

SAFETY.CAT.COM™

MAINTENANCE INTERVALS

Operation and Maintenance
Manual Excerpt



Operation and Maintenance Manual

247B2 and 257B2 Multi Terrain Loaders

MTL5075-Up (247B2 Machine)
SLK7300-Up (257B2 Machine)

i04193489

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

Battery or Battery Cable - Inspect/Replace	115
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Every 10 Service Hours or Daily

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Engine Oil Level - Check	131
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Sprocket - Inspect	147
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Track (Rubber) - Inspect/Adjust	149
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Work Tool Mounting Bracket - Inspect	155

Initial 250 Service Hours

Final Drive Oil - Change	135
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Every 250 Service Hours

Final Drive Oil Level - Check	135
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Every 250 Service Hours or Monthly

Belts - Inspect/Adjust/Replace	115
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Every 500 Service Hours

Cooling System Coolant Sample (Level 1) - Obtain	124
Final Drive Oil - Change	135
Hydraulic System Oil Sample - Obtain	142

Every 500 Service Hours or 6 Months

Fuel System Filter (In-Line) - Replace	136
Fuel System Primary Filter (Water Separator) Element - Replace	137
Hydraulic System Oil Filter - Replace	141

Every 500 Service Hours or 1 Year

Engine Oil and Filter - Change	132
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Every 1000 Service Hours

Engine Valve Lash - Check	134
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Every 1000 Service Hours or 6 Months

Rollover Protective Structure (ROPS) and Falling
Object Protective Structure (FOPS) - Inspect ... 145

Every 1000 Service Hours or 1 Year

Sprocket Sleeve - Inspect 148

Every 2000 Service Hours

Refrigerant Dryer - Replace 145

Every 2000 Service Hours or 1 Year

Fuel Injection Timing - Check 136

Hydraulic System Oil - Change 139

Every Year

Cooling System Coolant Sample (Level 2) -
Obtain 125

Every 3000 Service Hours or 2 Years

Cooling System Water Temperature Regulator -
Replace 127

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

Seat Belt - Replace 146

Every 6000 Service Hours or 3 Years

Cooling System Coolant Extender (ELC) - Add .. 124

Every 12 000 Service Hours or 6 Years

Cooling System Coolant (ELC) - Change 122

i03318742

Air Cleaner Dust Valve - Clean/Inspect

SMCS Code: 1051-571-VL

Service the air filter elements when the alert indicator for air filter restriction lights. Refer to Operation and Maintenance Manual, "Alert Indicators" for information about the indicator.

1. Open the engine access door.
2. The air filter housing is located in the engine compartment.

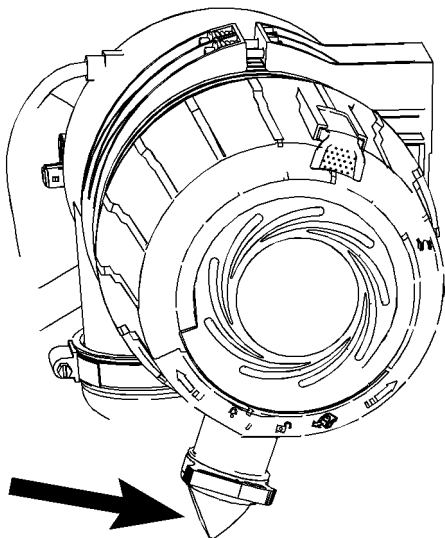


Illustration 95

g01433144

3. Check the air cleaner dust valve after every ten service hours or at the end of each day. Actuate the valve by squeezing the lips of the valve in order to remove any accumulated debris.

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Axle Bearings - Lubricate

SMCS Code: 3282-086-BD

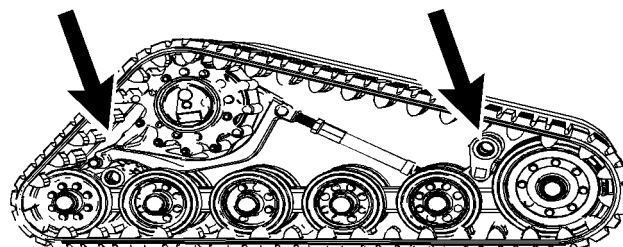


Illustration 96

g01387575

Apply lubricant to the grease fittings for the rear axle bearings and the front axle bearings.

Repeat the process for the opposite side of the machine.

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Backup Alarm - Test

SMCS Code: 7406-081

To prevent injury, make sure that no people are working on the machine or near the machine. To prevent injury, keep the machine under control at all times.

1. Get into the operator's seat. Fasten the seat belt and pull the armrest downward.
2. Start the engine.
3. Disengage the parking brake.
4. Move the speed/direction control lever to the REVERSE position.

The backup alarm (if equipped) should sound immediately. The backup alarm should continue to sound until the speed/direction control lever is returned to the HOLD position or to the FORWARD position.

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i01957641

Battery or Battery Cable - Inspect/Replace

SMCS Code: 1401-040; 1401-510; 1401-561; 1402-040; 1402-510

1. Turn the engine start switch to the OFF position. Turn all switches to the OFF position.
 2. The battery is located on the left side of the machine under the cab. Raise the cab. Refer to Operation and Maintenance Manual, "Cab Tilting" for information on raising the cab.
 3. Disconnect the negative battery cable at the battery.
- Note:** Do not allow the disconnected battery cable to contact the negative battery post.
4. Disconnect the negative battery cable from the frame in order to inspect the cable.
 5. Disconnect the positive battery cable at the battery.
 6. Perform the necessary repairs. Replace the cables or the battery, as needed.
 7. Connect the positive battery cable at the battery.
 8. Connect the negative battery cable to the frame of the machine.
 9. Connect the negative battery cable at the battery.
 10. Lower the cab. Refer to Operation and Maintenance Manual, "Cab Tilting" for information on lowering the cab.

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

Belts - Inspect/Adjust/Replace

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

If a new belt is installed, check the belt adjustment after 30 minutes of operation. A belt is considered to be used after 30 minutes of operation.

1. Stop the engine in order to inspect the belt.
2. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

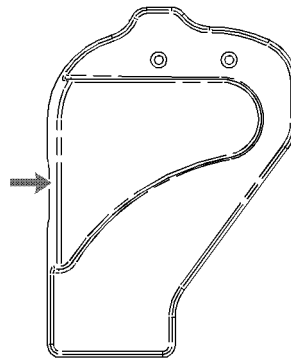


Illustration 97

g01017605

3. Remove the guard for the V-belt.

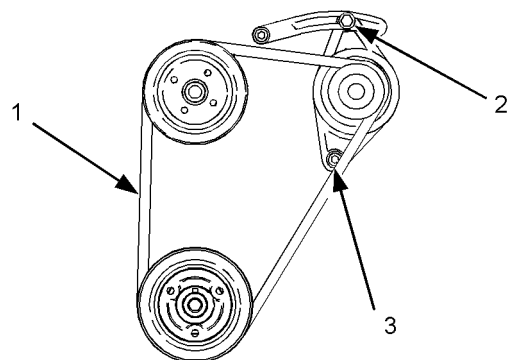


Illustration 98

g01017632

4. Inspect the condition of the belt (1) and the adjustment of the belt. The belt should deflect 10 mm (0.39 inch) under a straight pull of 44 N (10 lb). This measurement should be taken between the alternator pulley and the crankshaft pulley.

Note: A 144-0235 Borroughs Belt Tension Gauge may be used to measure belt tension. This measurement should be taken between the alternator pulley and the crankshaft pulley. Refer to the following table for belt tension.

Table 31

Belt Tension Initial	Belt Tension Used
534 ± 22 N (120 ± 5 lb)	400 ± 44 N (90 ± 10 lb)

5. Loosen the mounting bolt (2). Loosen the adjusting locknut (3).
6. Move the alternator until the correct tension is reached.
7. Tighten the adjusting locknut. Tighten the mounting bolt.
8. Recheck the belt deflection. If the amount of deflection is incorrect, repeat step 4 to step 7.
9. Install the guard for the V-belt.
10. Close the engine access door.

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Blade Frame - Adjust

SMCS Code: 6060-025-BG

Height Adjustment

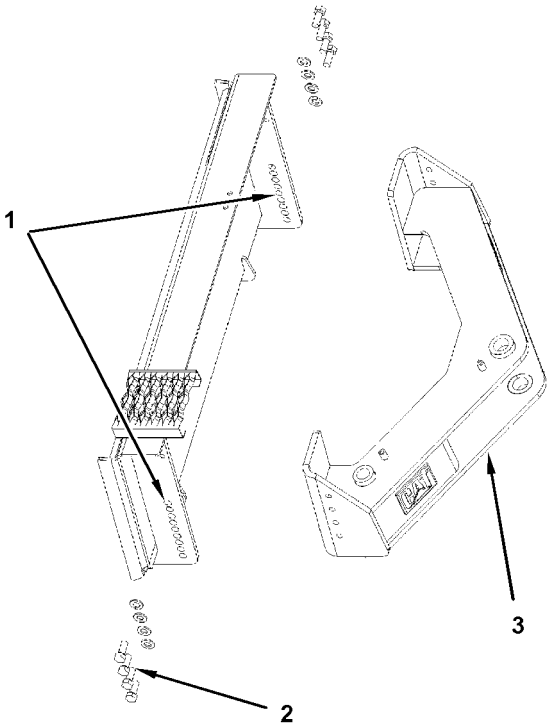


Illustration 99

g01161532

- (1) Height Adjustment for the Frame
(2) Adjusting Bolts
(3) Frame

The height of the frame may be adjusted in order to compensate for the wear on the cutting edge. The front portion of the frame needs to be lowered as the cutting edge wears. Remove the bolts (2) and lower the frame (3). Install the bolts. This will keep the blade level with the ground and this will prevent the blade from digging into the ground.

Note: In order to properly adjust the blade, the work tool coupler needs to be vertical. The position of the pivot point of the blade is perpendicular to the ground. Follow this procedure in order to ensure that the cutting edge will remain flat on the ground during operation.

i03318544

Trunnion Joint

Note: The trunnion is a dry joint. Adding grease to the trunnion simply attracts abrasive particles. The tightness of the joint should be monitored. Shims should be removed when the joint becomes too loose. This may be indicated by excessive movement in the blade.

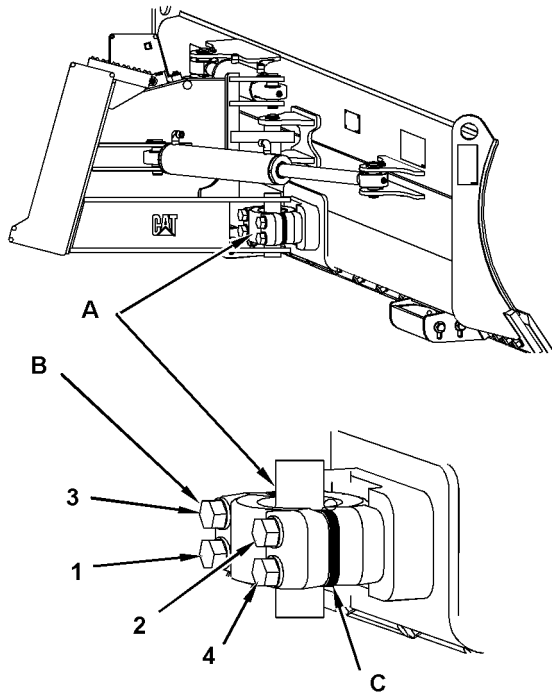


Illustration 100

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(A) Trunnion Joint
(B) Bolts
(C) Shims

- Remove the four retaining bolts (B) and the cap.
- Remove the necessary shims.
- Replace the cap and bolts.
- The tightening sequence is shown in illustration 100.
- Torque the bolts to 530 ± 70 N·m (391 ± 52 lb ft).

Note: Some noise is typical and the noise does not indicate a problem.

Bogie and Idler - Inspect/Replace

SMCS Code: 4159-040; 4159-510; 4192-040; 4192-510

Inspect

Clean the undercarriage before inspecting the bogies and the idlers.

Inspect the bogies and idlers for damage and wear.

Note: Minor damage to the rubber on the bogies and idlers is acceptable. Minor damage includes nicks, cuts, small pieces that are missing, and small grooves. This minor damage is normal and acceptable. Minor damage will not adversely affect machine performance.

The bogies and the idlers should be replaced when the damage to the rubber wheels adversely affects machine performance. Replace the bogies and the idlers when the rubber is worn beyond the minimum specifications that are listed below.

Table 32

Bogie Wheels and Idler Wheels Wear Limits		
	Minimum Width	Minimum Thickness
254 mm (10 inch)	48 mm (1.9 inch)	3 mm (0.12 inch)
358 mm (14 inch)	48 mm (1.9 inch)	3 mm (0.12 inch)

Loosen the Track

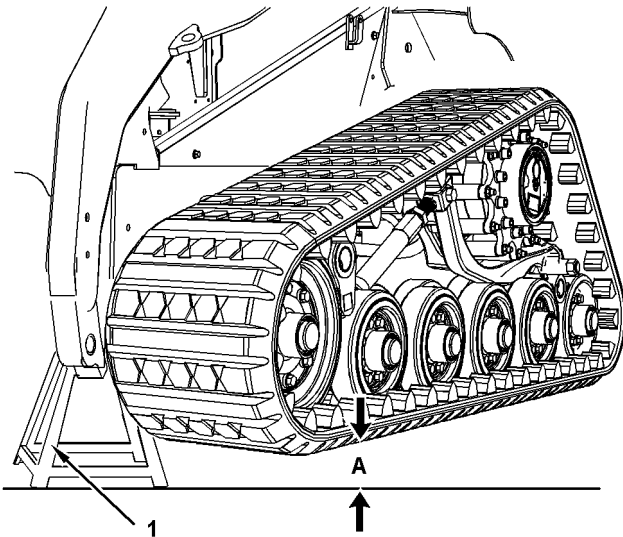


Illustration 101

g01393193

Use an appropriate floor jack in order to lift the machine off the ground. Use appropriate jack stands (1) in order to block up the machine. Raise the machine until tracks are approximately 50 mm (2.0 inches) (A) off the ground.

Loosen the track in order to work on the bogies and idlers. Refer to Operation and Maintenance Manual, "Track - Inspect/Adjust" for the procedure.

Note: The track may be removed in the illustrations for clarity.

Idler wheels

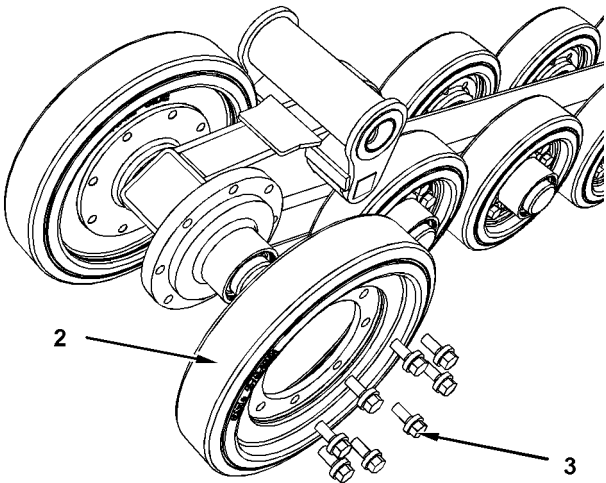


Illustration 102

g01393325

- (2) Outer idler wheel
(3) Bolts and washers for the wheels

1. Remove the bolts (3) and the washers for the outer idler wheel (2).
2. Remove the outer idler wheel.
3. If necessary, remove the bolts and the washers for the inner idler wheel and remove the wheel.
4. Install the wheels. Tighten the bolts to a torque of $50 \pm 5 \text{ N}\cdot\text{m}$ ($37 \pm 3.7 \text{ lb ft}$). Turn the bolts an additional 45 degrees ± 5 degrees in the same star pattern.

