



TSP6000 SERIES MAINTENANCE MANUAL



Order Number: 812564-006
Revision: A • Printed in Germany

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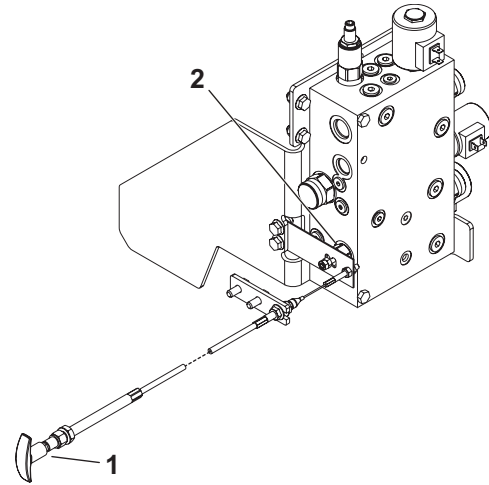
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HYDRAULIC SCHEMATIC	PAGE	SERIAL NO. CUT	REV.
Manifold Block Main Frame & Lift Cylinders	613		
Manifold Block Load Handler, with extending Forks	614		
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- Move truck to a secure non traffic maintenance area with a level floor.
- Lockout or tagout truck as described in Battery - Lockout/Tagout in this section. However, it must be sure that the truck is no longer supplied with battery voltage.
- Turn and hold the keyswitch to the “START” position for 30 seconds.
- Turn key switch to “OFF”, remove key.
- Or allow 5 minutes after battery disconnect for capacitors to discharge.

- Lockout or tagout truck as described in Battery - Lockout/Tagout in this section.



Hydraulic



WARNING

AVOID HIGH PRESSURE FLUIDS—Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

12727

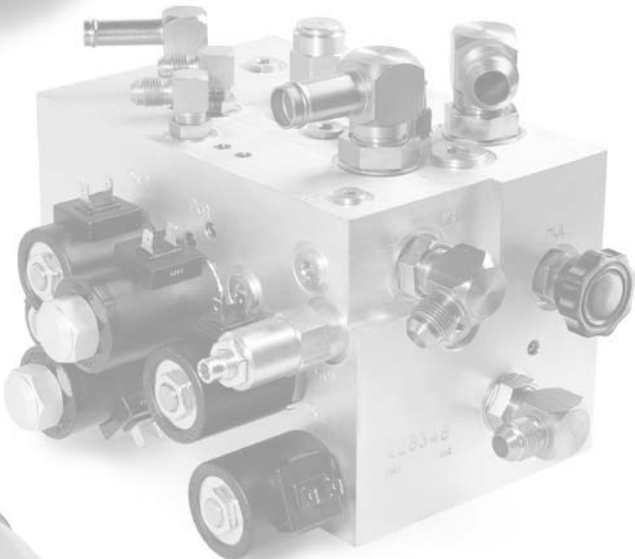
- 1 Handle for Manual Lowering Valve (MVL)
- 2 Manual Lowering Valve (MVL)

- Open power unit top, rear door and locate the manual lowering valve on the right edge towards the top of the power unit.
- Open the manual lowering valve to remove hydraulic pressure from the lift / lowering system.
- To depressurize the traverse System:
 Keep in mind the warning about high pressure fluids. Carefully loose the fitting at the sideshift hydraulic motor to relieve pressure.

Depressurizing the Hydraulic System

When maintenance is to be performed on the hydraulic system, make certain the hydraulic system is not under pressure:

- Move truck to a secure non traffic maintenance area with a level floor.
- No load on forks.
- Completely lower load engaging means (mast) or, if required for maintenance, block mast sections at appropriate height as described in Mast of this section.



INTRODUCTION

Alternate Lube Identification

Chart 2 - Alternate Lube Identification (Sheet 1 of 2)			
Type	Name	Manufacturer / Distributor	
A.	Gear Lube 75W-90 (Typical)	Mobilube1 SHC 75W-90* API GL-4 Dubois EG 0-75 & 90*	Mobil Dubois Chemical
B.	Grease (Multi-Purpose)	Union Unoba EP No.2 Retinax A* LM Grease Mobilgrease XHP 222 Special Unirex EP-2	Union 76 Co. Shell Burmah Castrol Mobil Exxon
BB	Grease (Low Temp.) ** (See Note 1)	Lubriplate Alvania RA* Helveum O*	Fiske Bros. Refining Co. Shell Burmah Castrol
C	Oil (SAE 40)		
D.	Hydraulic Oil	Union Unax AW ISO 32* Tellus 32* Hyspin AWS 32* Hydraulic AW-32 Sohio Energol HLP32 Nuto H 32	Union 76 Co Shell Burmah Castrol Mobil Sohio Exxon
DD.	Hydraulic Oil (Low Temp.) **	Mobil Aero HFA Tellus T-15* Hyspin AWH-15* Univis HVI 13 LT Hydraulic Oil	Mobil Shell Burmah Castrol Exxon Castrol HDL Inc.
DDD.	Hydraulic Oil ****	Mobil DTE 24	Mobil
E.	Channel Grease ***	Factran #2	Standard Oil Co.
	Chain and Cable Lube	Crown	Crown
G.	Premium Chain and Cable Lube	Crown	Crown
H.	Rubber & Vinyl Dressing	Armoral Protectant Clear Guard	Meckesson Corp. Turtle Wax Inc.
I.	Grease (Lift Pump Coupling)	Nyogel 774F-MS	NYE Lubricants
J.	Brake Fluid — Dot 5	Q2-1141 Silicon Brake Fluid	Dow Corning
K.	Grease (Wheel Bearing)	Mobilgrease XHP 222 Special Unirex EP-2 Lubriplate No. 1242*	Mobil Exxon Fiske Bros. Refining Co.
L.	Metal Assembly Spray	Dow Corning	Dow Corning
M.	Silicon Grease (Clear)	Dow Corning 111 Compound	Dow Corning



LUBRICATION & ADJUSTMENT

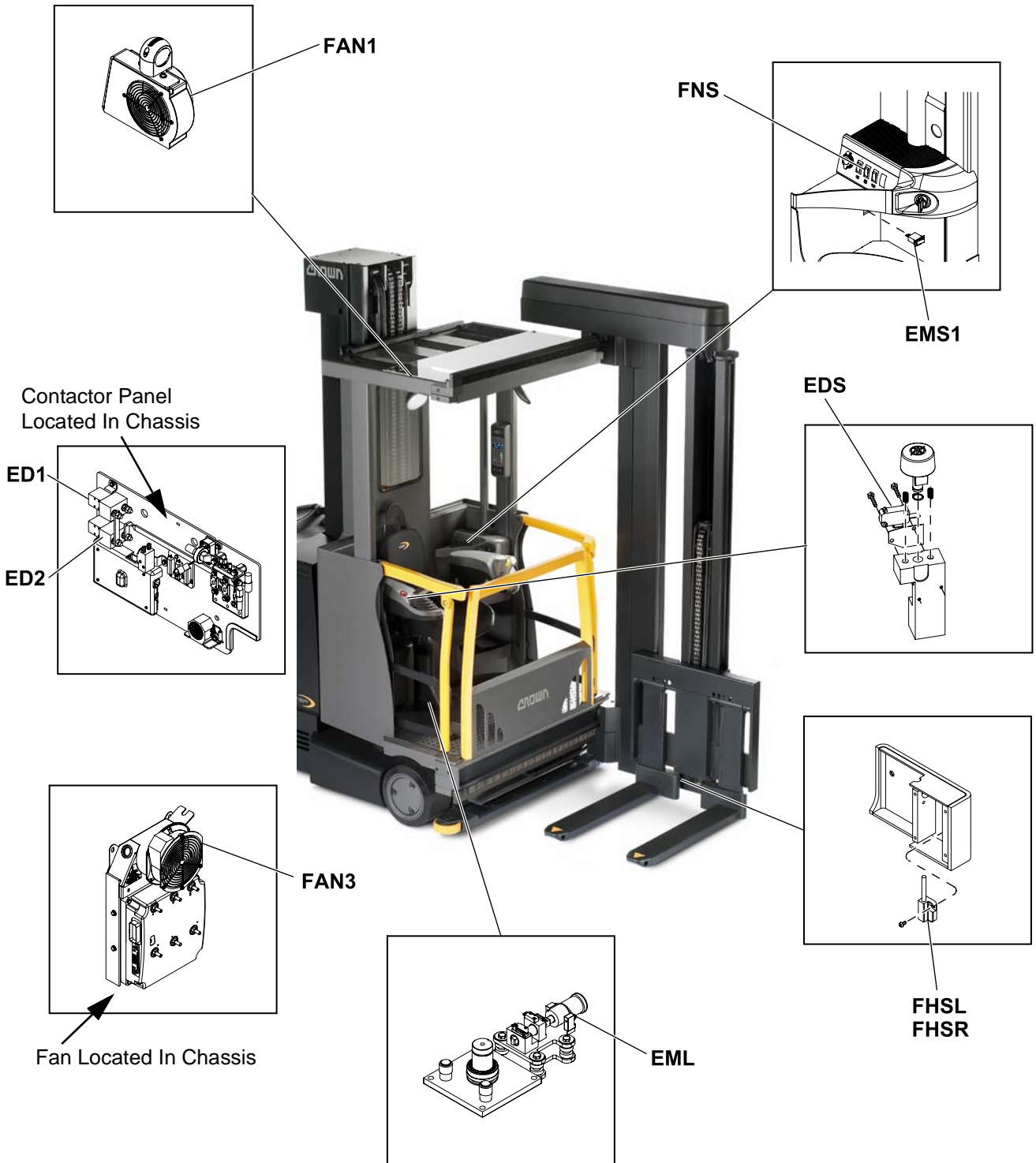
Maintenance Intervals

Charts Part 4

Index	Component	Lube Type	Qty.	60 da. 250 hr.	90 da. 500 hr.	6 mo. 1000 hr.	12 mo. 2000 hr.
L-26	Cylinder Yoke	B	AR	L			
L-27	Fork Slip Pin	B	AR	L			
L-28	Lift Chain	G	AR	L			
L-29	Mast Channels	E	AR	L			
L-30	Mast Pulleys	B	AR	L			
L-31	Mast Column Rollers	F	AR	L			
L-32	Pivot Chain	G	AR	L			
L-33	Pivot Cylinder Mount	B	AR	L			
L-34	Fork Slides	F	AR	L			
L-35	Traverse Gears	F	AR	L			
L-36	Traverse Pinion (4 Lub. Fittings)	B	AR	L			
L-37	Traverse Racks	F	AR	L			
L-38	Hydraulic Motor Chain	G	AR	L			

Index	Component	60 da. 250 hr.	90 da. 500 hr.	6 mo. 1000 hr.	12 mo. 2000 hr.
I-40	Chain Anchors & Retainers	I			
I-41	Column Rollers & Channels	I			
I-42	Forks	I			
I-43	Hydraulic Lines, Hoses & Fittings	I			
I-44	Lift Chain	I			
I-45	Lift Cylinder	I			
I-46	Lift Limit Switch	I			
I-47	Pivot Cylinder	I			
I-48	Hydraulic Motor	I			
I-49	Traverse Limit Switches	I			

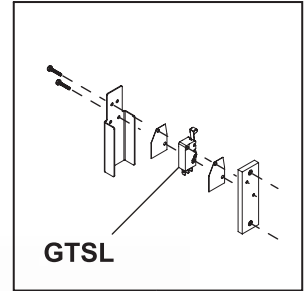
L = Lubricate I = Inspect / Adjust AR = As Required



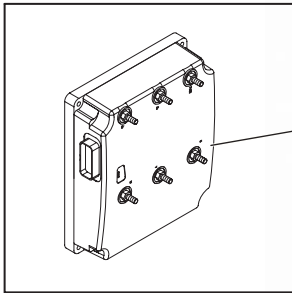
13976



GUS



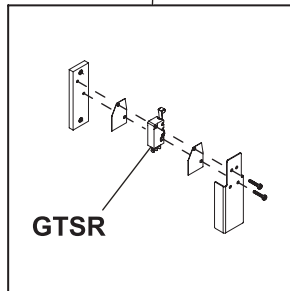
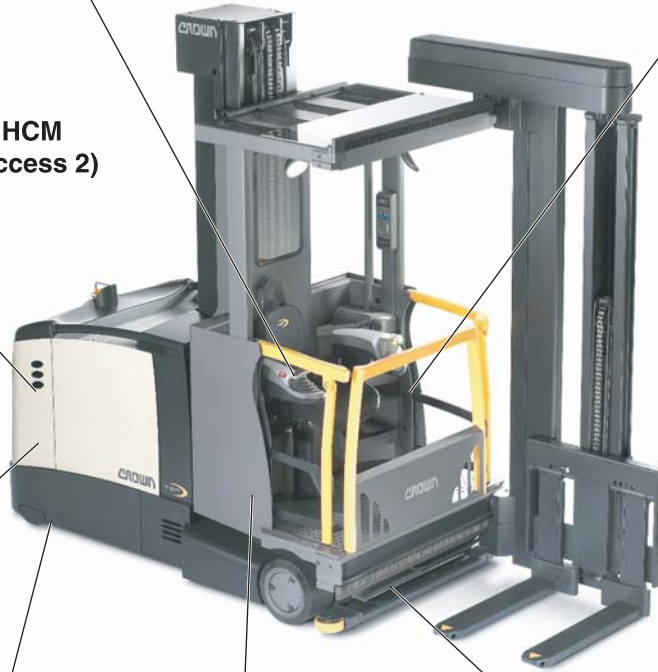
GTSL



**HCM
(Access 2)**

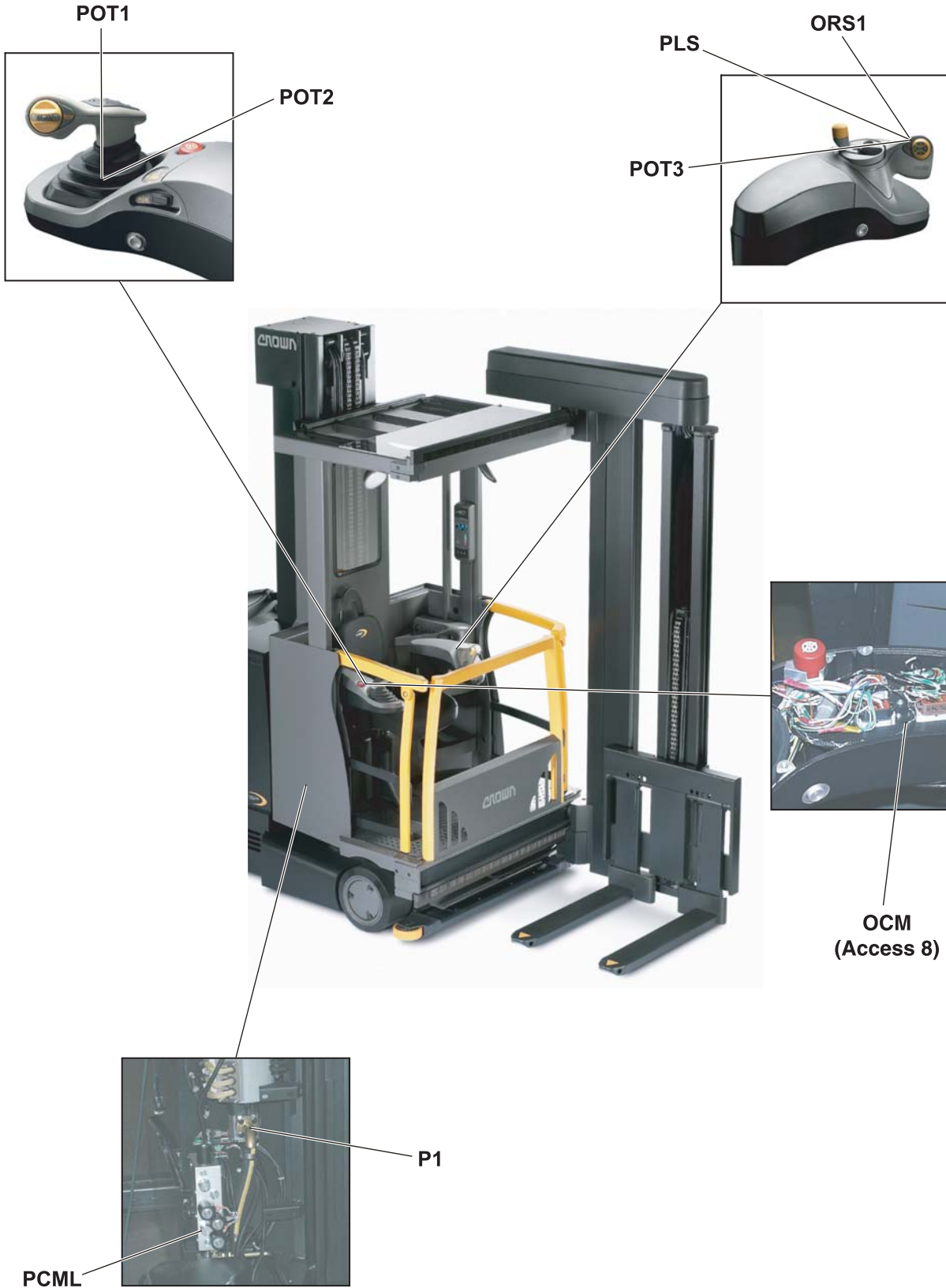


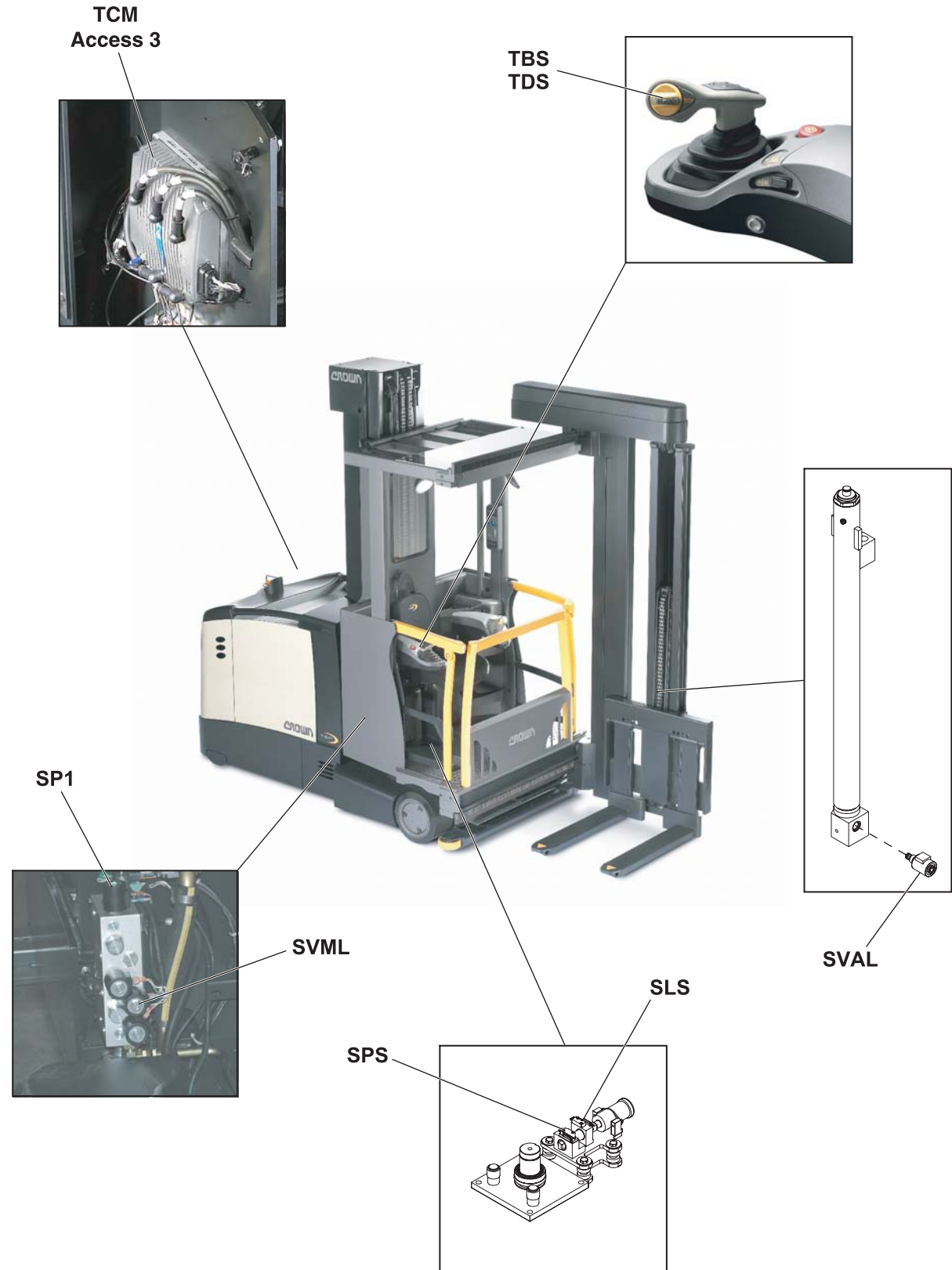
**GCM
(Access 6)**



GTSR







12808

General

The hydraulic system is powered by a gear type pump (P1) driven by a three phase AC motor.

