

# SAFETY.CAT.COM™

## MAINTENANCE INTERVALS

Operation and Maintenance  
Manual Excerpt



# Operation and Maintenance Manual

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## **247B, 257B, 267B, 277B and 287B Multi Terrain Loaders**

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MTL1-5074 ( 247B Machine)  
SLK1-7299 ( 257B Machine)  
CYC1-Up ( 267B Machine)  
MDH1-Up ( 277B Machine)  
ZSA1-Up ( 287B Machine)

i02743902

## Maintenance Interval Schedule

**SMCS Code:** 7000

**S/N:** ZSA1-Up

**S/N:** CYC1-Up

**S/N:** MDH1-Up

### When Required

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### Every 250 Service Hours

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### Every 250 Service Hours or Monthly

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### Every 500 Service Hours

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### Every 500 Service Hours or 6 Months

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Sprocket Bearings - Lubricate .....	146

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Fuel Injection Timing - Check .....	134
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Seat Belt - Replace .....	144
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### Every 6000 Service Hours or 3 Years

Cooling System Coolant Extender (ELC) - Add ..	125
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### Every 12 000 Service Hours or 6 Years

Cooling System Coolant (ELC) - Change .....	124
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## Axle Bearings - Lubricate

**SMCS Code:** 3282-086-BD

**S/N:** ZSA1-Up

**S/N:** SLK1-7299

**S/N:** MTL1-5074

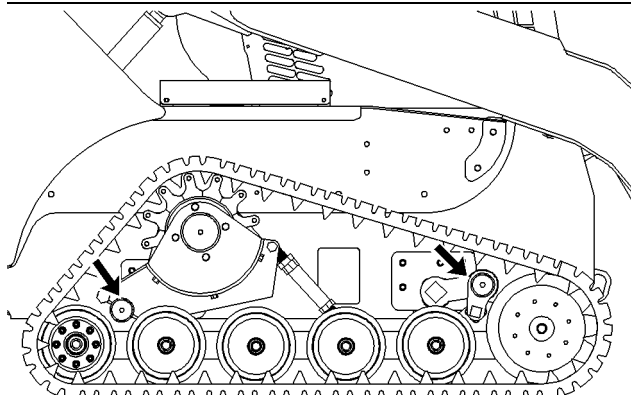


Illustration 101  
247 and 257

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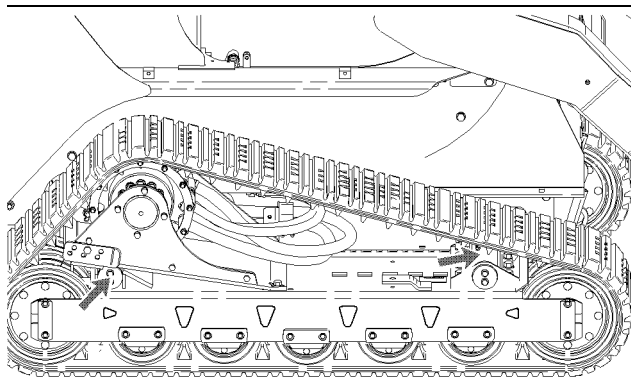


Illustration 102  
287

g01030370

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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## Battery - Recycle

**SMCS Code:** 1401-561

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

i01719520

## 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. Disconnect the negative battery cable from the starter.

**Note:** Do not allow the disconnected battery cable to contact the frame of the machine.

3. Disconnect the negative battery cable at the battery.
4. Perform the necessary repairs. Replace the cable or the battery, as needed.
5. Connect the negative battery cable at the battery.
6. Connect the battery cable to the starter of the machine.

7. Install the engine start switch key.

Repeat the process for the positive battery cable.

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## 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".

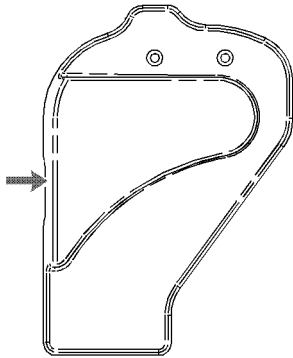


Illustration 103

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3. Remove the guard for the V-belt.

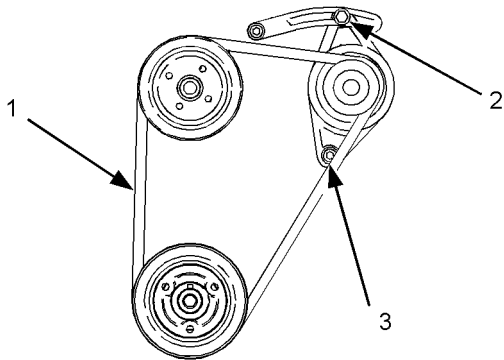


Illustration 104

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 24

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

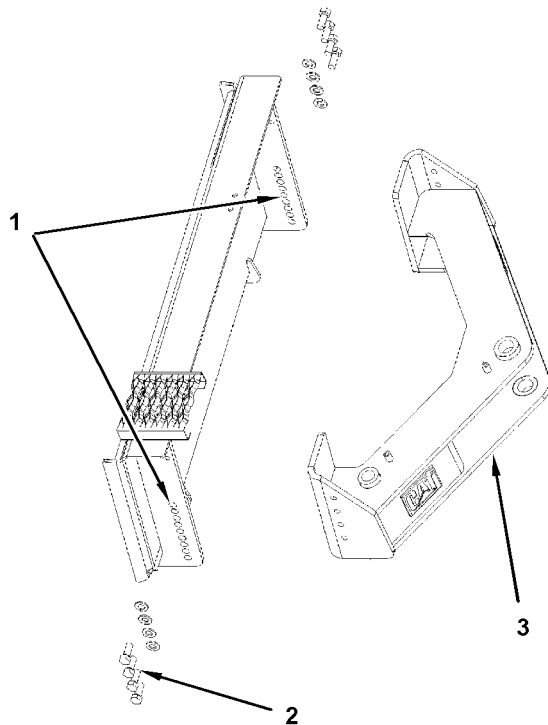


Illustration 105

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.

## 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.

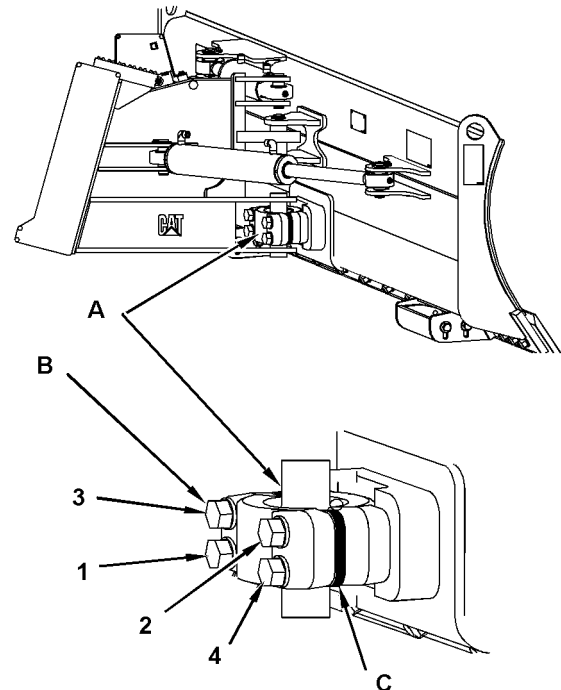


Illustration 106

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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 106.
- Torque the bolts to  $530 \pm 70 \text{ N}\cdot\text{m}$  ( $391 \pm 52 \text{ lb ft}$ ).

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

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## Bogie and Idler - Inspect/Replace

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

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.

**Note:** The tubes for the bogies and the tubes for the idlers on the 267B, 277B and 287B contain oil. Inspect the tubes for leaks. If a leak is suspected, the oil level should be checked. Refer to Operation and Maintenance Manual, "Bogie and Idler Oil Level - Check".

Table 25

Bogie Wheels and Idler Wheels Wear Limits 247B and 257B		
	Minimum Width	Minimum Thickness
254 mm (10 inch)	48 mm (1.9 inch)	3 mm (0.1 inch)
356 mm (14 inch)	48 mm (1.9 inch)	3 mm (0.1 inch)

Table 26

Bogie Wheels and Idler Wheels Wear Limits 267B, 277B and 287B		
	Minimum Width	Minimum Thickness
254 mm (10 inch) One-Piece Wheel and Two-Piece Wheel	32 mm (1.3 inch)	3 mm (0.1 inch)
356 mm (14 inch) One-Piece Wheel and Two-Piece Wheel	45 mm (1.8 inch)	3 mm (0.1 inch)

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## Replacement for the 247B and 257B

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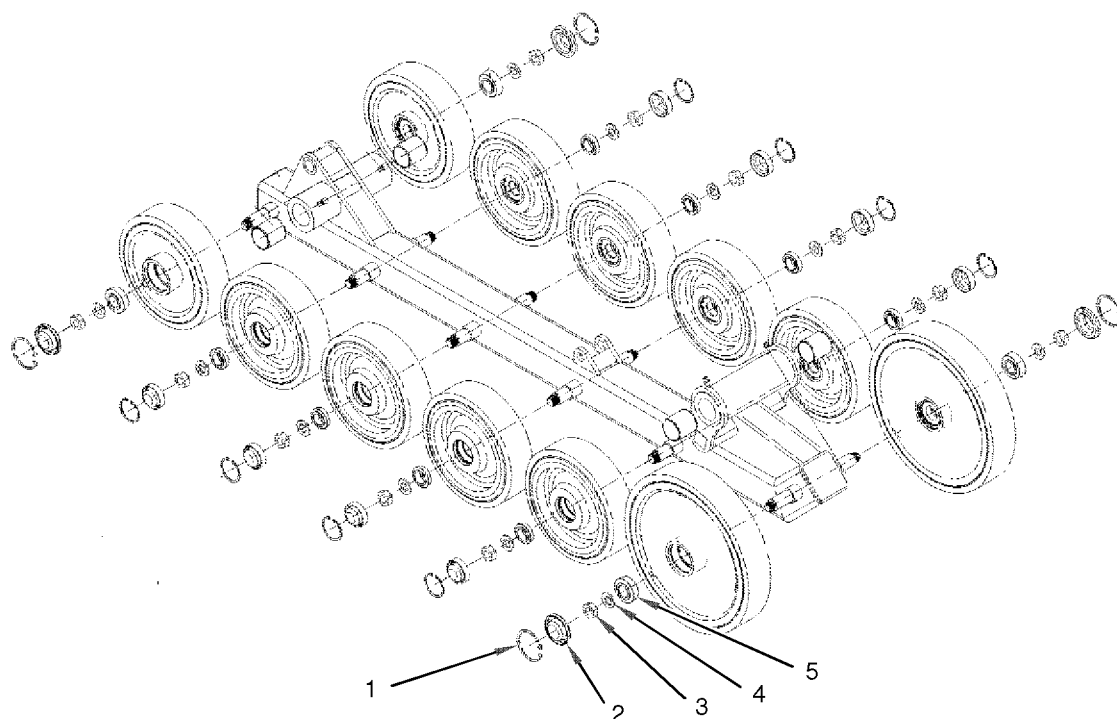


Illustration 107

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1. Remove the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Remove/Replace".
  2. Remove the retaining ring (1) and the dust cap (2).
  3. Remove the nut (3) and the washer (4).
- Note:** When you reinstall the nut (3), tighten the nut to the following torque  $168 \pm 30$  N·m ( $124 \pm 22$  lb ft).
4. Remove the bearing (5).

**Note:** When you reinstall the bearing (5) lubricate the bearing with 1P-0808 Multipurpose Grease.



## Replacement for the 267B and 277B

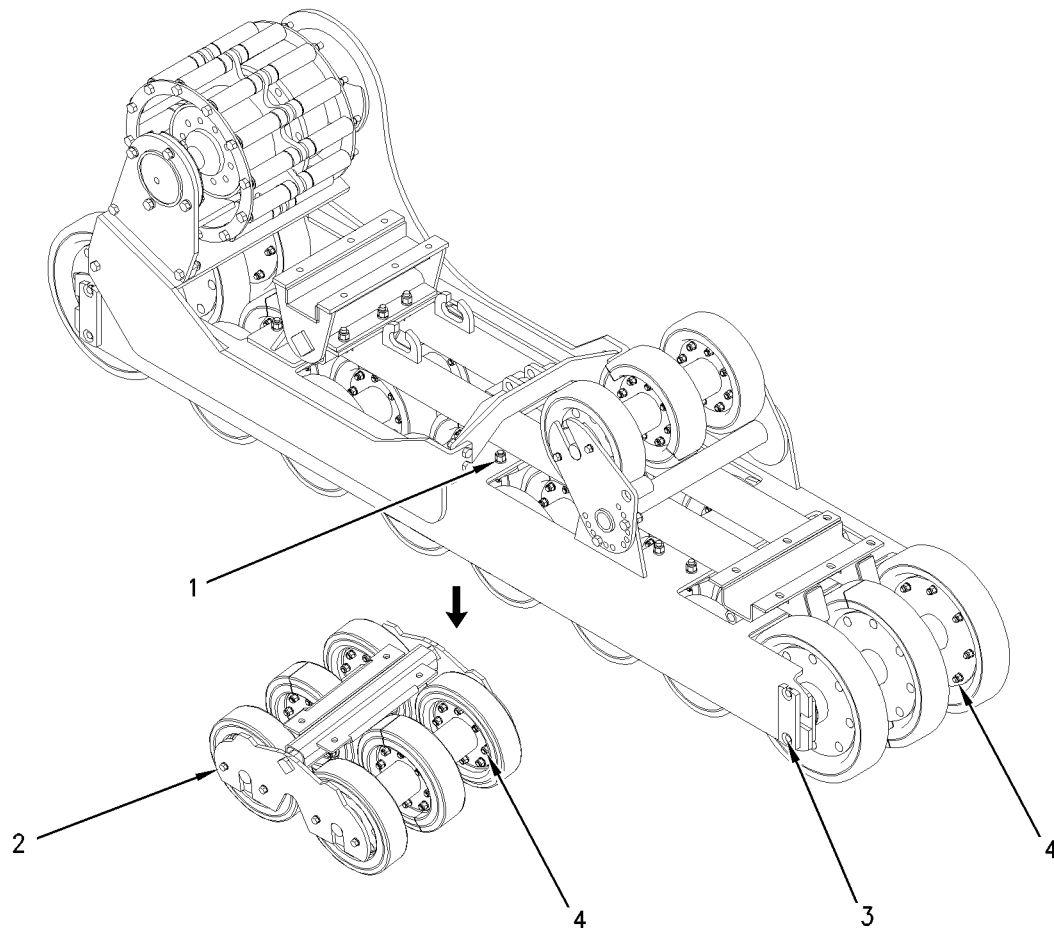


Illustration 108

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1. Remove the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Remove/Replace".
  2. In order to remove a bogie group, remove the four bolts, lockwashers, and locknuts (1). In order to remove an idler group, remove the four bolts, lockwashers (3) and the plates. An idler group can be removed at this point.
- Note:** When you reinstall the four bolts (1) tighten the bolts to the following torque  $120 \pm 20$  N·m ( $89 \pm 15$  lb ft). When you reinstall the four bolts (3) tighten the bolts to the following torque  $95 \pm 10$  N·m ( $70 \pm 7$  lb ft).
3. Raise the side of the machine so that the bogie group can be removed from the bottom of the undercarriage.
  4. Remove the four bolts, lockwashers (2) and the plates that retain the bogies.

**Note:** When you reinstall the four bolts, tighten the bolts to the following torque  $95 \pm 10$  N·m ( $70 \pm 7$  lb ft).

5. Remove the bolts, lockwashers and locknuts (4) that retain the bogie or the idler. Remove the bogie or the idler.

**Note:** When you reinstall the bolts on the idler, tighten the bolts to the following torque  $120 \pm 20$  N·m ( $88 \pm 15$  lb ft). When you reinstall the bolts on the bogie, tighten the bolts to the following torque  $50 \pm 14$  N·m ( $37 \pm 10$  lb ft).

6. Reverse steps in order to reassemble the components. Use the special torques that are noted.

## Replacement for the 287B

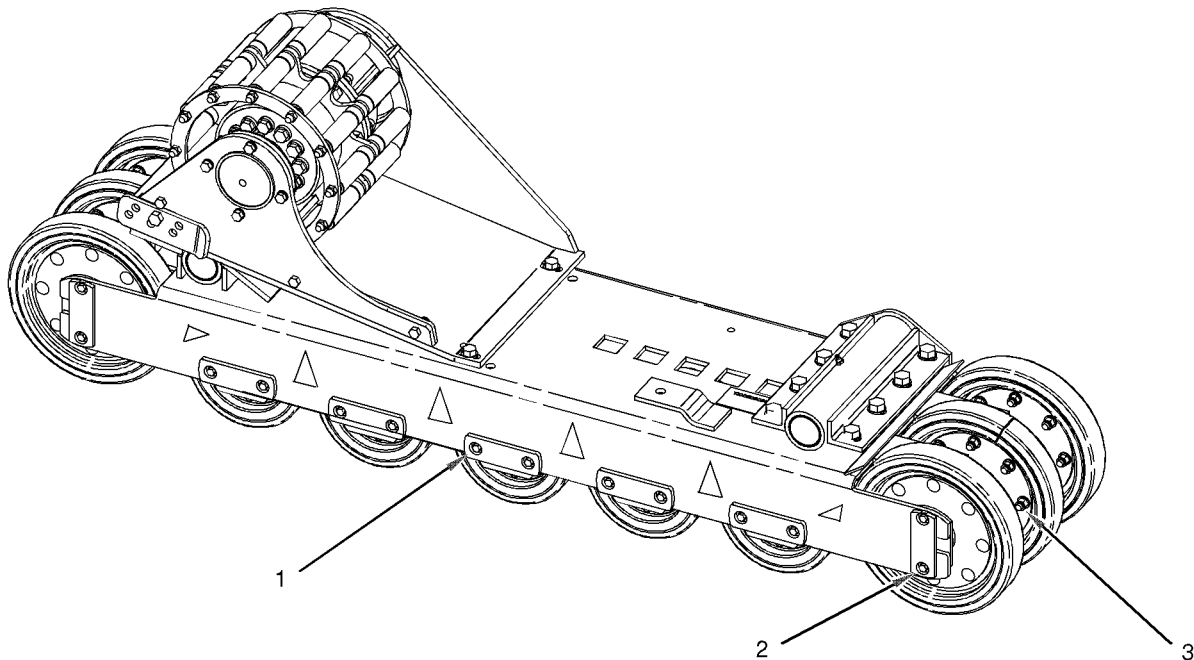


Illustration 109

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1. In order to remove a bogie group, remove the four bolts, lockwashers, locknuts (1) and plates. In order to remove an idler group, remove the four bolts, lockwashers (2) and plates. An idler group can be removed at this point.

**Note:** When you reinstall the four bolts (1) and (2) tighten the bolts to the following torque  $50 \pm 10$  N·m ( $37 \pm 7$  lb ft).

2. Raise the side of the machine so that the bogie group can be removed from the bottom of the undercarriage.
3. Remove the bolts, lockwashers and locknuts (3) that retain the bogie or the idler. Remove the bogie or the idler.

**Note:** When you reinstall the bolts on the idler, tighten the bolts to the following torque  $120 \pm 20$  N·m ( $88 \pm 15$  lb ft). When you reinstall the bolts on the bogie, tighten the bolts to the following torque  $50 \pm 14$  N·m ( $37 \pm 10$  lb ft).

4. Reverse steps in order to reassemble the components. Use the special torques that are noted.

## Bogie and Idler Oil Level - Check

**SMCS Code:** 4159-535-OC; 4192-535-OC

**S/N:** ZSA1-2204

**S/N:** CYC1-954

**S/N:** MDH1-3315

**Note:** Inspect the seals on the tubes for the bogies and the idlers during the walk around inspection. If a seal is leaking, replace the seal.

**Note:** The 267B (S/N: CYC 954-1399), 277B (S/N: MDH 3315-4699), and 287B (S/N: ZSA 2205-3999) have sealed bearings. The axles are stamped "Grease filled". The axles are maintenance free. If maintenance is required on the idler wheels or on the bogie wheels, please refer to your Caterpillar dealer.

New axle groups have been released for the following serial numbers: 267B(S/N: CYC1400-UP) and 277B(S/N: MDH4700-UP). The 267B and the 277B use oil in the idler wheel bearings. The 267B and the 277B use grease in the bogie wheel bearings. The idler wheels have a tag that states "Oil filled". There is no maintenance interval requirement for these axles. If maintenance is required on the axles, please refer to your Caterpillar dealer.

New axle groups have been released for the 287B(S/N: ZSA4000-UP). The 287B uses oil in the idler wheels and bogie wheels. The axles have a tag that states "Oil filled". There is no maintenance interval requirement for these axles. If maintenance is required on the axles, please refer to your Caterpillar dealer.

### WARNING

**Personal injury or death can result from servicing the track.**

**The machine must be on a hard, level surface before the track is removed or personal injury or death could occur.**

1. Park the machine on a hard, level surface.

### WARNING

**Personal injury or death can result from improper lifting or blocking.**

**When a jack is used to lift the machine, stand clear of the area. Use a jack that is rated for the correct capacity to lift the machine. Install blocks or stands before performing any work on the machine.**

2. Remove the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Remove/Replace" for the correct procedure.

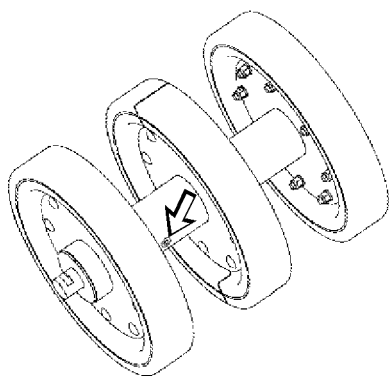


Illustration 110

g00873251

3. Clean the area around the filler plug for the tube for the bogie or the idler. Remove the filler plug.
4. Rotate the tube so that the filler plug hole is approximately level with the ground. The oil level should show at the bottom of the filler plug hole.

**Note:** The oil level will be low if the seals in the tube are leaking. If the oil level is low, replace the oil seals in the tube and refill the tube. See Operation and Maintenance Manual, "Capacities (Refill)".

