

SERVICE REPAIR

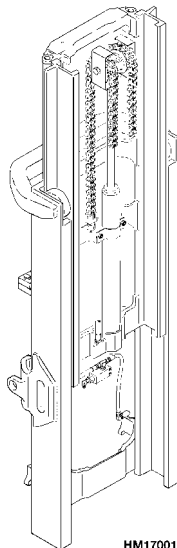
MANUAL

Hyster F108 (E45XM2 E50XM2 E55XM2 E60XM2 E65XM2)
Forklift

HYSTER

MAST REPAIRS

H/S/1.50-1.75XM (H/S/25-35XM) [D001, C010, D010, E001];
E1.50-1.75XM (E25-35XM, E25-35XM₂) [D114];
H/S/2.00XMS (H/S/40XMS) [D001, C010, D010, E001];
E2.00XMS (E40XMS, E40XM₂S) [D114];
H/S/2.00-3.20XM (H/S/40-65XM) [D177, D187];
E2.00-3.20XM (E40-65XM, E40-65XM₂) [F108];
J2.00-3.20XM (J40-60XM, J40-60XM₂) [A216];
J2.00-3.20XM (J40-60Z) [A416];
S/J2.00-3.00XL With Mast S/N C507, C508, C509, C562, C563, and C564
(S/E/J40-60XL) [A187, B187, C187, C108, B168];
J1.60-2.00XMT (J30-40XMT) [C160, F160];
H2.00-3.20XM (H45-65XM) [H177]; J30-40XMT₂ [H160];
E1.50-2.00XM (E25-35Z, E40ZS) [E114];
E2.00-3.20XM (E40-65Z) [G108]; J1.60-2.00XMT (J30-40ZT) [J160]



HM170013

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!

TABLE OF CONTENTS

General	1
Safety Procedures When Working Near Mast.....	1
Forks Repair.....	3
Remove	3
Install	3
Carriages Repair	4
Standard Carriage, Remove.....	4
Hang-On Sideshift Carriage, Remove	5
Standard Carriage and Hang-On Sideshift Carriage, Repair.....	6
Standard Carriage, Install.....	6
Hang-On Sideshift Carriage, Install	7
Integral Sideshift Carriage	7
Remove.....	7
Clean and Inspect.....	9
Repair.....	9
Install.....	10
Mast Repair.....	10
Remove	10
Two-Stage LFL and Two-Stage FFL Masts, Disassemble.....	12
Three-Stage FFL Mast	19
Disassemble	19
Mast and Chains, Clean and Inspect	23
Two-Stage LFL and Two-Stage FFL Mast, Assemble.....	24
Three-Stage FFL Mast, Assemble	25
Install	26
Lift Cylinders Repair	27
Main Lift Cylinders, Remove	27
Free-Lift Cylinder, Remove	28
Lift Cylinders, Disassemble	28
Lift Cylinders, Assemble	31
Main Lift Cylinders, Install	32
Free-Lift Cylinder, Install	32
Header Hose Arrangements	33
Two-Stage LFL Mast, New Hose Install	33
Two-Stage LFL Mast, Adjust Hoses After Installation	38
Two-Stage FFL Mast, New Hose Install	39
Two-Stage FFL Mast, Adjust Hoses After Installation	45
Three-Stage FFL Mast, New Hose Install	45
Three-Stage FFL Mast, Adjust Hoses After Installation	56
Header Hose Arrangement.....	57
Two-Stage LFL Mast, New Hose Install	57
Two-Stage LFL Mast, Adjust Hoses After Installation	61
Two-Stage FFL Mast, New Hose Install	61
Two-Stage FFL Mast, Adjust Hoses After Installation	66
Three-Stage FFL Mast, New Hose Install	68
Three-Stage FFL Mast, Adjust Hoses After Install.....	76
Lift and Tilt System Leak Check	77
Lift Cylinders Leak Check	77
Tilt Cylinders Leak Check	77
Tilt Cylinders Adjustment.....	78
Lift Chains Adjustment.....	79

**Thanks very much for your reading,
Want to get more information,
Please click here, Then get the complete
manual**

JustClickHere 

NOTE:

**If there is no response to click on the link above,
please download the PDF document first, and then
click on it.**

**Have any questions please write to me:
admin@servicemanualperfect.com**

TABLE OF CONTENTS (Continued)

Mast Adjustment 81
 Carriage Adjustment 83
 Troubleshooting..... 83

This section is for the following models:

H/S/1.50-1.75XM (H/S/25-35XM) [D001, C010, D010, E001];
 E1.50-1.75XM (E25-35XM, E25-35XM₂) [D114];
 H/S/2.00XMS (H/S/40XMS) [D001, C010, D010, E001];
 E2.00XMS (E40XMS, E40XM₂S) [D114];
 H/S/2.00-3.20XM (H/S/40-65XM) [D177, D187];
 E2.00-3.20XM (E40-65XM, E40-65XM₂) [F108];
 J2.00-3.20XM (J40-60XM, J40-60XM₂) [A216];
 J2.00-3.20XM (J40-60Z) [A416];
 S/J2.00-3.00XL With Mast S/N C507, C508, C509, C562, C563, and C564
 (S/E/J40-60XL) [A187, B187, C187, C108, B168];
 J1.60-2.00XMT (J30-40XMT) [C160, F160];
 H2.00-3.20XM (H45-65XM) [H177];
 J30-40XMT₂ [H160];
 E1.50-2.00XM (E25-35Z, E40ZS) [E114];
 E2.00-3.20XM (E40-65Z) [G108];
 J1.60-2.00XMT (J30-40ZT) [J160]

General



WARNING

Before working on or near the mast, see **Safety Procedures When Working Near Mast** in this section.

This section has the repair procedures for the Two-Stage, Limited Free-Lift (LFL); Two-Stage, Full Free-Lift (FFL); Three-Stage, Full Free-Lift (FFL) masts; and for the sideshift carriages. Carriage Adjustment and Troubleshooting are at the end of this section. See the section **Mast Description**

4000 SRM 521 for the description and operation of the masts.

NOTE: Hoses have a service life that is determined by application and time. All hoses must be inspected at the intervals specified in the Maintenance Schedule for the hydraulic system. Install a new hose if the hose is worn, damaged, soft or hard, and no longer flexible. If necessary, make a comparison to a new hose that is the correct replacement for the hose you are inspecting.

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 the power is off and the key is removed. Put a DO NOT OPERATE tag in the operator's compartment.**
- **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:

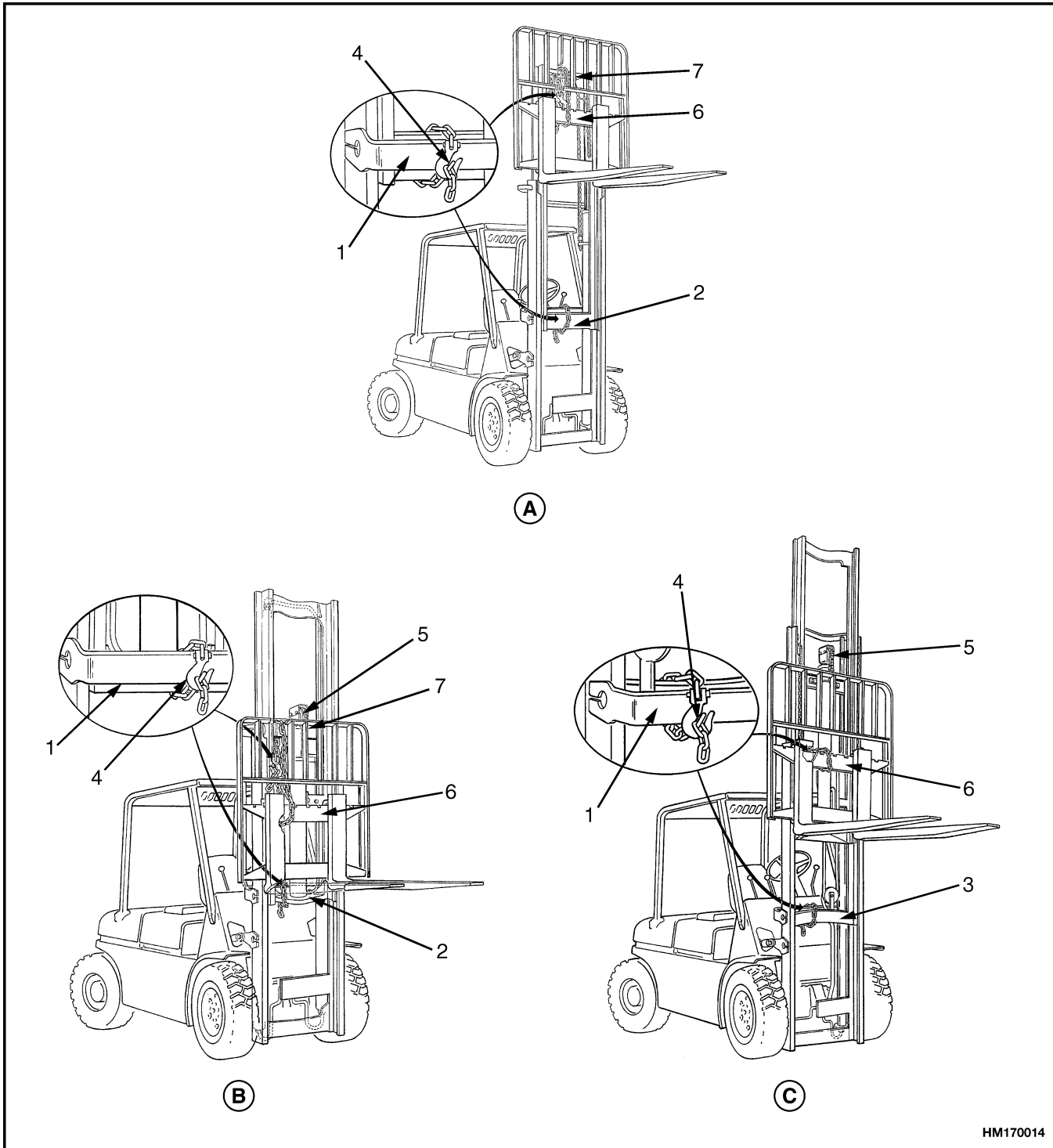
- **Lower the mast and carriage completely. Push the lift/lower control lever forward and make sure there is no movement in the mast. Make sure all parts of the mast that move are fully lowered.**

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 the mast in a vertical position.
2. Raise the mast to align the bottom crossmember of the weldment that moves in the outer weldment with a crossmember on the 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. See Figure 1.
3. Use a 9.5 mm (3/8 in.) minimum safety chain with a hook to fasten the crossmembers together so the movable member cannot 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.
4. Lower the mast until there is tension in the safety chain and the free-lift cylinder (two-stage full free-lift and three-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).

NOTE: 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.



HM170014

A. TWO-STAGE LFL MAST

B. TWO-STAGE FFL MAST

C. THREE-STAGE FFL MAST

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

- 4. HOOK
- 5. FREE-LIFT CYLINDER
- 6. CROSSMEMBER

- 7. CROSSMEMBER

Figure 1. Two-Stage LFL, Two-Stage FFL, and Three-Stage FFL Masts

Forks Repair

The forks are held on the carriage by hooks. The forks are kept in position by latch pins that fit through the top fork hooks and into slots in the top bar carriage. Always check that the latch pins for the forks keep the forks in position on the carriage. Replace damaged latch pin parts. The forks can be removed from the carriage by aligning the forks with the fork removal notch. The fork removal notch is in the bottom bar of the carriage.

REMOVE



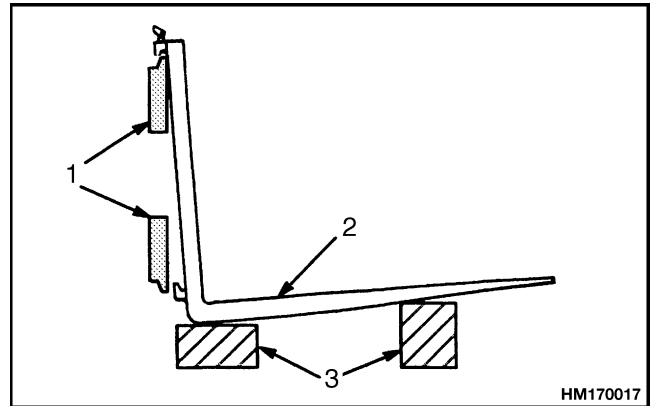
WARNING

Do NOT try to remove a fork without a lifting device. Each hook fork for these lift trucks can weigh 45 to 115 kg (99 to 254 lb).

A fork can be removed from the carriage for replacement of the fork or other maintenance. Slide the fork to the fork removal notch in the bottom bar of the carriage. See Figure 2 and Figure 3. Lower the fork onto blocks so the bottom hook of the fork moves through the fork removal notch. See Figure 3. Lower the carriage further so 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.

INSTALL

Move the fork and carriage so 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 both upper and lower hooks engage the carriage bars. Engage the latch pin with a notch in the upper carriage bar.



