

SERVICE REPAIR

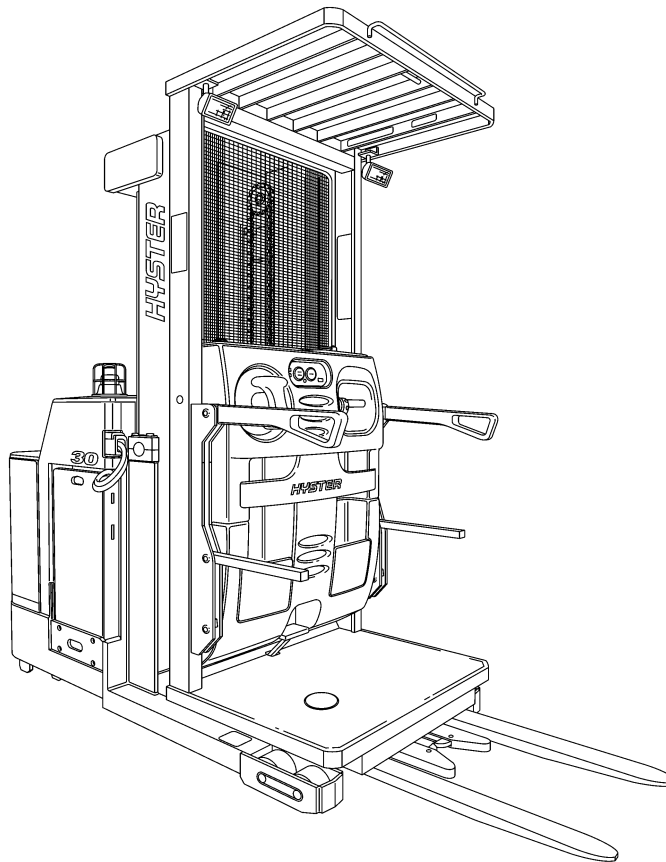
MANUAL

Hyster G118 (R30XM2, R30XMA2, R30XMF2) Forklift

HYSTER

PERIODIC MAINTENANCE

R30XMS2 [D174];
R30XM2/XMA2/XMF2 [G118]



HM211045

HYSTER

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks.
- Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:



WARNING

Indicates a condition that can cause immediate death or injury!



CAUTION

Indicates a condition that can cause property damage!

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manual**

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This section is for the following models:

R30XMS2 [D174];
R30XM2/XMA2/XMF2 [G118]

General

This section contains a Maintenance Schedule and the instructions for maintenance and inspection.

The Maintenance Schedule has time intervals for inspection, lubrication, and maintenance. The time intervals are based on a normal operation. A normal operation is considered to be one 8-hour shift per day, in a relatively clean environment, on an improved surface. Multiple shifts, dirty operating conditions, etc., will require a reduction in the recommended time periods in the Maintenance Schedule.

Some users have service personnel and facilities to do the items listed in the Maintenance Schedule. Service Manuals are available from your Hyster lift truck dealer to help users who do their own maintenance.

Your Hyster lift truck lift truck dealer has the personnel and equipment to do a complete program of inspection, lubrication, and maintenance. Periodic maintenance will help your lift truck operate better over a longer period.



WARNING

Do not make repairs or adjustments unless you have both authorization and training. Repairs and adjustments that are not correct can be made on a lift truck by people without authorization and training. Repairs and adjustments that are not correct can make a dangerous operating condition.

Do not operate a lift truck that needs repairs. Report the need for repairs immediately. If repair is necessary, put a DO NOT OPERATE tag in the operator's area. Remove the key from the key switch.

Put the lift truck on a level surface. Lower the platform and forks, apply the parking brake, and turn the key switch to the **OFF** position. Open the access panels and check for leaks and conditions that are not normal. Clean any oil or other spills. Make sure that lint, dust, paper, and other materials are removed from the compartments.

HOW TO MOVE A DISABLED TRUCK



WARNING

To avoid personal injury or property damage, use extra care when moving a lift truck if there is a problem with any of the following conditions:

- **Brakes do not operate correctly.**
- **Steering does not operate correctly.**
- **Tires are damaged.**
- **Traction conditions are bad.**
- **The lift truck must be towed on a steep grade.**

Poor traction can cause the disabled lift truck or towing vehicle to slide. Steep grades will increase the required brake effort.

NOTE: Always remember there may be problems with more than one of the above areas of the truck. Do not tow the lift truck if you have not identified all problem areas.

The best way to move the lift truck is to use another lift truck to raise the drive tire off the ground. This will allow the lift truck to be towed or pushed around. Whatever method is used, the important thing to remember is to travel slowly.

If there is no electrical power, there is no steering and the brake will be applied. If the lift truck is inoperable, the brake will have to be released using two 1/4-20 × 1-1/2 inch bolts. Poor traction can cause the disabled lift truck or towing vehicle to slide. Steep grades will require additional brake force to stop the lift truck.

Never carry a disabled lift truck unless the lift truck **MUST** be moved and cannot be towed. The lift truck used to lift the disabled lift truck **MUST** have a rated capacity equal to or greater than the weight of the disabled lift truck. The capacity must be for a load center equal to half the width of the disabled lift truck. See the nameplate on the disabled lift truck for the approximate total weight. The forks must extend the full width of the disabled lift truck. Center the weight of the disabled lift truck on the forks and be careful not to damage the underside of the disabled lift truck. Tilt the mast back and travel slowly.

How to Tow the Lift Truck



CAUTION

Do NOT tow the lift truck by fastening a towing device to the attachment or base arms. Make sure the guidance sensors are not damaged when connecting a chain to the lift truck.

1. If the lift truck must be towed, the operator must be on the lift truck to release the brake and steer the lift truck. If the lift truck is inoperable, release the brake using two 1/4-20 × 1-1/2 inch bolts.
2. Tow the lift truck slowly.
3. Raise the platform approximately 30 cm (12 in.) from the surface. Install a chain to prevent the platform and mast channels from moving.
4. If another lift truck that has the drive wheels near the forks is used to tow the disabled lift truck, that lift truck must have weight added to the forks. The total weight of the lift truck and load must be equal to or greater than the weight of the disabled lift truck. Install a load of approximately half the maximum capacity on the forks of the lift truck that is used for towing. This load will increase the traction of the lift truck. Keep the load on the forks lowered as much as possible.

If the lift truck used for towing has a master drive unit or drive unit similar to the R30XM2/XMA2/XMF2/XMS2, do NOT add weight to the forks. Additional weight on the forks will DECREASE the traction of the drive wheel(s). Make sure that the lift truck has a total weight equal to or greater than the weight of the disabled lift truck.

5. Make sure the tow chain has the capacity to tow the weight. Carefully fasten the tow chain to the drive unit end of the lift truck. Make sure the chain is fastened so that the chain will not cause damage to either lift truck.

