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 you and your personnel know how to operate your 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 C-5 Series.

Operator training

Crown has operator training programs that are available through your 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 your Crown dealer or visit www.crown.com.

Replacement parts

To ensure 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 your Crown dealer or visit www.crown.com for:

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

General Maintenance Instructions

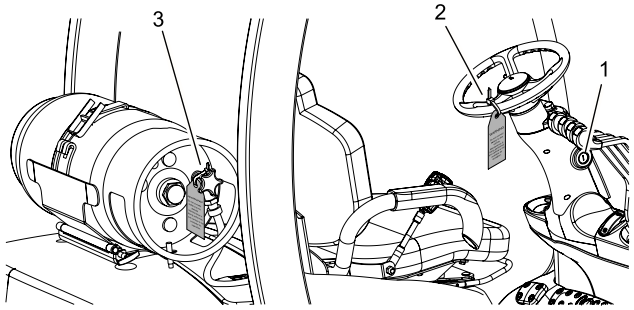
WARNING

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 the truck.
3. Before working on the truck:
   - Move the truck to a secure non-traffic maintenance area with a level floor and adequate clearance to check performance of the truck and/or its attachments.
   - Fully lower the load engaging means.
   - Place the directional controls in neutral.
   - Apply the parking brake.
   - Place the key switch in the OFF position.
   - Close the LPG tank valve.
   - Start the truck and fully expend any gas remaining in the supply lines.
   - Place the key switch in the OFF position and remove the key (if applicable). See Figure 17264-01.
   - Place tags on steering wheel and LPG tank valve to warn others that the truck is being serviced. See Figure 17264-01. **NOTE:** If repairs require you to leave the presence of the truck then the truck should be locked out in addition to being tagged out. Locking out the truck can be achieved by disconnecting the gas hose from the LPG tank and placing a locking device on the hose coupling.



1 Remove Key
2 Place Tag on Steering Wheel
3 Place Tag on LPG Tank Valve

Figure 17264-01

   - Chock all four wheels of the truck.
   - Disconnect the negative (-) battery cable.
   - Block the load engaging means, inter masts, or chassis before working under them.
4. Before starting to operate the truck:
   - Remove the blocks from load engaging means, inter masts, or chassis (if applicable).
   - Remove the chocks from the wheels.
   - Connect the negative (-) battery cable.
   - Open the LPG tank valve.
   - Remove tags from steering wheel and LPG tank valve that were previously placed there to warn others that the truck was being serviced.
   - Be in operating position.
   - Release the parking brake, if applicable.
   - Fasten the seat belt and pull it snug.
   - Adjust operator seat and steering wheel to their most comfortable positions.
   - Apply the brake.
   - Place the directional control in neutral.
   - Place the key switch in the ON position.
   - Check to make sure that the seat alarm and all the indicator lights work properly.
   - Check functions of lift systems, directional control, speed control, steering warning devices, brakes, and any attachments (if applicable).

11. Tow the lift truck at no more than 3.2 k/hr (2 mph) to a secure maintenance area with a level surface.

Note: Make sure that you allow enough stopping distance for the lift truck to coast to a stop.

12. Tagout the towed lift truck. Follow all instructions in the Tagout procedures.

Lifting and blocking the lift truck

Recommended tools and equipment:

- Hydraulic jack (see Figure 11)
  - Capacity: 3,992 kg (8,800 lb)
  - Crown part number: 300084
  - Minimum collapsed height: 60 mm (2.25 in)
  - Maximum raised height: 400 mm (16 in)

Fig. 11 (31988)

- Jack stand (see Figure 12)
  - Crown part number: 300081
  - Capacity: 6,350 kg (14,000 lb)

Fig. 12 (31989)

- Lift straps
  - Commercially available
  - Capacity: 900 kg (2,000 lb)
- Hardwood blocks
  - Choose from the following types of hardwood blocks: oak, hickory, or maple
  - 100 x 100 mm x 200 mm (4 x 4 x 8 in)

Note: Do not use softwood such as poplar or pine to block the lift truck.

- Composite blocks (see Figure 13)
  - Crown part number: 061142-001
  - 89 x 64 x 229 mm (3.5 x 2.5 x 9 in)
  - Crown part number: 061142-002
  - 89 x 64 x 330 mm (3.5 x 2.5 x 13 in)
  - Crown part number: 061143-001
  - 100 x 100 x 600 mm (4 x 4 x 22 in)
  - Crown part number: 061143-002
  - 100 x 100 x 1,219 mm (4 x 4 x 48 in)

Fig. 13 (31990)

- Wheel chocks (see Figures 14 and 15)
  - Crown part number: 340094-003
  - 127 x 102 x 203 mm (5 x 4 x 8 in)

Fig. 14 (31991)

Lubricants, Aerosols, and Service Supplies

Lubricant Identification			
Lubricant Identifier	**Description**	**Part Number**	**Package Quantity**
F	Gear grease	063002-024	14.5 oz cartridge
		063002-022	35 lb pail
G	Lubricant - chain and cable	363107-001	15 oz can
	Lubricant, premium - chain and cable	363115-001	12 oz can
H	Protectant - rubber and vinyl	363129-001	11 oz can
I	Grease, synthetic - motor spline connection	063002-039	1 lb
		127801S	1 oz
J	Fluid, brake, DOT 5	063004-002	12 oz
		063004-003	1 gal
K	Grease - wheel bearing	063002-034	14 oz cartridge
		063002-045	40 - 14 oz cartridges
L	Lubricant, metal spray, break-in	063002-021	16 oz spray
LL	Lubricant, S00727 - freezer condition	063002-059	9 oz can
M	Grease, clear - O-rings	063002-020	5.3 oz tube
N	Cleaner, low VOC - brakes and parts	363119-001	15 oz can
	Cleaner, nonflammable - brake and parts	363116-001	18 oz can
O	Lubricant, penetrating	363104-001	15 oz can
P	Grease, premium, multi-purpose	363108-001	13 oz can
Q	Grease, white, lithium	363110-001	14 oz can
R	Cleaner - carburetor and choke	363109-001	14 oz can
S	Cleaner, contact, nonflammable	363106-001	10 oz can
	Cleaner, contact	363128-001	13.5 oz can
T	Contact lubricant	127189-001	55 cc
		127189-002	2 oz. tube
U	Cleaner - battery	363124-001	18 oz can
V	Protector - battery	363125-001	14 oz can
W	Lubricant, food grade, machine	363127-001	12 oz can
X	Lubricant, food grade, silicone spray	363126-001	11 oz can
Y	Coolant, extended lift - C-5 LP series	363535-101	1 gal
		363535-005	6 - 1 gal bottles
Z	Fluid, windshield washer, protects to -29 °C (-20 °F)	300100-101	1 gal

Visual inspections, operational checks, and test drive

Visual Inspections		
System	**Component**	**Service Required**
General	Overall	Examine the lift truck for bent, damaged, or missing parts
	Fluids and lubricants	Check the following items for leaks: • Hydraulic hoses and fittings • Cylinders • Cooling system or radiator • Differential • Engine • Transmission • Fuel system • Brake system • Attachments
	Tires and wheels	Check the following items: • Condition of the tires and wheels • Tire pressure, if applicable • Loose or missing fasteners
	Forks and fork latches	Do a visual inspection for bent, cracked, or badly worn parts. Make sure that the forks are securely attached
	Mast assembly	Check the following items: • Mounting • Chains • Pulleys • Cables • Hoses • Chain anchors • Chain tension
	Stops and stop pads	Check the condition and the function of the stops and stop pads
	Overhead guard	Check the mounting and examine for bends or damage
	Safety decals and capacity plates	Check the condition and examine for missing or damaged decals and plates
	Seat belt / shoulder and hip restraints	Check the condition and the operation of the restraints. Examine for missing or damaged restraints
	Covers, shields, floor-mats, and latches	Check the condition and the operation. Examine for missing or damaged parts or fasteners
	Debris / shrink wrap	Check the following items for debris: • Wheels, tires, and axles • Fan and radiator
Brakes	Brake pedal	Check the condition and the operation
Electrical	Display lights and hour meter	Check the condition of all the lights and the indicators

1,000 Hour inspection table

Planned Maintenance Inspection – 1,000 Hour Interval (Approximately 6 Months)				
Complete all items on the 500 Hour Interval schedule plus the following:				
Index	**Component**	**Lubricant Type**	**Quantity**	**Service Required**
I-1	Differential drive axle oil	A	AR	Check the oil level

These published maintenance intervals are for typical application. Harsh environment and / or extreme applications require more frequent maintenance intervals
Lubrication intervals must be changed to a frequency that minimizes corrosion and wear on moving parts for lift trucks operated in environments with much dust and moisture, or freezer condition applications
See the appropriate section of the service and parts manual for additional information concerning maintenance procedures

1,000 Hour lubrication table

Planned Maintenance Lubrication – 1,000 Hour Interval (Approximately 6 Months)				
Complete all items on the 500 Hour Interval schedule plus the following:				
Index	**Component**	**Lubricant Type**	**Quantity**	**Service Required**
L-1	Seat deck latch and hinges	O	AR	Lubricate the latch and the hinges
L-2	Seat slides	Q	AR	Lubricate the seat slides
L-3	Engine oil (dipstick and drain plug shown)	CC	7.7 l [(1)] (8 qt)	Change the oil
L-4	Engine oil filter	N/A	N/A	Change the oil filter

[(1)] Includes the oil filter change
AR - As Required
N/A - Not Applicable
See the INSPECTION AND LUBRICATION / Lubricants, Aerosols, and Service Supplies section in the service and parts manual
These published maintenance intervals are for typical application. Harsh environment and / or extreme applications require more frequent maintenance intervals
Lubrication intervals must be changed to a frequency that minimizes corrosion and wear on moving parts for lift trucks operated in environments with much dust and moisture, or freezer condition applications
See the appropriate section of the service and parts manual for additional information concerning maintenance procedures

Lubricants, Aerosols, and Service Supplies - Internal Combustion

See the Lubricant Identification table and the Alternate Lubricants and Fluids table in this section for the recommended list of lubricants, aerosols, and service supplies. Use the tables when performing planned maintenance on Crown LPG lift trucks.

Lubricant Identification			
Lubricant Identifier	**Description**	**Part Number**	**Package Quantity**
A	Oil, gear, 80W-90, requires Extreme Pressure (EP)	363506-001	1 qt
		363506-012	12 - 1 qt bottles
AAA	Fluid, universal hydraulic and transmission	363513-001	1 qt
		363513-012	12 - 1 qt bottles
B	Grease, multi-purpose	063002-034	14.5 oz cartridge
		063002-045	40 - 14.5 oz cartridges
BB	Grease, multi-purpose, low temperature	063002-017	14.5 oz cartridge
		063002-046	40 - 14.5 oz cartridges
BBB	Grease, food grade, multi-purpose	363002-001	14 oz cartridge
		363002-030	30 - 14 oz cartridges
BBBB	Grease, multi-purpose, premium	063002-025	14.5 oz cartridge
		063002-026	5 gal
5B	Grease, NLGI 00	063002-060	16 oz can
C	Oil, engine LPG, 10W30	363500-001	1 qt
		363500-012	12 - 1 qt bottles
D	Oil, standard, hydraulic	363504-101	1 gal
		363504-106	6 - 1 gal bottles
E	Grease - mast channel and gears	063002-024	14.5 oz cartridge
		063002-022	35 lb (15.9 kg) pail
EE	Lubricant - channel slide	363143-001	10.5 oz can
		363143-012	12 - 10.5 oz cans
F	Grease, gear	063002-024	14.5 oz cartridge
		063002-022	35 lb (15.9 kg) pail

A1

Access 1

Location: on the left side of the console

Function: displays lift truck information and allows the service technician to modify the lift truck settings, calibrate components, and troubleshoot

Data: information received from the lift truck control modules and the sensors

Adjustment: N/A

Diagrams: DIA-2515-003 (C-3) (509)
DIA-2515-009 (C-1) (515)

Parts Breakdown: 04.8-2515-001 (1) (893)
04.8-2615-001 (1) (925)

A3

Access 3™

Location: below the seat deck in front of Access 4

Function: engine control unit (ECU)

Data: information received from the lift truck control modules and the sensors

Adjustment: N/A

Diagrams: DIA-2515-010 (C-1) (516)

Parts Breakdown: not shown

A4

Access 4

Location: below the seat deck in front of the battery

Function: lift truck application input and output

Data: information received from the lift truck control modules and the sensors

Adjustment: N/A

Diagrams: DIA-2515-005 (C-1) (511)
DIA-2515-015 (C-1) (521)

Parts Breakdown: 04.0-2515-005 (51) (887)
04.0-2615-052 (38) (913)

ALM HN

Horn

Location: on the overhead guard below the floorboard

Function: supplies an audible warning to the general area

Data: the horn operates when you push the button in the center of the steering wheel or on the optional rear post handle

Adjustment: point the bell of the horn down

Diagrams: DIA-2515-003 (B-2) (509)
DIA-2515-016 (C-1) (522)

Parts Breakdown: 04.0-2515-001 (5) (883)
04.0-2615-050 (4) (911)

CMD KY SW

Key Switch

Location: in the right side of the steer column

Function: supplies power to the dash components, ignition, and start signal to modules and power relays

Data: key-operated selector switch

Adjustment: N/A

Diagrams: DIA-2515-022 (C-1) (528)

Parts Breakdown: 06.0-2515-003 (30) (965)
06.0-2515-003 (31) (965)

CMD LGT WK/HD SW (hard cabin)

Front Worklights or Front Worklights and Travel Lighting Switch (Optional) (Hard Cabin)

Location: on the console

Function: turns on and off the front worklights or headlights

Data: rocker switch, wired normally open

Adjustment: N/A

Diagrams: DIA-2515-025 (B-1) (531)
DIA-2515-025 (C-1) (531)

Parts Breakdown: not shown

CMD LGT WK1 SW

Front Light Switch (Optional)

Location: on the accessory pod on the console

Function: turns on and off the front worklights

Data: wired in the open position, closed when the switch is operated

Adjustment: N/A

Diagrams: DIA-2515-025 (C-1) (531)

Parts Breakdown: 04.0-2515-007 (72) (889)

CMD LGT WK3 SW

Back Workight Switch (Optional)

Location: on the accessory pod on the console

Function: turns on and off the back worklight

Data: rocker switch, wired normally open

Adjustment: N/A

Diagrams: DIA-2515-025 (C-2) (531)

Parts Breakdown: 04.0-2515-007 (73) (889)

FB CRK SNS

Crank Sensor

Location: on the back of the engine on the flywheel housing

Function: supplies the crankshaft speed input to A3

Data: magnetic proximity and inductive pickup

Adjustment: N/A

Diagrams: DIA-2515-004 (B-2) (510)
DIA-2515-012 (C-4) (518)

Parts Breakdown: 03.1-2515-360 (6) (835)

FB ENG TMP

Engine Coolant Temperature Sensor

Location: on the engine thermostat housing

Function: supplies the coolant temperature input to A3

Data: energized by +5 V Power Supply in A3

Adjustment: N/A

Diagrams: DIA-2515-004 (C-1) (510)
DIA-2515-012 (C-3) (518)

Parts Breakdown:

FB EOP SNS

Engine Oil Pressure Sensor

Location: on the right side of the timing gear cover

Function: supplies oil pressure input to A3

Data: energized by +5 V Power Supply in A3

Adjustment: N/A

Diagrams: DIA-2515-004 (C-1) (510)
DIA-2515-012 (C-3) (518)

Parts Breakdown: not shown

FB FLV SNS

Fuel Level Sensor

Location: above the air filter, connected to the fuel line, after the fuel filter

Function: monitors the fuel temperature and the pressure for the correct fuel level

Data: +BV and B-NEG supplied to the pressure sensor, B-NEG supplied to the temperature sensor

Adjustment: N/A

Diagrams: DIA-2515-005 (B-1) (511)
DIA-2515-018 (D-3) (524)

Parts Breakdown: 03.1-2515-242 (58) (825)

FU11

Dash Fuse

Location: fuse box positions A1–B1

Function: protects overcurrent on A1, ALM OP1, CMD HN SW1, CMD KY SW, PRM1, and PRM2

Data: 5 A, 58 V

Adjustment: N/A

Diagrams: DIA-2515-003 (A-2) (509)
DIA-2515-007 (B-1) (513)

Parts Breakdown: 04.0-2515-005 (37) (887)
04.0-2615-052 (22) (913)

FU12

Engine Fuse A

Location: fuse box A2–B2

Function: protects overcurrent on ALT, CR316, EPR, FB HEGO SNS1, FB HEGO SNS2, K312, and SV FLOC

Data: 7.5 A, 58 V

Adjustment: N/A

Diagrams: DIA-2515-003 (B-1) (509)
DIA-2515-007 (B-1) (513)

