SERVICE REPAIR

MANUAL

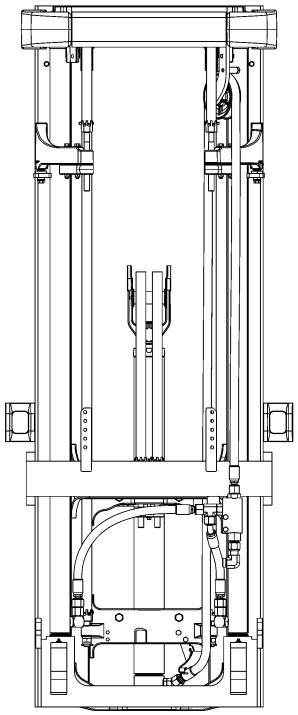
Hyster A380 (H40XT, H50XT, H60XT) Forklift Service Repair Manual

HYSTER

MAST REPAIR
(S/N A387, A389, A397, A399)

TWO-STAGE LFL AND THREE-STAGE FFL MAST

H2.0-3.0XT (H40-60XT) [A380]



HYSTER

PART NO. 4150993

4000 SRM 1999

SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- 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 hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the WARNING symbol and word are on orange background. The CAUTION symbol and word are on yellow background.

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This section is for the following models:

H2.0-3.0XT (H40-60XT) [A380]

General

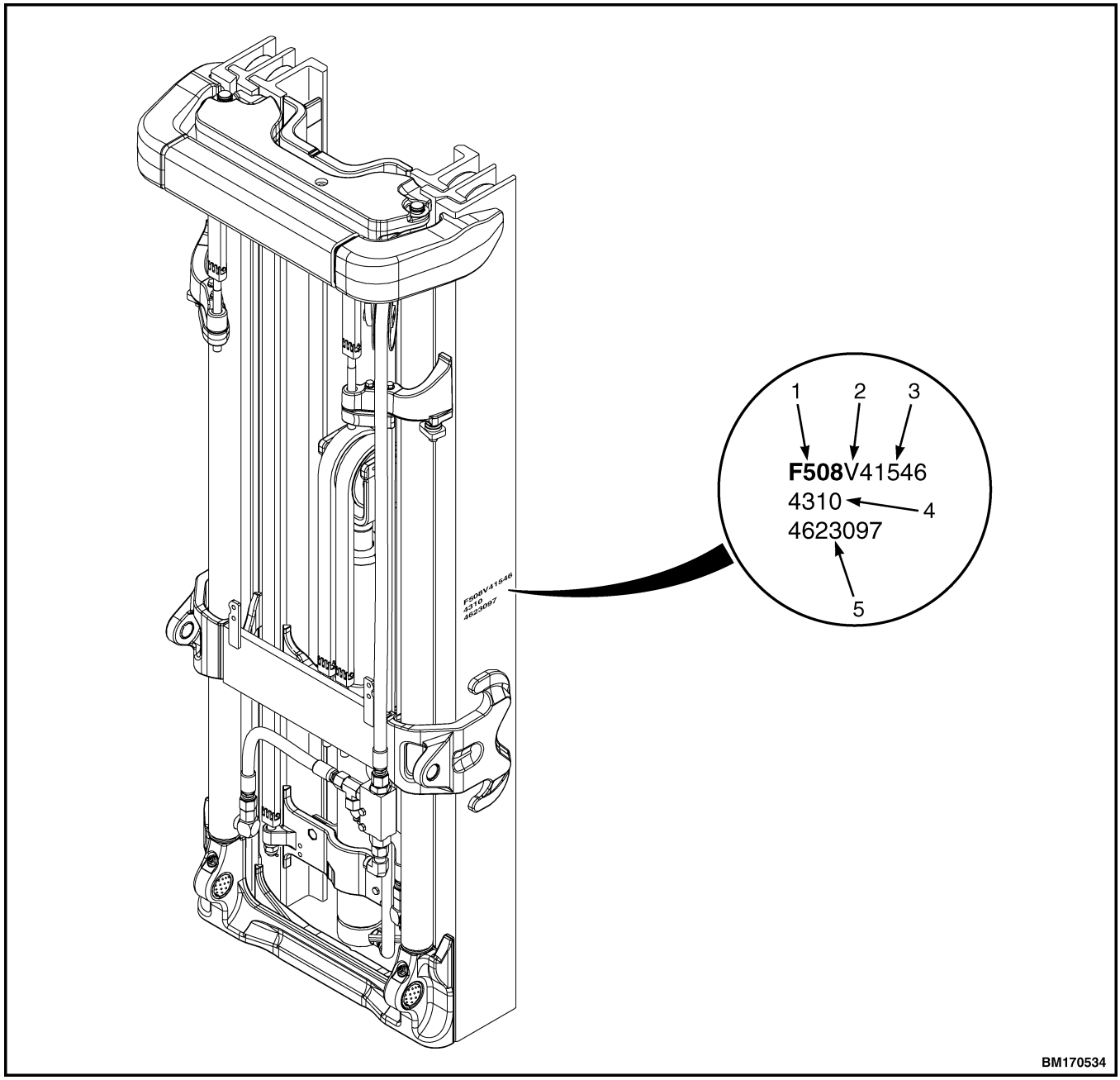
WARNING

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

NOTE: Hoses have a service life that is determined by application and time. Install a new hose if the hose is leaking, worn through, or damaged. A hose has been damaged if the hose cover is cracked, exposing the braiding, or if the hose has been kinked or crushed, or if the hose is no longer flexible. Install a new hose if the hose has been tensioned beyond the adjustment range. If necessary, make a comparison to a new hose that is the correct replacement for the hose you are inspecting.

This section contains the repair procedures for the Two-Stage, Limited Free-Lift (LFL) mast with serial numbers A389 and A399 and the Three-Stage, Full Free-Lift (FFL) mast with serial numbers A387 and A397. The mast serial number is located on the right side of the outer mast. Other information about the mast can also be found in this area. See Figure 1.

Procedures to repair the carriage, replace the forks, and adjust the lift chains, carriage, and mast are also covered in this manual.



NOTE: THE MAST AND TEXT SHOWN IN ABOVE ILLUSTRATION ARE FOR ILLUSTRATIVE PURPOSES ONLY. YOUR MAST AND TEXT MAY BE DIFFERENT, BUT THE TEXT IS FOUND IN THE SAME LOCATION.

1. MAST SERIAL NUMBER SERIES
2. MANUFACTURING PLANT
3. PRODUCTION SEQUENCE
4. MAST LIFT HEIGHT (IN MILLIMETERS)
5. MAST ASSEMBLY PART NUMBER

Figure 1. Mast Serial Number Location

Additional information concerning the mast may be included in other sections when the information is closely related to other systems. Sections may include:

Cylinder Repair 2100SRM1994

Periodic Maintenance 8000SRM2000

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. See the correct Service Manual section for the specific mast being repaired.

WARNING

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.