HOW TO PUT A LIFT TRUCK ON BLOCKS

How to Raise the Drive Tire



WARNING

The lift truck must be put on blocks for some types of maintenance and repair. The removal of the following assemblies will cause large changes in the center of gravity: mast, battery, and master drive unit.

Do NOT put the lift truck on blocks if the surface is not solid, even, and level. Make sure that any blocks used to support the lift truck are solid, one-piece units. Put a block in front and back of the tires touching the ground to prevent movement of the lift truck.

Do not raise the lift truck by attaching an overhead crane to the overhead guard or areas of the mast that will be damaged. Some of these components and other lift points are not designed to support the weight of the lift truck. The lift truck can be damaged or it can fall on someone causing serious injury. Attach the chain or sling to a support structure of the lift truck frame.



CAUTION

Make sure the sensors are not damaged on trucks that have wire guidance.

1. Put blocks on each side (front and back) of the load wheels to prevent movement of the lift truck. See Figure 1.
2. Use a special low clearance hydraulic jack, crane, or another lift truck to raise the drive tire. Make sure that the jack, crane, or other lift truck has the correct minimum capacity rating. The capacity must equal at least 2/3 the weight of the lift truck including the battery. See the nameplate.
3. Raise the lift truck only enough to suspend the drive tire. Install additional blocks under the frame near the drive tire.

How to Raise the Load Wheels



WARNING

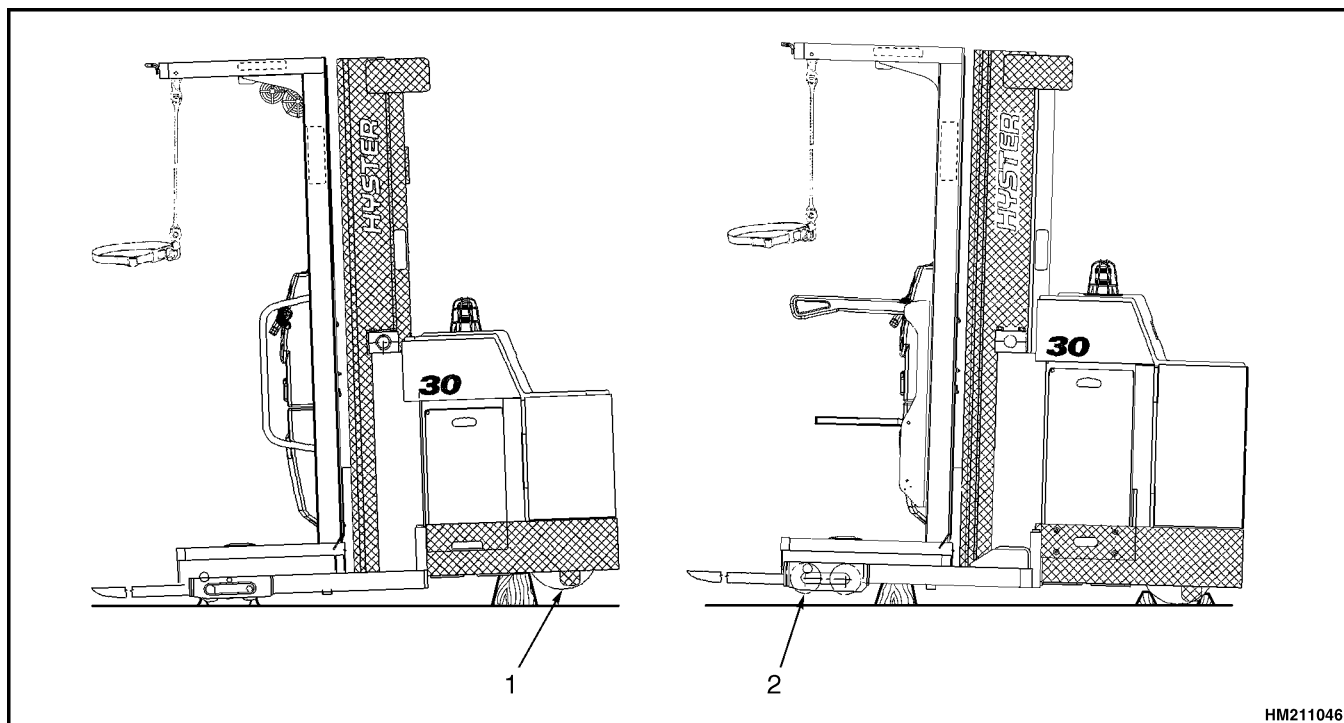
Never raise the base arms any higher than necessary to change the load wheels. Always raise both base arms at the same time. Raising the base arms too high can make the lift truck tip over and cause damage or possible injury.



CAUTION

Make sure the sensors are not damaged on trucks that have wire guidance.

1. Put blocks on both sides (front and back) of the drive tire to prevent movement of the lift truck. See Figure 1.
2. Use a hydraulic jack, crane, or another lift truck to lift the base arms. Make sure that the jack, crane, or other lift truck has a capacity equal to at least half the weight of the lift truck including the battery.
3. Put blocks under the base arm at the rear of the load wheel to support the lift truck.



NOTE: R30XMS2 IS ON THE LEFT, R30XM2/XMA2/XMF2 IS ON THE RIGHT.

