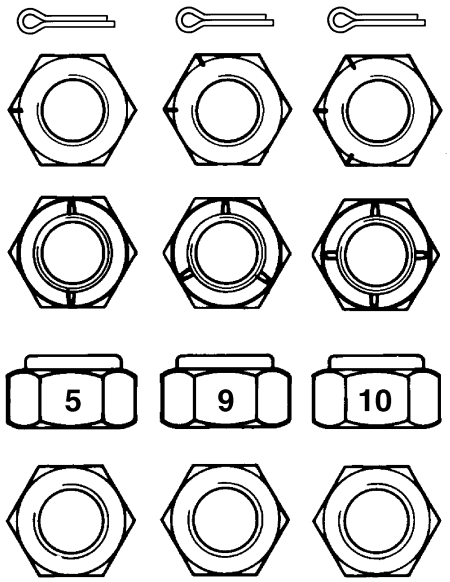
Yale®

Maintenance

METRIC AND INCH (SAE) FASTENERS



HM210064

During the discharge of the cell, lead peroxide and sponge lead mix with sulfuric acid to make lead sulfate ($PbSO_4$) on both plates. See Figure 4. This action decreases the voltage in the cell. When the sulfuric acid is removed from the electrolyte, the specific gravity of the electrolyte decreases. See Figure 5. The potential difference of a discharged cell is approximately 1.75 volts.

When a direct current is applied to a discharged cell, the lead sulfate is changed into lead and sulfuric acid. The lead goes to the positive plate and stays as lead and to the negative plate and stays as lead peroxide. See Figure 6. The concentration of sulfuric acid in the electrolyte increases. The specific gravity of the electrolyte increases as the concentration of sulfuric acid increases. In a fully charged cell, the positive plate again contains the lead peroxide and the negative plate contains the sponge lead.

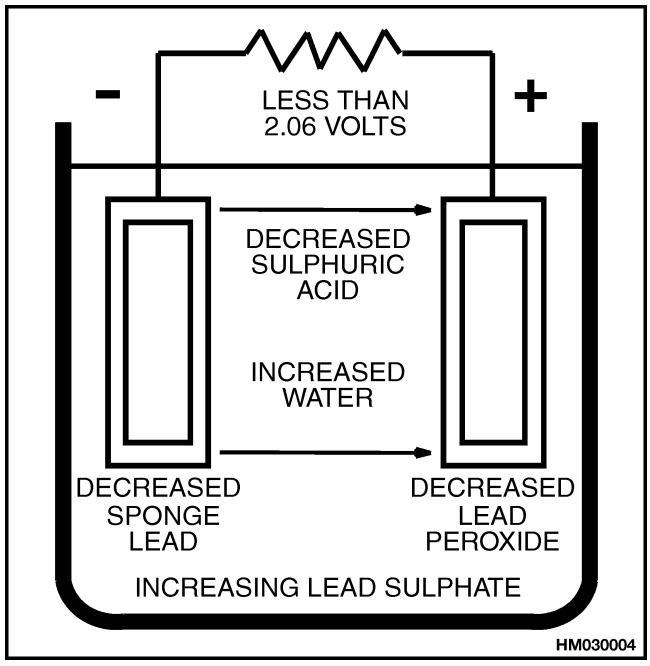


Figure 4. Discharging Cell

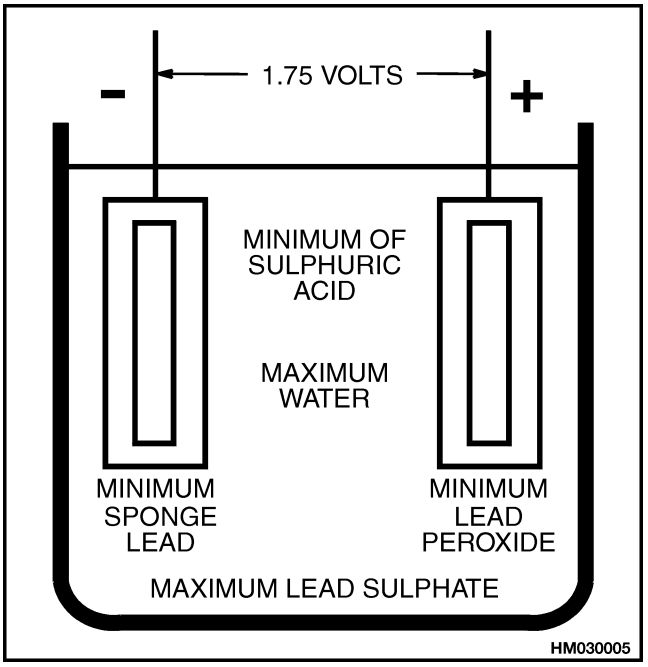


Figure 5. Discharged Cell

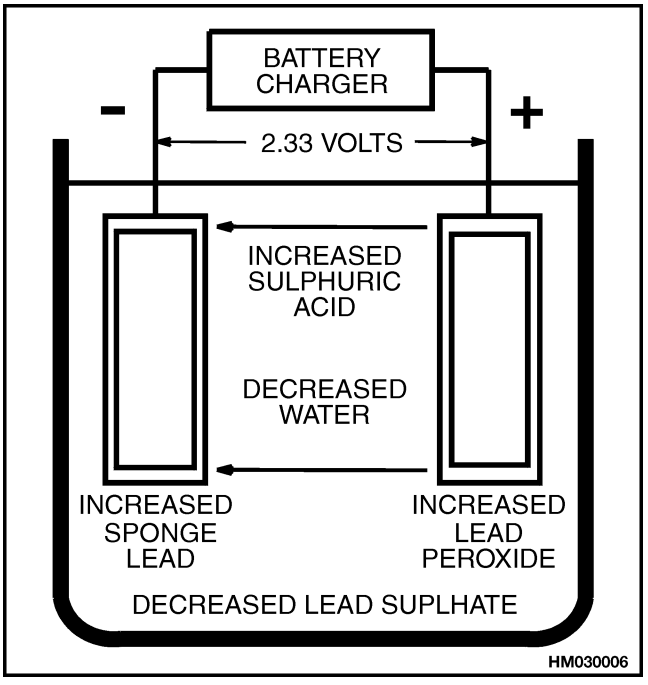


Figure 6. Charging Cell

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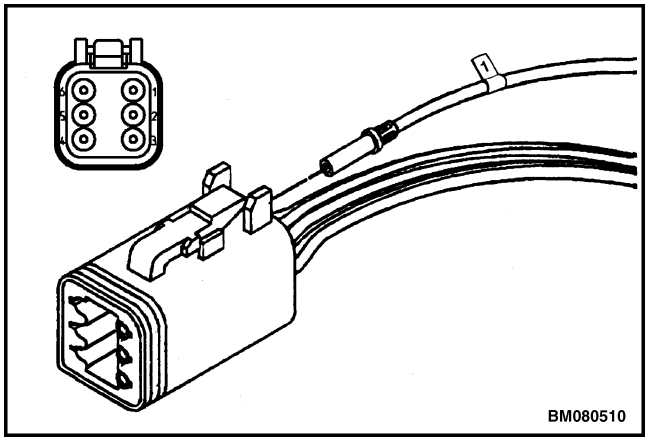
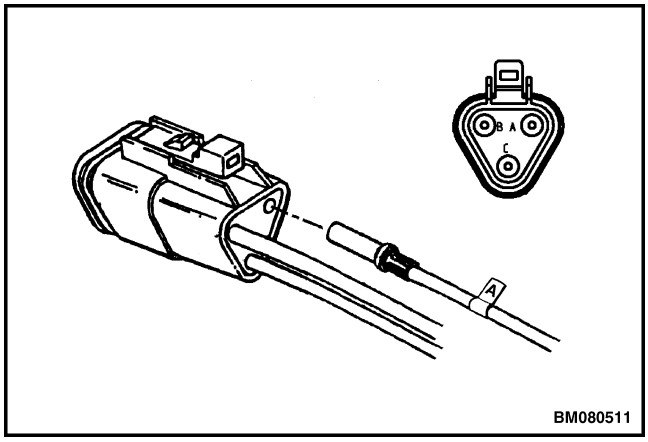
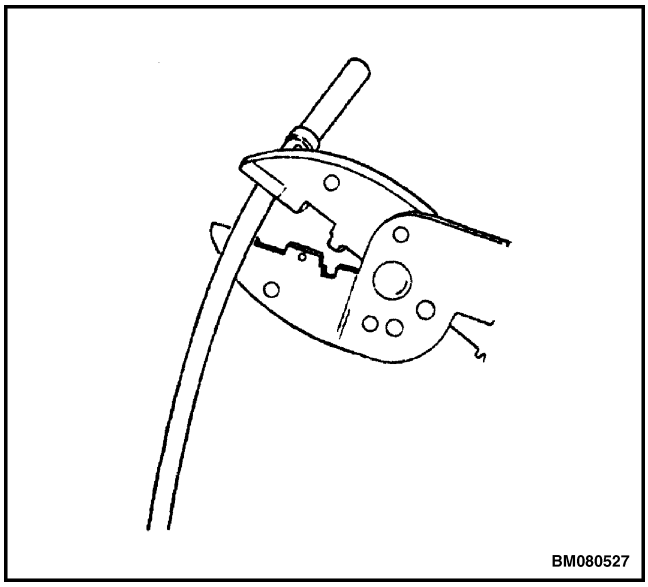
STEP 5.
If more than one socket is being removed, tag the wire and mark it with the corresponding number or letter on the back of the connector from which the wire was removed.