- 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 or 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:

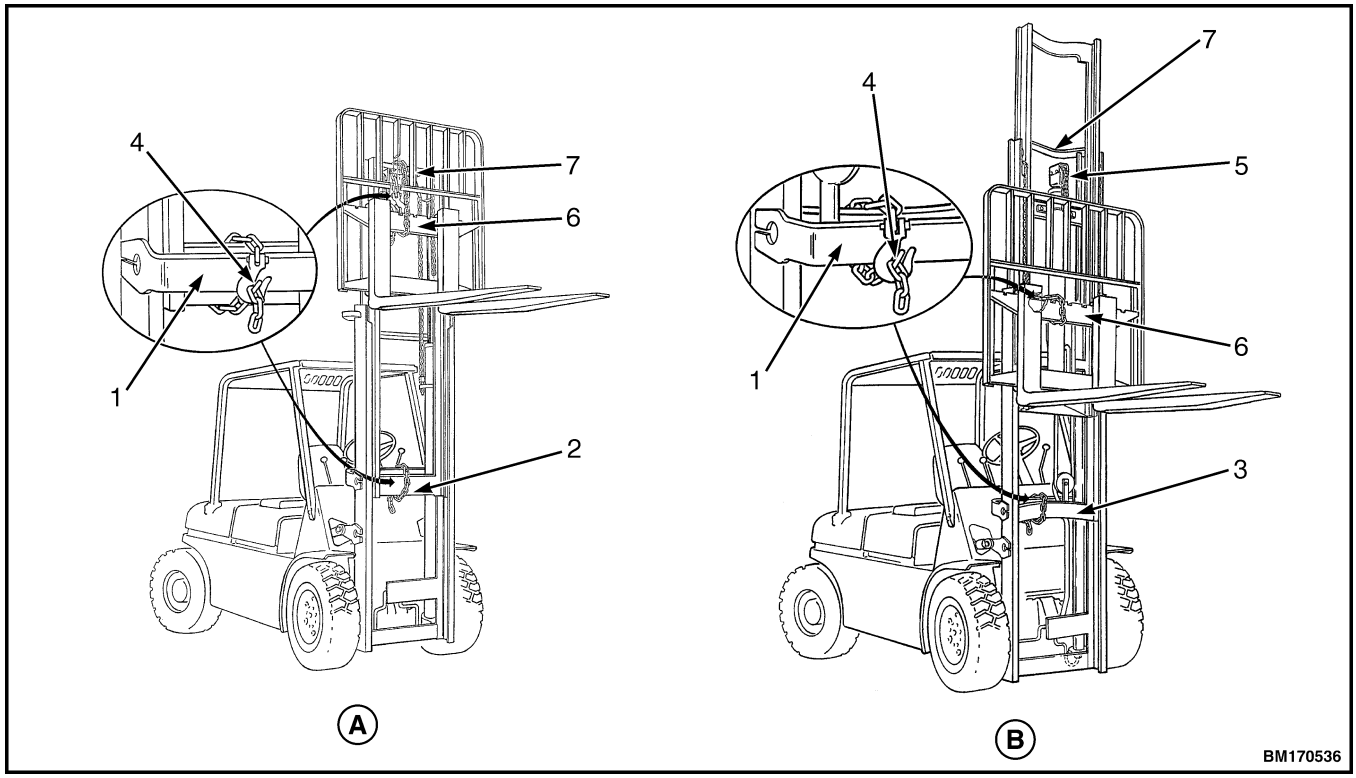
- Lower the mast and carriage completely. Push the lift/lower control lever forward and make sure there is no movement in the mast. Make sure that all parts of the mast that move are fully lowered.

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:

1. Put mast in vertical position.
2. Raise mast to align bottom crossmember of 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 2.
3. Use a 3/8 inch 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 mast until there is tension in the safety chain and the free-lift cylinder (three-stage) is completely retracted. If running, stop the engine. Apply 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 and a crossmember on the outer weldment. See Figure 2.

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



A. TWO-STAGE LFL MAST

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

B. THREE-STAGE FFL MAST

5. FREE-LIFT CYLINDER
6. CROSSMEMBER
7. CROSSMEMBER

Figure 2. Two-Stage LFL and Three-Stage FFL Masts

Fork Replacement

STANDARD CARRIAGE AND INTEGRAL SIDESHIFT CARRIAGE

On lift trucks equipped with a standard carriage or an integral sideshift carriage, the forks are held on the carriage by hooks. Forks are held in position by pins that fit through the top fork hooks and into slots in top carriage bar.

If pin does not remain engaged in carriage slot, replace with new pin. Always check that pins for forks keep forks in position on carriage. Replace damaged fork pin parts.

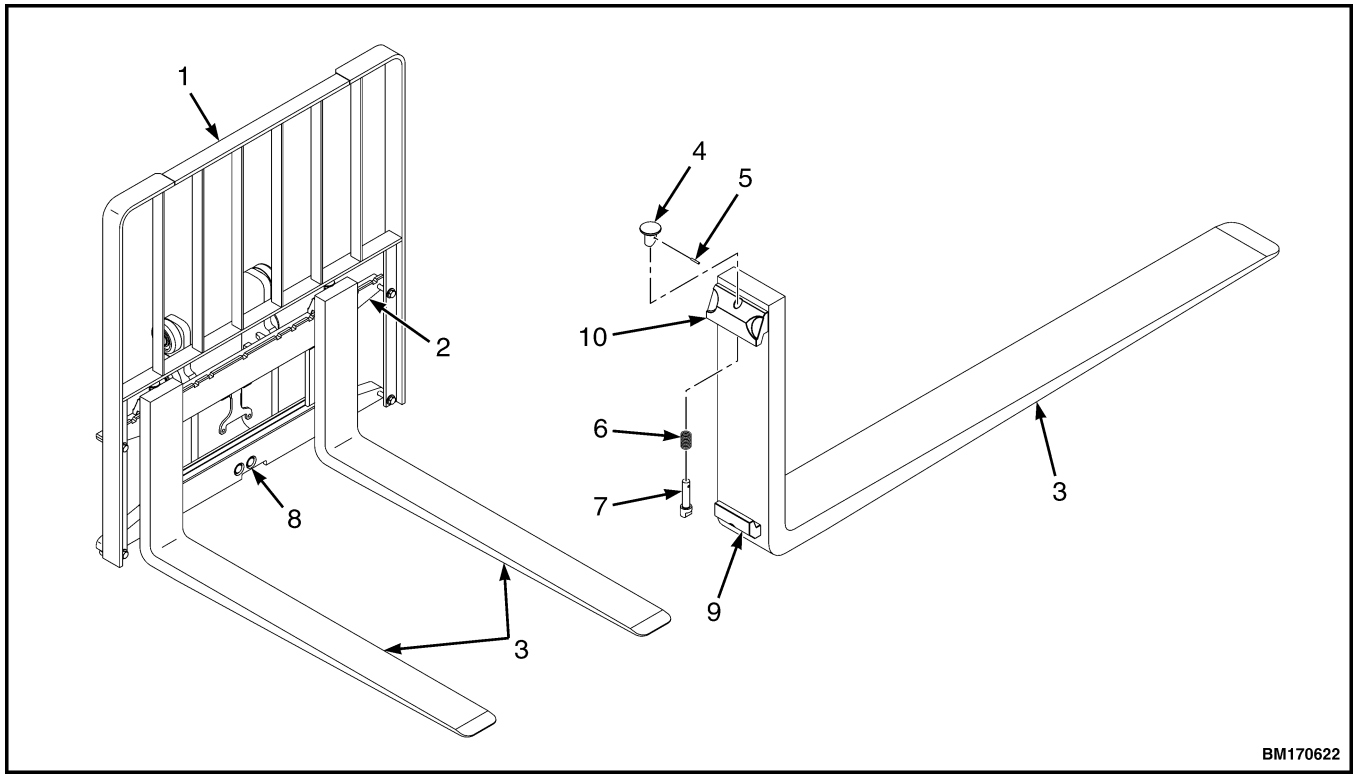
Remove

WARNING

DO NOT try to remove a fork without a lifting device. Each hook fork for these lift trucks can weigh 50 to 98 kg (110 to 216 lb).