5. Apply 5P-3413 Pipe Sealant to the threads of the filler plug. Install the filler plug.
6. Repeat the procedure on each tube for the bogie and the idler.

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## 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.

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## 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".

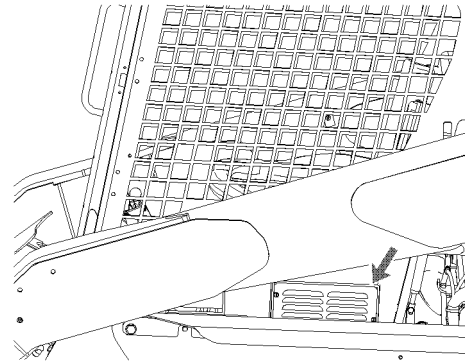


Illustration 111

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

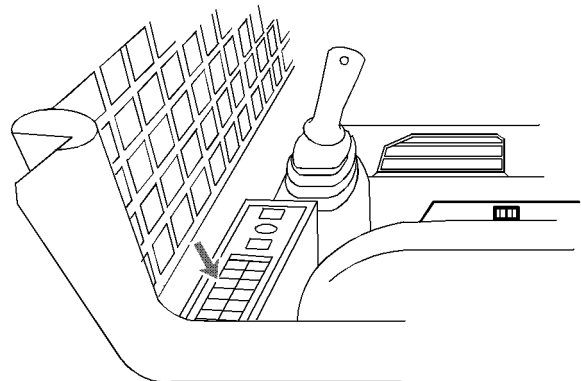


Illustration 112

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.

i02429415

## 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.

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### 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

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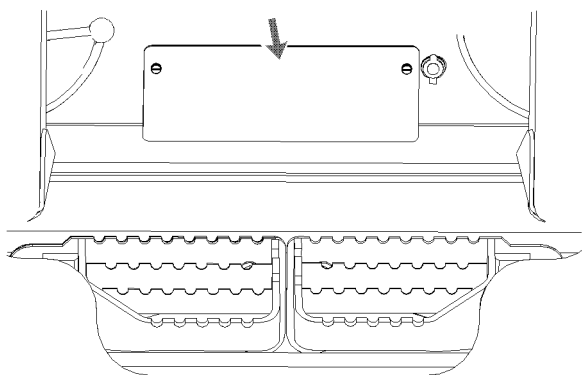


Illustration 113

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

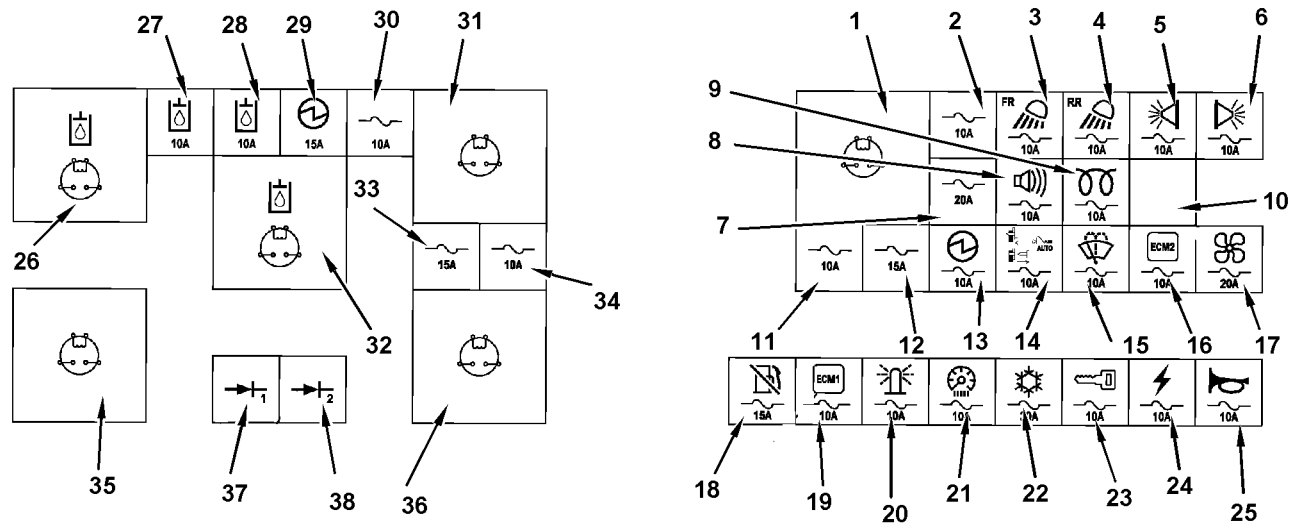


Illustration 114  
Fuses and Relays

g01213939

#### • 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+

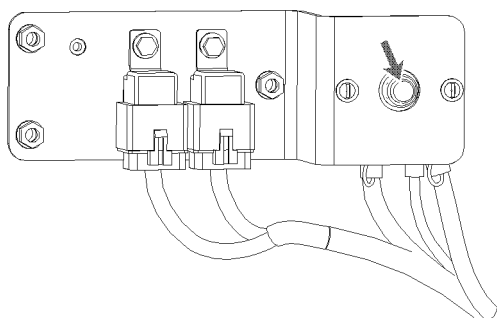


Illustration 115  
Circuit Breaker

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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".

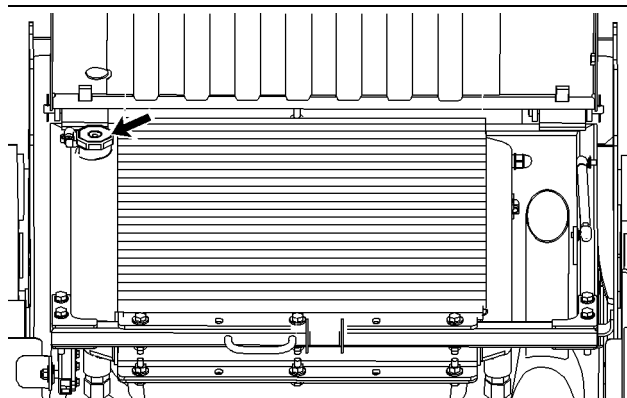


Illustration 116

g00956151

**Note:** The radiator cap is located on the left side of the radiator on machines that are equipped with the 3024 engine. The radiator cap is located on the right side of the radiator on machines that are equipped with the 3044 engine.

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

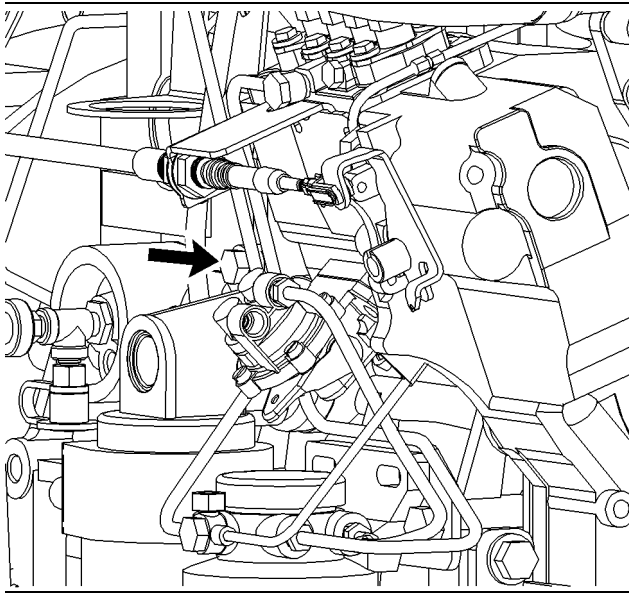


Illustration 117  
3024 drain valve

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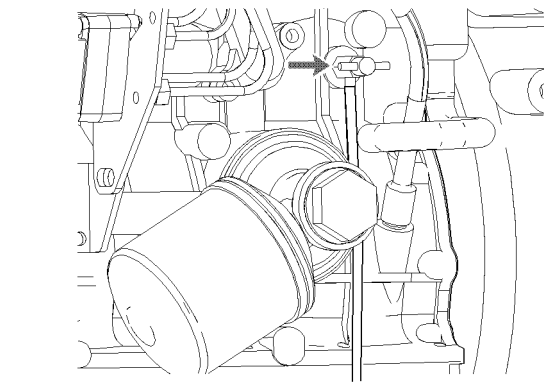


Illustration 118  
3044 drain valve

g01018862

4. Remove the drain plug and allow the coolant to drain into a suitable container.
5. Install the drain plug.
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.

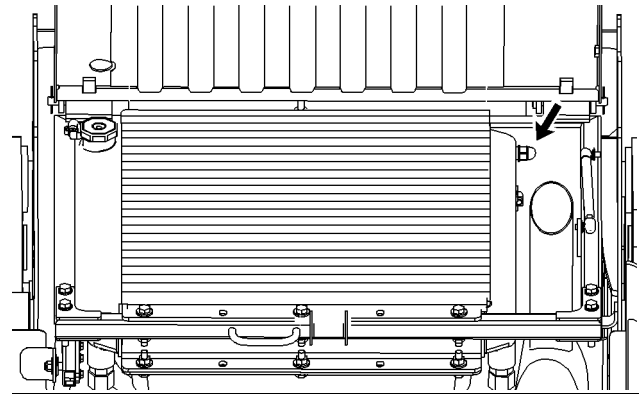


Illustration 119

g00956179

**Note:** The sight gauge for the coolant level is located on the right side of the radiator on machines that are equipped with the 3024 engine. The sight gauge for the coolant level is located on the left side of the radiator on machines that are equipped with the 3044 engine.

9. Maintain the coolant level in the sight gauge.
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.

i01962081

## 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".

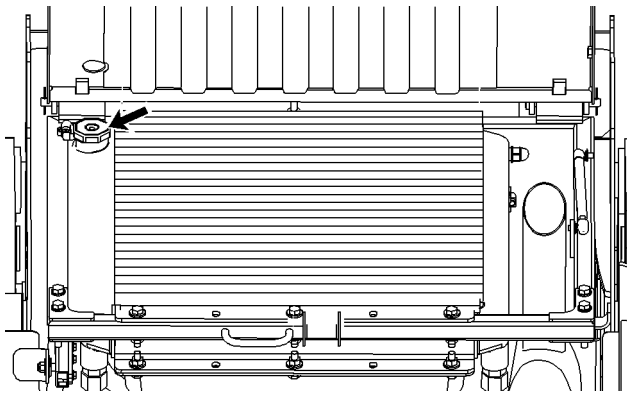


Illustration 120

g00956151

**Note:** The radiator cap is located on the left side of the radiator on machines that are equipped with the 3024 engine. The radiator cap is located on the right side of the radiator on machines that are equipped with the 3044 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.

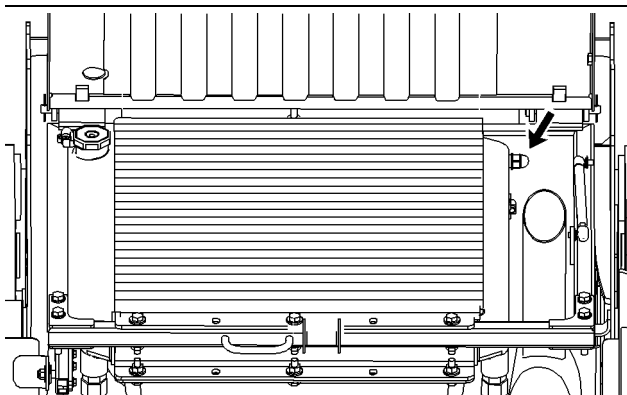


Illustration 121

g00956179

**Note:** The sight gauge for the coolant level is located on the right side of the radiator on machines that are equipped with the 3024 engine. The sight gauge for the coolant is located on the left side of the radiator on machines that are equipped with the 3044 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".

i01959244

## 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".

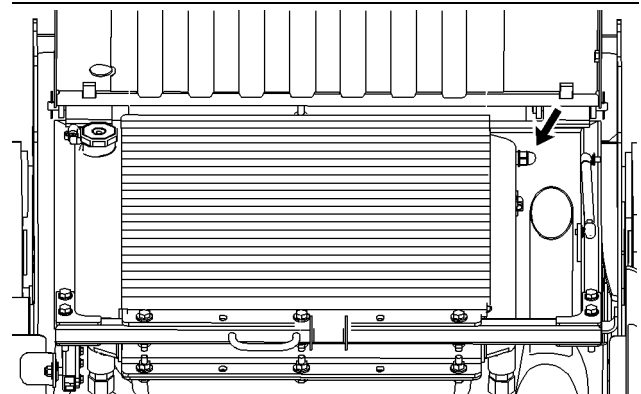


Illustration 122

g00956179

**Note:** The sight gauge for the coolant level is located on the right side of the radiator on machines that are equipped with the 3024 engine. The sight gauge for the coolant level is located on the left side of the radiator on machines that are equipped with the 3044 engine.

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

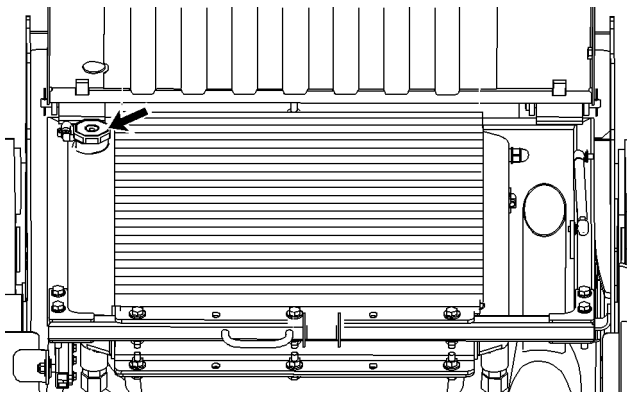


Illustration 123

g00956151

**Note:** The radiator cap is located on the left side of the radiator on machines that are equipped with the 3024 engine. The radiator cap is located on the right side of the radiator on machines that are equipped with the 3044 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.

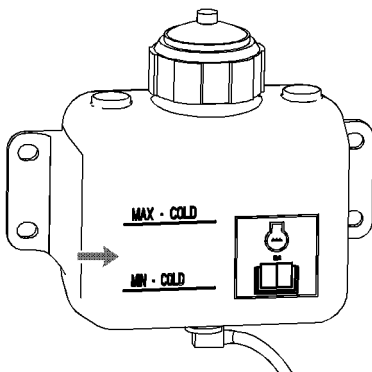


Illustration 124

g01018341

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

8. Close the engine access door.

i01958427

## 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.

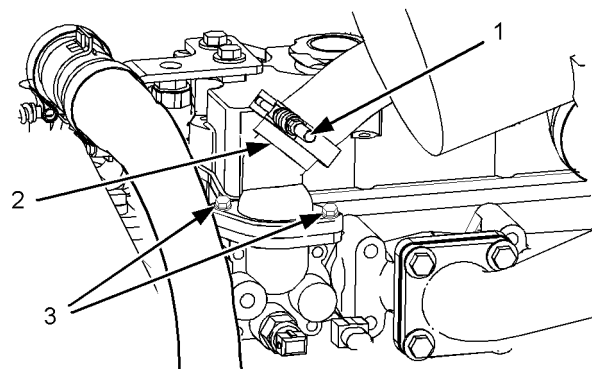


Illustration 125

3024 engine

g01018412

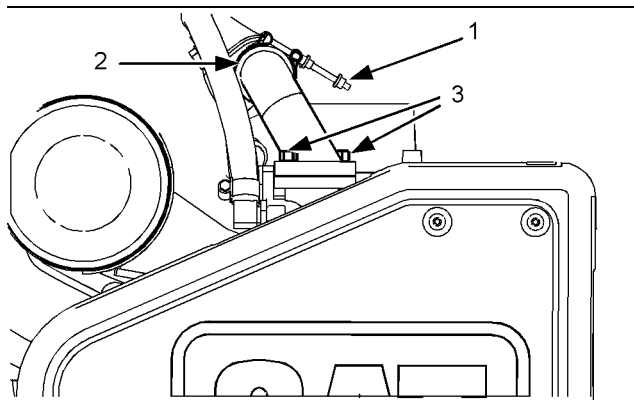


Illustration 126

g01018146

3044 engine

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. See Operation and Maintenance Manual, "Capacities - (Refill)". Refer to Special Publication, SEBU6250, "Caterpillar Machine Fluid Recommendations" for coolant information.
9. Close the engine access door.

i01961088

## 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 recommendations if you attempt to clean the filter element:

Never tap or strike the filter element in order to remove dust.

Never wash the filter element.

Use low pressure compressed air in order to remove the dust from the filter element. Air pressure must not exceed 206 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 tearing or voiding the pleats.

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

1. Open the engine access door.

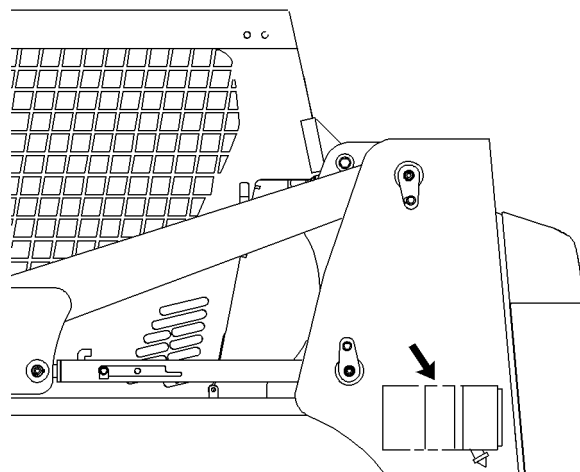


Illustration 127

g00891467

2. The air filter housing is located on the left side of the engine compartment on machines that are equipped with the 3024 engine. The air filter housing is located on the right side of the engine compartment on machines that are equipped with the 3044 engine.

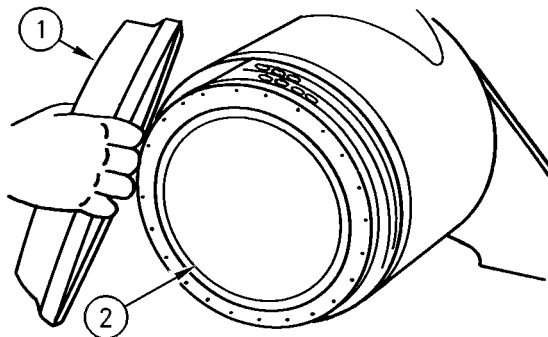


Illustration 128

g00101864

3. Unlatch the air cleaner housing cover (1). Rotate the cover and remove the cover.
4. Remove the primary filter element (2).
5. Install a clean filter element into the filter housing and install the cover for the filter housing.
6. Close the engine access door.
7. 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".

i02020796

## Engine Air Filter Secondary Element - Replace

**SMCS Code:** 1054-510-SE

### NOTICE

Always replace the secondary air filter element. Never attempt to reuse it by cleaning. The secondary air filter element should be replaced at the time the primary element is serviced for the third time. The secondary filter element should also be replaced if the alert indicator for air filter restriction lights.

1. Open the engine access door.

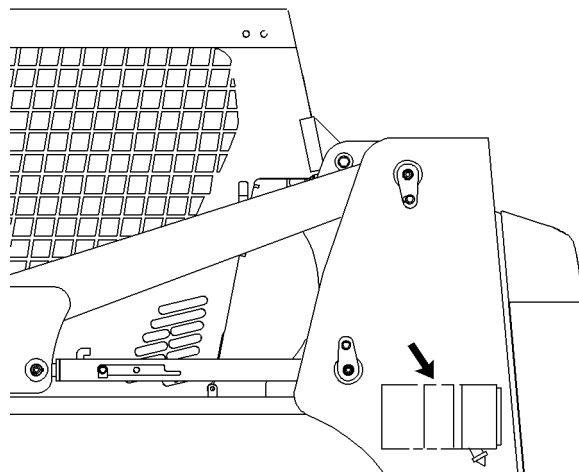


Illustration 129

g00891467

2. The air filter housing is located on the left side of the engine compartment on machines that are equipped with the 3024 engine. The air filter housing is located on the right side of the engine compartment on machines that are equipped with the 3044 engine.

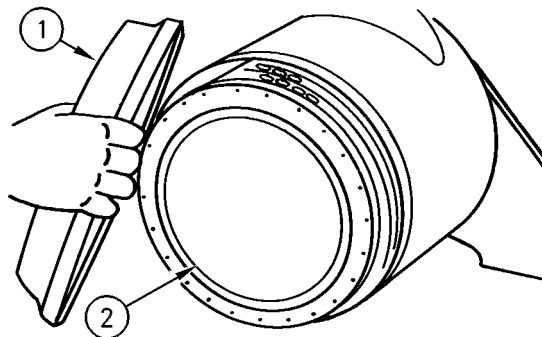


Illustration 130

g00101864

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

i01961301

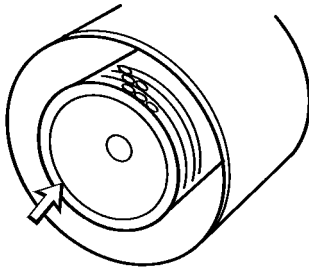


Illustration 131

g00038606

5. Remove the secondary filter element.
6. Cover the air inlet opening. Clean the inside of the air cleaner housing.
7. Inspect the gasket between the air inlet pipe and the air cleaner housing. Replace the gasket if the gasket is damaged.
8. Uncover the air inlet opening. Install a new secondary element.
9. Install the primary element and the air cleaner housing cover.
10. Close the engine access door.

## Engine Crankcase Breather (Closed Circuit) - Replace

**SMCS Code:** 1317-510

**S/N:** ZSA1-Up

**S/N:** CYC1-Up

**S/N:** MDH1-Up

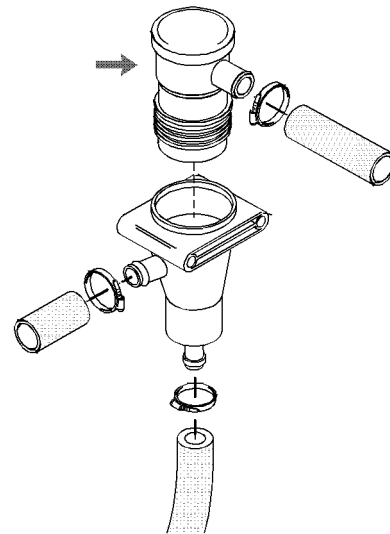


Illustration 132

g01018922

The breather is located on the right side of the 3044 engine.