Bogie wheels

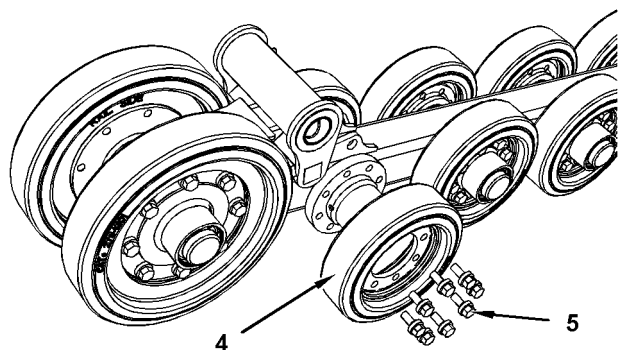


Illustration 103

g01393304

- (4) Bogie Wheel
(5) Bolts and washers for the wheels

1. Remove the bolts (5) and the washers for the outer bogie wheel (4).
2. Remove the outer bogie wheel.
3. If necessary, remove the bolts and the washers for the inner bogie wheel and remove the wheel.
4. Install the wheels. Tighten the bolts to a torque of $150 \pm 20 \text{ N}\cdot\text{m}$ ($110 \pm 15 \text{ lb ft}$).

i01743875

Bucket Cutting Edges - Inspect/Replace

SMCS Code: 6801-040; 6801-510

WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket cutting edges.

1. Lower the lift arms fully. Tilt back the bucket so that the bucket cutting edge is accessible.
2. Place blocks under the raised edge of the bucket.
3. Remove the bolts. Remove the cutting edge and the end bits.
4. Clean the contact surfaces.
5. Use the opposite side of the cutting edge, if this side is not worn.

6. Install a new cutting edge, if both edges are worn.
7. Install the bolts.
8. Remove the blocks that are under the bucket.
9. After a few hours of operation, check the bolts for proper torque.

i01764331

Bucket Tips - Inspect/Replace

SMCS Code: 6805-040; 6805-510

WARNING

Personal injury or death can result from bucket falling.

Block the bucket before changing bucket cutting edges.

1. Lower the lift arms fully. Tilt back the bucket so that the bucket tips are accessible.
2. Place blocks under the raised edge of the bucket.
3. Remove the mounting bolts. Remove the bucket tips.
4. Clean the mounting surface.
5. Replace the bucket tips.
6. Install the bolts.
7. Remove the blocks that are under the bucket.
8. After a few hours of operation, check the bolts for proper torque.

i01962545

Cab Air Filter - Clean/Replace (If Equipped)

SMCS Code: 7342-070; 7342-510

Fresh Air Filter

1. Raise the loader lift arms. Install the brace for the loader lift arm. Refer to Operation and Maintenance Manual, "Loader Lift Arm Brace Operation".

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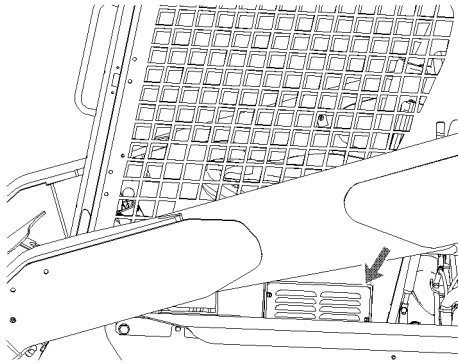


Illustration 104

g01019732

2. Remove the filter cover.
3. Remove the seal from the cover and inspect the seal. If the seal is damaged replace the seal.
4. Remove the air filter element from the cover and clean the filter element with low pressure air. Replace the element if the element is damaged.
5. Install the seal onto the filter cover and install the filter element.
6. Install the filter cover on the machine.
7. Remove the brace for the loader lift arms and return the brace to the stored position. Refer to Operation and Maintenance Manual, "Loader Lift Arm Brace Operation".

Recirculation Filter

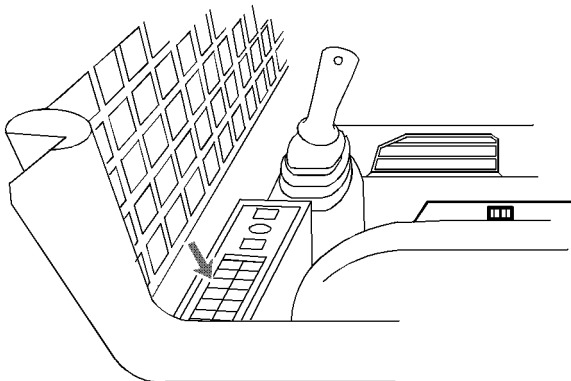


Illustration 105

g01024691

1. Remove the cover in order to access the air filter element.
2. Remove the air filter element and clean the element with soap and water. Replace the element if the element is damaged.
3. Install the element and replace the cover.

Circuit Breakers and Fuses - Reset/Replace

SMCS Code: 1417-510; 1420-529

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

NOTICE

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

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

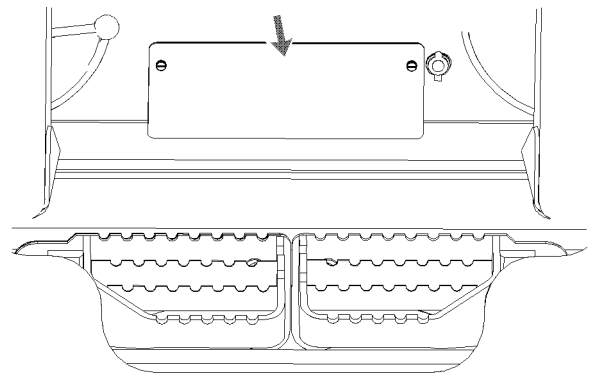


Illustration 106

g01019673

The fuse panel is located behind the cover underneath the seat. Remove the cover in order to access the fuse panel.

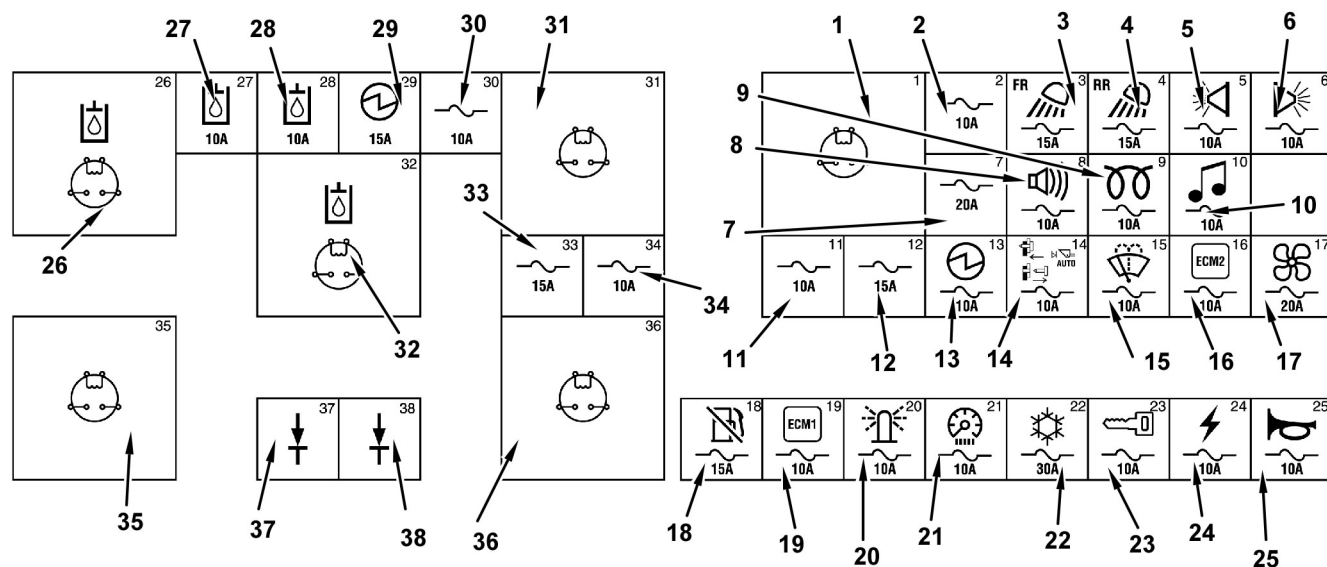


Illustration 107
Fuses and Relays

g01430673

• Fuses

- (2) Finger Trigger for the Work Tool
- (3) Front Work Lights
- (4) Rear Work Lights
- (5) Left Tail Lamp
- (6) Right Tail Lamp
- (7) Spare
- (8) Backup Alarm
- (9) Cold Start
- (10) Radio
- (11) Spare
- (12) Spare
- (13) 12 volt power socket
- (14) Hydraulic Quick Coupler
- (15) Wiper
- (16) Auxiliary Hydraulic ECM
- (17) HVAC Blower Fan and the Solenoid for the Compressor
- (18) Fuel Shutoff solenoid

- (19) Interlock ECM

- (20) Beacon
- (21) Gauges
- (22) The fan for the air conditioner condenser
- (23) Ignition Switch
- (24) Miscellaneous Power
- (25) Horn
- (27) Auxiliary Hydraulic C-
- (28) Auxiliary Hydraulic C+
- (29) Auxiliary Tools
- (30) Auxiliary Electrical Control C1
- (33) Spare
- (34) Auxiliary Electrical Control C2

• Relays

- (1) Finger Trigger for the Work Tool
- (26) Auxiliary Hydraulic C-Solenoid
- (31) Auxiliary Electric Control C1
- (32) Auxiliary Hydraulic C+Solenoid

- (35) ECM signal for the Auxiliary Hydraulic C+ and the Auxiliary Hydraulic C-
- (36) Auxiliary Electric Control C2
- **Diodes**
- (37) C-
- (38) C+

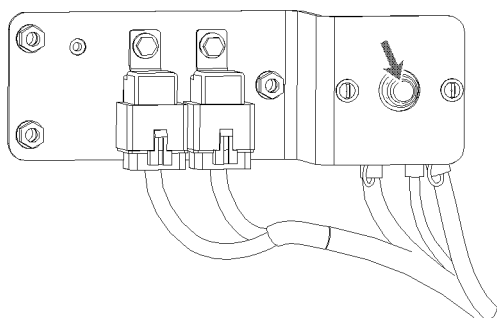


Illustration 108
Circuit Breaker

g01019607

The main circuit breaker is located in the engine compartment on the left side. Press the switch and release the switch in order to reset the circuit breaker.

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Cooling System Coolant (ELC) - Change

SMCS Code: 1395-044-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

Mixing ELC with other products will reduce the effectiveness of the coolant.

This could result in damage to cooling system components.

If Caterpillar products are not available and commercial products must be used, make sure they have passed the Caterpillar EC-1 specification for pre-mixed or concentrate coolants and Caterpillar Extender.

Note: The machine was shipped from the factory with Extended Life Coolant (ELC) in the cooling system.

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

Drain the coolant whenever the coolant is dirty or whenever the coolant is foaming.

The radiator cap is located under the radiator guard on the top of the engine compartment.

Allow the machine to cool before you change the coolant.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Raise the radiator guard. Refer to Operation and Maintenance Manual, "Radiator Tilting".

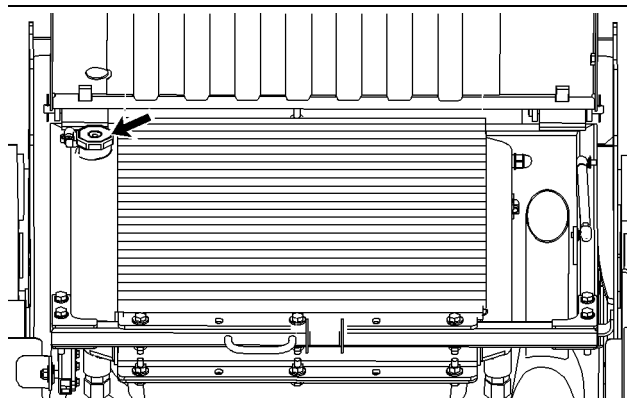


Illustration 109

g00956151

Typical Example

3. Slowly loosen the radiator cap in order to relieve system pressure. Remove the radiator cap.

Note: The radiator cap is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The radiator cap is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

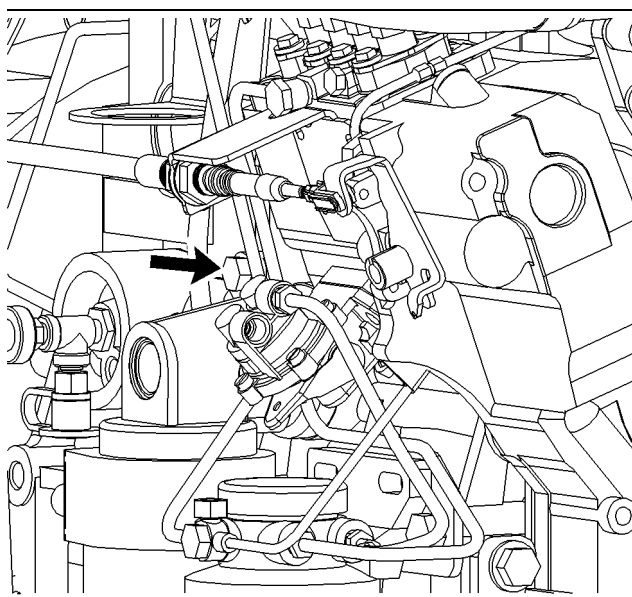


Illustration 110

g00954319

Drain Valve for the C2.2 engine

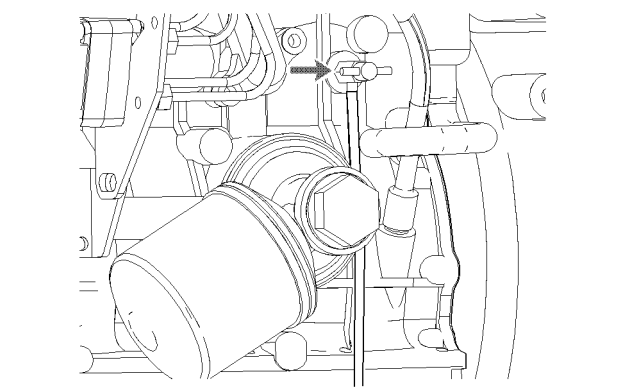


Illustration 111

g01018862

Drain Valve for the C3.4 engine

4. Remove the drain plug or open the drain valve (if equipped) and allow the coolant to drain into a suitable container.
5. Install the drain plug or close the drain valve (if equipped).
6. Replace the thermostat. See Operation and Maintenance Manual, "Cooling System Water Temperature Regulator - Replace" for the process for replacing the thermostat.
7. Add the coolant solution. Refer to Operation and Maintenance Manual, "Capacities - (Refill)". Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

Note: Premix the coolant solution before filling the cooling system. The coolant solution should contain 50 percent coolant and 50 percent distilled water.

Note: Add the coolant solution at a maximum rate of five liters per minute. This will reduce the chance of trapping air inside the engine block. A large amount of trapped air can cause localized heating to occur upon start-up. Localized heating may result in engine damage, which may lead to failure of the engine.

8. Start the engine. Run the engine without the radiator cap until the thermostat opens and the coolant level stabilizes.

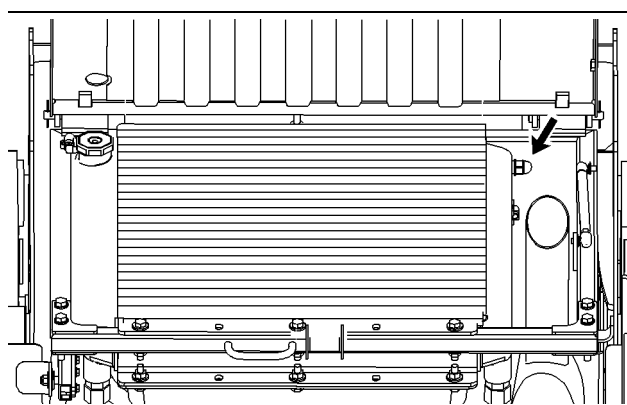


Illustration 112

g00956179

Typical Example

9. Maintain the coolant level in the sight gauge.

Note: The sight gauge is located on the right side of the engine compartment on machines that are equipped with the C2.2 engine. The sight gauge is located on the left side of the engine compartment on machines that are equipped with the C3.4 engine.