NOTE: Forks are to be replace in sets by trained personnel only. DO NOT replace forks individually.

1. Slide fork to fork removal notch on bottom bar of carriage. See Figure 3.
2. Lower fork onto blocks (see Figure 4), so bottom hook of fork moves through fork removal notch.
3. Lower carriage further so top hook of fork is disengaged from top carriage bar. See Figure 3.
4. Move carriage away from fork or use a lifting device to move fork away from carriage.



1. LOAD BACKREST
2. CARRIAGE
3. FORK(S)
4. KNOB
5. PIN RETAINER
6. SPRING
7. PIN (FORK LATCH)
8. FORK REMOVAL NOTCH
9. LOWER HOOK
10. UPPER HOOK

Figure 3. Carriage and Forks

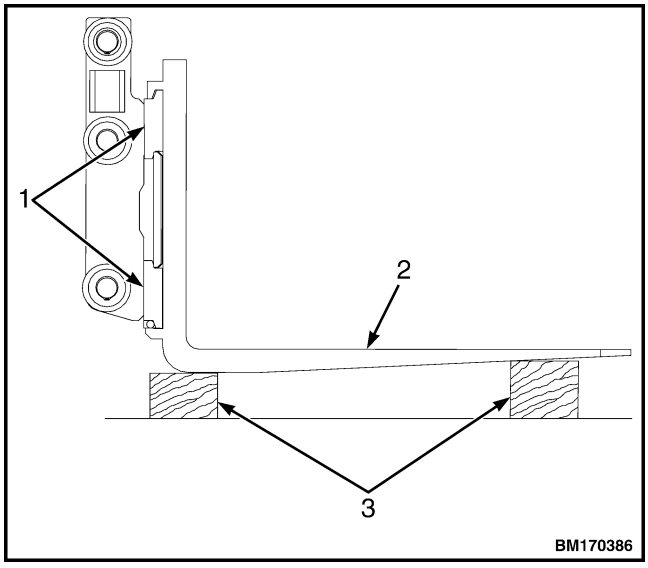


Figure 4. Hook Fork, Remove

Legend for Figure 4

1. CARRIAGE BARS
2. HOOK FORK
3. BLOCKS

Install

WARNING

DO NOT try to remove a fork without a lifting device. Each hook fork for these lift trucks can weigh 50 to 98 kg (110 to 216 lb).

NOTE: Forks are to be replace in sets by trained personnel only. DO NOT replace forks individually.

1. Move fork and carriage so top hook of fork can engage upper carriage bar. See Figure 4.
2. Raise carriage to move bottom hook of fork through fork removal notch.
3. Slide fork on carriage so both upper and lower hooks engage carriage bars. See Figure 3.
4. Install latch pin in top hook and notch in upper carriage bar. See Figure 3.

Checks

WARNING

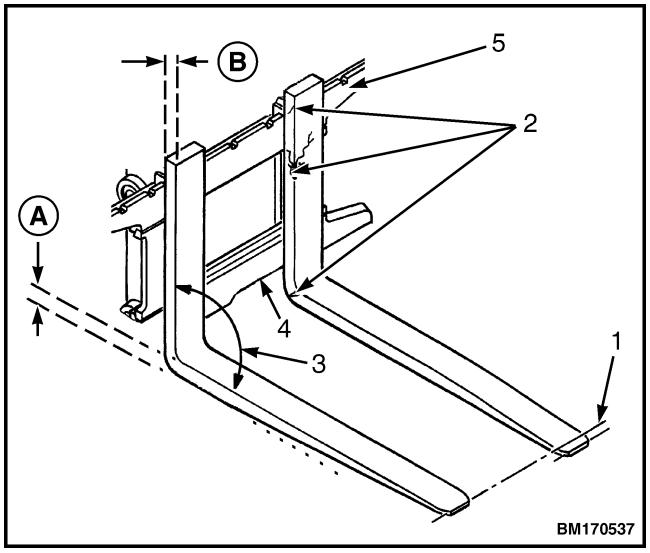
Never repair damaged forks by heating or welding. Forks are made of tempered steel using special procedures. Always replace damaged forks as a pair.

Inspect forks for cracks and wear. Check alignment of fork tips. The difference in height of fork tips must be less than three percent of the length of the forks. See Table 1 and Figure 5.

Some applications may require closer alignment. If forks do not meet specification, they both must be replaced. Check for smooth and proper operation of the fork lock pins. Repair or replace any damaged or broken fork lock pins or components and lubricate, as necessary. See Figure 5.

Table 1. Fork Tip Alignment

Fork Tip Alignment Specifications			
Standard Fork Lengths		Maximum Fork Tip Difference*	
mm	(in.)	mm	(in.)
914	(36)	27.4	(1.08)
1000	(39.5)	30	(1.20)
1016	(40)	30.5	(1.20)
1067	(42)	32	(1.25)
1100	(43)	33	(1.30)
1200	(47)	36	(1.40)
1207	(47.5)	36.2	(1.43)
1219	(48)	36.5	(1.43)
1372	(54)	41.1	(1.62)
1524	(60)	45.7	(1.80)
1829	(72)	54.9	(2.20)
*Difference of alignment between fork tips must be no more than 3% of the total fork length.			



A. HEEL OF FORK (MUST BE 90% OF DIMENSION B)
B. ORIGINAL FORK THICKNESS (DIMENSION B)

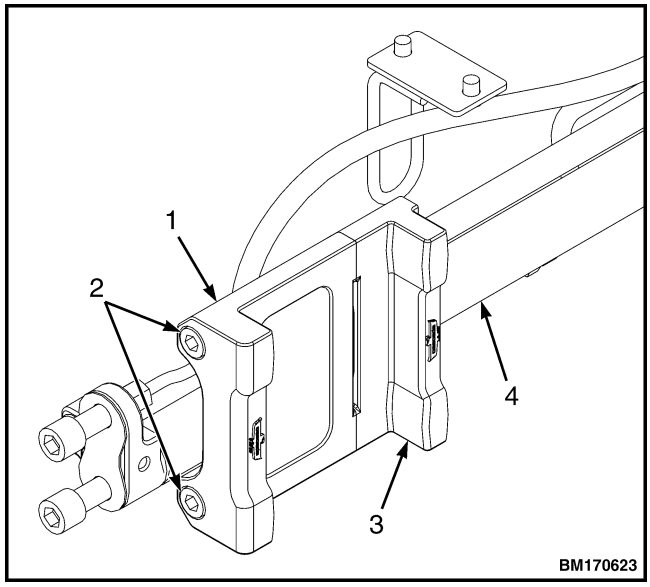
1. TIP ALIGNMENT (MUST BE WITHIN 3% OF FORK LENGTH)
2. CRACKS
3. MAXIMUM ANGLE 93°
4. FORK REMOVAL NOTCH
5. CARRIAGE

Figure 5. Fork Checks

FORK POSITIONER CARRIAGE

NOTE: The fork positioner can be removed from the integral sideshift carriage with integral sideshift carriage on or off the mast. In the steps below, the fork positioner is removed with integral sideshift carriage on the mast. If integral sideshift carriage must be removed from mast first, go to section Carriages Repair, Two-Stage LFL Mast or Carriages Repair, Three-Stage FFL Mast for removal procedures.

