OPERATING INSTRUCTIONS

OPERATING INSTRUCTIONS-GENERAL

Before attempting to operate this truck, carefully read and understand these operating procedures.

Make sure the truck is in proper operating condition. Visually inspect the entire truck for any damage that may have occurred during shipment.

NOTE: Throughout this manual the terms right, left, front and rear relate to the viewpoint of an operator riding on the truck facing the forks.

Familiarize yourself with the information contained on the capacity plate which is located on the battery compartment cover. Information on this capacity plate is shown in Figure 1-1 and as follows:

A. **Serial Number**

This is an identification number assigned to this particulartruck and should be used when ordering service parts or when requesting any information from your Yale industrial truck dealer. The serial number is a six digit number preceded by a letter and is stamped on the lift truck frame and on the nameplate.

B. Model Code

The model number and the serial number should be used when requesting information. An explanation of the model code is located on Page B of this manual.

C. Truck Weight

This is the approximate weight of the truck without a load on the forks. This weight plus the weight of the load to be moved must be considered when operating on elevated floors or elevators.

D. Capacity Rating

This rating shows the maximum load capacity of this truck. Personal injury and damage to the truck can occur if the capacity rating is exceeded.

This truck meets all applicable mandatory requirements of ANSI B56.1 Safety Standard for Powered Industrial Trucks at the time of manufacture. In addition, these trucks are classified by Underwriters' Laboratories, Inc. and/or approved by Factory Mutual Engineering Corporation for the type designation. Consult UL Index of Classified Products and FM Approval Guide.

No additions, omissions or modifications should be made that will affect compliance to the previously stated requirements or in any way minimize the effectiveness of the safety devices.

Safety and informational labels are located in conspicuous locations on this truck and should be strictly followed. Check the capacity plate of each truck before operation. These safety and informational labels must be replaced immediately if missing or defaced. Labels will vary with type of truck and equipment installed. Refer to the Parts Manual for part number and location for all labels.

NOTICE TO USER

The U.S.A. Occupational Safety and Health Act of 1970 and other national safety codes require a new plate if this unit is equipped other than as stated on plate. Obtain the correct plate from your authorized dealer.

If a truck is shipped incomplete from the factory, the capacity plate will be covered by the label shown above. Do not operate the lift truck until you obtain a complete capacity plate from your Yale industrial truck dealer.

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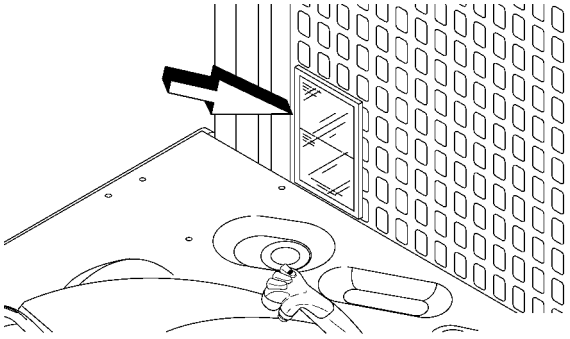


Figure 1-11 -Operating Manual

SAFE MAINTENANCE PROCEDURES

Your Yale industrial truck, as manufactured, meets all the applicable mandatory requirements of the American National Safety Standard for Powered Trucks -ANSI B56.1, Part I I.

All standard trucks conform to the Underwriters Laboratories requirements forthe type designation shown on the nameplate. The truck is also equipped with certain safety devices as standard equipment. For example, all high lift trucks are equipped with a load backrest extension and high lift rider trucks with an operator's overhead guard.

No additions, omissions, or modifications should be made that will affect compliance to the above requirements or in any way reduce the effectiveness of the safety devices.

The following instructions have been prepared for your safety and the safety of your fellow workers during maintenance operations and should be strictly followed. Carefully read and understand the maintenance procedures before attempting to repair the truck. When in doubt of any maintenance procedure, contact your local Yale industrial truck dealer.

1. When necessary to work with mast in a raised position, install a safety chain to restrain moving parts. Connect moving parts to a part that does not move.

2. The Recommended Schedules of Maintenance should be used as a guide for inspection of the truck.

3. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect the truck.

4. The work area should be properly ventilated. Keep shop clean and floor dry.

5. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level of electrolyte. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

6. Raise the lift truck only if it is on a solid level floor. Disconnect the battery. Use solid, one-piece blocks or other positive truck positioning devices to support the truck. Chock the wheels to prevent movement of the truck.

7. Before removing any component from the truck, such as counterweights, mast assembly, drive unit, etc., make surethat the lifting mechanism and slings are of the proper capacity and in good condition.

8. When working on the hydraulic system, be sure the truck is turned **off, battery** is disconnected, mast is lowered, and the hydraulic pressure is relieved in hoses and tubes.

9. Brakes, steering mechanisms, control mechanisms, warning devices, guards, and safety devices should be inspected regularly and maintained in a safe operating condition.

10. All parts of lift and tilt mechanisms and frame members should be carefully and regularly inspected and maintained in a safe operating condition.

11. All hydraulic systems should be regularly inspected and maintained in conformance with the maintenance schedules. Lift cylinders, valves, and other similar parts should be checked to assure that "drift" has not developed to the extent that it would create a hazard.

12. Special trucks or devices designed and approved for hazardous area operation should receive special attention to ensure that maintenance preserves the original approved safe operating features.

13. Modifications and additions which affect capacity and safe truck operation should not be performed by the customer or user without the manufacturer's prior written approval. Operation and maintenance instruction plates

TANDEM LOAD WHEELS

Removal-Tandem Load Wheels

NOTE: The load wheels are held in place by the load wheel brackets. For easier installation, remove and install one load wheel before removing the next load wheel.

1. Put the lift truck on blocks as described in HOW TO PUT THE LIFT TRUCK ON BLOCKS, Section 1, this manual.

2. Remove the axle nut, axle shaft, washers, bearings, and load wheel. Remove the axle sleeve from the load wheel.

Installation-Tandem Load Wheels

1. Pack the new load wheel with the recommended grease listed in the LUBRICATION SCHEDULE, this section. Install the new load wheel, axle shaft, axle sleeve, bearings, washers and axle nut. See Figure 2-6.

NOTE: On lift trucks used in freezer applications, apply the recommended Anti-Seize Lubricant listed in the LUBRICATION SCHEDULE, this section, to the load wheel axle shaft.

2. Remove the blocks from under the lift truck.

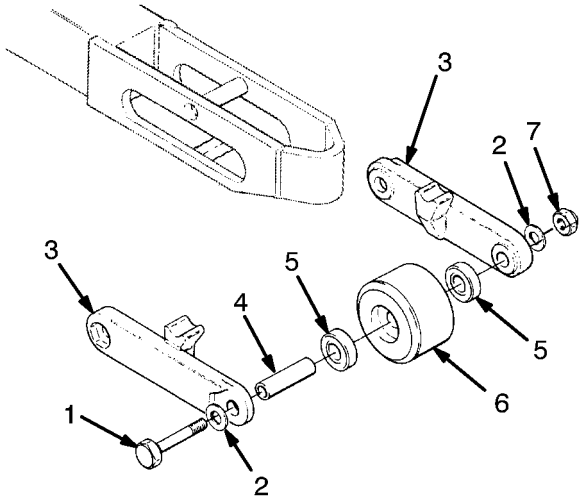


Figure 2-6 -Tandem Load Wheels

1. **AXLE SHAFT**
2. **WASHER**
3. **BRACKET**
4. **AXLE SLEEVE**
5. **BEARING**
6. **LOAD WHEEL**
7. **NUT**

CASTER AND CASTER WHEELS

Description

The caster is installed on the right hand end of the articulating axle weldment. The caster is one support for the rear of the lift truck. The drive wheel on the master drive unit is the other support at the left hand end of the articulating axle weldment. The axle of the caster is an articulated axle. The articulation of the axle permits both wheels of the caster to always have equal weight on each wheel. Caster operation and wheel wear are improved with this design. The caster is attached to the articulating axle weldment with a bearing locknut and lockwasher. The complete caster can be replaced as a unit or the wheels can be replaced. Always replace the wheels as a set for better caster operation and wheel wear. A single new wheel will wear rapidly.