10. Stop the engine. Inspect the radiator cap and the gasket. Replace the cap if the cap or the gasket is damaged. Install the radiator cap.
11. Pull the radiator guard downward.
12. Close the engine access door.

i03879996

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.

When a Caterpillar Extended Life Coolant is used, an extender must be added to the cooling system periodically.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator guard upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

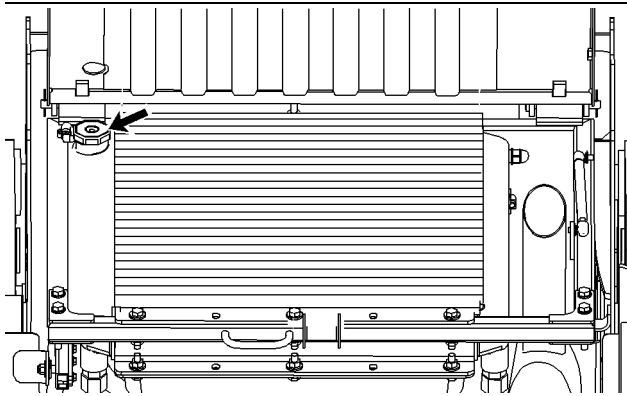


Illustration 113

g00956151

Typical Example

Note: The radiator cap is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The radiator cap is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

3. Slowly loosen the radiator cap in order to relieve system pressure. Remove the radiator cap.
4. If necessary, drain enough coolant from the radiator in order to allow the addition of the coolant additive.
5. Add 0.17 L (0.18 qt) of cooling system additive.
6. Inspect the radiator cap and the gasket. If the cap or the gasket is damaged, replace the cap. Install the radiator cap.

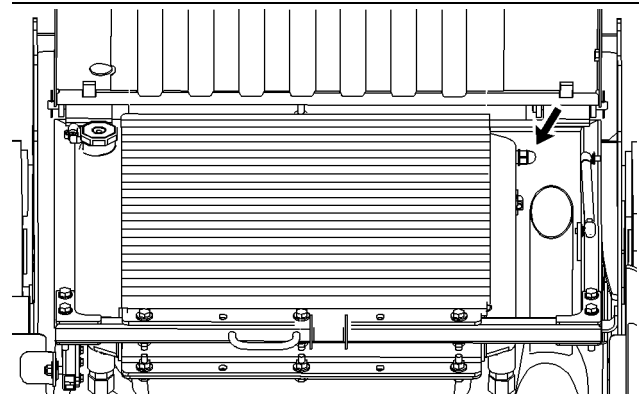


Illustration 114

g00956179

Typical Example

Note: The sight gauge for the coolant level is located on the right side of the engine compartment on machines that are equipped with the C2.2 engine. The sight gauge for the coolant level is located on the left side of the engine compartment on machines that are equipped with the C3.4 engine.

7. Check the coolant level in the sight gauge on the radiator. Maintain the coolant level to the top of the sight gauge with the radiator in the LOWERED position.
8. Tilt the radiator guard downward.
9. Close the engine access door.

For additional information on the addition of extender, see Special Publication, SEBU6250, "Caterpillar Machine Fluids Recommendations".

i03880003

Cooling System Coolant Sample (Level 1) - Obtain

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

NOTICE

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

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

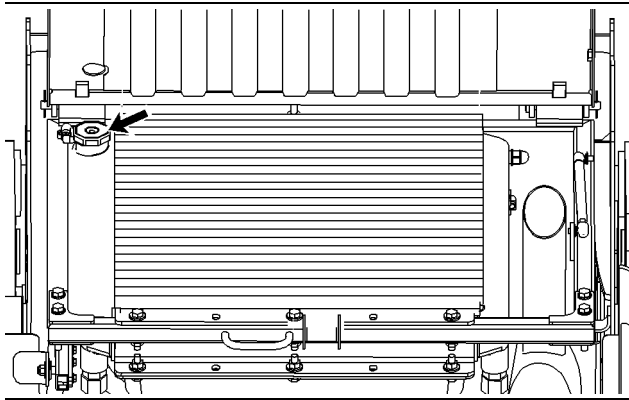


Illustration 115

g00956151

Typical Example

Refer to the Operation and Maintenance Manual, "Access Doors and Covers" for the location of the service points.

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.

Obtain the sample of the coolant from the radiator. When the system is cool, slowly remove the radiator cap.

Note: The radiator cap is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The radiator cap is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

Note: Do not take the sample from the Coolant Overflow Reservoir.

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:

- Keep the unused sampling bottles stored in plastic bags.
- Keep the lids on empty sampling bottles until you are ready to collect the sample.

- Complete the information on the label for the sampling bottle before you begin to take the samples.
- Use a designated pump to collect the sample in order to avoid contamination.
- Obtain coolant samples directly from the coolant tank. You should not obtain the samples from any other location.
- Place the sample in the mailing tube immediately after obtaining the sample in order to avoid contamination.
- Never collect samples from the drain for a system.

Submit the sample for Level 1 analysis.

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

i03880006

Cooling System Coolant Sample (Level 2) - Obtain

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

NOTICE

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

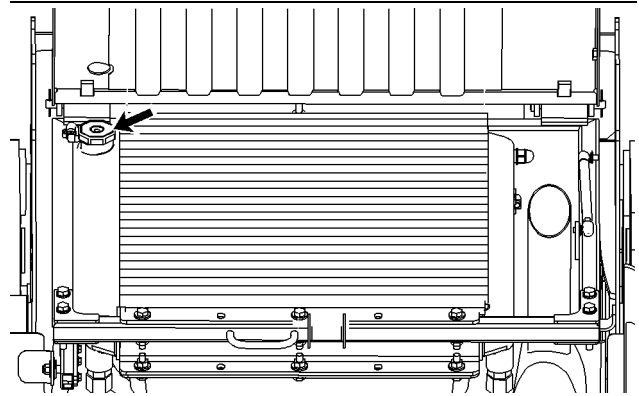


Illustration 116

g00956151

Typical Example

Refer to the Operation and Maintenance Manual, "Access Doors and Covers" for the location of the service points.

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.

Obtain the sample of the coolant from the radiator. When the system is cool, slowly remove the radiator cap.

Note: The radiator cap is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The radiator cap is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

Note: Do not take the sample from the Coolant Overflow Reservoir.

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

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

Submit the sample for Level 2 analysis.

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

i03880033

Cooling System Level - Check

SMCS Code: 1350-040-HX; 1350-535-FLV;
1382-070; 1382-510

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.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator guard upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

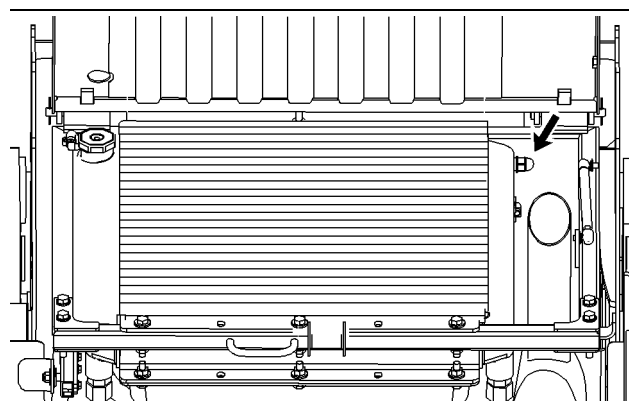


Illustration 117

g00956179

Note: The sight gauge for the coolant level is located on the right side of the engine compartment on machines that are equipped with the C2.2 engine. The sight gauge for the coolant level is located on the left side of the engine compartment on machines that are equipped with the C3.4 engine.

3. Maintain the coolant to the top of the sight gauge with the radiator in the LOWERED position.

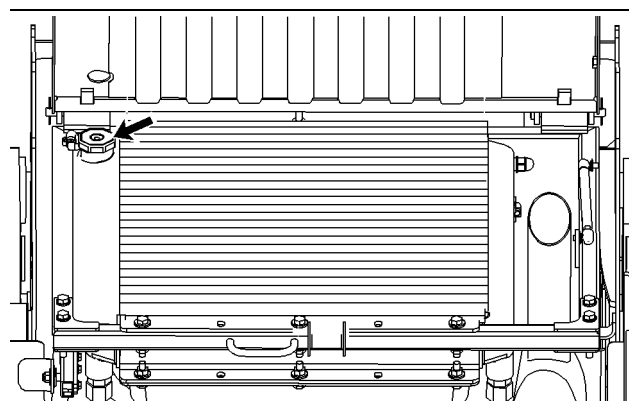


Illustration 118

g00956151

Note: The radiator cap is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The radiator cap is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

4. If you need to add coolant to the radiator, remove the radiator cap slowly in order to relieve system pressure.

Note: Inspect the cooling system hoses for any leaks, cracks, or signs of deterioration. Replace any damaged hoses.

5. Inspect the radiator cap and the gasket. Replace the cap if the cap or the gasket is damaged. Install the radiator cap.
6. Tilt the radiator guard downward.

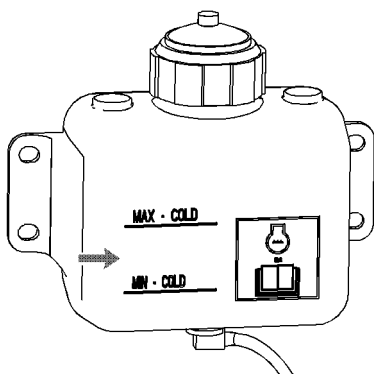


Illustration 119

g01018341

7. The coolant reservoir is located on either the left side of the engine compartment or on the engine access door. Maintain the coolant level in the coolant reservoir between the "MIN" and "MAX" lines.

8. Close the engine access door.

i03880044

Cooling System Water Temperature Regulator - Replace

SMCS Code: 1355-510; 1393-010

Replace the thermostat on a regular basis in order to reduce the chance of unscheduled downtime and of problems with the cooling system. Failure to replace the engine's thermostat on a regularly scheduled basis could cause severe engine damage.

The thermostat should be replaced after the cooling system has been cleaned. Replace the thermostat while the cooling system is completely drained or while the cooling system coolant is drained to a level that is below the thermostat housing.

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

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Drain the coolant from the machine. See Operation and Maintenance Manual, "Cooling System Coolant (ELC) - Change" for the procedure to drain the cooling system.

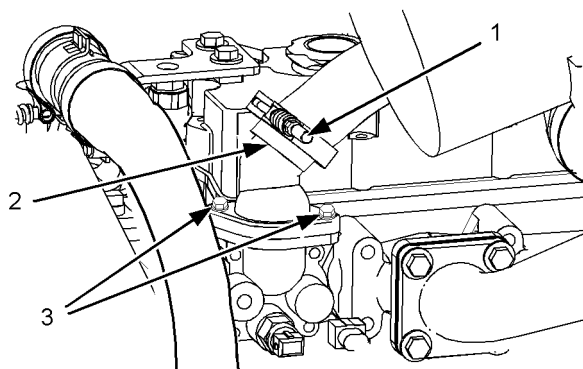


Illustration 120

g01018412

C2.2

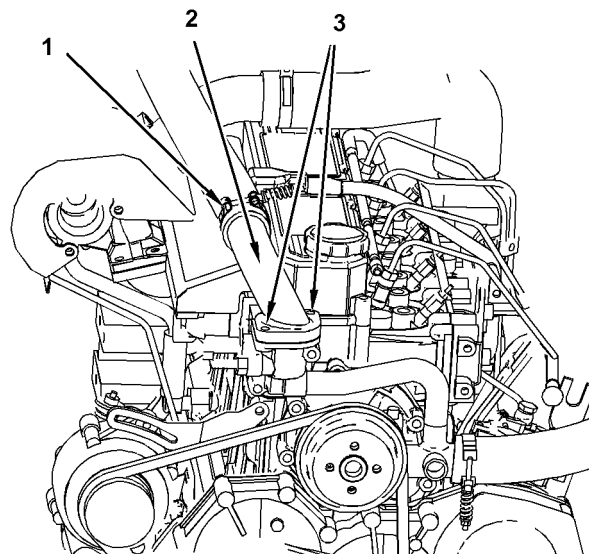


Illustration 121

g01210045

C3.4

3. Loosen the hose clamp (1) and remove the hose from the thermostat housing assembly (2).
4. Remove the two bolts (3) from the thermostat housing assembly. Remove the thermostat housing assembly.
5. Remove the seal and the thermostat from the thermostat housing assembly.
6. Install a new thermostat and a new seal. Install the thermostat housing assembly on the engine cylinder head.
7. Install the hose. Tighten the hose clamp.

8. Refill the cooling system. Refer to Operation and Maintenance Manual, "Capacities - (Refill)". Refer to Operation and Maintenance Manual, "Cooling System Coolant (ELC) - Change" for information about refilling the cooling system. Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluid Recommendations" for coolant information.
9. Close the engine access door.

i03880059

Engine Air Filter Primary Element - Clean/Replace

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

NOTICE

Never service the air cleaner when the engine is running, to avoid engine damage.

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.

Service the air filter elements when the alert indicator for air filter restriction lights. Refer to Operation and Maintenance Manual, "Alert Indicators".

The air filter housing is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The air filter housing is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

Clean

The primary filter element can be used up to three times if the element is properly cleaned and if the element is properly inspected. When the primary filter element is cleaned, check for rips or tears in the filter material. The primary filter element should be replaced at least one time per year. This replacement should be performed regardless of the number of cleanings.

1. Open the engine access door.

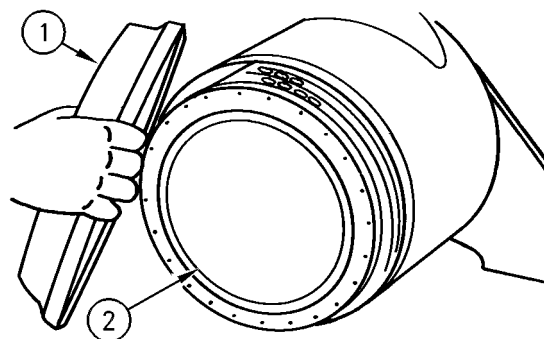


Illustration 122

g00101864

2. Unlatch the air cleaner housing cover (1). Rotate the cover counterclockwise and remove the cover.
 3. Remove the primary filter element (2).
 4. If it is appropriate, clean the primary filter element. Use air pressure to clean the primary filter elements. Pressurized air will not remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).
- Note:** When the primary filter elements are cleaned, always begin with the inside in order to force dirt particles toward the outside. Aim the hose so that the air flows inside the element along the length of the filter in order to help prevent damage to the paper pleats. Do not aim the stream of air directly at the primary filter element.
5. Inspect the cleaned, dry primary air filter element. Use a 60 watt blue light in a dark room or in a similar facility. Place the blue light in the primary air filter element. Rotate the primary air filter element. Inspect the primary air filter element for tears and/or holes. Inspect the primary air filter element for light that may show through the filter material. If it is necessary in order to confirm the result, compare the primary air filter element to a new primary air filter element that has the same part number.

Note: Do not use a primary air filter element that has any tears and/or holes in the filter material. Do not use a primary air filter element with damaged pleats, gaskets or seals. Discard damaged primary air filter elements.

6. Clean the inside of the air cleaner housing with a damp cloth. Do not use compressed air to clean the housing.
7. Install the primary filter element into the filter housing.
8. Install the cover for the filter housing.