Forks used on an integral sideshift carriage equipped with a fork positioner attachment, are held in position with fork carriers (inner and outer) that slide along the fork positioner cylinder. Forks are removed from carriage by aligning forks with fork removal notch. Fork removal notch is in the bottom bar of carriage. See Figure 6.



1. OUTER FORK CARRIER
2. CAPSCREWS
3. INNER FORK CARRIER
4. FORK POSITIONER CYLINDER

Figure 6. Fork Carrier Components

Remove

WARNING

DO NOT try to remove a fork without a lifting device. Each hook fork for these lift trucks can weigh 50 to 98 kg (110 to 216 lb).

CAUTION

Remove fork latch pins (7, Figure 3) if adding a fork positioner attachment. Damage to forks and other carriage components can occur if fork latch pins are not removed prior to using attachment.

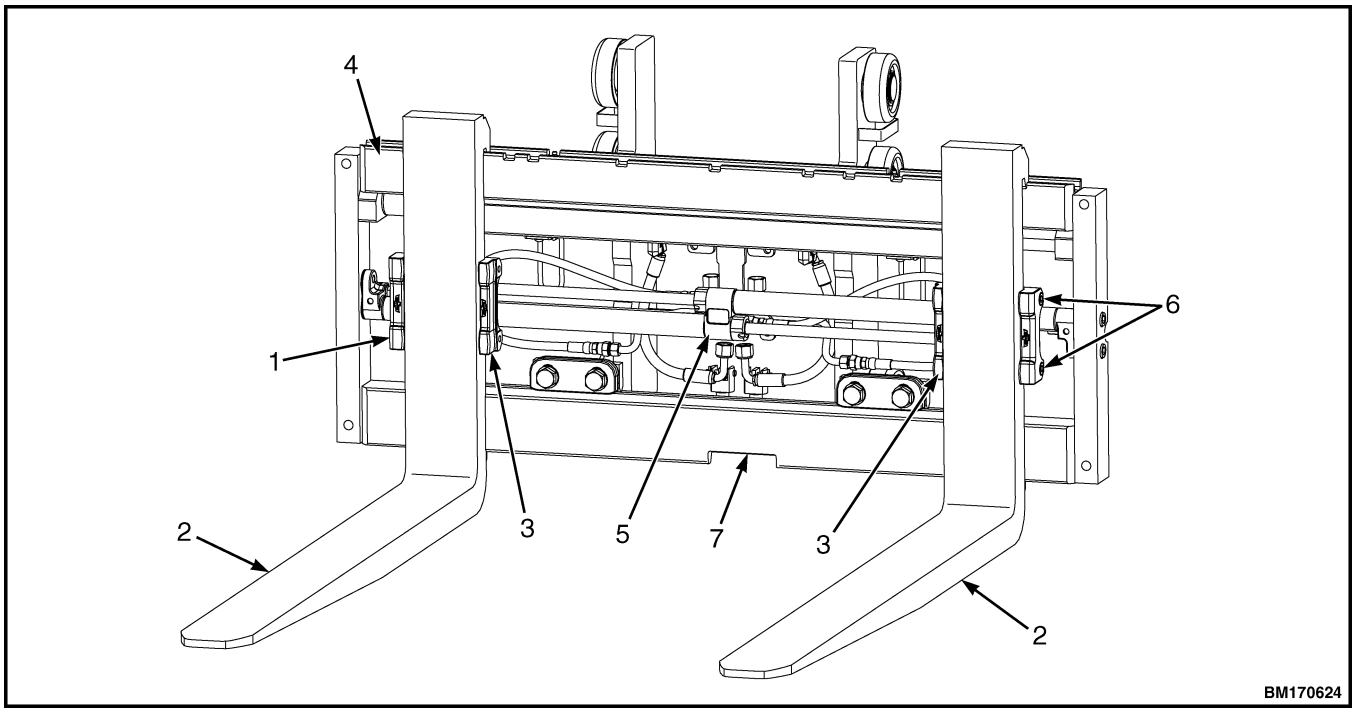
NOTE: Forks are to be replace in sets by trained personnel only. DO NOT replace forks individually.

1. Lower carriage and remove four capscrews from fork carriers. Slide inner fork carriers down cylinder shell to remove forks. See Figure 7.

2. Slide fork to fork removal notch in bottom bar of carriage. See Figure 7.

3. Lower forks onto blocks (see Figure 4) so bottom hook of fork moves through fork removal notch. Lower carriage further so top hook of fork is disengaged from top carriage bar.

4. Move carriage away from fork or use a lifting device to move fork away from carriage.



NOTE: FORK POSITIONER AND INTEGRAL SIDESHIFT CARRIAGE FOR THREE-STAGE FFL MAST SHOWN. REMOVAL OF FORKS FROM TWO-STAGE LFL MAST IS SIMILAR.

1. OUTER FORK CARRIER
2. FORKS
3. INNER FORK CARRIER
4. OUTER FRAME
5. FORK POSITIONER
6. CAPSCREWS
7. FORK REMOVAL NOTCH

Figure 7. Fork Positioner Fork Removal

Install

WARNING

DO NOT try to remove a fork without a lifting device. Each hook fork for these lift trucks can weigh 50 to 98 kg (110 to 216 lb).

CAUTION

Remove fork latch pins (7, Figure 3) if adding a fork positioner attachment. Damage to forks and other carriage components can occur if fork latch pins are not removed prior to using attachment.

NOTE: Forks are to be replace in sets by trained personnel only. DO NOT replace forks individually.

1. Move fork and carriage so top hook of fork can engage upper carriage bar. See Figure 4.

2. Raise carriage to move bottom hook of fork through fork removal notch. See Figure 7.

3. Slide fork on carriage so both upper and lower hooks engage carriage bars. See Figure 4.

4. Move fork into place on outer fork carrier. Secure inner fork carrier to outer fork carrier using four capscrews. Tighten capscrew to 35 N•m (25 lbf ft). See Figure 7.

Checks

WARNING

Never repair damaged forks by heating or welding. Forks are made of tempered steel using special procedures. Always replace damaged forks as a pair.

Inspect forks for cracks and wear. Check the alignment of fork tips. The difference in height of fork tips must be less than three percent of the length of the forks. See Table 2 and Figure 8.

Some applications may require closer alignment. If forks do not meet specification, they both must be replaced. Repair or replace any damaged or broken fork components and lubricate, as necessary. See Figure 8.