STEP 6.
Using wire cutters, cut the wire behind the old socket and discard old socket.



The wedge lock has slotted openings in the mating, forward, end. The slots are for circuit test tabs approximately 3.3 × 0.6 mm (0.13 × 0.02 in.), which prevent damage to the receptacle. Circuit testing in the field to be done by a flat probe, DO NOT use a sharp point.

Voltage Reading

CAUTION

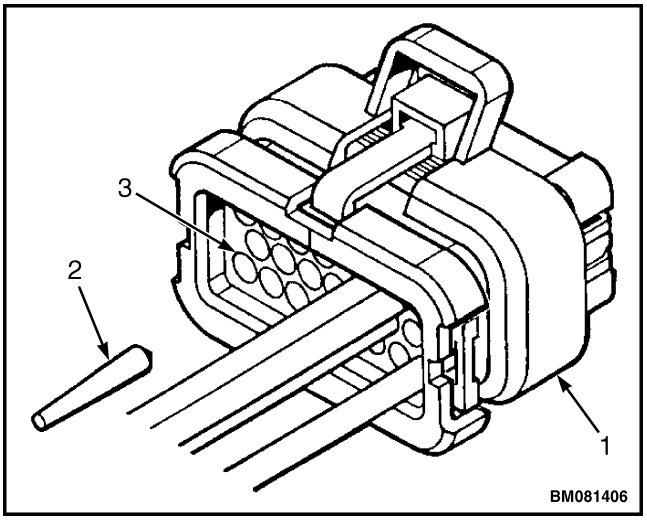
DO NOT pierce wire insulation to take voltage readings.

When using AMPSEAL plug assembly DO NOT pierce wire insulation with a sharp point. Pin holes in the insulation allow moisture to invade the sealed connector system nullifying effectiveness and resulting in possible system failure.

Seal Plug

All circuits are sealed by a diaphragm in the rubber wire seal. This diaphragm is pierced when the contact is pressed through it. Unused circuit cavities will remain sealed unless perforated by accidental insertion and removal of contact in the wrong cavity. The seal plug is designed to keep out contaminants if the diaphragm is accidentally pierced.

1. Insert the seal plug, large end first, into the circuit cavity as far as it will go. No insertion tool is required for this procedure. See Figure 46.



1. PLUG CONNECTOR
2. SEAL PLUG
3. CIRCUIT CAVITY

Figure 46. Seal Plug

Contact Crimping

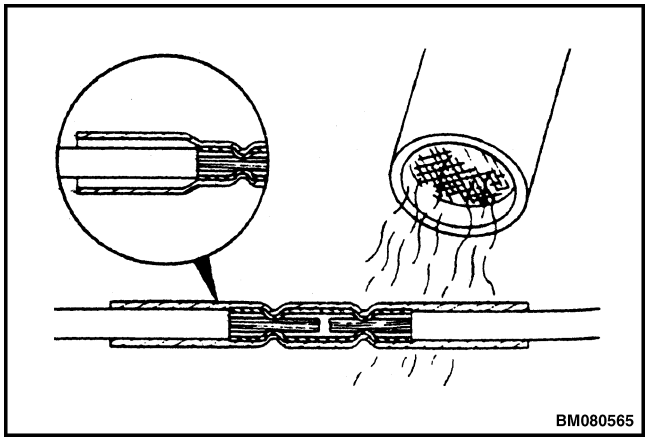
1. Information on contact crimping can be found in AMPSEAL Crimping Tools.

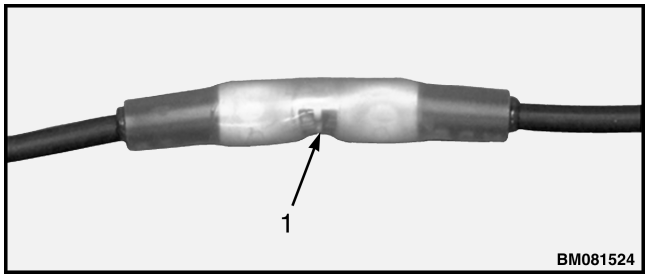
NOTE: DO NOT cut contacts from "reel", use loose contacts only.

2. Crimped contacts to meet conditions shown in Figure 47 and Table 7.

STEP 4.
Using a heat gun, apply heat evenly, to approximately 135°C (275°F), around the length of the tubing (including the crimp area) from the center out to the ends until the tubing fully recovers and adhesive flows.

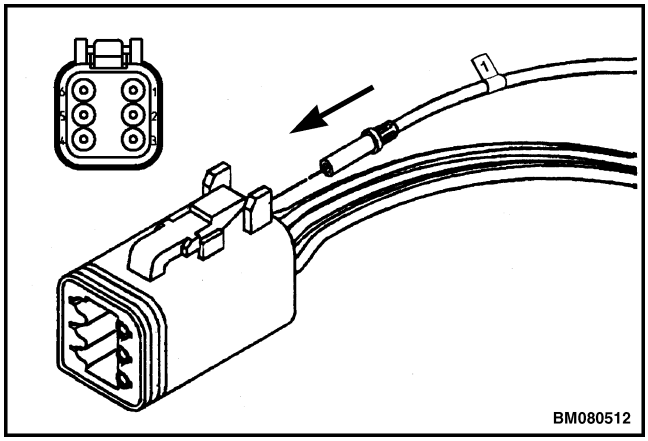
Continue distributing the heat over the solder sleeve until solder flows into the terminal barrel. Remove from the heat and let cool for ultimate connection performance.

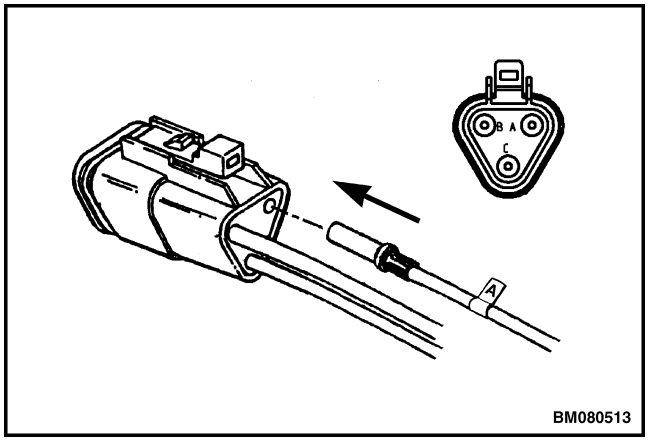




1. EXPOSED NOTCHES AFTER SOLDER BAND MELTS

STEP 7.
Insert the wires into the back of the new connector plug according to the number or letter on the tag and connector plug. Push the wires straight into the back of the plug until a click is felt. Slightly tug each wire to verify the wire is properly locked in place. Remove tags.





NOTE: Verify that the seal is in place on the connector plug before installing the secondary lock.

Legend for Figure 31.

A. FRONT OF TOOL
B. BACK OF TOOL

1. UPPER INSERT
2. ANVIL
3. INSULATION CRIMP ADJUSTMENT LEVER
4. CONTACT SUPPORT
5. LOCATOR
6. CERTI-CRIMP RATCHET
7. STRIPPED WIRE

The insulation adjust lever regulates the crimp height. See Insulation Crimp Adjustment.

The contact support prevents the contact from bending during crimping.

The locator functions two ways:

- position the contact between the upper insert and the anvil before crimping
- limits the insertion distance of the stripped wire into the contact.

The ejector pulls the locator down, and ejects the crimped contact when the tool handles are fully opened.

CAUTION

The crimping jaws bottom before the CERTI-CRIMP ratchet releases. This is a design feature that ensures maximum electrical and tensile performance of the crimp DO NOT readjust the ratchet.

The CERTI-CRIMP ratchet assures full crimping of the contact. Once engaged, the ratchet will not release until the handles have been fully closed.

Stripping Wire for Use with AMP Hand Crimping Tool

1. Choose the correct AWG for the contact being used.
2. See Table 2 for recommended strip length.

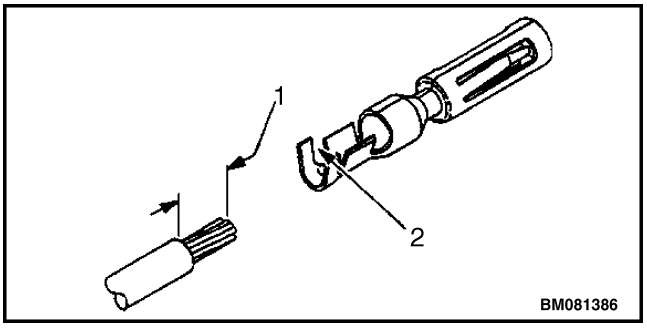
Table 2. Wire Size (AWG)

Wire Size (AWG)	Insulation Diameter Range	Tool Wire Size Marking	Contact	Wire Strip Length
16	1.7 to 2.7 mm (0.067 to 0.106 in.)	16	Yale P/N 520202601	5.5 mm (0.215 in.)
20 - 18		20 - 18		4.7 mm (0.185 in.)

