# INTRODUCTION

## 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 for your lift truck. The service intervals are given in both operating hours recorded on the lift truck hour meter, and in calendar time. The recommendation is to use the interval that comes first.

The recommendation for the time intervals are for eight hours of operation per day. The time intervals must be decreased from the recommendations in the MAINTENANCE SCHEDULE for the following conditions:

a. If the lift truck is used more than eight hours per day.

b. If the lift truck must work in dirty operating conditions.

Your dealer for Hyster lift trucks has the equipment and trained service personnel to do a complete program of inspection, lubrication, and maintenance. A regular program of inspection, lubrication, and maintenance will help your lift truck give more efficient performance and operate for a longer period of time.

Some users have service personnel and equipment to do the inspection, lubrication, and maintenance shown in the MAINTENANCE SCHEDULE. Service Manuals are available from your dealer for Hyster lift trucks to help users who do their own maintenance.

### ⚠ WARNING

**Do not make repairs or adjustments unless you have both authorization and training. Repairs and adjustments that are not correct can make a dangerous operating condition.**

### ⚠ 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.**

## HOW TO MOVE A DISABLED LIFT TRUCK

### ⚠ WARNING

**Use extra caution when towing a lift truck if any of the following conditions exist:**

**a. Brakes do not operate correctly.**

**b. Steering does not operate correctly.**

**c. Tires are damaged.**

**d. Traction conditions are bad.**

**e. The lift truck must be towed on a slope.**

**If the engine cannot run, there is no power available for the hydraulic steering system and the service brakes. This condition can make the lift truck difficult to steer and stop. If the lift truck uses power from the engine to help apply the brakes, the application of the brakes will be more difficult. Poor traction can cause the disabled lift truck or towing vehicle to slide. A slope will also make the lift truck more difficult to stop.**

**Never lift and move a disabled lift truck unless the disabled lift truck MUST be moved and cannot be towed. A lift truck used to move a disabled lift truck MUST have a capacity rating equal to or greater than the weight of the disabled lift truck. The capacity of the lift truck used to move a disabled lift truck must have a load center equal to half the width of the disabled lift truck. See the nameplate of the disabled lift truck for the approximate total weight. The forks must extend the full width of the disabled lift truck. Put the weight center of the disabled lift truck on load center of the forks. Be careful to not damage the under side of the lift truck.**

### How to Tow a Lift Truck

1. The towed lift truck must have an operator.

2. Raise the carriage and forks approximately 30 cm (12 inches) from the surface. Install a chain to prevent the carriage and mast channels from moving.

3. Tow with another lift truck of *equal* or *larger* capacity than the disabled lift truck. Install a load of approximately half–capacity on the forks of the lift truck that is being used to tow the disabled lift truck. The half–ca-

pacity load will increase the traction of the lift truck. Keep the load as low as possible.

4. Use a towing link made of steel that fastens to the tow pins in the counterweights of both lift trucks.

5. Release the parking brake.

6. Tow the lift truck slowly.

## HOW TO PUT A LIFT TRUCK ON BLOCKS

### ⚠ 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, drive axle, battery or counterweight. When the lift truck is put on blocks, put additional blocks in the following positions to maintain stability:**

a. **Before removing the mast and drive axle, put blocks under the counterweight so that the lift truck can not fall backward.**

b. **Before removing the counterweight, put blocks under the mast assembly so that the lift truck can not fall forward.**

**The surface must be solid, even, and level when the lift truck is put on blocks. Make sure that any blocks used to support the lift truck are solid, one piece units.**

**NOTE:** Some lift trucks have lifting eyes. These lift points can be used to raise the lift truck so that blocks can be installed.

### How To Raise the Drive Tires (See FIGURE 1.)

1. Put blocks on each side (front and back) of the steering tires to prevent movement of the lift truck.

2. Put the mast in a vertical position. Put a block under each outer mast channel.

3. Tilt the mast fully forward until the drive tires are raised from the surface.

4. Put additional blocks under the frame behind the drive tires.

5. If the hydraulic system will not operate, use a hydraulic jack under the side of the frame near the front. Make sure that the jack has a capacity equal to at least half the weight of the lift truck. See the nameplate.

### How To Raise the Steering Tires (See FIGURE 1.)

1. Apply the parking brake. Put blocks on both sides (front and back) of the drive tires to prevent movement of the lift truck.

2. Use a hydraulic jack to raise the steering tires. Make sure that the jack has a capacity of at least 2/3 of the total weight of the lift truck as shown on the nameplate.

3. Put the jack under the steering axle or frame to raise the lift truck. Put blocks under the frame to support the lift truck.

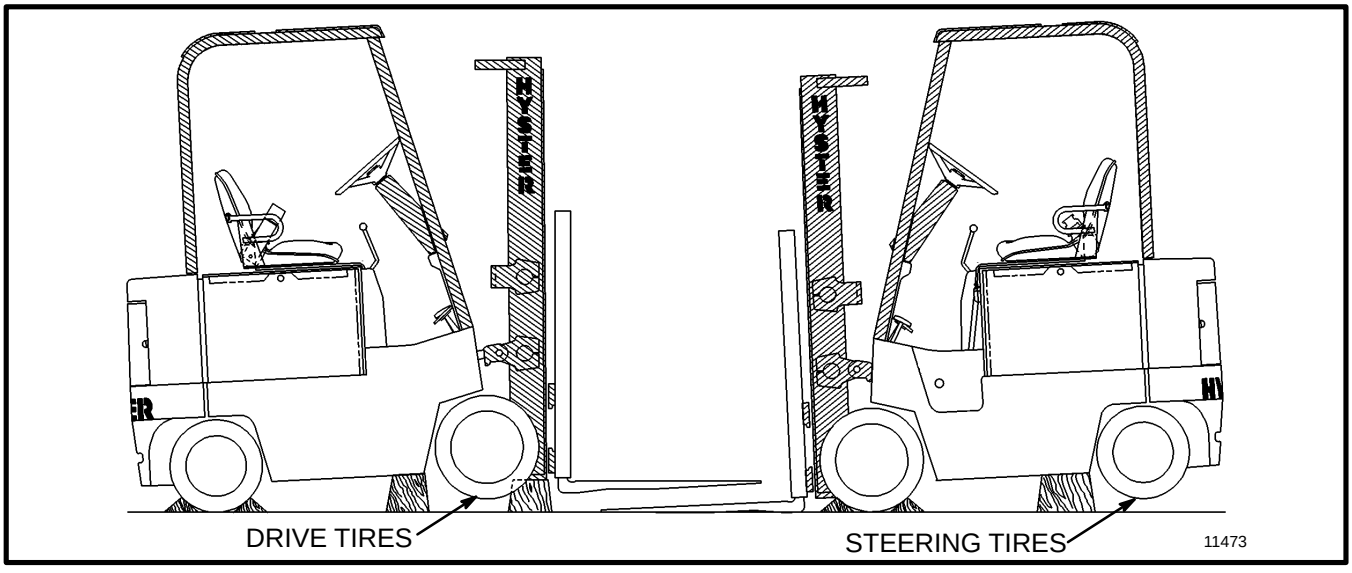



FIGURE 1. PUT THE LIFT TRUCK ON BLOCKS

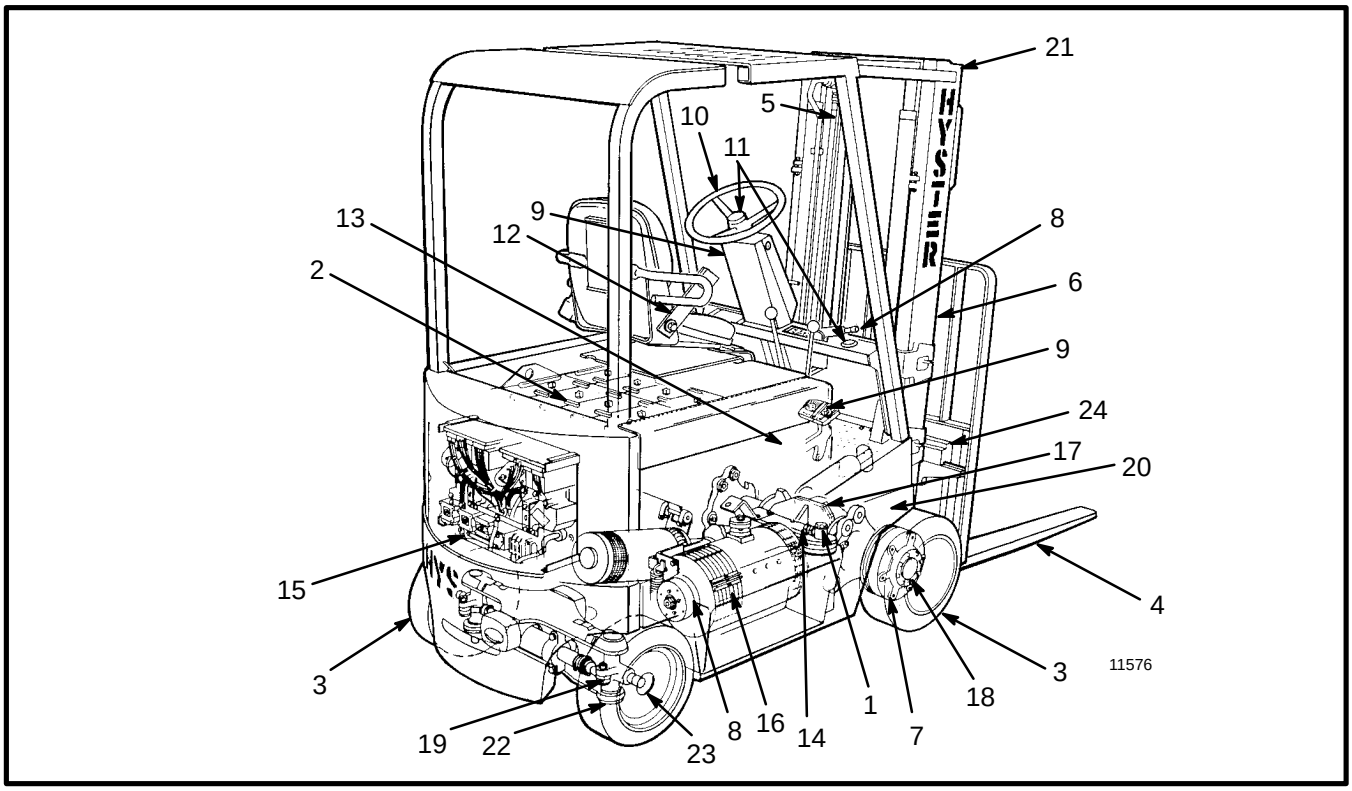



FIGURE 2. MAINTENANCE POINTS

## MAINTENANCE SCHEDULE

| ITEM NO. | ITEM | 8 hr/ Daily | 350 hr/ 2 mo | 2000 hr/ 1 yr | PROCEDURE OR QUANTITY | SPECIFICATION |
|---|---|---|---|---|---|---|
| 1 | HYDRAULIC OIL (Total)<br>E/J1.25–1.75XL (E25–35XL)<br>E2.00–3.00XL (E40–60XL)<br>E3.50–5.50XL (E70–120XL)<br>j2.00–3.00XL (J40–60XL) | X | | C | <br>17 litre (18 qt)<br>19 litre (20 qt)<br>19 litre (20 qt)<br>37 litre (39 qt) | API SC/CC<br>–18°C to 38°C (0°F to 100°F)<br>SAE 10W |
| | CHECK FOR OIL LEAKS | X | | | Check for Leaks | |
| 2 | BATTERY<br>BATTERY RESTRAINT | X[1] | | | Check Condition | |
| 3 | TIRES<br>AIR PRESSURE<br>(Pneumatic Tires) | X<br>X | | | Check Condition<br>Check Air Pressure | See Nameplate |
| 4 | FORKS | X | | | Check Condition | |
| 5 | LIFT CHAINS | X | L*<br>X | | Check Condition and Lubrication<br>Check Adjustment and Length | Engine Oil |
| 6 | MAST AND CARRIAGE | X | | | Check Operation | |
| 7 | SERVICE BRAKES | X | | X | Check Operation<br>Check Condition | |

X=Check C=Change L=Lubricate

* Lubricate every 250 hours of operation.

**NOTE:** Never use steam to clean electrical parts. See the Service Manual for cleaning information.

[1] Equalization Charge is required approximately each month

# MAINTENANCE SCHEDULE

| ITEM NO. | ITEM | 8 hr/ Daily | 350 hr/ 2 mo | 2000 hr/ 1 yr | PROCEDURE OR QUANTITY | SPECIFICATION |
|---|---|---|---|---|---|---|
| | SAFETY LABELS | X | | | Replace as Necessary | See Parts Manual |
| 8 | PARKING BRAKE | X | | | Check Operation | |
| 9 | DIRECTION/SPEED CONTROLS | X | | | Check Operation | |
| 10 | STEERING CONTROLS<br>STEERING COLUMN LATCH | X<br>X | | | Check Operation<br>Check Operation | |
| 11 | HORN, GAUGES, LIGHTS, ALARMS | X | | | Check Operation | |
| 12 | SEAT BELT, HIP RESTRAINTS AND SEAT RAILS | X | | | Check Condition | |
| 13 | BRAKE FLUID | | X | | 0.25 litre (0.5 pint) | SAE J–1703 |
| 14 | HYDRAULIC TANK BREATHER | | X | | Clean or Replace | |
| | SEAT (PARKING) BRAKE ADJUSTMENT | | X | | Service Person to make Adjustments | |
| 15 | CONTACTORS | | X | C[2] | Check Condition | |
| 16 | MOTOR BRUSHES | | X[3] | | Check Condition | |
| 17 | DIFFERENTIAL AND SPEED REDUCER | | X | C | 3.3 litre (3.5 qt)<br>5.2 litre (5.5 qt)<br>(E70–120XL) | Ultra Gear Lube Gear Oil<br>SAE 80W (Chevron Oil Co.)<br>or SAE 90W EP |
| 18 | WHEEL NUT TORQUE<br>E25–35XL (Drive Wheel)<br>E40–60XL (Drive Wheel)<br>E70–120XL (Drive Wheel)<br>J40–60XL (Drive Wheel)<br>J40–60XL (Steer Wheel) | | X | | Check Torque | <br>155 N.m (115 lbf ft)<br>237–305 N.m (175–225 lbf ft)<br>600 N.m (443 lbf ft)<br>237–305 N.m (175–225 lbf ft)<br>155 N.m (115 lbf ft) |
| 19 | TIE RODS, STEERING (E25–35XL) (J40–60XL) | | L* | | 4 Fittings | Multi–Purpose Grease with 2–4% Molybdenum Disulphide |
| 20<br>21 | MAST PIVOTS<br>MAST SLIDING SURFACES | | L<br>L | | 2 Fittings<br>As Required | Multi–Purpose Grease with 2–4% Molybdenum Disulphide |
| 22 | SPINDLE BEARINGS (J40–60XL) | | L* | | As Required | Multi–Purpose Grease with 2–4% Molybdenum Disulphide |
| 1 | HYDRAULIC FILTER | | | C[4] | 1 | See Parts Manual |
| 23 | WHEEL BEARINGS | | | L | As Necessary | Multi–Purpose Grease with 2–4% Molybdenum Disulphide |
| 24 | FORK GUIDES AND LOCKS | X | L | | As Necessary | Engine Oil |

X=Check C=Change L=Lubricate

**NOTE:** Never use steam to clean electrical parts. See the Service Manual for cleaning information.

* Lubricate every 250 hours of operation.

[2] Replace the contacts for the hydraulic pump contactor every 1000 hous of operation. Replace other contacts when thickness is reduced to 30% of new contacts.

[3] Check after 500 hours. If brush wear is slow, extend the interval to check to 1000 hours of opewration.

[4] Change filters on NEW lift trucks at first 100 hours on hourmeter.

# MAINTENANCE PROCEDURES
# EVERY 8 HOURS OR DAILY

## HOW TO MAKE CHECKS WITH KEY SWITCH OFF

Inspect the lift truck every eight hours or daily before use. Put the lift truck on a level surface. Lower the carriage and forks and turn the key switch to **OFF**. Apply the parking brake. Open the access panels and inspect for leaks and conditions that are not normal. Clean any oil spills. Make sure that lint, dust, paper and other materials are removed from the compartments.

### Hydraulic System (See FIGURE 3.)

**⚠ WARNING**

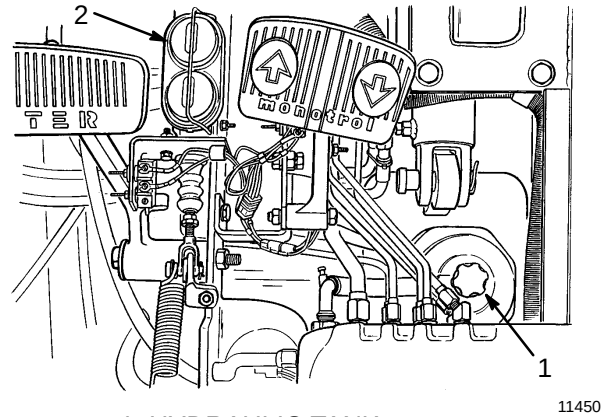
**The hydraulic oil is HOT at operating temperature. Do not permit the hot oil to contact the skin and cause a burn.**

**Hydraulic oil under pressure can be injected into the skin. Never check for leaks by putting hands on a hydraulic line under pressure.**

**⚠ CAUTION**

**Do not permit dirt to enter the hydraulic system when the oil level is checked or the filter is changed.**

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




1. HYDRAULIC TANK
2. BRAKE FLUID RESERVOIR

FIGURE 3. HYDRAULIC AND BRAKE CHECKS

Check the hydraulic oil level when the oil is at operating temperature, the carriage is lowered and the key switch is in the **OFF** position. Add hydraulic oil only as needed. If more hydraulic oil is added than the "FULL" level, hydraulic oil will leak from the breather during operation.

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

### Battery

Make sure that the voltage and the weight of the battery are correct as shown on the nameplate. See the **OPERATING MANUAL** to check for correct battery dimensions.

Keep the battery case, top cover and the area for the battery clean and painted. Leakage and corrosion from the battery can cause a malfunction in the electric controls of the lift truck. Use a water and sodium bicarbonate solution (soda) to clean the battery and the battery area. Keep the top of the battery clean, dry and free of corrosion.

Make sure the battery is charged and has the correct voltage and ampere hour rating for the lift truck (see the nameplate).

Inspect the battery case, connector and cables for damage, cracks or breaks. See the battery dealer in the area to repair any damage. Check the level of the electrolyte daily on a minimum of one cell. The correct level is half–way between the top of the plates and the bottom of the fill hole. Add only distilled water.

