Introduction

This manual is for qualified service technicians who have been appropriately trained to do troubleshooting and maintenance procedures on the lift truck. The manual contains information about maintenance, troubleshooting, and replacement parts.

Operator instructions

Operator instructions ensure that the technician knows how to operate a Crown lift truck safely. These instructions are provided in tag or booklet form with each lift truck and are not included in this manual. More copies can be ordered if necessary. For operator instructions, see the Operator Manual SC 6000 Series.

Operator training

Crown has operator training programs that are available through a Crown dealer. For more information on operator training, consult your Crown dealer or visit www.crown.com.

Service training

Service training is available for:

- All Crown lift trucks
- Module systems
- Hydraulic systems
- Electrical systems

For more information on service training, consult a Crown dealer or go to www.crown.com.

Replacement parts

For correct and fast service, always provide the following information when contacting Crown for replacement parts:

- The part number
- The lift truck model number
- The lift truck serial number
- The lift truck data number

Consult a Crown dealer or visit www.crown.com for:

- Current service manuals
- Current operator manuals
- Operator and service training
- Lift truck capacities
- Lift truck specifications

Manual structure

This manual contains sections that have maintenance and replacement parts. The section descriptions are as follows:

Service and Parts Pages			
Maintenance		Replacement Parts	
Section	Description	Section	Description
MA	Safety	1	Power Unit
M1	Inspection and Lubrication	2	Hydraulic System
M1.91	Componentry	3	Drive Unit
M2	Hydraulic	4	Electrical System
M3	Drive Unit	5	Brake System
M4	Electrical	6	Steering
M5	Brake	7	Lifting Mechanism
M6	Steering	8	Cylinders
M7	Lifting Mechanism	9	Reach and Attachments
M8	Cylinders	10	Accessories
M9	Reach and Attachments	10.9	Labels and Decals
M10	Glossary		
DIA	Schematic Diagrams	HYD	Hydraulic Schematic

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.
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.
14. Modifications and additions which affect capacity and safe truck operation shall not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance plates or decals shall be changed accordingly.
15. Care shall be taken to assure that all replacement parts are interchangeable with the original parts and of equal quality to that provided in the original equipment.

- Hydraulic jack, P/N 300083
  - Capacity: 3,991 kg (8,800 lb)
  - Collapsed height minimum: 60 mm (2.25 in)
  - Raised maximum height: 400 mm (16 in)
- Jack stand, P/N 300081
  - Commercially available
  - Capacity: 6,350 kg (14,000 lb)

1. Follow all instructions in Preparing the lift truck for maintenance.
2. Fully lower the forks.
3. Make sure that the forks are empty.
4. Attach a sling and an overhead device to all cross members of the mast.
5. Use a hydraulic jack to lift the power unit end only as much as necessary.
6. To support the lift truck, put hardwood blocks under the power unit skirt.
7. Lift the forks with an overhead lifting device or hydraulic jack no more than 400 mm (16 in).

Disconnecting the tilt cylinders

When the tilt cylinders are disconnected from the hydraulic system or mounting brackets, the mast must be secured to keep the mast from moving.

1. Follow all instructions in Preparing the lift truck for maintenance section.

Note: If the mast cannot be lowered using normal lift truck functions, see Manually lowering the mast.

2. See Figure 3. Attach a sling (1) and lifting device (2) to all top cross braces of the mast so that movement is minimal when the tilt cylinders (3) are disconnected.

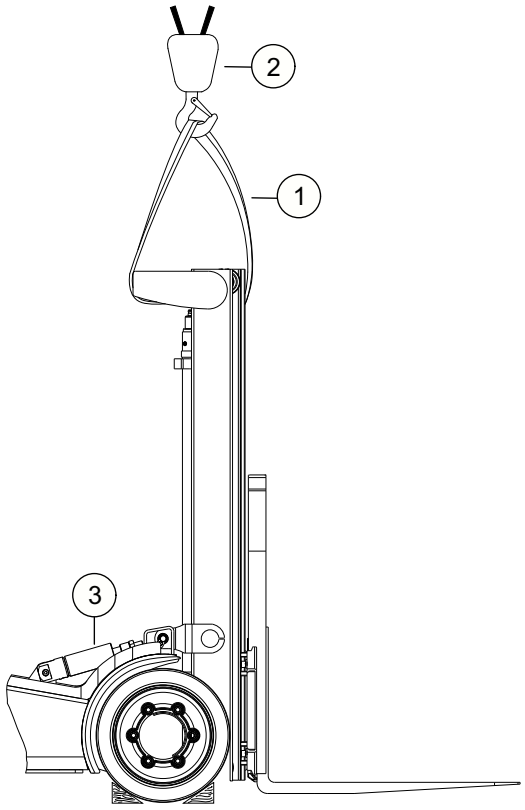


Fig. 3 (33634)

3. See Figure 4. Remove the screws (7) and wedge washer (6) from the block (4) that secures the tilt cylinder (2) to the mast and power unit.

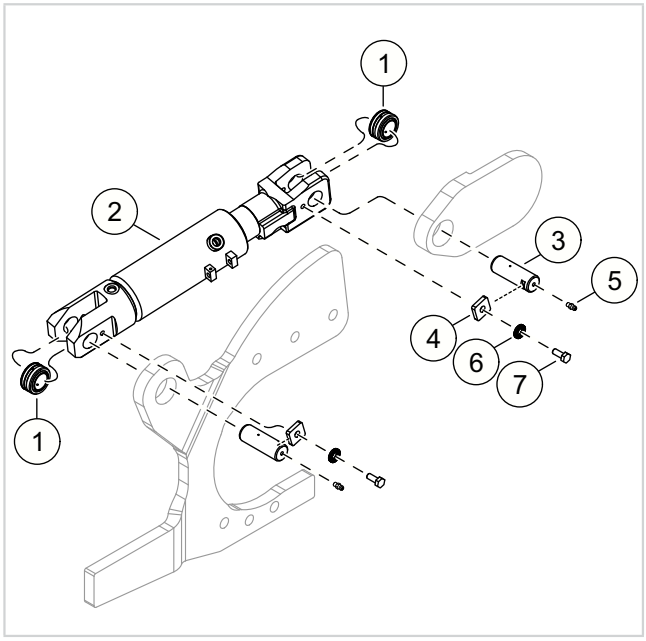


Fig. 4 (34444)

Alternate Lubricants and Fluids			
Type of Lubricant		Product Name	Manufacturer/ Distributor
H	Protectant, rubber and vinyl	Crown	Crown
I	Grease - lift pump coupling	Nyogel 774F-MS	NYE Lubricants
J	Fluid, DOT 5 - brake	Q2-1141 Silicone Brake Fluid	Dow Corning
K	Grease - wheel bearing	Mobilgrease XHP 222 Special	Mobil
		Unirex EP-2	Exxon
		Lubriplate No. 1242 (1)	Fiske Bros. Refining Co.
L	Spray - metal assembly	Dow Corning	Dow Corning
LL	Lubricant, spray on S00727, PTFE freezer lubricant	Spray on S00727	Sherwin Williams
M	Grease, silicone, clear	Dow Corning 111 Compound	Dow Corning
N	Cleaner, low VOC - brake and parts	Crown	Crown
	Cleaner, nonflammable - brake and parts	Crown	Crown
O	Lubricant, penetrating	Crown	Crown
P	Grease, premium, multi-purpose	Crown	Crown
Q	Grease, white, lithium	Crown	Crown
R	Cleaner - choke and carburetor	Crown	Crown
S	Cleaner - contact	Crown	Crown
T	Inhibitor - electrical connector oxidation and corrosion	NYE Grease	NYE Lubricants
U	Cleaner - battery	Crown	Crown
V	Protector - battery	Crown	Crown
W	Lubricant, food grade, machine	Crown	Crown
X	Lubricant, food grade, silicone spray	Crown	Crown
Y	Coolant, extended life	Mobil Delvac ELC	Mobil
		Shell Rotella Ultra ELC	Shell
		Zerex ELC HD Coolant	Zerex
Z	Fluid, windshield washer		

Planned Maintenance Lubrication					
Index	**Component**	**Lube Type**	**Quantity**	**180 Days 500 Hours**	**12 Months 2,000 Hours**
L-1	Seat deck hinges	Q	As Required	Check	
L-2	Steer column pivot and adjustment latch	Q	As Required	Check	
L-3	Seat deck latch	Q	As Required	Check	
L-4	Seat slides	Q	As Required	Check	
L-5	Steering wheel bearing (3–wheel)	B	As Required	Check	
L-6	Steering wheel bearings, steer linkage (4–wheel)	B	As Required	Check	
L-7	Drive unit oil	AAAA	775 ml (0.8 qt)	Check	Change
See Lubricants, Aerosols, and Service Supplies for lubricant type designation explanation.					
Lubrication intervals for lift trucks operated in a freezer, outdoor, dusty, or corrosive environment must be changed to a frequency that minimizes corrosion and wear.					

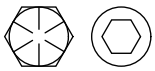
Planned Maintenance Inspection		
Index	**Component**	**180 Days 500 Hours**
I-1	Horn switch (HNS), horn, and operation	Check
I-2	Travel alarm and impact sensor	Check
See the appropriate chapter of the service manual for additional information concerning inspection or adjustment.		

Planned Maintenance Inspection		
Index	**Component**	**180 Days 500 Hours**
I-1	Load backrest	Check
I-2	Carriage	Check
I-3	Forks	Check
I-4	Fork latches	Check
I-5	Sideshifter (slide, cylinder, mounting hardware, hoses)	Check
I-6	Mast pivot bearings and mounting bolts	Check
I-7	Control levers linkage, switches, and lift potentiometer (lift trucks with manual valve only)	Check
I-8	Mast hydraulic lines, hoses, and fittings (not shown)	Check
I-9	Mast cable and wiring (not shown)	Check
See the appropriate chapter of the service manual for additional information concerning inspection or adjustment.		

SAE Torque Values

It is important to tighten fasteners to the correct torque value. This section shows the standard torque values for the screws and bolts used in Crown lift trucks and vehicles. Special torque values in the maintenance and parts sections of this manual override the standard torque values in this section.

Grade

Grade Identification (on Head)	Specification	Bolt and Screw Size (in)
	SAE - Grade 2	1/4 through 1-1/2
	SAE - Grade 5	1/4 through 1-1/2
	SAE - Grade 8	1/4 through 1-1/2

NOTE: Even though a bolt head is unmarked, Crown uses nothing less than Grade 5 in all its bolted assemblies. Instances do occur when Grade 5 bolts are manufactured unmarked. When a fastener is replaced that is unmarked, replace the fastener with a Grade 5.

Fig. 1 (14916-02)

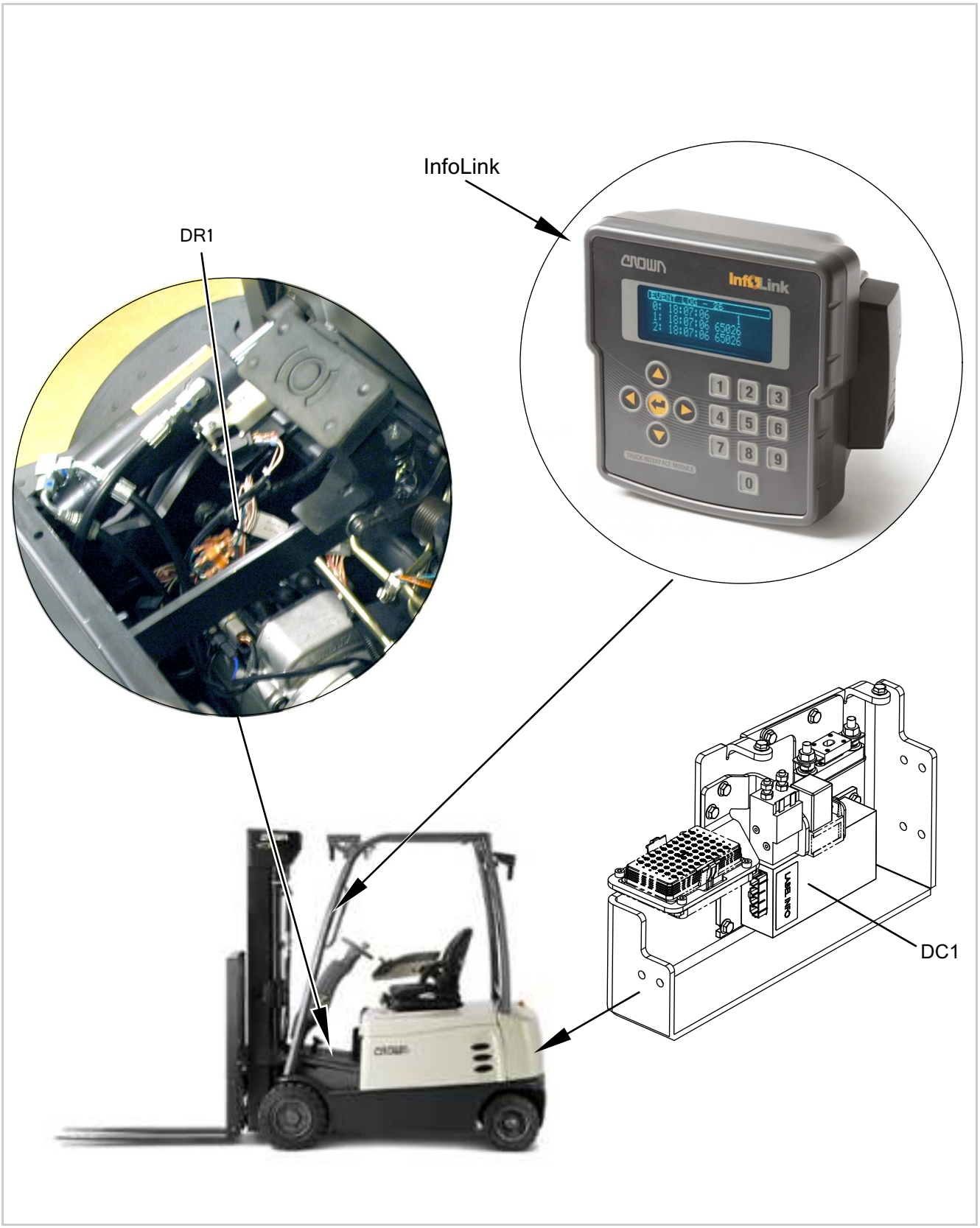


Fig. 22 (29971-01)

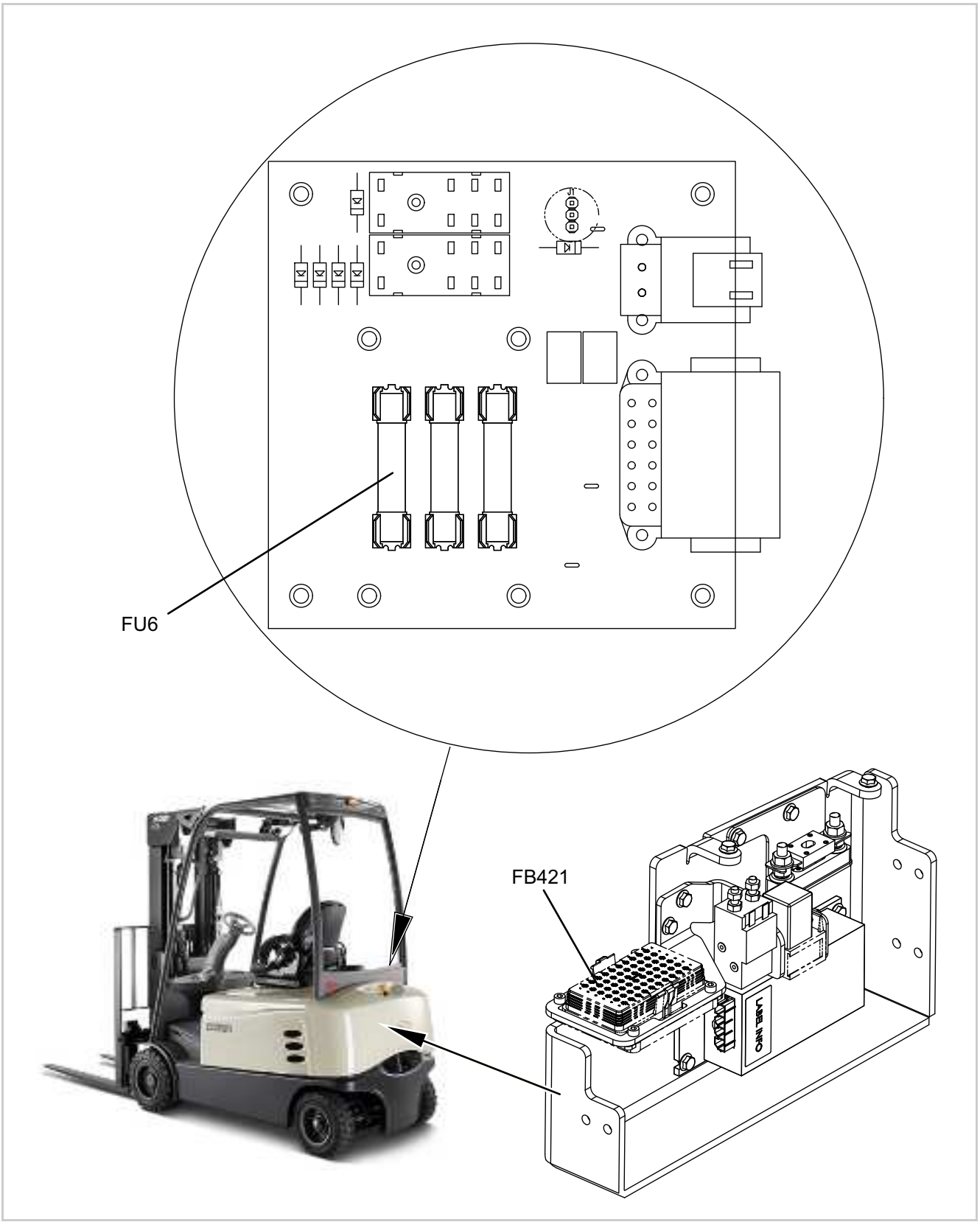
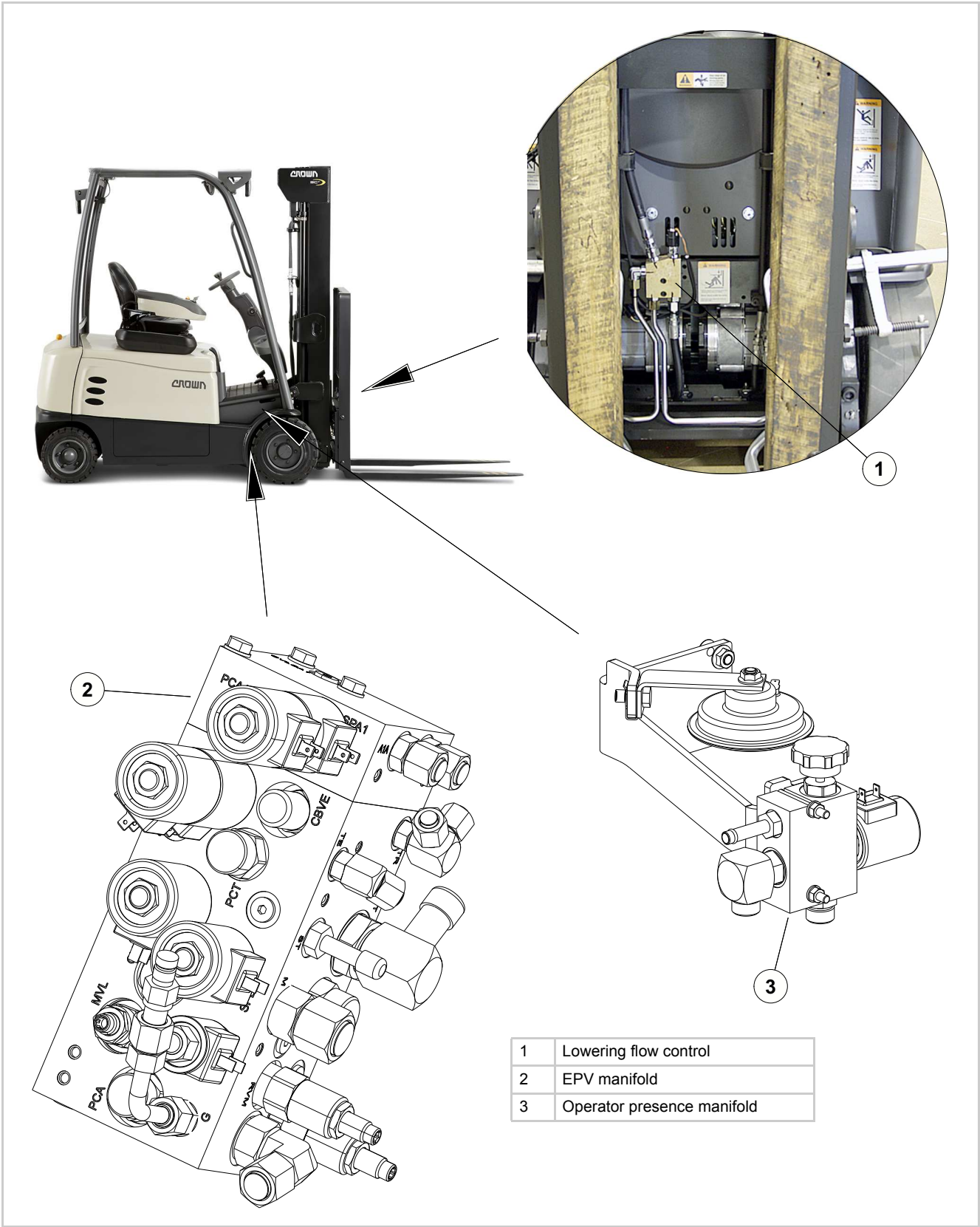


Fig. 27 (29976-01)



1	Lowering flow control
2	EPV manifold
3	Operator presence manifold

Fig. 31 (29979)

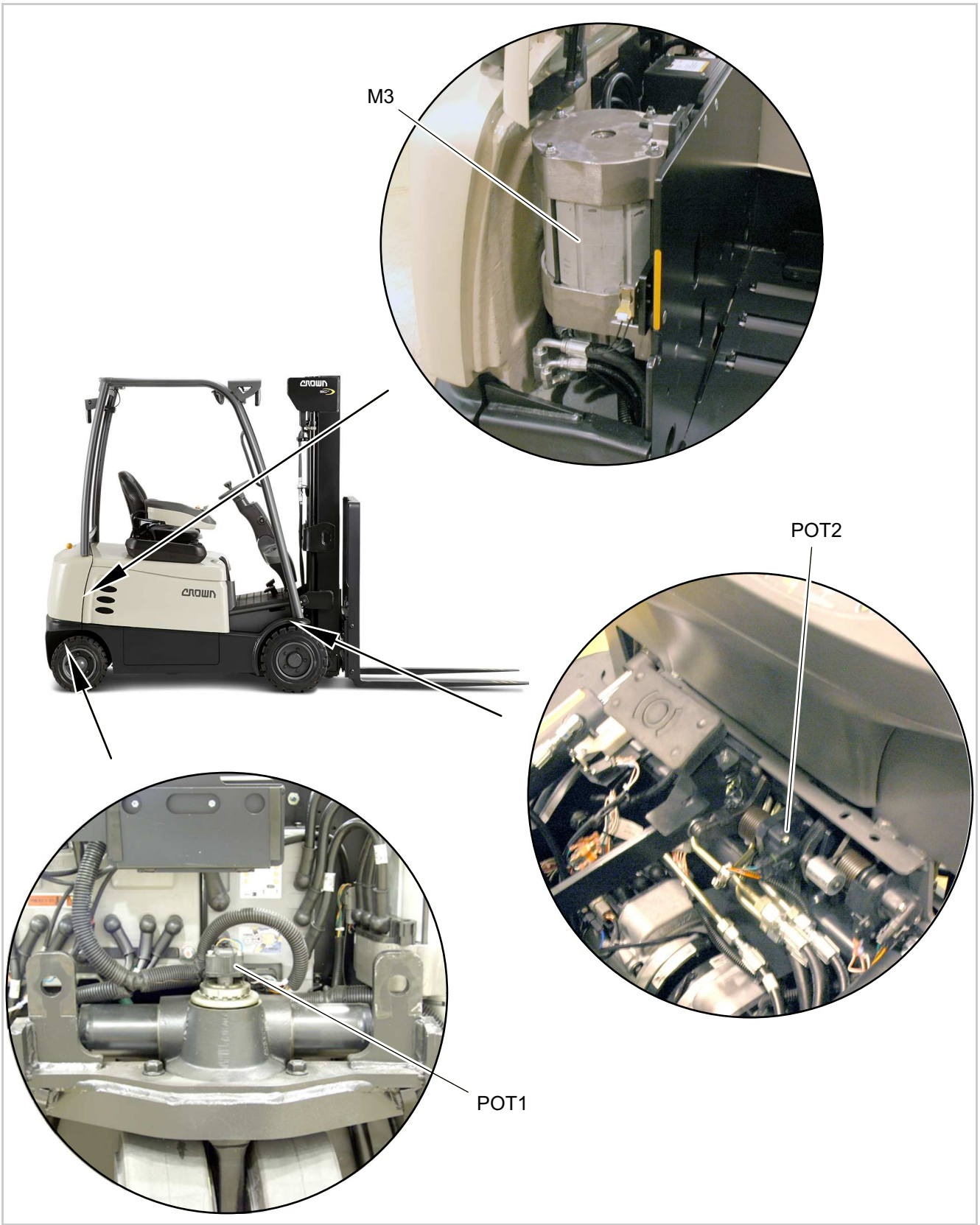
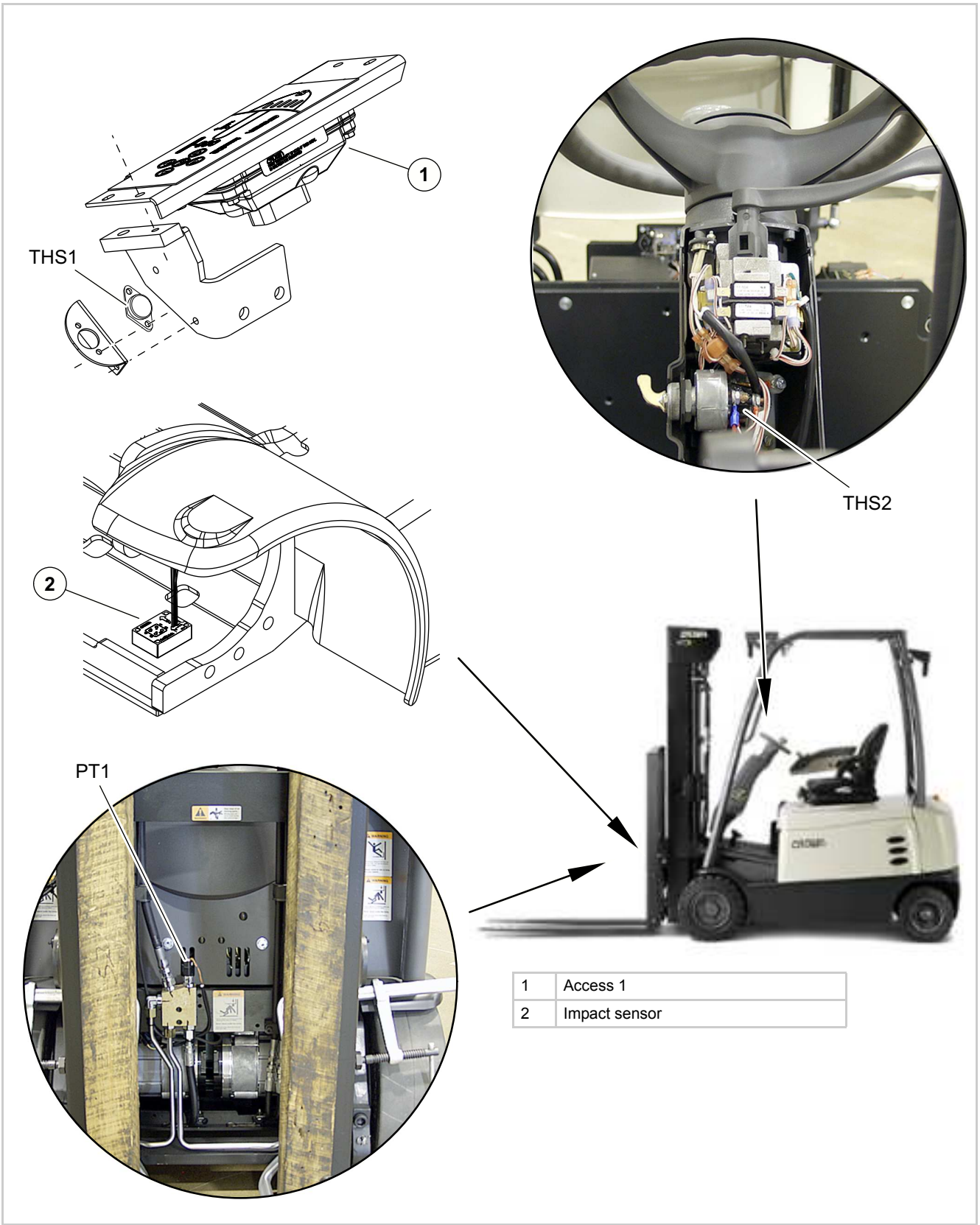


