

**SERVICE REPAIR**

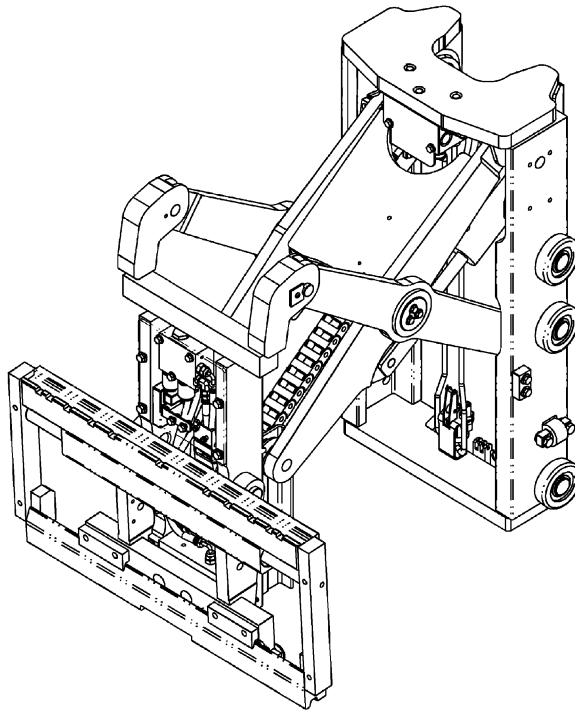
**MANUAL**

Hyster C264 (N45ZR, N35ZDR) Forklift

***HYSTER***

# REACH CARRIAGES

**N35ZDR, N45ZR [C264];**  
**N35ZDR2, N45ZR2 [D264];**  
**N30ZDR, N35-40ZR [D470];**  
**N35-40ZR2, N30ZDR2 [E470];**  
**N30ZDRS, N35-40ZRS [A265];**  
**N35-40ZRS2, N30ZDRS2 [B265]**



# ***HYSTER***

# 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:

(N35ZDR, N45ZR) [C264];  
(N35ZDR2, N45ZR2) [D264];  
(N30ZDR, N35-40ZR) [D470];  
(N35-40ZR2, N30ZDR2) [E470];  
(N30ZDRS, N35-40ZRS) [A265];  
(N35-40ZRS2, N30ZDRS2) [B265]

**Thanks very much for your reading,  
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## General

This section contains the descriptions and repair procedures for single-reach and double-reach carriages. Additional information can be found in the following sections:

For additional information on mast configurations, see Mast 4000SRM1195.

For additional information on hydraulic systems for models N35ZDR, N45ZR, N30ZDR, and N35-40ZDR, see the section Hydraulic System 1900SRM1189. For

additional information on hydraulic systems for models N30ZDRS and N35-40ZRS, see the section Hydraulic System 1900SRM1307.

For the recommended service intervals and regularly scheduled maintenance procedures, see the section Periodic Maintenance 8000SRM1197.

## Safety Procedures When Working Near Mast



### WARNING

All chains, ropes, and lifting equipment **MUST** be fully examined by qualified personnel at least once a year or more at frequent intervals according to the local conditions of use.



### WARNING

Mast parts are heavy and can shift. Distances between parts are small. Serious injury 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. Attach a **DO NOT OPERATE** tag to the control handle.
- **DO NOT** make repairs or adjustments unless specifically authorized to do so. Repairs and adjustments must be performed by trained service technicians.
- **DO NOT** climb on the mast or lift truck at any time. Use a ladder or personnel lift to work on the mast.
- Be careful of the forks. When the mast is raised, the forks can be at a height to cause an injury.
- Move the truck to a safe location with room to raise the mast if necessary. Block the wheels of the truck to prevent movement.

The forks may be difficult to see when the mast is raised. Be careful not to hit your head when working around raised forks. Also, be careful not to trip over forks on or near the floor. If possible, remove forks from carriage before safety chaining mast.

WHEN WORKING NEAR THE MAST, ALWAYS:

- Lower the mast and carriage completely. Make sure there is no movement in the mast. Make sure all parts of the mast, that can move, are fully lowered.

OR

- If the mast must be in a raised position for repairs, install a safety chain around the top or middle crossmember of the outer weldment and the crossmember of the inner weldment to secure the mast.



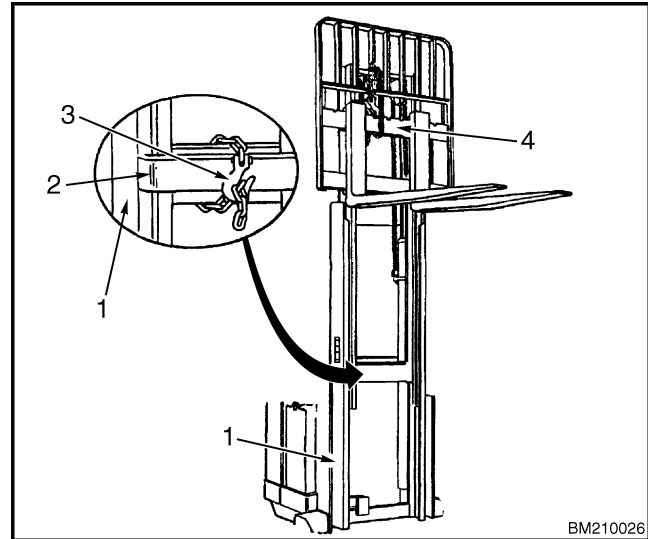
### WARNING

Perform the following step from the side of the mast using a ladder. Never stand under the carriage until safety chains are installed.

1. Remove forks from carriage if possible.
2. Raise mast to align bottom crossmember(s) of weldment(s) that move within the outer weldment with a crossmember on outer weldment. On the two-stage mast, the moving part is the inner weldment. On the three-stage mast, it is the intermediate weldment.

3. Wrap a safety chain, 9.5 mm (3/8 in.) minimum size, around crossmembers of inner and outer weldment. Secure it in place. See Figure 1.
4. Lower mast until safety chain stops mast. Make sure there is no movement of mast.
5. Turn key switch to OFF, disconnect battery, and place a DO NOT OPERATE tag on control handle head.
6. Wrap a second safety chain, 9.5 mm (3/8 in.) minimum size, around crossmembers of inner and outer weldment. Secure it in place as an additional precaution.

**NOTE:** The mast operator guard **MUST** be removed to install safety chain. Remove safety chain and install guard **AFTER** repairs are complete.



