

SERVICE REPAIR

MANUAL

Hyster A216 (J40XM, J50XM, J60XM, J65XM) Electric
Forklift

HYSTER

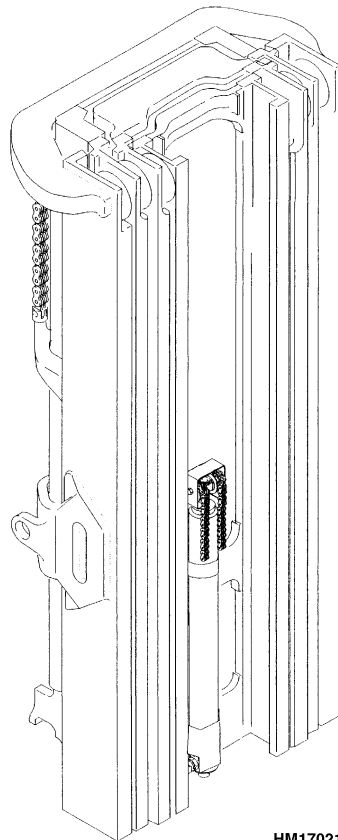
FOUR-STAGE MAST

S2.00-3.20XM (S40-60XM) [D187];

E2.00-3.20XM

(E45-65XM, E45-65XM₂) [F108];

E40-65Z [G108]



HM170219

HYSTER

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

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

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



WARNING

Indicates a condition that can cause immediate death or injury!



CAUTION

Indicates a condition that can cause property damage!

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This section is for the following models:

S2.00-3.20XM (S40-60XM) [D187];
 E2.00-3.20XM (E45-65XM, E45-65XM₂) [F108];
 E40-65Z [G108]

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manual**

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**"THE
QUALITY
KEEPERS"**

**HYSTER
APPROVED
PARTS**

General

This section has the description and repair procedures for the four-stage, full free-lift (FFL) mast, and the carriages. Checks, adjustments, and troubleshooting information are at the end of this section.

The mast is used to lift a load vertically. The mast has two movements controlled by hydraulic cylinders: forward and backward tilt, and the lifting and lowering of the mast weldments and carriage. The outer weldment can move on the pivot pins at the mast mounts. The operation of the tilt cylinders causes the mast to tilt forward and backward. The

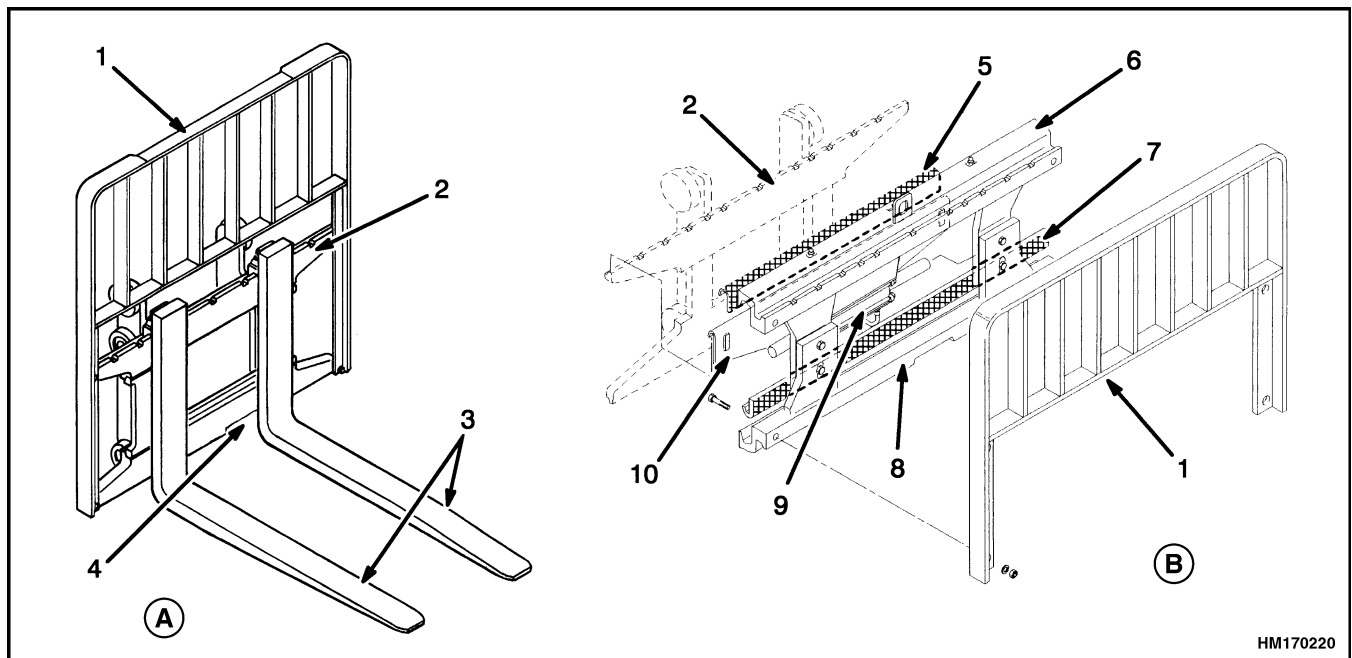
tilt cylinders are fastened between the frame of the lift truck and the outer weldment of the mast. Hydraulic lift cylinders are installed vertically on the mast weldments. The lift cylinders and lift chains raise and lower the weldments and the carriage. The hydraulic operation of the lift cylinders and tilt cylinders is described in the section **Main Control Valve** 2000 SRM 562 for lift truck models E2.00-3.20XM (E45-65XM, E45-65XM₂) (F108) and E40-65Z (G108) and 2000 SRM 516 for S2.00-3.20XM (S40-65XM) (D187) trucks.

Description

CARRIAGES

The carriage is a part of the mast assembly and moves within the channels of the inner weldment. See Figure 1. Forks or other types of load handling

equipment are attached to the carriage. A load backrest extension is attached to the carriage and adds support for a load that has multiple pieces.



A. CARRIAGE

1. LOAD BACKREST EXTENSION
2. STANDARD CARRIAGE
3. FORKS
4. FORK REMOVAL NOTCH

B. SIDESHIFT CARRIAGE

5. TOP BUSHING
6. TOP BAR
7. BOTTOM BUSHING
8. BOTTOM BAR
9. SIDESHIFT CYLINDER
10. CYLINDER MOUNTING BRACKET

Figure 1. Carriage and Forks

The sideshift carriage lets the operator move the forks and load from side to side. This function makes it easier for the operator to align the forks with a load or align the load with a stack. The sideshift carriage hangs on the fork bars of the standard carriage. Special bushings fit between the sideshift carriage and the fork bars. A sideshift cylinder is installed on a bracket that fits on the standard carriage. The sideshift cylinder moves the sideshift carriage on the standard carriage.