**⚠ WARNING**

**If the lift truck was operated with a low battery, inspect <u>all</u> contactors for welded contacts BEFORE you connect a charged battery. The lift truck can not be controlled if contacts are welded. This condition can cause personal injury when the battery is connected.**

**Do not put tools on the battery.**

**The acid in the electrolyte can cause injury. If the electrolyte is spilled, use water to flush the area. Make the acid neutral with a solution of sodium**

**bicarbonate (soda). Acid in the eyes must be flushed with water immediately.**

**Batteries generate explosive fumes. Keep the vents in the caps clean. Keep sparks or open flames away from the battery area. Do not make a spark from the battery connections. Disconnect the battery when doing maintenance.**

### Battery Restraint System (See FIGURE 4.)

## ⚠ WARNING

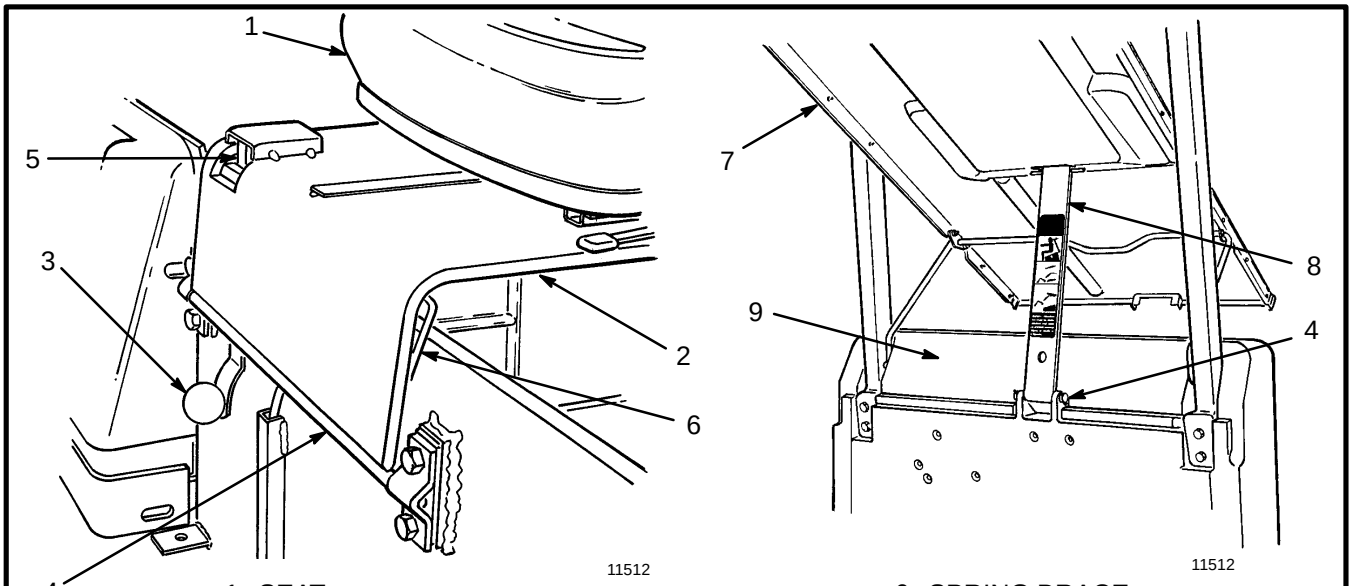
**The battery must fit the battery compartment so that the battery restraint will operate correctly. A loose battery can cause serious injury and property damage if the lift truck overturns. Use spacers to prevent the battery from moving more than 13 mm (0.5 in) in any horizontal direction.**

The battery restraint system is a heavy steel seat plate that has a hinge at the front of the battery compartment. Spacers are used inside the battery compartment to prevent horizontal movement of the battery. An additional battery retention bar is used on all models E3.50–5.50XL (E70–120XL) where batteries can be longer. This bar has a hinge fastened to the counterweight and is part of the hood mechanism on lift truck with hoods. The bar is also installed on lift trucks without hoods.

## ⚠ WARNING

**The battery restraint and its latch mechanisms must operate correctly before a lift truck is operated. A loose battery can cause serious injury and property damage if the lift truck overturns. On E3.50–5.50XL (E70–120XL) units the battery retention bar must be down and under the seat and battery restraint plate. Make sure the battery has a cover if the lift truck does not have a hood.**

To operate correctly, the battery restraint plate must be locked in the down position. On E3.50–5.50XL (E70–120XL) units the battery retention bar (and hood) must be lowered first, then the battery restraint plate is locked in the down position over the bar. Use spacers to prevent horizontal movement of the battery. Use the knob near the hinge to release the battery restraint plate (see FIGURE 4.). Use the handle on the restraint plate to raise the plate and seat. A spring brace will hold the assembly in the up position. Raise the hood if a hood is installed. Make sure that the battery cannot move more than a total of 13 mm (0.5 in) in any one horizontal direction. Make sure the correct spacers are installed to prevent the movement.




1. SEAT
2. BATTERY RESTRAINT (SEAT PLATE)
3. KNOB FOR LATCH MECHANISM
4. HINGE
5. LATCH
6. SPRING BRACE
7. HOOD
8 BATTERY RETENTION BAR (E70–120XL ONLY)
9. COUNTERWEIGHT

FIGURE 4. BATTERY RESTRAINT

If necessary, adjust the battery spacer system as described in HOW TO CHANGE THE BATTERY under GENERAL PROCEDURES. See your dealer for Hyster lift trucks to replace damaged or missing spacers.

Push the seat and the battery restraint down until the latch locks. Make sure the battery restraint is locked securely. Lift on the battery restraint to make sure it is latched and will not move.

### Operator Restraint System (See FIGURE 5. and FIGURE 6.)

The seat belt, hip restraint brackets, seat and seat rails, battery restraint (seat plate) and latch are all part of the operator restraint system. Each item must be checked to make sure it is attached securely, functions correctly and is in good condition.

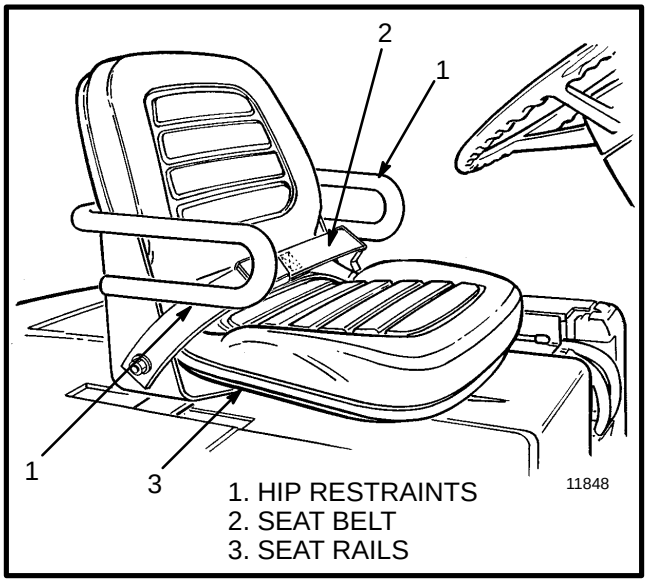



FIGURE 5. OPERATOR RESTRAINT SYSTEM

The end of the seat belt must fasten correctly in the latch. Make sure the seat belt pulls from the retractor assembly and retracts smoothly. The seat belt must be in good condition. A seat belt that is damaged or worn will not give protection when it is needed. If the seat belt can not be pulled from the retractor assembly, remove the screw that keeps the cover on the retractor. Push the bar to release the spool. Straighten the belt so that it will pull and retract smoothly from the retractor assembly. (See FIGURE 6.)

Make sure that the seat is not loose on the rails. The seat must lock tightly in position, but move freely when unlocked. The seat rails must be correctly fastened to the mount surface.

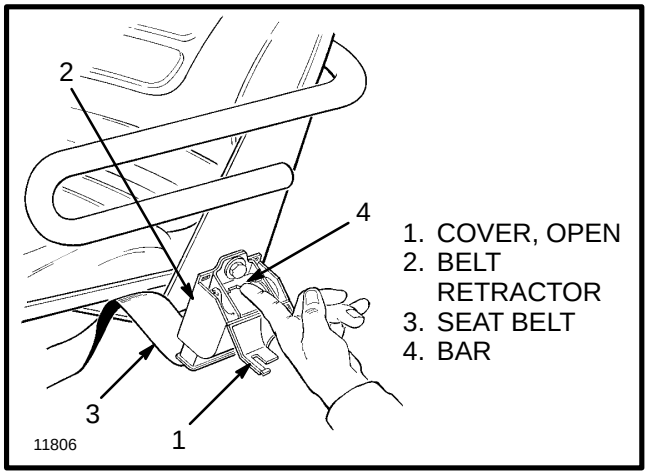



FIGURE 6. RELEASE A JAMMED SEAT BELT

### Inspection Of The Mast, Forks And Lift Chains (See FIGURE 7. and FIGURE 8.)

**⚠ WARNING**

**Lower the lift mechanism completely. Never allow any person under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered, the key switch is in the OFF position and the key is removed.**

**Do not try to correct the alignment of the fork tips by bending the forks or adding shims. Replace damaged forks.**

**Never repair damaged forks by heating or welding. Forks are made of special steel using special procedures. Replace damaged forks.**

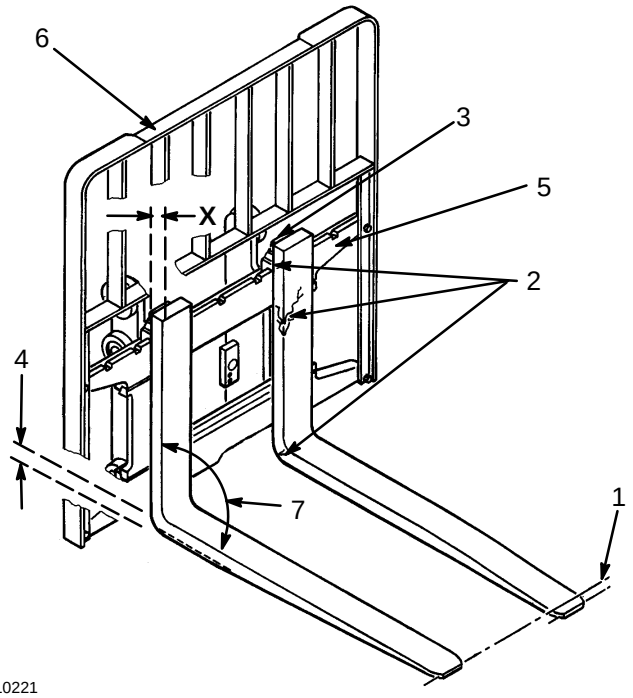
1. Inspect the welds on the mast and carriage for cracks. Make sure that the capscrews and nuts are tight.

2. Inspect the channels for wear in the areas where the rollers travel. Inspect the rollers for wear or damage.

3. Inspect the load backrest extension for cracks and damage.

4. Inspect the forks for cracks and wear. Check that the fork tips are aligned within 13 mm (0.5 in) of each other. See FIGURE 7. Check that the bottom of the fork is not worn (Item 4).

5. Replace any damaged or broken parts that are used to keep the forks locked in position.




1. TIP ALIGNMENT (MUST BE WITHIN 3% OF FORK LENGTH
2. CRACKS
3. LATCH DAMAGE
4. HEEL OF FORK (MUST BE 90% OF DIMENSION “X”)
5. CARRIAGE
6. LOAD BACKREST EXTENSION
7. MAXIMUM ANGLE 93°

| FORK TIP ALIGNMENT | |
|---|---|
| LENGTH OF FORKS | 3% DIMENSION |
| 915 mm (36 in) | 27 mm (1.10 in) |
| 1220 mm (48 in) | 37 mm (1.45 in) |
| 1830 mm (72 in) | 55 mm (2.15 in) |

FIGURE 7. CHECK THE FORKS

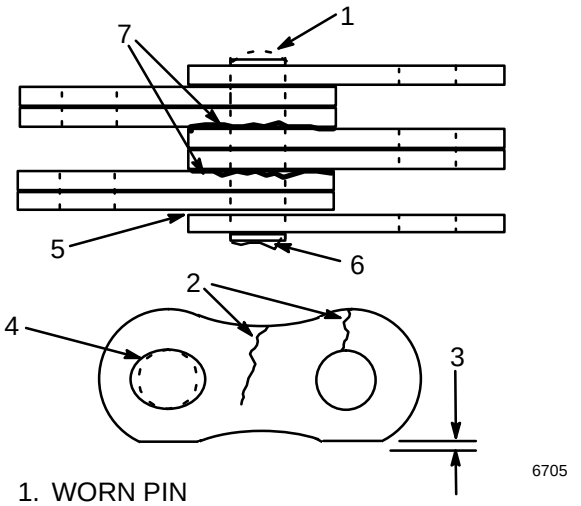
6. If the lift truck is equipped with a side–shift carriage or attachment, inspect the parts for cracks and wear. Make sure the parts that fasten the side–shift carriage or attachment to the carriage are in good condition.

7. Inspect the lift chains for cracks and broken links and pins. See FIGURE 8.

8. Make sure that the lift chains are correctly lubricated. Use 30W engine oil or Hyster Chain and Cable Lubricant (Hyster Part No. 171350).

9. Inspect the chain anchors and pins for cracks and damage.

10. Make sure the lift chains are adjusted so that they have equal tension. **Adjustment or replacement of the lift chains must be done by authorized personnel.** See LIFT CHAIN ADJUSTMENTS in GENERAL PROCEDURES in this section.




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

FIGURE 8. CHECK THE LIFT CHAINS

### Tires and Wheels (See FIGURE 9.)

## ⚠ WARNING

**Air pressure in tires can cause tire and wheel parts to explode. This action can cause serious injury or death.**

**Remove all of the air from the tires before the tires are removed from the lift truck.**

**If a tire has less than 80% of the correct air pressure, completely remove the air pressure from the tire. Remove the tire from the lift truck. Add air pressure to the tire only in a safety cage. See the procedures in Add Air To The Tires.**

**When air is added to the tires, use a remote air chuck. The person adding air must stand away and to the side and not in front of the tire.**

If the lift truck has pneumatic tires, keep the tires at the correct air pressure (see the nameplate). Check the air pressure with a gauge when the tires are cold. If it is necessary to add air to a tire that is warm, check the other tire on the same axle and add air to the tire that has low pressure so that the air pressures are equal. The air pressure of the warm tires must always be equal to or greater than the specification for air pressure for cold tires.

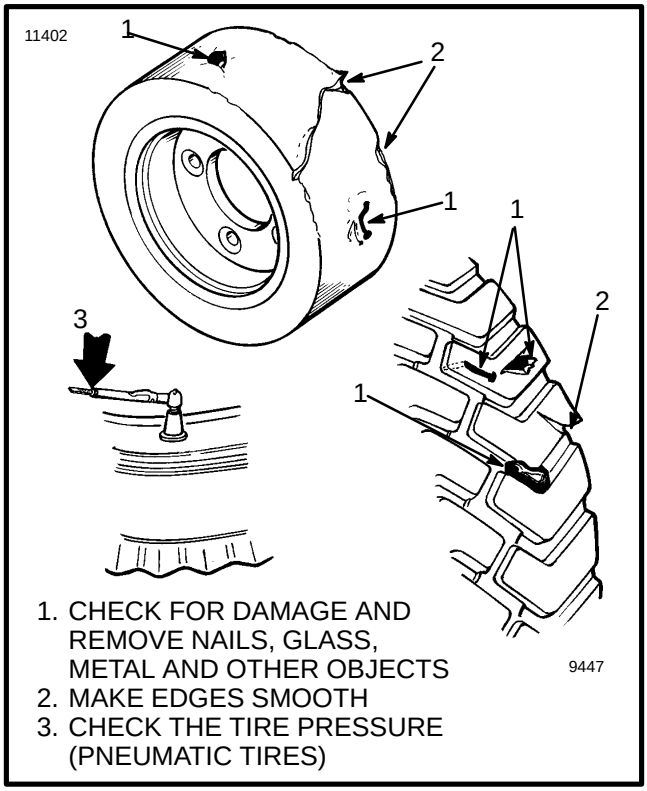



FIGURE 9. CHECK THE TIRES

Check the tires for damage. Inspect the tread and remove any objects that will cause damage. Check for bent or damaged rims. Check for loose or missing parts. Remove any wire, straps or other material wrapped around the axle.

Make sure that the wheel nuts are tight. Tighten the wheel nuts in a cross pattern to the correct torque value shown in the MAINTENANCE SCHEDULE.

## ⚠ CAUTION

**When the wheels have been 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. When the nuts stay tight for eight hours, the interval for checking the torque can be extended to 350 hours.**

### Forks, Adjustment

**Hook forks** are connected to the carriage by hooks and lock pins. See FIGURE 10. These lock pins are installed through the top fork hooks and fit into slots in the top carriage bar. Adjust the forks as far apart as possible for maximum support of the load. Hook forks will slide along the carriage bars to adjust for the load to be lifted. Raise the lock pin in each fork to slide the fork on the carriage bar. Make sure the lock pin is engaged in the carriage bar to lock the fork in position after the width adjustment is made.

### Forks, Removal And Installation

A fork can be removed from the carriage for replacement of the fork or other maintenance.

## ⚠ WARNING

**Do not try to move a fork without a lifting device. Each hook fork for these lift trucks can weigh 35 kg to 180 kg (80 to 395 lb).**

**Hook Fork (Removal).** Slide a hook fork to the fork removal notch on the carriage. See FIGURE 10. Lower the fork onto blocks so that the bottom hook of the fork moves through the fork removal notch. See FIGURE 11. Lower the carriage further so that the top hook of the fork is disengaged from the top carriage bar. Move the carriage away from the fork, or use a lifting device to move the fork away from the carriage. Lay the fork on its side so that it cannot fall and cause injury.

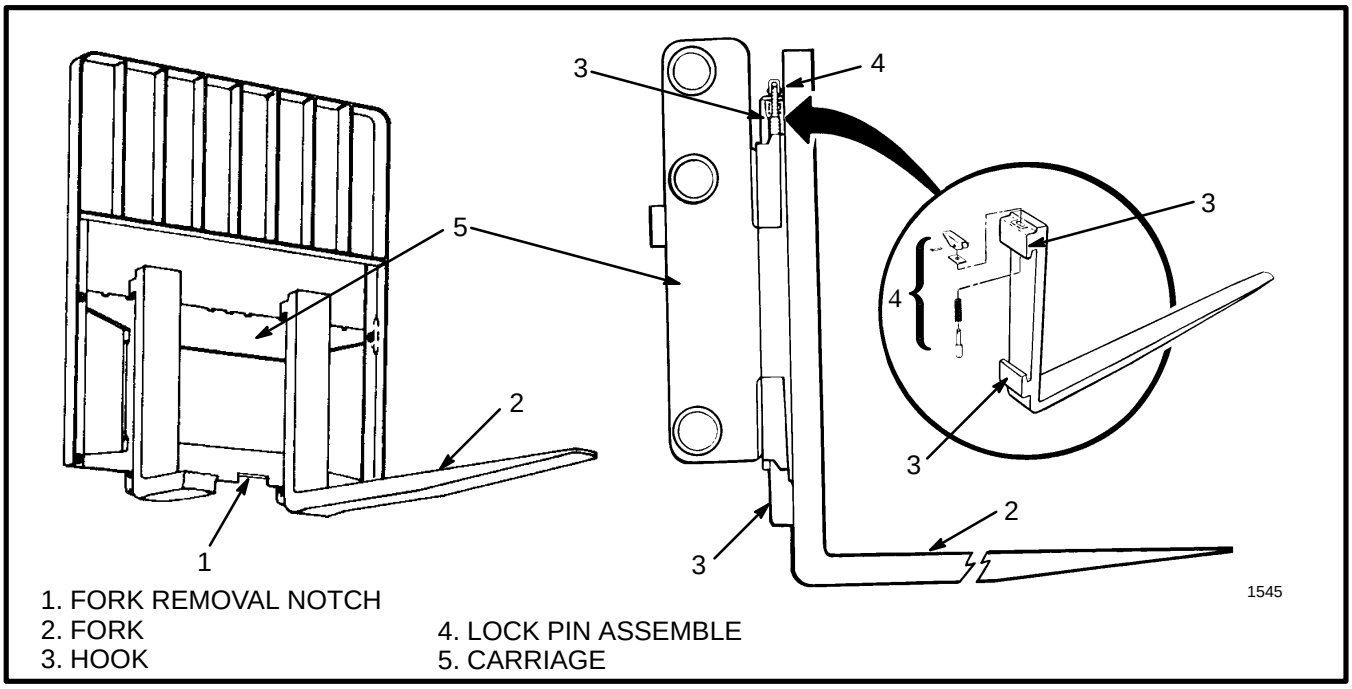



FIGURE 10. HOOK FORK

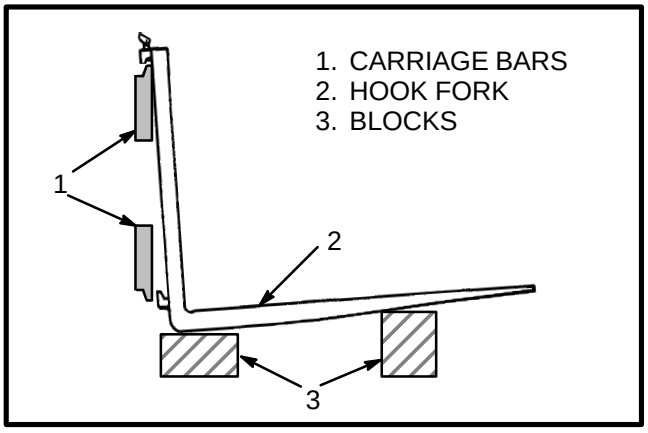



FIGURE 11. REMOVE A HOOK FORK

**Hook Fork (Installation).** Move the fork and carriage so that the top hook on the fork can engage the upper carriage bar. Raise the carriage to move the lower hook through the fork removal notch. Slide the fork on the carriage so that both upper and lower hooks engage the carriage. Engage the lock pin with a notch in the upper carriage bar.