### NOTICE

Ensure that the breather pipe connections are tight. Do not overfill the engine crankcase. If there is too much oil in the crankcase oil may enter the breather. Oil entering the breather may cause the engine speed to increase rapidly without control.

1. Firmly grasp the breather and pull up on the breather in order to remove the breather.
2. Remove the breather hoses. Clean the hoses with nonflammable solvent.
3. Install a new breather. Ensure that the breather is properly seated in the base.
4. Install the breather hoses. Ensure that the connections are tight.

i02022498

## Engine Crankcase Breather - Clean

**SMCS Code:** 1317-070

**S/N:** SLK1-7299

**S/N:** MTL1-5074

**Note:** Ensure that the area around the vent hole on the breather cover is clean and that the vent hole is not restricted. Ensure that the components of the breather assembly are seated in the correct positions. Otherwise, engine damage could result.

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".

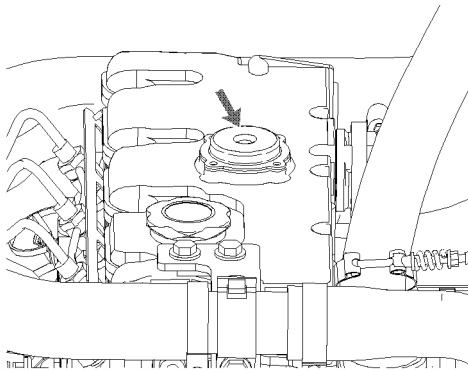


Illustration 133

g01018945

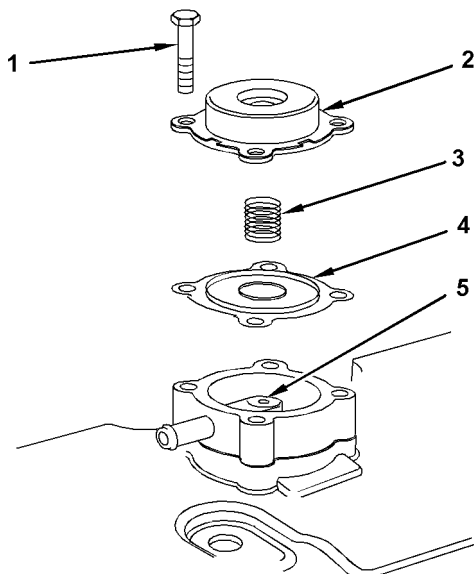


Illustration 134

g01044243

3. The breather is located on top of the valve cover on the 3024 engine. Remove the screws (1). Remove the breather cover (2).
4. Remove the diaphragm assembly (4). Remove the spring (3). The diaphragm assembly consists of the diaphragm and the locating ring.
5. Clean the cavity for the breather (5).
6. Remove the gauze that is located below the cavity for the breather.
7. Clean the following items with a clean diesel fuel:
  - Breather
  - Breather cover
  - Diaphragm assembly
  - Location ring assembly
  - Spring
  - Gauze
8. Allow the parts to dry. Pressure air may be used to dry the parts.
9. Install the gauze and install the components of the breather. Install the breather cover.
10. Tilt the radiator downward.
11. Close the engine access door.

i01959002

## 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".

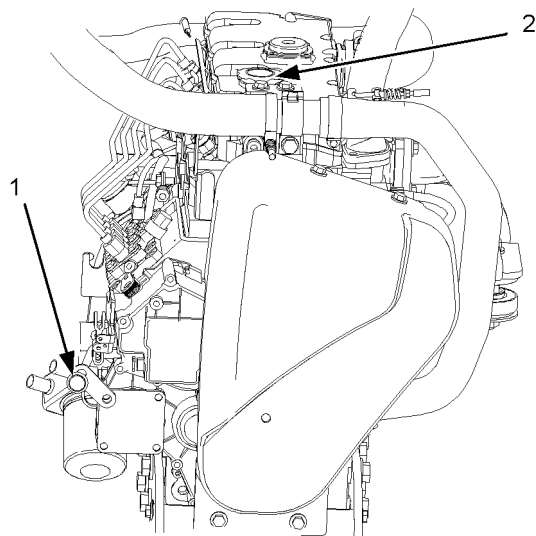


Illustration 135  
3024 engine

g01018561

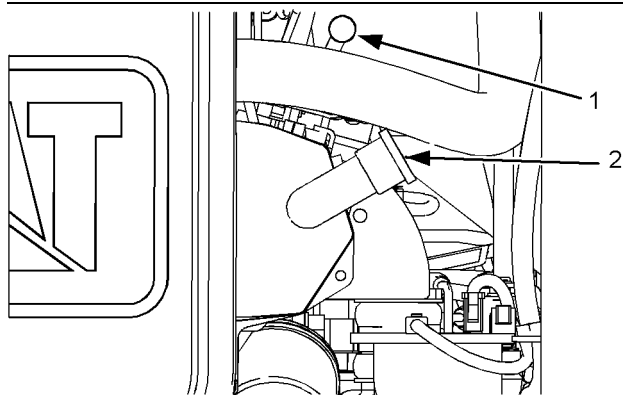


Illustration 136  
3044 engine

g01018171

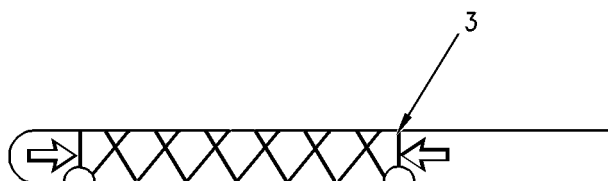


Illustration 137

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.

i01959048

## Engine Oil Sample - Obtain

SMCS Code: 1348-554-SM; 7542-008

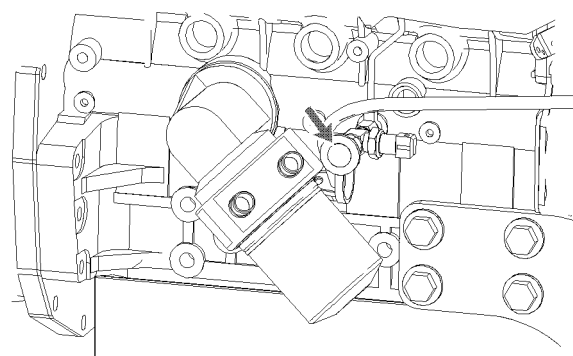


Illustration 138  
3024 engine

g01018202

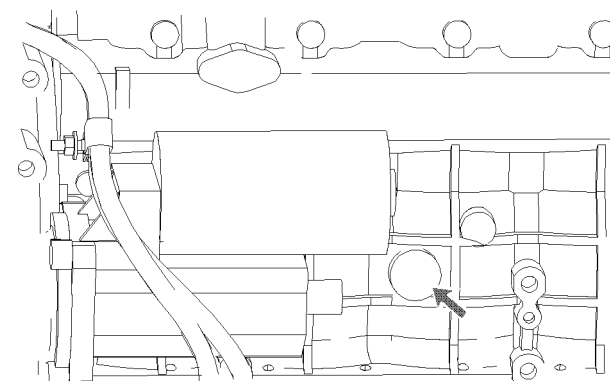


Illustration 139  
3044 engine

g01018203

The sampling port for the engine oil is located on the left side of the engine block.

i02742743

## Engine Oil and Filter - Change

**SMCS Code:** 1308-510; 1348-044**S/N:** ZSA1-Up**S/N:** CYC1-Up**S/N:** MDH1-Up

### 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:

- Caterpillar oil, API Specification CI-4, CH-4 or CG-4 multigrade oil is used.
- 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:

- Caterpillar oil, API Specification CI-4, CH-4 or CG-4 multigrade oil is not used.
- 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".

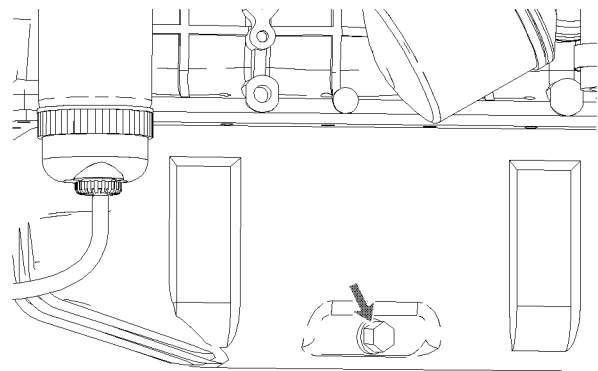


Illustration 140

g01031090

3044 engine

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

3. Remove the access panel that is located below the drain plug. Remove the drain plug and allow the oil to drain into a suitable container. Install the drain plug and install the access panel.

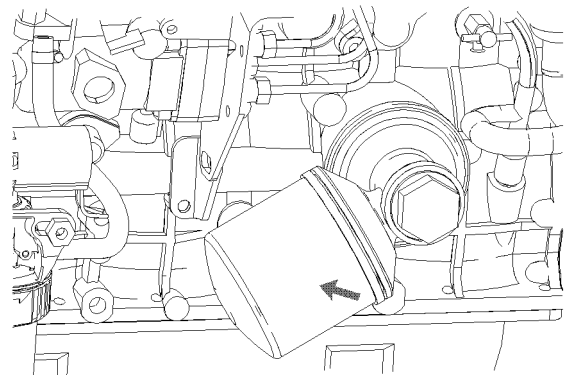


Illustration 141

g01022355

3044 engine

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.

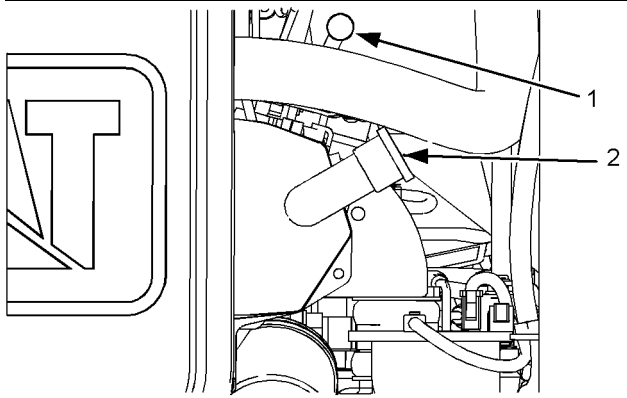


Illustration 142  
3044 engine

8. Remove the oil filler plug (1). 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.

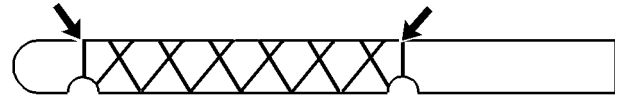


Illustration 143

g00849728

10. Stop the engine and allow the oil to drain back into the oil pan. Fill the crankcase to the "FULL" mark on the dipstick (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.

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.

i02645127

## 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".

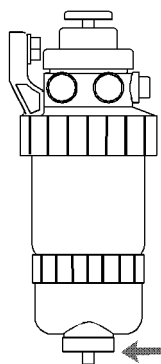


Illustration 144

g01023095

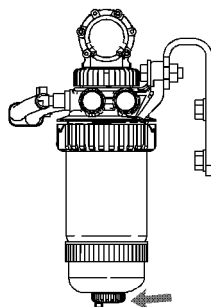


Illustration 145

g01023096

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.

i02645133

## 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".

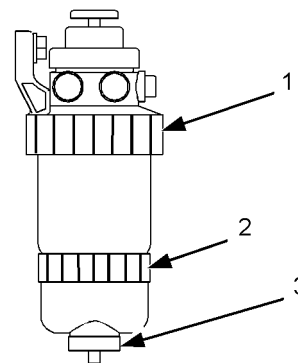


Illustration 146

g01017292

Fuel Filter/Water Separator for the 3024 engine that is located on the left side of the engine compartment

i02509334

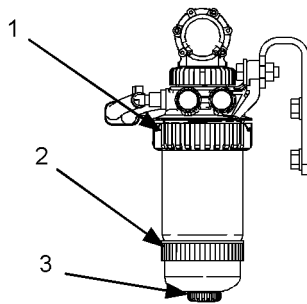


Illustration 147

g01017293

Fuel Filter/Water Separator for the 3044 engine that is located on the right 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.

## Fuel System Priming Pump - Operate

SMCS Code: 1258-548

### 3024 Engine

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

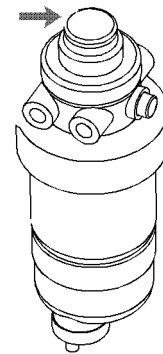


Illustration 148

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.

### 3044 Engine

Machines that are equipped with the 3044 engine are equipped with a fuel transfer pump that is electric.

1. Momentarily turn the engine start switch to the START position and then return the engine start switch to the ON position.

**Note:** Do not start the engine. This operation only starts the fuel pump.

2. Leave the engine start switch in the ON position for thirty seconds.
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.

i01819309

## Fuel Tank Cap - Clean

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

1. Remove the fuel cap.

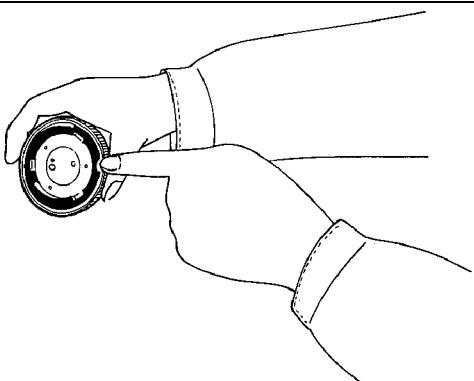


Illustration 149

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

**S/N:** ZSA1-Up

**S/N:** SLK1-7299

**S/N:** MTL1-5074

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

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

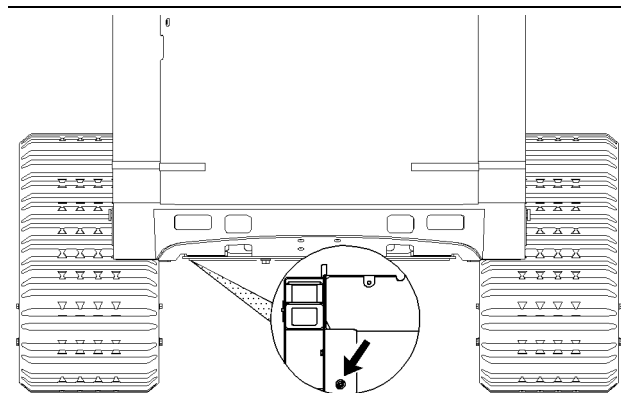


Illustration 150

g00928025

location of the drain plug for the 247 and the 257

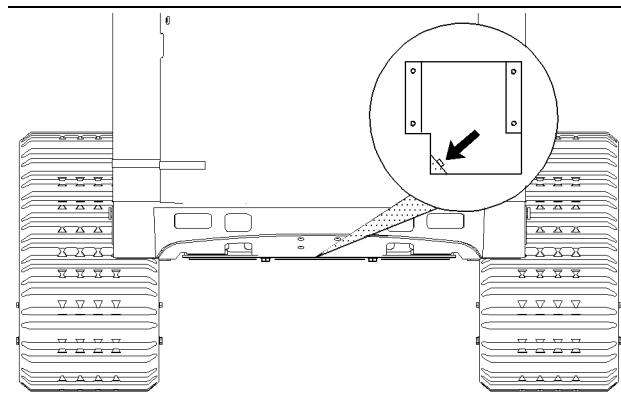


Illustration 151

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.

i01957445

## Hydraulic Oil Sample - Obtain

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

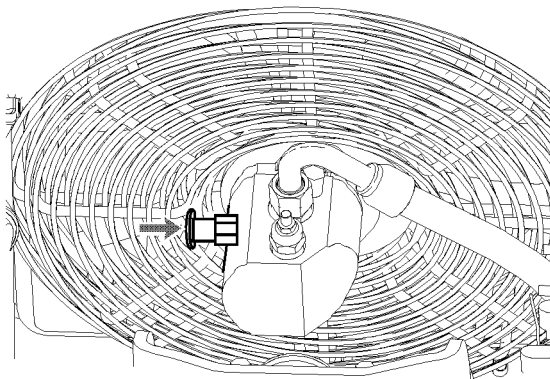


Illustration 152

g01026057

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

i01962605

## 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.

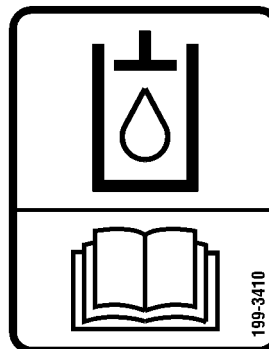


Illustration 153

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.

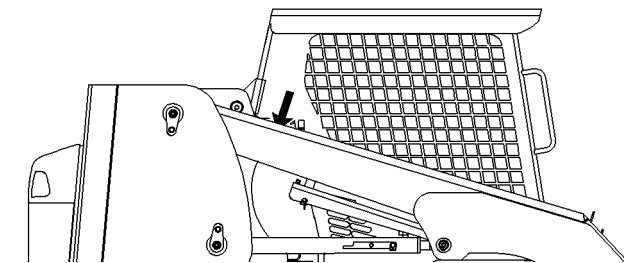


Illustration 154

g00926534

1. Remove the hydraulic tank filler cap.

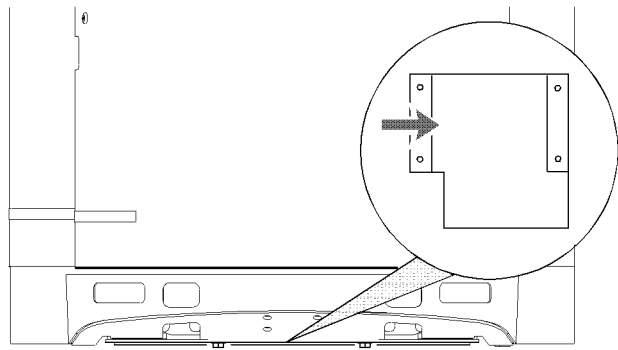


Illustration 155

g01021146

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

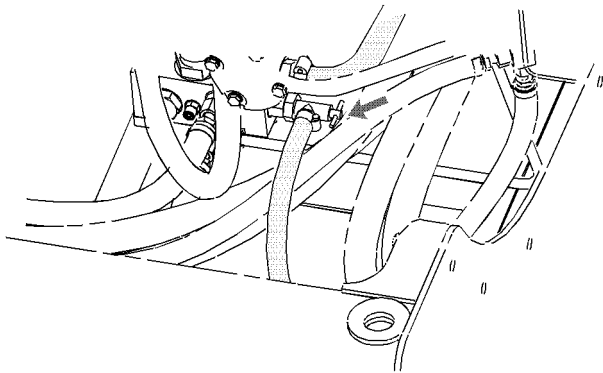


Illustration 156

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.

i02742828

## 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".

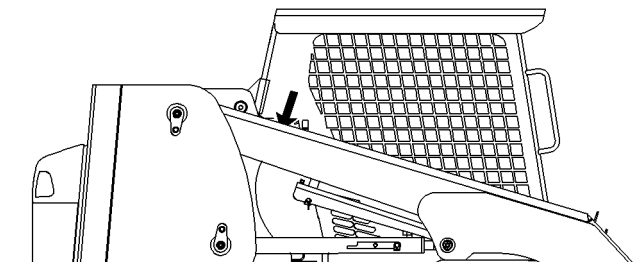


Illustration 157

g00926534

2. Remove the hydraulic tank filler cap.

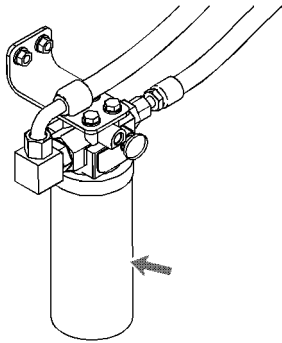


Illustration 158

g01017252

The hydraulic filter is located on the left side of the engine compartment.

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

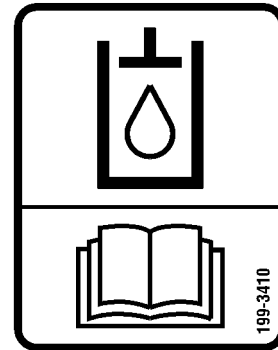


Illustration 159

g00956818

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

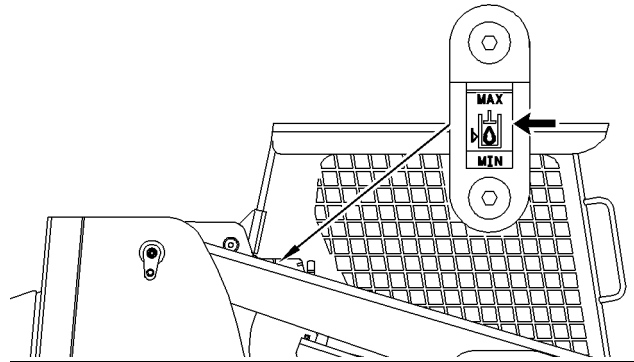


Illustration 160

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.**

i01957078

## Lift Arm and Cylinder Linkage - Lubricate

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

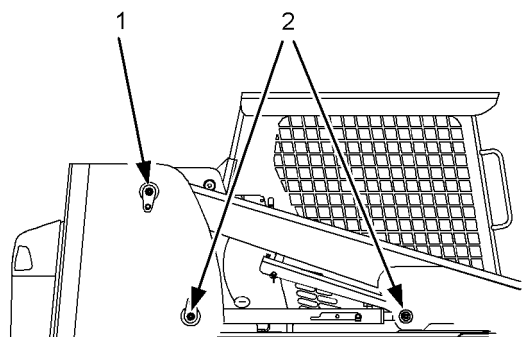


Illustration 161

Radial Lift

g01017352

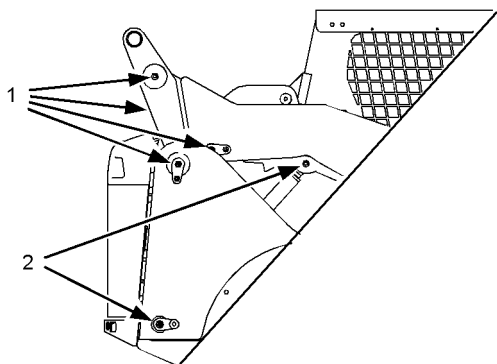


Illustration 162

Extended Reach

g01017361

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".

