Section 5.1

Preventive Maintenance Schedule

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General

NOTICE

You must read and understand the warnings and basic safety rules, found in Group-1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

Use recommended protective clothing and safety devices such as gloves, safety boots, safety hat, reflective vests and eye, ear and respiratory protection as required by job conditions.

Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.

Keep your head, hands, and feet clear of all moving parts.

Before performing maintenance or repairs on the machine, consult this manual and follow the recommended procedures.

Keep yourself, all objects and tools away from moving fan blades. Fan blades will cut or throw any object dropped or pushed into them.
Support components when working beneath them. Do not depend on hydraulic cylinders for support. A component may fall if a control is moved or a hose breaks.

At operating temperature, the radiator and hydraulic tank are HOT and under pressure. Allow these components to cool to the touch before servicing.

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

Pressurized air can cause personal injury. When using pressurized air for cleaning, wear protective clothing, face shield and shoes.

Pressure can be maintained in system circuits long after the engine and pumps have been shut down. Release trapped pressure in hydraulic, fuel, and cooling system lines before performing any maintenance or repair procedures.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.
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* Under extremely dusty conditions, the air cleaner filters may require changing more frequently.
** Under extremely wet and muddy conditions, the axle articulation bearings and drive shaft components will require daily lubrication.
### Lubrication Points Diagram - TF800

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<td>7) Loader Grapple Pivot</td>
<td>5.2</td>
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<tr>
<td>8) Loader Grapple (See Manufacturer's Manual)</td>
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<td>9) Floating Bunk Pivot</td>
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<td>15) Swing Bearing Race</td>
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<td>16) Drive Shaft U-Joints &amp; Carrier Bearings **</td>
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<td>19) Throttle Cable &amp; Linkage</td>
<td>5.5</td>
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<td>Light Oil</td>
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</table>

Use a good quality grease containing at least 5-6% Molybdenum Disulfide by volume at all lubrication points unless otherwise specified. TIMBCG recommends using Lubriplate #176.

** Under extremely wet and muddy conditions, the axle articulation bearings and drive shaft components will require daily lubrication.
### Lubrication Points Diagram - Optional Clambunk

<table>
<thead>
<tr>
<th>Section #</th>
<th># Fittings</th>
<th>Lubricant</th>
<th>Hour Interval</th>
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<td>Lubriplate #176</td>
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<tr>
<td>3) Clambunk Cylinder Rod End Pivot</td>
<td>5.2</td>
<td>2</td>
<td>Lubriplate #176</td>
</tr>
<tr>
<td>4) Clambunk Tilt Pivot</td>
<td>5.2</td>
<td>2</td>
<td>Lubriplate #176</td>
</tr>
<tr>
<td>5) Clambunk Bearing Race</td>
<td>5.2</td>
<td>4</td>
<td>Lubriplate #176</td>
</tr>
</tbody>
</table>

Use a good quality grease containing at least 5-8% Molybdenum Disulfide by volume at all lubrication points unless otherwise specified. TIMCO recommends using Lubriplate #176.
Daily Walk-Around Inspection

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General

NOTICE

You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

It is extremely important to perform a daily walk-around inspection of the machine before beginning to work. All preventive maintenance, especially a simple daily inspection, will ensure trouble-free operation and a long expected service life for your equipment.

TIMBCO’s daily walk-around inspection can be divided into three groups; Visual Inspection, Lubrication and Component/System Checks.

Visual Inspection

A general visual inspection of the machine should be the first procedure performed before the start of the workday or shift. Check for leaking fluids, damaged or loose components, unusual wear, accumulation of flammable debris, etc. Specific examples are given below.

Check For Loose Or Missing Fasteners

Inspect for any loose or missing bolts. Especially the tapered hub retaining bolts, pin retaining bolts and the bolts securing the access panels under the engine and pump compartments. See Figures 1, 2 and 3. Replace any missing bolts immediately.
Check Hydraulic Hoses

Inspect hydraulic hose assemblies for leaks, damaged fittings and worn exterior. Do not use your hands to check for hydraulic leaks. Hydraulic oil under pressure can penetrate body tissue and cause serious injury or possible death. Use a piece of cardboard or other material as a deflector to detect leaks. Replace any problem hose before beginning work.

Clean Flammable Debris From Exterior Surfaces

**NOTICE**

Keep flammable forestry debris and other trash from collecting around the turbo and exhaust areas where most fires start. KEEP THESE AREAS CLEAN.

Forest debris such as brush, leaves and needles can easily collect in and around the machine. This is not only an eyesore, but a real fire hazard. Clean away all forest debris and any oily rags or other trash that may accumulate around the machine, especially around the engine’s exhaust and turbo areas where most fires start.
Lubrication

Use a Good Quality grease containing at least 5-6% Molybdenum by volume, at all lubrication points. TIMBCO recommends using Lubriplate #176. Grease meeting the above requirement has a higher rated load pressure than a typical multi-purpose EP grease.

Add grease at the following points until it appears at the pivot area.

**Boom, Cylinder & Frame Articulation Pivots**

*Figure 4: Main Boom Cylinder Base End Pivot*  
(2 Fittings)

*Figure 5: Main Boom Pivot*  
(2 Fittings)

*Figure 6: Main Boom Cylinder Rod End*  
(1 Fitting Ea.)

*Figure 7: Stick Boom Cylinder Base End Pivot*  
(1 Fitting)

*Figure 8: Stick Boom Pivot*  
(2 Fittings)
DO NOT over-grease the frame articulation bearing. If the bearing lip seal is pushed out it will allow dirt and other contaminates into the bearing.

The frame articulation bearing is provided with 5 grease fittings. See Figure 13. Pump 1-3 strokes grease into each fitting. DO NOT over-grease.
Swing Bearing Ring Gear

The swing bearing ring gear is provided with a grease cup located in the cab. See Figure 14. Pump 5-6 strokes grease into the cup. To ensure uniform distribution of grease, rotate the bearing 90° and repeat greasing. Continue this procedure for a complete revolution.

Floating Bunk Pivot

The floating bunk pivot is provided with 2 grease fittings. See Figure 15. When equipped with the optional clam bunk, these pivots do not require grease.
Optional Clambunk Pivots

Figure 16: Clambunk Arm Pivot
(4 Fittings, 2 Each Arm Pivot Pin)

Figure 17: Clambunk Cylinder Base End
(2 Fittings, 1 Each Cylinder)

Figure 18: Clambunk Cylinder Rod End
(2 Fittings, 1 Each Cylinder)

Figure 19: Clambunk Tilt Pivot
(2 Fittings, 1 Each Pivot Point)

Figure 20: Clambunk Bearing Race
(4 Fittings)

The clambunk bearing race is provided with 4 grease fittings. Apply 5-6 strokes of grease to each fitting. See Figure 20.
Component/System Checks

Check Engine Oil Level

Never operate the machine with the engine oil level below or above the “FULL” range on the dipstick. Damage to the engine could result.

Position the machine on a level surface for the most accurate measurement. Shut down engine and wait at least 5 minutes before checking oil level.

Engine oil level check and fill points are located on the left side of the engine behind the perforated swing-out engine guard. See Figures 21 & 22. Oil level should be within the “FULL” range on the dipstick. Add oil if required (See Appendix A for capacities and oil recommendations).

Drain Water/Sediment At Primary Fuel Filter

Locate the water/sediment drain valve on the primary fuel filter. See Figures 23 & 24.

1. Turn drain valve COUNTER-CLOCKWISE by hand until fuel begins to drain. Drain fuel until it flows clear.

2. Turn drain valve CLOCKWISE by hand to close. Do not use tool to tighten the drain valve. Hand-tighten only to prevent damage.
Check Engine Coolant Level

For the most accurate measurement, check engine coolant level with the engine cold.

Coolant level is checked at the radiator overflow bottle mounted on the inside of the perforated swing-out engine guard, see Figure 25. Coolant level should be between the “HOT” and “COLD” marks on the bottle. If required, add coolant.

Adding Engine Coolant At Overflow Bottle

1. Allow the engine and cooling system to cool down before adding coolant.

2. Remove overflow bottle cap slowly to allow any trapped pressure to escape. See Figure 26.

3. Prepare a mixture of 50% low silicon ethylene glycol base antifreeze and 50% distilled water. If distilled water is not available, use clean tap water.

Avoid skin contact with used antifreeze. Skin contact with used antifreeze can cause skin disorders or other personal injury.

Wait until engine coolant temperature drops to 120°F (50°C) before removing the radiator cap. Hot coolant released under pressure can cause serious personal injury.

Do not fill the overflow bottle to the “HOT” mark with the engine cold. The coolant volume will expand as the engine reaches operating temperature.

If only a small amount of coolant is required it can be added at the overflow bottle.

At operating temperature, the radiator and hydraulic tank are HOT and under pressure. Allow these components to cool to the touch before servicing.

Loosen radiator cap slowly to release pressure.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.
**NOTE:** Check the engine manufacturer’s manuals supplied with the machine for special instructions regarding coolant mixture and addatives.

4. Add coolant mixture until level is between the “HOT” and “COLD” marks on bottle.

5. Install overflow bottle cap.

**Adding Engine Coolant At Radiator**

If the overflow bottle is dry, add coolant at the radiator fill spout.

1. Allow the engine and cooling system to cool down before adding coolant.

2. The radiator fill spout is located under an access cover on the engine compartment ROPS panel.

3. Loosen both star knobs so the access cover can be rotated out of the way to expose the radiator fill spout cap. See Figure 27.

Loosen radiator cap slowly to release pressure.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.

**CAUTION**

Avoid skin contact with used antifreeze. Skin contact with used antifreeze can cause skin disorders or other personal injury.

Wait until engine coolant temperature drops to 120°F (50°C) before removing the radiator cap. Hot coolant released under pressure can cause serious personal injury.

**NOTICE**

Do not overflow the radiator. Fill radiator until coolant level is above the core and about 2 - 3” (5 - 8cm) below the fill spout. The coolant volume will expand as the engine reaches operating temperature.
4. Prepare a mixture of 50% low silicon ethylene glycol base antifreeze and 50% distilled water. If distilled water is not available, use clean tap water.

**NOTE:** Check the engine manufacturer’s manuals supplied with the machine for special instructions regarding coolant mixture and addatives.

5. Fill radiator until coolant level is above the core and about 2 - 3” (5 - 8cm) below the fill spout. Do not overfill.

6. Replace radiator cap.

### Check Radiator/Oil Cooler Fins

**CAUTION**

Fire Hazard. Do not use diesel fuel or gasoline to clean parts. Use compressed air or a water soluble cleaning agent only.