MAST MOUNTS

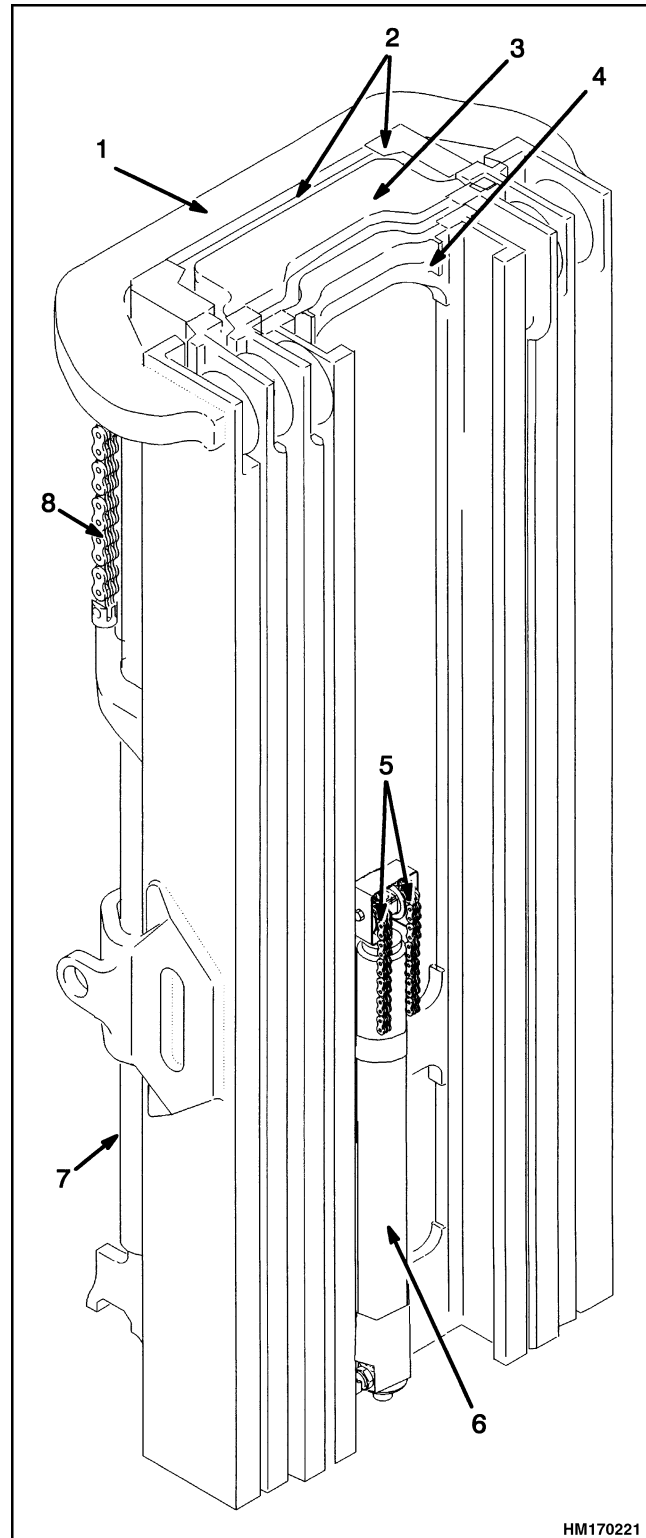
The mast can tilt forward and backward. See Figure 14. Tilt cylinders are fastened between the frame of the lift truck and the outer weldment of the mast to change the angle of the mast and forks. Pivot pins are installed in the drive axle hangers. The pivot pins rotate in bushings in the hangers. The outer weldment has mounts that fit on the pivot pins. Capscrews hold the mast to the pivot pins.

MAST

Description

The full free-lift, four-stage mast has four weldments: outer, first intermediate, second intermediate, and inner. See Figure 2. Two single-stage main lift cylinders and a free-lift cylinder are used to raise the carriage and extend the mast weldments. It is called a full free-lift mast because the carriage can travel to the top of the inner weldment without extending the inner weldment.

The weldments are telescopic and use load rollers and strip bearings to keep them in alignment. The load rollers are installed at the top of the outer, first, and second intermediate weldments. Load rollers are also used at the bottom of the first and second intermediate weldments and the inner weldment. These load rollers travel along the flanges of the weldments. The angle of the load rollers permits them to control the forces from the front, back, and sides of the mast. The strip bearings are installed at the top of the outer, first, and second intermediate weldments and help keep the correct clearance between the weldments. The load rollers and strip bearings are adjustable with shims.



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Figure 2. Four-Stage Mast

Legend for Figure 2

1. OUTER WELDMENT
2. FIRST INTERMEDIATE WELDMENT
3. SECOND INTERMEDIATE WELDMENT
4. INNER WELDMENT
5. FREE-LIFT CHAINS
6. FREE-LIFT CYLINDER
7. MAIN LIFT CYLINDER
8. LIFT CHAIN

The two main lift cylinders are installed at the back of the outer weldment. The base of each lift cylinder sits in a mount at the bottom crossmember of the outer weldment. The top of each main lift cylinder (cylinder rod) fits into a guide at the top crossmember of the first intermediate weldment. The free-lift cylinder is installed to the inner weldment. The free-lift and left-hand main lift cylinder has an internal (secondary) lowering control valve. A single external (primary) lowering control valve is connected by tubing and hoses to all of the lift cylinders.

One set of lift chains is connected to mounts that are near the top of the outer weldment. The lift chains then go over sheaves at the top of the first intermediate weldment and fasten at the bottom of the second intermediate weldment.

Another set of lift chains is connected to mounts that are near the top of the first intermediate weldment. The lift chains then go over sheaves at the top of the second intermediate weldment and fasten at the bottom of the inner weldment.

The free-lift chains connect at one end to the crossmember for the free-lift cylinder. Two chain sheaves are installed on a crosshead on the cylinder rod of the free-lift cylinder. The chains then go over sheaves on the crosshead and connect to the carriage.

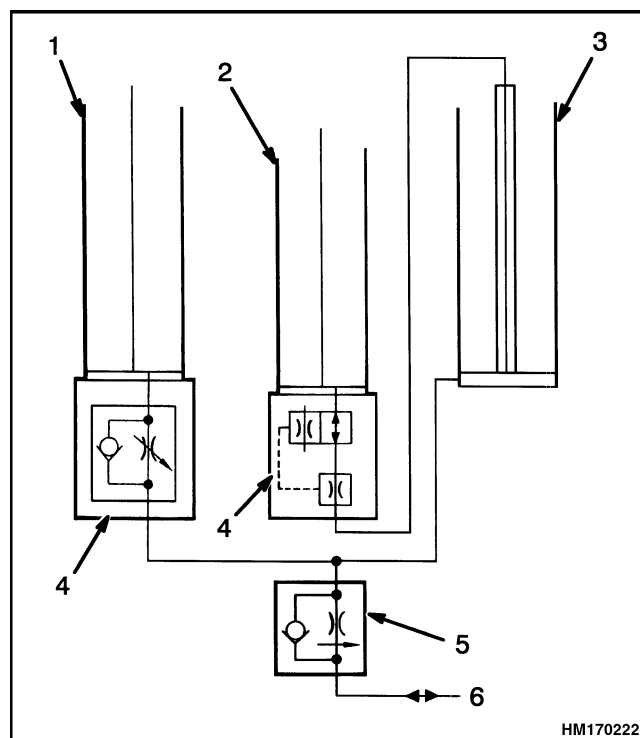
Operation

The three hydraulic cylinders are connected by hoses and tubing as shown in Figure 3. To extend the mast, oil from the main control valve flows to all cylinders at the same time. The free-lift cylinder extends first because it lifts the least amount of weight. The free-lift cylinder raises the carriage to the top of the inner weldment. After the free-lift cylinder reaches the end of its stroke, the main lift cylinders begin to

extend. As the main lift cylinders extend, the first intermediate weldment is raised by the lift cylinders. The second intermediate and inner weldments are raised by the lift chains. See Figure 4.

