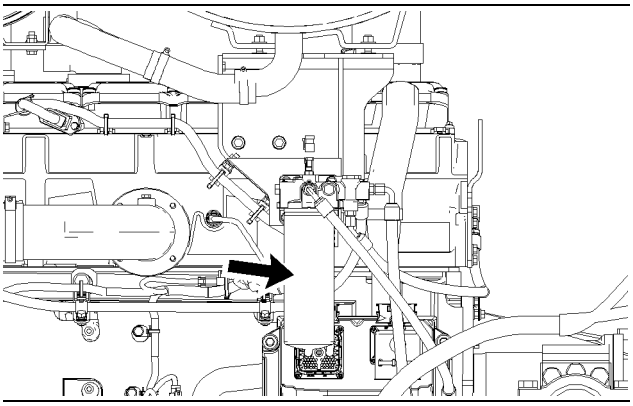


Illustration 189 g01002138

2. Remove the used filter element. Dispose of the used filter element properly.

3. Clean the filter mounting base. Make sure that all of the used seal is removed.

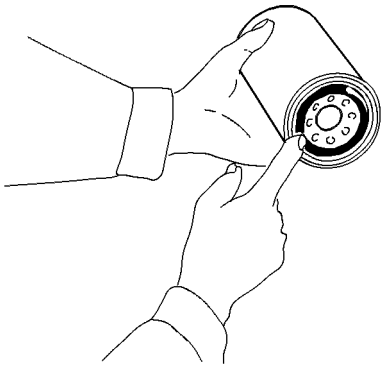


Illustration 190 g00101318

4. Apply a thin coat of clean diesel fuel to the seal on the new fuel filter. Install the 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 fuel 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.

5. 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.

6. Prime the fuel system.

   Reference: Refer to Operation and Maintenance Manual, “Fuel System - Prime” for the correct procedure.

7. Close the engine access door.

i02496986

Fuel Tank Cap and Strainer - Clean

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

The fuel tank cap is located on the left side of the machine.

1. Remove the fuel tank cap.

2. Inspect the seal for damage. Replace the seal, if necessary.

3. Remove the filter assembly from the cap.

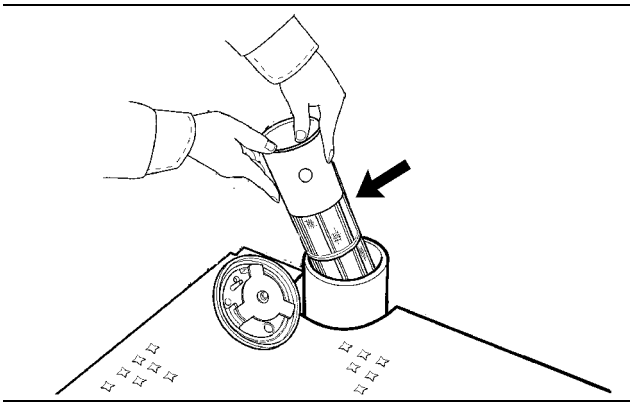


Illustration 191 g00930457

Note: Refer to Operation and Maintenance Manual, “General Hazard Information” for information on Containing Fluid Spillage.

4. Remove the strainer from the filler tube.

5. Wash the fuel tank cap and the strainer in a clean, nonflammable solvent.

6. Install a new cap filter kit. Install the other components in reverse order.

7. Install the strainer and the fuel tank cap.

i02156799

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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

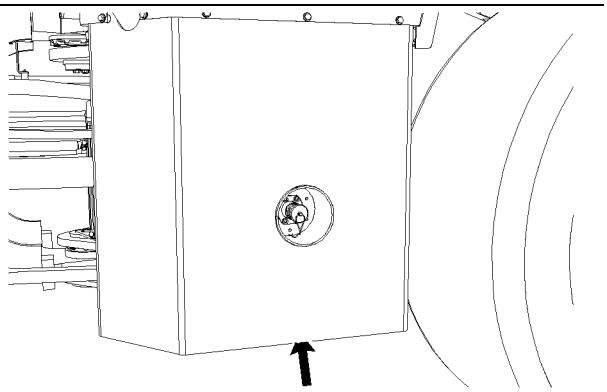


Illustration 192 g01093885

The fuel tank drain valve is located on the left side of the machine at the bottom of the fuel tank.

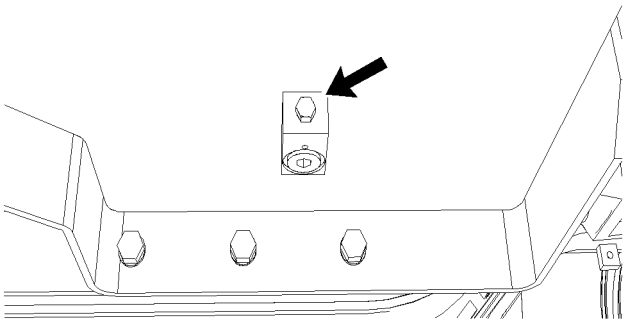


Illustration 193 g01093886

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

i02741651

Fuses - Replace

SMCS Code: 1417-510

Note: Your machine may not be equipped with all of the fuses that are discussed in this topic.

Fuses – The fuses protect the electrical system from damage that is caused by overloaded circuits. Replace a fuse if the element separates. If the element of a new fuse separates, inspect the circuit. Repair the circuit, if necessary.

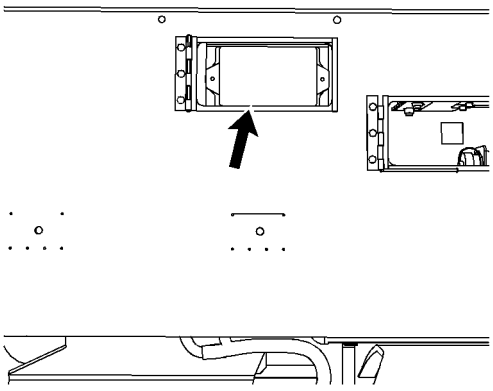


Illustration 194 g01093757

The fuses are located under a small access door on the right cab platform.

Note: Your machine may be equipped with glass fuses or your machine may be equipped with blade fuses.

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

Glass Fuses (If equipped)

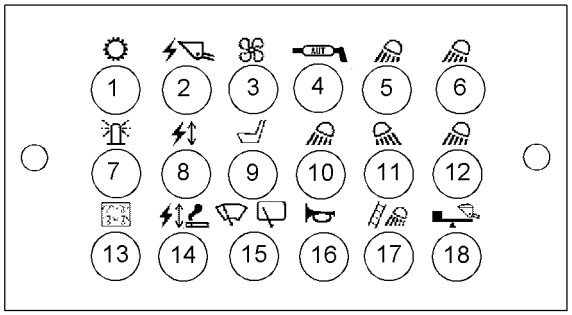


Illustration 195 g01119139

Transmission Electronic Control (1) – 10 amp

Implement Electronic Control (2) – 10 amp

Blower Fan (3) – 20 amp

Automatic Lubrication (4) – 10 amp

Front Work Lights (5) – 15 amp

Front Work Lights (6) – 10 amp

Rotating Beacon (7) – 10 amp

Voltage Converter (8) – 10 amp

Seat (9) – 15 amp

Front Work Lights (10) – 15 amp

Rear Work Lights (11) – 15 amp

Front Work Lights (12) – 15 amp

Electronic Gauges (13) – 10 amp

Lighter and Voltage Converter (14) – 10 amp

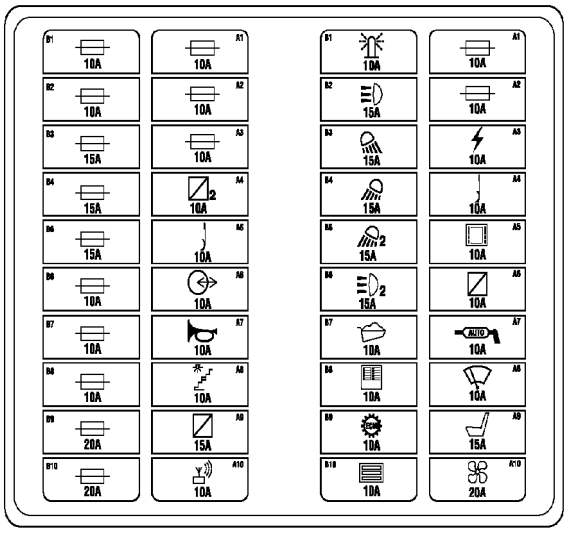
Window Wipers (15) – 10 amp

Horn (16) – 10 amp

Stairway Access Light (17) – 10 amp

Payload Control System (18) – 10 amp

Blade Fuses (If equipped)



g01353212

Illustration 196
Typical example

Open – 10 amp

Open – 15 amp

Open – 20 amp

Voltage Converter 2 – 10 Amp

Side Receiver Mast – 10 Amp

Input/Output – 10 Amp

Horn – 10 amp

Stairway Access Light – 10 amp

Voltage Converter – 15 Amp

Product Link – 10 amp

Rotating Beacon – 10 amp

Headlights – 15 amp

Rear Work Lights – 15 amp

Front Work Lights – 15 amp

Front Work Lights 2 – 15 amp

Headlights 2 – 15 amp

Payload Control System – 10 amp

Electrical Monitoring System – 10 amp

Power train Electronic Control Module (ECM) – 10 amp

Implement Control – 10 amp

Electrical Power (Accessories) – 10 amp

Side Receiver Mast – 10 amp

Rear Monitor (Vision) – 10 amp

Voltage Converter – 10 amp

Autolube System – 10 amp

Window Wipers – 10 amp

Seat – 15 amp

Blower Fan – 20 amp

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.

i03307817

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 in additional increments 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 4000 hour interval for changing the oil is for the following oil types.