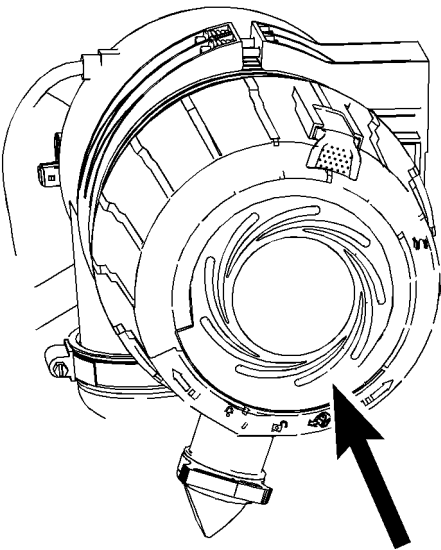


Illustration 123

g01433098

9. Rotate the cover clockwise and latch the cover.
10. Close the engine access door.
11. Start the engine. The alert indicator for air filter restriction should turn off. If the alert indicator continues to light, replace the secondary air filter. Refer to Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace".

Replace

The primary filter element should be replaced at least one time per year. **You can clean the primary filter up to three times.**

1. Open the engine access door.

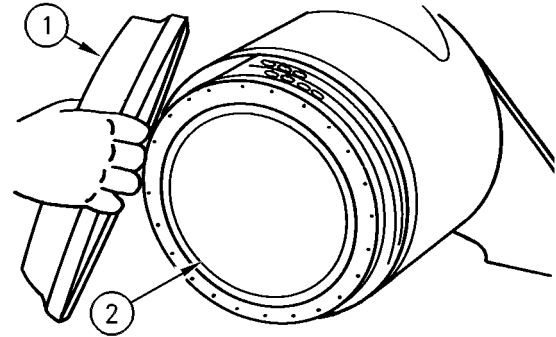


Illustration 124

g00101864

2. Unlatch the air cleaner housing cover (1). Rotate the cover counterclockwise and remove the cover.
3. Remove the primary filter element (2).
4. Clean the inside of the air cleaner housing with a damp cloth. Do not use compressed air to clean the housing.
5. Install a new primary filter element into the filter housing.
6. Install the cover for the filter housing.

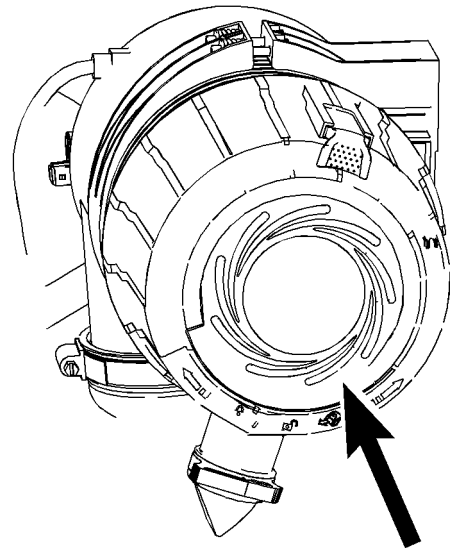


Illustration 125

g01433098

7. Rotate the cover clockwise and latch the cover.
8. Reset the air filter service indicator. Refer to Operation and Maintenance Manual, "Engine Air Filter Service Indicator - Inspect".
9. Close the engine access door.

10. Start the engine. The alert indicator for air filter restriction should turn off. If the alert indicator continues to light, replace the secondary air filter. Refer to Operation and Maintenance Manual, "Engine Air Filter Secondary Element - Replace".

i02879321

Engine Air Filter Secondary Element - Replace

SMCS Code: 1054-510-SE

NOTICE

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

When the primary filter element is cleaned for the third time, the secondary filter element should be replaced.

The secondary filter element should also be replaced if the restricted Air Filter indicator comes on after the installation of a clean primary filter element or if the exhaust smoke is still black.

The air filter housing is located on the left side of the engine compartment on machines that are equipped with the C2.2 engine. The air filter housing is located on the right side of the engine compartment on machines that are equipped with the C3.4 engine.

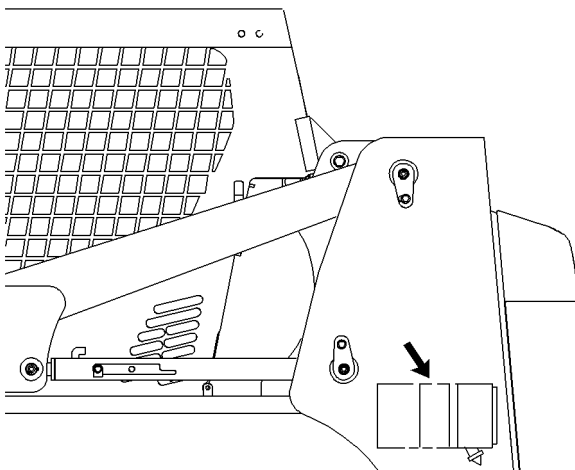


Illustration 126

g00891467

1. Open the engine access door.

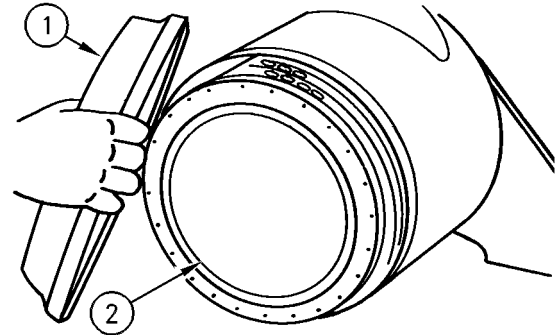


Illustration 127

g00101864

2. Unlatch the air cleaner housing cover (1). Rotate the cover counterclockwise and remove the cover.
3. Remove the primary filter element (2).

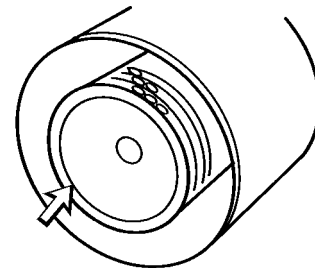


Illustration 128

g00038606

4. Clean the inside of the air cleaner housing with a damp cloth. Do not use compressed air to clean the housing.
5. Remove the secondary filter element.
6. Cover the air inlet opening.
7. Clean the inside of the air cleaner housing with a damp cloth, if necessary. Do not use compressed air to clean the housing.
8. Uncover the air inlet opening.
9. Install a new secondary element.
10. Install the primary element.
11. Install the cover for the filter housing.

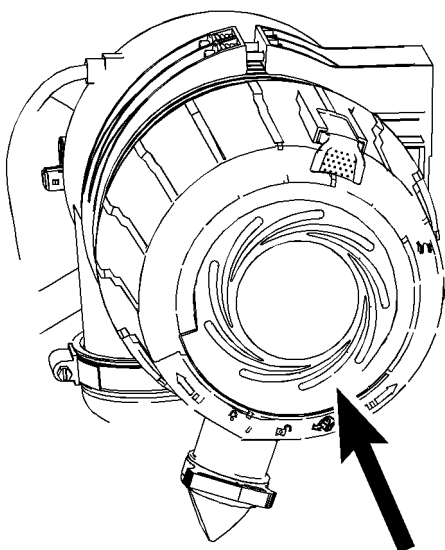


Illustration 129

g01433098

12. Rotate the cover clockwise and latch the cover.

13. Close the engine access door.

i02772835

Engine Compartment - Inspect/Clean

SMCS Code: 1000-040-CPA; 1000-070-CPA

Inspect the engine compartment for dirt buildup or debris. Remove any dirt or debris from the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

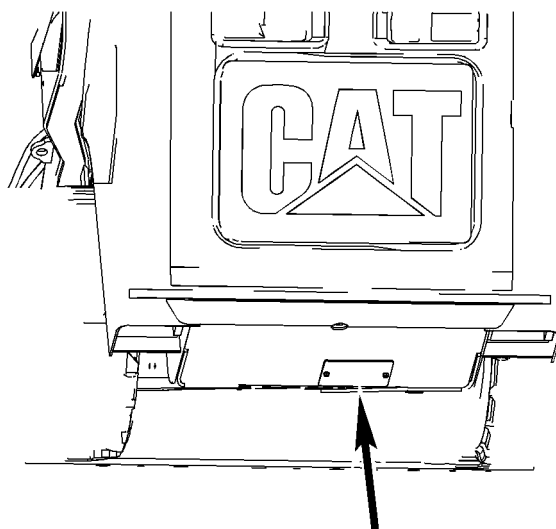


Illustration 130

g01264593

2. Remove any debris or dirt from the engine compartment. If necessary, remove the access panel in order to clean out the engine compartment.

Note: Use care when you clean the engine compartment. Damage to the machine may occur.

3. Close the engine access door.

Air Conditioning Condenser

The air conditioning condenser is located at the back of the engine compartment. Cleaning the air conditioning condenser will maintain optimum performance of the air conditioning system.

Use low pressure water in order to clean the condenser.

i02781044

Engine Oil Level - Check

SMCS Code: 1348-535-FLV

NOTICE

Do not overfill the crankcase. Engine damage can result.

1. Stop the engine and allow the oil to drain back into the oil pan.
2. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

3. Tilt the radiator upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

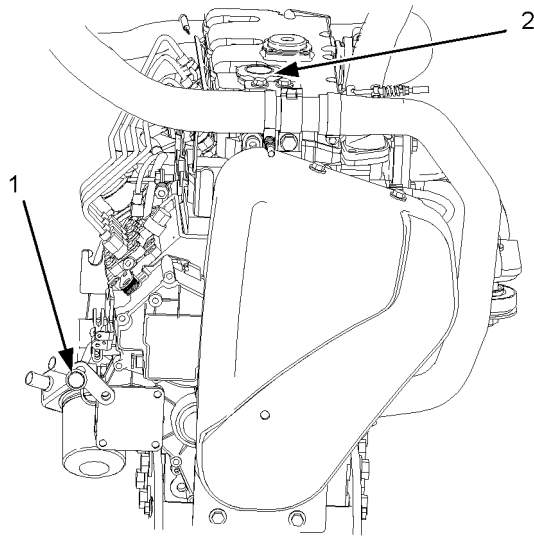


Illustration 131

g01018561

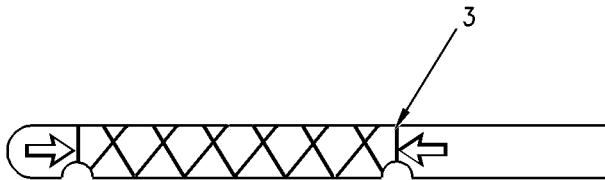


Illustration 132

g00850465

4. Maintain the oil level to the "FULL" mark (3) on the dipstick (1).
5. If necessary, remove the oil filler cap (2) and add oil.
6. Clean the oil filler cap and install the oil filler cap.
7. Tilt the radiator downward.
8. Close the engine access door.

i03880121

Engine Oil and Filter - Change

SMCS Code: 1308-510; 1348-044

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.

The normal oil change interval for the machine is Every 500 Service Hours or every year when the following conditions are met:

- Use an engine oil in the Operation and Maintenance Manual, "Lubricant Viscosities".
- Caterpillar filters are used.
- The altitude does not exceed 2300 m (7545 ft).
- Sulfur content in the fuel is between 0.05% and 0.50%.

An oil change interval of Every 250 Service Hours or every six months is required when the following conditions occur:

- Use an engine oil in the Operation and Maintenance Manual, "Lubricant Viscosities".
- The altitude exceeds 2300 m (7545 ft).
- Sulfur content in the fuel is between 0.50% and 1.00%.

An oil change interval of Every 125 Service Hours is required when the following condition occurs:

- Sulfur content in the fuel is above 1.00%.

Refer to the results of the S-O-S oil analysis in order to determine if the oil change interval should be decreased. Consult your Caterpillar Dealer for detailed information regarding the optimum oil change interval.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

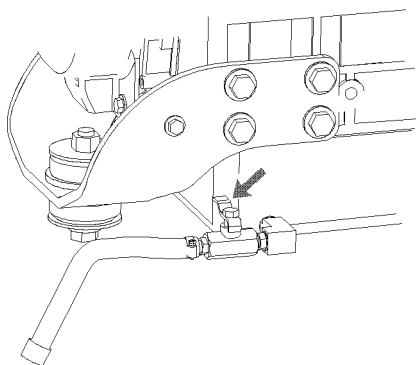


Illustration 133

g01022394

Note: The crankcase drain is located on the right side of the oil pan.

3. Pull the drain hose for the crankcase through the opening in the rear of the machine and remove the plug in the end of the drain hose. Open the crankcase drain valve and drain the oil into a suitable container. Close the crankcase drain valve. Install the plug in the drain hose.

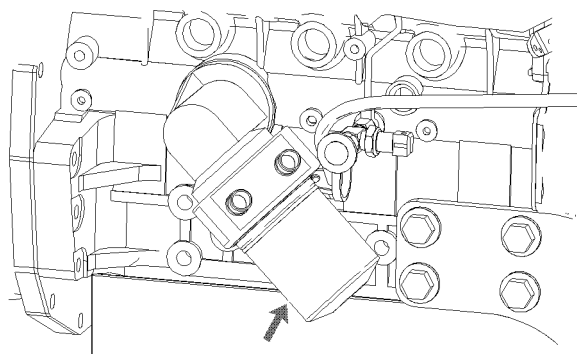


Illustration 134

g01022354

4. Remove the filter element with a 187-2718 Filter Wrench. Refer to Operation and Maintenance Manual, "Oil Filter - Inspect" in order to inspect the used filter for debris.
5. Apply a thin film of clean engine oil to the sealing surface of the new filter element.
6. 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.

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

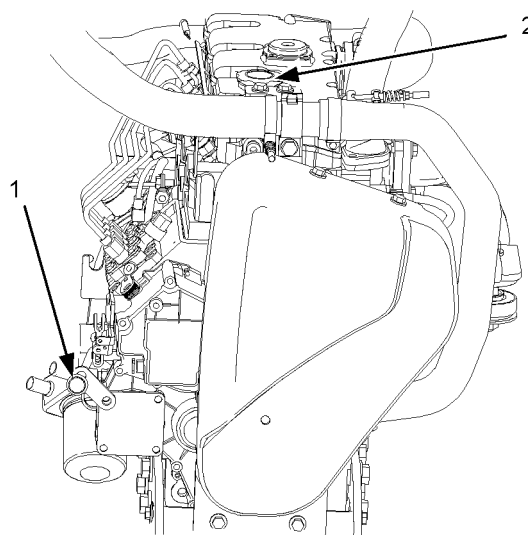


Illustration 135

g01018561

8. Remove the oil filler cap(2). Fill the crankcase with new oil. See Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Refill Capacities". Clean the oil filler plug and install the oil filler plug.
9. Start the engine and allow the oil to warm. Check for leaks.

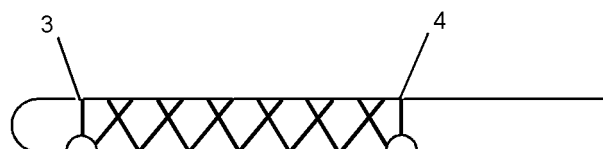


Illustration 136

g02126167

10. Stop the engine and allow the oil to drain back into the oil pan. Fill the crankcase to the "FULL" mark (4) on the oil level gauge (1). **Do not exceed the "FULL" mark on the dipstick.** Add oil or drain oil if it is necessary.

11. Tilt the radiator downward.

12. Close the engine access door.

i01020861

Engine Valve Lash - Check

SMCS Code: 1105-025

Refer to the Service Manual for the complete adjustment procedure for the engine valve lash.

A qualified mechanic should adjust the engine valve lash and the fuel injector timing because special tools and training are required.

i02793624

Equipment Lowering Control Valve - Check

SMCS Code: 5147-MA

WARNING

Personal injury or death can result from a work tool falling.

Keep personnel away from the front of the machine when lowering the work tool.

Before lowering any equipment, clear the area around the equipment of all personnel.