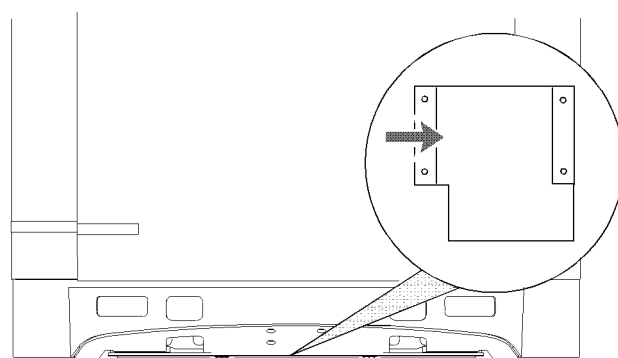


Illustration 163

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.

i02106227

## Oil Filter - Inspect

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

### Inspect a Used Filter for Debris

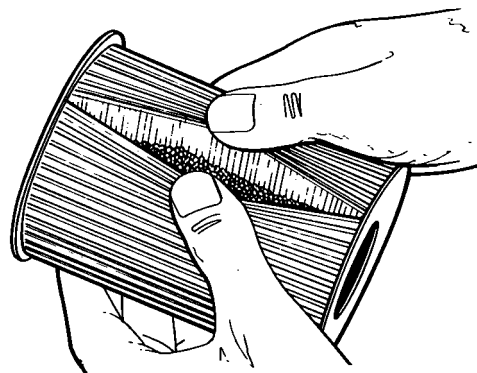


Illustration 164

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.

i01734746

## Quick Coupler - Inspect

**SMCS Code:** 6129-040

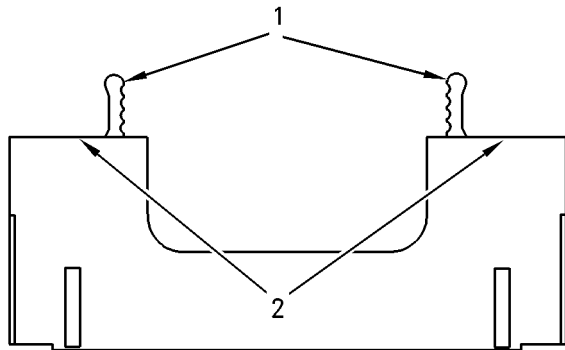


Illustration 165

g00889446

1. Move the quick coupler levers (1) to the disengaged position. Ensure that the levers are not bent or broken.
2. Check the top edges of the quick coupler assembly (2) for wear or for damage.

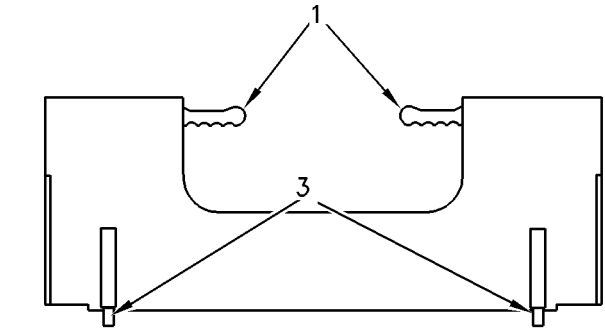


Illustration 166

g00889412

3. Move the quick coupler levers (1) to the engaged position. Ensure that the levers move freely without restriction.
4. Make sure that the coupler pins (3) extend through the bottom of the quick coupler assembly. Check the pins for wear and check the pins for damage.
5. Move the quick coupler levers to the disengaged position.

If any wear is suspected or damage is suspected, consult your Caterpillar dealer before you use a work tool.

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

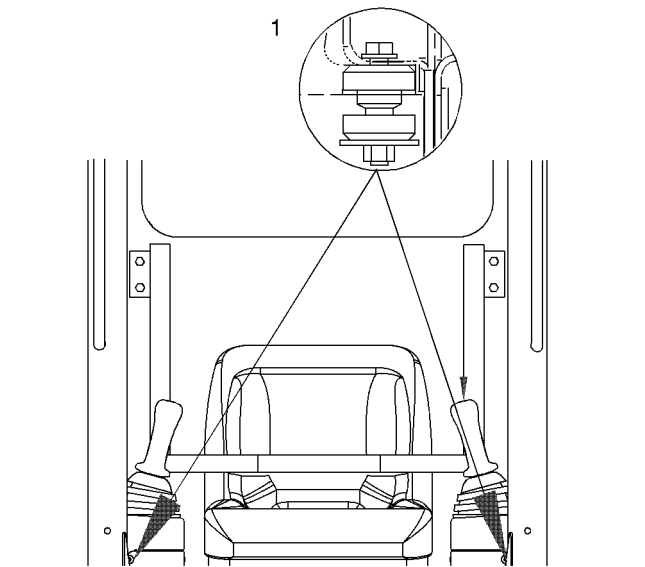


Illustration 167

g01022156

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

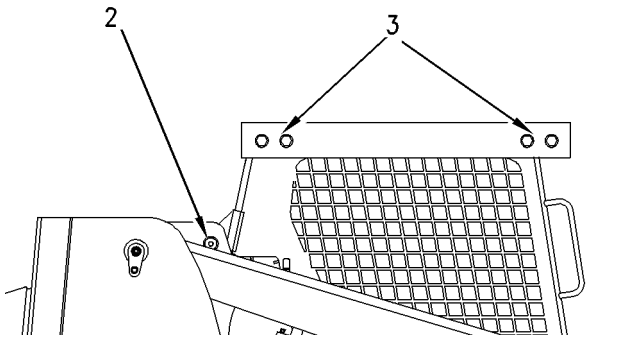


Illustration 168

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.

1. Inspect the ROPS and the FOPS for loose bolts. Tighten the bolts (1) to the following torque  $125 \pm 10 \text{ N}\cdot\text{m}$  ( $92 \pm 7 \text{ lb ft}$ ). Tighten the bolts (2) to the following torque  $55 \pm 5 \text{ N}\cdot\text{m}$  ( $41 \pm 4 \text{ lb ft}$ ). Tighten the bolts (3) to the following torque  $240 \pm 40 \text{ N}\cdot\text{m}$  ( $177 \pm 30 \text{ lb ft}$ ). ROPS and the FOPS for damaged bolts or missing bolts. Replace any damaged bolts or missing bolts with original equipment parts only.
2. Operate the machine on a rough surface. Replace the ROPS mounting supports if the ROPS emits a noise. Replace the ROPS mounting supports if the ROPS rattles.

Do not straighten the ROPS or the FOPS. Do not repair the ROPS or the FOPS by welding reinforcement plates to the ROPS or the FOPS.

Consult your Caterpillar dealer for repair of any cracks in the ROPS or the FOPS.

Inspect the Flying Object Guard (if equipped) for damage.

Consult your Caterpillar dealer for repair of any cracks in the Flying Object Guard.

## Seat Belt - Inspect

**SMCS Code:** 7327-040

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

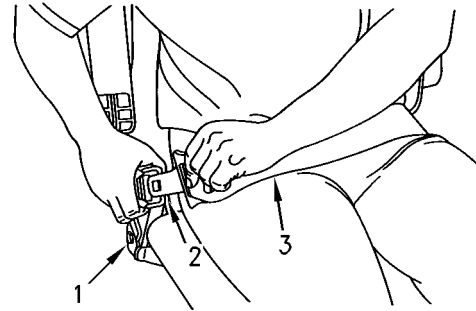


Illustration 169

g00932801

Typical example

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

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

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

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

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

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

i01970036

## Seat Belt - Replace

**SMCS Code:** 7327-510

Within three years of the date of installation (2) or within five years of the date of manufacture (1), replace the seat belt. Replace the seat belt at the date which occurs first. A date label for determining the age of the seat belt is attached to each seat belt.

i02429589

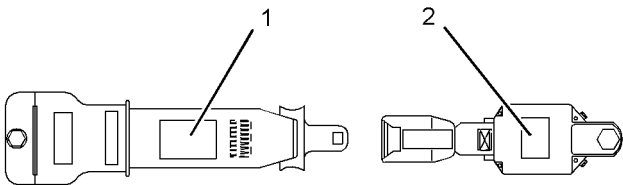


Illustration 170  
g01022746  
(1) Date of Manufacture  
(2) Date of Installation

Contact your Caterpillar dealer for the replacement of the seat belt.

i02110179

## Sprocket - Inspect

**SMCS Code:** 4164-040

**Note:** Operating the machine in conditions that are extremely muddy or sandy will cause accelerated wear on the drive sprocket and other undercarriage components. It is important to clean the undercarriage of the machine daily in order to maximize component life.

In order to service the drive sprocket, the tracks must be removed. Refer to Operation and Maintenance Manual, "Track (Rubber) - Remove/Install".

## Sleeves

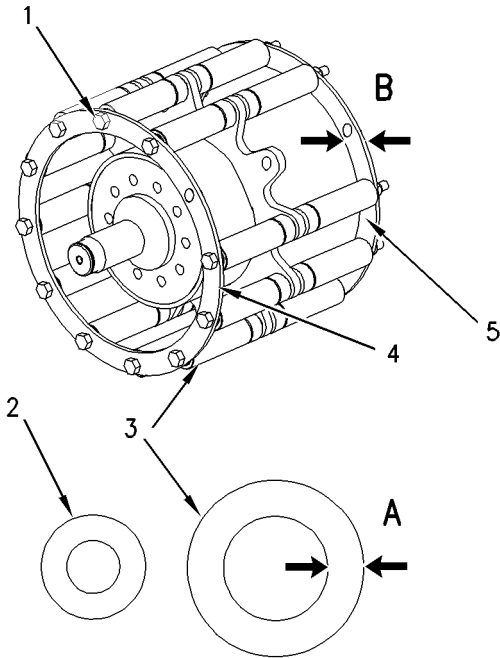


Illustration 171  
g00801623

The drive sprocket is equipped with two types of sleeves. The inner sleeves (2) are held in position by the rings of the sprocket (4) and (5). The outer sleeves (3) are free to rotate on the inner sleeves.

Measure thickness (A) for the outer sleeves. If the thickness of the outer sleeves measures less than the minimum thickness that is listed in the following table replace the sleeves.

**Note:** When you replace the outer sleeves, rotate the inner sleeves for 180°. If the inner sleeves have already been rotated, replace the inner sleeves.

Table 27

247, 257, 267, 277, and 287	
Component	Minimum Thickness
Outer Sleeve	3 mm (0.12 inch)

## Rings

The inner rings (5) and the outer rings (4) of the drive sprocket will wear from the rotation of the outer sleeves. Measure the thickness (B) of the inner rings and outer rings. If the thickness of the inner ring or outer ring measures less than the minimum thickness that is listed in the following table replace the ring.

Table 28

247, 257, 267, 277, and 287	
Component	Minimum Thickness
Sprocket Rings	4.75 mm (0.19 inch)

i01992415

## Sprocket Bearings - Lubricate

**SMCS Code:** 4164-086-BD; 7551-086-JK

**S/N:** ZSA1-3999

**S/N:** CYC1-1399

**S/N:** MDH1-4699

**S/N:** SLK1-7299

**S/N:** MTL1-5074

### NOTICE

The service interval for the lubrication of the sprocket bearings should be reduced to every 500 service hours if the machine is operated in wet and muddy conditions.

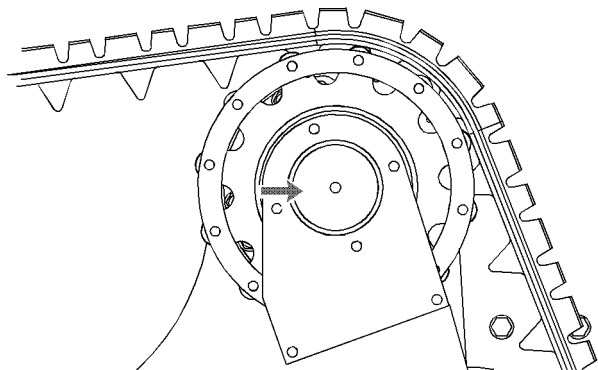


Illustration 172

typical example

1. Use a mallet in order to pound the housing plug inward until the plug falls out of the housing. If the plug was damaged during removal, replace the plug.
2. Wipe the old grease out of the housing.
3. Pull out the bearing seal. Replace the seal if the seal is damaged.
4. Pack the bearing with clean grease and push the seal into position. Place clean grease on the outside of the seal in order to protect the seal.
5. If the old housing plug is reinstalled, reverse the housing plug and pound the plug into the housing.

i02637639

## Sprocket Bearings - Lubricate

**SMCS Code:** 4164-086-BD; 7551-086-JK

**S/N:** ZSA4000-Up

**S/N:** CYC1400-Up

**S/N:** MDH4700-Up

**Note:** The bearing requires no maintenance under normal conditions. If the machine is used in wet conditions or muddy conditions, the bearings should be inspected, cleaned, and repacked at 1000 hours with 8T1808 grease.

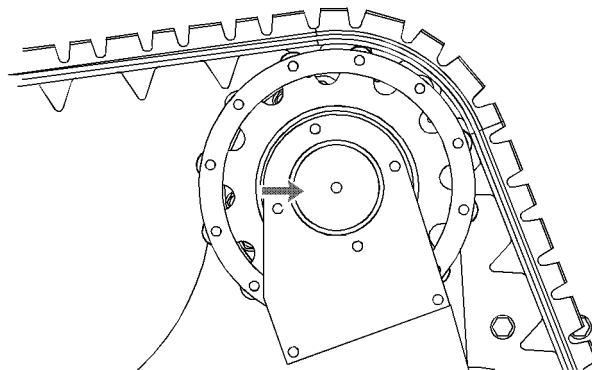


Illustration 173

typical example

g01025225

1. The housing plug is a rubber plug. Use a screwdriver in order to remove the plug.
2. Wipe the old grease out of the housing.
3. Pull out the bearing seal. Replace the seal if the seal is damaged.
4. Pack the bearing with clean grease and push the seal into position. Place clean grease on the outside of the seal in order to protect the seal.

i02125302

## Sprocket Retaining Nuts - Check

**SMCS Code:** 4164-535-NT

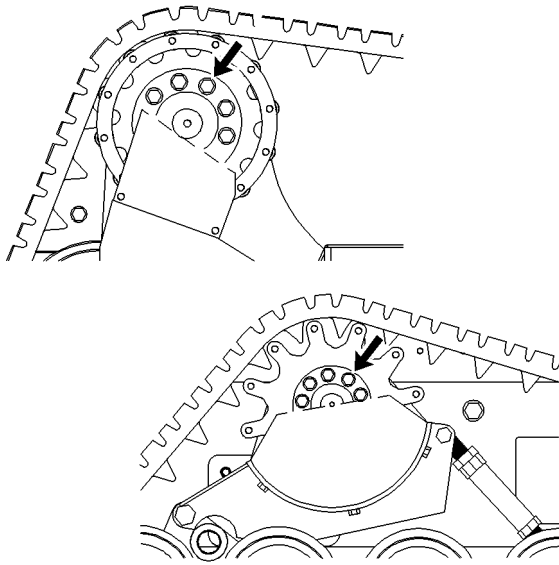


Illustration 174

g00953040

Check the torque on the nuts for new sprockets or for sprockets that have been reinstalled after every ten service hours until the specified torque is maintained.

Check the nuts on both sprockets. Use a star pattern when you tighten the nuts.

Tighten the nuts for the 247 and 257 to the following torque  $175 \pm 30$  N·m ( $129 \pm 22$  lb ft).

Tighten the nuts for the 267, 277 and 287 to the following torque  $270 \pm 40$  N·m ( $199 \pm 30$  lb ft).

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.

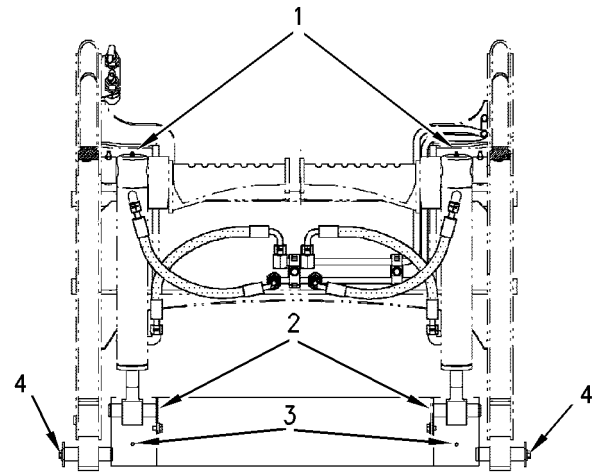


Illustration 175

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.

i02303960

## 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.

Track guides are recommended for the 267B and 277B if the machine will be frequently operated on side slopes or very rough terrain.

#### 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 for the 247B and 257B

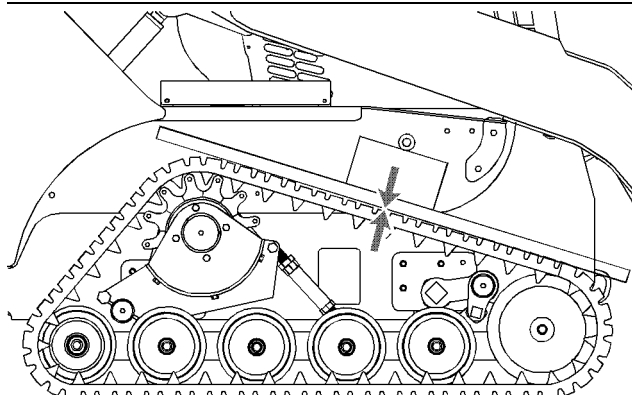


Illustration 176

g01031030

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.

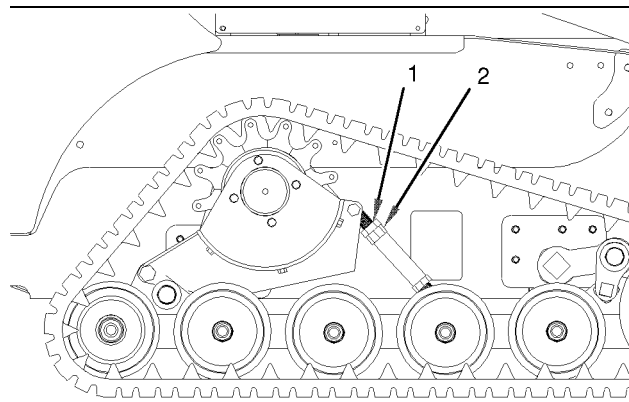


Illustration 177

g01031032

2. Loosen the jam nut (1).
  3. Turn the adjuster (2) in order to raise or lower the drive sprocket.
- Note:** In order to detension the track for removal, fully lower the drive sprocket.
4. Tighten the jam nut to the following torque  
 $270 \pm 40 \text{ N}\cdot\text{m}$  ( $199 \pm 30 \text{ lb ft}$ ).
  5. Recheck the track tension.

### Track Adjustment for the 267B and 277B

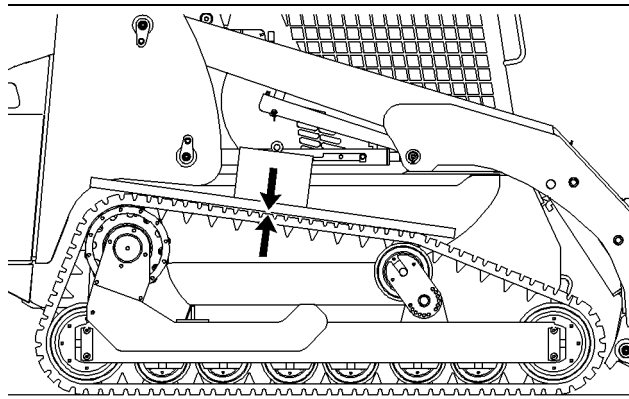


Illustration 178

g00900571

1. Place approximately 45 kg (100 lb) between the drive sprocket and the track tensioner. Place a straight edge across the drive sprocket and the track tensioner. 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.

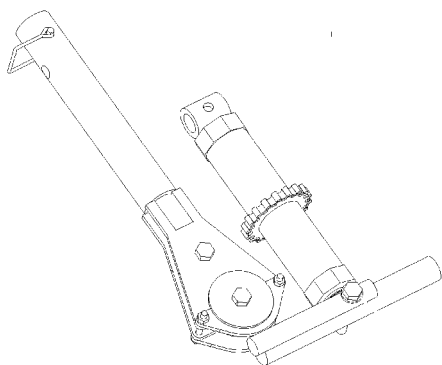


Illustration 179  
Stored Position

g01030181

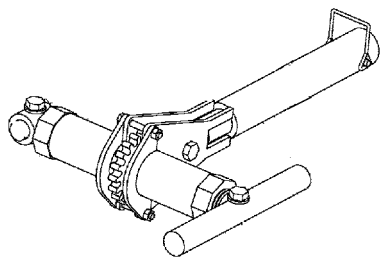


Illustration 180  
Assembled Position

g01090456

2. Remove the tool that is provided for tensioning the track. The tool is stored inside the engine compartment. The two parts of the tool must be assembled before the tool can be used.

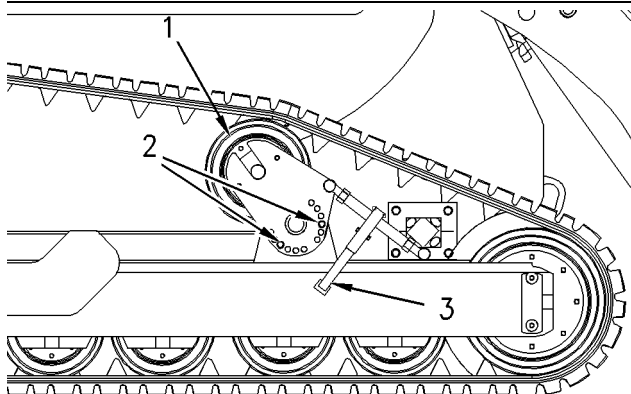


Illustration 181

g00899250

3. Install the tool (3). Ratchet the tool in order to remove any pressure that is being placed on the bolts (2). Remove the two bolts, lockwashers and locknuts (2). Ratchet the tool in order to pivot the idlers (1).

4. Pivot the idlers forward until you are able to reinstall the two bolts in the next available holes. Reinstall the two bolts, lockwashers and locknuts. Tighten the two bolts to the following torque 120 N·m (89 lb ft). Remove the tool.