- Caterpillar Hydraulic Oil (HYDO)
- CaterpillarTransmission/Drive Train Oil (TDTO)
- Caterpillar TDTO (TMS)
- Caterpillar Diesel Engine Oil
- Caterpillar Biodegradable Hydraulic Oil (HEES)
- Caterpillar Multipurpose Tractor Oil (MTO)
- Heavy-Duty Diesel Engine Oil with a minimum zinc content of 900 parts per million (ppm)

Heavy-duty oils are identified by the following classifications: Cat ECF-1, API CF, API CG-4, and TO-4. Cat ECF-1, API CF, API CG-4, and TO-4 oils must have a minimum zinc additive of 900 parts per million (ppm) in order to be considered acceptable for use in a hydraulic system.

Note: Industrial hydraulic oils are not recommended in Caterpillar hydraulic systems. These oils are more likely to cause corrosion and excessive wear.

Monitoring the Condition of the Oil

The oil should be monitored during intervals of 500 hours. Caterpillar's standard S·O·S 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 when you sample the oil:

- Significant changes in wear metals should be monitored. These metals include iron, copper, chromium, lead, aluminum, and tin.
- The following additives should be observed for significant changes: 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 normal levels 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 at 100 °C (212 °F) should not exceed a 2 cSt change.

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.

1. Operate the machine in order to warm the hydraulic oil.

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

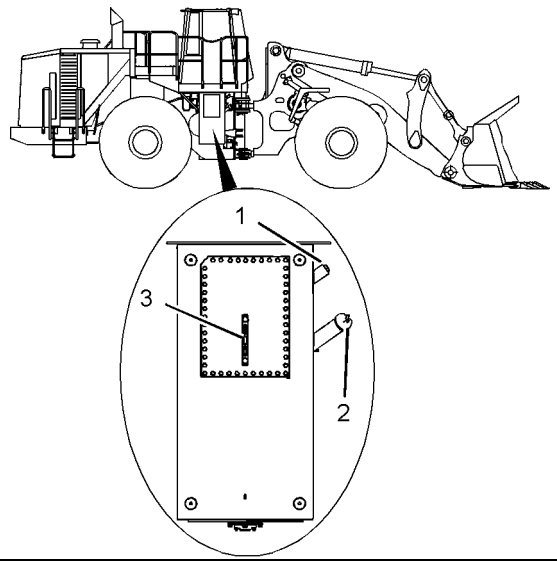


Illustration 197 g01152499

3. The hydraulic tank is located on the right side of the machine. Press the button on the breaker relief valve (1) in order to relieve any tank pressure.

4. Remove the hydraulic tank filler cap (2). Remove the filler strainer from the hydraulic tank filler neck. Wash the filler cap and the strainer in a clean, nonflammable solvent. Install the strainer.

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

6. Remove the drain plug from the bottom of the hydraulic tank. Wash the drain plug in a clean, nonflammable solvent.

7. Install a 6B-3156 Pipe Nipple into the drain valve in order to unseat the drain valve. 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.

8. Remove the pipe nipple in order to close the drain valve. Install the hydraulic tank drain plug.

9. Change the hydraulic oil filter.

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

10. Fill the hydraulic tank with clean oil. Make sure that the oil level is at the “FULL” mark on sight gauge (4).

    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.

11. Install filler cap (2).

Note: The steering pump and the implement pump must be primed before the engine is started. This is necessary in order to ensure proper operation of the pumps.

Filling the Cases of the Implement Pump and the Steering Pump

The cases of the steering pump and the implement pump must be filled with oil before the engine is started. This is necessary in order to ensure proper operation of the pumps.

1. Open the access doors that are located behind the operator compartment.

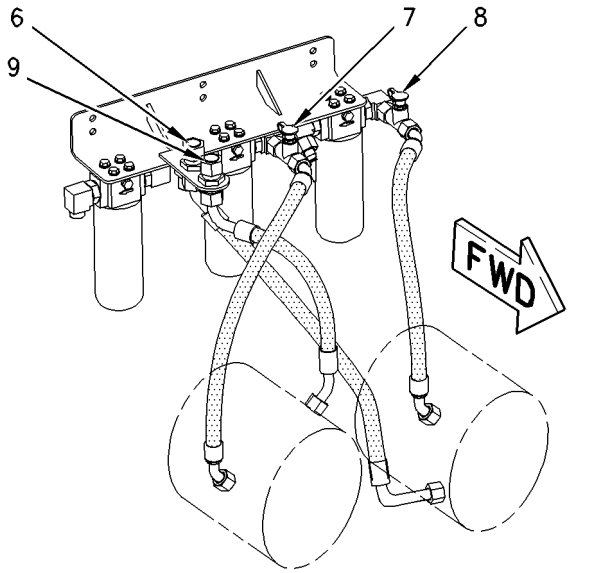


Illustration 198 g00935858

2. Remove the cap from port (6). Attach a drain hose that is equipped with a quick connect fitting to tee (8). Place the end of the drain hose into a suitable container in order to collect excess hydraulic oil. Pour clean hydraulic oil into port (6). Continue to pour hydraulic oil until the hydraulic oil comes out of the drain hose that is attached to tee (8).

3. Remove the drain hose and install the cap onto port (6). The steering pump case is now filled.

4. Remove the cap from port (9). Attach a drain hose that is equipped with a quick connect fitting to tee (7). Place the end of the drain hose into a suitable container in order to collect excess hydraulic oil. Pour clean hydraulic oil into port (9). Continue to pour hydraulic oil until the hydraulic oil comes out of the drain hose that is attached to tee (7).

5. Remove the drain hose and install the cap onto port (9). The case for the implement pump is now filled.

6. Replace any hydraulic oil that was lost during the installation of the hoses.

   Reference: Refer to Operation and Maintenance Manual, “Hydraulic System Oil Level - Check” for more information.

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 the hose clamps.

i02281910

Hydraulic System Oil Filter (Steering and Implement Pilot) - Replace

SMCS Code: 5068-510-PS

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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

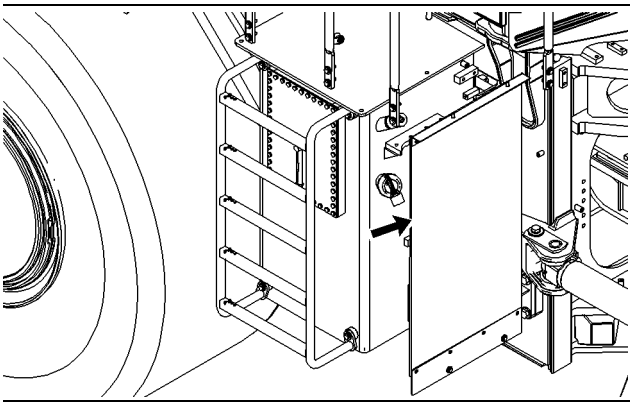


Illustration 199 g01001201

The hydraulic oil filter is located behind the mud flap on the front of the hydraulic tank.

Note: The mud flap may be removed for easier access to the filter.

1. Stop the engine.

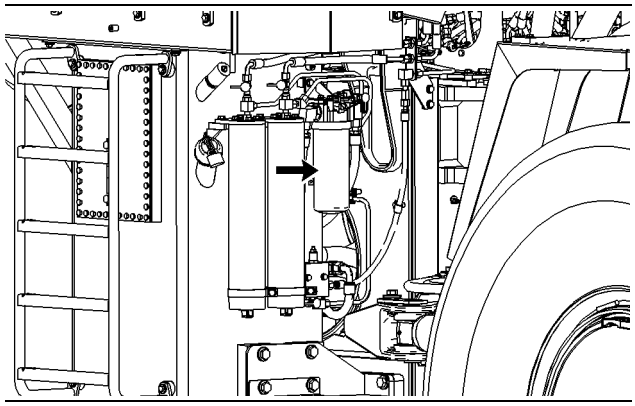


Illustration 200 g01001186

2. Use a strap type wrench to remove the hydraulic oil filter element. Dispose of the used filter properly.

3. Remove the filler cap and the strainer from the hydraulic oil filler tube. Wash the filler cap and the strainer in a clean nonflammable solvent. Allow the strainer to air dry.

4. Inspect the strainer for damage. Replace the strainer, if necessary. Install the strainer and the filler cap.

5. Clean the filter mounting base. Make sure that all of the used gasket is removed from the filter mounting base.

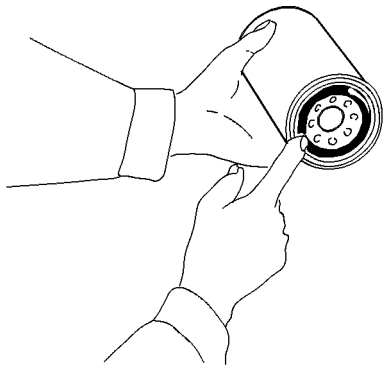


Illustration 201 g00101318

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

7. 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.