CAUTION

DO NOT cut or nick the wire strands.

3. Strip wire to recommended strip length. A small piece of insulation should come off the wire after stripping. See Figure 32.



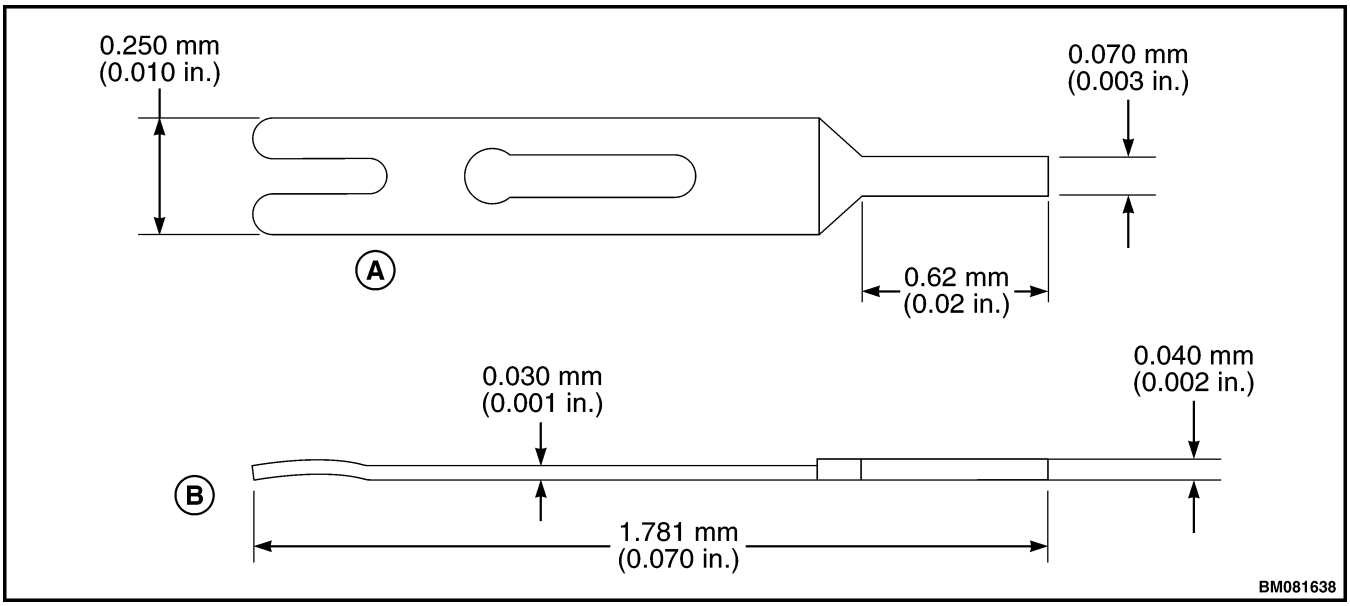
NOTE: SEE TABLE 2 FOR WIRE STRIP LENGTH.

1. STRIPPED WIRE
2. LOCATOR SLOT

Figure 32. Strip Length

MAINTENANCE AND INSPECTION

For proper operation, tool to conform to measurements indicated in Figure 71. Inspections to be performed at regular intervals, refer to manufacturers data for specifics.



A. TOP VIEW B. SIDE VIEW

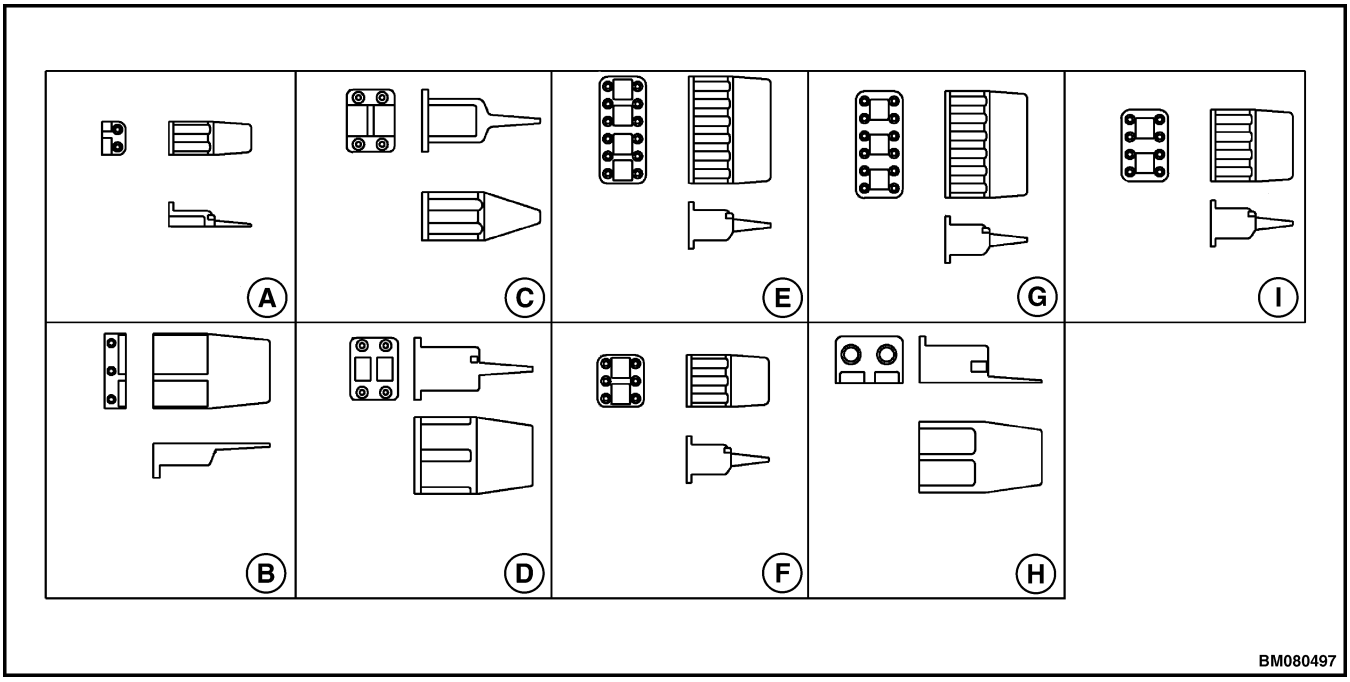
Figure 71. Tool Tip Inspection

Clean extraction tool with clean, soft, lint-free cloth and store in clean, dry place.

HOW TO USE AMP EXTRACTION TOOL

It is necessary to depress locking lance of receptacle from its cavity inside connector housing. Procedure below describes steps of extraction.

1. Orient extraction tool tip with mating face of connector. See view A of Figure 72.
2. Insert tip of extraction tool, aligned in center of housing cavity where locking lance is located. See view B of Figure 72.
3. Push wire from **BACK** of housing TOWARD tool and depress locking lance. See view C of Figure 72.
4. Pull **BACK** on wire and remove receptacle from housing. See view D of Figure 72.
5. Remove extraction tool from housing.

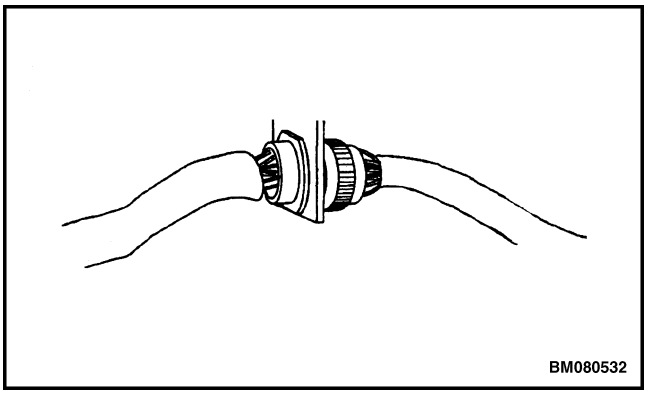


A. DTM SECONDARY LOCK TYPE HA
B. DTM SECONDARY LOCK TYPE HB
C. DTM SECONDARY LOCK TYPE HC
D. DTP SECONDARY LOCK TYPE HD
E. DTM SECONDARY LOCK TYPE HE
F. DTM SECONDARY LOCK TYPE HF
G. DTM SECONDARY LOCK TYPE HG
H. DTP SECONDARY LOCK TYPE HH
I. DTM SECONDARY LOCK TYPE HJ