Removal-Caster

1. Put the rear of the lift truck on blocks. See HOW TO RAISE THE DRIVE/STEER TI RE AND CASTER WHEELS, Section 1. Make sure the blocks are in a location to permit removal of the caster from the right hand side of the lift truck.
2. Remove two screws (1), lockwashers (2), retainer (3), and live swivel (4) from articulating axle (7).

NOTES:

1. Tires -Condition affects Stability, Safety and Load Capacity that can be handled safely.

2. Use MagnagloorequivalentFatigueCrackDetectortotest forks. Refer to Service News Bulletin SE-643 for Procedure on Field Testing Load Forks. The Bulletin also defines minimum acceptable fork tine thickness due to wear.

3. With the mast vertical and with a rated load at 609.6 mm (24in) load center, check lift cylinder drift. Lift drift must not exceed 25.4 mm (1 .0 in) in 2 minutes, oil at 26°C (79°F). Refer to Service Bulletin SE-1077 for Procedure to Measure Hydraulic Drift.

4. With a rated load at 609.6 mm (24 in) load center, check tilt cylinder, if equipped, for drift. Tilt drift must not exceed 25.4 mm (1 .0 in) in 2 minutes, oil at 26°C (79°F). Referto Service Bulletin SE-1077 for procedure to measure hydraulic drift.

5. The presence of hydraulic fluid on cylinder rods and fittings does not necessarily indicate a leak.

6. Recycle all waste oils.

To obtain more information on the above reference Service Bulletin, contact your nearest authorized Yale industrial truck dealer.

HYDRAULIC OILS

JIC FLARED TYPE AND SAE STRAIGHT THREAD O-RING FITTINGS				SWIVEL ADAPTER UNIONS			
DASH SIZE	THREAD SIZE	MAXIMUM TORQUE N•m (lbf ft)		DASH SIZE	PIPE SIZE	MAXIMUM TORQUE N•m (lbf ft)	
		SWIVEL NUT	LOCKNUT			FEMALE PIPE	MALE PIPE
-2	5/16”-24	8 (6)	8 (6)	-2	1/8”-27	18 (13)	16 (12)
-3	3/8”-24	8 (6)	8 (6)	–	–	–	–
-4	7/16”-20	14 (10)	11 (8)	-4	1/4”-18	27 (20)	34 (25)
-5	1/2”-20	20 (15)	14 (10)	–	–	–	–
-6	9/16”-18	27 (20)	18 (13)	-6	3/8”-18	34 (25)	54 (40)
-8	3/4”-16	41 (30)	28 (21)	-8	1/2”-14	64 (47)	73 (54)
-10	7/8”-14	54 (40)	456 (33)	–	–	–	–
-12	1-1/16”-12	95 (70)	65 (48)	-12	3/4”-14	114 (84)	106 (78)
-14	1-3/16”-12	108 (80)	76 (56)	–	–	–	–
-16	1-5/16”-12	122 (90)	85 (63)	-16	1”–11-1/2	175 (129)	152 (112)
-20	1-5/8”-12	163 (120)	–	-20	1-1/4”-11-1/2	206 (152)	209 (154)
-24	1-7/8”-12	178 (131)	–	-24	1-1/2”-11-1/2	206 (152)	286 (211)
-32	2-1/2”-12	407 (300)	–	-32	2”-11-1/2	407 (300)	407 (300)

NOTE: Values shown are for zinc plated fittings. Values for cadmium plated fittings may vary slightly, but not enough to be of any appreciable difference.

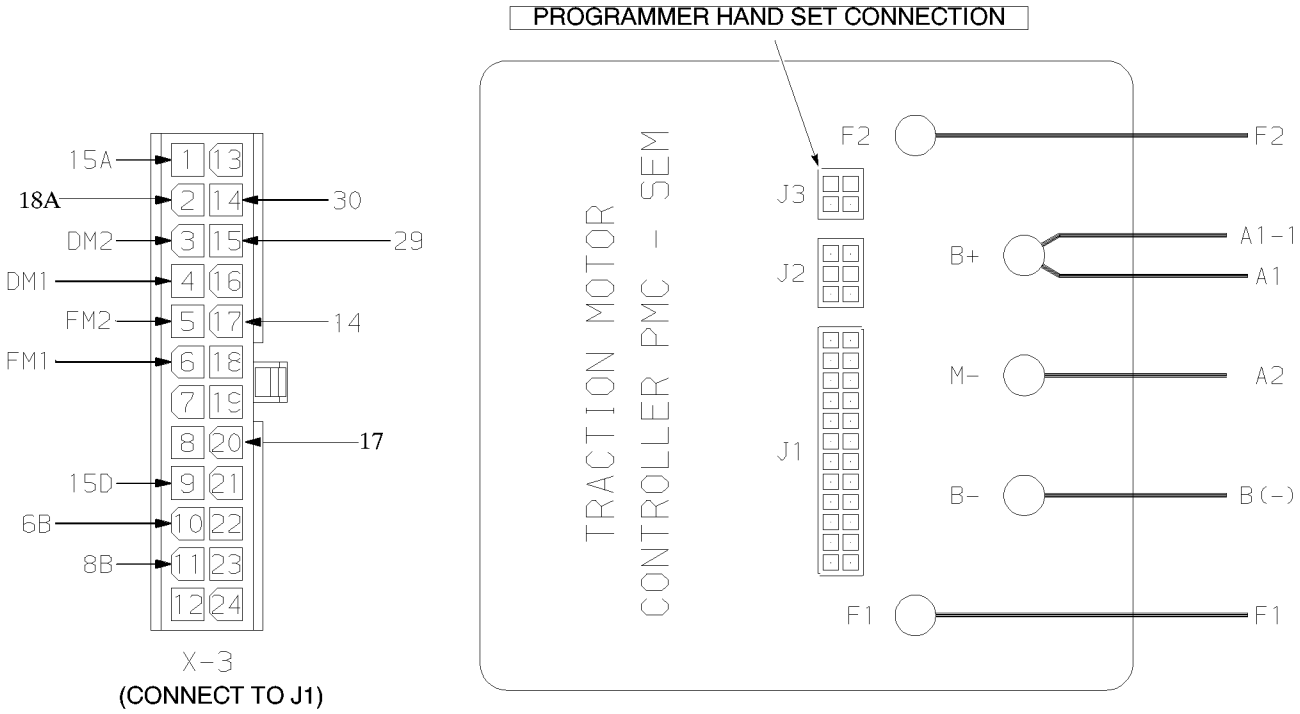
*Torque Values furnished by Air-Way Manufacturing Co., Olivet, Michigan

Table 2-8 -Conversion Table for Metric and English Units

between the frame and the traction motor controller. Align the traction motor controller in the lift truck on the studs. Install the washers and nuts to retain the controller to the frame. The studs must be installed from the back wall through the controller. They are driven in place using a small ball peen hammer.

2. Connect the power wires to the terminals. See Figure 3-21. Plug the X-3 connector into the J1 receptacle of the traction motor controller.

3. Refer to PROGRAMMING THE TRACTION MOTOR CONTROLLER to set-up the controller.



X-19 PIN 1: KEY SWITCH INPUT
X-19 PIN 2: BRAKE SWITCH
X-19 PIN 3: DRIVE MODE SELECT #2 INPUT
X-19 PIN 4: DRIVE MODE SELECT #1 INPUT
X-19 PIN 5: FAULT 2 OUTPUT
X-19 PIN 6: FAULT 1 OUTPUT
X-19 PIN 7: NOT USED
X-19 PIN 8: NOT USED
X-19 PIN 9: KEY SWITCH INPUT (COIL RETURN)
X-19 PIN 10:FORWARD SIGNAL INPUT
X-19 PIN 11: REVERSE SIGNAL INPUT
X-19 PIN 12:NOT USED
X-19 PIN 13:NOT USED
X-19 PIN 14:THROTTLE REFERENCE VOLTAGE
X-19 PIN 15:0-5 VOLT THROTTLE SIGNAL INPUT
X-19 PIN 16:NOT USED
X-19 PIN 17:TRACTION COIL DRIVER
X-19 PIN 18:NOT USED
X-19 PIN 19:NOT USED
X-19 PIN 20:ELECTROMAGNETIC BRAKE DRIVER(A861
X-19 PIN 21:NOT USED
X-19 PIN 22:NOT USED
X-19 PIN 23:NOT USED
X-19 PIN 24:NOT USED

Figure 3-21 -TRACTION MOTOR CONTROLLER PIN ARRANGEMENT

PROGRAMMER HANDSET

Description/Features

The Programmer Hand Set is a hand held tool that allows the user to PROGRAM, TEST and DIAGNOSE the

LED CODE	EXPLANATION
OFF (no flashes)	No power or defective controller
ON (continuously)	Controller or microprocessor fault
0,1	Controller operational, no faults
1,2	Hardware failsafe fault
1,3	M–, current sensor, or motor fault
2,1	Throttle fault
2,2	Static return to off (SRO) fault
2,3	High pedal disable (HPD) fault
3,1	Contactor driver overcurrent
3,2	Welded contactor
3,3	Precharge fault
3,4	Missing contactor, or traction contactor did not close
4,1	Low battery voltage
4,2	Overvoltage
4,3	Thermal cutback; over/under temp

NOTE: Only one LED fault code is indicated at a time, and faults are not queued up. Operational faults -such as a fault in SRO sequencing -are cleared by cycling the key switch.