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

9. Check the level of the hydraulic oil.

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

i01923843

Hydraulic System Oil Level - Check

SMCS Code: 5056-535-FLV

Note: The work tool must be positioned on the ground in order to have an accurate reading.

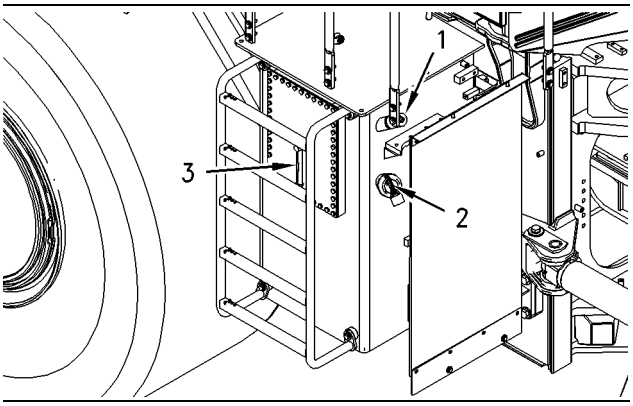


Illustration 202 g01001204

The hydraulic tank is located on the right side of the machine.

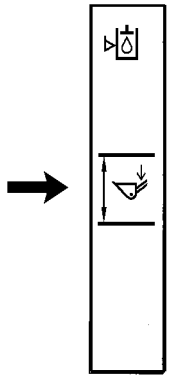


Illustration 203 g00935879

1. Maintain the hydraulic oil level within the designated range (3).

2. If necessary, press hydraulic tank breaker relief valve (1) in order to relieve any tank pressure. Then, remove hydraulic tank filler cap (2) and add hydraulic oil.

3. If hydraulic oil was added, clean the hydraulic tank filler cap and install the hydraulic tank filler cap.

i02156928

Hydraulic System Oil Sample - Obtain

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

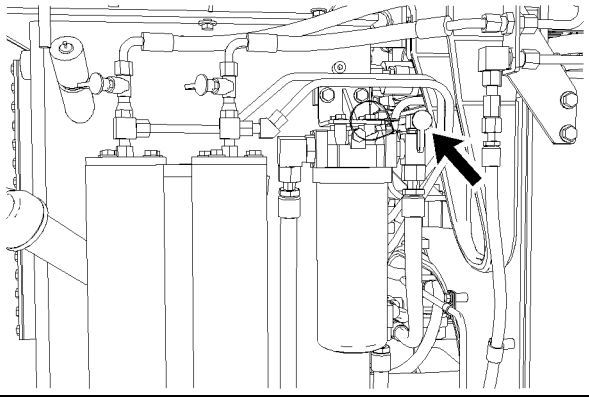


Illustration 204 g01093962

Obtain a sample of the hydraulic oil from the hydraulic oil sampling valve. The sampling valve is located on the hydraulic oil filter base on the front of the hydraulic tank. Refer to Special Publication, SEBU6250, “S·O·S Oil Analysis” for information that pertains to obtaining a sample of hydraulic oil. Refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample” for more information about obtaining a sample of hydraulic oil.

i01923846

Hydraulic Tank Breaker Relief Valve - Clean

SMCS Code: 5118-070

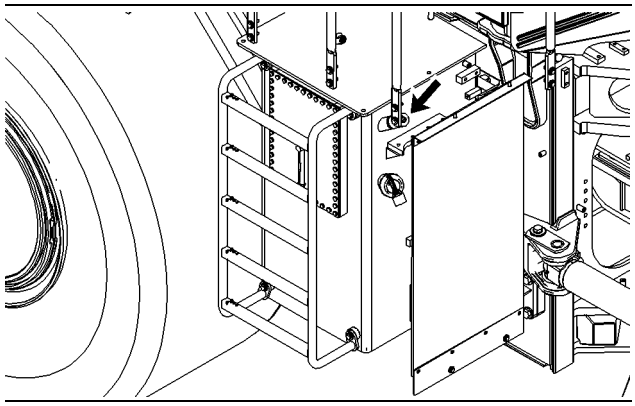


Illustration 205 g01001206

The hydraulic tank breaker relief valve is located on the side of the hydraulic tank.

1. To relieve the pressure in the hydraulic tank, press 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 the relief valve dry or use pressure air.

3. Install the hydraulic tank breaker relief valve.

i02157156

Lift Cylinder Pin Oil - Change

SMCS Code: 7070-044-OC

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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

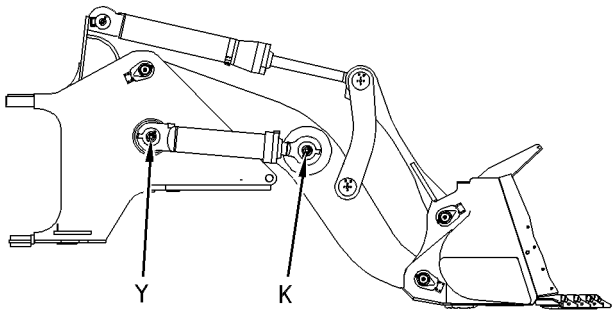


Illustration 206 g00560502

1. Park the machine on level ground and engage the parking brake. Lower the bucket so that the bottom of the bucket is flat on the ground. Stop the engine.

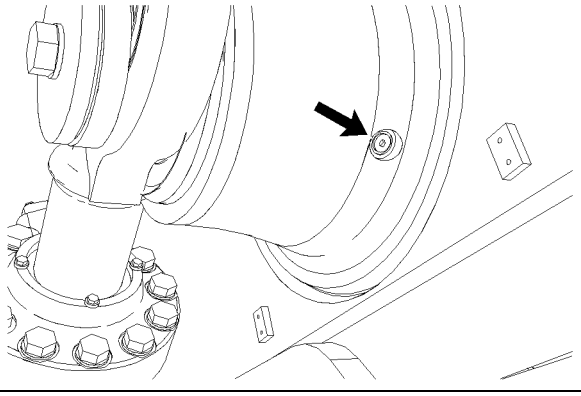


Illustration 207 g01094056
Pin Joint (K)

2. Remove the drain plug for pin joint (K). The drain plug is located on the right side of the machine. Allow the oil to drain into a suitable container.

3. Remove the filler plug for pin joint (K). The filler plug is located on the right side of the machine.

4. After the oil has drained, clean the drain plug and install the drain plug.

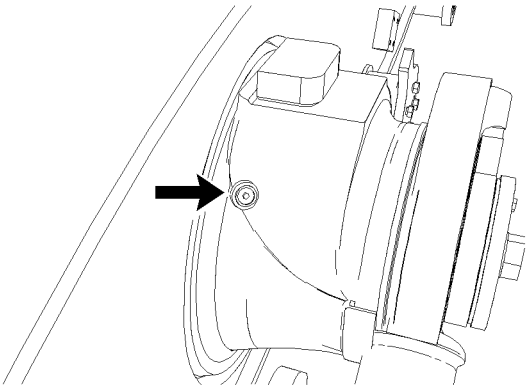


Illustration 208 g01094058
Pin Joint (K)

5. Fill the pin joint with SAE 80W90 oil until oil escapes from the filler opening.

6. Clean the filler plug and install the filler plug.

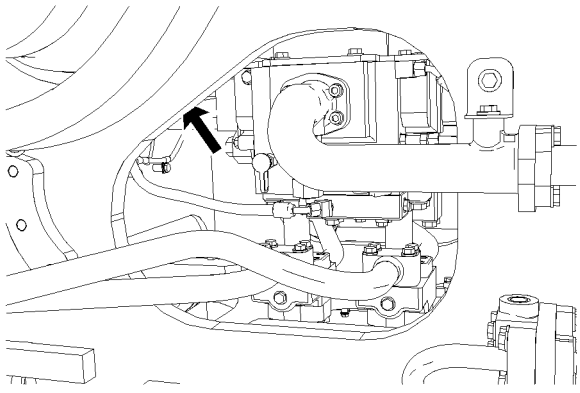


Illustration 209 g01094059

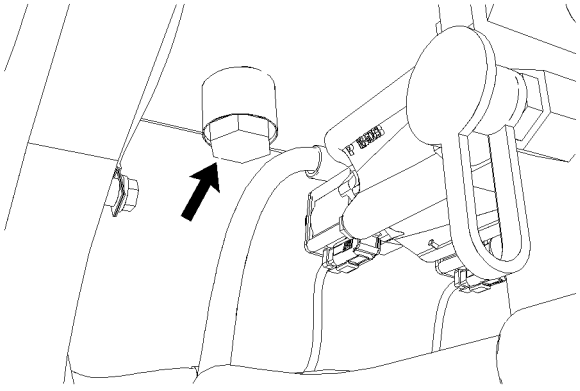


Illustration 210 g01094061
Pin Joint (Y)

7. Remove the drain plug for pin joint (Y). The drain plug is located on the inside of the left front loader frame. Allow the oil to drain into a suitable container.