- 1. CARRIAGE BARS
- 2. HOOK FORK
- 3. BLOCKS

Figure 2. Hook Fork Removal

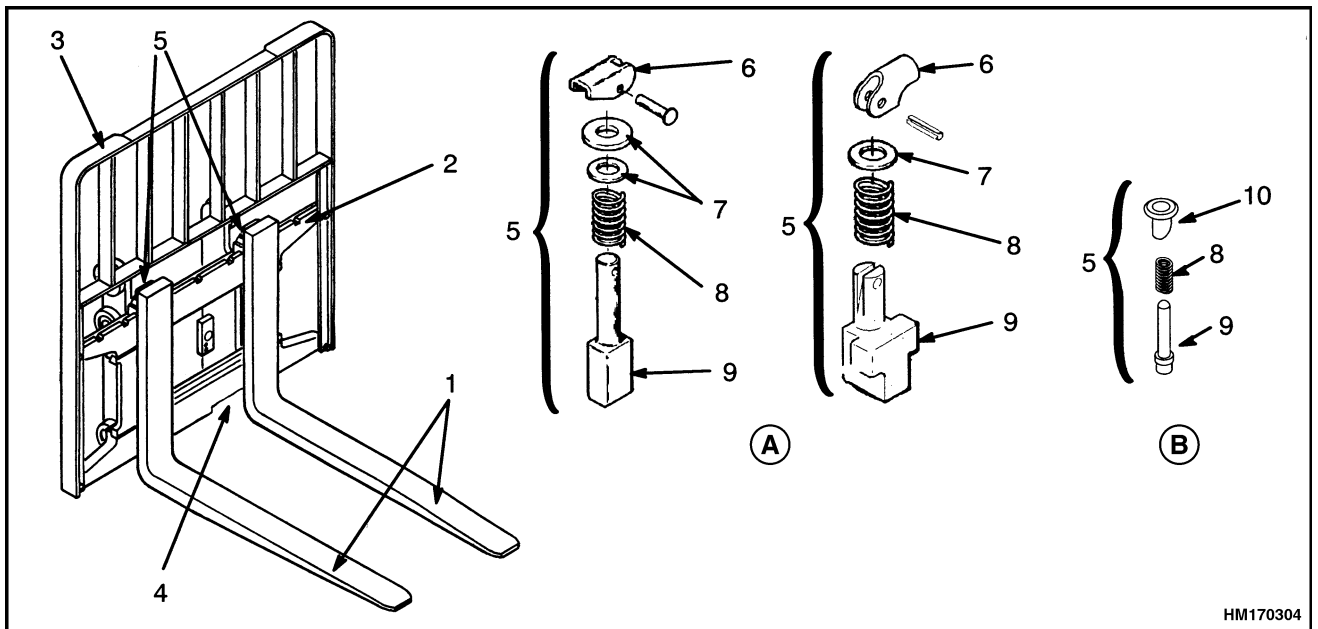


Figure 3. Carriage and Forks

Legend for Figure 3

A. EARLIER MODELS

- 1. FORKS
- 2. CARRIAGE
- 3. LOAD BACKREST EXTENSION
- 4. FORK REMOVAL NOTCH
- 5. LATCH PIN ASSEMBLY

B. LATER MODELS

- 6. LEVER
- 7. WASHER
- 8. SPRING
- 9. PIN
- 10. KNOB

Carriages Repair

STANDARD CARRIAGE, REMOVE

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

WARNING

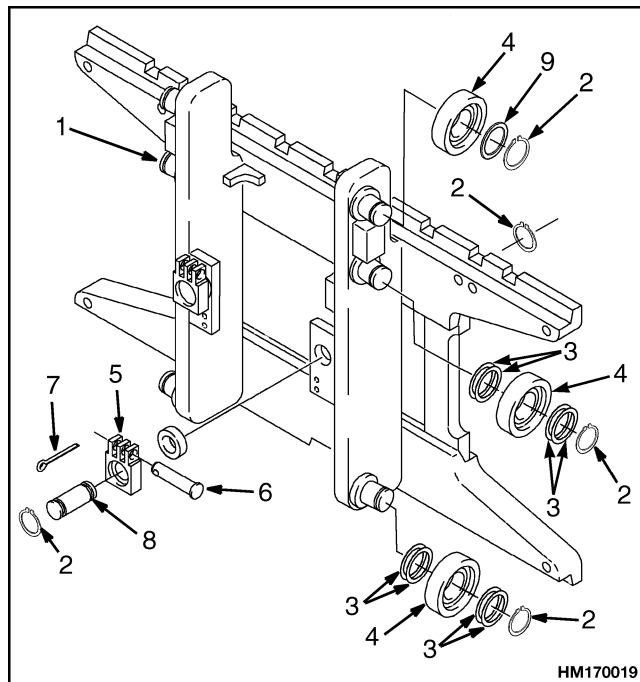
When disconnecting the lift chains, keep control of the ends. Use wire to temporarily connect the ends of the lift chains to the mast. This procedure will prevent the lift chains from falling from the sheaves and causing an injury or damage.

4. Remove the pin from each chain anchor at the carriage. See Figure 4. Disconnect the lift chains from the carriage. Use wire to connect the ends of the lift chains to a part of the mast. Make sure the chains can move freely when the inner mast weldment is raised.

WARNING

To help prevent possible injury, make sure the carriage is stable when the inner mast weldment is above the load rollers of the carriage.

5. Use the lift cylinders to raise the inner mast weldment. If the hydraulic system cannot be used, disconnect the lift cylinders from the inner or intermediate mast weldment. Connect a crane [the capacity of the crane must be at least 681 kg (1501 lb)] to the top of the inner mast weldment. Carefully raise the inner mast weldment until it is above the load rollers of the carriage.



NOTE: TWO-STAGE LFL CARRIAGE SHOWN.

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

Figure 4. Standard Carriage

6. Move the lift truck away from the carriage. Completely lower the inner mast weldment so it cannot move.
7. Connect a lifting device to the carriage. Remove the load from the forks with another lift truck. Lower the carriage to the floor so the load rollers are facing up.
8. If the forks are removed, use a lifting device to put the carriage on the floor so the load rollers are up.

HANG-ON SIDESHIFT CARRIAGE, REMOVE

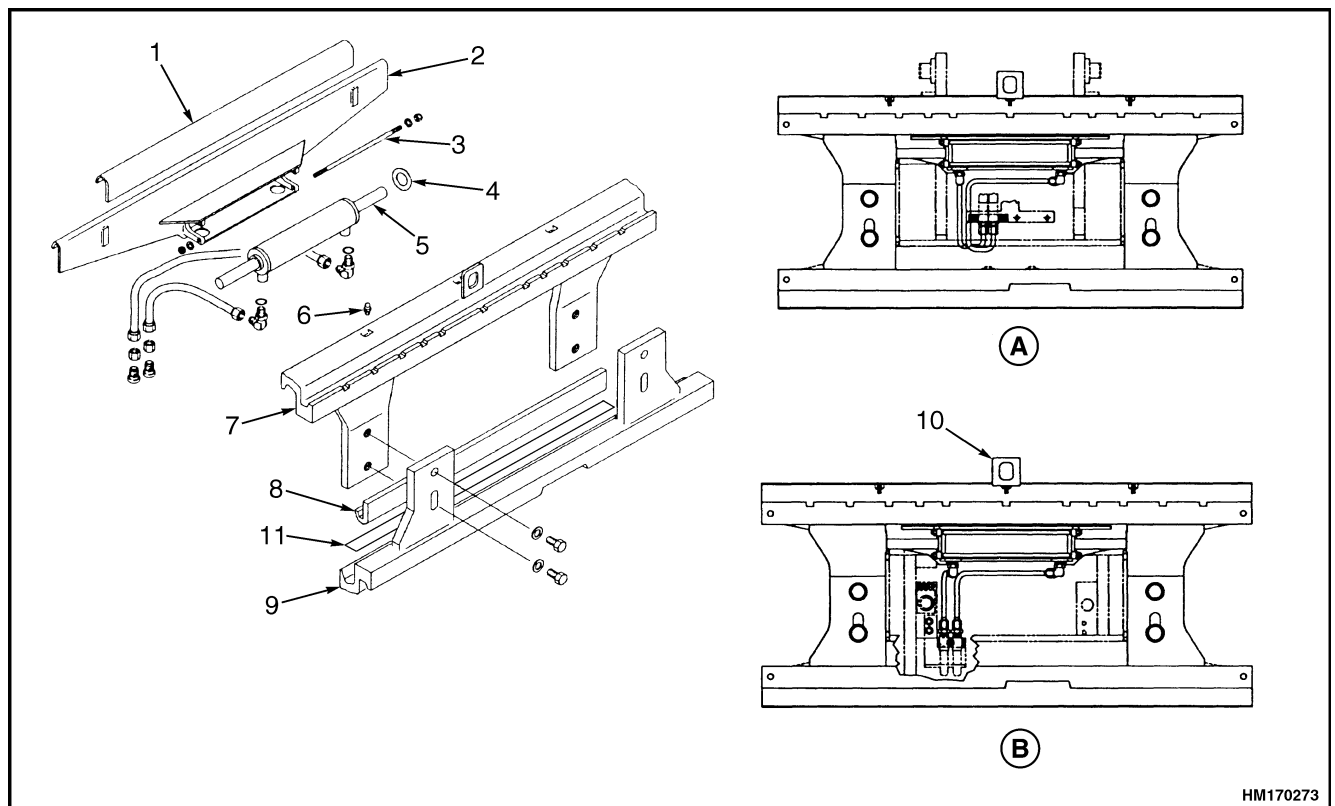
1. Lower the carriage completely. Remove the forks and the load backrest extension.
2. Connect a crane [the capacity of the crane must be at least 681 kg (1501 lb)] to the lifting eye on the sideshift carriage. See Figure 5.
3. Remove the two upper capscrews from the lower apron. Slowly loosen the two bottom capscrews, but do not remove them. The slotted holes will allow the lower apron to move down so the sideshift carriage can be removed.
4. Carefully lift the sideshift carriage from the standard carriage. The sideshift cylinder support

bracket and cylinder will stay on the standard carriage. Remove the bearings.

WARNING

Hydraulic oil is hot after system operation and can cause burns. Do not disconnect any hydraulic lines of the system until the oil for the system is cool and the pressure is relieved.

5. Disconnect the hydraulic lines at the sideshift cylinder. Put caps on the open hydraulic lines. Remove the cylinder support bracket from the standard carriage. If necessary, remove the threaded rods and shims in order to remove the sideshift cylinder.