Figure 22. DTM and DTP Connector Plug Secondary Locks

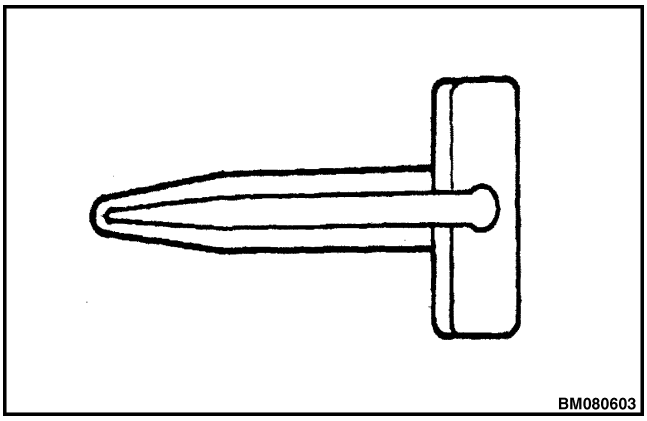
Connector Plug Socket Replacement

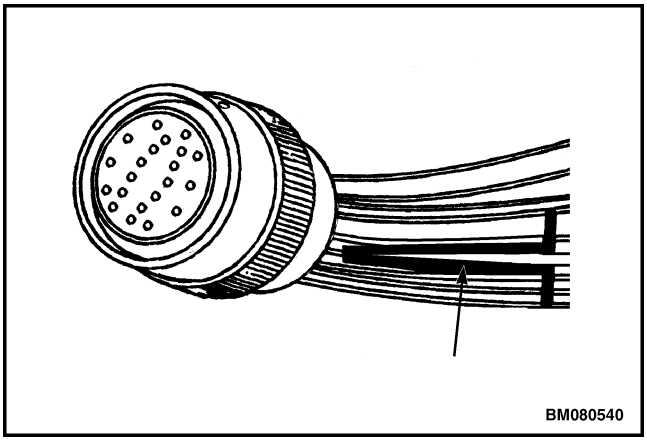
STEP 1.
Separate the connector plug from the connector receptacle.



NOTE: Be sure to use correct extraction tool; see Special Tools section of this manual.

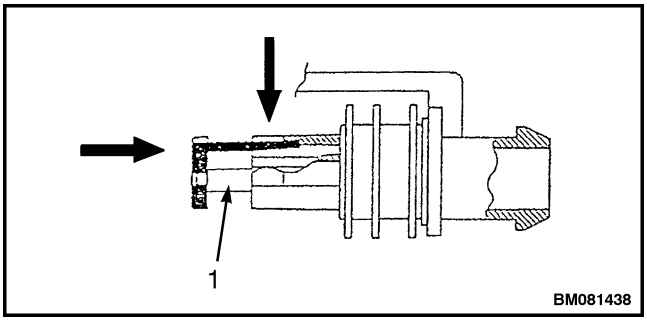
STEP 2.
Insert a Deutsch extraction tool over the wire being removed.





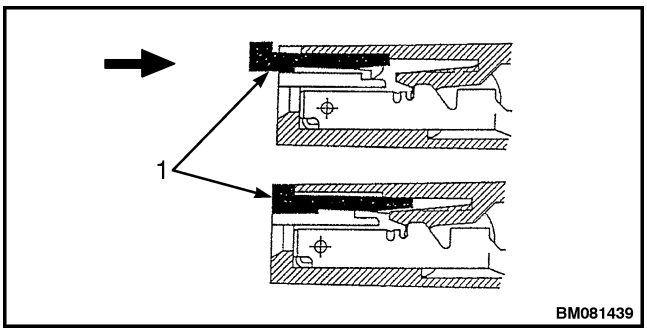
NOTE: Do not twist the tool or insert the tool at an angle.

STEP 3.
Push the two lances for position 2 housing, the central lance for positions 3 and 5 housing, and the two central lances for positions 4 and 6 housing inward. Then push until the side arms lock.



1. ANTI-BACK OUT DEVICE

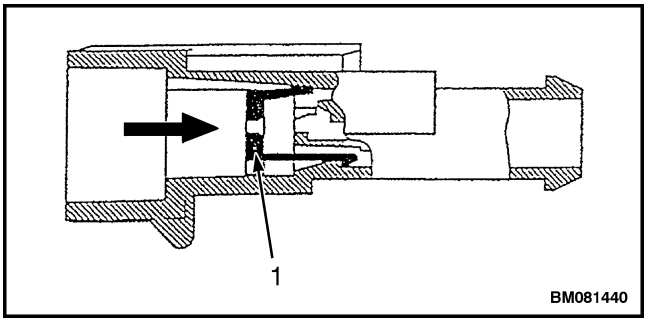
STEP 4.
For position 1, manually or machine operated, push the anti-backout device until its upper end is the same level as the housing mating face.



1. ANTI-BACK OUT DEVICE

NOTE: Different jigs are needed for position 1 and 2 housings and position 3 to 6 housings.

STEP 5.
To close the anti-backout device for tab housings, either manually or by machine, push the device in with a jig until it meets the stop.

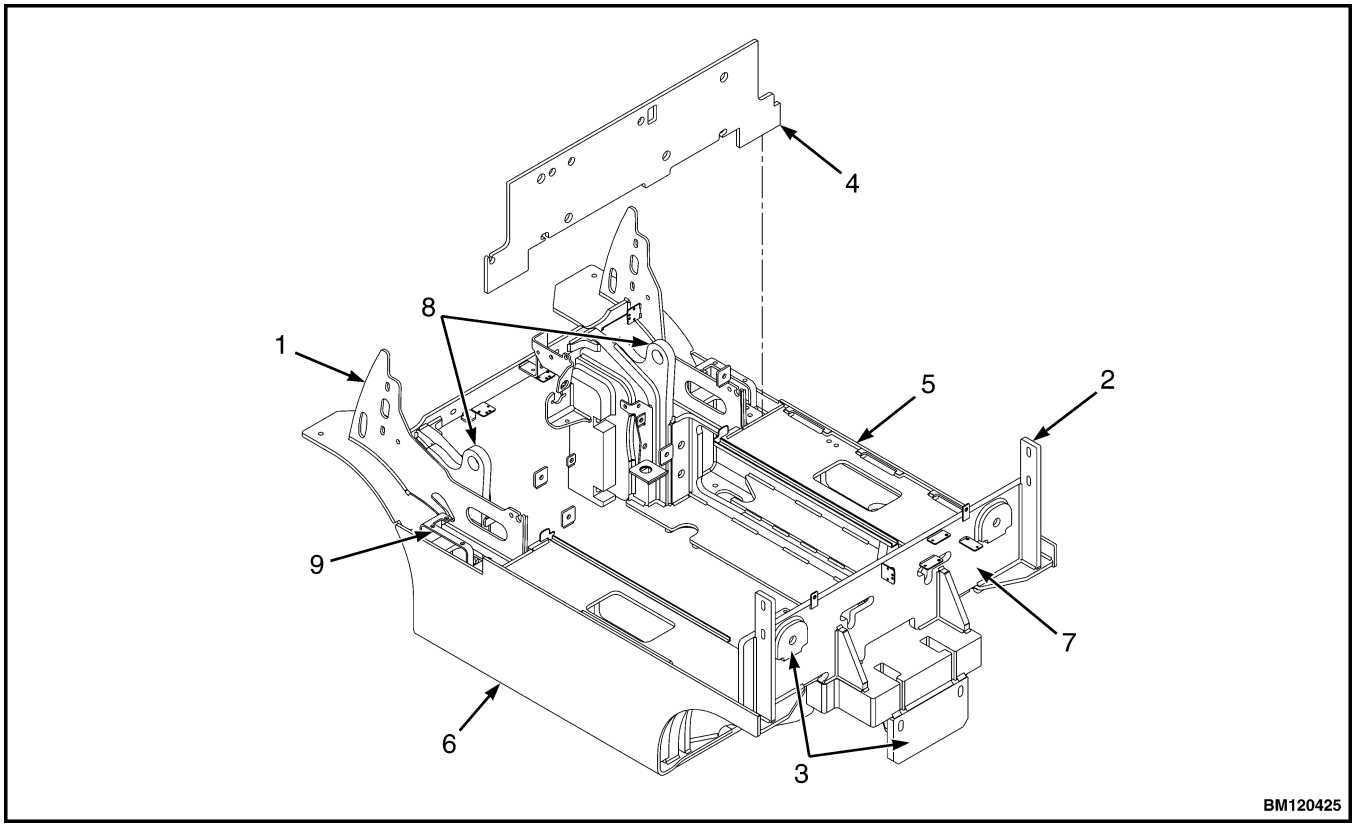


1. ANTI-BACK OUT DEVICE

Removal of Contacts

Since the locking lance of contacts can be reached from the mating side of the housings, it is necessary to remove the anti-backout device first.

NOTE: Perform Step 1 and Step 2 for removal of receptacle contact.