Maximum pressure is limited by an adjustable relief valve (RV1). The setting for RV1 is noted on the hydraulic schematics. Refer to the *Table of Contents* for pump, valve and manifold information.

To lower the operator compartment in an emergency or for service, this can be done by operating the manual lowering valve even with battery disconnected.



WARNING

Before using Manual Lowering Valve warn operator to keep all body members within the operator compartment. Make sure the forks are clear of the rack. Close valve immediately if chains become slack.



WARNING

Avoid high pressure fluids! Escaping fluid under pressure can penetrate the skin causing serious injury.

- *Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.*
- *Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.*

Hydraulic Lines and Fittings

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

- All hoses and lines are to be clear of any surface or edge which will cause damaging wear and cuts, or on which they can become caught.
- All connections are to be leak free.
- The beaded elbows in suction ports of all pumps must be positioned such that the suction hose retains its full volume flow and does not collapse.

Freezer Preparation

Crown trucks may require a mixture of low temperature hydraulic oil, Crown P/N 063001-006 (gal.), blended with standard hydraulic oil, Crown P/N 063001-021 (gal.) when used in a freezer or cooler.

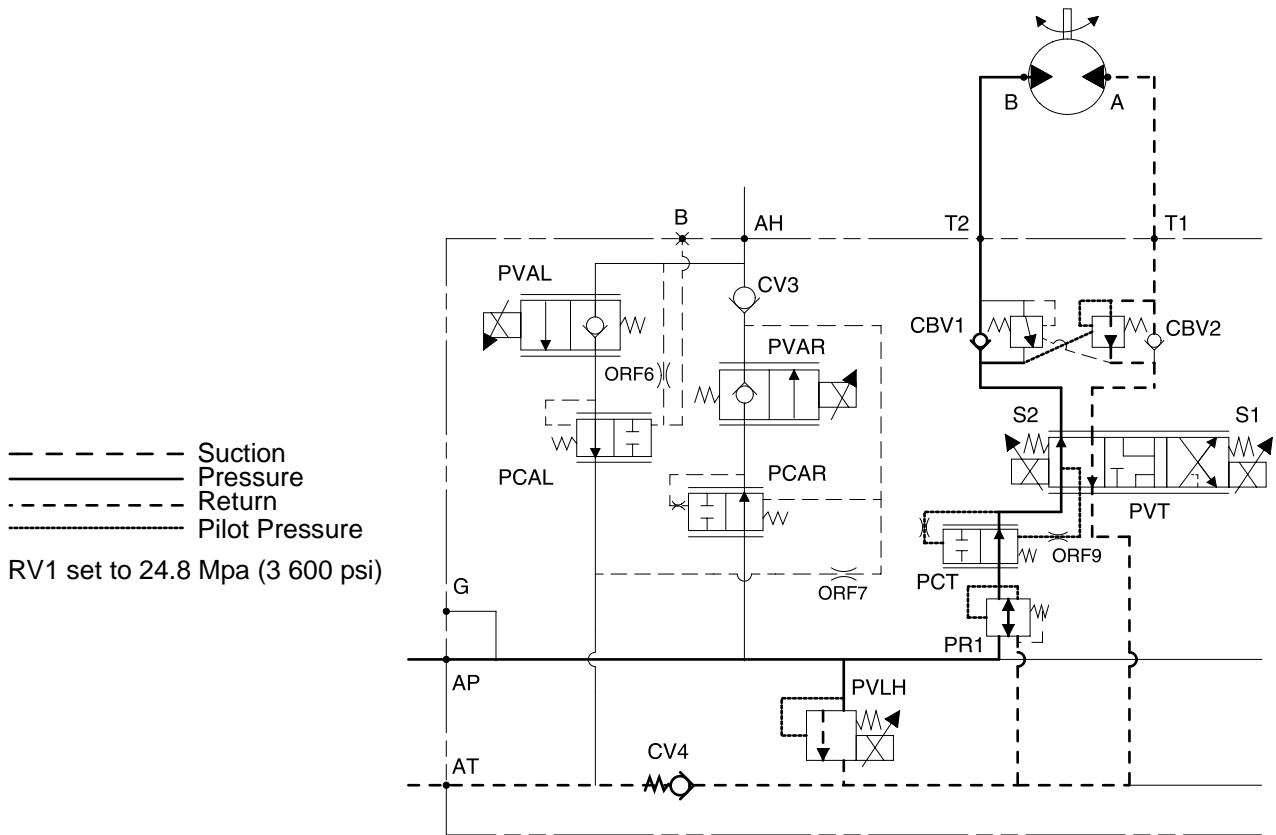
100% low temperature oil is too thin for most cold storage operations and therefore could shorten the life of cylinder packings and pumps if used in higher ambient temperatures.

NOTE

Trucks equipped with velocity fuses may experience staging issues if an insufficient mix of low temperature oil has been used.

- For trucks operating continually in temperatures at or above 0 °C (32 °F) use 100% standard hydraulic oil (063001-001).
- For trucks operating continually at temperatures at 0 °C (32 °F) or below, use an 80:20 blend: 80% low temperature (063001-006) and 20% standard hydraulic oil (063001-021) (2).

Traverse Left Circuit



12880

PVT provides proportional control of the traverse function. When traversing right, S1 coil is energized, moving PVT spool right; when traversing left, S2 coil is energized moving PVT spool left (S1 is the top coil and S2 is the bottom coil). Access 7 controls PVT by varying the applied voltage to the coils. The more voltage applied to PVT coils, the more PVT spool moves which permits more oil to flow to the traverse motor.

Two valves in the load handler manifold control the pressure setting for the traverse circuit, PVLH and PR1.

When traverse only is requested, the valve pressure settings are the same so the valves perform the same function. However, when more than one load handler function is requested, pressure settings may be different.

For example, if auxiliary lift and traverse are selected, PVLH will be electronically adjusted by Access 2 up to 24.1 MPa (3 500 psi) to ensure adequate pressure for lift while PR1 is factory set to limit the pressure to 16.5 MPa (2 400 psi) to ensure proper pressure for traverse.

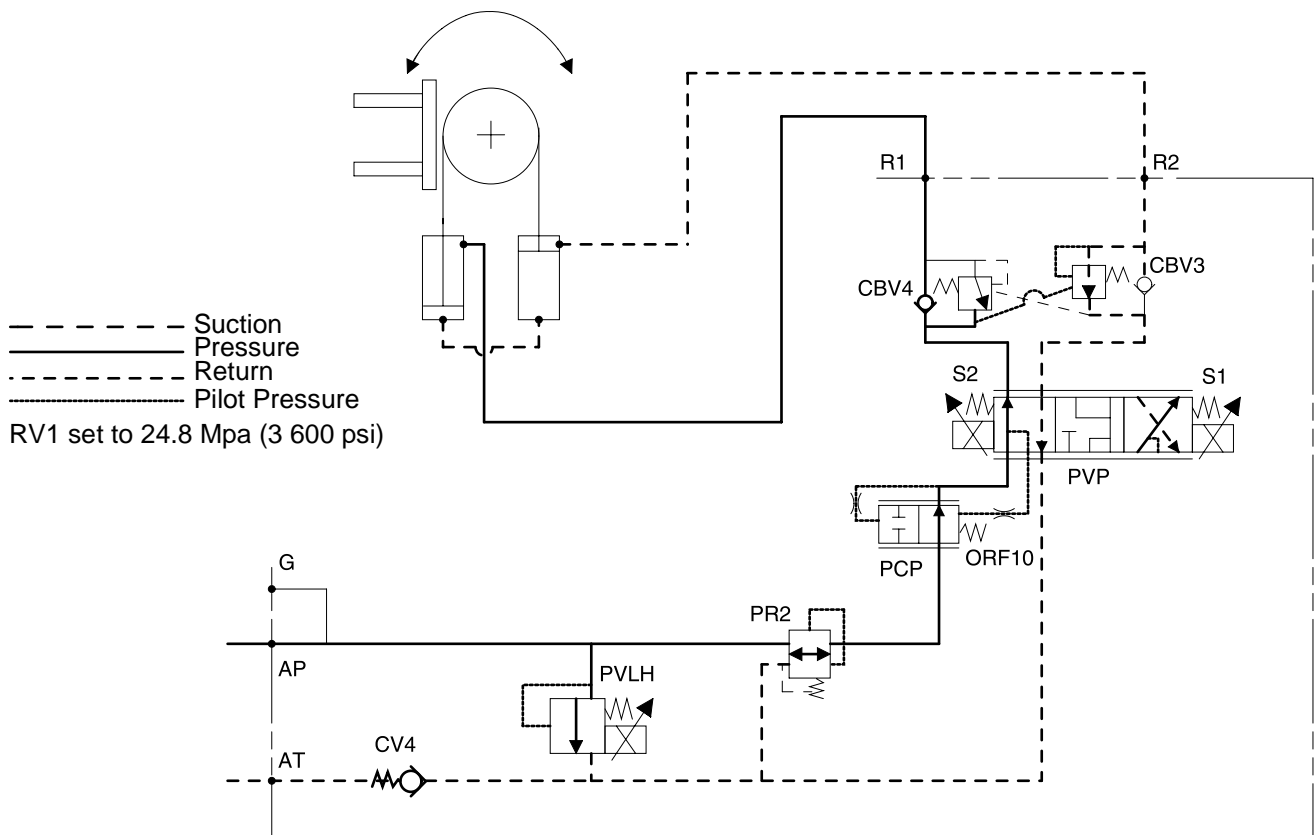
When an operator requests traverse left, Access 7 energizes PVT S2 coil shifting the valve spool in proportion to operator's request. Access 7 also energizes PVLH coil adjusting the pressure setting to 9.7 MPa (1 400 psi).

Oil flows from the main frame manifold into port AP of the load handler manifold to PVLH. PVLH pilot line senses the pressure and if the pressure is greater than 9.7 MPa (1 400 psi), PVLH's spool will move and divert some of the flow to the reservoir. As oil flows through PR1, pilot pressure is delivered to the left side of PR1.

If pressure is greater than 16.6 MPa (2 400 psi) downstream of PR1, pilot pressure will overcome spring force and shift PR1's spool to the right restricting flow to PCT limiting the pressure to 16.6 MPa (2 400 psi).

Oil flows through PCT, PVT to CBV1. Pressure is diverted to CBV2 through a pilot line. Oil flows through CBV1, out port T2 and into the traverse motor. Return oil flows from the traverse motor through CBV2's upper pilot line shifting CBV2's spool and creating a path for return oil.

Pivot Left Circuit



12885

PVP is the proportional valve that controls the pivot function. When pivoting left, S1 coil is energized moving PVP spool to the left and when pivoting counter-clockwise, S2 coil is energized moving PVP spool to the right (S1 is the top coil and S2 is the bottom coil). The hydraulic control module, Access 7 controls PVP by varying the applied voltage to the coils. The more voltage applied to PVP coils, the more PVP spool moves which permits more oil to flow to the pivot cylinders.

Two valves in the load handler manifold control the pressure setting for the pivot circuit, PVLH and PR2. When pivot only is requested, the valve pressure settings are the same so the valves perform the same function. However, when more than one load handler function is requested, pressure settings may be different. For example, if auxiliary lift and pivot are selected, PVLH will be electronically adjusted by Access 7 up to 24.1 MPa (3 500 psi) to ensure adequate pressure for lift, while PR2 is factory set to limit maximum pressure to 9.7 MPa (1 400 psi) to ensure proper pressure for pivot.

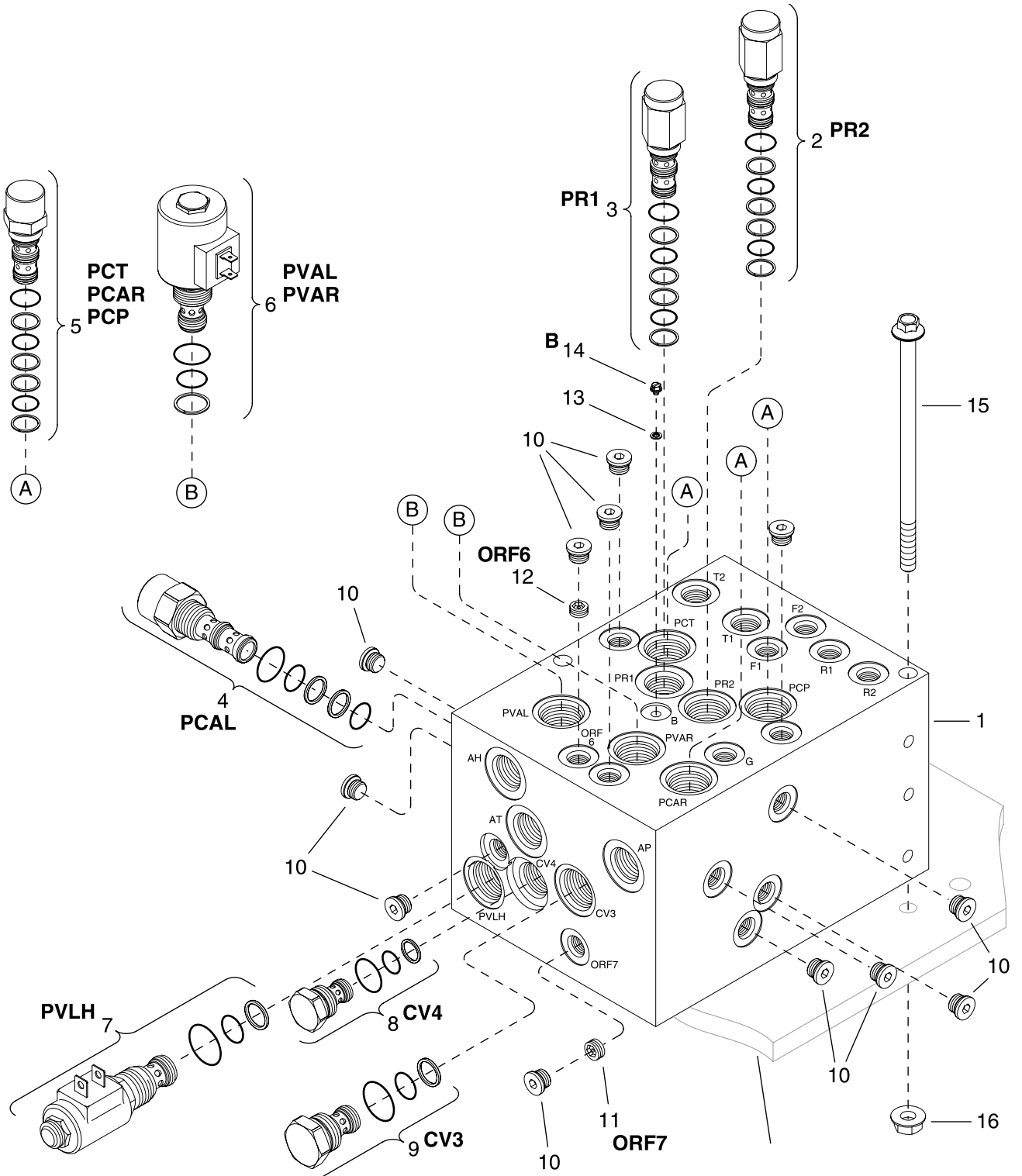
When an operator requests left pivot, Access 7 energizes PVP S2 coil shifting the valve spool in proportion to operator's request.

Access 7 also energizes PVLH coil adjusting the pressure setting to 9.7 MPa (1 400 psi). Oil flows from the main frame manifold into port AP of the load handler manifold to PVLH. PVLH pilot line senses the pressure and if pressure is greater than 9.7 MPa (1 400 psi), will move PVLH's spool and divert some of the flow to the reservoir.

Oil flows through PR2. Pilot pressure is delivered to the top of PR2. If downstream pressure is greater than 9.7 MPa (1 400 psi), pilot pressure will overcome spring force and gradually move PR2's spool down restricting flow to PVP limiting pressure to 9.7 MPa (1 400 psi).

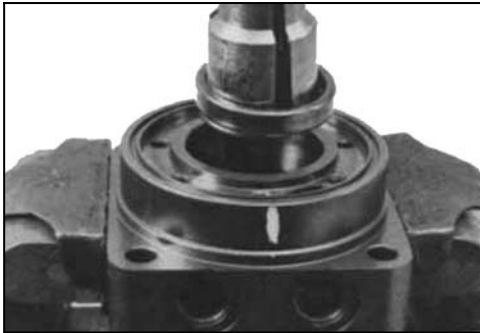
Oil flows through PCP and PVP to CBV4, and pilot pressure is applied to CBV3 to open CBV3 for return flow. Oil flows through CBV4, out port R1 of the load handler manifold and into the front left pivot cylinder causing the left pivot cylinder piston rod to retract.

Manifold - Load Handler, Illustration 1

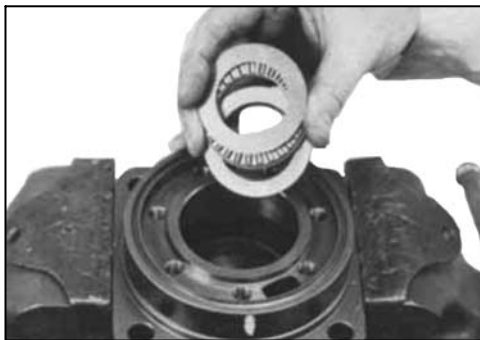


12543

previously retained in the housing by bearing/bushing (12). Refer to Figure 12946 and 12947.



12946



12947

flame or light. Avoid producing sparks as these can cause fatal injuries.

Wash all parts in clean petroleum-based solvents before assembly. Blow them dry with compressed air. Remove any paint chips from mating surfaces of the end cover, commutator set, manifold rotor set, wear plate and housing and from port and sealing areas.

- If housing (18) bearing components were removed for replacement, thoroughly coat and pack a new outer bearing/bushing (19) with clean corrosion resistant grease. Recommended grease is E/M Lubricant No. K-70M, Crown No. 107334.
- Press the new bearing/bushing into the counterbore at the mounting flange end of the housing using a special bearing mandrel, refer to Figure 12923 (see page 122). This bearing mandrel will seat the bearing/bushing (19) into the housing to a required depth of $3.84^{-0/+0.25}$ mm ($0.151^{-0/+0.1}$ in.) from the end of the bearing counterbore (see Fig. 12948)

NOTE

*Bearing mandrel must be pressed against the **lettered** end of bearing shell. Take care that the housing bore is square with the press base and the bearing/bushing is not cocked when pressing a bearing/bushing into the housing.*

Reassembly

Replace all seals and seal rings with new ones each time you reassemble the hydraulic motor. Lubricate all seals and seal rings with SAE 10W40 oil or clean grease before assembly.