1. Lower arms to the fully lowered position. Turn the keyswitch to the OFF position.

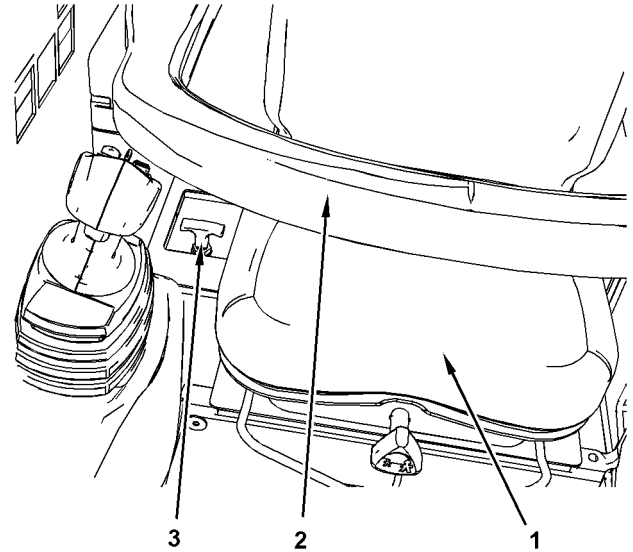


Illustration 137

g01272578

The bypass valve handle is located next to the operator seat on the right side.

- (1) Seat
- (2) Armrest
- (3) Bypass valve handle

2. Pull up on the red handle in order to fully actuate the valve.
3. Push the red handle to the original position. Ensure that the handle is fully seated.

i02939717

Final Drive Oil - Change

SMCS Code: 4050-044-OC

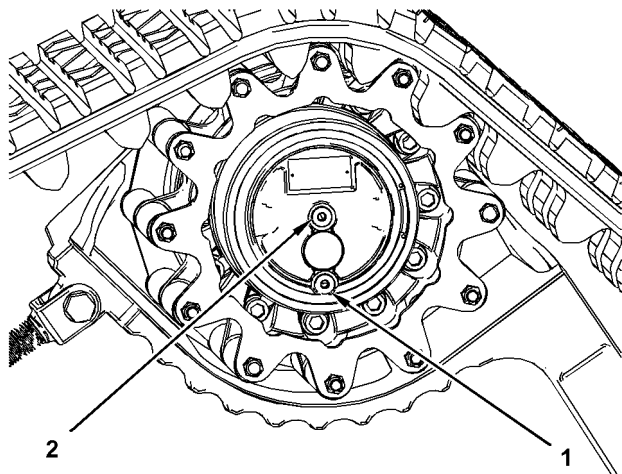


Illustration 138

g01291697

- (1) Oil fill/drain plug
(2) Oil check plug

1. Position one final drive so that the oil fill/drain plug (1) is at the bottom.

Note: Refer to Operation and Maintenance Manual, "General Hazard Information" for information on containing fluid spillage.

2. Use an 8 mm (5/16 inch) allen wrench. Remove the oil plugs (1) and (2). Allow the oil to drain into a suitable container.
3. Check the drained oil for metal chips or for particles. If there are any chips or particles, consult your Caterpillar dealer.

Note: Dispose of drained fluids according to local regulations.

4. Clean the plugs and inspect the plugs. Replace a worn plug or a damaged plug.
5. Position the final drive so that the oil fill/drain plug (1) is at the top.
6. Add oil through the opening for the oil fill/drain plug (1) that is now at the top.

7. Fill the final drive to the bottom of the opening for the oil plug (2). Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)".
8. Install the oil plugs. Tighten the oil plugs to a torque of 27 ± 1 N·m (20 ± 0.7 lb ft).
9. Perform Step 1 to Step 8 on the other final drive.
10. Completely remove any oil that has spilled.
11. Start the engine and allow the final drives to operate through several cycles.
12. Stop the engine.
13. Check the oil level.
14. Maintain the oil level to the bottom of the opening for the oil check plug (2).

i02939714

Final Drive Oil Level - Check

SMCS Code: 4050-535-FLV

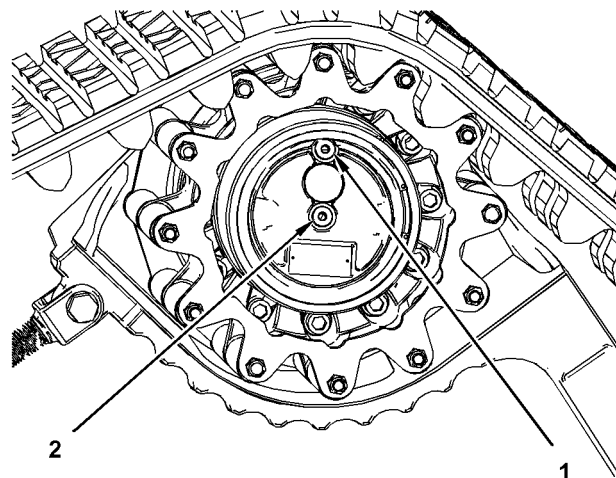


Illustration 139

g01457026

- (1) Oil fill/drain plug
(2) Oil check plug

1. Position one final drive so that the oil fill/drain plug (1) is at the top.

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

2. Use an 8 mm (5/16 inch) allen wrench. Remove the oil check plug (2).
3. Check the oil level. The oil should be near the bottom of the opening for the oil check plug (2).
4. Add oil through the opening for the oil fill/drain plug (1), if necessary.

Note: Overfilling the final drive will cause the seals on the travel motor to allow hydraulic oil or water to enter the final drive. This may contaminate the final drive.

5. Clean the oil plugs.
6. Install the oil plugs. Tighten the oil plugs to a torque of $27 \pm 1 \text{ N}\cdot\text{m}$ ($20 \pm 0.7 \text{ lb ft}$).
7. Repeat the procedure for the other final drive.

i00916186

Fuel Injection Timing - Check

SMCS Code: 1251-531

Note: The correct fuel timing specification is found on the Engine Information Plate. Fuel timing specifications may vary for different engine applications and/or for different power ratings.

A qualified mechanic should adjust the fuel injection timing because special tools and training are required.

Refer to the Service Manual for the complete adjustment procedure for the fuel injection timing. Refer to your Caterpillar dealer for the complete adjustment procedure for the fuel injection timing.

i02868096

Fuel System Filter (In-Line) - Replace

SMCS Code: 1261-510

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.

Note: Replace the fuel filter before the scheduled interval if any of the following occur:

- The filter screen is more than half obstructed.
 - Engine performance is poor.
1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

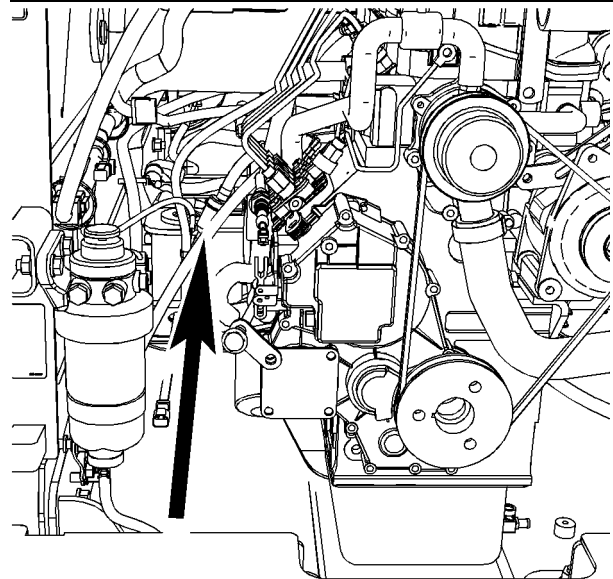


Illustration 140

g01428665

2. Loosen hose clamps.
3. Remove the fuel filter and discard the fuel filter.

4. Replace the fuel filter. Ensure that the arrow on the filter points upward.
5. Tighten hose clamps.
6. Start the engine.
7. Check for leaks.
8. Close the engine access door.

i02781090

Fuel System Primary Filter (Water Separator) - Drain

SMCS Code: 1263-543

NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

The fuel system water separator is located in the left side of the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

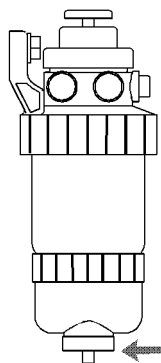


Illustration 141

g01023095

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

3. Tighten the drain valve by hand. Do not tighten the drain valve with a tool. Damage to the valve or to the seals may occur.
4. Close the engine access door.

i02867255

Fuel System Primary Filter (Water Separator) Element - Replace

SMCS Code: 1260-510-FQ; 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.

Note: This unit has a dual purpose. The element serves as a water separator and a fuel filter.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

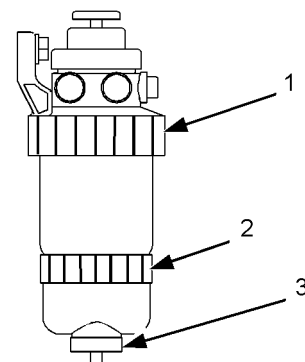


Illustration 142

g01017292

Fuel Filter/Water Separator that is located on the left side of the engine compartment

2. Open the drain on the fuel filter/water separator (3). Allow the water and fuel to drain into a suitable container.

3. Close the drain valve by hand. Do not tighten the drain valve with a tool. Damage to the valve or to the seals may occur.
4. Support the fuel filter/water separator and rotate the locking ring (1) counterclockwise. Remove the fuel filter/water separator.
5. Rotate the locking ring (2) counterclockwise. Remove the bowl assembly.
6. Clean the mounting base for the fuel filter/water separator.
7. Clean the bowl assembly for the fuel/water separator.
8. Install the bowl assembly onto the new fuel/water separator and rotate the locking ring clockwise.
9. Install the new fuel filter/water separator onto the mounting base. Rotate the locking ring clockwise in order to fasten the fuel filter/water separator to the mounting base.
10. Prime the fuel system in order to fill the fuel filter/water separator with fuel. Refer to Operation and Maintenance Manual, "Fuel System Priming Pump - Operate".
11. Close the engine access door.

i02781099

Fuel System Priming Pump - Operate

SMCS Code: 1258-548

The fuel priming pump is located on top of the fuel filter/water separator.

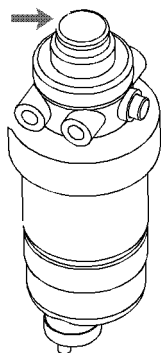


Illustration 143

g01019689

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

2. Push down on the top of the fuel priming pump plunger and release the fuel priming pump plunger in order to operate the fuel priming pump. Operate the fuel priming pump plunger in order to fill the new filter element with fuel. Continue to pump until increased resistance is felt. This resistance will indicate that the filter element is full of fuel.
3. Attempt to start the engine. If the engine starts and the engine runs rough or the engine misfires, operate the engine at low idle until the engine runs smoothly. If the engine fails to start or if the engine continues to misfire or smoke repeat the priming procedure.
4. Close the engine access door.

i01819309

Fuel Tank Cap - Clean

SMCS Code: 1273-070-Z2

1. Remove the fuel cap.

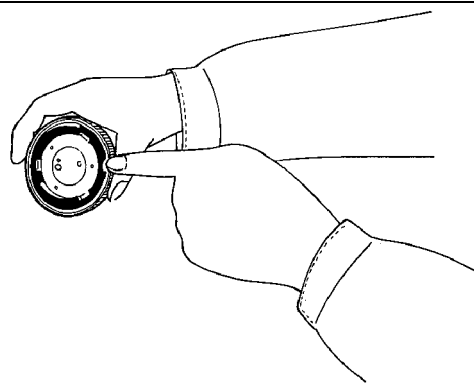


Illustration 144

g00104238

2. Inspect the cap. Replace the cap if the cap is damaged.
3. Wash the fuel cap in a clean, nonflammable solvent and dry the fuel cap.
4. Put a light coating of fuel on the cap gasket.
5. Install the fuel cap.

i01989211

Fuel Tank Water and Sediment - Drain

SMCS Code: 1273-543-M&S

Note: Drain the water and the sediment from the fuel tank when the tank is almost empty.

i01962605

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

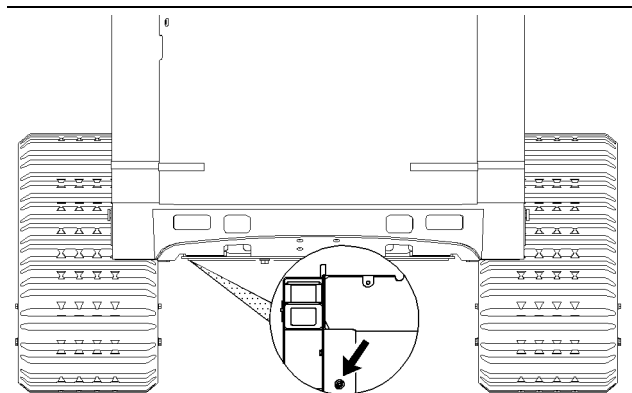


Illustration 145

g00928025

location of the drain plug for the 247 and the 257

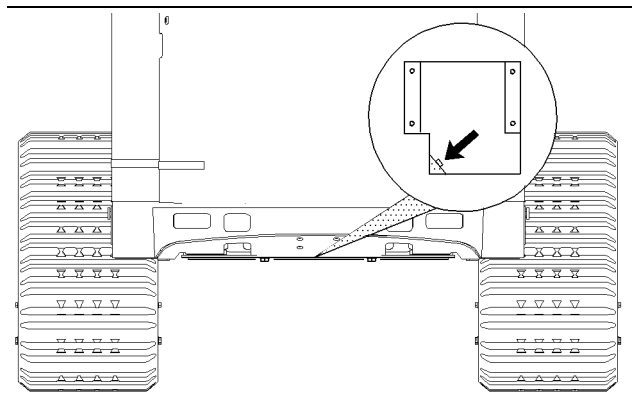


Illustration 146

g00928088

location of the drain plug for the 287

2. The fuel tank drain plug for the 287 machine is located on the side of the tank. Remove the access panel in the bottom of the machine in order to access the drain plug. Loosen the drain plug. The fuel tank drain plug for the 247 and 257 machines is located underneath the machine at the left rear corner. Loosen the plug.

3. Allow the water and the sediment to drain into a suitable container.

4. Install the fuel tank drain plug.

Note: Apply 5P-3413 Pipe Sealant to the threads on the drain plug.

5. Install the fuel tank cap.

Hydraulic System Oil - Change

SMCS Code: 5095-044

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.

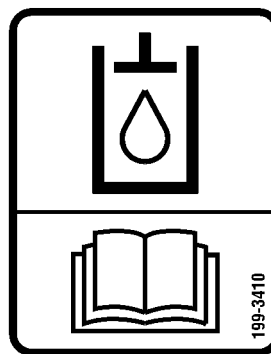


Illustration 147

g00956818

Note: This film is located near the hydraulic filler cap on machines that are filled with synthetic oil.

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

WARNING

Personal injury or death can result without releasing all of the hydraulic pressure.

Release all the pressure from the hydraulic system before any lines are disconnected.

The machine should be on level ground. Lower the bucket to the ground and apply slight downward pressure. Engage the parking brake and stop the engine. Keep the armrest lowered. Turn the engine start switch key to the ON position. Push the parking brake switch. Move all of the hydraulic control levers while you press several times on each side of the auxiliary hydraulic control (if equipped) in order to relieve hydraulic pressure. Move the engine start switch key to the OFF position.