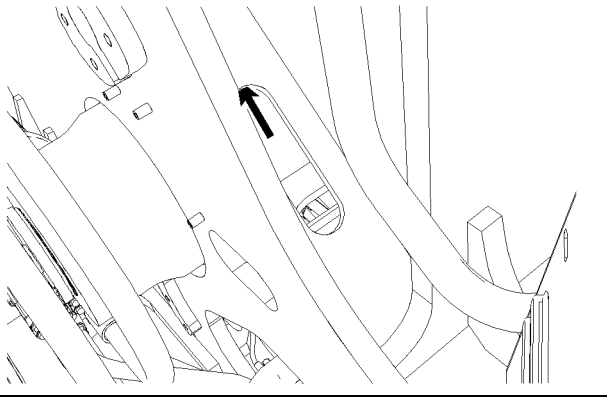


Illustration 211 g01094064

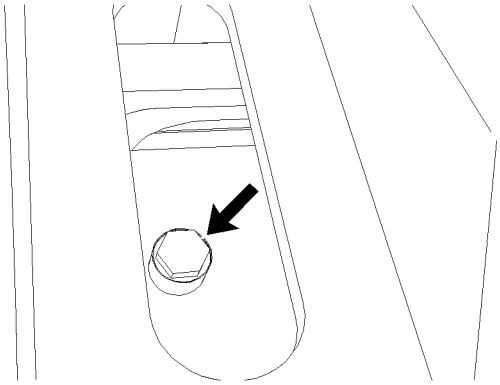


Illustration 212 g01094065

Pin Joint (Y)

8. Remove the filler plug for pin joint (Y). The filler plug is located on the inside of the left front loader frame.

9. After the oil has drained, clean the drain plug and install the drain plug.

10. Fill the pin joint with SAE 80W90 oil until oil escapes from the filler opening.

Note: It will be necessary to use a funnel and a hose to fill the pin joint through the filler opening.

11. Clean the filler plug and install the filler plug.

i02157325

Lift Cylinder Pin Oil Level - Check

SMCS Code: 7070-535-FLV

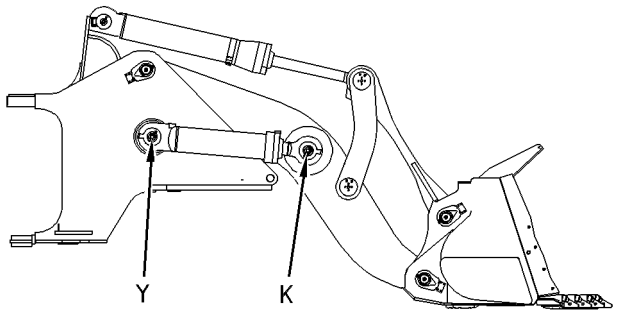


Illustration 213 g00560502

1. Park the machine on level ground and engage the parking brake. Lower the bucket so that the bottom of the bucket is flat on the ground.

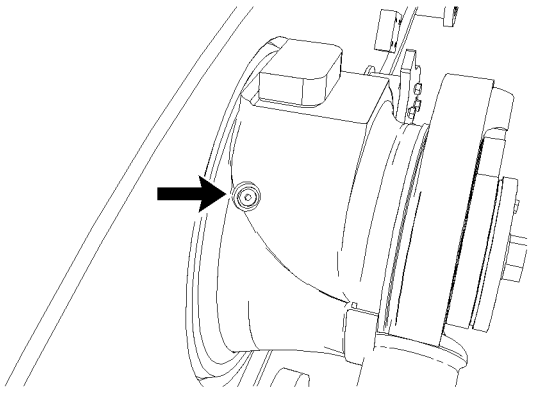


Illustration 214 g01094058

Pin Joint (K)

2. Clean the area around the filler plug for pin joint (K). Slowly loosen the filler plug.

3. If the oil escapes from the filler opening, the oil level in the pin joint is correct. If the oil level is low, add SAE 80W90 until oil escapes from the filler opening.

4. Clean the filler plug and install the filler plug.

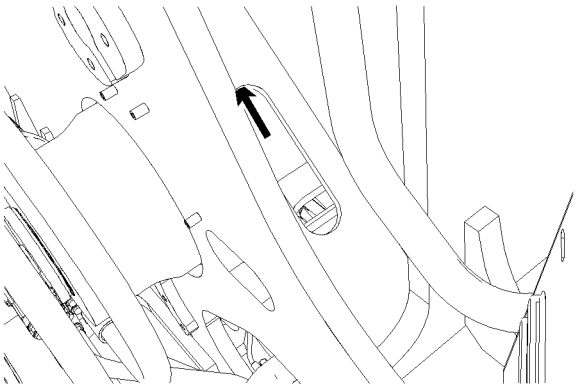


Illustration 215 g01094064

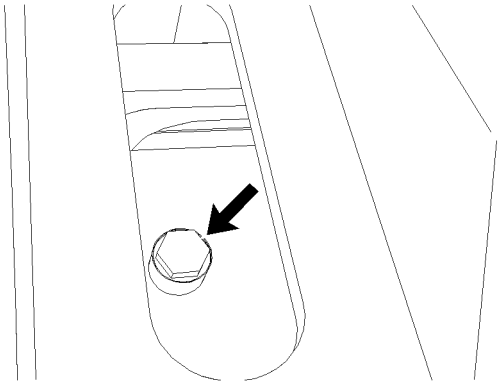


Illustration 216 g01094065

Pin Joint (Y)

5. Repeat the procedure for pin joint (Y).

i02280356

Loader Boom Pin Oil - Change

SMCS Code: 6118-044-OC

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 Tools and Shop Products Guide” for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.

1. Park the machine on level ground and engage the parking brake. Lower the bucket so that the bottom of the bucket is flat on the ground. Stop the engine.

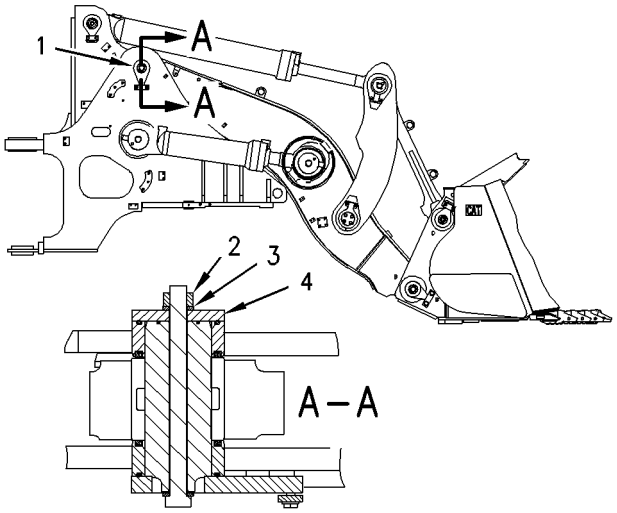


Illustration 217 g00811718

The A-pin joints (1) do not have drain plugs.

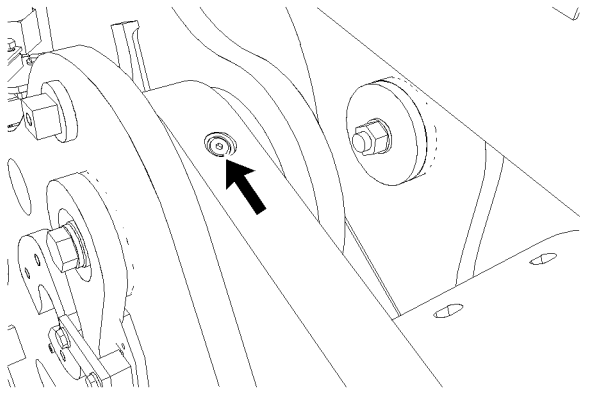


Illustration 218 g01094359

A-Pin Joint

2. Remove the filler plugs for both A-pin joints.

3. Attach a piece of tubing that is at least 610 mm (2 ft) to a 1U-5718 vacuum pump. Mark the tubing 305 mm (12 inch) from the open end. Cut the open end of the tube at a 45 degree angle in order to allow the tube to be inserted into the joint properly.

4. Install a sampling bottle onto the vacuum pump and insert 305 mm (12 inch) of the tubing through the filler plug opening. Insert the correct amount of tubing through the filler plug opening in order to make sure that the end of the tubing is at the bottom of the oil cavity. Use the mark on the tubing from step 3 as a guide.

5. Fill the sampling bottle and withdraw the tube from the filler plug opening.

6. Drain the sampling bottle into a suitable container.

7. Until no oil remains in the A-pin joints, repeat the following steps: 4, 5, and 6.

8. Fill each pin joint with 0.25 L (8 oz) of SAE 80w90 oil.

9. Install the filler plugs for both A-pin joints.

10. Start the engine. Move the boom through a minimum of four complete cycles. This will force any trapped air to the top of the joint. Inspect the joint for leaks. Check the oil level of the joint.

    Reference: Refer to Operation and Maintenance Manual, “Loader Boom Pin Oil Level - Check” for more information.