1. OUTER MAST WELDMENT
2. INNER MAST LOWER CROSSMEMBER
3. SAFETY CHAIN
4. CARRIAGE

**Figure 1. Safety Chain the Mast**

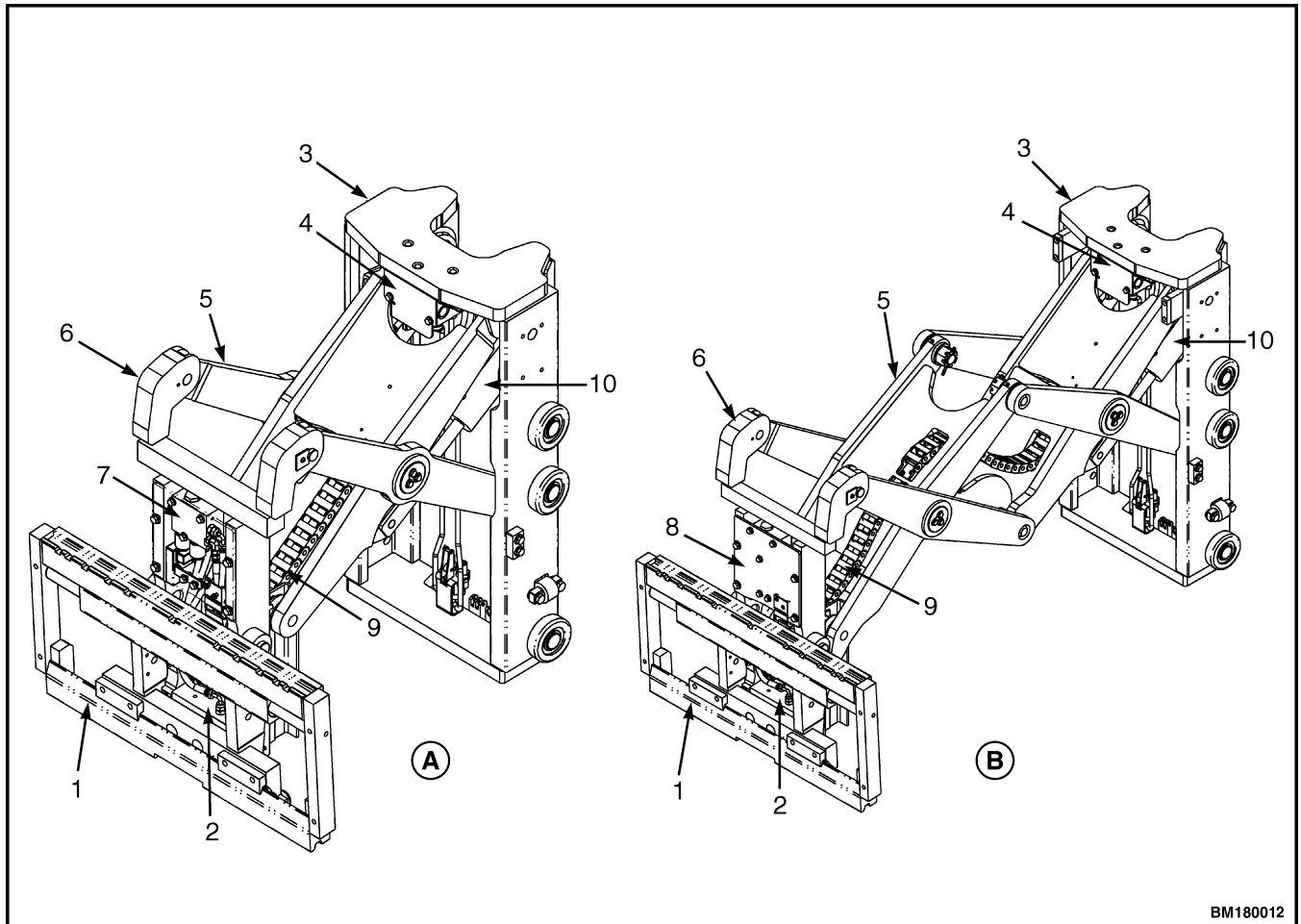
## Description

The reach carriages are used to extend the forks of the carriage. There are two types of reach carriages. There is a single-reach carriage with one set of scissor arms. The other carriage has two sets of scissor arms for double reach. See Figure 2. Both carriages have a tilt cylinder to tilt the forks. Each carriage is available with sideshift function. Refer to Figure 9 and Figure 10. The rear and front frame assemblies are connected by a scissor linkage. The top of the scissor arm weldment is fastened to the top of the rear frame by pins located within the rear frame assembly. The top of each scissor arm at the front frame is fastened by pins located at the top of the front frame assembly. On double reach

units, the ends of each set of scissor arms and scissor arm weldments are fastened together by studs with bushings. The bushings permit the arms to pivot. Large bearings at the center pivot of each scissor arm assembly also permit the linkage to pivot. Refer to Figure 11 and Figure 15.

**NOTE:** The reach assembly can be removed from the mast assembly with the load backrest and forks attached. The three-stage mast assemblies can also be removed with the reach assembly installed. Perform only those procedures necessary for repair.





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**A. SINGLE-REACH CARRIAGE**

**B. DOUBLE-REACH CARRIAGE**

- 1. FORK CARRIAGE
- 2. TILT CYLINDER
- 3. REAR FRAME ASSEMBLY
- 4. REAR SELECTOR VALVE
- 5. SCISSOR ARMS

- 6. FRONT FRAME ASSEMBLY
- 7. FRONT SELECTOR VALVE
- 8. VALVE COVER PLATE
- 9. HOSE AND WIRING GUIDE
- 10. REACH CYLINDER

**Figure 2. Reach Carriage Assembly (Major Components)**

## Repair - General

**NOTE:** Most repairs of the reach carriage can be done without removing the carriage from the mast. These repair procedures require that the carriage is installed in the mast and the scissor arms are fully extended.

### WARNING

The reach carriage can fall or tip easily and cause an injury when not installed in the mast. If the reach carriage cannot be installed in a mast during repair, make sure the rear frame is fastened to a support that cannot move. The rear frame must be in the same position as it is in the mast. The rear frame must also be fastened so that it cannot move on the support. The support must be strong enough to allow full extension of the reach carriage without tipping.

### 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.

### CAUTION

Make sure the lift truck is in a location that is level and has access to a crane or other lifting device before doing any repairs on the reach carriage.

**NOTE:** It is usually not necessary to completely disassemble the reach carriage. Do only the steps of the procedures necessary to make the required repairs.

Read and follow the Safety Procedures When Working Near Mast in this section, as well as all WARNINGS and CAUTIONS.

## Load Backrest

### REMOVE

#### WARNING

The load backrest is heavy and can cause an injury. Remove using a lifting device.

1. Use a hoist to secure the load backrest in position.
2. Remove the four capscrews and lockwashers that fasten the load backrest to the carriage frame.
3. Lift the load backrest off the carriage frame.

### INSTALL

#### WARNING

The load backrest is heavy and can cause an injury. Install using a lifting device.

1. Raise the load backrest into position using the lifting device.
2. Align the holes in load backrest with the mounting holes in the carriage frame, and install the four capscrews and lockwashers.
3. Torque the capscrews to 102 N•m (75 lbf ft).

## Forks

### REPLACEMENT

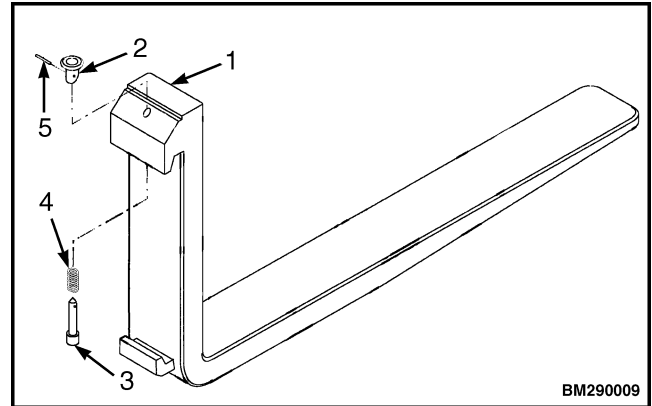
#### WARNING

Forks are heavy and can cause an injury. **DO NOT** try to remove forks without using a lifting device.

The forks are connected to the fork carriage by hooks. Spring-loaded latch pins, installed in the top fork hooks, extend into slots on the top crossmember of the carriage to hold the forks in position. See Figure 3.

## Remove

1. Pull the latch pin and turn it 180 degrees to lock the pin in a retracted position.
2. Slide the fork to the fork removal notch located in the center of the bottom crossmember of the fork carriage.
3. Place a wooden block under the tip of the fork and tilt the carriage forward. The bottom hook of the fork will move through the fork removal notch.
4. Using a lifting device and a sling, raise the fork so the top hook of the fork is disengaged from the top crossmember. Remove the fork from the carriage.



- |               |           |
|---------------|-----------|
| 1. FORK       | 4. SPRING |
| 2. BUTTON CAP | 5. PIN    |
| 3. LATCH PIN  |           |

**Figure 3. Forks**

## Install

1. Make sure the latch pin is locked in a retracted position.
2. Using a lifting device, move the fork or carriage so the top hook on the fork engages the top crossmember of the fork carriage.
3. Raise the carriage or lower the fork to move the lower hook through the removal notch.
4. Slide the fork on the carriage so both upper and lower hooks are engaged and the latch pin aligns with a notch.
5. Release the latch pin and check that it properly engages in a top bar notch.

## Reach Carriage Assembly

### REMOVE

**NOTE:** The following steps outline the procedures for removing the reach carriage assembly from a mast, which is installed to a lift truck.