## SAFETY LABELS

### ⚠ WARNING

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

Check that all safety labels are installed in the correct location on the lift truck. See the **PARTS MANUAL** or the **FRAME** section of the **SERVICE MANUAL** for the correct location of the safety labels. See the **FRAME** section for the installation procedure.

## HOW TO MAKE CHECKS WITH THE KEY SWITCH ON

### ⚠ WARNING

**FASTEN YOUR SEAT BELT! The seat belt is installed to help the operator stay on the truck if the lift truck tips over. IT CAN ONLY HELP IF IT IS FASTENED.**

Make sure the area around the lift truck is clear before moving the lift truck. Always look in the direction that you intend to move the lift truck. Be careful when making the checks.

### Gauges and Horn

**NOTE**: The control fuse is under the floor plate (EV–1) or in the electrical compartment (EV–100 or EV–200).

1. Check the operation of the gauges and horn. The horn will operate when the key switch is OFF. The hour meter will operate when the key switch is ON and the seat switch is closed.

2. The battery indicator will operate when the key switch is ON. If the battery is replaced with a fully

charged battery, the battery indicator will not indicate a fully charged battery until the lift truck has operated for a short period of time. Tilt the mast backward until the hydraulic relief valve operates. The battery indicator will then indicate correctly. A battery indicator without "lift interrupt" will only indicate battery charge when the hydraulic relief valve operates.

### Lift System Operation

**WARNING**

**Lower the lift mechanism completely. Never allow any person under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered, the key switch is in the OFF position and the key is removed.**

**Before making any repairs, use blocks and chains on the mast weldments and carriage so that they can not move. Make sure the moving parts are attached to a part that does not move.**

**Do not try to locate hydraulic leaks by putting hands on pressurized hydraulic components. 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 mast several times without a load. The mast components must raise and lower smoothly in the correct sequence. The carriage raises first, then the inner weldment and the intermediate weldment (three–stage masts only). The inner weldment(s) and the carriage must lower completely.

**NOTE:** Some parts of the mast move at different speeds during raising and lowering.

3. Put a capacity load on the forks. Tilt the mast backwards. Raise the carriage until the rods of the main lift cylinders extend 60 to 90 cm (2 to 3 ft), then lower the carriage. The components of the mast must move smoothly in the correct sequence.

4. With the load lowered, tilt the mast backward and forward. The mast must tilt smoothly and both tilt cylinders must stop evenly.

5. Check that the controls for the attachment operate the functions of the attachment. (See symbols by each of the controls.) Make sure all of the hydraulic lines are connected correctly and do not leak.

### Service Brakes

Check the operation of the service brakes. Push on the brake pedal. The brake pedal must stop firmly and must not move slowly down after the brakes are applied. The service brakes must apply equally to both drive wheels. The service brakes must not pull the lift truck to either side of the direction of travel when they are applied. The service brakes are automatically adjusted when the brakes are applied and the lift truck changes direction.

**WARNING**

**Loss of fluid from the master cylinder indicates a leak. This condition can cause brake failure. The result can be material damage or personal injury. Repair the brake system before the lift truck is used. Replace the brake fluid in the system if there is dirt, water, or oil in the system.**

### Parking Brake

Check the operation of the parking brake. The parking brake, when correctly adjusted, will hold the lift truck with a capacity load on a 15% grade [1.5 metre rise in 10 metres (1.5 ft rise in 10 ft)]. Turn the knob on the end of the hand lever to adjust the parking brake. Do not tighten the adjustment so that the brakes are applied when the hand lever is released.

Some lift trucks are equipped with an additional brake that is actuated automatically when the operator leaves the seat. When correctly adjusted, this brake will hold the lift truck with a capacity load on a 15% grade. Make sure the service brakes operate correctly before checking the operation of the seat brake. If the brake does not hold the lift truck on the grade, the seat brake must be adjusted by authorized service personnel according to the procedure in the **SERVICE MANUAL**.

## Steering System

**WARNING**

**The lift truck has hydraulic power steering. Steering can be difficult when the power steering pump is not operating.**

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

# EVERY 350 HOURS OR TWO MONTHS

Do these procedures in addition to the 8–hour checks.

## HYDRAULIC TANK BREATHER

Check and clean the hydraulic tank breather. Clean the breather when it is dirty and will not permit the easy passage of air. The breather is on a pipe near the hydraulic filter.

## STEERING TIE RODS, E/J1.25–1.75XL (E25–35XL) and J2.00–3.00XL (J40–60XL)

Use multi–purpose grease to lubricate the four fittings on the steering tie rods.

## DIFFERENTIAL AND SPEED REDUCER (See FIGURE 12.)

### ⚠ WARNING

**Do not work under a raised carriage. Lower the carriage or use a chain to prevent the carriage and the inner or intermediate weldments from lowering when doing maintenance. Make sure that the moving parts are attached to parts that can not move.**

Check the oil level at the fill plug in the differential housing. The oil level must be even with the bottom of the hole. Add oil if the oil level is low. Install and tighten the plug.

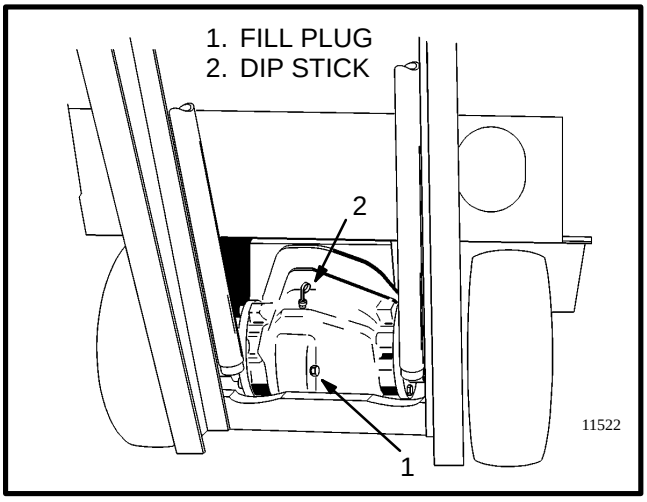



FIGURE 12. DIFFERENTIAL

## WHEEL NUT TORQUES

Tighten wheel nuts as required. See Install The Wheels and SPECIFICATIONS.

## STEERING AXLE SPINDLES, E/J2.00–3.00XL (E/J40–60XL) E3.50–5.50XL (E70–120XL)

Use multi–purpose grease to lubricate the king pins in the steering axle. A grease fitting is at the end of each king pin on the bottom of the steering axle.

## MAST (See FIGURE 13.)

### ⚠ CAUTION

**DO NOT use steam or high–pressure water to clean the load rollers or the lift chains. Steam and high–pressure water can remove the lubrication from the bearings in the load rollers. Water in the bearings of the sheaves and the link pins of chains can also shorten the service life of these parts.**

### ⚠ WARNING

**Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.**

**Parts of the lift mechanism can move and cause serious injury. Do not allow anyone under a raised carriage or forks. Do not put any part of your body in or through the lift mechanism if any part of the lift mechanism can move.**

**Before you reach into the lift mechanism:**

- **Make sure that all parts of the lift mechanism are completely lowered.**
- **If the lift mechanism cannot be lowered completely, use blocks or chains on the mast weldments and carriage so that they cannot move. Use a chain to attach each moving part of the lift mechanism to a part that does not move. If blocks are used, make sure that blocks are placed between each part that moves and the ground. Operate the lift/lower control to check that all parts will not move, but do not allow the lift chains to become loose.**

- **Turn the key switch to OFF. Remove the key.**

1. Clean the mast assembly. Inspect the mast channels in the areas where the rollers travel. If there are loose or displaced metal particles, remove the metal particles.

## ⚠ WARNING

**Metal particles can fall into the eyes during the operation of the mast. Failure to remove this loose material can cause eye injury. Remove displaced metal particles with a grinder if necessary.**

2. Lubricate the sliding surfaces and the load roller surfaces along the *full length* of the channels as shown in FIGURE 13. Only apply lubricant to surfaces that are clean and dry. Only apply lubricant to the darker areas like those indicated by 1 and 2.

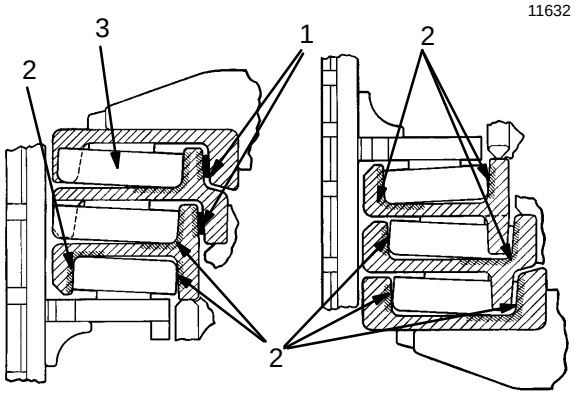



FIGURE 13. LUBRICATE THE MAST

**NOTE**: Some applications will require more frequent cleaning and lubrication of the mast assembly. DO NOT use a lubricant–spray on the surfaces of the mast channels where the load rollers make contact. The use of the correct lubricant is important! Use multi–purpose grease (Hyster Part No. 3020381) or an equivalent grease with 2% to 4% molybdenum disulfide. The load rollers and sheaves have sealed bearings that do not need additional lubrication.

3. Lubricate the pivots for the mast at the grease fittings on the pivots or the pivot pins. Use multi–purpose grease.

4. If a side–shift carriage is installed, lubricate the fittings for the rollers or the sliding surfaces with multi–purpose grease.

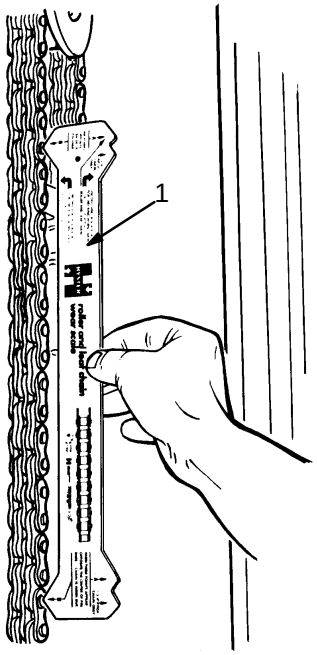
### LIFT CHAINS (See FIGURE 14.)

#### Check for Wear

## ⚠ WARNING

**Do not repair a worn or damaged lift chain. Replace a worn or damaged lift chain with a new chain. If a pair of lift chains is used in the mast, both lift chains must be replaced.**

| pitch | | Total length of 20 links(pitch) of new chain | | WEAR LIMIT The maximum length of 20 links | |
|---|---|---|---|---|---|
| **mm** | **(inch)** | **mm** | **(inch)** | **mm** | **(inch)** |
| 12.7 | (0.50) | 254.0 | (10.0) | 261.6 | (10.3) |
| 15.9 | (0.63) | 317.5 | (12.5) | 327.0 | (12.9) |
| 19.1 | (0.75) | 381.0 | (15.0) | 392.4 | (15.6) |
| 25.4 | (1.00) | 508.0 | (20.0) | 523.3 | (20.6) |




1. CHAIN WEAR SCALE

12174

**NOTE:** The instructions for measuring chain wear are shown on the Chain Wear Scale.

FIGURE 14. CHECK THE LIFT CHAINS

If a section of chain is 3% longer than a similar section of new chain, the chain is worn and must be replaced. If a chain scale is available, check the lift chains as shown in

FIGURE 14. If a chain scale is not available, measure 20 links of chain. Measure from the center of a pin to the center of another pin 20 links away. Compare the length with the chart in FIGURE 14. Replace the chain if the length of 20 links of the worn section is more than the WEAR LIMIT.

Inspect the lift chains for edge wear where they pass over the chain sheaves. Make sure the chain links are a minimum of 95% (5% wear) of a chain link that is not worn. See FIGURE 8.

### Lubrication

Lubricate the lift chains with clean 30W engine oil or Hyster Chain and Cable Lubricant (Hyster Part No. 171350).

**NOTE:** Lubrication or cleaning (see EVERY 2000 HOURS OR YEARLY) can be needed more frequently in very dirty applications. Correct lubrication helps provide normal service life from these parts.

## FORKS (See FIGURE 7.)

### ⚠ WARNING

**Never repair damaged forks. Do not heat, weld, or bend the forks. Forks are made of special steel using special methods. Replace damaged forks.**

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

2. Measure the thickness of the forks at a vertical section where there is no wear. This is dimension X. Now measure the thickness at the heel (4) of the fork. If the thickness is not more than 90% of dimension X, replace the fork.

3. Use clean engine oil as necessary to lubricate the guides and locks for the forks.

## BRAKE FLUID

### ⚠ WARNING

**Loss of fluid from the master cylinder indicates a leak. This condition can cause brake failure. The result can be material damage or personal injury. Repair the brake system before the lift truck is used. Replace the brake fluid in the system if there is dirt, water, or oil in the system.**

Check the brake fluid in the reservoir for the master cylinder. Add brake fluid as necessary. Use the brake fluid shown in the MAINTENANCE SCHEDULE.

## OTHER LUBRICATION

Lubricate hinges, pins, linkages, cables, pedals, and levers as necessary. Use SAE 30 oil, multi–purpose grease, or silicone lubricant–spray (Hyster Part No. 328388) as needed. See the MAINTENANCE SCHEDULE.

## SEAT BRAKE

Adjust the seat brake for parking as described in section **100 SRM 284, THE FRAME**. Lubricate the linkage for the brake as shown in FIGURE 15. See the MAINTENANCE SCHEDULE for lubricants.

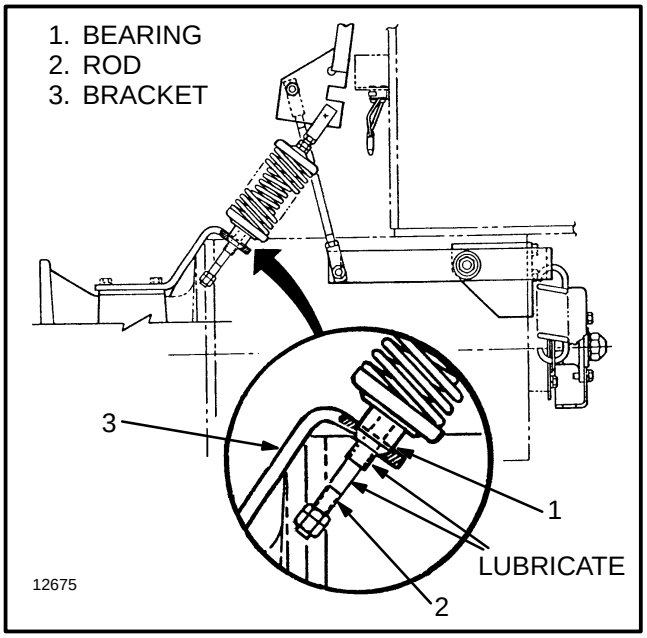



FIGURE 15. LUBRICATE THE LINKAGE FOR THE SEAT BRAKE

## ELECTRICAL INSPECTION

### ⚠ WARNING

**Disconnect the battery connector to prevent injury from electric shock before you make any inspections or repairs.**

### ⚠ CAUTION

**Never clean the components of the electrical system with steam or high pressure water.**

All models of the E/J1.25–1.75XL (E25–35XL) and the E/J2.00–3.00XL (E/J40–60XL) series of electric lift

(More Content includes: Brake system, Capacities, and specifications, Frame, Hydraulic, System, Industrial battery, Main control, Valve, Mast repair, Fasteners, Schematics diagrams, Steering axle, Steering system, Wire harness repair And more)

trucks are now equipped with the EV–100 SCR motor controller. See FIGURE 19. These motor controllers are made for Hyster Company by the General Electric Company.

The E3.50–5.50XL (E70–120XL) series of electric lift trucks are equipped with the EV–100 or EV–200 SCR traction motor controller made for Hyster Company by the General Electric Company. See FIGURE 19.

Some units can be equipped with both types of motor controllers. The E4.50–5.50XL (E100–120XL) lift trucks are equipped with the EV–200 traction motor controller because a larger traction motor is used in the lift truck. These units can also have an EV–100 motor controller and a contactor when two hoist pump motors are installed.

The E3.50–4.00XL (E70–80XL) lift trucks will be equipped with the EV–200 controller if the larger traction motor is installed as optional equipment.

The EV–100 and the EV–200 SCR motor controllers have the same operation and use the same troubleshooting procedures. Many of the components are the same. The EV–200 is required for the higher motor current that the larger traction motor uses.

Additional information for the EV–100 and EV–200 motor controllers is available in the following sections:

- **EV–100LXT/LX/LXP AND EV–200LXT/LX MOTOR CONTROLLER, & DIAGNOSTIC HAND SET, 2200 SRM 460**, Part No. 897409
- **EV–200 MOTOR CONTROLLER, Description And Operation, 2200 SRM 414**, Part No. 897346
- **EV–100 MOTOR CONTROLLER, Description And Operation, 2200 SRM 287**, Part No. 897069
- **EV–100 MOTOR CONTROLLER, Repairs And Adjustments**, Part No. 897070
- **EV–100 MOTOR CONTROLLER, Trouble–shooting, 2200 SRM 312**, Part No. 897094
- **DIAGRAMS, 8000 SRM 293**, Part No. 897075
- **DIAGRAMS, 8000 SRM 416**, Part No. 897348

## MOTOR CONTROLLERS IN EARLIER MODEL LIFT TRUCKS

**NOTE**: Electric lift trucks, "XL" series, manufactured in Irvine, Scotland before November 1987 are equipped with a Cableform Mark XI motor controller. The electric lift trucks manufactured in Berea, Kentucky, U.S.A. are equipped with the EV–100 motor controller made for Hyster Company by the General Electric Company. During November 1987, a revision was made in the configuration of the EV–100 motor controller and this revised motor controller was installed in all electric lift truck, "XL" series, manufactured by Hyster Company in Irvine and Berea after this date.