**Note:** In order to detension the track for removal, pivot the idlers backward.

**Note:** If the idler is already in a vertical position it may be necessary to relocate the mounting bolts for the drive frame into the second set of holes that is provided in order to achieve the proper track tension. Refer to Operation and Maintenance Manual, "Adjustment of the Drive Frame for the 267 and 277" for the correct procedure.

5. Recheck the tension of the track.

### Adjustment of the Drive Frame for the 267B and 277B

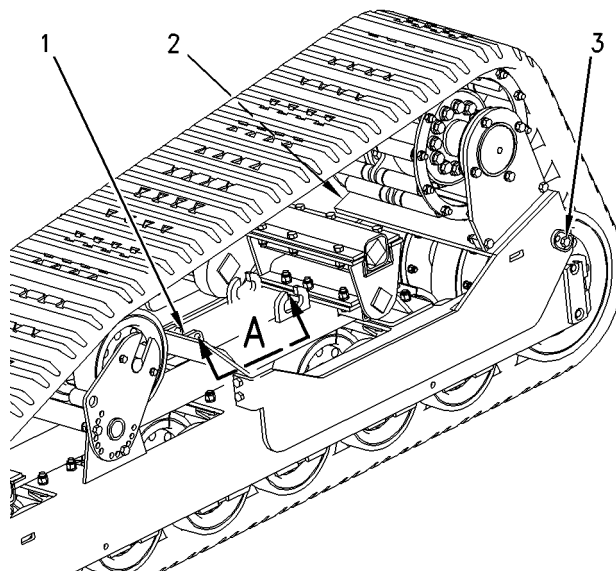


Illustration 182

g00900564

1. Fully lower the wheels that tension the track so that all tension is removed from the track. Remove the bolts (1), (2) and (3) that secure the drive frame.

**Note:** The bolt (2) is located on the opposite side of the drive frame from bolt (3). It will be necessary to raise the body of the machine in order to gain access to this bolt.



2. Install the tool into the brackets (A). Position the tool so that the fixed end of the tool is positioned inside the hooks. Slide the pin that is located on the other end of the tool through the holes in the undercarriage in order to secure the tool. Ratchet the tool in order to move the drive frame backward. Continue to move the drive frame until the second set of mounting holes are visible and the three bolts can be reinstalled. Tighten the bolts. Adjust the track tension.

**Note:** A pry bar may be needed in order to lift the drive frame upward when you move the drive frame rearward.

**Note:** Ensure that the drive lugs of the track do not contact the front axle.

## Track Adjustment for the 287B ZSA1-544

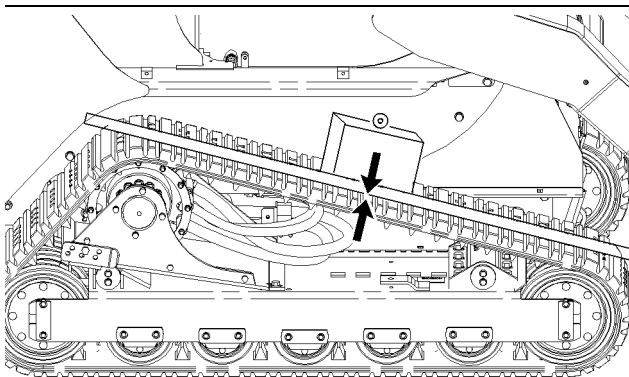


Illustration 183

g00954633

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.

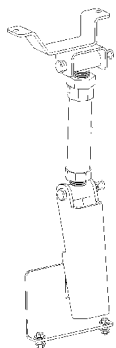


Illustration 184

g01030189

2. Remove the tool that is provided for tensioning the track. The tool is stored inside the engine access door.

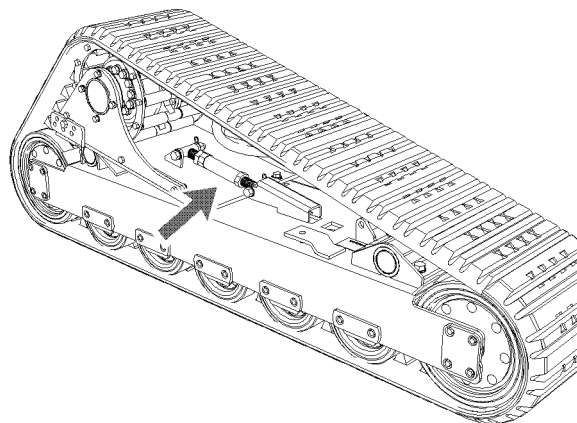


Illustration 185

g01011089

3. Install the track tensioner. The square portion of the bracket assembly for the track tensioner fits into the square cutouts on top of the undercarriage.

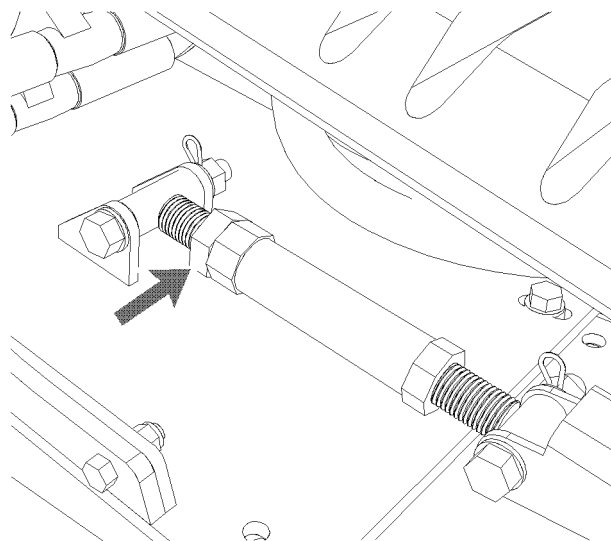


Illustration 186

g01011091

4. Loosen the jam nut and turn the adjuster in order to align the bore of the track tensioner with the holes in the mounting brackets on the drive frame.
5. Install the retaining pin through the holes and install the lock pin in order to secure the retaining pin.

6. Keep the jam nut loosened and turn the adjuster in order to tighten the turnbuckle. The track tensioner should be tight enough to hold the weight of the drive frame.

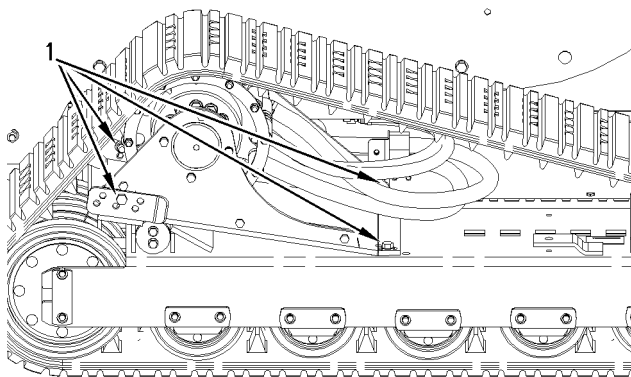


Illustration 187

g00954340

7. Remove the four retaining bolts (1).
8. Turn the adjuster in order to move the drive frame rearward. Turn the adjuster until the four bolts can be loosely installed into the next set of mounting holes.
9. Recheck the tension per Step 1.  
  
If the sag that is measured is 12 mm (0.5 inch), tighten the bolts to a torque of  $215 \pm 40$  N·m ( $159 \pm 30$  lb ft).  
  
If the sag that is measured is NOT 12 mm (0.5 inch), repeat Step 6 through Step 6.
10. Turn the adjuster slightly in order to relieve tension.

**Note:** Maintain a tension that is sufficient for retaining the track tensioner in the stored position on the undercarriage.

11. Tighten the jam nut to a torque of  $270 \pm 40$  N·m ( $199 \pm 30$  lb ft).

## Track Adjustment for the 287B ZSA545-up

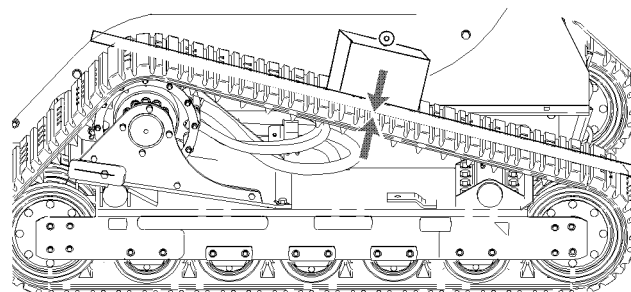


Illustration 188

g01087974

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.

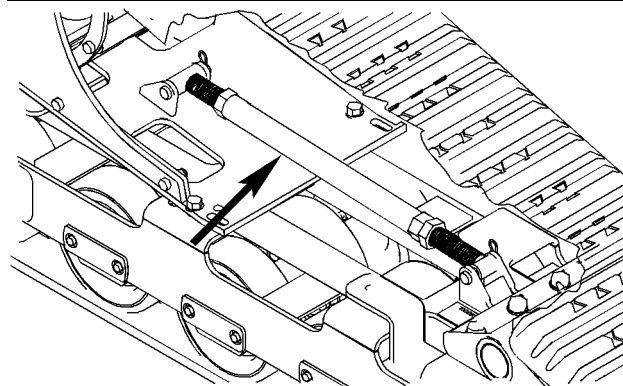


Illustration 189

g01081668

2. Locate the track tensioner on the undercarriage frame.

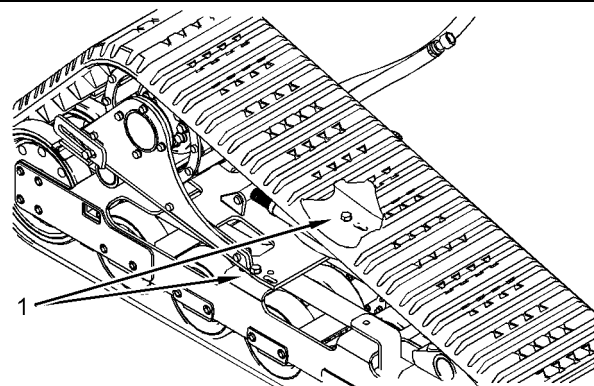


Illustration 190

g01081665

3. Remove the two retaining bolts (1) in the front of the drive assembly.

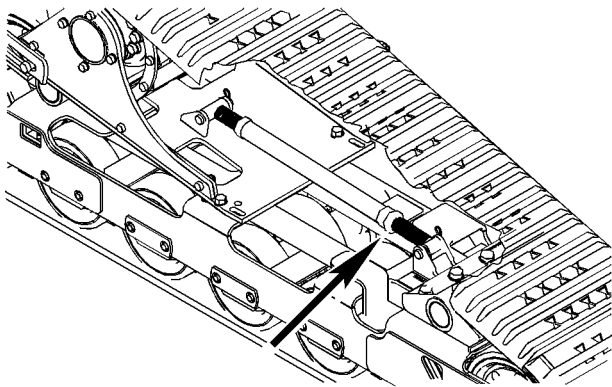


Illustration 191

g01081661

Reversing the four 238 - 7709 Bracket will increase the distance between the idler wheels by 24 mm (0.94 inch). After you reverse the brackets and after you reassemble the components for the undercarriage frame, check for proper track tension. Refer to the procedure "Track Adjustment for the 287".

4. Loosen the jam nut and turn the adjuster in order to move the drive assembly in the required direction.
5. Keep the jam nut loosened. The track tensioner should be tight enough to hold the weight of the drive frame.
6. Recheck the tension per Step 1.

If the sag that is measured is 12 mm (0.5 inch), reinstall the two retaining bolts into the undercarriage. Tighten the bolts to a torque of  $240 \pm 40$  N·m ( $177 \pm 30$  lb ft).

If the sag that is measured is NOT 12 mm (0.5 inch), repeat Step 4 through Step 6.

7. Tighten the jam nut to a torque of  $270 \pm 40$  N·m ( $199 \pm 30$  lb ft).

### Additional Adjustment for the 287

In certain situations, the tracks are in usable condition but the normal adjustment procedure will not tension the track to the recommended specification. By reversing the position of the 238 - 7709 Bracket, additional track tension can be achieved. This is possible because the slot for the brackets is offset. Reversing the brackets will increase the distance between the idler wheels, which results in additional tension on the track. See Illustration 192.

**Note:** In order to access the brackets, refer to the procedure for removing the idler wheels in the Operation and Maintenance Manual, "Bogie and Idler - Inspect/Replace".

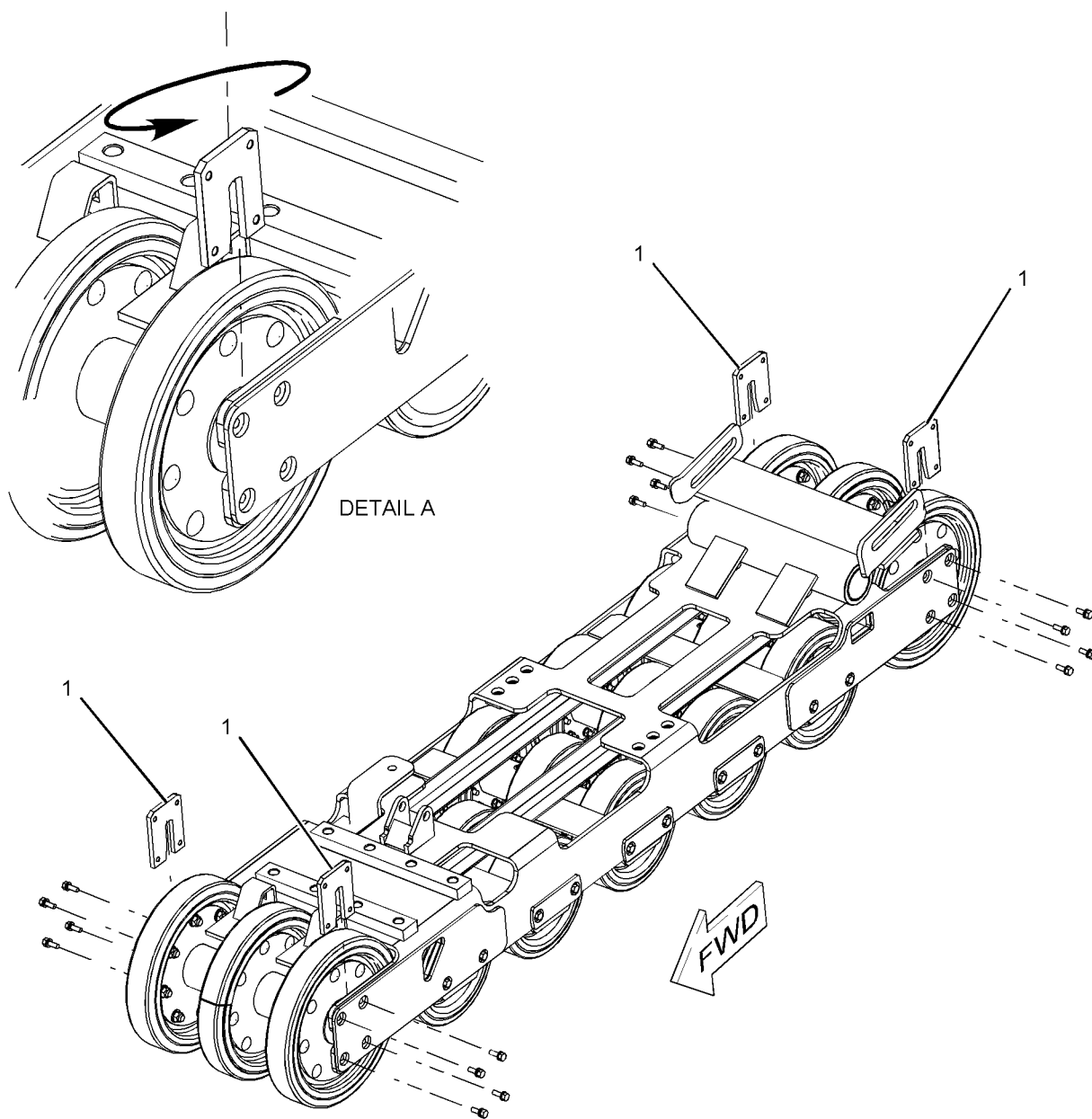


Illustration 192

Reverse the four brackets (1) by rotating each bracket by 180°. See Detail A.

g01132610

i02125025

# Track (Rubber) - Remove/Replace

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

## Removing the Track 247B and 257B

**Note:** Refer to the table for the tooling that is needed in order to remove the tracks and install the tracks.

Table 29

Required Tools	
Part Number	Part Description
224-9415	Kit <sup>(1)</sup>

<sup>(1)</sup> The Kit includes the Cap, the insert, and the Installation Tool.

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".
4. Use an appropriate floor jack in order to lift the machine off the ground. Use appropriate jack stands in order to block up the machine.
5. Detension the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

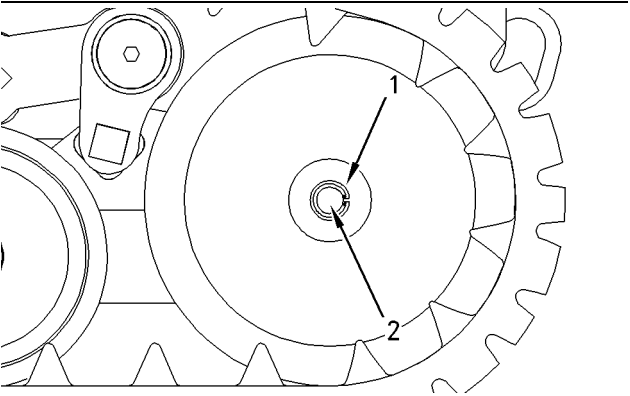


Illustration 193

g00953660

6. Remove the snap ring (1) and the dust cover (2).

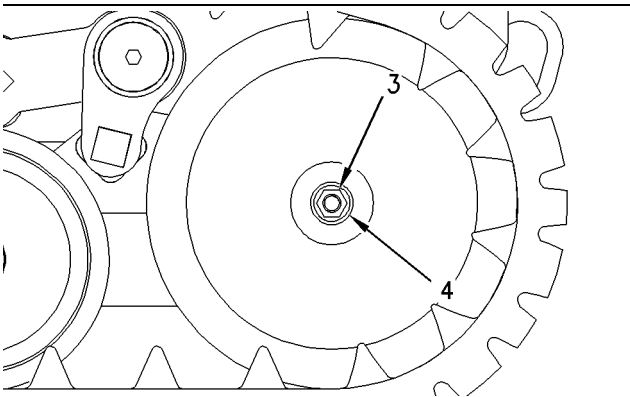


Illustration 194

g00953716

7. Remove the nut (3) and the washer (4).

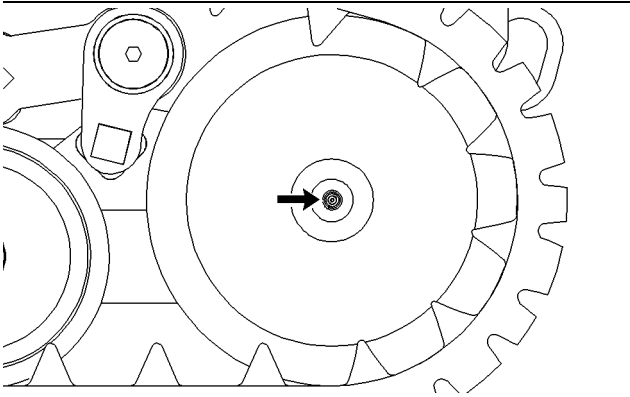


Illustration 195

g00953721

8. Thread the cap onto the end of the axle shaft.

**Note:** If the cap is not installed, the seal on the wheel will be damaged.

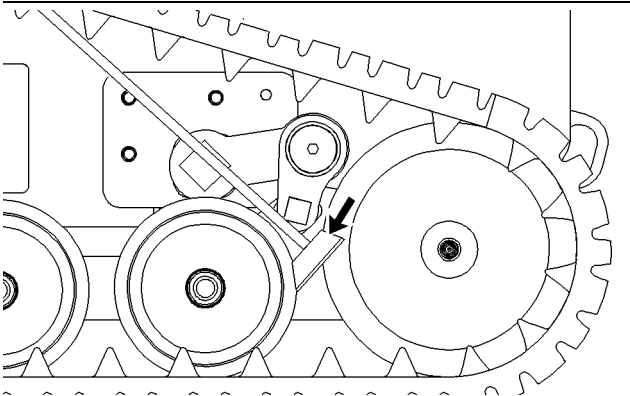


Illustration 196

g00953723

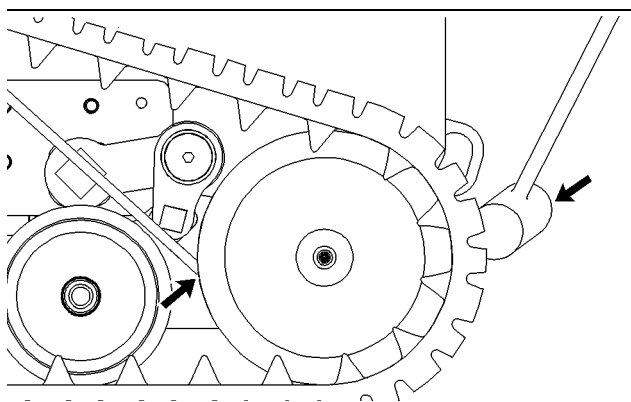


Illustration 197

g00953730

9. Use a large mallet in order to strike the inside of the track. This will cause the wheel bearing to pop out of the wheel. The bearing must come out of the wheel in order for the wheel to be removed. A pry bar may be needed in order to remove the wheel completely.