1. FRONT OVERHEAD GUARD MOUNTING BRACKET
2. REAR OVERHEAD GUARD MOUNTING BRACKET
3. COUNTERWEIGHT MOUNTING PLATE
4. FRONT BULKHEAD
5. RIGHT FRAME CHANNEL
6. LEFT FRAME CHANNEL
7. REAR BULKHEAD
8. TILT ANCHOR PLATE
9. SIDE STEP MOUNTING BRACKET

Figure 7. Frame Weldment for Lift Trucks ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

The hydraulic and traction motor electronic controllers and contactors are located in the counterweight cavity for the following lift truck models

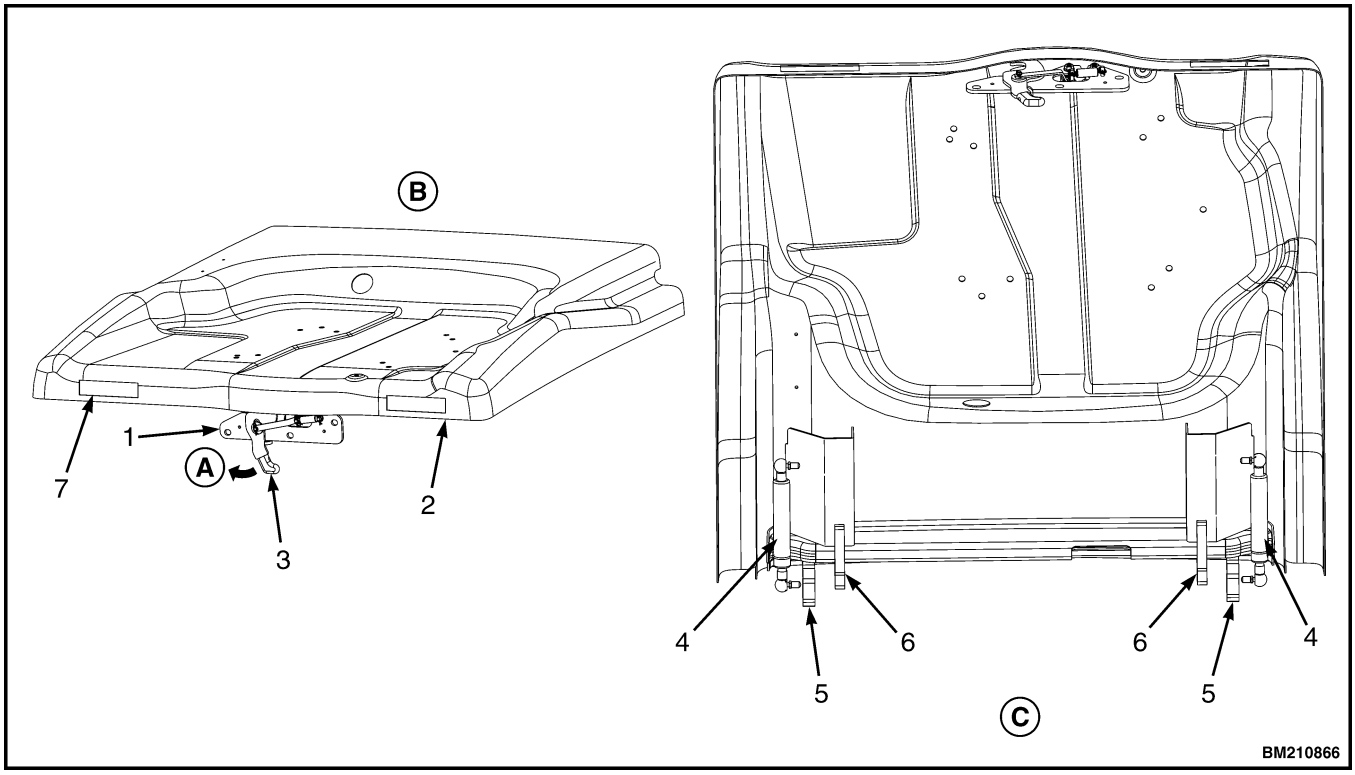
- ERC22-35VG (ERC045-070VG) (A968)
- ERC16-20VA (ERC030-040VA) (A969)
- ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

The hydraulic motor electronic controller and contactor are located in the counterweight cavity and the traction motor controller is attached to the front bulkhead for the following lift truck models

- ERP22-35VL (ERP045-070VL) (A976)
- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

NOTE: Lift truck models ERC22-35VG (ERC045-070VG) (A968) manufactured after June, 2012 are equipped with a removable floor plate that requires no tools to remove.

For all lift truck models covered in this **Service Manual**, the Vehicle Systems Manager (VSM) is either mounted on or near the front bulkhead underneath the floor mat and floor plate.



NOTE: 1015 mm (40 in.) HOOD SHOWN. OTHER SIZES SIMILAR.
NOTE: SEAT NOT SHOWN FOR CLARITY.

A. RELEASE DIRECTION
B. FRONT VIEW
C. BOTTOM VIEW

1. HOOD LATCH ASSEMBLY
2. HOOD
3. HOOD RELEASE LEVER
4. GAS-CONTROLLED STRUT
5. HOOD HINGE
6. BATTERY STOPPER
7. HANDLE

Figure 42. Hood and Latch Assembly, Lift Truck Models Manufactured Prior to June, 2012ERC22-35VG (ERC045-070VG) (A968)

12. Remove locking clip from gas-controlled strut front end. Remove gas-controlled strut front end from ball stud and hood hinge arm. See Figure 74.

13. Remove locking clip from gas-controlled strut back end. Remove gas-controlled strut back end from ball stud and hood hinge. See Figure 74.

14. Repeat Step 12 and Step 13 for opposite gas-controlled strut.

15. Close hood. See the section Opening and Closing the Hood for procedures.

16. Remove counterweight cover. See the section Counterweight Replacement for Lift Truck Models ERP22-35VL (ERP045-070VL) (A976) and ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985) for procedures.

NOTE: Note placement of washers prior to removal to aid in installation.

17. Remove nuts, shoulder bolts, washers, and plates from hood hinges and hood hinge arms. See Figure 74.

18. On left hood hinge, remove washers and snap ring from bottom of link plate. Remove bottom of link plate from pin. See Figure 74.

19. Using a lifting device, remove hood from lift truck frame.

INSTALL

1. Using a lifting device, position hood onto hinges and install washers, shoulder bolts, nuts, and plates as noted during removal. See Figure 74.

   Tighten nuts.

   Nuts must be fully engaged with shoulder bolt and hood hinge arm assembly must be free to move.

   Add or subtract washers, if necessary, to allow hood hinge arm assembly to move freely when opening and closing hood.

2. On left side of hood hinge, install washer and bottom of link plate to pin. Install other washer and snap ring to secure bottom of link plate to pin. See Figure 74.

3. Open and close hood to check for proper clearance. See section Opening and Closing the Hood for procedures.

4. Install counterweight cover. See section Counterweight Replacement for Lift Truck Models ERP22-35VL (ERP045-070VL) (A976) and ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985) for procedures.

5. Raise hood. Install gas-controlled strut back end onto ball stud on hood hinge. Install locking clip on gas-controlled strut back end and ball stud. See Figure 74.

6. Install gas-controlled strut front end onto ball stud on hood hinge arm. Install locking clip on gas-controlled strut front end and ball stud. See Figure 74.

7. Repeat Step 5 and Step 6 for opposite gas-controlled strut.

8. If seat rails were removed from seat assembly, hold ride position indicator in the open position and slide seat onto seat rails. Install stop screws. See **Electrical System** 2200YRM1369 for procedures.

9. If seat assembly has been removed from hood, position seat onto hood and install capscrews and washers into hood and seat rails. See Figure 70.

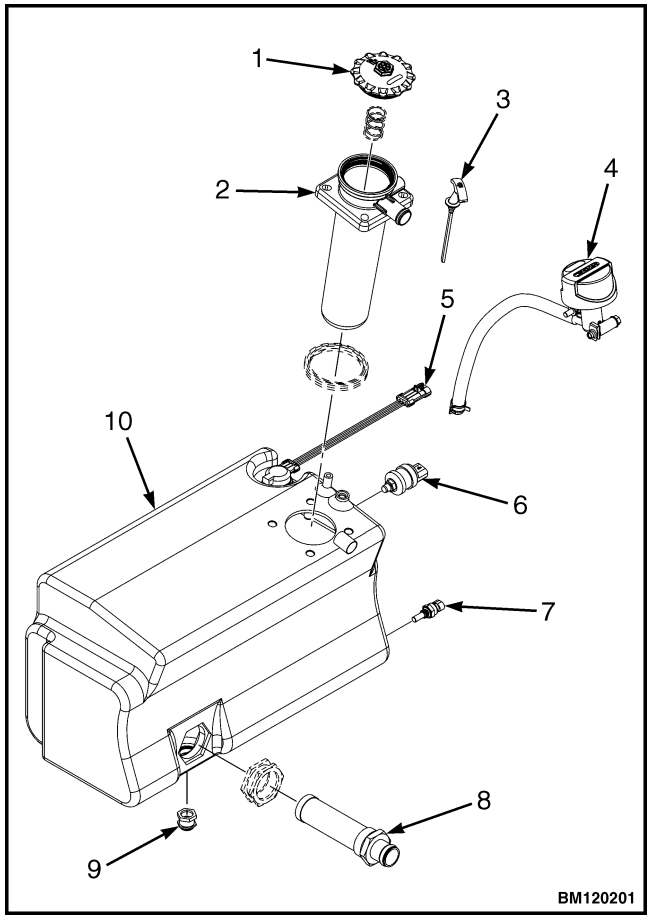
NOTE: Remove tags as electrical connections are made.