If your lift truck is equipped with a Cableform Mark XI motor controller, additional information is available in the following sections:

**CABLEFORM MARK XI MOTOR CONTROLLER, Description And Operation, 2200 SRM 289, Part No. 897071**

**CABLEFORM MARK XI MOTOR CONTROLLER, Troubleshooting And Repairs, 2200 SRM 290, Part No. 897072**

**DIAGRAMS, 8000 SRM 314, Part No. 897096**

### Contactors (See FIGURE 16., FIGURE 17., FIGURE 18. and FIGURE 19.)

The contactor contacts are made of special silver alloy. The contacts will look black and rough from normal operation. This condition does not cause problems with the operation of the lift truck. Cleaning is not necessary. DO NOT USE A FILE ON THE CONTACTS. DO NOT LUBRICATE THE CONTACTS. Always replace the contacts in sets. Check for equal spring tension if the contacts do not wear evenly. See the **ELECTRICAL** sections for replacement and adjustment procedures.

### Motor Brushes

**NOTE**: The traction motor and the hydraulic pump motor are below the battery compartment. Remove the battery and the access panel to check the motors. The steering pump motor is on a vertical mount below the floor plate. Remove the floor plates for access to the steering pump.

1. Visually inspect the commutator and brushes every 350 hours. Make sure the surface of the commutator is good and the operation of the motor is correct. Worn motor brushes must be replaced before they damage the surface of the commutator.

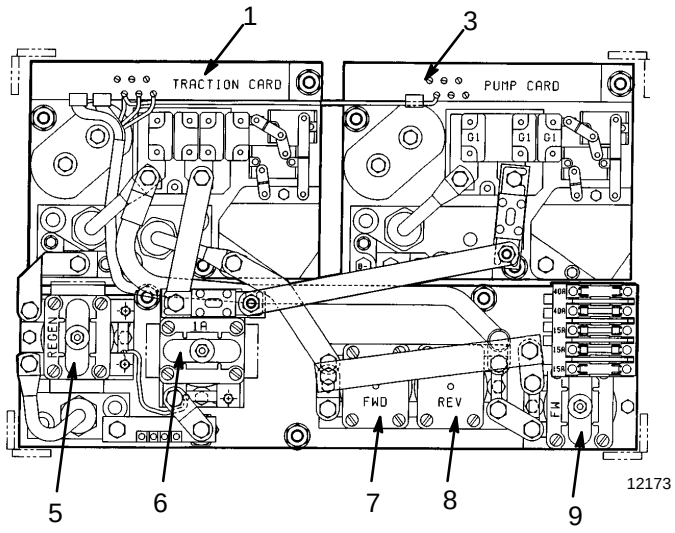
Move the brush spring and remove a brush from the brush holder. When the brush wears within approximately 1.5 mm (0.060 in) of where the brush wire joins the brush, the brush must be replaced.

2. Some lift trucks are equipped with brush wear indicators on the traction and hydraulic motors. The brush wear indicators give a signal on the LED display panel on the instrument panel. The sensor wires for the brush wear indicators are an insert in the brush material when it is made. When the brush wears within 1.5 mm (0.060 in) of the brush wire, the insulation between the sensor wire and the brush material is destroyed. The connection between the brush and the sensor causes the LED indicator to illuminate. The brush wear indicators will not indicate a damaged commutator nor indicate a motor malfunction. Visually inspect the commutator and brushes on lift trucks with brush wear indicators also.

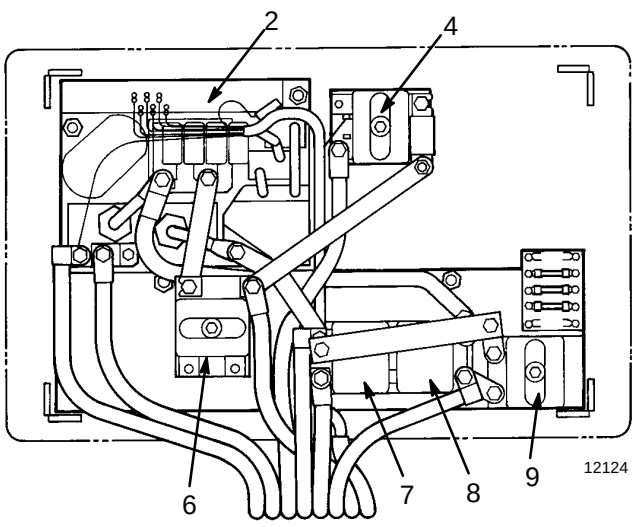
3. Inspect the brush holders for burns or damage. Make sure the brush holder is fastened tightly to the mounts at the end of the motor. Make sure the brushes will move freely and smoothly in the brush holders.

4. Check the brush springs for damage from heat and corrosion. Replace a damaged brush spring.

See the section **DC MOTOR MAINTENANCE, 620 SRM 294**, for additional information to inspect the commutator and brushes.



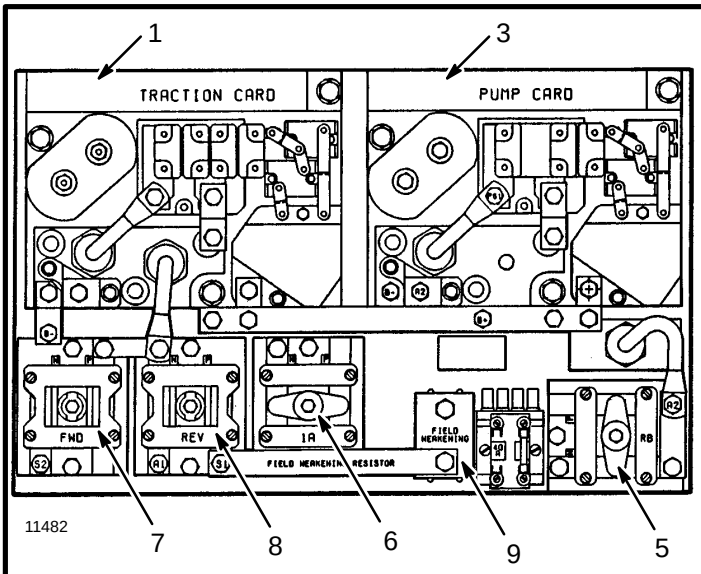

MOTOR CONTROLLER WITH REGENERATIVE BRAKING, 1A BY–PASS, AND SCR CONTROLLER FOR HYDRAULIC PUMP



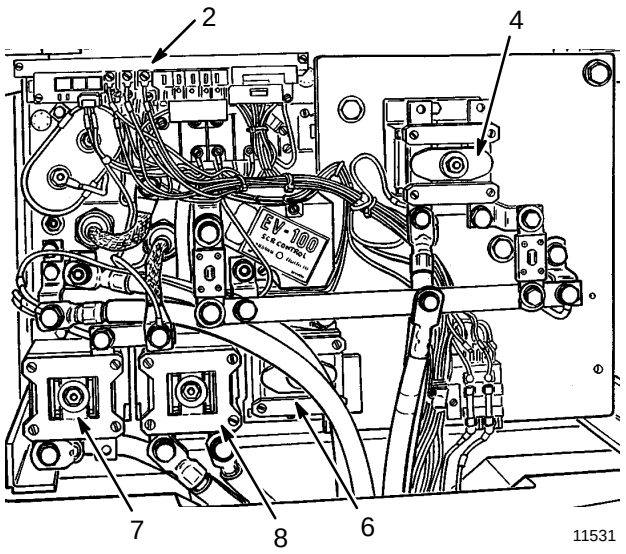

MOTOR CONTROLLER WITH 1A BY–PASS, AND CONTACTOR CONTROL FOR HYDRAULIC PUMP

1. CONTROL CARD, TRACTION, WITH REGENERATIVE BRAKING (TX or TT)
2. CONTROL CARD, TRACTION, WITHOUT REGENERATIVE BRAKING (TX)
3. CONTROL CARD, SCR CONTROL FOR HYDRAULIC PUMP MOTOR (PX)
4. CONTACTOR, HYDRAULIC PUMP MOTOR
5. CONTACTOR, REGENERATIVE BRAKING
6. CONTACTOR, 1A
7. CONTACTOR, FORWARD DIRECTION
8. CONTACTOR, REVERSE DIRECTION
9. CONTACTOR, FIELD WEAKENING

FIGURE 16. TYPICAL CONFIGURATIONS OF THE EV–100LX MOTOR CONTROLLER (AFTER NOVEMBER 1987)



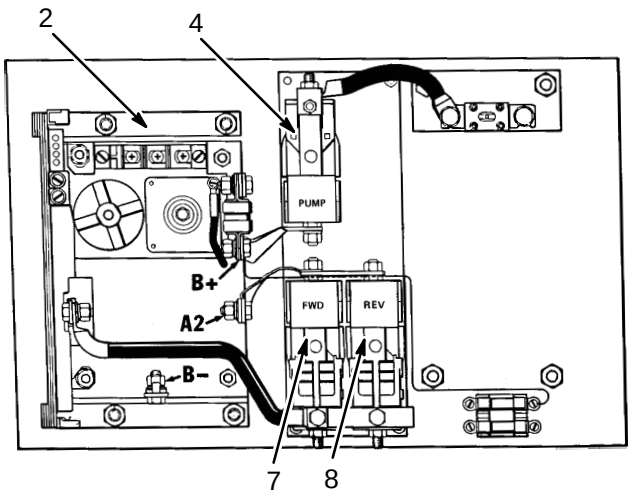

MOTOR CONTROLLER WITH REGENERATIVE BRAKING, 1A BY–PASS, AND SCR CONTROLLER FOR HYDRAULIC PUMP



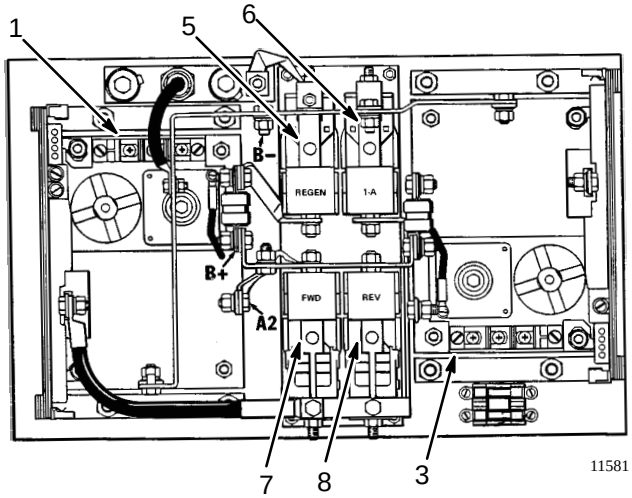

MOTOR CONTROLLER WITH 1A BY–PASS, AND CONTACTOR CONTROL FOR HYDRAULIC PUMP

1. TRACTION CARD REGENERATIVE BRAKING (R1)
2. TRACTION CARD WITHOUT REGENERATIVE BRAKING (T1)
3. EV–100 CONTROL, HYDRAULIC PUMP MOTOR
4. CONTACTOR, HYDRAULIC PUMP MOTOR
5. CONTACTOR, REGENERATIVE BRAKING
6. CONTACTOR, 1A
7. CONTACTOR, FORWARD DIRECTION
8. CONTACTOR, REVERSE DIRECTION
9. CONTACTOR, FIELD WEAKENING

FIGURE 17. TYPICAL CONFIGURATIONS OF THE EV–100 CONTROLLER (BEFORE NOVEMBER 1987)




SCR TRACTION CONTROL ONLY




SCR TRACTION CONTROL WITH REGENERATIVE BRAKING AND SCR HYDRAULIC CONTROL

1. TRACTION CONTROLLER WITH REGENERATIVE BRAKING
2. TRACTION CONTROLLER WITHOUT REGENERATIVE BRAKING
3. MOTOR CONTROLLER, HYDRAULIC PUMP MOTOR
4. CONTACTOR, HYDRAULIC PUMP MOTOR
5. CONTACTOR, REGENERATIVE BRAKING
6. CONTACTOR, 1A
7. CONTACTOR, FORWARD DIRECTION
8. CONTACTOR, REVERSE DIRECTION
9. CONTACTOR, FIELD WEAKENING

*LIFT TRUCKS THAT HAVE A HYDRAULIC PUMP CONTACTOR DO NOT HAVE A 1A CONTACTOR OR A REGENERATIVE BRAKING CONTACTOR.

FIGURE 18. CABLEFORM CONTROLLERS

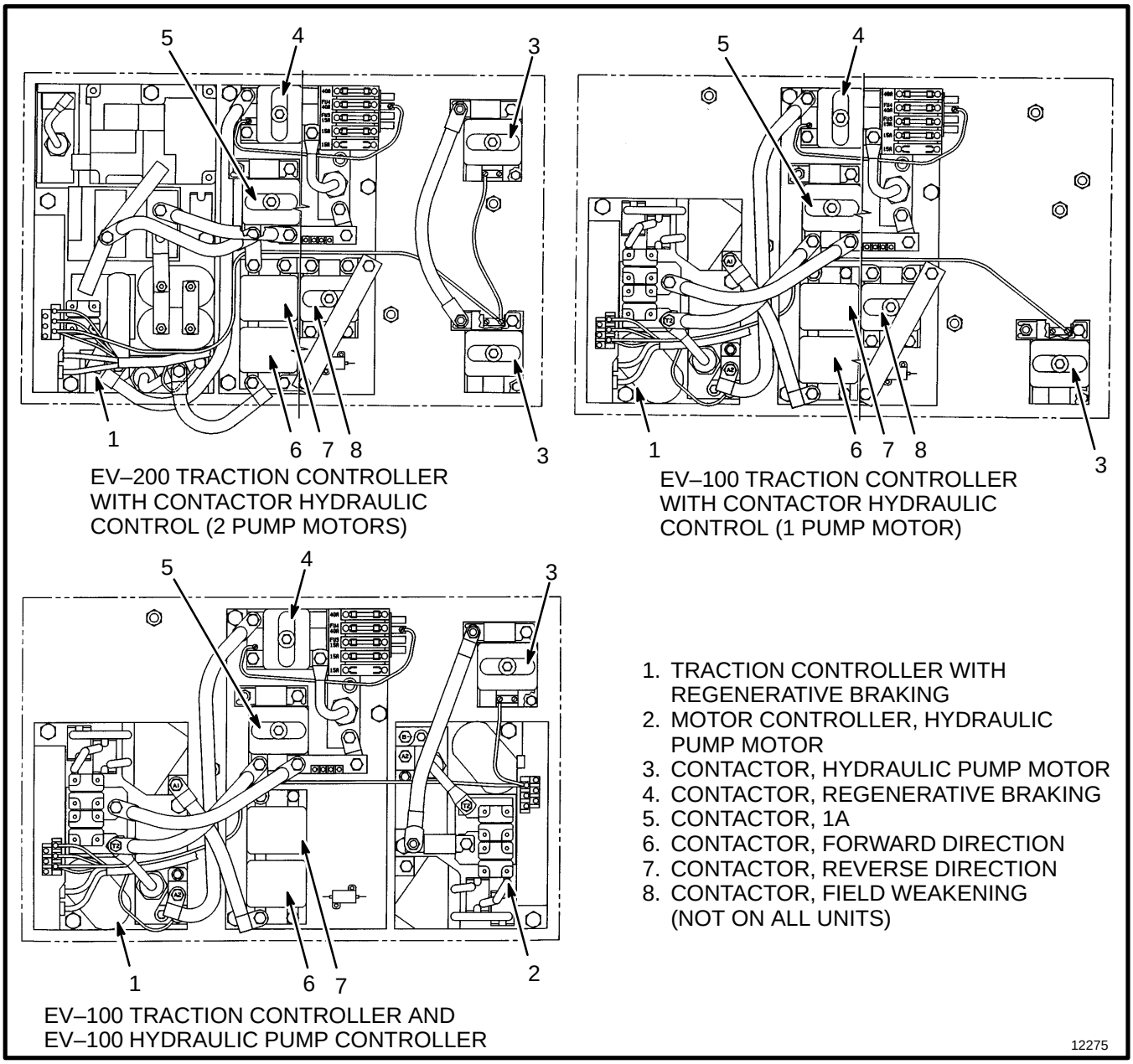



FIGURE 19. EV–200 AND EV–100 MOTOR CONTROLLERS FOR E3.50–5.50XL (E70–120XL)

## EVERY 2000 HOURS OR YEARLY

### HYDRAULIC SYSTEM

**⚠ WARNING**

**The hydraulic oil is HOT at operating temperature. Do not permit the hot oil to contact the skin and cause a burn.**

**⚠ CAUTION**

**Do not permit dirt to enter the hydraulic system when the oil level is checked or the filter is changed.**

**Dirt can cause damage to components of the hydraulic system.**

#### Change the Filter for the Hydraulic Oil (See FIGURE 20.)

**NOTE**: Change the oil filter for the hydraulic system after the first 100 hours on new lift trucks.

1. Remove the floor plates. Clean the top of the hydraulic tank in the area of the filter.

2. Follow the procedure in step 2. a. or step 2. b.:

a. **E3.50–5.50XL (E70–120XL).** Remove the nut, retainer and wire clamp that hold the filter head on the tank. Remove the filter head. Remove the filter from the tank.

b. **Other Models**. Disconnect the hydraulic return hose at the filter. Loosen the band clamps on the rubber sealing ring. Turn the filter cap counterclockwise to disengage the two pins that hold the filter cap in the hydraulic tank. A coil spring under the filter holds the filter against the filter cap. Remove the filter cap and then remove the filter.

**NOTE:** The hydraulic oil filter has a by–pass relief valve that is part of the filter. Make sure the correct replacement filter with a by–pass relief valve is installed.

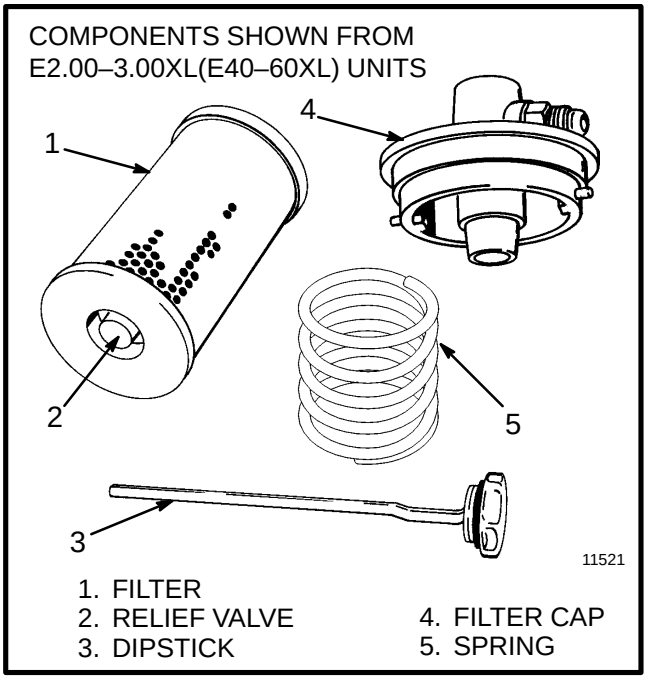



FIGURE 20. HYDRAULIC FILTER

### Change the Hydraulic Oil

Put the lift truck on a level surface. Lower the mast. Put a drain pan with a 25 litre (26 qt) capacity under the hydraulic tank. Disconnect the hydraulic hose from the hydraulic tank to the steering pump and drain the oil into the drain pan. (The quantity of oil is according to the size of the mast and the optional hydraulic equipment.)

When the oil has drained, connect the hydraulic hose. Fill the hydraulic tank with the correct oil *after* the filter is installed. See the MAINTENANCE SCHEDULE.