**NOTICE**

The machine is equipped from the factory with “sucker” engine fan and a screen installed behind the radiator guard to further protect the radiator and oil cooler fins. DO NOT operate the machine without this screen.

The radiator/oil cooler fins must be kept clean to prevent engine and hydraulic system overheat problems. The radiator/oil outer core is located behind the louvered swing-out radiator guard at the front of the machine. See Figure 29.

1. Remove star knobs and open the louvered swing-out radiator guard.

2. Check radiator/oil cooler fins for dirt and debris. If required, clean the fins with compressed air under 30 PSI (205 kPa). Compressed water or steam can also be used.

3. Remove the radiator screen from the back side of the radiator guard. See Figure 30. Shake the screen to remove dirt and debris. Compressed air, compressed water and steam can also be used to clean the screen.

4. Re-install screen.
Check Fuel Level

The fuel tank is located directly behind the cab and swings out to allow access to the hydraulic and electrical components mounted next to it. The fuel fill spout and fuel level dipstick are located on top of the tank and protected by a wrap-around guard. See Figure 31.

1. Clear all dirt and debris from around the fuel neck so they are not accidentally knocked into the open tank.

![Figure 31: Fuel Tank Fill Spout](image)

All fuels, most lubricants and some coolant mixtures are flammable. Do not smoke while refueling while near refueling operations. Keep all fuels, lubricants and coolant mixtures away from open flames.

![Figure 32: Fuel Cap (Typical)](image)

2. Lift the handle on the fuel cap to remove. See Figure 32.

![Figure 33: Fuel Tank Dipstick](image)

3. The fuel level dipstick is located under the fuel cap. Lift dipstick to check fuel level in tank. See Figure 33.

4. Add fuel as required.

![Figure 33: Fuel Tank Dipstick](image)

Fuel spilled or leaked onto hot surfaces or electrical components can cause a fire.
5. Before installing the fuel cap, check the strainer in the fuel neck. See Figure 34. If it is clean, replace fuel cap.

6. If the fuel neck strainer needs cleaning, remove the four 1/2” bolts securing the access cover to which the fuel neck is mounted. Lift the access cover clear being careful not to knock dirt and debris into the open tank.

7. Remove the snap ring securing the strainer to the access cover. Clean the strainer with compressed air, below 30 PSI (205 kPa), only. Do not use water or steam.

8. Re-install access cover. Make sure the cover’s o-ring is seated properly.

9. Install fuel cap.
Check Fire Extinguisher

Maintain a charged fire extinguisher on the machine AND KNOW HOW TO USE IT.

Check the charge condition of the fire extinguisher. The charge indicator gauge pointer should be in the green zone. See Figure 35. If not, have fire extinguisher recharged or replaced before beginning work.

Check Air Cleaner Restriction Indicator

NOTICE

Service the air cleaner only when the engine is shut down. Dirt and debris can enter the engine and cause damage if the engine is operated with the air cleaner filters removed.

The air cleaner is equipped with a filter restriction indicator visible from the operator’s seat with the main boom raised. See Figure 36. The air cleaner filters need replacing if the indicator’s colored piston has popped out and is visible when the engine is running at high idle.

Replacing Air Cleaner Filters

1. Shut down the engine.

2. Loosen the wing nut securing air cleaner canister cover. Remove cover. See Figure 37.
3. Remove the wing nut securing the primary filter. Remove filter from the air cleaner housing. See Figure 38.

4. Remove the wing nut securing the secondary filter. Remove filter from the air cleaner housing. See Figure 39.

5. Cover the engine air intake opening and wipe away any dust from inside the air cleaner housing and cover.

6. The secondary filter can generally be used longer before replacement than the primary filter. Inspect the secondary filter and replace it if required.

7. Uncover the engine air intake opening.

8. Re-install the secondary filter, primary filter and air cleaner housing cover. Secure wing nuts finger tight. Do not use a tool to tighten the wing nuts or damage to the threads could result.

9. Reset the air filter restriction indicator by pushing in the reset button. See Figure 40.

10. Start the engine and run at high idle. If the filter restriction indicator's colored piston pops out and is visible again, or exhaust smoke is still black, shut down the engine and replace the secondary filter.
**Check Hydraulic Oil Level**

**NOTICE**

Low hydraulic oil level can expose suction filters to air and cause catastrophic damage to the pumps. Keep hydraulic oil level in green zone of sight gauge at operating temperature.

Position the machine on a level surface for the most accurate measurement.

The hydraulic oil tank is equipped with a sight gauge visible from the operator’s seat with the main boom raised. See Figure 41. The oil level should be kept within the green zone of the sight gauge at operating temperature, and within the yellow zone when cold. Add oil if required. See tables in Appendix A for oil type recommendations.

**Adding Hydraulic Oil**

**WARNING**

Hydraulic oil tank under pressure. Escaping oil can cause serious injury. Vent tank before removing cap or servicing hydraulic system.

**NOTICE**

At operating temperature, the radiator and hydraulic tank are HOT and under pressure. Allow these components to cool to the touch before servicing.

Loosen radiator cap slowly to release pressure.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.

Hydraulic oil straight from the drum may contaminate the hydraulic system resulting in possible pump failure. Use pre-filtered hydraulic oil only.

Added hydraulic oil must pass through the return filters. If not filtered, hydraulic system contamination and possible pump failure may result. Never add oil through the hydraulic tank access cover.

Release boost pressure from the tank by opening the T-valve at the base of the swing out pump guard. See Figure 42. This must be done before adding oil or working on the hydraulic system.

---

Figure 41: Hydraulic Oil Sight Gauge

Figure 42: Venting the hydraulic tank
Hand Pump - Hydraulic oil can be added with a hand pump at a quick-coupling provided on the return oil manifold located on the left side of the engine. See Figure 43. The mating female quick-coupling is shipped with the machine in the Up-Time Kit located under the operator’s seat. Add oil until level in the tank is within green zone of sight gauge at operating temperature or within yellow zone when cold.

Electric Fill Pump - An electric fill pump is available as an option. To add hydraulic oil, place the fill pump’s suction hose into a container filled with pre-filtered oil. Press and hold the fill pump actuation button located near the return oil manifold on the left side of the engine. See Figure 44. Add oil until level in the tank is within green zone of sight gauge at operating temperature or within yellow zone when cold.
Check Instrument Panel Gauges

NOTICE

There is an audible warning alarm that will sound an alert if a systems monitoring gauge reads a possible system problem, or if the hydraulic oil level drops below the oil level sensor in the tank.


With the engine running at operating temperature, check all system monitoring gauges to ensure they are working properly. See Figure 45.

- **Return filter back pressure**: 5 - 15 PSI (35 - 105 kPa)
- **Voltmeter**: In green zone
- **Engine oil pressure**: Varies
  - @ Cold idle: 70 - 80 PSI (480 - 550 kPa)
  - @ Hot idle: 30 - 40 PSI (210 - 275 kPa)
  - @ Hot full throttle: 60 - 70 PSI (415 - 480 kPa)
- **Hydraulic oil temperature**: +100°F (54°C) Above ambient temperature
- **Engine water temperature**: 160°F - 210°F (70°C - 99°C)
Section 5.3

Preventive Maintenance - 50 Hours Of Operation

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Run Air Conditioner ........................................................... 5.3.7

Check Cab Window Emergency Escapes:
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  Front Kick-Out Window ..................................................... 5.3.9
You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

Perform the following maintenance items after every 50 hour interval of operation.

**Test Hydraulic Interrupt Operation**

**WARNING**

Do not bypass, remove or tamper with the hydraulic interrupt system. Serious personal injury could occur while operating the machine with the cab door open.

All TIMBCO Hydro-Skidders are equipped with a hydraulic interrupt system that only allows operation of the machine when the cab door is closed.

A normally-open electrical switch is located at the base of the cab door. See Figure 1. When the cab door is open, the electrical power supply is cut off to all electrical machine controls as well as a solenoid valve that supplies pilot pressure to all hydraulic machine controls.

Use the following procedure to test the hydraulic interrupt system:

1. Sit in the operator’s seat and fasten the safety belt.
2. Be sure the cab door is fully open.
3. Slowly activate one of the hand controls. The controls should not respond with the cab door open.

If the controls do respond with the cab door open, have the hydraulic interrupt system repaired before beginning to work.

**Lubricate Swing Bearing Race**

The swing bearing ball race is provided with a remote grease fitting in the operator’s cab. This location allows the operator to grease the swing bearing race while rotating the upper turntable for better grease distribution. See Figure 2. Three additional fittings are provided around the exterior of the bearing race as auxiliary grease points.

1. Operate the swing function at medium speed while pumping grease into the bearing race. Make three complete revolutions.
2. Reverse direction of swing and continue to pump grease into the bearing race for three complete revolutions.
Follow the procedure below. If the swing bearing race must be greased from the exterior auxiliary fittings.

1. Add grease at each fitting until grease appears at the lip seal. See Figure 3.

2. Rotate upper turntable 45° to either side. Rotating the upper turntable ensures the grease is distributed evenly.

3. Add grease at each fitting again until grease appears at the lip seal.

**Check Pump Drive Transmission Oil Level**

2. Locate the pump drive transmission oil level dipstick just ahead of where the wheel drive pump mounts to the pump drive transmission housing. See Figure 5.

The oil level should be within the FULL range on the dipstick. If required, add SAE 75W-90 synthetic oil that meets MIL-L-2105 specs. A large oil fill port is located just above the dipstick.

3. Close and secure the swing-out pump compartment guard.

1. Open the swing-out pump compartment guard to gain access to the pump drive transmission. See Figure 4.
Check Lohmann Swing Gearbox Oil Level

Locate the Lohmann swing gearbox oil level dipstick. See Figure 6.

The oil level should be within the FULL range on the dipstick. If required, add SAE 75W-90 synthetic oil that meets MIL-L-2105 specs. Fill the gearbox through the dipstick port.

Check Axle Differential Oil Level

1. Position machine on a level surface.

2. Axle differential oil is added and checked at the dipstick provided. See Figure 7.

   The rear axle dipstick is located under the axle differential access cover. See Figure 8. The front axle dipstick can be reached through the pedestal access covers. See Figure 9.

3. If required, add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the FILL port until the oil level reaches the top mark on the dipstick.
Check Bogie Drive Housing Oil Level

1. Position machine on a level surface so that the bogie drive housings are horizontal (level across the tops of the wheels).