A. HYDRAULIC CONNECTIONS - TWO-STAGE, FULL FREE-LIFT AND THREE-STAGE, FULL FREE-LIFT

B. HYDRAULIC CONNECTIONS - TWO-STAGE, LIMITED FREE-LIFT

1. TOP BEARING
2. CYLINDER SUPPORT BRACKET
3. THREADED ROD
4. SHIM
5. SIDESHIFT CYLINDER
6. GREASE FITTING

7. UPPER APRON
8. BOTTOM BEARING
9. LOWER APRON
10. LIFTING EYE
11. SHIM STRIP

Figure 5. Hang-On Sideshift Carriage

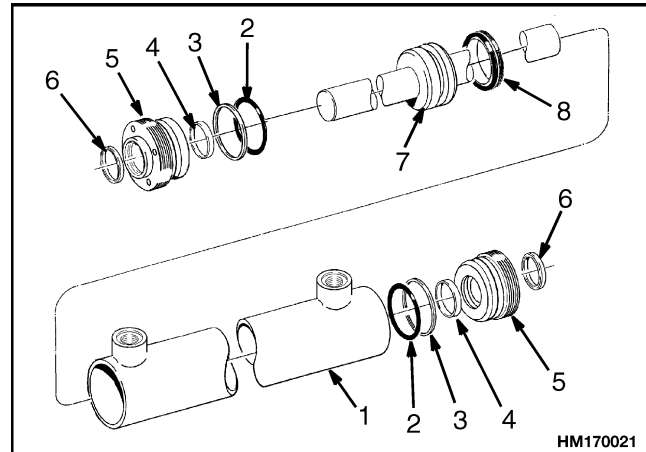
STANDARD CARRIAGE AND HANG-ON SIDESHIFT CARRIAGE, REPAIR

NOTE: The carriage can have four or six load rollers. When the carriage has four load rollers, shims are used behind all of the load rollers. When the carriage has six load rollers, shims are installed on the bottom and middle rollers only.

1. If any of the load rollers must be replaced, make a note of the location and number of the shims. Install the shims, load rollers, and snap rings. See Carriage Adjustment for correct adjustment of the load rollers.
2. If the carriage aprons have any protruding welds or damaged notches, repair by grinding, filing, or welding.
3. The repair procedure for the sideshift cylinder is as follows (see Figure 5 and Figure 6):
 - a. Remove the retainers from the shell. Pull the rod from the shell.
 - b. Replace seals, O-rings, or backup rings as necessary. Use the installation guides to prevent damage to the seals.
 - c. Lubricate all internal parts with clean hydraulic oil.
 - d. Install the piston and rod in the shell. Apply Loctite® 242 to the threads of the retainers. Install the retainers and tighten them to 27 N•m (20 lbf ft).
4. Replace the cylinder rod seals as follows:
 - a. Clamp the cylinder in a soft-jawed vise. DO NOT clamp on the cylinder shell.
 - b. With the cylinder rod centered, unscrew the retainer from each end of the cylinder. Slide the retainers off the cylinder rod.

NOTE: If new retainers that are already assembled with seals are being installed, proceed to Step f.

- c. Remove the seals and O-ring from each retainer with a brass O-ring tool. DO NOT scratch the grooves.



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

Figure 6. Sideshift Cylinder



WARNING

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

- d. Clean the retainers and the cylinder rod with cleaning solvent. Lubricate the new seals and O-rings with hydraulic oil.
- e. Install the seals into the retainer grooves. Form the seals into a "kidney" shape to ease placement into the groove. Note the direction of the rod seals. **Pressure seals are installed with the lip toward the pressure side of the cylinder.**
- f. Apply a film of hydraulic oil to the inside of the retainers. Carefully slide them onto the cylinder rod. Tighten the retainers to 165 N•m (122 lbf ft).

STANDARD CARRIAGE, INSTALL

1. Use the hydraulic system of the lift truck or a crane to raise the inner mast weldment. If the hydraulic system cannot be used, disconnect the lift cylinders from the inner or intermediate mast

weldment. Connect a crane [the capacity of the crane must be at least 681 kg (1501 lb)] to the top of the inner mast weldment. Carefully raise the inner mast weldment until it is above the load rollers of the carriage.

2. Move the lift truck toward the carriage until the inner mast weldment is aligned with the carriage rollers. Carefully lower the inner mast weldment until it engages all of the load rollers.
3. Check the clearance of the load rollers. See Carriage Adjustment in this section.
4. Connect the lift chains to the chain anchors at the carriage. Use new cotter pins in the anchor pins. Adjust the lift chains as described in Carriage Adjustment in this section.
5. Install the backrest on the sideshift carriage. Tighten the capscrews to 195 N•m (144 lbf ft).

HANG-ON SIDESHIFT CARRIAGE, INSTALL

1. Install the sideshift cylinder in the cylinder support bracket. See Figure 5. Use an equal number of shims on both sides of the cylinder to limit side-to-side movement within the bracket. Maximum movement is 0.6 mm (0.024 in.). Install the threaded rods to hold the cylinder in position and tighten to 18 N•m (159 lbf in).
2. Install the cylinder support bracket on the standard carriage. Make sure the bracket is engaged in the center notch in the top carriage bar.
3. Connect the hydraulic lines to the sideshift cylinder. See Figure 5. Lubricate the ends of the cylinder rod with multipurpose grease.
4. Install the top bearing on the cylinder support bracket. Lubricate only the outer surface of the bearing with multipurpose grease.
5. Connect the top and bottom aprons by installing the two bottom capscrews. Do NOT tighten the capscrews. Lubricate only the outer surface of the bottom bearing with multipurpose grease. Install the bottom bearing in the lower apron.
6. Install the shim strips under the bottom bearing strip (be sure the shims are seated between the shim stops) so the bottom bearing strip will just clear the lower lip of the standard carriage bar when the lower apron is brought into position.
7. Make sure the standard carriage is completely lowered. Connect a crane [the capacity of the crane must be at least 908 kg (2002 lb)] to the lifting eye. Install the sideshift carriage on the standard carriage. Put blocks under the bottom apron of the sideshift carriage so the bottom bearing moves tight against the standard carriage when the lifting device is lowered.

Install the two top capscrews into the sideshift carriage. Tighten the capscrews to the following torque:

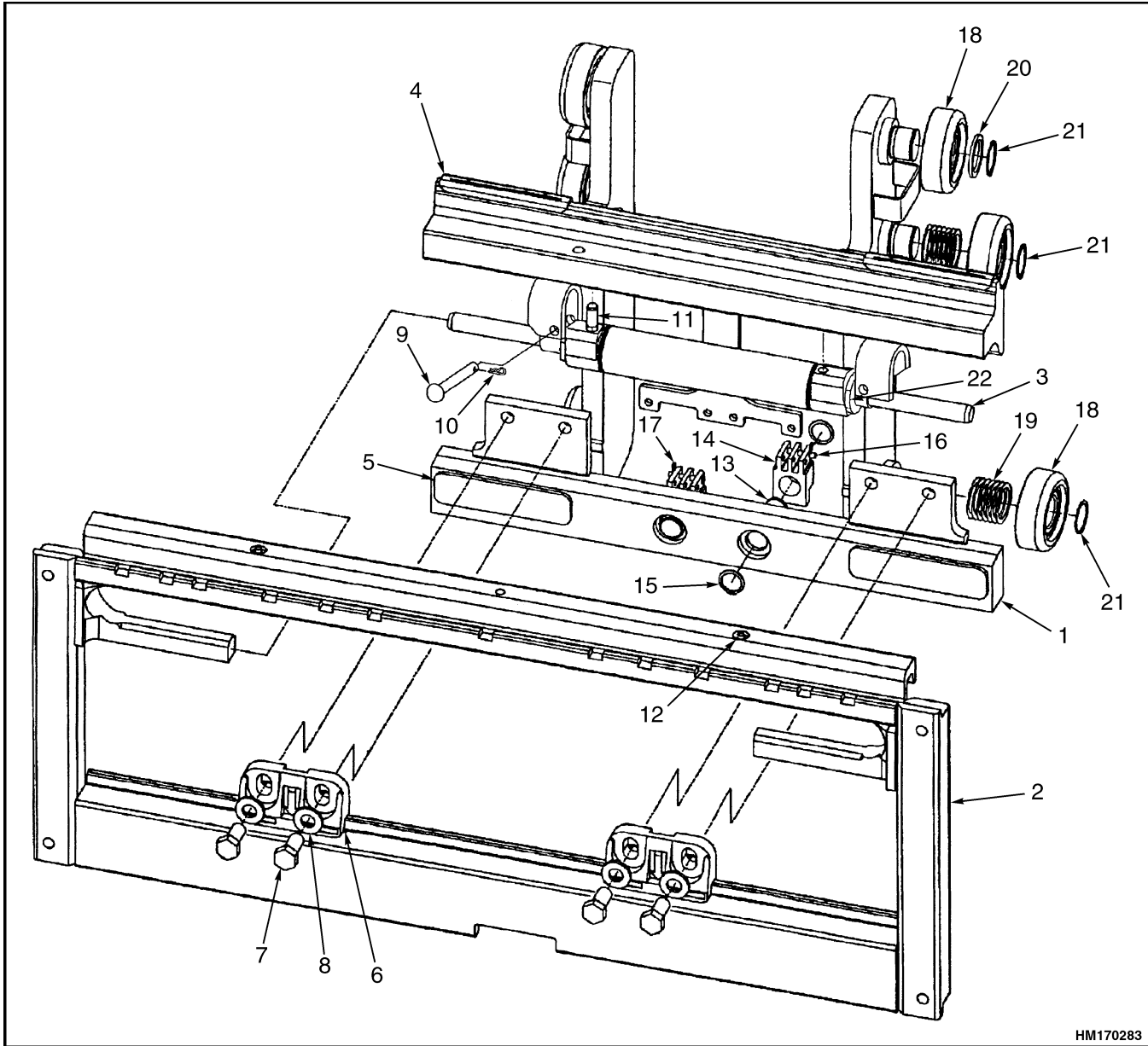
- On H/S1.50-1.75XM, H/S2.00XMS (H/S25-35XM, H/S40XMS), E1.50-1.75XM (E25-35XM, E25-35XM₂) [D114], E2.00XMS (E40XMS, E40XM₂S [D114], E1.50-2.00XM (E25-35Z, E40ZS) [E114], H/S2.00-2.75XM (H/S40-55XM), S/E/J2.00-2.50XL (S/E/J40-50XL), J1.60-2.00XMT (J30-40XMT), J2.00-2.50XM (J40-50XM) [A216], and J2.00-2.50XM (J40-50Z) [A416] units, tighten all of the capscrews to 435 N•m (321 lbf ft).
- On H/S3.00-3.20XM (H/S60-65XM), J3.00-3.20XM (J60XM) [A216], J3.00-3.20XM (J60Z) [A416], E2.00-3.20XM (E40-65Z) [G108], and S/E/J3.00XL (S/E/J60XL) units, tighten all of the capscrews to 755 N•m (557 lbf ft).

8. Install the load backrest extension on the sideshift carriage. Tighten the capscrews to 195 N•m (144 lbf ft).
9. Remove the lifting device. Lubricate the top bearings at the grease fittings.

INTEGRAL SIDESHIFT CARRIAGE

Remove

1. Lower the carriage completely. Remove the forks and the load backrest extension. See Figure 3 and Figure 7.



NOTE: TWO AND THREE-STAGE FFL IS SHOWN.

- | | | |
|-----------------------|------------------|-----------------|
| 1. INNER CARRIAGE | 9. CLEVIS PIN | 17. COTTER PIN |
| 2. OUTER FRAME | 10. HAIRPIN | 18. LOAD ROLLER |
| 3. SIDESHIFT CYLINDER | 11. PIN | 19. SHIMS |
| 4. UPPER BEARING | 12. LUBE FITTING | 20. SPACER |
| 5. LOWER BEARING | 13. PIN | 21. SNAP RING |
| 6. LOWER HOOK | 14. CHAIN ANCHOR | 22. SPACER |
| 7. CAPSCREW | 15. SNAP RING | |
| 8. WASHER | 16. PIN | |

Figure 7. Integral Sideshift Carriage

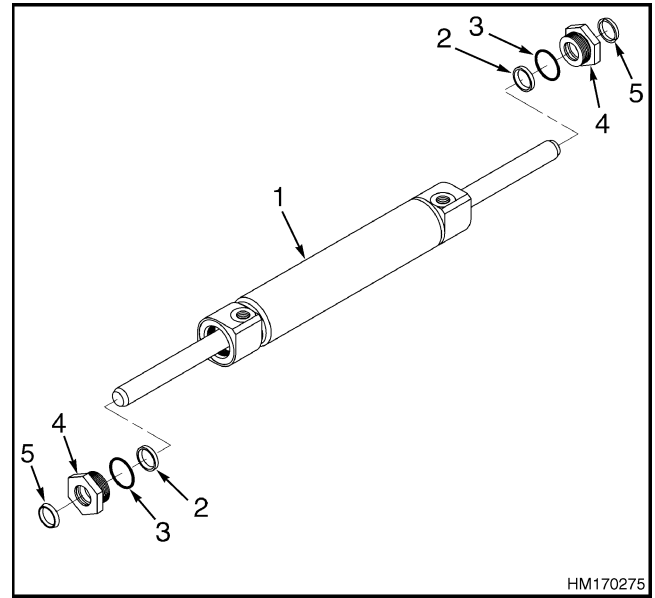
**WARNING**

Hydraulic oil is hot after system operation and can cause burns. Do not disconnect any hydraulic lines of the system until the oil for the system is cool and the pressure is relieved.

2. Disconnect the hydraulic lines at the sideshift cylinder. Put caps on the open hydraulic lines.
3. Remove the lower mounting hooks.
4. Use a crane with a capacity of at least 450 kg (992 lb) to lift the outer frame away from the inner frame. Lay the outer frame flat on a pallet or workbench.
5. If the sideshift cylinder or the bearings are to be serviced, remove the capscrews and the cylinder assembly from the inner frame.

Clean and Inspect

1. Inspect the lower mounting hooks for wear. Replace the hooks if they are worn beyond the wear limit. The wear limit clearance range is 0.8 mm (1/32 in.) minimum and 1.6 mm (1/16 in.) maximum. See Figure 7.
2. Clean and inspect the carriage bars for damage and smoothness. Ensure the bars are parallel and the ends are flush.
3. Clean the bearing areas. Inspect the sideshift bearings for wear as follows:
 - a. Remove the upper bearings from the upper apron. If either upper bearing is worn to less than 2.5 mm (3/32 in.) thickness, replace both upper bearings by driving the upper bearings from the upper apron.
 - b. Remove the lower bearings from the lower carriage bar. If either lower bearing is worn to less than 2.5 mm (3/32 in.) thickness, replace both lower bearings by prying the lower bearings from the lower carriage bar.
4. Inspect the sideshift cylinder. Replace the entire cylinder assembly if a cylinder rod is bent or scored or if there is damage on the outside of the cylinder shell that could impair performance or cause leaks under pressure. See Figure 8.



- | | |
|---------------------------|-------------|
| 1. CYLINDER SHELL AND ROD | 3. O-RING |
| 2. SEAL | 4. RETAINER |
| | 5. WIPER |

Figure 8. Integral Sideshift Cylinder

Repair

1. If any of the load rollers must be replaced, make a note of the location and number of the shims. Install the shims, load rollers, and snap rings. See Carriage Adjustment for correct adjustment.
 2. If the carriage bars have any protruding welds or damaged notches, repair by grinding, filing, or welding.
 3. Replace the cylinder rod seals as follows:
 - a. Clamp the cylinder in a soft-jawed vise. DO NOT clamp on the cylinder shell.
 - b. With the cylinder rod centered, unscrew the retainers from each end of the cylinder. Slide the retainers off the cylinder rod.
- NOTE:** If new retainers that are already assembled with seals are being installed, proceed to Step f.
- c. Remove the seals and O-ring from each retainer with a brass O-ring tool. DO NOT scratch the grooves.