## DIFFERENTIAL AND SPEED REDUCER

Remove the plug from the bottom of the differential housing to drain the oil. See the MAINTENANCE SCHEDULE (Item 17) for the correct lubricant. Fill the differential and speed reducer so that the oil level is even with the fill plug or the "FULL" mark on the dipstick.

## SERVICE BRAKES

### ⚠ WARNING

**Brake linings contain asbestos or other fibers. Breathing the dust from these brake linings is a cancer or lung disease hazard. Do not create dust! Do not clean brake parts with compressed air or by brushing. Use vacuum equipment approved for asbestos dust or follow the cleaning procedure in this section. When the brake drums are removed, do not create dust.**

**Do not sand, grind, chisel, hammer or change linings in any way that will create dust. Any changes to brake linings must be done in a restricted area with special ventilation. Protective clothing and a respirator must be used.**

Cleaning Procedures:

a. Do not release brake lining dust from the brake linings into the air when the brake drum is removed.

b. Use a solvent approved for cleaning of brake parts to wet the lining dust. Follow the instructions and cautions of the manufacturer for the use of the solvent. If a solvent spray is used, do not create brake lining dust with the spray.

c. When the brake lining dust is wet, clean the parts. Put any cloth or towels in a plastic bag or an airtight container while they are still wet. Put an "ASBESTOS" warning label on the plastic bag or airtight container.

d. Any cleaning cloths that will be washed must be cleaned so that fibers are not released into the air.

### ⚠ CAUTION

**Do not use an oil solvent to clean the wheel cylinder. Use a solvent approved for cleaning of brake parts. Do not permit oil or grease in the brake fluid or on the brake linings.**

Check the brake lining and parts of the brake assembly for wear or damage. See the **BRAKE SYSTEM** section for the removal and installation procedures of the drive wheels and hubs. If the brake linings or brake shoes are worn or damaged, they must be replaced. Brake shoes must be replaced in complete sets. Inspect the brake drums for cracks or damage. Replace any damaged parts.

**NOTE:** Additional information can be found in the section of the **SERVICE MANUAL:**

- **THE BRAKE SYSTEM, 1800 SRM 315**
  for models E/J1.25–1.75XL (E25–35XL) and E/J2.00–3.00XL (E/J40–60XL)
- **THE BRAKE SYSTEM, 1800 SRM 338**
  for models E3.50–5.50XL (E70–120XL)

## CONTACTORS

Always replace the contacts of a contactor as a complete set. See the **ELECTRICAL** sections for replacement and adjustment procedures.

## WHEEL BEARINGS

### Steer Wheels, Lubrication

Lubricate the wheel bearings in the hubs for the steer wheels with multi–purpose grease. Do the following procedure to install the hubs:

a. Install the hub and bearings on the spindle.

b. Install the castle nut. Tighten the castle nut to 200 N.m (150 lbf ft) while rotating the wheel and hub. Loosen the nut until the wheel rotates freely and the bearings are not loose. Tighten the nut to 35 N.m (25 lbf ft) and install the cotter pin at the closest slot in the nut. Install the cap for the bearings.

### Drive Wheels, Lubrication

**NOTE:** Additional information can be found in the section of the **SERVICE MANUAL:**

- **DRIVE AXLE, SPEED REDUCER AND DIFFERENTIAL, 1400 SRM 285**
  for models E/J1.25–1.75XL (E25–35XL) and E/J2.00–3.00XL (E/J40–60XL)
- **DRIVE AXLE, SPEED REDUCER AND DIFFERENTIAL, 1400 SRM 413**
  for models E3.50–5.50XL (E70–120XL)

Lubricate the inner wheel bearings in the hubs for the drive wheels with multi–purpose grease. See the section for the **DRIVE AXLE** or the **BRAKE SYSTEM** for the procedures to remove and install the drive wheels and hubs.

## LIFT CHAINS

### ⚠ WARNING

**Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.**

**Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.**

Remove the lift chains. Clean the lift chains by soaking them in a solvent that has a petroleum base for at least 30 minutes. Use compressed air to completely dry the chains when they are clean.

Lubricate the lift chains by soaking them in 30W engine oil for at least 30 minutes. Remove the chains from the oil. Hang the chains for one hour so that excess oil will drain from the chains.

## HOW TO CHARGE THE BATTERY

### ⚠ WARNING

**If the lift truck was operated with a low battery, inspect <u>all</u> contactors for welded contacts BEFORE you connect a charged battery. The lift truck can not be controlled if contacts are welded. This condition can cause personal injury when the battery is connected.**

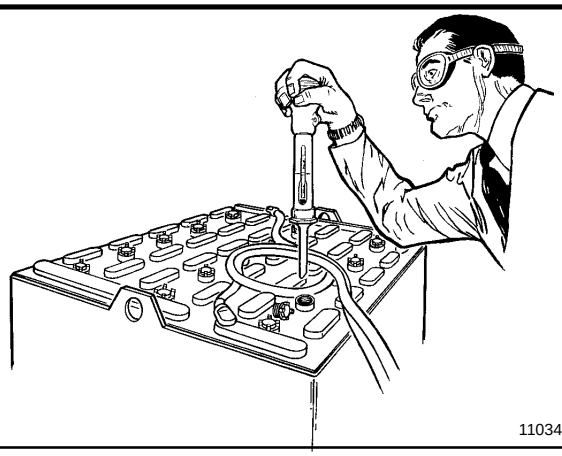
### ⚠ CAUTION

**Never connect the battery charger plug to the plug of the lift truck. You can damage the electronic controller. Make sure the battery charger voltage is the correct voltage for the battery.**

### ⚠ WARNING

**The acid in the electrolyte can cause injury. Use water to flush the area and make the acid neutral with a water and soda solution. Acid in the eyes must be flushed with water. Batteries generate explosive fumes when they are being charged. Keep fire, sparks and burning material away from the battery charger area. Avoid sparks from the battery connections. Charge batteries only in the special area for charging batteries. When the battery is being charged, keep the vent caps clear. The battery charger area must have ventilation so that explosive fumes are removed. Open the battery cover on a covered battery. Disconnect the battery when doing cleaning and maintenance.**

Correct use of the hydrometer (See FIGURE 21.) and proper operation of the battery charger is important. Follow the instructions of the charger manufacturer. Never let the battery discharge below the minimum value given by the battery manufacturer. A fully charged battery will have a specific gravity of 1.265 to 1.310 at 25°C (77°F). Never charge a battery at a rate that will raise the electrolyte temperature above 49°C (120°F). Never let a battery stay discharged for long periods.




| SPECIFIC GRAVITY READING | ELECTRO–LYTE TEMP. | CORRECTION POINTS | CORRECT VALUE |
|---|---|---|---|
| 1.210 | 31°C (87°F) | +0.003 | 1.213 |
| 1.210 | 27°C (80°F) | +0.001 | 1.211 |
| 1.210 | 25°C (77°F) | 0.000 | 1.210 |
| 1.210 | 18°C (64°F) | –0.004 | 1.206 |

+0.001 or –0.001 for each 2 degrees C from the 25 degree base value.

FIGURE 21. CHECK SPECIFIC GRAVITY

1. NORMAL CHARGE: This charge is the charge that is normally given to a battery that is discharged from normal service. Many users give this charge at a regular interval based on usage. This practice will keep the battery fully charged if the battery is not discharged below the limit. Always use a hydrometer (TABLE 2) to check the battery if the interval charge cycle is used. Frequent charging of a battery that has 2/3 of a full charge or more can decrease battery life.

2. EQUALIZING CHARGE: This charge is at a low rate and balances the charge in all of the cells. The equalizing charge is normally given approximately once a month. It is a charge at a slow rate for three to six hours in addition to the regular charging cycle.

DO NOT give an equalizing charge more than once a week. The most accurate specific gravity measurements for a charged battery will be after an equalizing charge. If the specific gravity difference is more than 0.020 between cells of the battery after and equalizing charge, there can be a damaged cell. Consult your battery dealer.

**NOTE**: Many users have battery chargers that can follow a program to automatically charge a battery according to recommendations of the battery manufacturer.

Use the recommendations of the battery manufacturer for charging the battery.

Also see the section **THE INDUSTRIAL BATTERY, 2240 SRM 1**, for additional information on the charging and maintenance of a battery.

## HOW TO CHANGE THE BATTERY

### ⚠ WARNING

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

**Make sure the capacity of the crane and spreader bar is greater than the weight of the battery. The weight of the battery is normally shown on the battery case. The maximum battery weight is shown on the lift truck nameplate. The spreader bar must NOT be made of metal or it must have insulated straps.**

**The replacement battery must fit the battery area correctly. Use spacers to prevent the battery from moving horizontally in the battery compartment.**

**Make sure that the battery voltage and weight of the replacement battery is correct as shown on the nameplate.**

**Make sure the battery restraint is locked in the down position before the lift truck is operated. On E70–120XL units, make sure the battery retention bar is lowered and locked under the seat.**

**Before connecting the battery, make sure the key switch is in the OFF position and the parking brake is set.**

1. Disconnect the battery. Move the connector and cables so that they will not be damaged when the battery is moved. Tilt the steering column forward and make sure the detent engages to hold the steering column. Slide the seat to the rear adjustment position. Release the lock on the battery restraint and tilt the battery restraint and seat to the up position. Make sure the battery restraint and the seat are locked in the up position.

2. If the lift truck has a hood, open the hood from over the battery. See FIGURE 24. If the battery is not a covered battery, put an insulating cover over the battery. If the lift truck has a battery retention bar, secure the bar in the UP position.

3. Use a spreader bar and crane to lift the battery from the lift truck. See FIGURE 25. When a replacement battery is installed, make sure the battery fits the battery compartment. Use spacers to prevent the battery from moving more than a total of 13 mm (0.5 in) in any one horizontal direction. See FIGURE 22.

### ⚠ WARNING

**Correct operation of the battery restraint system requires that the battery does not move more than 13 mm (0.5 in). Make sure the battery spacers are correctly adjusted. Use only spacers supplied with the truck.**

4. The lift trucks are equipped with adjustable spacers in the battery compartment. See FIGURE 22. Add or remove shims from under the front spacer bar to control the movement of the battery in the forward and backward directions. Install an equal number of shims at each capscrew. Install the unused shims under the nuts of the capscrews (outside battery compartment). The spacers on each side of the battery can be adjusted to control the movement of the battery from side to side. Access to the nuts for the spacers for the sides of the battery is under the frame near the steer tires. Tighten all capscrews. It can be necessary to install the side spacers facing the opposite direction for some batteries. If the spacers can not be adjusted for a battery that is specified for this lift truck, see your dealer for Hyster lift trucks for the correct spacers.

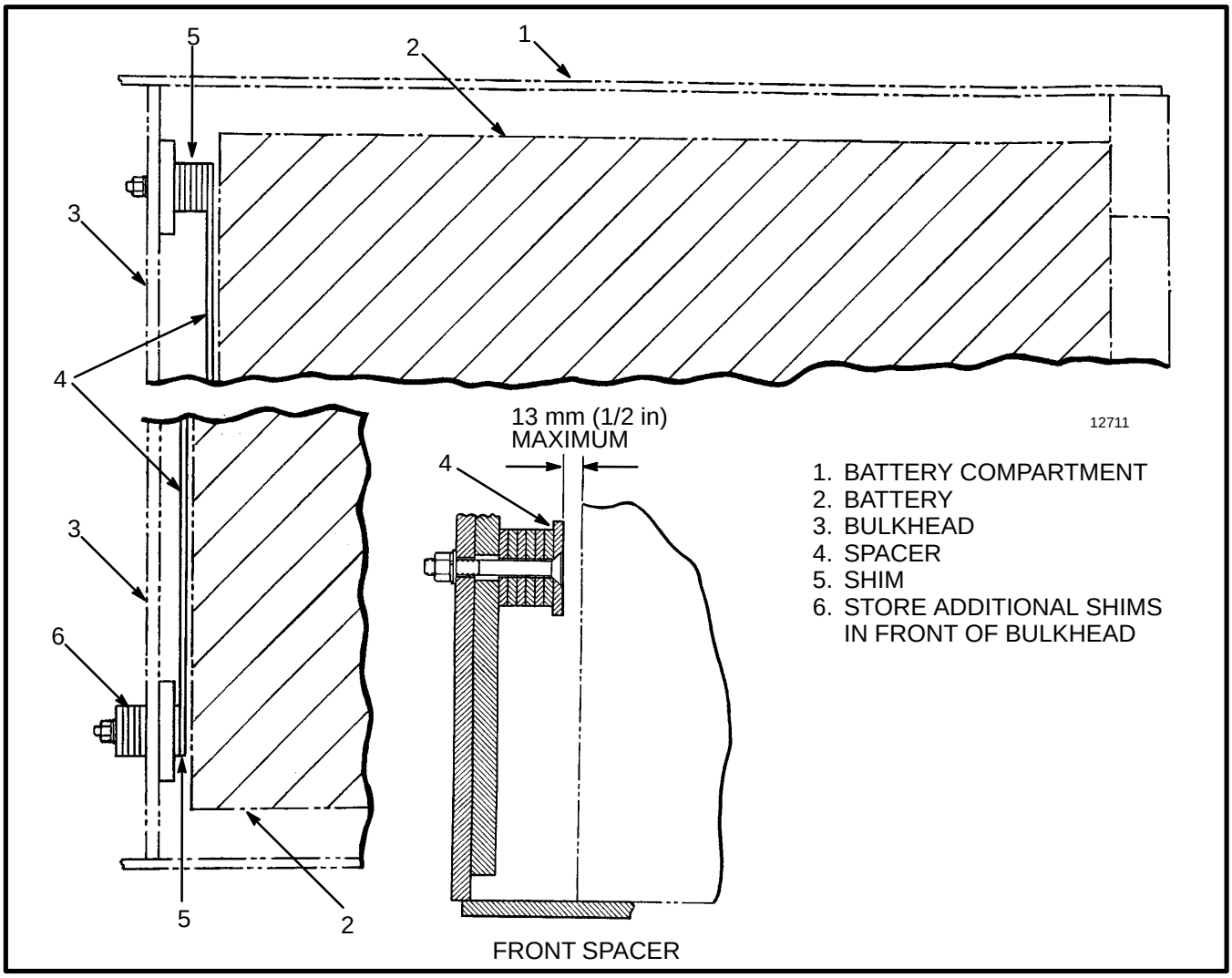



FIGURE 22. BATTERY COMPARTMENT SPACERS

## ⚠ WARNING

**Make sure the capacity of the crane and spreader bar is greater than the weight of the battery. The weight of the battery is normally shown on the battery case. The spreader bar must NOT be made of metal or it must have insulated straps.**

**Batteries are heavy. Use care to avoid injury.**

**The replacement battery must fit the battery compartment so that the battery restraint system operates correctly.**

**Make sure the weight of the replacement battery is within the maximum and minimum weights shown on the nameplate.**

**Make sure that the voltage of the battery is the correct voltage for the lift truck.**

**Make sure that the key switch is in the OFF position and the park brake is applied before you connect the battery.**

**Make sure the battery restraint plate is locked in the down position before the lift truck is operated. On E3.50–5.50XL (E70–120XL) units, make sure the battery retention bar is lowered and locked under the seat.**

1. Disconnect the battery. Move the connector and cables so that they will not be damaged when the battery is moved. Tilt the steering column forward and make sure it locks in position. Slide the seat to the rear adjustment position. Release the lock on the battery restraint and tilt the battery restraint and seat to the up position. Make sure they are locked in the up position.

2. If the lift truck has a hood, open the hood from over the battery (see FIGURE 23. and FIGURE 24.). If the battery is not a covered battery, put an insulating cover

over the battery. Lift trucks without hoods must have a battery cover. If installed, raise the battery retention bar and put it in the up position.

**NOTE:** Lift trucks made in Irvine, Scotland have a different hood design (FIGURE 23.) than lift trucks made in the U.S.A. (FIGURE 24.).

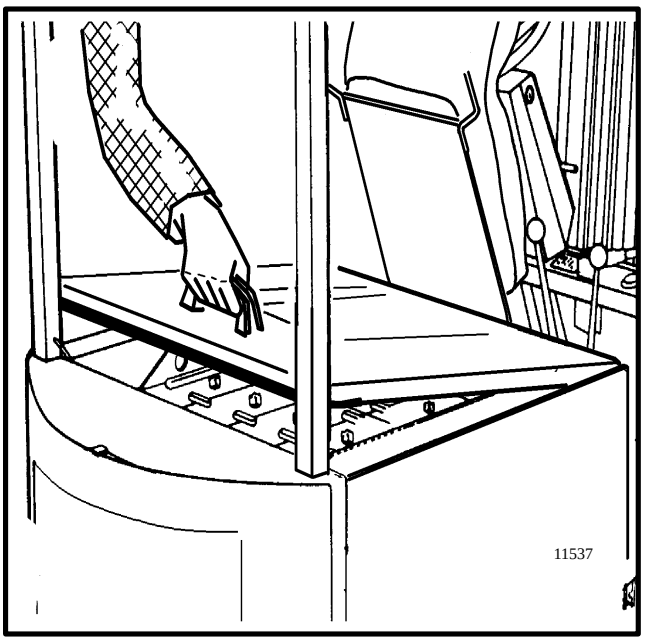



FIGURE 23. OPEN THE HOOD
(IRVINE DESIGN)

3. Use a spreader bar and crane to lift the battery from the lift truck. (See FIGURE 25.) When a replacement battery is installed, make sure the battery fits the battery compartment. Use the spacers designed by Hyster Company to prevent the battery from moving more than 13 mm (0.5 in) in any horizontal direction. See the **OPERATING MANUAL** for installation of spacers.