Programmer Diagnostics

The programmer presents complete diagnostic information in plain language. Faults are displayed in the DIAGNOSTIC menu. The status of the controller inputs and outputs is dis-played in the TEST menu. The DIAGNOSTIC HISTORY menu provides a list of the faults that have occurred since the diag-nostic history file was last cleared. Checking (and clearing) the diagnostic history file is recommended each time the truck is serviced.

Press the DIAGNOSTIC key to enter the DIAGNOSTIC mode. The LED in the corner of the DIAGNOSTIC key illuminates to indicate that the programmer has been placed in the DIAG-NOSTIC mode. The DIAGNOSTICS menu displays all current-ly active faults detected by the controller. It is capable of dis-playing 16 different faults, four at a time.

Press the DIAGNOSTICS key and the MORE INFO key simul-taneously to enter the DIAGNOSTIC HISTORY menu. The DIAGNOSTIC HISTORY lists all of the faults observed and re-corded by the controller since the history was last cleared. Press the SCROLL DOWN key to display any recorded faults. Each fault will be listed only once, regardless of the number of times the fault may have occurred.

Press the TEST key to enter the TEST mode. The LED in the corner of the TEST key illuminates to indicate that the program-mer has been placed in the TEST mode. The TEST menu dis-plays real time information about the status of the inputs, out-puts and controller temperature. In the TEST mode, the item of interest does not need to be the top item in the window; it only needs to be one of the four items displayed in the window. The MORE INFO key, when used in the TEST mode, displays addi-tional information about the top item in the window.

The charts on the following pages should be used in conjunc-tion with the wiring diagrams for best results. The DIAGNOS-TIC (and DIAGNOSTIC HISTORY) menu items are shown, fol-lowed by the TEST menu items. See the section for the wiring diagrams and schematics.

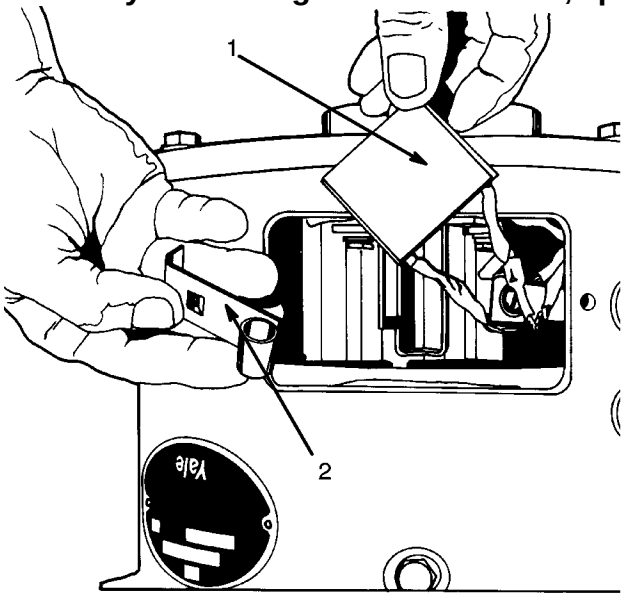
Diagnostics Menu

Menu Item	TEST MENU 22° C (71.5° F) shown		OPERATING RANGE
	Scroll display until HEATSINK °C is shown on the top line	***For Additional Information: Press*** **MORE INFO**	Between −25° C (−13° F) and 85 °C (185 °F)
5	HEATSINK °C 22	HEATSINK TEMPERATURE °C 22	
Indicates traction motor controller heatsink temperature.			

Menu Item	TEST MENU (Control handle positioned for forward travel.)		OPERATING RANGE
	Scroll display until FORWARD INPUT is shown on the top line	***For Additional Information: Press*** **MORE INFO**	Control handle in “NEUTRAL” . . . . **OFF** “FORWARD” selected . . . . . **ON**
6	FORWARD INPUT ON	FORWARD INPUT IS ON	
Shows status of forward signal input at traction motor controller. Output of MIB.			

Menu Item	TEST MENU (Control handle positioned for reverse travel.)		OPERATING RANGE
	Scroll display until REVERSE INPUT is shown on the top line	***For Additional Information: Press*** **MORE INFO**	Control handle in “NEUTRAL” . . . . **OFF** “REVERSE” selected . . . . . **ON**
7	REVERSE INPUT ON	REVERSE INPUT IS ON	
Shows status of reverse signal input at traction motor controller. Output of MIB.			

Menu Item	TEST MENU (Brake switch closed.)		OPERATING RANGE
	Scroll display until INTRLCK INPUT is shown on the top line	***For Additional Information: Press*** **MORE INFO**	Brake pedal “DEPRESSED” . . . . . **ON** Brake pedal “UP” . . . . . **OFF**
8	INTRLCK INPUT ON	INTERLOCK INPUT ON	
Shows status of interlock (brake) switch input at traction motor controller.			



1. BRUSH
2. BRUSH SPRING

Figure 3-35 -Brush Removal and Inspection

A brush for a hydraulic pump motor has an area of approximately 1.74 x 0.375 in. = 0.653 in.2 (4.42 x 0.95 cm = 4.21 cm2>. Brush springs forthe hydraulic pump motor normally have a spring force of approximately 1 Ibf and 8 ozft4 ozf (6.3 t 1.1 Newtons) when measured with a spring scale as shown in Figure 3-36. (Look for a reading of approximately 1.5 t .25 pounds on the spring scale.) The minimum length of the hydraulic motor brushes is 15.9 mm (0.625 in). Replace all brushes if any one of the brushes are less than the minimum brush length.

NOTE: The brush springs used in motors made by Yale have a constant force design. The force of the brush spring against the brush stays almost constant as the brush wears and becomes shorter in its brush holder.

10. New brushes must be made to fit the surface of the commutator by an abrasive procedure called "stoning the commutator". Use a **Brush Seater and Commutator Stone** (No. 23-007M from the Ideal Company or an equivalent brush seater stone). See STONING THE COMMUTATOR, this section.

If new brushes are not fitted to the commutator by stoning, the contact surface can be small until the brushes wear to fit the commutator. This small surface can cause burns and a rough surface on the commutator. "Stoning the Commutator" is most easily done when the motor rotates slowly. When the motor rotates at higher speeds, the centrifugal force removes the abrasive particles from the commutator more quickly. See Figure 3-37.

