General Maintenance Instructions

WARNING

TO PREVENT SERIOUS RISK OF INJURY TO YOURSELF AND OTHERS OBSERVE THE FOLLOWING SAFETY INSTRUCTIONS

Power industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, trained personnel and procedures should be provided.

Maintenance and inspection shall be performed in conformance with the following practices:

1. A scheduled planned maintenance, lubrication, and inspection system should be followed.
2. Only qualified and authorized personnel shall be permitted to maintain, repair, adjust and inspect truck.
3. Before leaving the truck—
   - Stop truck.
   - Fully lower the load engaging means.
   - Place directional controls in neutral.
   - Apply the parking brake.
   - Turn off power (power disconnect).
   - Remove key.
   - Block the wheels if truck is on an incline.
4. Before working on truck—
   - Raise drive wheel free of floor or disconnect power sources.
   - Use chocks or other positive positioning devices.
   - Block load engaging means, inter masts, or chassis before working under them.
   - Operation to check performance of truck or attachments shall be conducted in an authorized safe clearance area.
5. Before starting to operate truck—
   - Be in operating position.
   - Apply brake.
   - Place directional control in neutral.
   - Before operating truck, check functions of lift systems, directional control, speed control, steering, warning devices, brakes and any attachments if any used.
6. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage of electrolyte and fluids or oil. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.
7. Keep shop well ventilated, clean and dry.
8. Brakes, steering mechanisms, control mechanisms, lift overload devices, guards, and safety devices shall be inspected regularly and maintained in a safe operating condition.
   - All guards must be installed to factory configuration and condition before operating truck. Do not operate truck if any guards or fasteners are damaged, improperly installed or missing.
9. Capacity, operation and maintenance instruction plates or decals shall be maintained in legible condition.
10. All parts of lift mechanisms shall be inspected to maintain them in safe operating condition.
11. All hydraulic systems shall be regularly inspected and maintained in conformance with good practice. Cylinders, valves, and other similar parts shall be checked to assure that “drift” has not developed to the extent that it would create a hazard.
12. Batteries, motors, controllers, limit switches, protective devices, electrical conductors, and connections shall be maintained in conformance with good practice. Special attention shall be paid to the condition of electrical insulation.
13. Trucks shall be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

FU2

Main Control Fuse

Location: on control panel bracket inside power unit.

Purpose: protects control circuitry and associated wiring from over current.

Data: 10 A.

Adjustments: none required.

Diagrams: DIA-8055-002 (A-4), DIA-8055-003 (B-3).

Parts Breakdown: 04.1-8055-001 (8).

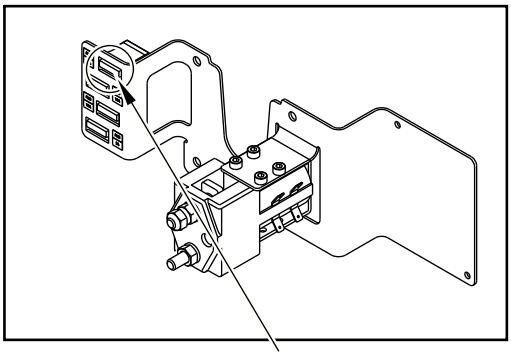


Figure 18927

FU3

Hydraulic Motor Power Fuse

Location: on control panel bracket inside power unit.

Purpose: protects ACCESS 3 and associated wiring from over current.

Data: 10 A.

Adjustments: none required.

Diagrams: DIA-8055-002 (A-4), DIA-8055-003 (B-3).

Parts Breakdown: 04.1-8055-001 (8).

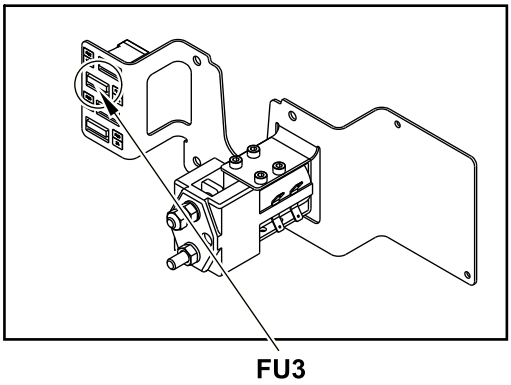


Figure 18928

FU4

Steering Pump Motor Power Fuse

Location: on ACCESS 5.

Purpose: protects steering pump motor and associated wiring from over current.

Data: 30 A.

Adjustments: none required.

Diagrams: DIA-8055-003 (B-3), DIA-8055-007 (A-3).

Parts Breakdown: 04.1-8055-001 (23).

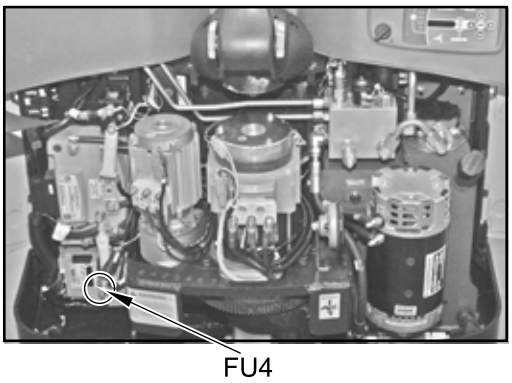


Figure 18929

Hydraulic Lines and Fittings

Blow air through all hoses and lines to remove loose particles before installing. Any rubber hose with wire braid inner construction and any steel tube lines which have been collapsed or kinked are permanently damaged and must be replaced even if the damage is not externally visible.

Flexible hose shall be replaced if it collapses in its normal operating position.

All hoses and lines are to be clear of any surface or edge which can cause damaging wear, cuts or on which they become caught.

All connections are to be leak free.