10. Remove the track.

## Installing the Track 247B and 257B

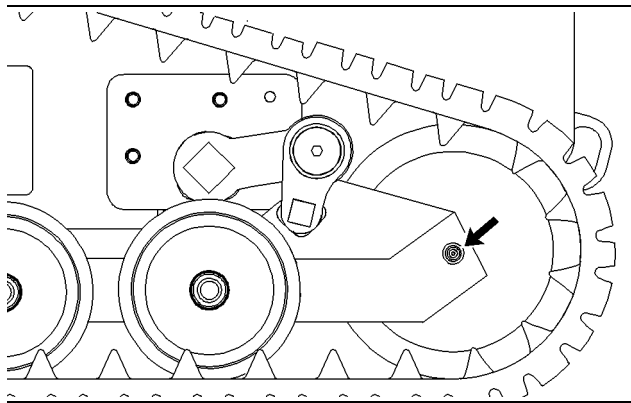


Illustration 198

g00953812

1. Install the cap.

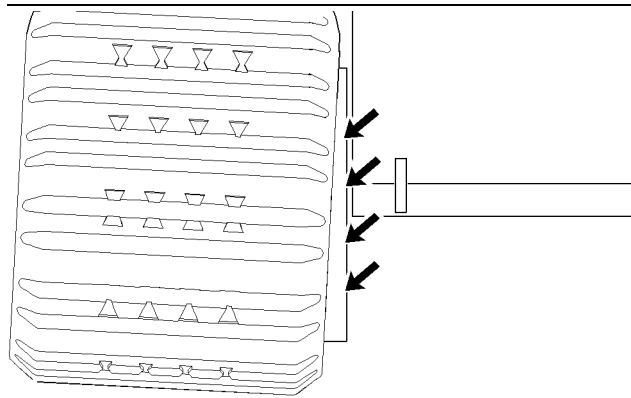


Illustration 199

g00953873

2. Lubricate the wheel and the inside of the track in order to ease the installation of the track. Pull the track onto the wheels.

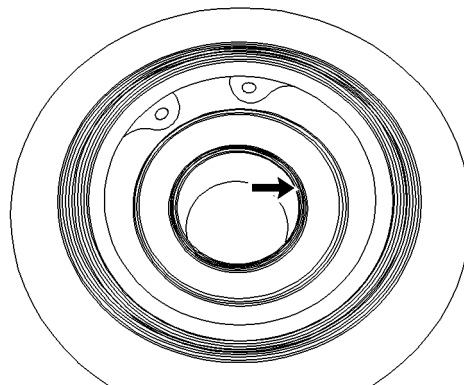


Illustration 200

g00953919

3. Inspect the seal on the wheel. Replace the seal if the seal is damaged.

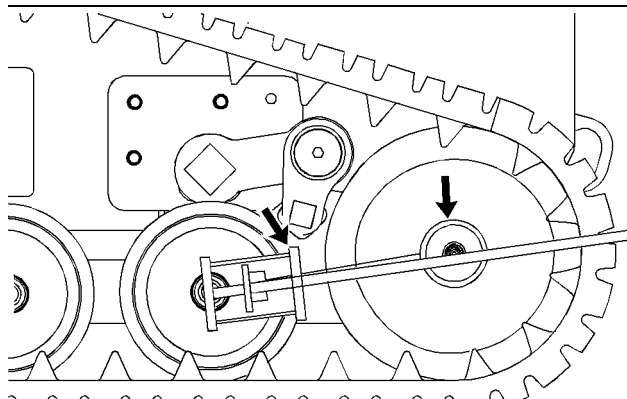


Illustration 201

g01094038

4. Use the installation tool for the track in order to install the wheel onto the shaft. Remove the cap.

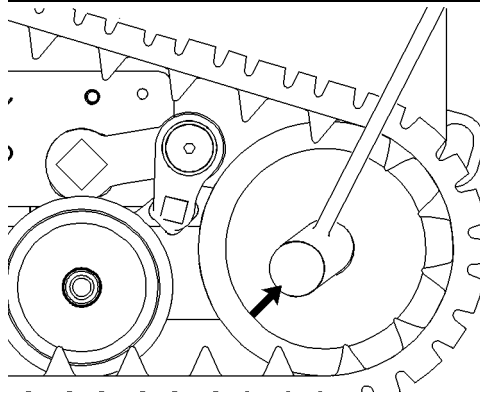


Illustration 202

g00954078

5. Use a mallet in order to seat the wheel on the shaft.

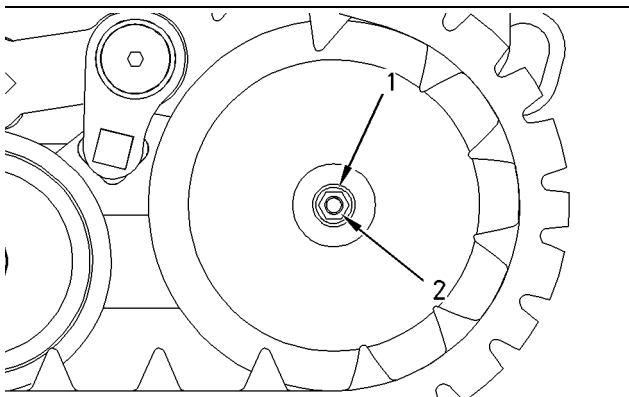


Illustration 203

g00954079

6. Install the washer (1) and the nut (2). Torque the nut to the following torque  $168 \pm 30 \text{ N}\cdot\text{m}$  ( $124 \pm 22 \text{ lb ft}$ ).

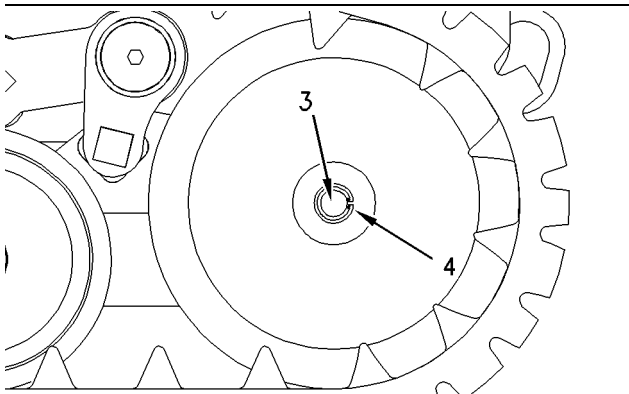


Illustration 204

g00954083

7. Install the dust cap (3) and the snap ring (4).
8. Tension the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

## Removing the Track 267B and 277B

1. Position the machine on firm, level ground.
2. Remove any work tool that is attached to the quick coupler. The quick coupler is mounted to the front of the loader arms.
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".
4. Detension the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

5. Use an appropriate floor jack to lift the machine so that the track is nearly off of the ground. Use appropriate jack stands in order to block up the machine.

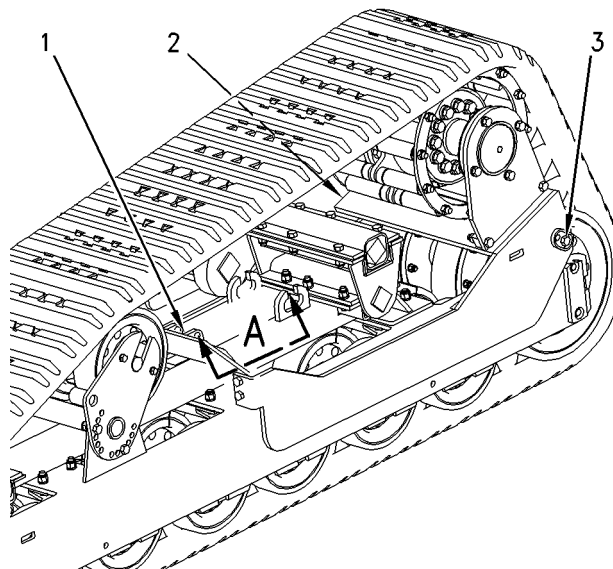


Illustration 205

g00954089

6. Remove the three bolts (1),(2) and (3) that secure the drive frame.

**Note:** The bolt (2) is located on the opposite side of the drive frame from bolt (3). It will be necessary to raise the body of the machine in order to gain access to this bolt.

**Note:** When you reinstall the three bolts, tighten bolts (2) and (3) to the following torque  $120 \pm 20 \text{ N}\cdot\text{m}$  ( $89 \pm 15 \text{ lb ft}$ ). When you reinstall the bolt (1) tighten the bolt to the following torque  $430 \pm 60 \text{ N}\cdot\text{m}$  ( $317 \pm 44 \text{ lb ft}$ ).

7. Install the track adjusting tool into the brackets (A). Ratchet the tool in order to slide the drive frame forward.

**Note:** When you reinstall the track you must slide the drive frame rearward into the original position. A pry bar may be needed in order to pry the drive frame upward when you slide the drive frame rearward.

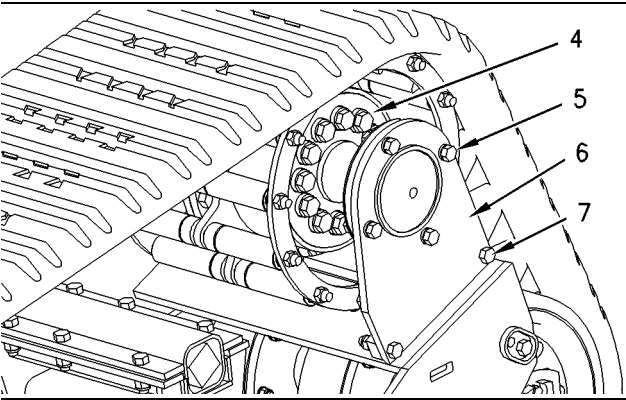


Illustration 206 g00954090

8. Remove the two bolts and the locknuts (7). Remove the four bolts and lockwashers (5). Remove the support plate for the drive sprocket (6).

**Note:** When you reinstall the bolts (6) tighten the bolts to the following torque  $120 \pm 20 \text{ N}\cdot\text{m}$  ( $89 \pm 15 \text{ lb ft}$ ). When you reinstall the bolts (7) tighten the bolts to the following torque  $105 \pm 20 \text{ N}\cdot\text{m}$  ( $77 \pm 15 \text{ lb ft}$ ).

9. Remove the twelve bolts (4) that retain the drive sprocket to the drive motor.

**Note:** When you reinstall the bolts (4) tighten the bolts to the following torque  $270 \pm 40 \text{ N}\cdot\text{m}$  ( $199 \pm 30 \text{ lb ft}$ ).

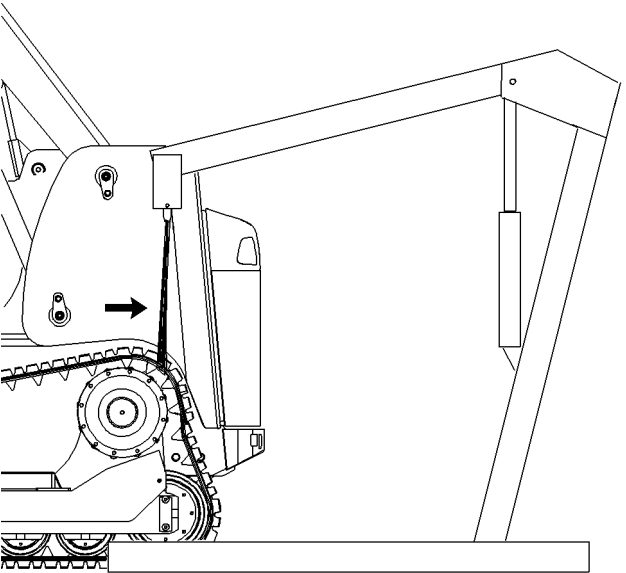


Illustration 207 g00954096

10. Use a lifting device that is suitable in order to lift the track. Lift the track in order to remove the drive sprocket. It may be necessary to insert a chock in front of the rear idler in order to prevent the track from spinning as you lift the track.

11. Remove the drive sprocket.
12. Remove the lifting device from the track. The lifting device is not required for removing the track from the machine.
13. Grasp the track on top of the drive sprocket. Pull the top of the track upward and pull the track to the outside. Slide the track past the bogies. Lift the track off the front idlers.

### Installing the Track 267B and 277B

1. Follow the steps in reverse order in order to replace the track.
2. Tighten the track to the proper tension. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

### Removing the Track 287B (S/N: ZSA1-544)

Table 30

Required Tools			
Tool	Part Number	Part Description	Qty
A	180-3033	Repair Stand Set	4

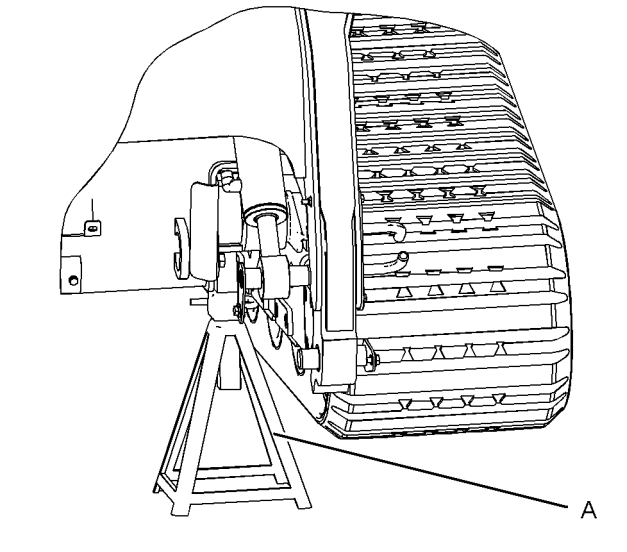


Illustration 208 g01057463

1. Use Tooling (A) to support the machine.



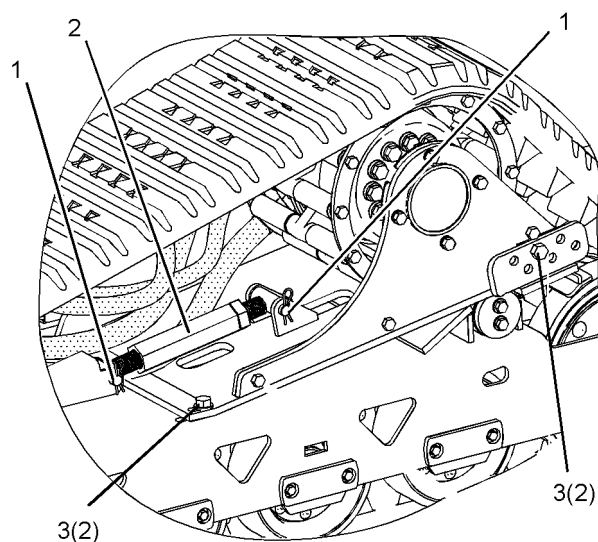


Illustration 209

g01086387

2. Remove bolts (3) on both sides of the undercarriage.
3. Release the tension on the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".
4. Remove pins (1). Remove track tensioner (2).

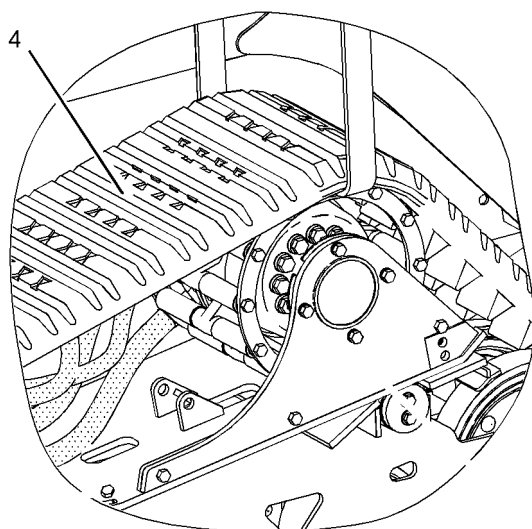


Illustration 210

g01057441

5. Use a suitable lifting device to support track (4). The weight of track (4) is approximately 136 kg (300 lb).
6. Use the track tensioner and slide the drive frame forward into the bracket.

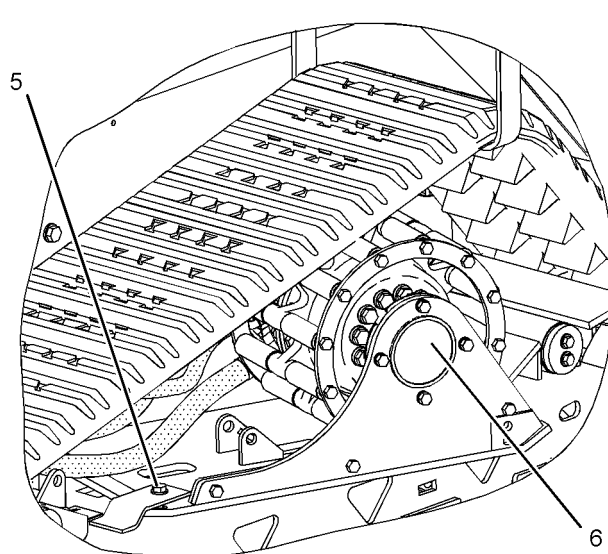


Illustration 211

g01058011

7. Fully insert one of the bolts (5) for the drive frame through the bracket and the drive frame. Remove the track tensioner. Use a suitable pry bar to swing track drive (6) away from the machine.

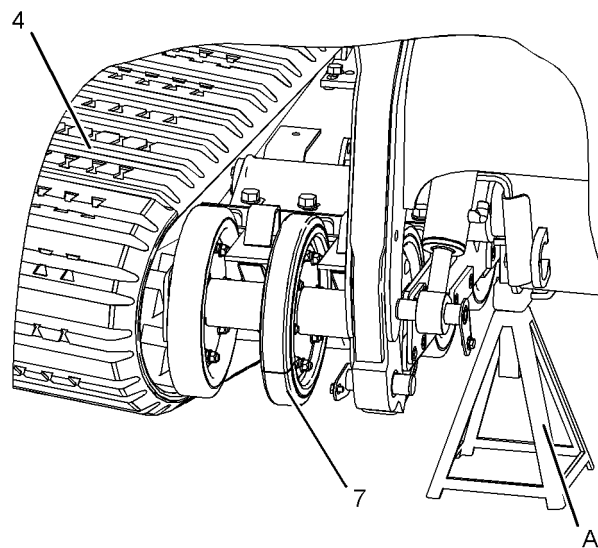


Illustration 212

g01057451

8. Lubricate front idler wheels (7) with a solution of soap and water. Use a suitable pry bar to remove track (4).

# Installing the Track 287B (S/N: ZSA1-544)

Table 31

Required Tools			
Tool	Part Number	Part Description	Qty
A	180 - 3033	Repair Stand Set	4
B	242 - 6165	Track Tool	1

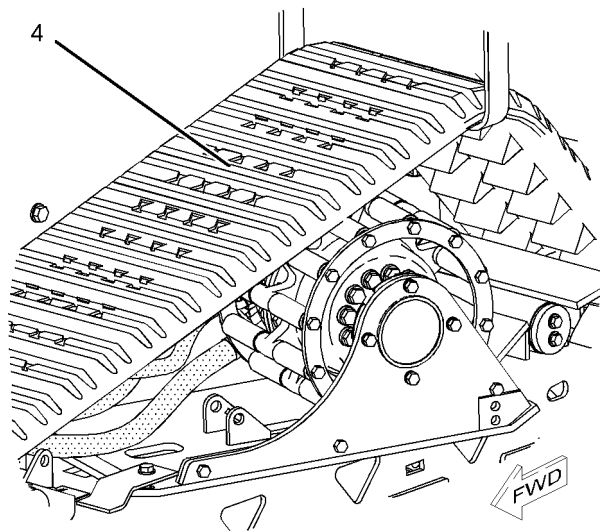


Illustration 213

g01086391

1. Use a suitable lifting device to support track (4). The weight of track (4) is approximately 136 kg (300 lb).

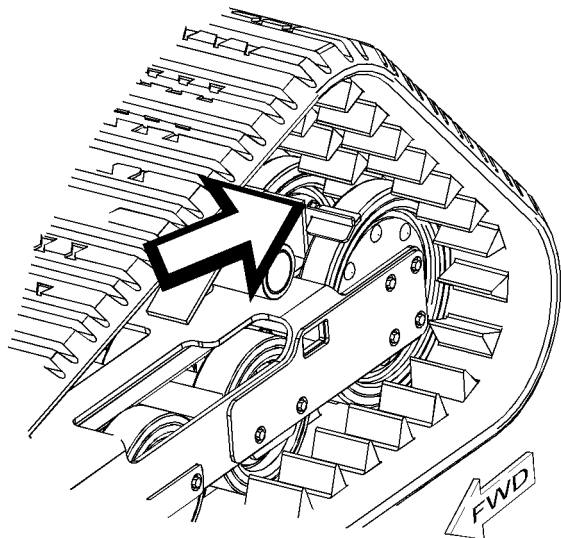


Illustration 214

g01083317

2. Install the track loosely onto the undercarriage. The first row of drive lugs at the rear portion of the track should be installed between the rear idler wheels.

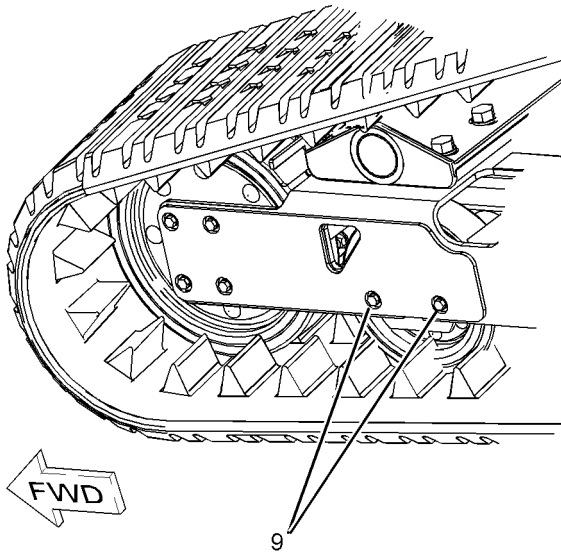


Illustration 215

g01083073

3. Remove bolts (9) in order to install Tooling (B). Removal of bolts (9), which are the retaining bolts for the bogie axle group, will release the axle's retainer plate.

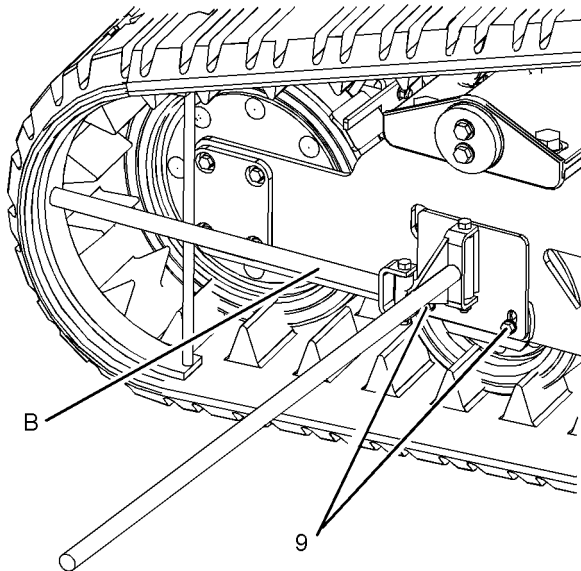


Illustration 216

g01083113

4. Install Tooling (B).
5. Lubricate the wheels and the track's drive lugs with a solution of soap and water in order to facilitate installation of the track.