2. Remove the LEVEL plug shown in Figure 10. The oil level should be even with the bottom of the port hole.

3. If required, remove the FILL plug and add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications until the oil level reaches the bottom of the LEVEL port hole.

4. Install the LEVEL and FILL plugs.

5. Repeat for remaining bogie drive housings.

Check Bogie Planetary Oil Level

1. Position the wheel so that the DRAIN port in the planetary hub cover is at the bottom. See Figure 12.

2. Remove the LEVEL plug. The oil level should be even with the bottom of the LEVEL port opening.

3. If required, remove the FILL plug and add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the LEVEL port until the oil reaches the bottom of the port opening.

4. Clean the LEVEL plug. Inspect the plug seal and replace if damaged.

5. Install LEVEL plug and torque to 40 ft.lbs. (50 Nm).

6. Repeat for remaining bogie planetary drives.
**Torque Tapered Hub Retaining Bolts**

**NOTICE**

Severe structural damage can occur if tapered hub assemblies are not kept tight.

![Figure 13: Tapered Hub (Typical)](image)

Tapered hub pin retainers are used at the pivot between the main boom and upper turntable. See Figure 13. Torque all tapered hub retaining bolts to 100 ft.lbs. (135 Nm). See Figure 14.

![Figure 14: Recommended Tapered Hub Retaining Bolt Torquing Pattern](image)
Run Air Conditioner

The air conditioner should be operated for a few minutes at least once a week regardless of the season. Regular operation keeps the compressor shaft seal lubricated with oil to prevent it from drying out.

1. Start the engine and set the throttle at half speed.

2. Activate the air conditioner system.
   See Figure 15:

   Select “A/C” at the function select switch.

   Select fan speed at the fan speed select switches.

   Adjust temperature of air flow at the thermostat knob.

3. Operate the air conditioner for at least 5 minutes.

NOTICE

During seasons when the heater will not be used, close the shut-off valves in the hot water supply and return lines to the control unit. The shut-off valves are located on the engine.
Check Cab Window Emergency Escapes

Removable Rear Window

**WARNING**

Keep cab window emergency escape hatches easily removable. Serious personal injury or death could result if an emergency escape hatch can not be removed in an emergency.

**NOTICE**

The cab window emergency escape hatches must be easily removed in order to be effective. Do not allow the weatherstripping to become stuck to the cab or the star knobs to become bound or difficult to remove.

Do not use grease to lubricate the rear window guard weatherstripping or star knobs. In cold weather grease can become hard and cause the weatherstripping to stick or bind the star knobs.

The rear cab window and its guard weighs approximately 57 lbs. (26 kg).

The cab window emergency escape hatches should be checked at least once a week.

1. Loosen, but do not remove, the star knobs securing the rear window emergency escape hatch. See Figure 16. Leave about 3/8” (10 mm) of play between the star knob spacer and guard.

   Each star knob should turn freely by hand. If not, remove the star knob and coat the threaded stud with an anti-seize compound such as Loctite 765-1151.

2. Push/pull the escape hatch away from the opening. The escape hatch should be free to move. If not, remove the escape hatch and apply an anti-seize compound, such as Loctite 765-1151, to the weatherstripping. See Figure 17.

3. Re-install the escape hatch and tighten all star knobs.
Front Kick-Out Window

**WARNING**

Keep cab window emergency escape hatches easily removable. Serious personal injury or death could result if an emergency escape hatch can not be removed in an emergency.

**CAUTION**

There are six cam latches securing the front kick-out window emergency escape hatch. Disengage the four front latches ONLY when checking hatch operation. If all latches are disengaged the front kick-out window can suddenly fall away and result in serious personal injury or equipment damage.

**NOTICE**

The cab window emergency escape hatches must be easily removed in order to be effective. Do not allow the weatherstripping to become stuck to the cab or the star knobs to become bound or difficult to remove.

Do not use grease to lubricate the front kick-out window hatch weatherstripping. In cold weather grease can become hard and cause the weatherstripping to stick to the cab weldment.

The cab window emergency escape hatches should be checked at least once a week.

1. Check to be sure the two latches securing the front kick-out window emergency escape hatch are fully engaged. See Figure 18.

2. Disengage the four latches securing the four corners of the front window area ONLY. DO NOT disengage the two latches in the overhead skylight area. See Figure 18.

**IMPORTANT:** If all latches are disengaged the front kick-out window can suddenly fall away and result in serious personal injury or equipment damage.

2. Push the hatch away from the opening near the bottom of the front window area.

If the escape hatch is free to move at the bottom of the front window area, the operational check is o.k. Engage all latches, procedure complete.

If the escape hatch sticks it must be removed so an anti-seize compound can be applied to the weatherstripping before the machine is returned to service. Continue with Step #3 to remove the escape hatch.

A crane or other suitable lifting device must be used to support the front kick-out window emergency escape hatch. Lift eye brackets, Timbco PN# 22567 will also be required. See Figure 19.

**NOTE:** The escape hatch weighs approximately 200 lbs. (91 kg).
3. Install lift eye brackets, Timbco PN# 22567, to the skylight window frame mounting studs. See Figure 19.

4. Support the front kick-out window emergency escape hatch with a crane or other suitable lifting device so the cam latches can be disengaged.

5. Disengage all six cam latches securing the escape hatch.

6. Lift the escape hatch away from the cab and place on the ground.

7. Apply an anti-seize compound, such as Loctite 765-1151, to the weatherstripping around the escape hatch frame. See Figure 20.

8. Re-install the escape hatch and fully engage all cam latches.
Preventive Maintenance - 100 Hours of Operation

Check Engine Fan .......................................................... 5.4.2

Check Belts:
  General Inspection Information ....................................... 5.4.3
  Check Alternator Belt:
    Cummins 6C8.3-C260 .................................................. 5.4.4
    Caterpillar 3126T ...................................................... 5.4.4
  Check A/C Compressor Belt:
    Cummins 6C8.3-C260 .................................................. 5.4.5
    Caterpillar 3126T ...................................................... 5.4.6
  Check Water Pump Drive Belt (Caterpillar 3126T Only) .......... 5.4.7

Check Battery .............................................................. 5.4.8

Lubricate Drive Shaft U-Joints & Carrier Bearings ............... 5.4.9

Lubricate Axle Drive Shaft Yoke Bearings ......................... 5.4.10

Lubricate Axle Articulation Bearings .............................. 5.4.10
Perform the following maintenance items after every 100 hour interval of operation.

**Check Engine Fan**

1. Shut down engine before working near the engine fan and belts.

2. Open the perforated swing-out engine guard and pivot the slotted engine pivot guard forward to across the engine fan and belts. See Figures 1 & 2.

3. Remove engine fan shroud. See Figure 3.

4. Remove engine fan. Inspect blades and hub for cracks or other damage. On metal Caterpillar fans, check for loose or missing rivets that secure the blades to the hub. See Figure 4. Replace engine fan if required.

**NOTE:** If also checking engine belts, leave the engine fan removed until all the belts have been inspected. If an engine belt must be replaced, the engine fan would have to be removed in order to replace the belt.

5. Install engine fan in reverse procedure order. Use Loctite 242 on engine fan mounting bolts.

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**NOTICE**

You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.
Check Belts

General Inspection Information

Keep engine and accessory belts properly tensioned for maximum engine performance and fuel economy. Proper belt tension minimizes slippage and increases belt life.

Belts that are too loose see excessive vibration and increased wear. Belts that are too tight produce wear on both the belt and the bearings of the pulleys it travels around.

Check ribbed serpentine belts for intersecting cracks. Cracks across the width of a ribbed belt are acceptable. Cracks along the length of a ribbed belt are not acceptable. Ribbed belts with cracks along their length should be replaced. See Figure 1.

Any cracking on a V-belt is not acceptable. Replace any V-belt that has cracking. See Figure 2.

Any ribbed belt or V-belt showing signs of wear or that has material missing should be replaced. When a belt is replaced, check its tension again after 30 minutes of operation. New belts will stretch with use.
Check Alternator Belt - Cummins 6C8.3-C260

Inspection

Visually inspect the ribbed serpentine alternator belt according to guidelines under “Check Engine Fan & Belts.” If a belt requires replacement, see instructions below.

Tension Check

The Cummins engine is equipped with an automatic tensioner for the alternator belt. No manual adjustment is required.

Replacement

1. Remove engine fan. See procedure under “Check Engine Fan & Belts.”

2. Raise the automatic tensioner to release the old belt and install the new belt. See Figure 7.

3. When replacing the alternator belt, it is a good idea to check the tensioner cap screw torque. Torque should be 32 ft.lbs (43 Nm). See Figure 7.

4. If no other belts are to be inspected, reinstall the engine fan. See procedure under “Check Engine Fan & Belts.”

Check Alternator Belts - Caterpillar 3126T

Inspection

Visually inspect the alternator v-belts according to guidelines under “Check Engine Fan & Belts.” If a belt requires replacement, see instructions below.

Tension Check

Check the adjustment of the alternator belts by applying 25 lbs. (110 N) of force to the belt midway between the pulleys. A correctly adjusted belt will deflect 1/2” - 3/4” (13mm-19mm). Adjust alternator belt tension or replace belts if required.

Replacement & Adjustment
1. Loosen alternator mounting bolt (1) and adjustment bracket bolt (2). See Figure 9.

**NOTICE**

If only one belt in a matched set requires replacement, always replace the full set of matched belts. Never replace only the worn belt of a matched set because the new belt will carry the full load, as it will not be as stretched as the older belts of the set. All belts will fail in rapid succession.

If the belts are to be replaced, remove the old belts now and install the new belts.

2. Move the alternator to obtain correct tension. Tighten mounting and adjustment bracket bolts to secure the alternator.

3. When replacing the alternator belt, it is a good idea to check the alternator shaft nut (3) torque. Torque should be 37 ft.lbs (50 Nm). See Figure 9.

4. Recheck belt tension after 30 minutes of operation. New belts will stretch with use.

**Check A/C Compressor Belt - Cummins 6C8.3-C260**

**Inspection**

1. Remove the A/C compressor belt guard. See Figure 10.

2. Visually inspect the A/C compressor V-belt according to guidelines under “Check Engine Fan & Belts.” If the belt requires replacement, see instructions below.

**Tension Check**

Check the adjustment of the A/C compressor belt by applying 25 lbs. (110 N) of force to the belt midway between the pulleys. A correctly adjusted belt will deflect 1/2” - 3/4” (13mm - 19mm). See Figure 11. Adjust A/C compressor belt tension or replace belts if required.