Fig. 34 (29982)



1	Access 1
2	Impact sensor

Fig. 39 (29987)

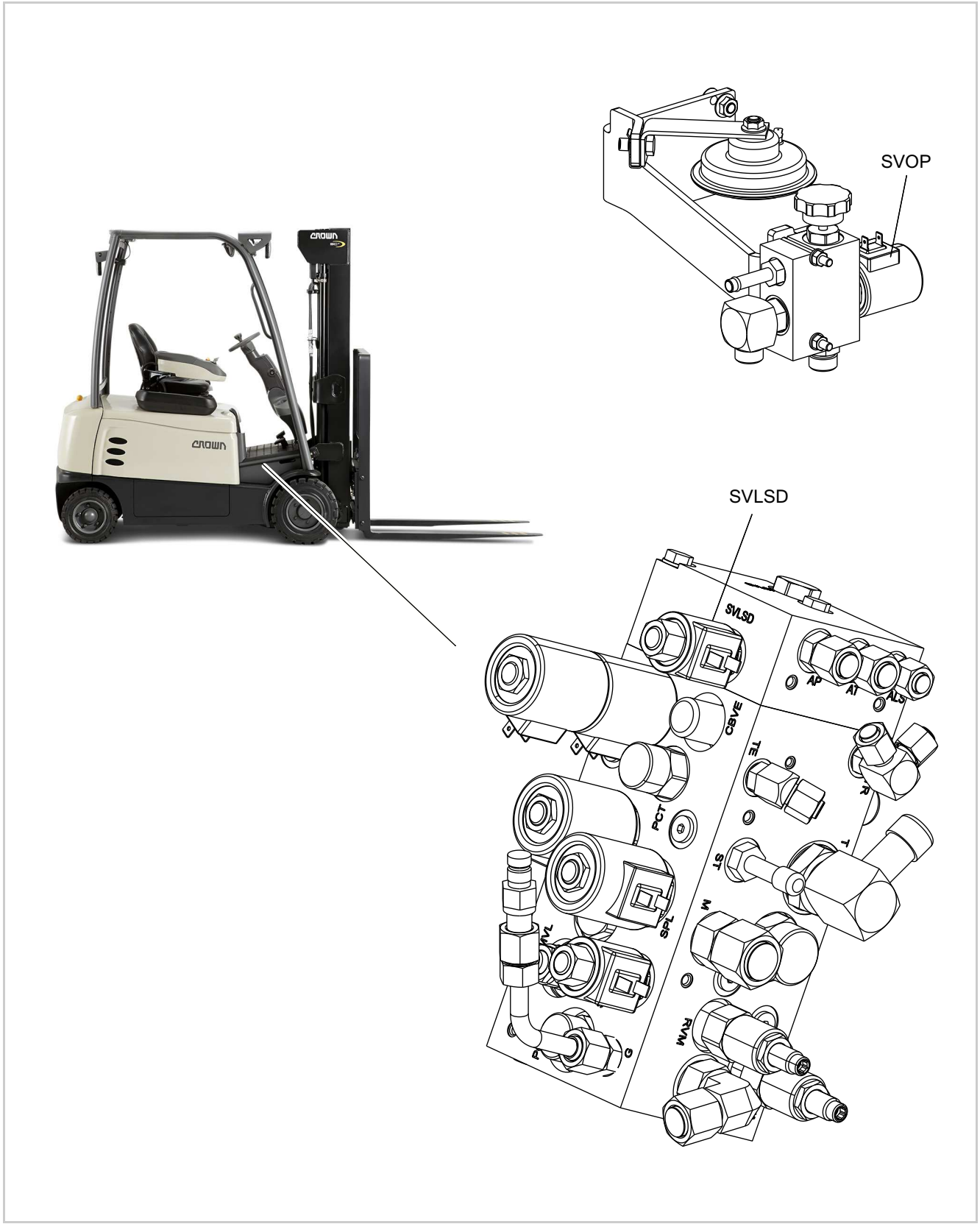
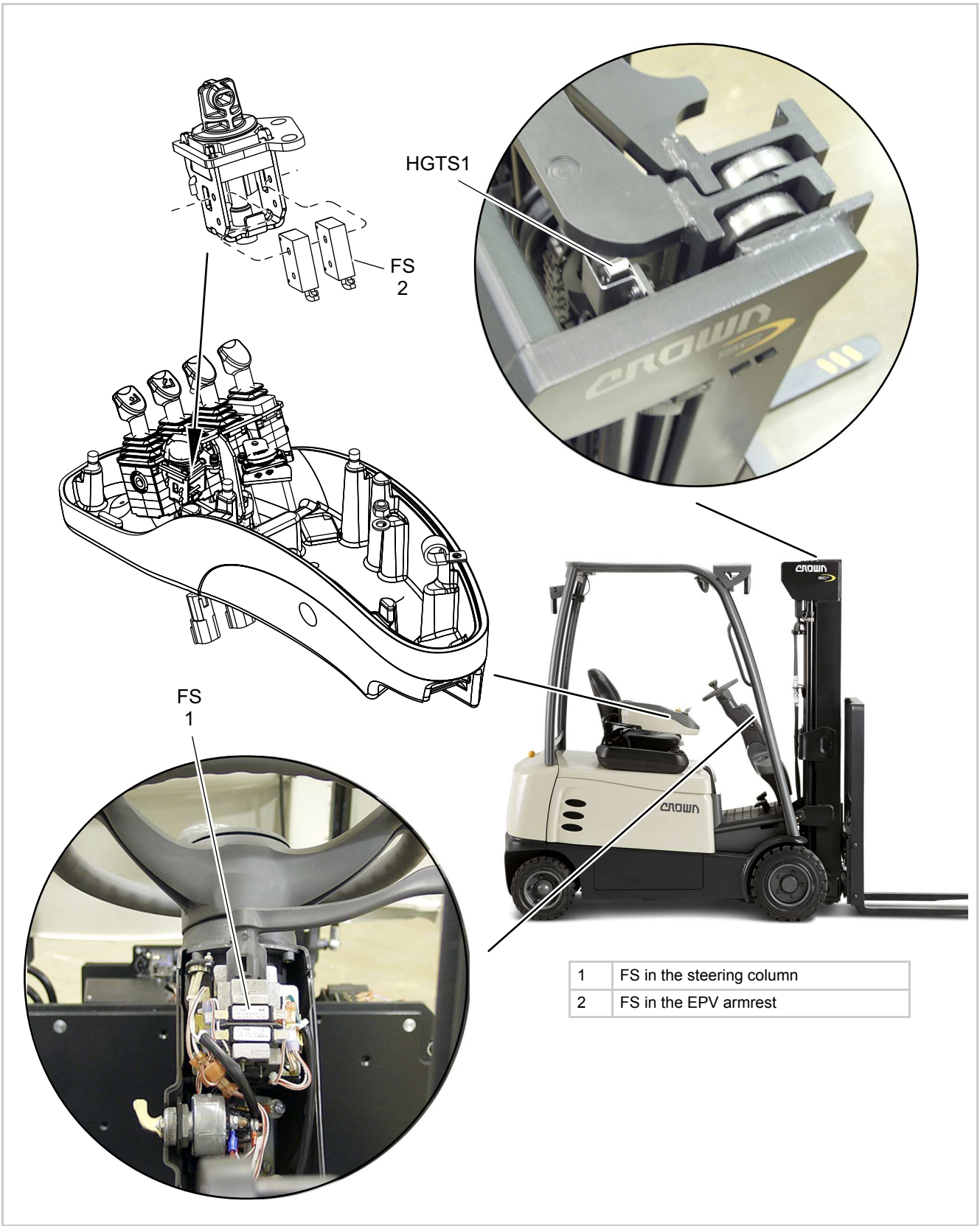


Fig. 44 (29992)



1	FS in the steering column
2	FS in the EPV armrest

Fig. 49 (29996)

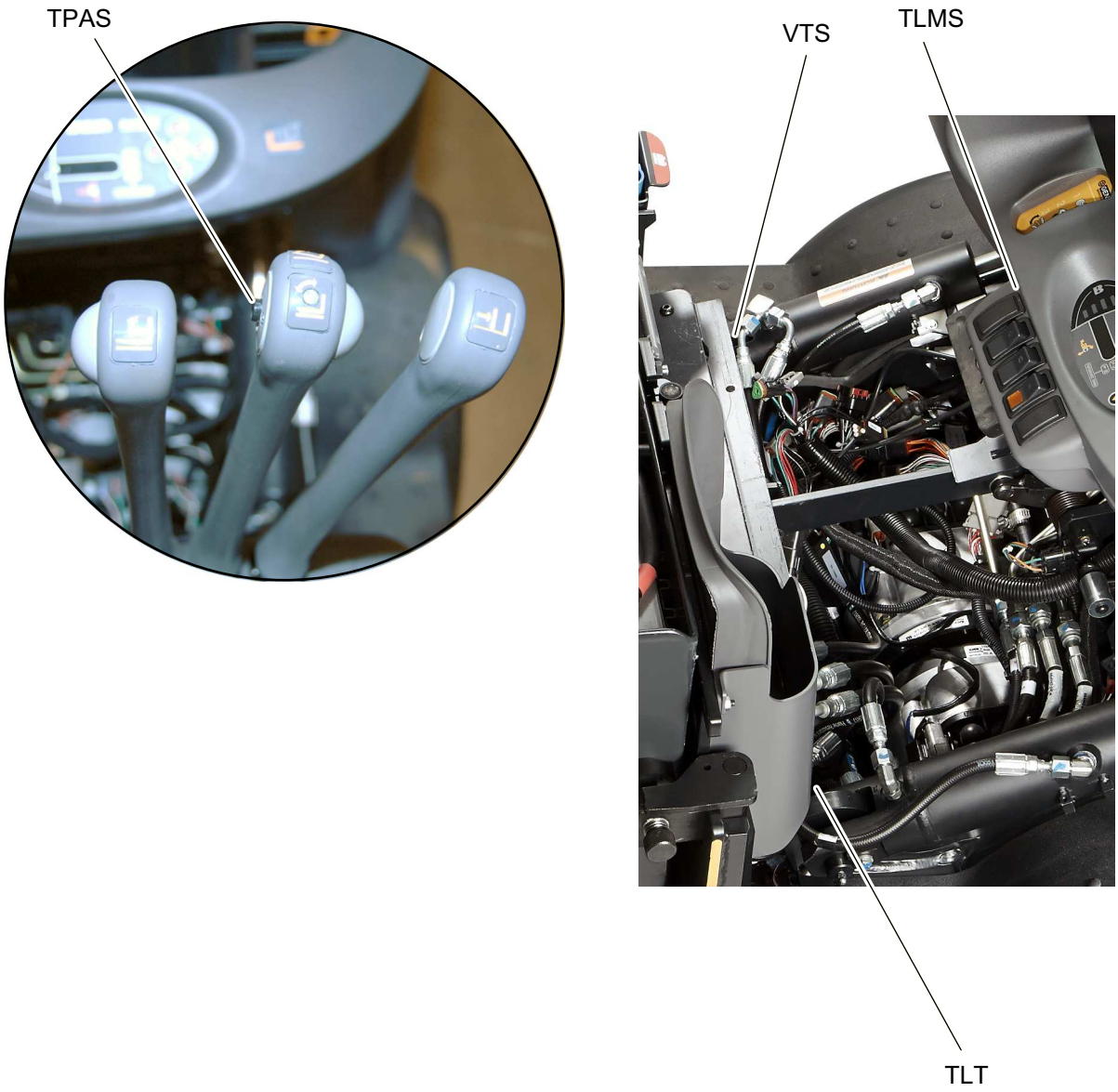
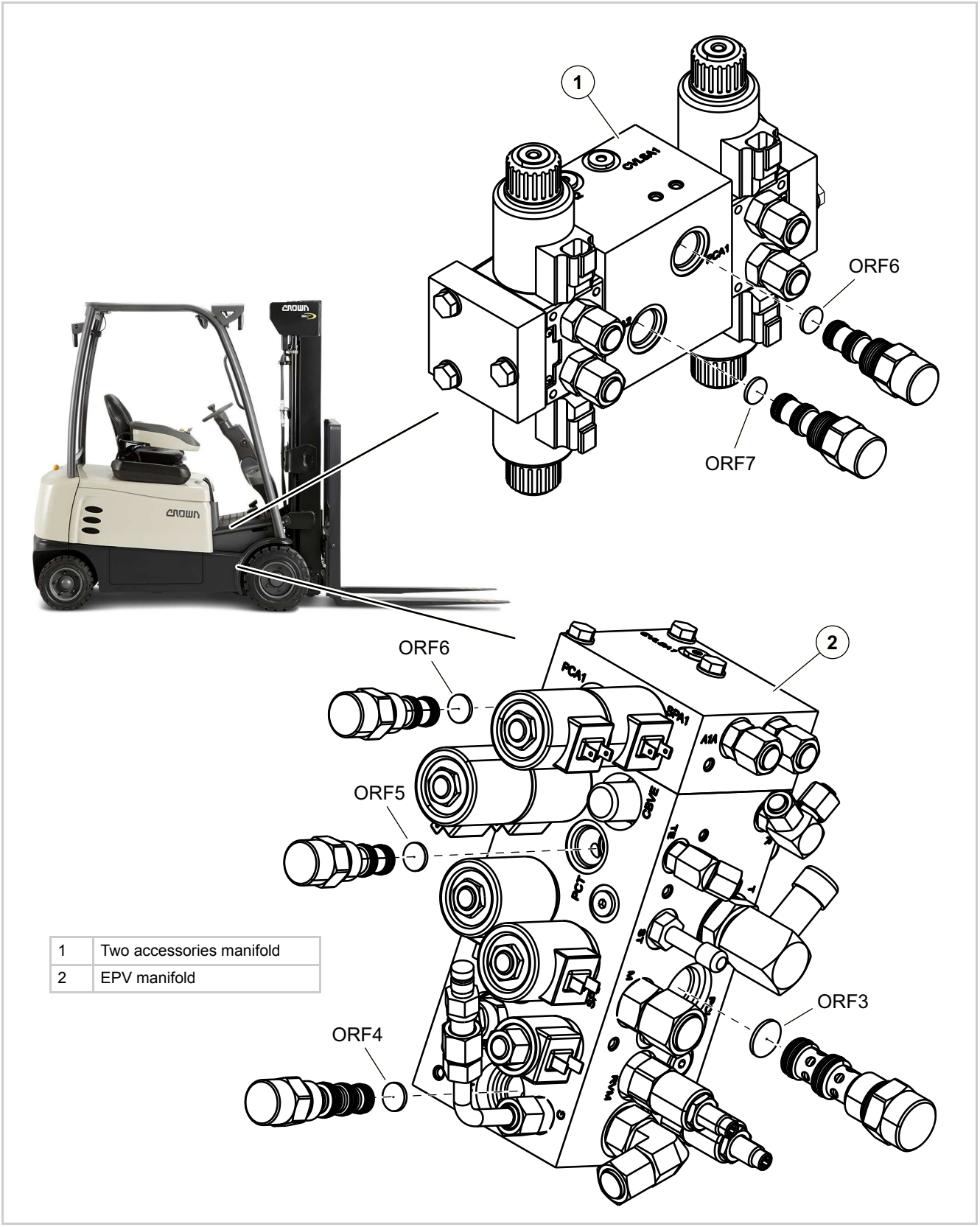


Fig. 53 (30001)

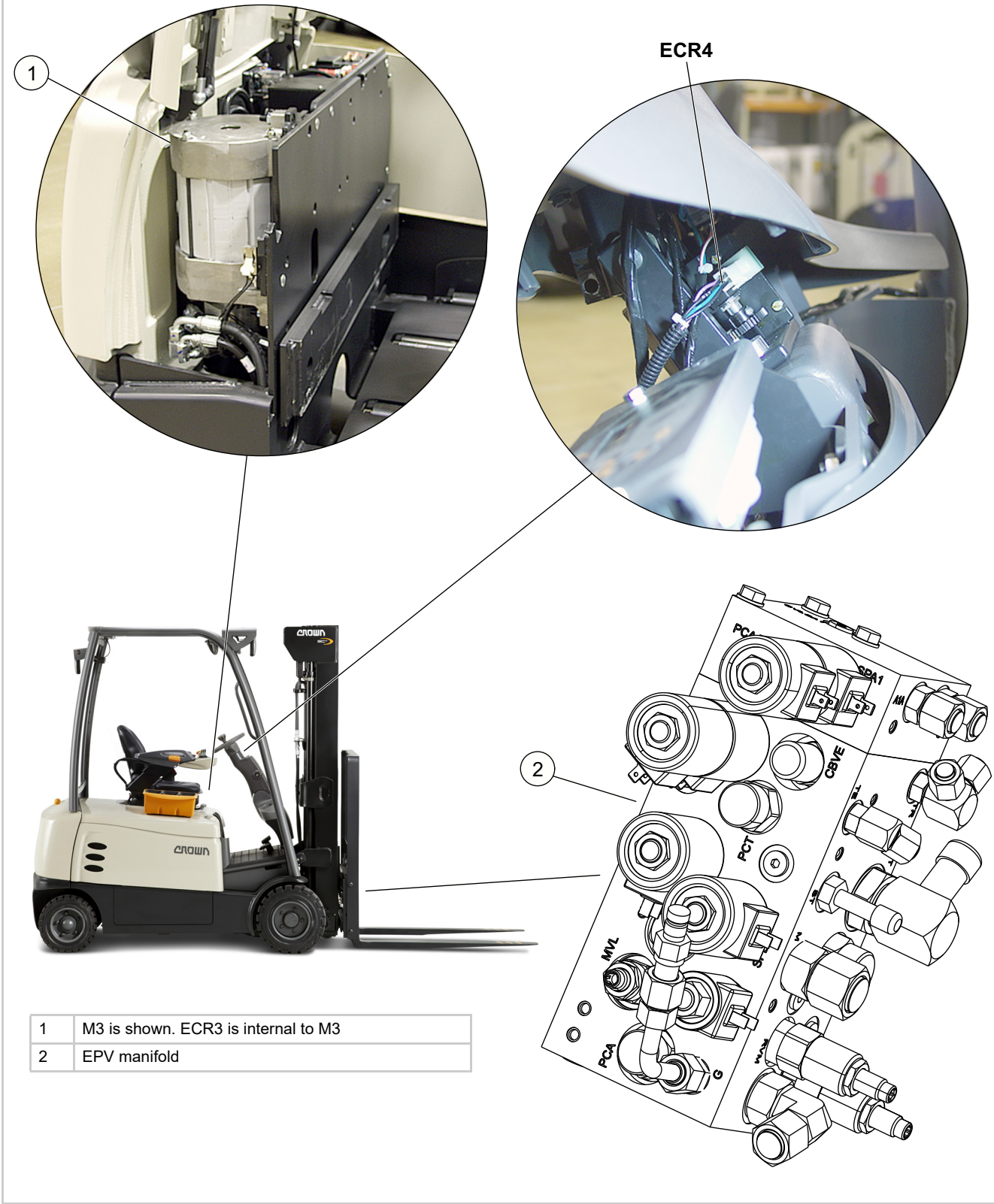


1	Two accessories manifold
2	EPV manifold

Fig. 58 (30005)

Fig. 1 (33978)

Fig. 6 (33983)

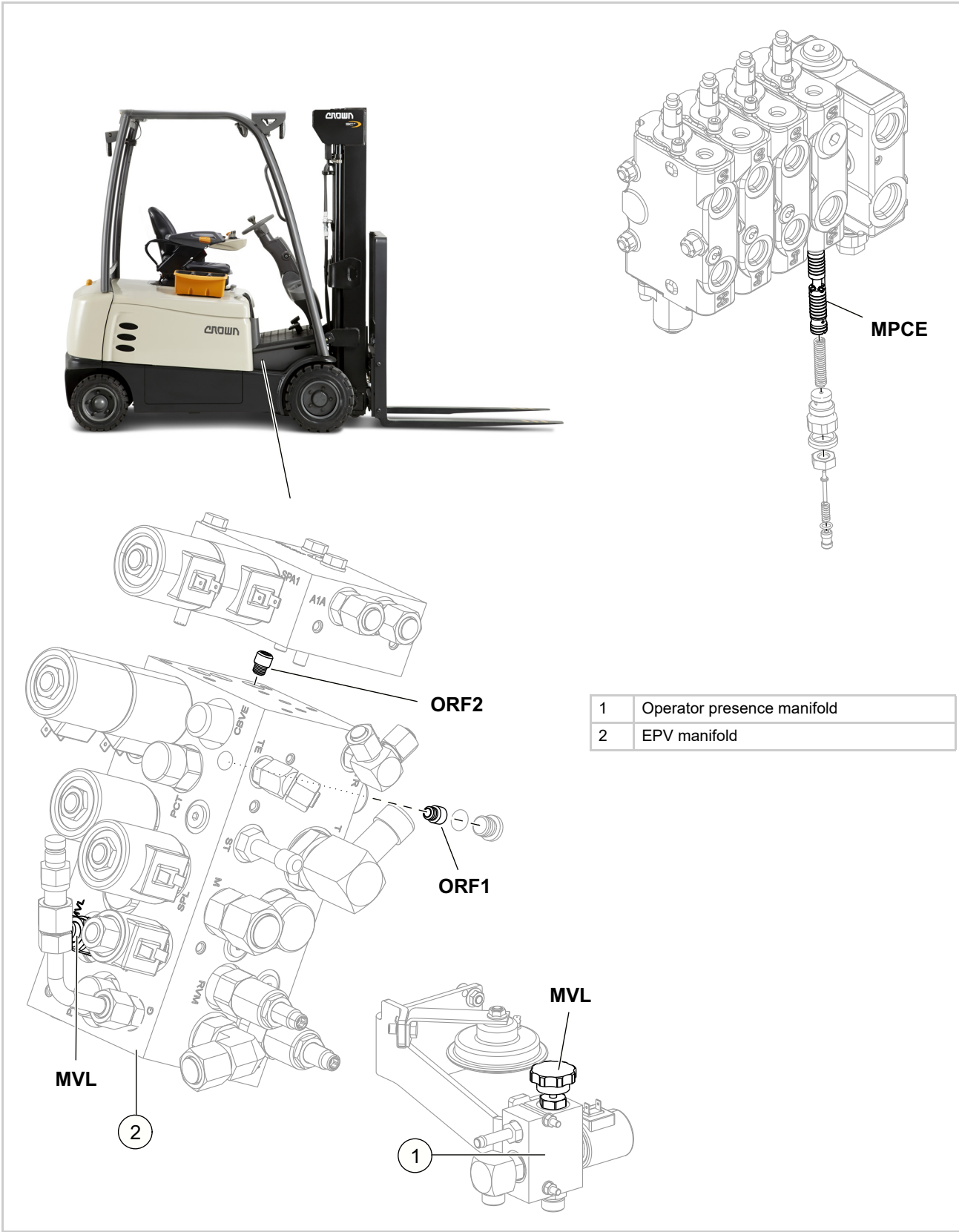


1	M3 is shown. ECR3 is internal to M3
2	EPV manifold

Fig. 11 (33988)

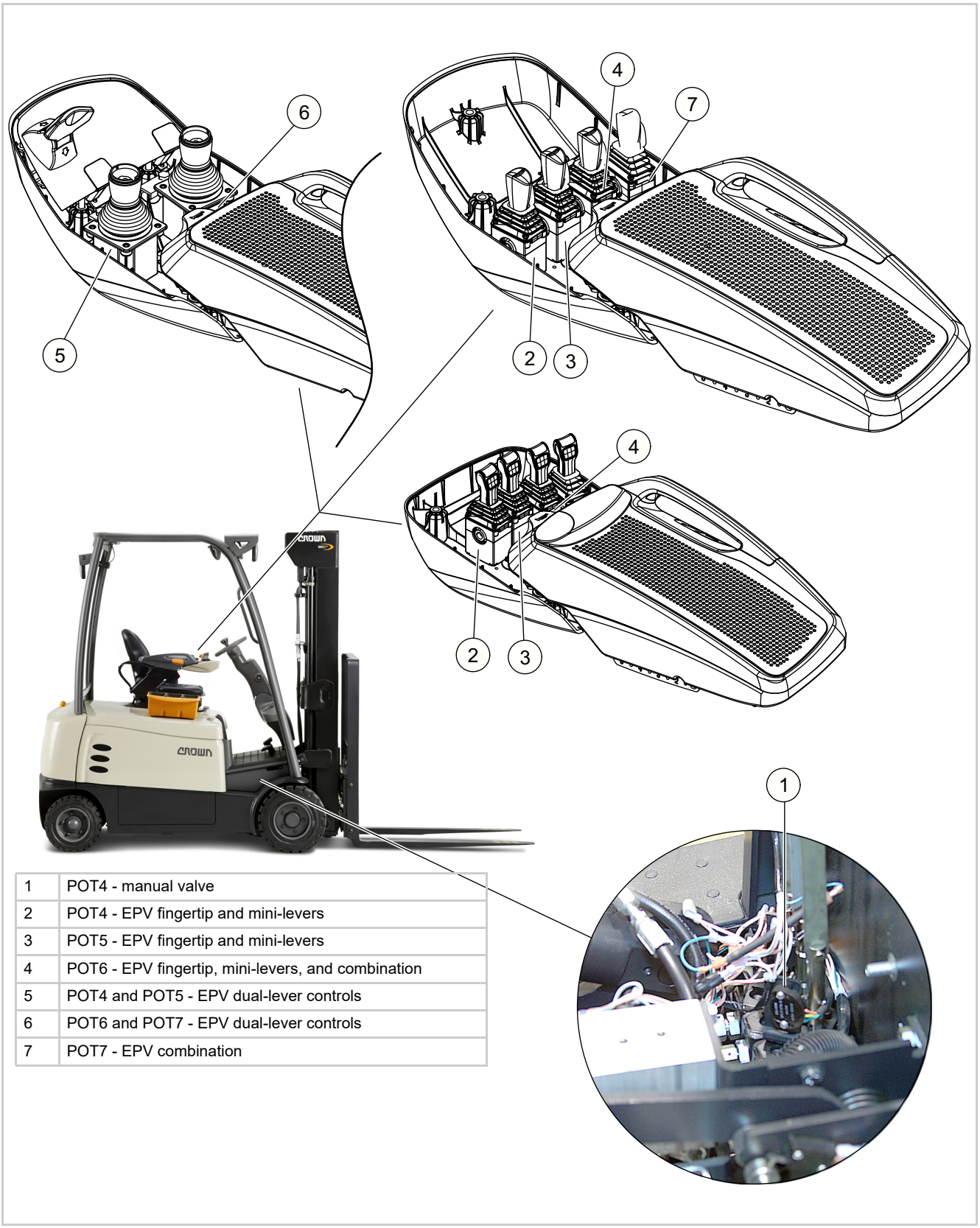
Fig. 15 (33992)

Fig. 20 (33997)



1	Operator presence manifold
2	EPV manifold

Fig. 25 (34002)



1	POT4 - manual valve
2	POT4 - EPV fingertip and mini-levers
3	POT5 - EPV fingertip and mini-levers
4	POT6 - EPV fingertip, mini-levers, and combination
5	POT4 and POT5 - EPV dual-lever controls
6	POT6 and POT7 - EPV dual-lever controls
7	POT7 - EPV combination

Fig. 30 (34007)