NOTE

Individual seals and seal rings as well as a complete seal kit are available.

NOTE

Unless otherwise indicated, do not oil or grease parts before assembly.



12948

! DANGER

Explosion hazard! Be extremely careful when using any solvent. Do not smoke and do not use a naked

! CAUTION

If the bearing mandrel specified is not available and alternate methods are used to press in bearing/bushing (12) and (19), the bearing/bushing depths specified must be achieved to insure adequate bearing support

Drive Tyre

Replacement

NOTE

When installing a new drive tyre the new tyre must be lath cut. Refer to lath cutting instructions and tyre dimensions in this section.

1. Move truck to a secure non-traffic maintenance area with a level floor. Lower platform and forks, and chock load wheels (see Fig. 12899).
2. Open and remove power unit doors and turn drive tyre so lug nuts are accessible for removal and disconnect battery.



CAUTION

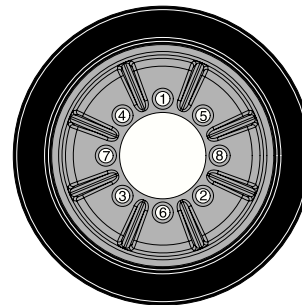
If truck is equipped with wire guidance make sure when raising rear of the power unit the jack does not damage the steer wheel wire guidance bracket.

3. Raise rear of power unit so drive tyre just clears the floor. Place hardwood blocks under each corner of power unit (see Fig. 12899). After blocks are in place and truck is secure remove jack. Refer to Control Of Hazardous Energy Lock/Tagout section for lifting and blocking instructions.



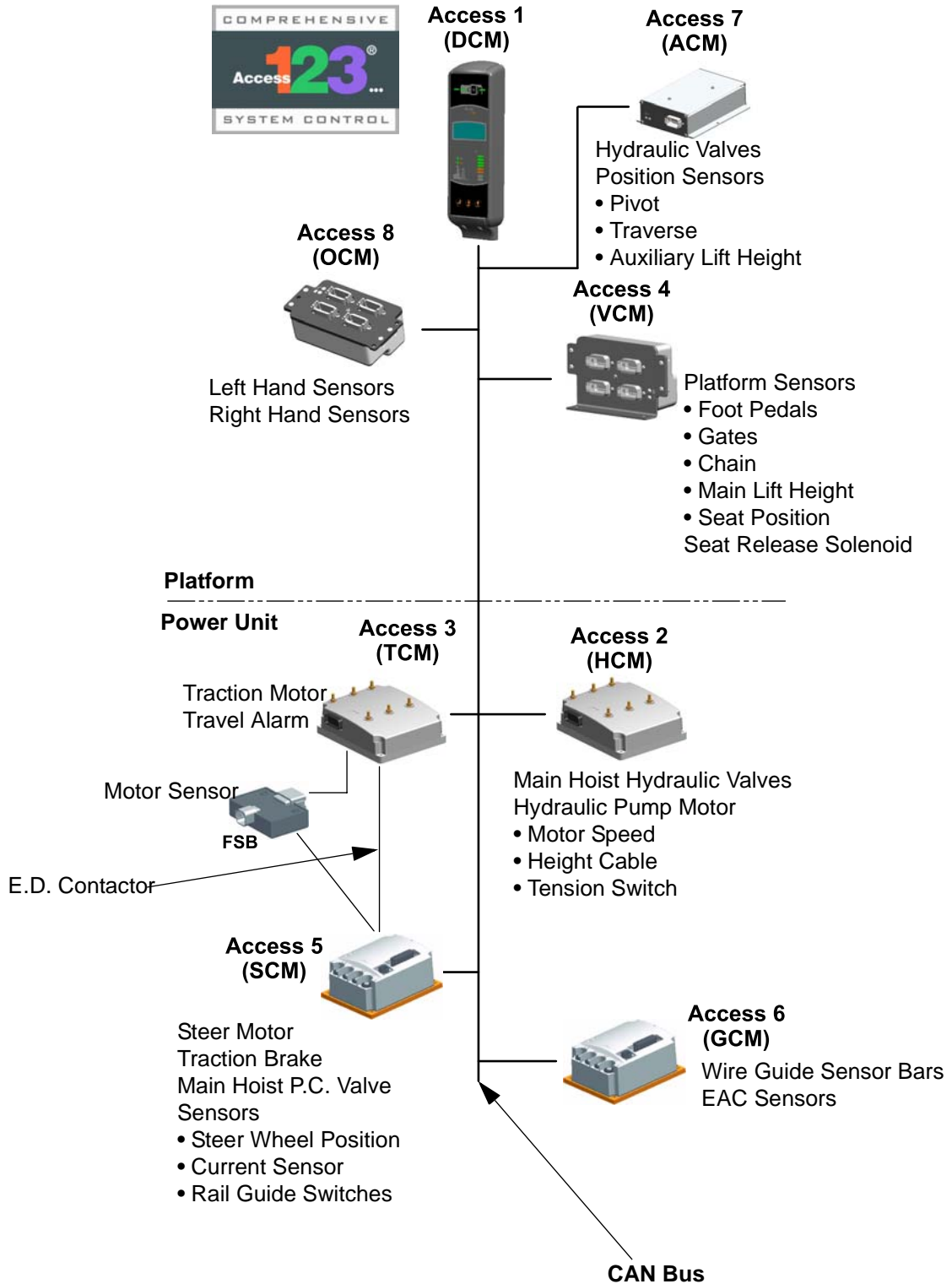
12899

4. Remove centre skirt to allow access to drive tyre and lug nuts.
5. Remove wire guidance bracket by the side of the steer wheel, on trucks equipped with wire guidance option.
6. Remove eight lug nuts and drive tyre from drive unit.
7. Press existing tyre off of hub.
8. Inspect hub for any damage and replace as needed.
9. Remove any paint that may be present on tapered lug seats or on inner hub face that contacts truck axle.
10. Verify replacement drive tyre being installed is of the correct type and size. The incorrect type of tyre can affect manoeuvrability and brake power of the truck. Refer to the parts manual for tyre part number selection.
11. Press replacement tyre onto hub. The outside of the hub must be pressed flush with the outside edge of the tyre.
12. Install tyre on truck and finger tighten lug nuts.
13. Torque lug nuts **in sequence** as illustrated in Figure 13885.

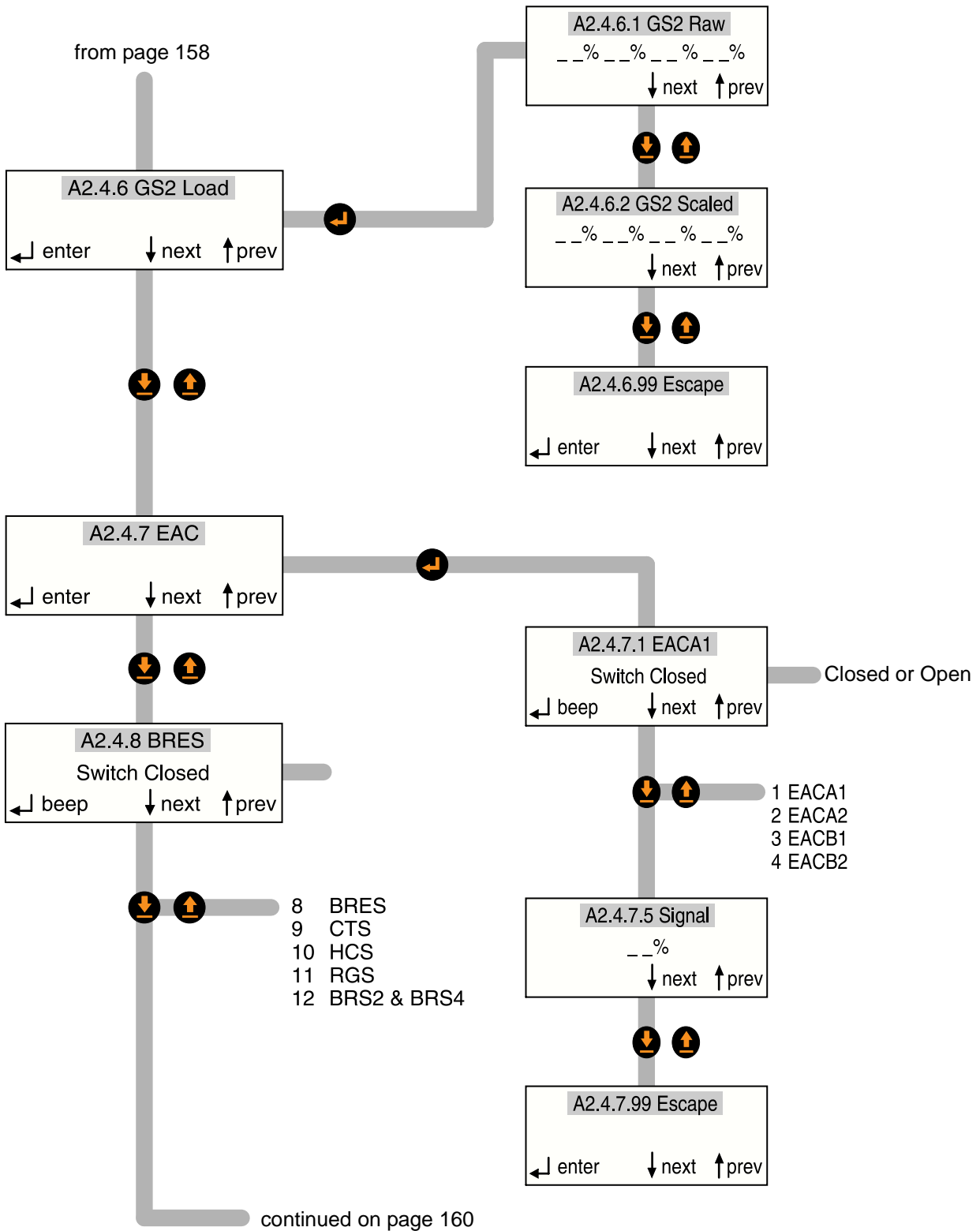


13885

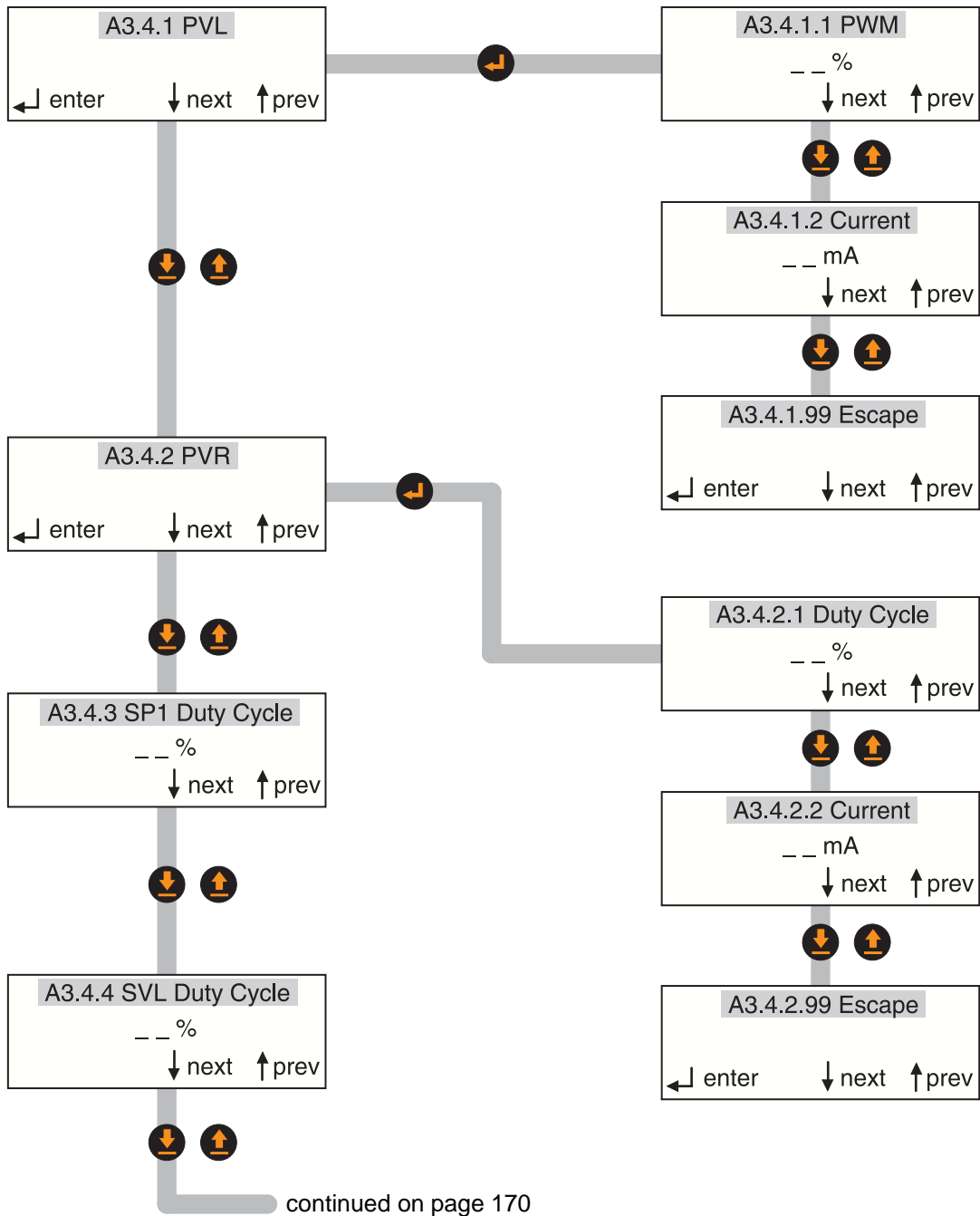
- First, torque nuts in the correct sequence to 41 - 54 Nm (30 - 40 ft lbs)
 - Second, torque nuts to 122 - 136 Nm (90 - 100 ft lbs)
 - Third, torque nuts to 205 - 216 Nm (151 - 159 ft lbs)
14. If truck is equipped with wire guidance reinstall steer wheel wire guidance bracket on truck.
 15. Install rear skirt on truck.



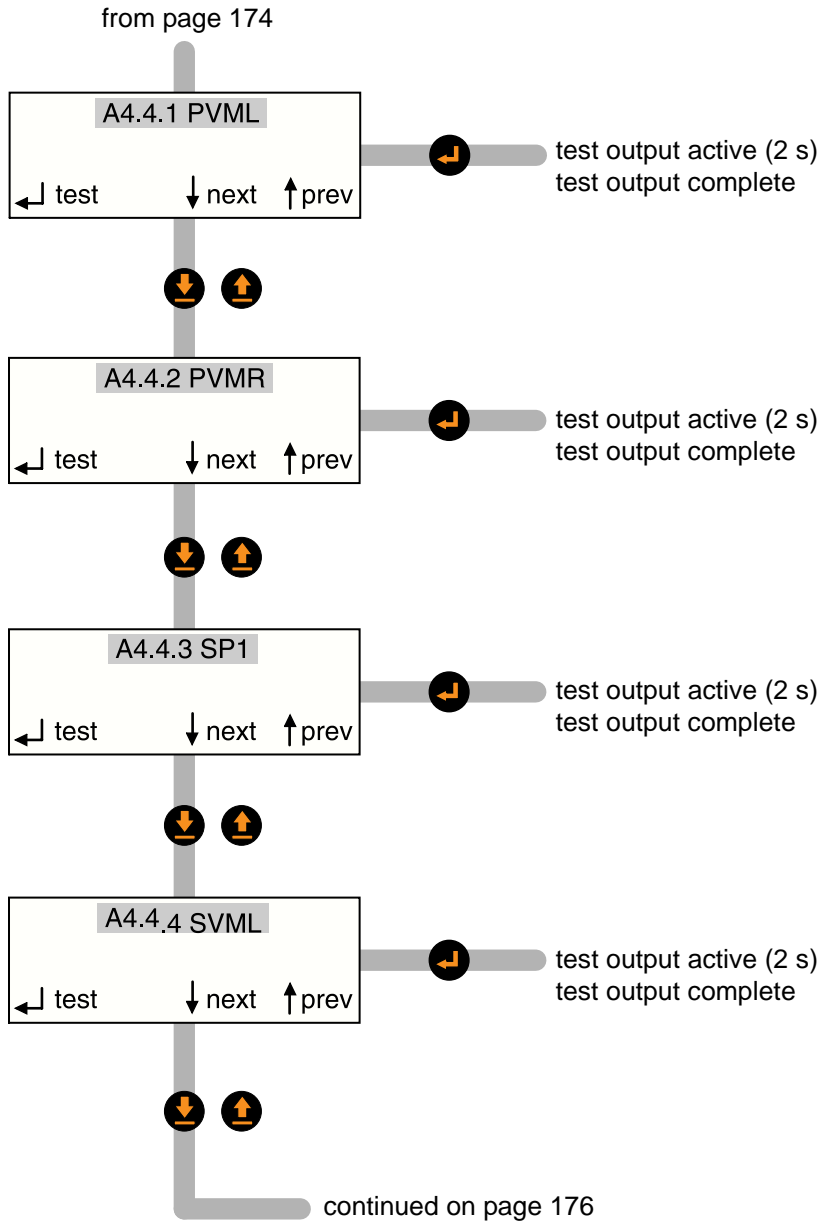
A2.4. – Power Unit Menu



A3.4 – Power Unit Menu



A4.4 – Power Unit Menu



13941

C2.4 – Main L Valve

from page 185

C2.4 Main L Valve
 Raise to Min, Lower
 to begin _ _ _ in

C2.4 Main L Valve
 Paused-Raise, Lower
 to cont _ _ _ in

This message occurs if you have reached the top and need to lower to continue.

C2.4 Main L Valve
 Finding Breakout
 maintain _ _ _ mA

Steps automatically from menu to menu.