 **WARNING**

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

- d. Clean the retainers and the cylinder rod with cleaning solvent. Lubricate the new seals and O-rings with hydraulic oil.
- e. Install the seals into the retainer grooves. Form the seals into a "kidney" shape to ease placement into the groove. Note the direction of the rod seals. **Pressure seals are installed with the lip toward the pressure side of the cylinder.**
- f. Apply a film of hydraulic oil to the inside of the retainers. Carefully slide them onto the cylinder rod. Tighten the retainers to 165 N•m (122 lbf ft).

Install

NOTE: Use a wood block or a plastic hammer to fully seat the upper bearings onto the upper carriage bar.

Proper lower hook clearance requires the upper bearings be fully seated.

1. If necessary, install the lower sideshift bearings. Then install the upper sideshift bearings. Lubricate the upper and lower sideshift bearings with chassis grease. See Figure 7.
2. If necessary, install the sideshift cylinder.
3. Use a crane with a capacity of at least 450 kg (992 lb) to install the outer frame on the inner frame.
4. Install the lower mounting hooks. For proper sideshift operation, make sure there is 0.8 to 1.6 mm (1/32 to 1/16 in.) clearance between the bottom of the hooks and the outer frame.
5. Connect the hydraulic lines to the sideshift cylinder.
6. Install the backrest on the sideshift carriage. Tighten the capscrews to 195 N•m (144 lbf ft).
7. Install the forks.

Mast Repair**REMOVE**
 **WARNING**

The mast is heavy. The mast can weigh approximately 907.2 kg (2000 lb). Make sure all lifting devices (hoists, cables, chains, slings, etc.) are suitable and of adequate capacity to lift the mast.

NOTE: If the mast needs to be disassembled, remove the forks and carriage. If only the lift cylinders need to be removed for repair, the mast does not need to be removed from the lift truck. See the procedures for Lift Cylinders Repair.

NOTE: The length of the lift chains must be checked before the mast is removed. See Step 2 in Mast and Chains, Clean and Inspect.

1. Fully lower all of the mast weldments and the carriage. Tilt the mast fully forward. Connect a crane with a capacity of at least 1600 kg (3527 lb) to the top of the mast using chains. Make sure all

the mast weldments are fastened together. Make sure the chains will not damage the sheaves, tubing, or other parts of the mast.

 **WARNING**

Hydraulic oil is hot after system operation and can cause burns. Do not disconnect any hydraulic hoses until the oil in the system is cool.

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

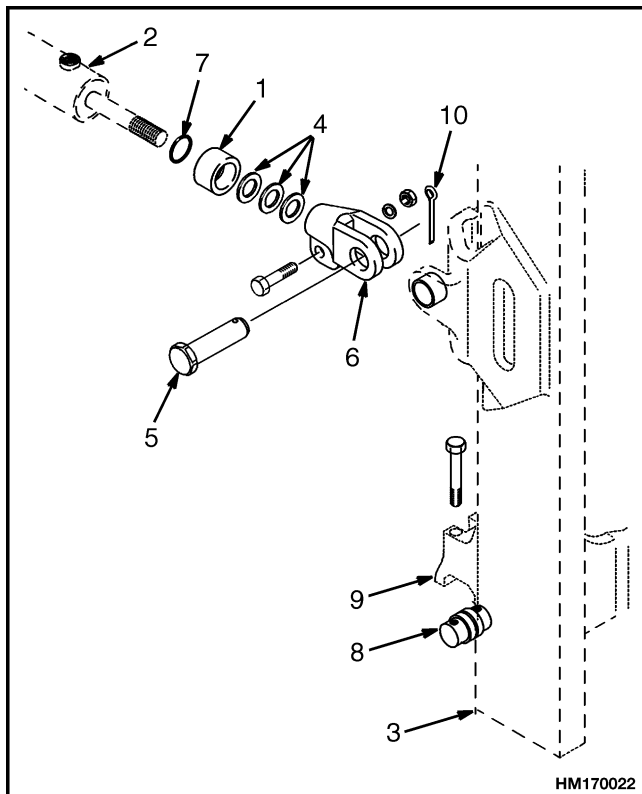
 **WARNING**

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

3. Remove the cotter pins and anchor pins or the capscrews, washers, and anchor pins at the tilt cylinder mounts on the outer mast weldment.

NOTE: To perform the next two steps, the lift truck must be raised. See the **Operator Manual** or **Periodic Maintenance Manual** for your lift truck for instructions on how to put a lift truck on blocks.

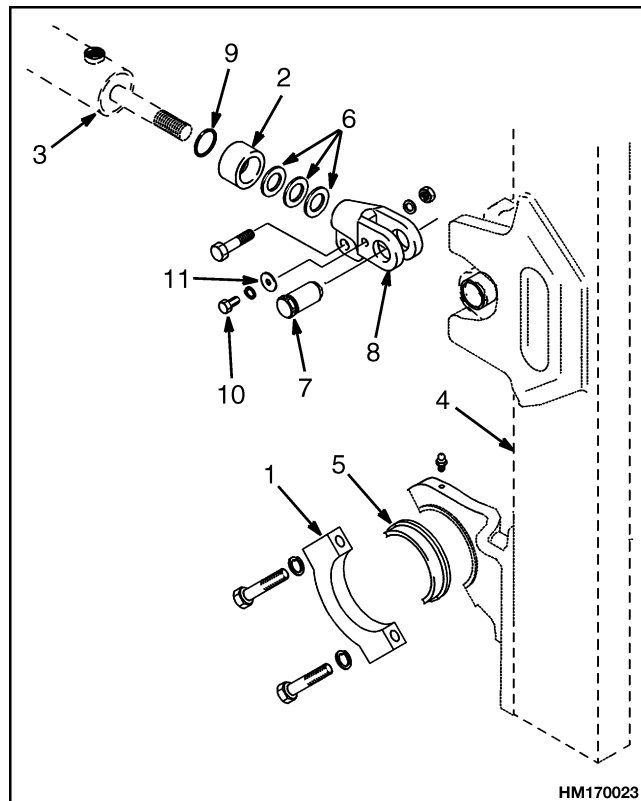
- On the H/S2.00-3.20XM (H/S40-65XM), E2.00-3.20XM (E40-65XM, E40-65XM₂) (F108), E2.00-3.20XM (E40-65Z) (G108), J2.00-3.20XM (J40-60XM, J40-60XM₂) (A216), and J2.00-3.20XM (J40-60Z) (A416), see Figure 9, remove the capscrews that hold the outer mast weldment to the pivot pins at the mounts.



- | | |
|------------------------|-----------------------------------|
| 1. SPACER | 7. O-RING |
| 2. TILT CYLINDER | 8. PIVOT PIN |
| 3. OUTER MAST WELDMENT | 9. DRIVE AXLE HANGER (MAST MOUNT) |
| 4. SHIMS | 10. COTTER PIN |
| 5. PIN | |
| 6. ROD END | |

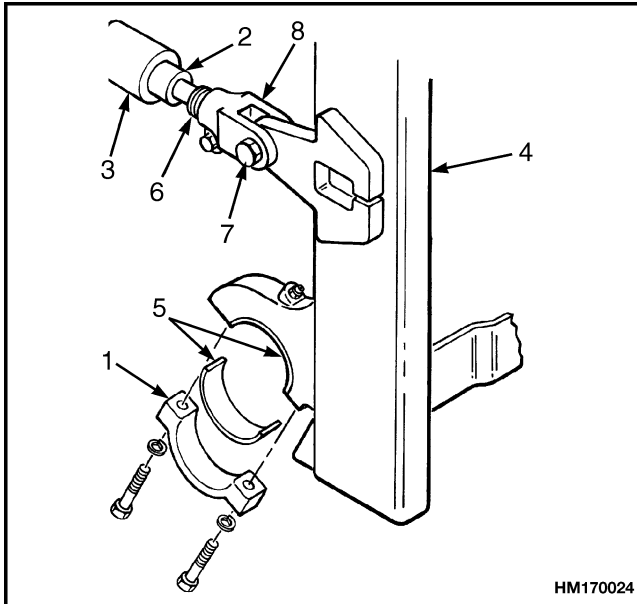
Figure 9. Mast Mounting H/S2.00-3.20XM (H/S40-65XM), E2.00-3.20XM (E40-65XM, E40-65XM₂) (F108), E2.00-3.20XM (E40-65Z) (G108), J2.00-3.20XM (J40-60XM, J40-60XM₂) (A216), and J2.00-3.20XM (J40-60Z) (A416),