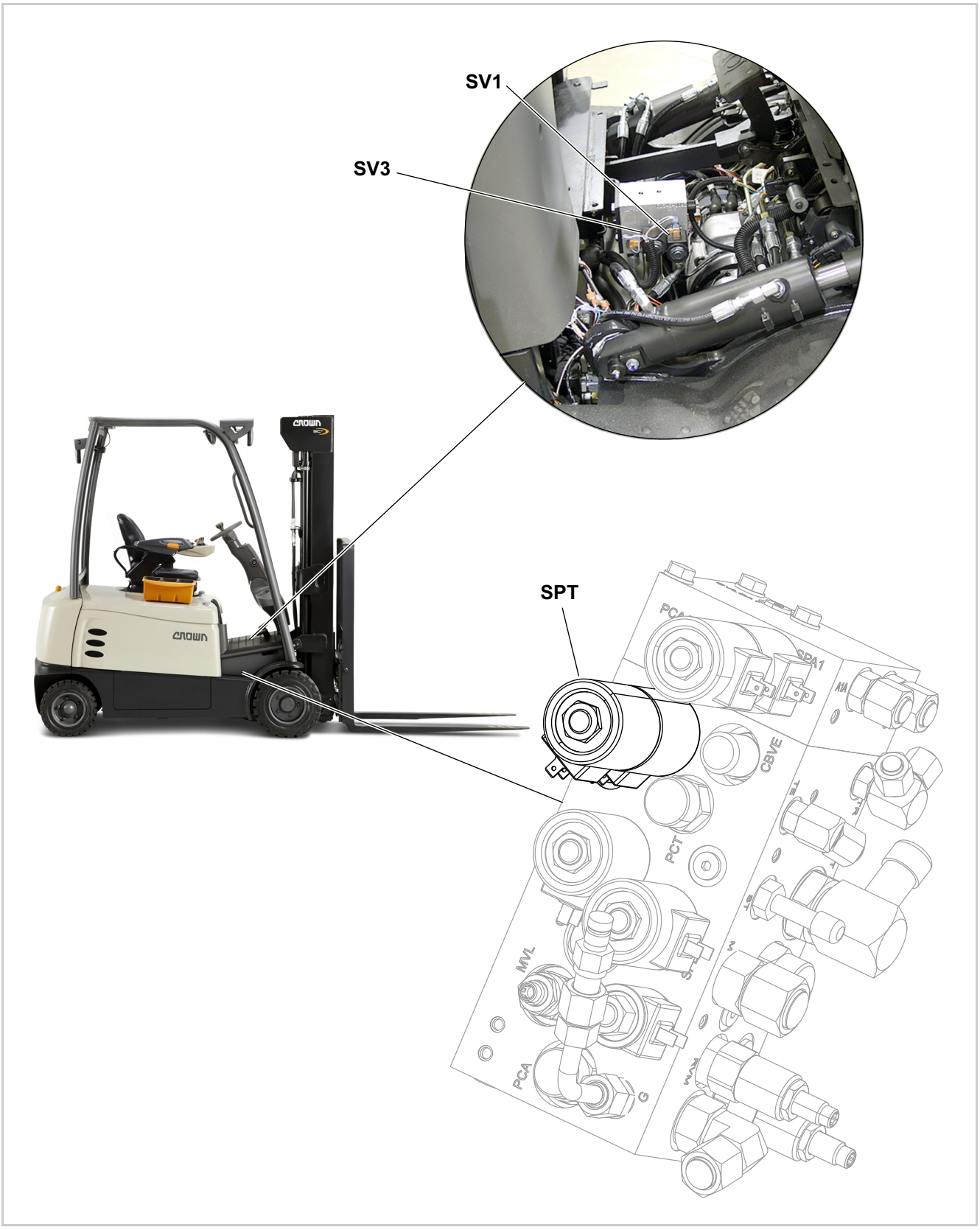
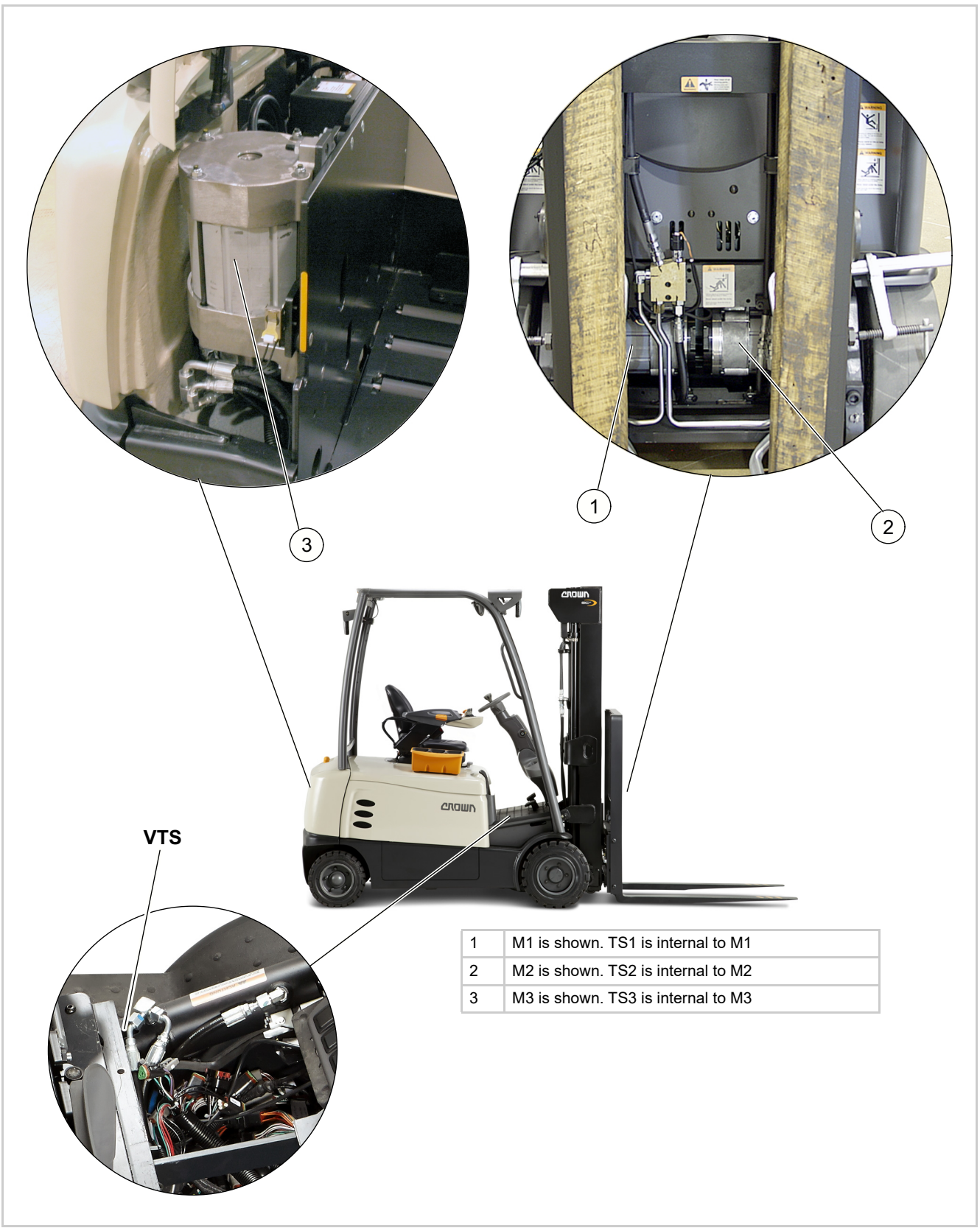
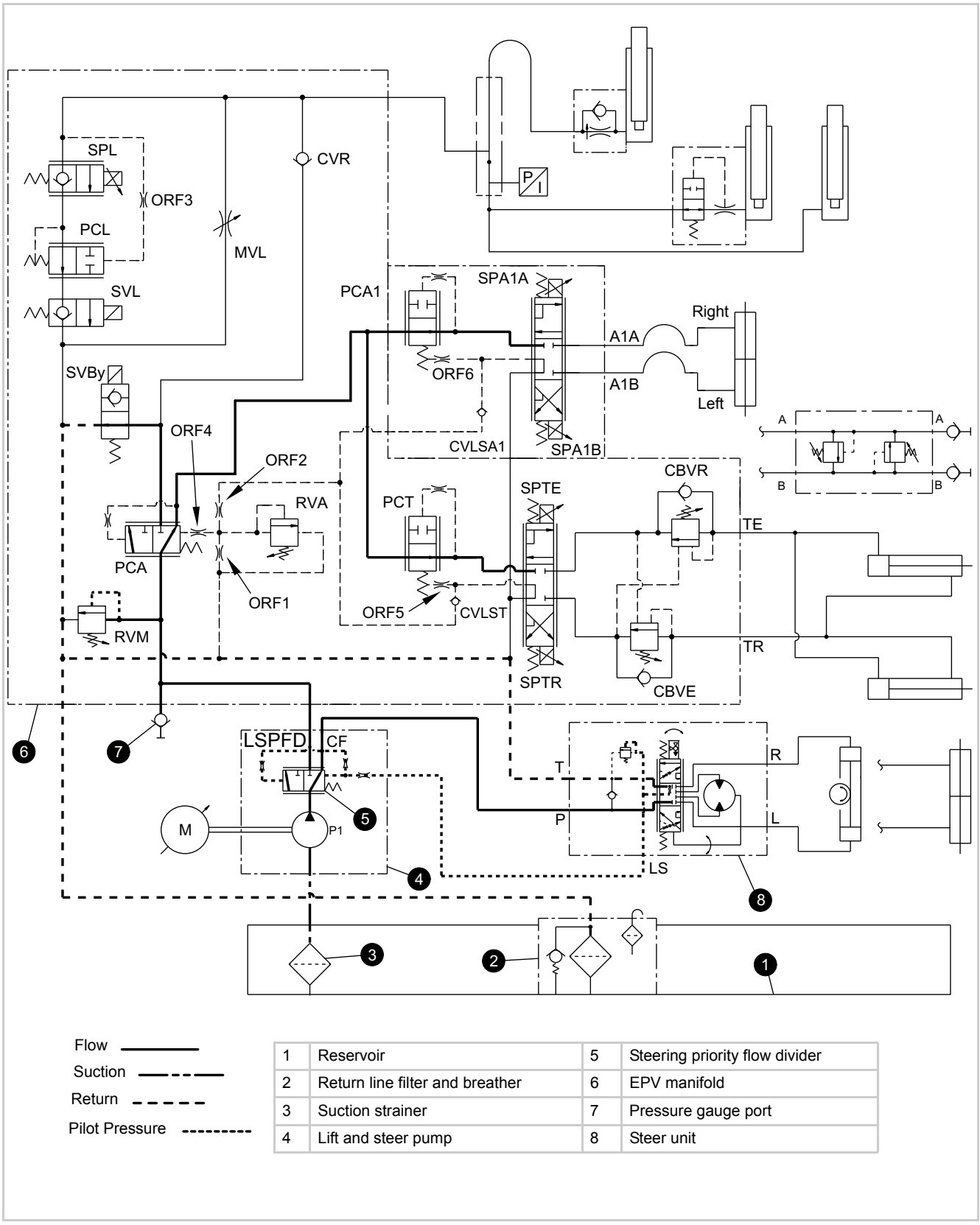


Fig. 35 (34012)



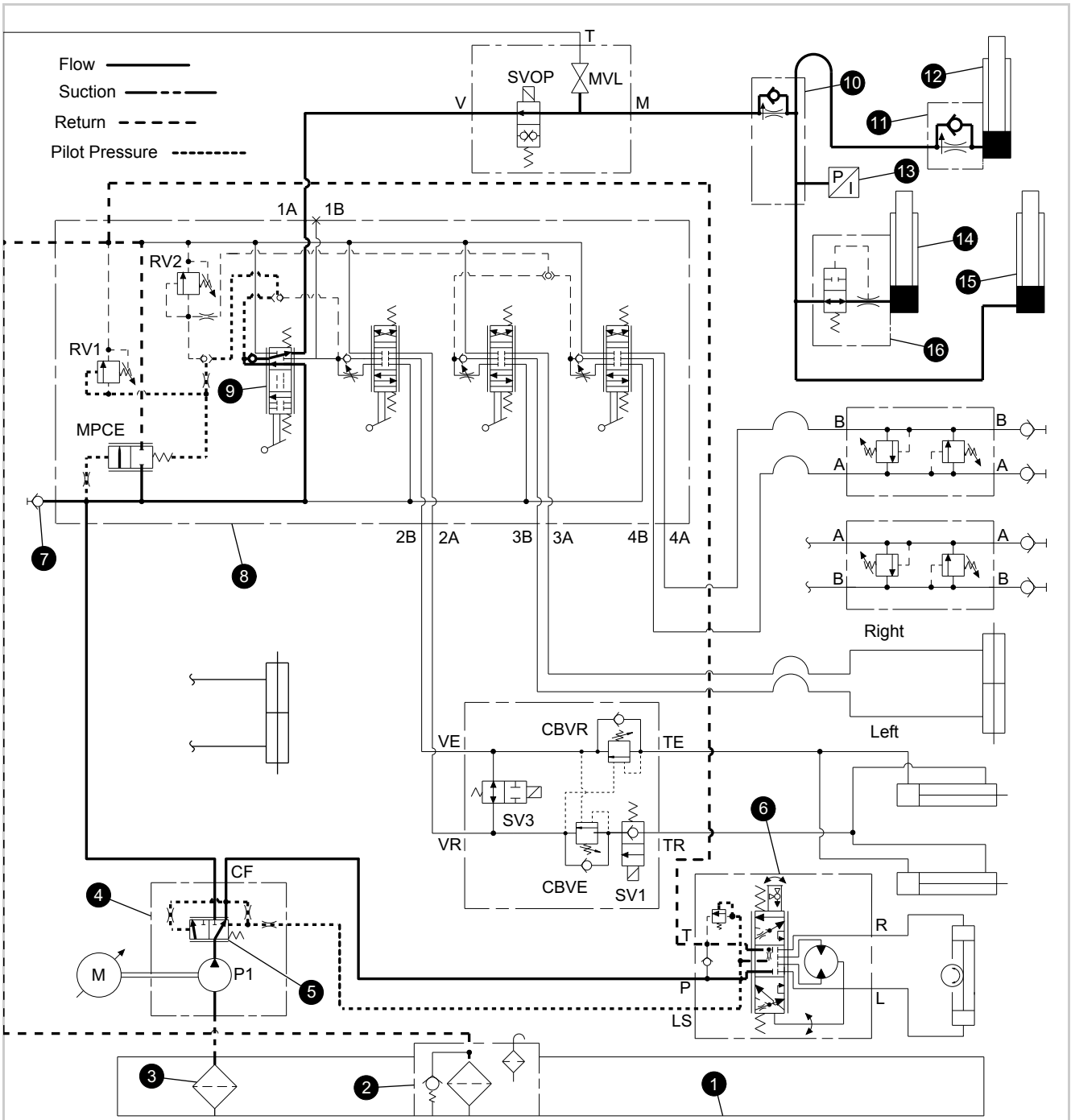
1	M1 is shown. TS1 is internal to M1
2	M2 is shown. TS2 is internal to M2
3	M3 is shown. TS3 is internal to M3

Fig. 40 (34017)



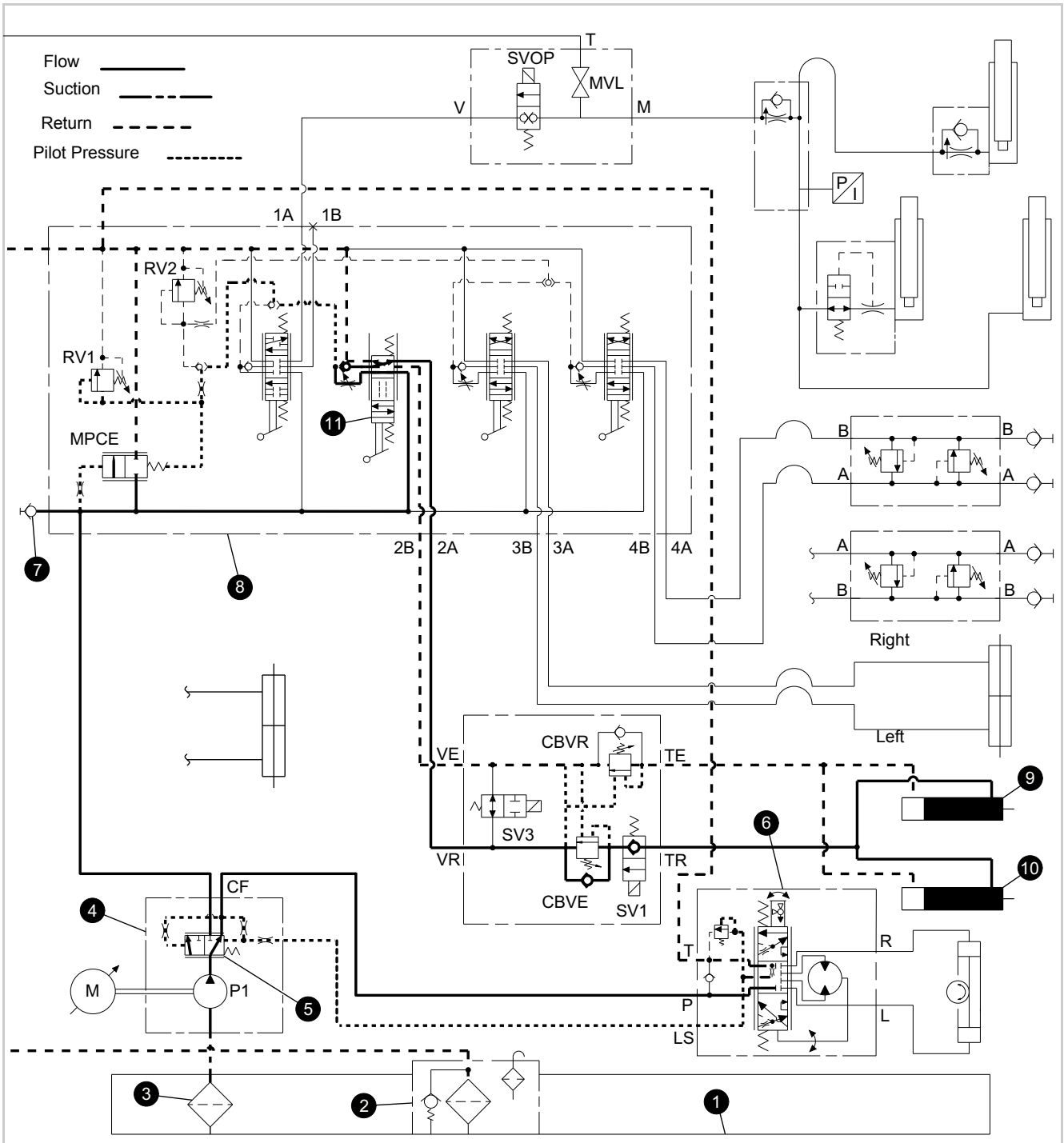
1	Reservoir	5	Steering priority flow divider
2	Return line filter and breather	6	EPV manifold
3	Suction strainer	7	Pressure gauge port
4	Lift and steer pump	8	Steer unit

Fig. 3 (29919)



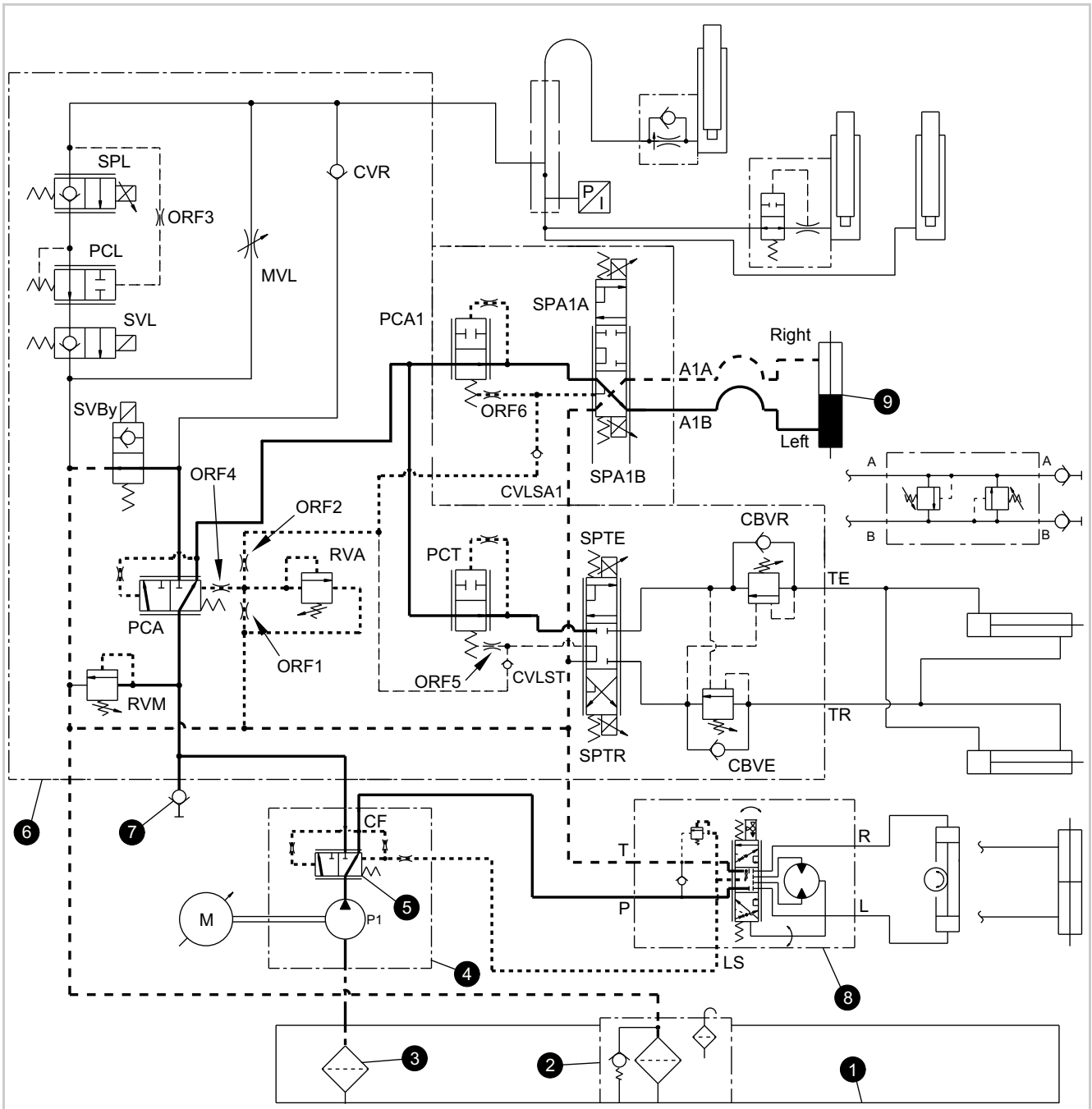
1	Reservoir	5	Steering priority flow divider	9	Lift and lower valve	13	Pressure transducer (PT1)
2	Return line filter and breather	6	Steer unit	10	Lowering flow control manifold	14	Right mast cylinder
3	Suction strainer	7	Pressure gauge port	11	Flow regulator	15	Left mast cylinder
4	Lift and steer pump	8	Directional control valve	12	Carriage cylinder	16	Velocity fuse

Fig. 8 (29924)



1	Reservoir	5	Steering priority flow divider	9	Left tilt cylinder
2	Return line filter and breather	6	Steer unit	10	Right tilt cylinder
3	Suction strainer	7	Pressure gauge port	11	Tilt valve
4	Lift and steer pump	8	Directional control valve		

Fig. 13 (29929)

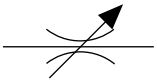


Flow
Suction
Return
Pilot Pressure

1	Reservoir	6	EPV manifold
2	Return line filter and breather	7	Pressure gauge port
3	Suction strainer	8	Steer unit
4	Lift and steer pump	9	Sideshift cylinder
5	Steering priority flow divider		

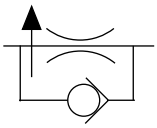
Fig. 18 (29934)

ORIFICE THROTTLE
fixed

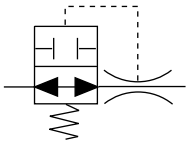


ORIFICE THROTTLE
adjustable

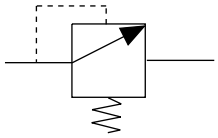
FLOW CONTROL
PRESSURE COMPENSATED
fixed



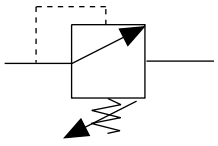
FLOW CONTROL
PRESSURE COMPENSATED
fixed with reverse flow bypass



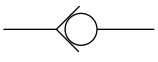
FUSE VELOCITY



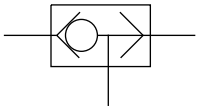
VALVE RELIEF
fixed



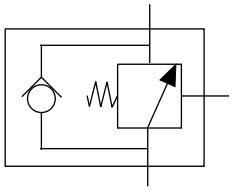
VALVE RELIEF
adjustable



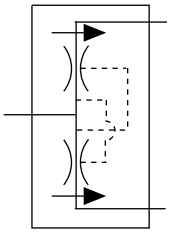
VALVE CHECK



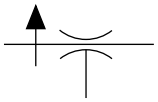
VALVE SHUTTLE



VALVE
SINGLE COUNTERBALANCE
in manifold

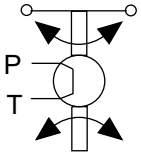


FLOW DIVIDER/COMBINER

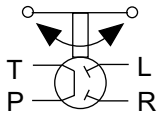


BYPASS FLOW CONTROL
controlled flow, pressure
adjusted

VALVE MANUAL SHUTOFF



TORQUE GENERATOR



STEER UNIT
hydrostatic

Fig. 3 (3561-05)

5. Inspect the valves for weak, broken, or distorted springs.
6. Replace the springs as necessary.

Assembling the spools

1. Assemble RV1 (2, Figure 2) with the spring (13) to the body
2. Assemble RV2 (3) to the body.
3. Use the two screws (7) at the top of the body to install the seal plate (10), the wiper (11), and the O-ring (12).
4. Torque the screws to 22–26 Nm (16–19 ft lb).
5. Install the spool end (8), the two spring seats (6), and the spring (9).
6. Torque the spool end to 22–26 Nm (16–19 ft lb).
7. Use the screws (4, Figure 2) to install the spool cap.
8. Install the flow control screw (9) and the O-ring.
9. Install the plug (8, Figure 1) and the O-ring to the body.

Assembling the directional control valve

1. Clean the directional control valve and tools.
2. Apply a layer of hydraulic oil to all components.
3. Install the orifice set screw (10, Figure 3).

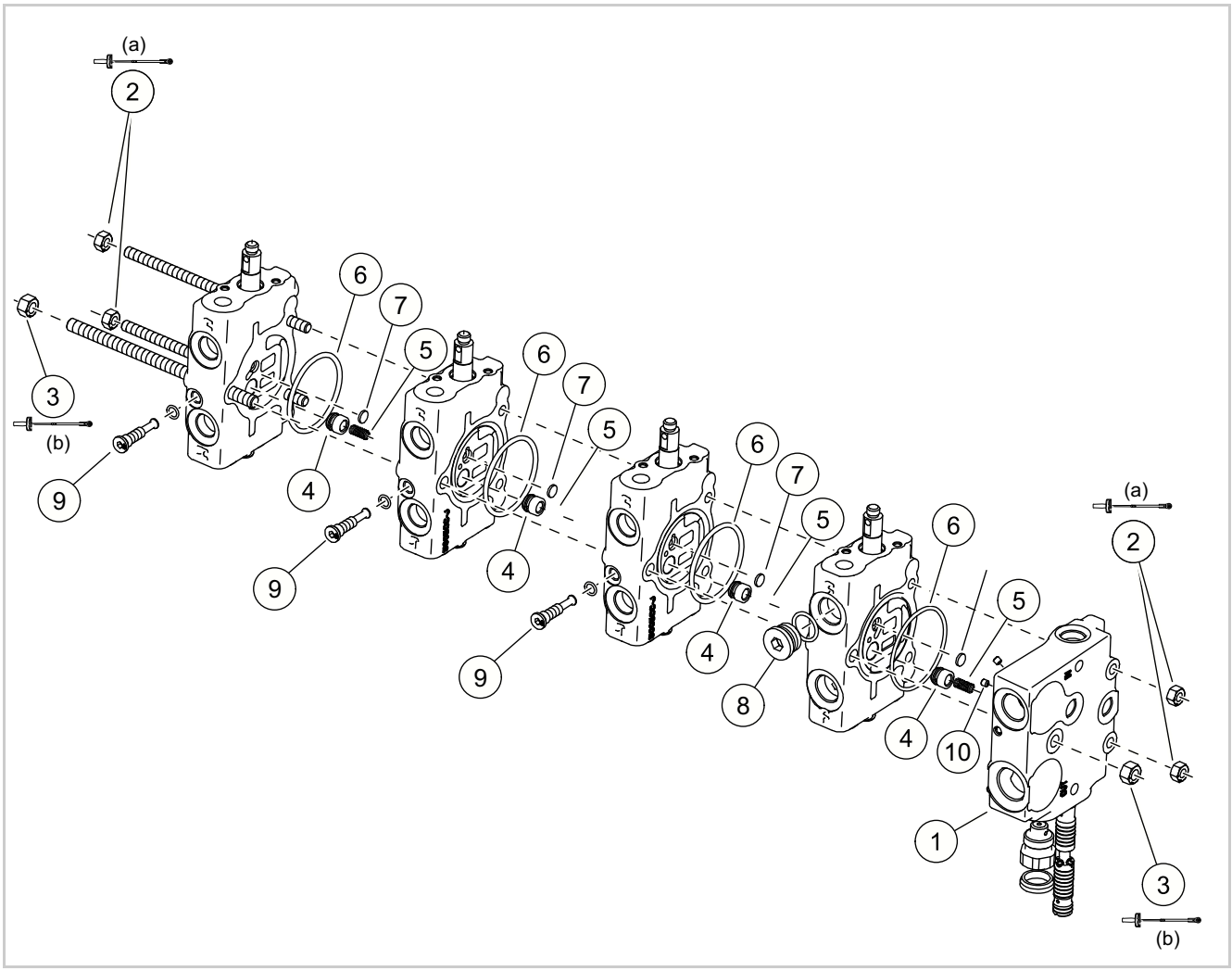


Fig. 3 (29854)

(a)	Torque to 41– 49 Nm (30–36 ft lb)
(b)	Torque to 10 Nm (7 ft lb)

Control Valve Cause and Solution		
Symptom	**Probable Cause**	**Possible Solution**
The load does not hold.	The cylinder is leaking or worn.	Check the cylinders.
	The oil is by-passing the valve spool.	Replace the valve or section.
The load lowers when the spool is moved from neutral.	Dirt is in the check valve.	Disassemble and clean the valve.
	The check valve, poppet, or seat is scored.	Replace the poppet or lap the poppet to the seat.
The hydraulic system is performing poorly.	The pump is defective.	Check the pressure or replace the pump.
	Dirt is in the relief valve.	Disassemble and clean the valve.
	The relief valve is defective.	Replace the valve.
	The cylinders are worn.	Repair or replace the cylinders.
	The load is too heavy.	Check the line pressure.
	The internal valve is cracked.	Replace the valve or section.
	The spool is not at full stroke.	Check the movement and linkage.
	The reservoir is low on oil.	Add oil to the lift truck.
	The system filter is clogged.	Clean or replace the filter.
	The lines are restricted.	Check the lines.