1. DRIVE/STEER WHEEL

2. LOAD WHEEL

Figure 1. How to Put Lift Truck on Blocks

Maintenance Schedule

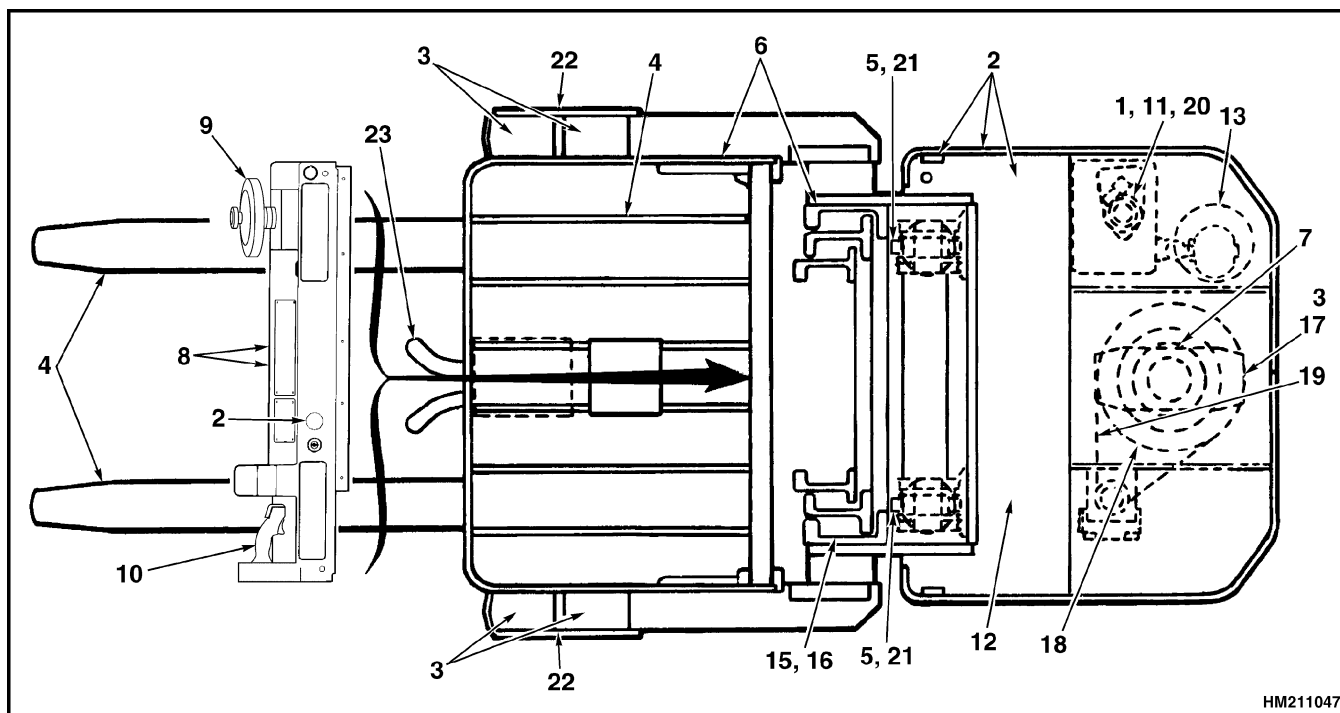


Figure 2. Maintenance Points

Table 1. Maintenance Schedule

Item No.	Item	8 hr/ 1 day	350 hr/ 2 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
1	Hydraulic Oil (Full Mark) (Approximate) R30XM2/XMA2/XMF2 R30XMS2 Oil Leaks	X X		C ¹ C ¹	8.5 liter (2.25 gal) 14.65 liter (3.87 gal) Check for leaks	-18 to 38°C (0 to 100°F) SAE 10W API SC/CC
2	Battery Panels - Latches Disconnect Switch	X X X	²		Check level Check operation Check operation	See Battery Specifications
3	Drive Tire and Wheels	X			Check condition	See Parts Manual
4	Forks	X		C	Check condition	See Parts Manual
5	Lift Chains	X	L		Check condition	SAE-30
6	Mast and Platform	X			Check condition	
7	Brake	X			Check operation	Hold On 5% Grade
8	Gauges and Horn	X			Check operation	
9	Steering	X	L		Check operation	Multipurpose Grease ³
X=Check C=Change L=Lubricate IR=Initial Replacement						
¹ Change oil after first 350 hours. Change oil every 1000 hours or 6 months with corrosion/freezer option.						
² Equalization Charge approximately once each month but not more than once each week.						
³ Multipurpose Grease with 2-4% Molybdenum Disulfide.						
NOTE: Never use steam to clean electrical parts.						

Table 1. Maintenance Schedule (Continued)

Item No.	Item	8 hr/ 1 day	350 hr/ 2 mo	2000 hr/ 1 yr	Procedure or Quantity	Specification
10	Direction/Speed Control	X		L	Check operation	MIL-G-7711A or equivalent
11	Hydraulic Tank Breather		X		Clean or replace	See Parts Manual
13	Hydraulic Pump Coupling		L		Clean and lube	Multipurpose Grease ³
12	Contactor Tips		X		Check condition	See Parts Manual
13	Motor Brushes		X		Check condition	See Parts Manual
14	Safety Labels (not shown)		X		Replace if necessary	See Parts Manual
6 4 5 16	Mast and Platform Fork Pin and Guides Lift Chains and Sheaves Sliding Surfaces		L X,L L		As required As required As required	SAE 30 Oil SAE 30 Oil Multipurpose Grease ³
17	Wheel Nut Torque		X		Tighten if required	136 N•m (100 lbf ft)
18	Master Drive Unit		X,IR	C	3.8 liter (1 gal)	SAE 80W-90 or 85W
19	Steering Chain		L		As required	Multipurpose Grease ³
20	Hydraulic Filter		IR	C	1 ea.	See Parts Manual
21	Electrical Cable Sheaves		L		As required	SAE 30 Oil
22	Base Arm Bearings			L	As required	SAE 30 Oil
23	Pallet Clamp			L	As required	SAE 30 Oil
	Misc.			L	As required	Hyster Part No. 328388
X=Check C=Change L=Lubricate IR=Initial Replacement						
¹ Change oil after first 350 hours. Change oil every 1000 hours or 6 months with corrosion/freezer option.						
² Equalization Charge approximately once each month but not more than once each week.						
³ Multipurpose Grease with 2-4% Molybdenum Disulfide.						
NOTE: Never use steam to clean electrical parts.						

Maintenance Procedures Every 8 Hours or Daily

HOW TO MAKE CHECKS WITH KEY SWITCH IN THE OFF POSITION

Hydraulic System



WARNING

Do NOT operate a lift truck that needs repairs. Report the need for repairs immediately. If repair is necessary, put a **DO NOT OPERATE** tag in the operator's area. Remove the key from the key switch.



WARNING

Do not permit the hot hydraulic oil to touch the skin and cause a burn. When the hydraulic oil is at operating temperature, it is HOT.



CAUTION

Do not permit dirt to enter the hydraulic system when the filter is changed.



CAUTION

Never operate the hydraulic pump without oil in the hydraulic system. The operation of the hydraulic pump without oil will damage the pump.

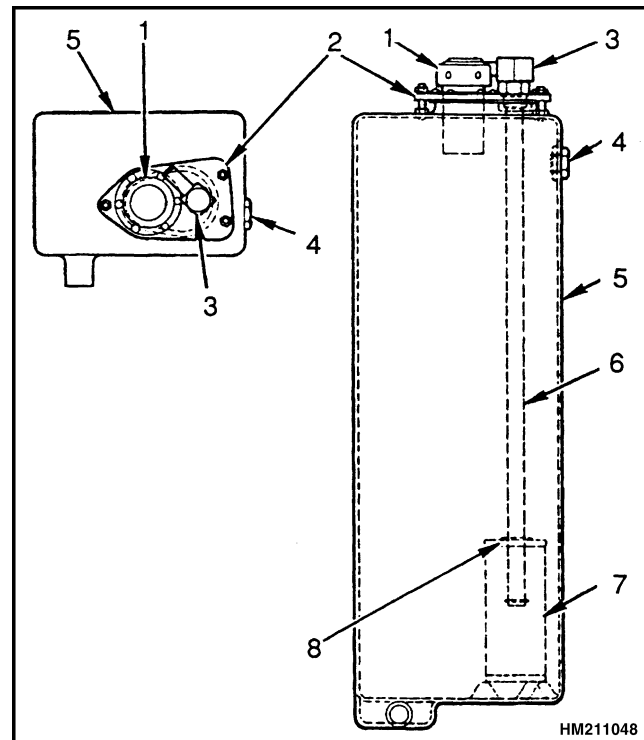
Park the lift truck on a level surface. Completely lower the mast and the forks.