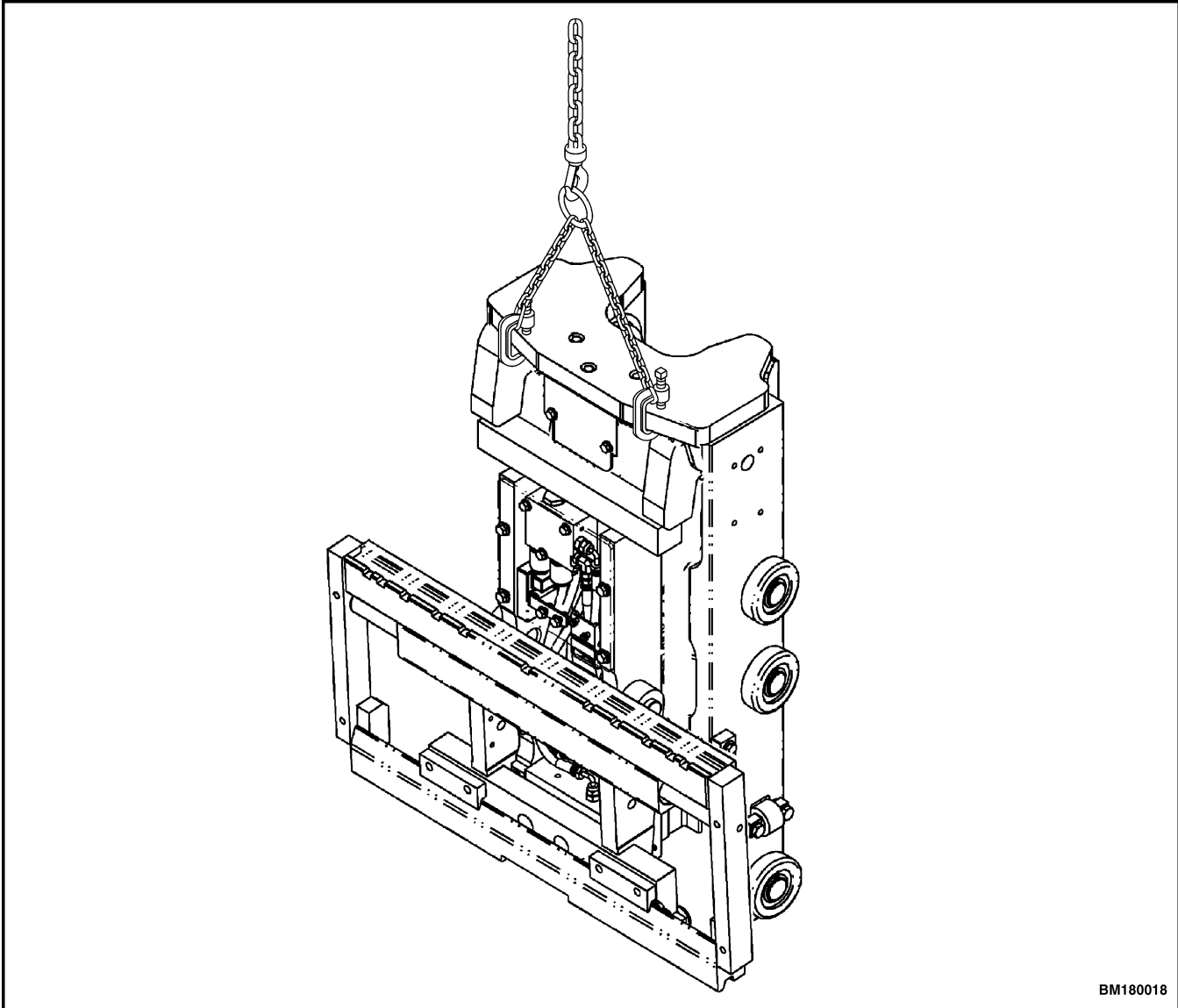
1. Remove the forks. See Forks.
2. Remove the load backrest. See Load Backrest.
3. Remove the hardware securing the operator guard from the rear of the mast, and remove the operator guard.



### WARNING

Reach carriage assemblies are heavy. Be sure that all lifting devices are suitable and of adequate capacity to lift the components.

4. Attach an overhead lifting device to the top of the reach carriage assembly:
  - a. Install heavy-duty, industrial C-clamps to each side of the rear frame. See Figure 4.



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**Figure 4. Install C-Clamps to Rear Frame**

- b. Ensure clamps are secure before lifting the reach carriage assembly.
  - c. Install a chain loop or sling through each clamp separately, and attach each loop to the overhead lifting device.
5. Raise the reach carriage assembly high enough to access the hydraulic connections and wiring harness mounting plate on the rear frame.
  6. Safety chain the reach carriage assembly in place. See Safety Procedures When Working Near Mast.
  7. Disconnect the lift chains from the reach carriage assembly:
    - a. Remove the cotter pin and chain anchor pin securing the chain to the anchors.
- NOTE:** Make sure lift chains, wiring, and hoses are secured out of the way so they do not interfere with reach assembly removal procedures.
- b. Secure chains to the mast using stiff wire to keep them from falling from the sheaves.

- c. If the mast must be disassembled or the chains need to be cleaned/lubricated, remove the lift chains and inspect and clean.
- 8. Tag and disconnect the attachment hoses from the two fittings at bottom of the rear frame of the reach carriage assembly. Cap or plug all open hydraulic hoses.
- 9. Remove the plate securing the reach wiring harness to the top of the rear frame. Disconnect the wiring connector.
- 10. Remove the safety chains and completely lower the reach carriage assembly to the floor.

**WARNING**

**Mast assemblies are heavy. Be sure that all lifting devices are suitable and of adequate capacity to lift the components.**

**NOTE:** Use a second lift truck or overhead lifting device to move the reach carriage assembly.

- 11. Attach an overhead lifting device to the top of the inner mast. Raise the inner mast until clearly higher than the reach carriage assembly. Move the reach carriage assembly away from the lift truck and completely lower the mast.
- 12. Disconnect the lifting device from the reach carriage assembly.

**INSPECT**

- 1. Inspect the rollers for excessive wear or damage. Rollers with visible flat spots or cracks should be replaced.
- 2. Inspect the load roller bearings and thrust roller bearing by turning the rollers on their shafts. Rollers with roughness or noticeable restrictions to turning must be replaced.

**WARNING**

**Welding repairs to the reach carriage assembly or mast must be factory approved by Hyster® before the repair is performed. Written instructions out-**

**lining specifications and welding techniques will be provided upon approval to ensure the structural integrity and safety of the repair.**

- 3. Inspect all welds between the reach carriage assembly side plates and the carriage fork bars. If any welds are cracked, repair or replace the damaged components as necessary.
- 4. Inspect the roller stub shafts. If they are damaged or if there are cracks at the base of the stub shafts, repair or replace the damaged components as necessary.
- 5. Inspect the chain anchor mounts for wear or damage.
- 6. Inspect the lift chains for wear or damage. If removed, clean and lubricate. See Lift Chains.

**NOTE:** The side rollers must be adjusted while the reach carriage assembly is removed from the mast.

- 7. 6.9 Mast Only (N30ZDRS and N35-40ZRS) - Adjust the side rollers. See Adjust Side Rollers and Load Rollers.

**INSTALL**

**NOTE:** Use a second lift truck or overhead lifting device to move the reach carriage assembly.

- 1. Position the reach carriage assembly in an upright position in front of the mast. Align the load rollers on the rear frame of the reach carriage assembly with the inner mast.

**WARNING**

**Mast assemblies are heavy. Be sure that all lifting devices are suitable and of adequate capacity to lift the components.**

**NOTE:** Use an overhead lifting device of suitable capacity to raise the inner mast when installing the reach carriage assembly. Use second lift truck to position the reach carriage assembly if the first truck is not mobile.

- 2. Raise the inner mast until clearly higher than the reach carriage assembly. Position the reach carriage assembly so the load rollers on the rear frame are centered within the channels of the inner mast.

3. Lower the inner mast channels onto the load rollers of the rear frame. If the inner mast does not lower smoothly and completely, raise the inner mast, reposition the reach carriage assembly, and lower the inner mast again.

**WARNING**

Reach carriage assemblies are heavy. Be sure that all lifting devices are suitable and of adequate capacity to lift the components.

4. Attach an overhead lifting device to the top of the reach carriage assembly:
  - a. Install heavy-duty, industrial C-clamps to each side of the rear frame. See Figure 4.
  - b. Install a chain loop or sling through each clamp separately, and attach each loop to the overhead lifting device.
5. Raise the reach carriage assembly high enough to access the hydraulic connections and wiring harness mounting plate on the rear frame.
6. Safety chain the reach carriage assembly in place. See Safety Procedures When Working Near Mast.

**CAUTION**

If reusing chains, make sure chains have been properly inspected, cleaned, and lubricated. See Lift Chains.

7. Reconnect the lift chains to anchors on reach carriage assembly as removed. Install anchor pins and cotter pins.
8. Connect the wiring connector and install the mounting plate to the top of the rear frame.
9. Remove caps/plugs from the attachment hoses and fittings. Reconnect the hoses as removed.
10. Remove the safety chains and completely lower the reach carriage assembly.
11. Remove the C-clamps and lifting device from the reach carriage assembly.
12. Raise and lower the mast several times to remove air from the system. Cycle the sideshift function and the tilt function several times to remove air from the circuit. Check for proper operation.
13. Check the hydraulic oil level and add as required.
14. Check reach carriage assembly height and alignment and adjust the lift chains as required. See Reach Assembly Adjustments.
15. Install the load backrest. See Load Backrest.
16. Install the forks. See Forks.
17. Install the operator guard as removed.

## Reach Carriage Assembly Repair

**NOTE:** Most repairs of the reach carriage assembly can be done without removing the reach carriage assembly from the mast. These repair procedures require that the reach carriage assembly is installed in the mast and the scissor arms are fully extended.



### **WARNING**

The reach carriage assembly can fall or tip easily and cause an injury when not installed in the mast. If the reach carriage assembly cannot be installed in a mast during repair, make sure the rear frame is fastened to a support that cannot move. The rear frame must be in the same position as it is in the mast. The rear frame must also be fastened so it cannot move on the support. The support must be strong enough to allow full extension of the reach carriage assembly without tipping.



### **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.



### **CAUTION**

Make sure the lift truck is in a location that is level and has access to a crane or other lifting device before doing any repairs on the reach carriage assembly.