Beaded elbows in suction ports of all pumps must be positioned such that suction hose retains its full volume flow, and does not collapse.

NOTE

Should a leak develop in one of the hydraulic lines, oil reservoir can be unbolted and moved without disconnecting hydraulic hose line. Reservoir will slide out of the way and provide access to hydraulic components.

Hydraulic Oils

Use only a good grade of hydraulic oil such as those mentioned in "Lubrication" section of this manual. On trucks equipped to operate in below freezing temperatures, "low-temp" oil should be used.

NOTE

Do not use hydraulic brake fluid.

Drift Test

All drift tests should be conducted with a capacity load (refer to truck serial plate for the rated capacity). Material used for test load must be evenly stacked within limits of a four foot square pallet and must be secured to fork carriage with forks spread to their maximum width.

NOTE

Lift measurement is to be taken from tip of the fork to floor.

WARNING

Never stand or work under a suspended load.

Lift Drift Test

Elevate test load approximately 600 mm (24.0 in) and shut off truck. After five minutes, measure distance forks have drifted. Drifting in excess of 63.5 mm (2.5 in) is considered unacceptable. Five minute duration of this test is necessary due to centering time required for control valve spool.

Occasionally, a slight creep of fork assembly may occur due to internal leakage in the check or control valve. To seat these valves properly when this occurs, raise and lower forks to flush out any foreign material from valve seat. A thorough check for leaks in the system should be conducted if abnormal oil losses occur.

Tilt Test

The maximum allowable fork tilt drift on trucks equipped with a tilting carriage is 12.7 mm (0.5 in).

In five minutes. Measurement is taken at 600 mm (24.0 in) load center.

Occasionally, a slight creep of fork assembly may occur due to internal leakage in piston pack, but it can also be caused by leakage in check or control valve. To seat these valves properly when this occurs, raise and lower forks to flush out any foreign material from valve seat.

A thorough check for leaks in system should be conducted if abnormal oil losses occur. Hydraulic system is designed to eliminate mechanical damage even if fittings become loose.

NOTE

The thickness size of the shim is 1.0 mm (0.04 in).

19. Press the roller bearing (49) onto the bevel gear (48). Refer to Figure 18743.
20. Install the bevel gear in the correct position in the gear housing (57). Refer to Figure 18743.
21. Install the shaft and adjust the friction torque. Refer to shaft assembly.
22. Check the bevel gear teeth on the reference diameter of the pinion (29). Refer to Figure 19164.
    - Clearance tolerance: 0.2 - 0.5 mm (0.008 - 0.020 in)

NOTE

Adjust clearance if necessary.

23. Install the bevel gear (48), roller bearing (49) and washer (43) into the housing (57). Refer to Figure 18743.

Figure 19164

24. Press the bearing (49) onto the bevel gear (48). This can be done through the two holes in the bevel gear. Refer to Figure 18743. Remove the washers (43) adjust the thickness:
    - To reduce the clearance: Increase the number of shims (43).
    - To increase the clearance: Reduce the number of shims (43).
25. Install the washers (43) with the adjusted size.
26. Press on the roller bearing (49). Refer to Figure 18743.
27. Install the shaft and check the clearance again. Keep adjusting if necessary until the clearance is within the tolerance range of 0.2 - 0.5 mm (0.008 - 0.020 in).
28. Press the shaft seal (54) over the holes in the flange on the shaft in the correct position. Refer to Figure 18743.

NOTE

For gear units with screw-on cover (43):
- *Clean the contact surface of the housing (57) and cover (46) with a suitable solvent. Refer to Figure 18743.*
- *Apply sealing compound to the contact surfaces in accordance with the manufacturer's instructions.*
- *Attach the cover (46) with the screws (45). Torque to 10 Nm (7.5 ft lb).*

NOTE

Before adding oil, check the hardening times required for the sealing compound used.

For gear units with a press-on cover (46).

- Install a new cover (46) with the sealed side facing out.
- Using a plastic hammer strike the cover evenly without damaging the cover (46).

29. Install the drive gear cover (26) into the correct position.
30. Install the O- ring (22), shim (23), supporting ring (24) and retaining ring (27) into the correct position and fasten the screws (15). Torque to 25 Nm (18 ft lb). Refer to Figure 19160.
31. Install the bleeder valve (25). Refer to Figure 19160.
32. Install and tighten the drain plug.

Control Modules

General

Display, travel, lifting and steering are controlled by modules that communicate with each other via a common CAN interface.

- ACCESS 1 (Display)
- ACCESS 2 (Traction controller)
- ACCESS 3 (Lift controller)
- ACCESS 5 (Steer controller)
- ACCESS 8 (CAN interface #1 and #2)

Display Control Module (ACCESS 1)

Location is on the power unit (4), refer to Figure 18968. It is activated by the key switch. Function of display module (ACCESS 1) is to display pertinent truck information to the operator or service technician. This information is received from truck control modules and sensors. The information supplied is battery charge and operation hours, etc.

Figure 18968

Traction Control/Lift Control Module (ACCESS 2 and 3)

The traction control module (ACCESS 2) and the lift control module (ACCESS 3) are within the same housing (1), refer to Figure 18891. Location is on the control panel within the power unit. Function of traction control module and lift control module is to control traction motor speed via operator input from POT1 ACCEL and hydraulic pump motor speed via operator input from the X10 handle. Information is also received from various truck control modules and sensors.

Steering Control Module (ACCESS 5)

The Steering Control Module (ACCESS 5) is located on the control panel beneath ACCESS 2 and 3 within the power unit (4), refer to Figure 18891. Function of the steering control module is to the control steer motor via information from the operator using POT2 (STEER CMD). This provides speed and directional control to the steering motor in relation to POT3 (STEER FEEDBACK) and ECR2.