    Reference: Refer to Special Publication, NEHP6013, “S·O·S Fluid Analysis Products” for more information.

i02157449

Loader Boom Pin Oil Level - Check

SMCS Code: 6118-535-FLV

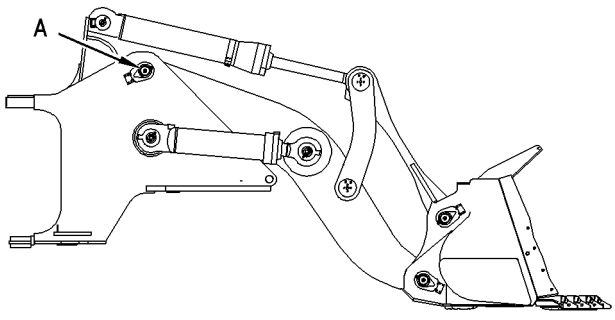


Illustration 219 g00560643

1. Park the machine on level ground and engage the parking brake. Lower the bucket so that the bottom of the bucket is flat on the ground.

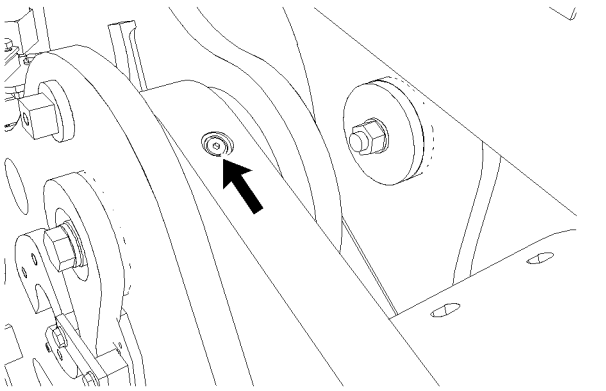


Illustration 220 g01094359

A-Pin Joint

2. Clean the area around the filler plugs for both A-pin joints. Slowly loosen each filler plug.

3. If the oil escapes from the filler opening, the oil level is correct. If the oil level is low, add SAE 80W90 until oil escapes from the filler opening.

4. Clean the filler plugs and install the filler plugs.

i01613549

Loader Boom Pin and Lift Cylinder Pin - Inspect

SMCS Code: 5102-040-PN; 6501-040-PN

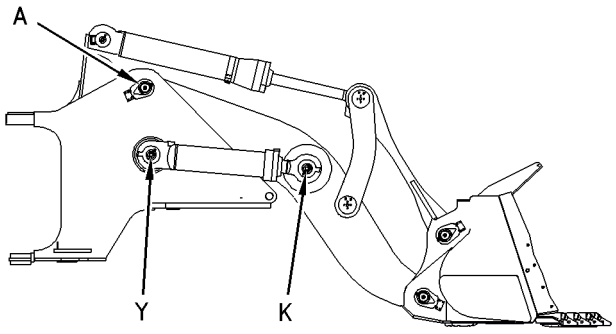


Illustration 221 g00818239

Inspect the Loader Boom Pin (A) for signs of leakage. If signs of leakage are found, check the oil level in the pin joint. Refer to Operation and Maintenance Manual, “Loader Boom Pin Oil Level - Check” for the correct procedure.

Inspect Lift Cylinder Pins (Y) and (K) for signs of leakage. If signs of leakage are found, refer to Operation and Maintenance Manual, “Lift Cylinder Pin Oil Level - Check” for information on checking the oil level of the pins.

i02158811

Loader Pins and Bearings - Lubricate

SMCS Code: 5104-086-BD; 6117-086-BD; 7070-086

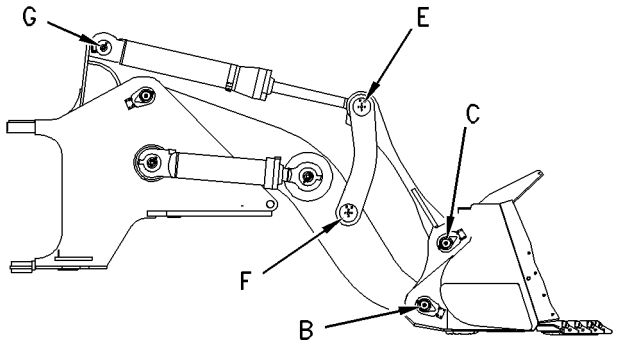


Illustration 222 g00560806

Wipe off the fittings before any lubricant is applied.

There is a total of nine fittings.

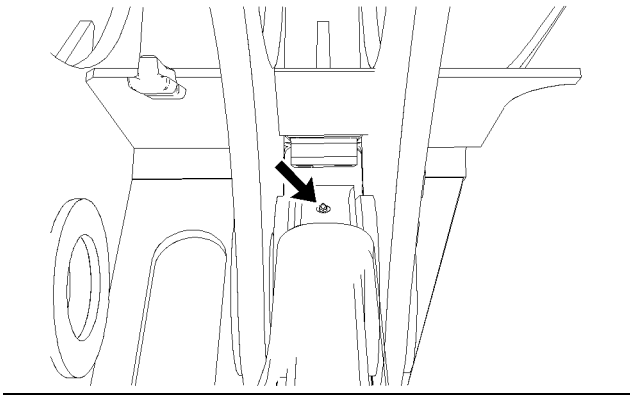


Illustration 223 g01094968

B-Pin Joint

For the B-pin joint, apply lubricant through the fitting on the top of the boom.

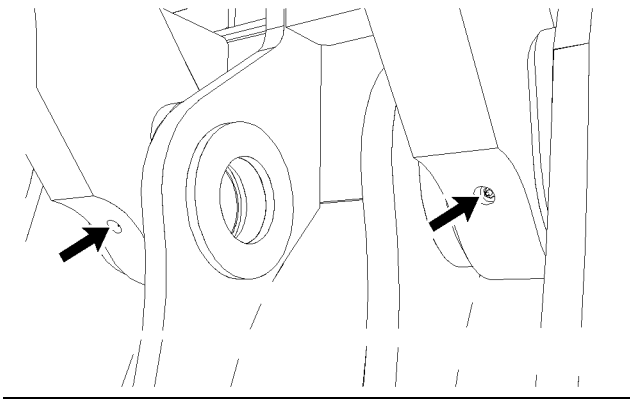


Illustration 224 g01094969

C-Pin Joints

For the C-pin joints, apply lubricant through the fittings at the bottom of each bucket link.

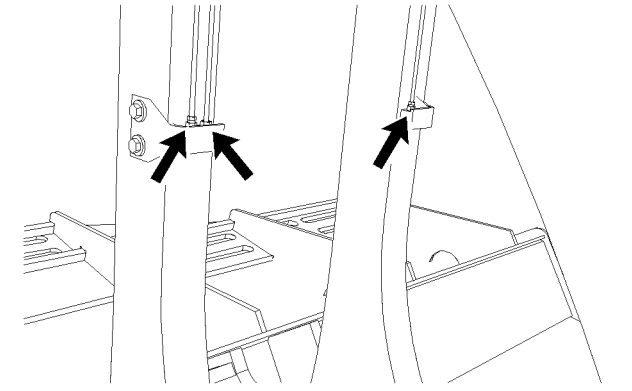


Illustration 225 g01094970

E-Pin Joints

For the E-pin joints, apply lubricant through three remote fittings on the bucket links.

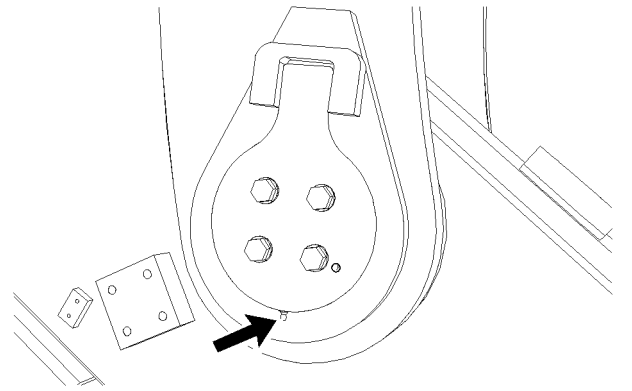


Illustration 226 g01094972

F-Pin Joint (Right Side)

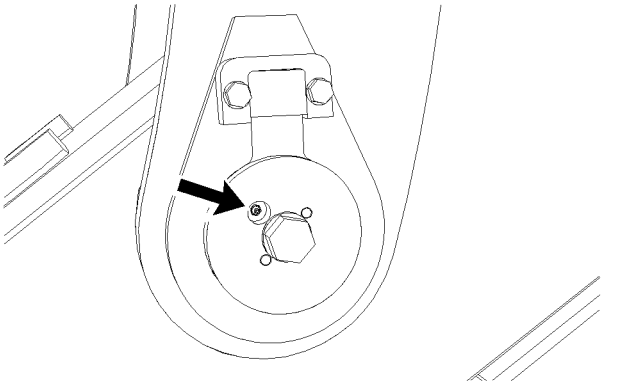


Illustration 227 g01094974

F-Pin Joint (Left Side)

For the F-pin joints, apply lubricant through the fittings at the bottom of each tilt lever.