22. Attach the mounting bar (2, Figure 23) to the drive unit sub-assembly (3) with the fasteners (1).

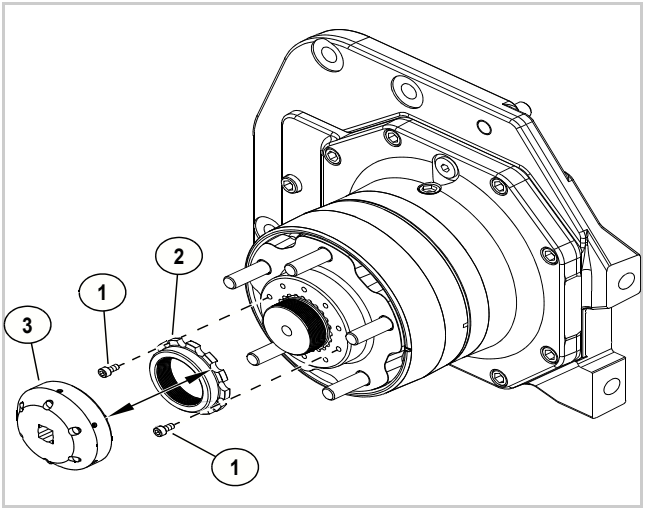


Fig. 23 (26419)

23. Put the mounting bar (2) in the vise and tighten the vise.
24. Torque the adjustment plate to 380 Nm (280 ft lb) with a spanner socket (1, Figure 24).

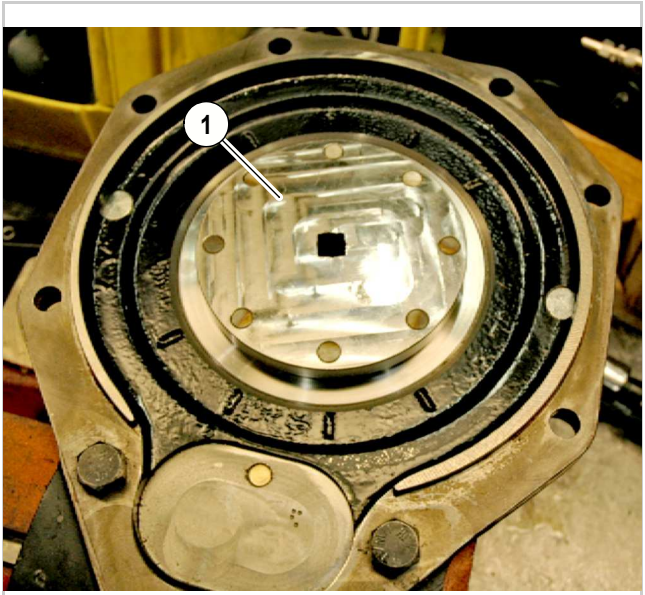


Fig. 24 (26434)

25. Loosen the adjustment plate. Do not loosen the bearing cone from the bearing race or move the bearing roller.
26. Use the spanner socket (1) and torque the adjustment plate to 102 Nm (75 ft lb).
27. Turn the carrier shaft counterclockwise approximately 10 times. Continue to torque the adjustment plate to 202 Nm (150 ft lb).
28. Turn the carrier shaft for three full revolutions in each direction.
29. Examine the set screw holes (1, Figure 25) in the drive unit sub-assembly and adjustment plate (2). If the holes are not aligned, tighten the adjustment plate (2) until they are aligned.

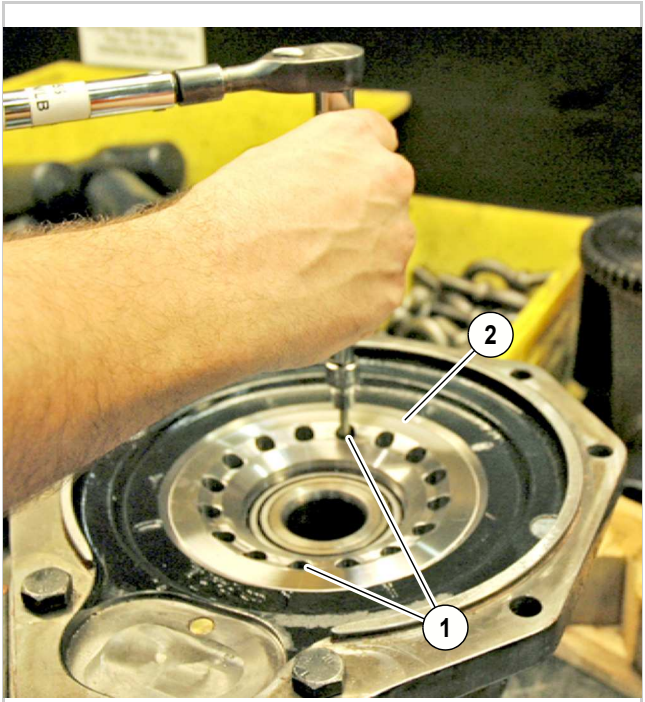


Fig. 25 (26433)

30. Apply primer (061004-002) to the two set screws and hole threads. Let the primer dry for 2 min.
31. Apply thread-locking adhesive (061004-012) to the two set screws.
32. Install and torque the set screws (1) to 12.4 Nm (110 in lb).
33. Remove the drive unit tool from the vise.
34. Remove the mounting bar from the drive unit sub-assembly.

Hub assembly

Notice: The inner part of the wheel hub is smaller than the carrier shaft. If you make the hub hot, the hub expands and you can install it on the carrier shaft. The wheel hub must be 205 °C (400 °F) before you install it on the carrier shaft. If you can install the hub and not make the hub hot, the splines are worn. Replace the hub and carrier shaft.

1. Put the hub in an oven. Set the temperature to 205 °C (400 °F). Keep the hub in the oven for 30 min.

- Catch pan
- Oven

Drive axle seal removal

Notice: The figures that follow show the drive unit removed from the lift truck. You can keep the drive unit in the lift truck to replace the axle seal.

1. Move the lift truck to your work area on a level floor.
2. Lower the forks.
3. Turn the lift truck OFF.
4. Disconnect the battery.
5. Lockout/Tagout the lift truck. See SAFETY / Control of Hazardous Energy chapter for the correct procedures.

DANGER

A lift truck that falls can cause severe injury or death.

Using a lifting device or blocks that do not have sufficient capacity can result in severe injury or even death.

- *Do not do maintenance under or around a lift truck that is not correctly secured.*
- *See SAFETY / Control of Hazardous Energy / Lifting and Blocking in the Service and Parts Manual for the applicable lifting and blocking procedures.*
- *Read and obey all safety procedures in SAFETY / Control of Hazardous Energy / Lifting and Blocking in the Service and Parts Manual.*

6. Remove the drive tire.
7. Remove the drain plug (1, Figure 12) from the drive unit (2) and let the gear oil drain into a catch pan.

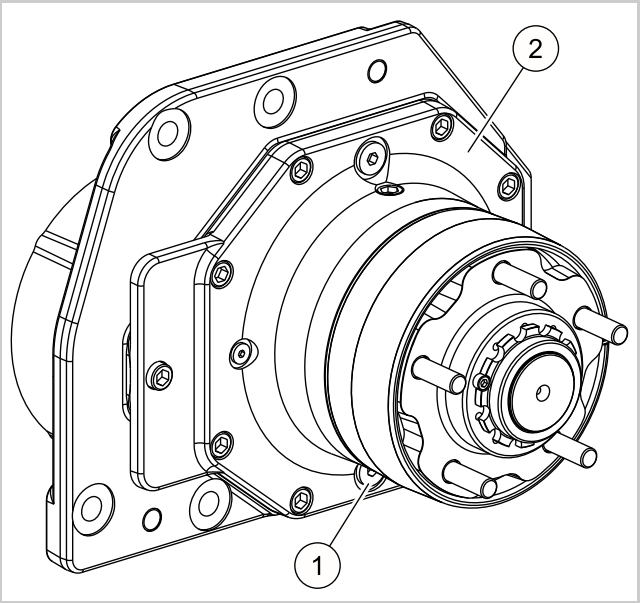


Fig. 12 (24671-01)

8. Remove the screws (1, Figure 13) that keep the locknut (2) in position.

Fig. 13 (24672-02)

9. Use the nut driver (3) to remove the locknut.
10. See Figure 14. Put the drive unit tool (1) on the hub studs. Install all lugnuts on the studs and tighten the nuts.

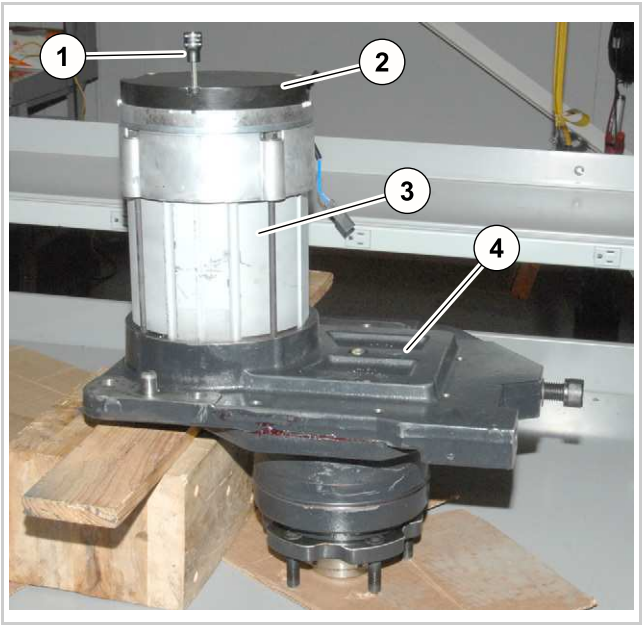


Fig. 35 (26529)

5. Remove the brake from the traction motor.
6. Disassemble the retaining ring (1, Figure 36), the washer (2), the brake hub (3), the two O-rings (4), and the spring (5) from the traction motor.

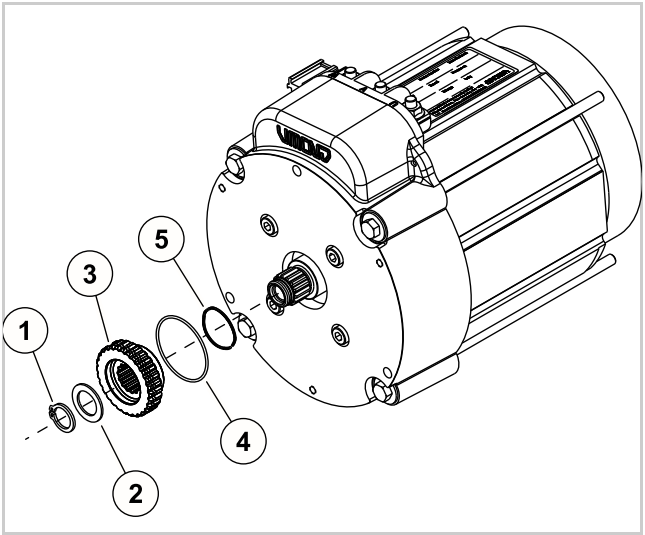


Fig. 36 (30012)

7. Remove the four screws (1, Figure 37) that assemble the traction motor to the drive unit.

Fig. 37 (26535)

8. Record the locations of the traction motor terminals on the drive unit.
9. Loosen the traction motor with a rubber mallet.
10. See Figure 38. Remove the traction motor from the drive unit.

Fig. 38 (25427-01)

Traction motor installation

Special Tools and Equipment:

Pilot Rods (141316)

Notice: Use 141316 pilot rods when you install the traction motor to prevent damage to the oil seal.

Installing the seal

Additional tools and equipment:

- Nut driver, P/N 141357
- Drive unit tool, P/N 340079
- Hydraulic press
- Catch pan
- Oven
- Seal extraction tool, P/N 164221
- Drill bit, P/N 165868
- Two screws, P/N 060063-004
- Four screws, P/N 060032-100

1. Make sure that the seal and all surfaces on the drive unit are clean and free of dirt, debris, or defects.
2. Lubricate the seal with oil. Make sure that there is no dirt on the seal during installation.
3. See Figure 34. Install the seal (1) on the drive unit opening.

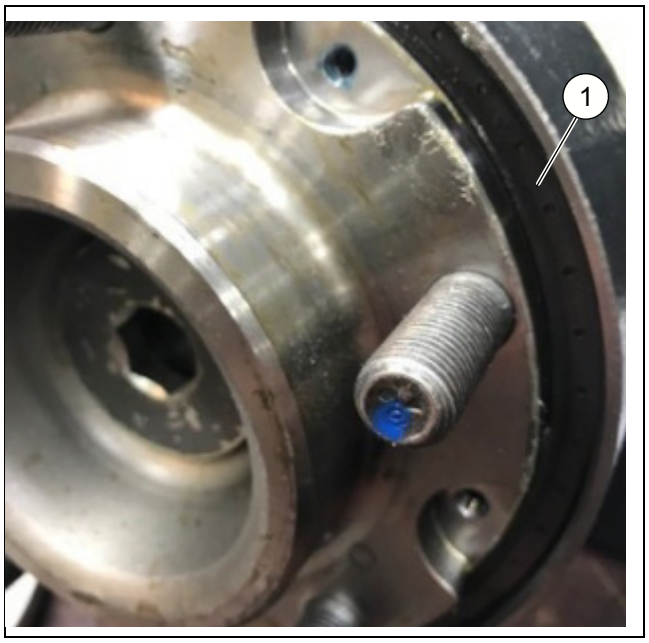


Fig. 16 (34979)

4. See Figure 35. Make sure that the seal tool (1) is clean and install it over the seal.

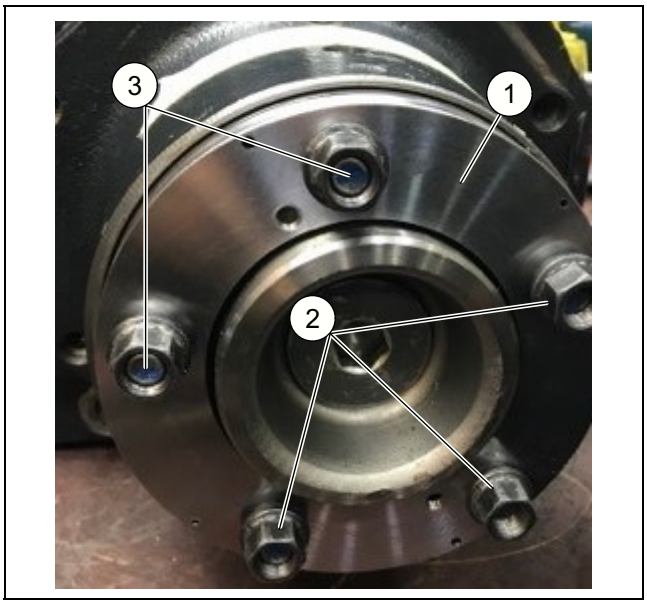


Fig. 17 (34980)

5. See Figure 36. Tighten the lugnuts (1) in a cross-pattern with a socket (2) and ratchet (3). Do not use power tools.

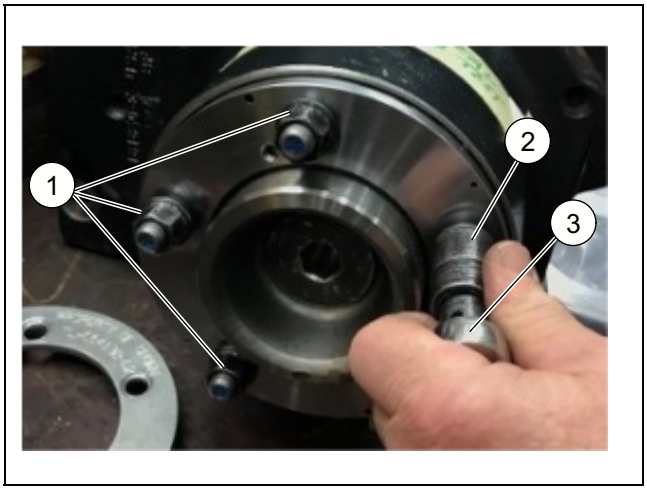


Fig. 18 (34981)

6. Remove the lugnuts and the seal tool from the drive unit.

Encoders

Operation

Encoders change mechanical movement into a digital signal. The encoder sends digital signals (channel A and channel B) to the applicable control module. The digital signals change from 0 V to the supply voltage at different times. The control module then compares the digital signals to calculate which channel comes first and how quickly the channels change. Finally, the control module calculates the direction and speed of the component.

Wire designations

- Supply wire: The supply wire supplies positive voltage input to the encoder. The voltage can be 5 V, 11.3 V, or 12 V.
- Common wire: The common wire supplies the negative voltage input to the encoder.
- Channel A wire: The channel A wire supplies one of the output signals from the encoder to the controller.
- Channel B wire: The channel B wire supplies one of the output signals from the encoder to the controller.
- Index wire: Not all encoders have an index wire. The index wire supplies a center reference point in functions such as steering feedback.

Testing the encoders

Testing the encoders helps verify that the data and feedback from the vehicle is accurate.

Supply voltage test

See Figure 1.

1. Connect the black (negative) probe to the common pin on the encoder.
2. Connect the red (positive) probe to the supply pin on the encoder.
3. Measure the supply voltage between the common and the supply pins.

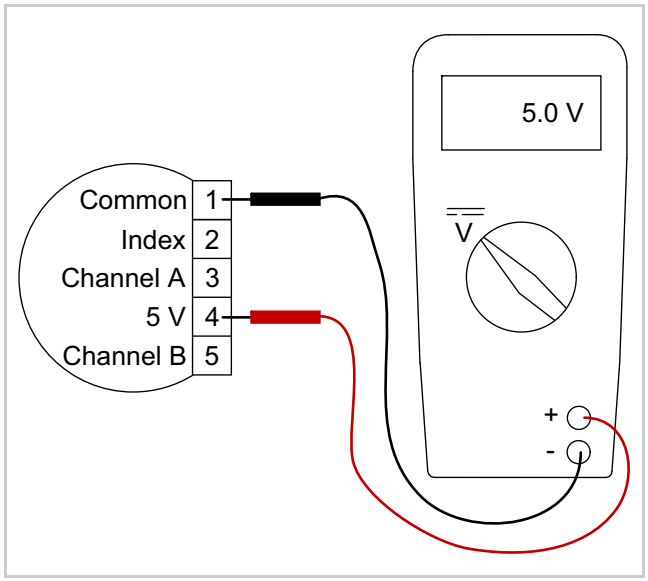


Fig. 1 (25535-01)

The DVOM should show supply voltage. For example, a 5 V encoder should have 5 V between the common and the supply pins.

Channel feedback overview

The encoder sends a digital pulse of supply voltage from each channel wire. A DVOM is too slow to show the pulse signal. The DVOM shows the average voltage as the encoder turns. This voltage is approximately half of the signal voltage. For example, a 5 V encoder sends pulses of 5 V on each channel. The DVOM shows approximately 2.5 V. A voltage that changes from an average of 2.5 V indicates a defective encoder.

Electrical System

Wire color-codes and schematic symbols

This section includes information on wire color-codes and schematic symbols that are standard on Crown electrical diagrams.

Wire color-codes

See the Wire Color-Codes table for the applicable wire colors. The function of the circuit determines the wire color. Each wire has a three or four digit number. The first one or two digits identify the color of the lead. The last two digits identify the lead from one through 99. It is possible that some vendor component leads do not have these same numbers or colors. A wire pictorial identifies each wire by number. See the WIRING DIAGRAMS chapter for wire pictorials and electrical diagrams.

Wire Color-Codes

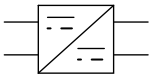
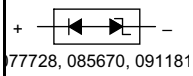
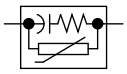
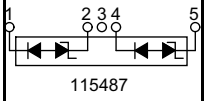
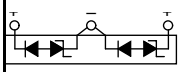
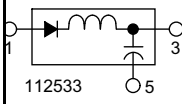
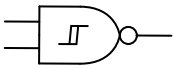
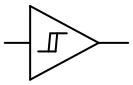
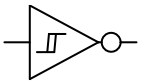
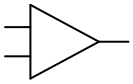
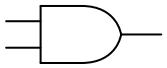
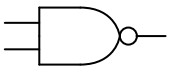
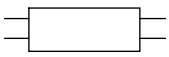
Number	Color	Function
0xx	Black	Digital Signal (1)
1xx	Brown	Analog Signal (1)
2xx	Red	Primary positive that has not gone through a switch (2)
3xx	Orange	12 V Non-Battery Positive (3)
4xx	Yellow	Non-Battery Positive (3)
5xx	Green	Primary negative that has not gone through a switch (2)
6xx	Blue	Isolated Negative (4)
7xx	Violet	5 V Non-Battery Positive (3)
8xx	Gray	Non-Battery Positive (3)
9xx	White	Miscellaneous
29xx	Red/White	Primary positive that has gone through a switch (2)
59xx	Green/White	Primary negative that has gone through a switch (2)

(1) Signal - A conductor that gives a variable input or output potential.

(2) Primary- A conductor that gives battery positive potential or battery negative potential.

(3) Non-Battery Positive - A conductor that gives a non-battery positive potential from the output of a regulated DC-to-DC converter.

(4) Isolated Negative - A conductor that gives a negative potential that is electrically isolated from battery negative.

Other Electrical Symbols					
Symbol	**Name**	**Symbol**	**Name**	**Symbol**	**Name**
 Fig. 124 (34339)	Transistor NPN	 Fig. 125 (34353)	Transformer	 Fig. 126 (34364)	Horn
 Fig. 127 (34340)	Transistor PNP	 Fig. 128 (34354)	DC/DC Converter Power Supply	 Fig. 129 (34365)	Encoder
 Fig. 130 (34342)	Darlington NPN	 077732 Fig. 131 (34366)	Suppressor	 077728, 085670, 091181 Fig. 132 (34367)	Suppressor
 Fig. 133 (34343)	Darlington PNP	 085484, 086755 Fig. 134 (34368)	Suppressor	 115487 Fig. 135 (34369)	Dual Suppressor
 082495, 086322, 093757 Fig. 136 (34370)	Dual Suppressor	 112533 Fig. 137 (34371)	Filter Block	 Fig. 138 (34372)	OR Gate
 Fig. 139 (34373)	NOR Gate	 Fig. 140 (34374)	Schmitt NAND	 Fig. 141 (34375)	Schmitt Neutralizer
 Fig. 142 (34376)	Schmitt Inverter	 Fig. 143 (34377)	Amp/Comp	 Fig. 144 (34378)	AND Gate
 Fig. 145 (34379)	NAND Gate	 Fig. 146 (34380)	X-OR Gate	 Fig. 147 (34381)	X-NOR Gate
 Fig. 148 (34382)	Integrated Circuit				

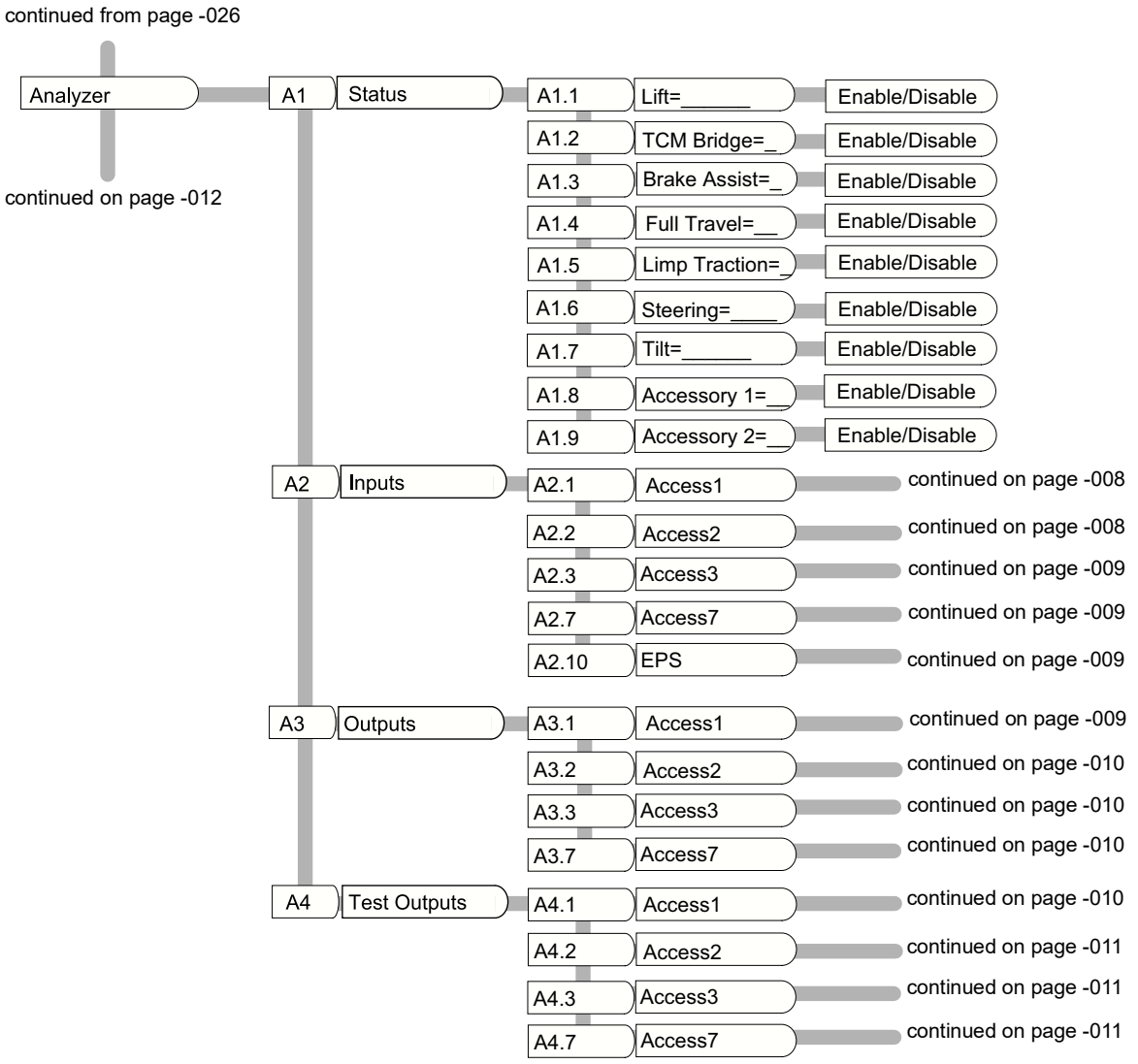


Fig. 4 (29849-02)

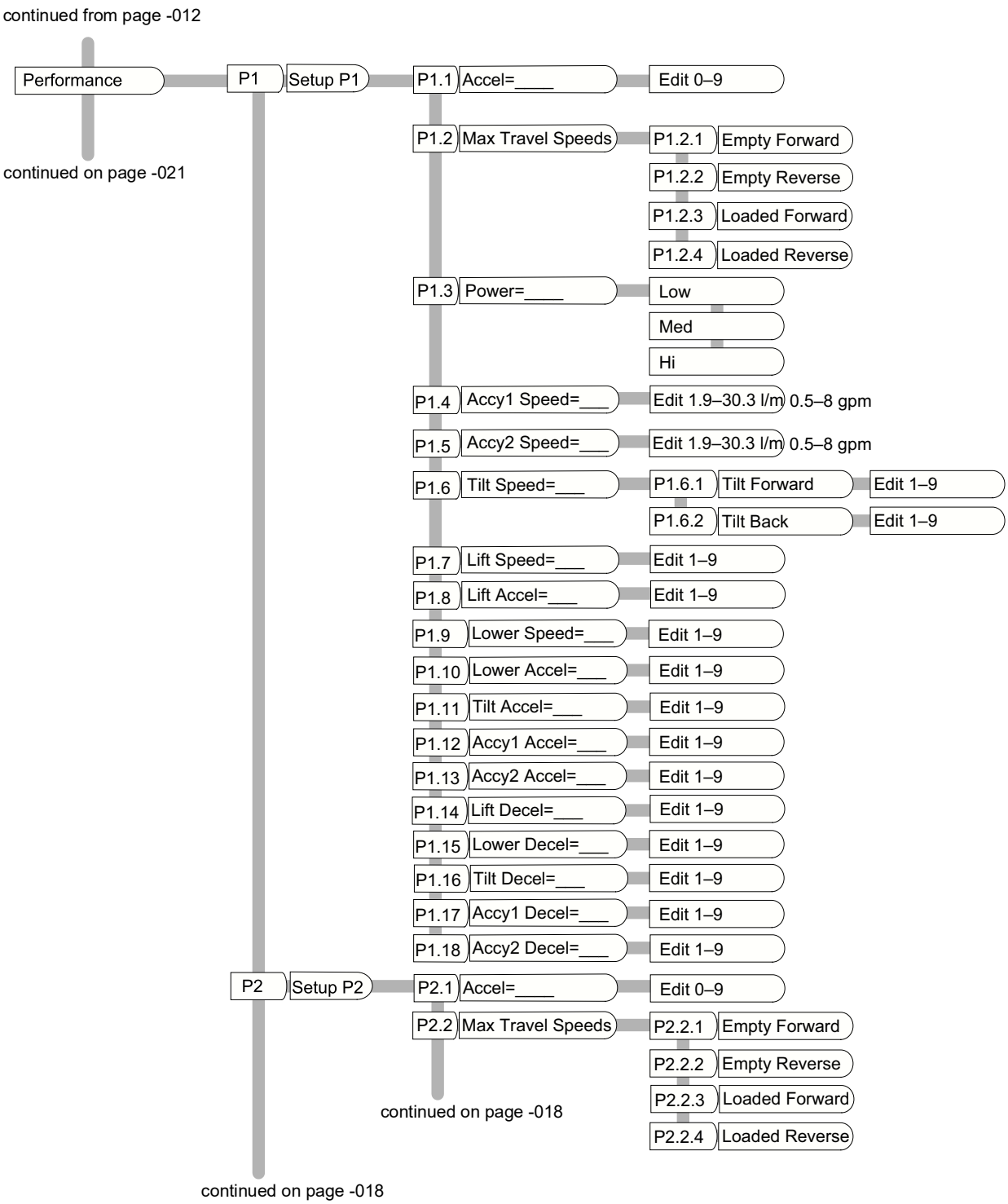


Fig. 14 (29829-01)

ANALYZER Menus

ANALYZER menu overview

The ANALYZER menus let you check and test the components and the circuits. The menus are:

SERVICE LEVEL 2:

- A1 Menu - Check the status of the circuits
- A2 Menu - Check the component inputs to the Access 1 2 3® modules
- A3 Menu - Check the Access 1 2 3® module outputs to the components
- A4 Menu - This menu is not available in SERVICE LEVEL 2

SERVICE LEVEL 3:

- A1 Menu - Check the status of the circuits
- A2 Menu - Check the component inputs to the Access 1 2 3® modules
- A3 Menu - This menu is not available in SERVICE LEVEL 2
- A4 Menu - Check the Access 1 2 3® module outputs to the components

ANALYZER menu access

Note: To scroll through the ANALYZER menus, see the charts in this section of the service manual.