- On the H/S1.50-1.75XM, H/S2.00XMS (H/S25-35XM, H/S40XMS), E1.50-1.75XM (E25-35XM, E25-35XM₂) (D114), E2.00XMS (E40XMS, E40XM_S) (D114), E1.50-2.00XM (E25-35Z, E40ZS) (E114), and J1.60-2.00XMT (J30-40XMT), see Figure 10; on S/E/J2.00-3.00XL (S/E/J40-60XL), see Figure 11; and on J1.60-2.00XMT (J30-40ZT), see Figure 12, and remove the capscrews that hold the retainer caps to the mast mounts.



- | | |
|------------------------|-----------------|
| 1. RETAINER CAP | 6. SHIMS |
| 2. SPACER | 7. PIN |
| 3. TILT CYLINDER | 8. ROD END |
| 4. OUTER MAST WELDMENT | 9. O-RING |
| 5. BUSHING | 10. CAPSCREW |
| | 11. FLAT WASHER |

Figure 10. Mast Mounting H/S1.50-1.75XM, H/S2.00XMS (H/S25-35XM, H/S40XMS), E1.50-1.75XM (E25-35XM, E25-35XM₂) (D114), E2.00XMS (E40XMS, E40XM_S) (D114), E1.50-2.00XM (E25-35Z, E40ZS) (E114), and J1.60-2.00XMT (J30-40XMT)



- | | |
|------------------------|------------|
| 1. RETAINER CAP | 5. BUSHING |
| 2. SPACER | 6. SHIMS |
| 3. TILT CYLINDER | 7. PIN |
| 4. OUTER MAST WELDMENT | 8. ROD END |

Figure 11. Mast Mounting S/E/J2.00-3.00XL (S/E/J40-60XL)

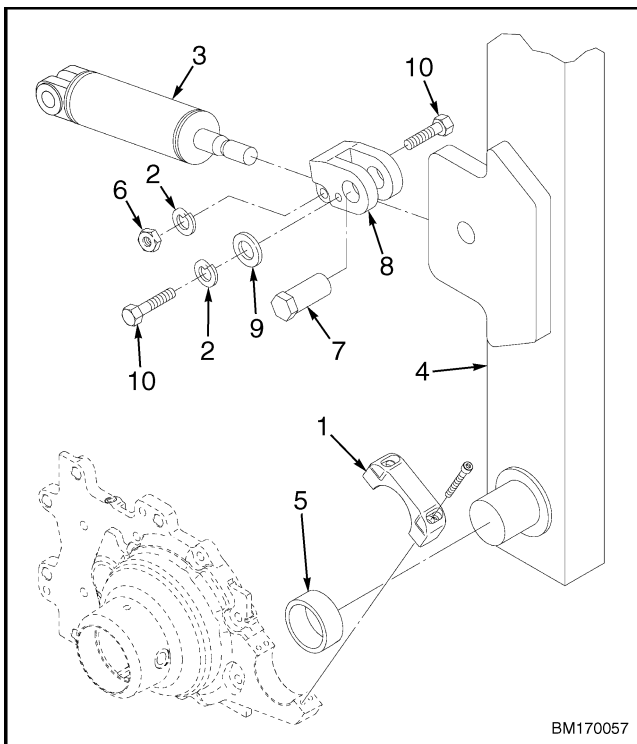


Figure 12. Mast Mounting J1.60-2.00XMT (J30-40ZT)

Legend for Figure 12

- | | |
|------------------------|--------------|
| 1. RETAINER CAP | 6. NUT |
| 2. LOCKWASHER | 7. PIN |
| 3. TILT CYLINDER | 8. ROD END |
| 4. OUTER MAST WELDMENT | 9. WASHER |
| 5. BUSHING | 10. CAPSCREW |

WARNING

The mast is heavy. The mast can weigh approximately 907.2 kg (2000 lb). Make sure all lifting devices (hoists, cables, chains, slings, etc.) are suitable and of adequate capacity to lift the mast.

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

TWO-STAGE LFL AND TWO-STAGE FFL MASTS, DISASSEMBLE

WARNING

Hydraulic oil is hot after system operation and can cause burns. Do not disconnect any hydraulic lines of the system until the oil for the system is cool and the pressure is relieved.

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.

- Clean the area around the hydraulic fittings for the lift cylinders. Disconnect the fittings at the lift cylinders and put caps on the open lines.
- Remove the chains and header hoses. On the two-stage FFL mast, remove the brackets and disconnect the hydraulic line for the free-lift cylinder. Remove the free-lift cylinder. Disconnect the free-lift chains at the crossmember.

**WARNING**

Be careful when removing or installing snap rings. These snap rings can come loose during removal or installation with enough force to cause an injury. Always use the correct snap ring pliers, and wear eye and face protection during removal or installation.

3. Remove the nut, bolt, and spacer at the mount near the top of each main lift cylinder. Remove the snap rings and washers from the top of each main lift cylinder. Disconnect the main lift chains at the mounts.
4. On the H/S2.00-3.20XM (H/S40-65XM), E2.00-3.20XM (E40-65XM, E40-65XM₂) (F108), E2.00-3.20XM (E40-65Z) (G108), J2.00-3.20XM (J40-60XM, J40-60XM₂) (A216), J2.00-3.20XM (J40-60Z) (A416), and S/E/J2.00-3.00XL (S/E/J40-60XL), two-stage FFL mast, disconnect the FFL supply tube and remove the hydraulic fitting from the top of the left-hand main lift cylinder.

On the H/S1.50-1.75XM, H/S2.00XMS (H/S25-35XM, H/S40XMS), E1.50-1.75XM (E25-35XM, E25-35XM₂) (D114), E2.00XMS (E40XMS, E40XM₂S) (D114), E1.50-2.00XM (E25-35Z, E40ZS) (E114), and J1.60-2.00XMT (J30-40XMT) two-stage FFL masts, disconnect the FFL supply tube and remove the hydraulic fitting from the top of the right-hand main lift cylinder.

**WARNING**

The mast weldment can slide when the mast is moved. A weldment that slides can cause injury.

5. Slide the inner mast weldment from the outer mast weldment approximately 30 cm (12 in.) to

disengage the main lift cylinders from the inner mast weldment. Remove the main lift cylinders from the outer mast weldment. See Figure 13 and Figure 14.