## ⚠ WARNING

**Correct operation of the battery restraint system requires that the battery does not move more than 13 mm (0.5 in). Make sure that the battery spacers are correctly adjusted.**

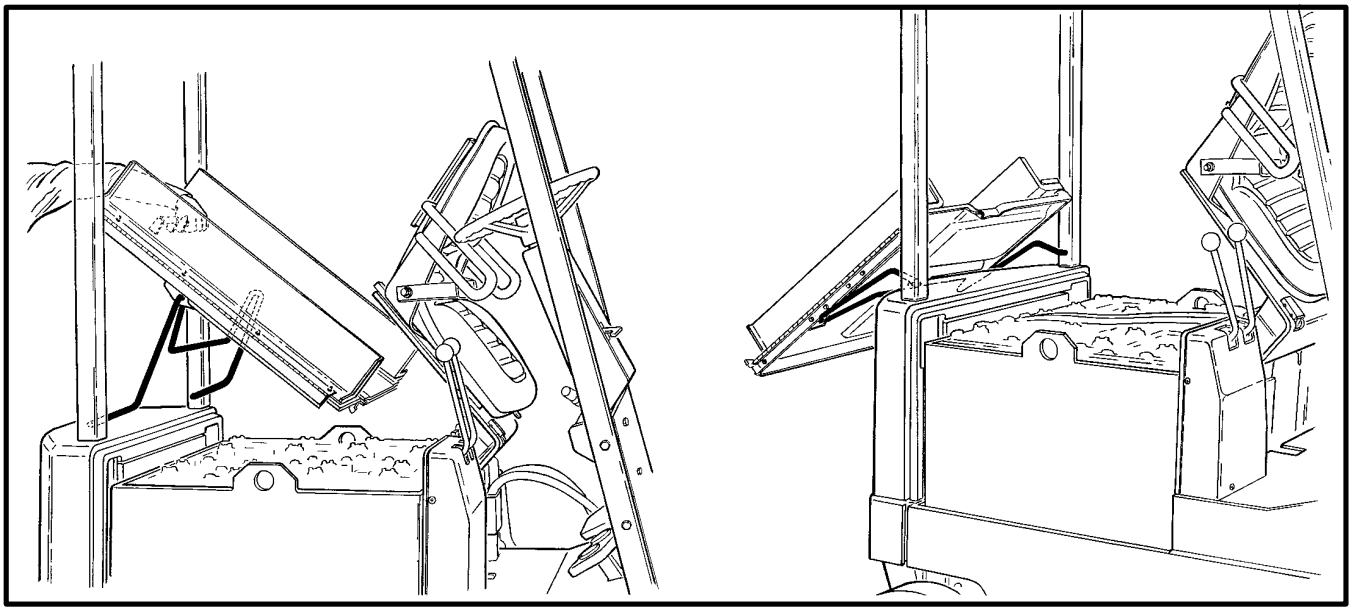


FIGURE 24. OPEN THE HOOD

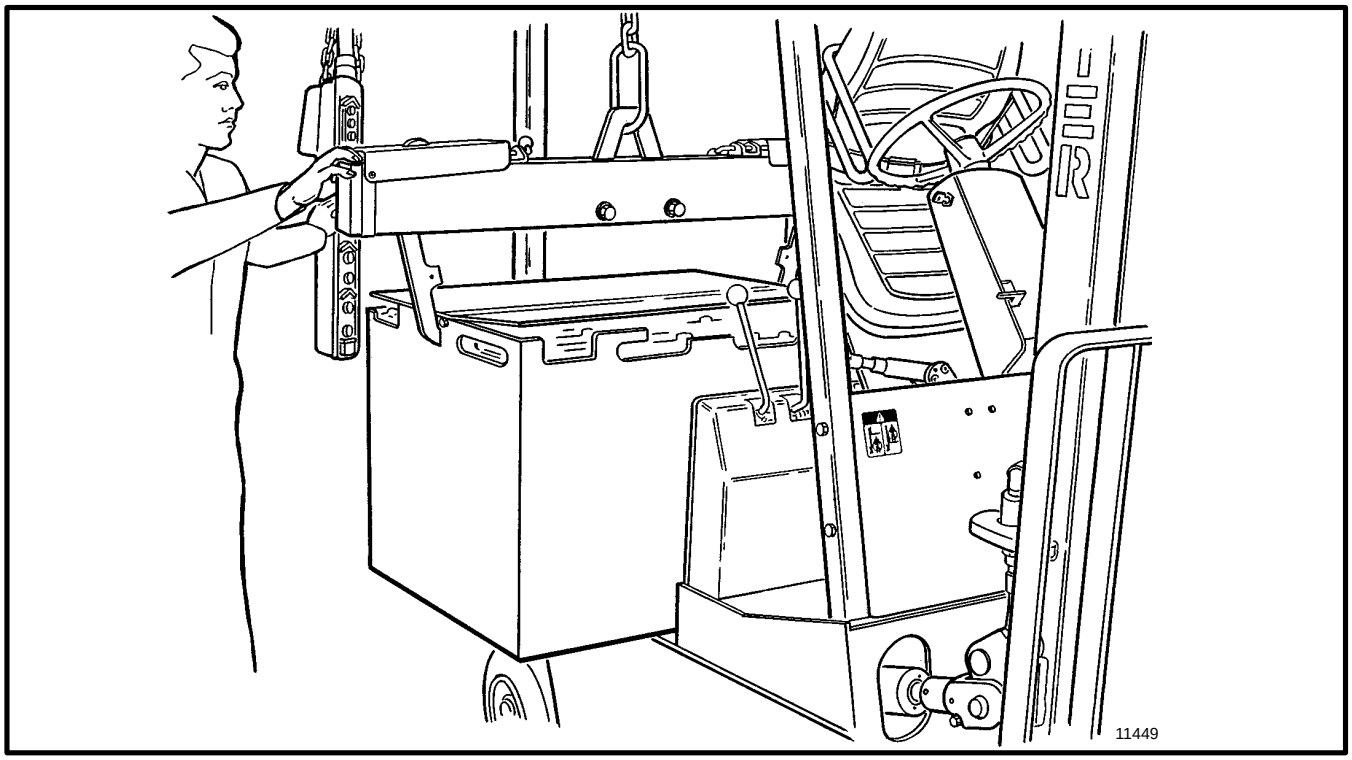



FIGURE 25. CHANGE THE BATTERY

4. The lift trucks are equipped with adjustable spacers in the battery compartment. Add or remove shims from under the front spacer bar to control the movement of the battery in the forward and backward directions. Install an equal number of shims at each capscrew. Install the unused shims under the nuts of the capscrews (outside battery compartment). The spacers on each side of the battery can be adjusted to control the movement of the battery from side to side. Access to the nuts for the spacers for the sides of the battery is under the frame near the steer tires. Tighten all capscrews. It can be necessary to install the side spacers facing the opposite direction for some batteries. If the spacers can not be adjusted for a battery that is specified for this lift truck, see your dealer for Hyster lift trucks for the correct spacers.

## SAFETY PROCEDURES WHEN WORKING NEAR THE MAST (1 of 2)

The following procedures must be used when inspecting or working near the mast. Additional precautions and procedures can be required when repairing or removing the mast. See the correct Service Manual section for the specific mast being repaired.

**⚠ WARNING Mast parts are heavy and can move. Distances between parts are small. Serious injury or death can result if part of the body is hit by parts of the mast or the carriage.**

- **Never put any part of the body into or under the mast or carriage unless all parts are completely lowered or a safety chain is installed. Also make sure that the power is off and the key is removed. Put a "DO NOT OPERATE" tag in the operator's compartment. Disconnect the battery on electric lift trucks and put a tag or lock on the battery connector.**
- **Be careful of the forks. When the mast is raised, the forks can be at a height to cause an injury.**
- **DO NOT climb on the mast or lift truck at any time. Use a ladder or personnel lift to work on the mast.**
- **DO NOT use blocks to support the mast weldments nor to restrain their movement.**
- **Mast repairs require disassembly and removal of parts and can require removal of the mast or carriage. Follow the repair procedures in the correct Service Manual for the mast.**

**WHEN WORKING NEAR THE MAST ALWAYS:**

- Lower the mast and carriage completely. Push the lift/lower control lever forward and make sure there is no movement in the mast. Make sure that all parts of the mast that move are fully lowered.

**OR**

- If parts of the mast must be in a raised position, install a safety chain to restrain the moving parts of the mast. Connect moving parts to a part that does not move. Follow these procedures:

**a**. Put the mast in a vertical position.

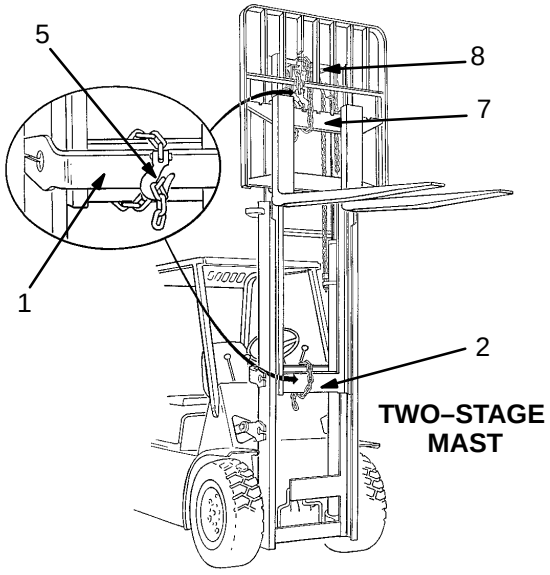
**b**. Raise the mast to align the bottom crossmember of the weldment that moves in the outer weldment with a crossmember on the outer weldment (1). On the two–stage and free–lift mast, the moving part is the inner weldment (2). On the three–stage mast it is the intermediate weldment (3). On the four–stage mast it is the first intermediate weldment (4).

**c**. Use a 3/8 inch minimum safety chain with a hook (5) to fasten the crossmembers together so that the movable member can not lower. Put the hook on the back side of the mast. Make sure the hook is completely engaged with a link in the chain. Make sure the safety chain does not touch lift chains or chain sheaves, tubes, hoses, fittings or other parts on the mast.

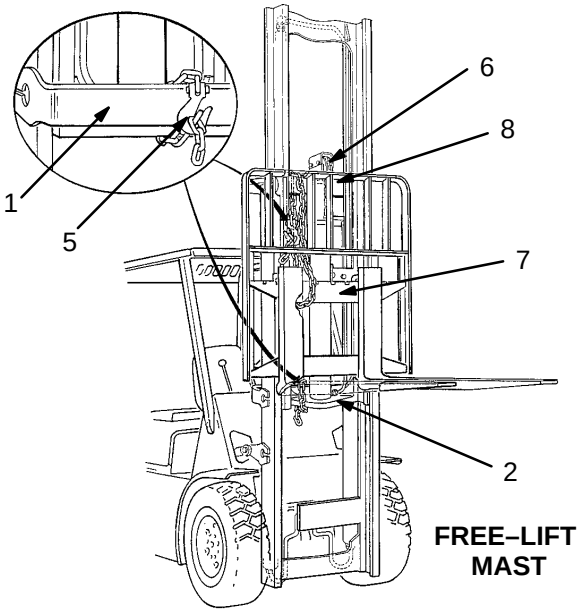
**d**. Lower the mast until there is tension in the safety chain and the free–lift cylinder (6) (free–lift, three–stage and four–stage masts only) is completely retracted. If running, stop the engine. Apply the parking brake. Install a **"DO NOT REMOVE"** tag on the safety chain(s).

**e**. Install another safety chain (3/8 inch minimum) between the top or bottom crossmember of the carriage (7) and a crossmember on the outer weldment (8).

- Apply the parking brake. After lowering or restraining the mast, shut off the power and remove the key. Put a **"DO NOT OPERATE"** tag in the operator's compartment. Disconnect the battery on electric lift trucks and put a tag or lock on the battery connector.

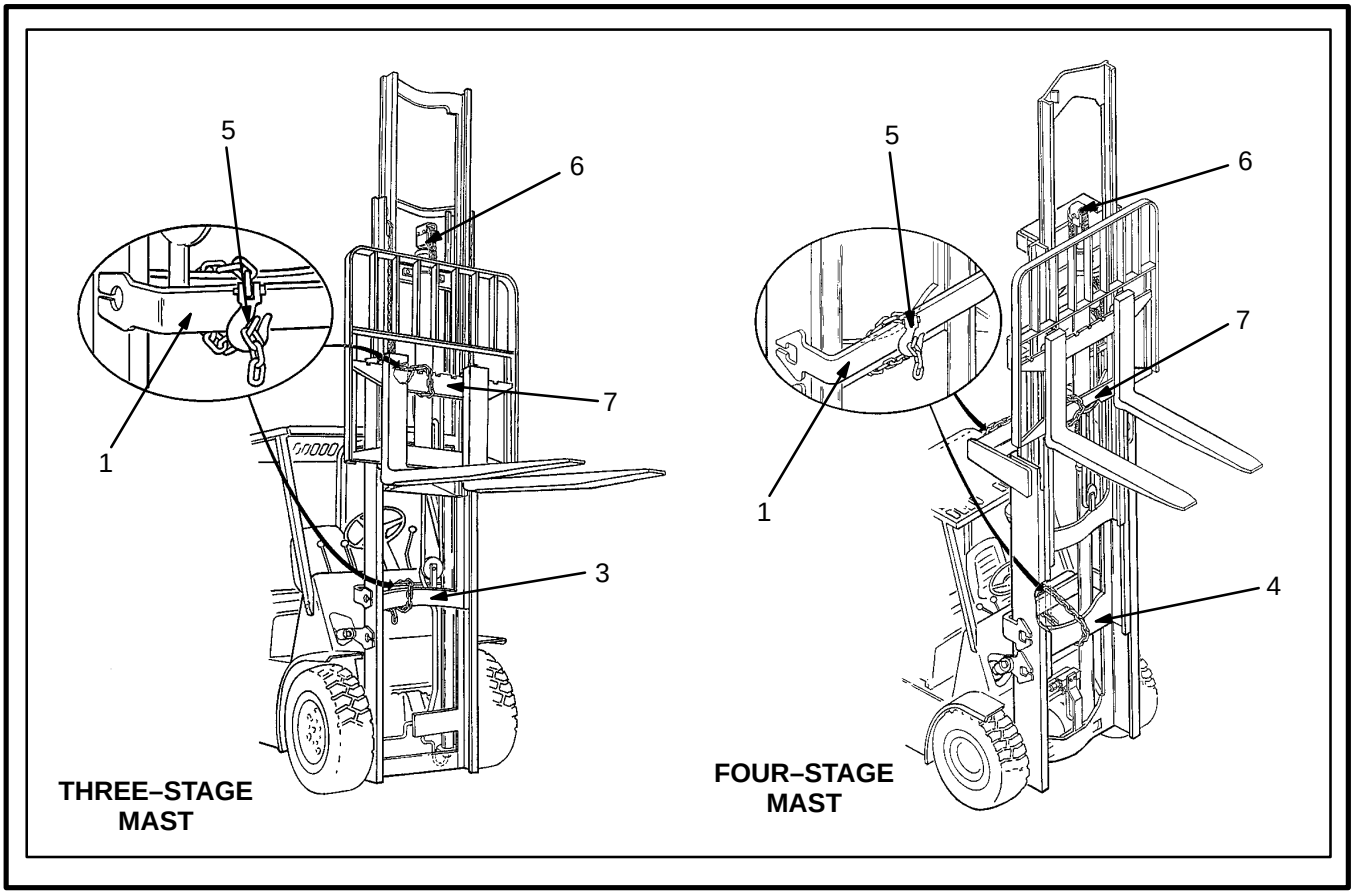



**TWO–STAGE MAST**




**FREE–LIFT MAST**

## SAFETY PROCEDURES WHEN WORKING NEAR THE MAST (2 of 2)




## CHECK FOR LEAKS IN THE LIFT AND TILT SYSTEM

### ⚠ WARNING

**Never allow any person under a raised carriage. Do not put any part of your body in or through the lift mechanism unless all parts of the mast are completely lowered, the key switch is in the OFF position and the key is removed.**

**Before making any repairs, use blocks and chains on the mast weldments and carriage so that they can not move. Make sure the moving parts are attached to the parts that can not 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 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 Lift Cylinders for Leaks

1. Operate the hydraulic system. Put a capacity load on the forks and raise and lower the load several times. Lower the load and tilt the mast forward and backward several times. Check for leaks.

2. Raise the carriage and load so that the rods of the main lift cylinders extend at least 60 cm (2 ft). If the carriage lowers slowly with the control valve in the NEUTRAL position, there are leaks inside the hydraulic system. The maximum speed that the carriage is allowed to lower is 50 mm (2 in) per 10 minutes when the hydraulic oil is 30°C (90°F). If the oil temperature is 70°C (160°F), the maximum speed that the carriage can lower is 150 mm (6 in) per 10 minutes.

3. Check the lift cylinders for internal leaks. Remove the load from the forks. Install a gate valve in the supply line between the main control valve and the mast. Put a capacity load on the forks again. Raise the carriage and load so that the rods of the main lift cylinders extend at least 60 cm (2 ft). Close the gate valve. If the carriage or mast weldments lower slowly, the seals in the lift cylinders have leaks.

4. If the carriage and mast weldments do not move, open the gate valve and check for movement again. If the carriage lowers when the valve is open, check for leaks in the hydraulic lines or fittings. If no leaks are found, the main control valve can have damage. Remove the load from the forks.

### Check the Tilt Cylinders for Leaks

1. Put a capacity load on the forks. Slowly tilt the mast forward. If the mast continues to slowly tilt forward when the control valve is in the NEUTRAL position, there are leaks inside the hydraulic system. The maximum speed that the mast is allowed to tilt forward when there are internal leaks in the lift system is 13 mm (0.50 in) per 10 minutes (measured at the tilt cylinder). The maximum speed is measured when the hydraulic oil is 30°C (90°F). If the oil temperature is 70°C (160°F), the maximum speed is 39 mm (1.5 in) per 10 minutes.

2. If the leak rate is greater than specifications, remove the load from the mast. Install a valve between the port at the front of the tilt cylinder and the hydraulic line. Put the load on the forks again. Close the valve. If the mast tilts slowly forward, the cylinder seals are leaking. Be sure to check both tilt cylinders.

3. If the mast does not move, open the gate valve and check for movement again. If the mast moves forward when the gate valve is open, check for leaks in the hydraulic lines or fittings. If no leaks are found, the main control valve can have damage. Remove the load from the forks.

## LIFT CHAIN ADJUSTMENTS (See FIGURE 26.)

When the lift chains are correctly adjusted:

- The tension will be the same on each chain of the chain set. Check tension by pushing on both chains at the same time.
- The chain length will be correct.
- The chains must travel freely through the complete cycle.

1. When adjusting the two–stage or the free–lift mast, start with step 2. Do the following steps first when adjusting the three–stage or the four–stage mast.

### ⚠ CAUTION

**Adjust the four–stage mast carefully and keep it correctly adjusted. Incorrect adjustment can cause damage to the free–lift hoses.**

a. Adjust the chain anchors on the outer weldment so that the top of the inner (or third) weldment is level with the top of the outer weldment. The tolerance is ±1.5 mm (0.06 in).

b. On the four–stage mast, adjust the chain anchors on the second weldment so that the top of the inner weldment is level with the top of the outer weldment. Use the tolerance above.

2. Put a load equal to 80 to 90% of the capacity load on the forks. Lower the forks as much as possible. Tilt the mast fully backward.

3. See FIGURE 26. Check the amount that the bottom carriage roller extends below the inner channel of the mast. The carriage roller must not extend more than 1/3 of the roller diameter below the inner channel. If the adjustment is not correct, remove the load and adjust the chain anchors. Make sure that each chain anchor is adjusted the same amount.

4. Remove the load from the forks. On the two–stage mast, check the clearance of the carriage when the mast is fully extended. On an mast with a free–lift cylinder, make this check after extending the weldments a short distance. The carriage stops must not touch the stop on the top crossmember of the inner weldment. The chains are too tight if the carriage touches the crossmember. Put the mast in a vertical position and lower the carriage completely. If the forks do not just touch the surface, the chains are too tight. If the chains are too tight, adjust the chain anchors. Make sure that each anchor is adjusted the same amount.

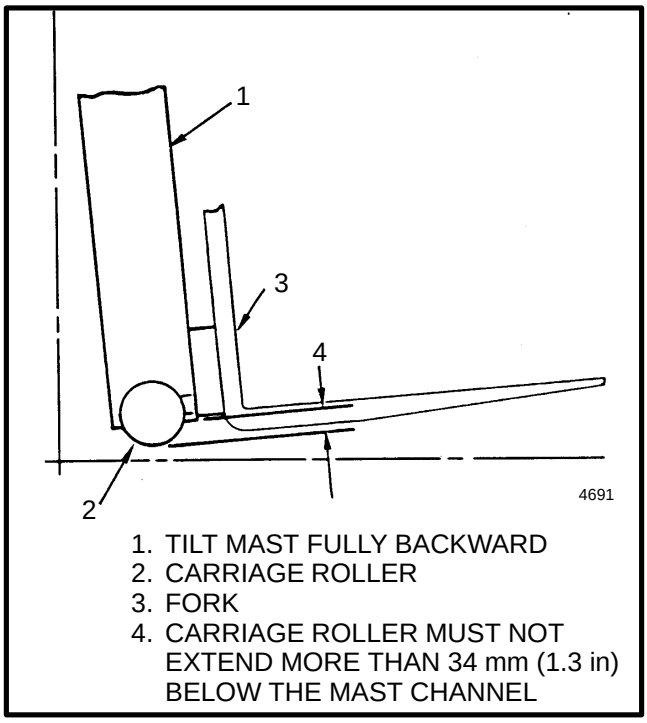
**NOTE:** When the chain adjustments are complete, make sure that the threads on the nuts of the chain anchors are completely engaged. Make sure that all of the adjustment is not removed from the chain anchors. The chain anchors must be able to move in their sockets.