1. Turn on the lift truck.
2. Scroll to the SERVICE menu, LEVEL 2, or LEVEL 3 menu.
3. Push the right arrow.
   ⇨ Access 1 shows ****.
4. Push the up or the down arrow to scroll to the first number.
5. Push the right arrow to go to the next number.
6. Repeat steps 4 and 5 until you enter all four numbers.
7. Push ENTER to accept the password.
   ⇨ Access 1 shows ANALYZER.
8. Push the right arrow to go to the A1 STATUS menu.

A1 STATUS menu descriptions

These menus show the status of monitored lift truck systems and circuits.

A1 STATUS		
A1	**Status Menu**	**Menu Description**
A1.1	LIFT = ____	ENABLE = lift is permitted.
		DISABLE = lift is not permitted. A system event could cause this.
A1.2	TCM BRIDGE = ____	ENABLE = Access 3™ can operate.
		DISABLE = Access 3™ cannot operate. A system event could cause this.
A1.3	BRAKE ASSIST = ____	ENABLE = BRK1 and BRK2 are applied.
		DISABLE = BRK1 and BRK2 are released.
A1.4	FULL TRAVEL = ____	ENABLE = Access 1 2 3® lets the operator travel at full speed.
		DISABLE = Access 1 2 3® does not let the operator travel at full speed. A system event could cause this.
A1.5	LIMP TRACTION = ____	ENABLE = slower travel speed is permitted. During the usual lift truck operation, full travel and limp travel is ENABLED. System events can DISABLE full travel, but let limp travel be ENABLED.
		DISABLE = traction is not permitted.

A3 OUTPUTS [a]		
A3.1	**Access 1 Outputs Menu**	**Menu Descriptions**
A3.1.7 [c]	SVBY = ____	ON = the SVBY coil is energized.
		OFF = the SVBY coil is not energized.
A3.1.8 [c]	SVL = ____	ON = the SVL coil is energized.
		OFF = the SVL coil is not energized.
A3.1.9 [d]	DRI = ____	ON = the direction reverse indicator is energized.
		OFF = the direction reverse indicator is not energized.
A3.1.10 [d]	DFI = ____	ON = the direction forward indicator is energized.
		OFF = the direction forward indicator is not energized.

a). Access 1 shows this menu only in SERVICE LEVEL 2.
b). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV and the F7.2 FLOORBOARD FAN menu is set to ENABLE.
c). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV.
d). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to MANUAL, and the F20.8 DIRECTION SELECTOR menu is set to LIFT LEVER.

A3.2 ACCESS 2 OUTPUTS menu

This menu shows the Access 2 outputs to the components.

A3 OUTPUTS [a]		
A3.2	**Access 2 Outputs Menu**	**Menu Descriptions**
A3.2.1 [b]	SV1 = ____	ON = the SV1 coil is energized when not at center (HGTS1).
		OFF = the SV1 coil is not energized when at center (HGTS1).
A3.2.2 [b]	SVOP = ____	SVOP does not let the operator lower the mast when SES is open. SVOP also does not let the operator raise the mast if HGTS1 is open and TLMS is open.
		ON = the SVOP coil is energized, SES is closed, and HGTS1 or TLMS is closed.
		OFF = the SVOP coil is not energized, SES is open, and HGTS1 or TLMS is open.

FEATURES (F3)		
Sub-Menus	**Display**	**Menu Description**
F3.5 c)	COLLAPSED HEIGHT = ____	Use this menu to set the collapsed height of the mast.
		To find the collapsed height, lower the forks fully and measure the height of the mast from the floor to the top of the mast.
		The range of the collapsed height is 1,955–3,350 mm (77–132 in).
		To enter the collapsed height, push the up or the down arrow to scroll to the first number.
		Push the right arrow to go to the next number.
		Repeat the previous two procedures until you enter all the numbers.
		Push ENTER to accept the collapsed height.
F3.6 c)	LIFT HEIGHT = ____	Use this menu to set the lift height of the mast.
		The lift height is in the data number on the data plate.
		The range of the lift height is 2,890–8,075 mm (114–318 in).
		To enter the lift height, push the up or the down arrow to scroll to the first number.
		Push the right arrow to go to the next number.
		Repeat the previous two procedures until you enter all the numbers.
		Push ENTER to accept the lift height.
F3.7 c)	TILT FORWARD = ____	Use this menu to set the maximum degree of forward tilt.
		For the maximum degree of tilt, see the tilt cylinder part number on the end of the tilt cylinder.
		The tilt cylinder part number includes a dash number. The degree of tilt is equal to the dash number. See Figure 24.
		1–10 DEG

FEATURES (F20)		
Sub-Menus	**Display**	**Menu Description**
F20.17	TILT INTERLOCK CONDITION	Determines the tilt interlock parameters.
		Weight
		Always
F20.18	ACCESS 1 DIRECTION INDICATION = ____	If the F20.8 DIRECTION SELECTOR menu is set to LIFT LEVER, then set this menu to ENABLE.
		DISABLE = the default setting if the F4 HYDRAULIC VALVE TYPE menu is set to MANUAL.
		ENABLE = the default setting if the F4 HYDRAULIC VALVE TYPE menu is set to EPV.
F20.20	TILT INTERLOCK SRO	DISABLE
		ENABLE

a). Access 1 shows this menu only if the F5.2 LEVEL menu is set to Level 0.
b). Access 1 shows this menu only if the F20.4 ACCY2 menu is set to DISABLE.
c). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to MANUAL.
d). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV and F20.4 ACCY2 menu is set to DISABLE.
e). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV.
f). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV.
g). Access 1 shows this menu only if the F10 USER PERFORMANCE menu is set DISABLE.
h). Access 1 shows this menu only if the F20.13 SPEED LIMIT menu is set to NONE.
i). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV and the F20.10.1 CUTOUT TRIGGER menu is set to HGTS1, HGTS2, or HGTS3
j). Access 1 shows this menu only if the F20.10.1 CUTOUT TRIGGER menu is set to NONE.
k). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV, F20.3 ACCY1 menu is set to ENABLE, and the F20.4 ACCY2 menu is set to ENABLE.
l). Access 1 shows this menu only if the F20.3 ACCY1 menu is set to LOW or HIGH FLOW.
m). Access 1 shows this menu only if the F20.4 ACCY2 menu is set to ENABLE.

PERFORMANCE Menus

PERFORMANCE menu overview

The PERFORMANCE menus have multiple levels of access and authorization:

OPERATOR:

- If the F10 USER PERFORMANCE menu is set to ENABLE, the operator can set or change the performance level (P1, P2, or P3).
- If the F10 USER PERFORMANCE menu is set to DISABLE, the operator cannot set or change the performance level.
- If a performance level is set to the operator user code, the operator cannot set or change the performance level.

SERVICE LEVEL:

These menus let the service technician see and change the performance settings.

- P1 SETUP P1
- P2 SETUP P2
  - Access 1 shows this menu only if the F10 USER PERFORMANCE menu or the F11 USER CODE menu is set to ENABLE.

PX.15 LOWER DECEL menu descriptions

PERFORMANCE (PX.15) a)		
Sub-Menus	**Display**	**Menu Description**
N/A	PX.15 LOWER DECEL = ____	Use this menu to set the lower deceleration rate.
		1 = the slowest lower deceleration rate.
		9 = the fastest lower deceleration rate.
		The default setting is 9 for P1 and P3.
		The default setting is 2 for P2.

a). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV.

PX.16 TILT DECEL menu descriptions

PERFORMANCE (PX.16) a)		
Sub-Menus	**Display**	**Menu Description**
The default setting is 9 for P1 and P3.N/A	PX.16 TILT DECEL = ____	Use this menu to set the tilt deceleration rate.
		1 = the slowest tilt deceleration rate.
		9 = the fastest tilt deceleration rate.
		The default setting is 9 for P1.
		The default setting is 6 for P2 and P3.

a). Access 1 shows this menu only if the F4 HYDRAULIC VALVE TYPE menu is set to EPV.

PX.17 ACCY1 DECEL menu descriptions

PERFORMANCE (PX.17) a)		
Sub-Menus	**Display**	**Menu Description**
N/A	PX.17 ACCY1 DECEL = ____	Use this menu to set the deceleration rate for the first accessory.
		1 = the slowest deceleration rate for the first accessory.
		9 = the fastest deceleration rate for the first accessory.
		The default setting is 9.

a). Access 1 shows this menu only if the F20.3 ACCY1 menu is set to LOW FLOW or HIGH FLOW.

PERFORMANCE (P10) [a]		
Sub-Menus	**Display**	**Menu Description**
P10.1.1	FORWARD SPEED = ____	Use this menu to set the maximum travel speed in the forward direction when HGTS2 or HGTS3 opens.
		The speed is set in km/h if the F2 UNITS OF MEASURE menu is set to METRIC.
		The speed is set in mph if the F2 UNITS OF MEASURE menu is set to ENGLISH.
		The range is 0–16 km/h (0–10 mph).
		The default setting is 0 km/h (0 mph).
P10.1.2	REVERSE SPEED = ____	Use this menu to set the maximum travel speed in the reverse direction when HGTS2 or HGTS3 opens.
		The speed is set in km/h if the F2 UNITS OF MEASURE menu is set to METRIC.
		The speed is set in mph if the F2 UNITS OF MEASURE menu is set to ENGLISH.
		The range is 0–16 km/h (0–10 mph).
		The default setting is 0 km/h (0 mph).
P10.2	WEIGHT TRIGGER = ____	Use this menu to set the maximum weight on the forks when HGTS2 or HGTS3 opens.
		ALWAYS
		EMPTY
		0.5 t (1,100 lb)
		0.75 t (1,650 lb)
		1.0 t (2,200 lb)
		1.25 t (2,760 lb)
		1.5 t (3,310 lb)
		1.75 t (3,860 lb)
		2.0 t (4,410 lb)
		The default setting is ALWAYS.

a). Access 1 shows this menu only if the F20.13 SPEED LIMIT menu is set to HGTS2 or HGTS3.

EVENTS Menus

EVENTS menu overview

The EVENTS menus show the event codes that logged on Access 1.

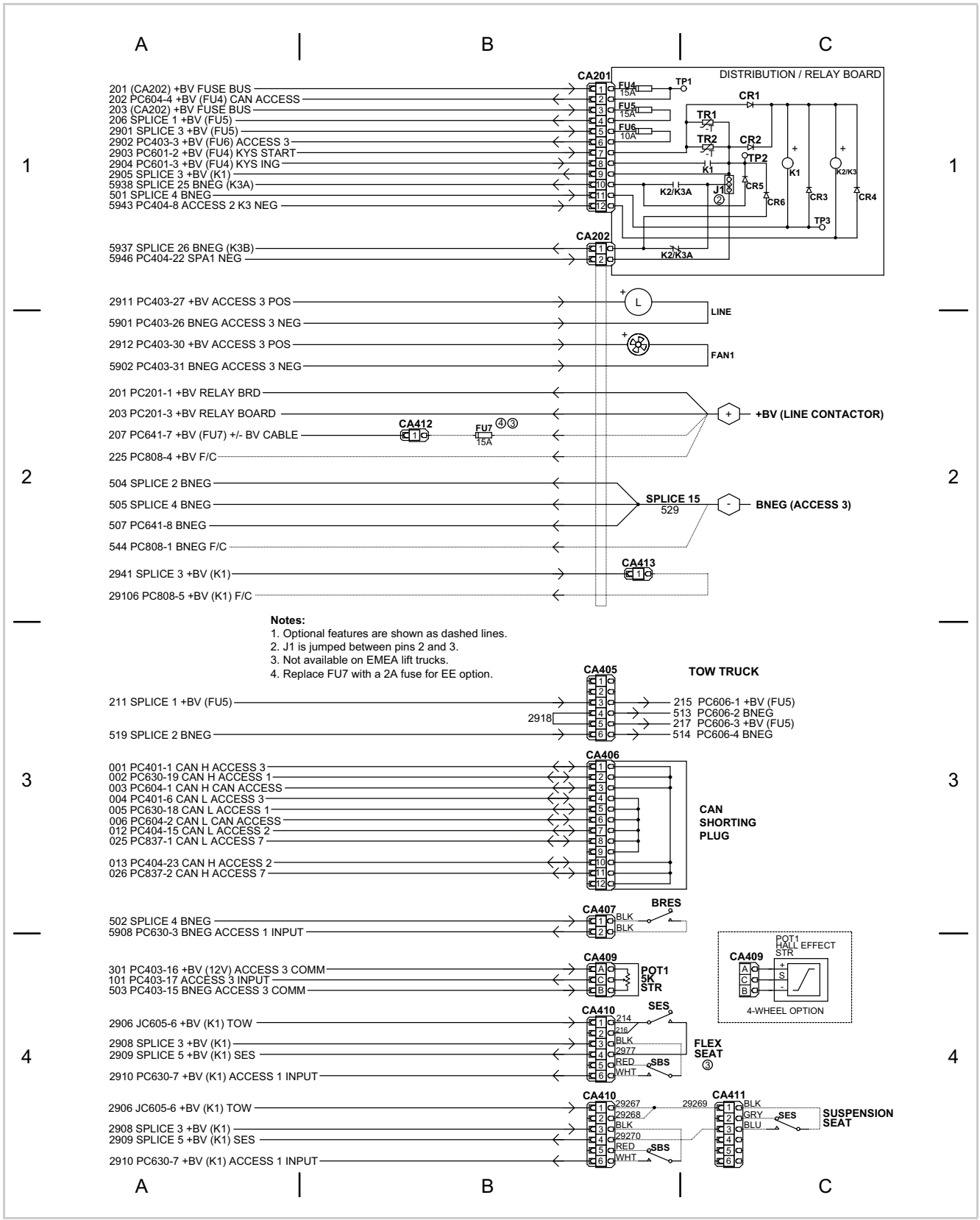
EVENTS menu access

Note: To scroll through the EVENTS menus, see the charts in this section of the service manual.

1. Turn on the lift truck.
2. Scroll to the SERVICE menu, LEVEL 2, or LEVEL 3 menu.
3. Push the right arrow.
   ⇨ Access 1 shows ****.
4. Push the up or the down arrow to scroll to the first number.
5. Push the right arrow to go to the next number.
6. Repeat steps 4 and 5 until you enter all four numbers.
7. Push ENTER to accept the password.
   ⇨ Access 1 shows ANALYZER.
8. Push the up or the down arrow to scroll to the EVENTS menu.
9. Push the right arrow to go to the E1 CHRON HISTORY menu.

EVENTS		
Menu Level	**Display**	**Menu Description**
E1	CHRON HISTORY	Use this menu to show a chronological list of the last 16 event codes.
		The first event code in the list is the most recent.
E1.1 LAST	CODE = ____	Use this menu to show the event code that logged.
	HOUR = ____	Use this menu to show the hour when the event code logged.
	SOC [a)]= ____	Use this menu to show the status of the battery charge when the event code logged.
E1.2–E1.16	LAST-1–LAST-15	This menu shows the same information for each logged event code. See E1.1 LAST for more information.
		LAST-1 is the second most recent event code logged.
E2	ACCUM HISTORY	Use this menu to show the number of times an event code occurred.
E3 [a)]	EPS	Use this menu to access information about the electrical power source.
E3.1–E3.8	ERROR = ___	This menu shows the error logged for the electrical power source.
E3.9	WARNING CODE = ___	This menu displays the warning code for the electrical power source.
E4	CLEAR HISTORY	Use this menu to remove the event code history.
E4.1	CLEAR CHRONOLOGICAL	Use this menu to remove the event codes one at a time.

Back of Lift Truck - EPV



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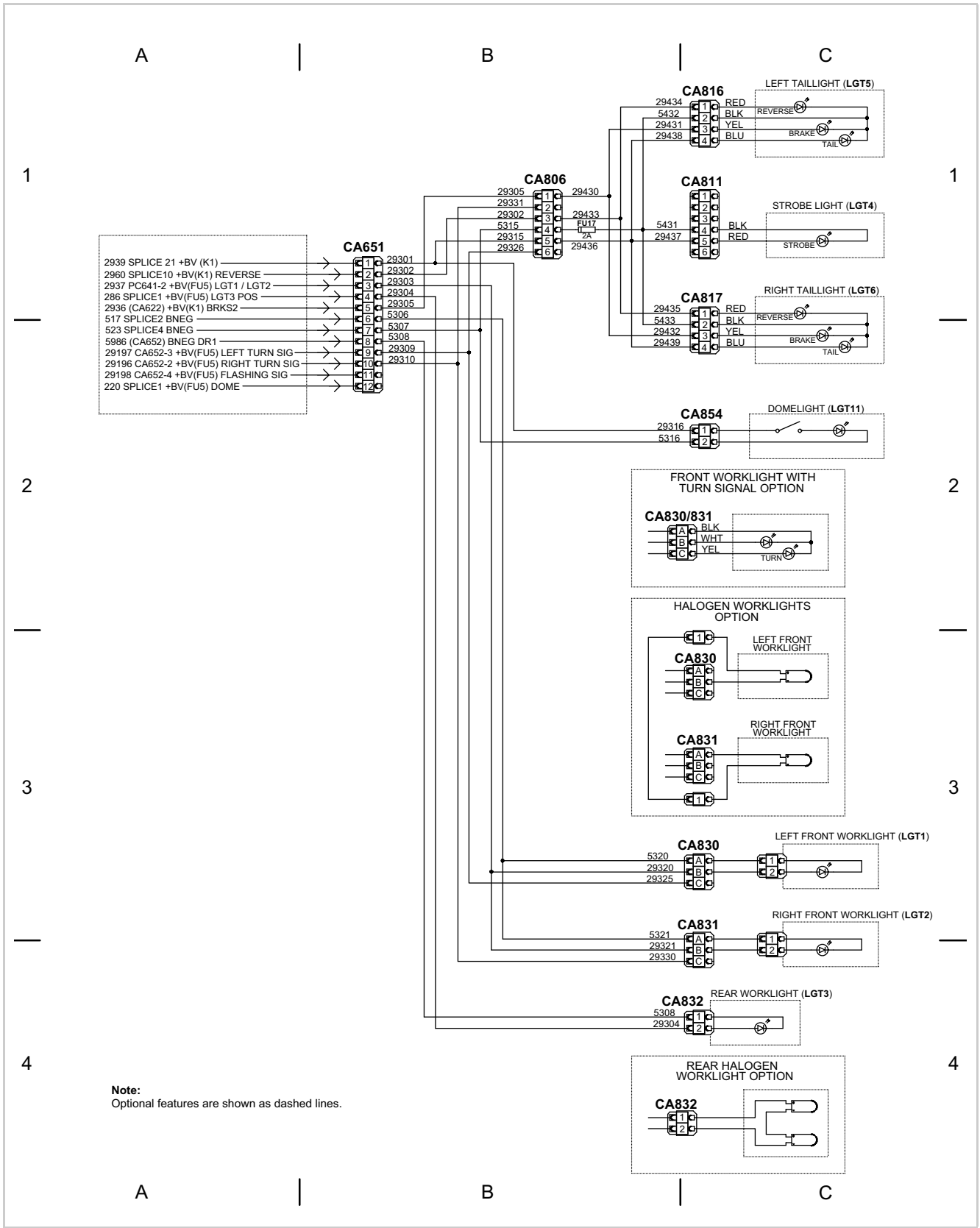
Overhead Guard Lights



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Wire Harnesses - EPV

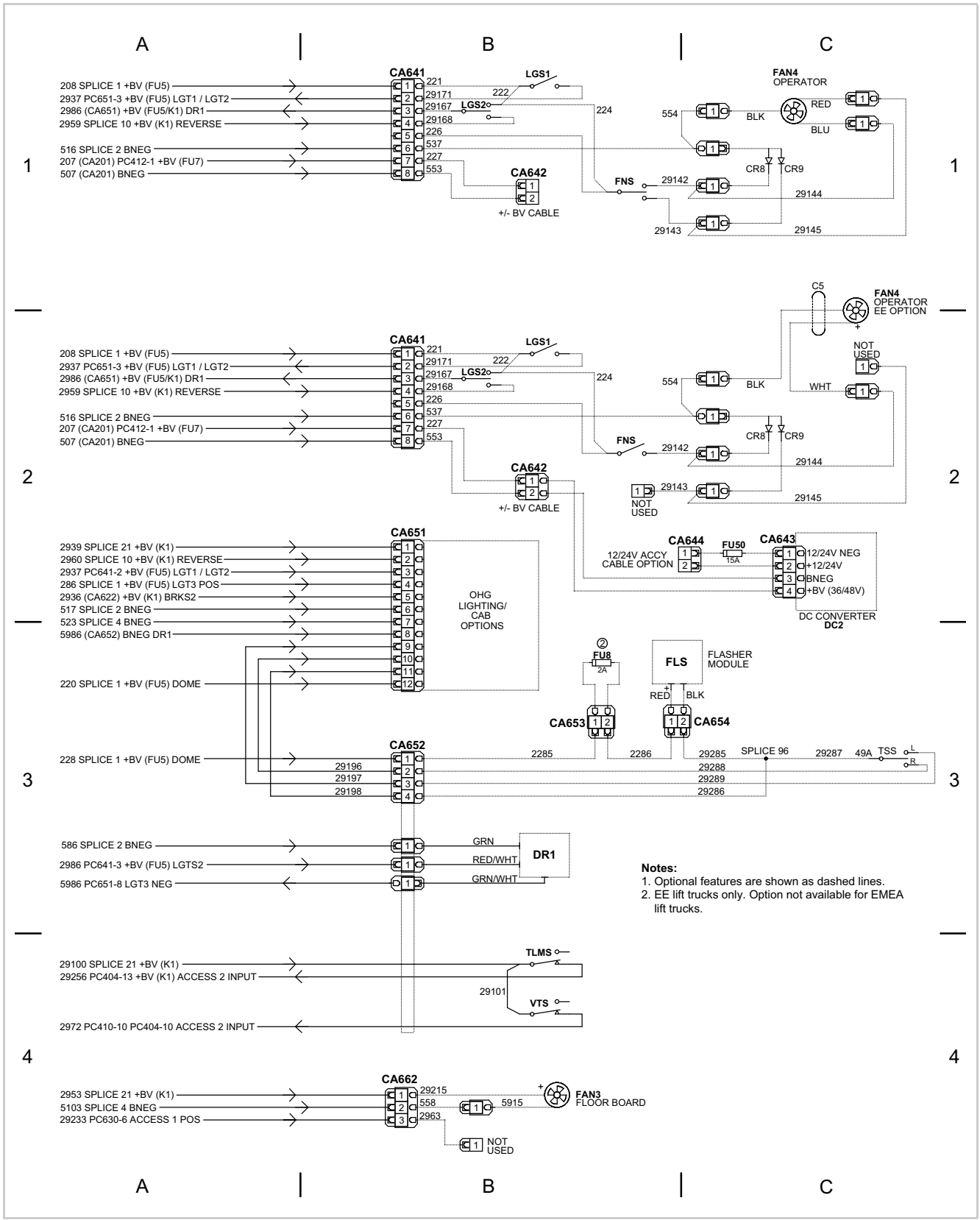
Chart 1 Wire Harness Chart - EPV	
155491	EPV armrest harness: JC416, JC417, PC415, PC670, PC671, PC672, PC673, PC674, PC675
155492	Turn signal: JC652,PC653, PC654, TSS
155493	Turn signal fuse: JC563
155515	Cab heater: Access 3™ BNEG, FU19, K4, H20, line contactor
155516	Cab heater jumper: FU19, K4
158086	Accessory voltage converter: JC642, PC643, PC644
158088	Dual pedal bracket: ACS, BRKS1, BRKS2, FS, JC611, PC610, RS
158089	Dual pedal floorboard: ACS, BRKS1, BRKS2, JC601, JC612, PC601, PC611
*To select the applicable part number, use the lift truck data number to find the lift truck features. See chapter Introduction.	

Chart 2 - Harness Lift Heights*			
mm	in	Part Number	
		5th Function	Height Switch
4365	172	127515-002	150962-002
4825	190	127515-003	150962-003
5280	208	127515-004	150962-004
5740	226	127515-005	150962-005
6120	241	127515-006	150962-006
6400	252	127515-007	150962-007
6930	273	127515-010	150962-010
7490	295	127515-010	150962-010

Chart 3 - Accessory Fuse*	
Part Number	Amps
148208-003	2
148208	15

Chart 4 - Overhead Guard Lights*	
Part Number	Light
155490-002	LED, halogen
155490	LED, with turn signal

Front of LIft Truck 2 - Manual Valve



Notes:
1. Optional features are shown as dashed lines.
2. EE lift trucks only. Option not available for EMEA lift trucks.