11. Close the drive unit compartment cover.

12. Connect the battery.

13. Remove the blocks from under the drive wheels, remove the "DO NOT OPERATE" tag and install the key.

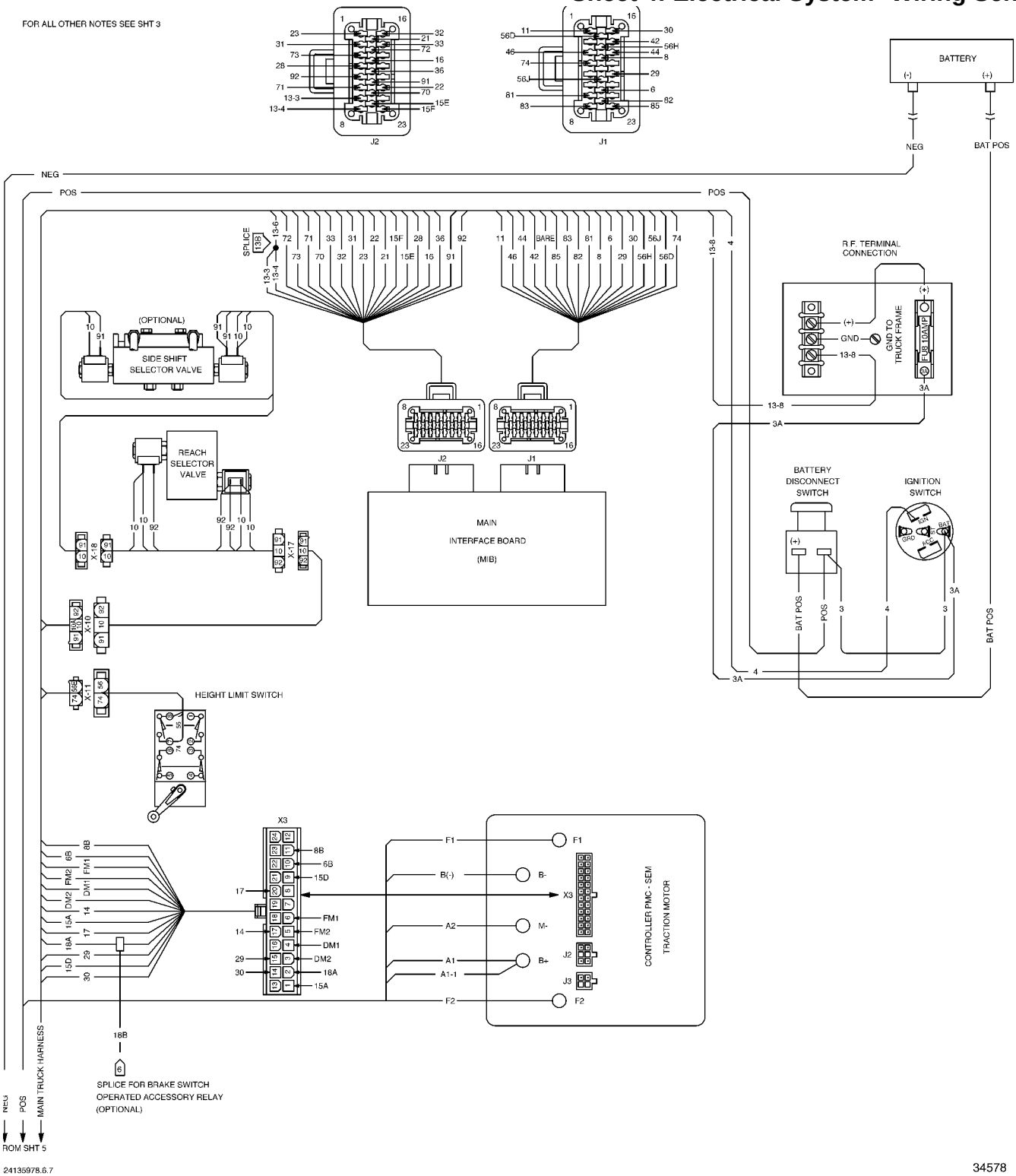


FIGURE 3-45 -WIRING SCHEMATIC 36 VOLT -TYPE 524135978

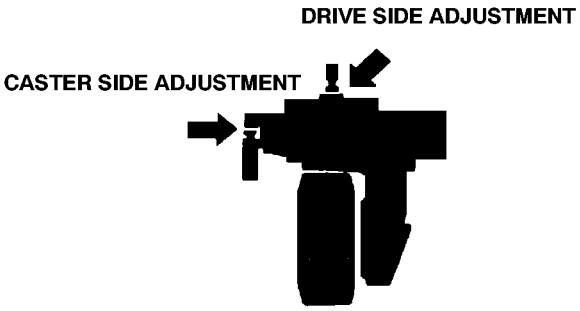


Figure 4-2 -Drive Unit Articulation Stops Capacity Plate

Table 4-32 -Articulation Chart

	MAX. FORK HEIGHT	
STOP SETTING	BELOW 6909 mm (272 in)	6909 mm (272 in) AND ABOVE
DRIVE SIDE	4.8-6.4 mm (0.19-0.25 in)	1.6-3.2 mm (0.06-0.125 in)
CASTER SIDE	4.8-6.4 mm (0.19-0.25 in)	4.8-6.4 mm (0.19-0.25 in)

NOTE: The articulation stop settings are also listed on the capacity plate.

ARTICULATION ADJUSTMENT PROCEDURE

1. Position the truck on a flat, level floor.
2. Disconnect the battery.
3. Open the drive unit compartment door.
4. Check the articulation stop clearance on both the drive and caster stop screws. If the clearance between the stops are not within the range listed in the ARTICULATION CHART, loosen the locknuts and adjust the stop screws to the correct setting.
5. Tighten the locknuts and torque to 108 Nm (80 lbf ft).
6. Close and lock the compartment door.

AXLE ASSEMBLY

The axle assembly consists of an axle weldment which is the mount for the master drive unit (MDU), the hydraulic steering motor and the caster. The traction motor fastens to the top of the MDU near the left end of the axle weldment. The MDU is
attached to the bottom of the axle weldment and rotates on a large bearing. The traction motor supplies the power to turn the drive wheel. The hydraulic steering motor rotates the MDU for steering. The caster supports the right end of the axle
weldment. The axle weldment assembly is fastened to the lift truck by an articulating shaft. The articulating axle assembly pivots on the shaft.

TRACTION MOTOR

The traction motor is not part of the steering system. The motor is part of the MDU assembly and must be removed to remove the axle assembly from the lift truck.

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during assembly. Measure the distance between the edge of the case and the inner seal ring at the axle bore. The replacement seal ring MUST be installed in the same position as the old seal. Remove the seal ring.

Assembly

NOTE: If neither the bevel pinion shaft and gear set nor the lower case are being replaced, use the upper bearing shim set and lower bearing shim set removed during disassembly.

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

1. Clean all components thoroughly. Remove all traces of Loctite. Use Loctite Fast Cleaner No. 706 to remove Loctite from the lower housing in the area where the thread protecting shield had been located. Spray the cleaner from a distance of approximately 30 cm (0.50 in), while holding the can upright. Allow the cleaner to work, then thoroughly remove the dissolved dirtfrom the lower housing using a clean cloth. Spray the surface with the cleaner again and allow to air dry.

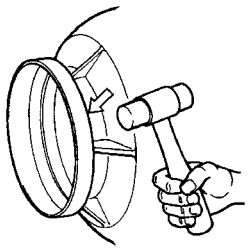

Figure 4-9 -Bearing and Shim Location

1. **UPPER PINION BEARING CUP**
2. **LOWER PINION BEARING CUP**
3. **INNER AXLE SHAFT BEARING CUP**
4. **OUTER AXLE SHAFT BEARING CUP**
5. **SHIMS-UPPER PINION BEARING**
6. **SHIMS-LOWER PINION BEARING**
7. **SHIMS-INNER AXLE SHAFT**
8. **SHIMS-OUTER AXLE SHAFT**
9. **INNER SEAL RING**
10. **BEARING SHIELD**

2. Check all parts for damage or cracks. Replace any damaged parts.

CAUTION: The axle and gear assemblies are installed and removed several times during this procedure. Be careful not to damage the seals.

BRAKE SYSTEM

GENERAL (C829)

This section provides the description and repair procedures for the brake assembly for models NR045/NDR030GA (C829).

NOTE: Many of the procedures need the compartment door open. To open the door, remove two capscrews that fasten the door and open the door.

The brake assembly is a mechanical brake mechanism that is installed on the top of the traction motor. The brake assembly has a brake drum, two brake shoes, a cam and cam lever and the return spring for the brake shoes. The cam moves the brake shoes against the brake drum. A spring and linkage operates the cam lever to apply the brake. A hydraulic slave cylinder moves this same linkage to release the brake. The brake drum rotates with the armature of the traction motor. The brake shoe assembly and the linkage are fastened to the traction motor housing.

A master cylinder and brake pedal assembly is fastened to the frame under the operator compartment. The brake pedal extends through the floor plate and is foot operated. There is a hydraulic line between the master cylinder and the slave cylinder. The master cylinder assembly operates the slave cylinder using hydraulic pressure from the master cylinder and pedal operation. A reservoir for the brake fluid is mounted on the traction motor compartment door.

The brake is a normally ON type of mechanism. The brake is fully applied when the brake pedal is in the UP position. Releasing the brake pedal permits a spring to move the cam lever and apply the brake shoes against the brake drum. A brake switch prevents the operation of the traction system when the brake pedal is released to apply the brake.