Parts Breakdown: 04.0-2515-005 (37) (887)
04.0-2615-052 (22) (913)

FU13

Engine Fuse B

Location: fuse box A3–B3

Function: protects overcurrent on ECU, K313, K314, IGN COIL1–IGN COIL4, and M STRT

Data: 15 A, 58 V

Adjustment: N/A

Diagrams: DIA-2515-003 (B-1) (509)
DIA-2515-007 (B-1) (513)

Parts Breakdown: 04.0-2515-005 (37) (887)
04.0-2615-052 (22) (913)

FU14

Power Brake Fuse

Location: fuse box A4–B4

Function: protects overcurrent on ALM OP2, CMD PBRK SW, and SV PBRK

Data: 10 A, 58 V

Adjustment: N/A

Diagrams: DIA-2515-003 (B-1) (509)
DIA-2515-007 (B-2) (513)

Parts Breakdown: 04.0-2515-005 (37) (887)
04.0-2615-052 (22) (913)

FU15

Access 4 High Side Drivers Fuse

Location: fuse box A5–B5

Function: protects overcurrent on A4, SV FF, and SV PUF, ALM TVL, ALM HN

Data: 15 A, 58 V

Adjustment: N/A

Diagrams: DIA-2515-003 (B-1) (509)
DIA-2515-007 (B-2) (513)

Parts Breakdown: 04.0-2515-005 (37) (887)
04.0-2615-052 (22) (913)

K53

Forward Floor Spotlight Driver Relay (Optional)

Location: relay box

Function: switches BNEG for lights that turn on with forward travel

Data: N/A

Adjustment: N/A

Diagrams: DIA-2515-039 (C-1)(545)

Parts Breakdown: not shown

K54

Rear Floor Spotlight Driver Relay (Optional)

Location: relay box

Function: switches BNEG for lights that turn on with reverse travel

Data: N/A

Adjustment: N/A

Diagrams: DIA-2515-039 (D-1)(545)

Parts Breakdown: not shown

K60 (hard cabin)

Defroster Timer Relay

Location: overhead guard

Function: switches +BV for timed period to HTR DFR

Data: N/A

Adjustment: N/A

Diagrams: DIA-2515-032 (C-3) (538)

Parts Breakdown:

K64 (soft cabin) (not shown)

Washer Motor Relay

Location: front center under the floorboard

Function: enables M WSH

Data: N/A

Adjustment: N/A

Diagrams: DIA-2515-034 (D-4)(540)

Parts Breakdown: not shown

K91

Rear Work Light Driver

Location: fuse box A9–B9 A10–B10

Function: switches BNEG for LGT WK3

Data: N/A

Adjustment: N/A

Diagrams: DIA-2515-007 (B-4) (513)

Parts Breakdown: 04.0-2515-005 (60)(887)
04.0-2615-052 (47)(913)

K92

Drum Brake Alarm Driver

Location: fuse box D9–F9 D10–F10

Function: switches +BV for ALM OP2

Data: N/A

Adjustment: N/A

Diagrams: DIA-2515-005 (A-1) (511)
DIA-2515-007 (C-4) (513)

Parts Breakdown: 04.0-2515-005 (61)(887)
04.0-2615-052 (48)(913)

M WPR1 (hard cabin)

Front windshield wiper motor

Location: on the front windshield

Function: supplies power to the front windshield wiper

Data: 12 V–24 V

Adjustment: N/A

Diagrams: DIA-2515-032 (C-2) (538)
DIA-2515-034 (C-2) (540)

Parts Breakdown: 04.0-2615-100 (1) (917)

M WPR2 (hard cabin)

Rear windshield wiper motor

Location: on the back windshield

Function: supplies power to the rear windshield wiper

Data: 12 V

Adjustment: N/A

Diagrams: DIA-2515-032 (C-2) (538)

Parts Breakdown: 04.0-2615-100 (2) (917)

M WSH (hard cabin)

Washer pump motor

Location: below the front windshield

Function: supplies power to the washer to let the fluid spray onto the front windshield

Data: 12 V

Adjustment: N/A

Diagrams: DIA-2515-032 (C-3) (538)
DIA-2515-034 (C-3) (540)

Parts Breakdown: 04.0-2615-100 (3) (917)

Notes:

Examining the hydraulic reservoir suction strainer and pump

See Figure 7.

1. Use a pan to catch the hydraulic oil.
2. Remove the drain plug (6) from the bottom of the reservoir (1).
3. Drain the hydraulic oil from the reservoir and examine for debris.
4. Remove and examine the suction strainer (5).
5. If the strainer (5) is clogged or keeps too much debris, clean out the reservoir (1).
6. Replace the suction strainer (5), install the drain plug (6), and fill the reservoir (1) with clean hydraulic oil. See the INSPECTION AND LUBRICATION chapter to select the correct hydraulic oil.
7. Repeat the Examine the primary relief valve and the hydraulic pump and Check the brake accumulator pressure in this section.
8. If the suction strainer (5) and the oil are clean, remove the hydraulic pump from the transmission and examine the pump and the shaft coupling. Replace the parts if necessary.

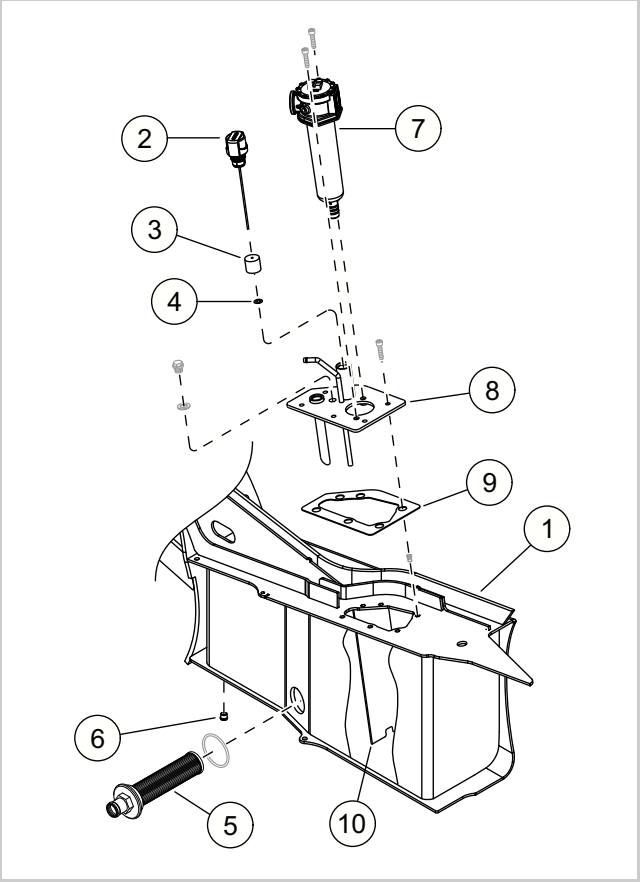


Fig. 6 (32004-01)

Mast and forks drift down

1. See Figure 8. Complete the Basic hydraulic inspection in this section.
2. Make sure that the manual lowering valve is closed.
3. Complete the Mast drift test in this section. If you see too much drift, continue to Examining the lift interlock coil and the valve.

Examining the lift interlock solenoid coil and the valve

1. Lower the mast fully.
2. Turn off the engine.
3. Open the manual lowering valve.
4. Remove the lift interlock coil and the valve.
5. Examine the valve and replace if necessary.
6. Continue to Examining the lift spool on the hydraulic control valve in this section.

Tilt function

The tilt lever sensor (CMD T SNS) is an input to Access 4 that lets the system know which direction the tilt is commanded. If the tilt lever sensor (CMD T SNS) is not within the proper range, the system generates a Release Lever message and de-energizes the main interlock solenoid valve (SV MINT) coil.

See Figure 15. When the tilt lever is pulled back, it positions the tilt spool (1) in the control valve and allows hydraulic oil to flow out of the 2B port of the control valve.

The hydraulic oil flows from 2B to the front of the tilt cylinders (2), causing the rods to retract and bringing back the mast towards the lift truck. The hydraulic oil that is behind the pistons in the tilt cylinders is pushed out and flows in the 2A port of the control valve. The hydraulic oil flows back through the tilt spool valve (1) and returns to the reservoir through the return line filter.

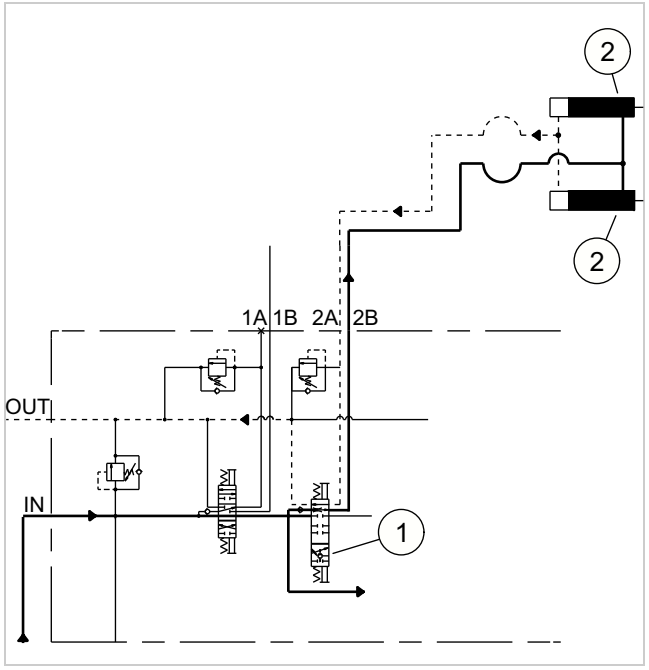


Fig. 15 (32067-01)

See Figure 16. When the tilt lever is pushed forward, it positions the tilt spool (1). This action allows the hydraulic oil to flow out of the 2A port of the valve assembly to the back of the tilt cylinders (2). The rods extend and push the mast away from the lift truck.The hydraulic oil in the front of the pistons is pushed out and flows in the 2B port of the control valve, through the tilt spool (1), and back to the reservoir. A pilot-operated tilt lock valve and control orifices within the tilt spool prevent tilt overrun to maintain control in the tilt forward function.

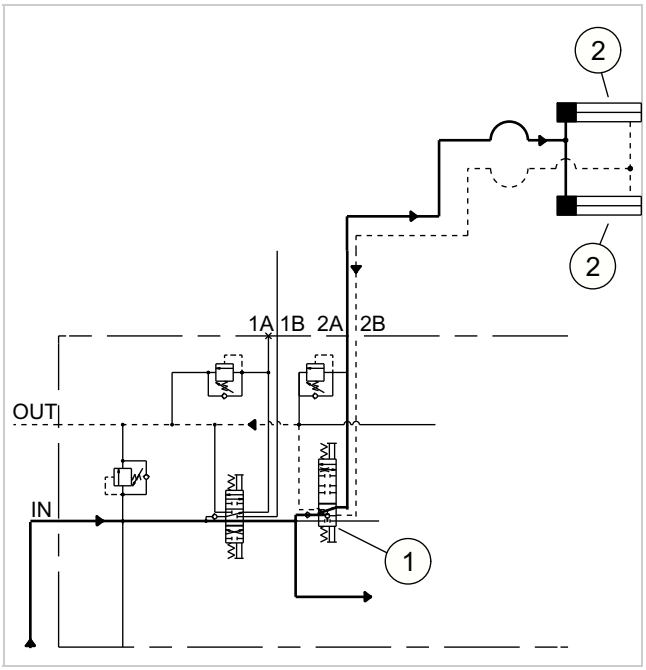


Fig. 16 (32068-01)

Inspecting and repairing the control valve

All seats, poppets, seal counterbores, spools, and related components must be smooth and free of nicks, scratches, or grooves. Replace the components as necessary.

Check the springs and replace if damaged.

Checking the O-rings and wipers is not necessary since they must be replaced when valve is disassembled.

Assembling the control valve

Before assembling the valve, make sure that the valve parts and tools are thoroughly clean and free from dust and foreign matter.

Coat all of the valve parts with hydraulic oil.

When assembling the valve, finger tighten the stud nuts before torquing. Make sure that there is not any spacing between sections. Any spacing between the sections is an indication of incorrect assembly of the spring, poppet, and seal.

The valve must have no spacing between sections, and the spools must return to neutral position when pushed and released. Torque the nut on the large tie rod to 41–49 N m (30–36 ft lb). Torque the nuts on the small tie rods to 21–27 N m (15–20 ft lb).

Adding a fourth spool valve section (second accessory)

The control valve is designed so that if an additional accessory function is required, a three spool valve can be converted to a four spool valve. To convert a four spool control valve, proceed as follows.

1. See Figure 2. Assemble the nuts to the tie rods in the kit. Assemble the nuts to the ends of rods that have the shortest thread length and bottom nuts on the threads.
2. Put the three spool control valve on a clean and flat surface with the inlet section (1) facing down.
3. Remove the nuts (12) from one end of the tie rods.
4. From the accessory end of the valve (7), replace the existing rods, one at a time, with the pre-assembled tie rods.
5. Carefully remove the existing outlet section and discard.
6. Check the surface of the exposed section to make sure that the O-ring (11), poppet (10), and spring (9) are in place.
7. Ensure that the O-ring, poppet, and spring are positioned properly on the section to be added. Put the new second accessory spool valve section (8) over the tie rods with the capped end facing up.
8. Finger tighten the remaining nuts on the tie rods.
9. Put the valve flat with the port holes facing up.
10. Torque the nut on the large tie rod to 41–49 N m (30–36 ft lb).
11. Torque the nuts on the small tie rods to 21–27 N m (15–20 ft lb).

Forward and reverse clutch packs

See Figure 3.

- The clutch assembly (2) contains two clutch packs.
- The clutch packs each contain outer discs, inner discs, and a piston to push the discs together.
- The outer discs have splines on their outer diameters.
- The splines engage with the forward or reverse clutch drum.
- The inner discs have splines on their inside diameters and engage with the forward drive gear (3) or the reverse drive gear (4).
- The outer discs and the clutch shaft assembly operate by the torque converter turbine.
- When the transmission is in neutral, the outer disc and the clutch shaft assembly turns the hubs of the forward drive gear (3) and the reverse drive gear (4) without being engaged.
- When the transmission is engaged in forward or reverse, the inner discs and the outer discs are pushed together.
- The outer discs cause the inner discs to move which moves the forward drive gear (3) or the reverse drive gear (4).
- The forward drive gear (3) directly operates the power output gear (6). The power output gear attaches to the differential pinion shaft.
- The reverse drive gear (4) operates the power output gear (6) with the reverse idler shaft gears (4, 5, and 6).

Forward and reverse directional control valves

See Figure 4.

- The two solenoid-operated control valves (2, 3) are installed on the transmission control valve (valve body) (1).
- When the Forks First Solenoid (SV FF) valve (2) is operated, oil flow goes to the forward clutch.
- When the Power Unit First Solenoid (SV PUF) valve (3) is operated, oil flow goes to the reverse clutch.
- Access 3™ energizes the solenoid coils of these valves.
- The information comes from the input received from the forward direction sensor or the reverse direction sensor (or Direction Lever Sensor).

WARNING

Keeps hands and body clear of any pinch points when pressure is applied to the tire press. Serious injury could occur.

18. Using the tire press, apply enough pressure to the pedestal to press the rim out of the tire. Then release tire press pressure and remove pedestal, pressing plate, tire, and mounting/demounting cage from the tire press.
19. Inspect the rim for damage. Replace if necessary.
20. Place the base ring that was previously used in step 6 on the bottom platen of the tire press. Then place the rim on the base ring.

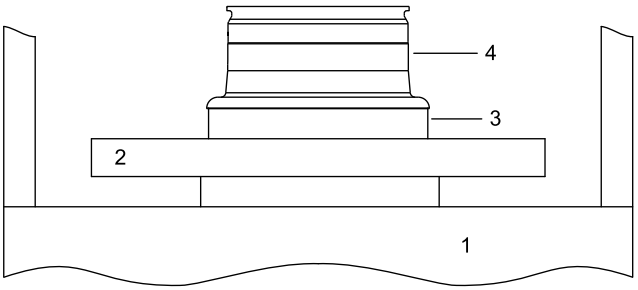


Figure 24525

1 Tire Press
2 Bottom Platen
3 Base Ring
4 Rim

21. Using tire soap, lubricate the new drive tire on the inside and the rim on the outside.
22. Place the new drive tire on the rim and level it.
23. Using the proper size mounting/demounting cage, position the cage on the tire so that you have equal distance between the cage and the rim around the entire rim.

WARNING

Keeps hands and body clear of any pinch points when pressure is applied to the tire press. Serious injury could occur.

24. Using the tire press, apply enough pressure to the mounting/demounting cage to press the new drive tire onto the rim.
25. Release tire press pressure and remove the mounting/demounting cage.
26. Insert the advance band between the tire and the rim and push the advance band down until there's sufficient clearance to install the lock ring.