Check the hydraulic oil level at the sight gauge when the oil is at operating temperature. See Figure 3. If the oil level is not visible at the sight gauge, the oil level is above or below the sight gauge. Open the door of the hydraulic compartment to check for the correct level and fill the tank if necessary. If too much hydraulic oil is added, the oil will leak from the breather during operation. Clean the breather and fill cap by removing the fill cap and flushing it with

solvent. Make sure the breather and fill cap are free of solvent. Install and tighten the fill cap.

To drain the oil, put the lift truck on a level surface. Completely lower the mast and forks. Use a container with a 38 liter (10 gal) capacity near the supply hose of the hydraulic tank. Turn the key switch to the **OFF** position and disconnect the battery.

Inspect the hydraulic system for leaks and damaged or loose components.



- | | |
|-------------------|-------------------|
| 1. FILL/BREATHER | 5. HYDRAULIC TANK |
| 2. PLATE ASSEMBLY | 6. TUBE |
| 3. HOSE CONNECTOR | 7. FILTER ELEMENT |
| 4. SIGHT GAUGE | 8. GROMMET |

Figure 3. Hydraulic Checks

Battery



WARNING

Do not put tools on the battery. Tools on the battery can cause a short circuit and possible damage or injury.

The acid in the electrolyte can cause injury. If the electrolyte leaks, use water to flush the area. Make the acid neutral with a solution of sodium bicarbonate (baking soda). Acid in the eyes must be immediately flushed with water.



WARNING

Do NOT put hands, arms, feet, or legs between the battery and a solid object. Batteries are very heavy and can cause an injury.

The lift truck and battery stand MUST be on a level surface to remove the battery.

Check the level of the electrolyte daily on a minimum of one cell. Add only distilled water if the cell is low. The correct level is halfway between the top of the plates and the bottom of the fill hole. To check and add water to the cells, the battery must be out of the battery compartment.

Remove the battery as described in How to Change the Battery. Check the battery case, connector, and cables for damage, cracks, or breaks. See the battery dealer in your area to repair any damage. Keep the battery case and the battery compartment clean and painted. Leaks and corrosion from the battery can cause a malfunction in the electric controls of the lift truck. Use a water and soda solution to clean the battery and the battery compartment. Keep the top of the battery clean, dry, and free of corrosion.

Check that the correct spacer is installed across the mast side of the battery compartment. The spacer must allow the battery to move not more than 13 mm (0.5 in.) toward the front or rear of the compartment. Check that the battery cannot move more than 13 mm (0.5 in.) across the width of the lift truck. If the battery can move more than the maximum amount, make sure the battery is the correct weight and the correct spacers are installed for that battery.

See your Hyster lift truck dealer for the correct spacers. The correct battery is in Table 4 of Battery Maintenance at the end of this section. Check that each battery compartment panel fits correctly and is not bent.

Mast, Platform, Forks, and Lift Chains



WARNING

To avoid personal injury or property damage, NEVER work under a raised platform or forks. Lower the platform or use chains on the mast weldments and platform so they cannot move. When chains are used, make sure the moving parts are fastened to a part that cannot move.



WARNING

Never repair damaged forks. Do not heat, weld, or bend forks. Replace damaged forks.

Check the attachment points of the forks with a penetrant or magnetic particle inspection.

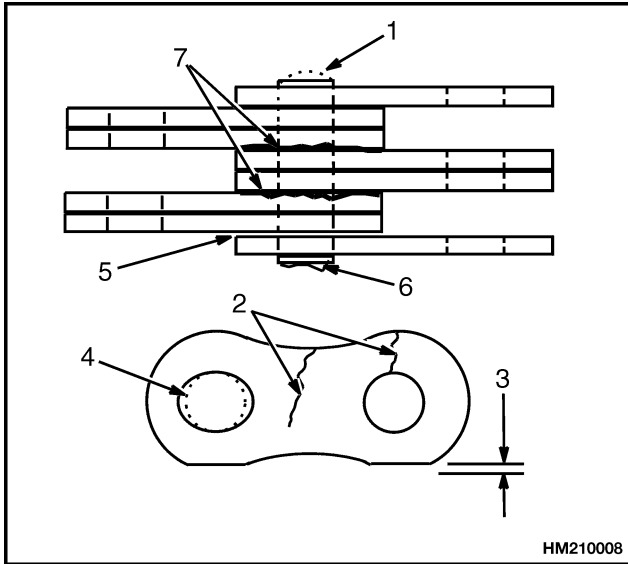


CAUTION

Do not try to correct alignment of the fork tips by bending the forks. Use shims to align the fork tips. Replace damaged forks.

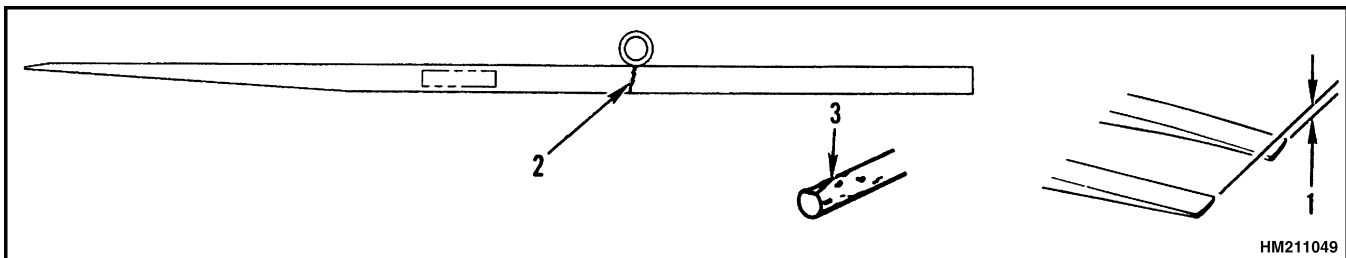
Never repair damaged forks by heating or welding. Forks are made of special steel using special procedures. Replace damaged forks. Always replace forks in pairs.

1. Inspect the welds on the mast and platform for cracks. Make sure the nuts and bolts are tightened.
2. Inspect the channels for wear in the areas where the rollers travel. Inspect the rollers for wear or damage.
3. Check all lift chains for the correct lubrication. Lubricate the lift chains using the oil specified in the Maintenance Schedule.
4. Inspect the lift chains for cracks or broken links and pins. See Figure 4.



- | | |
|--------------|-----------------|
| 1. WORN PIN | 5. LOOSE LEAVES |
| 2. CRACKS | 6. DAMAGED PIN |
| 3. EDGE WEAR | 7. RUST |
| 4. HOLE WEAR | |

Figure 4. Inspect Lift Chains and Cables



- | | | |
|------------------|-----------|--------------------|
| 1. TIP ALIGNMENT | 2. CRACKS | 3. FORK PIN DAMAGE |
|------------------|-----------|--------------------|

Figure 5. How to Inspect Forks

Tether Line and Belt



WARNING

To help avoid personal injury, the tether line is specially made to lessen the shock of a fall. Do not substitute other types of rope.