C2.4 Main L Valve
 Finding Speed 1
 maintain _ _ _ mA

C2.4 Main L Valve
 Finding Speed 2
 maintain _ _ _ mA

C2.4 Main L Valve
 Finding Speed 3
 maintain _ _ _ mA

C2.4 Main L Valve
 Finding Speed 4
 maintain _ _ _ mA

C2.4 Main L Valve
 Finding Speed 5
 maintain _ _ _ mA

C2.4 Main L Valve
 Finding Speed 6
 maintain _ _ _ mA

C2.4 Main L Valve
 Stop Command

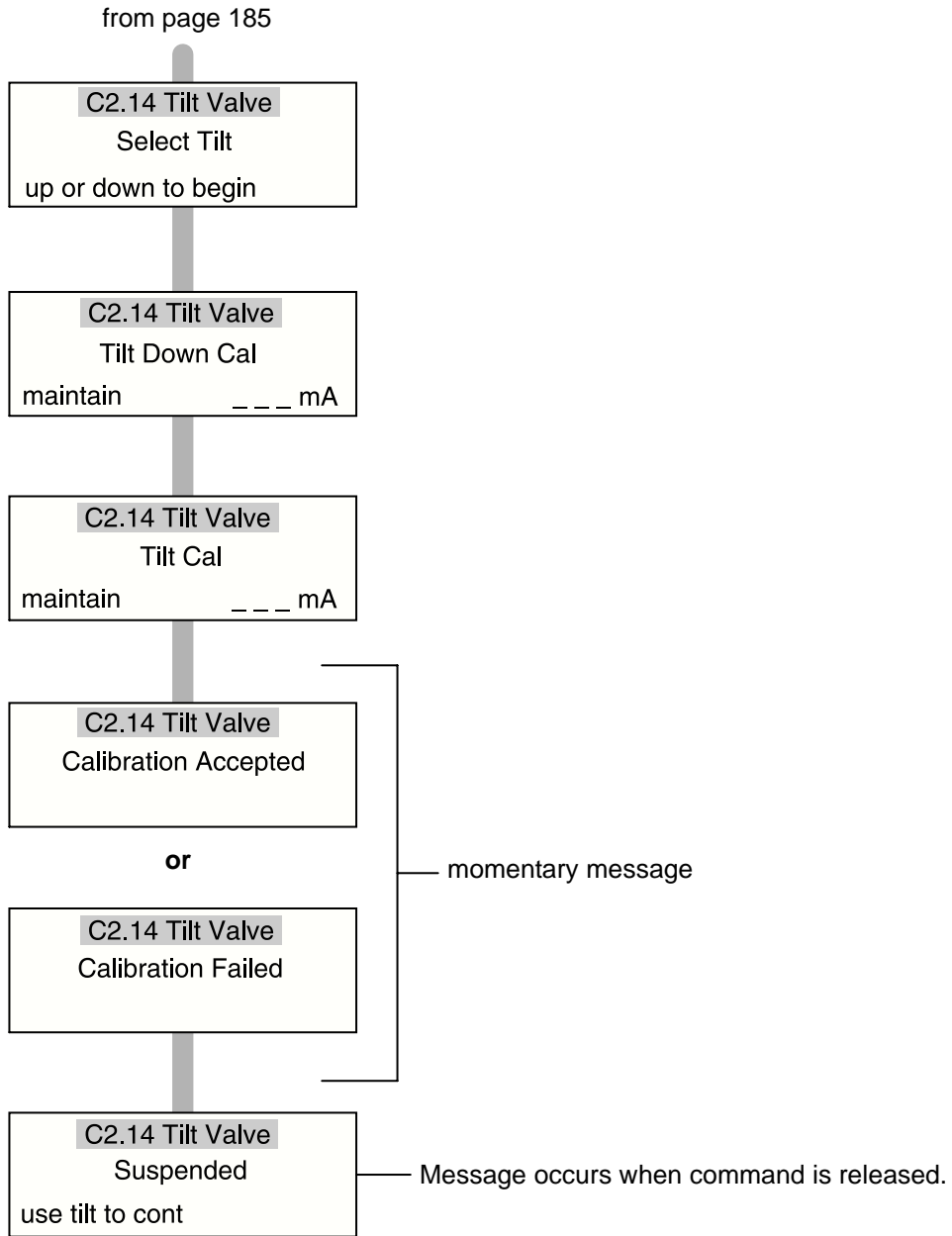
C2.4 Main L Valve
 Calibration Accepted

or

C2.4 Main L Valve
 Calibration Failed

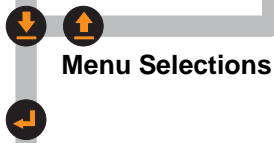
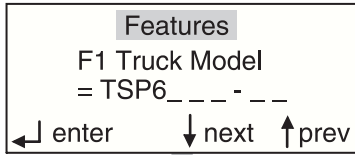
momentary message

C2.14 – Tilt Valve



13958

F – Features Menu

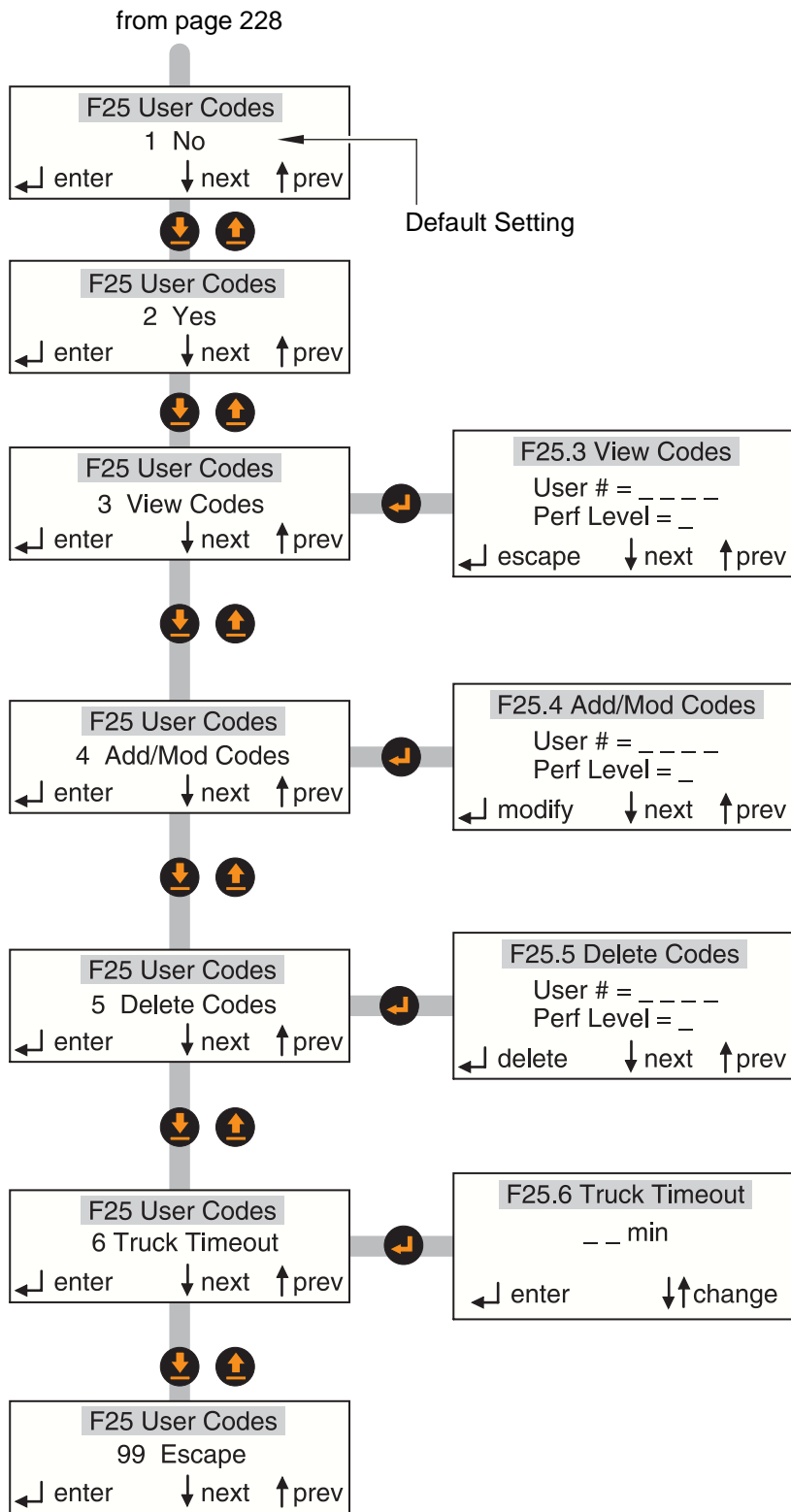


- F1 Truck Model
- F2 Mast Type
- F3 Measurement
- F4 Collapsed Height
- F5 Lift Height
- F6 Traverse Frame
- F7 Fork Type
- F8 Fork Length
- N/A ¹⁾ —
- F10 Pallet Width
- F11 Pallet Length
- F12 Battery Compartment
- F13 Truck Weight
- F14 Max. Load
- F15 Lift Motor
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- F17 Wire Guidance
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- F19 End Aisle Sense
- F20 Battery Retainer Switch
- F21 Travel Alarm
- F22 N/A
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- F24 User Performance
- F25 User Codes
- F26 Cold Condition
- F27 Options
- F28 Front Rail
- F29 Zone Switch
- F30 Aux. Mast
- F31 Screen Setup
- F99 Save

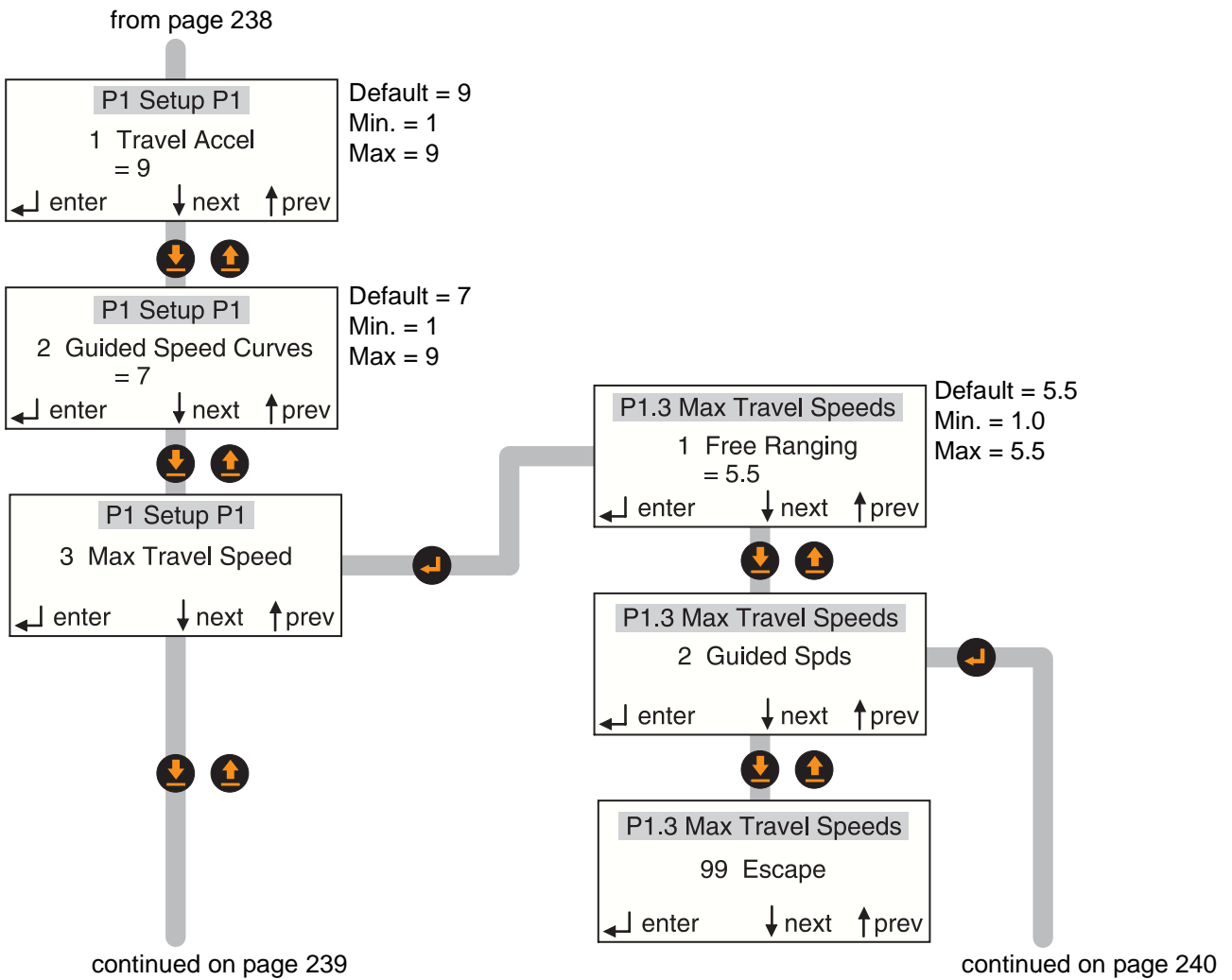
¹⁾ F9 is not available

Notes:

F25 – User Codes

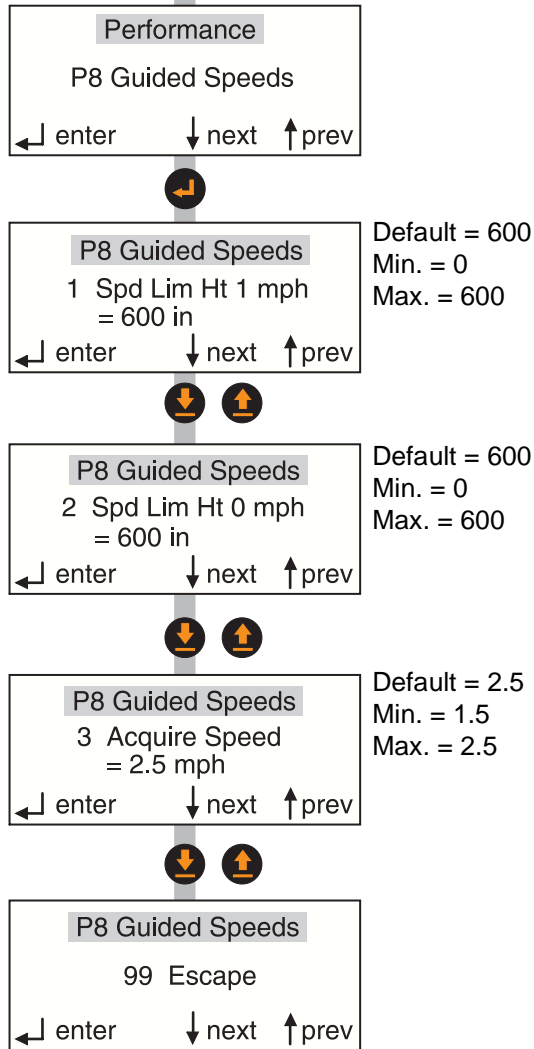


P1 – Setup P1



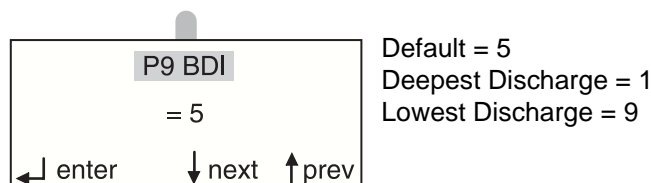
P8 – Guided Speeds

from page 248



14009

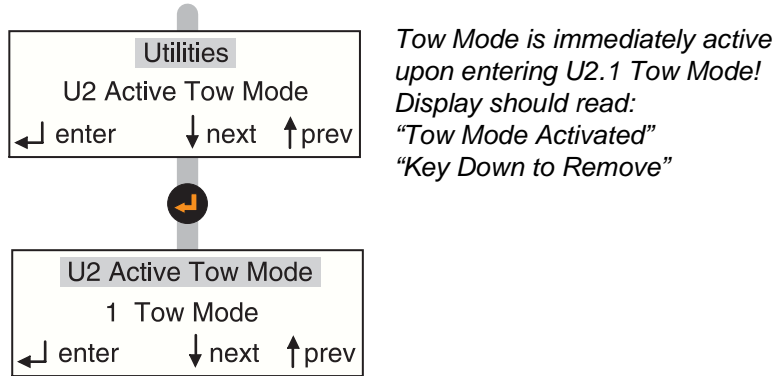
P9 – BDI



14009-1

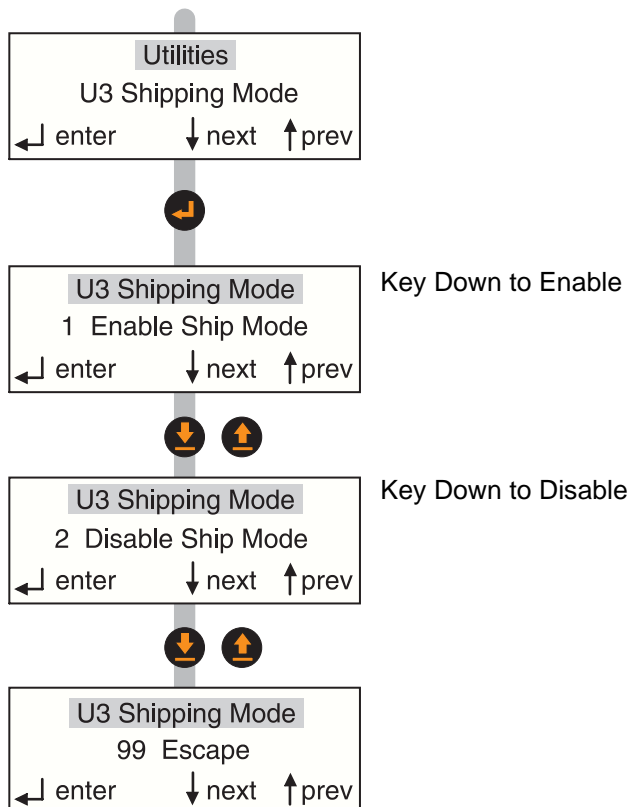
U2 – Tow Mode

from page 258



14016-1

U3 – Shipping Mode



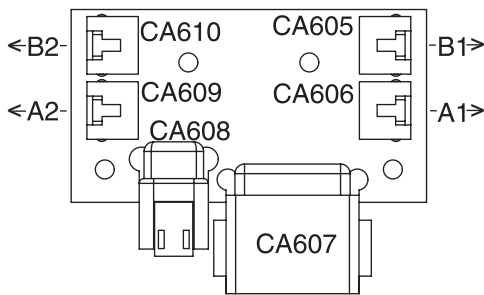
14016-2

U4 – Truck Lockout

truck's centre line provided the "B" sensors are a minimum of 100 mm (4 in.) from the "A" sensors.

Different sensors must be used for sensing north or south magnetic poles. Sensors for sensing north magnetic poles are standard

Located in the centre of the front bumper is a distribution module for interconnection of the EAC components (see Fig. 12977-EU). Signals from the sensors and EAC distribution module are connected to CA602, pins 1 through 14 on wire guidance module.



12977-EU

Wire Guidance Calibration Speed

Peak sensor wire guidance calibration

Peak sensor wire guidance calibration is performed in manual steering mode. End Aisle operations are not active in peak calibration (End Aisle Slow down/Stop). The truck speed is reduced either to the maximum or to 2.4 km/h (1.5 mph.)

Offset wire guidance calibration

Offset wire guidance calibration is performed in automatic mode, therefore EAC control is active.

EAC Zones

- Zone 1 - Out of Aisle/Entering Aisle
- Zone 2 - Centre of Magnets
- Zone 3 - Out of Aisle/Exiting Aisle

Troubleshooting

EAC components are monitored by system software and will log a fault into memory whenever a problem with the EAC system occurs.

EAC Event Codes

568	EAC Hardware Fault
569	EAC Sensor Latched ON
570-572	EAC Sensor Latched ON
573-574	EAC Magnet Missed
652-659	EAC Sensor Signal Range Fault
660-663	EAC Sensor Digital Fault
664-667	EAC Weak Magnet Fault
668-671	EAC Sensor Hardware Fault
672	EAC Multiple Sensors Active Fault

Two menu items in 1—Button mode can be used to determine fault cause.

The first shows the state of the digital threshold detection. Anyone of the four sensors can be analysed. The state of the digital input shall change as the truck passes over it's corresponding magnet.

The second is a display of the active sensor signal strength. It is presented as a percentage of full scale. The system has shown that the EAC system works reliably with sensors demonstrating a wide variation of reported peak signal strength.

If issues are realized verify the height of the sensors above the floor, the distance of the centre line of guidance bars to the EAC sensors and proper magnet positioning. Distance off the floor should be 18 to 25 mm (0.69 to 1.0 in.).

Eventcode 101

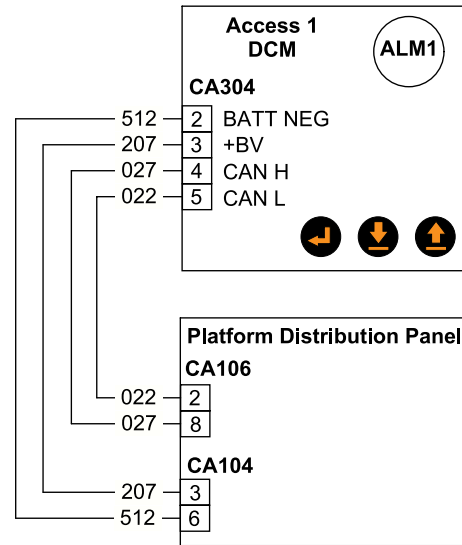
Access 1 module CAN error.