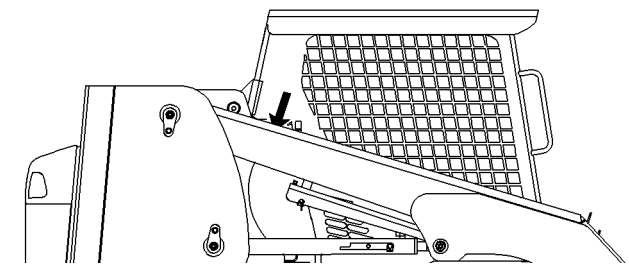


Illustration 148

g00926534

1. Remove the hydraulic tank filler cap.

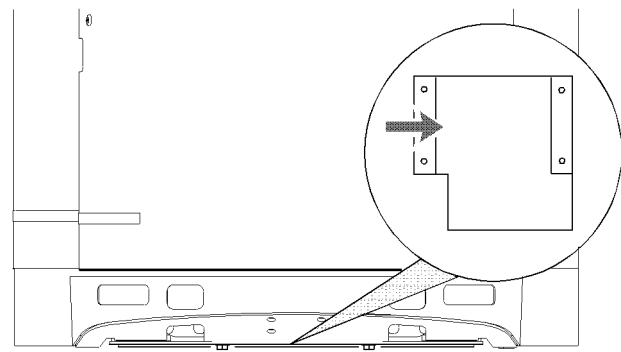


Illustration 149

g01021146

2. Remove the access panel in the belly guard underneath the machine.

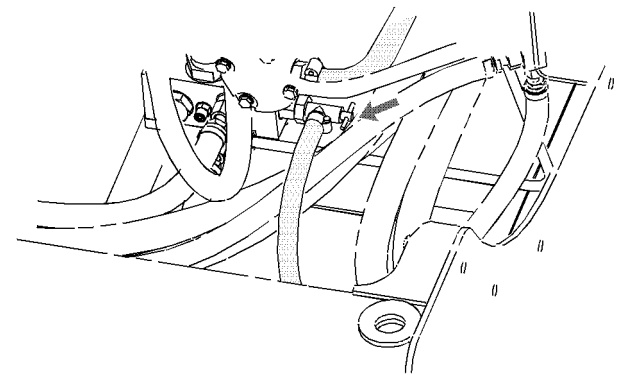


Illustration 150

g01030411

3. Remove the plug from the end of the drain hose. Pull the drain hose through the access panel in the belly guard. Open the drain valve and drain the oil into a suitable container.
4. Close the drain valve and pull the drain hose back into the machine. Install the drain plug into the drain hose.
5. Change the hydraulic system filter. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Filter - Change".
6. Fill the hydraulic system oil tank. Refer to Operation and Maintenance Manual, "Lubricant Viscosities" and Operation and Maintenance Manual, "Capacities (Refill)".
7. Maintain the hydraulic oil level approximately in the middle of the sight gauge.

Check the oil level with the loader arms in the fully lowered position.

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

8. Install the hydraulic tank filler cap.

i03880895

Hydraulic System Oil Filter - Replace

SMCS Code: 5068-510

NOTICE

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

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

Dispose of all fluids according to local regulations and mandates.

The hydraulic oil filter is located in the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".

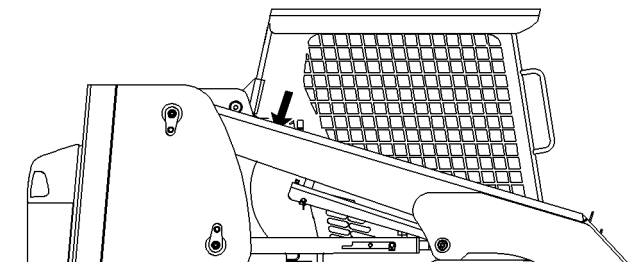


Illustration 151

g00926534

2. Remove the hydraulic tank filler cap.

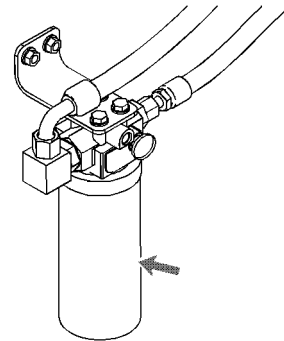


Illustration 152

g01017252

3. Remove the filter with a strap type wrench.

Note: Place a suitable nonconductive container under the hydraulic oil filter. Use this container in order to catch any oil that may spill from the filter or the filter element mounting base.

4. Clean the filter element mounting base. Remove any part of the filter element gasket that remains on the filter element mounting base.
5. Apply a light coat of oil to the gasket of the new filter element gasket.
6. Install a new filter hand tight until the seal of the filter contacts the base. Note the position of the index marks on the filter in relation to a fixed point on the filter base.

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

7. Tighten the filter according to the instructions that are printed on the filter. Use the index marks as a guide.

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. Maintain the hydraulic oil level to the middle of the sight gauge. Refer to Operation and Maintenance Manual, "Hydraulic System Oil Level - Check". **Do not overfill the hydraulic tank.**
9. Inspect the gasket on the hydraulic tank filler cap for damage. Replace the hydraulic tank filler cap, if necessary. Install the hydraulic tank filler cap.
10. Close the engine access door.

i01957050

Hydraulic System Oil Level - Check

SMCS Code: 5095-535-FLV

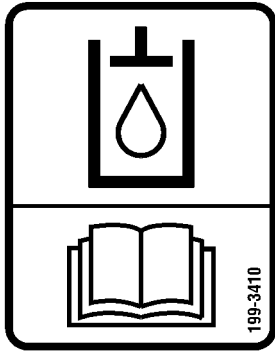


Illustration 153

g00956818

Note: This film is located near the hydraulic filler cap on machines that are filled with synthetic oil.

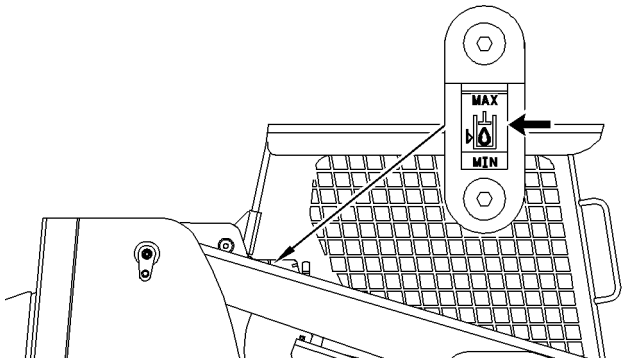


Illustration 154

g00926177

1. Park the machine on level ground.
2. Lower the work tool to the ground. Turn off the engine.
3. Wait for about five minutes before checking the level of the hydraulic oil.
4. Maintain the oil level to the middle of the sight gauge. **Do not overfill the hydraulic tank.**

i02920120

Hydraulic System Oil Sample - Obtain

SMCS Code: 5050-008; 7542-008

Open the rear access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers" for information about the rear door.

Raise the radiator. Refer to Operation and Maintenance Manual, "Radiator Tilting" for information about the radiator.

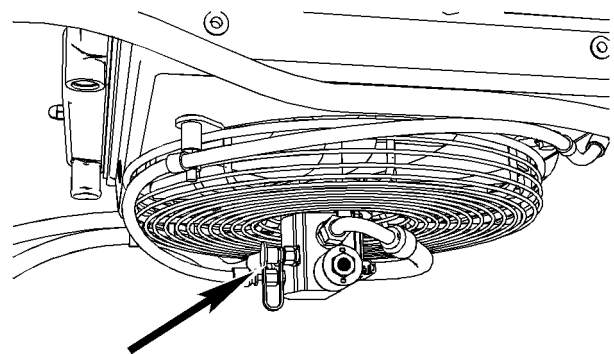


Illustration 155

g01280271

The sampling port for the hydraulic oil is located on the fan motor.

i01957078

Lift Arm and Cylinder Linkage - Lubricate

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

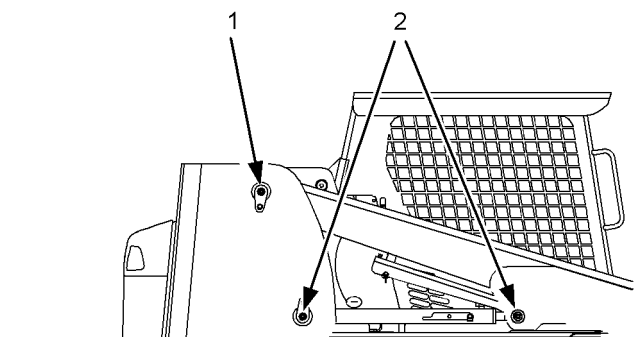


Illustration 156

g01017352

Radial Lift

i02106227

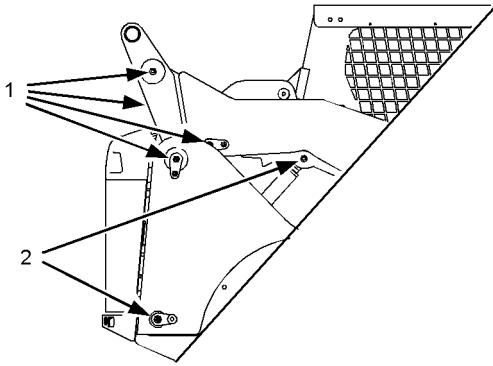


Illustration 157

g01017361

Extended Reach

Apply lubricant to the grease fittings (1) for the lift arm linkage.

Apply lubricant to the grease fittings (2) for the lift cylinder bearings.

Repeat the process for the opposite side of the machine.

i01963869

Lower Machine Frame - Clean

SMCS Code: 7050-070

1. Tilt the cab upward. Refer to Operation and Maintenance Manual, "Cab Tilting".

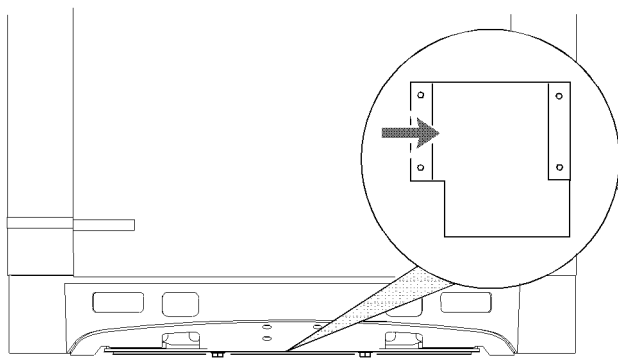


Illustration 158

g01020241

2. Remove the access panel in the frame that is located underneath the machine.
3. Remove any debris or dirt from the inside of the frame.
4. Reinstall the access panel and tilt the cab downward.

Oil Filter - Inspect

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

Inspect a Used Filter for Debris

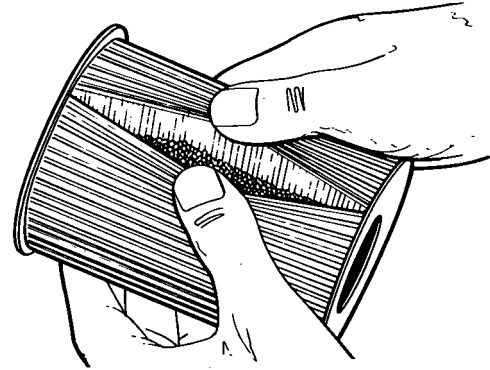


Illustration 159

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.

i02634143

Quick Coupler - Clean/Inspect

SMCS Code: 6129-040; 6129-070

WARNING

Personal injury or death can result from improperly checking for a leak.

Always use a board or cardboard when checking for a leak. Escaping air or fluid under pressure, even a pin-hole size leak, can penetrate body tissue causing serious injury, and possible death.

If fluid is injected into your skin, it must be treated immediately by a doctor familiar with this type of injury.

Note: Do not weld on the quick coupler without consulting your Caterpillar dealer.

1. Clean the quick coupler prior to inspection in order to properly inspect the quick coupler.

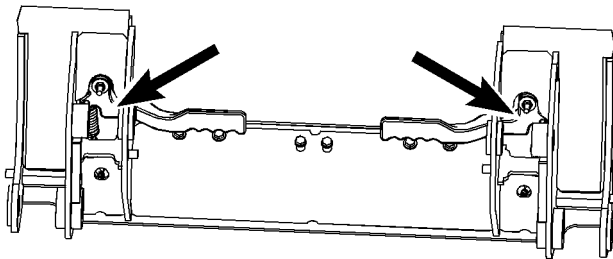


Illustration 160

g01322438

This is the back side of the quick coupler. The lift arm and the tilt cylinder are removed for clarity.

2. Tilt the quick coupler all the way forward in order to clean the debris away from the pins.
3. Move the quick coupler levers. Ensure that the levers are not bent or broken.
4. Make sure that the coupler pins extend through the bottom of the quick coupler assembly. Check the pins for wear and check the pins for damage.
5. Check the top edges of the quick coupler assembly for wear or for damage. Check the face of the quick coupler assembly for wear or for damage.

6. Inspect the components inside the quick coupler for the following problems: loose bolts, oil leaks, broken parts, missing parts, and cracked components
7. Inspect the hydraulic lines and the hydraulic fittings for damage or for wear. Repair any worn components or replace any worn components. Repair any leaking components.
8. Inspect the steel material of the quick coupler for cracks.

Note: Perform all repairs before placing the quick coupler back into operation.

i01488851

Radiator Core - Clean

SMCS Code: 1353-070-KO

The radiator is located at the rear of the machine above the engine compartment.

1. Open the engine access door. Refer to Operation and Maintenance Manual, "Access Doors and Covers".
2. Tilt the radiator guard upward. Refer to Operation and Maintenance Manual, "Radiator Tilting".

NOTICE

When you are using compressed air or high pressure water to clean the radiator fins, ensure that the air or water is directed parallel to the fins. If the compressed air or high pressure water is not directed parallel to the radiator fins, the radiator fins could be bent or damaged.

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

3. Clean the radiator core.

NOTICE

Do not clean a running fan with high pressure water. Fan blade failure can result.

4. Remove any dirt or debris from the fan, the fan hub, the oil cooler, the radiator guard and the fan guard.

Note: Dirt or debris on the cooling fan can cause an imbalance.

5. Tilt the radiator guard downward.

6. Close the engine access door.

i01968724

Refrigerant Dryer - Replace (If Equipped)

SMCS Code: 7322-510

WARNING

Personal injury can result from contact with refrigerant.

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

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

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

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

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

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

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

NOTICE

If the refrigerant system has been open to the outside air (without being plugged) for more than 30 minutes, the receiver-dryer must be replaced. Moisture will enter an open refrigerant system and cause corrosion which will lead to component failure.

Refer to Service Manual, SENR5664, "Air Conditioning and Heating R-134a For All Caterpillar Machines" for the proper procedure to change the receiver-dryer assembly and for the procedure to reclaim the refrigerant gas.

Note: The receiver-dryer must also be replaced when the air conditioning system is evacuated.

i02798931

Rollover Protective Structure (ROPS) and Falling Object Protective Structure (FOPS) - Inspect

SMCS Code: 7323-040; 7325-040

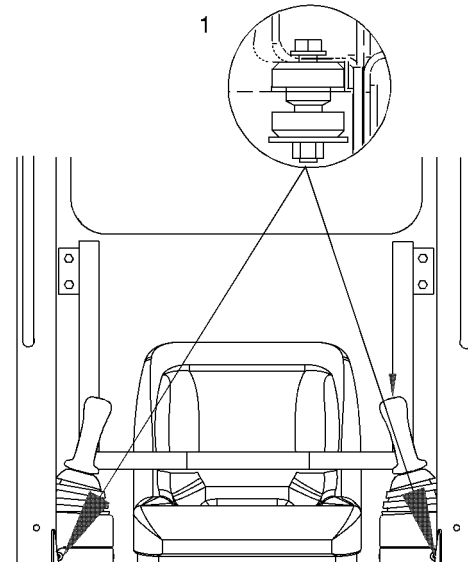


Illustration 161

g01022156

(1) Front ROPS retaining bolt (one bolt per side)

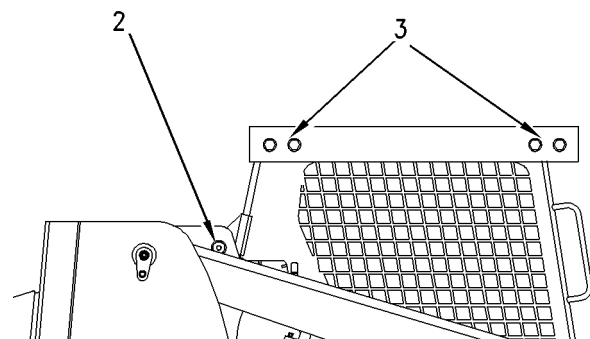


Illustration 162

g00925477

(2) Rear ROPS retaining bolt (one bolt per side)
(3) Retaining bolts for the FOPS 2

Note: There is a total of four retaining bolts for the ROPS. There is a total of eight retaining bolts for the FOPS 2.