Table 2. Fork Tip Alignment

Fork Tip Alignment Specifications			
Standard Fork Lengths		Maximum Fork Tip Difference*	
mm	(in.)	mm	(in.)
914	(36)	27.4	(1.08)
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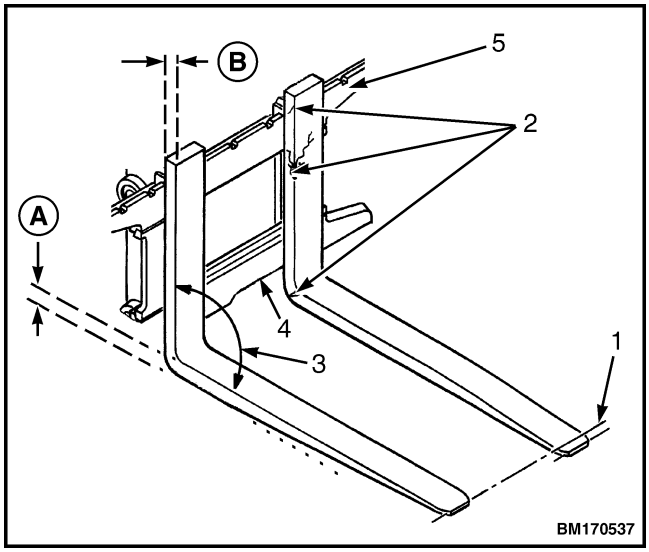


Figure 8. Fork Checks

Legend for Figure 8

A. HEEL OF FORK (MUST BE 90% OF DIMENSION B)
B. ORIGINAL FORK THICKNESS (DIMENSION B)

1. TIP ALIGNMENT (MUST BE WITHIN 3% OF FORK LENGTH)
2. CRACKS
3. MAXIMUM ANGLE 93°
4. FORK REMOVAL NOTCH
5. CARRIAGE

Carriages Repair, Two-Stage LFL Mast

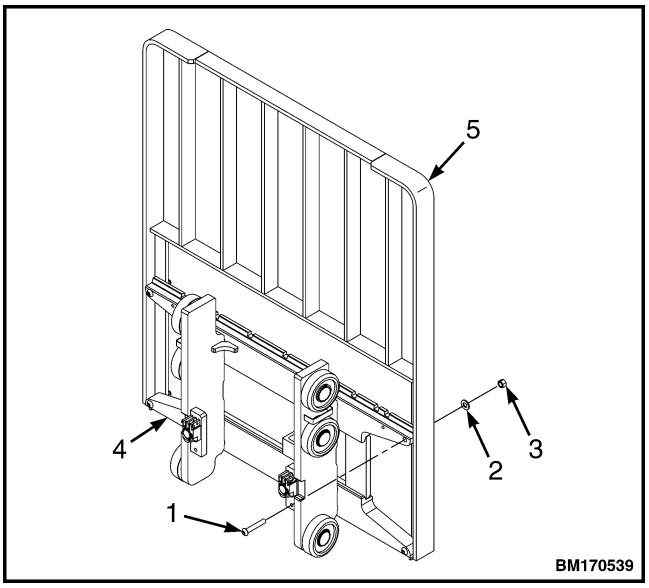
STANDARD CARRIAGE

Remove

1. Remove forks. See Fork Replacement section for procedures.

2. Remove four capscrews and load backrest from carriage. See Figure 9.

3. Connect a lifting device to the carriage. Lift carriage so that lift chains become loose.



1. CAPSCREW
2. WASHER
3. NUT
4. CARRIAGE
5. LOAD BACKREST

Figure 9. Load Backrest, Remove

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 and causing an injury or damage.

1. Remove chain pin from each chain anchor at the carriage. Disconnect lift chains from carriage. Use wire to connect the ends of lift chains to a part of the mast. Make sure chains can move freely when inner mast is raised. See Figure 10.

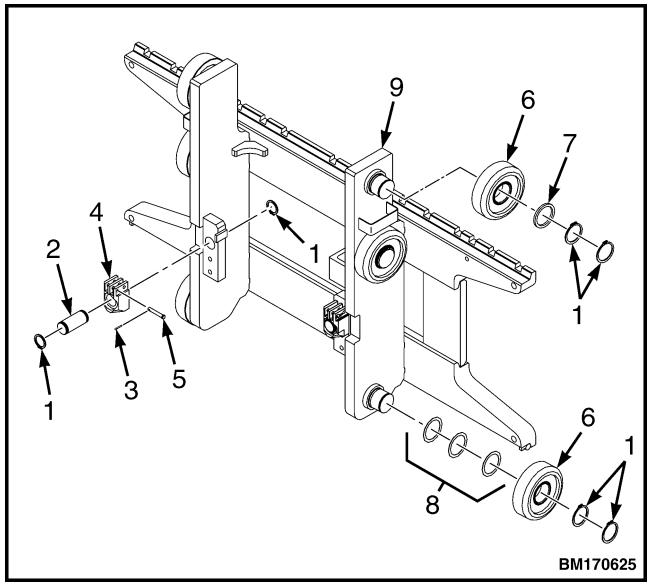
WARNING

To help prevent possible injury, make sure the carriage is stable and will not fall over when the inner mast is raised above the load rollers of the carriage.

2. Use lift cylinders to raise inner mast. If hydraulic system cannot be used, disconnect lift cylinders from inner mast. See the Cylinder Repair manual listed in the General section of this manual for procedures.

3. Connect a crane with a capacity of at least 700 kg (1550 lb), to top of inner mast. Carefully raise inner mast until it is above the load rollers of the carriage. Install safety chains to secure mast in its extended position and disconnect the crane. See Safety Procedures When Working Near Mast.

4. Move lift truck away from carriage. Completely lower inner mast so it cannot move.



NOTE: BOTTOM AND MIDDLE LOAD ROLLER COMPONENTS ARE THE SAME.

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

Figure 10. Standard Carriage Components

Clean and Inspect

NOTE: Shims are installed on the bottom and middle load rollers only.

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

WARNING

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.

WARNING

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

CAUTION

DO NOT use cleaning solvent, compressed air, or steam to clean lift chain sheaves or load rollers. The bearings in the lift chain sheaves and load rollers are sealed and lubricated. Cleaning solvent, compressed air, and steam can damage the load roller bearings.

2. Clean any oil, grease, dirt, and other debris from carriage frame. Use a cleaning solvent and compressed air to dry.

WARNING

Improper welding procedures can damage the structure of the mast or cause incorrect function of the mast. Consult a Resident Service Engineering through the Contact Management System before welding on the mast.

3. If carriage bars have any protruding welds or damaged notches, repair by grinding, filing, or welding.

4. Clean and inspect the chain anchors and chain anchor pins. Check chain anchors and anchor pins for wear and serviceability. Discard worn or unserviceable chain anchors and chain anchor pins. Discard used cotter pins. See Figure 10.

Install

1. Move the lift truck towards the carriage until inner mast is aligned with carriage rollers. If inner mast has been raised and secured using a crane and safety chains, connect the crane, raise inner mast, and remove safety chains. Carefully lower inner mast until it engages all of the load rollers. Disconnect the crane, if attached, and reconnect lift cylinders. See the Cylinder Repair manual listed in the General section of this manual for procedures.

2. Check the clearance of the load rollers. See Carriage Adjustments section for procedures.

NOTE: Use new cotter pins each time chain pins are removed.

3. Connect lift chains to chain anchors at the carriage. Install cotter pins in chain pins. Adjust lift chains as described in Lift Chains Adjustment.

4. Install load backrest on carriage. Tighten capscrews to 195 N•m (144 lbf ft).

5. Install forks. See Fork Replacement for procedures.

INTEGRAL SIDESHIFT CARRIAGE

Remove

1. Lower carriage completely. Remove forks. See Fork Replacement for removal procedures.

2. Remove four capscrews and load backrest from carriage. See Figure 9.

WARNING

Before disconnecting the hydraulic hoses, relieve the pressure in the hydraulic system. Serious injury can occur if pressure is not relieved from hydraulic system prior to disconnecting hydraulic hoses.