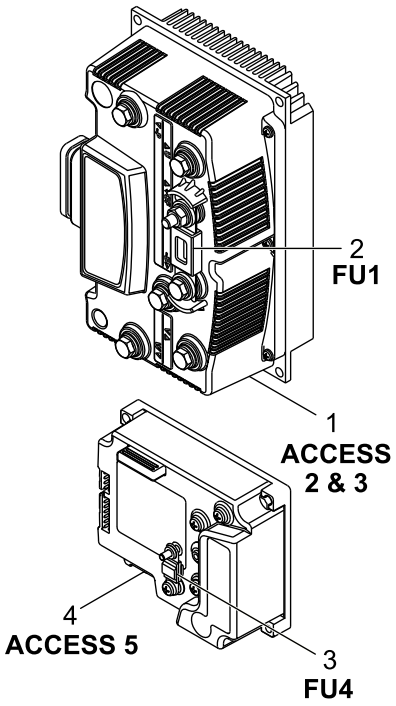


Figure 18891

Event Code 305

Logic Failure #1

Occurs during an overvoltage or undervoltage condition. Overvoltage threshold is 45 V. Undervoltage threshold is 9 V in the 24 V controller.

Step 1: Verify if issue is a startup code or occurs after startup in run time mode.

- If: Not startup code.
  - Then proceed to Step 4.
- If: Startup code.
  - Then proceed to Step 2.

Step 2: Temporarily remove (disable) any accessories that may be added on. Issue is likely an undervoltage caused by an initial current inrush at the key input signal pulling down the input voltage due to external loads, like DC/DC converters starting-up, relays or contactor switching, solenoids energizing or de-energizing.

- If: Event is a result of external loads.
  - Then consult the Crown pictorials for proper addition of accessories.

Step 3: Clear code and re-key the truck.

- If: Event clears.
  - Then return to operation.
- If: Event continues.
  - Then replace ACCESS 2 and 3 combination.

Step 4: When the issue appears during motor driving, an undervoltage or overvoltage condition exists. When an issue occurs during traction acceleration or driving hydraulic functions, it is likely an undervoltage condition. Verify battery charge condition, power cable connections.

- If: Issue exists in battery or power cable connections.
  - Then repair or replace as necessary.
- If: Issue does not exist in battery or power cable connections.
  - Then proceed to Step 5.

Step 5: When an issue occurs during release braking, it is likely an overvoltage condition. Verify the line contactor contact is fully seated and power cable connections are correct and tight. Proceed to Step 6.

Step 6: Clear code and re-key the truck.

- If: Event clears.
  - Then return to operation.
- If: Event continues.
  - Then replace ACCESS 2 and 3 combination.

Event Code 306

VMN Low

Verified at start-up and at runtime.

Start up test

Before switching the line contactor ON, the software verifies the power bridge: it turns ON alternating the high side power mosfets (metal oxide semiconductor field-effect transistors) and expects the phases voltage to increase toward the rail capacitor value. When the phases' voltage does not increase, this issue occurs.

Run time test

Motor running test. When the traction motor (M1) is running, power bridge is ON, the motor voltage feedback is tested if it is lower than commanded value issue status is entered.

Step 1: Verify the line contactor is closing properly with good contact.

- If: Contacts are not closing properly.
  - Then repair or remove the contactor as necessary.

Step 2: Verify the power cables for M1are properly connected.

- If: Power cables are not correct.
  - Then repair or remove cables as necessary.

Flaking

It is not uncommon for a new mast to appear as if it is flaking or peeling. This appearance is an indication rollers are seating to mast channel and is considered normal. Eventually, this condition will disappear. Grease applied to the channel will retain these particles.

Mast Staging Bumper Replacement

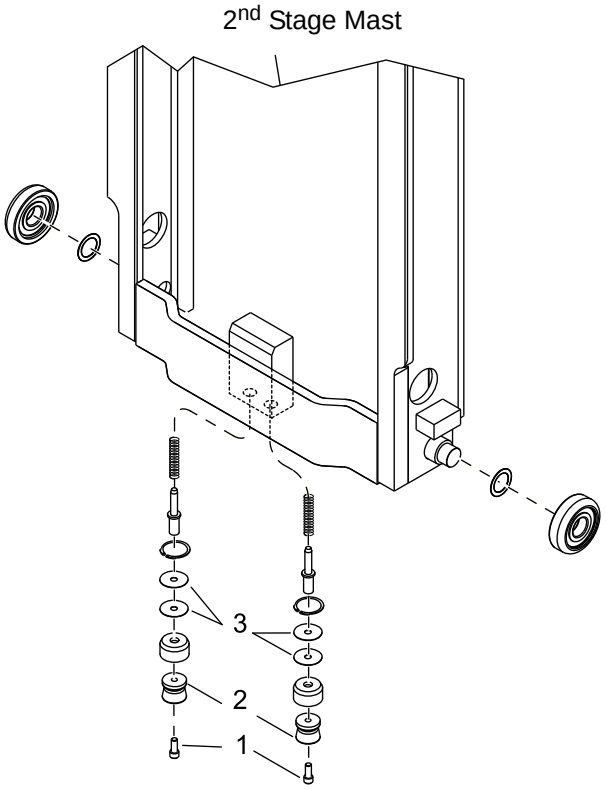


Figure 18726

1. Raise mast and replace bumper, item 2. Refer to Figure 18726.
2. Lower mast and check that mast bumpers contact their stops at same time. Adjust by adding or removing shims as required. Use shim 060030-277, 0.8 mm (0.031 in) thick, item 3. Refer to Figure 18726.
3. Apply thread locking adhesive to bumper screws and tighten, item 1. Refer to Figure 18726.