All truck functions disabled.

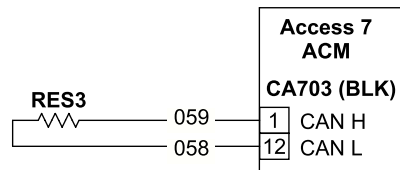
NOTE

Absence of B- to modules on the CAN bus will load the bus and impede CAN communications.

1. Check Access 1 CAN wiring. Wire #027 CA304-4 to CA106-8 and wire #022 CA304-5 to CA106-2.
 - If wiring is OK and event code persists, then proceed to step 2.
 - If wiring is bad, then repair/replace.
2. Check power to Access 1, wire #207 CA304-3 to CA104-3 and wire #512 CA304-2 to CA104-6.
 - If Wiring is OK and event code persists then proceed to step 3.
 - If wiring is bad then repair/replace.
3. Check for B- to other modules on CAN bus by verifying power lamps are ON.
 - If module is without power then check for B+ and B- with a DVOM. Should either be missing check associated wiring, connector and fuse.
4. CAN communications line test:
 - If 0 Ω , then a short circuit exists between CAN_H and CAN_L. Check associated wiring, connections and fuses. Repair/replace as necessary.
 - If greater than 60 Ω , then CAN bus terminating resistors are open. Remove CA402 from Access 5. With a DVOM check resistance between CA402-4 and CA402-5 of the module. If resistance is greater than 60 Ω , then replace Access 5. If the resistance is 60 Ω , then check resistor RES3 located in wire harness between CA703-1 and CA703-12. If bad, then replace.
5. Check for CAN line short to battery negative, battery positive and truck frame: Key OFF truck, disconnect battery. With a DVOM, check resistance at the chassis side from CAN_L to Battery Negative Bus Bar, CAN_L to TP8 and TP9 on the PUDP and CAN_L to truck frame. Resistance should be greater then 10 k Ω . If less then 10 k Ω , then repair/replace wiring as necessary.



13112



13547

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- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

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Event Code 223 — 224

Event Code 223

Access 2 module undervoltage cutback.

Hydraulic performance reduced.

NOTE

Event code 223 could log as the result of other events. Check for other event codes and resolve them before proceeding with event code 223.

Event code is logged when voltage at Access 2 B+ terminal is low.

1. Check for correct battery.
 - If correct battery, then proceed to step 2.
2. Disconnect battery. Using a DVOM check battery voltage at the connector.
 - If BV is 48 V — 52 V, then proceed to step 3.
 - If BV is below voltage range, then charge or replace battery.
3. Check operation of ED1 and ED2 (if present). If ED1 (ED2 if present) activates, then check battery voltage between Access 2 B+ and B- terminals.
 - If BV is 48 V — 52 V and event code persists, then replace Access 2.
 - If BV is less than 48 V, then check FU12, power cable connections between battery, ED1 (ED2 if present) and Access 2.

Event Code 224

Access 2 module overvoltage cutback.

No action taken.

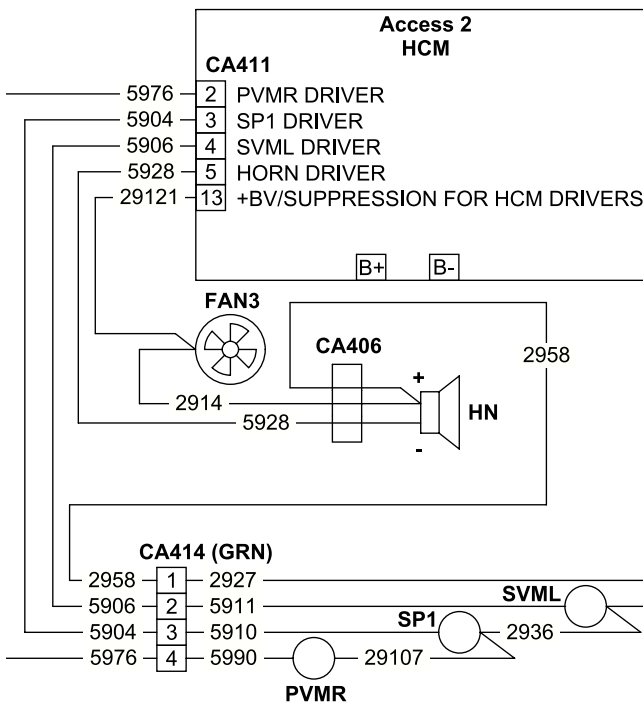
NOTE

Event code 224 could log as the result of other events. Check for other event codes and resolve them before proceeding with event code 224.

NOTE

Event code is logged if voltage at Access 2 +B terminal is too high. This could occur if regenerative braking currents is high enough to elevate battery voltage during regen braking.

1. Check for correct battery.
 - If correct battery, then proceed to step 2.
2. Disconnect battery. Using a DVOM check battery voltage at the connector.
 - If BV is 48 V — 52 V, then proceed to step 3.
 - If BV is above voltage range, then replace battery.
3. Check power cable on Access 2 B+ and B- terminals. Check also U, V and W connections on Access 2 and hydraulic pump motor.
 - If connections are loose, then tighten.
 - If connections are OK and event code persists, then replace Access 2.



13612

Event Code 326 and 327

Event Code 326

Access 3 module pedestrian detection system (PDS) "Platform Down" driver pin #19 over current.

Full traction disabled.

NOTE

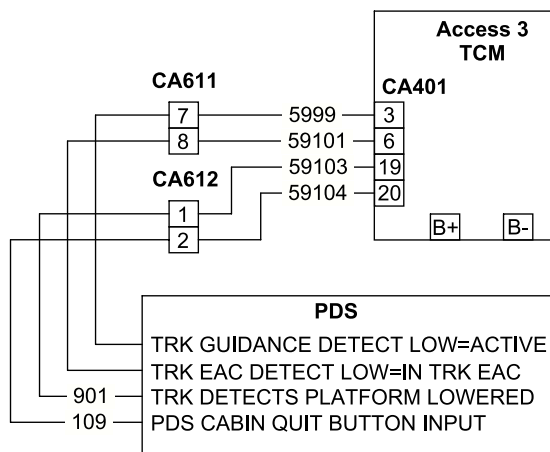
Event is logged under the following condition(s).

- Driver is drawing too much current.
 - Damaged PDS.
1. Check for shorts. PDS wire #901 to CA612-1 and wire #59103 CA612-1 to CA401-19. If wiring is shorted to B+ the PDS or Access 3 could be damaged.
 - If wiring is OK, then check for damage to PDS.
 - If PDS is OK, then replace Access 3.

NOTE

Access analyzer menu.

- To view output driver key ON truck while pressing up arrow key, select PDS A3.4.14.
- To test output driver connect DVOM positive lead to CA612-1 and negative lead to B-. Key ON truck while pressing up and down arrow keys. Select PDS A4.4.14 on menu. Press and hold enter key (turns ON driver). 5 V is OFF and 0 V is ON.



13235

Event Code 327

Access 3 module pedestrian detection system (PDS) "Quit Button" driver pin #20 over current.

Full traction disabled.

NOTE

Event is logged under the following condition(s).

- Driver is drawing too much current.
 - Damaged PDS.
1. Check for shorts. PDS wire #109 to CA612-2 and wire #59104 CA612-2 to CA401-20. If wiring is shorted to B+ the PDS or Access 3 could be damaged.
 - If wiring is OK, then check for damage to PDS.
 - If PDS is OK, then replace Access 3.

NOTE

Access analyzer menu.

- To view output driver key ON truck while pressing up arrow key, select PDS A3.4.15.

To test output driver connect DVOM positive lead to CA612-1 and negative lead to B-. Key ON truck while pressing up and down arrow keys. Select PDS A4.4.15 on menu. Press and hold enter key (turns ON driver). 5 V is OFF and 0 V is ON.

Event Code 400**Access 4 module / Access 8 module CAN error.**

Main and auxiliary raise/lower disabled.

NOTE

Access 4 CAN bus communication with Access 8 has not occurred within specified time.

1. Key ON truck, check status of Access 8 power ON lamps.
 - If Access 8 indicator lamps are ON, then problem is in the wiring between Access 8 CA504-3, -4 and platform distribution panel CA106-3, -10. Check wire condition and connections.
 - If Access 8 indicator lamps are OFF, then with a DVOM check for BV between CA504-1 and CA504-2.
 - If 48V, then replace Access 8.
 - If 0 V, then problem is in wiring:
Check wire #2995 CA504-1 to CA318-6.
Check blue wire CA318-6 to CA317-6. Check wire #2963 CA317-6 to CA103-15. Check wire #520 CA504-2 to CA505-1. Repair if necessary. Check fuse FU18 on platform distribution panel.
 - If wiring is OK and event code persists, then check Access 4 wiring:
Check wire #029 CA314-3 to CA106-9.
Check wire #028 CA314-4 to CA106-1.

CAN communication line test:

- Key OFF truck, with a DVOM check resistance (Access 8) between CA504-3 (CAN_H) and CA504-4 (CAN_L). Resistance should be approximately 60 Ω .
- If approximately 0 Ω , then short exists between CAN_H and CAN_L. Check wiring and Access modules for shorts. Repair or replace as necessary.
- If greater than 60 Ω , then CAN bus terminating resistors are open. Remove CA402 from Access 5. With a DVOM check resistance between CA402-4 and CA402-5 of module.
- If greater than 120 Ω , then replace Access 5.
- If 120 Ω , then check resistor RES3 located in wire harness between CA703-1 and CA703-12.

- If 120 Ω and event code persists, then replace Access 8. Event Code 401

Event Code 441

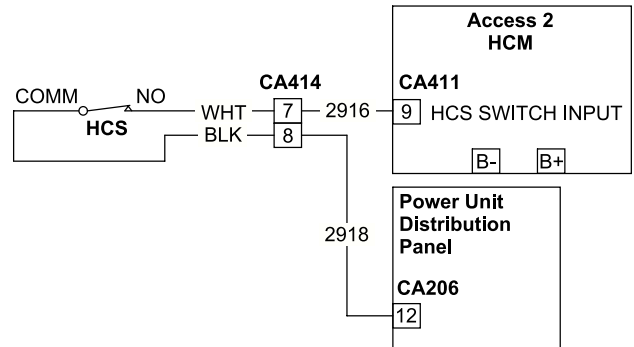
Access 4 module main mast broken height sensor cable.

Traction, main raise/lower and auxiliary raise in limp mode.

NOTE

Event code could be logged if truck is operating on a rough floor surface and/or abrupt raise/lower handle movements.

1. Key ON truck while pressing up arrow key. Select HCS (height cable switch) A2.4.13 on display menu and view reading.
 - If Switch shows closed, then status is normal. Event code may have occurred due to the above Note.
 - If switch shows open, then raise and block the platform (see page 10). Inspect the main mast height encoder ECR5 cable for tears, frays or other damage.
 - If cable is OK, then check HCS wiring:
 - Access 2 module wire #2916 CA411-9 to CA414-7.
 - White wire CA414-7 to HCS.
 - Black wire HCS to CA414-8.
 - Wire #2918 CA414-8 to CA206-12.
 - If wiring is OK, then check adjustment of HCS.
 - If HCS adjustment is OK and event code persists, then replace HCS.
 - If event code persists, then replace Access 2.



13559

Event Code 507

Access 7 module CAN timeout.

Traction, steering, hydraulics and ED disabled.

1. Check power to Access 7.

- If Access 7 lights are ON, then fault is in wiring between platform distribution panel and Access 7.

Check wiring and connections:

Brown wire between CA701-7 and CA106-6.

Yellow wire between CA701-8 and CA106-7.

Black wire between CA701-1 and CA105-1.

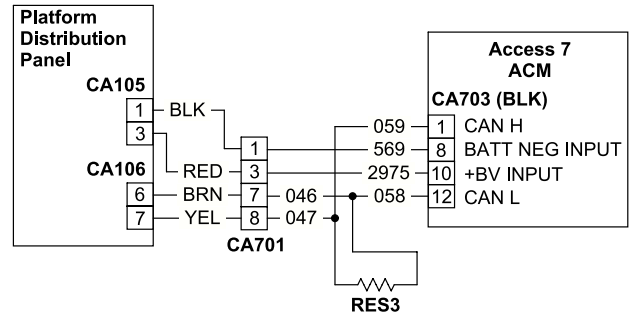
Red wire between CA701-3 and CA105-3.

Wire #046 between CA701-7 and junction of wire #058 connected to CA703-12.

Wire #047 between CA701-8 and junction of wire #059 connected to CA703-1.

Wire #2975 between CA701-3 and CA703-10.

- If Access 7 lights are OFF, then fault is in power wiring between platform distribution panel and Access 7, with a DVOM check for BV between CA703-10 and B-.
- If 48 V, then replace Access 7.
- If 0 V, then fault is in wiring between platform distribution panel and Access 7, check wiring and connections:
Wire #2975 between CA703-10 and CA701-3.
Red wire between CA701-3 and CA105-3.



13115

Event Code 540**Access 5 +BV (+ battery voltage) out of range.**

Steering, traction, and hydraulics disabled.

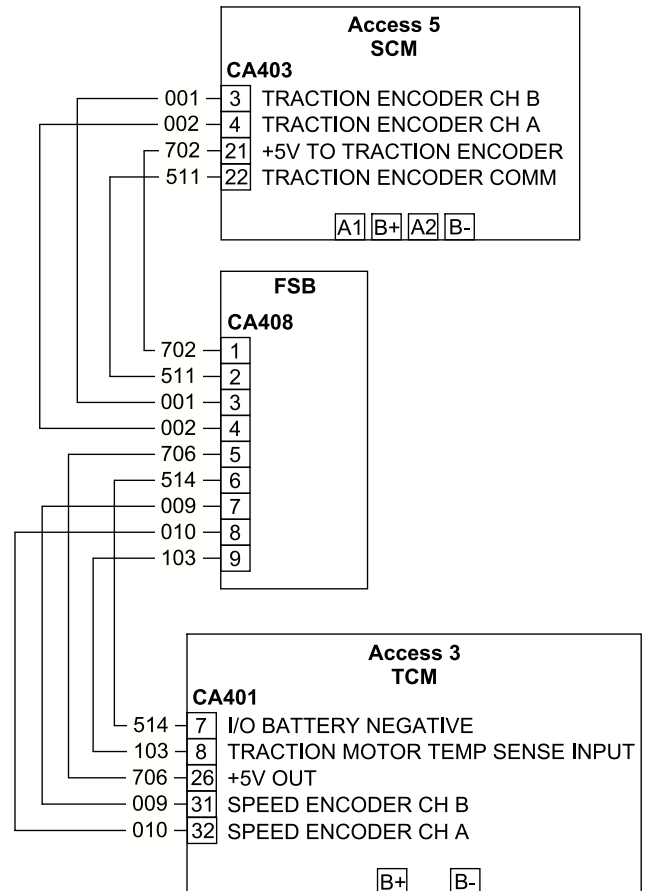
1. Disconnect battery and with a DVOM check battery voltage.
 - If 48 V (all cells good), then proceed to step 2.
 - If 24 V, 36 V, 80 V, then install 48 V battery.
2. Check condition of FU9, FU10, and FU13.
 - If fuses are OK, then proceed to Step 3.
 - If fuse(s) are open, then replace.
3. Key ON truck and check pull-in of ED contacts.
 - If contactor pulls in, even momentary, then ED system is OK. Proceed to step 4.
 - If contactor fails to pull-in, then ED bus is open. Refer to event code 541 for troubleshooting.
4. Key OFF truck. Remove +BV cable from Access 5 power terminal. Key ON truck. With a DVOM check voltage between Access 5, +BV cable end and -BV terminal while ED is pulled in (1/2 to 1 second).
 - If 4 8V, then Key OFF truck and reconnect Access 5 +BV cable. Key ON truck. With a DVOM check voltage between Access 5, +BV terminal and -BV terminal.
 - If less than 48 V, then check ED power distribution using procedure event code 541.
 - If 48 V and event persists, then replace Access 5.

Event Code 565

Access 3 and Access 5 module ECR7 (traction sensor) error.

Traction, steering and hydraulics disabled.

1. Check status of events 325, 369, 522 and 523. Events 336, 373 and 565 all pertain to ECR7.
 - 336: One or both channels lost at Access 3 while truck is traveling.
 - 373: One or both channels lost at Access 3 at traction start.
 - 565: One or both channels lost at Access 5 in idle or traveling.
 - If Logged., then resolve them before proceeding with 565.
2. Clear event log. Key down then up and request traction.
 - If event 565 is logged, then check wiring between FSB CA408 and Access 5 CA403.
 - If wiring is OK, then replace FSB.
 - If event code persists, then replace Access 5.
 - If event 373 is logged, then check wiring between FSB CA408 and Access 3 CA401.
 - If wiring is OK, then replace FSB.
 - If event code persists, then replace Access 3.



13126

Event Code 597

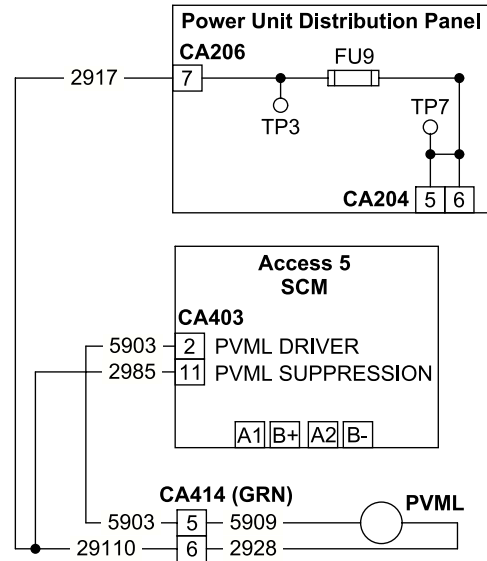
Access 5 module PVML (proportional flow valve,) driver error.

Main raise and lower disabled.

NOTE

Shorted driver event could be due to outside short, CA403-2 to -B or internal short in Access 5.

1. Key ON truck. Using a DVOM check PVML voltage between wire #5909 CA414-5 and -B.
 - If not BV, then key OFF truck and check fuse FU9.
 - If FU9 is open, then replace.
 - If FU9 is OK, then remove wire #2985 from CA403-11. Key ON truck. Using a DVOM check voltage between wire #5909 and -B.
 - If BV, then replace Access 5.
 - If not BV, then remove wire #5909 from PVML. Using a DVOM check voltage at PVML tab and -B.
 - If not BV, then check wiring:
 - Wire #29110 CA414-6 to wire #2917 CA206-7.
 - Wire #2985 CA403-11 to wire #29110 and wire #2917.
 - If BV, then reconnect wire #5909 and remove wire #5903 from CA403-2. Check voltage between wire #5909 and -B.
 - If not BV, then check wiring:
 - Wire #5909 CA414-5 and PVML.
 - Wire #5903 CA403-2 and CA414-5.
 - If BV, then replace Access 5.



13129

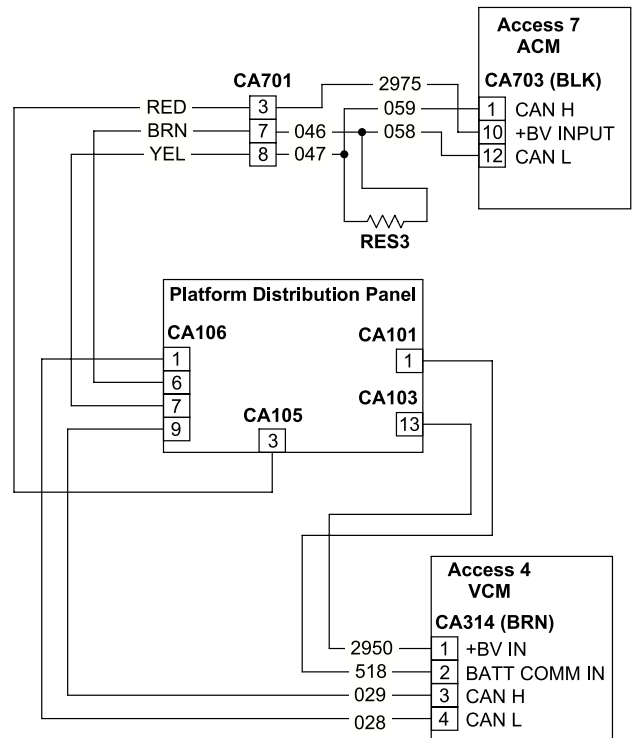
Event Code 701

Access 7 module / Access 4 module CAN time out.