If the belt does not require adjustment, reinstall the A/C compressor belt guard.
Replacement & Adjustment

1. Loosen A/C compressor mounting bolt (1) and adjustment bracket bolt (2). See Figure 12.

   If the belt is to be replaced, remove the old belt now and install the new belt.

2. Move the A/C compressor to obtain correct tension. Tighten mounting and adjustment bracket bolts to secure the compressor.

3. Reinstall the A/C compressor belt guard.

4. Recheck belt tension after 30 minutes of operation. New belts will stretch with use.

Check A/C Compressor Belt - Caterpillar 3126T

Inspection

Visually inspect the A/C compressor V-belt according to guidelines under “Check Engine Fan & Belts.” If the belt requires replacement, see instructions below.

Tension Check

Check the adjustment of the A/C compressor belt by applying 25 lbs. (110 N) of force to the belt midway between the pulleys. Correctly adjusted belts will deflect 1/2" - 3/4" (13mm - 19mm). See Figure 13 Adjust A/C compressor belt tension or replace belts if required.
Replacement & Adjustment

1. Loosen A/C compressor mounting bolt (1) and the bolts securing the adjustment bracket (2). See Figure 14.

   If the belt is to be replaced, remove the old belt now and install the new belt.

2. Move the A/C compressor to obtain correct tension. Tighten mounting and adjustment bracket bolts to secure the compressor.

3. Recheck belt tension after 30 minutes of operation. New belts will stretch with use.

Check Water Pump Drive Belt - Caterpillar 3126T

Inspection

Visually inspect the water pump drive belt. Replace the belt if it shows any sign of wear, see instructions below.

Tension Check

Check the adjustment of the water pump drive belt by applying 25 lbs. (110 N) of force to the belt midway between the pulleys. A correctly adjusted belt will deflect 1/2" - 3/4" (13mm - 19mm). See Figure 15. Adjust water pump belt tension or replace belt if required.
**Check Battery**

**Figure 17: Battery Location - Typical**

The battery is located behind the perforated swing-out engine guard. See Figure 17.

**Figure 18: Checking Battery Electrolyte (Acid) Level**

1. Remove all 6 cell caps from the battery. See Figure 18.

2. Use a flashlight to check the battery electrolyte (acid) level in each of the 6 cells. Maintain electrolyte level to the bottom of the fill opening (approx. 1-1/2” (38mm)) with distilled water. If distilled water is not available, clean drinking water can be used.

3. Check the rubber gasket seal on each cap before installing. Replace if cracked or damaged.

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Do not smoke while checking battery electrolyte (acid) level. Keep open flames or sparks away from batteries and where they are stored or charged. Battery fumes are flammable and can explode.

Always wear protective clothing and suitable eye, face and hand protection when working with batteries.

Battery electrolyte (acid) is highly corrosive. Avoid contact with eyes, skin and clothing.
Lubricate Drive Shaft  
U-Joints & Carrier Bearings

NOTICE
The drive shaft u-joints and carrier bearings should be lubricated daily if the machine is working in very damp conditions or the drive shaft is submerged in water or mud during operation. Greasing daily will help keep water out of these areas.

1. Remove all access covers along the top of the front and rear frames to access the entire drive shaft.

2. Apply 1-2 strokes of grease to each u-joint cross fitting (1 per u-joint), drive shaft yoke fitting and carrier bearing fitting. See Figure 19.

Use a Good Quality grease containing at least 5-6% Molybdenum by volume. TIMBCO recommends using Lubriplate #176. Grease meeting the above requirement has a higher rated load pressure than a typical multi-purpose EP grease.

Figure 19: Drive Shaft Grease Points (Typical)
**Lubricate Axle Drive Shaft Yoke & Beam Bearings**

**NOTICE**

The axle drive shaft yoke bearings should be lubricated daily if the machine is working in very damp conditions or the drive shaft is submerged in water or mud during operation. Greasing daily will help keep water out of these areas.

1. Remove all access covers where the drive shaft meets the front and rear axles.

2. Apply 1-2 strokes of grease to each axle drive shaft yoke fitting. See Figure 20.

Use a Good Quality grease containing at least 5-6% Molybdenum by volume. TIMBCO recommends using Lubriplate #176. Grease meeting the above requirement has a higher rated load pressure than a typical multi-purpose EP grease.

**Lubricate Axle Articulation Bearings**

**NOTICE**

DO NOT over-grease the frame articulation bearing. If the bearing lip seal is pushed out it will allow dirt and other contaminates into the bearing.

Each axle bogie articulation bearing is provided with 8 grease fittings. See Figure 21. Remove the plastic protective cover and pump 1-3 strokes grease into each fitting. DO NOT over-grease.

Use a Good Quality grease containing at least 5-6% Molybdenum by volume. TIMBCO recommends using Lubriplate #176. Grease meeting the above requirement has a higher rated load pressure than a typical multi-purpose EP grease.
Section 5.5

Preventive Maintenance - 250 Hours of Operation

Change Engine Oil & Filter ........................................ 5.4.2

Change Fuel Filters:
  Changing Filters .................................................. 5.5.4
  Bleeding Fuel System ............................................ 5.5.4

Lubricate Throttle Linkage ........................................ 5.5.4

Torque Specific Bolts:
  Swing Motor Mounting Bolts ................................. 5.5.5
  Swing Bearing Mounting Bolts .............................. 5.5.5
  Hydraulic Tank Mounting Bolts ............................ 5.5.5
  Frame Articulation Bearing Mounting Bolts ............ 5.5.6
  Axle Mounting Bolts ........................................... 5.5.6
  Wheel Lug Nuts .................................................. 5.5.6
  Axle Box Spreader Bolts ...................................... 5.5.7
  Drive Shaft U-Joint Bolts .................................... 5.5.7
  Drive Shaft Carrier Bearing Mounting Bolts .......... 5.5.7

Check Air Conditioner Refrigerant ............................ 5.5.8

Clean Air Conditioner Condenser ............................... 5.5.9

Clean Caterpillar Engine Crankcase Breather ............. 5.5.10
Preventive Maintenance - 250 Hours of Operation

You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

Perform the following maintenance items after every 250 hour interval of operation.

**Change Engine Oil & Filter**

1. Allow the engine to cool down before changing oil.

2. Remove the engine oil sump access cover. See Figure 1.

3. Remove the oil pan plug and allow oil to completely drain into a suitable container. See Appendix A for engine oil capacities.

4. Dispose of waste oil properly.

5. Install oil pan plug.

6. Remove the upper bolt securing the slotted engine pivot guard. Loosen the lower bolt to pivot the guard and gain access to the engine oil filter. See Figure 2.

**NOTICE**

**At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.**

**Position the machine on a level surface. Shut down engine and wait at least 5 minutes to allow the oil to drain back into the crankcase.**

It is best to change the engine oil while it is still warm, not hot, from operation. Contamination or sediment will be suspended in warm oil when it is drained. As the oil cools, contamination or sediment may settle to the bottom and not drain with the oil.

Never operate the machine with the engine oil level below or above the “FULL” range on the dipstick. Damage to the engine could result.
7. Remove the used engine oil filter and dispose of properly. The oil filter is located just behind the alternator. See Figure 3.

8. Clean the filter mount housing base to remove any remaining gasket material from the used filter.

9. Apply a thin coating of oil to the gasket of the new filter. Install new filter by hand until the filter gasket contacts the housing. Tighten an additional 3/4 turn. Do not over-tighten.

10. Open the perforated swing-out engine guard to gain access to the engine oil fill. See Figure 4.

11. Remove the oil fill cap on the engine. See Figure 5. Fill the engine with new oil. See Appendix A for engine oil type and capacity. Clean and install engine oil fill plug.

12. Start and run the engine at low idle for 2 minutes. Watch for leaks.

13. Shut down the engine and wait at least 5 minutes to allow the oil to drain back into the crankcase.

14. Check engine oil level. Oil level should be within the “FULL” range on the dipstick. Add oil if required.

15. Reinstall the engine oil sump access cover and secure the slotted engine pivot guard and perforated swing-out engine guard.
**Change Fuel Filters**

Allow the engine to cool down before changing fuel filters. Fuel filters are located behind the perforated swing-out engine guard.

**Changing Filters**

1. Clean the area around all fuel filter heads. Remove the old fuel filters by turning COUNTER-CLOCKWISE. See Figure 6.

2. Clean the filter mount housing bases to remove any remaining gasket material from the old filters.

3. Fill each filter with clean fuel.

   **NOTE:** Failure to fill each fuel filter with clean fuel before installation will require manual bleeding of the fuel system during start-up.

4. Apply a thin coating of clean fuel or light oil to the gasket of the new filter.

5. Install each new filter by hand until the filter gasket contacts the housing. Tighten an additional 3/4 turn. Do not over-tighten.

   **NOTE:** Caterpillar engines must have the fuel system primed after changing fuel filters. See Section 5.9.

**Bleeding Fuel System**

See the engine manufacturer’s manual supplied with this machine for fuel system bleeding procedures.

**Lubricate Throttle Linkage**

The throttle linkage terminates on the left side of the engine behind the perforated swing-out engine guard. Lubricate the throttle cable with a light lubricating oil. See Figure 7.

The other end of the throttle cable terminates under the dash panel in the cab.

1. To access the throttle linkage, remove the screws securing the side dash panel.

2. Lubricate the throttle cable and throttle control slide with a light lubricating oil. See Figure 8.

3. Replace side dash panel.
**Preventive Maintenance - 250 Hours of Operation**

**Torque Specific Bolts**

**NOTICE**
Maintain correct torque on all bolts. Failure to do so may result in severe structural damage to the machine.

**Swing Motor Mounting Bolts**

Torque the 5/8” Lohmann swing motor mounting bolts(16) to 200 ft.lbs. (265 Nm). See Figure 9.

**Swing Bearing Mounting Bolts**

Torque the 1” swing bearing mounting bolts(22) to 1000 ft.lbs. (1330 Nm). See Figure 10.

**Hydraulic Tank Mounting Bolts**

**Figure 9: Torque Swing Motor Mounting Bolts** (Lohmann)

Torque the 5/8” upper hydraulic tank mounting bracket bolts(2) to 200 ft.lbs. (265 Nm). See Figure 12.

**Figure 11: Torque 1/2” Hydraulic Tank Mounting Bolts** (Typical)

Torque the 1/2” hydraulic tank mounting bolts(7) to 100 ft.lbs. (135 Nm). See Figure 11.