Disassembly

WARNING

Wear appropriate items, such as safety glasses, whenever performing maintenance work. Do not place fingers, hands or arms through mast or position them at pinch points.
In this section you may be required to lift and block the truck and mast or raise and lower different components for removal and installation. Make sure lifting device and sling are sufficiently rated to withstand the weight being lifted. Never work under or around a truck that is not properly secured. Refer to truck Data Plate for truck weight information.
It will be necessary to disconnect and remove battery from truck, disconnect tilt cylinders from mast, disconnect electrical connections and hydraulic lines. "Control of Hazardous Energy" section provides information for performing above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

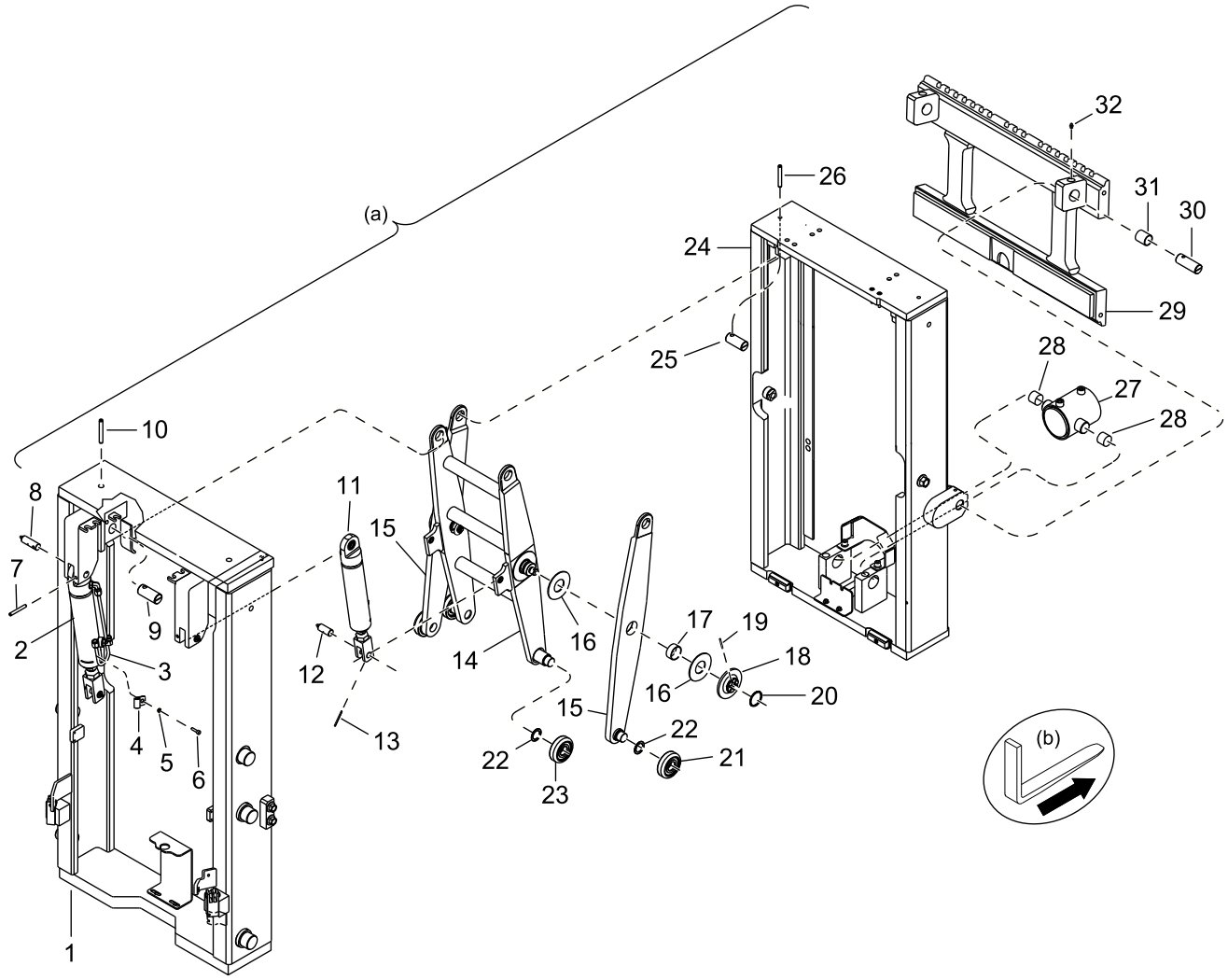


Figure 19202

(a) TL Mast Shown

(b) Left and Right Determined from Operator's Perspective

Disassembly

Refer to Figure 19202 as follows:

NOTE

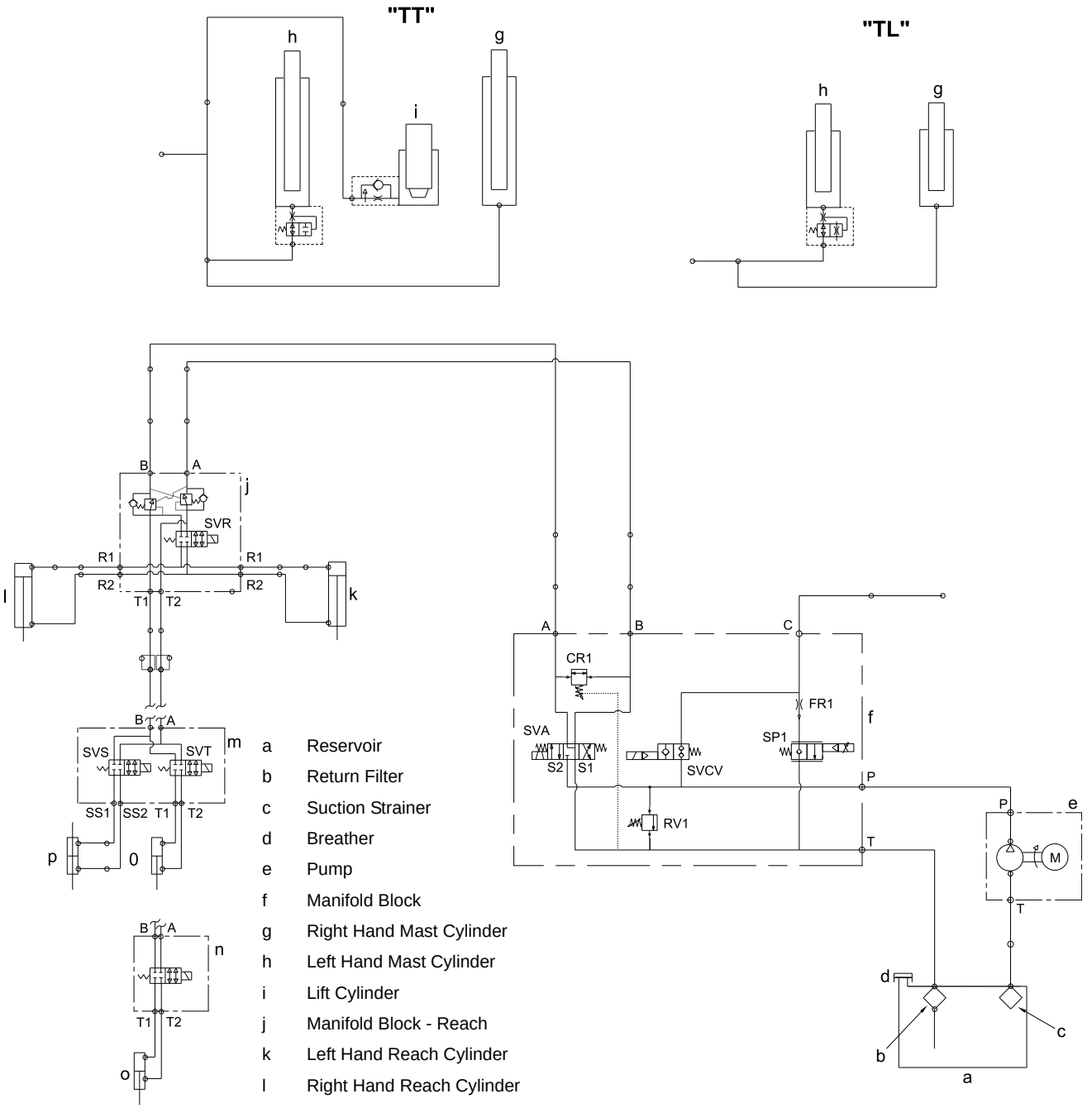
Disconnect battery. If complete disassembly of reach assembly is required, removal of entire reach assembly from mast assembly will ease disassembly procedure.

1. Remove four screws holding load backrest (not shown) to carriage (29) and remove load backrest.
2. Remove forks (not shown) from fork plate.
3. Extend reach assembly and place a 50 x 100 x 200 mm (2 x 4 x 8 in) hardwood block (approximate size) in either left or right channel of reach support (1).
4. Retract reach assembly until column roller (21) on outer arm (15) is resting on hardwood block. The hardwood block will not allow assembly to retract when the reach cylinders are removed.

NOTE

Ensure hoist has a minimum lifting capacity of 905 kg (2000 lb).