It is usually not necessary to completely disassemble the reach carriage assembly. Do only the steps of the procedures necessary to make the required repairs.

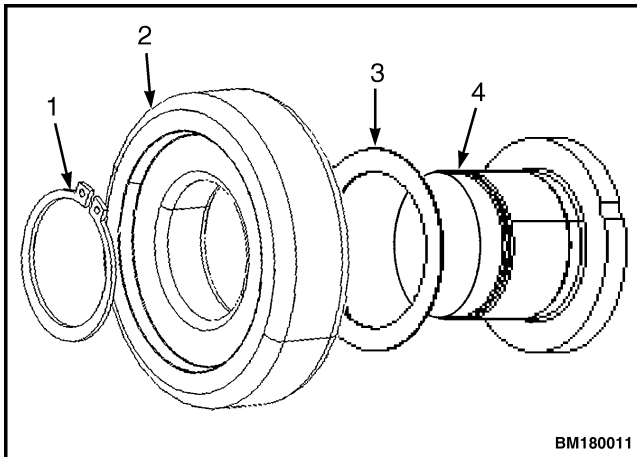
## Load Rollers Repair

1. Remove the rear frame from the mast as required to remove and install the load rollers. See Reach Carriage Assembly.

### WARNING

Be careful when removing or installing snap rings. Snap rings can eject during removal or installation with enough force to cause an injury. Always use the proper snap ring pliers and wear eye and face protection during removal or installation.

2. Remove the snap rings from the load rollers. See Figure 5.

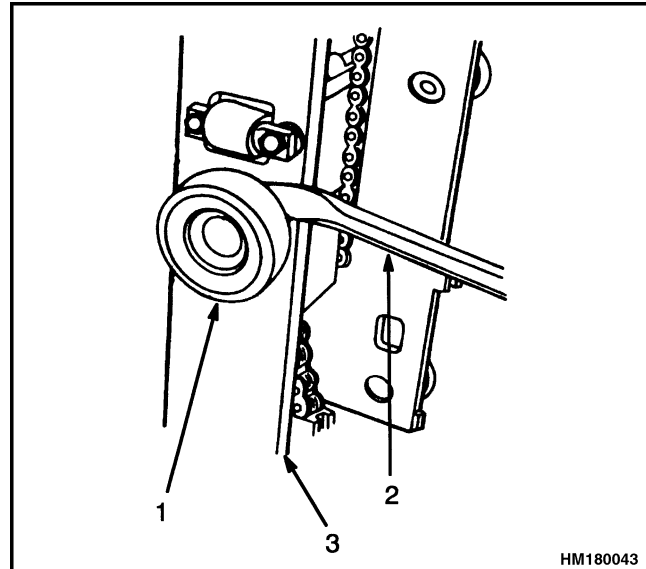


- |                |               |
|----------------|---------------|
| 1. SNAP RING   | 3. SPACER     |
| 2. LOAD ROLLER | 4. STUB SHAFT |

**Figure 5. Load Roller Assembly**

**NOTE:** Lightly pry the load roller from the stub shaft if necessary. See Figure 6.

3. Remove the load roller from the stub shaft. Replace as necessary.



1. LOAD ROLLER (WITH SNAP RING REMOVED)
2. PRY BAR
3. REAR FRAME

**Figure 6. Removing Load Roller (6.9 Mast)  
(N30ZDRS and N35-40ZRS)**

**NOTE:** Tag and identify the shim packs for each roller.

4. Remove the shims from the stub shaft.
5. Use a cloth to clean each load roller. Inspect the load rollers for cracks, flat spots, or bearings that do not turn freely. Replace any roller that shows wear or is damaged.



## Side Rollers Repair (6.9 Mast Only) (N30ZDRS and N35-40ZRS)

1. Remove the reach carriage assembly from the mast to adjust or replace the side rollers. See Reach Carriage Assembly.

**NOTE:** Make note of the position of the shims. Shim requirements should be similar to the previous requirements.

2. Remove the capscrews, shim packs, and washers that secure the side roller bracket.
3. Inspect and replace all damaged or worn parts.

### CAUTION

Correct placement of shims is critical for the operation of the reach carriage assembly. Unless the shims are installed correctly, the reach carriage assembly will not operate properly.

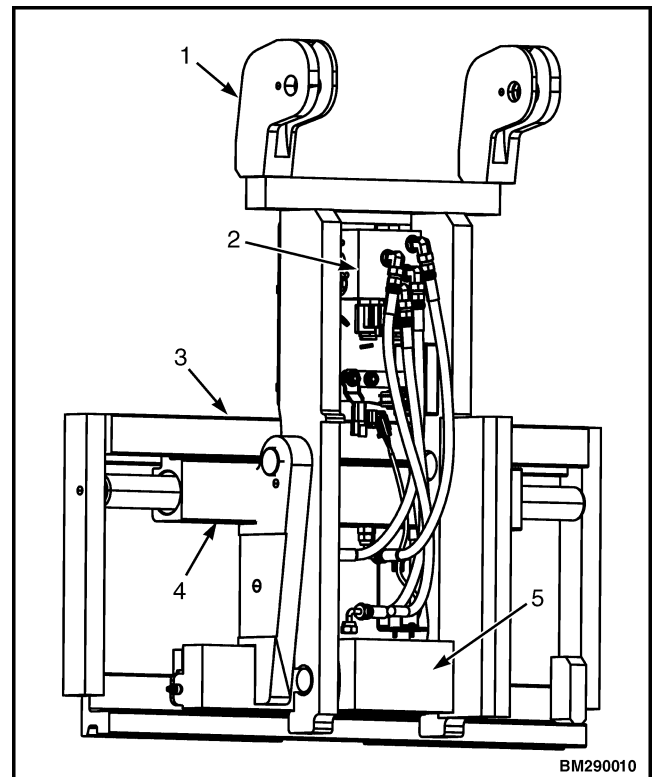
4. Install the side rollers using shim packs, washers, and capscrews.
5. Measure and adjust the side rollers as necessary. See Reach Assembly Adjustments.
6. Install the reach carriage assembly to the mast.

## Reach Assembly Front Frame

### REMOVE

**NOTE:** It is not necessary to remove the reach carriage assembly from the mast to service the front frame.

The front frame is located at the front of the reach carriage assembly and is attached to the outer end of the scissor arms. The assembly consists of a tilting frame, a fixed frame with tilt cylinder, and front selector valve hydraulics. See Figure 7. When equipped with optional sideshift, a movable fork carriage and the sideshift cylinder are included.



1. FIXED FRAME
2. SELECTOR VALVE
3. FORK CARRIAGE
4. SIDE SHIFT CYLINDER
5. TILT CYLINDER

*Figure 7. Front Frame Assembly*

### WARNING

There are pinch points on the reach carriage assembly that can cause an injury. Use clamps and blocks to prevent the scissor arms from moving. Install the clamps and blocks at the channels of the rear frame to make sure the load bearings cannot move in the channel. See Figure 8.

**NOTE:** Use safety chains on the rear frame and mast weldments to keep the reach carriage assembly and mast weldments from moving. Install the safety chains as described in Safety Procedures When Working Near Mast in this section.

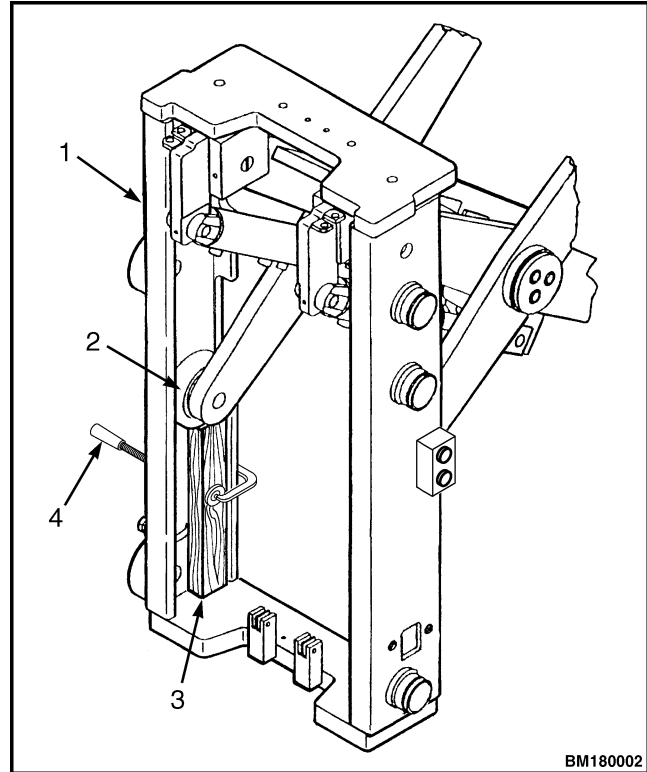
**NOTE:** Make sure the reach carriage assembly is in the fully-extended position. The front frame should be removed with the forks removed.