**Figure 12: Torque 5/8” Upper Hydraulic Tank Mounting Bracket Bolts**

Torque the 5/8” upper hydraulic tank mounting bracket bolts(2) to 200 ft.lbs. (265 Nm). See Figure 12.
Frame Articulation Bearing Mounting Bolts

Torque the 7/8” articulation bearing mounting ring bolts (48) to 600 ft.lbs. (800 Nm). See Figure 13.

Axle Mounting Bolts

Torque the 27mm axle mounting bolts (8) to 1000 ft.lbs. (1330 Nm). See Figure 14.

Wheel Lug Nuts

The wheel mounting studs on the N.A.F. bogie axle serve two purposes; (1) retain the wheel/tire to the axle, and (2) retain the planetary wheel drive to the axle hub casting. If the wheel/tire assembly is allowed to work loose a failure of the wheel planetary and axle hub will occur.

It is very important that the wheel lug nuts be kept tight. The machine operator should be aware of the importance of the wheel lug nuts being kept tight. If the operator notices any wheel wobble the machine must be stopped and the wheel lug nuts inspected.

Due to stresses and vibrations exerted of the axle it is possible for various bolts and nuts to become loose. Timely checking and tightening of these fasteners will prevent leaks and other damage.

Torque all wheel lug nuts to 600 ft.lbs. (800 Nm). See Figure 15.
Axle Box Spreader Bolts

Torque axle box spreader bolts (2 per axle box) to 700 ft.lbs. (935 Nm). See Figure 16.

Drive Shaft U-Joint Bolts

Torque all 1/2” drive shaft u-joint bolts (8 per joint) to 115 ft.lbs. (155 Nm). See Figure 17.

Drive Shaft Carrier Bearing Mounting Bolts

Torque all 1/2” drive shaft carrier bearing mounting bolts (2 per carrier bearing) to 75 ft.lbs. (100 Nm). See Figure 18.
Check Air Conditioner Refrigerant

NOTICE

During seasons when the heater will not be used, close the shut-off valves in the hot water supply and return lines to the control unit. The shut-off valves are located on the engine.

NOTICE

It is important to maintain the refrigerant level in the air conditioner system. Failure to do so may damage the compressor.

1. Select “A/C” at the mode select switch. See Figure 19.

2. Adjust temperature of air flow at the thermostat knob to MAX setting.

3. Select fan speeds at the fan speed select switches.

4. Remove the access cover (shelf) over the air conditioner / heater unit behind the operator’s seat. Locate the air conditioner drier assembly. See Figure 20.

5. Observe the sight glass on the air conditioner drier. Note the condition of the refrigerant moving past the sight glass.

If the refrigerant is running clear, or there are a few air bubbles that disappear as engine RPM varies, the system is operating normally. See Figure 21.

If there are many air bubbles in the sight glass, there is a lack of refrigerant in the system. Contact an authorized air conditioner repair service to have the system recharged. See Figure 22.

If the refrigerant is a milky white color, there is compressor oil mixed with the refrigerant. This is acceptable as long as it is free of air bubbles.
Clean Air Conditioner Condenser

The air conditioner condenser is located at the rear of the cab in the fire suppression tank mounting area. See Figure 23. Remove the bolts and swing away the perforated access panel. Clean away any debris that has accumulated around the condenser.
Clean Caterpillar Engine
Crankcase Breather

Remove and clean the crankcase breather assembly. See the engine manufacturer’s manuals supplied with the machine for detailed instructions.

Figure 24: Caterpillar Crankcase Breather
Section 5.6

Preventive Maintenance - 500 Hours of Operation

- Check Engine Coolant Antifreeze Concentration
- Check Radiator Hoses
- Check Transfer Case Oil Level
- Change Air Cleaner Filters
- Change Hydraulic Oil Filters:
  - Return Filters
  - Suction Strainers (Cleanable)
  - Wheel Drive Charge Pressure Filter

DAILY...
50 HRS...
100 HRS...
250 HRS...
500 HRS...
1000 HRS...
2000 HRS...
You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

Perform the following maintenance items after every 500 hour interval of operation.

**Check Engine Coolant Antifreeze Concentration**

1. Allow the engine and cooling system to cool down before adding coolant.

2. The radiator fill spout is located under an access cover on the engine compartment ROPS panel.

   Loosen both star knobs so that the access cover can rotate out of the way, exposing the radiator cap. See Figure 1.

3. Remove radiator cap slowly to allow any trapped pressure to escape.

4. Check the engine coolant’s antifreeze concentration at the fill spout. See Figure 2. Low temperature capability should protect to -34°F (-37°C) year round.

**NOTICE**

Do not overfill the radiator. The coolant volume will expand as the engine reaches operating temperature.

Using a mixture of antifreeze and water as engine coolant increases the operating range of the engine. Antifreeze lowers the coolant’s freezing point and raises the boiling point.
If required, adjust coolant antifreeze concentration by adding an appropriate mixture of low silicone ethylene glycol base antifreeze and distilled water.

**Example:** If low temperature capability must be increased, mix more antifreeze to less distilled water. If distilled water is not available, use clean tap water.

5. Fill radiator until coolant level is above the radiator core and about 2 - 3” (5 - 8 cm) below the fill spout. Do not over fill.

6. Replace the radiator cap.

**Check Radiator Hoses**

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

the bolts securing the slotted engine pivot guard. Open guard to gain access to radiator and heater hoses. See Figure 3.

Check the following radiator and heater hoses for cracks, hose clamps or leaks. See Figure 4. Replace any damaged hoses immediately:

- 90⁰ rubber elbow at base of radiator
- 1” (25mm) radiator bypass hose
- Radiator flex hose at top of engine
- 1/2” (12mm) heater hose
Check Transfer Case Oil Level

1. Position machine on a level surface.

2. Remove the transfer case dipstick access cover. See Figures 5 & 6.

3. Check the transfer case oil level with the dipstick provided. Oil level should reach the FULL mark on the dipstick.

   If oil level is O.K. replace the access cover, procedure complete.

   If oil is required, continue with Step #4.

   4. Remove the guards protecting the transfer case and wheel motors.

   5. Remove the FILL plug. See Figures 7 & 8.

   6. Add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the FILL port until the oil level reaches the FULL mark on the dipstick.

   7. Clean the FILL plug. Inspect the plug seal and replace if damaged.

   8. Install FILL plug and torque to 40 ft.lbs. (53 Nm).

   9. Re-install guards.
Change Air Cleaner Filters

1. Shut down the engine.

2. Loosen the wing nut securing air cleaner canister cover. Remove cover. See Figure 9.

3. Remove the wing nut securing the primary filter. Remove filter from the air cleaner housing. See Figure 10.

4. Remove the wing nut securing the secondary filter. Remove filter from the air cleaner housing. See Figure 11.

5. Cover the engine air intake opening and wipe dust from inside the air cleaner housing and cover.

6. The secondary filter can generally be used longer before replacement than the primary filter. Inspect secondary filter and replace it if required.

7. Uncover the engine air intake opening.

8. Re-install the secondary filter, primary filter and air cleaner housing cover. Secure wing nuts finger tight. Do not use a tool to tighten the wing nuts or damage to the threads could result.

9. Reset the air filter restriction indicator by pushing in the reset button. See Figure 12.

10. Start the engine and run at high idle. If the filter restriction indicator’s colored piston pops out, or exhaust smoke is still black, replace the secondary filter.
Change Hydraulic Oil Filters

Return Filters

**WARNING**

Hydraulic oil tank under pressure. Escaping oil can cause serious injury. Vent tank before removing cap or servicing hydraulic system.

**NOTICE**

Preventing the return filters from going into bypass is extremely important. Return filter bypass allows unfiltered oil into the main tank where it can contaminate the rest of the hydraulic system. Prevent return filter bypass.

Return filter bypass will result if dirty filters are not changed. Change filters in according to preventive maintenance guidelines, or sooner if required.

Following this simple rule will help prevent costly downtime due to hydraulic system contamination and greatly increase the life of your equipment.

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

At operating temperature, the radiator and hydraulic tank are HOT and under pressure. Allow these components to cool to the touch before servicing.

Loosen radiator cap slowly to release pressure.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.
The return filters should be changed after the first 100 hours of operation and, thereafter, every 500 hours of operation.

1. Place booms on the ground and shut down the engine.

2. Release boost pressure on the hydraulic oil tank by opening the T-valve at the base of the swing-out pump guard. See Figure 13. Turbo boost pressure on the hydraulic tank must be released before beginning any work on the hydraulic system.

3. Remove the bolts securing the guard over the return filters on top of the hydraulic tank. See Figure 14.

4. Remove the filter head cover to expose the filter element. See Figure 15. When changing return filters, care must be taken to insure that no contaminated oil is allowed to drain into the main tank.

5. Visually inspect the condition of the element before removing it.

   If there are no bronze or brass specks visible, remove the filter element and install a new one. Dispose of used filter element properly. Skip to step #10.

   If there has been a known pump failure, or there are bronze or brass specks visible, the whole filter head/canister assembly must be removed so that contaminated oil cannot drain into the main tank when the element is removed. Continue with Step #6.
Figure 16: Exploded View - Hydraulic Tank Filters & Strainers
6. Disconnect the hydraulic lines at the filter head.

7. Remove the bolts securing the filter head/canister assembly in the tank. Lift the assembly from the tank. See Figure 16. This forces all oil to drain through the filter as the assembly is removed.

8. Remove the filter element and install a new one. Dispose of used filter element properly.

9. Re-install assembly into the tank. Re-connect any hydraulic lines that were removed.

10. Re-install filter head.

11. Repeat for remaining return filters.

12. Close the turbo boost T-valve if no other work is to be done on the hydraulic system.

**Suction Strainers (Cleanable)**

the drivetrain pump and implement pump suction screen filters can be accessed from the bottom of the tank. See Figure 17.

These filters would only need cleaning or changing when changing hydraulic oil or after 2000 hours of operation.

---

**Wheel Drive Charge Pressure Filter**

The wheel drive charge pressure filter should be changed after the first 100 hours of operation and, thereafter, every 500 hours of operation.

1. Place booms on the ground and shut down the engine.

2. Release boost pressure on the hydraulic oil tank by opening the T-valve at the base of the swing-out pump guard. See Figure 18. Turbo boost pressure on the hydraulic tank must be released before beginning any work on the hydraulic system.