To RELEASE the brake, the operator must step on the brake pedal. The brake pedal moves the push rod of the master cylinder to apply hydraulic pressure to the slave cylinder. The push rod pushes the control bar against the brake spring to release the brake shoes. The shoe springs move the brake shoes away from the brake drum. The brake shoes will be gradually released as the brake pedal is depressed. The brake pedal must be depressed as far as possible to completely release the brake. Movement of the control bar operates the brake switch when the brake pedal is depressed to release the brake. The brake switch must be ON before the traction system can operate.

BRAKE ASSEMBLY (C829)

NOTE: Remove the two capscrews that fasten the door and open the door.

Removal and Disassembly See Figure 5-1 and Figure 5-3)

NOTE: The complete brake assembly normally does not need to be removed to make repairs. Remove only the parts necessary to make the repair.

1. Disconnect the battery. Put blocks on each side of the drive wheel to prevent movement of the lift truck. Open the motor compartment door for access to the brake assembly.

NOTE: If the brake shoes need replacing, replace them before adjusting the brake. Check and replace the brake shoes.

1. Disconnect the battery. Put blocks on each side of the drive wheel to prevent movement of the lift truck. Open the door for access to the brake assembly.

2. Tighten the actuation locknut until the brake spring length is 63.5 t 0.8 mm (2.50 t 0.03 in).

3. Loosen the jam nut and set screw retaining the push rod between the setscrew and slave cylinder sothatthe push rod is loose, but cannot be removed.

4. Tighten the setscrew until the push rod causes the slave cylinder to bottom. Back off on the setscrew one full turn and lock in place by tightening the jam nut.

5. The brakes must hold a lift truck with a rated load on a 15% grade with the pedal in the up position.

6. Fill the brake reservoir with the recommended brake fluid and remove air from the brake system. See REMOVE AIR FROM THE BRAKE SYSTEM.

Remove Air from the Brake System

1. Before the air is removed from the brake system, make sure the brake is correctly adjusted. Make sure the master cylinder reservoir is filled with the recommended brake fluid. See Section 2 for the recommended brake fluid and the quantity of brake fluid for the brake system.

2. Put one end of a rubber hose on the bleed screw at the top of the slave cylinder. Put the other end of the hose into a clear container of brake fluid.

3. Loosen the bleed screw one turn. Slowly push the brake pedal and hold it at the end of its stroke. Close the bleed screw and release the brake pedal. Repeat the procedure until there are no air bubbles from the rubber hose. Visually check the level of the brake fluid in the reservoir for the master cylinder during this procedure to make sure not to drain the reservoir and put air into the brake system.

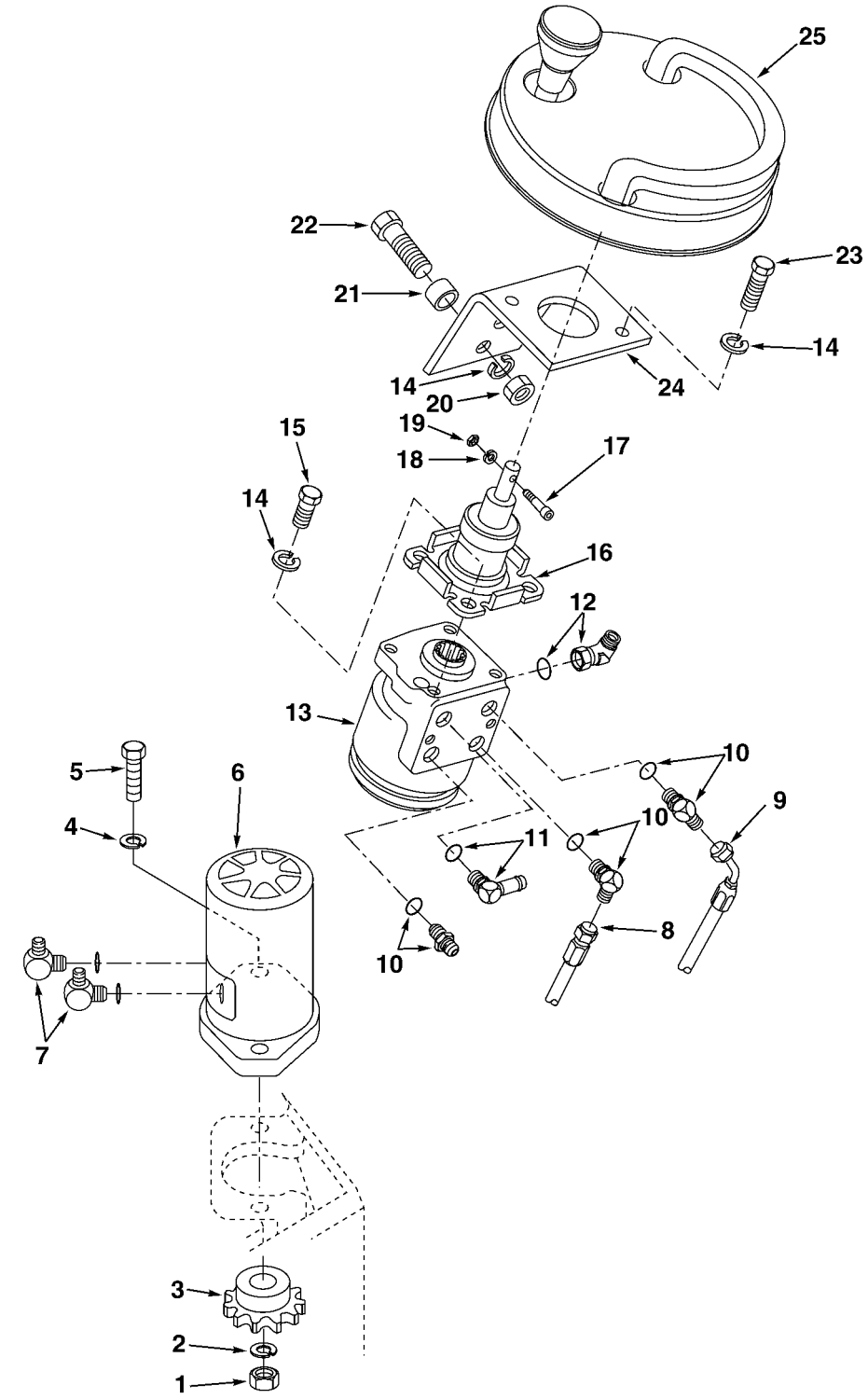

Figure 6-2 -Steering System

1. **LOCKNUT**
2. **HARDENED WASHER**
3. **SPROCKET**
4. **LOCKWASHER**
5. **CAPSCREW**
6. **STEERING MOTOR**
7. **FITTING w/O-RING**
8. **HOSE ASSEMBLY**
9. **HOSE ASSEMBLY**
10. **90°FITTING w/O-RING**
11. **90°FITTING w/O-RING**
12. **FITTING w/O-RING**
13. **STEER CONTROL UNIT**