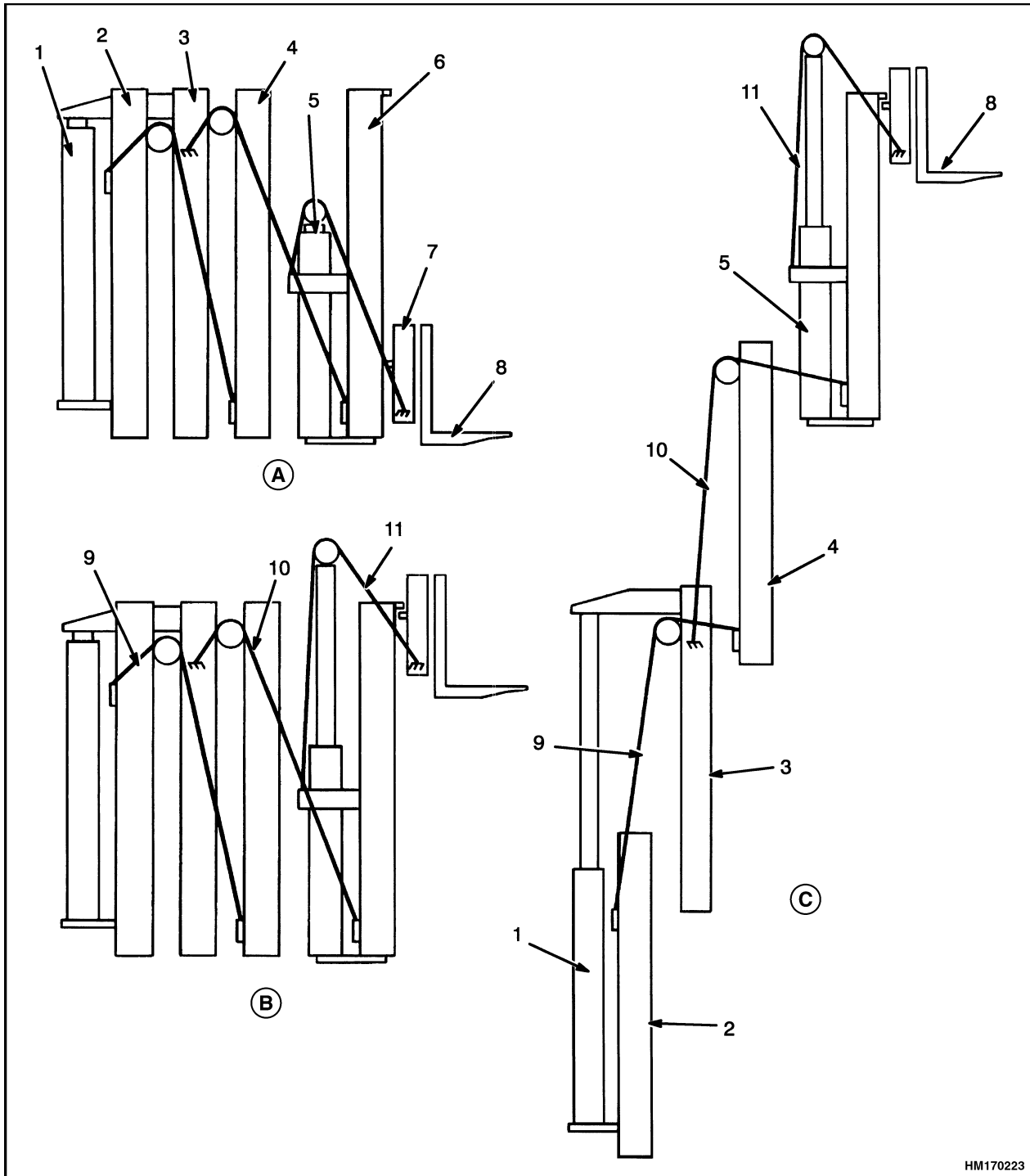
The left-hand lift cylinder has a small amount of oil below the piston. The free-lift cylinder has a small amount of oil above the piston. This oil provides a hydraulic cushion during operation. See Figure 5 and Figure 6.

During lowering, the main lift cylinders lower first because they have a greater load. After the main lift cylinders have retracted, the free-lift cylinder lowers. All oil from the lift cylinders flows through the lowering control valves to the hydraulic tank.



1. MAIN LIFT CYLINDER (LEFT-HAND)
2. FREE-LIFT CYLINDER
3. MAIN LIFT CYLINDER (RIGHT-HAND)
4. LOWERING CONTROL VALVE (INTERNAL)
5. LOWERING CONTROL VALVE (EXTERNAL)
6. TO/FROM MAIN CONTROL VALVE

Figure 3. Hydraulic Schematic



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A. LOWERED

- 1. MAIN LIFT CYLINDER
- 2. OUTER WELDMENT
- 3. FIRST INTERMEDIATE WELDMENT

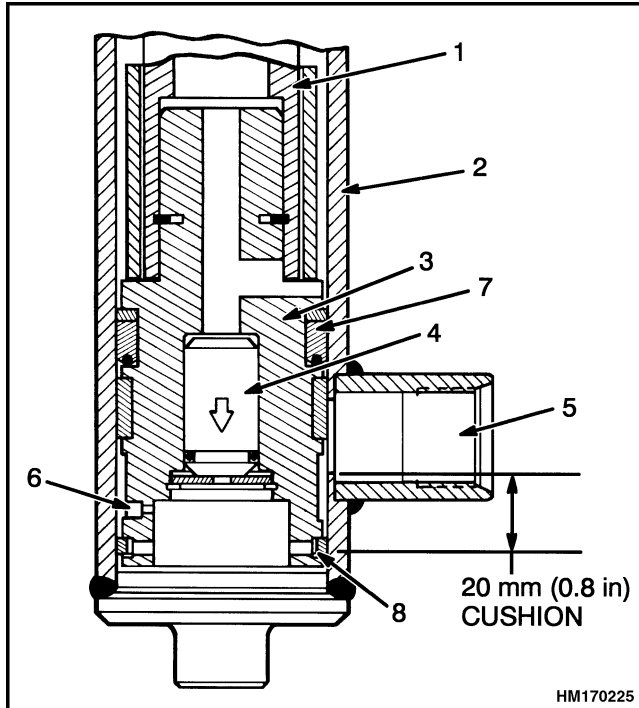
B. FREE-LIFT

- 4. SECOND INTERMEDIATE WELDMENT
- 5. FREE-LIFT CYLINDER
- 6. INNER WELDMENT
- 7. CARRIAGE

C. FULLY RAISED

- 8. FORK
- 9. MAIN LIFT CHAIN
- 10. INTERMEDIATE LIFT CHAIN
- 11. FREE-LIFT CHAIN

Figure 4. Operation

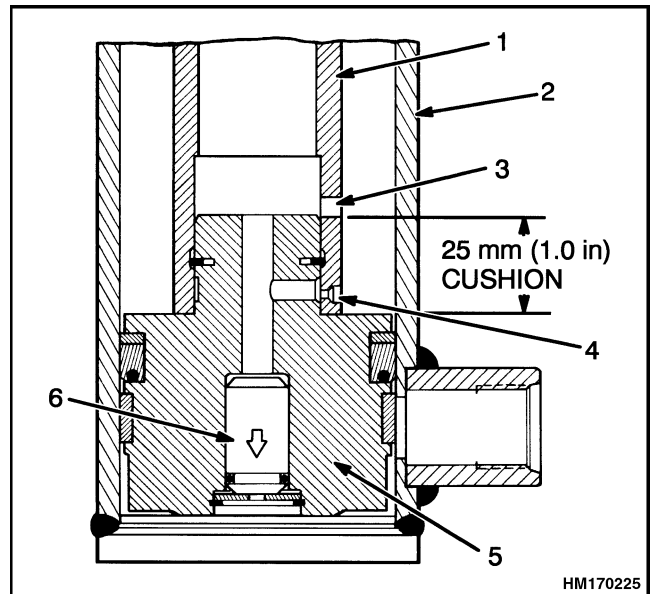


NOTE: LEFT-HAND LIFT CYLINDER SHOWN.

- | | |
|-------------------------|-------------------|
| 1. CYLINDER ROD | 5. HYDRAULIC PORT |
| 2. CYLINDER SHELL | 6. ORIFICE |
| 3. PISTON | 7. PISTON SEAL |
| 4. INTERNAL CHECK VALVE | 8. CUSHION RING |

Figure 5. Main Lift Cylinder Operation

As the main lift cylinders retract, hydraulic oil flows out of the cylinders through the hydraulic port. During the last 20 mm (0.8 in.) of the stroke, the hydraulic oil must flow out through the small orifice. This action causes the cylinder rod to move much more slowly at the end of the stroke. This cushion effect prevents a sudden stop at the end of the lowering sequence, making a smoother lowering operation.