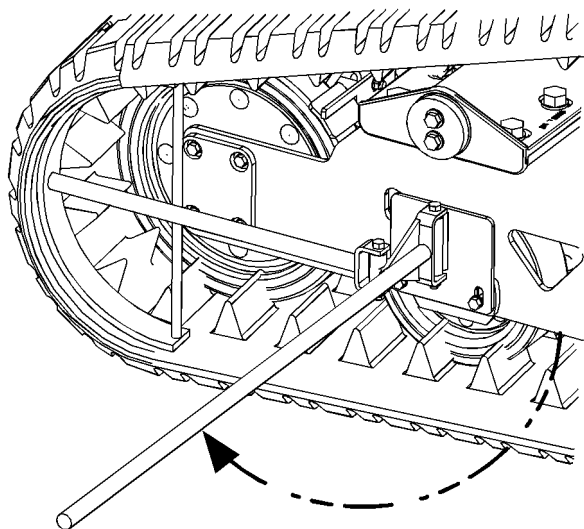


Illustration 217

g01083132

6. Pull the handle of Tooling (B) away from the machine in order to push the track over the front idler wheel.

**Note:** Multiple repositioning of Tooling (B) on the track may be required in order to completely install the track.

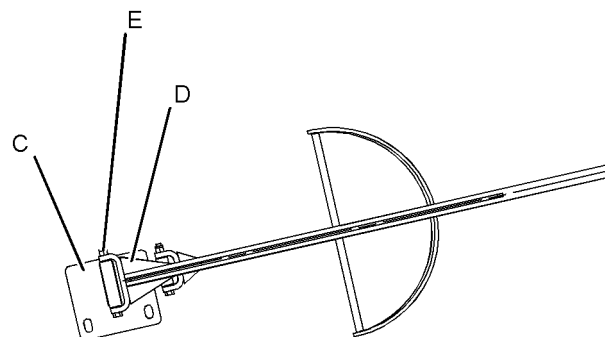


Illustration 219

g01083314

8. In order to use Tooling (B) for installation of the track on the rear idler wheels, remove mounting plate (C) by removing bolt (E) that installs handle (D) to mounting plate (C). Then, rotate mounting plate (C) for 180° and reinstall handle (D) with bolt (E). Tighten bolt (E) to a torque of  $47 \pm 9$  N·m ( $35 \pm 7$  lb ft).

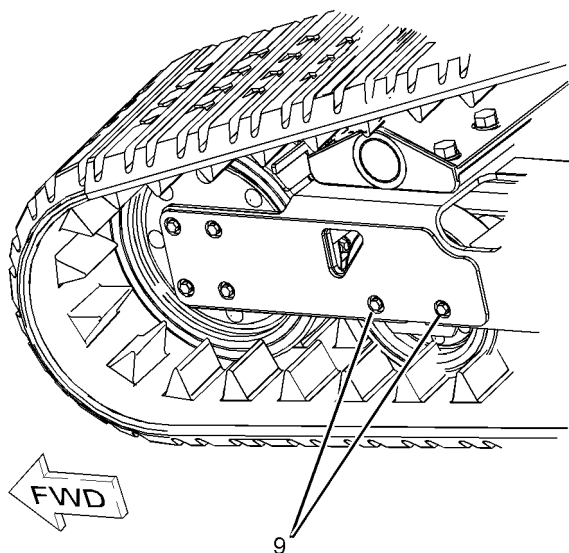


Illustration 218

g01083073

7. Remove Tooling (B). Place the axle's retaining plate in position and install bolts (9). Tighten bolts to a torque of  $50 \pm 10$  N·m ( $37 \pm 7$  lb ft).

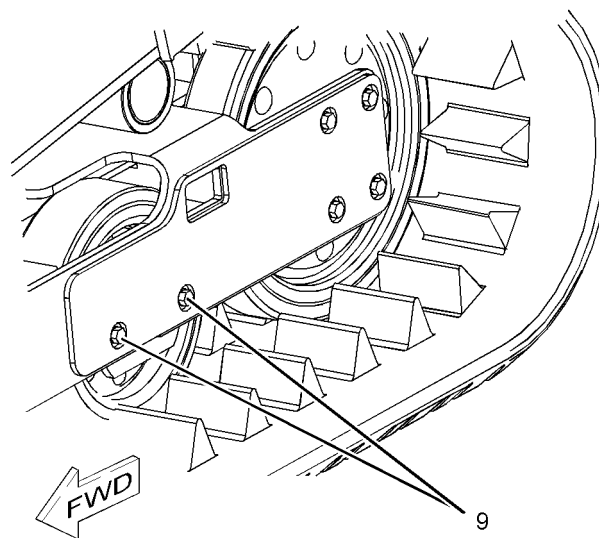


Illustration 220

g01089081

9. Remove bolts (9) in order to install Tooling (B). Removal of bolts (9), which are the retaining bolts for the bogie axle group, will release the axle's retainer plate.

10. Install Tooling (B).

**11.** Lubricate the wheels and the track's drive lugs with a solution of soap and water in order to facilitate installation of the track.

**12.** Pull the handle of Tooling (B) away from the machine in order to push the track over the rear idler wheels.

**Note:** Multiple repositionings of Tooling (B) on the track may be required in order to completely install the track.

**13.** Remove Tooling (B). Place the axle's retainer plate in position and reinstall bolts (9). Tighten bolts to a torque of  $50 \pm 10$  N·m ( $37 \pm 7$  lb ft).

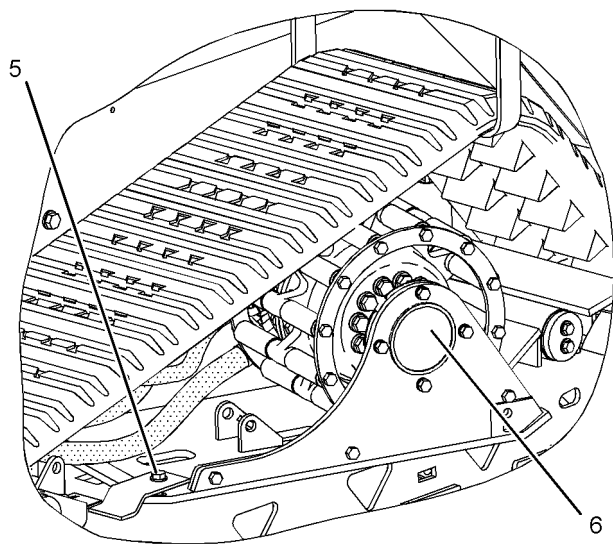


Illustration 221

g01058011

**14.** Use a suitable pry bar in order to reposition track drive (6). Remove bolt (5).

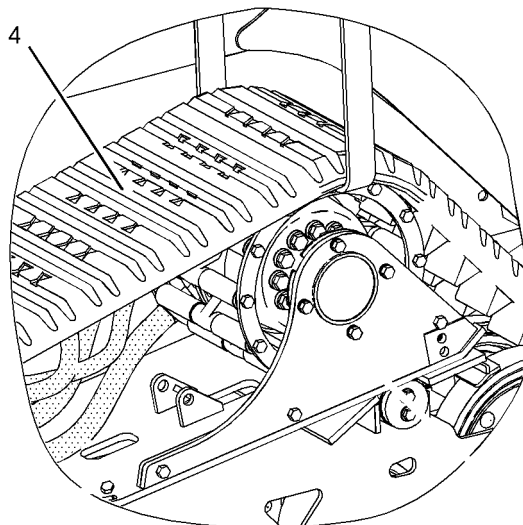


Illustration 222

g01057441

**15.** Use a suitable lifting device to support the track. Install track (4) onto the track drive.

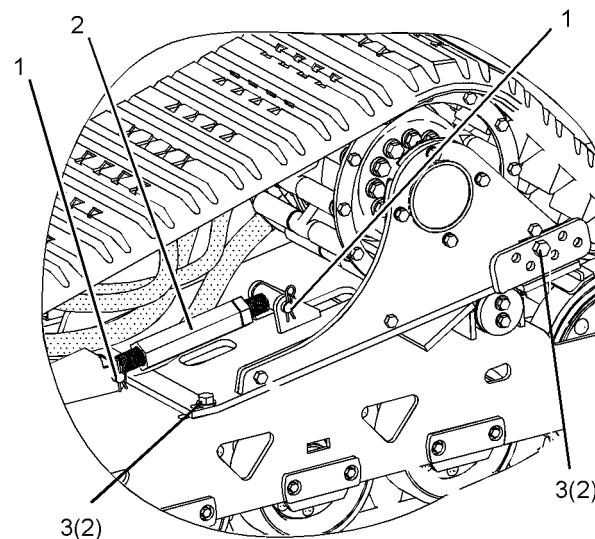


Illustration 223

g01086387

**16.** Place track tensioner (2) in position and install pins (1).

**17.** Install bolts (3) on both sides of the undercarriage.

**18.** Adjust the tension on the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

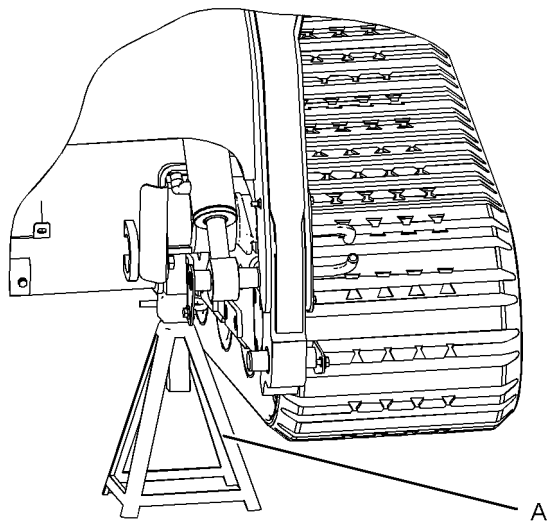


Illustration 224

g01057463

19. Remove Tooling (A) from the machine.

### Removing the Track 287B (S/N: ZSA545-Up)

Table 32

Required Tools			
Tool	Part Number	Part Description	Qty
A	180-3033	Repair Stand Set	4

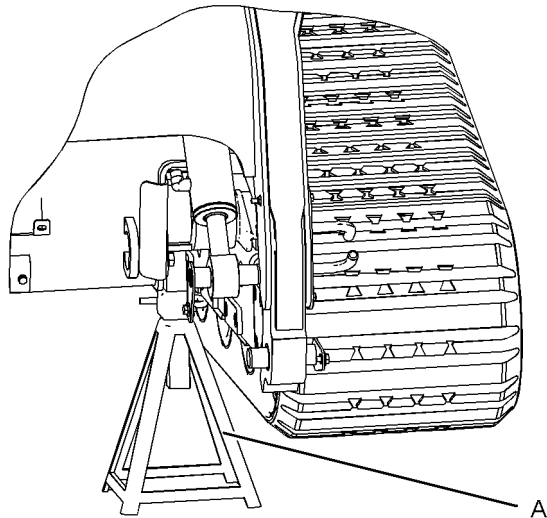


Illustration 225

g01057463

1. Use Tooling (A) to support the machine.

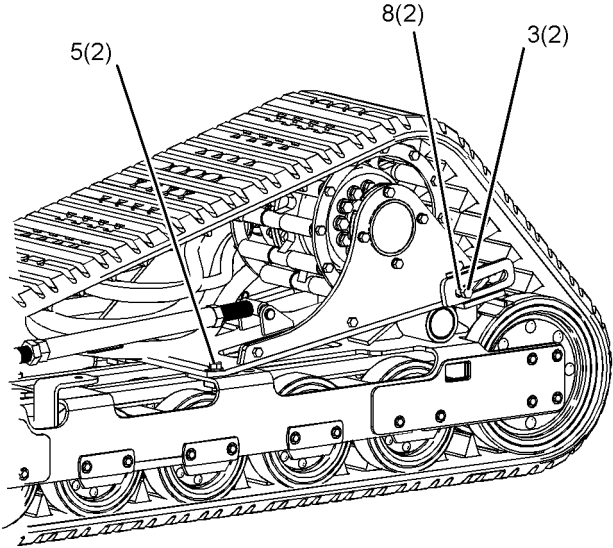


Illustration 226

g01082256

2. Remove bolt (3) and spacer (8) on both sides of the undercarriage.

**Note:** The track drive may need to be moved forward in order to provide access to bolt (3) on the inside of the track drive. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

3. Remove bolt (5) on both sides of the undercarriage.

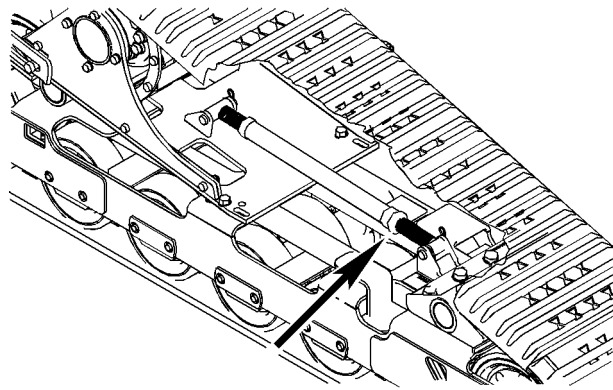


Illustration 227

g01081661

4. Loosen the jam nut and turn the adjuster in order to move the drive assembly.

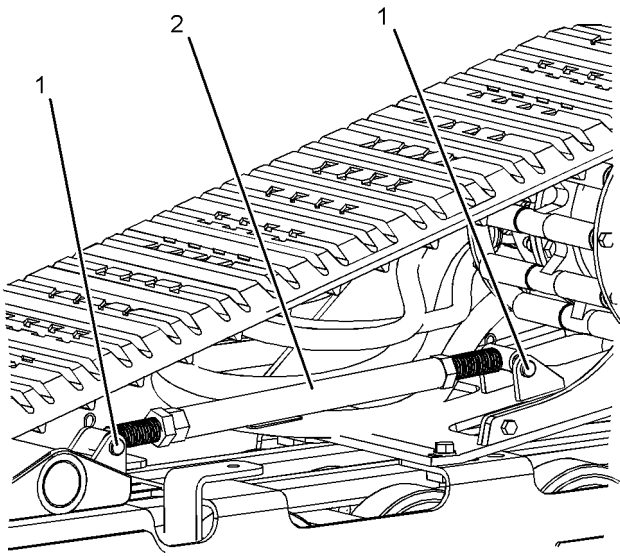


Illustration 228

g01082257

5. Use the track tensioner (2) in order to move the track drive forward onto the flat portion of the undercarriage. Remove pins (1). Remove track tensioner (2).

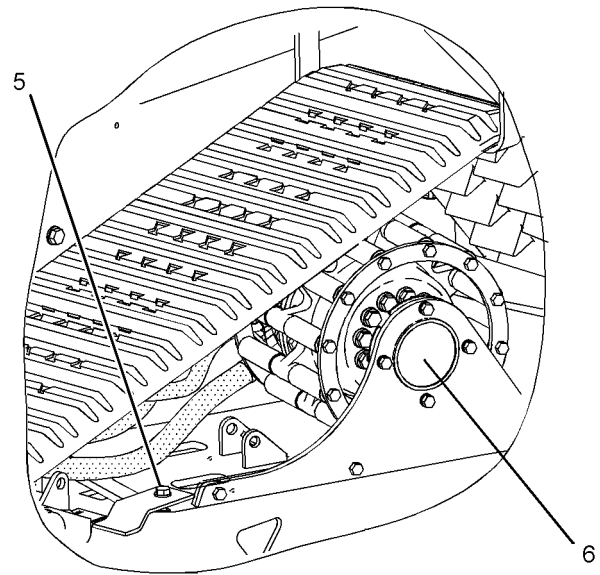


Illustration 230

g01082509

7. Align the drive frame and the bracket on the undercarriage. Install bolt (5). Use a suitable pry bar to reposition track drive (6) away from the machine.

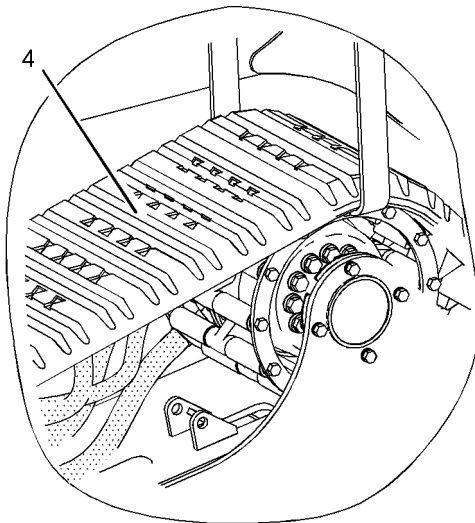


Illustration 229

g01082508

6. Use a suitable lifting device to support track (4). The weight of track (4) is approximately 136 kg (300 lb).

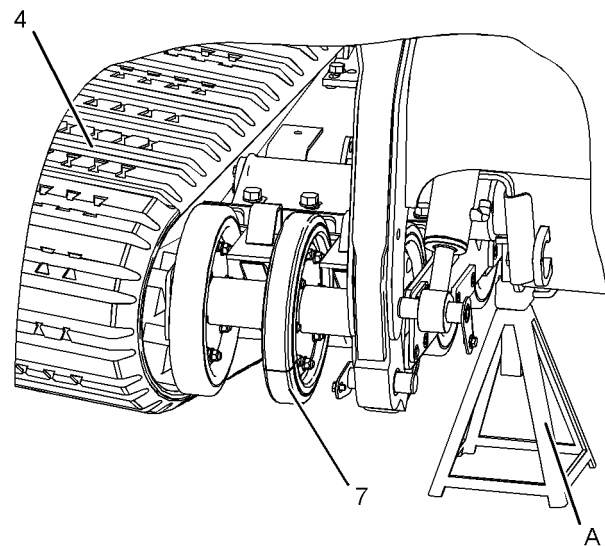


Illustration 231

g01057451

8. Lubricate front idler wheels (7) with a solution of soap and water. Use a suitable pry bar to remove track (4).

# Installing the Track 287B (S/N: ZSA545-up)

Table 33

Required Tools			
Tool	Part Number	Part Description	Qty
A	180 - 3033	Repair Stand Set	4
B	242 - 6165	Track Tool	1

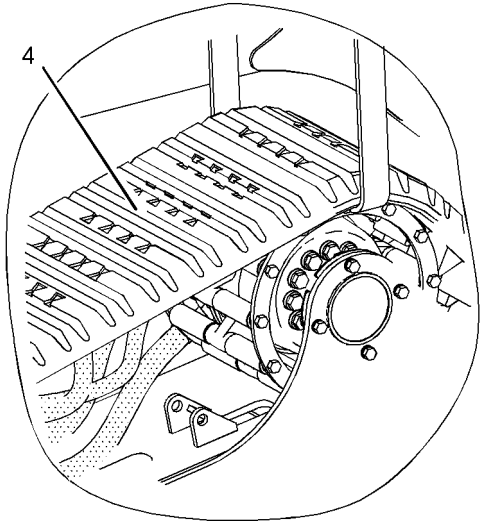


Illustration 232

g01082508

1. Use a suitable lifting device to support track (4). The weight of track (4) is approximately 136 kg (300 lb).

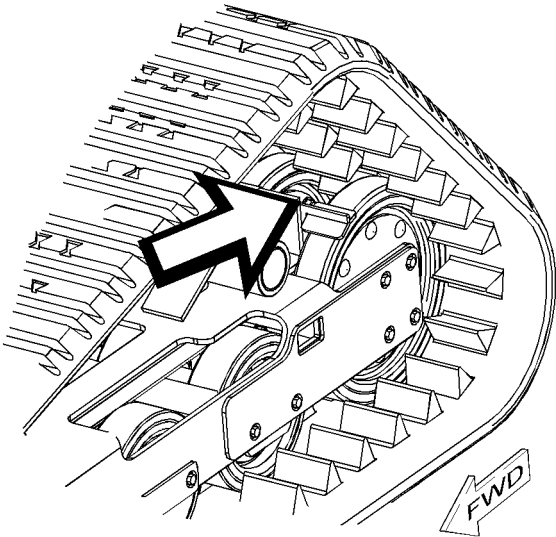


Illustration 233

g01083317

2. Install the track loosely onto the undercarriage. Position the first row of the drive lugs at the rear portion of the track between the rear idler wheels.

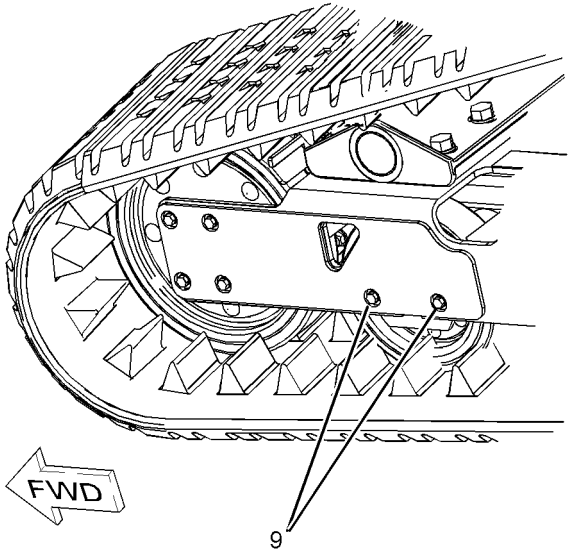


Illustration 234

g01083073

3. Remove bolts (9) in order to install Tooling (B). Removal of bolts (9), which are the retaining bolts for the bogie axle group, will release the axle's retainer plate.