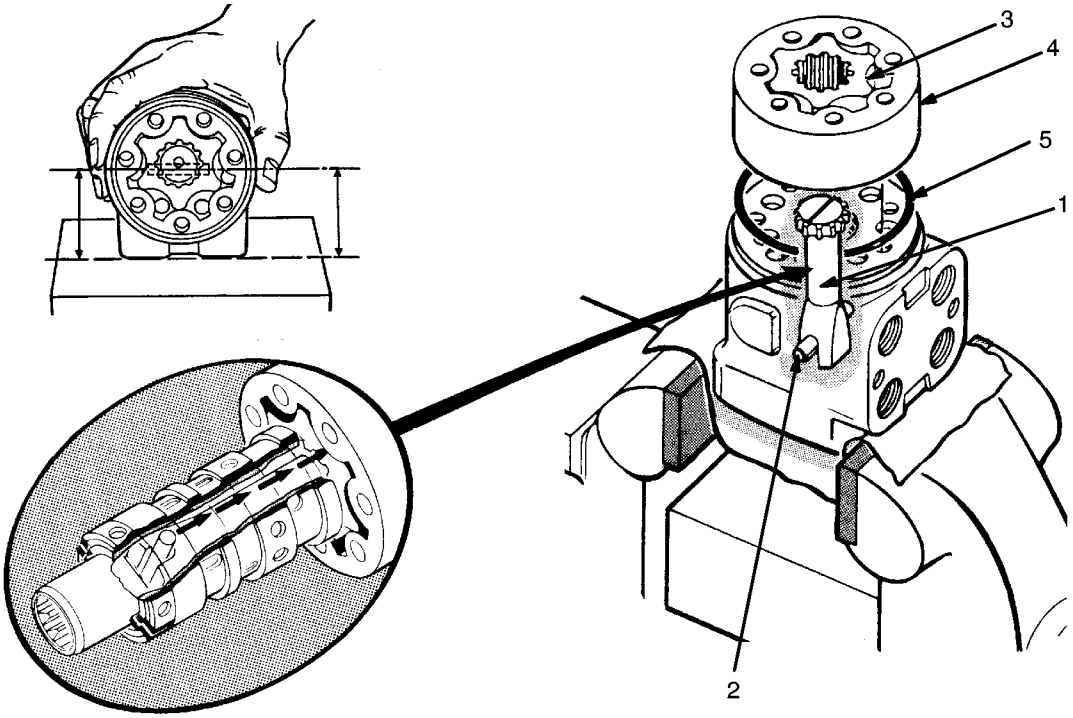

Figure 6-17 -Stator and Rotor Assembly

1. **CENTER SHAFT**
2. **CENTER PIN**
3. **ROTOR**
4. **STATOR**
5. **O-RING**

8. Install the spacer plate (1). Install the O-ring (2) and the Nm (265 Ibf in). Make sure the capscrew (4) with the pin fits in end cap (3). Tighten the capscrews for the end cap in the the hole for the check ball (5). sequence shown to 17 Nm (150 Ibf in), then tighten them to 30

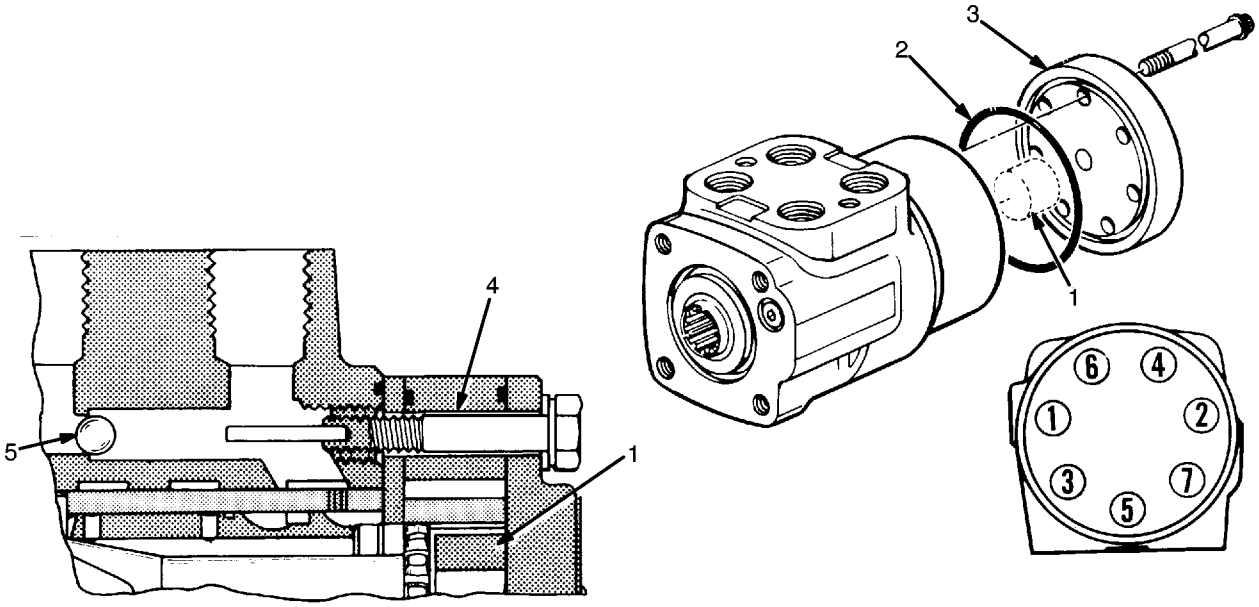

Figure 6-18 -End Cap Installation

1. **SPACER PLATE**
2. **O-RING**
3. **END CAP**
4. **CAPSCREW**
5. **CHECK BALL**

9. Install the steering column on the steering control unit. Make sure the spines are aligned.

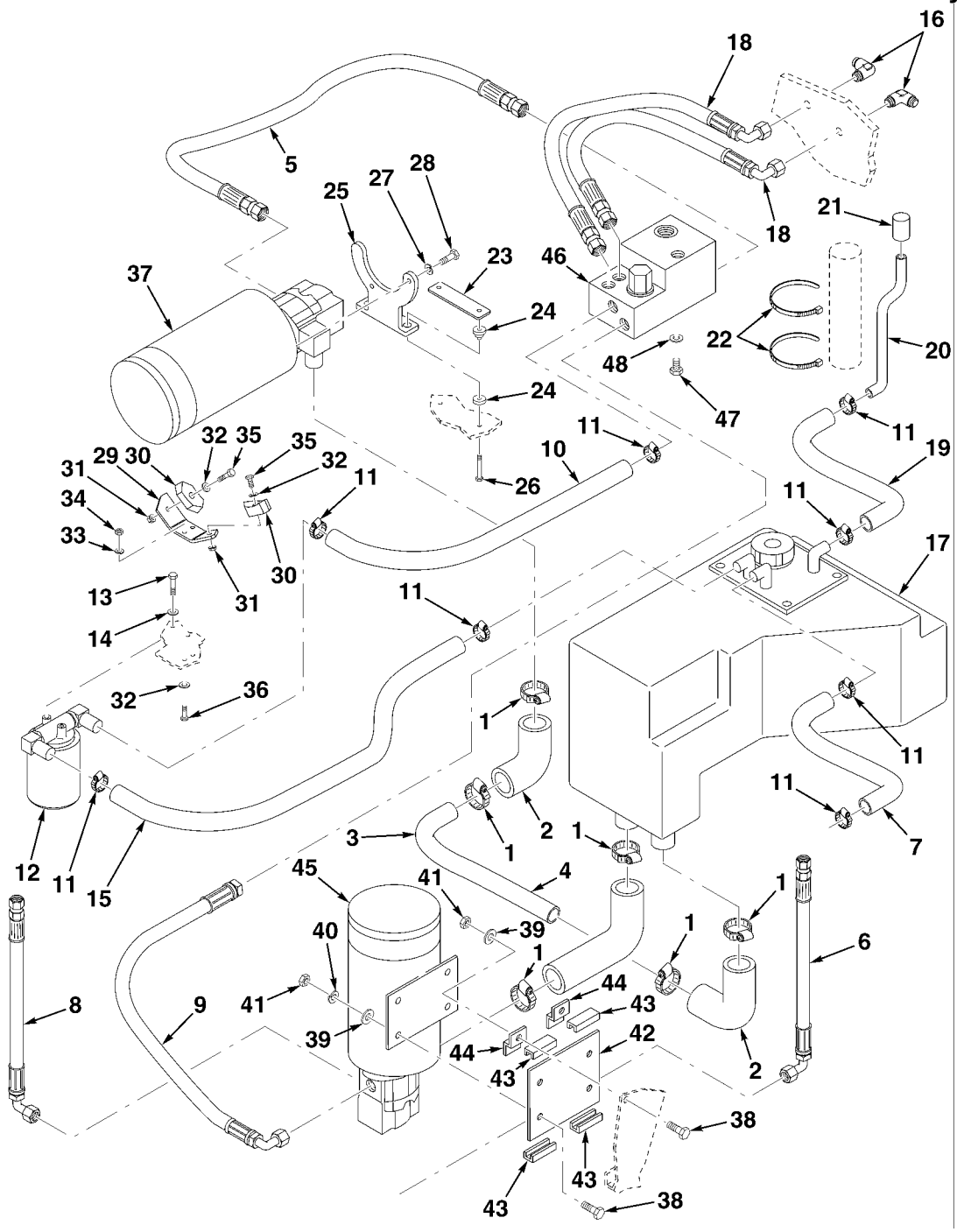

Figure 7-3 -Hydraulic System

1. HOSE CLAMP
2. HOSE, MOLDED ELBOW
3. TUBE-SUCTION
4. HOSE
5. HOSE
6. HOSE
7. HOSE
8. HOSE
9. HOSE
10. HOSE
11. HOSE CLAMP
12. FILTER ELEMENT
13. CAPSCREW
14. LOCKWASHER
15. HOSE
16. HOSE FITTING
17. HYDRAULIC TANK

MAST AND REACH ASSEMBLY

MASTS

This section provides the removal, installation and adjustment procedures for the triplex masts and for the reach and carriage assemblies. A troubleshooting chart is provided at the end of this section.