3. Open the swing-out pump compartment guard to gain access to the wheel drive charge pressure filter assembly. See Figure 19.
4. Place a container under the wheel drive charge pressure filter assembly to catch oil spillage when removing the filter canister. Remove filter canister. See Figure 20.

5. Remove the filter element and install a new one. Dispose of used filter element properly.

6. Inspect o-ring on the filter canister, replace if damaged.

7. Install filter canister. Do not over tighten the canister.

**NOTE:** Be very careful not to cross-thread the filter canister into the manifold body. Both components are constructed of aluminum and will seize together if forced to thread.

8. Close the turbo boost T-valve if no other work is to be done on the hydraulic system.

9. Close and secure the swing-out pump compartment guard.
Section 5.7

Preventive Maintenance - 1000 Hours of Operation

DAILY...
50 HRS...
100 HRS...
250 HRS...
500 HRS...
1000 HRS...
2000 HRS...

Secure & Clean Battery .................................................. 5.7.2
Change Pump Drive Transmission Oil ................................. 5.7.3
Change Lohmann Swing Gearbox Oil ................................. 5.7.4
NOTICE

You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

Perform the following maintenance items after every 1000 hour interval of operation.

Secure & Clean Battery

1. Open the perforated swing-out engine guard to gain access to the battery and battery box. See Figure 1.

2. Tighten all battery box hardware to keep battery securely in place.

3. Disconnect the battery cables.

4. Clean the battery surface with a clean rag. The rag will get battery acid on it, wear protective clothing and dispose of the rag properly.

5. Coat the battery posts with petroleum jelly and re-install the battery cables.

6. Close and secure the perforated swing-out engine guard.

Battery electrolyte (acid) is highly corrosive. Avoid contact with eyes, skin and clothing.

Do not smoke while checking battery electrolyte (acid) level. Keep open flames or sparks away from batteries and where they are stored or charged. Battery fumes are flammable and can explode.

Always wear protective clothing and suitable eye, face and hand protection when working with batteries.
**Change Pump Drive Transmission Oil**

**NOTICE**

Position the machine on a level surface. Shut down engine and wait at least 5 minutes to allow the oil to drain to the bottom of the pump drive transmission housing.

It is best to change the pump drive transmission oil while it is still warm, not hot, from operation. Contamination or sediment will be suspended in warm oil when it is drained. As the oil cools, contamination or sediment may settle to the bottom and not drain with the oil.

1. **Allow the pump drive transmission and hydraulics to cool down before changing oil.**

2. **Remove the lower pump access cover to access the pump drive transmission drain plug. See Figure 2.**

3. **Open the swing-out pump compartment guard to access the pump drive transmission dipstick and oil fill port. See Figure 3.**

4. **Remove the pump drive transmission housing oil drain plug and allow the oil to completely drain into a suitable container with at least a 3 gallon (11.35 litres) capacity. See Figure 4.**

5. **Dispose of waste oil properly.**

6. **Install oil drain plug.**
7. Locate the pump drive transmission oil level dipstick and oil fill port where the left rear engine mount attaches to the pump drive transmission housing. See Figure 5.

8. Add SAE 75W-90 synthetic oil that meets MIL-L-2105 specifications at the oil fill port until the oil level is within the FULL range on the dipstick.

9. Install oil fill plug.

10. Close and secure the swing-out pump compartment guard and lower pump access cover.

---

**Change Lohmann Swing Gearbox Oil**

It is best to change the swing gearbox oil while it is still warm, not hot, from operation. Contamination or sediment will be suspended in warm oil when it is drained. As the oil cools, contamination or sediment may settle to the bottom and not drain with the oil.

**NOTICE**

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

The drain port for the Lohmann swing gearbox is located in the lower rear section of the housing near the mounting bolts. See Figure 6. To minimize oil spillage, use the following procedure to drain the gearbox.
1. If the machine is equipped with optional cab leveling, tilt the turntable all the way forward for better access to the gearbox drain port.

2. Allow the pump drive transmission and hydraulics to cool down before changing oil.

3. Remove the Lohmann swing gearbox oil level dipstick. See Figure 7.

4. Use a suction gun to siphon as much oil as possible out the dipstick port. See Figure 8. Transfer the waste oil to a container with at least a 3 gallon (11.35 litres) capacity.

5. Remove the drain port plug and remove as much oil as possible, then re-install the plug.

6. Dispose of waste oil properly.

7. Start the engine and return the upper turntable to a level position. Shut-down engine.

8. Add SAE 75W-90 synthetic oil that meets MIL-L-2105 specifications at the dipstick port until the oil level is within the FULL range on the dipstick.

9. Install the dipstick.
Section 5.8

Preventive Maintenance - 2000 Hours of Operation

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You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional engine maintenance guidelines, see the manufacturer’s manuals provided with the machine.

Perform the following maintenance items after every 2000 hour interval of operation.

**Flush Engine Cooling System**

1. The radiator drain plug is located behind the louvered swing-out radiator guard at the front of the machine. See Figure 1. Remove the star knobs and open the guard.

2. Remove the bolts securing the slotted engine pivot guard. Open the guard to gain access to radiator hoses. See Figure 2.

3. Remove the star knobs securing the perforated swing-out engine guard. Open the guard to gain access to the radiator overflow bottle. See Figure 3.

**NOTICE**

Dispose of waste antifreeze properly. Waste antifreeze disposal can be subject to local, state and federal regulations. Contact your local authorities or the EPA regarding proper disposal of waste antifreeze.

At operating temperature, the radiator and hydraulic tank are HOT and under pressure. Allow these components to cool to the touch before servicing.

Loosen radiator cap slowly to release pressure.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.

Avoid skin contact with used antifreeze. Skin contact with used antifreeze can cause skin disorders or other personal injury.

Wait until engine coolant temperature drops to 120°F (50°C) before removing the radiator cap. Hot coolant released under pressure can cause serious personal injury.
4. The radiator fill spout is located under an access cover on the engine compartment ROPS plate. See Figure 4. Loosen both star knobs so that the access cover can rotate to the right and out of the way, exposing the radiator cap.

5. Remove radiator cap slowly to allow any trapped pressure to escape.

6. Place a suitable container, with a minimum capacity of 9.3 gal. (35.2 liters), within reach of the radiator overflow bottle's supply hose.

7. Remove the bolts securing the radiator overflow bottle to the guard. Open the bottle and pour its contents into the container. See Figure 5.

9. Replace the cap on the overflow bottle and re-install on the guard.

10. Place the waste antifreeze container below the radiator drain plug. Remove the drain plug and allow the radiator to drain completely.

11. Replace the radiator drain plug and dispose of the waste antifreeze properly.

12. From the right side of the engine, check the following radiator hoses for cracking, loose hose clamps and leaks. See Figure 6. Replace any damaged hoses immediately:

- 90° rubber elbow at base of radiator
- 1" (25mm) radiator bypass hose
- Radiator flex hose at top of engine
**Flushing The Cooling System**

The machine can be equipped with several different engine options. Refer to the engine manufacturer’s manuals supplied with your machine for specific cooling system flushing procedures.

**Filling The Cooling System**

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not over fill the radiator. Fill radiator until coolant level is above the core and about 2-3” (5-8 cm) below the fill spout. The coolant volume will expand as the engine reaches operating temperature.</td>
</tr>
</tbody>
</table>

All engine options require a coolant mixture of 50% low silicon ethylene glycol base antifreeze and 50% distilled water. If distilled water is not available, use clean tap water. See Appendix A for cooling system capacities.

With most engines, the procedure for filling a completely drained cooling system requires special steps to prevent air pockets from forming in the system. Reference the engine manufacturer’s manuals supplied with your machine for specific cooling system filling procedures.

After completing the engine manufacturer’s instructions for filling the cooling system, follow the steps below to complete the engine cooling system flushing procedure.

1. Check the radiator coolant level. The coolant should be is above the core and about 2 - 3” (5 - 8cm) below the fill spout. Do not overfill.

2. Check the radiator overflow bottle. With the radiator properly filled, the coolant level in the overflow bottle should be between the HOT and COLD level marks.

3. Close and secure the slotted engine pivot guard, louvered swing-out radiator guard, perforated swing-out engine guard and the access cover over the radiator fill spout.
Clean Hydraulic Tank & Change Hydraulic Oil

Hydraulic Tank Draining

Pressure can be maintained in system circuits long after the engine and pumps have been shut down. Release trapped pressure in hydraulic, fuel, and cooling system lines before performing any maintenance or repair procedures.

At operating temperature, the radiator and hydraulic tank are HOT and under pressure. Allow these components to cool to the touch before servicing.

Loosen radiator cap slowly to release pressure.

Release pressure from hydraulic tank at the turbo boost release valve before opening fill spout.

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

1. Position the machine where the hydraulic tank can be accessed by a crane or other lifting device. Lower the boom to the ground and shut down the engine.

2. Release boost pressure on the hydraulic oil tank by opening the T-valve at the base of the swing-out pump guard. See Figure 7. Turbo boost pressure on the hydraulic tank must be released before beginning any work on the hydraulic system.

3. The hydraulic tank has a capacity of 100 gal. (379 liters). Have a suitable container or other means of disposing the waste oil available.

4. Attach a large funnel to a length of hose or tubing and place the other end in the waste oil container.
Preventive Maintenance - 2000 Hours of Operation

5.8.6

Form M290

5. Remove the pilot pressure manifold return line where it enters the tank. See Figure 8. Use the hose and funnel to catch and route the oil to the waste container. Drain the tank completely.

6. Cap the pilot pressure valve return line fitting and plug the line to keep contaminates from entering the hydraulic system.

7. Dispose of the waste oil properly.

**Hydraulic Tank Removal**

2. Remove the bolts securing the engine compartment ROPS panel. Remove the ROPS panel and set it aside to gain access to the hydraulic connections at the return filters. **NOTE:** It is o.k. if the air cleaner extension tube is removed with the ROPS panel.

3. Disconnect the any hydraulic lines entering the tank at the return filters. Plug all lines to keep contaminates from entering the hydraulic system. Label all connections for proper installation later.

4. Remove the hydraulic oil temperature gauge sending unit and the hydraulic oil level sensor from the front of the tank. See Figure 10.

6. Close all suction line shut-off valves. See Figure 11.

1. Support the engine compartment ROPS panel over the air cleaner and muffler with a crane or other lifting device. See Figure 9.