10. Connect operator presence system connector to main wire harness. See Figure 70.

11. Install hood and latch switches and emergency battery disconnect switch, if removed, and adjust as necessary. See **Electrical System** 2200YRM1369 for procedures.

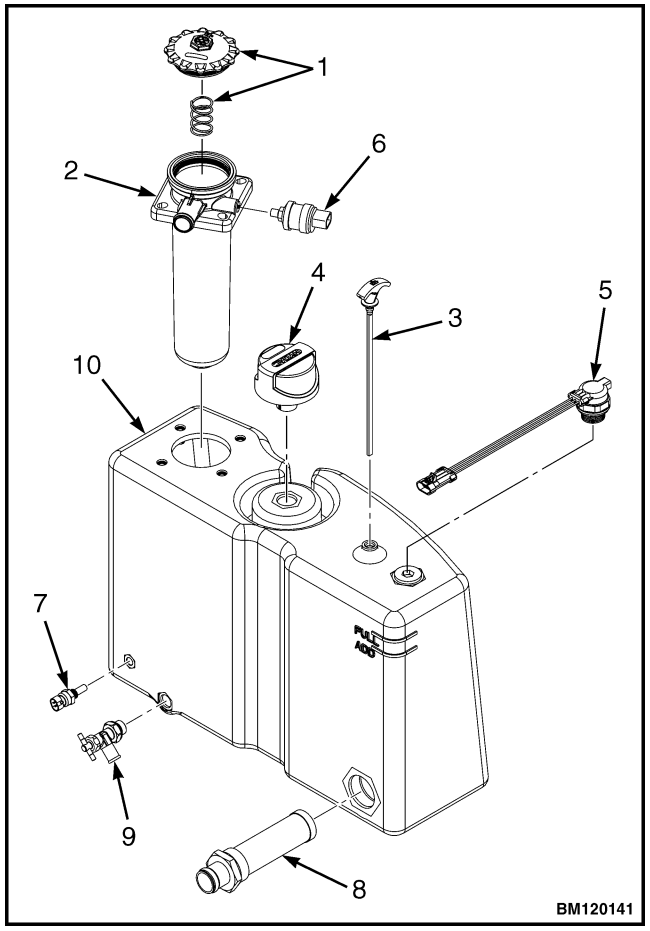
12. Connect electrical wires, as tagged during removal, to emergency battery disconnect and hood and latch position switches. See **Electrical System** 2200YRM1369 for procedures.

13. If equipped, connect electrical connector for E-Hydraulic controller. See **Electrical System** 2200YRM1369 for procedures.



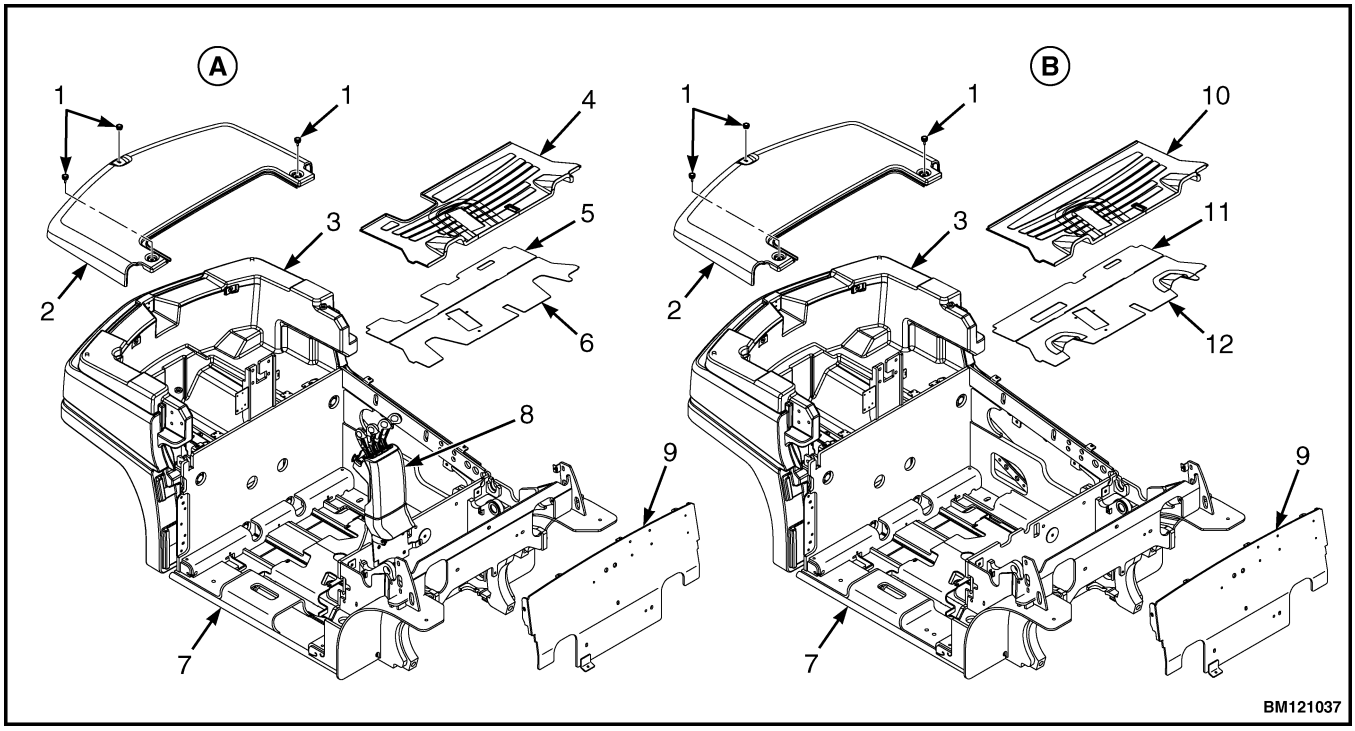
1. FILL CAP
2. FILTER HOUSING
3. DIPSTICK
4. BREATHER FILTER
5. OPTIONAL LEVEL SENSOR
6. OPTIONAL FILTER PRESSURE SWITCH
7. TEMPERATURE SENSOR
8. SUCTION STRAINER W/O-RING
9. MAGNETIC PLUG W/O-RING
10. HYDRAULIC TANK

Figure 110. Nylon Hydraulic Tank for Lift Truck ERC22-35VG (ERC045-070VG) (A968)



1. FILL CAP
2. FILTER HOUSING
3. DIPSTICK
4. BREATHER FILTER
5. LEVEL SENSOR
6. PRESSURE SWITCH
7. TEMPERATURE SENSOR
8. SUCTION STRAINER W/ O-RING
9. DRAIN VALVE
10. HYDRAULIC TANK

Figure 111. Hydraulic Tank for Lift Truck ERP22-35VL (ERP045-070VL) (A976)



A. MANUAL HYDRAULIC CONTROL LEVERS

1. CAPTIVE CAPSCREW*
2. COUNTERWEIGHT COVER
3. COUNTERWEIGHT
4. MANUAL HYDRAULIC FLOOR MAT
5. MANUAL HYDRAULIC FLOOR PLATE
6. MANUAL HYDRAULIC FLOOR PLATE

*Capscrew after May, 2019

B. E-HYDRAULIC CONTROL LEVERS

7. FRAME
8. MANUAL HYDRAULIC COVERS
9. COWL
10. E-HYDRAULIC FLOOR MAT
11. E-HYDRAULIC FLOOR PLATE
12. E-HYDRAULIC FLOOR PLATE

Figure 18. Covers and Floor Plates for Lift Truck Models Equipped With Side Battery Removal Option ERP40-55VM (ERP080-120VM) (A985)