These mast assemblies, carriages and reach assemblies have wear plugs and wear strips to allow for adjustment due to wear. The wear plugs are in the stub shafts of the load rollers and slide against the center part of the channel. A setscrew and jamnut keep each wear plug in the correct position. The load rollers take the forward and back loads during operation of the mast. The load rollers have ball bearings with grease seals. The wear strips are made of a friction material and slide against the outside edge of the channel flange.

The mast weldments must be parallel with equal clearance on each side. Correct operation depends on periodic cleaning, lubrication and adjustment of the clearance between weldments. See CHECKS AND ADJUSTMENTS at the rear of this section.

NOTE: See the GENERAL TRUCK AND LUBRICATION SECTION for the correct maintenance and inspection procedures for the masts, hydraulic cylinders, forks, chains and carriages.

WARNING: The mast, reach assemblies, carriage assemblies and their components, are heavy. To help prevent damage or an injury, a lifting device must be used during all service procedures.

NOTE: The reach assembly or carriage assembly can be removed from the mast assembly with the load backrest extension and forks attached. The triplex mast assembly can also be removed with the carriage or reach assembly installed. Do only those procedures necessary for repair.

CARRIAGE ASSEMBLY

The carriage is a part of the mast assembly and moves within the vertical channels of the inner weldment. Load rollers, attached to the carriage, travel in the channels of the inner weldment. Forks or other types of load handling equipment are attached to the carriage. A load backrest extension is attached to the carriage and adds support for a load that has multiple pieces. (See Figure 8-1).

The lift truck may be furnished with an optional sideshift carriage which allows the operator to move the forks and load from side-toside. This function makes it easier for the operator to align the forks with a load or align the load with a stack. The sideshift carriage is installed on the fork bars of the standard carriage. Special bushings fit between the sideshift carriage and the fork bars. A sideshift cylinder is installed on a plate that fits on the standard carriage. The sideshift cylinder moves the sideshift carriage on the standard carriage.

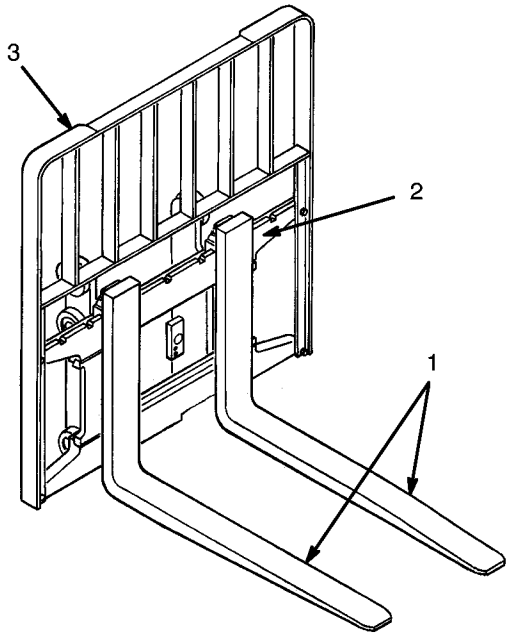

Figure 8-1 -Carriage Assembly

1. **FORK**
2. **CARRIAGE**
3. **LOAD BACKREST EXTENSION**

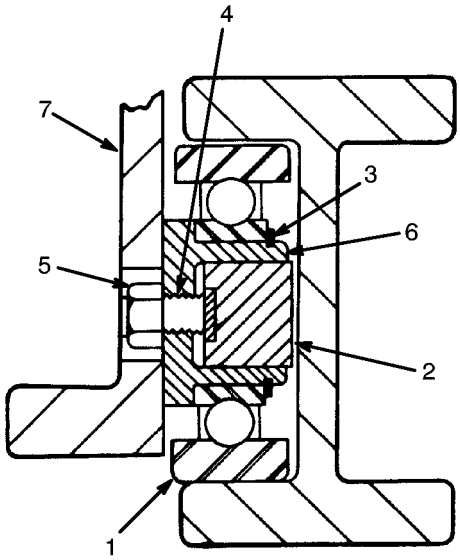

Figure 8-9 -Removing Load Roller

1. **LOAD ROLLER**
2. **WEAR PLUG**
3. **SNAP RING**
4. **SET SCREW**
5. **JAM NUT**
6. **STUB SHAFT**
7. **MAST, REACH OR CARRIAGE COMPONENT**

WARNING: Lift chains, hoses and cables can roll I/N over the sheaves to fall and cause an injury if the ends are not fastened. Keep control of the ends of the lift chains, hoses and cables as they are removed. Use wire to temporarily connect the ends of the lift chains, hoses or cable to the masts.

4. Remove the safety chains installed in Step 4, Reach Assembly, Removal, and Installation. Lower the reach assembly for access to the chain anchors at the back of the free lift cylinder. Use safety chains to fasten the movable member of the mast to the outer weldment so that it cannot move. Move the key to the OFF position and disconnect the battery.

5. Install lifting eyes in the reach assembly for chains or slings. Fasten chains or slings to the reach assembly so that the reach assembly cannot tip as it is removed from the mast weldment. Fasten the chains to the lifting eyes. Use the crane to raise the reach assembly so that the lift chains become loose.

WARNING: 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.

6. Remove the snap rings from the stub shaft for the load roller.

7. Use a prybar to remove the load roller from the stub shaft for the load roller. See Figure 8-9.

8. 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.

9. Install the carriage or reach assembly. See CARRIAGE ASSEMBLY or REACH ASSEMBLY-REMOVAL AND INSTALLATION.

10. Adjust the carriage or reach assembly. See ADJUSTMENTS in CHECKS AND ADJUSTMENTS.

SIDE ROLLERS-DISASSEMBLY AND ASSEMBLY (SEE FIGURE 8-9)

1. Remove the carriage assembly from the mast to replace the side rollers. See CARRIAGE ASSEMBLY REMOVAL AND INSTALLATION to remove the carriage.

2. Remove the capscrews that fasten the side roller bracket.

NOTE: Observe the position of the shims.

hoses at the inner frame so that they are not damaged.

2. Use a crane and chains or slings as a support for the scissor arm weldment. Do not damage the hose sheave mount.

WARNING: The points between the scissor arms and the inner frame are pinch points and can cause an injury. Do NOT put your finger in the hole when you remove the pins at the reach cylinders or scissor arm weldment. Use a brass drift to remove the pins.

3. Use a punch to remove the roll pins in the rod ends of the reach cylinders (Item 2, Figure 8-24). Use a drift to remove the pins that fasten the rod ends of the reach cylinders to the scissor arm weldment. Use wire to hold each reach cylinder and their hoses in a position for clearance as the load bearings move. Remove the bushings from the mounts.

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

4. Carefully remove the clamps and blocks at the load bearings on the channels of the inner frame. Slowly move the scissor arms to align the load bearings with the removal notch in the inner frame. Raise the scissor arm weldment and the scissor arms to move the load bearings out of the inner frame.

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

NOTE: Install labels for each set of shims and the load bearing on the scissor arms for correct assembly during installation of the scissor arms. When new load bearings are installed, the shim arrangement will normally be the same or similar. Remove the load bearings and shims.

5. Install labels for correct installation of the right hand or left hand scissor arms. Carefully remove the three capscrews, the lockwashers, the end cap and the two thrust washers at the center pivot for the scissor arm and scissor arm weldment. Hold the scissor arm and carefully slide it off the bushing and stub shaft of the scissor arm weldment. Remove the bushing and the other two thrust washers. Remove the other scissor arm following this same procedure.

6. Remove the roll pins and anchor pins that fasten the scissor arm weldment to the inner frame. Move the scissor arm weldment and put it on the floor without damaging the hose sheave mount. Remove the bushings.

7. If necessary, install the forks and load backrest extension as described in FORK REPLACEMENT and LOAD BACKREST EXTENSION-REMOVAL AND INSTALLATION.