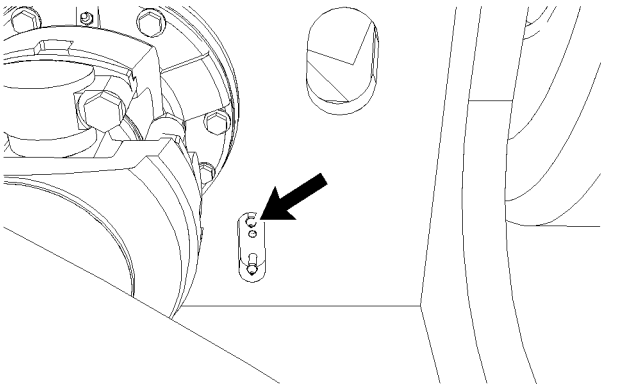


Illustration 228 g01094975

G-Pin Joint

For the G-pin joint, apply lubricant through one remote fitting on the inside of the right front loader frame.

i02106227

Oil Filter - Inspect

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

Inspect a Used Filter for Debris

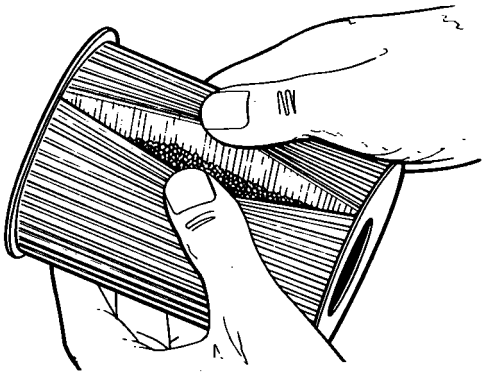


Illustration 229 g00100013

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.

i02158840

Radiator Core - Clean

SMCS Code: 1353-070-KO

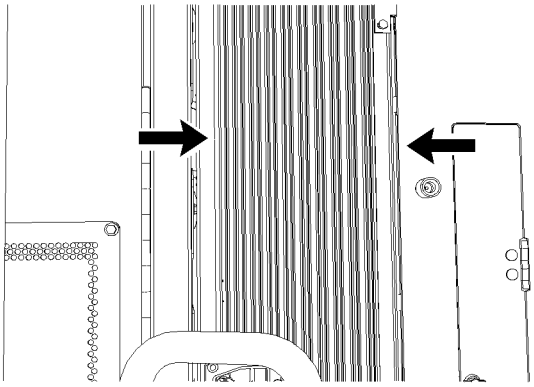


Illustration 230 g01094991

On each side of the machine, the radiator core can be accessed through the vents and through the narrow access doors.

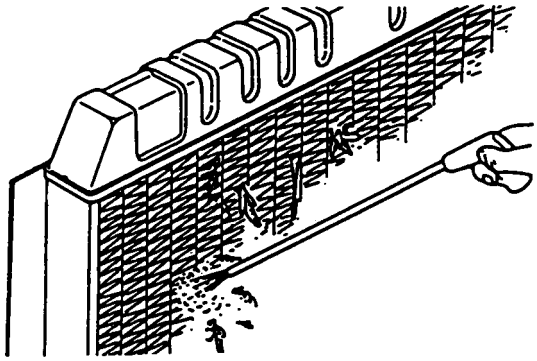


Illustration 231 g00100062

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

Refer to Special Publication, SEBD0518, “Know Your Cooling System” for the complete procedure for cleaning the radiator core.

i02728869

Refrigerant Receiver-Dryer - Replace

SMCS Code: 7322-510

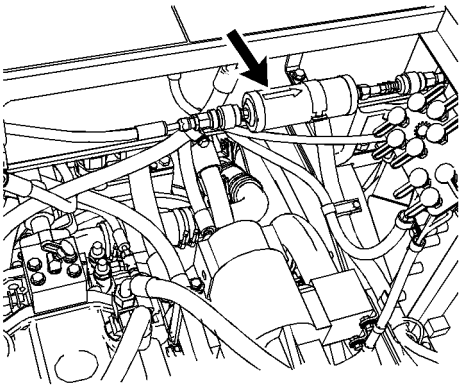


Illustration 232 g01095018

The refrigerant dryer is located behind the cab. Open the access panel on the operator platform in order to access the dryer.

Before any service work is performed on the air conditioning system, refer to the Service Manual, SENR5664, “Machine Preparation for Troubleshooting” section in Testing and Adjusting.

1. Stop the engine for five minutes in order to equalize the pressure in the air conditioning system.

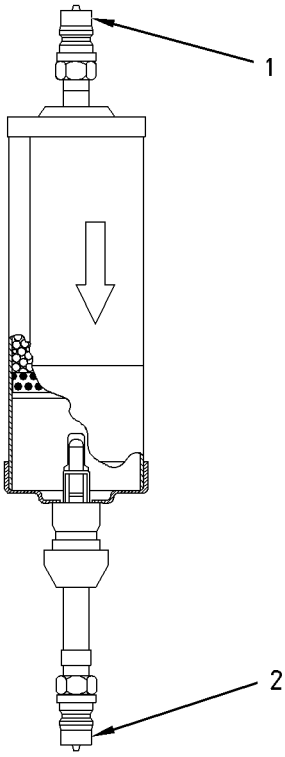


Illustration 233 g00654556

Typical In-Line Dryer

(1) Inlet hose with air conditioner quick disconnects
(2) Outlet hose with air conditioner quick disconnects

2. Disconnect the inlet hose (1) from the old in-line dryer.

3. Connect the inlet hose that was disconnected in Step 2 to the inlet on the new in-line dryer.

4. Start the engine and operate the air conditioning system.

5. With the air conditioning system in operation, disconnect the outlet hose (2) from the old in-line dryer.

6. Stop the engine for five minutes in order to equalize the pressure in the air conditioning system.

7. Connect the outlet hose (2) that was disconnected in Step 5 to the outlet on the new in-line dryer.

Note: Do not add oil to the in-line dryer.

Note: If the in-line dryer assembly does not have quick disconnects, 30 mL (1 oz) of refrigerant oil will need to be added to the air conditioner system. Refer to the Service Manual, SENR5664, “Refrigerant Recovery” section in Testing and Adjusting for the proper procedure.

i02159129

Rollover Protective Structure (ROPS) - Inspect

SMCS Code: 7325-040

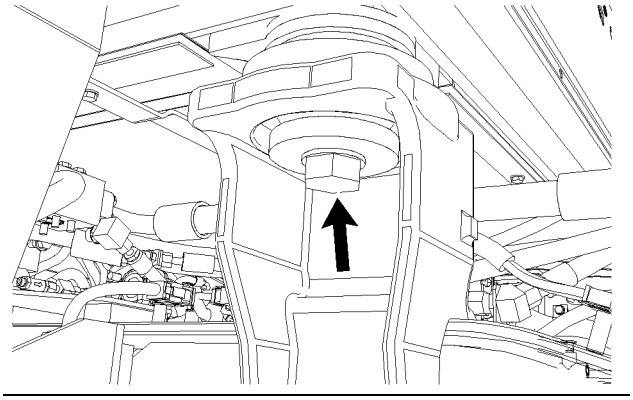


Illustration 234 g01095101

Inspect the ROPS for bolts that are loose or damaged. Use original equipment parts only to replace bolts that are damaged or missing. Tighten the four cab mounting bolts to a torque of 1500 ± 200 N·m (1106 ± 147.5 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.

i02429589

Seat Belt - Inspect

SMCS Code: 7327-040

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

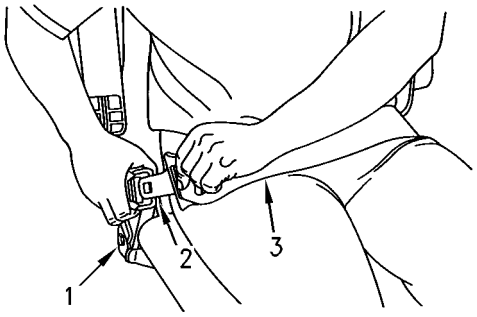


Illustration 235 g00932801

Typical example

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

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

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

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

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

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

i02429594

Seat Belt - Replace

SMCS Code: 7327-510

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

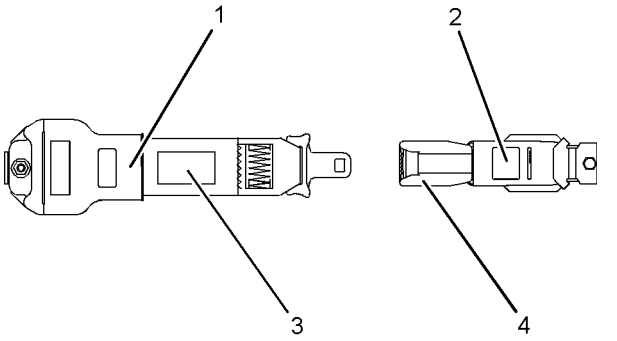


Illustration 236 g01152685

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

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

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

i01547608

Seat Side Rails - Adjust

SMCS Code: 7312-025

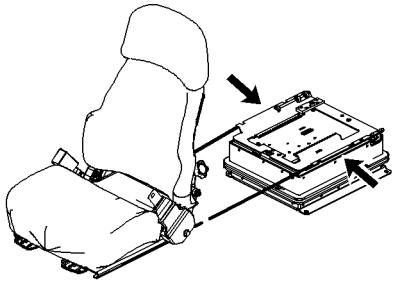


Illustration 237 g00804394

Caterpillar recommends adjusting the side rails after the initial 500 hours of machine operation. After the initial 500 service hours, perform this procedure when it is necessary.

Reference: Refer to Service Manual, SENR6615, “Contour Series Seat” for the adjustment procedure.

i03694709

Secondary Steering - Test

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

i01061080

Starting Motor - Inspect

SMCS Code: 1453-040

Caterpillar recommends a scheduled inspection of the starting system.