- | | |
|-------------------|-------------------------|
| 1. CYLINDER ROD | 5. PISTON |
| 2. CYLINDER SHELL | 6. INTERNAL CHECK VALVE |
| 3. LARGE ORIFICE | |
| 4. SMALL ORIFICE | |

Figure 6. Free-Lift Cylinder Operation

There is hydraulic oil on the rod side of the piston. There are two orifices in the cylinder rod, one larger than the other. As the cylinder rod extends, the hydraulic oil on the rod side flows to the base of the cylinder through the larger orifice and the internal check valve. When the cylinder rod extends to the last 25 mm (1.0 in.) of its stroke, the retainer at the top of the cylinder closes the larger orifice. Now, the remainder of the hydraulic oil must flow through the small orifice to the internal check valve. This action increases the hydraulic pressure so that the main lift cylinders begin to extend.

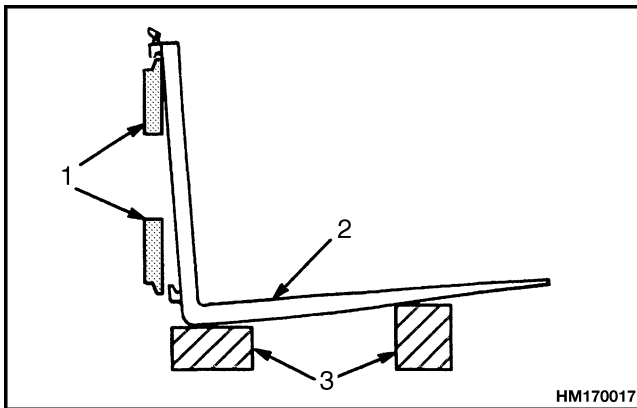
At the end of the free-lift stroke the oil flow through the small orifice gives a cushion effect for the free-lift cylinder.

Forks Repair

WARNING

Before working on or near the mast, read **Safety Procedures When Working Near Mast**. See Figure 10.

The forks are held on the carriage by one of two types of hooks and lock pin assemblies (see Figure 7 and Figure 8.) The forks are kept in position by latches that fit through the top fork hooks and into slots in the top carriage bar. The forks can be removed from the carriage by aligning the forks with the fork removal notch. See Figure 9. The fork removal notch is in the bottom crossmember of the carriage. Always check that latches for the forks keep the forks in position on the carriage. Replace damaged latch parts.



1. CARRIAGE BARS 3. BLOCKS
2. HOOK FORK

Figure 7. Hook Fork Removal

REMOVE

WARNING

Do not try to remove a fork without a lifting device. Each hook fork for these lift trucks can weigh 45 to 115 kg (100 to 250 lb).

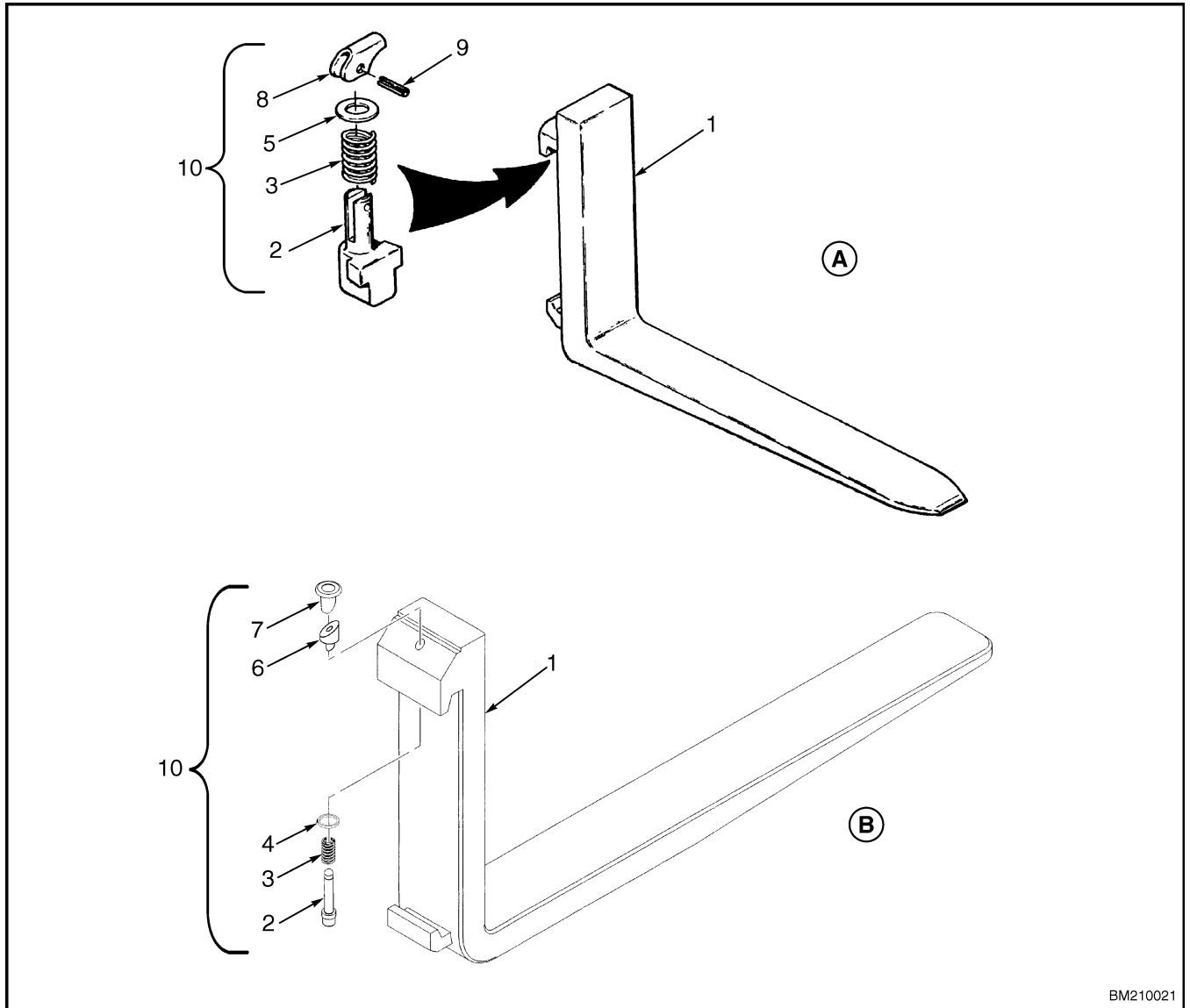
A fork can be removed from the carriage for replacement of the fork or other maintenance. Slide hook fork to fork removal notch on carriage. See Figure 9. Lower fork onto blocks so bottom hook of fork moves through fork removal notch. See Figure 7. Lower carriage farther so top hook of fork is disengaged from top carriage bar. Move carriage away from fork, or use lifting device to move fork away from carriage.

INSTALL

WARNING

Do not try to install a fork without a lifting device. Each hook fork for these lift trucks can weigh 45 to 115 kg (100 to 250 lb).

Move fork and carriage so top hook on fork can engage upper carriage bar. Raise carriage to move lower hook through fork removal notch. Slide fork on carriage so both upper and lower hooks engage carriage. Engage lock pin with notch in top carriage bar.