Figure 8: Hydraulic Tank Drain Port (Typical)

Figure 9: Engine Compartment ROPS Panel Removal (Typical)

Figure 10: Hydraulic Oil Temperature Sending Unit And Hydraulic Oil Level Sensor (Typical)

Figure 11: Suction Lines & Shut-Off Valves
7. Disconnect the suction lines immediately after the shut-off valves. There will still be some oil in the lines, have a small container ready to drain excess oil into. Plug all lines to keep contaminants from entering the hydraulic system.

8. If equipped, disconnect the fire suppression distribution lines at the cross located on the bottom of the hydraulic tank. See Figure 12.

9. Remove the bolts securing the boom side pump panel to the boom mounting ear. Remove the panel. See Figure 13.

10. Support the hydraulic tank with a crane or other lifting device.

11. Remove the bolts securing the hydraulic tank support and guard to the tank and upper turntable. See Figure 14. Remove the hydraulic tank support and guard.

12. Remove the bolts securing the upper hydraulic tank mounting bracket to the engine compartment. See Figure 15.
13. Remove the remaining bolts securing the hydraulic tank mounting brackets to the lower engine compartment. See Figure 16. Use caution as the tank may shift as the last bolts are removed.

14. Use wooden blocks to support the hydraulic tank upright without having to disassemble the attached suction fittings. The blocks should support the tank 12 - 14” (31 - 36cm) off the floor.

15. Remove the hydraulic tank and set it on the wooden blocks.

16. Remove the bolts securing the return filter guard. See Figure 17. Remove the guard.

17. Remove the bolts securing the return filters in the tank. See Figure 18. Lift the filter assemblies out of the tank and set them aside.

18. Remove the 10” diameter access cover on top of the tank to gain access to the suction strainers. See Figure 19.

19. Remove the drivetrain pump and implement pump suction strainers.
Figure 19: Exploded View - Hydraulic Tank Filters & Strainers
**Hydraulic Tank Cleaning**

1. Remove the cap on the pilot pressure valve return line fitting on the bottom of the tank. Open all suction line shut-off valves.

2. Thoroughly steam clean the tank and suction strainers.

3. Thoroughly rinse the tank and suction strainers with clean water.

4. Allow tank and suction strainers to air dry or use compressed air. Avoid towel drying the inside of the tank.

**Hydraulic Tank Assembly**

1. After the tank is completely dry, re-install the cap on the pilot pressure valve return line fitting.

2. Inspect all suction strainers. Replace any damaged suction strainers. Cap the pilot pressure valve return line fitting and close all shut-off valves.

3. Inspect the o-ring seal on the 10” access cover. Replace if damaged. Re-install access cover.

4. Re-install the return filters into the tank. Be sure the rubber gasket at the base of the return filter head is in place. See Figure 20.

5. If not already done as part of the **Every 500 Hour Interval** preventive maintenance schedule, replace the return filter elements at this time. If the return filters have been changed recently, skip to step #9.

**NOTICE**

Pressurized steam is the best way to clean the hydraulic tank. Use only steam, do not use a detergent. Detergents can leave a residue inside the tank which can react adversely with the hydraulic oil.

Avoid towel drying the inside of the tank. Towels can snag on corners and leave thread shards and lint behind which can damage a pump.

*Figure 20: Return Filter Rubber Gasket*
6. Remove the bolts securing the return filter head cover. See Figure 21. Remove cover to expose the filter element.

7. Remove and replace the filter element. See Figure 22. Dispose of used element properly.

8. Re-install filter head cover.

9. Re-install return filter guard.

10. Inspect all decals on the hydraulic tank. Replace any decals that are damaged or un-readable.

Hydraulic Tank Installation

1. Use a crane or suitable lifting device to position and support the hydraulic tank on the upper turntable.

2. Secure the hydraulic tank mounting brackets to the lower engine compartment. See Figure 23. Torque the 1/2” bolts to 100 ft.lbs. (135 Nm).

3. Secure the upper hydraulic tank mounting bracket to the engine compartment. See Figure 24. Torque the 5/8” bolts to 200 ft.lbs. (265 Nm).
4. Position the hydraulic tank support. See Figure 25. Test fit closing the swing-out pump guard. When the hydraulic tank support is in position, torque the 1/2” bolts to 100 ft.lbs. (135 Nm).

5. Re-install the boom side pump panel.

6. If Equipped, re-install the fire suppression distribution lines at the cross on the bottom of the hydraulic tank.

7. Re-connect all suction lines. Open all suction line shut-off valves. Starting the machine with a suction line shut-off valve closed will destroy the pump within seconds.

8. Re-connect the pilot pressure manifold return line at the bottom of the hydraulic tank.

9. Re-install the hydraulic oil temperature gauge sending unit and hydraulic oil level sensor. See Figure 27.

10. Re-connect the case drain lines at the case drain return filter. See Figure 28. Be sure all case drain lines are full of oil to prevent damage to the pumps and swing motor on start-up.

11. Re-connect the remaining hydraulic lines at the return filters.

12. Use a crane or other lifting device to re-install the engine compartment ROPS panel. Be sure the air cleaner extension tube is in position on the air cleaner intake.
Hydraulic Tank Re-Filling

**NOTICE**

Hydraulic oil straight from the drum may contaminate the hydraulic system resulting in possible pump failure. Use pre-filtered hydraulic oil only.

Added hydraulic oil must pass through the return filters. If not filtered, hydraulic system contamination and possible pump failure may result. Never add oil through the hydraulic tank access cover.

Re-fill the hydraulic tank with the same type of oil already being used in the hydraulic system. See Appendix A for capacities.

**Hand Pump** - Hydraulic oil can be added with a hand pump at a quick-coupling provided on the return oil manifold located on the left side of the engine. See Figure 30. The mating female quick-coupling is shipped with the machine in the Up-Time Kit located under the operator’s seat. Add oil until level in the tank is within green zone of sight gauge at operating temperature or within the yellow zone when cold.

**Electric Fill Pump** - An electric fill pump is available as an option. To add hydraulic oil, place the fill pump’s suction hose into a container filled with pre-filtered oil. Press and hold the fill pump actuation button located near the return oil manifold on the left side of the engine. See Figure 29. Add oil until level in the tank is within green zone of sight gauge at operating temperature or within the yellow zone when cold.
Hydraulic System Start-Up

1. Close the turbo boot release valve to allow turbo boost pressure to build in the hydraulic tank at machine start-up. See Figure 31.

2. Start engine and operate at idle for a few minutes to cycle the pumps. Listen for any unusual sounds coming from the pump area that could indicate a problem. If you think a possible problem exists, shut down the engine immediately, investigate and correct the problem before continuing.

3. Operate a few implement functions SLOWLY for a about minute to get the oil cooler return oil flowing into the tank. If equipped, activate the disc saw circuit for a few moments to get the disc saw circuit return oil flowing into the tank.

4. Shut down the engine and allow the machine to sit for 10-15 minutes.

**NOTE:** Air bubbles are created in the oil when the return oil first spills into the tank. These air bubbles will damage pumps. Leaving the machine sit for a few minutes allows the air bubbles to rise to the surface and dissipate.

5. Check the hydraulic oil level in the tank. See Figure 32. Add oil if required.

6. Close and secure the swing-out pump guard.

Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.

**NOTICE**

Be sure ALL suction line shut-off valves are open. Starting the machine with a suction line shut-off valve closed will destroy the pump in seconds.

**Figure 31: Turbo Boost Release Valve**

**Figure 32: Hydraulic Oil Sight Gauge**
Check Engine Valve Lash

Remove Muffler & Air Cleaner

1. Remove the star knobs securing the perforated swing-out engine guard. Open the guard to gain access to the hardware securing the muffler and air cleaner panels. See Figure 33.

2. Remove the bolts securing the slotted engine pivot guard. Open the guard to gain access to the hardware securing the muffler and air cleaner panels. See Figure 34.

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

3. Support the engine compartment ROPS panel over the air cleaner and muffler with a crane or other lifting device. See Figure 35.

4. Remove the bolts securing the ROPS panel to the engine compartment. Remove the ROPS panel and set it aside to gain access to the muffler and air cleaner.

**NOTE:** It is o.k. if the air cleaner extension tube is removed with the ROPS panel.

Figure 33: Perforated Swing-Out Engine Guard

Figure 34: Slotted Engine Pivot Guard

Figure 35: Engine Compartment ROPS Panel Removal (Typical)
5. Remove the bolts securing the muffler panel. Remove the muffler panel. See Figure 36.

6. Loosen the U-bolt muffler clamp securing the muffler outlet at the rubber mount location. See Figure 37.

7. Loosen the clamp between the steel exhaust elbow and turbo housing. Support the muffler and remove the bolts securing the exhaust elbow to the engine manifold. See Figure 38.

8. Remove the muffler from the engine compartment.

9. Remove the hose clamps connecting the rubber elbow between the air cleaner assembly and the steel intake connector. Remove the rubber elbow. See Figure 39.

10. Remove the small rubber boot cover on the air cleaner baffle. See Figure 40.
11. Loosen the straps securing the air cleaner assembly to the air cleaner panel. See Figure 41. Remove the air cleaner assembly. Also remove the circular rubber boots where the steel intake connector and air cleaner baffle passed through the panel.

12. Remove the bolts securing the air cleaner panel. See Figure 42. Remove the air cleaner panel.

13. Cover the lower rubber elbow opening to keep contaminates out of the engine air intake.

14. The engine compartment should now be fully open above the engine to check the valve lash. See Figure 43.

**Check Valve Lash**

TIMBCO Feller-Bunchers can be equipped with either a Cummins or Catapillar engine option. Refer to the engine manufacturer’s manuals supplied with your machine for specific valve lash inspection procedures.
Install Muffler & Air Cleaner

Figure 44: Install Air Cleaner Panel (Typical)

1. Re-install air cleaner panel. See Figure 44.

2. Position the circular rubber boots for the steel intake connector and air cleaner baffle on the air cleaner panel.

Figure 45: Install Air Cleaner (Typical)

3. Re-install the air cleaner assembly in its mounting straps on the air cleaner panel. Tighten straps. See Figure 45.

4. Slide the strap clamps over the rubber elbow. Re-install the rubber elbow between the air cleaner assembly and steel intake connector. See Figure 46. Be sure the elbow is seated completely, then tighten the clamps.

Figure 46: Install Air Cleaner Rubber Elbow (Typical)

5. Re-install the rubber boot on the air cleaner baffle. See Figure 47.

Figure 47: Air Cleaner Baffle Boot Cover (Typical)

6. Slide the turbo clamp over the turbo outlet. Position the muffler and secure the steel exhaust elbow to the exhaust manifold. See Figure 48. Position and tighten the turbo clamp.
7. Tighten the U-bolt muffler clamp to secure the muffler outlet at the rubber mount location. See Figure 49.