1. Remove the forks and the load backrest. Refer to Load Backrest and Forks.
2. Extend the reach fully and install blocks and clamps inside the channels of the rear frame to make sure the load rollers cannot move in the channel. See Figure 8.
3. Tag and disconnect the hydraulic lines from the hose guide at the valve. Cap or plug the hydraulic lines and valve ports to prevent dirt from entering the system. Make note of the location of all cable ties for replacement during installation. Disconnect the sideshift cylinder hydraulics if equipped. See Sideshift Cylinder, Repair.
4. Tag and disconnect the wire connectors from the hose guide.
5. Connect an overhead lifting device (crane) to the top of the front frame.
6. Remove the screws that retain the pivot pins in the front frame to the inner scissor arms. Remove the pivot pins.
7. Use the crane to lift the front frame high enough to allow the inner scissor arm rollers to come out of the bottom of the front frame channels. Move the front frame away from the lift truck and place it face down on the floor.

### DISASSEMBLE (WITH SIDESHIFT)

For the following procedures, refer to Figure 9.

1. Orient front frame assembly with roller guides down and secure the unit.
2. Remove the selector valve. Refer to Front Selector Valve.

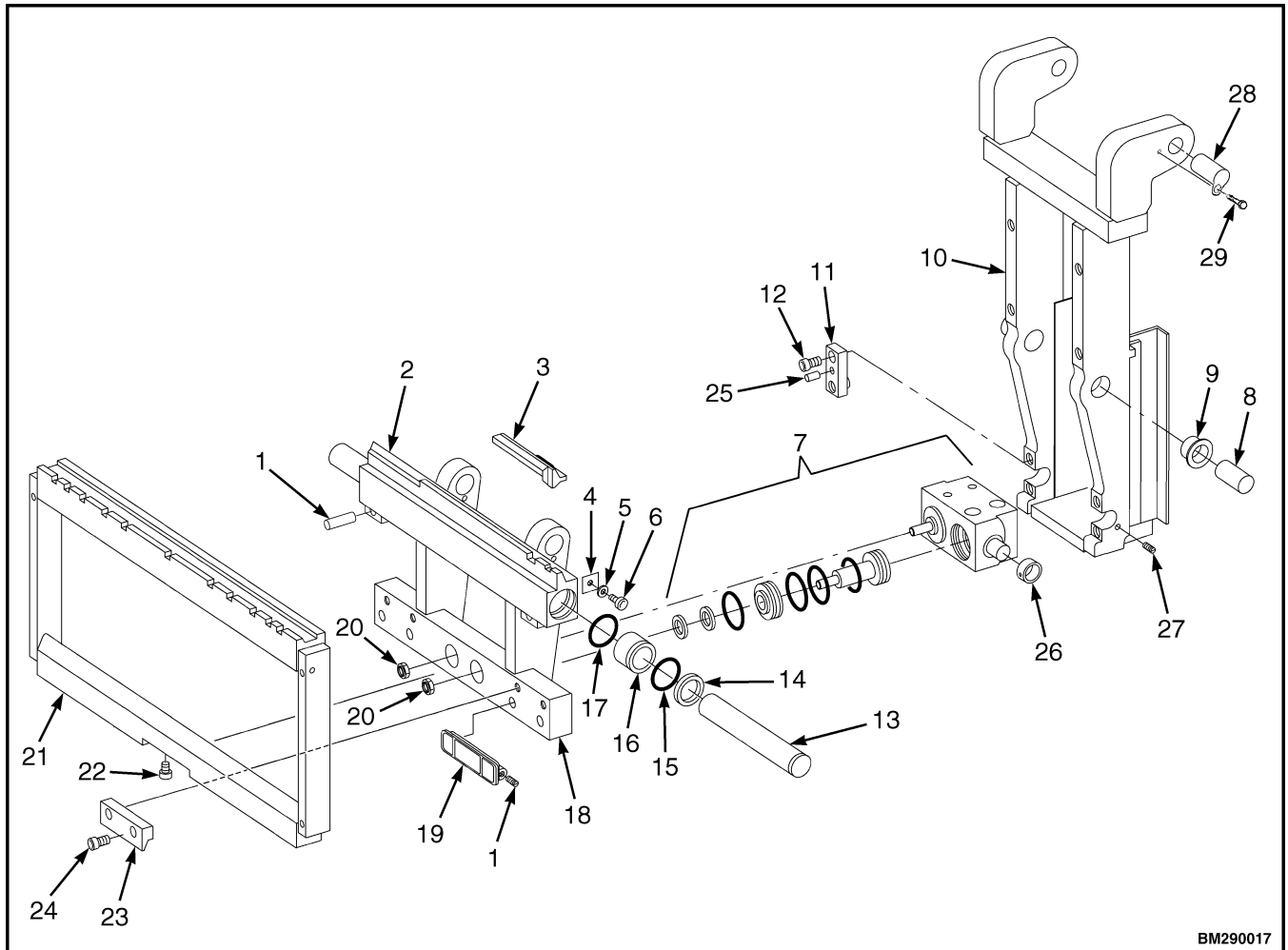


1. REAR FRAME ASSEMBLY
2. LOAD BEARING
3. WOOD BLOCK
4. CLAMP

**Figure 8. Blocking the Rear Frame**

3. Remove tilt cylinder nuts (20).
4. Remove brackets and capscrews (24) from the fork carriage.
5. Remove fork carriage.
6. Remove wear strips (2, 3, and 19).
7. Remove capscrews (6), washers (5), and retainer plates (4) from each side of tilting frame.
8. Use a punch to remove pins (8) from each side of tilting frame.
9. Remove tilting frame from fixed frame.

- 10. Remove bushings from fixed frame.
- 11. Disassemble sideshift cylinder only if needed for service. See Sideshift Cylinder.
- 12. Remove trunnion caps, capscrews (12), and pins (25) from each side of tilt cylinder.
- 13. Remove tilt cylinder.
- 14. Remove bushings from tilt cylinder.
- 15. Disassemble tilt cylinder only if repair is necessary. See Tilt Cylinder.



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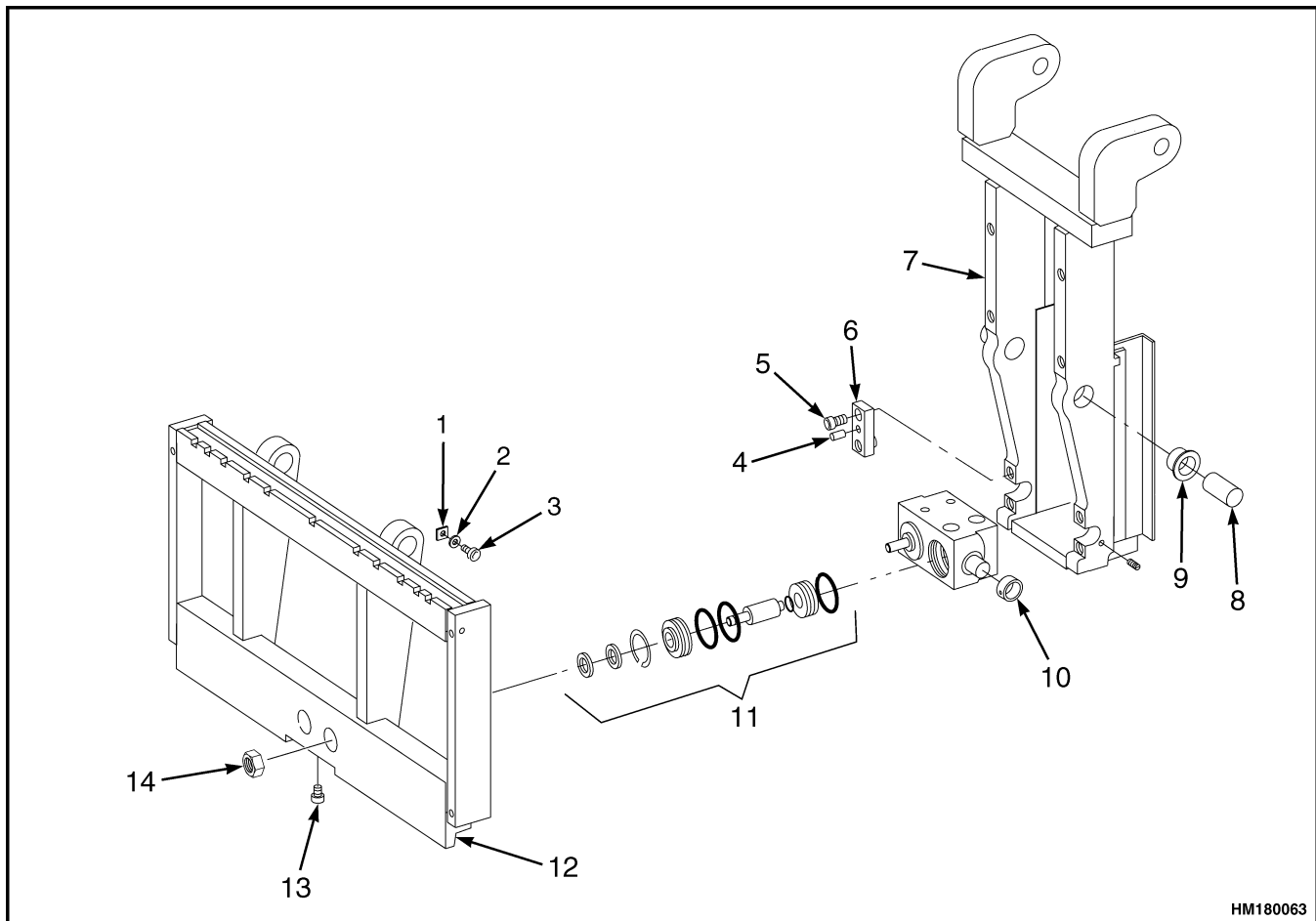
- |                   |                   |                       |
|-------------------|-------------------|-----------------------|
| 1. LUBE FITTING   | 11. TRUNNION CAP  | 21. FORK CARRIAGE     |
| 2. WEAR STRIP     | 12. CAPSCREW      | 22. CAPSCREW          |
| 3. WEAR STRIP     | 13. ROD           | 23. BRACKET           |
| 4. RETAINER PLATE | 14. WIPER         | 24. CAPSCREW          |
| 5. LOCKWASHER     | 15. SEAL          | 25. PIN               |
| 6. CAPSCREW       | 16. SLEEVE        | 26. BUSHING           |
| 7. TILT CYLINDER  | 17. SEAL          | 27. LUBE FITTING      |
| 8. PIVOT PIN      | 18. TILTING FRAME | 28. PIVOT PIN         |
| 9. BUSHING        | 19. WEAR STRIP    | 29. RETAINER CAPSCREW |
| 10. FIXED FRAME   | 20. NUT           |                       |