CAUTION

Lock ring must be in one piece and in good condition. If the ring is cracked or in bad condition it must be replaced.

27. Place the side flange and lock ring on top of the rim. NOTE: Make sure the lock ring is in one piece and in good condition. Then position the mounting/demounting cage on the tire so that you have equal distance between the cage and the rim around the entire rim.

WARNING

Keeps hands and body clear of any pinch points when pressure is applied to the tire press. Serious injury could occur.

28. Using the tire press, apply enough pressure to the mounting/demounting cage to press the tire downward until the side ring drops far enough to install the lock ring. Make certain to keep pressure on the tire until instructed otherwise.
29. Using pry bars, install the lock ring on the rim. Then slowly release tire press pressure until the side ring is properly seated on the lock ring.
30. Release tire press pressure. Then remove the cage and any excessive soap from the tire and rim assembly.
31. Apply anti-seize compound to the "inside surface" of the hub.
32. Mount the drive tire assembly on the truck.

LP fuel lockoff solenoid

See Figure 6. An LP fuel lockoff solenoid valve (SV FLK) (1) is used to stop the flow of LP fuel from the bottle to the vaporizer when the engine is off. Access 3™ (A3) controls the solenoid coil valve.

Fig. 6 (32261)

The LP fuel lockoff solenoid (SV FLK) of the shutoff valve is electronically connected between the battery positive and A3. The crank sensor input to A3 shows that the engine turns, such as during the engine startup. When the engine turns, the logic in A3 applies battery negative to the LP fuel lockoff solenoid. The LP fuel lockoff solenoid energizes the coil. The coil causes the shutoff valve to open and let the LP fuel flow from the LP fuel bottle.

Vaporizer and electronic pressure regulator (EPR)

See Figure 7. After the LP fuel flows through the SV FLK, it flows to the vaporizer and then to the EPR (1).

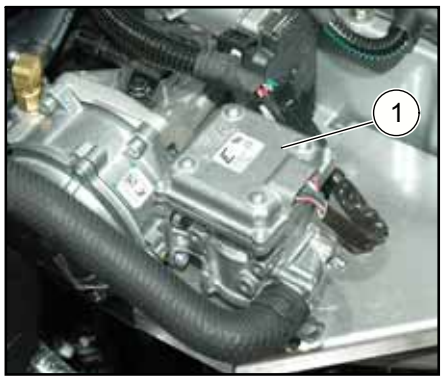


Fig. 7 (32263)

The function of the vaporizer in the LP fuel system is to change the LP fuel into vapor. The EPR adjusts the vapor pressure in the system.

The EPR is a software operated device that speaks with and is controlled by A3 through the CAN line. The CAN lines connect the EPR to A3. The +BV for the EPR is supplied from K31 relay and FU13. The EPR ground terminal connects to battery negative (lift truck frame ground).

See Figure 8. LP fuel enters the end of the vaporizer that functions as a heat exchanger (1). The heat from the engine coolant that flows through the housing (2) is used to change the LP fuel into vapor. The LP fuel vapor is then supplied to the EPR through the outlet port (3).

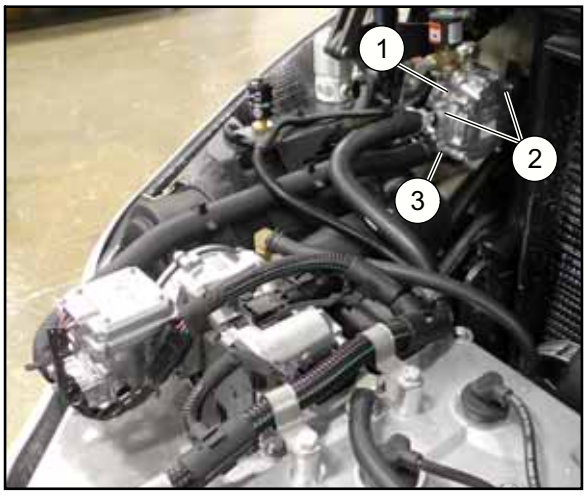


Fig. 8 (32496)

Oxygen sensors and catalytic converter

The oxygen sensors monitor the quantity of oxygen remaining in the engine exhaust and sends that information to Access 3™.

- See Figure 13. There are two oxygen sensors (1) (FB HEGO SNS1 and FB HEGO SNS2). They are located before and after the catalytic converter (2). The catalytic converter is connected to the exhaust manifold on the right side of the engine.

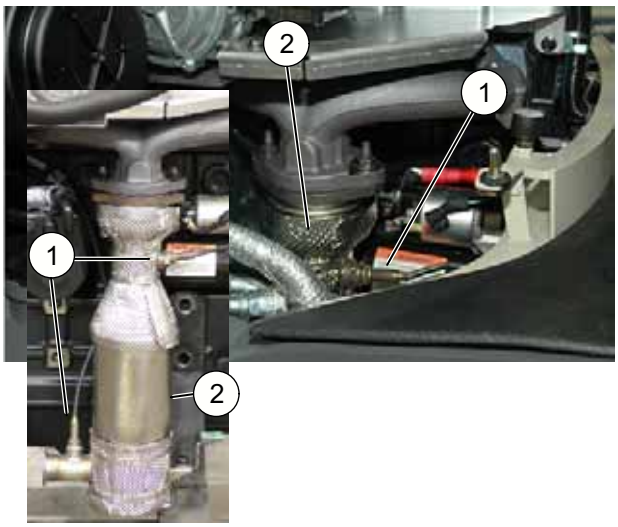


Fig. 13 (32231)

- Access 3™ adjusts the air to fuel ratio.
- A high exhaust oxygen level indicates a lean mixture (not enough fuel).
- Access 3™ signals the EPR to increase the fuel vapor pressure to the carburetor.
- The oxygen sensors (FB HEGO SNS1 and FB HEGO SNS2) are most accurate at more than 600 °C (1,112 °F).
- An electrical heat element in the sensor, controlled by Access 3™, is used to increase the temperature at engine start-up. This allows Access 3™ to go from closed loop mode quicker to help lower the emissions.
- The heat element is not energized until the engine is on.
- The oxygen sensors (FB HEGO SNS1 and FB HEGO SNS2) supply a low-level voltage, usually between 200 mV–800 mV.
- The voltage level goes up as the quantity of oxygen in the exhaust decreases.
- The voltage level goes down as the quantity of oxygen in the exhaust increases.
- A rich air-to-fuel ratio (too much fuel vapor) can cause the oxygen sensors (FB HEGO SNS1 and FB HEGO SNS2) to make a higher voltage.
- A lean air-to-fuel ratio (not enough fuel vapor) can cause the oxygen sensors (FB HEGO SNS1 and FB HEGO SNS2) to make a low voltage.
- The oxygen sensor (FB HEGO SNS1 and FB HEGO SNS2) input to Access 3™ changes many times each second between an indication of rich and lean. During this time, Access 3™ controls the EPR to maintain the ideal ratio.

For more information on wiring for the oxygen sensors, see SCHEMATIC DIAGRAMS.

Muffler

See Figure 14.

The muffler decreases the engine noise level.

- The muffler (1) is attached to the lift truck frame behind the steer axle. It is protected by the counterweight of the lift truck.
- The muffler (1) is connected to the catalytic converter with a mid-pipe assembly (2) and clamps (3).
- With the engine control devices and good engine maintenance, the catalytic converter helps clean the LP exhaust gases to obey strict emissions standards.

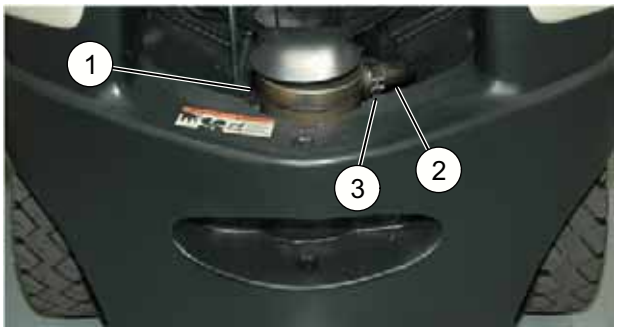


Fig. 14 (32233)

Figure 9 shows the operation of a basic pressure sensor.

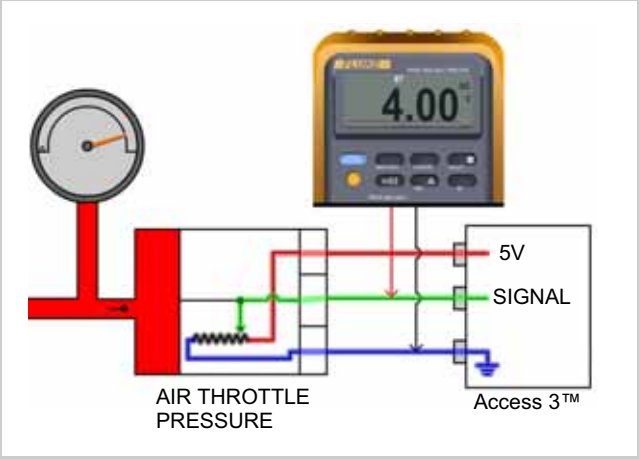


Fig. 9 (32224)

All engine pressure sensors are three-wire devices. As pressure against the sensor changes, the voltage feedback signal from the sensor changes.

- Access 3™ supplies the upstream throttle temperature and pressure sensor (FB UTTP SNS) with a reference voltage and ground.
- Access 3™ then monitors the feedback voltage signal from the sensor.
- Access 3™ compares the upstream throttle pressure with the manifold absolute pressure sensor (FB MAP SNS).
- Access 3™ then selects the fuel requirements for the engine load.

Air throttle actuator

See Figure 10.

The air throttle actuator adjusts the engine speed by controlling of the quantity of air and fuel mixture pulled into the intake manifold.

- The throttle plate (1), which is a part of the air throttle actuator, controls the air and fuel mixture pulled into the intake manifold.
- The air throttle actuator consists of an electric motor (2) controlled by Access 3™ which opens and closes the throttle plate.
- The throttle position sensor (FB ATP SNS) (3) sends the throttle plate position feedback to Access 3™, and contains two potentiometers.
- The potentiometers share the same +5 V supply (E) and return (F).
- The potentiometer wipers are turned by the throttle plate shaft. Then, the voltages measured at the potentiometer wipers change as the throttle plate position changes.

For more information on wiring for the air throttle actuator, see SCHEMATIC DIAGRAMS.

Fig. 10 (32225)

Oil Separator

Removing the filter

See Figure 2.

1. Open the seat deck and remove the left side cover.
2. Remove the screw (1) and the Access 3™ (A3) cover (2) from the bracket.
3. Cut the cable tie from the harness and bracket.
4. Disconnect the connector PC310 from A3 (4).
5. Remove the screws (3) and the bracket from the battery bracket.
6. Remove relay K314 from the bracket.
7. See Figure 1. Disconnect the hose from the top cover on the oil separator.
8. Remove the screws (8) and the top cover from the oil separator.
9. Remove the filter and O-rings from the oil separator.

Installing the filter

1. Install the new O-rings onto the filter and put the filter into the oil separator.
2. See Figure 1. Put the top cover on the oil separator and secure it with the four screws (8). Torque to 3–5 N m (27–44 in lb).
3. Connect the hose to the top cover on the oil separator. Torque the clamp to 7–11 N m (5–8 ft lb).
4. Install relay K314 to the bracket.
5. See Figure 2. Put the bracket on the battery bracket and secure it with the screws (3). Torque to 17–26 N m (13–19 ft lb).
6. Connect the connector PC310 to A3 (4).
7. Attach a cable tie to the harness and bracket.
8. Put the cover (2) on the bracket and secure it with the screw (1). Torque to 19–27 N m (14–20 ft lb).
9. Install the left side cover and close the seat deck.

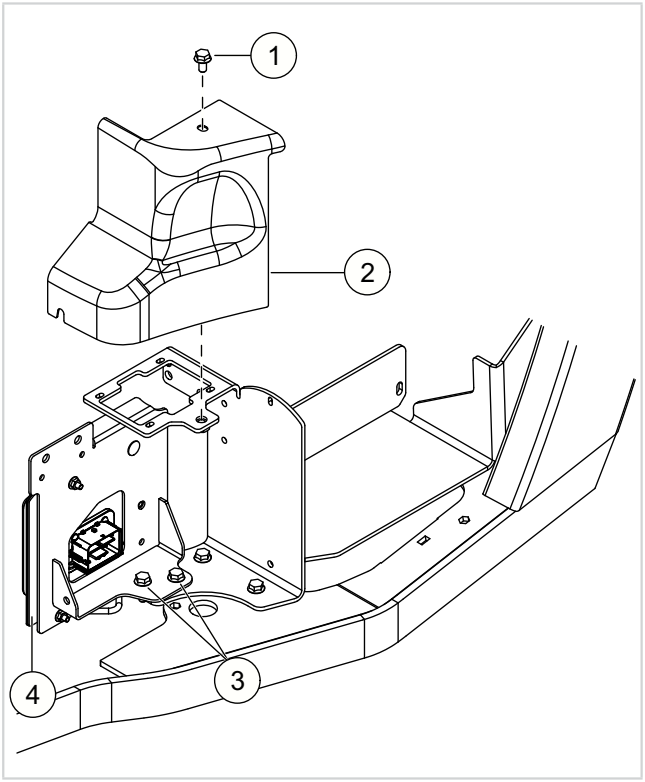


Fig. 2 (32371)

Coolant

See Figure 1.

Before working on the lift truck, follow all instructions in Preparing the lift truck for maintenance.

A coolant overflow reservoir (1), also known as the coolant bottle, is next to the radiator on the left side of the engine compartment. The bottle has marks indicating HOT and COLD coolant levels.

Check the coolant quantity each day when you do the operator daily checks. Add coolant and water mixture as necessary.

The coolant used in this lift truck is mixed in a 50% water to 50% coolant ratio. The water quality is important to the performance of the cooling system. Distilled, de-ionized, or de-mineralized water is recommended to mix with the coolant concentrate.

See the INSPECTION AND LUBRICATION / Planned maintenance section for more information that is applicable to the planned maintenance intervals and the coolant specifications and quantities.

Note: Do not use cooling system sealing additives or antifreeze that contains additives to seal.

Note: Do not mix ethylene glycol and propylene glycol base coolants.

Fig. 1 (32314)

Changing the coolant

The amount of coolant required for a complete coolant change is up to 10.4 L (11 qt). See the INSPECTION AND LUBRICATION / Planned maintenance section for the coolant change intervals.

Note: When the aluminum timing gear cover or water pump is replaced, flush and service the cooling system, regardless of the time and the hours.

Draining the coolant

See Figure 2.

1. Prepare to catch the coolant from the drain hoses (1) that extend below the lift truck.
2. To drain the radiator, open the petcock (2) on the lower left side near the reservoir.
3. To drain the engine block, open the petcock (3) on the water pump.
4. Remove the lower radiator (cold) hose to drain the remaining coolant.

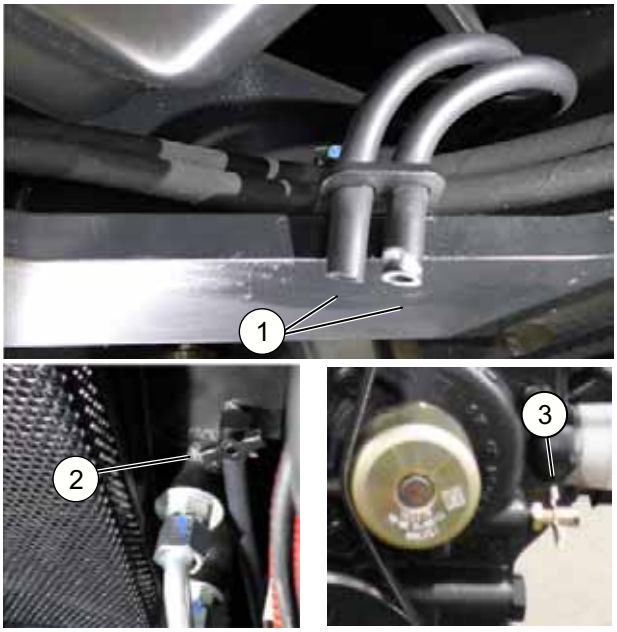


Fig. 2 (32315)

Properly disposing of the coolant

To properly dispose of coolant, follow these procedures:

- If you incorrectly discard the engine coolant, you can damage the environment and the ecology.
- Use leak-proof containers when you drain the fluids. Do not use food or beverage containers. Someone could accidentally drink from them.
- Do not put waste onto the ground, down a drain, or into a water source.
- Contact your local environmental or recycling center about the correct procedure to recycle or discard waste.