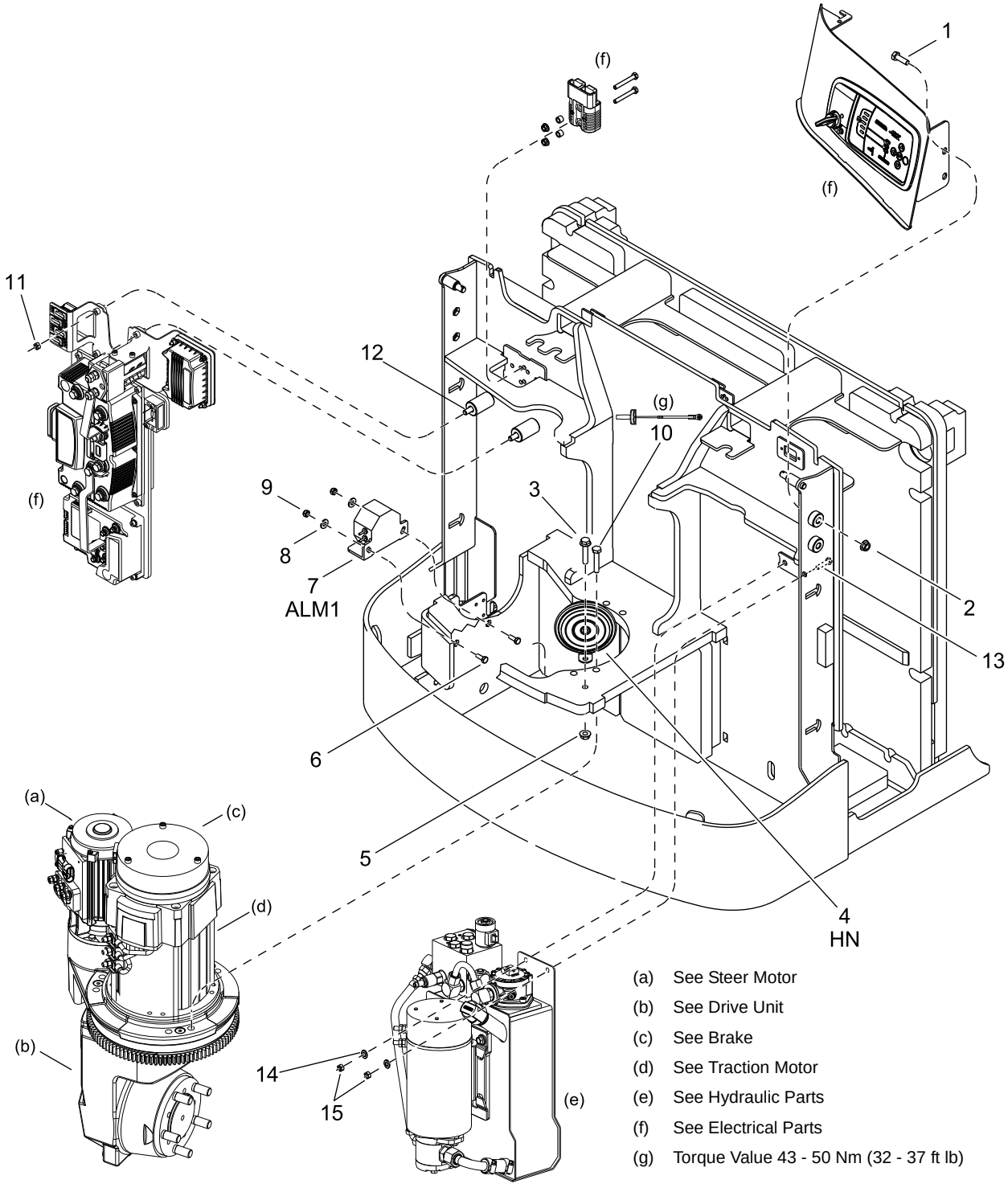
SHR 5500



a	Reservoir
b	Return Filter
c	Suction Strainer
d	Breather
e	Pump
f	Manifold Block
g	Right Hand Mast Cylinder
h	Left Hand Mast Cylinder
i	Lift Cylinder
j	Manifold Block - Reach
k	Left Hand Reach Cylinder
l	Right Hand Reach Cylinder
m	Manifold Block - Tilt/Sideshift
n	Manifold Block - Tilt
o	Tilt Cylinder
p	Reach Cylinder

Figure 17404-02

INDEX	PART NUMBER	PART NAME	NUMBER REQUIRED
1	134385	Tube Assembly	1
2	134386	Tube Assembly	1
3	060005-007	Lockwasher	2
4	060015-006	Screw	2
5	134371	Tilt Cylinder	1
6	064280-004	90° Adaptor	2
	064019-031	O-Ring	4
7	064253-276	Hose Assembly	2
	064019-004	O-Ring	2
	064019-014	O-Ring	2
8	064280-004	90° Adaptor	2
	064019-031	O-Ring	4
9	134371	Tilt Cylinder	1
10	134385	Tube Assembly	1
11	134386	Tube Assembly	1
12	050025-003	Bolt	4
13	064034-003	Bulkhead Fittings	2
14	050068-002	Nut	4
15	136728	Bracket	2
16	060015-006	Screw	2
17	060005-007	Lockwasher	2
18	137153-002	Tube Assembly	1
19	137152-002	Tube Assembly	1
20	069030-004	Nut	2
21	064061-002	Elbow 90°	2
	064019-031	O-Ring	4



(a) See Steer Motor
(b) See Drive Unit
(c) See Brake
(d) See Traction Motor
(e) See Hydraulic Parts
(f) See Electrical Parts
(g) Torque Value 43 - 50 Nm (32 - 37 ft lb)