- i02429589

g00932801

i02429594

q01152685

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

i03890329

Sprocket - Inspect

SMCS Code: 4164-040

Note: Operating the machine in conditions that are muddy or sandy will cause accelerated wear on the sprocket and other undercarriage components. It is important to clean the undercarriage of the machine daily in order to maximize component life. Sleeves that do not meet the minimum thickness or sleeves that do not turn freely may cause unnecessary wear on the drive lugs on the rubber track.

Remove the Sprocket

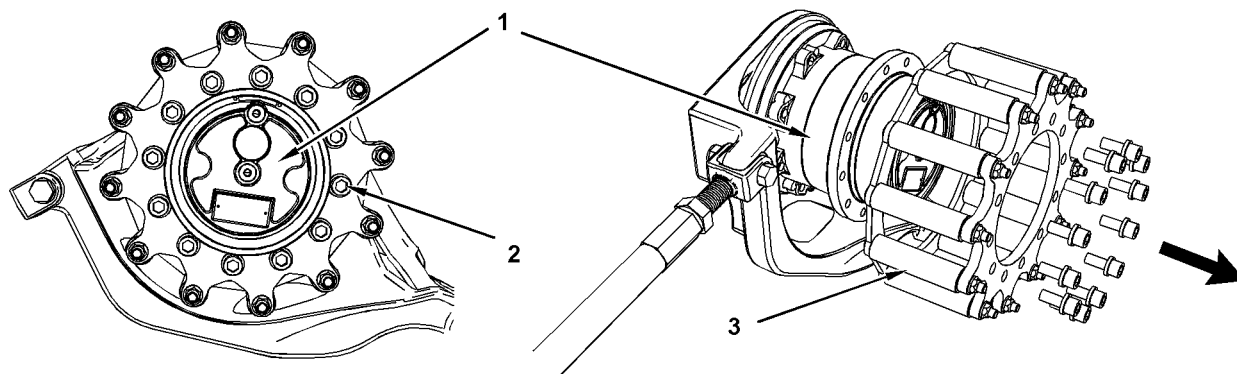


Illustration 165

g01394413

(1) Drive motor

(2) Bolts and washers

(3) Sprocket assembly

Note: In order to service the sprocket, the tracks must be loosened. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust" for the procedure.

1. Remove the 12 bolts and the 12 washers that hold the sprocket assembly to the drive motor.
2. Slide the sprocket assembly off the drive motor.

Sleeves and Rings

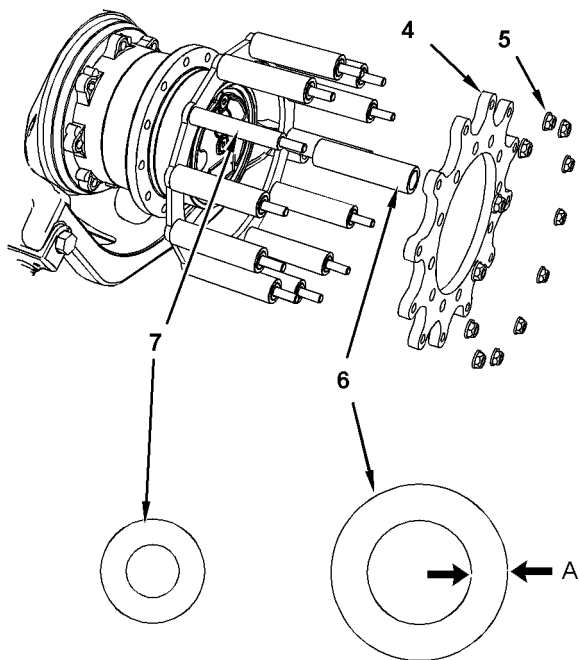


Illustration 166

g01394415

- (4) Sprocket mounting ring
- (5) Washers and Locknuts
- (6) Outer sleeve
- (7) Inner sleeve

The sprocket is equipped with two types of sleeves.

- Inner Sleeves (6)
- Outer sleeves (5)

The outer sleeves are free to rotate on the inner sleeves. The sleeves are held in position by the sprocket mounting ring.

Note: There are many parts in the sprocket assembly. Remove the sprocket completely from the machine in order to work on the sprocket. Use a clean, flat surface in order to disassemble the sprocket and assemble the sprocket.

1. Remove the 12 locknuts and washers that hold the sprocket mounting ring in place.
2. Remove the ring.
3. Remove the outer sleeves and the inner sleeves.

4. Measure thickness (A) for the outer sleeves. If the thickness of the outer sleeves measures less than 3 mm (0.12 inch), replace the sleeves. Sleeves that do not meet the minimum thickness or sleeves that do not turn freely may cause unnecessary wear on the drive lugs on the rubber track.
5. When you replace the outer sleeves, rotate the inner sleeves for 180°. If the inner sleeves have already been rotated, replace the inner sleeves.
6. Repeat steps 2 through 5 for each set of sleeves.
7. The sprocket mounting rings of the drive sprocket will wear from the rotation of the outer sleeves. Measure the thickness of the inner rings and outer rings. If the thickness of the inner ring or outer ring measures less than 4.75 mm (0.19 inch), replace the ring.
8. Install the sleeves and the rings.
9. Install the new locknuts. **Do not reuse the locknuts.** Tighten the locknuts to a torque of $70 \pm 5 \text{ N}\cdot\text{m}$ ($51.6 \pm 3.7 \text{ lb ft}$) in a star pattern. Turn the nuts an additional 120 degrees ± 5 degrees in the same star pattern.
10. Install the sprocket on the drive motor. Tighten the bolts to a torque of $270 \pm 40 \text{ N}\cdot\text{m}$ ($199 \pm 30 \text{ lb ft}$).

Track

Tighten the track to the proper tension. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust" for the procedure.

i02790866

Sprocket Sleeve - Inspect

SMCS Code: 4164-040-ZV

Note: Operating the machine in conditions that are muddy or sandy will cause accelerated wear on the sprocket and other undercarriage components. It is important to clean the undercarriage of the machine daily in order to maximize component life. Sleeves that do not meet the minimum thickness or sleeves that do not turn freely may cause unnecessary wear on the drive lugs on the rubber track.

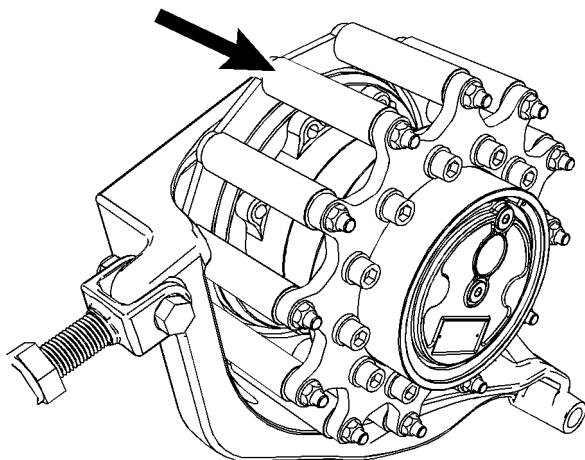


Illustration 167

g01394383

Check the outer sleeves in order to ensure that the sleeves rotate freely. If the sleeves do not rotate freely, refer to Operation and Maintenance Manual, "Sprocket - Inspect" for information about the inspection of the sprocket assembly.

i01878236

Tilt Cylinder Bearings and Bucket Linkage Bearings - Lubricate

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

Wipe all of the grease fittings before you apply lubricant.

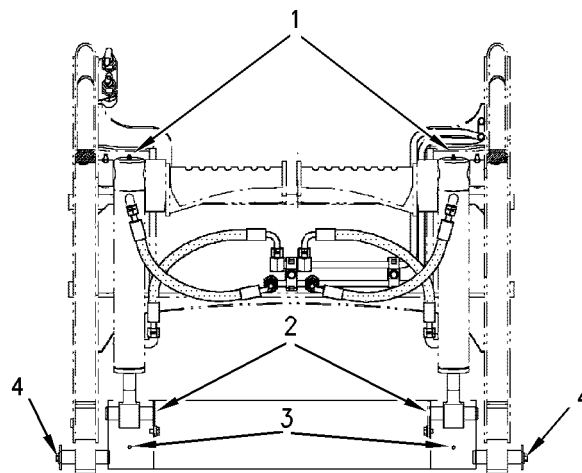


Illustration 168

g00955895

Note: Lubricate the fittings with the loader lift arms in the fully lowered position.

Apply lubricant to the grease fittings (1) for the upper bearings for the tilt cylinders.

Apply lubricant to the grease fittings (2) for the lower bearings for the tilt cylinders.

Apply lubricant to the grease fittings (3) for the coupler engagement pins.

Apply lubricant to the grease fitting (4) for the pivot pin of the quick coupler assembly.

There are a total of 8 grease fittings.

i02970641

Track (Rubber) - Inspect/Adjust

SMCS Code: 4197; 4198-025; 4198-040

Periodic adjustment of the track tension is necessary in order to avoid damage to the tracks. Maintaining the tracks at the proper tension will maximize the service life of the undercarriage components. The undercarriage components include the sleeves of the drive sprocket, the rings of the drive sprocket, the wheels, and the track.

NOTICE

Do not overtighten the tracks. Tracks that are too tight can cause premature failure of the tracks. Tracks that are too tight can cause power loss and bearing failures.

Tracks that are too loose increase the possibility of the track derailing or the drive lugs mis-feeding on the drive sprocket. In aggressive operating conditions, occasional mis-feeding is normal. If consistent mis-feeding is observed, ensure that the track tension is set to the recommended specification. If the track tension is set to the recommended specification and mis-feeding is still observed, then your application may require a tighter track tension. Increase the track tension until consistent mis-feeding is no longer observed.

The intervals for track tension vary depending on the following conditions: the machine application, the operator, the soil conditions, the climate, and the condition of the undercarriage components. Operators are responsible for basic visual inspections of the track tension on a daily basis.

Track Adjustment

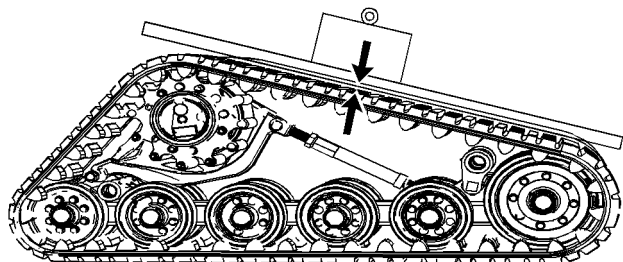


Illustration 169

g01393224

1. Place approximately 45 kg (100 lb) between the drive sprocket and the idlers. Place a straight edge across the drive sprocket and idlers. Measure the track sag between the bottom of the straight edge and the top of the track. **The track sag should be set at 12 mm (0.5 inch).** If the track needs adjustment proceed with the following steps.

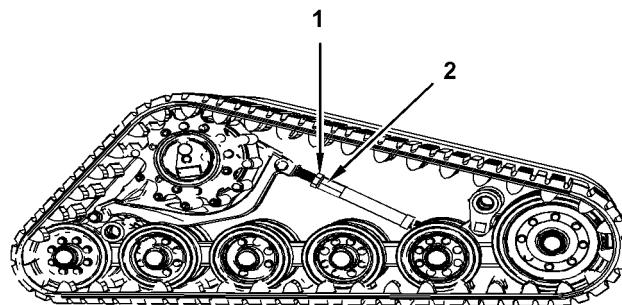


Illustration 170

g01393226

2. Loosen the jam nut (1).
3. Turn the adjuster (2) in order to raise or lower the drive sprocket.
4. Inspect the hoses. Ensure that the hoses are not kinked. If the hoses are kinked, loosen the clamp and move the hoses so that the hoses are not kinked.

Note: In order to detension the track for removal, fully lower the drive sprocket.

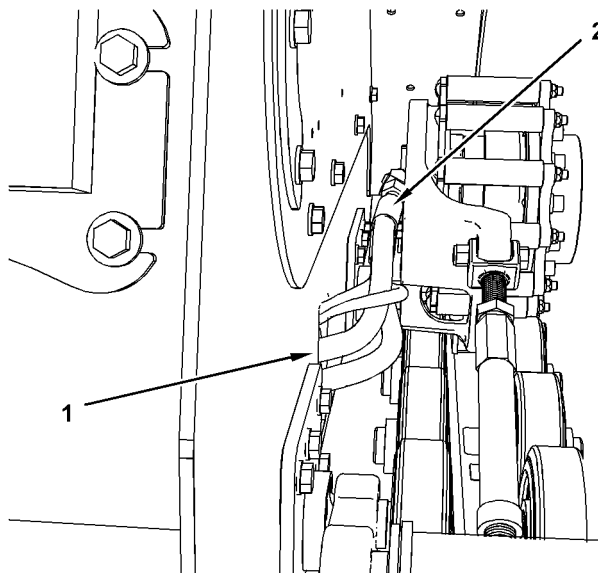


Illustration 171

g01497493

Note that the rubber track is removed for clarity.

- (1) Hoses at the frame
- (2) Fittings on final drive

Note: The hoses should not be under tension. The fittings at the drive motor may leak if there is tension on the hoses.

5. Tighten the jam nut to the following torque
270 ± 40 N·m (199 ± 30 lb ft).

6. Recheck the track tension.
7. Check the hoses. Ensure that there is no tension in the hoses. Ensure that the hoses are not kinked. Tighten the hose clamps at the frame.

Note: Too much slack in the hoses may allow the hoses to contact other components. Not enough slack may strain hose connections at the drive motor.

i03880897

Track (Rubber) - Remove/Replace (MTL)

SMCS Code: 4197; 4198-011; 4198-510

Removing the Track

1. Position the machine on firm, level ground.
2. Remove any work tool that is attached to the quick coupler.
3. Raise the loader arms and install the brace for the loader lift arm. Refer to Operation and Maintenance Manual, "Loader Lift Arm Brace Operation".

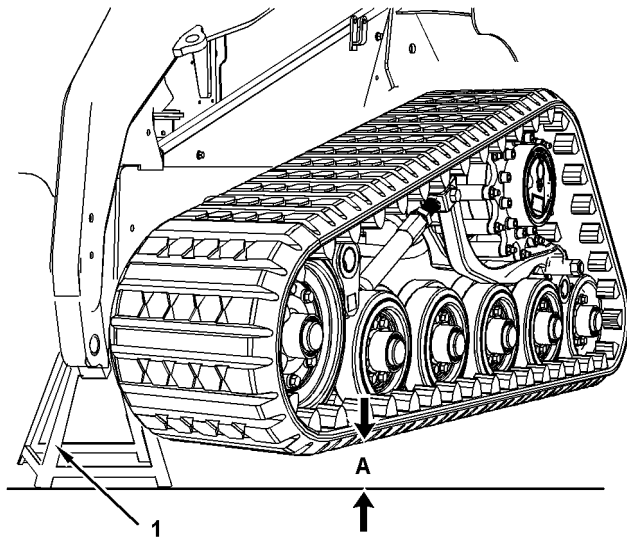


Illustration 172

g01393193

4. Use an appropriate floor jack in order to lift the machine off the ground. Use appropriate jack stands (1) in order to block up the machine. Raise the machine until tracks are approximately 50 mm (2.0 inch) (A) off the ground.

5. Detension the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

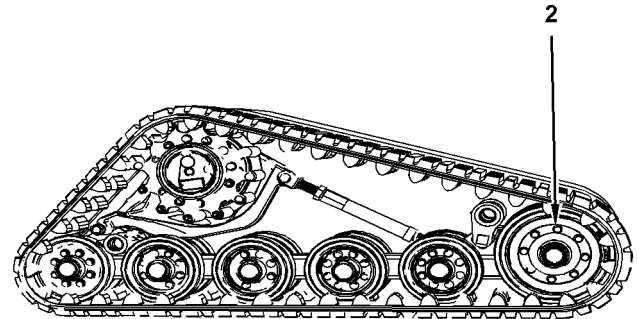


Illustration 173

g01393194

6. Remove the front idler wheel. Refer to Operation and Maintenance Manual, "Bogie and Idler - Inspect/Replace" for the procedure to remove the idler wheels.
7. If necessary, lubricate the remaining front idler wheel and the inside of the track in order to ease the removal of the track.
8. Grasp the track on top of the front idler. Pull the track forward and pull the track away from the frame. Slide the drive lugs past the inside front idler wheels.
9. Lift the track off the drive sprocket and pull the track away from the rear idler wheels.