Filling the coolant bottle

1. Make sure that all of the petcocks are closed.
2. Remove the air from the cooling system when you fill it.

Removing the hydraulic motor and fan

1. See Figure 20. Disconnect the hydraulic lines (1) from the hydraulic motor (2).

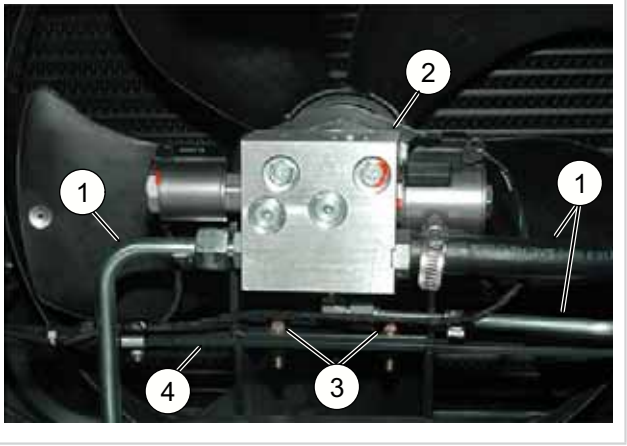


Fig. 20 (32331)

2. Disconnect the electrical connections from the hydraulic motor.
3. Remove the two screws (3) that hold the hydraulic motor bracket on the crossmember bracket (4).
4. Turn the hydraulic motor and the motor bracket 180° in the clockwise direction so the bottom of the bracket is facing up.
5. Tilt the hydraulic motor and the motor bracket 90° towards the back of the lift truck so that the fan blade is facing up.
6. Remove the hydraulic motor and the motor bracket through the opening in the counterweight.

Removing the fan from the hydraulic motor (for pneumatic lift trucks only)

1. Remove the fan blade from the fan hub. Keep the hardware and discard the fan blade.
2. Remove the two set screws and key that hold the fan hub on the motor shaft. Discard the set screws and the key.
3. Use a 3-jaw gear / bearing puller to remove the fan hub from the hydraulic motor.

Note: Fan drives with cup point set screws do not need a puller to remove the fan hub.

Removing the fan from the hydraulic motor (for cushion lift trucks only)

1. Remove the two set screws and the key that hold the fan on the motor shaft. Discard the set screws and the key.

Note: Disassemble the fan if necessary to get access to the set screws.

2. Use a 3-jaw gear / bearing puller to remove the fan from the hydraulic motor.

Note: Fan drives with cup point set screws do not need a puller to remove the fan hub.

3. Discard the fan.

Cleaning the hydraulic motor shaft

1. Use a degreasing solvent to remove contamination from the hydraulic motor shaft.

Note: Crown One Source items such as the degreaser and cleaner or the low volatile organic compound (V.O.C.) brake and parts cleaner are acceptable to use.

2. Let the degreasing solvent fully dry.

Installing the new fan on the hydraulic motor (for pneumatic lift trucks only)

1. Install the new fan blade on the fan hub using the screws and nuts from when the fan was removed from the lift truck. Torque the nuts to 14–15 N m (10–11 ft lb).

Note: This hardware holds the blade on the hub.

2. Apply thread-locking adhesive primer to the new key and the hydraulic motor shaft keyway.
3. Apply thread-locking adhesive primer to the two new set screws.
4. Let the thread-locking adhesive primer fully dry.
5. Apply three drops of thread-locking adhesive along the hydraulic motor shaft keyway.

Note: The thread-locking adhesive begins to cure in approximately 1 min.

6. Put the new key in the hydraulic motor shaft keyway. Put the end of the key approximately 0–2 mm (0–0.08 in) from the end of the shaft.

Note: Make sure that the key is not in the radius groove cut at the base of the hydraulic motor shaft. This action makes it difficult to assemble the fan hub.

7. Remove the residual thread-locking adhesive from the key or hydraulic motor shaft that was pushed out when you installed the key.
8. Apply thread-locking adhesive to the two new set screws.
9. Install the new set screws in the fan hub and make sure that they turn freely. Then back them out slightly.

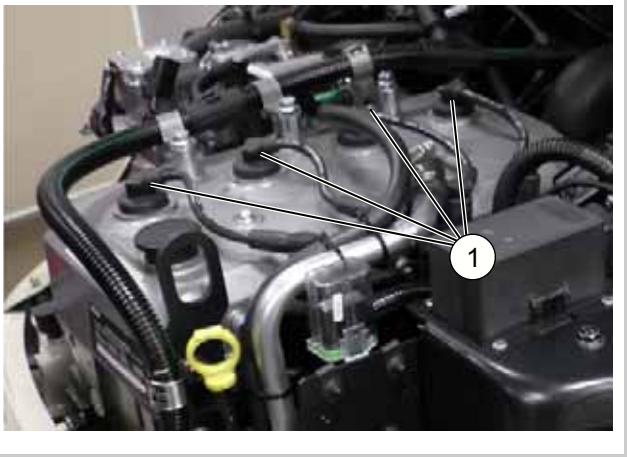


Fig. 16 (32155)

3. Remove the spark plugs from the engine. Discard the spark plugs.
4. Check the gap on new spark plugs to make sure that they are within specifications.

Note: The spark plug gap is not adjustable. Replace the spark plug if the gap measures more than 0.77 mm (0.030 in).

5. Install the spark plugs in the engine. Torque the spark plugs to 30–38 N m (23–27 ft lb).
6. Apply a bead of dielectric grease completely around the inner rim of the spark plug boot.
7. Press firmly on ignition wire boot to seat the boot properly on the spark plug.
8. Seat the other end of the ignition boot firmly onto the ignition coil.

Engine wiring harness

Installing the engine wiring harness

See Figure 17.

1. Route and attach the wiring harness to the rocker arm cover with screws (1), spacers (2), and clamps (3). Torque the screws to 10–14 N m (7–10 ft lb).
2. Attach the wiring harness to the engine block with the clamp (4) and screw (5). Torque the screw to 10–14 N m (7–10 ft lb).
3. Attach the wiring harness to the engine block using clamps (6) and screws (7). Torque the screws to 10–14 N m (7–10 ft lb).
4. Attach the wiring harness to the battery bracket with clamps (8) and screws (7, 9, 10). Torque the screws to 10–14 N m (7–10 ft lb).
5. Connect the wiring harness to the fuel lockoff solenoid valve (SV FLK) (11).
6. Connect the wiring harness to the electronic pressure regulator (12)
7. Connect the wiring harness to the air throttle actuator position (FB ATP SNS) (13)
8. Connect the wiring harness to the upstream throttle temperature and position sensor (FB UTTP SNS) (14)
9. Connect the wiring harness to the manifold air pressure sensor (FB MAP SNS) (15)
10. Connect the wiring harness to the fuel pressure and temperature sensor (FB FLV SNS) (16)
11. Put the engine coolant temperature sensor (FB ENG TEMP) (17) in the thermostat housing in the timing gear cover.
12. Connect the wiring harness to the camshaft position sensor (FB CAM SNS) (18).
13. Put the oil pressure sensor (FB EOP SNS) (19) in the engine block.
14. Connect the wiring harness to the ignition coils (IGN COIL1–4) (20).
15. Connect the wiring harness to the Access 3™ module (21)
16. Connect the oxygen sensor pumping circuit relay (22).
17. Connect the wiring harness to the starter (23) and secure with the nut (24). Torque the nut to 4–6 N m (35–53 in lb).
18. Connect the wiring harness to the crankshaft position sensor (FB CRK SNS) (25, 26).
19. Connect the wiring harness to R312 (27).
20. Connect the wiring harness to the lift truck interface (JC300) (28).
21. Connect the wiring harness to the fuel level interface (JC437) (29).

6. See Figure 14. Torque the large diameter cylinder head cap screws numbered 1 through 10 to 110 N m (81 ft lb) in the sequence shown.
7. Starting with screw number 1, completely loosen the screw. Torque the screw to 70 N m (52 ft lb) plus 150°.
8. Repeat step 7 for each screw numbered 2–8.
9. Completely loosen screw number 9. Torque the screw to 70 N m (52 ft lb) plus 120°.
10. Repeat step 9 for screw number 10.
11. Apply clean engine oil to the smaller diameter cylinder head screws numbered 11–15. Remove any excess oil from the screws.
12. Install the screws numbered 11–15 hand-tight. Torque the screws to 26–30 N m (19–22 ft lb) in the sequence shown.

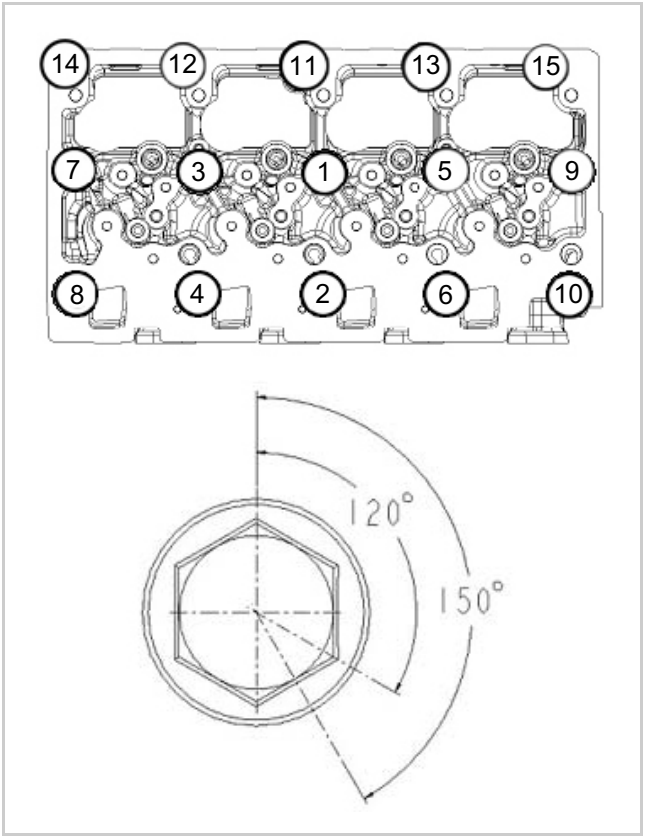


Fig. 14 (32282)

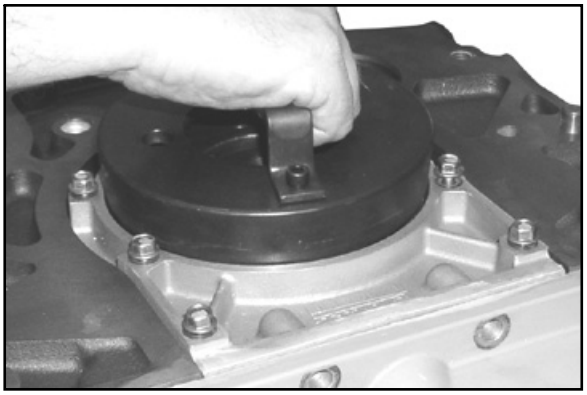


Fig. 16 (32356)

6. See Figure 17. Torque the screws to 5 N m (44 in lb) in the sequence shown.
7. Repeat the torque sequence a second time to 13–15 N m (10–11 ft lb).

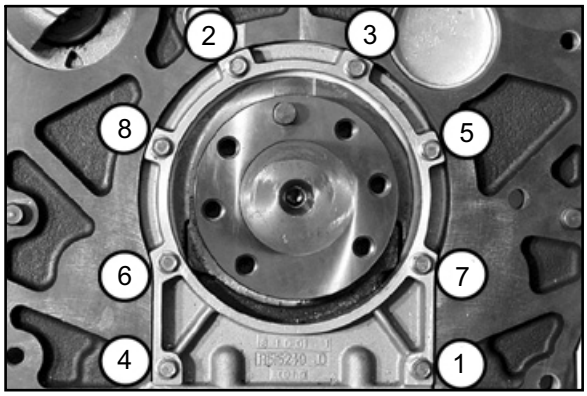


Fig. 17 (32357)

Installing the rear oil seal

Note:

- Do not allow any lubrication to touch the seal when you install it. Use of a lubricant results in premature seal failure.
- Always install the rear oil seal immediately after removal from the plastic bag to avoid contamination.

1. Clean the outer diameter of the crankshaft flange and the inside diameter of the seal housing. Use a cleaning solvent that removes the sealant if previously applied.
2. Make sure that the outer diameter of the crankshaft flange and the inside diameter of the seal housing bore are free from nicks or burrs.
3. See Figure 18. Install the pilot (1) from the rear oil seal and wear sleeve installer tool set (P/N 145003) on the end of the crankshaft.
4. Use two 38 mm (1.5 in) socket-head screws (2). Tighten both screws until they touch the base of the pilot, then back them off approximately one-half turn.

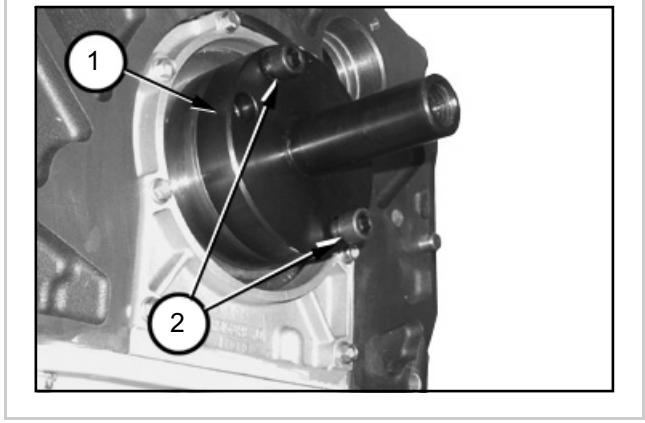


Fig. 18 (32358)

5. See Figure 19. Install the driver over the pilot until the driver cross-plate touches the pilot. This driver properly centers the pilot with the crankshaft flange.
6. Tighten the two socket-head screws.
7. Remove the driver from the crankshaft flange.

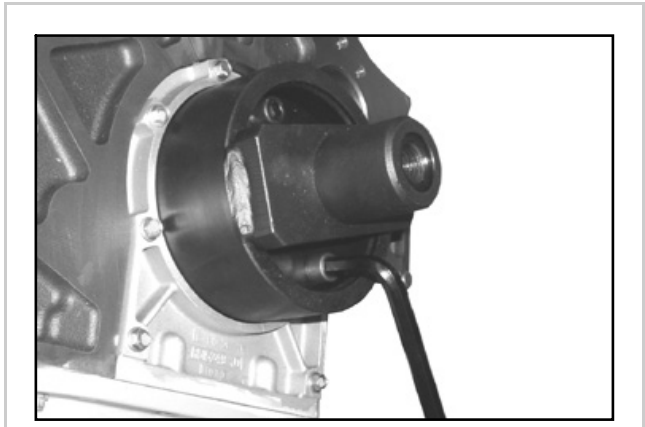
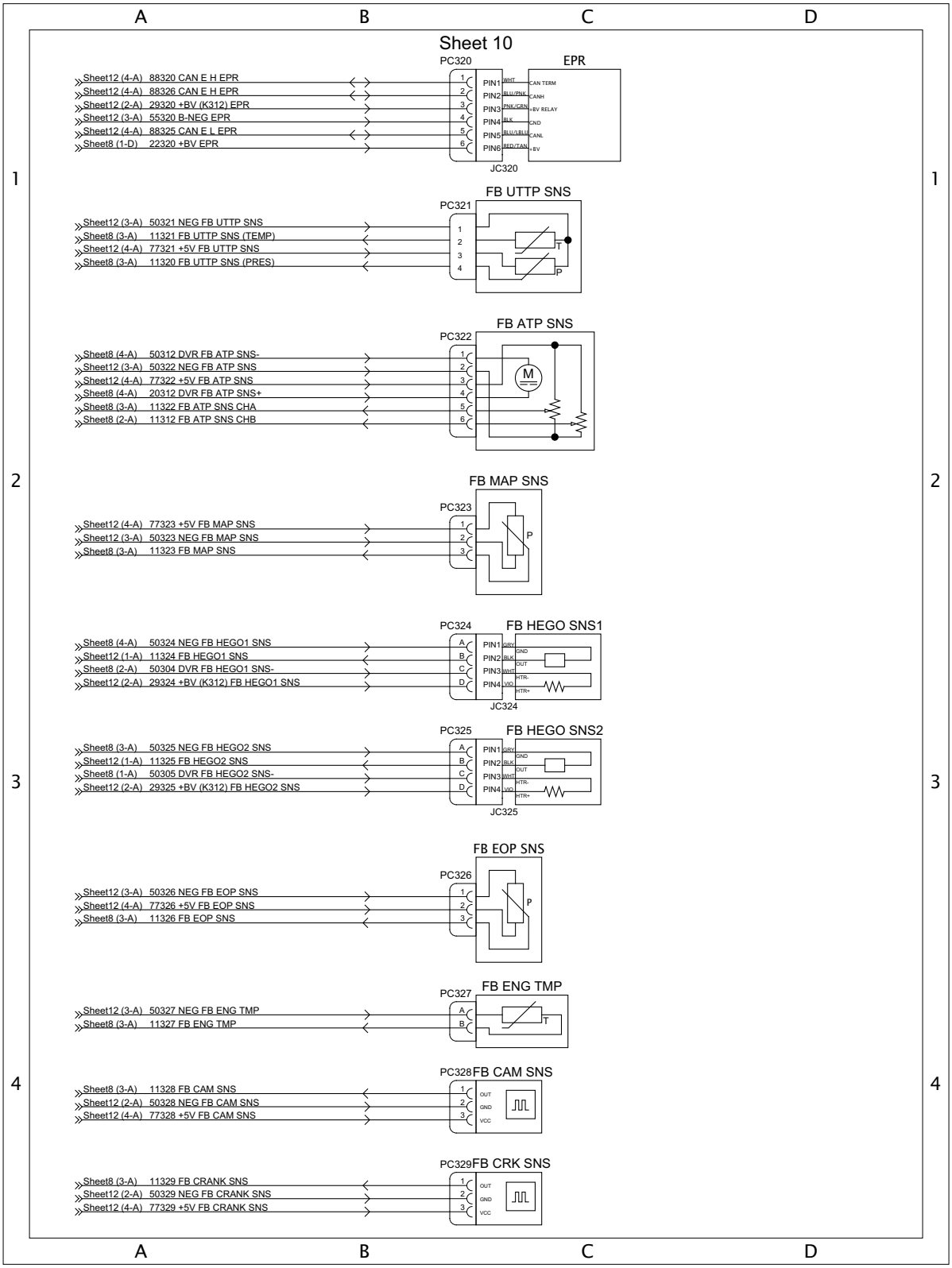


Fig. 19 (32359)

8. See Figure 20. Carefully start the rear oil seal over the pilot and the crankshaft flange with the open side of the seal toward the engine.