1. Inspect the tether line for wear, cuts, or damage. Inspect the clips for cracks and proper operation.
2. Inspect the belt for cracks, cuts, or wear. The operator must fasten the belt snugly with the "D" ring in the center of the back.

Pallet Clamp

Check for correct operation of the pallet clamp. Put an empty pallet on the forks. With the forks raised so the pallet is supported by the forks, stand on the corners of the pallet farthest from the operator's platform. Some movement may occur, but the board under the opposite fork must not raise enough to contact the fork. Use multipurpose grease to lubricate the pawls of the pallet clamp.

Tire, Wheels, and Caster

Inspect the drive tire and load wheels for damage. Inspect the tread and remove any objects that will cause damage. See Figure 6. Smooth any cuts or tears to prevent further damage. Inspect the wheels

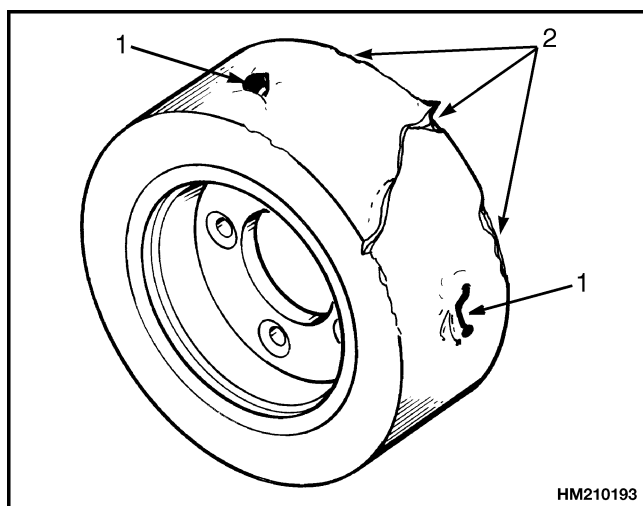
and caster for loose or missing parts. Remove any wire, strapping, or other material wound around the axles or caster.



CAUTION

If the wheels have been removed and installed, check all wheel nuts after 2 to 5 hours of operation. Tighten the nuts (in a cross pattern) to the correct torque value shown in the Maintenance Schedule table. When the nuts stay tight after 8 hours, the interval for checking the torque can be extended to 350 hours.

Make sure the wheel nuts are tightened to the correct torque value. Tighten the nuts (in a cross pattern) to the correct torque value shown in the Maintenance Schedule table.



1. MAKE SMOOTH EDGES
2. REMOVE NAILS, GLASS, AND ALL METAL

Figure 6. Inspecting Tire and Wheels

HOW TO MAKE CHECKS WITH KEY SWITCH IN THE ON POSITION

Gauges, Lights, Horn, and Fuses



WARNING

Make sure the area around the lift truck is clear before moving the lift truck or checking for correct operation. Be careful to avoid injury or damage when making the checks.

NOTE: None of the electrical controls will operate until the power disconnect circuit is energized by the key switch. See Figure 2 and Table 1.

Check that all the instruments and controls operate as described in the **Operating Manual**. Check the operation of the gauges and horn. The key switch must be in the **ON** position to operate the horn. The key switch must be **ON** and the foot switch must be depressed for the hourmeter to operate. The battery meter operates whenever a charged battery is connected.

The battery meter correctly indicates the condition of the battery. If the battery meter LED is illuminated red, charge the battery. There must be a current flow from the battery before the "lift interrupt" indicator will be reset. Normal operation, after connecting a charged battery, will reset the indicator.

Fuses

There are seven fuses on this truck and they are all found on the Contactor Panel. Ratings of the fuses are shown in Table 2.

Table 2. Fuses

Fuses	Circuit	Rating
FU-1	Traction	300A
FU-2	Pump	300A
FU-3	Start Circuit	5A
FU-4	Operator Compartment light Fan and Flashing Light	15A
FU-5	APS Power	15A
FU-6	APS Power	15A
FU-7	MCU, LS3, WGU, and Indicator	5A

Power for the APS Steering Motor Controller is supplied by fuses FU-5 and FU-6. They are wired in parallel to provide 30 amps to the controller so that if one blows, the other may too. Without this current, the controller will be disabled. The MCU will sense that the steering controller is disabled and will not allow the drive motor to work.

All the fuses are located in the electrical compartment. See Figure 7. Remove the cover over the electrical compartment for access. The condition of some fuses can be checked by looking at them. Other fuses do not change in looks and must be checked with an ohmmeter to determine continuity. Disconnect the battery before checking fuses.