8. Re-install the muffler panel. See Figure 50.

9. Use a crane or other lifting device to re-install the ROPS panel over the air cleaner and muffler. See Figure 51. Be sure the air cleaner extension tube is in position on the air cleaner intake tube.

10. Close and secure the perforated swing-out engine guard and slotted engine pivot guard.
Change Axle Differential Oil

1. Position machine on a level surface. Change the axle differential oil while it is still warm from operation.

2. Thoroughly clean around the FILL port, DRAIN port and dipstick. See Figure 52.

3. Remove the FILL plug. Place a container under the DRAIN port to catch waste oil. Remove the DRAIN plug and allow the oil to drain completely.

4. Clean the DRAIN plug. Inspect the plug seal and replace if damaged. Install the DRAIN plug and torque to 35 ft.lbs (45 Nm).

5. Add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the FILL port until the oil reaches the top mark on the dipstick.

6. Clean the FILL plug. Inspect the plug seal and replace if damaged. Install the FILL plug and torque to 53 ft.lbs. (70 Nm).

7. Repeat for other tandem axle assembly.

   **NOTE:** The front axle oil ports and dipstick can be reached through the rear pedestal access cover. See Figure 53.

8. Dispose of all waste oil properly.
Change Bogie Drive Housing Oil

1. Position the machine so that the bogie drive housing is horizontal (level across the tops of the wheels). Change the bogie drive housing oil while it is still warm from operation and has been allowed to settle for a minimum of 30 minutes. This will let sediment and other contaminants settle properly.

2. Thoroughly clean around the LEVEL port, "SAVE" OIL port and DRAIN ports on each end of the bogie drive housing. See Figure 54.

3. Remove the FILL plug. See Figure 55. Place a clean container under the "SAVE" OIL port to catch the reusable oil. Remove the "SAVE" OIL plug and allow the oil to drain. Repeat for the other "SAVE" OIL port. This oil can be reused later.

4. Place another container under one of the DRAIN ports. Remove the DRAIN plug and allow the oil to drain completely. Repeat for the other DRAIN port.

5. Clean the "SAVE" OIL and DRAIN plugs. Inspect the plug seals and replace if damaged. Install the "SAVE" OIL and DRAIN plugs and torque to 60 ft.lbs (80 Nm).

6. Add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the FILL port until the oil reaches the bottom of the LEVEL port hole. The "SAVE" OIL drained in step #3 can be reused here.

7. Install the LEVEL and FILL port plugs.

8. Repeat for remaining bogie drive housings.

9. Dispose of all waste oil properly.
Change Bogie Planetary Oil

1. Position the wheel so that the DRAIN port in the planetary hub cover is at the bottom. See Figure 56. Change the bogie planetary oil while it is still warm from operation.

2. Thoroughly clean around the LEVEL port and DRAIN port.

3. Remove the LEVEL plug. Place a container under the DRAIN port to catch waste oil. Remove the DRAIN plug and allow the oil to drain completely.

4. Clean the DRAIN plug. Inspect the plug seal and replace if damaged. Install the DRAIN plug and torque to 40 ft.lbs (50 Nm).

5. Add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the LEVEL port until the oil reaches the bottom of the port opening.

6. Clean the LEVEL plug. Inspect the plug seal and replace if damaged. Install the LEVEL plug and torque to 40 ft.lbs. (50 Nm).

7. Repeat for the remaining bogie planetary drives.

8. Dispose of all waste oil properly.
Changing Transfer Case Oil

1. Position machine on a level surface. Change the transfer case oil while it is still warm from operation.

2. Remove the guards protecting the transfer case and wheel motors. See Figures 57 & 58.

3. Thoroughly clean around the FILL port, DRAIN port, and dipstick. See Figures 59 & 60.

4. Remove the FILL plug. Place a container under the DRAIN port to catch waste oil. Remove the DRAIN plug and allow the oil to drain completely.

5. Clean the DRAIN plug. Inspect the plug seal and replace if damaged. Install the DRAIN plug and torque to 40 ft.lbs (53 Nm).

6. Add SAE 75W-90 synthetic transmission oil meeting MIL-PRF-2105E specifications thru the FILL port until the oil reaches the FULL mark on the dipstick.

7. Clean the FILL plug. Inspect the plug seal and replace if damaged. Install the FILL plug and torque to 40 ft.lbs. (53 Nm).

8. Re-install all guards and dispose of all waste oil properly.
Section 5.9

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You must read and understand the warnings and basic safety rules, found in Group 1 of this manual, before performing any operation or maintenance procedures.

For additional maintenance guidelines, see Section 5.1 of this manual.

Changing Ether Cylinder (Optional)

The ether injector and ether cylinder are located behind the perforated swing-out engine guard. Replacement ether cylinders can be ordered under TIMBCO PN# 16551, or they can be ordered from any Cummins engine dealer as PN# 3833593-A.

1. Open the perforated swing-out engine guard to gain access to the ether cylinder. See Figure 1.

2. Loosen the strap clamps securing the ether cylinder in the injector. Turn the cylinder COUNTER-CLOCKWISE to remove it from the injector. See Figure 2.

**NOTICE**

Do not smoke while changing ether cylinders or where ether cylinders are stored. Keep ether cylinders away from open flames.

Discard spent ether cylinders per manufacturer’s instructions. Do not puncture or burn. Ether cylinders can burst causing serious personal injury.

Ether is poisonous. Do not store ether cylinders in the operator’s compartment. Breathing ether fumes or repeated contact with skin can cause serious personal injury. Use ether only in well ventilated areas.
3. Install replacement ether cylinder and hand tighten only. Dispose of the used ether cylinder per manufacturer’s instructions printed on the cylinder.

**Changing Air Conditioner/Heater Unit Blower Filter**

1. Turn off the air conditioner/heater control unit.

2. The filter slides into place along channels and should pull out easily. If the filter snags or is difficult to remove, there are 2 screws that may be blocking it. See Figure 4. Remove the screws with a phillips head (+) screwdriver.

3. Clean the filter with compressed air. If the filter requires replacement, it can be ordered as TIMBCO PN# 20870, or it can be ordered from any Red Dot dealer as PN# FF-3.

4. Re-Install the filter.

The air conditioner/heater control unit is equipped with an intake filter for the blower fans. The filter is located directly behind the operator’s seat near the floor in the air conditioner/heater control unit shroud. See Figure 3. If air flow from the blower vents has degraded, remove and service the filter.
**Priming Caterpillar Engine Fuel System**

The Caterpillar engine’s fuel system must be primed whenever the fuel filter is replaced.

1. Open the perforated swing-out engine guard to gain access to the fuel system priming pump. See Figure 5.

2. Locate the hand operated fuel system priming pump plunger. See Figure 6.

3. Unlock and pump the plunger in and out until resistance is felt, then push the plunger all the way in and lock in place.

4. Start the engine. If the engine will not start, or once started continues to misfire or smoke, further priming is necessary.

5. If the engine starts, but runs rough, continue running the engine at low idle until it runs smoothly.

6. Check for fuel leaks and correct if found.

7. Shut-down engine.

8. Close and secure the perforated swing-out engine guard.

Rotek Swing Bearing Service Tolerance

NOTICE
You must read and understand the warnings and basic safety rules, found in Group-1 of this manual, before performing any operation, test or adjustment procedures.

Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.

At operating temperature, the engine, exhaust system components, cooling system components and hydraulic system components are HOT. Any contact can cause severe burns.

Periodically, the Rotek swing bearing service tolerance may need to be checked. A service tolerance of up to 0.095” is acceptable.

1. Torque all bearing mounting bolts to specification before beginning procedure.

2. Position a dial indicator with its magnetic base affixed to the lower turntable weldment and the indicator pointer against the outer race of the bearing. See Figure 7. Position a second dial indicator on the opposite side of the bearing.

- Position the dial indicators as near as possible to the centerline of the bearing (looking towards the bearing from the sides of the machine).

- Be sure the magnetic base is fixed to a smooth flat surface and it has firm contact with the lower turntable.

3. Start the engine. Position the boom at full extension over one side of the machine with the grapple bucket or cutting attachment a few inches off the ground. Shut down the engine.

4. Zero both dial indicators.

5. Start the engine. Lower the grapple bucket or cutting attachment to the ground, then use the main boom down function to continue putting down pressure on the boom until the wheels on the boom side begin to lift off the ground.

6. Shut down the engine. Record both dial indicator readings. The indicator readings should be within .002” of each other. If not, it could indicate loose bearing mounting bolts that may be allowing the bearing flex slightly.
7. Re-position both dial indicators to the front and rear of the machine. Perform steps #3 thru #6 with the boom extended over the front of the machine.

- Position the dial indicators as near as possible to the centerline of the bearing (looking towards the bearing from the front and rear of the machine).

- Be sure the magnetic base is fixed to a smooth flat surface and it has firm contact with the lower turntable.

8. A new machine at the factory has approx. .020-.024" of bearing tolerance (this is actually bearing tolerance plus other inherent tolerances found in machine assembly). The difference between “new” and your readings is the bearing’s service tolerance.

**Rotek Articulation Bearing Service Tolerance**

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**NOTICE**

You must read and understand the warnings and basic safety rules, found in Group-1 of this manual, before performing any operation, test or adjustment procedures.

*Diesel exhaust fumes contain elements that are hazardous to your health. Always run engine in a well ventilated area. If in an enclosed space, vent exhaust to the outside.*

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2. Position a dial indicator with its magnetic base affixed to the lower front frame weldment and the indicator pointer against the face of the articulation joint casting. See Figure 8.

- Be sure the magnetic base is fixed to a smooth flat surface and it has firm contact with the front frame weldment.
3. Start the engine. Position the boom over the front of the machine so that the pin for the grapple bucket or cutting attachment is approx. 11’ (3.35 m) from the upper turntable center of rotation. Shut down the engine.

4. Zero the dial indicator.

5. Start the engine. Lower the grapple bucket or cutting attachment to the ground, then use the main boom down function to continue putting down pressure on the boom until the function bottoms out.

6. Shut down the engine. Record the dial indicator reading.

7. A new machine at the factory has approx. .040” of bearing tolerance (this is actually bearing tolerance plus other inherent tolerances found in machine assembly). The difference between “new” and your reading is the bearing’s service tolerance.