Figure 9. Front Frame With Sideshifter

**DISASSEMBLE (WITHOUT SIDESHIFT)**

For the following procedures, refer to Figure 10.

1. Orient front frame assembly with roller guides down and secure the unit.
2. Remove the selector valve. Refer to Front Selector Valve.
3. Remove nuts from tilt cylinder. See Figure 10.
4. Remove capscrews (3), washers (2), and retainer plate (1) from each side of tilting frame.
5. Use a punch to remove pivot pins (8) from each side of tilting frame.
6. Remove tilting frame from fixed frame.
7. Remove bushings from fixed frame.
8. Remove tilt cylinder trunnion caps, capscrews (5), and pin (4).
9. Remove tilt cylinder. Remove bushings from tilt cylinder.
10. Disassemble tilt cylinder if repair is necessary. See Tilt Cylinder.



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- |                    |                 |                   |
|--------------------|-----------------|-------------------|
| 1. RETENTION PLATE | 6. TRUNNION CAP | 11. TILT CYLINDER |
| 2. LOCKWASHER      | 7. FIXED FRAME  | 12. TILTING FRAME |
| 3. CAPSCREW        | 8. PIVOT PIN    | 13. CAPSCREW      |
| 4. PIN             | 9. BUSHING      | 14. NUT           |
| 5. CAPSCREW        | 10. BUSHING     |                   |

**Figure 10. Front Frame Without Sideshifter**

**CLEAN AND INSPECT****WARNING**

Cleaning solvents can be flammable and toxic and can cause skin irritation. Always wear the proper protective equipment including eye protection and petroleum resistant gloves when handling. Always follow the recommendations of the manufacturer.

**CAUTION**

**DO NOT** use steam to clean the load bearings. **DO NOT** use compressed air or immerse in solvent to clean the bearings. The bearings are sealed and permanently lubricated. Wipe bearings off with a clean cloth and turn to check for proper operation. Replace if movement is restricted or if bearing does not turn smoothly.

Clean all of the parts of the front frame with solvent. Dry the parts with compressed air. Inspect the parts of the front frame for damage and wear. Replace all bushings.

**ASSEMBLE (WITH SIDESHIFT)**

For the following procedures, refer to Figure 9.

1. Assemble tilt cylinder if necessary. See Tilt Cylinder.
2. Install tilt cylinder bushings and install tilt cylinder to fixed frame.
3. Install trunnion cap and hardware (12 and 25) to tilt cylinder.
4. Assemble sideshift cylinder (13 through 17) if disassembled. Refer to Sideshift Cylinder Repair.
5. Install bushings to fixed frame if removed.
6. Position tilting frame to fixed frame. Use a prybar to align pivot pin holes.
7. Install pivot pins (8) through tilting frame into fixed frame. Secure using pin-retaining hardware (4, 5, and 6).

8. Install wear strips (2, 3, and 19) to tilting frame.
9. Install fork carriage to tilting frame.
10. Install brackets and hardware (24) to fork carriage.
11. Install tilt cylinder nuts (20) as removed.
12. Install the selector valve. Refer to Front Selector Valve.
13. Install load backrest. See Load Backrest section.
14. Install forks. Refer to Forks.

**ASSEMBLE (WITHOUT SIDESHIFT)**

For the following procedures, see Figure 10.

1. Install bushings to fixed frame if removed.
2. Assemble tilt cylinder if necessary. See Tilt Cylinder.
3. Install tilt cylinder bushings and install tilt cylinder to fixed frame.
4. Install tilt cylinder trunnion cap and hardware (4 and 5).
5. Position tilting frame to fixed frame. Align pivot pin holes using a prybar.
6. Install pivot pins (8) through the tilting frame into the fixed frame. Secure in place using pin-retaining hardware (1, 2, and 3).
7. Install tilt cylinder nuts as removed.
8. Install the selector valve if removed. Refer to Front Selector Valve.
9. Install load backrest. See Load Backrest section.
10. Install forks. Refer to Forks.

**INSTALL****WARNING**

The points between the scissor arms and the front frame is a pinch point and can cause an injury. **DO NOT** put any part of your body between these assemblies. Use a screwdriver or other tool to move the bearing blocks or assemblies into the correct positions.

1. Use multipurpose grease to lubricate the bushings on the inner and outer scissor arms. Use multipurpose grease to lube the bottom bearings in the channel at the bottom of the front frame.

2. Use a crane to lift the front frame. Align the front frame with the outer scissor arms. Install the pivot pins that retain the inner scissor arms to the front frame.
3. Install the brackets and hardware to retain the pivot pins.

**NOTE:** The reach carriage assembly must be installed on the mast before starting.

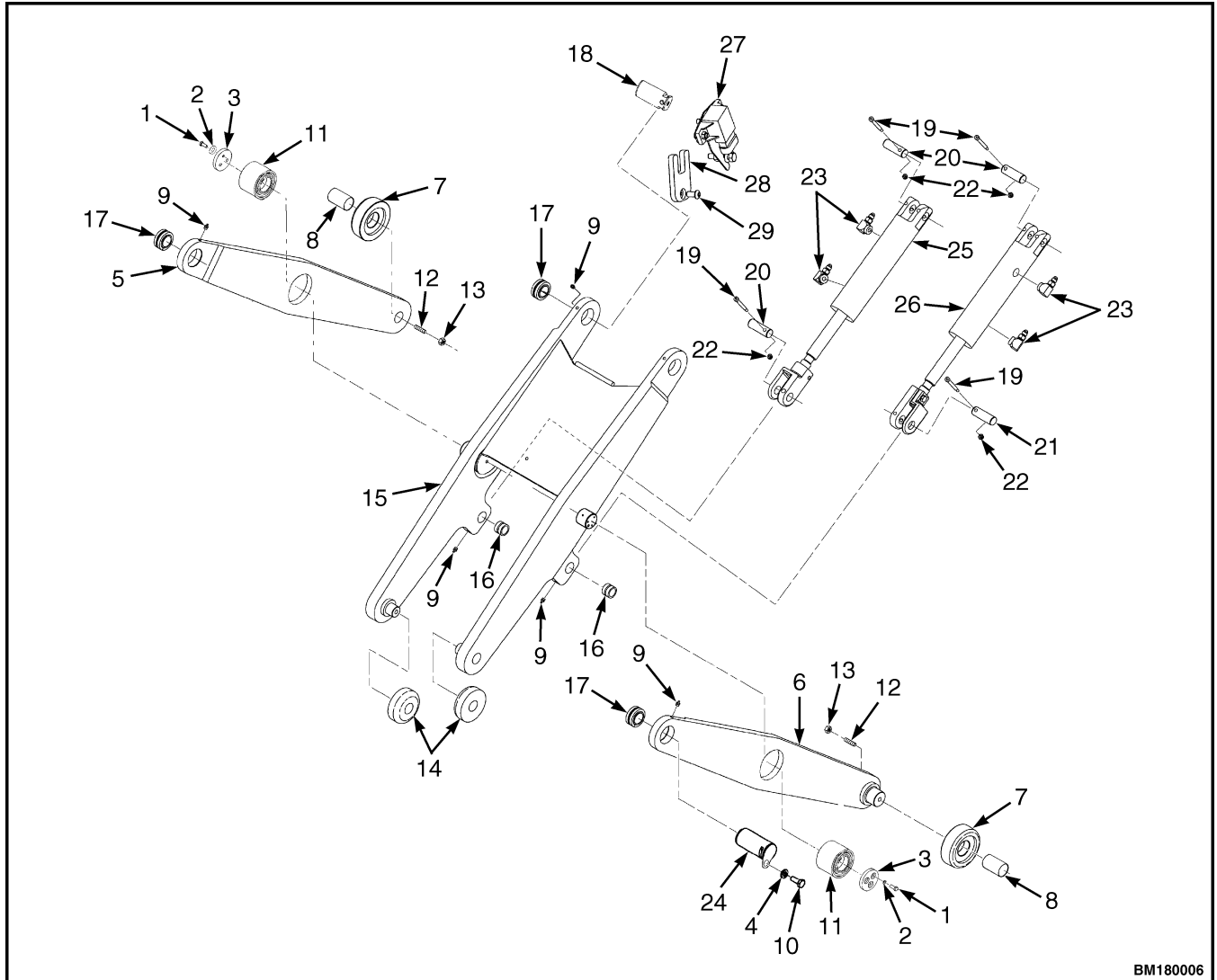
4. After all hydraulic lines are connected, operate the functions to check for leaks and correct operation. Remove the air from the system and adjust the stroke of the tilt cylinder as described in Reach Assembly Adjustments.
5. Install the forks and load backrest as removed. See Forks and Load Backrest.