Auxiliary raise/lower, traverse, pivot, fork extend/retract disabled.

1. Key ON truck and verify status of Access 4 indicator lamps.
 - If Access 4 indicator lamps are ON, then problem is in the wiring between Access 4 CA314-3, -4 and platform distribution panel CA106-9, -1. Check wire condition and connections.
 - If Access 4 indicator lamps are OFF, then with a DVOM check for BV between CA314-1 and CA314-2.
 - If 48 V, then replace Access 4.
 - If 0 V, then problem is in wiring. Check wire: #2950 CA314-1 to CA103-13. Wire #518 CA314-2 to CA101-1. Repair if necessary. Check fuse FU19 on platform distribution panel.
 - If wiring is OK and event code persists, then check Access 7 CAN wiring: Wire #059 CA703-1 to wire #047/#059 CA701-8. Yellow wire CA701-8 to CA106-7. Wire #2975 CA703-10 to CA701-3. Red wire CA701-3 and CA105-3. Repair if necessary.

- If event code persists, then replace Access 7.



13598

CAN communications line test:

Key OFF truck. With a DVOM check resistance (Access 4) between CA314-3 (CAN_H) and CA314-4 (CAN_L). Resistance should be approximately 60 Ω.

- If approximately 0 Ω, then short exists between CAN_H and CAN_L. Check wiring and Access modules for shorts. Repair/replace as necessary.
- If greater than 60 Ω, then CAN bus terminating resistors are open. Remove CA402 from Access 5. With a DVOM check resistance between CA402-4 and CA402-5 of module.
- If greater than 120 Ω, then replace Access 5.
- If 120 Ω, then check resistor RES3 located in wire harness between CA703-1 and CA703-12.
- If 120 Ω and event code persists, then replace Access 4.

Event Code 743

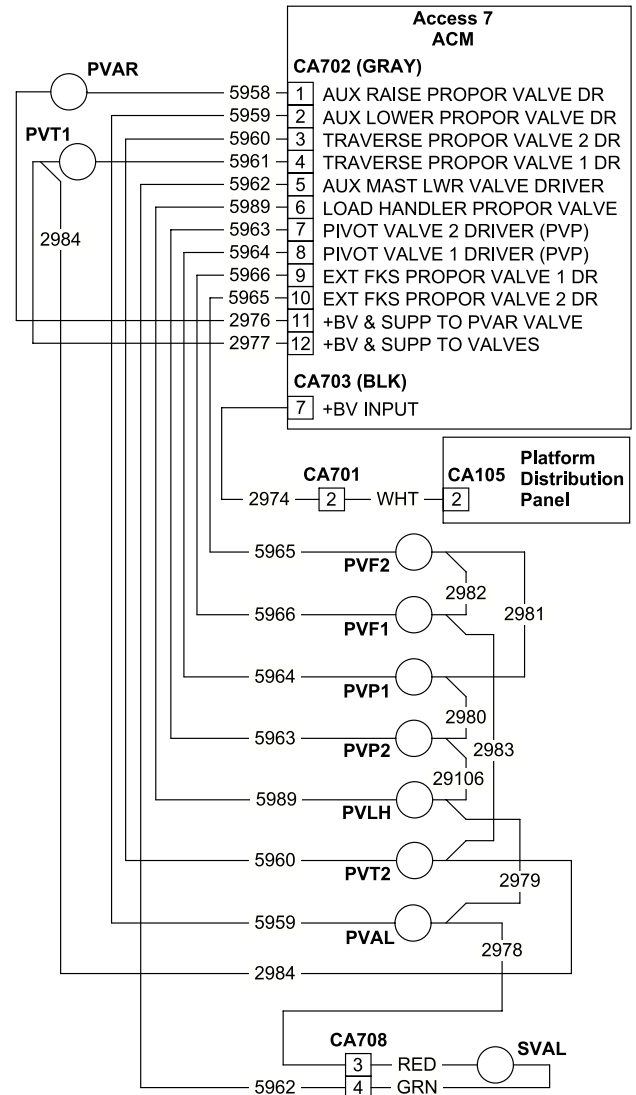
Access 7 module PVF2 (proportional flow valve, fork retract) over current.

Fork retract disabled.

NOTE

Event code is logged if excessive current flows through module driver CA702-10.

1. Remove wire #5965 from connector CA702-10. Key ON truck. Attempt fork retract. Check event code.
 - If event code 743 is still the last event code logged, then replace Access 7.
 - If event code 743 is not the last event code logged, then short circuit exists in wiring and/or solenoid. Reinstall wire #5965 and proceed to step 2.
2. Remove wire #2981 and wire #2982 from PVF2. Key ON truck. Attempt fork retract. Check event code.
 - If event code 743 is still the last event code logged, then short exists in the wiring. Check for shorts between wire #5965 and red/white wires (#2981 and #2982).
 - If event code 743 is not the last event code logged, then short exists in PVF2. Replace PVF2.



13601

Event Code 756

Access 7 module PVP1 (proportional flow valve, pivot) driver or load open.

Pivot clockwise disabled.

NOTE

Event code is logged if an open exists preventing current flow through driver CA702-8.

- Connect DVOM leads across PVP1 coil terminals (wires connected). Select analyser mode. Access PVP1 A4.1.8 on display menu. Press and hold enter key (drives component). Check meter reading.
 - If BV, then PVP1 is open. Replace PVP1.
 - If 0 V, then positive or negative is missing. Proceed with step 2.
- Connect DVOM negative lead to B- and positive lead to PVP1 wire #5964. Select analyser mode. Access PVP1 A4.1.8 on display menu. Press and hold enter key (drives component). Check meter reading.
 - If 0 V, then positive is missing. Refer to positive test below.
 - If BV, then negative is missing. Refer to negative test below.
 - If 24 V for 3 seconds and then drops to 0 V, then circuit is OK. Problem may be intermittent due to loose and/or oxidized connection.

Missing positive test:

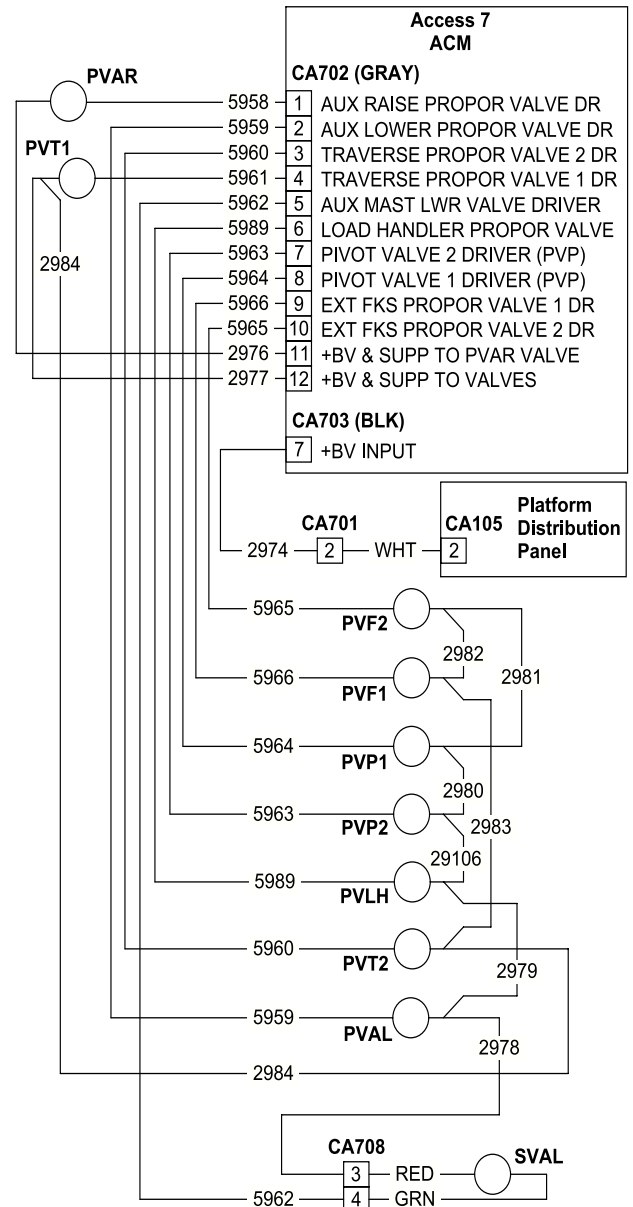
Check wiring:

- PVP1 to wire #2981.
- Wire #2981 to wire #2982.
- Wire #2982 to wire #2983.
- Wire #2983 to wire #2984.
- Wire #2984 to wire #2977.
- Wire #2977 to CA702-12.
- Wire #2974 CA703-7 to CA701-2.
- White wire CA701-2 to CA105-2.

Missing negative test:

Connect DVOM leads between PVP1 terminal with wire #5964 and CA702-8. Select analyser mode. Access PVP1 A4.1.8 on display menu. Press and hold enter key (drives component). Check meter reading.

- If BV, then wiring is open between Access 7 and PVP1
- If 0 V, then open is internal to the module. Replace Access 7.



13601

Event Code 769 & 770

Event Code 769

Access 7 module pivot potentiometer (POT5) voltage changing to slowly.

Traction limp mode and pivot disabled.

NOTE

Event code is logged if a voltage at CA704-7 is changing to slowly.

1. Check pivot potentiometer cable.
 - If cable is off pulley, then reinstall and check for cause.
 - If cable is OK, then key ON truck and attempt pivot.
 - If forks fail to rotate, then check for contamination and operation of PVP1, PVP2, PVLH, SP1 and RV1.

NOTE

PVLH failure: Traverse, auxiliary raise and fork extend will be disabled.

RV1 failure: Main raise will be disabled.

- If forks rotate and event code persists, then check POT5 wiring between CA706-A, B, C and CA704-9,-8, -7.
- If wiring is OK and event code persists, then replace POT5 and recalibrate pivot function.
- If event code persists, then replace Access 7

Event Code 770

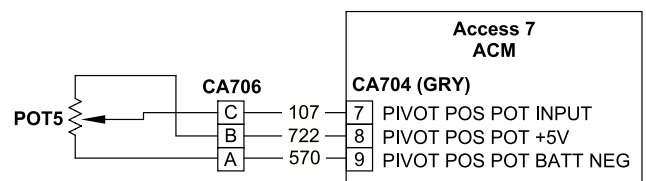
Access 7 module pivot potentiometer (POT5) voltage out of calibration limit.

Traction limp mode.

NOTE

Event code is logged if voltage at CA704-7 is outside the stored calibration value.

1. Check for event code 764. If logged, address event code 764 before proceeding with event code 770.
 - If event code 764 was not logged but POT5 was replaced and/or adjusted, then check POT5 wiring and cable. Recalibrate pivot function.
2. Key ON truck while pressing up arrow key. Select POT5 A2.1.3 on display menu. Pivot forks and view reading on display.
 - If 0.5 V to 1.5 V, then pivot should be fully clockwise.
 - If 3.3 V to 4.5 V, then pivot should be fully counter clockwise.
 - If either voltage is out of the above range, then recalibrate pivot function.
 - If event code persist after calibration, then replace POT5.



13606

Event Code 783

Access 7 module auxiliary height encoder (ECR3) not counting.

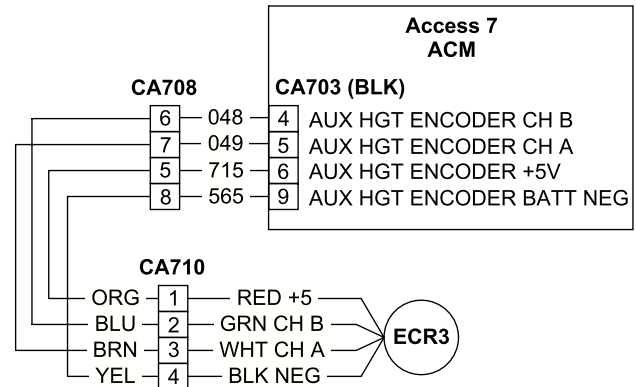
Traction limp mode and auxiliary lower disabled.

NOTE

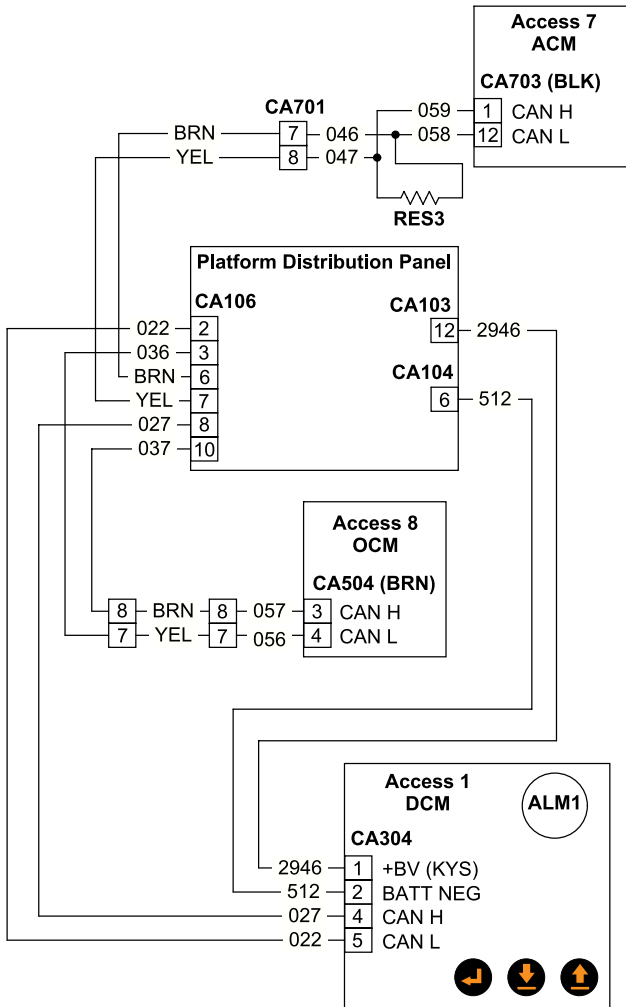
Event code will log if load is to great preventing auxiliary raise movement.

1. Key truck OFF then ON.

- If event code 751 is logged, then check PVLH circuit. Refer to event code 751.
- If event code 751 is not logged, then attempt to raise and lower auxiliary forks.
- If forks do not move, then check PVAR, PVLH, SP1, RV1 and LS operation.
- If PVAR, PVLH, SP1, RV1 and LS operation is OK, then check PVAR, PVLH, SP1, RV1 and LS for contamination.
- If forks move, then check ECR3 wiring:
 - Red wire ECR3 to CA710-1.
 - Orange wire CA710-1 to CA708-5.
 - Wire #715 CA708-5 to CA703-6.
 - Green wire ECR3 to CA710-2.
 - Blue wire CA710-2 to CA708-6.
 - Wire #48 CA708-6 to CA703-4.
 - White wire ECR3 to CA710-3.
 - Brown wire CA710-3 to CA708-7.
 - Wire #49 to CA703-5.
 - Black wire ECR3 to CA710-4.
 - Yellow wire CA710-4 to CA708-8.
 - Wire #565 CA708-8 to CA703-9.
- If event code persists, then replace ECR3 and recalibrate.
- If event code persists, then replace Access 7.



13608



13692

Event Code 840

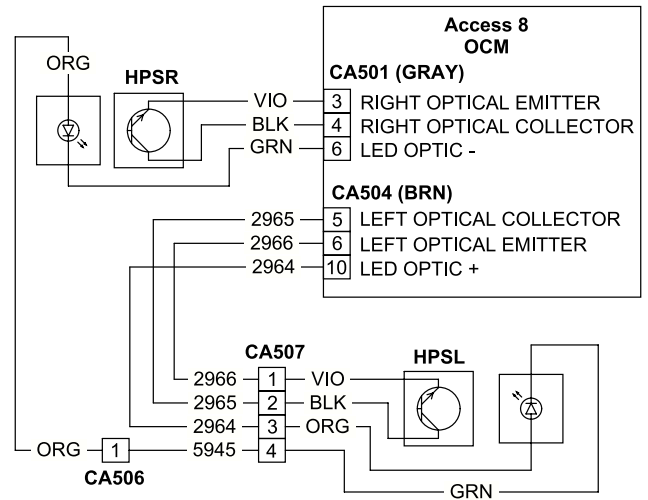
Access 8 module hand presence switch HPSL (left hand presence switch) or HPSR (right hand presence switch) photo diode open.

Limp traction, main and auxiliary raise/lower, traverse, fork extend/retract and pivot disabled.

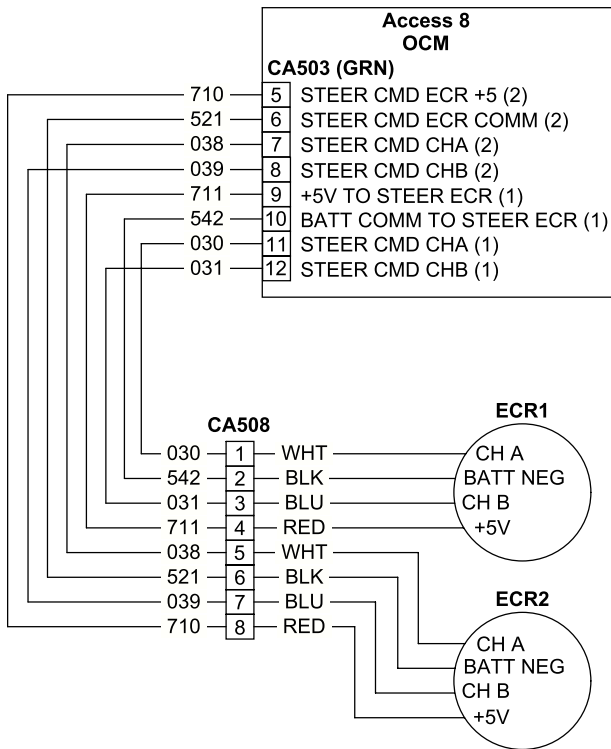
NOTE

HPSL and HPSR are wired in series. Tests are performed with truck power off and disconnected connectors to allow access to indicated terminals. To obtain accurate results meter leads must be orientated as indicated in each step.

1. Check for continuity and proper diode orientation of both photo diodes. Set DVOM on diode check. Connect positive meter lead to wire #2964 CA504-10 and negative to wire #2966 CA504-6. DVOM should show the two diodes forward biased by displaying approximately 2.3 V.
 - If 2.3 V, then HPSL and HPSR are wired correctly.
 - If 2.3 V and event code persists, then check wiring:
 - Wire 2966 CA504-6 to CA507-1.
 - Violet wire CA507-1 to HPSL.
 - Wire #2964 to CA507-3.
 - Orange wire CA507-3 to HPSL.
 - If wiring is OK and event code persists, then replace Access 8.
 - If “OL” (out of limit), then an open or incorrectly wired condition exists in the photo diode circuit. Set DVOM on diode check. Connect positive lead to orange wire CA506-1 and negative to green wire CA501-6.
 - If approximately 1.1 V, then HPSR circuit is OK. To check HPSL circuit set DVOM on diode check. Connect positive lead to wire #2964 CA504-10 and negative on CA506-1.
 - If “OL” (out of limit), then replace HPSR.
 - If approximately 1.1 V, then HPSL circuit is OK.
 - If “OL”, then replace HPSL.
 - If 1.1 V and event code persists, then replace Access 8.