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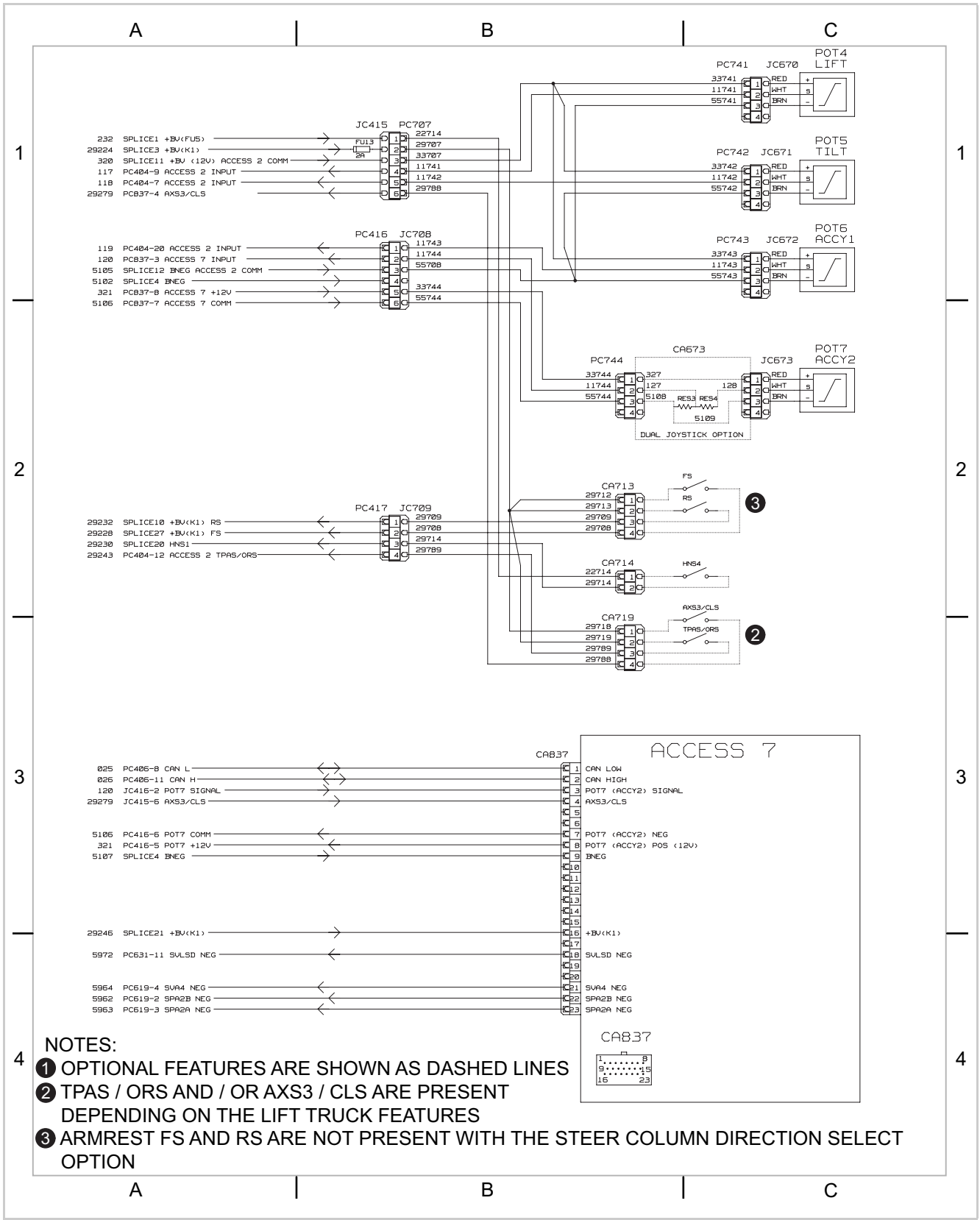
Wire Harnesses - Manual Valve

Chart 1 Wire Harness Chart - Manual Valve	
Part No.	**Harness Connections**
127342	Accessory +BV Jumber: JC642, customer accessory
*See Chart 2	5ht function: accessory, JC615
128720	Freezer condition front: THS1, THS2, RES2, RES3, JC813
130117-002	Steer column harness: includes one resistor. Use two harnesses for each lift truck
139943	Flex seat: JC410, SES
140290-001	InfoLink®: module connector, current connector, load connector, alarm connector, CAN connector, prog connector, shock connector, RS232, card proximity reader
141045	Steer column: HNS, KYS, RS, FS, JC601
144485	InfoLink®: impact sensor
146087-003	Travel alarm: ALM2, JC603
*See Chart 3	Accessory +BV fuse: line contactor, JC412
148210	Dash switches: diodes CR5 and CR6, FNS, JC641, LGS1, LGS2, PC642
148213	Hydraulic manifold block: AXS1 though 3, JC631, PC633, TBS, TLT
148214	Freezer condition: Access 3™ BNEG, line contactor, +BV(K1), PC807, PC808, PC813
148360	TPAS upper: DS20, TPAS
149124	Steer encoder: JC602, PC602
149623	Floorboard fan: DR3, FAN3, JC662
*See Chart 2	Height switch: JC613, PC614
151032	Grammer seat: JC410, PC411
153347	Overhead guard LED work lights: LGT1, LGT2, PC830/831
154681	Cab travel lights: JC418, PC852, PC853, Splice 50 through 52
154682	Cab power panel: Access 3™ BNEG, FB421, K4 coil/contacts, JC423, JC424, line contactor, PC418, PC422, PC655, PC656, Splice 53, Splice 54, Splice 56 through 59
154683	Cab overhead guard: Defroster neg/pos, JC651, JC655, JC656, JCPC806, PC830, PC831, PC832, PC850, PC851, PC858, PC859, PC860, PC862, PC863, PC864, PC865, PC866, Splice 60 through 77
154684	Overhead guard rear lights: JC806, PC811, PC816, PC817
155154	Main lift truck harness: Access 3™ BNEG, ACS, BRKS1, BRKS2, DR1, FAN1, freezer condition, HN1, JC405, JC604, JC605, line contactor, PC201, PC401, PC403, PC404, PC405, PC406, PC407, PC408, PC409, PC410, PC412, PC414, PC601, PC602, PC603, PC604, PC605, PC606, PC607, PC612, PC613, PC616, PC618, PC622, PC625, PC626, PC627, PC628, PC630, PC631, PC641, PC651, PC652, PC662, Splice 1 through 7, Splice 9 through 12, Splice 15, Splice 19, Splice 21, Splice 31, SV1, SV3, SVOP, TLMS, VTS
*See Chart 4	Overhead guard lights: JC651, PC806, PC830, PC831, PC832, PC854
155492	Turn signal: JC652, PC653, PC654, TSS



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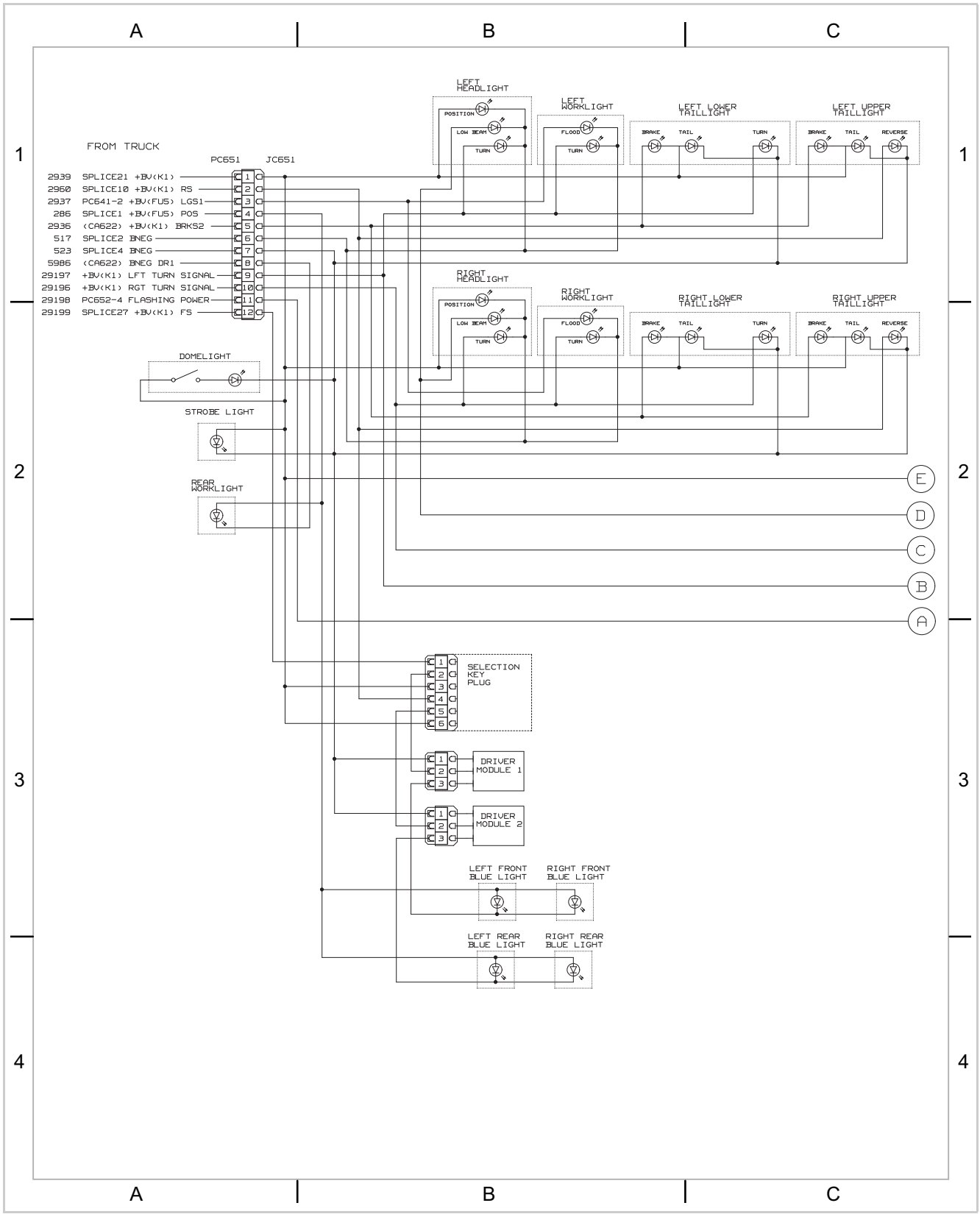
Hard Cabin - Schematics - Part Two



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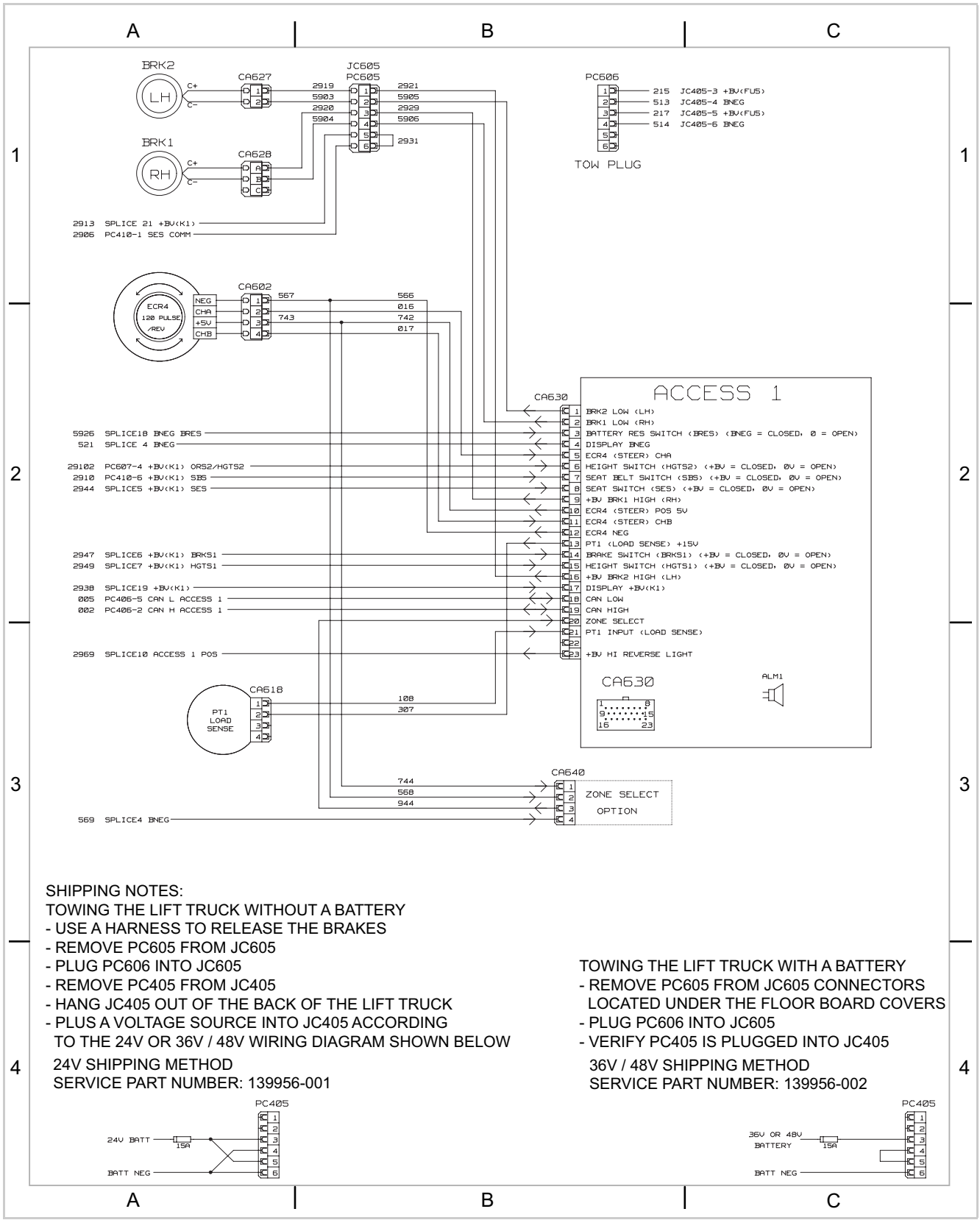
EPV - Wiring Harnesses

EPV - Wiring Harnesses	
Part Number	**Wiring Harness Connections**
155492	Turn signal: JC652, PC653, PC654, TSS
155493	Turn signal fuse: JC563
155515	Cab heater: Access 3™ BNEG, FU19, K4, H20, line contactor
155516	Cab heater jumper: FU19, K4
158086	Accessory voltage converter: JC642, PC643, PC644
158088	Dual pedal bracket: ACS, BRKS1, BRKS2, FS, JC611, PC610, RS
158089	Dual pedal floorboard: ACS, BRKS1, BRKS2, JC601, JC612, PC601, PC611
160000-002	Overhead guard lights: JC105, PC106, PC107, JC950, PC951, PC952, PC953, PC957, PC959, PC960, PC961, PC962, PC963, PC964, PC965, PC966
160001-001	Overhead guard taillights: PC954, PC955, PC956, JC957
159927-002	Floor spotlight jumper harness: JC961, PC961A or JC962, PC962A or JC965, PC965A or JC966, PC966A
164045-003	EPS to lift truck harness V Force®: EPS, FU EPS, TRUCK
164045-006	EPS to lift truck harness Lithium capable: EPS, FU EPS, TRUCK
164047	EWS harness: TRUCK, PROG PLUG, PROG RECT, RELAY, EWS

Table 1 - Harness Collapsed Heights*			
mm	**in**	**Part Number**	
		Fifth Function	**Height Switch**
1,955	77	127515-102	150962-002
2,105	83	127515-103	150962-003
2,260	89	127515-104	150962-004
2,410	95	127515-105	150962-005
2,540	100	127515-106	150962-006
2,665	105	127515-107	150962-007
2,840	112	127515-110	150962-008
3,035	119	127515-110	150962-009



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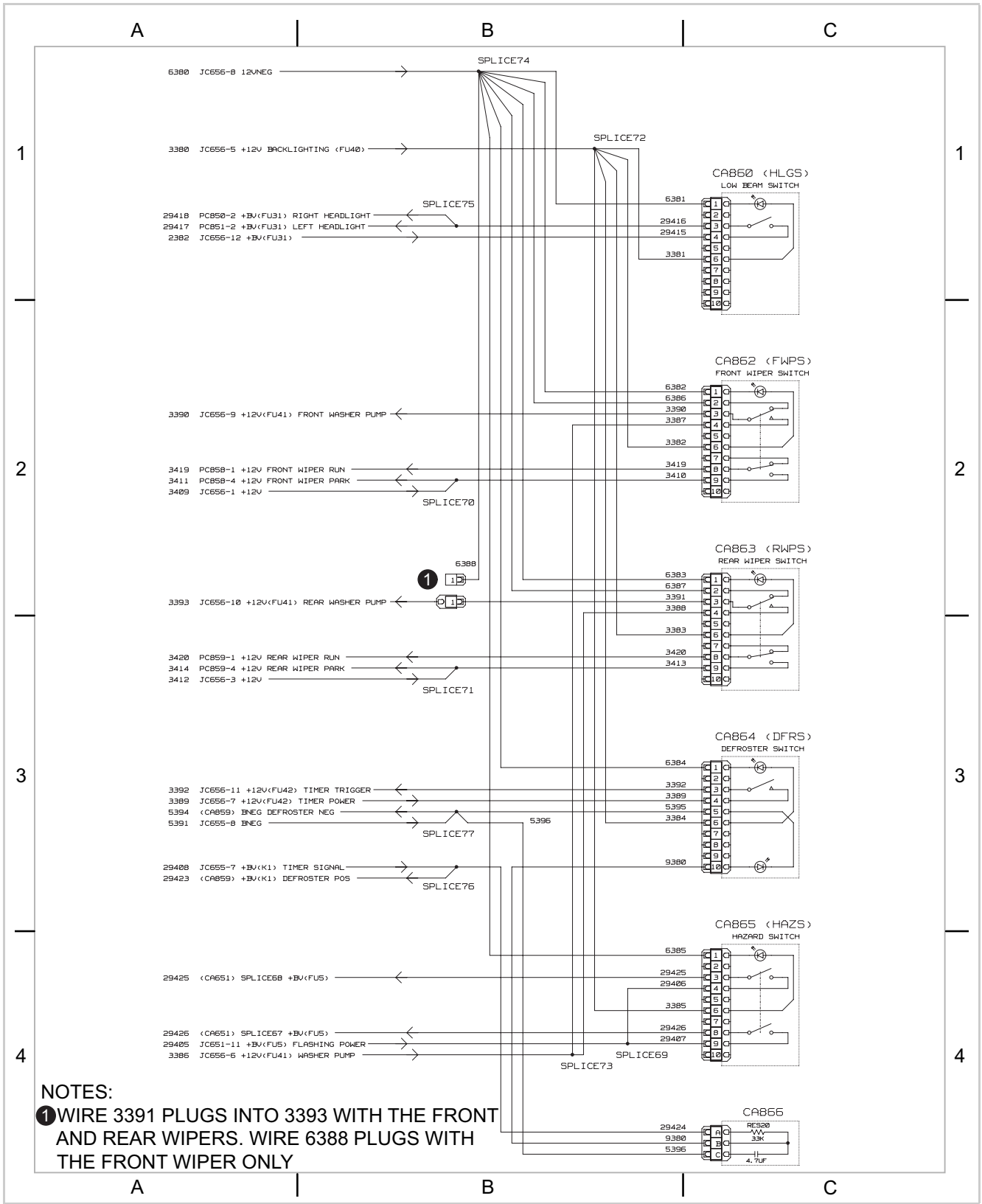
Hard Cabin - Switch Pod



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Battery Care

A battery powers this lift truck. Here are a few suggestions which help you give the battery proper care.

The battery is beneath the operator seat.

1. Charge the battery only in areas designated for that use.
2. Make sure the charger matches the voltage and amperage of the lift truck battery. The lift truck data plate lists this voltage.
3. Before disconnecting or connecting batteries to a charger, make sure that the charger is OFF. If you attempt to connect or disconnect when the charger is ON, serious injury to you, the battery, and the charger results.
4. Before charging, make sure that the battery cells contain the correct amount of water. Charging batteries with a low water level results in damage to the cells. When checking water levels, never use open flame. Battery fumes are explosive.
5. Before connecting the battery cable to the lift truck receptacle, make sure that the key switch is OFF and controls are in the OFF position. Fully connect the battery cable before using the lift truck. If the contacts are not making good contact, there is heat build-up in the two parts of the battery connector. This poor contact makes it difficult to remove the contacts and necessary to replace the connector.
6. Regularly check and clean corrosion from the battery cables. Good contact between the battery terminal is essential, not only for operation, but also for proper charging of the battery. Clean terminals with PN 363124 Battery Terminal Cleaner and seal terminals with PN 363125 Battery Terminal Protector.
7. Charging requirements vary depending on the use of the lift truck. Give the battery an equalizing charge weekly. This charge is normally an extra 3 hours at the finish rate.
8. See the charger manufacturer manual for specific charging procedures.
9. Make sure the battery used meets weight and size requirements of the lift truck (refer to the data plate). NEVER operate the lift truck with an undersized battery.

Charging

Charging requirements vary depending on the use of the lift truck. Recharge a battery with specific gravity of 1.160. Some applications need more than one battery to provide ample power to the unit during the service period.

WARNING

Risk of gas explosion.
Battery gases are explosive. An injury or death could occur if the battery gas explodes.

- *Do not smoke, use an open flame, or make an arc or sparks around the battery.*
- *Do not use a source of ignition (for example, a cigarette, lighter, or grinder) near the battery or battery charging area.*
- *Make sure that the area where you charge the battery is correctly vented.*
- *Use designated areas for charging batteries if they are available.*

Consult the charger manufacturer manual covering your charger for information on operation and maintenance. Some of the basic rules are as follows:

Placing battery on charge:

1. Park the lift truck at the charging station with the forks lowered and the key removed. Raise the seat deck for venting.
2. Make sure the charger control is in the OFF position.
3. Connect the battery to the charger and make sure to plug the connectors together completely.
4. Set the timer for the specified time. Set for normal (Daily Charge, except one night a week when an equalize [Weekend] charge is used).
5. Check to make sure the ammeter shows charge.

Removing the battery from charge:

1. Turn the charger OFF.
2. Disconnect the connector, using both hands with a straight pulling motion.
3. Hang up the charger cable. Prevent damage to the connector. (Broken connectors cause poor connections and connector failures).
4. Make daily battery checks and add distilled water as needed.

Chart 1- Charge level comparison with P4.1 and P4.2 at factory settings	
Battery charge %	48 V Battery
100	**> 50.20 V**
90	<= 50.20 V
80	<= 50.00 V
70	<= 49.60 V
60	<= 49.20 V
50	<= 49.00 V
40	<= 48.80 V
30	<= 48.70 V
20 (Yellow bar flashing)	<= 48.00 V
10 (lift lockout)	<= 47.70 V

To optimize BDI performance, perform the following steps:

1. Start with a fully charged and equalized battery of the size and condition normally used in the lift truck.
2. Measure and record the open circuit voltage of the battery.
3. Complete C5 calibration procedures.
4. Run the lift truck through one complete battery cycle, under normal working conditions.
5. When the lift truck reaches 10% charge remaining (lift lockout), measure and record the open circuit voltage of the battery.
6. Adjust P4.1 according to Chart 2, based on voltage recorded in step 2.
7. Adjust P4.2 according to Chart 2, based on voltage recorded in step 5.
8. Fully charge the battery.
9. Perform steps 2 through 8 until you achieve the desired performance.

Voltage values between 90% and 10% in the charts are modified linearly after P4.1 and P4.2 are set.

Chart 2-Factory settings for P4.1 and P4.2		
	P4.1 Settings 100% to 90% Transition	P4.2 Settings 20% to 10% Transition (lift lockout)
Setting	48 V Battery	48 V Battery
0	**49.1 V**	**45.8 V**
1	49.3 V	46.1 V
2	49.6 V	46.4 V
3	49.9 V	46.6 V
4	50.2 V	46.9 V
5	50.4 V	47.2 V
6	50.7 V	47.5 V
7	51.2 V	47.7 V
8	51.5 V	48.0 V
9	52.1 V	48.5 V

Do not set P4.2 setting for higher voltage than P4.1 setting transition.

Event Code 123

Brake Switch (BRKS1) Input to Access 1 and Access 3™ Does Not Match

Step 1: Turn on the lift truck and go to the Analyzer Menu. Compare A2.1.3 and A2.3.3 with BRKS1 open and closed.

Note: A2.3.3 indicates switch state (1 open or 0 switch closed) and POT2 percentage. For this event only, switch state is used.

- **If:**A2.1.3 does not change from on to off as BRKS1 is opened and closed but A2.3.3 does change from on to off.
  - Then continue to step 2.
- **If:** A2.3.3 does not change from on to off as BRKS1 is opened and closed but A2.1.3 does change from on to off.
  - Then continue to step 3.
- **If:** A2.1.3 and A2.3.3 do not change from on to off as BRKS1 is opened and closed.
  - Then check the brake switch and wires.

Step 2: Keep the lift truck on. Measure the voltage between Access 1 CA630-14 (+) and Access 1 CA630-4 (-). Go to Analyzer A2.1.3.

- **If:**The voltage < 45 V and A2.1.3 indicates off.
  - Then check the wires between BRKS1 and CA630-14.
- **If:**The voltage < 45 V and A2.1.3 indicates on.
  - Then replace Access 1.
- **If:**The voltage = 45–51 V and A2.1.3 indicates off.
  - Then replace Access 1.

Step 3: Keep the lift truck on. Measure the voltage between Access 3™ CA403-9 (+) and battery negative. Go to Analyzer A2.3.3.

- **If:**The voltage < 45 V and A2.3.3 indicates off.
  - Then check the wires between BRKS1 and Access 3™ CA403-9.
- **If:**The voltage < 45 V and A2.3.3 indicates on.
  - Then replace Access 3™.
- **If:**The voltage = 45–51 V and A2.3.3 indicates off.
  - Then replace Access 3™.

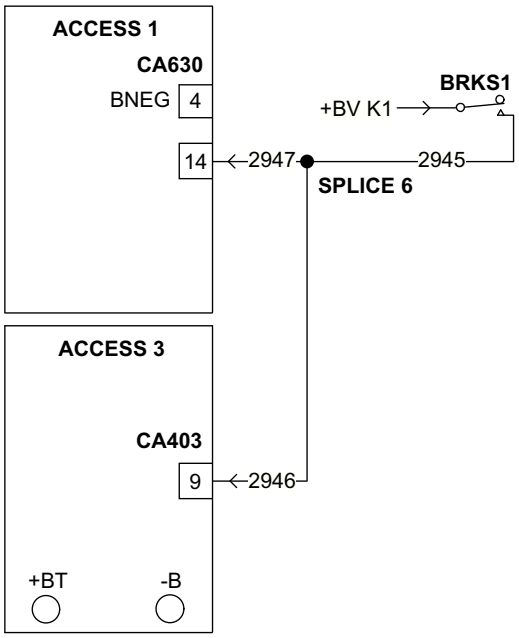

Fig. 27 (29879)

Event Code 124

Steering Command Encoder (ECR4) Out of Range

Step 1: Turn on the lift truck. Go to the Analyzer Menu A2.1.10 and monitor the counts as the steering wheel is slowly turned.

- **If:** The counts do not change or are erratic as the steering wheel is turned.
  - Then continue to step 2.
- **If:** The counts change smoothly as the steering wheel is turned.
  - Then replace Access 1.

Step 2: Keep the lift truck on. Measure the voltage between Access 1 CA630-10 (+) and Access 1 CA630-12 (-).

- **If:**The voltage ≈ 5 V.
  - Then continue to step 3.
- **If:**The voltage < 5 V.
  - Then replace Access 1.

Step 3: Keep the lift truck on. Measure the voltage between Access 1 CA602-3 (+) and Access 1 CA602-1 (-).

- **If:**The voltage < 5 V.
  - Then check the wires between Access 1 CA630 and Access 1 CA602.
- **If:**The voltage ≈ 5 V.

Event Code 224

Access 2 Operating Temperature < -25 °C (-13 °F)

This event is logged if the lift truck is left unused for long periods of time in ambient temperatures < -25 °C (-13 °F).

Step 1: Turn on the lift truck and go to the Analyzer Menu A2.2.13.

- **If:**The temperature < -25 °C (-13 °F).
  - Then verify the application. Move the lift truck to an area where the ambient temperature > -25 °C (-13 °F). Turn off the lift truck and then turn on the lift truck.
- **If:**The temperature > -25 °C (-13 °F).
  - Then replace Access 2.

Event Code 225

Access 2 Operating Temperature < -45 °C (-49 °F)

This event is logged if the lift truck is left unused for long periods of time in ambient temperatures < -45 °C (-49 °F). The event clears when the module temperature = -43 °C (-46 °F).

Step 1:

- **If:**The temperature < -43 °C (-46 °F).
  - Then verify application. Move the lift truck to an area where the ambient temperature > -43 °C (-46 °F). Turn off the lift truck and then turn on the lift truck.
- **If:**The temperature > -43 °C (-46 °F).
  - Then replace Access 2.

Event Code 226

Access 2 Operating Temperature > 85 °C (185 °F)

The lift truck continues to operate. The performance is reduced to manage the controller thermal limits. Restricted air flow in the FAN1 duct also causes this event.

Step 1: Turn on the lift truck and go to the Analyzer Menu A2.2.13. The seat switch must be closed.

- **If:**The temperature ≥ 85 °C (185 °F).
  - Then follow the Event Code 321 procedures.
- **If:**The temperature < 85 °C (185 °F).
  - Then Turn off the lift truck and then turn on the lift truck. Replace Access 2 if the event does not clear.

Note: If FAN1 operates during the testing procedures and the event continues to occur during the lift truck operation, set the Features Menu (F7.1) to Always On.

Event Code 227

Access 2 Operating Temperature > 105 °C (221 °F)

The lift truck continues to operate. The performance is reduced to manage the controller thermal limits. Restricted air flow in the FAN1 duct also causes this event. The event clears when the module temperature = 103 °C (218 °F).

Step 1: Turn on the lift truck and go to the Analyzer Menu A2.2.13. The seat switch must be closed.

- **If:**The temperature ≥ 103 °C (218 °F).
  - Then follow the Event Code 321 procedures.
- **If:**The temperature < 103 °C (218 °F).
  - Then Turn off the lift truck and then turn on the lift truck. Replace Access 2 if the event does not clear.

Note: If FAN1 operates during the testing procedures and the event continues to occur during the lift truck operation, set the Features Menu (F7.1) to Always On.

Event Code 228

Lift Motor (M3) Temperature > 165 °C (329 °F)

Step 1: Turn on the lift truck and go to the Analyzer Menu A2.2.12 (M3 temperature). Record the reading.

- **If:**The temperature > 165 °C (329 °F).
  - Then continue to step 2.
- **If:** The temperature < 165 °C (329 °F).
  - Then Turn off the lift truck and then turn on the lift truck. Watch the event frequency.
- **If:** No temperature is displayed.
  - Then check the wires between Access 2 and the motor thermal sensors (TS3).

Step 2: Keep the lift truck on. Determine if the lift truck is under extreme duty cycles or high ambient temperatures.

- **If:** The lift truck is under extreme duty cycles or high ambient temperatures.
  - Then allow the lift truck to cool. Then continue to use the lift truck.
- **If:** The lift truck is not overheating due to the previous conditions.
  - Then continue to step 3.

Event Code 246

Access 2 Detects Tilt Back Solenoid (SPTR) Open (EPV Only)

Step 1: Turn on the lift truck. Measure the voltage between the wire 29250 (battery positive) and the wire 5953 (-) at Access 2 SPTR. Go to the Analyzer Menu A4.2.9 and press enter to apply power to Access 2 SPTR.

- **If:**The voltage < 22 V.
  - Then continue to step 2.
- **If:** The voltage = 22–26 V.
  - Then replace the Access 2 SPTR coil.