Figure 17165-01

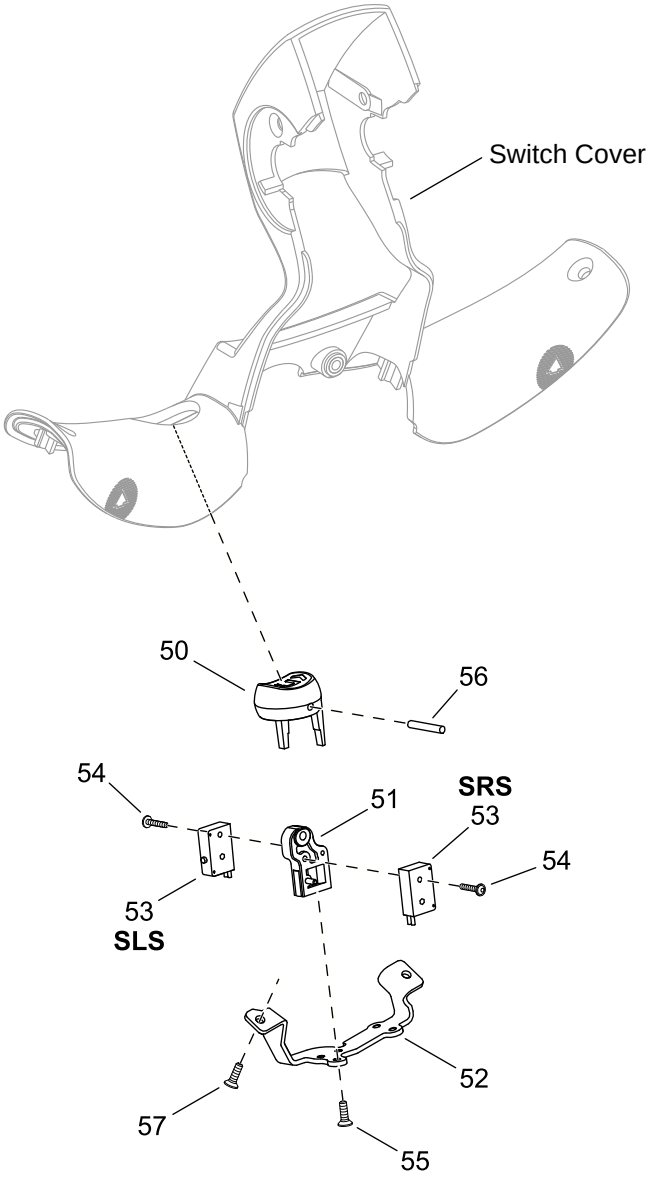


Figure 17227-02

2nd Stage Mast

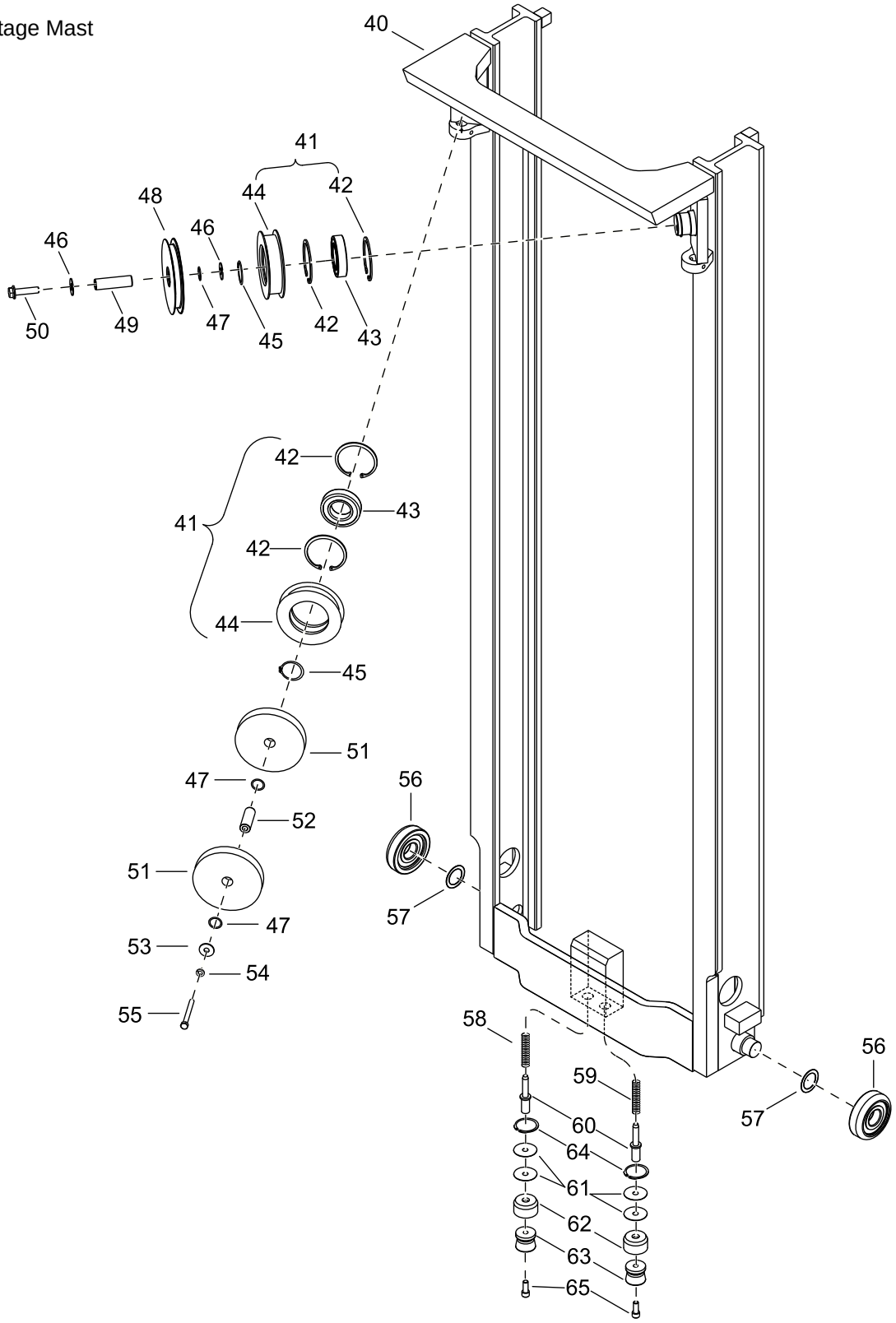


Figure 17579

127 mm (5 in) O.D. Tandem Load Wheels

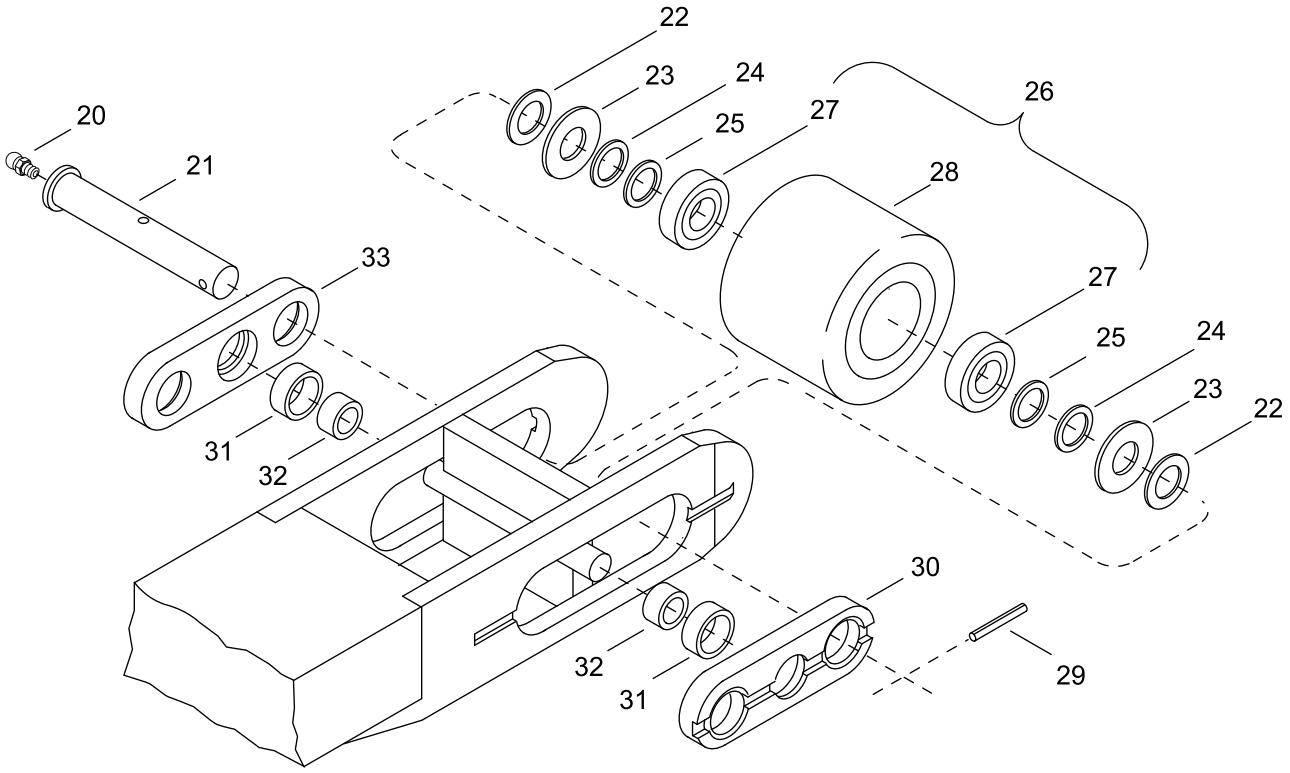