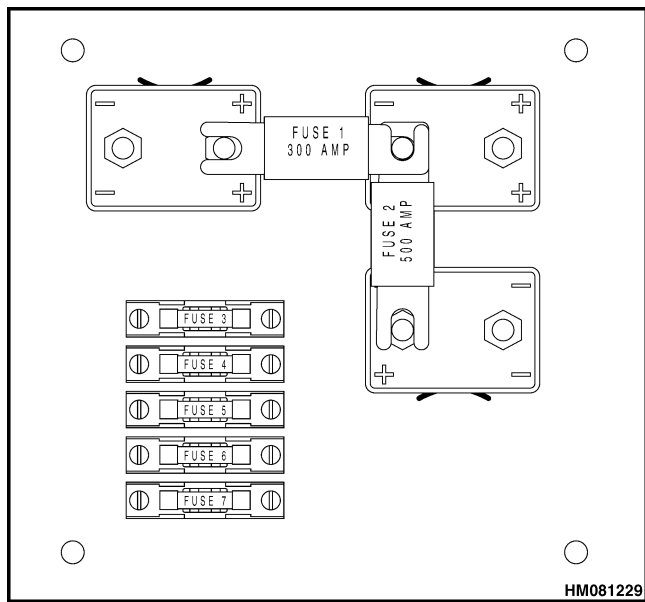


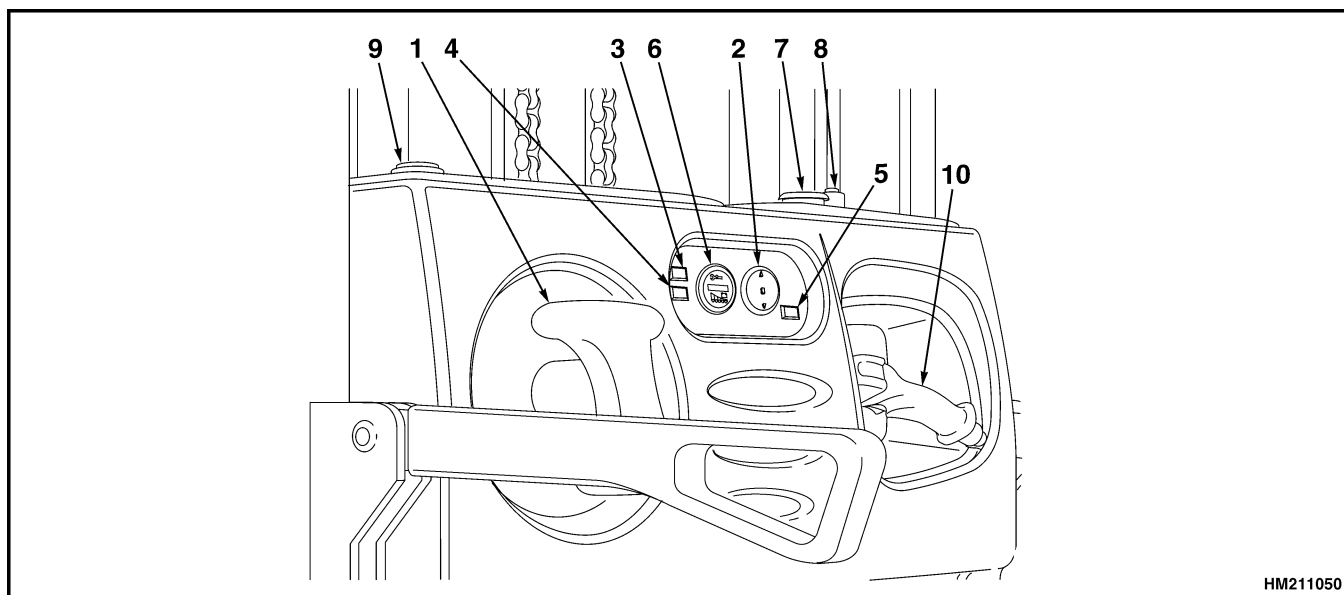
Figure 7. Fuse Locations

Check that the fuses are the correct sizes and are not burned. Some types of fuses must be checked with an ohmmeter. If any of the fuses are bad, disconnect the battery before replacing the fuse.

Switches and Direction/Speed Control

Check that the Direction/Speed control and the switches for Lift and Lower operate as described in Table 1 of the **Operating Manual**. Check that the foot switch and Direction/Speed control operate as described in the Operating Procedures section of the **Operating Manual**.

Check the operation of the Power Disconnect Switch. The location of the switch is shown in Figure 8. Push the switch with the key switch in the **ON** position and the foot switch depressed. All electrical circuits must **NOT** operate. Move the key to the **OFF**, **START**, and **ON** positions to reset the power disconnect circuit.



- | | |
|--|--|
| 1. STEERING CONTROL (RETURN TO CENTER SHOWN) | 6. BATTERY INDICATOR/HOURMETER |
| 2. POSITION INDICATOR (MULTITURN STEERING) | 7. BATTERY DISCONNECT SWITCH |
| 3. GUIDANCE BUTTON (OPTIONAL) | 8. KEY SWITCH |
| 4. FAN SWITCH (OPTIONAL) | 9. CONSOLE ADJUSTMENT RELEASE (OPTIONAL) |
| 5. LIFT LIMIT SWITCH (OPTIONAL) | 10. DIRECTION/SPEED CONTROL ASSEMBLY |

Figure 8. Instruments and Controls

Lift System Operation



WARNING

Lower the lift mechanism completely. Never allow anyone under a raised platform or forks. Do not put any part of your body in or through the lift mechanism unless all parts of the mast and platform are completely lowered and the key switch is in the OFF position. Remove the key.

Before making any repairs, completely lower the platform or use chains on the mast weldments and platform so they cannot move. Make sure the moving parts are fastened to the parts that cannot move.

Do not try to find hydraulic leaks by putting hands on hydraulic components under pressure. Hydraulic oil can be injected into the body by pressure.

1. Check for leaks in the hydraulic system. Check the condition of the hydraulic hoses and tubes.
2. Slowly raise and lower the forks and the platform several times without a load. All moving components must raise and lower smoothly.
3. The platform and the forks must lower completely.
4. Raise the platform 1 m (3 ft) with a capacity load. The inner weldment and platform must raise smoothly. Lower the platform and forks. All moving components must lower smoothly.

5. Check the operation of the limit switches on the mast. The maximum travel speed must be slower when the platform is above 1524 mm (60 in.). Maximum travel speed with the platform below 1524 mm (60 in.) is 9.7 km/h (6.0 mph). It should noticeably slower above 1524 mm (60 in.).
6. If necessary, have the lift truck checked and adjusted by authorized service personnel.

Brake

Check the operation of the brake. The brake, when in good condition and correctly adjusted, will hold the lift truck with a capacity load on a 5% grade [a slope of 0.5 m in 10 m (1.6 ft in 33 ft)]. If the brake does not hold the lift truck on the grade, the brake needs to be checked by authorized service personnel. Refer to the procedures for the Brake in Maintenance Procedures Every 350 Hours or 2 Months of this section.

Steering System



WARNING

There is NO steering if there is no electrical power. To prevent injury or damage, make sure the electric power steering is operating correctly before moving the lift truck.

Make sure that the steering system operates smoothly and has good steering control.

Maintenance Procedures Every 350 Hours or 2 Months

NOTE: Do the following procedures in addition to the 8-hour checks.

BRAKE

The brake, when in good condition and correctly adjusted, will hold the lift truck with a capacity load on a 5% grade [a slope of 0.5 m in 10 m (1.6 ft in 33 ft)]. If the brake will not hold the lift truck on the grade as described, have the adjustment checked by authorized personnel. See the manual **Electric Brake** 1800 SRM 305 and 1800 SRM 761 to check or repair the brake or to replace the friction disc.

ELECTRICAL CABLE SHEAVES

Lubricate the cable sheaves at the top of the mast and cylinder head using SAE 30 Oil.

HYDRAULIC TANK BREATHER

The fill cap and breather assembly are in the hydraulic compartment at the top of the hydraulic tank. See Figure 3. Remove the fill cap assembly from the hydraulic tank and clean the filter material of the breather in solvent. Replace the fill cap and breather assembly if air will not flow through it easily.

ELECTRICAL INSPECTION

Contactors



WARNING

Disconnect the battery connector before making any inspections or repairs. Personal injury or equipment and tool damage can occur if the battery is not disconnected.



CAUTION

If the lift truck has been operated using a low battery or de-energized with the power disconnect circuit, inspect for welded contacts **BEFORE** connecting a charged battery. The Power Disconnect circuit will not reset and lift truck operation cannot be controlled if the contacts are welded.



CAUTION

Low battery voltage makes motors use high currents for a longer time to do the same work. The high currents can damage motors and weld contactor contacts. Never try to repair contactor contacts that are welded. Always replace welded contacts. Do not operate the lift truck using a battery that has a specific gravity of 1.130 or less.