Step 2: Keep the lift truck on. Measure the voltage between the distribution relay board CA201-9 (battery positive) and Access 2 CA404-18 (-). Go to Analyzer A4.2.9 and press enter to apply power to Access 2 SPTR.

- **If:**The voltage = 22–26 V.
  - Then check the wires between Access 2 SPTR, the distribution relay board CA201, and Access 2 CA404.
- **If:**The voltage < 22 V.
  - Then replace Access 2.

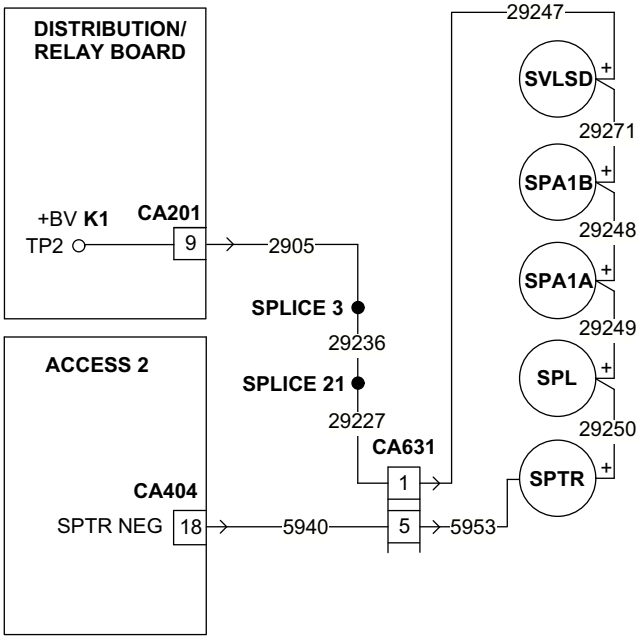

Fig. 51 (29886)

Event Code 247

Access 2 Detects the Circuit for the Tilt Position Assist Solenoid (SV3) is an Open Circuit (Manual Valve Only)

Check the event history. If there are many event codes for lift truck coils with open circuits, then first check the positive circuit for the coils.

Step 1: Turn on the lift truck. Measure the voltage between the wire 2984 (+) at Access 2 SV3 and battery negative.

- **If:** The voltage < 33 V (36 V lift truck) or 45 V (48 V lift truck).
  - Then check the wires and the connections between distribution relay board CA201-9 and Access 2 SV3(+).
- **If:** The voltage = 33–38 V (36 V lift truck) or 45–52 V (48 V lift truck).
  - Then continue to step 2.

Step 2: Keep the lift truck on. Measure the voltage between the wire 2984 (+) and the wire 5919 (-) at Access 2 SV3. Go to the Analyzer Menu A4.2.3 and press enter to apply energy to Access 2 SV3.

- **If:** The voltage < 22 V.
  - Then continue to step 3.
- **If:** The voltage = 22–26 V.
  - Then replace the Access 2 SV3 coil.

Step 3: Keep the lift truck on. Measure the voltage between the distribution relay board CA201-9 (+) and Access 2 CA404-21 (-). Go to the Analyzer Menu A4.2.3 and press enter to apply power to Access 2 SV3.

- **If:** The voltage = 22–26 V.
  - Then check the wires and the connections between Access 2 SV3, distribution relay board CA201 and, Access 2 CA404.
- **If:** The voltage < 22 V.
  - Then replace Access 2.

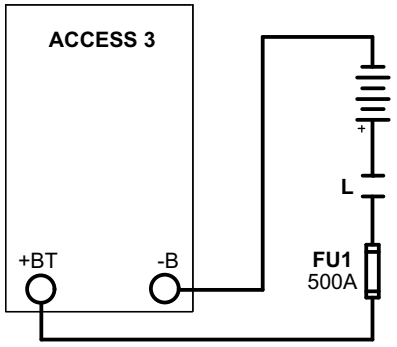

Fig. 62 (29894)

Event Code 307

Voltage Not Present at Battery Positive Terminal on Access 3™ After the Lift Truck is Turned on

Improper battery calibration causes this event. Perform the C5 calibration.

Step 1: Turn on the lift truck. Verify that the line contactor closes with the seat switch closed.

- **If:**The line contactor closes.
  - Then continue to step 2.
- **If:**The line contactor opens.
  - Then follow the Event Code 312 procedures.

Step 2: Keep the lift truck on. Measure the voltage between Access 3™ battery positive and battery negative. Close the seat switch.

- **If:**The voltage = 44–47 V.
  - Then check the circuit between the battery and Access 3™ battery positive, including FU1.
- **If:**The voltage < 44 V.
  - Then follow the Event Code 303 procedures.
- **If:**The voltage = 45–52 V.
  - Then replace Access 3™.

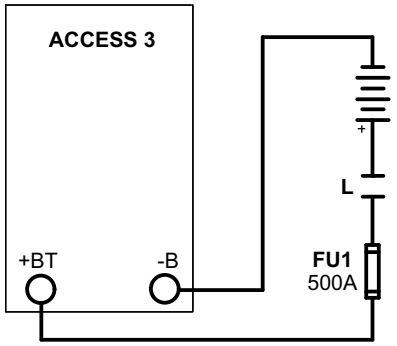

Fig. 63 (29894)

Event Code 308

Access 3™ Detects Left Motor (M2) Shorted

Step 1: Follow the Event Code 304 procedures.

Event Code 309

The traction motor short circuit to the frame causes this event.

Step 1: Follow the Event Code 303 procedures.

Event Code 310

Access 3™ Internal Communication Not Present

Step 1: Turn on the lift truck. Verify that the line contactor closes with the seat switch closed.

- **If:**The line contactor closes.
  - Then follow the Event Code 303 procedures.
- **If:**The line contactor opens.
  - Then follow the Event Code 312 procedures.

If the lift truck operates, the event code could be a random nuisance code. Monitor the code frequency. If the frequency gradually increases for no apparent reason, replace Access 3™.

Event Code 311

Line Contactor Driver Shorted

Step 1: Turn off the lift truck. Unplug the battery, disconnect the wire 5901, and the wire 2911 from the line contactor coil. Connect the battery and turn on the lift truck.

- **If:**The event does not clear nor change.
  - Then connect the wire 5901 and the wire 2911 to the line contactor coil and continue to step 2.
- **If:**The event clears or changes.
  - Then replace the line contactor coil.

Step 2: Keep off the lift truck. Disconnect the Access 3™ wire 5901 (CA403-26) and the Access 3™ wire 2911 (CA403-27). Turn on the lift truck and close the seat switch.

- **If:**The event clears or changes.
  - Then check the wires between the line contactor coil and Access 3™ CA403.
- **If:**The event does not clear nor change.
  - Then replace Access 3™.

tery negative wire from Access 7 SPA2A and turn on the lift truck.

- **If:**The event does not clear.
  - Then continue to step 2 (do not connect the wires to the coil).
- **If:**The event clears or changes to Event Code 722.
  - Then replace the Access 7 SPA2A coil.

Step 2: Turn off the lift truck and disconnect the battery. Disconnect Access 7 CA837 and distribution relay board CA201. Check the resistance between Access 7 SPA2A battery positive and Access 7 SPA2A battery negative coil wires.

- **If:**A short circuit is detected.
  - Then check the wires between Access 7 SPA2A, distribution relay board CA201, and Access 7 CA837.
- **If:**There is an open (O/L).
  - Then replace Access 7.

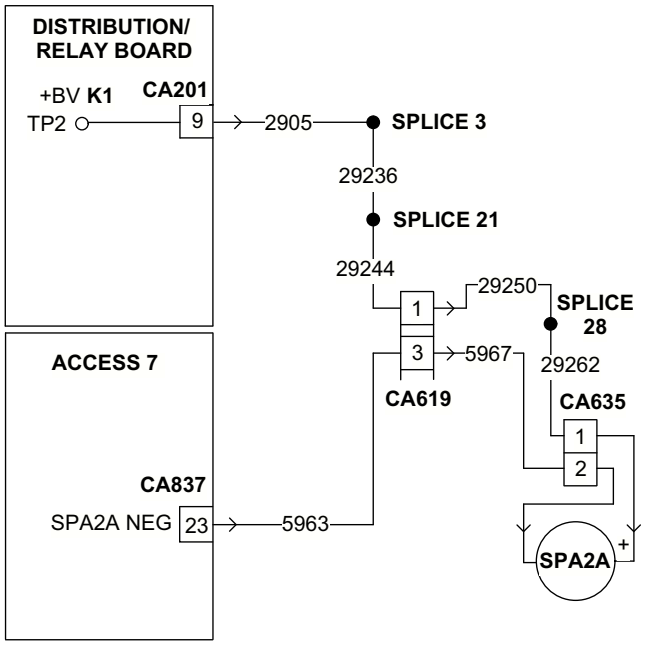

Fig. 78 (29898)

Event Code 709

Access 7 Detects Second Accessory Proportional Solenoid Port B (SPA2B) Overcurrent (EPV Only)

Step 1: Turn off the lift truck. Disconnect the Access 7 battery positive wire and the Access 7 battery negative wire from Access 7 SPA2B and turn on the lift truck.

- **If:**The event does not clear.
  - Then continue to step 2 (do not connect the wires to the coil).
- **If:**The event clears or changes to Event Code 723.
  - Then replace the Access 7 SPA2B coil.

Step 2: Turn off the lift truck and disconnect the battery. Disconnect Access 7 CA837 and distribution relay board CA201. Check the resistance between Access 7 SPA2B battery positive and Access 7 SPA2B battery negative coil wires.

- **If:**A short circuit is detected.
  - Then check the wires between Access 7 SPA2B, distribution relay board CA201, and Access 7 CA837.
- **If:**There is an open (O/L).
  - Then replace Access 7.

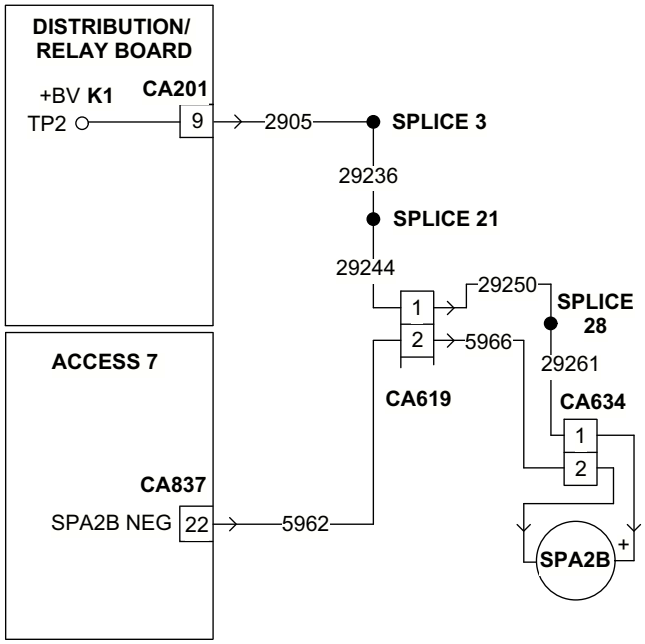

Fig. 79 (29899)

Event Code 710

Access 7 Detects Accessory Solenoid 4 (SVA4) Overcurrent (EPV Only)

Step 1: Turn off the lift truck. Disconnect the Access 7 battery positive wire and the Access 7 battery negative wire from Access 7 SVA4 and turn on the lift truck.

- **If:**The event does not clear.
  - Then continue to step 2 (do not connect the wires to the coil).
- **If:**The event clears or changes to Event Code 724.

5. Remove the floorboards.
6. Disconnect the left brake connector CA627 and the right brake connector CA628.
7. Remove the screws that attach the brake to the traction motor using a hex key wrench.
8. Remove the brake from the lift truck.
9. See Figure 3. Disassemble the brake.
10. Inspect all parts for wear that includes the brake hub on the motor. Replace the parts as needed.

Assemble the brake

WARNING

Incorrect installation of the springs on the brakes can cause death or injury.
Install the correct number of springs on the left or right brake. If you do not, incorrect operation of the brakes happens and can cause death or injury.

➢ *Use the following steps and install the springs.*

1. See Figure 2. Install the three springs on the left brake.
2. Install the six springs on the right brake.

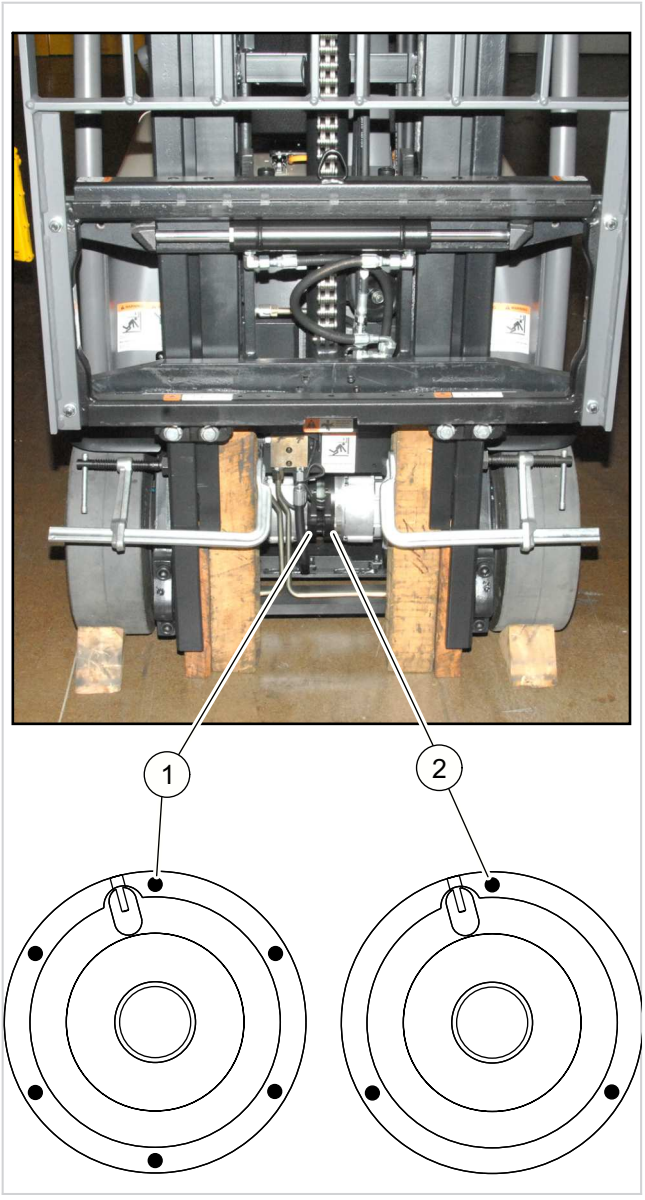

Fig. 2 (29865)

1	Right brake - six springs
2	Left brake - three springs

3. See Figure 3. Assemble the brake to the motor using the three socket head screws.
4. Torque the three socket head screws to 8–9 Nm (6–7 ft lb).

9. Once the steering column assembly is installed onto the frame, check the tilting and locking functions for correct operation.

Check the "full up" and "full back" positions. The full up (forward) position is 16° ± 2° and the full back position is 40° ± 2° from vertical.

Steer Axle Assembly

Steer Tire

See Figure 12. When you replace the steer tire (4), make sure that the composition and size provide the correct maneuverability, stability, and braking. Replace both steer tires at the same time for equal tire circumference. See Introduction for the tire type.

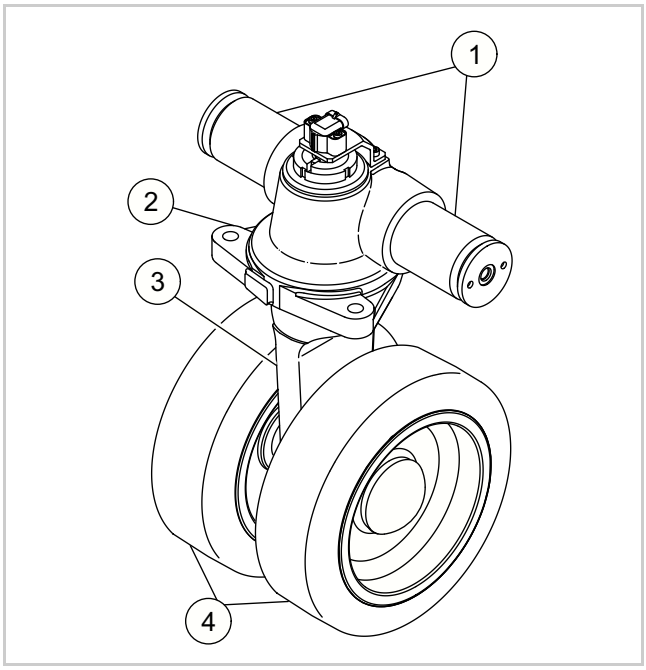

Fig. 12 (30017)

1	Cylinders
2	Housing
3	Yoke shaft
4	Steer tires

Hub

The steer tire hub is sealed by an outer ring seal and a grease cap.

1. See Figure 13. Before you assemble the hub (5), pack the bearings (4), and fill the hub bearing cavities with grease (063002-034).
2. Put a light coating of lubricant on the steer axle bearing holes.

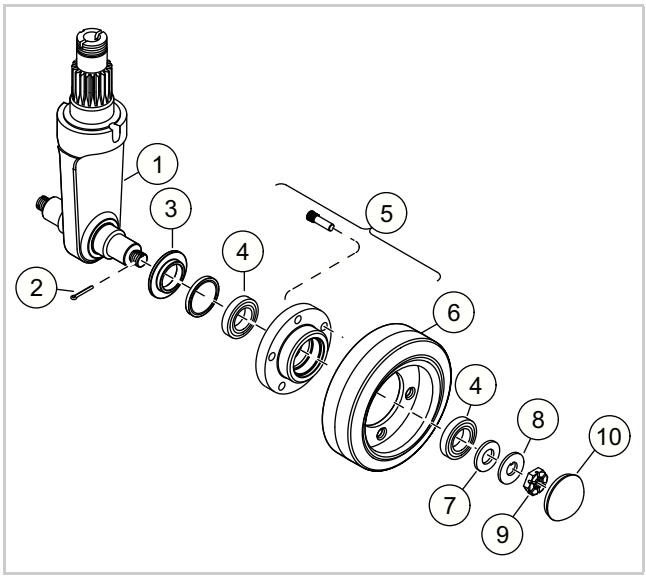

Fig. 13 (30018)

1	Yoke shaft assembly
2	Cotter pin
3	Seal
4	Bearing assembly
5	Hub assembly
6	Steer tire assembly
7	Flatwasher
8	Tabbed washer
9	Locknut
19	Grease cap

3. See Figure 14. Install the outer ring seal (1) and the bearing (2) on the steer axle (first bearing cup area).
4. Install both bearing cups into the hub.
5. Install the hub on the steer axle.
6. Pack grease (063002-034) into the bearing and hub cavity.
7. Install the bearing cone (4) into the second bearing cup (3).

2. See Figure 104. Install the cam lever (1) into the bracket (2). Make sure that you put the handle at the correct position.

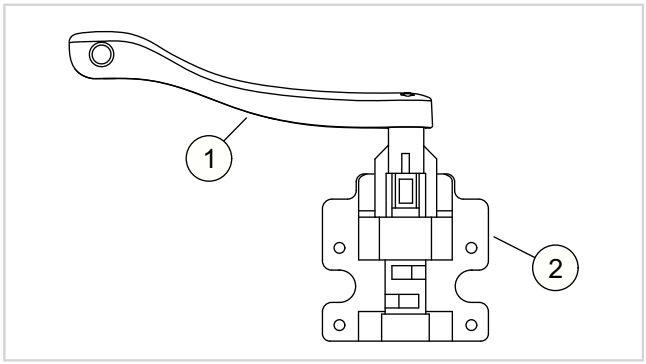

Fig. 104 (29958)

1	Cam lever
2	Bracket

Steering wheel removal

1. Move the lift truck to your work area on a level floor.
1. Turn off the lift truck.
2. Disconnect the battery.
3. Put the chocks against the wheels.
4. Put the steering column at a position that allows you to remove the steering wheel.
5. See Figure 105. Remove the horn button (1).

Fig. 105 (29959)

1	Horn button

Note: Do not remove the horn contact rings from the steering wheel.

6. See Figure 106. Disconnect the wires (2) from the horn contact rings.
7. Remove the jam nut (1).

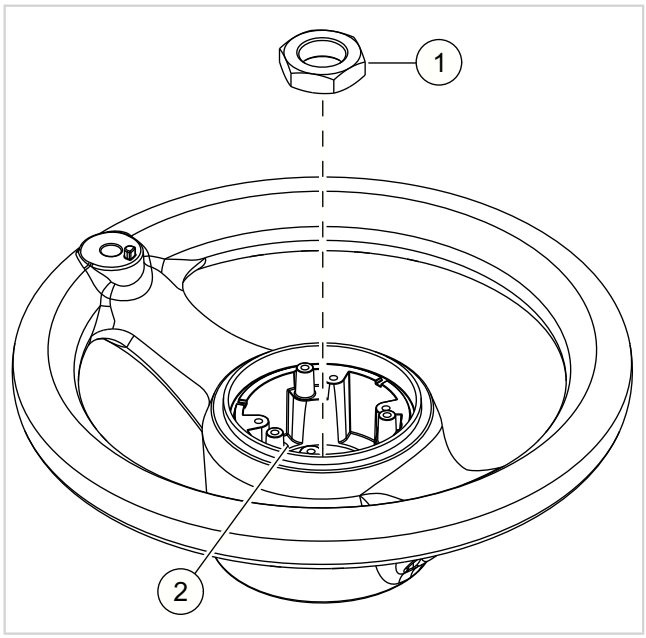

Fig. 106 (29960)

1	Jam nut
2	Horn wires

Note: To prevent the wires from being pinched during the removal of the steering wheel, you must put the wires inside the wheel puller (3).

8. See Figure 107. Put the horn wires in the notch (1) of the wheel puller (3).

Note: To prevent the steering wheel from binding during removal, make sure that you turn each screw (2) the same amount of turns.

9. Use the two screws (2) and the wheel puller (3) to turn each screw the same amount of turns until the steering wheel is loose.

Note: Use a rubber mallet to loosen the steering wheel from the steering shaft by hitting up on the bottom of the steering wheel base.

10. Remove the steering wheel from the steering shaft.

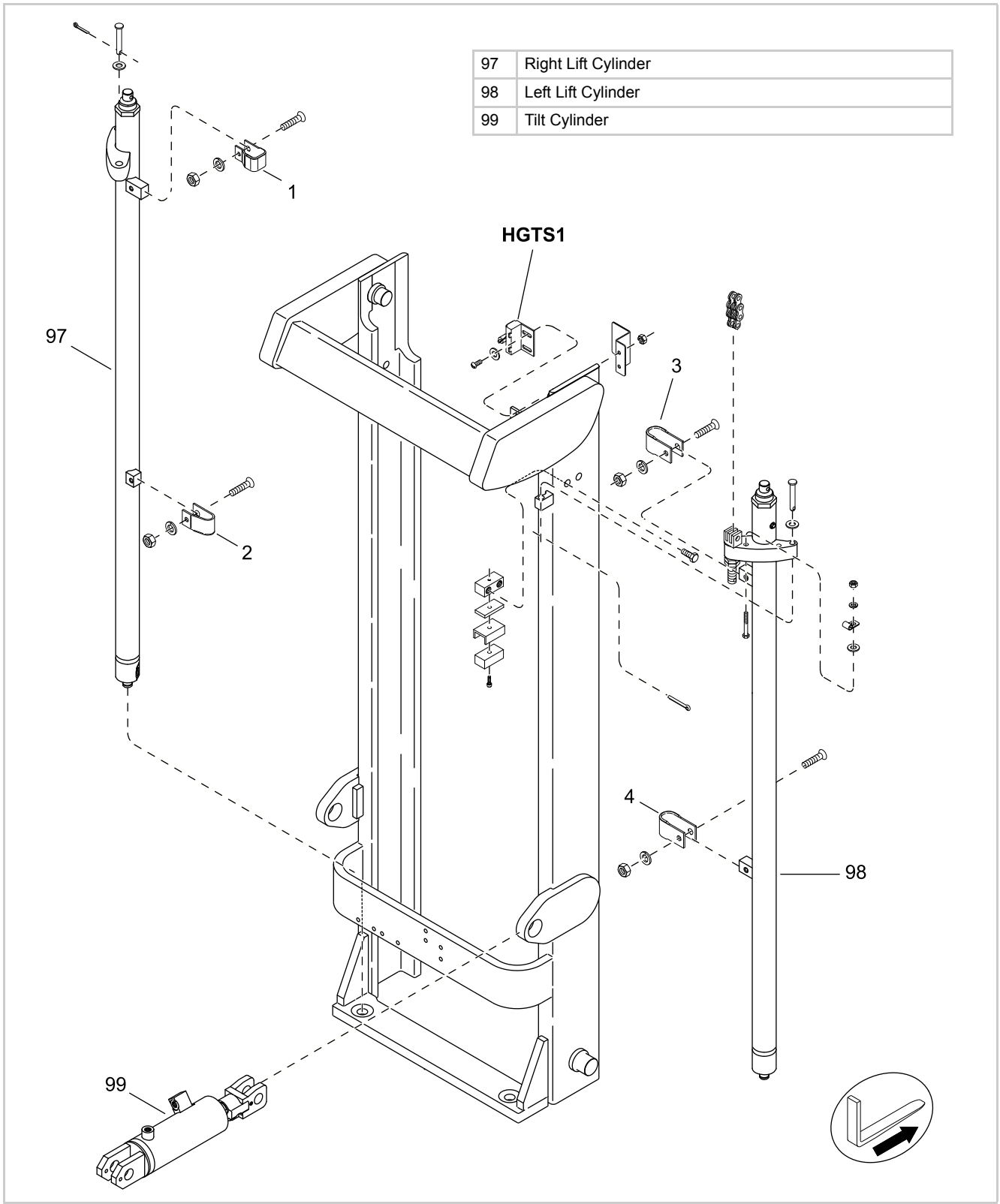
97 Right Lift Cylinder
98 Left Lift Cylinder
99 Tilt Cylinder
HGTS1
1
2
3
4
97
98
99

Fig. 3 (25456)

6. Install the chain pulleys (1 through 4, Figure 21) to the intermediate mast.

Notice: Install with the flat side of the pulley (5) toward the chain pulley as shown.

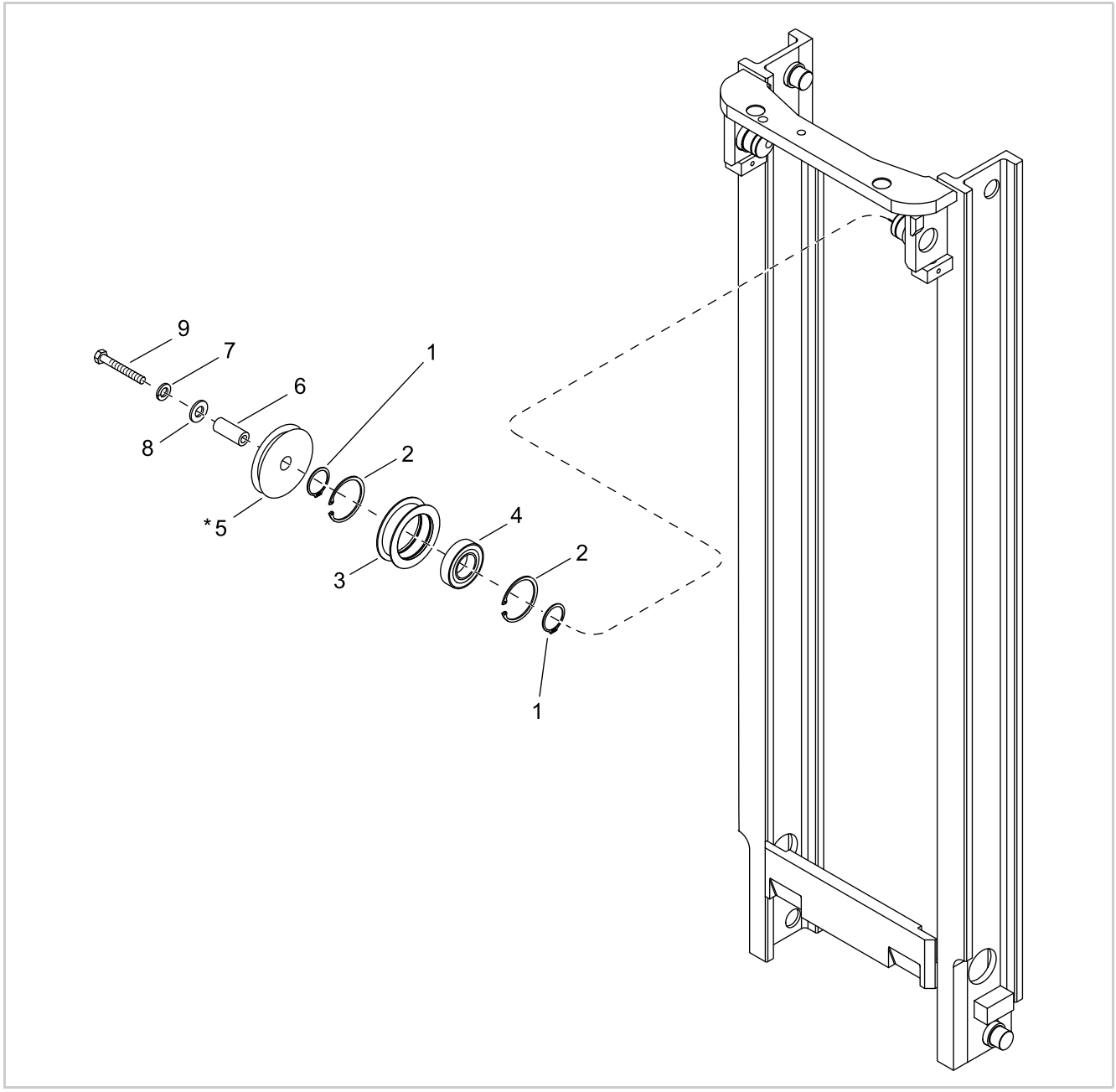

Fig. 21 (25467)

7. Install two shims and a column roller on the two studs at the top of the intermediate mast. Install two at the bottom of the inner mast. Use the same method previously described to shim the column rollers.
8. Install the inner mast the same way as the intermediate mast.
9. Use hardwood blocks and block each mast section 300–380 mm (12–15 in) apart.
10. Route the lift chains through the pulleys at the top of the intermediate mast. Connect to the bottom of the inner mast with pins (1, Figure 22) and roll pins (2).