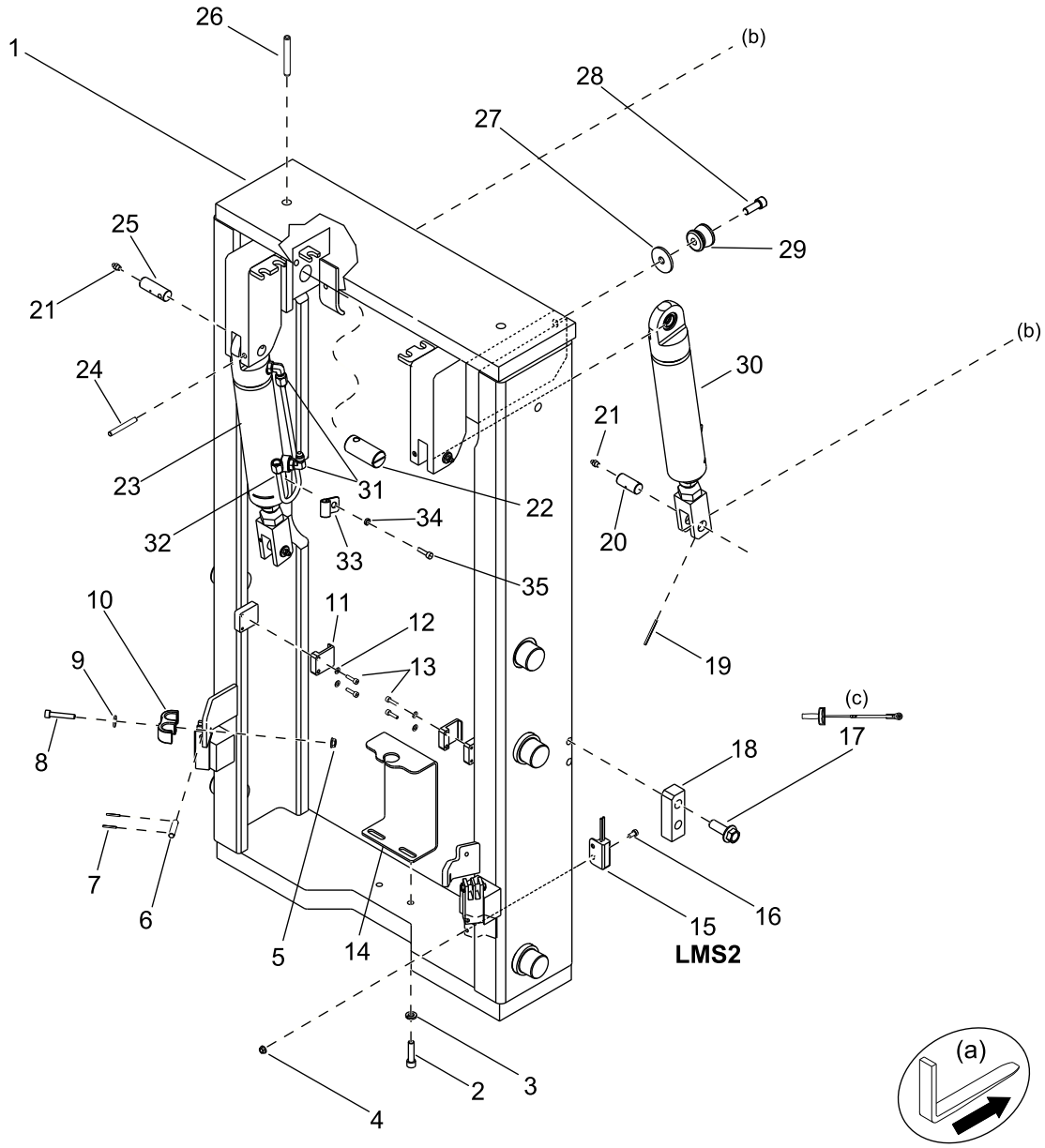


Figure 18830



(a) Left and Right is Determined from Operator's Perspective

(b) To Inner Arm Weldment

(c) Torque Value 108 - 117 Nm (80 - 86 ft lb)

Figure 17599-02