## Single-Reach Scissor Arms

**REMOVE AND DISASSEMBLE**

**NOTE:** The reach assembly must be in the fully-extended position.

The following procedures refer to removing the scissor arms from the rear frame. See Figure 11.



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- |                           |  |
|---------------------------|--|
| 1. CAPSCREW               | 16. BUSHING  |
| 2. BELLEVILLE WASHER      | 17. BUSHING  |
| 3. BEARING CAP            | 18. PIVOT PIN  |
| 4. WASHER                 | 19. SHOULDER BOLT  |
| 5. RH OUTER SCISSOR ARM   | 20. PIN  |
| 6. LH OUTER SCISSOR ARM   | 21. PIN  |
| 7. LOAD ROLLER AND SHIM   | 22. NUT  |
| 8. WEAR PLUG              | 23. 90° HYDRAULIC FITTING                                |
| 9. LUBE FITTING           | 24. PIN  |
| 10. CAPSCREW              | 25. RH CYLINDER ASSEMBLY                                 |
| 11. BEARING               | 26. LH CYLINDER ASSEMBLY                                 |
| 12. SETSCREW              | 27. POSITION SENSOR (N35ZDR, N45ZR,<br>N30ZDR, N35-40ZR) |
| 13. JAM NUT               | 28. BRACKET  |
| 14. LOAD ROLLER AND SHIMS | 29. CAPSCREW   |
| 15. INNER SCISSOR ARM     |  |

Figure 11. Single-Reach Scissor Arms

 **WARNING**

There are pinch points on the reach carriage assembly that can cause an injury. Use clamps and blocks to prevent the scissor arms from moving. Install the clamps and blocks at the channels of the rear frame to make sure that the load rollers cannot move in the channel. See Figure 8.

Be careful when removing or installing snap rings. These snap rings are large and 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.

**NOTE:** Use safety chains on the rear frame and mast weldments to keep the rear frame and mast weldments from moving. Install the safety chains as described in Safety Procedures When Working Near Mast in this section.

1. Remove the front frame. Secure the cable guide at the rear frame to avoid damage.
2. Remove the hydraulic components from the reach carriage assembly as required.
3. Use a crane to support the inner scissor arm. Securely attach chains or slings to the arm so that it cannot slip. Be careful not to damage the hose mount sheaves.

 **WARNING**

The points between the scissor arms and the rear frame are pinch points and can cause an injury. **DO NOT** put your hands near pinch points when removing the pivot pins. Use a hammer and brass drift to remove the pins.

4. Remove the shoulder bolt and nut from the reach cylinder pins. Use a drift to drive out the cylinder rod end pins attaching the reach cylinders to the inner scissor arm. Use wire to hold each reach cylinder and their hoses in position when the pins are removed. Remove the bushings from the mounts.

 **WARNING**

The load rollers and scissor arms can move and cause an injury when the clamps and blocks at the load rollers are removed. Make sure the crane is in a position to prevent movement of the scissor arms as the clamps and blocks are removed.

5. Carefully remove the clamps and blocks at the load rollers on the channels of the rear frame. Carefully move the scissor arms to align the load rollers with the removal notch in the rear frame. Raise the crane to move the load rollers out of the rear frame.

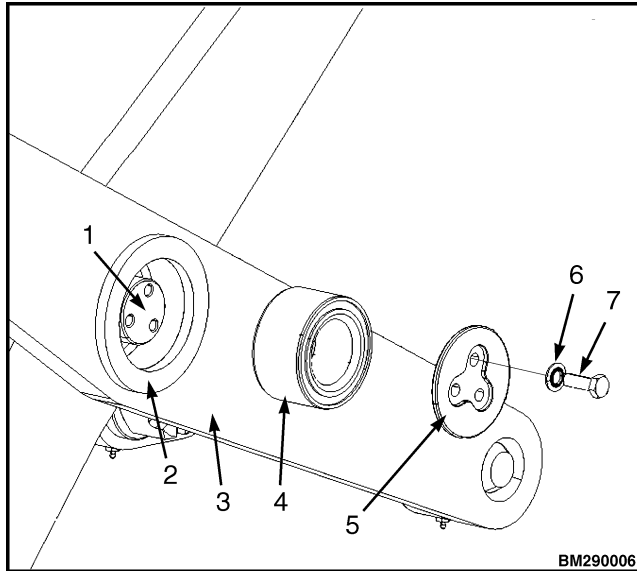
 **WARNING**

The scissor arms are heavy and can cause an injury if allowed to fall. Have another person help you support the scissor arm during removal and installation.

**NOTE:** Install labels identifying scissor arm component locations and orientation for correct installation.

6. Remove the three capscrews, lockwashers, and end plate at the center pivot. Hold the outer scissor arm and carefully slide it and the bearing off the stub shaft. Remove the bearing assembly and spacer. Repeat for the other side. See Figure 12.





1. STUB SHAFT
2. SPACER
3. LH OUTER SCISSOR ARM
4. BEARING ASSEMBLY
5. BEARING RETAINER CAP
6. BELLEVILLE WASHER
7. CAPSCREW

**Figure 12. Outer Arm and Bearing Assembly**

**NOTE:** Tag and identify each shim pack and the load roller. When new load rollers are installed, the shim arrangement will normally be the same or similar.

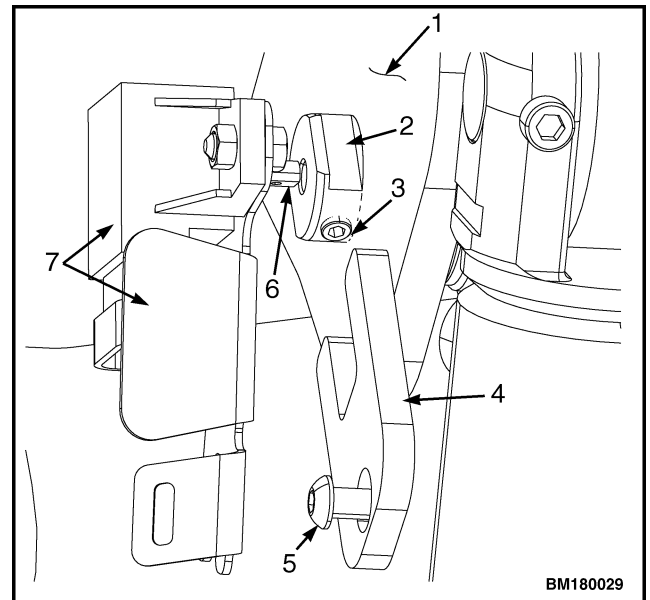


### WARNING

The points between the scissor arms and the rear frame are pinch points and can cause an injury. **DO NOT** put hands near pinch points when you remove the pins. Use a hammer and brass drift to remove the pivot pins.