Cleaning and Inspection

WARNING: Cleaning solvents can be flammable and toxic, and can cause skin irritation. Wear protection for eyes and skin. When using cleaning solvents, always follow the recommendations of the manufacturer.

CAUTION: Do NOT use steam to clean the load bearings. Do not use compressed air on the bearings. The bearings are sealed and permanently lubricated. The air can force the lubricant out of the bearings.

Clean all of the parts of the scissor arm assembly with solvent. Dry the parts with compressed air. Inspect the parts of the scissor arm assembly for damage and wear. Replace all bushings and load bearings.

frame for damage and wear. Inspect all rollers for cracks, flat spots or bearings that do not turn freely. Replace any roller that shows wear or is damaged.

Assembly
(See Figure 8-15)

WARNING: The inner frame assembly is heavy and can cause an injury if it tips or falls. Make sure the innerframe assembly is stable before installing any parts.

WARNING: 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: If the scissor arms are not installed, install the inner frame in the mast before installing the scissor arm assembly. See INNER FRAME ASSEMBLY-INSTALLATION.

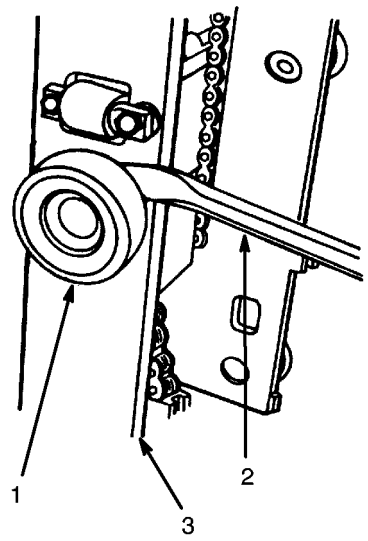

Figure 8-17 -Removing Load Roller

1. **LOAD ROLLER WITH SNAP RING REMOVED**
2. **PRYBAR**
3. **MAST OR CARRIAGE COMPONENT(CARRIAGE SHOWN)**

Install all parts that were removed. If necessary, install the selector valve as described in REACH/TILT SELECTOR VALVE-INSTALLATION. Install all shim sets in the original positions as marked during removal. Use new snap rings. Install the load rollers on the inner frame. Install the shims at each location as marked during disassembly.

Adjust the carriage side rollers during assembly. See ADJUSTMENTS in CHECKS AND ADJUSTMENTS.

If the rod ends of the reach cylinders were removed, the reach cylinders must be adjusted after the reach assembly is completely assembled and installed in the mast. See ADJUSTMENTS in CHECKS AND ADJUSTMENTS.

Installation
(See Figure 8-15)

NOTE: If the scissor arm assembly will be installed in the innerframe, it is easierto install afterthe innerframe is installed in the mast. See SINGLE REACH SCISSOR ARMS or DOUBLE REACH SCISSOR ARMS to install the scissor arm assembly.

NOTE: The side rollers must be adjusted while the reach assembly is out of the mast channels. Adjust the side rollers as described in CHECKS AND ADJUSTMENTS.

1. Install lifting eyes in the reach assembly or inner frame assembly for chains or slings. Fasten chains or slings to the lifting eyes. Use a crane to raise the reach assembly or inner frame assembly to align the load rollers with the channels of the inner weldment of the mast. Carefully lower the inner frame assembly into the mast channels. Continue to lower the assembly to a position to connect the hydraulic lines at the manifold block.

NOTE: Use safety chains on the inner frame and mast weldments to keep the inner frame and mast weldments from moving. Install the safety chains as described in SAFETY PROCEDURES.

18. HYDRAULIC HOSE FROM SHEAVE SUPPORT
19. HYDRAULIC HOSE TO CARRIAGE

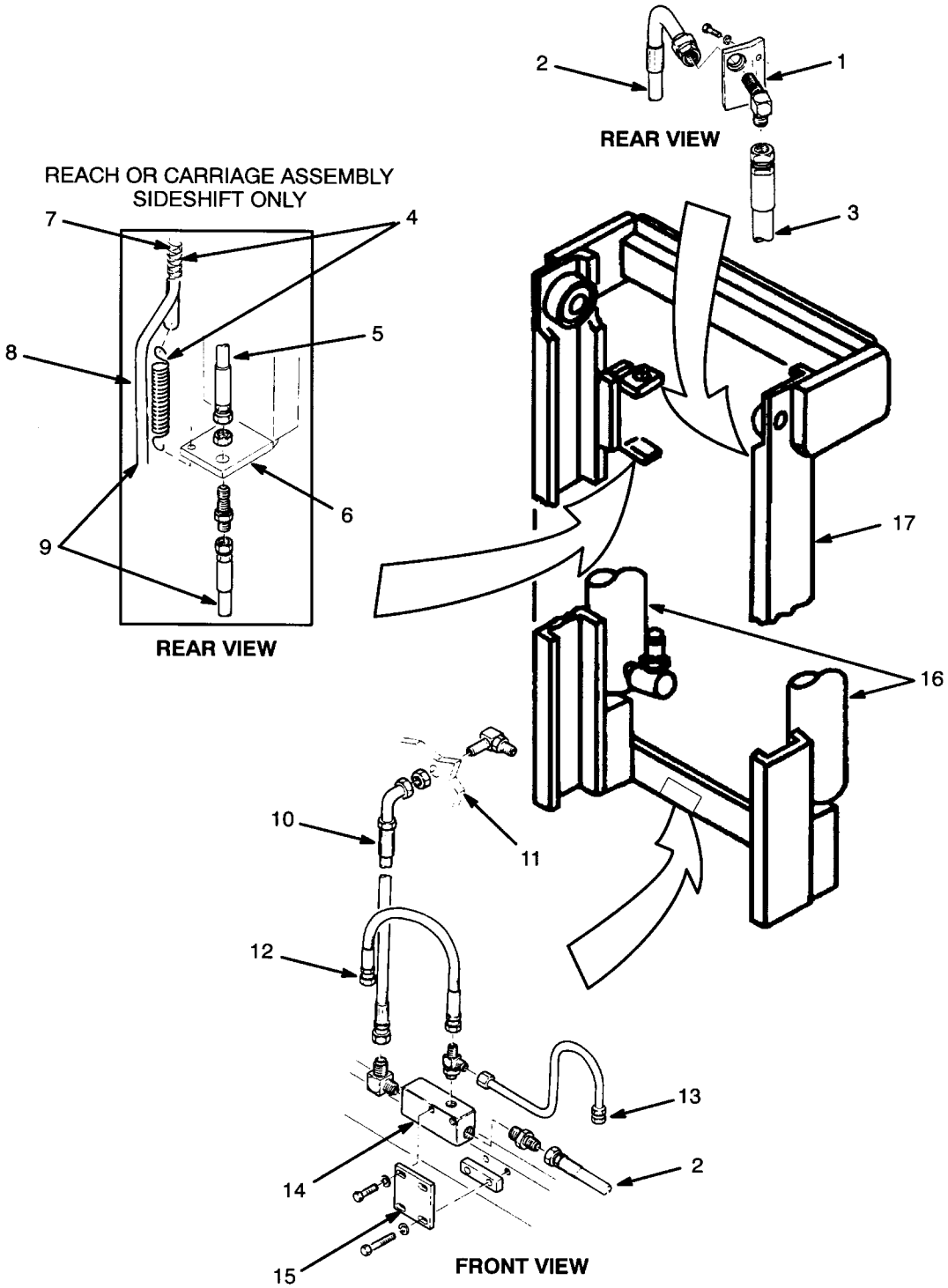

Figure 8-22 -Hose and Cable Assemblies-Outer Weldment

1. HOSE BRACKET
2. TO FLOW REGULATOR
3. TO FREE LIFT CYLINDER
4. TENSION DEVICE
5. HOSE TO MANIFOLD BLOCK (EACH SIDE OF WELDMENT)
6. HOSE BRACKET (EACH SIDE OF WELDMENT)
7. TO REACH OR CARRIAGE ASSEMBLY
8. ELECTRICAL CABLE FOR REACH ASSEMBLY
9. TO LIFT TRUCK
10. HYDRAULIC HOSE (LIFT)
11. LIFT TRUCK FRAME
12. HOSE TO RIGHT MAIN CYLINDER

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