13697



13694

Event Code 875 — 877

Access 8 module / Access 4 module CAN error.

Procedures listed apply to Event Codes 875 thru 877.

No action taken.

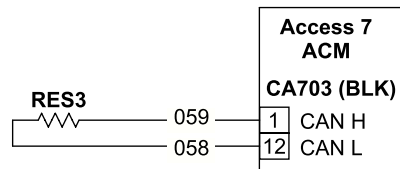
Event code 875: Access 4 passive error.

Event code 876: Access 4 event control error.

Event code 877: Access 4 CAN off line.

1. Key ON truck. Verify status of Access 4 power light. Access 4 +48 V at CA314-1 and B- at CA314-2.
 - If 48 V and event code persists, then check wiring for proper connections:
Wire #2950 CA314-1 to CA103-13.
Wire #518 CA314-2 to CA101-1.
 - If 0 V, then check FU7 and FU19.
Check wires:
#2950 CA314-1 to CA103-13.
Wire #518 CA314-2 to CA101-1.
Orange wire CA107-5 to CA413-5.
Blue wire CA107-6 to CA413-6.
Black wire CA107-1 to CA413-1.
White wire CA107-2 to CA413-2.
Red wire CA107-3 to CA413-3.
2. Determine if event code is being logged during different truck functions.
 - If event code is logged during a function, then check load and suppression.
 - If event code is logged when truck is idle, then key OFF truck. Disconnect flashing light and key ON truck.
 - If event code clears, then replace flashing light.
 - If event code persists, then proceed with steps 3, 4.
3. Check CAN communications lines.
Key OFF truck. With a DVOM check resistance between CAN_H and CAN_L. Resistance should be 60 Ω.
 - If 0 Ω, then short exists between CAN_H and CAN_L. Check associated wiring, connections and fuses. Repair/replace as necessary.
 - If greater than 60 Ω, then CAN A bus terminating resistor may be open. Remove CA402 from Access 5. With a DVOM check resistance between CA402-4 and CA402-5 of module.

- If greater than 120 Ω, then replace Access 5.
 - If 120 Ω, then check resistor RES3 located in wire harness between CA703-1 and CA703-12.
 - If bad, then replace.
4. Check for CAN line short to Battery Negative, Battery Positive, or Truck Frame.
Key OFF truck, disconnect battery. With a DVOM, check resistance at the Power Unit from CAN_L to Battery Negative Bus Bar, CAN_L to TP8 and TP9 on the PUDP and CAN_L to truck frame. Resistance should be greater than 10 kΩ.
 - If less than 10 kΩ, then repair/replace wiring as necessary.



13547

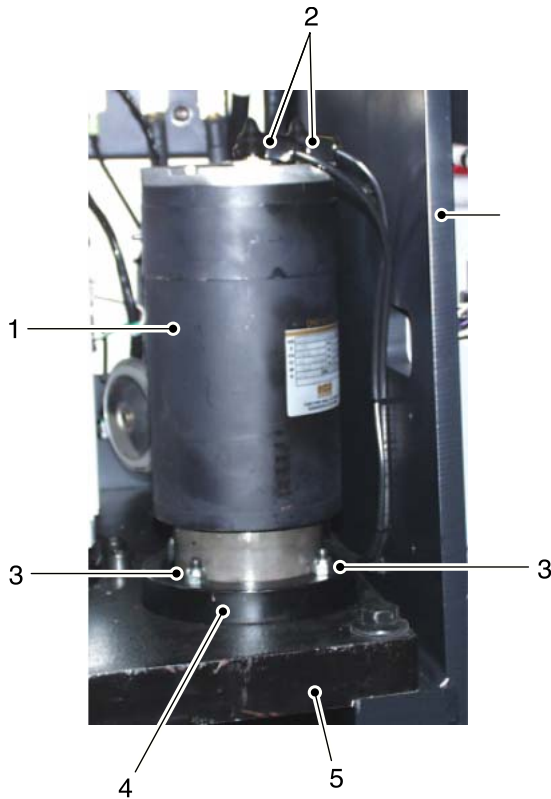
Assembly

(see Fig. 12843)

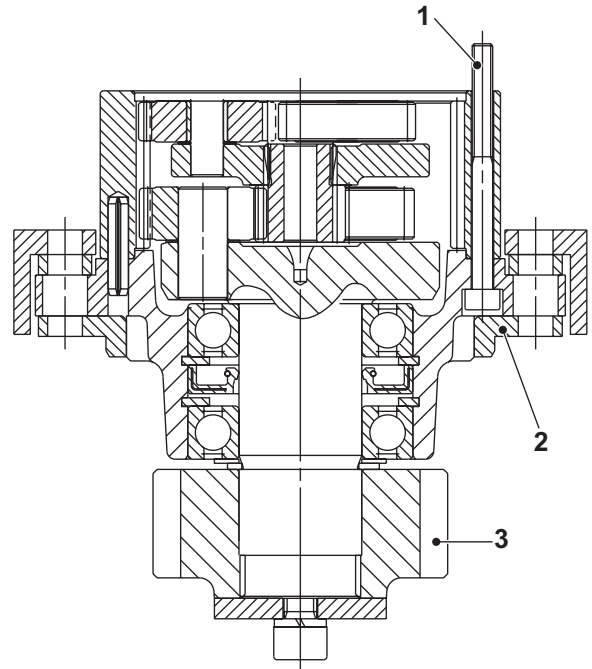
Before assembling brake, inspect all components for wear, grooves, nicks or other damage. If any abnormal wear or damage appears that may affect brake operation, replace with new parts. Assemble brake as follows:

- Assemble torque adjuster plate (2) by threading it onto the motor end cap as far as possible to reduce spring force.
- Apply a light coat of multipurpose grease (063002-024) to the motor end cap threads and on top of the torque adjuster plate (2).
- Place adjuster disk (3) on torque adjuster plate (2).
- Position the magnet body (4) on the motor (1) so the coil wires (7) are positioned as shown in Figure 12843. Apply blue thread locking adhesive (061004-026) to the three M8 x 40 mm hex socket head cap screws (6) and secure magnet to motor with screws.
- Assemble springs (5), inner and outer armatures (8 & 9) to magnet body (4). Apply a light coat of multipurpose grease (063002-024) to entire bottom of brake pad plate assembly (11). Be careful not to contaminate brake pads with grease.
- Install compression spring (10) over armature shaft.
- Slip rotor (12) on motor shaft, hub first. Thread the 1-1/8" hex nut (13) onto motor shaft. Tighten the nut until the rotor moves down and almost touches the brake pads. Proper air gap adjustment will be made later.
- Thread the 7/8" hex nut (14) onto motor shaft. Add flatwasher(s) (15) and place retaining ring (16) on motor shaft.
- Set torque adjuster gap to its original factory setting (see page 467).
- Connect wire harness to brake assembly.
- Adjust air gap (see page 466).
- Check brake operation and stopping distance. See adjustment procedures in truck settings section of this manual.

Replacing Steering Gearbox



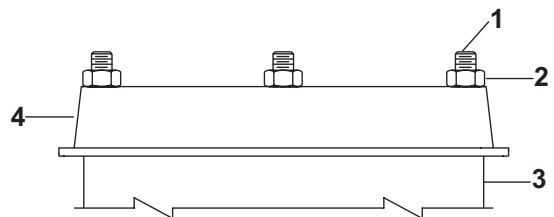
12903



12904

1. Disconnect battery and chock load wheels.
2. Remove rear door on power unit to access steering motor .
3. Note the positon of steering motor terminal leads (2, Fig. 12903) for future reference during installation. Then disconnect leads from steering motor (1, Fig. 12903).
4. Remove the four M8 Locknuts (3, Fig. 12903) used to secure the steering motor (1, Fig. 12903) and gearbox (4, Fig. 12903) to the drive unit mounting plate (5, Fig. 12903). Then remove steering motor and gearbox.
5. Remove isolator from gearbox (see Fig. 12904) to obtain access to steering motor mounting screws.

- 1 SteeringMotor Mounting Screw
- 2 Isolator
- 3 Steering Pinion
6. Remove the four M5 x 60 socket head cap screws used to secure the steering motor (1, Fig. 12903) to the gearbox (4, Fig. 12903) and remove the motor from the gearbox.
7. Install new steering gearbox. Begin by blocking the gearbox in the upright position and removing the shipping cover (4, Fig. 12995).



12995

NOTE

With the shipping cover removed, the internal components of gearbox are not restrained and could fall out if gearbox is overturned.

Installing Second Stage Mast Without Sufficient Overhead Clearance

1. Attach lifting equipment to second stage mast. Make certain lifting equipment is attached in such a manner that will keep the mast parallel with the main frame during installation. The use of a spreader bar or other weight-balancing type arrangement is recommended.



Make certain the lifting equipment is of sufficient capacity and/or size to safely handle the second stage mast. Lifting equipment with insufficient capacity and/or size may break or become unstable resulting in an unsafe condition.

2. With the main frame properly blocked in the horizontal position, align the second stage mast with the main frame. Then carefully slide the second stage mast onto the main frame and install poly stops on main frame. See Figure 13042, page 486.



Make certain main frame supports are positioned properly and both load wheels are chocked. Control the main frame and second stage mast to prevent unnecessary weight shifting.

3. Install the shipping bracket (originally shipped with truck) on top of the second stage mast and secure it to the main frame using the mounting hardware that was furnished with the bracket. See Figure 13040, page 485.
4. Attach lifting equipment to the shipping bracket at the top of the mast and also to the base of the main frame. Make certain the lifting equipment is of sufficient capacity and/or size to safely handle the main frame/platform assembly. The weight of the main frame/platform assembly is approximately 3630 kg. (8000 lbs.). Extreme care must be exercised during this procedure.
5. Carefully raise the main frame until the mast is in a vertical position. Then place blocks beneath main frame as shown in Figure 13036. Make certain to secure the assembly in a manner that will prevent the mast from going beyond a vertical position.



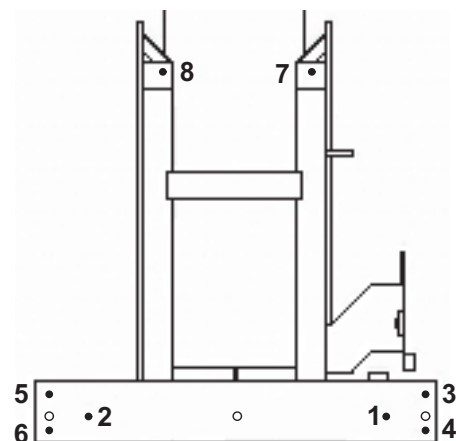
Load wheels must remain chocked securely throughout this procedure.

6. Remove lifting equipment from main frame and shipping bracket on second stage mast. Then remove shipping bracket and return bracket and associated hardware to storage for future use.
7. Position power unit in proper alignment with main frame/platform assembly. Place blocks beneath power unit and chock drive wheel.
8. Install mounting bolts (two at top (060099-007) -- six at bottom (060099-008)) and flatwashers (060131-005) through power unit with bolt heads pointing towards power unit. Install flatwashers (060131-006 thru -008) between the power unit and main frame (see NOTE below). Make certain that the flatwashers are installed in correct location. Then install flatwashers (060131-005) and hex nuts (060059-035) on mounting bolts.

NOTE

Assemble using the same washers that had been previously used.

9. Torque bolts manually in the sequence shown in Fig. 13037-1 in the following steps:
 - Step 1: 305 Nm (225 ft. lbs.)
 - Step 2: 435 Nm (320 ft. lbs.)
 - Step 3: Verify torque of 435 Nm (320 ft. lbs.)



13037-1

Rust *film* on lift chains can be removed and neutralised by cleaning with chain oil. **Always replace heavily corroded and rusting chains. The risk of cracking as a result of rust is too great.**

Chain Lateral Wear

Wear traces along a stretch of the chain on the pin heads and the outer plates indicate misalignment. This can have one of two causes: uneven chain tension or misalignment between the pulleys and the chain anchors.

Uneven Chain Tension

When fitting or adjusting the chains make sure that they are evenly charged. If for example the fork heel height or the platform height are changed, the chain anchors must be loosened until both forks touch the ground.

Both chains must have equal amounts of air or tension at this point. The lower chain anchor nuts must be tightened by the same number of turns. When the required height has been reached, fix the setting with the top (chain side) lock nut and its respective lock washer.

Misaligned Lift Components

Misalignment of the chain pinion and the chain due to the wrong number of washers on the mast or a damaged mast or cylinder components can also contribute to wearing of the chain sides.

To test whether this is the case, proceed as follows: Place the truck on a horizontal surface in the service station. Support the fork carriage and/or platform and detach both ends of the lift chain from the chain anchor and visually inspect the alignment with the anchor slots.

TF Lift Cylinders

General

Great care and cleanliness should be exercised in the disassembly and assembly of hydraulic cylinders.

Wipe all surfaces clean of dirt and oil before attempting disassembly. Care should be taken when removing the ram from the cylinder to prevent damage to the packing on the piston end.

After cylinder components are disassembled and seals, o-rings and wipers are removed, thoroughly wash all metallic parts in solvent and blow dry with low pressure air.

Carefully inspect the ram assembly and cylinder bore. Replace if scored, grooved, pitted or worn. Minor damage to the cylinder bore can be removed with the use of a cylindrical honing tool. Place washed components in a clean container until reassembly. Whenever new packings are required, new wiper rings should also be installed.

Pivoting The Tip-Out Assembly

(Accessing the Lift Cylinders)

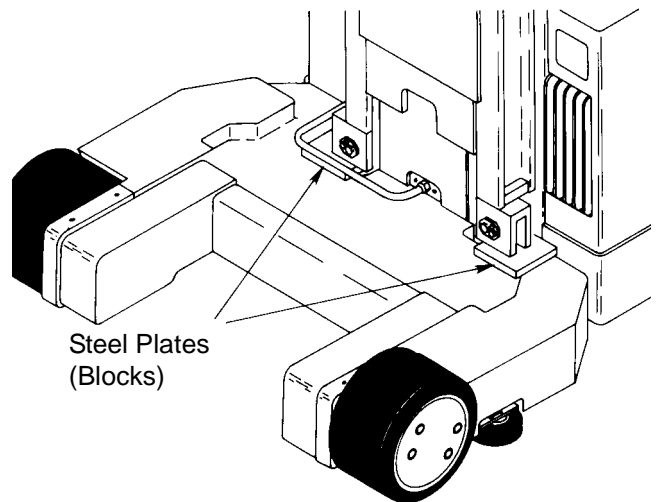
To gain access to the lift cylinders for repair or removal, proceed as follows:

1. The second stage mast must be blocked to allow the mast tip-out assembly to be pivoted. To block the mast, raise the second stage mast so that the column roller covers on the bottom of the mast can be easily removed.
2. Position blocks made of approximately 250 mm x 250 mm (10 in. x 10 in.) *steel plates*, 13 to 25 mm (0.5 to 1.0 in.) thick, on top of the base of the main frame, against each main frame I-beam (see Fig. 2490-01).



WARNING

Do not use blocks more than 25 mm (1.0 in.) thick. Using thicker blocks may deform and damage the hydraulic tubes located at the top of the mast when lowering the second stage mast.



2490-01

3. Completely lower the second stage mast onto the blocks.
4. Disconnect battery and chock load wheels.
5. Remove the cover on the top of the mast. A short chain is attached to the cover to allow it to be moved and hung aside.
6. The primary lift cylinder must be secured prior to removing mounting bolts from the cylinder rams

TN Lift Cylinder

Great care and cleanliness should be exercised in the disassembly and assembly of hydraulic cylinders. Wipe all surfaces clean of dirt and oil before attempting disassembly.

Care should be taken when removing the ram from the cylinder to prevent damage to the packing on the piston end.

After cylinder components are disassembled and seals, o-rings and wipers are removed, thoroughly wash all metallic parts in solvent and blow dry with low pressure air.

Carefully inspect the ram assembly and cylinder bore. Replace if scored, grooved, pitted or worn. Minor damage to the cylinder bore can be removed with the use of a cylindrical honing tool. Place washed components in a clean container until reassembly.

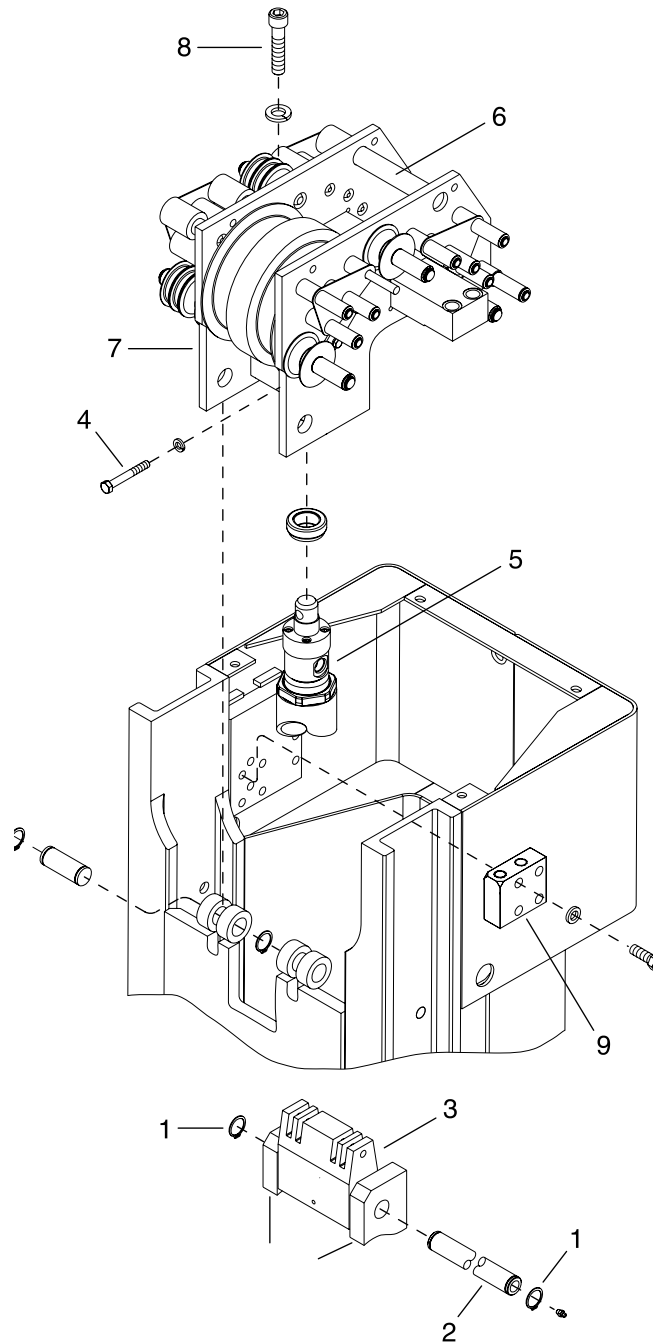
Whenever new packings are required, new wiper rings should also be installed.

Pivoting The Tip-Out Assembly

(Accessing the Lift Cylinder)

To gain access to the lift cylinder for repair or removal, proceed as follows:

1. Raise the platform approximately 0.5 m (2 feet). Block the platform securely with 100 mm x 100 mm (4 in. x 4 in.) hardwood blocks. Then lower the cylinder completely. This procedure will produce slack in the lift chain, cables and hoses.
2. Disconnect battery and chock load wheels.
3. Secure lift chains to top of platform so all slack is above platform.
4. Remove the cover on the top of the mast. A short chain is attached to the cover to allow it to be moved and hung aside.
5. Remove retaining rings (1, Fig. 12864) from chain anchor pin (2)



12864

6. Remove chain anchor pin (2). Access holes in the main frame and second stage mast are in line with pin.
7. Hang chain out over edge of mast and secure it.
8. Remove bolt (4) that secures lift cylinder (5) to tip-out assembly (7)

- Apply light lubrication to the seal and installation groove. Use the same oil that will be used later in the cylinder.