The contact surfaces of the contactor are a silver alloy over a copper base. In normal operation, the contact surfaces become a dark color and rough. Cleaning is not necessary. Do not use a file or emery cloth on the contacts. Replace the contacts when the surface is worn to the base material. Always replace the contacts in sets (two pairs). If necessary, disassemble the contactor to inspect the contacts.

Open the electrical compartment for access to the contactors.

Motor Brushes



WARNING

Disconnect the battery before making any checks on the motors. Personal injury or equipment and tool damage can occur if the battery is not disconnected.



CAUTION

Low battery voltage makes motors use high currents for a longer time to do the same work. The high currents can damage motors and contactor contacts. Do not operate the lift truck using a battery that has a specific gravity of 1.130 or less.

Open the front compartment doors for access to the motors.

To check the motor brushes, disconnect the battery and get access to the motor. Check motor brushes using the following procedure:

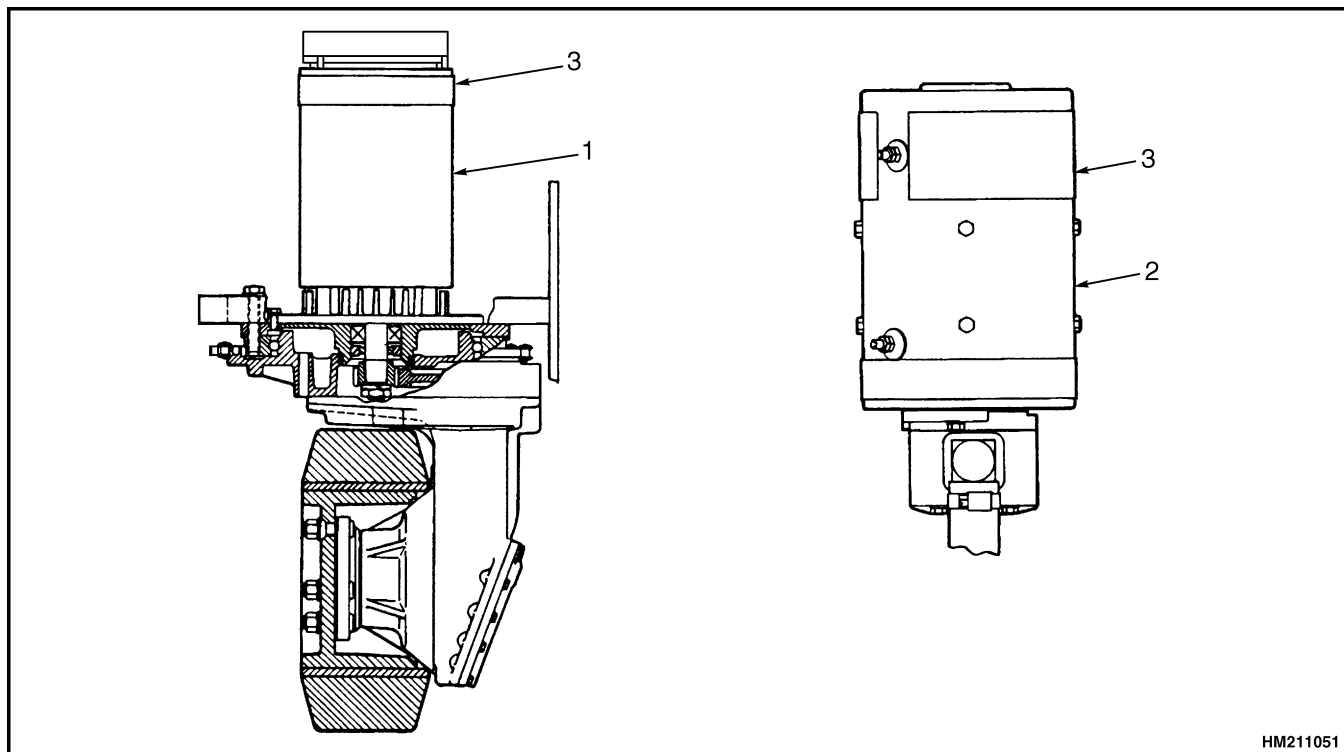
1. Visually inspect the commutator and brushes every 350 hours on the Hydraulic and Drive motors. See Figure 9. Remove the brush cover. Move the brush spring to remove a brush from the holder. Pull the brush from the holder. Make sure the surface of the commutator is good and the operation of the motor is correct. Replace brushes before they are worn to the values shown in Table 3.

Table 3. Motor Brush Minimum Dimensions

Motor	Dimension A
Traction Motor	16 mm (0.63 in.)
Lift Pump Motor	14 mm (0.55 in.)
NOTE: Measure brush from armature side to spring side. Use smallest measurement.	

2. Inspect the brush holders for burns or damage. Make sure the brush holder is fastened tightly to the mounts. Make sure the brushes will move freely and smoothly in the brush holders and do not have wire breaks.
3. Check the brush springs for damage from heat (color changes) and corrosion. Replace a damaged brush spring.
4. Use dry compressed air under low pressure to remove any brush dust.

NOTE: See the section **DC Motor Maintenance** 620 SRM 294 for additional information for repair of the commutator and brushes.



1. TRACTION MOTOR

2. LIFT PUMP MOTOR

3. ACCESS COVER EE ONLY

Figure 9. Inspect the Motor Brushes**SAFETY LABELS****WARNING**

If labels that have warnings or instructions are damaged, they must be replaced immediately.

Safety labels are installed on the lift truck to give information about possible hazards. It is important that all safety labels are installed on the lift truck and can be read.

MAST**WARNING**

To avoid injury or damage, never work under a raised platform or forks. Lower the platform and the forks or use chains on the mast weldments and carriage so they cannot move. When chains are used, make sure the moving parts are fastened to a part that cannot move.

1. Inspect the surfaces in the channels where the load rollers travel. A scraper and solvent can be used to clean dirt from the mast channels.

Make sure all safety labels are installed in the correct location on the lift truck. Make sure all labels are not damaged and that they can be read. If necessary, see the Frame section or the PARTS MANUAL for your lift truck for the correct location of the labels. See the Frame section for the installation procedures.

**CAUTION**

Be careful when steam or high-pressure water is used to clean the mast channels. Do NOT permit the steam or water to be used on the load rollers, sheaves, or lift chains. The steam or water will damage the bearings in the load rollers and sheaves, and will cause corrosion in the lift chains.

2. Apply a thin layer of multipurpose grease to the surfaces in the channels of the inner mast where the load rollers travel. Apply the grease to both the roller surfaces and the thrust surfaces in the mast.

NOTE: The mast and platform load rollers have sealed bearings that do not need additional lubrication.

3. Use multipurpose grease to lubricate all sliding surfaces and the chain sheaves at the top of the masts.
4. Lubricate the lift chains using the oil specified in the Maintenance Schedule.