## HOW TO CHECK THE PMT CIRCUIT

### ⚠ WARNING

**Some malfunctions can make the traction motor run at high speed with no control by the speed controller.**

**The PMT circuit prevents this operation if these malfunctions occur. Do not operate the lift truck if the PMT circuit does not operate correctly.**




1. TILT MAST FULLY BACKWARD
2. CARRIAGE ROLLER
3. FORK
4. CARRIAGE ROLLER MUST NOT EXTEND MORE THAN 34 mm (1.3 in) BELOW THE MAST CHANNEL

FIGURE 26. LIFT CHAIN ADJUSTMENTS

The Pulse Monitor Trip (PMT) circuit only functions if a fault occurs. To check the circuit, we must cause a temporary malfunction. Check the PMT circuit for correct operation as follows:

1. Raise the drive wheels and put the lift truck on blocks. See "How To Raise The Drive Tires" in this section. Release the parking brake.

## ⚠ 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.**

**Do not touch the terminals of capacitor C1 of the traction or lift control circuits. The charge on the capacitors can cause electrical shock and personal injury. Use an insulated screwdriver or jumper wire to make a short–circuit across the capacitor terminals to discharge each capacitor. This will discharge the capacitors to prevent electrical shocks.**

2. Disconnect the battery, open the electrical compartment and discharge capacitor(s) C1 on the SCR control panels.

**NOTE**: The EV–200 motor controller has capacitor C2 connected in parallel with capacitor C1. Both capacitors will be discharged.

3. Disconnect the gate lead from the SCR 5 for the traction circuit (white/violet wire). The gate lead has a push–on connector. Make sure that the end of the lead does not touch any other surface. See the **DIAGRAMS** section that came with the lift truck for the location of the gate lead.

4. Connect the battery.

5. Sit on the seat to close the seat switch and turn the key to the **"ON"** position. Actuate the Monotrol control pedal or the direction control lever and accelerator for slow movement in the FORWARD or REVERSE direction.

6. Listen for the direction contactor to open. The traction system will not operate. The traction motor controller will allow two power pulses before opening the contactor.

7. As soon as the PMT circuit disables the traction control, turn the key to the **"OFF"** position. If the PMT circuit does not disable the traction control, replace the control card. Correct procedures are in the **SERVICE MANUAL**:

- **EV–100™ MOTOR CONTROLLER, Repairs and Adjustments, 2200 SRM 288,** for models E/J1.25–1.75XL (E25–35XL) and E/J2.00–3.00XL (E/J40–60XL)
- **EV–200™ MOTOR CONTROLLER, Operation, Checks, Repairs and Adjustments, 2200 SRM 414,** for models E3.50–5.50XL (E70–120XL)
- **ELECTRICAL SYSTEM, Checks and Adjustments, 2200 SRM 464,** for SitDrive™ Models with EV–1, EV–1B, EV–1W, EV–100 or EV–200 Motor Controllers

8. Disconnect the battery, open the electrical compartment and discharge capacitors C1 (and C2 if installed) on the SCR control panels as described in the earlier WARNING.

9. Connect the SCR 5 gate lead. Connect the battery. Raise the drive wheels and remove the blocks. Check for normal operation of the traction motor.

### WELDING REPAIRS

Some repairs require welding. If an acetylene or arc welder is used, make sure the procedures in the following WARNING and CAUTION are done.

**⚠ WARNING**

**Welding can cause a fire or an explosion. Always follow the instructions in the FRAME section of the SERVICE MANUAL if a fuel or hydraulic tank must be welded. Make sure there is no fuel, oil, or grease near the weld area. Make sure there is good ventilation in the area where the welding must be done.**

**Do not heat, weld, or bend forks. Forks are made of special steel using special methods. Get information from your dealer for Hyster lift trucks before welding on an mast.**

**⚠ CAUTION**

**When an arc welder is used, always disconnect the battery connector on the lift truck. This action will prevent damage to the SCR control.**

**Connect the ground clamp for the arc welder as close as possible to the weld area. This action will prevent damage to a bearing from the large current from the welder.**

### CHANGES TO THE OVERHEAD GUARD

**⚠ WARNING**

**Do not weld mounts for lights or accessories to the legs of the overhead guard. The strength of the overhead guard can be reduced by welding or heating.**

## WHEELS AND TIRES

**⚠ WARNING**

**The type of tire and the tire pressure (pneumatic tires) are shown on the nameplate. Make sure the nameplate is correct for the type of tires on the lift truck.**

### GENERAL

The **E1.25–1.75XL (E25–35XL), E2.00–3.00XL (E40–60XL) and E3.50–5.50XL (E70–120XL)** series of lift trucks use solid rubber tires. Solid rubber tires made from softer or harder material can be installed as optional equipment. The tread on the solid rubber tires can be either smooth or it can have lugs. DO NOT mix types of tires or tread on the lift truck.

There are three configurations of drive wheel mounts used on the **E1.25–1.75XL (E25–35XL)** series of lift trucks. See FIGURE 29. The methods used to fasten the drive wheels to the hub are different for the three configurations. When the drive tires are removed or installed, small changes in the procedure must be made for the differences in the axles. DO NOT mix types of tires or tread on the lift truck.

The **J1.25–1.75XL** and **J2.00–3.00XL (J40–60XL)** series of lift trucks use pneumatic tires or solid rubber tires that fit on pneumatic type wheels. DO NOT mix types of tires or tread on the lift truck.

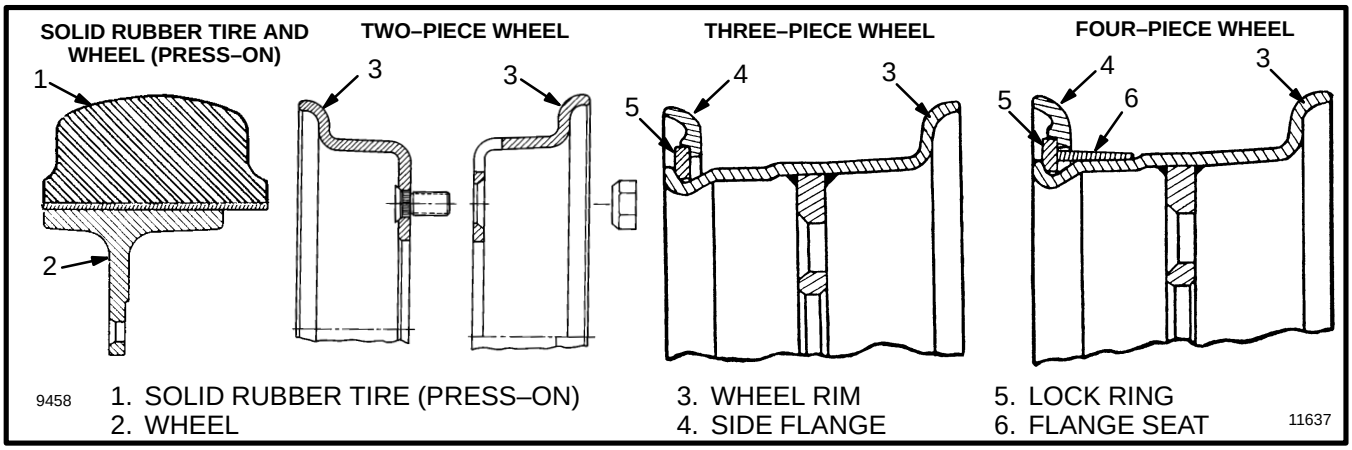



FIGURE 27. TYPES OF WHEELS

| UNIT | WHEEL | TIRE WIDTH | OFFSET* MEASUREMENT "A" |
|---|---|---|---|
| E40–60XL | STEER | 127 mm (5 in) | 6.4 mm (0.25 in) |
| | | 152 mm (6 in) | 31.8 mm (1.25 in) |
| | DRIVE | 178 mm (7 in) | 0 |
| | | 203 mm (8 in) | 0 |
| | | 229 mm (9 in) | 25.4 mm (1.0 in) |
| E70–120XL | DRIVE | 229 mm (9 in) | 0 |
| | | 304 mm (12 in) | 0 |
| | STEER | 152 mm (6 in) | 0 |
| | | 178 mm (7 in) | 12.7 mm (0.5 in) |

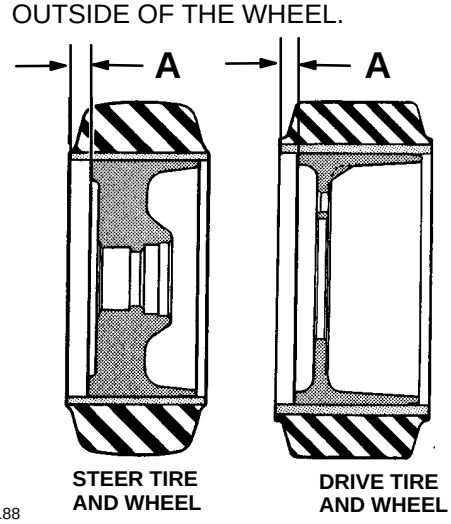



FIGURE 28. WHEEL AND TIRE MOUNTS, E2.00–3.00XL (E40–60XL)AND E3.50–5.50XL (E70–120XL)

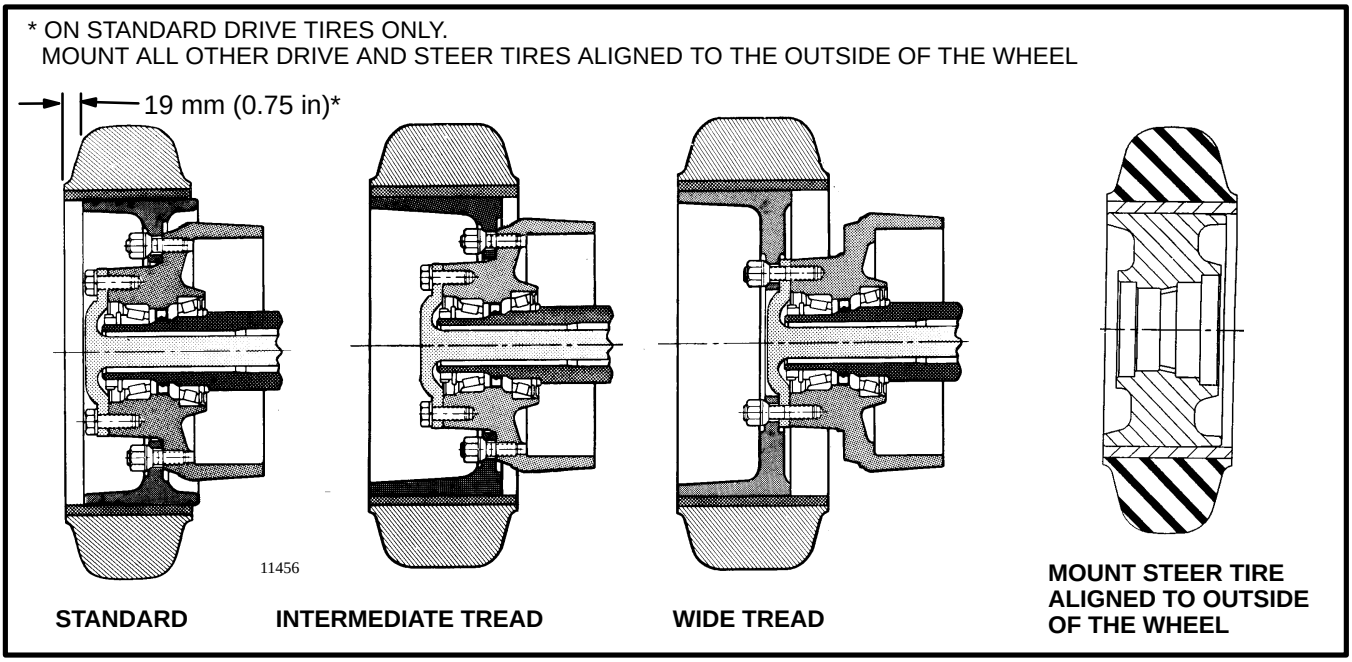



FIGURE 29. WHEEL MOUNTS, E1.25–1.75XL (E25–35XL)

## SOLID RUBBER TIRES (PRESS–ON)

### How To Change A Solid Rubber Tire

When new solid rubber tires (press–on) must be installed, put the lift truck on blocks as described in How To Put The Lift Truck On Blocks at the beginning of this section. Remove the wheel. The correct tools, equipment and a press ring must be used for each size wheel. A press that has a capacity of approximately 36 000 kg (80 000 lb) is also required to press the wheel from the rim. Do not try to change the solid rubber tires on the wheels unless you have the correct tools, equipment and experience.

Make sure the tires are installed on the wheels to the dimensions shown in FIGURE 28. or FIGURE 29. Install the tires on both drive wheels at the same dimensions. Install the tires on both steering wheels at the same dimensions. Check the nameplate on the lift truck for the correct tread width. The tread width is measured from the outside of one wheel to the inside of the other wheel.

### Install The Wheels

**Steering Wheels:**

a. Lubricate the bearings with multi–purpose grease. Install the wheel and bearings on the spindle.

b. Install the washer and nut on the spindle.

c. Tighten the nut to 200 N.m (150 lbf ft) while rotating the wheel. Loosen the nut until the wheel rotates freely and the bearings are not loose. Tighten the nut to 35 N.m (25 lbf ft) and install the cotter pin at the closest slot in the nut.

d. Install the cap for the bearings.

**Drive Wheels.** Install the wheel on the hub. Tighten the nuts in a cross pattern to the torque value in the MAINTENANCE SCHEDULE.

## ⚠ WARNING

**When the wheels have been installed, check all wheel nuts after 2 to 5 hours of operation. Tighten the nuts to the correct torque. When the nuts stay tight for eight hours, the interval for checking can be extended to 350 hours.**

## PNEUMATIC TIRES

## ⚠ WARNING

**A solid rubber tire that is the same shape as a pneumatic tire can be installed on a wheel for a pneumatic tire. DO NOT make changes in the parts of the rim if this type of solid rubber tire is installed instead of a pneumatic tire.**

**The type of tire and the air pressure (pneumatic tires) are shown on the nameplate. Make sure that the nameplate is correct for the type of tires on the lift truck.**

**If a tire has less than 80% of the correct air pressure, completely remove the air pressure from the tire. Remove the tire from the lift truck. Add air pressure to the tire only in a safety cage. See the procedures in "Add Air To The Tires."**

### Remove the Wheels From The Lift Truck

## ⚠ WARNING

**Wheels must be changed and tires repaired by trained personnel only.**

**Always wear safety glasses.**

**Completely remove the air from the tire before removing the wheel from the lift truck. Air pressure in the tires can cause the tire and rim parts to explode causing serious injury or death.**

**Never loosen the nuts that hold the inner and outer wheel halves together when there is air pressure in the tire.**

1. When pneumatic tires must be repaired or new tires installed, put the lift truck on blocks. See HOW TO PUT THE LIFT TRUCK ON BLOCKS, page 2.

2. Completely remove the air from the tire. Remove the valve core to make sure that all of the air is out of the inner tube. Push a wire through the valve stem to make sure that the stem does not have a restriction.

3. Lift truck tires and wheels are heavy. Remove the wheel nuts and carefully remove the wheel and tire from the lift truck.

### Remove The Tire From The Wheel (See FIGURE 30. or FIGURE 31.)

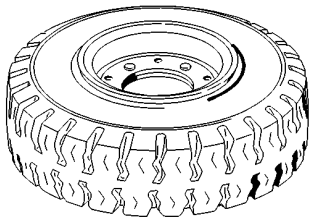
**NOTE:** When you disassemble the wheels, see FIGURE 27. There are several types of wheels used on this series of lift trucks.

## ⚠ WARNING

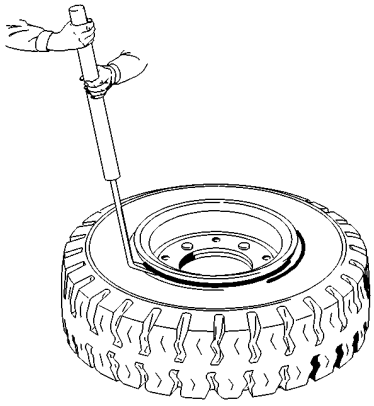
**Make sure all of the air pressure is removed from the tire before a wheel is disassembled. Air pressure in the tires can cause the tire and rim parts to explode causing serious injury or death.**

**Keep tire tools in firm contact with the wheel parts. If the tool slips, it can move with enough force to cause an injury.**

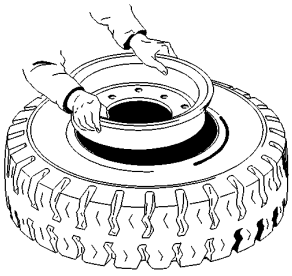
**SEE WARNINGS**



**STEP 1.** Remove the nuts that fasten the wheel rims together.



**STEP 2.** Loosen tire bead from wheel rim.



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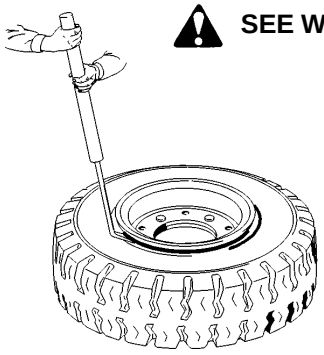
**STEP 3.** Remove wheel rims from tire. Remove The inner tube and flap.

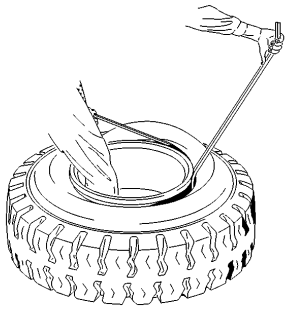
FIGURE 30. TIRE REMOVAL, TWO–PIECE WHEEL

**SEE WARNINGS**

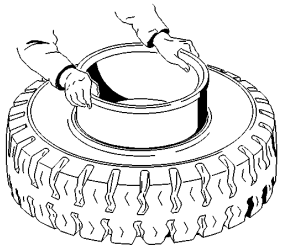


**STEP 1.** Loosen the tire bead from the side flange.

**STEP 2.** Put the tire tool into the slot between the lock ring and wheel rim. Remove the lock ring and side flange. If there is a flange seat, remove it.



**STEP 3.** Loosen the bead from the other side of the wheel rim. Remove the valve stem from the wheel.



**STEP 4.** Remove the wheel from the tire.

FIGURE 31. TIRE REMOVAL, THREE AND FOUR–PIECE WHEELS

### Install The Wheel In The Tire (See FIGURE 32. or FIGURE 33.)

## ⚠ WARNING

**Wheels can explode and cause injury or death if the following procedures are not followed:**

- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure that all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, type of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

**Do not use a steel hammer on the wheel. Use a rubber, lead, plastic or brass hammer to put parts together. Make sure that the side flange and lock ring are in the correct position. The ends of the lock ring must not touch. The clearance at the ends of the lock ring must be 2.5 to 6.5 mm (0.10 to 0.25 in) after it is installed. If the clearance is wrong, the wrong part has been used.**

1. Clean and inspect all parts of the wheel. Paint any parts that have rust or corrosion.

2. Install a new inner tube in the tire. Used tubes and flaps can cause tire failure.

3. Apply a rubber lubricant or a soap solution to the tire bead and tube.

## ⚠ WARNING

**Do not lubricate the tire bead with anti–freeze or petroleum based liquid. Vapors from these liquids can cause an explosion during inflation or use.**

4. Install a new tire flap.

5. Make sure the rim is the correct size for the tire. Lubricate the part of the wheel that contacts the bead and flap.

6. Install the two–piece wheel in the tire as shown in FIGURE 32. Install the three–piece or four–piece wheel in the tire as shown in FIGURE 33.