3. Relieve hydraulic pressure to the sideshift cylinder by moving sideshift lever in both directions several times.

WARNING

Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.

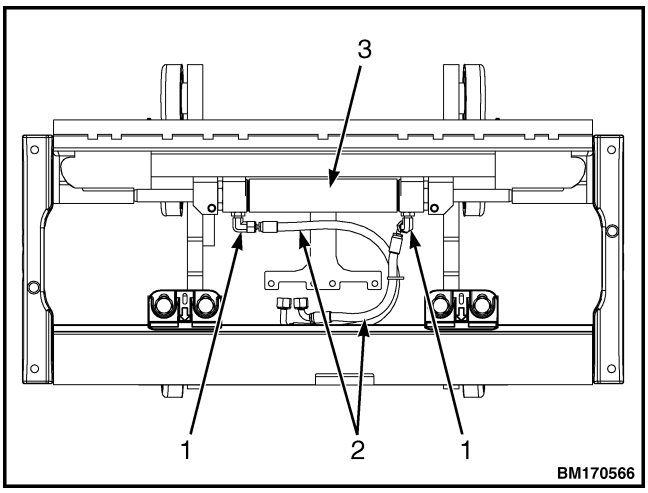
The hydraulic oil is hot at normal operating temperatures. Be careful when draining the oil.

WARNING

Never check for leaks by putting hands on hydraulic lines or components under pressure. Hydraulic oil under pressure can be injected into the skin.

NOTE: Tag hydraulic lines and fittings prior to disconnecting to aid in connecting during installation.

4. Disconnect hydraulic hoses from sideshift cylinder. Put caps and plugs on open lines and cylinder ports. See Figure 11.



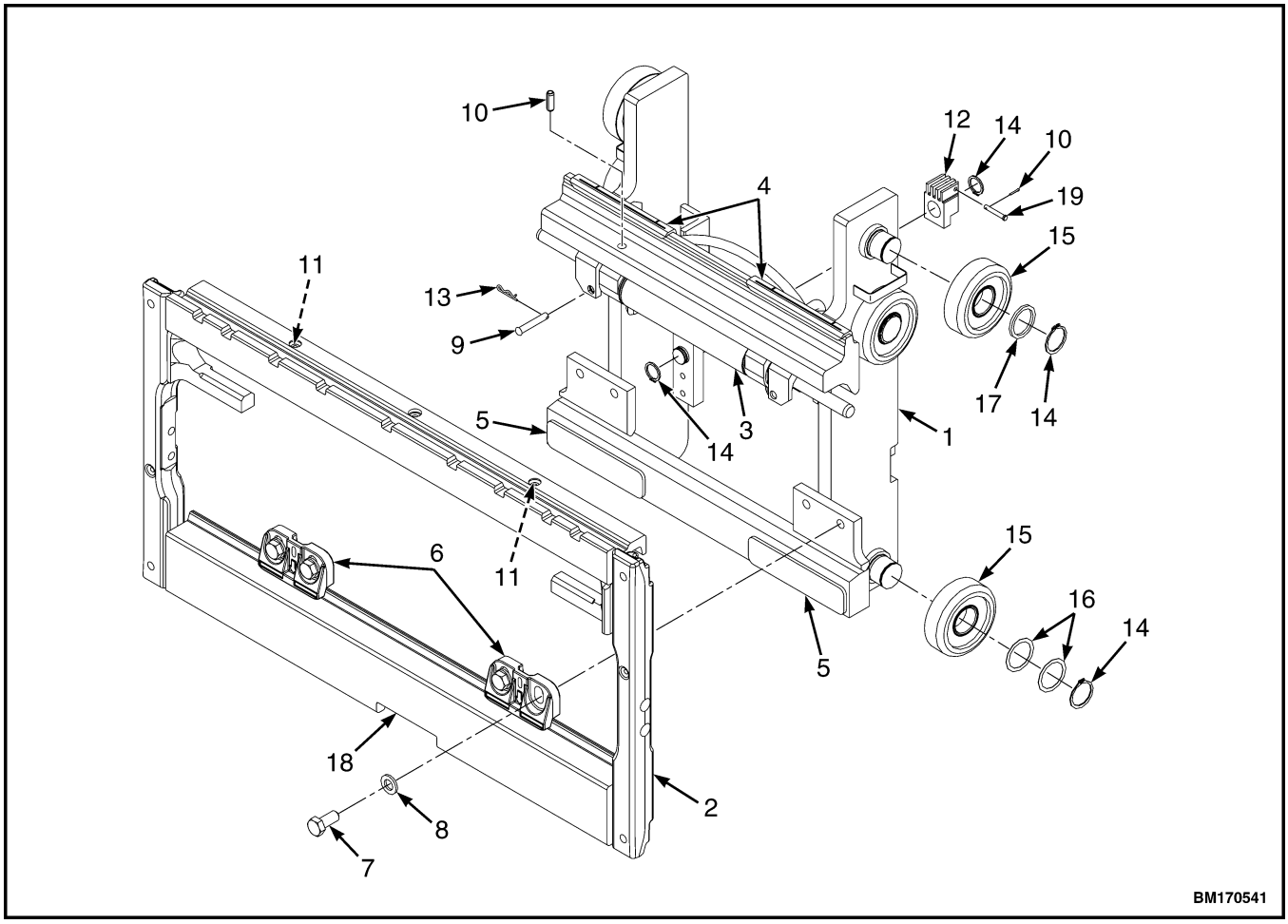
1. HOSE FITTINGS
2. HOSES
3. INTEGRAL SIDESHIFT CYLINDER

Figure 11. Integral Sideshift Carriage Hydraulic Hose Connections

5. Remove lower mounting hooks by removing four capscrews securing hooks. See Figure 12.

6. Remove integral sideshift cylinder from carriage. See the Cylinder Repair manual listed in the General section of this manual for procedures.

7. Insert a M12 x 1.75 lifting eye in hole on top of outer frame. Use a crane with a capacity of at least 78 kg (172 lb) to lift outer frame away from inner frame. Lay outer frame flat on a pallet or work bench. See Figure 13.

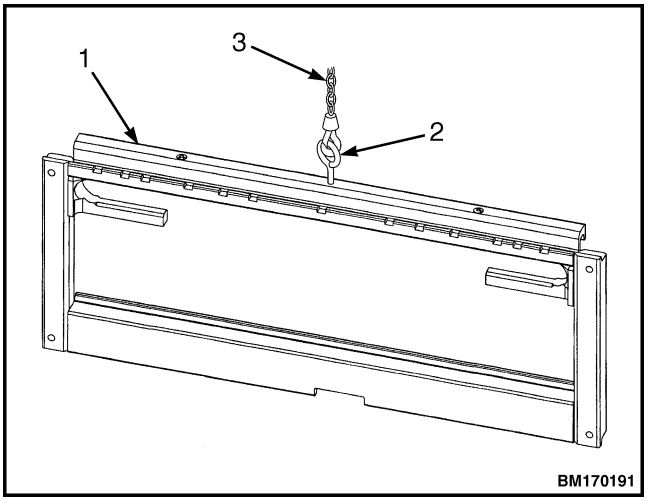


1. INNER FRAME
2. OUTER FRAME
3. SIDESHIFT CYLINDER
4. UPPER BEARING
5. LOWER BEARING
6. LOWER HOOK
7. CAPSCREW
8. WASHER
9. CLEVIS PIN
10. PIN
11. LUBE FITTING
12. CHAIN ANCHOR
13. COTTER PIN
14. SNAP RING
15. LOAD ROLLER
16. SHIMS
17. SPACER
18. FORK REMOVAL NOTCH
19. CHAIN ANCHOR PIN

Figure 12. Integral Sideshift Component Parts

Disassemble

1. Remove upper and lower bearings from inner frame. See Clean and Inspect section for procedures. See Figure 12.
2. If damaged, remove lube fittings from outer frame. See Figure 12.
3. Dissemble the integral sideshift cylinder. See the Cylinder Repair manual listed in the General section of this manual for procedures.