A. OLD STYLE LOCK PIN ASSEMBLY

- 1. FORK
- 2. LOCK PIN
- 3. SPRING
- 4. WASHER
- 5. WASHER

B. NEW STYLE LOCK PIN ASSEMBLY

- 6. WEDGE
- 7. KNOB
- 8. LEVER
- 9. COTTER PIN
- 10. LOCK PIN ASSEMBLY

Figure 8. Fork Lock Pin Assembly

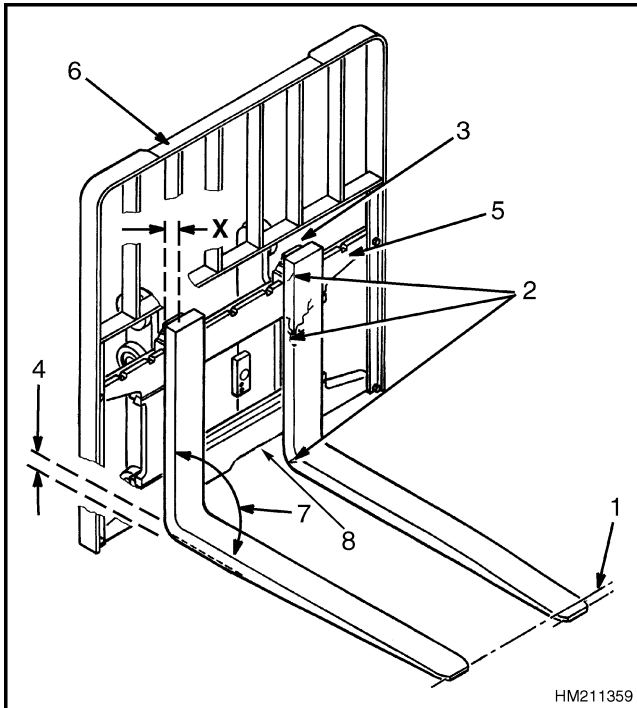


Figure 9. Forks Check

Legend for Figure 9

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°
8. FORK REMOVAL NOTCH

Safety Procedures When Working Near Mast

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.



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 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 this section.

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.**

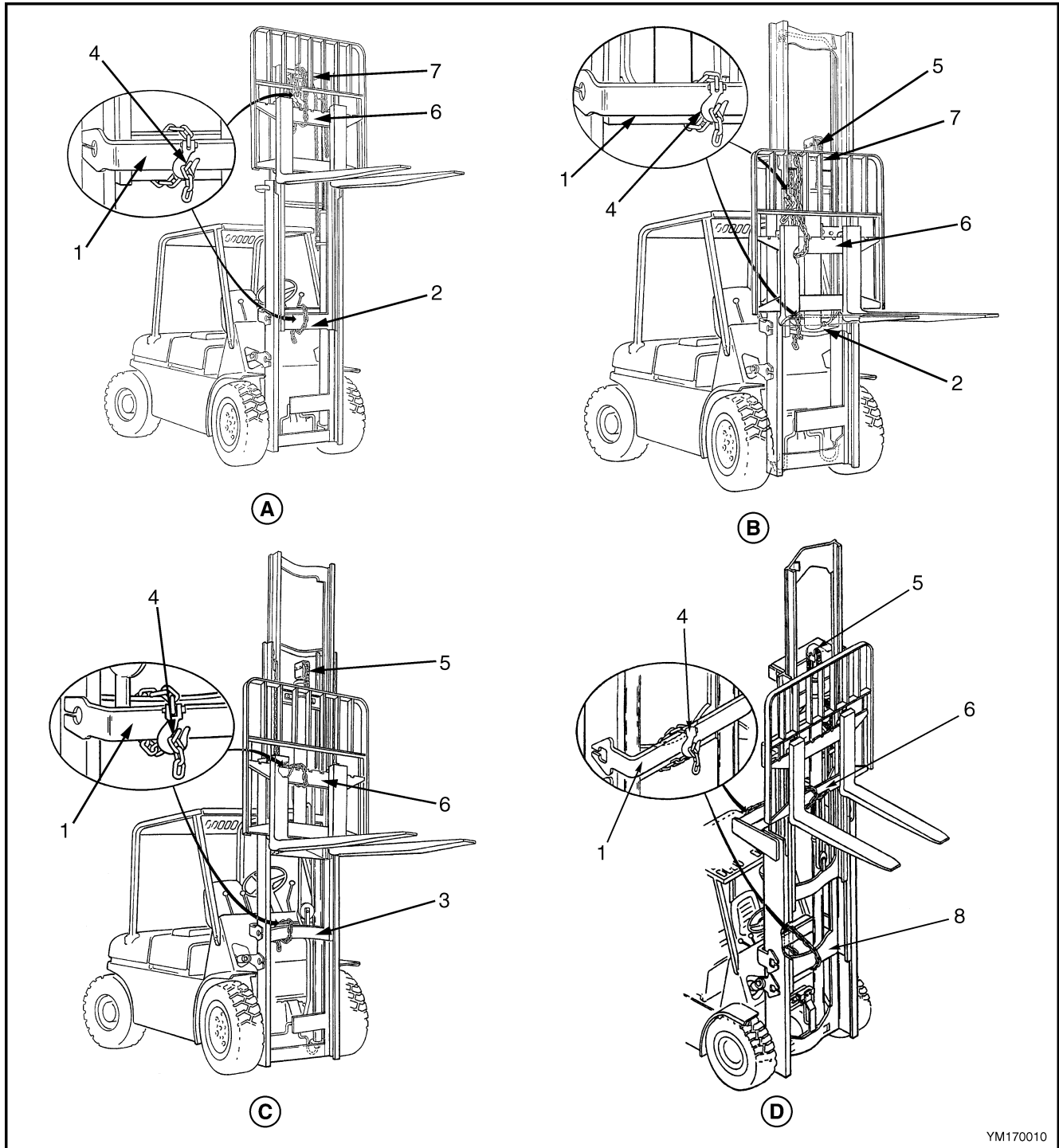
OR

- **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:**

1. Put mast in vertical position.
2. Raise mast to align bottom crossmember of weldment that moves in outer weldment with crossmember on outer weldment. On the two-stage and free-lift mast, the moving part is the inner weldment. On the three-stage mast, it is the intermediate weldment. On the four-stage mast, it is the first intermediate weldment. See Figure 10.

3. Use a 3/8-inch minimum safety chain with a hook to fasten the crossmembers together so the movable member cannot lower. Put hook on back side of mast. Make sure hook is completely engaged with a link in the chain. Make sure safety chain does not touch lift chains or chain sheaves, tubes, hoses, fittings, or other parts on the mast.
4. Lower mast until there is tension in safety chain and free-lift cylinder (two-stage full free-lift, three-stage, and four-stage) is completely retracted. If running, turn the power **OFF**. Apply the parking brake. Install a **DO NOT REMOVE** tag on the safety chain(s).
5. Install another safety chain (3/8-inch minimum) between the top or bottom crossmember of the carriage (6) and a crossmember on the outer weldment.