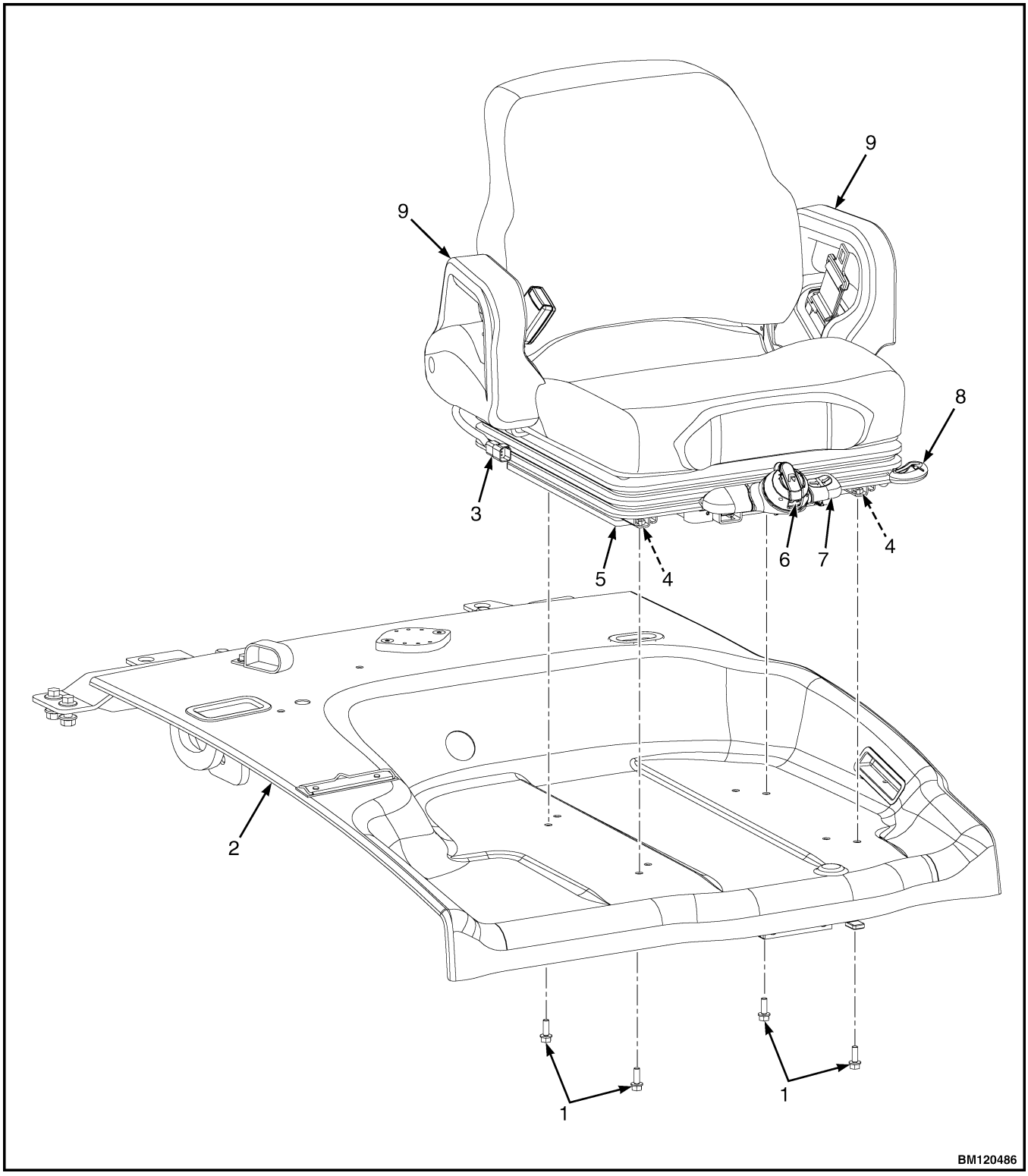


Figure 56. Seat Assembly, Lift Trucks Manufactured After June, 2012

Table 4. Counterweights for Lift Truck Manufactured Prior to June 2016 ERP22-35VL (ERP045-070VL) (A976)

Model	(mm*)	Weight	+ 50 kg (110 lb) - 0 kg (0 lb)
ERP22-25VL (ERP045-050VL)	717	725 kg (1598 lb)	
ERP30VL (ERP060VL)	861	801 kg (1766 lb)	
ERP35VL (ERP070VL)	861	1116 kg (2460 lb)	
*Approximate battery compartment lengths.			

Table 5. Counterweights for Lift Truck Manufactured After June 2016 ERP22-35VL (ERP045-070VL) (A976)

Model	(mm*)	Weight	+ 50 kg (110 lb) - 0 kg (0 lb)
ERP22-25VL (ERP045-050VL)	717	736 kg (1623 lb)	
ERP30VL (ERP060VL)	861	812 kg (1790 lb)	
ERP35VL (ERP070VL)	861	1126 kg (2482 lb)	
*Approximate battery compartment lengths.			

Table 6. Counterweights for Lift Truck ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

Model	(mm*)	Weight	+ 50 kg (110 lb) - 0 kg (0 lb)
ERP40-45VM (ERP080-090VM)	859	1453 kg (3203 lb)	
ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML)	1006	2621 kg (5778 lb)	
*Approximate battery compartment lengths.			

The counterweight normally is not removed for most repairs. Replacement of controller and hydraulic components is easier with counterweight installed. The counterweight is fastened to rear bulkhead with mounting bolts.

See Figure 85 for lift truck models

- ERP22-35VL (ERP045-070VL) (A976) manufactured prior to June, 2012

See Figure 86 for lift truck models

- ERP22-35VL (ERP045-070VL) (A976) manufactured after June, 2012

See Figure 87 for lift truck model

- ERP22-35VL (ERP045-070VL) (A976) manufactured after November, 2015

See Figure 88 for lift truck model

- ERP22-35VL (ERP045-070VL) (A976) manufactured after June, 2016

See Figure 89 for lift truck models

- ERP40-50VM (ERP080-100VM) (A985) manufactured before Nov, 2014

See Figure 90 for lift truck models

- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985) manufactured after Nov, 2014

Table 14. Model TrucksERP40-50VM, ERP50-55VM6 (A985)

Model	Minimum Compartment Size Length × Width	Battery Size Min/Max		Weight		Maximum Battery Height
		Length	Width	Minimum	Maximum	
ERP40-50 VM, ERP50-55 VM6	1006 x 1037 mm (39.6 x 40.8 in.)	960 to 1000 mm (37.8 to 39.4 in.)	1013 to 1030 mm (39.8 to 40.6 in.)	2070 kg (4564 lb)	2287 kg (5042 lb)	798 mm (31.4 in.)
ERP40VM, ERP45VM	859 x 1037 mm (33.8 x 40.8 in.)	800 to 855 mm (31.5 to 33.7 in.)	1013 to 1030 mm (39.8 to 40.6 in.)	1770 kg (3902 lb)	1956 kg (4312 lb)	798 mm (31.4 in.)

NOTE: Tolerances of the battery compartment are +3 and −0 mm (+0.12 and −0 in.). The battery size column shows the size range that will permit the battery to still fit into a battery compartment.

NOTE: Battery compartment length is front to back. Width is side to side. The "length" dimension of the battery must fit within the battery compartment front-to-back dimension with a clearance of 0 to 13 mm (0 to 0.5 in.) maximum. Battery width must fit within the battery compartment side-to-side dimension.

WARNING

The battery must fit the battery compartment so that the battery restraint system will operate correctly. Use only batteries with the correct length shown in this table. Adjust the spacer plate to prevent the battery from moving more than 13 mm (0.5 in.) forward or backward.

Torque Specifications for Lift Truck Models ERC22-35VG (ERC045-070VG) (A968) and ERC16-20VA (ERC030-040VA) (A969)

OVERHEAD GUARD

Front Overhead Guard Leg Capscrews
66 N•m (49 lbf ft)

Rear Overhead Guard Leg Capscrews
66 N•m (49 lbf ft)

Handle Capscrews
12 N•m (8.9 lbf ft)

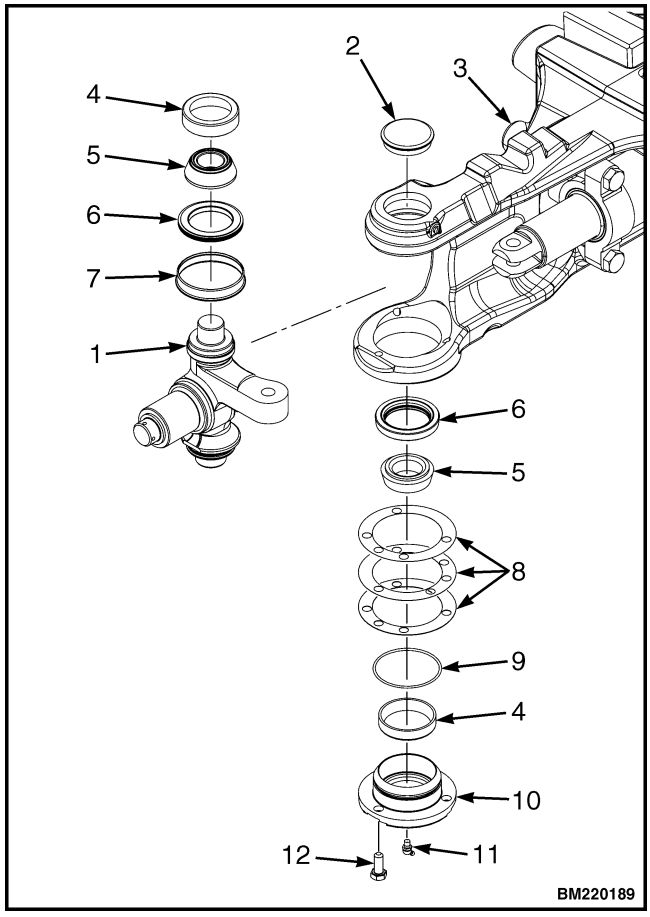
COUNTERWEIGHT

Upper Capscrews
755 N•m (557 lbf ft)

Lower Capscrews
90 N•m (66 lbf ft)

TRACTION MOTOR

Traction Motor to Mounting Flange Capscrews
38 to 48 N•m (28 to 35 lbf ft)



1. SPINDLE LH
2. GREASE CAP
3. STEERING AXLE
4. BEARING CUP
5. BEARING CONE
6. SEAL
7. WEAR RING
8. SHIMS
9. O-RING
10. BEARING CAP
11. LUBRICATION FITTING
12. CAPSCREWS

Figure 41. Spindle Repair ERC22-35VG (ERC45-70VG) (A968) and ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

NOTE: Note the thickness of the shims during removal to aid in installation.