NOTE: OUTER FRAME SHOWN MAY BE DIFFERENT FROM WHAT IS ON YOUR LIFT TRUCK. HOWEVER, REMOVING THE OUTER FRAME FROM THE INNER FRAME IS THE SAME.

1. OUTER FRAME
2. LIFTING HOOK (M12 X 1.75)
3. LIFTING DEVICE

Figure 13. Remove Outer Frame

Clean and Inspect

1. Inspect lower mounting hooks for wear. Replace hooks if they are worn beyond the wear limit. The wear limit clearance range is 0.76 mm (0.03 in.) minimum and 1.52 mm (0.06 in.) maximum. See A in Figure 14.

CAUTION

Improper welding procedures can damage the structure of the mast or cause incorrect function of the mast. Consult your Hyster lift truck dealer for more information before welding on the mast.

2. Clean and inspect carriage bars for damage and smoothness. Ensure carriage bars are parallel and ends are flush. If carriage bars have any protruding welds or damaged notches, repair by grinding, filing, or welding.
3. Clean bearing areas. Inspect sideshift bearings for wear as follows:
   a. If either upper bearing is worn to less than 2.5 mm (0.1 in.) thickness, replace both upper bearings by driving the upper bearings from the inner frame.
   b. If either lower bearing is worn to less than 2.5 mm (0.1 in.) thickness, replace lower bearings by prying the lower bearings from the inner frame.
4. Inspect the sideshift cylinder. See Cylinder Repair manual listed in the General section of this manual for procedures.
5. Inspect load rollers for wear or damage. If load rollers must be replaced, make a note of the location and number of shims. Install shims, load rollers and snap rings. See section Carriage Adjustments for correct adjustment.

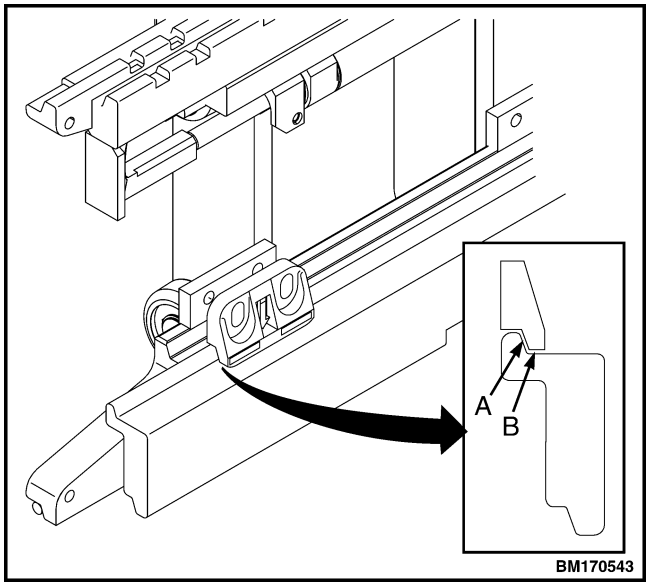
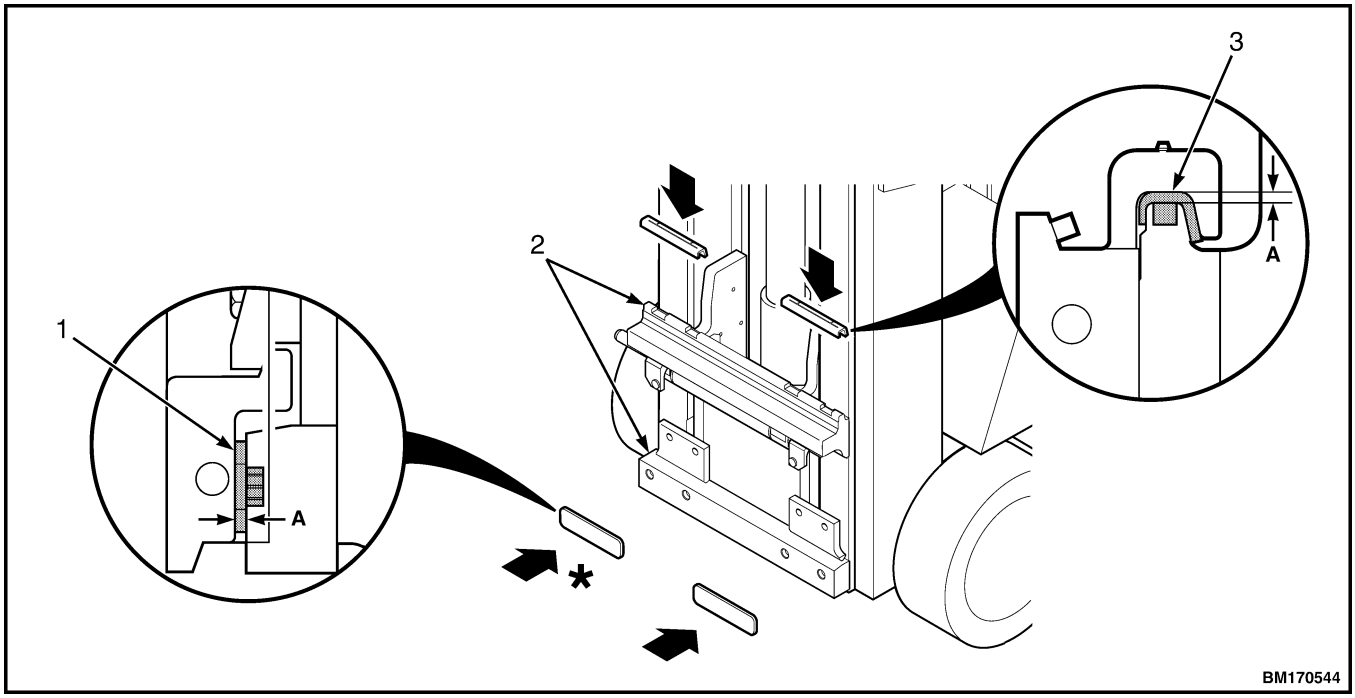


Figure 14. Lower Mounting Hook Wear Limit and Clearance Adjustment

Legend for Figure 14

A. WEAR LIMIT - 0.76 mm (0.03 in.) MINIMUM AND 1.52 mm (0.06 in.) MAXIMUM
B. CLEARANCE ADJUSTMENT - 0.76 mm (0.03 in.) MINIMUM AND 1.52 mm (0.06 in.) MAXIMUM



A. MINIMUM THICKNESS 2.5 mm (0.1 in.)

1. LOWER BEARINGS
2. CARRIAGE BARS
3. UPPER BEARINGS

*BOLD ARROWS INDICATE WHICH SIDE TO APPLY GREASE.