Rod Packing Installation

- Apply light lubrication to rod packing and wiper ring. Use the same oil that will be used later in the cylinder.
- Install wiper ring in cylinder cap.

NOTE

The seals used in the cylinder are made of an extremely durable, hard polyurethane material which can be deformed temporarily to allow for installation without permanent damage.

- Install rod packing in cylinder cap. For “lip first” installation, a sleeve similar to that shown in Figure 12852 should be used to protect the packing from damage on threads and shoulders. (Crown has a packing sleeve available, part number 091240-004).



CAUTION

Seal installation tools should be made of soft metal or suitable plastic, free of burrs and sharp edges. Screwdrivers and other similar tools should not be used as they may damage the sealing edges.

- Install the cylinder cap.



CAUTION

Care should be taken when installing the cylinder cap to prevent threads and sharp edges from damaging new rod packing and wiper ring.

- Screw cylinder cap in clockwise direction until cap is tight with the top of the cylinder tube.
- Install yoke assembly on lift cylinder and replace any components that were previously removed.
- Attach a hoist or other suitable lifting equipment to the fork carriage. Then raise carriage and remove blocking.
- Lower forks completely, remove wheel chocks, and connect the battery.
- Bleed auxiliary lift cylinder. (See “Auxiliary Lift Cylinder Bleeding”.)

Auxiliary Lift Cylinder Bleeding



DANGER

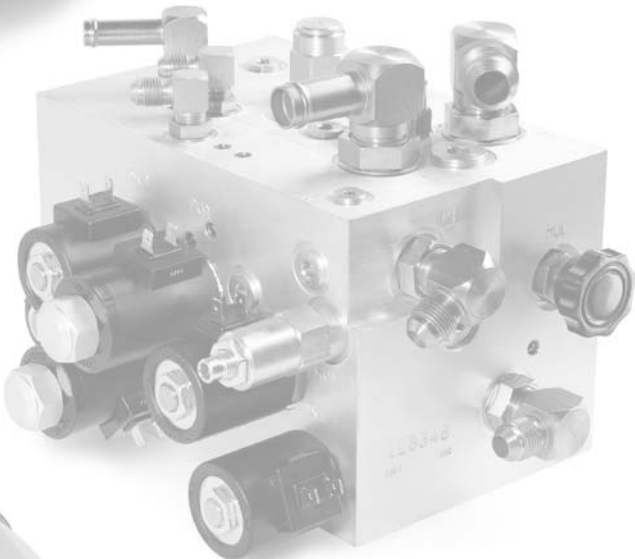
AVOID HIGH PRESSURE FLUIDS — Escaping fluids under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately from a specialist who has had experience with this type of injury.

After the cylinder is installed in the truck, air must be bled from the hydraulic system.

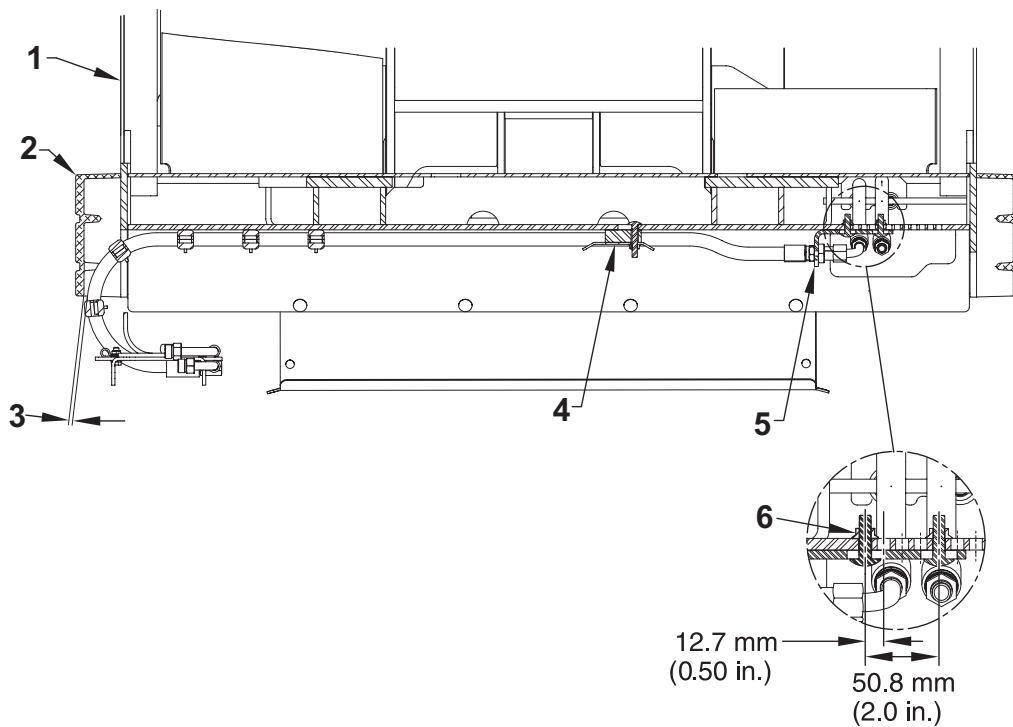
- Without a load on the forks, raise and lower the mast through one complete cycle.
- Then, with the mast fully lowered, check the hydraulic reservoir and add fluid if necessary.
- Raise and lower the mast through the complete cycle at least five more times. This action will force any air that may be trapped in the system to the top of the cylinder.
- Loosen the bleed screw located the top of the cylinder until all air escapes and only oil continues to flow from the cylinder. Tighten the screw and wipe off all excess oil.

CROWN



PLATFORM

Traverse Hose Replacement



13212

- | | | | |
|---|---|---|---------------------------------------|
| 1 | Platform | 2 | Right Side Traverse Extension |
| 3 | Gap, adjusted to 6 — 16 mm (0.25 — 0.625 in.) | 4 | Hose Support Weldment in Keyhole Slot |
| 5 | Bracket | 6 | Bolt |

NOTE

Right and left references shall be to the truck relative to the operator facing the forks.

- To replace the traverse hose, traverse the load handler completely to the right. This will allow for better access and easier disassembly and assembly of the traverse hose connections at the load handler.

NOTE

It is recommended the traverse hose be replaced as a pair.

- Raise platform 915 — 1 525 mm (36 — 60 in.) if possible. Place blocks under platform and lower platform onto blocks to relieve hydraulic pressure in the raise/lower circuit.
- Disconnect battery and chock load wheels.
- Remove load handler covers.

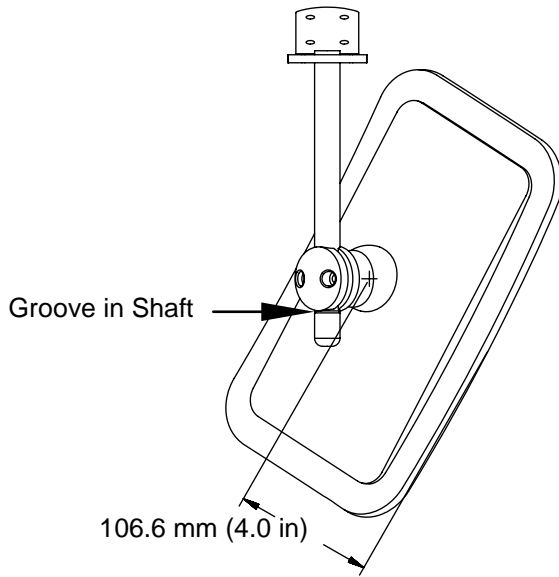


DANGER

AVOID HIGH PRESSURE FLUIDS—Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic lines. Tighten all connections before applying pressure. Keep hands and body away from pin holes which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.

Any fluid injected into the skin under high pressure should be considered as a serious medical emergency despite an initial normal appearance of the skin. There is a delayed onset of pain, and serious tissue damage may occur. Medical attention should be sought immediately by a specialist who has had experience with this type of injury.

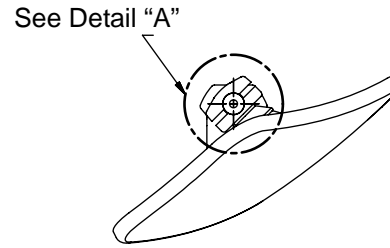
- Disconnect hoses at bulkhead under the left side of platform and at the load handler.



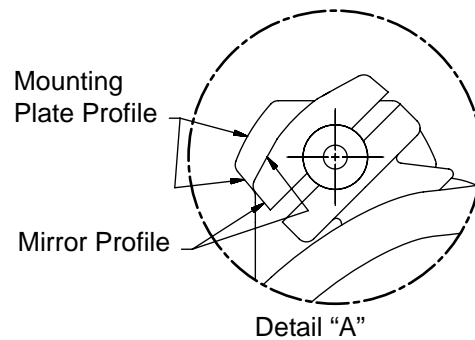
Mounting Location of Mirror on Shaft for Trucks with a 1 320 mm, 1 473 mm and 1 625 mm (52, 58 and 64 in.) platform.

13049

10. From the bottom, look straight up the centre of the mirror mounting shaft. Rotate mirror clamp on the shaft until the profile of the mounting bracket visually aligns with the profile of the mirror clamp as shown in Figure 13211, detail "A". Tighten the two mirror clamp screws.



Bottom View of Figures 10348 and 13049.



13211

11. Install and position convex mirror label (Objects In The Mirror Are Closer Than They Appear) in lower right hand corner of the mirror glass.

Index

Components have been listed in chart form to assist you in locating these components on the schematic diagrams.

The chart is in columns: *Component*; *Location*; *Function*; *Schematic Diagram(s) on Page(s)*. The *Component* column contains the abbreviation of the component as it appears on the chapter *Schematic Diagrams*.

The *Location* column gives the general location on the truck such as on platform or in power unit. The *Function* column then explains the function or circuit of that device. The *Schematic Diagram(s) on Page(s)* column gives the page number of the diagram on which the component can be found.

Audible Indicators			
Component	Location	Function	Schematic Diagram(s) on Page(s)
ALM1	Display	Status Alarm	587, 592
ALM2	Contactor Panel	Travel Alarm	588, 599
HN	Power Unit	Horn	

Battery			
Component	Location	Function	Schematic Diagram(s) on Page(s)
Battery	Power Unit	Power	588

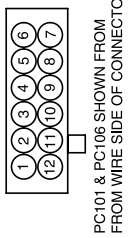
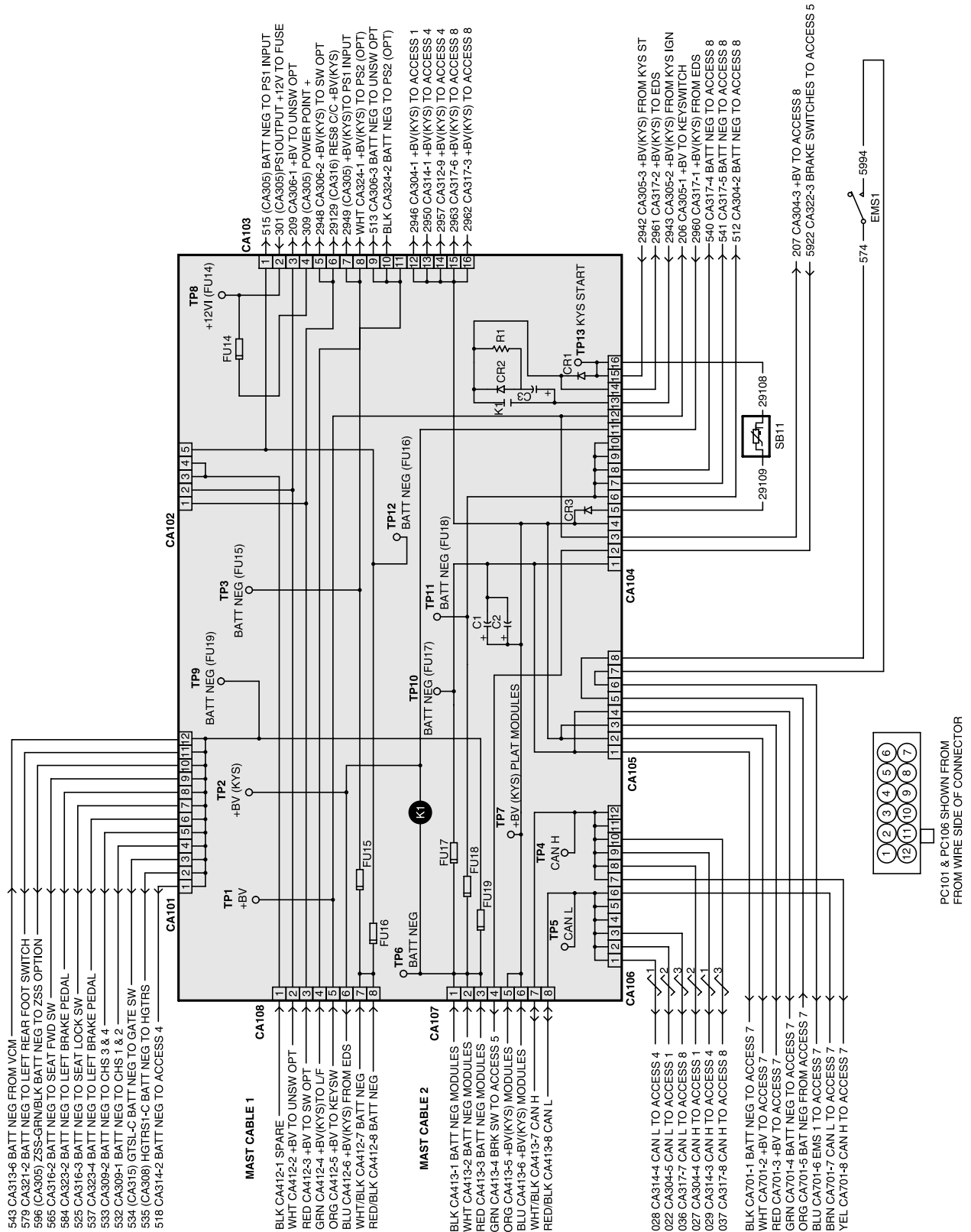
Connectors			
Component	Location	Function	Schematic Diagram(s) on Page(s)
CA101	Platform Distribution Panel	Seat Forward, Seat Lock Switch, Brake Pedal, CHS1, 2, 3 & 4	589
CA102	Platform Distribution Panel	Can Down Load Information (Factory Use Only)	
CA103	Platform Distribution Panel	PS1, B+ To ODM, VCM, OCM, PS2	
CA104	Platform Distribution Panel	BV+ To KYS, EDS, Batt- to OCM, ODM	
CA105	Platform Distribution Panel	CAN L/CAN H To ACM	
CA106	Platform Distribution Panel	CAN L/CAN H To ODM and VCM	

Potentiometers			
Component	Location	Function	Schematic Diagram(s) on Page(s)
POT1	R.H. Armrest	Traction	587, 603
POT2	R.H. Armrest	Main Raise/Lower	
POT3	R.H. Armrest	Auxilliary Raise/Lower	588, 607
POT4	R.H. Armrest	Traverse Command	587, 599
POT5	Load Handler	Pivot Position Sense	587, 590

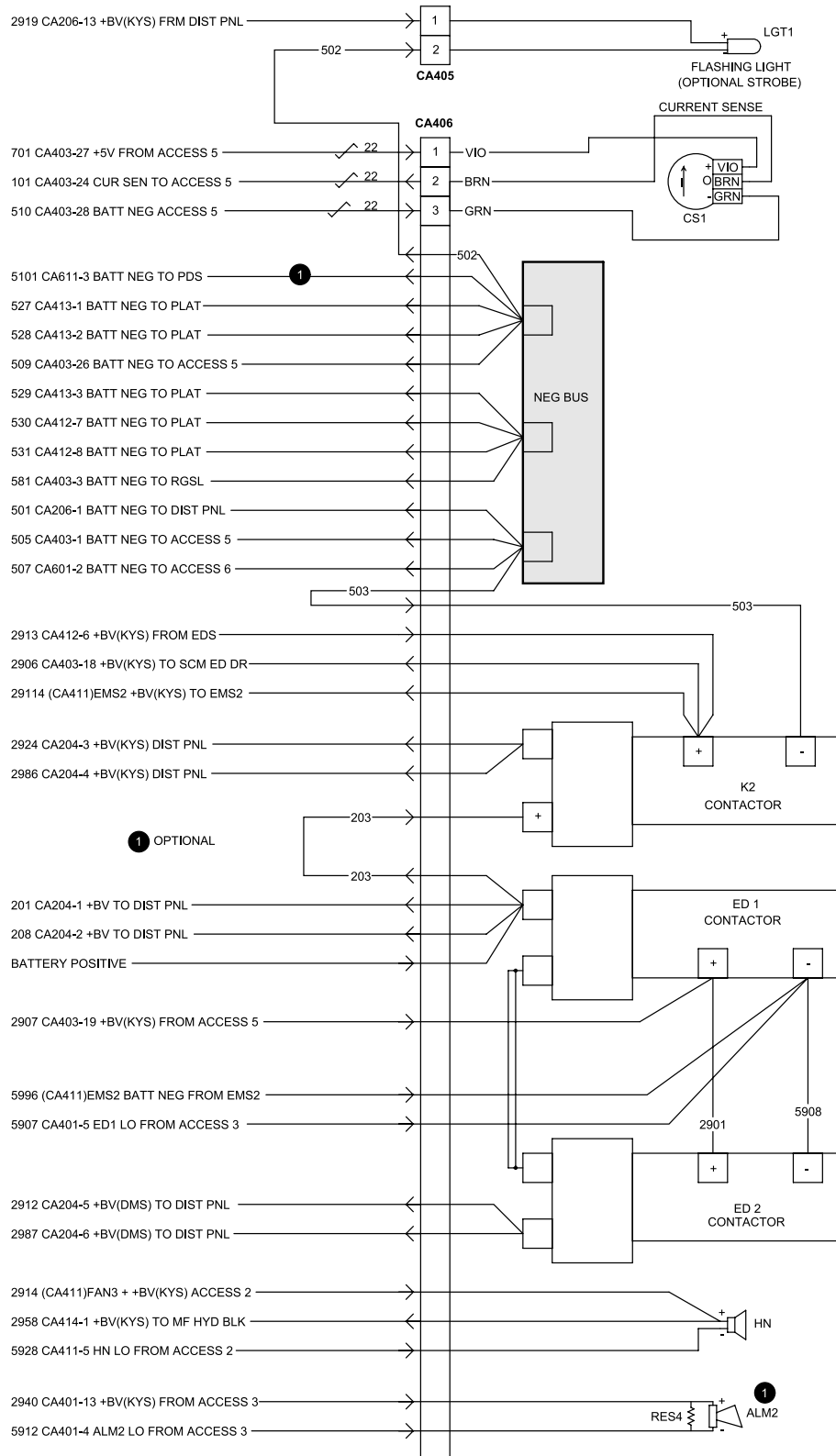
Relays			
Component	Location	Function	Schematic Diagram(s) on Page(s)
K1	Platform Distribution Panel	Key Latch, K1, ED1, ED2	587, 589

Relays			
Component	Location	Function	Schematic Diagram(s) on Page(s)
RES1	Contactor Panel	Dropping Resistor For Drive/Tow	588, 590
RES2	Contactor Panel	Dropping Resistor For Drive/Tow	
RES3	Load Handler (Part of Wire Harness)	CAN Balancing Resistor	587, 590
RES4	Contactor Panel	Travel Alarm (Optional)	588, 599
RES5	Contactor Panel	For Traverse Override Switch	588, 590

Platform Distribution Panel



Contactor Panel



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