CHECK FOR LEAKS IN LIFT SYSTEM



WARNING

Never allow anyone under a raised platform or forks. Do not put any part of your body in or through either lift mechanism unless all parts of the mast and carriage are completely lowered and the key is in the OFF position.

Before making any repairs, use chains on the mast weldments and carriage so they cannot move. Make sure the moving parts are fastened to the parts that cannot move.

Do not try to find hydraulic leaks by putting your hand on hydraulic components under pressure. Hydraulic oil can be injected into the body by the pressure.

During test procedures for the hydraulic system, fasten the load to the carriage with chains to prevent it from falling. Keep all personnel away from the lift truck during the tests.

Check the hydraulic system for internal leaks after every 350 hours of operation.

Check Lift Cylinders for Leaks

1. Operate the hydraulic system. Put a capacity load on the forks and raise and lower the load several times. Check for leaks.
2. Raise the carriage and load 1 m (3 ft). If the carriage slowly lowers when the control valve is in the neutral position, there are leaks inside the hydraulic system. The maximum speed that the forks can slowly lower when there are internal leaks is 50 mm (2 in.) per 10 minutes. This maximum leak rate is specified for an oil temperature of 30°C (90°F). If the temperature of the hydraulic

oil is 70°C (160°F), the specification increases to 150 mm (6 in.) per 10 minutes.

3. If there are leaks in the hydraulic system, check the lift cylinders for internal leaks.
4. Completely lower the forks. Install a gate valve at the base of each main lift cylinder. Raise the load. Close the gate valve at the base of one main lift cylinder. Move the Lift/Lower knob to lower the mast. If the load slowly lowers, the seals in one main cylinder leak. The cylinder that has the leak is the cylinder with the closed valve. Open the gate valve of the first main cylinder and close the gate valve at the base of the other main cylinder. Repeat the check for the other main lift cylinder.
5. If the load does not lower with either gate valve closed, open the gate valve and check the movement again. If the load lowers when the gate valve is open, check for leaks in the hydraulic lines and fittings. If no leaks are found, the lowering valve can have a malfunction. Remove the load from the forks.
6. Completely lower the forks. Remove all gate valves and connect the hydraulic lines to the cylinders.

LIFT CHAINS



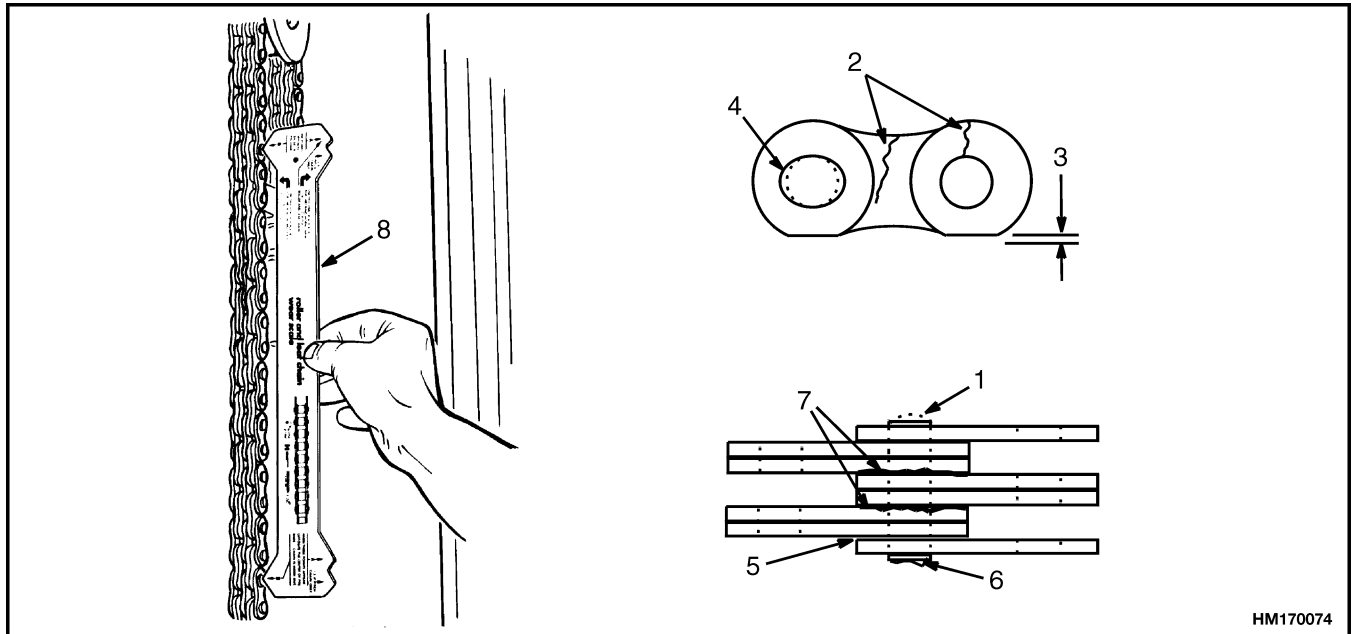
CAUTION

Do not repair a worn lift chain. Replace a worn lift chain with a new lift chain. Both chains must be replaced if one lift chain needs replacing.

Lubricate the lift chains using the oil specified in the Maintenance Schedule.

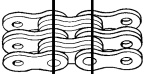
If a section of chain is 3% longer than a similar section of new chain, replace the worn chain.

If a chain scale is available, check the lift chains as shown in Figure 10. If a chain scale is not available, measure 20 links of chain. Compare the lengths with the chart in Figure 10. Replace the chain if the length of 20 links of the worn section is more than the maximum wear limit.



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NOTE: THE INSTRUCTIONS FOR MEASURING CHAIN WEAR ARE SHOWN ON THE CHAIN WEAR SCALE.

Pitch 	Total Length of 20 Links (Pitch) of New Chain	Wear Limit The Maximum Length of 20 Links
12.7 mm (0.50 in.) 15.9 mm (0.626 in.) 19.1 mm (0.75 in.) 25.4 mm (1.00 in.) 31.8 mm (1.25 in.) 44.5 mm (1.75 in.) 50.8 mm (2.00 in.)	254.0 mm (10.0 in.) 317.5 mm (12.5 in.) 381.0 mm (15.0 in.) 508.0 mm (20.0 in.) 635.0 mm (25.0 in.) 889.0 mm (35.0 in.) 1016.0 mm (40.0 in.)	261.6 mm (10.3 in.) 327.0 mm (12.87 in.) 392.4 mm (15.45 in.) 523.25 mm (20.6 in.) 654.1 mm (25.75 in.) 915.7 mm (36.05 in.) 1046.5 mm (41.2 in.)

- | | |
|--------------|---------------------|
| 1. WORN PIN | 5. LOOSE LEAVES |
| 2. CRACKS | 6. DAMAGED PIN |
| 3. EDGE WEAR | 7. CORROSION |
| 4. HOLE WEAR | 8. CHAIN WEAR SCALE |

Figure 10. Inspect the Lift Chains