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



YM170010

- A. TWO-STAGE LFL MAST
- B. TWO-STAGE FFL MAST

- C. THREE-STAGE FFL MAST
- D. FOUR-STAGE FFL MAST

- 1. OUTER WELDMENT
- 2. INNER WELDMENT
- 3. INTERMEDIATE WELDMENT
- 4. HOOK

- 5. FREE-LIFT CYLINDER
- 6. CROSSMEMBER
- 7. CROSSMEMBER
- 8. FIRST INTERMEDIATE WELDMENT

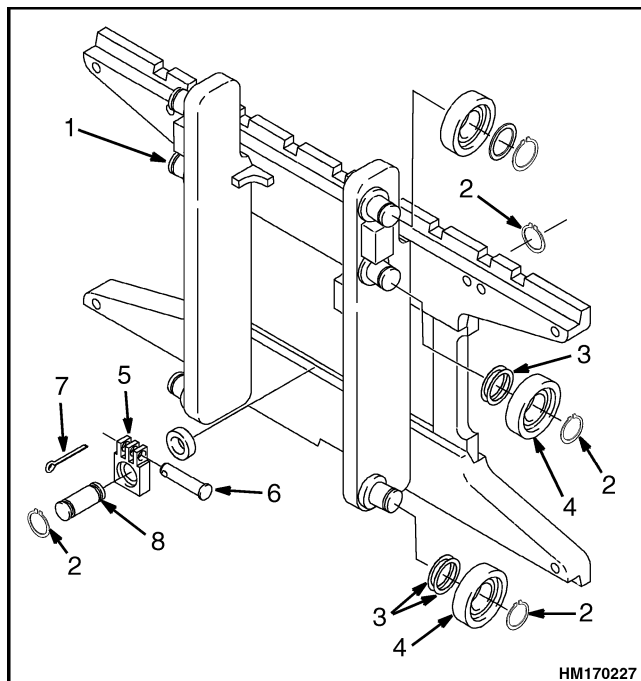
Figure 10. Two-Stage LFL, Two-Stage FFL, Three-Stage FFL, and Four-Stage FFL Masts

Carriage Repair

REMOVE

Standard Carriage

1. Put a one-quarter capacity load on forks. The load must give the carriage stability so the carriage cannot fall when it is disconnected from the mast. See Figure 8 and Figure 11.
2. Lower carriage and forks on blocks so lift chains become loose.



- | | |
|----------------|-----------------|
| 1. CARRIAGE | 5. CHAIN ANCHOR |
| 2. SNAP RING | 6. CHAIN PIN |
| 3. SHIM | 7. COTTER PIN |
| 4. LOAD ROLLER | 8. ANCHOR PIN |

Figure 11. Carriage



WARNING

When disconnecting the lift chains, keep control of the ends. Use wire to temporarily connect the ends of the lift chains to the mast. This procedure will prevent the lift chains from falling from the sheaves and causing an injury or damage.

3. Remove pin from each chain anchor at carriage. Disconnect lift chains from carriage. Use wire to

connect ends of lift chains to a part of the mast. Make sure chains can move freely when inner weldment is raised.



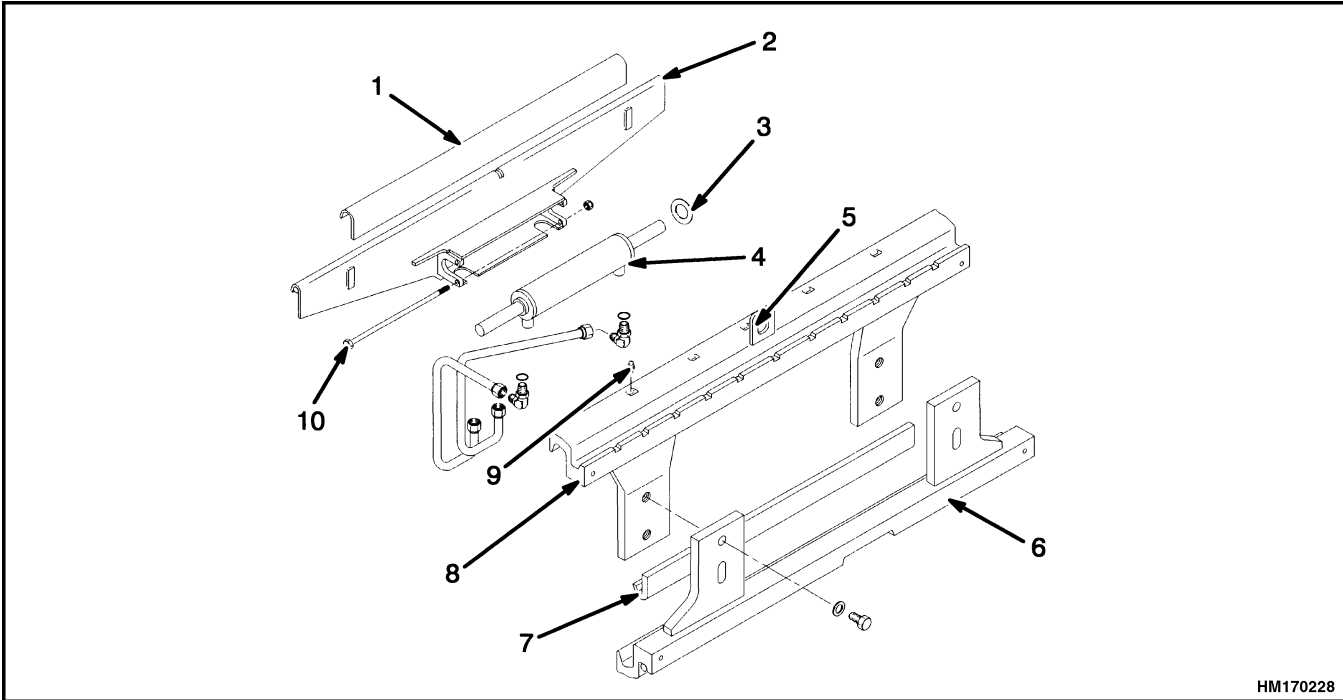
WARNING

Make sure that the carriage has stability when the inner weldment is above the load rollers of the carriage.

4. Use lift cylinders to raise inner weldment. If the hydraulic system cannot be used, connect crane to top of inner weldment. Carefully raise inner weldment until it is above load rollers of carriage.
5. Move lift truck away from carriage. Completely lower inner weldment so it cannot move.
6. Connect lifting device to carriage. Remove load from forks with another lift truck. Lower carriage to floor so load rollers are up.
7. If forks are removed, use lifting device to put carriage on floor so load rollers are up.

Sideshift Carriage

1. Lower carriage completely and remove forks.
2. Connect lifting device to lifting eye on sideshift carriage. The sideshift carriage weighs approximately 200 kg (441 lb).
3. Remove two upper capscrews from bottom carriage bar. Slowly loosen two bottom capscrews, but do not remove them. The slotted holes will allow the bottom carriage bar to move down so that the sideshift carriage can be removed. Carefully lift sideshift carriage from standard carriage. The sideshift cylinder mounting bracket and cylinder will stay on the standard carriage. Remove bushings. See Figure 12.
4. Disconnect hydraulic lines at sideshift cylinder. Put caps on open lines. Remove cylinder mounting bracket from carriage. If necessary, remove threaded rods and shims to remove sideshift cylinder.



- | | | |
|------------------------------|------------------------|---------------------|
| 1. TOP BUSHING | 4. SIDESHIFT CYLINDER | 8. TOP CARRIAGE BAR |
| 2. CYLINDER MOUNTING BRACKET | 5. LIFTING EYE | 9. GREASE FITTING |
| 3. SHIM | 6. BOTTOM CARRIAGE BAR | 10. BOLT |
| | 7. BOTTOM BUSHING | |

Figure 12. Sideshift Carriage

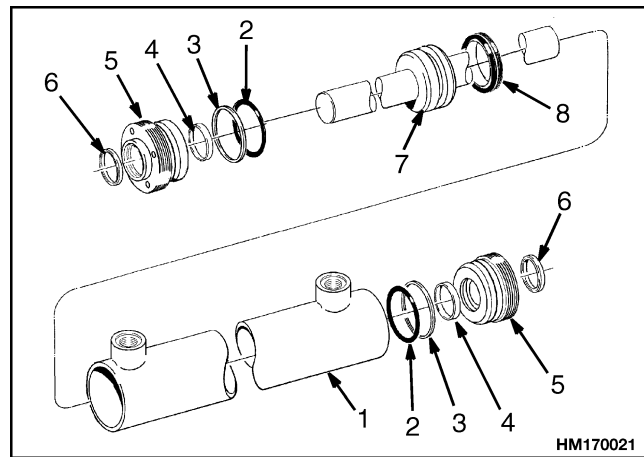
REPAIRS

1. If any of the load rollers must be replaced, make a note of location and number of shims. See Figure 11. Install shims, load rollers, and snap rings. See Carriage Adjustments for correct adjustment of load rollers.