Index

EPR and Engine Sensors



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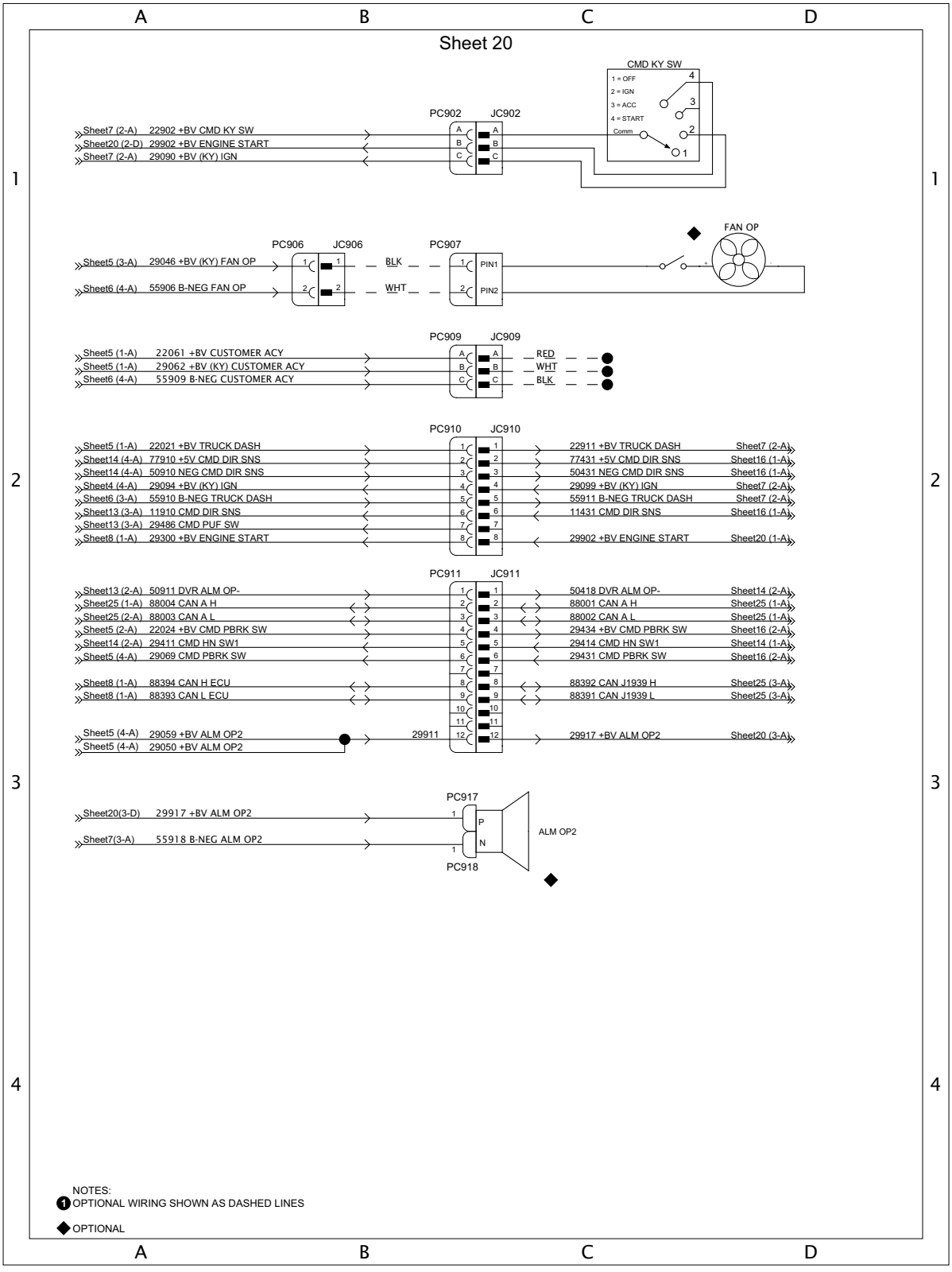

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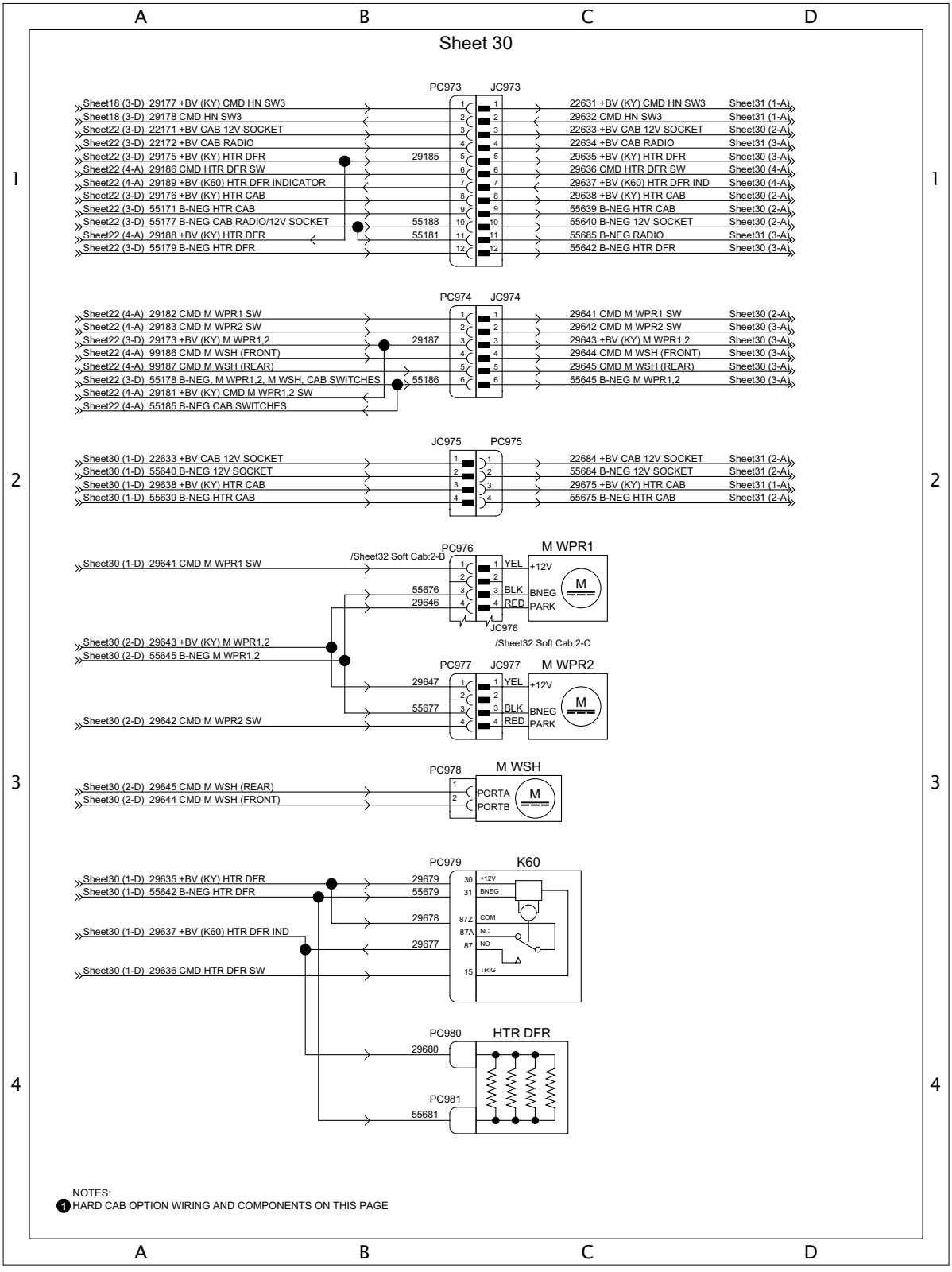
Hard Cabin Wipers and Defroster



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Notes:

FEATURES menus

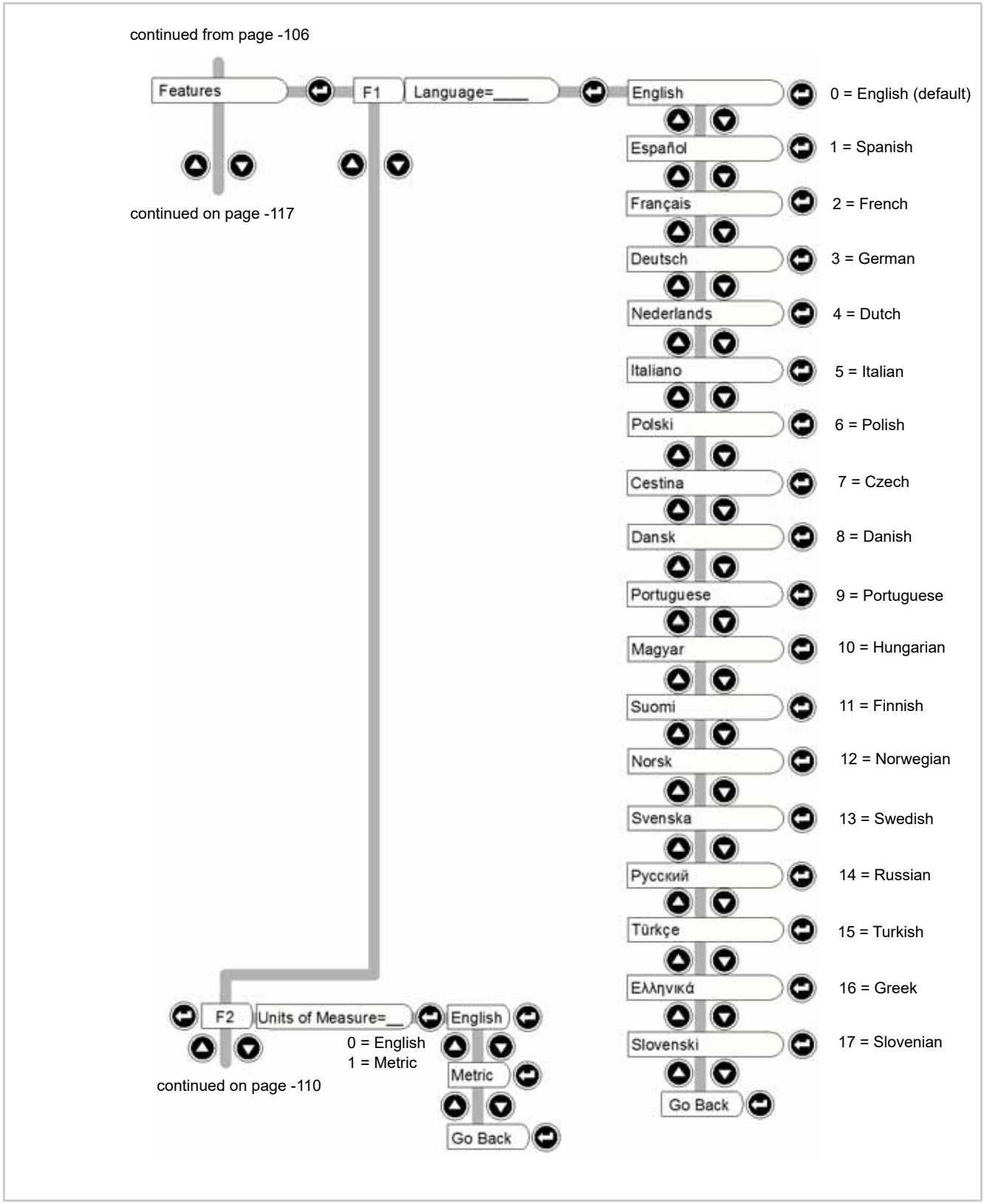
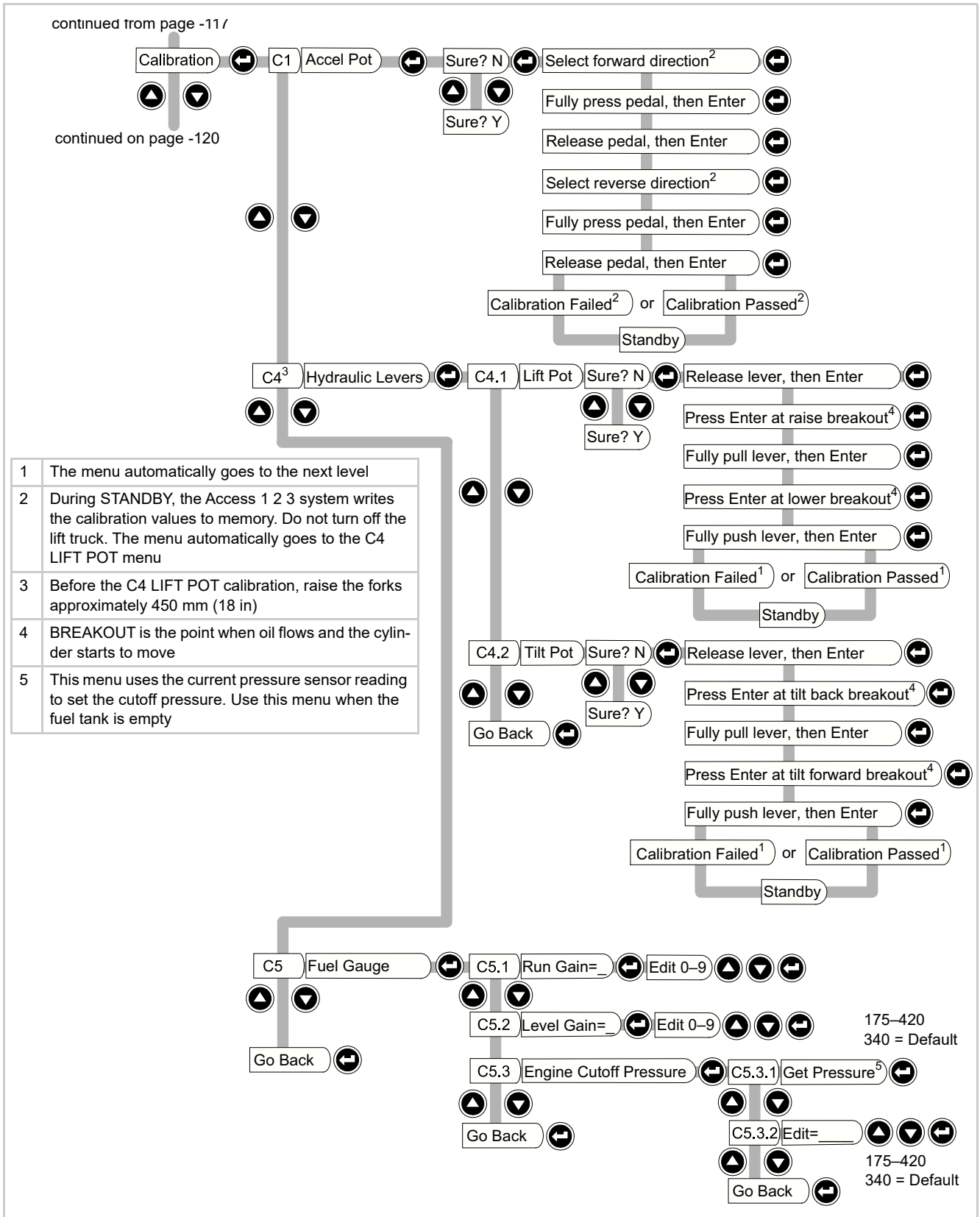


Fig. 7 (31957)

CALIBRATION menus



1	The menu automatically goes to the next level
2	During STANDBY, the Access 1 2 3 system writes the calibration values to memory. Do not turn off the lift truck. The menu automatically goes to the C4 LIFT POT menu
3	Before the C4 LIFT POT calibration, raise the forks approximately 450 mm (18 in)
4	BREAKOUT is the point when oil flows and the cylinder starts to move
5	This menu uses the current pressure sensor reading to set the cutoff pressure. Use this menu when the fuel tank is empty

Fig. 17 (32310)

F8 MESSAGE MODE menu descriptions

FEATURES (F8)		
Menu Level	**Display**	**Menu Descriptions and Procedures**
N/A	F8 MESSAGE MODE = ____	Use this menu to set the messages on Access 1. 0 = Model 1 = Timer 2 = Trip 3 = Hours 4 = Odometer 5 = All
N/A	MODEL	This message shows the model number of the lift truck.
N/A	TIMER	This message lets the operator use a stop-watch.
N/A	TRIP	This message shows the distance traveled in the forward and reverse directions since the previous reset.
		The distance is in meters if the F2 UNITS OF MEASURE menu is set to METRIC.
		The distance is in feet if the F2 UNITS OF MEASURE menu is set to ENGLISH.
N/A	HOURS	This message shows the total hours of operation of the lift truck set in the F9 HOUR METER menu.
N/A	ODOMETER	This message shows the total travel distance of the lift truck.
		The distance is in kilometers if the F2 UNITS OF MEASURE menu is set to METRIC.
		The distance is in miles if the F2 UNITS OF MEASURE menu is set to ENGLISH.
N/A	ALL	This setting lets the operator see all of the messages.
N/A	GO BACK	Push the enter button to go back to FEATURES.