Check the starting motor and the battery charger for proper operation. Check for loose electrical connections.

Reference: For the complete procedure for inspecting the starting system, refer to the Systems Operation/Testing and Adjusting manual for your machine's engine.

i02168764

Steering Cylinder Bearings - Lubricate

SMCS Code: 4303-086-BD

Wipe off the fittings before any lubricant is applied.

There is a total of four fittings.

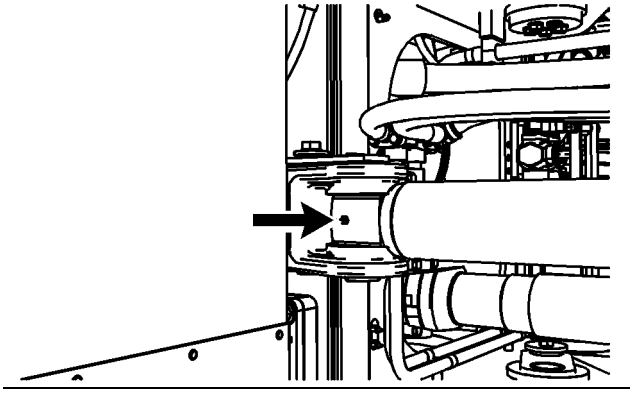


Illustration 238 g01098863

Apply lubricant through the fitting on the head end of each steering cylinder.

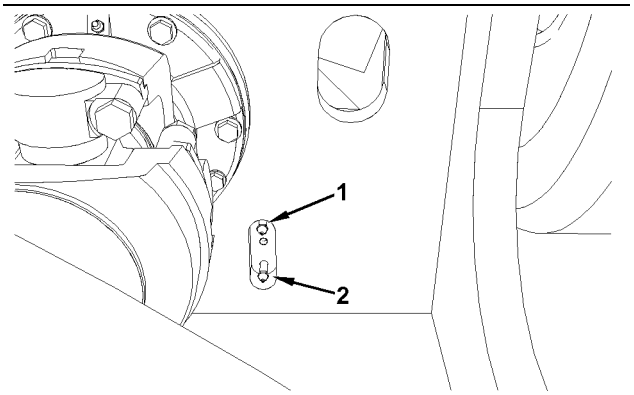


Illustration 239 g01098864

The bearing on the rod end of each steering cylinder is lubricated through two remote fittings on the inside of the right front loader frame.

Apply lubricant through fitting (1) for the right steering cylinder. Apply lubricant through fitting (2) for the left steering cylinder.

i02305841

Tire Inflation - Check

SMCS Code: 4203-535-AI

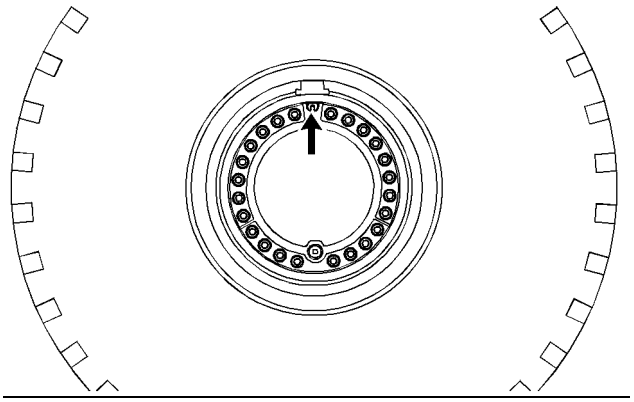


Illustration 240 g01160201

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.

i02229100

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 Tools and Shop Products Guide” 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 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. Stop the engine.

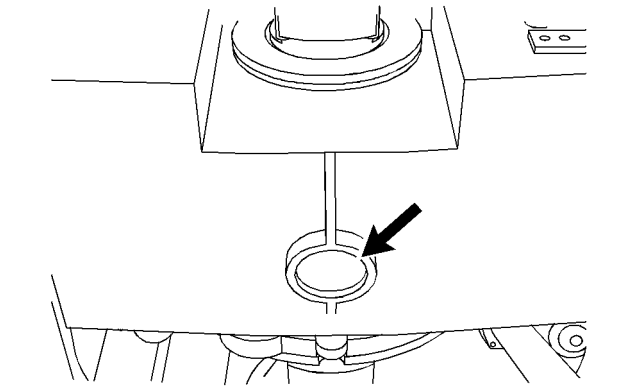


Illustration 241 g01095645

3. There is an access hole in the transmission guard for the transmission drain plug.

Note: The drain valve is an ecology drain valve.

4. Remove the transmission drain plug from the bottom of the transfer gear case. Attach a hose to a Oil Drain Coupling. Install the threaded end of the coupling into the drain valve in order to unseat the internal drain valve. Allow the oil to drain into a suitable container.

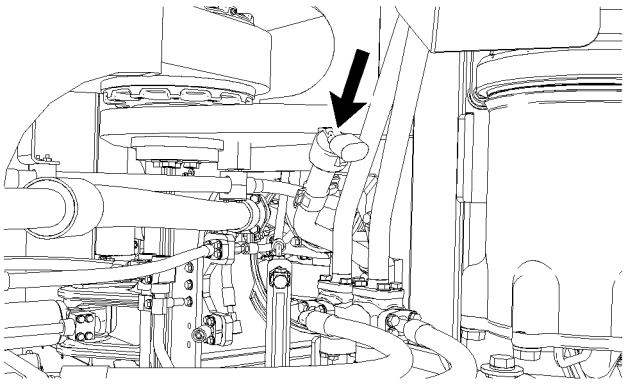


Illustration 242 g01095647

5. The transmission oil filler tube is located near the articulation joint on the left side of the machine. Remove the transmission oil filler cap in order to ease drainage.

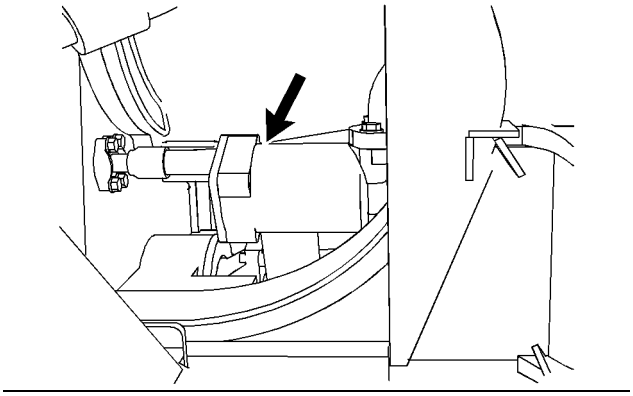


Illustration 243 g01095648

6. The transmission magnetic screen is located on the left side of the transfer gear case. The screen may be accessed through the left side of the rear frame, as shown.

Use the following procedure to clean the transmission magnetic screen:

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

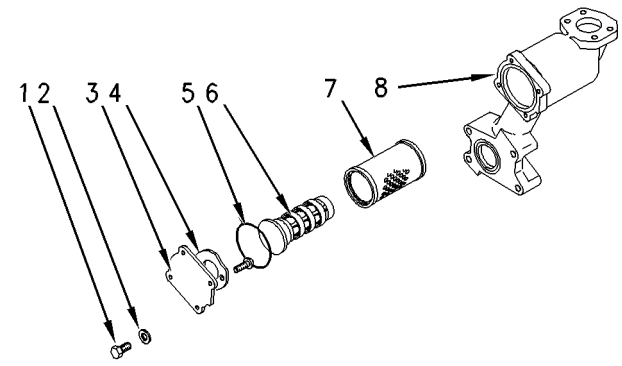


Illustration 244 g00838905

a. Remove bolts (1) and washers (2). Remove cover assembly (3) and seal (5).

b. Remove screen tube assembly (6) and suction screen (7).

c. Wash the screen tube assembly and the suction screen in a clean, nonflammable solvent.

d. Install screen tube assembly (6) and suction screen (7).

e. Inspect seal (5) for damage. Replace the seal, if necessary. Install seal (5) and cover assembly (3).

7. Replace the transmission oil filter.

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

8. Clean the transmission drain plug. Install the transmission drain plug.

9. Fill the transmission with oil.

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

10. Clean the filler cap and install the filler cap.

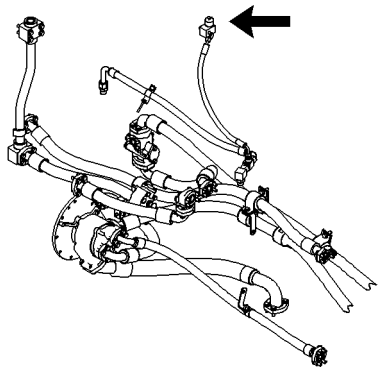


Illustration 245 g00935383

Transmission Breather

11. Open the access door in the platform behind the cab. Remove the transmission breather.

12. Wash the breather in a clean, nonflammable solvent. Allow the breather to air dry or use air pressure to dry the breather. Install the breather.