NOTE: The carriage has six load rollers. The shims are installed on the bottom four rollers only.

2. Repair sideshift cylinder as follows (see Figure 13):

- a. Remove retainers from shell. Pull rod from shell.
- b. Replace seals, O-rings, or backup rings as necessary.
- c. Lubricate all internal parts with clean hydraulic oil.
- d. Install piston and rod in shell. Apply Loctite® 242 to threads of retainers. Install retainers and tighten them to 27 N•m (20 lbf ft).



- | | |
|----------------|-------------------|
| 1. SHELL | 5. RETAINER |
| 2. O-RING | 6. WIPER |
| 3. BACKUP RING | 7. PISTON AND ROD |
| 4. ROD SEAL | 8. PISTON SEAL |

Figure 13. Sideshift Cylinder

INSTALL

Standard Carriage

1. Use hydraulic system of lift truck or crane to raise inner weldment. If hydraulic system cannot be used, connect crane to top of inner weldment. Carefully raise inner weldment until it is above load rollers of carriage. Move lift truck toward carriage until inner weldment is aligned with carriage rollers. Carefully lower inner weldment until it engages all load rollers.
2. Check clearance of load rollers. See Carriage Adjustments in this section.
3. Connect lift chains to chain anchors at carriage. Use new cotter pins in anchor pins. Adjust lift chains as described in Lift Chain Adjustments in this section.

Sideshift Carriage

1. Install sideshift cylinder in bracket. See Figure 12. Use equal number of shims on both sides of cylinder to limit side-to-side movement within bracket. Maximum movement is 0.6 mm (0.024 in.). Install bolts and nuts to hold cylinder in position. Tighten nuts to 26 N•m (19 lbf ft).
2. Install cylinder mounting bracket on standard carriage, making sure it is engaged with notch

in top carriage bar. Connect hydraulic lines to sideshift cylinder. Put grease on ends of cylinder rod.

3. Install top bushing on mounting bracket. Lubricate outer surface of bushing with multipurpose grease.
4. Connect top and bottom carriage bars by installing two bottom capscrews. Do not tighten capscrews. Lubricate outer surface of bottom bushing with multipurpose grease. Install bottom bushing in bottom carriage bar.
5. Make sure standard carriage is completely lowered. Connect lifting device to lifting eye. Install sideshift carriage on standard carriage. Put blocks under bottom bar of sideshift carriage so bottom bushing moves tight against standard carriage.
6. Install two top capscrews into sideshift carriage. On E2.00-2.75XM (E45-55XM, E45-55XM₂) (F108), E40-55Z (G108), and S2.00-2.50XM (S40-50XM) (D187) units, tighten all capscrews to 435 N•m (320 lbf ft). On E3.00-3.20XM (E60-65XM, E60-65XM₂) (F108), E60-65Z (G108), and S3.00-3.20XM (S55-65XM) (D187) units, tighten all capscrews to 755 N•m (557 lbf ft). Remove lifting device. Lubricate top bushing at grease fittings.

Mast Repair

REMOVE

NOTE: If the mast must be disassembled, remove forks and carriage as described in Carriage Repair. If only the lift cylinders need to be removed, see the procedures for Lift Cylinders Repair.

1. Before removing mast, check length of lift chains. See the procedures in Clean and Inspect.
2. Fully lower all mast weldments and carriage. Tilt mast fully forward. Use chains and connect a crane to top of mast. Make sure all weldments are fastened together. Make sure chains will not damage sheaves, tubing, or other parts of mast. Make sure crane has a capacity of at least 1600 kg (3500 lb).

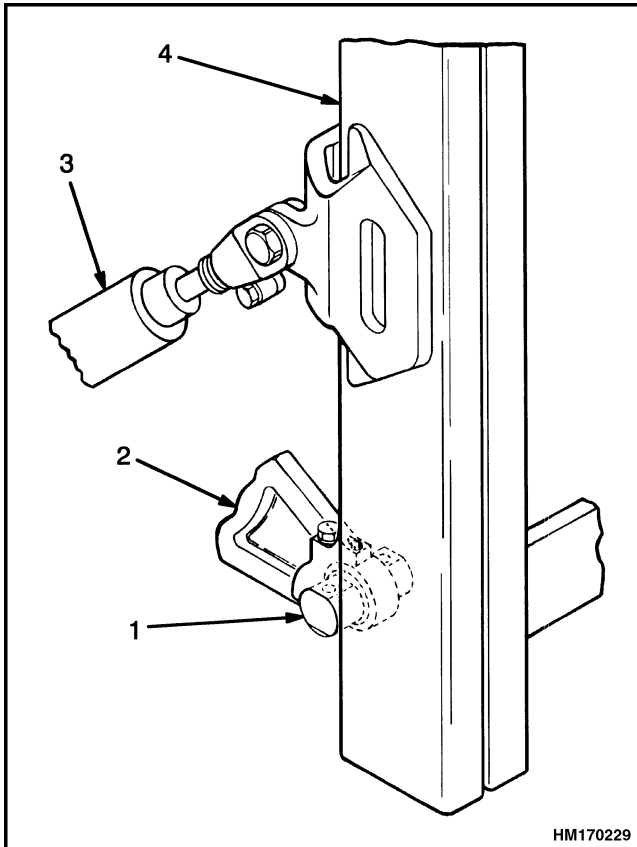
3. Put drain pan under the area of hydraulic fittings. Disconnect hydraulic line at external lowering control valve on outer weldment.



WARNING

Use a driver, not your fingers, to push the anchor pins from the rod ends on the tilt cylinders. The cylinder or mast can move and cause serious injury.

4. Remove cotter pins and anchor pins at tilt cylinder mounts on mast. See Figure 14.
5. Remove capscrews that hold mast to pivot pins at mounts.



1. PIVOT PIN
2. DRIVE AXLE HANGER (MAST MOUNT)
3. TILT CYLINDER
4. OUTER WELDMENT

Figure 14. Mast Mounting

6. Use crane to lift mast assembly from lift truck. Put mast on floor so back of mast is toward floor.

DISASSEMBLE

NOTE: If only the lift cylinders need to be removed and repaired, see the procedures for Lift Cylinders Repair. When the mast has header hoses, see the procedures for the Header Hose Arrangements.

1. Disconnect and remove hydraulic lines for free-lift cylinder. Remove brackets for free-lift cylinder. Remove free-lift cylinder. Disconnect free-lift chains at crossmember. See Figure 17 and Figure 18.
2. Disconnect lift chains at bottom of inner weldment and top of first intermediate weldment. Remove lift chains. Push inner weldment toward bottom of mast assembly until bottom load rollers are seen. See Figure 17 and Figure 18.

3. Remove strip bearings at top of second intermediate weldment. Remove load rollers at bottom of inner weldment. Remove load rollers at top of second intermediate weldment. Make a note of each shim arrangement and load roller location. The shim arrangements will be approximately the same during assembly.
4. Slide inner weldment halfway out of top of second intermediate weldment. Connect crane to center of inner weldment. See Figure 15. Slide inner weldment out until stub shafts are in notches of second intermediate weldment. Remove inner weldment from second intermediate weldment.