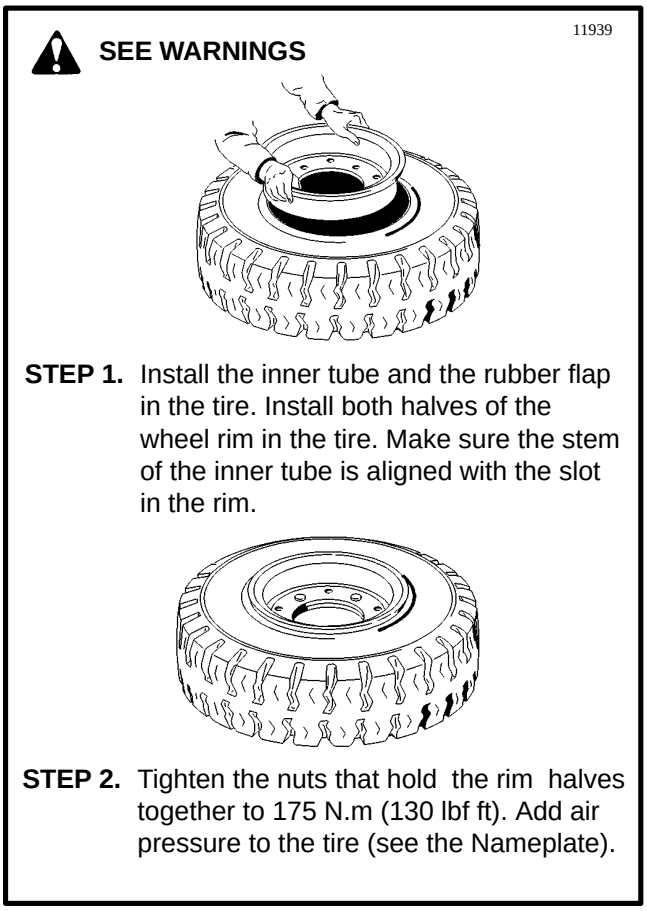
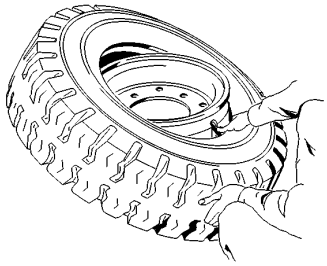


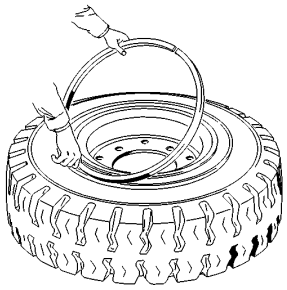

FIGURE 32. INSTALL THE WHEEL IN THE TIRE, TWO–PIECE WHEEL

**SEE WARNINGS**

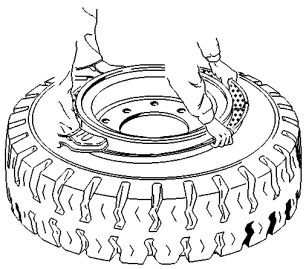
**STEP 1**. Install the inner tube and the rubber flap in the tire..



**STEP 2**. Install the wheel rim in the tire. Make sure the stem of the inner tube is aligned with the slot in the rim.



**STEP 3.** Turn over the rim and tire. Put blocks under the rim so that the rim is 8 to 10 cm (3 to 4 in) above the floor. Install the flange seat (if used) and the lock ring.



**STEP4.** Put the lock ring in the correct position on the rim. Add air pressure to the tire as described in “Add Air To The Tires”.

FIGURE 33. INSTALL THE WHEEL IN THE TIRE, THREE OR FOUR–PIECE WHEEL

**Add Air To The Tires (See FIGURE 34.)**

## WARNING

**Add air pressure to the tires only in a safety cage. Inspect the safety cage for damage before use. When air pressure is added, use a chuck that fastens onto the valve stem of the inner tube. Make sure there is enough hose to permit the operator to stand away from the safety cage when air pressure is added to the tire.**

**Do not sit or stand by the safety cage. Do not use a hammer to try and correct the position of the side flange or lock ring when the tire has air pressure greater than 20 kPa (3 psi).**

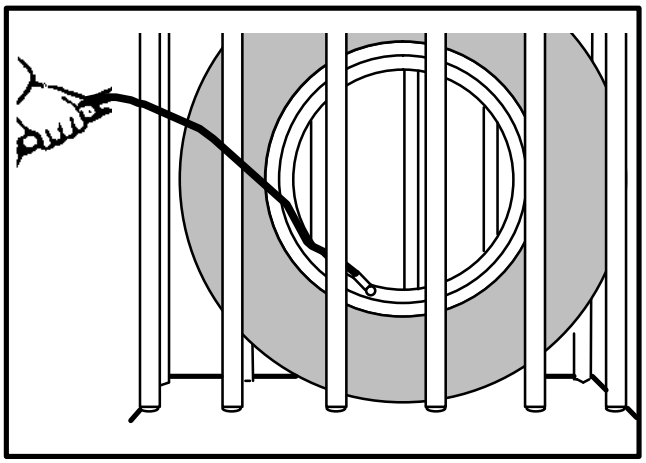


FIGURE 34. ADD AIR TO THE TIRES

1. Put the tire in a safety cage.

2. Add 20 kPa (3 psi) of air pressure to the tire.

3. Check that all wheel parts are correctly installed. Tap the lock ring with a soft hammer to make sure that the lock ring is in the seat.

4. If installation is correct, add air pressure to the tire to the specified pressure.

5. Check that all wheel parts are correctly installed. If installation is not correct, remove all of the air pressure from the tire. Remove the valve core to make sure all of the air pressure has been removed and then make adjustments. The clearance at the ends of the lock ring will be 2 to 6 mm (0.10 to 0.25 in) when the tire has the correct air pressure.

### Install The Wheels

Install the wheel on the hub. Tighten the nuts as shown in the MAINTENANCE SCHEDULE. If the wheels are

the two–piece rims, make sure the nuts that fasten the rim halves together are toward the hub when they are installed.

## ⚠ WARNING

**When the wheels have been installed, check all wheel nuts after 2 to 5 hours of operation. Tighten the nuts to the correct torque. When the nuts stay tight for eight hours, the interval for checking can be extended to 350 hours.**

## SOLID RUBBER TIRES THAT LOOK LIKE PNEUMATIC TIRES

## ⚠ WARNING

**Wheels must be changed and tires repaired by trained personnel only.**

**Always wear safety glasses.**

1. Put the lift truck on blocks as described in "How To Put The Lift Truck On Blocks" at the beginning of this section.

2. Remove the wheel nuts and remove the wheel and tire from the lift truck. Lift truck tires and wheels are heavy.

### Remove The Tire From The Wheel (See FIGURE 35.)

**NOTE:** When you disassemble the wheels, see FIGURE 27. There are several types of wheels used on these series of lift trucks.

## ⚠ WARNING

**Keep tire tools in firm contact with the wheel. If the tool slips, it can move with enough force to cause serious injury.**

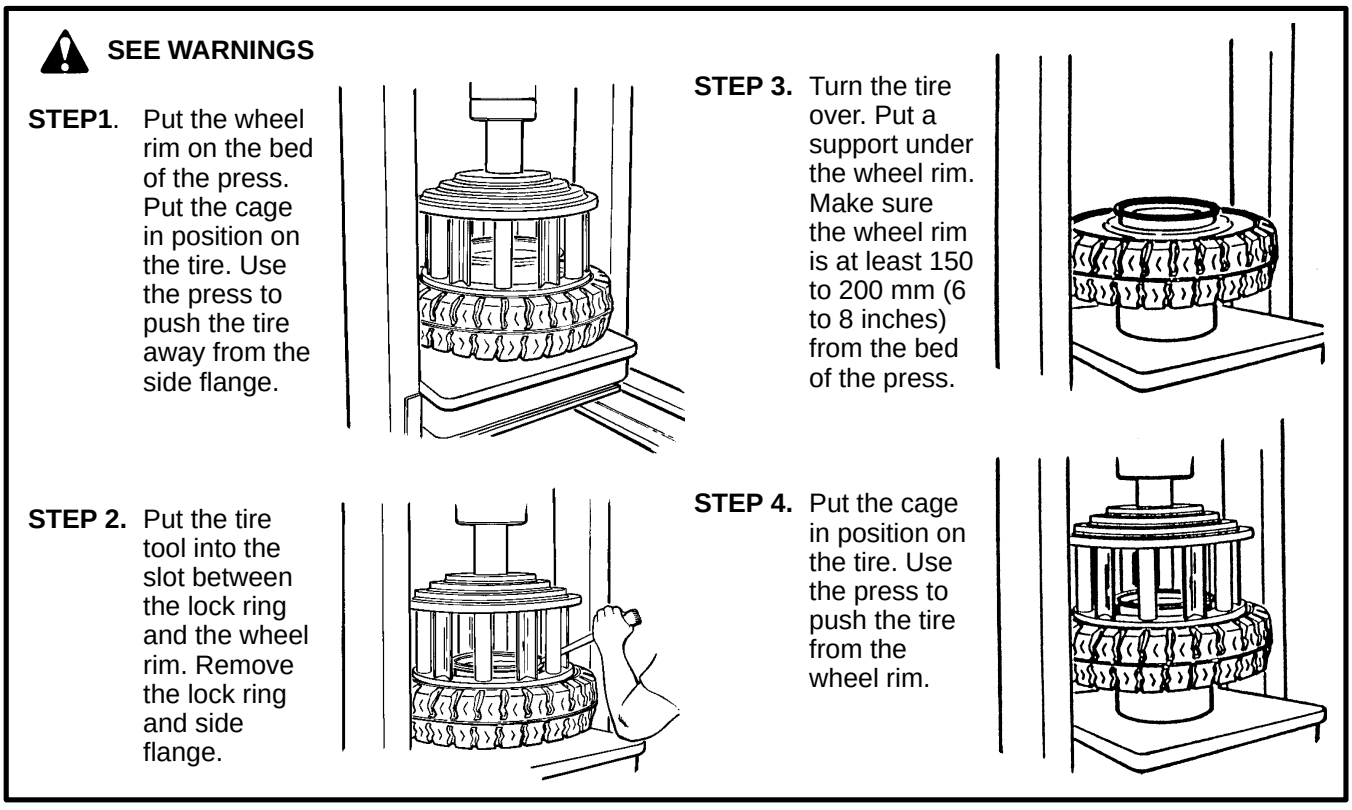



FIGURE 35. REMOVE THE TIRE FROM THE WHEEL

### Install The Tire On The Wheel (See FIGURE 36.)

**NOTE:** When you assemble the wheels, see FIGURE 27. There are several types of wheels used on these series of lift trucks.

## ⚠ WARNING

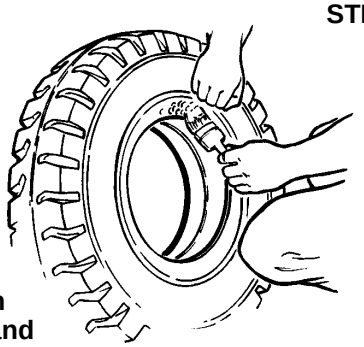
**Failure to follow these procedures will cause damage to the tire and wheel assembly and can cause an injury.**

- **Clean and inspect all parts of the wheel before installing the tire.**
- **DO NOT use any damaged or repaired wheel parts.**
- **Make sure that all parts of the wheel are the correct parts for that wheel assembly.**
- **DO NOT mix parts between different types or manufacturers of wheels.**
- **DO NOT mix types of tires, type of tire tread, or wheel assemblies of different manufacturers on any one lift truck.**

**Do not use a steel hammer on the wheel. Use a rubber, lead, plastic or brass hammer to put parts together. Make sure that the side ring is in the correct position. The ends of the side ring must not touch. The clearance at the ends of the lock ring will be approximately 13 to 25 mm (0.5 to 1.0 in) after it is installed. If the clearance is wrong, the wrong part has been used.**

**⚠ SEE WARNINGS**

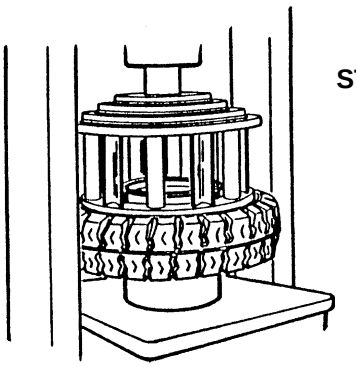
**STEP 1.** Lubricate the wheel rim and the inner surface of the tire with tire lubricant or soap.



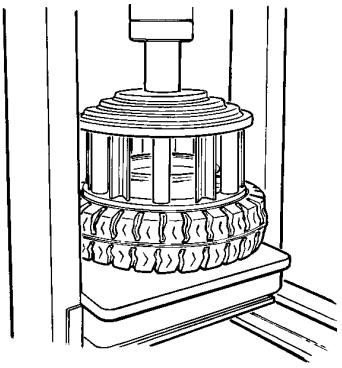
**⚠ CAUTION**

**Too much lubricant can cause the tire to slide and move around the wheel rim.**

**STEP 2.** Put the wheel rim on the bed of the press. Put the tire over the wheel rim. Put the cage in position on the tire. Use the press to install the tire on the wheel rim.



**STEP 3.** Remove the cage and put the flange seat (if used),the side ring and the lock ring in position on the wheel rim. Install the cage on the tire. Use the press to push the tire onto the wheel rim so that the side flange and lock ring can be installed.



**STEP 4.** While the cage is holding the tire on the wheel rim, install the lock ring. Use a tire tool to make sure the lock ring is in the correct position.

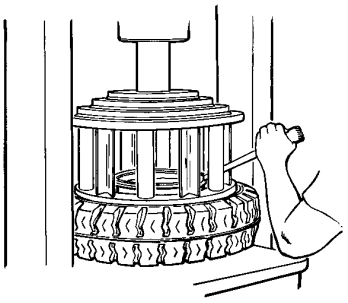


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FIGURE 36. INSTALL THE TIRE ON THE WHEEL

# SPECIFICATIONS

## E/J1.25–1.75XL (E25–35XL)

| | |
|---|---|
| Wheel nut torque, drive wheels | 155 N.m (115 lbf ft) |
| Drive tires, size: | |
| E1.25XL (E25XL) (solid rubber) | 18 x 5 x 12.12 |
| J1.25XL (E25XL) (pneumatic) | 18 x 7 – 8 (16 ply) 1 MPa (145 psi) |
| E1.50–1.75XL (E30–35XL) (solid rubber) | 18 x 6 x 12.12 |
| J1.50–1.75XL (E30–35XL) (pneumatic) | 18 x 7 – 8 (16 ply) 1 MPa (145 psi) |
| Steering tires, size: | |
| E1.25–1.75XL (E25–35XL) (solid rubber) | 14 x 4.5 x 8 |
| J1.25–1.75XL (E25–35XL) (pneumatic) | 15 x 4.5 – 8 (12 ply) 1 MPa (145 psi) |
| Wheel nut torque (pneumatic tires, steering) | 155 N.m (115 lbf ft) |

## E2.00–3.00XL (E40–60XL)

| | |
|---|---|
| Wheel nut torque, drive wheels | 235–305 N.m (175–225 lbf ft) |
| Drive tires, size: | |
| E2.00XL (E40XL) (solid rubber) | 18 x 7 x 12.12 |
| E2.50XL (E50XL) (solid rubber) | 18 x 8 x 12.12 |
| E3.00XL (E60XL) (solid rubber) | 18 x 9 x 12.12 |
| Steering tires, size: | |
| E2.00XL (E40XL) (solid rubber) | 16 x 5 x 10.5 |
| E2.50–3.00XL (E50–60XL) (solid rubber) | 16 x 6 x 10.5 |

## E3.5–5.50XL (E70–120XL)

| | |
|---|---|
| Wheel nut torque, drive wheels | 600 N.m (443 lbf ft) |
| Drive tires, size: | |
| E3.50–4.00XL (E70–80XL) (solid rubber) | 22 x 9 x 16 |
| E4.50–5.50XL (E100–120XL) (solid rubber) | 22 x 12 x 16 |
| Steering tires, size: | |
| E3.50–4.00XL (E70–80XL) (solid rubber) | 18 x 6 x 12.12 |
| E4.50–5.50XL (E100–120XL) (solid rubber) | 18 x 7 x 12.12 |

## J2.00–3.00XL (J40–60XL)

| | |
|---|---|
| Wheel nut torque, drive wheels | 235–305 N.m (175–225 lbf ft) |
| Wheel nut torque, steering wheels | 155 N.m (115 lbf ft) |
| Drive tires, size (pneumatic) | 23 x 10 – 12 (16 ply) 930 kPa (135 psi) |
| Steering tires, size (pneumatic) | 18 x 7 – 8 (16 ply) 1 MPa (145 psi) |

# REFERENCE TABLE

## Adhesives And Sealants

| Hyster Part No. | Loctite® Part No. | Description | Size |
|---|---|---|---|
| 360387 | 222 | Small Screw Threadlock (Purple) | 50 ml |
| 318702 * | 242 | Removable Threadlock (Blue) | 10 ml |
| 226414 * | 271 | High Strength Threadlock (Red) | 10 ml |
| 318996 | 277 | High Viscosity Threadlock (Red) | 50 ml |
| 318650 | 290 | Low Viscosity Threadlock (Green) | 0.02 oz |
| 251099 | 290 | Low Viscosity Threadlock (Green) | 50 ml |
| 355844 * | 422 | SuperBonderR Adhesive | 3 ml |
| 350830 | 515 | Gasket Eliminator (Purple) | 6 ml |
| 313022 * | 515 | Gasket Eliminator (Purple) | 50 ml |
| 273338 * | 567 | Pipe Sealant with TeflonR (White) | 50 ml |
| 318705 | 595 | Super FlexR Silicone | 100 ml |
| 318701 * | 609 | Retaining Compound | 10 ml |
| 341959 | 680 | Retaining Compound | 50 ml |
| 226415 | | Primer T – Aerosol | 6 oz |
| 316865 | | Anti–Seize Compound | 1 lb |
| 360053–10 | | Chisel Gasket Remover (10 Aerosol cans per case) | 18 oz |
| 318700 * | | Adhesive & Sealant Kit [Contains one each of * items] | |



## Hydraulic Oil, Lubricant, And Coolant Specifications

| Hyster Part No. | Description | Size |
|---|---|---|
| 336830 | Hydraulic and Tractor Transmission Oil (J20A Specifications) | 1 qt |
| 336831 | Hydraulic and Tractor Transmission Oil (J20A Specifications) | 2 gallon |
| 336832 | Hydraulic and Tractor Transmission Oil (J20A Specifications) | 5 gallon |
| 336833 | Hydraulic and Tractor Transmission Oil (J20A Specifications) | 55 gallon |
| 3002338 | Anti–Freeze (Ethylene Glycol) | 1 gallon |
| 326457 | Multi–Purpose Grease | 5 lb |
| 328388 | Spray–Lubricant, Silicone | 8 & 16 oz |