ANALYZER menu

Overview of the ANALYZER menu

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

- A1 menu - Status - check the status of the circuits
- A2 menu - Inputs - check the component inputs to the Access 1 2 3® modules
- A3 menu - Outputs - check the Access 1 2 3® module outputs to the components
- A4 menu - Test outputs - test the Access 1 2 3® module outputs to the components.

Accessing the ANALYZER menu

Note: To scroll through the ANALYZER menus, see the tables in this section.

1. Turn on the lift truck.
2. Scroll to the SERVICE menu.
3. Enter the service mode password.
4. Push the enter button.
   ⇨ Access 1 shows ****.
5. Push the up or down arrow key to scroll to the first number.
6. Push the enter button to go to the next number.
7. Repeat steps 5–6 until you enter all four numbers.
8. Push the enter button to accept the user code.
   ⇨ If the user code is incorrect, Access 1 shows INVALID.
   ⇨ Access 1 shows SETUP.
9. Push the up or down arrow key to go to the DIAGNOSE menu.
10. Push the enter button to go to the ANALYZER menu.
11. Push the enter button to go to the STATUS menu.

A1 STATUS menu descriptions

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

ANALYZER		
Menu Level	**Display**	**Menu Descriptions and Procedures**
A1 STATUS	N/A	Use this menu to make sure that the circuits are set to ENABLE or DISABLE.
	A1.1 LIFT	ENABLE = lets the lift truck have lift function
		DISABLE = does not let the lift truck have lift function
	A1.4 FULL TRAVEL	ENABLE = lets the lift truck have full travel function
		DISABLE = does not let the lift truck have full travel function. A system event could cause this.
	A1.5 LIMP TRACTION	ENABLE = lets the lift truck travel slowly
		DISABLE = does not let the lift truck travel slowly
	A1.7 TILT	ENABLE = lets the lift truck have tilt function
		DISABLE = does not let the lift truck have tilt function
	A1.8 ACCESSORY 1	ENABLE = lets the operator use the accessory 1 function
		DISABLE = does not let the operator use the accessory 1 function
	A1.9 ACCESSORY 2	ENABLE = lets the operator use the accessory 2 function
		DISABLE = does not let the operator use the accessory 1 function
	GO BACK	Push the enter button to go back to STATUS.

EVENTS menu

The EVENTS menu includes active and inactive event codes. You can also see the total count of each code. This can help isolate an intermittent event. See the ELECTRICAL SYSTEM / Event Codes section in the service manual for event code troubleshooting steps.

Accessing the EVENTS menu

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

1. Turn on the lift truck.
2. Scroll to the SERVICE menu.
3. Enter the service mode password.
4. Push the enter button.
   ⇨ Access 1 shows ****.
5. Push the up or down arrow key to scroll to the first number.
6. Push the enter button to go to the next number.
7. Repeat steps 5–6 until you enter all four numbers.
8. Push the enter button to accept the user code.
   ⇨ If the user code is incorrect, Access 1 shows INVALID.
   ⇨ Access 1 shows SETUP.
9. Push the up or down arrow key to go to the DIAGNOSE menu.
10. Push the enter button to go to the ANALYZER menu.
11. Push the up or down arrow key to go to the EVENTS menu.
12. Push the enter button to go to the ACTIVE menu.

WARNING

Incorrect operation of the lift truck can cause death or injury.

While in the password protected Service Menu, the lift and tilt lockouts are not disabled. This action allows the technician to operate the mast in its full range of motion for servicing.

- *Make sure that no load is on the forks when in the Service Menu. The lift truck stability decreases if the load is tilted forward more than 2° above staging.*
- *If it is necessary to operate the lift truck during servicing, travel with the forks close to the floor and the mast tilted back.*
- *Do not operate with the forks raised above staging and travel more than 8.0 km/h (5.0 mph). An unloaded lift truck can tip over.*

Software

Software updates can sometimes eliminate event codes so periodically check to make sure that the lift truck has the latest software. Your lift truck includes an application software (makes the lift truck operate), engine software (makes the engine operate), and diagnostics software (includes the menus and event codes). To ensure that the software is the latest version, enter the service mode from Access 1 and scroll to the Utilities Menu. See the Access 1 menu for the display software, Access 3™ for the engine software, and Access 4 for the lift truck application software. Consult your local Crown dealer for software updates.

Password

The service mode password can be changed. To change the password, consult your Crown dealer.

Calibration

The accelerator pedal, directional control lever, raise lever, and tilt lever sensors are the only components that require calibration. When you replace any of these sensors, you must recalibrate them. See the Access 1 2 3® section for the calibration procedures when you replace the Access 1 and Access 4 modules.

No event code?

Not all electrical problems result in an event code being displayed. Open fuses, switches, relay coils, relay tips, or a cut wire keeps some components or the entire lift truck from operating. But that does not necessarily result in an event code being displayed. However, when the lift truck malfunctions and no event codes are entered, it usually means that the malfunction is not electrical.

Locating components

Component and wire location maps are provided at strategic locations on the lift truck to help you quickly determine the physical location of the items in question.

All components are clearly marked at the connection points.

Event codes

This lift truck is equipped with a CAN-based event code system that follows the SAE J1939 Recommended Practices.

SAE J1939 Standard (Society of Automotive Engineers) summary

SAE J1939 is a Surface Vehicle Recommended Practice guideline developed by the Truck and Bus Control and Communications Network Subcommittee of the Truck and Bus Electrical and Electronics Committee. The objectives of the subcommittee are to develop information reports, recommended practices, and standards concerned with the requirement, design, and usage of Access 3™ which transmits electrical signals and control information among the vehicle components. The usage of these Recommended Practices is not limited to the lift truck and the bus applications. Other applications are accommodated with immediate support being provided for construction and agricultural equipment, and stationary power systems.

Event codes are supplied to give information on Access 3™, engine, and other lift truck components. The event codes are written from the SAE J1939 standard as a two-part code. The first part is called the Suspect Parameter Number (SPN) and typically contains between two and four digits. The second part of the code is called the Failure Mode Identifier (FMI) code.

Example: 110.03 (sometimes shown as 000110.03). In this example, 110 is the SPN and 03 is the FMI.

Step 2: Disconnect PC327. Turn the key switch to the ignition position. Measure the power supply output voltage from PC327-A to PC327-B.

- **If:** The voltage is not 4.75–5.25 V.
  - Then continue to step 3.
- **If:** The voltage is 4.75–5.25 V.
  - Then continue to step 4.

Step 3: Turn off the lift truck. Measure the resistance from PC327-A to the frame ground.

- **If:** The resistance is less than 5 Ω.
  - Then continue to step 4.
- **If:** The resistance is greater than 5 Ω.
  - Then the power supply to ground has an open circuit.

Step 4: Insert a probe into PC327-B. Measure the resistance to all the other pins in PC310.

- **If:** Any pin is less than 5 Ω.
  - Then the signal is shorted in the harness.
- **If:** The resistance is greater than 5 Ω.
  - Then continue to step 5.

Step 5: Connect PC327. Disconnect PC310. Measure the resistance from pins PC310-32 to PC310-39.

- **If:** The resistance is not 50–2,000 Ω with a warm engine.
  - Then replace the coolant sensor.
- **If:** The resistance is 50–2,000 Ω with a warm engine.
  - Then turn off the lift truck. Replace Access 3™. Turn the key switch to the ignition position. Make sure that Access 3™ operates correctly.

Event Code 110.16

Engine temperature

The engine temperature is high. 80% of the engine power is available.

Step 1: Turn off the lift truck. Check the radiator.

- **If:** The radiator core is plugged or damaged.
  - Then clean or repair the core.
- **If:** The radiator core is not plugged or damaged.
  - Then check the coolant bottle level. Add coolant as needed. If the event code is active, continue to step 2.

Step 2: Check the serpentine belt.

- **If:** The tension is incorrect or damage is found.
  - Then adjust the belt tension or replace the belt.
- **If:** There is no damage.
  - Then check the coolant pump. Remove the belt and manually cycle the pump by hand.
- **If:** The pump cycles hard.
  - Then replace the pump.
- **If:** The pump does not cycle hard.
  - Then return the lift truck to operation and monitor the engine temperature.

Event Code 158.03

Battery voltage high

The ignition battery voltage is out of range high.

Step 1: Turn the key switch to the ignition position. Enter Service Mode 2 then enter the Analyzer Menu. Select A2 Inputs, A2.4 Access 4, A2.4.13 Battery Voltage. Press **Enter**.

- **If:** The voltage is greater than 11.5 V.
  - Then continue to step 2.
- **If:** The voltage is less than 11.5 V.
  - Then continue to step 5.

Step 2: Turn off the lift truck. Disconnect PC310. Turn the key switch to the ignition position. Measure the voltage at pin PC310-38.

- **If:** The voltage measurement is greater than 14 V (not equal to battery voltage).
  - Then there is a printed circuit board issue.
  - Then replace Access 3™. Make sure that Access 3™ operates correctly.
- **If:** The voltage measurement is less than 14 V (equal to battery voltage).
  - Then continue to step 3.

Step 3: Turn off the lift truck. Connect PC310. Start the engine. Measure the voltage from the positive stud on the alternator to the battery ground.

- **If:** The output is greater than 15 V or is unstable.
  - Then continue to step 4.
- **If:** The output is less than 15 V or is stable.
  - Then continue to step 5.

Step 4: Turn off the lift truck. Disconnect PC317 and remove the terminals from the alternator stud. Start the engine. Measure the voltage from the positive stud on the alternator to the battery ground.

- **If:** The output is greater than 15 V or is unstable.
  - Then there is an alternator issue.
- **If:** The output is less than 15 V or is stable.
  - Then continue to step 5.

Step 5: Check the event code.

Step 2: Turn off the lift truck. Disconnect PC410 and PC411. Measure the resistance from PC411-16 to PC425-1 and from PC410-33 to PC425-2.

- **If:** The resistance is greater than 5 Ω in either wire.
  - Then a broken wire exists in the harness. Replace the harness.
- **If:** The resistance is less than 5 Ω in both wires.
  - Then continue to step 3.

Step 3: Measure the resistance between PC410-33 and all the other pins on PC410.

- **If:** The resistance is greater than 5 Ω in all other wires.
  - Then continue to step 4
- **If:** The resistance is less than 5 Ω in any other wire.
  - Then there is a shorted high or low side to ground. Replace the harness.

Step 4: Measure the resistance across the terminals of the main interlock coil.

- **If:** The resistance equals 3–10 Ω.
  - Then continue to step 5.
- **If:** The resistance is less than 3 Ω or is greater than 10 Ω.
  - Then replace the main interlock coil. Make sure that the main interlock coil operates correctly.

Step 5: Connect PC410, PC411, and PC425. Turn the key switch to the ignition position. Check if new software was recently loaded.

- **If:** The software was recently loaded.
  - Then the incorrect software was loaded.
- **If:** The software was not recently loaded.
  - Then continue to step 6.

Step 6: Check if the event code is still active.

- **If:** The event code is active.
  - Then continue to step 7.
- **If:** The event code is not active.
  - Then check for an intermittent connection.

Step 7: Turn off the lift truck. Replace Access 4. Turn the key switch to the ignition position.

- **If:** Issues do not exist.
  - Then Access 4 was the issue. Make sure that Access 4 operates correctly.
- **If:** Issues do exist.
  - Then continue to step 1.

Event Code 700.06

Main interlock solenoid coil - high or low side

There is a grounded circuit. No lift or tilt functions.

Step 1: Turn off the lift truck. Disconnect PC425. Insert probes across PC425-1 and PC425-2. Enter Service Mode 2 then enter the Analyzer Menu. Select A4 Test Outputs, A4.4 Access 4, A4.4.1 Main Sol. Press **Enter** to drive the output from the menu.

- **If:** Battery voltage is not present.
  - Then continue to step 2.
- **If:** Battery voltage is present.
  - Then continue to step 4.

Step 2: Turn off the lift truck. Disconnect PC410 and PC411. Measure the resistance from PC411-16 to PC425-1 and from PC410-33 to PC425-2.

- **If:** The resistance for either wire is greater than 5 Ω.
  - Then a broken wire exists. Replace the harness.
- **If:** The resistance for both wires is less than 5 Ω.
  - Then continue to step 3.

Step 3: Measure the resistance from PC411-16 to all the other pins on PC410.

- **If:** The resistance is less than 5 Ω in any of the other wires.
  - Then there is a shorted high or low side to ground. Replace the harness.
- **If:** The resistance is greater than 5 Ω in all of the other wires.
  - Then continue to step 4.

Step 4: Measure the resistance across the main interlock coil terminals.

- **If:** The resistance equals 3–10 Ω.
  - Then continue to step 5.
- **If:** The resistance is less than 3 Ω or is greater than 10 Ω.
  - Then replace the main interlock coil. Make sure that the main interlock coil operates correctly.

Step 5: Connect PC410, PC411, and PC425. Turn the key switch to the ignition position. Check if new software was recently loaded.

- **If:** The new software was recently loaded.
  - Then the incorrect software was loaded.
- **If:** The new software was not recently loaded.
  - Then continue to step 6.

Step 6: Check if the event code is still active.

- **If:** The event code is active.
  - Then continue to step 7.

- **If:** Damage does not exist.
  - Then continue to step 2.

Step 2: Turn the key switch to the ignition position. Enter Service Mode 2 then enter the Analyzer Menu. Select A2 Inputs, A4 Access 4 Inputs, A2.4.2 Tilt Lever. Press **Enter**.

- **If:** The voltage is not 0-5 V and FWD, NEU, BAK is not displayed.
  - Then continue to step 3.
- **If:** The voltage is 0-5 V and FWD, NEU, BAK is displayed.
  - Then continue to step 4.

Step 3: Turn off the lift truck. Disconnect PC422. Turn the key switch to the ignition position. Measure the voltage from PC422-1 to PC422-3.

- **If:** The voltage is greater than 5.5 V.
  - Then the Access 4 power supply is shorted to the battery.
- **If:** The voltage is 4.75–5.25 V.
  - Then continue to step 4.

Step 4: Turn off the lift truck. Connect PC422. Turn the key switch to the ignition position. Insert probes into the wires on PC422-2 and PC422-3.

- **If:** The voltage is greater than or equal to 5 V.
  - Then the tilt lever sensor signal input is shorted.
- **If:** The voltage is less than 5 V.
  - Then continue to step 5.

Step 5: Check the voltage with the tilt lever in the home position.

- **If:** The voltage is not 2.0–2.8 V.
  - Then replace the tilt lever sensor. Make sure that the tilt lever sensor operates correctly.
- **If:** The voltage is 2.0–2.8 V.
  - Then turn off the lift truck. Replace Access 4. Turn the key switch to the ignition position. Make sure that Access 4 operates correctly.