7. Models N35ZDR, N45ZR, N30ZDR, and N35-40ZR have a position sensor mounted to the right side inner scissor arm pivot pin at the rear frame. Remove the position sensor as follows:

- a. Disconnect the wiring harness, carefully clip the wire tie, and remove the capscrew and spacer securing sensor bracket to the rear frame. The sensor can now be turned, but the sensor shaft should still be attached to the pivot pin. See Figure 13.



1. INNER SCISSOR ARM
2. PIVOT PIN
3. SETSCREW
4. PIN RETAINER
5. SCREW
6. SENSOR SHAFT (FLAT TOWARD SETSCREW)
7. POSITION SENSOR AND BRACKET

**Figure 13. Position Sensor**

- b. Remove the screw securing the pin retainer to the scissor arm and slide the pin retainer from behind the sensor.
  - c. A setscrew in the pivot pin (behind the sensor) secures the sensor shaft to the pivot pin. Loosen the setscrew and slide the position sensor from the pivot pin.
8. Remove the pivot pins from the inner scissor arms using a hammer and a brass drift. Remove the inner scissor arms from the rear frame. Remove the bushings from the inner arms if replacement is necessary.

## CLEAN AND INSPECT



### WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. Always wear the proper protective equipment including eye protection and petroleum resistant gloves when handling. Always follow the recommendations of the manufacturer.



### CAUTION

**DO NOT use steam to clean sealed bearings. DO NOT use compressed air or immerse in solvent to clean sealed bearings. Sealed bearings are self-contained and permanently lubricated. Wipe bearings off with a clean cloth and turn to check for proper operation. Replace if movement is restricted or if bearing does not turn smoothly.**

Clean all of the parts of the scissor arm assembly with solvent. Inspect the parts of the scissor arm assembly for damage and wear. Replace all bushings and load rollers.

## ASSEMBLE AND INSTALL

Always use new bushings and load rollers. Install a thin coat of multipurpose grease on all new bushings, all thrust washers, all shims, all stub shafts, and all pins of the scissor arm assembly. For the following procedures, refer to Figure 11.



### WARNING

**Use safety chains on the rear frame and mast weldments to keep the rear frame and mast weldments from moving. Install the safety chains as described in Safety Procedures When Working Near Mast in this section.**

**The points between the scissor arms and the rear frame are pinch points and can cause an injury. DO NOT put your hands near pinch points when removing the pivot pins. Use a hammer and brass drift to remove the pivot pins.**

1. Install the bushings to inner scissor arm if removed. Using an overhead lifting device (crane), raise inner scissor arm to align the mounts with the mounts of the rear frame. Install both pivot pins, the LH pin retainer, and screw to secure.
2. Install position sensor to right pivot pin as removed:
  - a. Check that the pin retainer hole aligns with mounting hole in scissor arm. Adjust to align if necessary. **DO NOT** install the pin retainer at this time. See Figure 13.
  - b. Remove the setscrew from the pivot pin and clean old thread-lock residue from the threads. Apply Loctite® 242 to the threads and start screw into the pivot pin.
  - c. Position the sensor assembly to the pivot pin so that the sensor shaft enters the pin with the flat side of the shaft facing the setscrew. Tighten the setscrew.
  - d. Install the pin retainer onto the pivot pin and secure in place with screw as removed.
  - e. Align the sensor and mounting bracket hole and install capscrew and spacer.
  - f. Install wiring connector and secure harness to bracket with new wire tie as removed.

### WARNING

The scissor arms are heavy and can cause an injury if allowed to fall. Have another person help you support the scissor arm during removal and installation. NEVER put any part of your body between the parts of the scissor arm assembly.

**NOTE:** Move the outer scissor arm when tightening the capscrews to make sure the bearings seat properly.

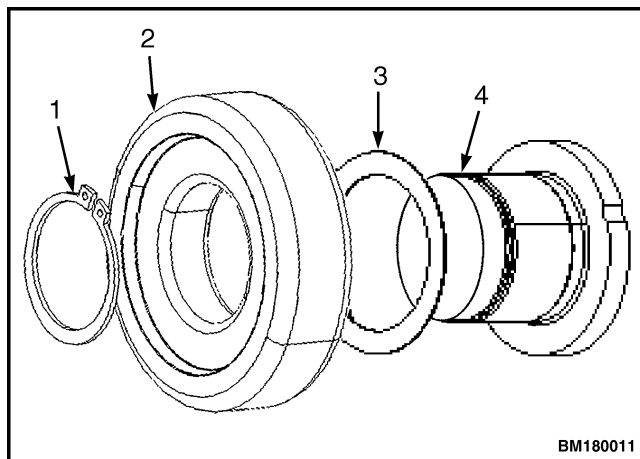
3. Install the bearing assembly onto the left hand stub shaft of the inner scissor arms. Install the left hand outer scissor arm over the bearing assembly. Install the bearing cap, and align the holes with the stubshaft holes. Apply Loctite® 290 and install three capscrews and belleville washers. Tighten the three capscrews to snug, then tighten each capscrew incrementally to maintain even pressure on the bearing until each of the belleville washers are flattened. When the belleville washers are flat, the capscrews are properly tightened.

### CAUTION

**DO NOT** let the load rollers or shims fall off the scissor arms.

**NOTE:** Correct placement of shims is critical for the operation of the reach mechanism. Unless the shims are installed correctly, the reach mechanism will not operate.

4. Install the shim sets and load rollers on each outer scissor arm as marked during removal and disassembly. Install snap rings onto stub shafts to secure. See Figure 14.
5. Use the crane to slowly raise the scissor arms to align the load rollers with the removal notches in the rear frame. Use the crane to move the scissor arm assembly so the load rollers move into the channels.
6. Slowly raise the scissor arm assembly to align the mounts with the rod ends of the reach cylinders. Install the bushings, pins, and shoulder bolt to fasten the reach cylinders to the inner scissor arm. See Figure 21.



- |                |               |
|----------------|---------------|
| 1. SNAP RING   | 3. SHIM(S)    |
| 2. LOAD ROLLER | 4. STUB SHAFT |

*Figure 14. Load Roller Assembly*

### WARNING

The scissor arms are heavy and can cause an injury if allowed to fall. Have another person help you support the scissor arm during removal and installation. NEVER put any part of your body between the parts of the scissor arm assembly.

### CAUTION

**DO NOT** let the load rollers or shims fall off the scissor arms.

7. Install the shims and load rollers on the inner scissor arm weldment as marked during removal and disassembly. If necessary, use tape to keep the load rollers on the scissor arms. Install the hoses on the hose sheaves, and install the hose sheaves and snap rings at the mount of the scissor arm weldment. Refer to Figure 14.
8. Install the front frame as removed.

## Double-Reach Scissor Arms

### DISASSEMBLE

The entire scissor assembly may not need to be disassembled to make repairs. Perform only the steps necessary to safely complete the necessary repairs. For the following procedures, refer to Figure 15.

#### WARNING

There are pinch points on the reach carriage that can cause an injury. Use clamps and blocks to prevent the scissor arms from moving. Install the clamps and blocks at the channels of the rear frame to make sure that the load rollers cannot move in the channel. See Figure 8.

Be careful when removing or installing snap rings. These snap rings are large and 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.

**NOTE:** Use safety chains on the rear frame and mast weldments to keep the rear frame and mast weldments from moving. Install the safety chains as described in Safety Procedures When Working Near Mast in this section.

1. Remove the front frame as described in Reach Assembly Front Frame. Remove the snap rings and hose sheaves at the scissor arm weldments. Fasten the cable and hoses at the rear frame so they are not damaged.
2. Remove the hydraulic components from the reach carriage assembly as required.
3. Use a crane to support scissor arm weldment A. Securely attach chains or slings to the weldment so that it cannot slip. Be sure not to damage the hose mount sheaves.
4. Install the clamps and blocks at the channels of the rear frame to make sure the load rollers cannot move in the channel and the scissor arms cannot retract. See Figure 8.

#### WARNING

The points between the scissor arms and the rear frame are pinch points and can cause an injury. **DO NOT** put your hands near pinch points when removing the pivot pins. Use a hammer and brass drift to remove the pins.

5. Remove the shoulder bolt and nut from the reach cylinder pins. Use a drift to drive out the cylinder rod end pins attaching the reach cylinders to the inner scissor arm. Use wire to hold each reach cylinder and their hoses in position when the pins are removed. Remove the bushings from the mounts. See Figure 21.
6. Remove the cotter pin, castle nut, and washer from the threaded shaft on the bottom pivot points of outer scissor arms D and C. See Figure 15.

#### WARNING

The scissor arms are heavy and can cause an injury if allowed to fall. Have another person help you support the scissor arm during removal and installation.

7. Remove the three capscrews, lockwashers, end cap, and the spacer at the center pivot for outer scissor arm D. Hold outer scissor arm D and slide it and the bearing assembly off the stub shaft. Remove the bearing at the center pivot. Remove scissor arm C following this same procedure.