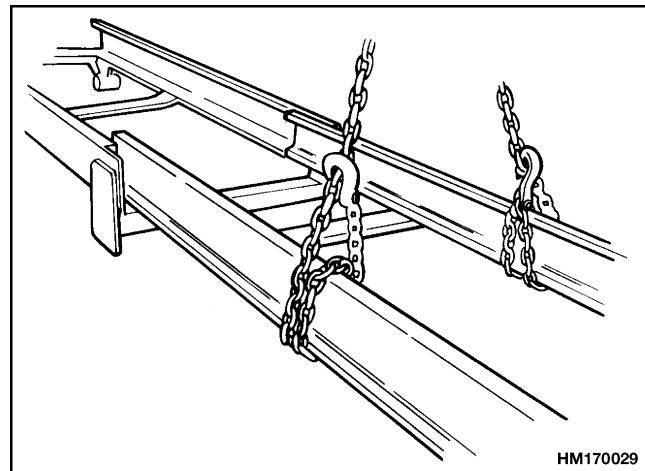


Figure 15. Weldment Removal

5. Disconnect lift chains at bottom of second intermediate weldment and top of outer weldment. Remove lift chains. Push second intermediate weldment toward bottom of mast assembly until bottom load rollers are seen.
6. Remove strip bearings and spacers at top of first intermediate weldment. Remove load rollers at bottom of second intermediate weldment. Remove load rollers at top of first intermediate weldment. Make a note of each shim arrangement and load roller location. The shim arrangements will be approximately the same during assembly.
7. Slide second intermediate weldment halfway out of top of first intermediate weldment. Connect crane to center of second intermediate weldment. See Figure 15. Slide second intermediate weldment out until stub shafts are in notches of first intermediate weldment. Remove second intermediate weldment.

8. Disconnect hydraulic lines at top and bottom of lift cylinders. Disconnect balance line at top of right-hand lift cylinder.
9. Remove snap rings and washers at top of main lift cylinders. Remove nut, bolt, and spacer at mount near top of each main lift cylinder.
10. Push first intermediate weldment to disengage lift cylinders. Remove main lift cylinders. Keep shims from top of right-hand lift cylinder with cylinder.
11. Slide first intermediate weldment from bottom of outer weldment approximately 30 cm (12 in.). Remove strip bearings at top of outer weldment. Remove snap rings and load rollers from both weldments. Make a note of each shim arrangement and load roller location. The shim arrangements will be approximately the same during assembly.
12. Slide intermediate weldment halfway out of top of outer weldment. Connect crane to center of first intermediate weldment. See Figure 15. Slide weldment out of outer weldment until stub shafts are in notches of outer weldment. Remove first intermediate weldment from outer weldment.
13. Disassemble chain sheaves as necessary for repair and cleaning. Remove hydraulic lines and fittings from weldments as necessary.

CLEAN AND INSPECT



CAUTION

DO NOT use steam to clean lift chains, sheaves, or load rollers. The bearings in the sheaves and load rollers are sealed and lubricated.

1. Inspect chain sheaves and load rollers for wear or damage.



WARNING

Cleaning solvents can be flammable and toxic and can cause severe skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety precautions.

2. Clean lift chains with solvent. Remove all dirt and grease. Inspect lift chains for wear or damage. The lift chains must be installed on the mast before they can be checked for length. A lift chain becomes longer when it is worn. If a chain is 3% longer than a new lift chain, a new set of lift chains must be installed. If a chain scale is available, check lift chain as shown in Figure 16. If a chain scale is not available, measure 20 links of lift chain. Compare measurement with lengths given in Figure 16. Lubricate chains with SAE 30 engine oil. The best procedure is to soak the lift chains in engine oil.



WARNING

Never replace just the worn section of a chain. Install the complete chain. Never replace just one chain of a chain pair. Install new chains in pairs.

3. Inspect chain anchors and pins. Install new parts for old parts that are worn or damaged.



WARNING

Be careful when cleaning with steam. Steam can cause serious burns. Wear protective clothing and gloves. Never expose your skin to steam.



WARNING

Cleaning solvents can be flammable and toxic and can cause severe skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety precautions.

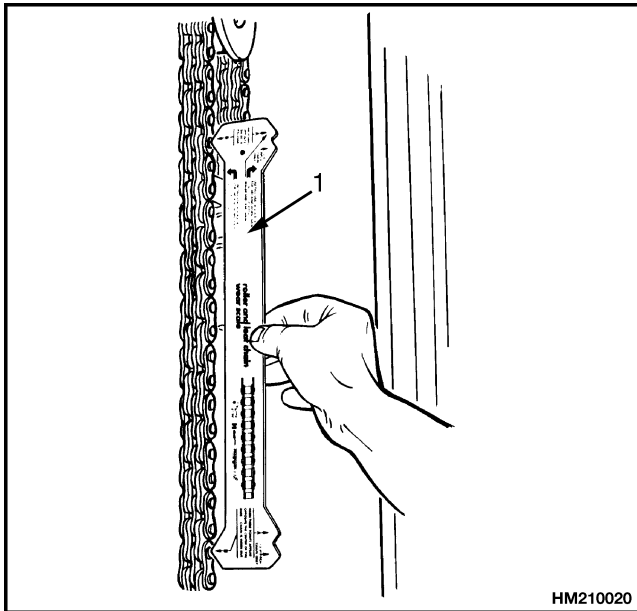
4. Clean mast weldments with steam or solvent.



WARNING

Incorrect welding procedures can cause damage to the structure of the mast. Get information from your Hyster lift truck dealer before welding on the mast.

5. Inspect sliding surfaces for wear or damage. Inspect load roller contact surfaces for wear or damage. Inspect all welds for cracks.



Pitch	Total length of 20 links (pitch) of new chain	Wear Limit The maximum length of 20 links
12.7 mm (0.50 in.)	254.0 mm (10.0 in.)	261.6 mm (10.3 in.)
15.9 mm (0.63 in.)	317.5 mm (12.5 in.)	327.0 mm (12.9 in.)
19.1 mm (0.75 in.)	381.0 mm (15.0 in.)	392.4 mm (15.5 in.)
25.4 mm (1.00 in.)	508.0 mm (20.0 in.)	523.3 mm (20.6 in.)

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

1. CHAIN WEAR SCALE

Figure 16. Lift Chains Check

ASSEMBLE

NOTE: The shims for the load rollers keep the weldments parallel and give correct clearance. During assembly, the shim arrangement will be approximately the same as before disassembly. Check clearance and adjust shims for wear or for changes caused by repairs. The strip bearings are also adjusted by using

shims. See Mast Adjustments in this section for the adjustment procedures.

NOTE: When the mast has header hoses, see the procedures for the Header Hose Arrangements.

1. Put outer weldment on floor with mast pivots toward floor. See Figure 17 and Figure 18. Connect crane to center of first intermediate weldment. Fit lower stub shafts of first intermediate weldment into notches in top of outer weldment. Slide first intermediate weldment into outer weldment so stub shafts are seen at top and bottom of both weldments.
2. Install strip bearings and shims on channels of outer weldment. See Figure 19. Apply grease to bearing surfaces.
3. Install load rollers and shims on outer weldment and at bottom of first intermediate weldment. Before doing the next step, adjust first intermediate weldment as described in Mast Adjustments. Install chain sheaves, shims, and snap rings on first intermediate weldment.
4. Install main lift cylinders in mounts at bottom of outer weldment. Push intermediate weldment to engage lift cylinders. Check clearance at top of lift cylinder mounts. Add or remove shims at top of left-hand cylinder rod until both cylinders are even. Install keeper at top of right-hand cylinder. Install snap ring and washer at top of lift cylinders. Install nuts, bolts, and spacers at lift cylinder mounts on outer weldment. Tighten nuts to 53 N•m (39 lbf ft).
5. Install housing for lowering control valve on outer weldment. Tighten nuts for lowering control valve to 18 N•m (13 lbf ft). Install lowering control valve in housing. Connect hydraulic lines and fittings between lowering control valve and main lift cylinders.
6. Install chain sheaves and snap rings on second intermediate weldment.
7. Connect crane to center of second intermediate weldment. Slide weldment into first intermediate weldment so stub shafts are seen at top and bottom of both weldments.