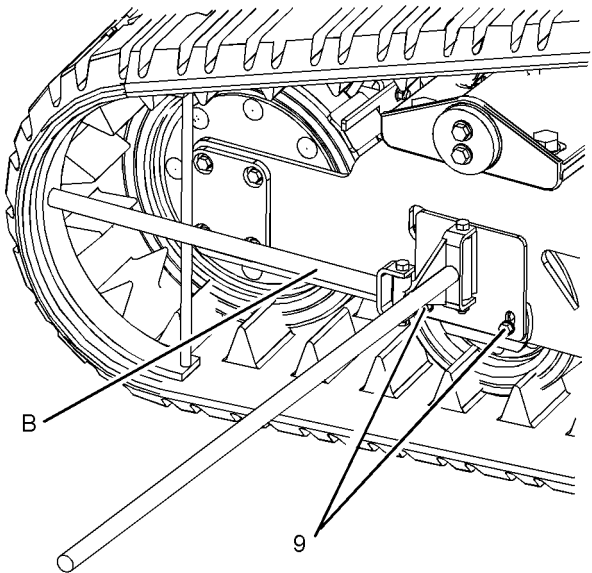


Illustration 235

g01083113

4. Install Tooling (B).
5. To facilitate installation of the track, lubricate the wheels and the track's drive lugs with a solution of soap and water.

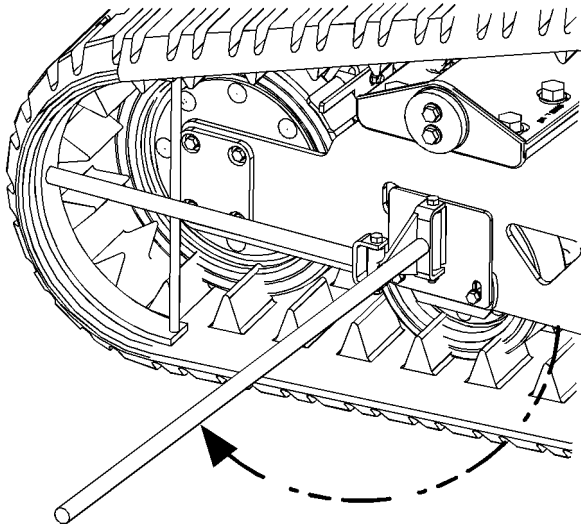


Illustration 236

g01083132

6. Pull the handle of Tooling (B) away from the machine in order to push the track over the front idler wheel.

**Note:** Multiple repositioning of Tooling (B) on the track may be required in order to completely install the track.

7. Remove Tooling (B). Place the axle's retaining plate in position and reinstall bolts (9). Tighten the bolts to a torque of  $50 \pm 10 \text{ N}\cdot\text{m}$  ( $39 \pm 7 \text{ lb ft}$ ).

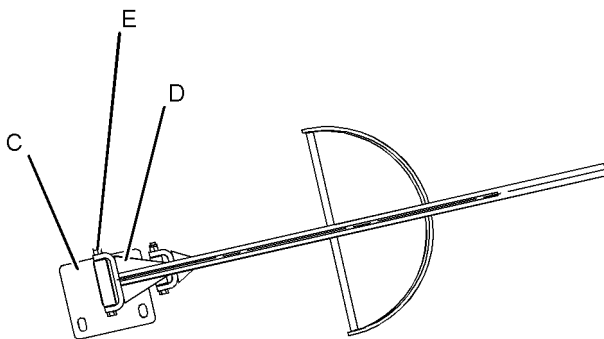


Illustration 237

g01083314

8. In order to use Tooling (B) for installation of the track on the rear idler wheels, remove mounting plate (C) by removing bolt (E) that installs handle (D) to mounting plate (C). Then, rotate mounting plate (C) for  $180^\circ$  and reinstall handle (D) with bolt (E). Tighten bolt (E) to a torque of  $47 \pm 9 \text{ N}\cdot\text{m}$  ( $35 \pm 7 \text{ lb ft}$ ).

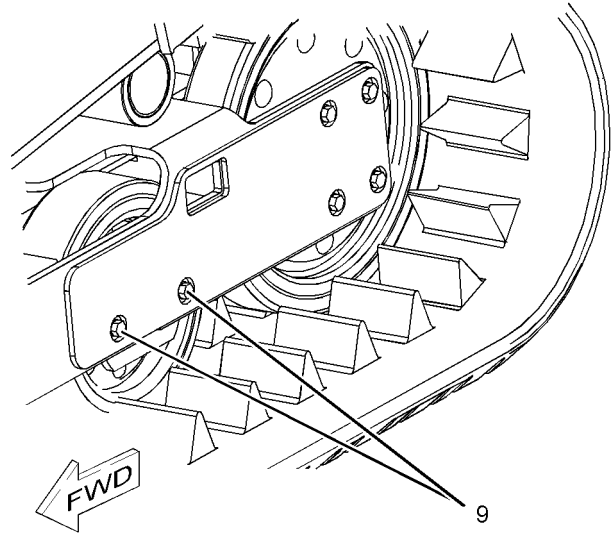


Illustration 238

g01089081

9. Remove bolts (9) in order to install Tooling (B). Removal of bolts (9), which are the retaining bolts for the bogie axle group, will release the axle's retainer plate.

10. Install Tooling (B).

11. Lubricate the wheels and the track's drive lugs with a solution of soap and water in order to facilitate installation of the track.

12. Pull the handle of Tooling (B) away from the machine in order to push the track over the rear idler wheels.

**Note:** Multiple repositionings of Tooling (B) on the track may be required in order to completely install the track.

13. Remove Tooling (B). Place the axle's retainer plate in position and reinstall bolts (9). Tighten the bolts to a torque of  $50 \pm 10 \text{ N}\cdot\text{m}$  ( $39 \pm 7 \text{ lb ft}$ ).



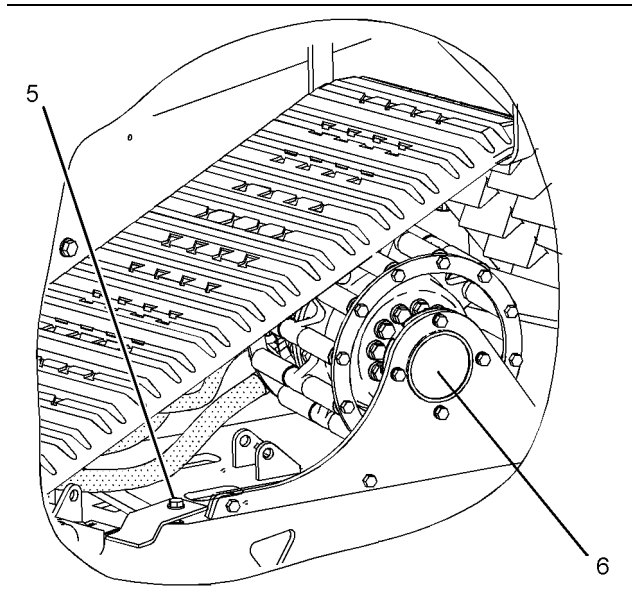


Illustration 239

g01082509

- 14.** Use a suitable pry bar in order to reposition track drive (6). Remove bolt (5).

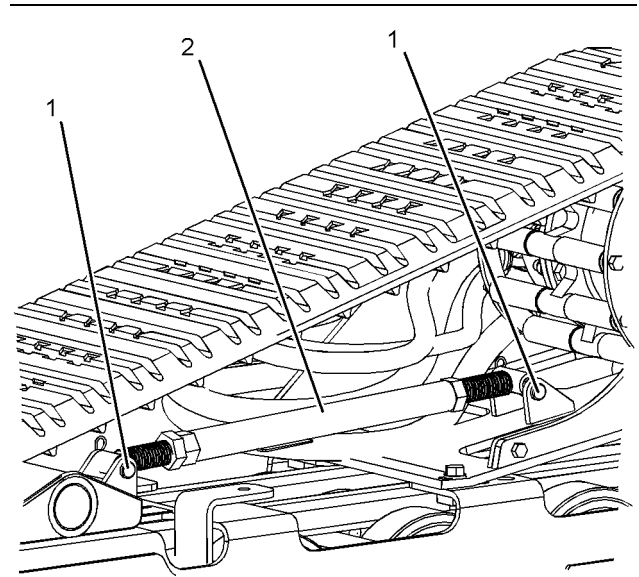


Illustration 241

g01082257

- 16.** Place track tensioner (2) in position and install pins (1).

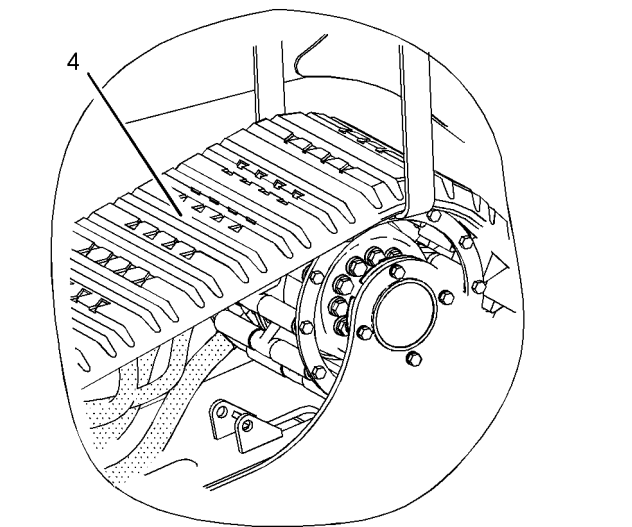


Illustration 240

g01082508

- 15.** Use a suitable lifting device to support the track. Install track (4) onto the track drive.

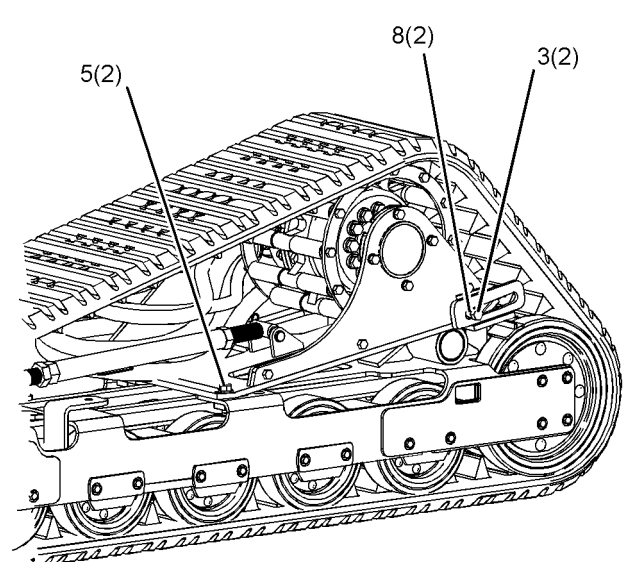


Illustration 242

g01082256

- 17.** Move the drive frame rearward until the rear bolts (3) and spacers (8) can be installed in the drive frame. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust". Install bolt (3) and spacer (8) on both sides of the undercarriage. Tighten bolts to a torque of  $215 \pm 40$  N·m ( $159 \pm 30$  lb ft).

- 18.** Adjust the tension of the track. Refer to Operation and Maintenance Manual, "Track (Rubber) - Inspect/Adjust".

19. Install bolt (5) on both sides of the undercarriage. Tighten bolts to a torque of  $240 \pm 40$  N·m ( $177 \pm 30$  lb ft).

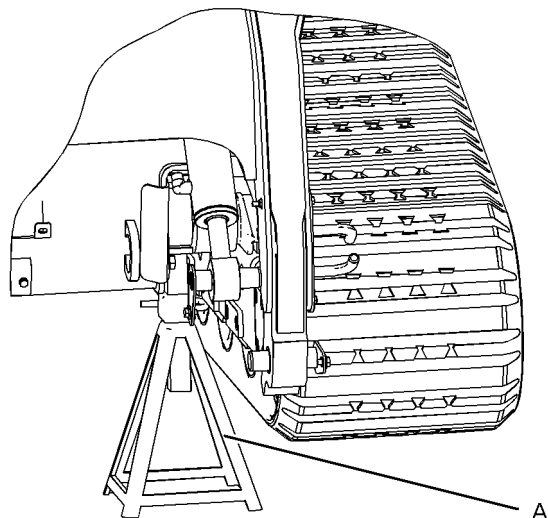


Illustration 243

g01057463

**Note:** For detailed instructions about track installation, refer to Disassembly and Assembly , RENR4884, "Track (Rubber) - Remove and Install".

20. Remove Tooling (A) from the machine.

i01982402

## 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.

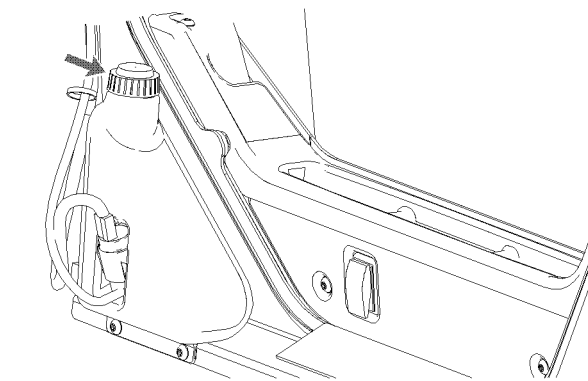


Illustration 244

g01027404

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

Fill the reservoir with window washer solvent.

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.

i01981264

## 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.

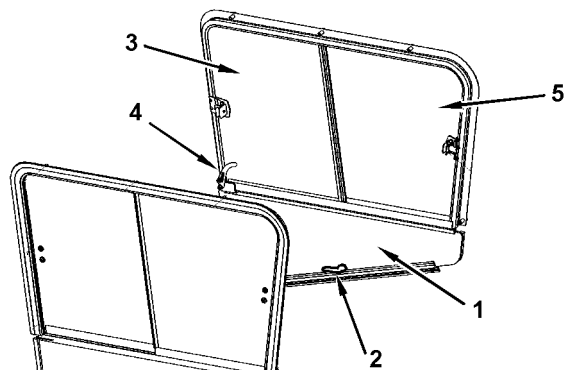


Illustration 245

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.

i02728710

## Work Tool - Lubricate

SMCS Code: 6700-086

### Multipurpose Bucket

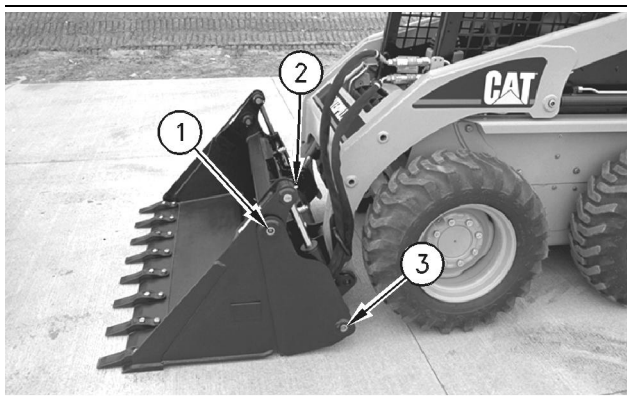


Illustration 246

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

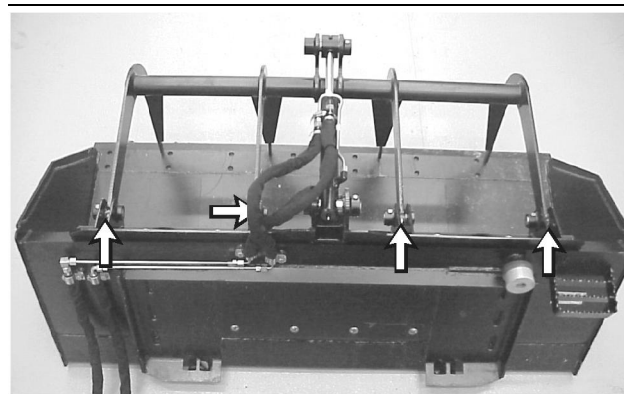


Illustration 247

g00647980

Apply lubricant to the four grease fittings for the grapples.

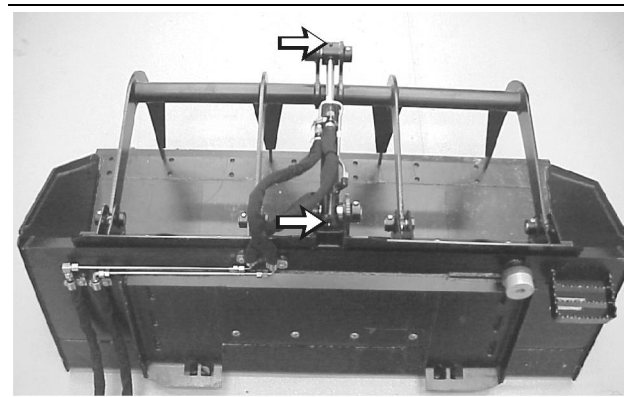


Illustration 248

g00647988

Apply lubricant to the two fittings for the grapple cylinder.

There are six grease fittings.

## Industrial Grapple Tools

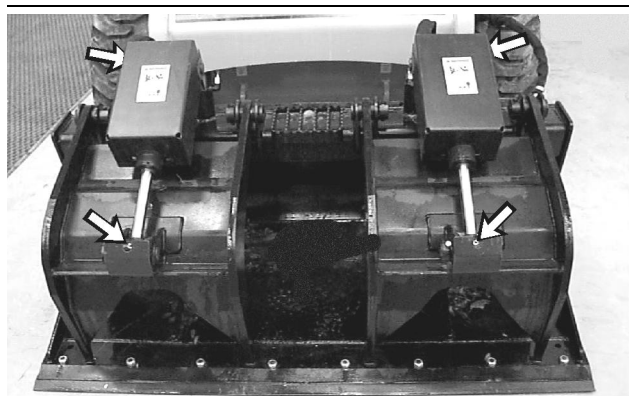


Illustration 249

g00645995

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



Illustration 250

g00646004

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

There are eight grease fittings.

## Grapple Rake

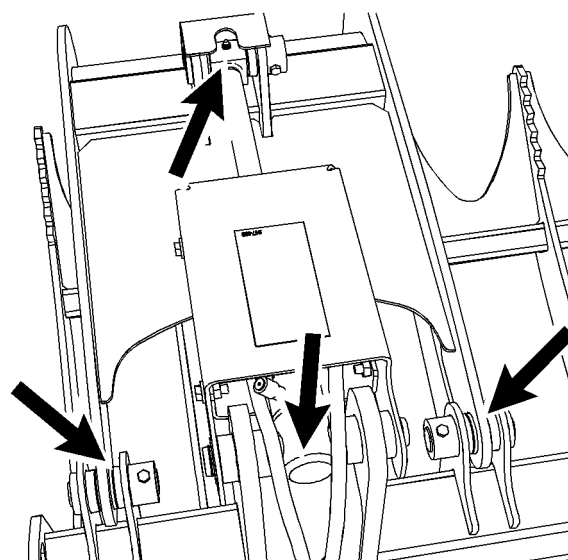


Illustration 251

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

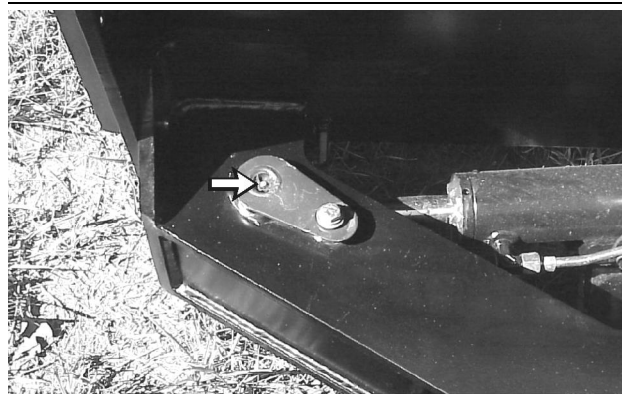


Illustration 252

g00648033

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

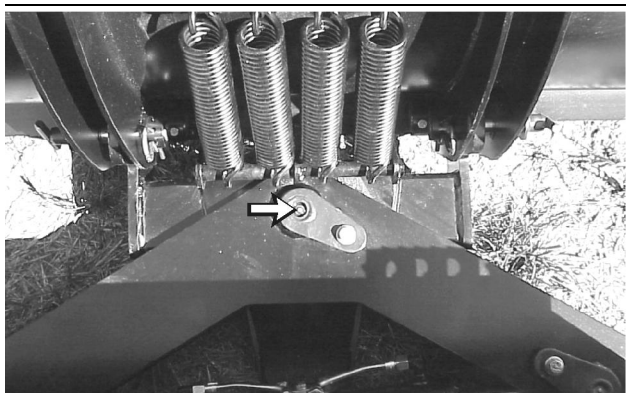


Illustration 253

g00648037

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



Illustration 254

g00648038

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

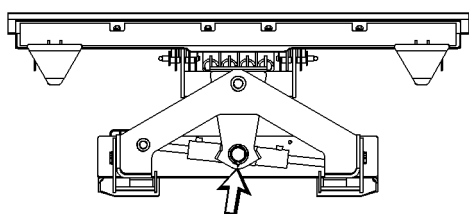


Illustration 255

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

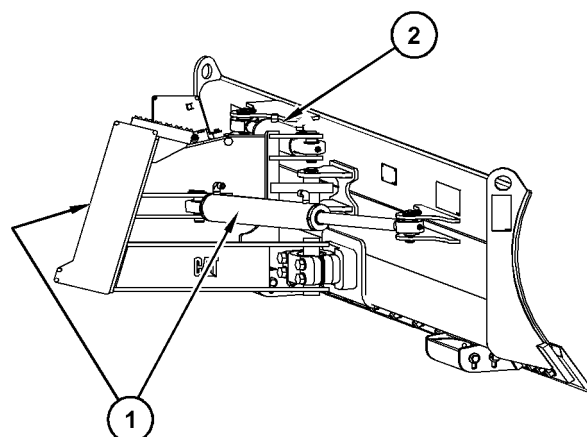


Illustration 256

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

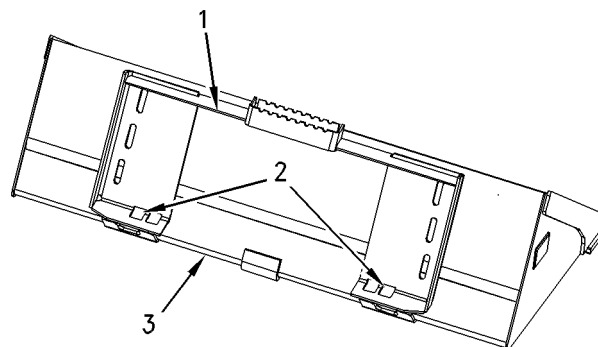


Illustration 257

g00925058

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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.