Figure 15. Checking Upper and Lower Bearings

Assemble

1. Assemble the integral sideshift cylinder. See the Cylinder Repair manual listed in the General section of this manual for procedures.
2. If lube fittings were removed, install new lube fittings into outer frame. See Figure 12.

NOTE: Use a wood block or a plastic hammer to fully seat upper bearings onto inner frame. Proper lower hook clearance requires the upper bearings be fully seated.

3. Apply a 1 mm (0.040 in.) layer of multipurpose grease to upper and lower bearing surfaces. Install upper and lower bearings into the inner frame. Bearings snap into place. See Figure 15.

Install

1. Install integral sideshift cylinder onto carriage. See Cylinder Repair manual listed in the General section of this manual for procedures.
2. Insert a M12 x 1.75 lifting eye in hole on top of outer frame. Use a crane with a capacity of at least 78 kg (172 lb) and install outer frame onto inner frame. See Figure 12.
3. Install lower mounting hooks using four capscrews. Tighten to 150 to 180 N•m (108 to 132 lbf ft). For proper sideshift operation, make sure there is 0.76 to 1.52 mm (0.03 to 0.06 in.) clearance between the bottom of the hooks and the outer frame. See B in Figure 14.
4. Connect hydraulic hoses, as noted during removal, to sideshift cylinder. See Figure 11.
5. Install load backrest to sideshift carriage. Tighten capscrews to 195 N•m (144 lbf ft). See Figure 9.
6. Install forks. See Fork Replacement section for procedures.

FORK POSITIONER CARRIAGE

Remove

NOTE: The fork positioner can be removed from the integral sideshift carriage with integral sideshift carriage on or off the mast. In the steps below, the fork positioner is removed with integral sideshift carriage on the mast. If integral sideshift carriage must be removed from mast first, go to Integral Sideshift Carriage in this section for procedures.

1. Remove forks. See Fork Replacement section for procedures.
2. Remove four capscrews and load backrest from carriage. See Figure 9.

WARNING

Before disconnecting the hydraulic hoses, relieve the pressure in the hydraulic system. Serious injury can occur if pressure is not relieved from hydraulic system prior to disconnecting hydraulic hoses.

WARNING

Always wear the proper protective equipment including eye protection and petroleum-resistant gloves when handling hydraulic oil. Thoroughly wash oil from exposed areas of skin as soon as possible.

WARNING

The hydraulic oil is hot at normal operating temperatures. Be careful when draining the oil.

Never check for leaks by putting hands on hydraulic lines or components under pressure. Hydraulic oil under pressure can be injected into the skin.

CAUTION

Protect the hydraulic system from dirt and contaminants when servicing the hydraulic system.

CAUTION

DO NOT bend tube assemblies during removal.

NOTE: Tag all hydraulic hoses, lines, and fittings prior to removal to aid in installation.

3. Disconnect and cap tube assemblies (8,Figure 16) from header hoses.

4. Remove capscrews and washers and remove lower hooks and bracket weldments from carriage. See Figure 17 and Figure 18.

5. Install an M12 x 1.75 lifting eye in tapped hole (7, Figure 17) on integral sideshift carriage and use lifting device, with a capacity of 92 kg (202 lb), to lift outer frame up. See Figure 13.

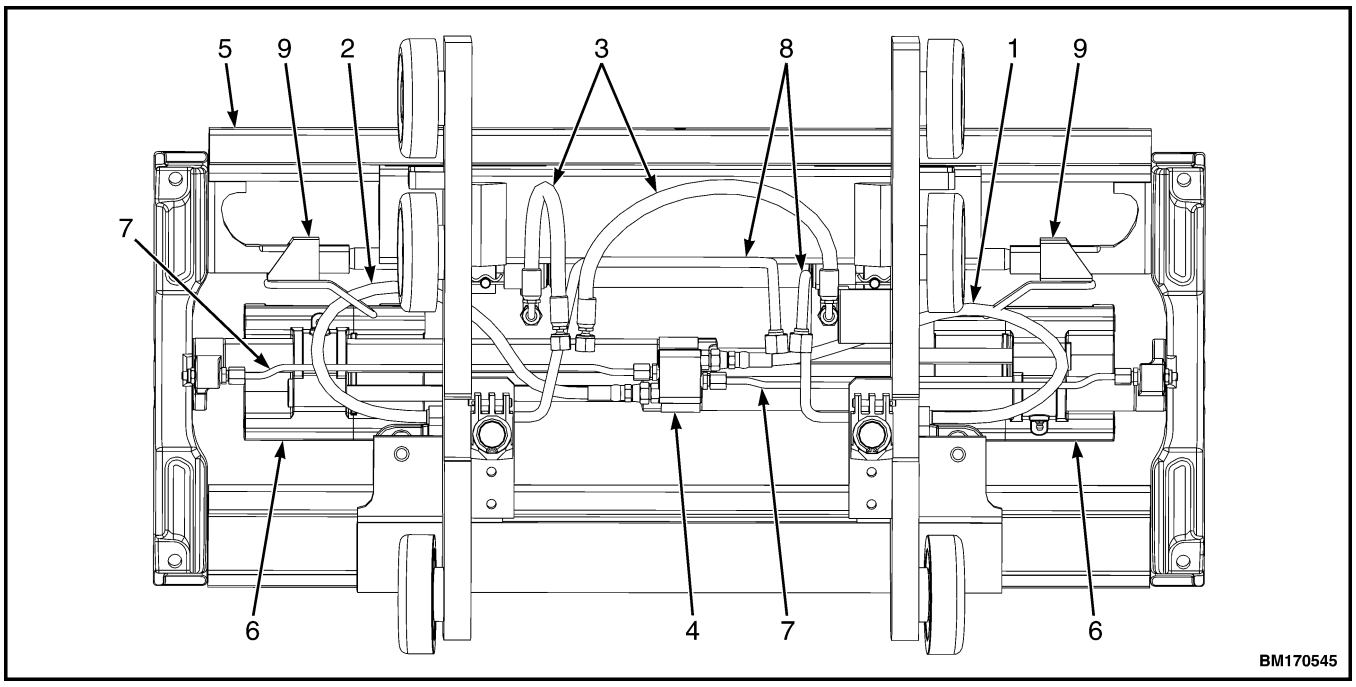
6. Disconnect relief tube assembly and hydraulic hoses (open and close) from fork positioner. See Figure 16.

NOTE: Make note of shims used to aid in reassembly.

7. Remove capscrews, lockwashers, and shims from integral sideshift carriage. See Figure 17.

8. Remove fork positioner from outer frame. See Figure 18.

For procedures to repair the fork positioner cylinder, see Cylinder Repair manual listed in the General section of this manual.



NOTE: BACK (DRIVER'S) VIEW SHOWN.

1. FORK POSITIONER HYDRAULIC HOSE (OPEN)
2. FORK POSITIONER HYDRAULIC HOSE (CLOSED)
3. INTEGRAL SIDESHIFT CARRIAGE HYDRAULIC HOSES
4. FORK POSITIONER
5. OUTER FRAME
6. FORK CARRIER
7. RELIEF TUBE ASSEMBLY
8. TUBE ASSEMBLY
9. HOSE GUIDE

Figure 16. Hydraulic Connections, Fork Positioner Cylinder