Event Code 1083.04

Tilt lever sensor shorted low

The tilt lever sensor is out of range low. No tilt forward or backward.

Step 1: Turn off the lift truck. Check the area around PC422 for pinched or damaged wires on the routing path to Access 4.

- **If:** Damage does exist.
  - Then replace the connectors, terminals, or the harness.
- **If:** Damage does not exist.
  - Then continue to step 2.

Step 2: Turn the key switch to the ignition position. Enter Service Mode 2 then enter the Analyzer Menu. Select A2 Inputs, A4 Access 4 Inputs, A2.4.2 Tilt Lever. Press **Enter**.

- **If:** The voltage is not 0–5 V and FWD, NEU, BAK is not displayed.
  - Then continue to step 3.
- **If:** The voltage is 0–5 V and FWD, NEU, BAK is displayed.
  - Then continue to step 5.

Step 3: Turn off the lift truck. Disconnect PC410 and PC422. Measure the resistance from PC410-5 to PC422-2.

- **If:** The resistance is greater than 5 Ω.
  - Then there is a broken wire. Replace the harness.
- **If:** The resistance is less than 5 Ω.
  - Then continue to step 4.

Step 4: Turn the key switch to the ignition position. Measure the voltage from PC422-1 to PC422-3.

- **If:** The voltage equals 4.75–5.25 V.
  - Then continue to step 5.
- **If:** The voltage is not equal to 4.75–5.25 V.
  - Then the Access 4 power supply is shorted or there is an open in the harness.

Step 5: Turn off the lift truck. Connect PC410 and PC422. Turn the key switch to the ignition position. Insert probes into wires PC410-5 and PC422-2. Check the voltage with the tilt lever in the home position.

- **If:** The voltage does not equal 2.0–2.8 V.
  - Then replace the tilt lever sensor. Make sure that the tilt lever sensor operates correctly.
- **If:** The voltage equals 2.0–2.8 V.
  - Then turn off the lift truck. Replace Access 4. Turn the key switch to the ignition position. Make sure that Access 4 operates correctly.

Event Code 1084.03

Hoist lever sensor

The main hoist sensor is out of range high.

Step 1: Turn off the lift truck. Check the area around PC421 for pinched or damaged wires on the routing path to Access 4.

- **If:** Damage does exist.

A4.4 Access 4, A4.4.9 Horn. Press **Enter** and drive the output from the menu.

- **If:** Battery voltage is present.
  - Then continue to step 3.
- **If:** Battery voltage is not present.
  - Then continue to step 2.

Step 2: Disconnect PC411. Measure the resistance from PC411-21 to PC412-B.

- **If:** The resistance is less than 5 Ω.
  - Then there is a shorted wire to ground.
- **If:** The resistance is greater than 5 Ω.
  - Then continue to step 3.

Step 3: Replace the alarm. Connect PC411 and PC412. Turn the key switch to the ignition position.

- **If:** Issues do not exist.
  - Then the alarm was the issue. Make sure that the alarm operates correctly.
- **If:** Issues do exist.
  - Then continue to step 4.

Step 4: Turn off the lift truck. Replace Access 4. Turn the key switch to the ignition position.

- **If:** Issues do not exist.
  - Then Access 4 was the issue. Make sure that Access 4 operates correctly.
- **If:** Issues do exist.
  - Then there is an intermittent connection or a connector issue.

Event Code 2641.12

Access 4 internal fault

Horn does not function.

Step 1: Enter Service Mode 2 then enter the Events Menu. Select E3, Clear History, and then Clear All Events. Press **Y** to clear all events.

Step 2: Turn off the lift truck and turn on the lift truck.

Step 3: Enter the Events menu and go to Active Events menu.

- **If:** Issues do not exist.
  - Then Clear All Events fixed the issue.
- **If:** Issues do exist.
  - Then repeat steps 1, 2, and 3.
- **If:** Issues still exist.
  - Then continue to step 4.

Step 4: Turn off the lift truck. Replace Access 4. Turn the key switch to the ignition position. Make sure that Access 4 operates correctly.

Event Code 2641.31

Access 4 internal fault

Horn does not function.

Step 1: Enter Service Mode 2 then enter the Events Menu. Select E3, Clear History, and then Clear All Events. Press **Y** to clear all events.

Step 2: Turn off the lift truck and turn on the lift truck.

Step 3: Enter the Events menu and go to Active Events menu.

- **If:** Issues do not exist.
  - Then Clear All Events fixed the issue.
- **If:** Issues do exist.
  - Then repeat steps 1, 2, and 3.
- **If:** Issues still exist.
  - Then continue to step 4.

Step 4: Turn off the lift truck. Replace Access 4. Turn the key switch to the ignition position. Make sure that Access 4 operates correctly.

Event Code 2819.31

Power brake lift trucks only

Parking brake pressure switch

There is an open circuit or a grounded circuit. No parking brake release.

Step 1: Turn the key switch to the ignition position. Enter Service Mode 2 then enter the Analyzer Menu. Select A2 Inputs, A2.4 Access 4 Inputs, A2.4.9 Park Brake SW. Press **Enter**.

- **If:** With the parking brake switch in the applied position, Park Brake SW equals 1.
  - Then continue to step 2.
- **If:** With the parking brake switch in the applied position, Park Brake SW is not equal to 1.
  - Then the parking brake switch input is shorted to the battery or a defective parking brake switch.

Step 2: Put the parking brake switch in the released position.

- **If:** Park Brake SW is not equal to 0.
  - Then there is a broken wire to the switch input. or a defective parking brake switch
- **If:** Park Brake SW equals 0.
  - Then continue to step 3.

Shutdown/Derate Messages

The following messages indicate lift truck issues that likely need serviced:

Derate

See the ELECTRICAL SYSTEMS / Engine Protection section.

An event code is received regarding:

- engine oil pressure is less than the specified pressure at a specific rpm
- fuel vapor or intake air temperature is above 68 °C (154 °F)
- engine coolant temperature is greater than 110 °C (230 °F)
- transaxle oil temperature is greater than 113 °C (235 °F)
- low EPR pressure
- oxygen sensor input issue
- MAP input issue

Specific event codes for each derate are stored, but not displayed while the engine runs.

Low Battery

The battery voltage is less than 11.4 V.

Shut Down Engine

The engine oil pressure is low.

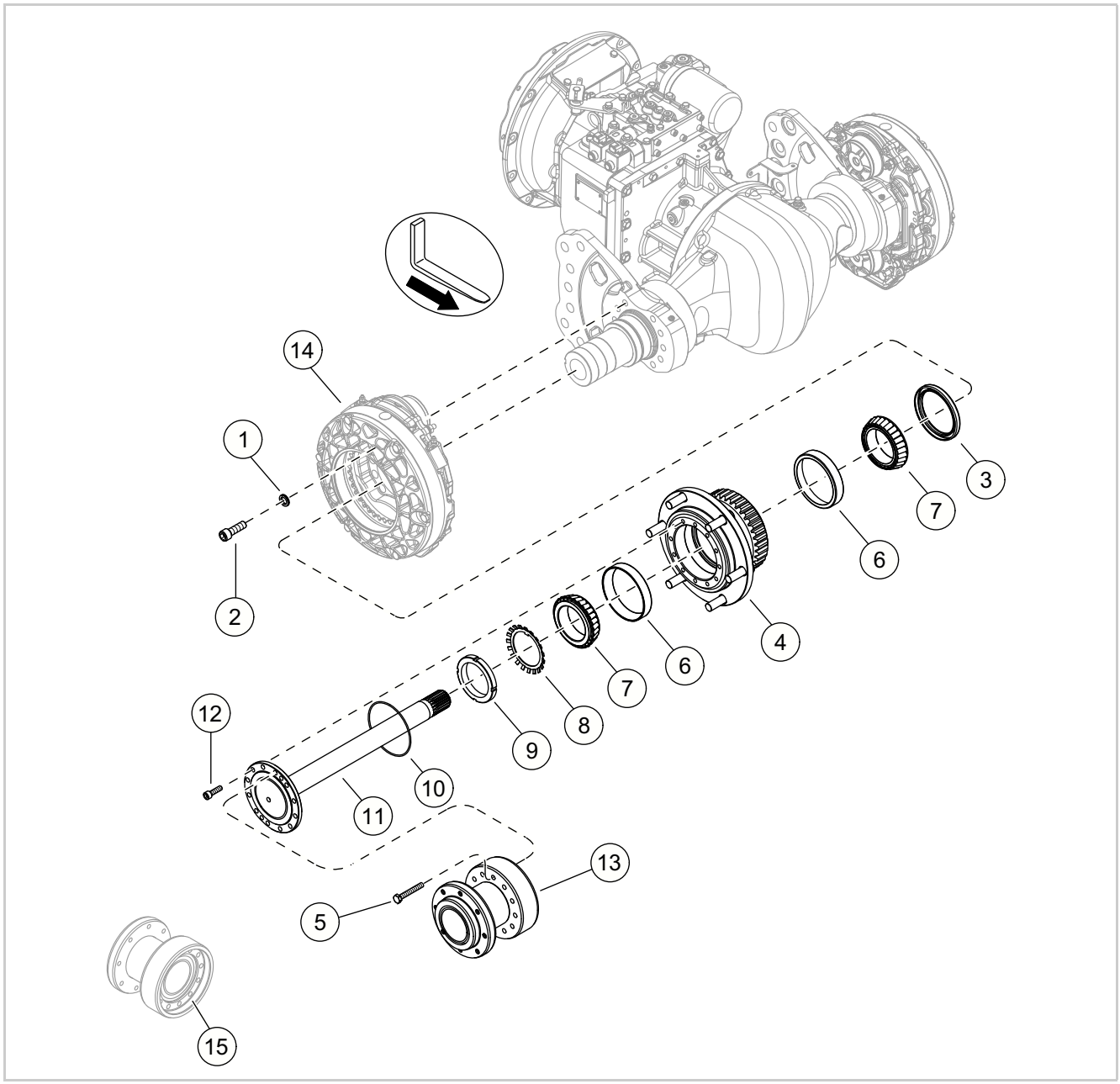


Fig. 13 (32385)

1	Wedge washer	8	Washer
2	Screw	9	Lock nut
3	Oil seal	10	O-ring
4	Drive axle hub assembly	11	Axle shaft
5	Screw	12	Screw
6	Bearing cup	13	Dual drive adapter (pneumatic lift trucks only)
7	Bearing cone	14	Right brake assembly
		15	Apply anti-seize compound to this surface prior to installation

2. Set the brake assembly with the SAHR caps up on the floor below the lift truck axle where it will be installed.
3. See Figure 30. Remove the SAHR cap set screw access plugs from the SAHR caps using a small screwdriver and hammer.

Fig. 30 (32401)

4. See Figure 31. Use a pliers to remove the plugs from the SAHR caps. Keep the plugs for later assembly.

Fig. 31 (32402)

5. Loosen the SAHR cap set screws by one and a half turns each or until the friction rotor can be moved freely by hand.
6. Turn the brake over on the work surface.
7. Disassemble the brakes according to the directions in Disassembling the power brakes in this section.
8. Remove the cap or plug from the parking brake hose.
9. Attach the parking brake hose to the brake assembly. Make sure that the service brake port is plugged.
10. Turn on the lift truck and release the parking brake.
11. Adjust the SAHR cap set screws until the inner stator, lining assembly, and outer stator all touch. To check that they touch, make sure that the friction rotor cannot move. Do not over tighten the set screws.
12. Use a hex wrench and back off each SAHR cap set screw ¾ to one turn.
13. Turn off the lift truck.
14. Remove the service brake port plug and install the fitting.
15. Remove the parking brake hose from the brake assembly.
16. Install the SAHR cap set screw access plugs.
17. Repeat steps 1–16 on the opposite brake assembly.
18. Put the power brake assemblies on the lift truck. See Installing the power brakes in this section.

Disassembling the parking brake

In order to access the parking brake cylinders, the power brake assembly must be removed from the lift truck. See Removing the brakes in this section for more instructions.

CAUTION

Incorrect or missing safety procedures and safety equipment can cause injury.
The spring force in each parking brake cylinder pushes the inner stator against the lining assembly and the outer stator. Be careful when you disassemble the brakes.

- *Loosen in sequence the screws and the nuts that attach the outer stator to the brake assembly. Loosen until the parking brake spring tension is released.*
- *See Disassembling the power brakes in this chapter.*

Inspecting and replacing the parking brake piston wiper rings, and seal

See Figure 50.

1. Remove the brake from the lift truck. See Removing the power brakes in this section.
2. Disassemble the stators and linings. See Disassembling the power brakes in this section.
3. Remove the lower crossover tube (1) from the parking brake assembly. Examine and replace the O-rings (2) as necessary.
4. Secure the brake assembly to a work bench.
5. Use a pipe, strap, or spanner wrench to remove the two SAHR caps (10) from the parking brake assembly.
6. Remove the piston (7), disc springs (8), and adjustment plunger (6) from the assembly.
7. Remove all the seals and the backup rings from the pistons (7), SAHR plunger (6), and piston housing.
8. Clean all the parts and examine for excessive wear or cracking. Replace as necessary.

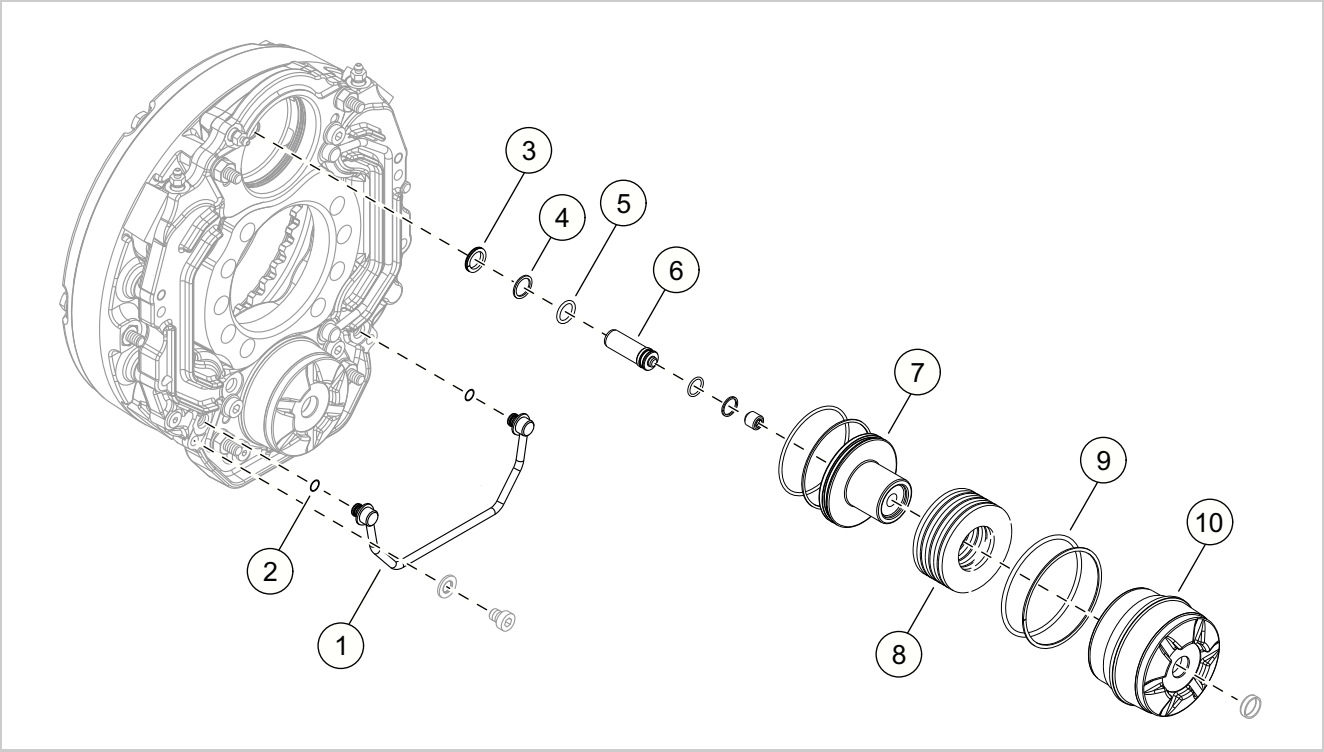


Fig. 50 (32422)

Steering column installation

Installing the steering column

1. See Figure 12. Apply grease on the outside diameter of the tilt pin (1) and install the release head with gas cylinder included on the tilt pin.
2. Install the retaining ring (2) to secure the release head to the tilt pin.

Note: The release head (with the gas cylinder) must rotate freely on the tilt pin, with 0.025 mm (0.001 in) maximum movement.