13. Start the engine and run the engine at low idle.

14. Slowly operate the transmission control in order to circulate the oil. Return the transmission to neutral.

15. Stop the engine. Inspect the entire transmission for leaks.

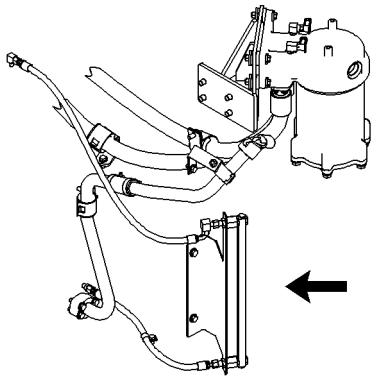


Illustration 246 g00935572

16. Check the transmission oil level.

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

i02595697

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.

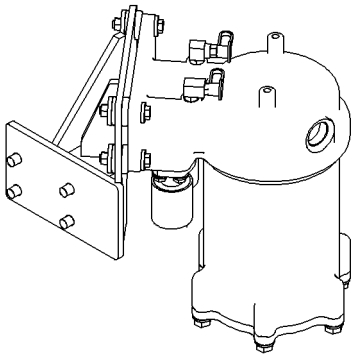


Illustration 247 g00935569

The transmission oil filter is located on the left side of the machine near the articulation joint.

Note: The hose for the steering cylinder may obstruct the bottom of the filter.

1. Stop the engine and remove the key.

2. Turn the battery disconnect switch to the OFF position.

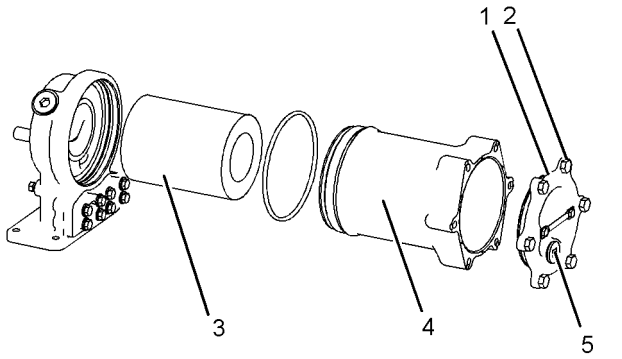


Illustration 248 g01299247

3. Remove drain plug (5) and allow any oil to drain into a suitable container.

4. Install the drain plug once the oil has drained completely.

5. Remove bolts (2) and cover plate (1) from the bottom of filter housing (4).

6. Remove filter element (3) from filter housing (4). Dispose of the used filter element properly.

7. Clean the filter housing and the filter housing base with a clean, nonflammable solvent.

8. Inspect the cover seal for the filter housing. Replace the seal if the seal is damaged.

9. Install a new filter element, the cover plate and bolts on the bottom of the transmission oil filter housing.

10. Start the engine and run the engine at low idle.

11. Slowly operate the transmission control in order to circulate the transmission oil. Return the transmission to neutral.

12. Stop the engine. Check the transmission oil filter for leaks.

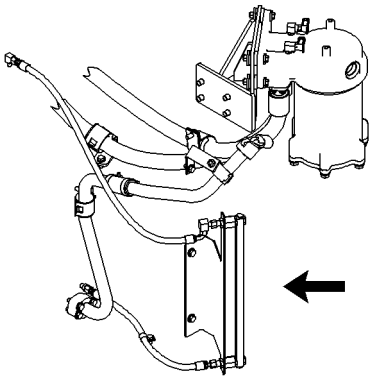


Illustration 249 g00935572

13. Check the transmission oil level.

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

i01833015

Transmission Oil Level - Check

SMCS Code: 3030-535-FLV

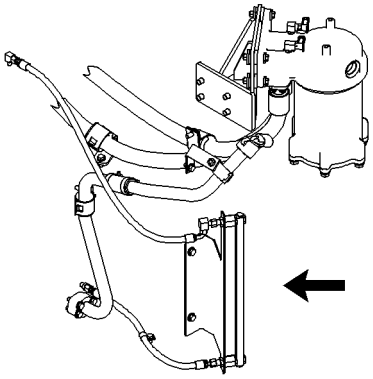


Illustration 250 g00936405

The sight gauge is located on the left side of the machine near the articulation joint.

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

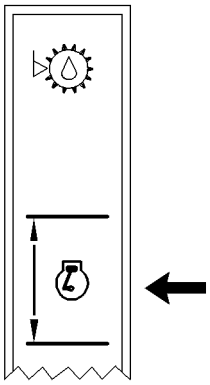


Illustration 251 g00936406

2. Check the oil level in the sight gauge. Maintain the oil level within the operating range while the engine is running.

Note: The oil level varies significantly when the engine is stopped. The oil level will be considerably higher than the operating range. The oil level should be above the middle of the gauge before the engine is started.

3. If necessary, remove the filler cap and add oil. Clean the filler cap and install the filler cap.

i02161205

Transmission Oil Sample - Obtain

SMCS Code: 3080-008; 7542

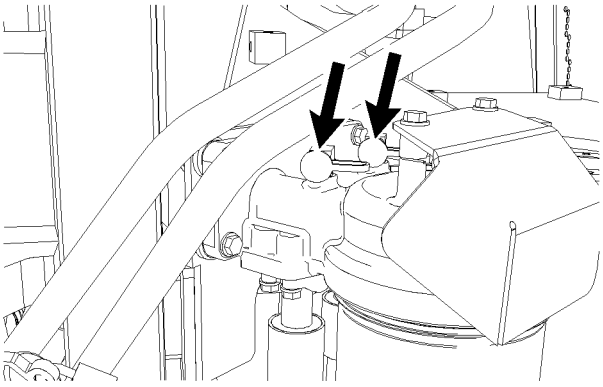


Illustration 252 g01095817

The sampling valve for the transmission oil is located on the transmission oil filter base on the left side of the machine.

Refer to Special Publication, SEBU6250, “Caterpillar Machine Fluids Recommendations”, “S·O·S Oil Analysis” for information that pertains to obtaining an oil sample from the transmission housing. Refer to Special Publication, PEHP6001, “How To Take A Good Oil Sample” for more information about obtaining an oil sample from the transmission housing.

i01394768

Turbocharger - Inspect

SMCS Code: 1052-040

If the turbocharger fails during engine operation, severe damage to the turbocharger compressor wheel and to the entire engine can result.

Turbocharger bearing failures can cause large quantities of oil to enter the intake system and the exhaust system. Loss of engine oil can result in serious engine damage.

Do not continue to operate the engine when a turbocharger bearing failure is accompanied by a significant loss of engine performance. Engine smoke and speeding up of the engine with no load are characteristics of a loss of engine performance.

Reference: For more information about inspecting the turbocharger, refer to the appropriate Service Manual for your machine's engine.

i02161333

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.

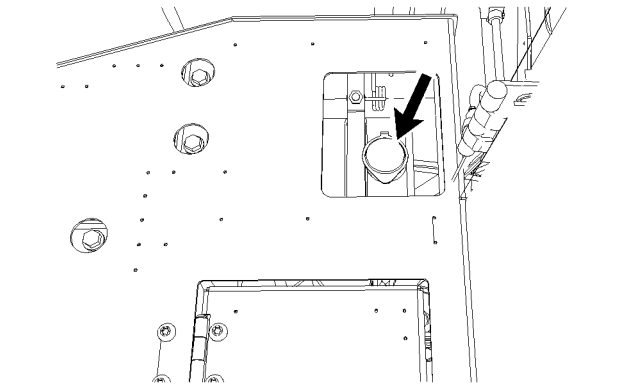


Illustration 253 g01095908

The window washer reservoir is located beneath an access panel on the left cab platform .

Fill the reservoir with window washer solvent.

i02168843

Window Wiper - Inspect/Replace

SMCS Code: 7305-040; 7305-510

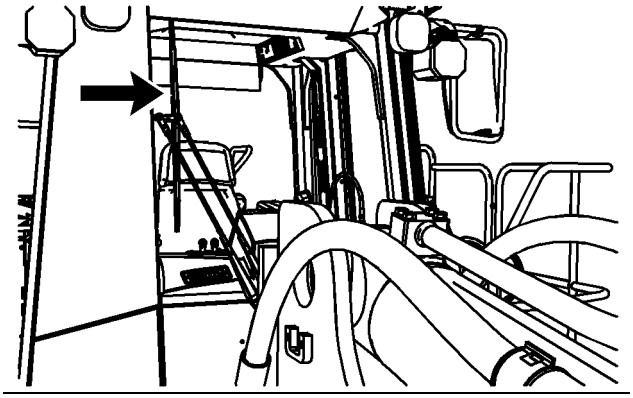


Illustration 254 g01098903

Inspect the front wiper blade and the rear wiper blade. Replace the wiper blades if the wiper blades are worn or damaged or if streaking occurs.

i00037755

Windows - Clean

SMCS Code: 7310-070

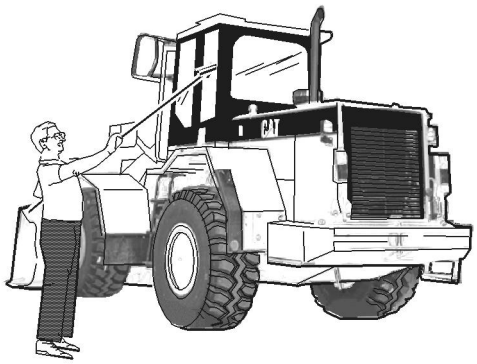


Illustration 255 g00038949

Use commercially available window cleaning solutions in order to clean the windows. Clean the outside windows from the ground unless handholds are available.