Installing the Track

1. Slide the track onto the drive sprocket.
2. Position the rear of the track so that the drive lugs are aligned between the rear idler wheels.
3. Pull all of the slack forward and make sure that the drive lugs are properly meshed with the drive sprocket. This will provide the maximum amount of slack to aid with installation across the front idler.
4. Lubricate the idler wheels and the inside of the track in order to ease the installation of the track.
5. Pull the track over the front idler wheel.
6. Install the front idler wheel. Refer to Operation and Maintenance Manual, "Bogie and Idler - Inspect/Replace" for the procedure to install the idler wheel.

7. Tension the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

i03880912

Window Washer Reservoir - Fill (If Equipped)

SMCS Code: 7306-544-KE

NOTICE

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

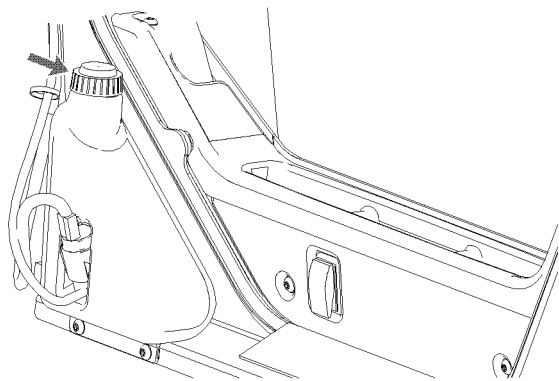


Illustration 174

g01027404

The reservoir for the window washer solvent is located inside the cab on the left side.

Fill the reservoir with window washer solvent.

Note: Window washer solvent with isopropyl alcohol is recommended.

i02810705

Window Wiper - Inspect/Replace (If Equipped)

SMCS Code: 7305-040; 7305-510

Inspect the condition of the front window wiper blade. Replace the window wiper blade if the window wiper blade is worn or damaged. If the window wiper blade streaks the window, replace the window wiper blade.

Windows - Clean

SMCS Code: 7310-070

Use commercially available window cleaning solutions in order to clean the windows. The side windows of the cab can be removed for cleaning. Refer to the following procedure in order to remove the side windows.

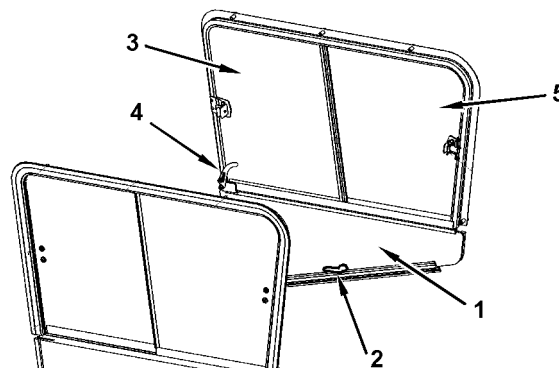


Illustration 175

g01026875

1. Release the latch (2) in order to remove the window (1). Pull downward on the window in order to remove the window. Pull outward on the window in order to remove the window.
2. Release the latch (4) in order to remove the window (3). Pivot the channel for the window downward. Pull the window outward in order to remove the window.
3. Slide the window (5) forward. Pull the window outward in order to remove the window.

Polycarbonate Front Door

Note: Do not wipe the window dry. Do not use paper towels. This may scratch the finish of the polycarbonate windows over time.

For cleaning your polycarbonate top window use a soft cloth, a sponge, or a chamois. Use any of the following cleaners:

- soap and water
 - isopropyl alcohol
 - kerosene
 - denatured alcohol
 - commercially available window cleaning solutions
- Apply the cleaning solution liberally. Wipe the surface.

i02728710

Work Tool - Lubricate

SMCS Code: 6700-086

Multipurpose Bucket

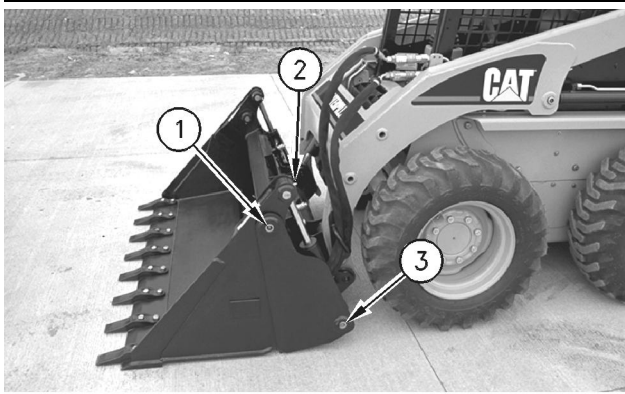


Illustration 176

g00534457

Apply lubricant to the grease fitting (1) for the pivot pin of the apron.

Apply lubricant to the grease fitting (2) for the rod end of the multipurpose bucket cylinder.

Apply lubricant to the grease fitting (3) for the head end of the multipurpose bucket cylinder.

Repeat for the other side of the bucket.

There are six grease fittings.

Utility Grapple Tools

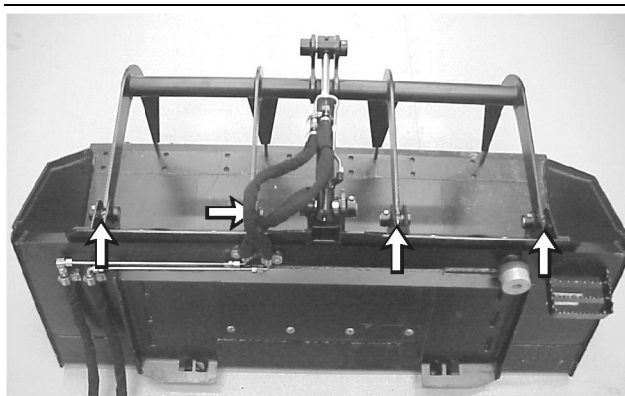


Illustration 177

g00647980

Apply lubricant to the four grease fittings for the grapples.

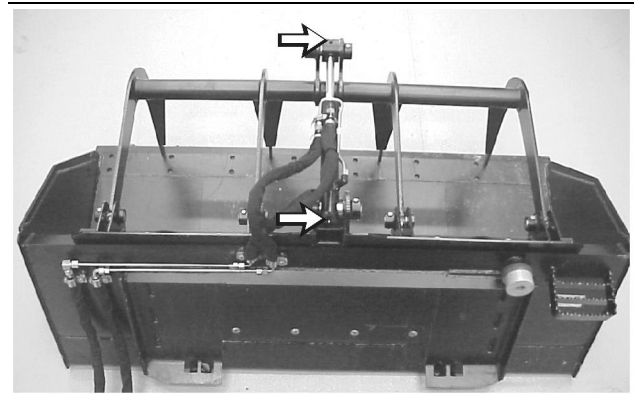


Illustration 178

g00647988

Apply lubricant to the two fittings for the grapple cylinder.

There are six grease fittings.

Industrial Grapple Tools

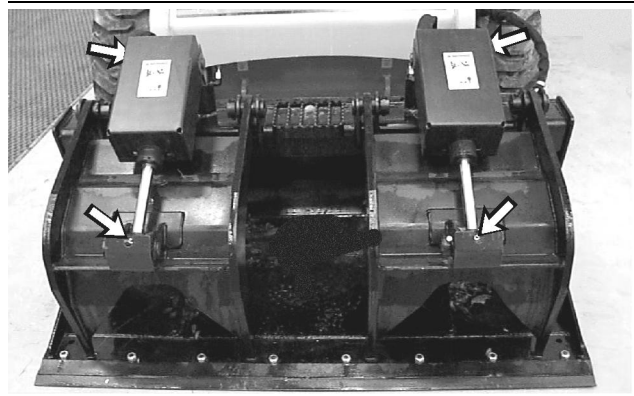


Illustration 179

g00645995

Apply lubricant to the four grease fittings for the fork cylinders.

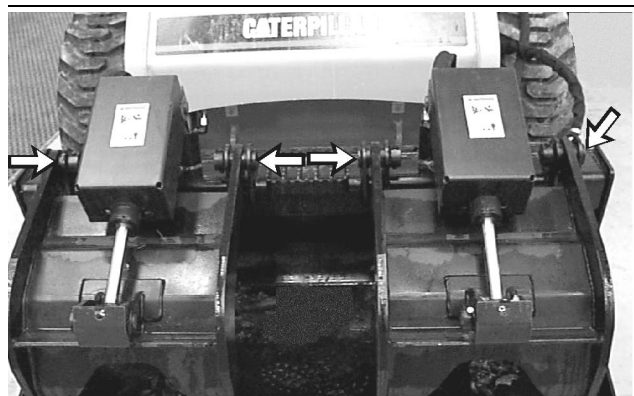


Illustration 180

g00646004

Apply lubricant to the four grease fittings for the two forks.

There are eight grease fittings.

Grapple Rake

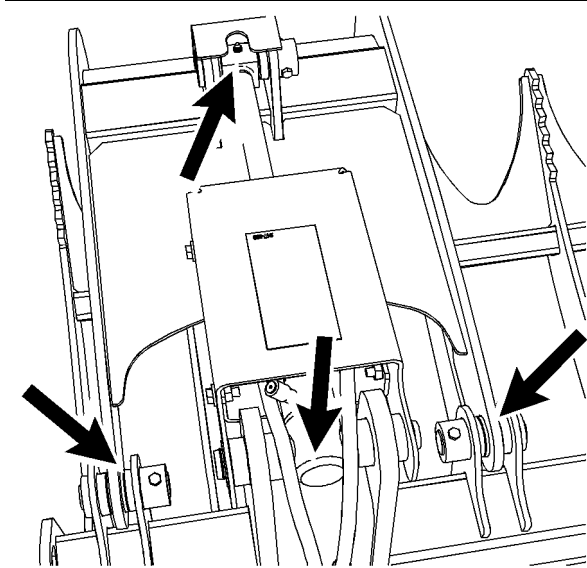


Illustration 181

g01368386

Apply lubricant to the four grease fittings for the grapple cylinders.

Apply lubricant to the four grease fittings for the two grapples.

There are eight grease fittings.

Angle Blade

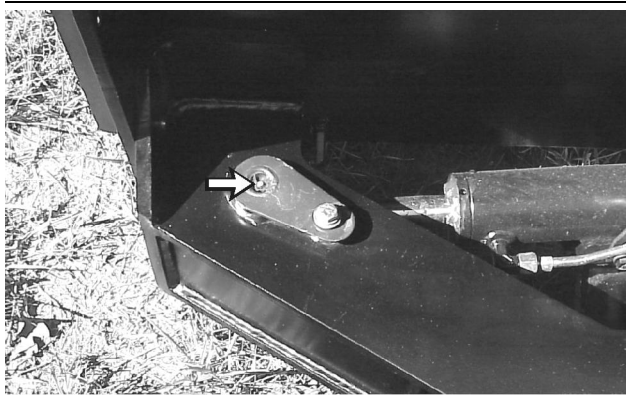


Illustration 182

g00648033

Apply lubricant to the grease fitting on the rod end of the angle cylinder.

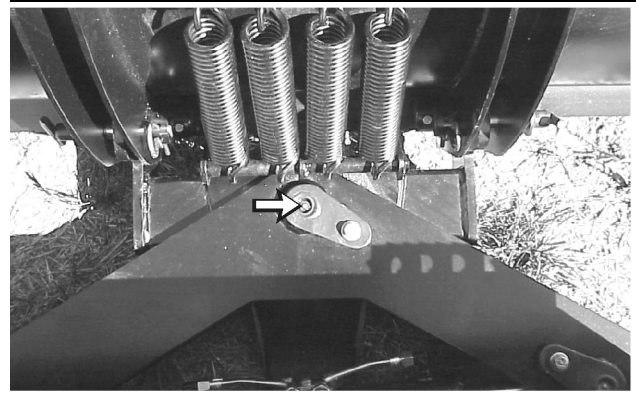


Illustration 183

g00648037

Apply lubricant to the grease fitting on the horizontal pivot point of the blade.

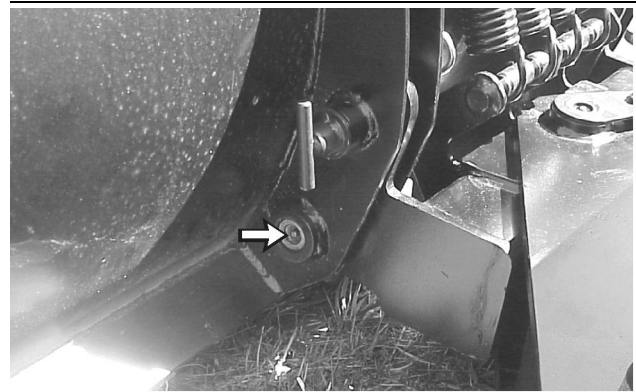


Illustration 184

g00648038

Apply lubricant to the grease fitting on the vertical pivot point of the blade. Repeat for opposite side of the blade.

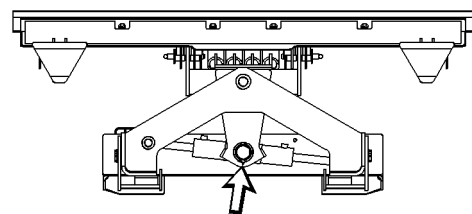


Illustration 185

g00677570

This is a bottom view of the angle blade.

Apply lubricant to the grease fitting on the pivot point of the cylinder.

There are five grease fittings.

Dozer Blade

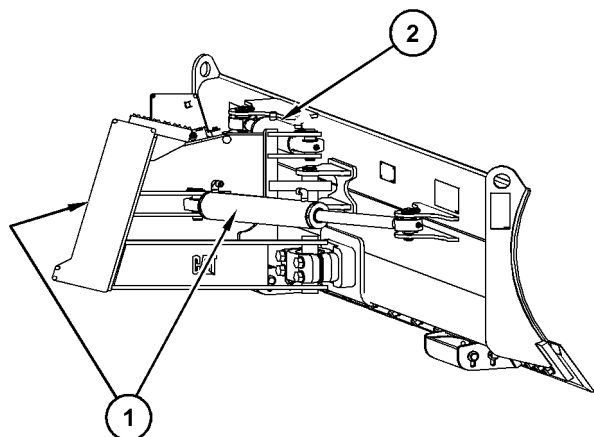


Illustration 186

g01073259

Apply lubricant to the grease fitting on both ends of the right hand angle cylinder (1). Repeat for opposite side of the blade.

Apply lubricant to the grease fitting on the pivot points on each end of the tilt cylinder (2).

There are six grease fittings.

i01809997

Work Tool Mounting Bracket - Inspect

SMCS Code: 6700-040-BK

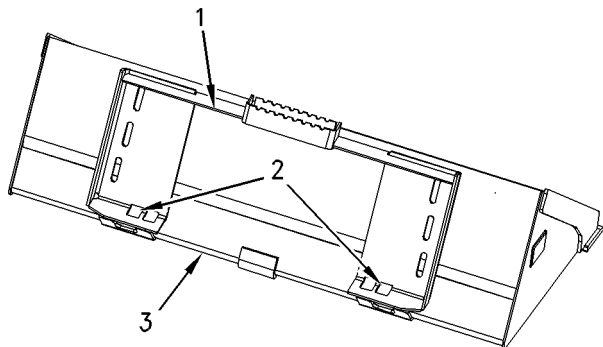


Illustration 187

g00925058

Inspect upper angled plate (1) and ensure that the plate is not bent or otherwise damaged. Inspect holes (2) for wear and for damage. Inspect lower angled plate (3) and ensure that the plate is not bent or otherwise damaged. If any wear is suspected or any damage is suspected, consult your Caterpillar dealer before you use the work tool.