- Also, adjust the lift chains if:
  - the masts rest on stop bolts at the bottom of the second stage
  - the masts rest on the stop bar welded to the bottom of the third stage mast
  - the masts rest on the bracket mounted to the bottom of the inner mast.

See Figure 31.

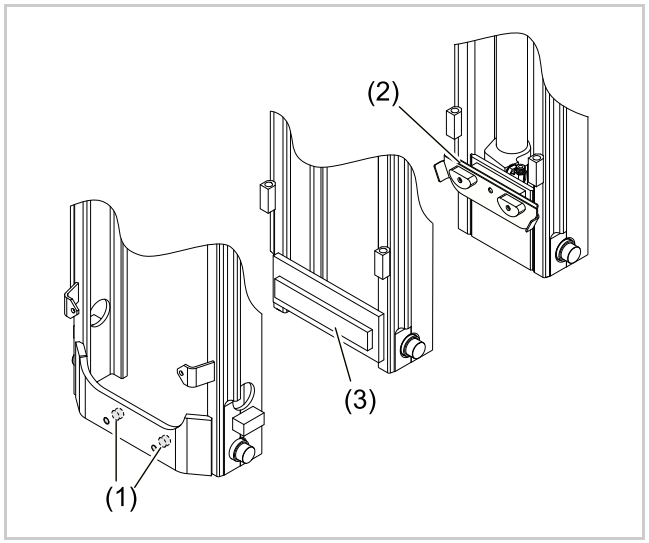

Fig. 31 (16952)

Part of the 2nd, 3rd, and inner masts	
1	Stop bolts of the second stage mast
2	Stop bracket of the inner mast
3	Third stage mast stop bar

Notice: Always replace lift chains in pairs.

Replacing the wear pads on TT mast

Outer mast guide replacement

1. Move the lift truck to a maintenance area with a level floor.
2. Disconnect the battery.
3. Lockout/Tagout the lift truck as described in the Control of Hazardous Energy section.
4. Chock the wheels.
5. At the top of the mast, remove the jam nut (2, Figure 32).

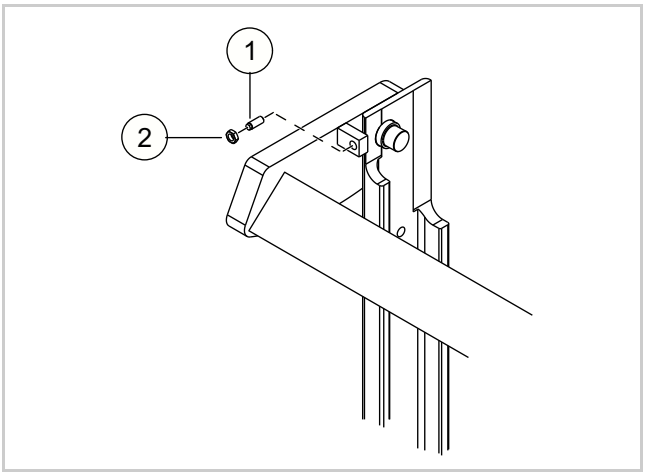

Fig. 32 (30009)

6. Slide the guide off the stud and discard.
7. Install the replacement guide.
8. Install the jam nut.
9. Remove the wheel chocks.
10. Remove the lockout/tagout items.
11. Connect the battery.

Third stage mast guide replacement.

1. Move the lift truck to a maintenance area with a level floor.
2. Disconnect the battery.
3. Lockout/Tagout the lift truck as described in the Control of Hazardous Energy section.
4. Chock the wheels.
5. At the bottom of the mast, remove the jam nut (2, Figure 33).

5. See Figure 137. Remove the screws and the nuts (1) from the cylinder bracket on the middle brace (2) of the inner mast.

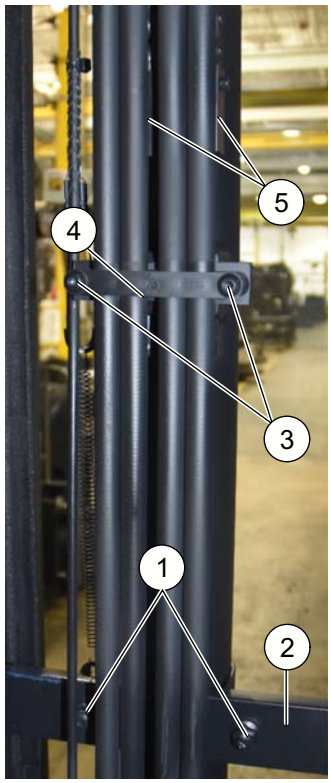

Fig. 137 (35094)

6. Rotate the primary cylinder 180° to access the chain anchors (5).
7. Remove the screws (3) and the nuts (3) from the hose guide (4).
8. Remove the cotter pins and the nuts from the chain anchors (5).
9. Remove the chain anchors (5) from the primary cylinder.
10. Use a lifting device and sling to remove the primary cylinder from the inner mast.

Removing the inner mast

1. For TT and TF masts, an accessory guide is mounted to the bottom of the inner mast for hose routing.
2. See Figure 138. Remove the screws (1) from the accessory guide to free the hydraulic hoses.

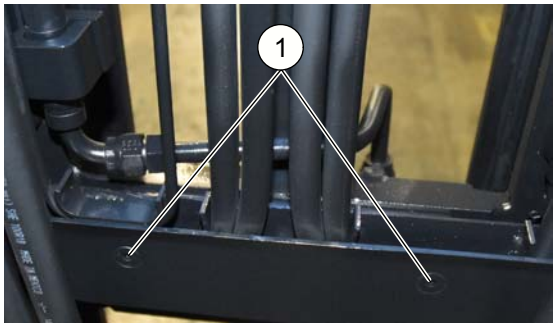

Fig. 138 (35095)

3. Remove hose from the inner mast hose guide by sliding it so that fitting clears the guide.

Technicians Tip: It may be necessary to extend the inner mast out the top of the mast assembly a few inches to create slack to free the hose.

4. Move the hoses away from the work area.
5. See Figure 139. Adjust the guide stud (1) as necessary to free the inner mast.

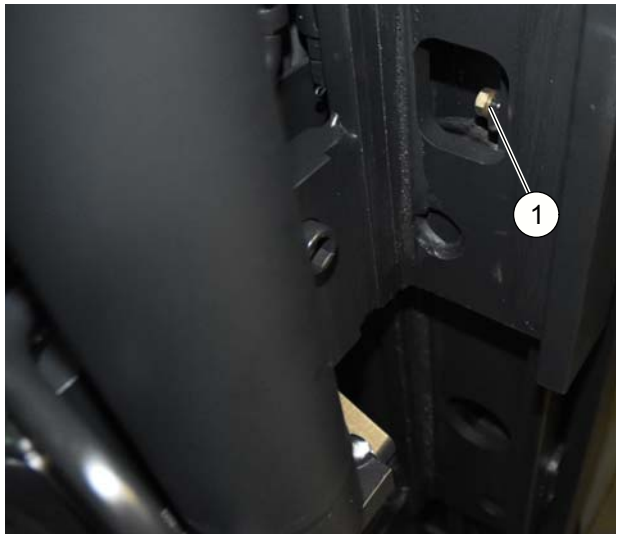

Fig. 139 (35096)

For TT Masts:

– Guide studs are located and the top of the outer mast and bottom of the inner mast.

For TF and TL Masts

– Set screws are located at the bottom of the inner mast.

6. Remove the pins and nuts from the chain anchors on the bottom of the inner mast.

Installing the plumbing, wiring and final assembly

Technician Tips: Accessory hoses and plumbing configuration varies by mast type.

1. See Figure 158. Verify the hydraulic hoses (1) per the hydraulic schematic of the lift truck. Make sure that the O-rings are in the face seal fittings before connecting.

Technician Tips: A twisted hose moves from side to side in the pulley or rises out of the pulleys when the fork carriage or mast is raised or lowered.

2. Connect all accessory parts, hose guides, and bulkheads with the appropriate hose.
3. Attach the hose and the harness guides to the lift cylinders.
4. Install the load backrest.
5. Install the forks.
6. Check the mast chain adjustment. With the mast lowered, the top of the inner mast is even with the top of the outer mast. If not, adjust the lift cylinder chain anchors.
7. Check the fork carriage chain adjustment. With the mast lowered and the forks parallel with the floor, the bottom rear of the forks are 25 mm (1 in) from the floor. If not, adjust the fork carriage chain anchors.

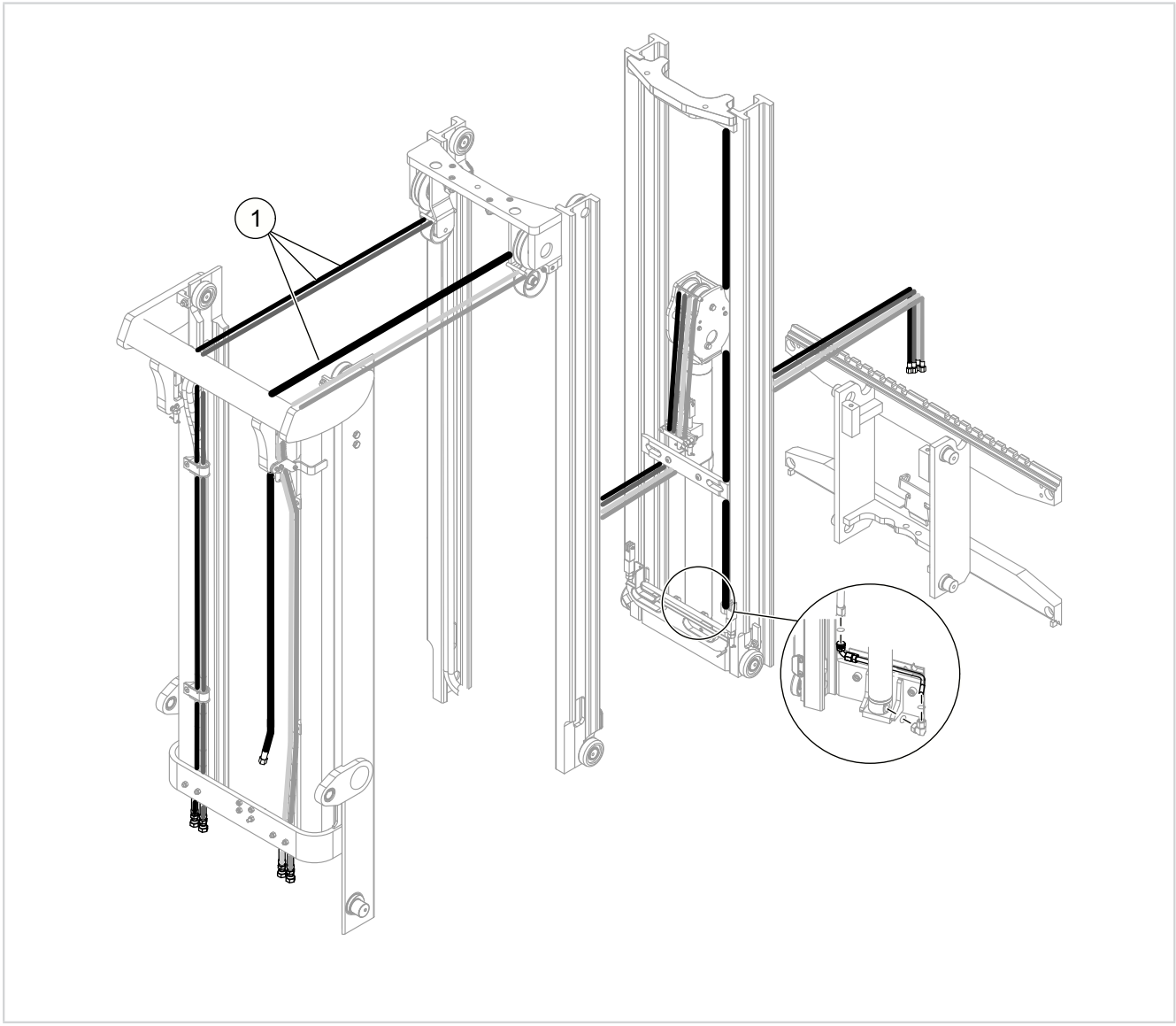

Fig. 158 (35108)

Fork Inspection

DANGER

This section shows causes of fork failure. Fork failure causes loss of equipment, damaged materials, bodily injury, and loss of life. Inspect and measure the forks at each planned maintenance interval to check for wear, overload, fatigue, bends, and so on.

WARNING

- *Use the proper fork for how it was designed to be used.*
- *Avoid using fork extensions.*
- *Do not modify the forks.*
- *Only qualified personnel can make repairs.*
- *Visually inspect the forks each work day.*

WARNING

If the fork locking pin is not fully engaged, the fork could become unintentionally disengaged.

Abrasion

See Figure 1.

Abrasion gradually reduces the thickness of the fork. Make sure that the fork thickness is within the specifications. Do not allow the forks to rub against the floor during operation. If the forks rub the floor when the mast is vertical, then check the lift chain adjustment.

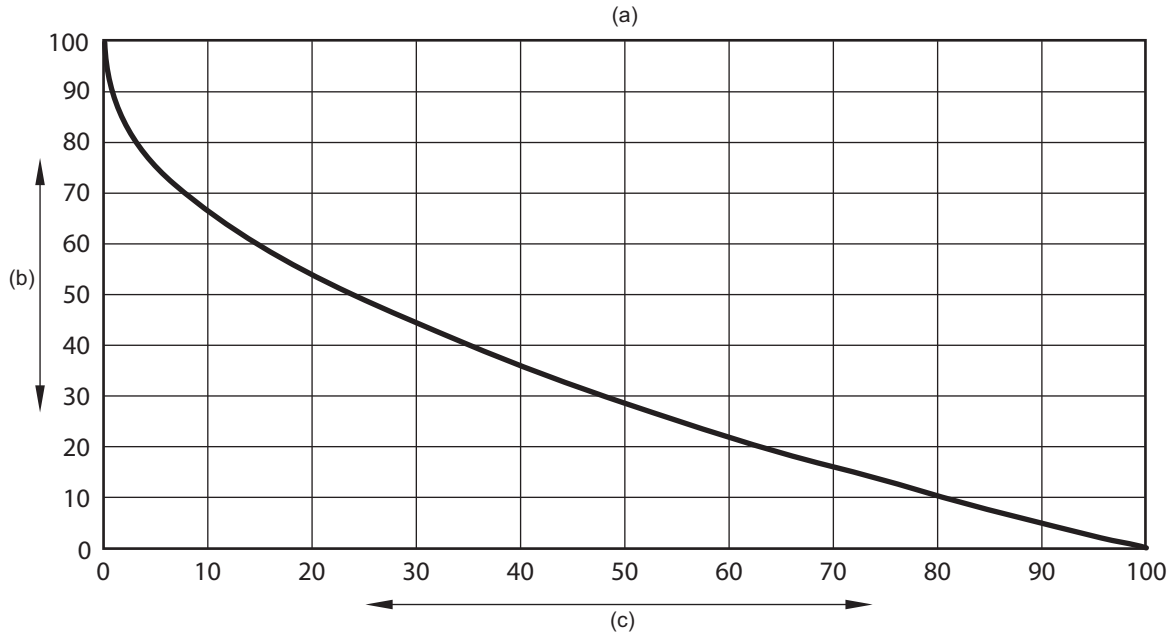

Fig. 1 (16858-02)

(a)	Fork wear versus load capacity		(c)	Percentage reduction in fork blade thickness
(b)	Percentage remaining of specified fork load capacity			

Fork wear at the fork heel must not exceed 10% of the original thickness. When the fork heel has worn 10% of the original thickness, 80% of rated capacity is the maximum load that the forks can support. The rated capacity of the fork decreases exponentially as the fork wears. Use the fork wear calipers, a measuring instru-

Flushing the mast and primary cylinders

1. After the cylinders are bled, actuate the control valve to raise the carriage through free-lift and staging and stop to hold it in position.
2. With the carriage raised, check the cylinders for any leaks.
3. Repair any leaks.
4. Actuate the control valve to lower carriage through staging and free-lift to examine operation and staging.
5. Raise and lower the carriage rapidly at least 10 cycles to flush the system.

Drift test

All drift tests are conducted with a capacity load. See the capacity plate for the rated capacity of the lift truck. The load used for the test must be evenly stacked within the limits of a 1.2 m x 1.2 m (4 ft x 4 ft) pallet. Secure the load to the fork carriage with the forks spread to their maximum width.

WARNING

A mast, platform, or fork that falls or lowers can cause injury or death.
The forks and mast can automatically lower when the hydraulic system pressure releases and during the drift test, causing injury or death.

- *Do not stand below raised forks.*
- *Do not do work around or below a lift truck that is not correctly blocked.*
- *Make sure that the blocks are sufficiently rated to support the necessary weight.*

1. If the lift truck is equipped with a manual lowering valve, make sure that the manual lowering valve is closed.
2. Fully extend the mast with maximum rated load.
3. The load must not drift down more than 50 mm (2.0 in) within 5 min. The lift measurement is to be taken from the fork heel to the floor.
4. A leak in the internal cylinder seal, check valves, control valves, or other valves will cause drift. To seat these valves properly when a leak occurs, raise and lower the forks to flush out any foreign material from the valve seat.
5. Repeat the drift test. If drift still exceeds the acceptable limit, see the HYDRAULIC SYSTEMS / Hydraulic system troubleshooting section.

Preparing the lift truck for operation

1. Install the covers if necessary.
2. Remove the chocks from the wheels.
3. Remove the lockout/tagout device.
4. Connect the battery.
5. Turn on the lift truck.
6. Disengage the parking brake.
7. Make sure that the lift truck operates correctly.

Hook-on Sideshifter Cylinder

The hook-on sideshifter cylinder is on the base of the load backrest and sits between the forks. Make sure that you are careful when you are repairing the hook-on sideshifter cylinders.

Remove and repair the cylinders if you have the issues that follow:

- Too much oil is leaking around the rod end of the cylinder.
- The cylinder is unable to move the load side-to-side.

Inspecting the hook-on sideshifter cylinder

Note: Minor nicks on the cylinder surface will not cause leaks. If the damage on the cylinder surface cannot be removed with an emery cloth, replace the component.

1. Inspect the components for damage. Remove damage from the components with a 400-grit emery cloth.
2. Check the outside of the shell for damage and replace if necessary. Damage can weaken the performance of the shell when under pressure.

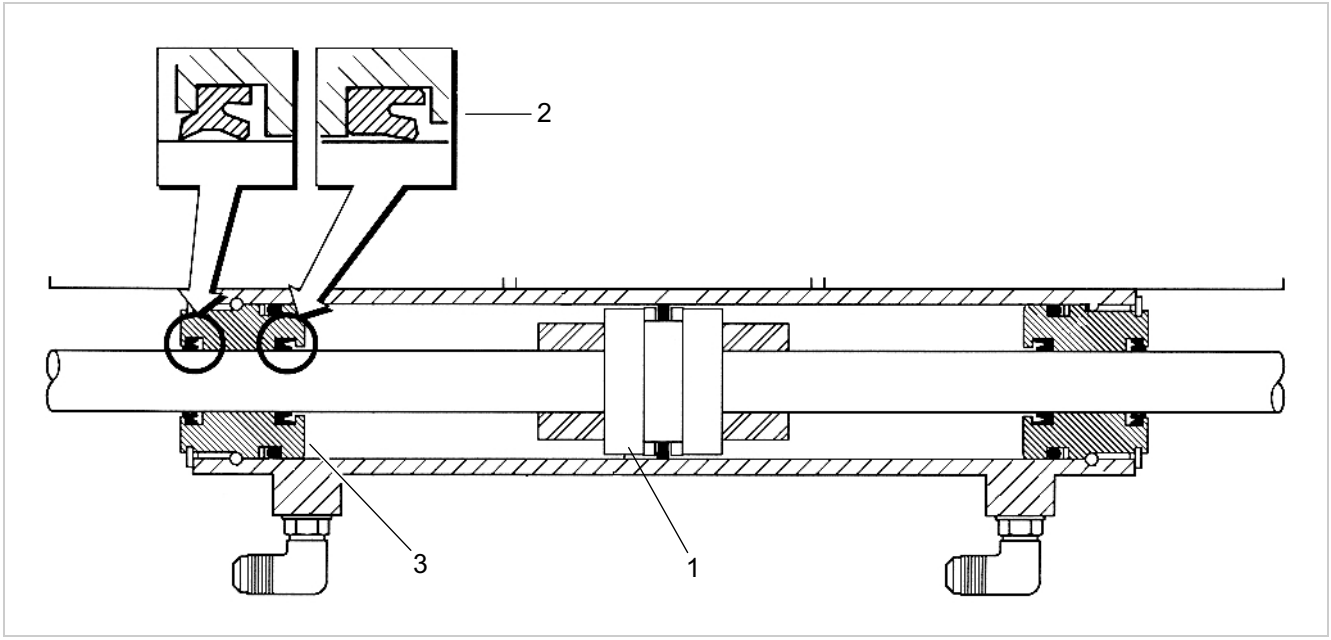

Fig. 22 (16061-01)

1	Piston
2	U-cup seals
3	Retainer

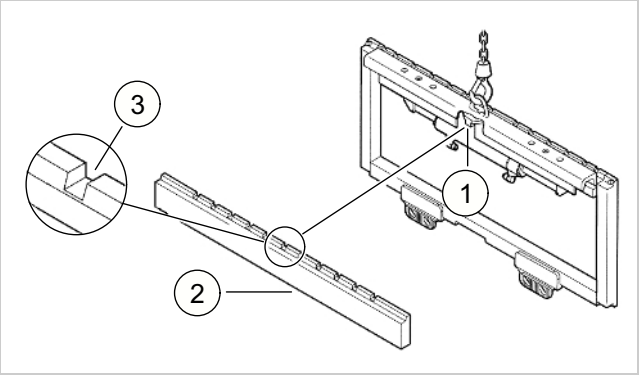

Fig. 6 (16211-01)

1	Locating tab
2	Upper fork carriage bar
3	Center notch

4. See Figure 7. Install and adjust the lower hooks (3). Torque the nuts (5) to 165 N m (122 ft lb).

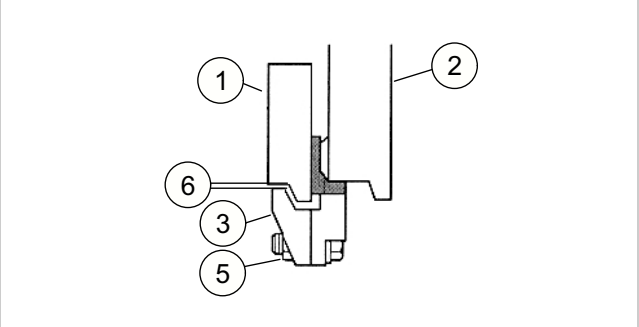

Fig. 7 (16965-02)

1	Lower fork carriage bar
2	Sideshifter
3	Lower hook
4	Cap screws
5	Nut
6	Clearance: 0.8 mm (0.03 in) minimum 1.6 mm (0.06 in) maximum

5. Flush the supply hoses thoroughly and install them.
6. See Figure 8. Install the forks.

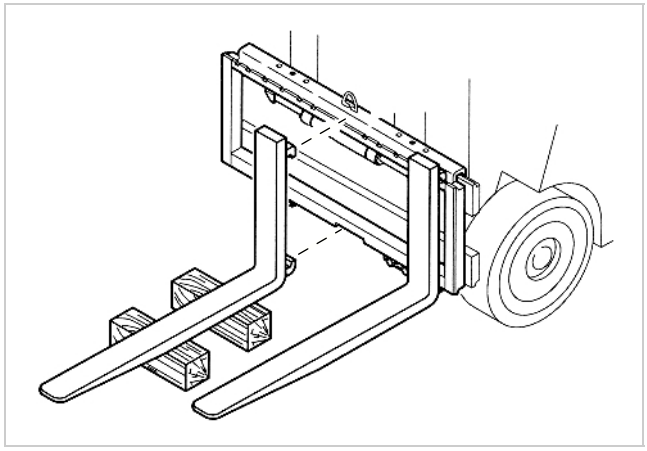

Fig. 8 (16213-01)

7. See Figure 9. Put the load backrest (1) on the fork carriage and secure with the screws (2). Torque the screws (2) to 196 N m (145 ft lb).

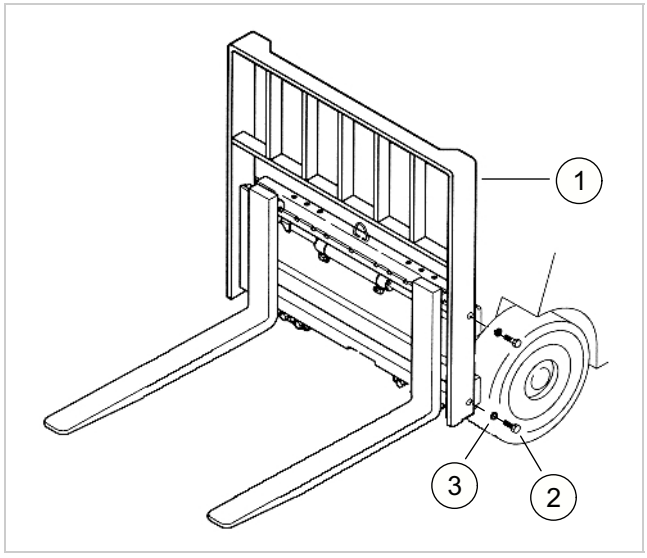

Fig. 9 (16214-01)

1	Load backrest
2	Cap screw
3	Lock washer

8. See Figure 10. Lubricate the lower bearing grease areas (2) with a general-purpose, lithium-based chassis grease.

Glossary

The Connector column shows the designator or the connector number that is on the electrical diagrams. The Location column gives the general location on the lift truck (for example, in the power unit). The Diagram column gives the page number of the electrical diagram on which you can find the connector. The Parts Breakdown column includes the page number on which you can find the connector and an index number (in parentheses).

Connector	Location	Diagram	Parts Breakdown
Alarm (InfoLink)	InfoLink harness in the traction motor compartment	DIA-1161-014 DIA-1161-034	04.8-1153-200 (1)
CA201	in the back of the power unit of the distribution relay board	DIA-1161-004 DIA-1161-025	04.3-1161-001 04.8-1153-200 (1)
CA202 (EPV only)	distribution relay board	DIA-1161-004	04.3-1161-001
CA401	in the back of the power unit on Access 3	DIA-1161-006 DIA-1161-027	04.8-1153-200 (7)
CA402	in the back of the power unit on Access 3	DIA-1161-006 DIA-1161-027	not shown
CA403	in the back of the power unit on Access 3	DIA-1161-006 DIA-1161-027	04.8-1153-200 (7)
CA404	in the back of the power unit on Access 2	DIA-1161-007 DIA-1161-028	04.8-1153-200 (7)
CA405	in the back of the power unit above Access 3	DIA-1161-004 DIA-1161-025	04.8-1153-200 (1,2)
CA406	in the back of the power unit below the fan	DIA-1161-004 DIA-1161-025	04.8-1153-200 (1)
CA407	near the back, right of the battery compartment wall below the battery retainer switches (BRES)	DIA-1161-004 DIA-1161-025	04.8-1153-200 (1)
CA408	in the back of the power unit on AC hydraulic motor (M3)	DIA-1161-007 DIA-1161-028	04.8-1153-200 (1)
CA409	on top of the steer axle on the steer angle potentiometer (POT1)	DIA-1161-004 DIA-1161-025	04.8-1153-200 (8) 06.0-1161-150
CA410	in the back of the power unit near fan	DIA-1161-004 DIA-1161-025	04.8-1153-200 (1,2)
CA411	below the seat	DIA-1161-004 DIA-1161-025	04.8-1153-200 (1)
CA412	+/- accessory harness	DIA-1161-004 DIA-1161-025	not shown
CA413	options harness	DIA-1161-004 DIA-1161-025	not shown
CA414	in the back of the power unit, below Access 3 and above the steer axle	DIA-1161-007 DIA-1161-028	not shown
CA415 (EPV only)	in the back of the power unit, on top of Access 3 and left of the distribution panel	DIA-1161-008	04.8-1153-200 (1,2)