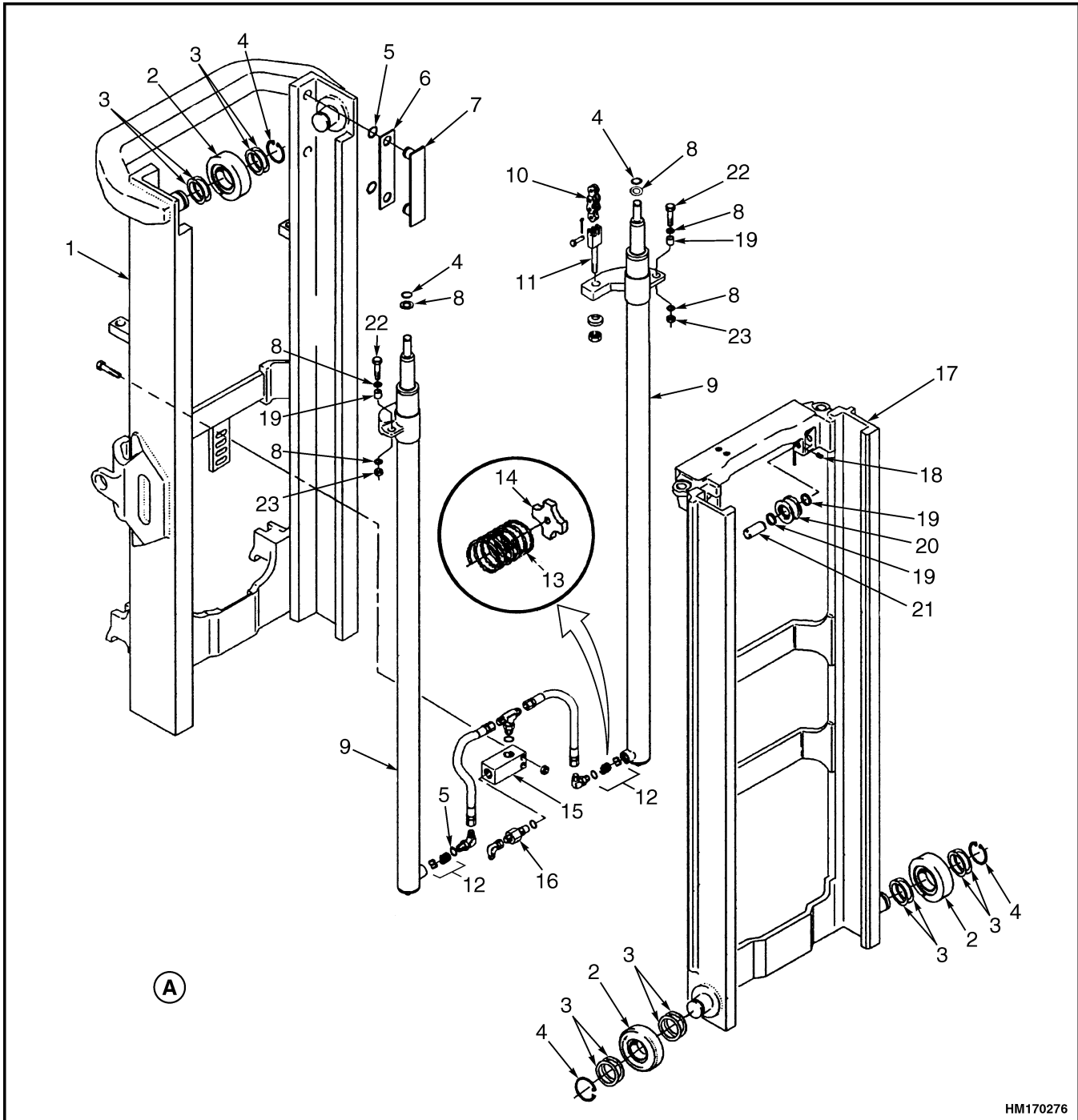
6. Slide the inner mast weldment from the bottom of the outer mast weldment approximately 30 cm (12 in.). Remove the strip bearings and load rollers from the top of the outer mast weldment. Remove the load rollers from the bottom of the inner mast weldment. Make a note of each shim arrangement and load roller location. The shim arrangements will be approximately the same during assembly.

**WARNING**

The mast is heavy. The mast can weigh approximately 681 kg (1501 lb). Make sure all lifting devices (hoists, cables, chains, slings, etc.) are suitable and of adequate capacity to lift the mast.

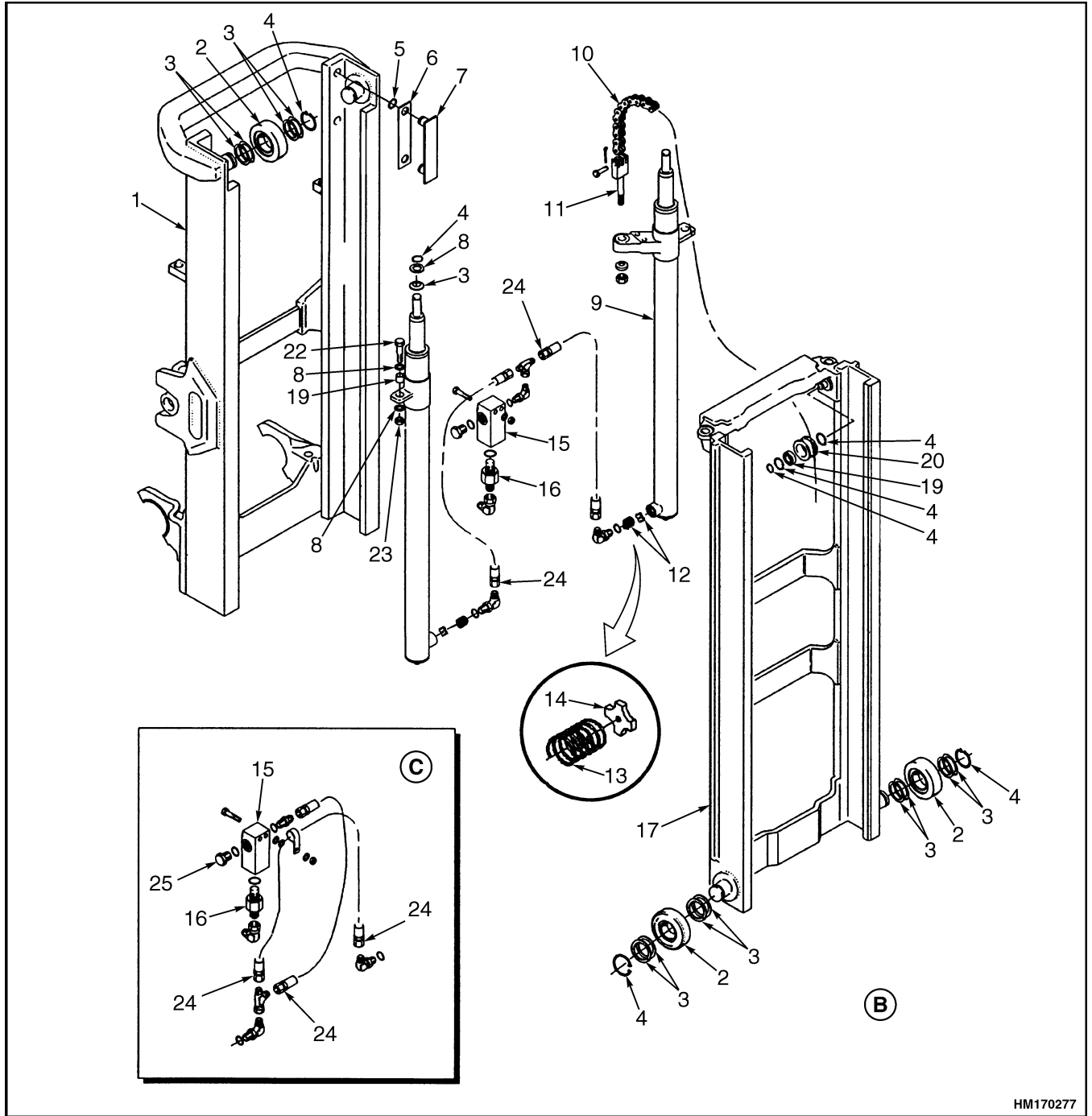
NOTE: When replacing the outer channel weldment, copy the part number and date code information from the old channel and stamp that information on the new channel with a letter R at the end to indicate that it has been replaced.

7. Slide the inner mast weldment halfway out of the top of the outer mast weldment. Connect a crane [the capacity of the crane must be at least 681 kg (1501 lb)] to the center of the inner mast weldment. See Figure 15. Slide the inner mast weldment out of the outer mast weldment until the mast stub shafts of the inner mast weldment are in the notches of the outer channels. Remove the inner mast weldment from the outer mast weldment.
8. Remove the chain sheaves and disassemble them as necessary for repair and cleaning.



HM170276

Figure 13. Two-Stage, Limited Free-Lift Mast (Sheet 1 of 2)



HM170277

Figure 13. Two-Stage, Limited Free-Lift Mast (Sheet 2 of 2)