3. Apply grease to the gas cylinder lower end mounting pin (3) on the lift truck frame.
4. Position the gas cylinder and column assembly on the lift truck frame.

Note: The fit of the gas cylinder to the mounting pin must not have free movement of more than 0.050 mm (0.002 in) maximum.

5. Attach the steering column to the lift truck with the a screw (4) and nut. (5).

Note: The screw and nut hold the steering column in position while the other screws are installed.

6. Install the three screws (4, 6). Torque the screws and nut to 48–87 N m (35–64 ft lb).
7. Install the directional control lever on the steering column with four screws (7). Torque the screws to 4–6 N m (35–53 in lb).
8. Check the tilting and locking functions of the steering column assembly after it is mounted to the frame.

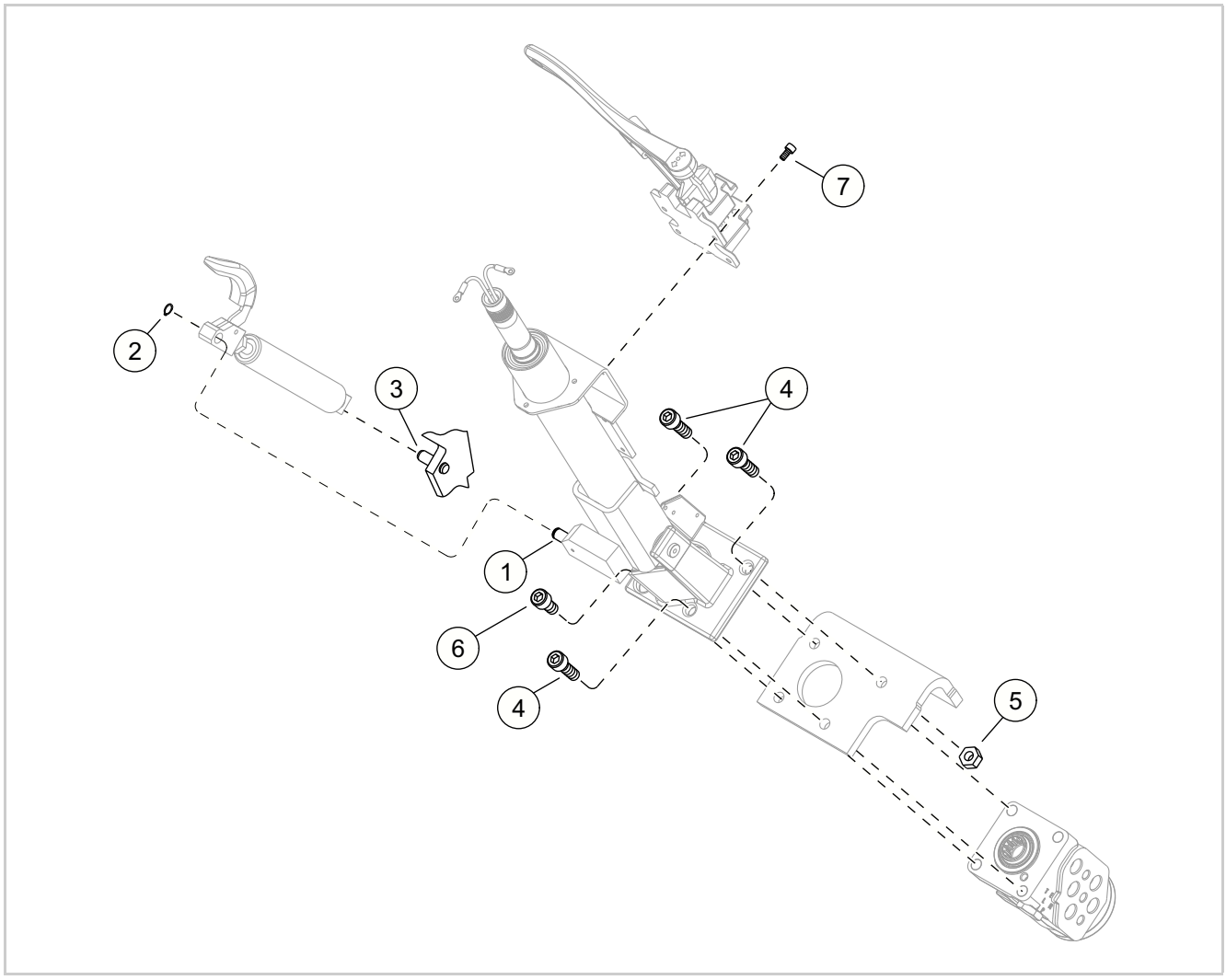


Fig. 12 (31237)

Shim Removal

Under certain circumstances it may be necessary to remove shims with the mast assembled. When necessary, refer to the following procedures.

WARNING

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

Mast Column Rollers

1. To access column rollers at top of the mast, completely lower the mast. To access column rollers at bottom of the mast, raise mast to a position where the column roller that requires adjustment is accessible.
2. Securely block the mast. Refer to Control of Hazardous Energy section for proper mast blocking procedures.
3. To access shims behind the column roller, use a pry bar to push column roller out.
4. Locate the thinnest shim and push it away to isolate it from the rest. Refer to Figure 17407.
5. Using a hammer and chisel, break and remove the thinnest shim.

Never remove the thickest shim. Its removal will cause the mast to be loose.

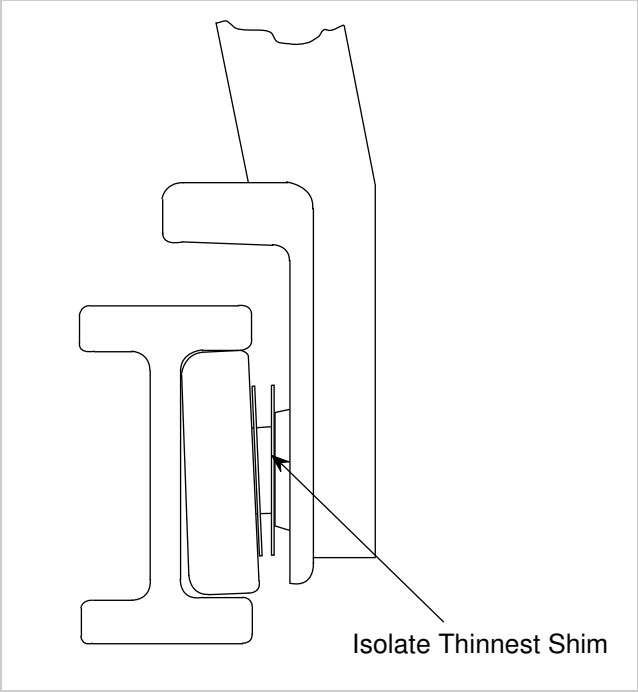


Figure 17407

18. Verify all mast stop blocks are in place. When assembling mast stop blocks to outer mast, apply thread locking adhesive (blue) 061004-006 to mounting bolts. Torque bolts 170 - 190 Nm (125 - 140 ft lb).
19. Connect battery.
20. Run operational check on mast assembly. Verify mast operates smoothly and does not bind.
21. Check for oil leaks.
22. Lubricate all grease fittings on mast.
23. Lubricate mast channels as needed.

Refer to Lubrication and Adjustment section for additional information on lubrication points and intervals.

Tilt Cylinder Adjustments

Refer to the Electrical and Cylinder service sections for adjustments.

WARNING

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

In this section you will be required to lift and block the truck and mast, use a lifting device to raise and lower different components for removal and installation. It will be necessary to disconnect and remove the battery from the truck, disconnect tilt cylinders from the mast, disconnect electrical connections and hydraulic lines. Section MA, "Control of Hazardous Energy" provides information for performing the above procedures along with some additional information on other procedures dealing with truck maintenance. This section should be read and reviewed prior to mast removal, installation and maintenance as outlined in this section.

2. Refer to Figure 12851-01. Insert the tools (4) between the ram (1) and the cylinder walls (2), 180 degrees apart, and screw into the face of the packing (3). After the threads are sufficiently secured into the packing, evenly pull on the screwdriver handles until the packing is removed.

NOTE

Extreme care should be taken to prevent damage to cylinder wall and ram assembly.

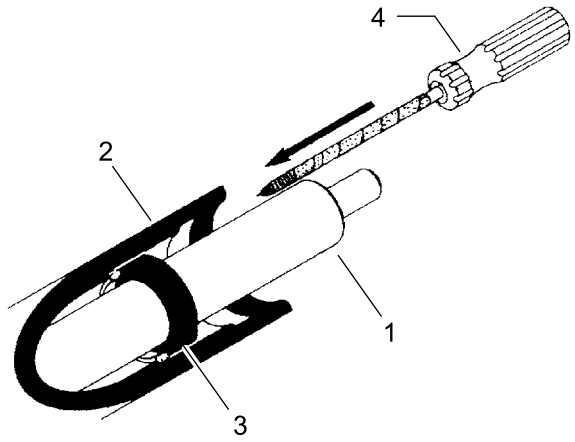


Figure 12851-01

3. Remove the wiper ring, since packings and wiper rings should always be replaced in pairs.
4. Thoroughly clean the area where the seals seat. Remove any burrs, dirt or seal debris before re-installing new seals.

CAUTION

Make a close inspection of seal seating critical areas before installing the new seal. Refer to Figures12892-01 and 12852-01. Your seal failure may not have been caused by a worn seal, but rather, by burrs, nicks and dirt located on the seal seating area, causing the seal to deform and lose its sealing ability.

Seal Installation - General

- Use tools made of soft metal or suitable plastic, free of burrs and sharp edges to install hydraulic seals. Do not use screwdrivers or other similar tools as they may damage the sealing edges.
- Make sure the area in contact with the seal is free of burrs, sharp edges and nicks.
- If necessary to force seal over sharp edges, slots or undercuts, use protective devices such as a Poly-Pak tool.
- Apply light lubrication to the seal and installation groove prior to installation. Use the same oil that will be used in the cylinder.

Rod U-Cup Installation

Small U-Cup

Refer to Figure 12892-01.

Installation Tools

- A groove alignment plug (1) that is flush with groove edge. Use any metal or plastic material which is smooth and lubricated.

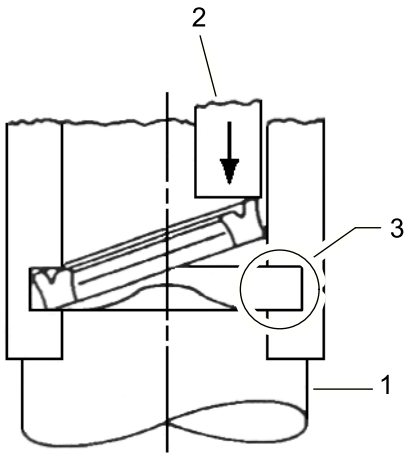


Figure 12892-01

1 Groove Alignment Plug
2 Pusher Rod
3 Critical Seal Seating Area

- A soft metal or plastic pusher rod (2).

Installation Procedure

1. Squeeze U-cup together and insert end into bore first.

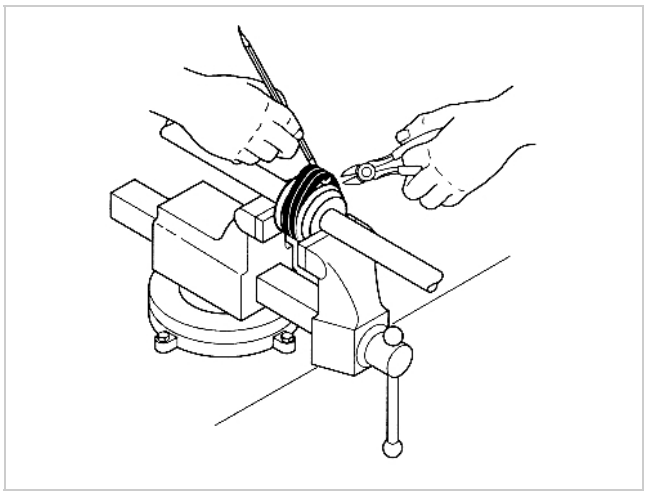


Fig. 28 (16059)

Assembling the hook-on sideshifter cylinder

1. Clean the seals with an emery cloth. Make sure that the seals slide over the piston and retainer chamfer.

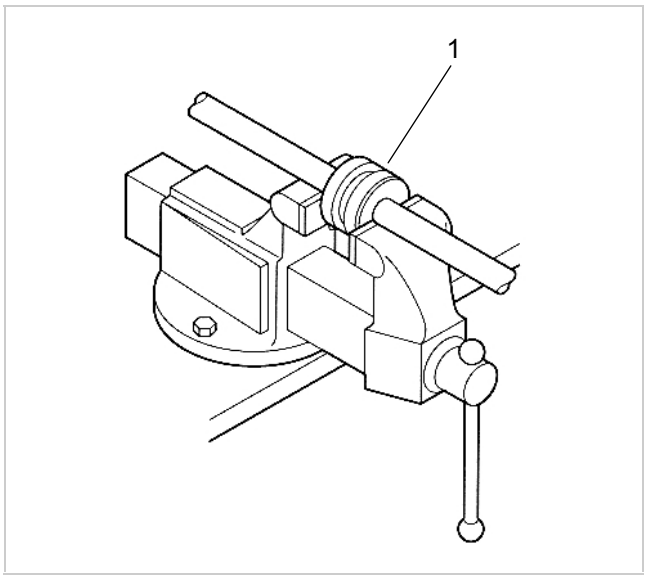


Fig. 29 (16060-01)

1	Piston and retainer chamfer

2. Wash the components with cleaning solvent and lubricate the new seals and rings.

Note: Make sure that the u-cup seals are installed in the correct direction. If you install the u-cup seals backwards, they will not work as designed.

3. See Figure 22. To install the new seals, hook one side of each seal in the groove and push the seal over the piston or retainer.
4. Lubricate the inside of the cylinder shell, piston seals, and retainers.
5. Insert the rod assembly into the cylinder shell. If the rod assembly does not slide easily into the cylinder shell, tap the end of the rod assembly with a rubber mallet.
6. Push the retainers into the shell. Make sure that there is room to install the retaining rings.
7. Pull the rod out from the shell on one side to position the retainer. Install the spiral snap ring. Repeat this process on the other side of the shell.

Sideshifter Maintenance

NOTE

Refer to Lubrication & Adjustment chapter for appropriate lubricant and planned maintenance intervals.

Refer to Figure 20686.

1. Lubricate the sideshifter carriage slide at the two upper bearing grease fittings (1).
2. Operate carriage from one side to the other to distribute the grease.
3. Using a paint brush, apply a light film of grease on the upper part of the sideshifter carriage (2).

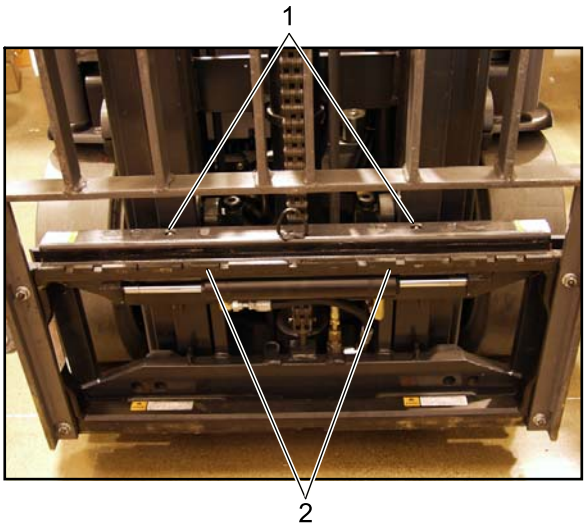


Figure 20686

Refer to Figure 20687.

4. Inspect lower hooks (3) for damage or loose fasteners.
5. Lubricate lower bearing pads with brush or spray on lubricant. Refer to the “Lubrication & Adjustment” chapter for appropriate lubricant information.

NOTE

Lubricant is not recommended in applications that have abrasive contaminants such as grind dust, metal shavings, etc.

6. Torque lower hook fasteners to 163 Nm (120 ft lb).

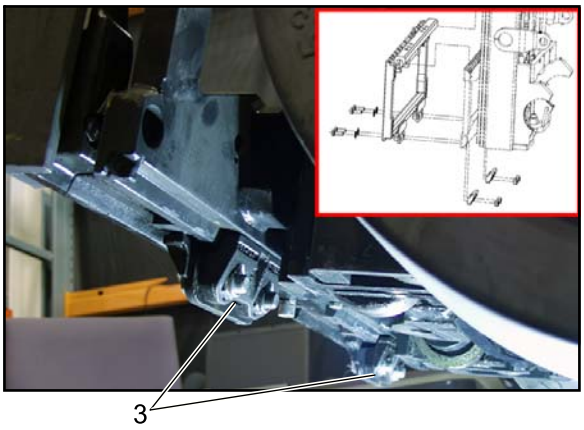


Figure 20687