10. Remove three capscrews, bearing cap, and shims from the bottom of the steering axle. See Figure 41.

11. Tilt the spindle and lift from the steering axle.

12. Remove the wear sleeve from the steering axle.

13. Repeat Step 2, Step 3 and Step 9 through Step 12 for the other spindle.

DISASSEMBLE ERC22-35VG (ERC45-70VG) (A968) AND ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

1. Remove and discard O-ring from the bearing cap. See Figure 41.

2. Remove bearing cone, and seal from top of the spindle. Discard seal.

3. Remove bearing cone, and seal from bottom of the spindle. Discard seal.

CLEAN

WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

WARNING

Compressed air is used for cleaning or drying purposes, or for clearing restrictions. Wear protective clothing (goggles/shield, gloves, etc.) to avoid injury to personnel.

1. Clean bearings by placing them in a wire basket and immersing in a container of fresh solvent. Agitate the bearings in the solvent to remove all traces of old lubricant.

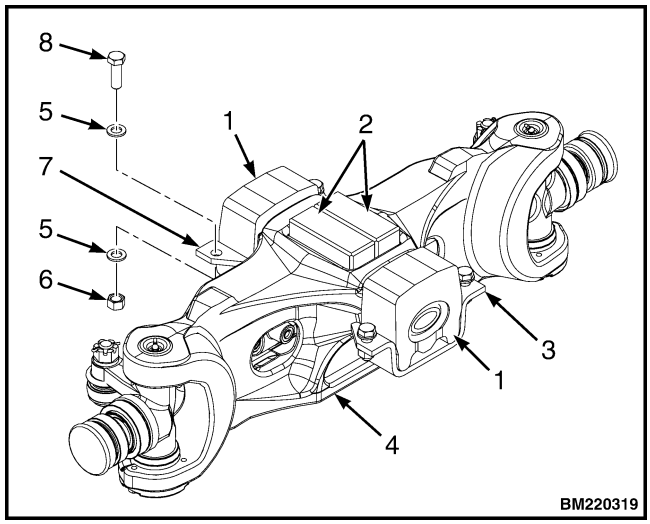
2. After cleaning the bearings, dry them with clean compressed air. Take care to prevent spinning the bearings when using a compressed air jet.

3. Immediately wrap bearings in a lint-free cloth to protect them from dust and other foreign matter.

4. Clean the spindle with solvent and air dry with compressed air.

5. Clean the wear ring using warm soapy water and dry with a lint free cloth.

4. If the lift truck is equipped with the steering direction sensor option, connect steering direction sensor cable to the main wiring harness. See Figure 7.



1. RUBBER MOUNT
2. TOP MOUNTS
3. REAR MOUNT BRACKET
4. STEER AXLE
5. WASHER
6. NUT
7. FRONT MOUNT BRACKET
8. CAPSCREW

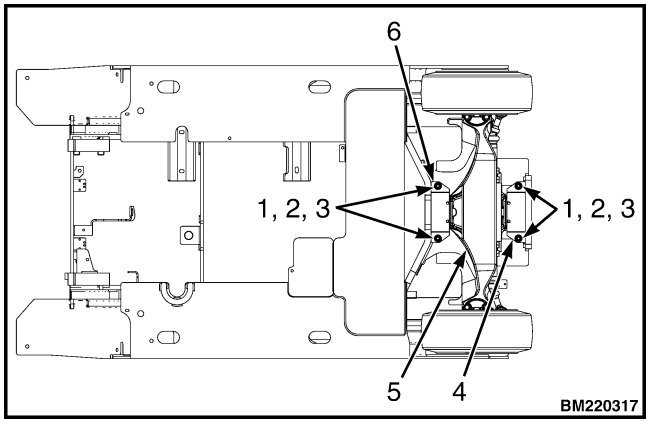
Figure 13. Mount Installation, Lift Trucks ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

5. Lift the steer axle into position on the lift truck frame, and install the rear and front mount brackets, eight washers, four capscrews, and four nuts. Tighten capscrews to 225 to 280 N•m (166 to 207 lbf ft). See Figure 14.

6. Remove plugs and caps and connect hydraulic lines to steering cylinder as noted during removal.

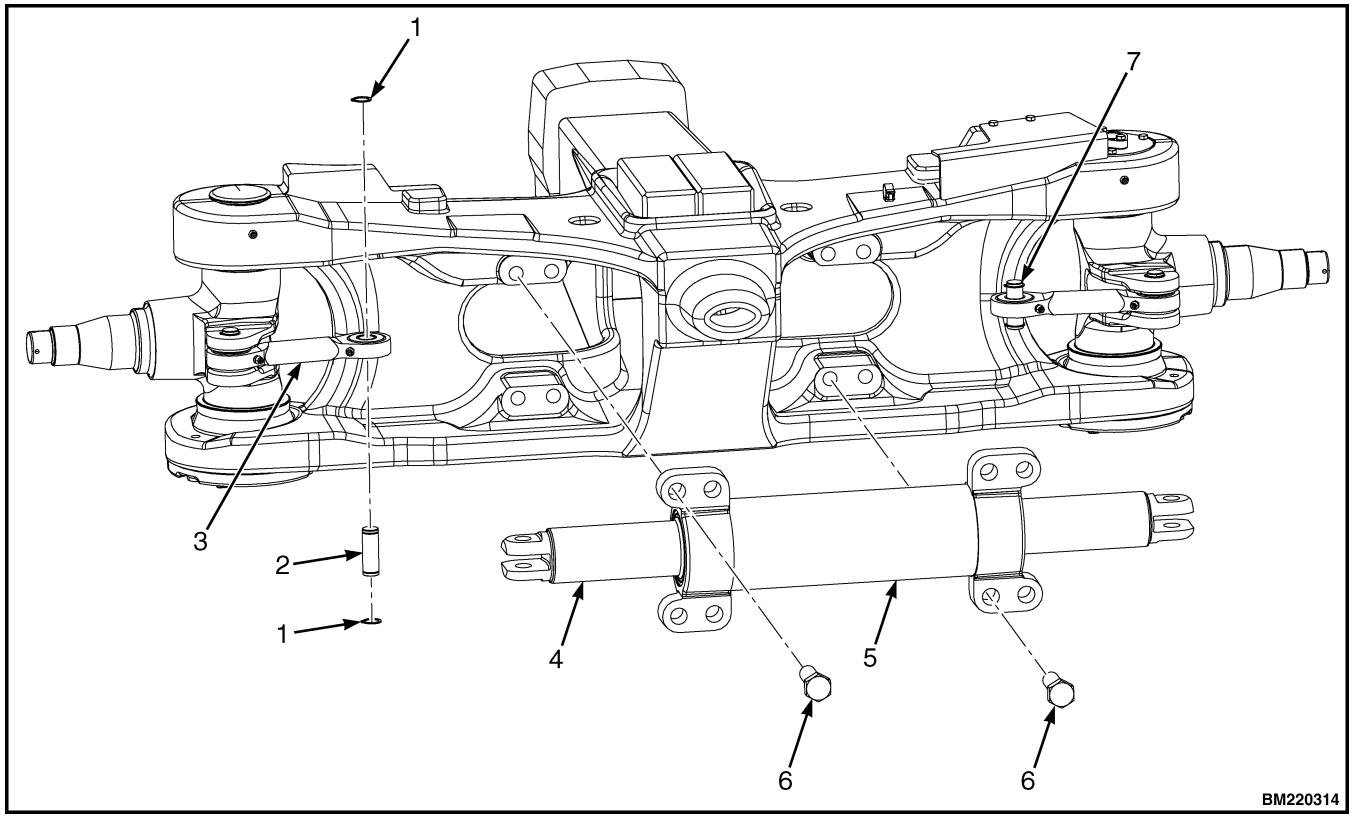
7. Remove the floor jack from under the lift truck, and remove the lift truck from the blocks.

8. Operate steering system to remove air from system. Turn steering wheel several times from one stop to the other. Check for hydraulic leaks.



1. CAPSCREW
2. WASHER
3. NUT
4. REAR MOUNT BRACKET
5. STEER AXLE
6. FRONT MOUNT BRACKET

Figure 14. Steer Axle Installation, Lift Trucks ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)



1. SNAP RING
2. PIN
3. TIE ROD
4. STEERING CYLINDER ROD
5. STEERING CYLINDER
6. CAPSCREW
7. PIN AND SNAP RINGS

Figure 63. Steering Cylinder Removal for Lift Truck Models ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

3. Hold end of steering cylinder over a container. Remove plug for hydraulic fitting from each end cap. Push rod toward end of shell that is over container. Oil will drain from cylinder. Repeat procedure for other end.

DISASSEMBLE ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

1. Remove one end cap from cylinder shell and slide off of cylinder rod. See Figure 64.

2. Remove the rod wiper, seal, O-ring, backup ring, and O-ring from the end cap. Discard rod wiper, seal, and O-rings. See Figure 64.

Torque Specifications

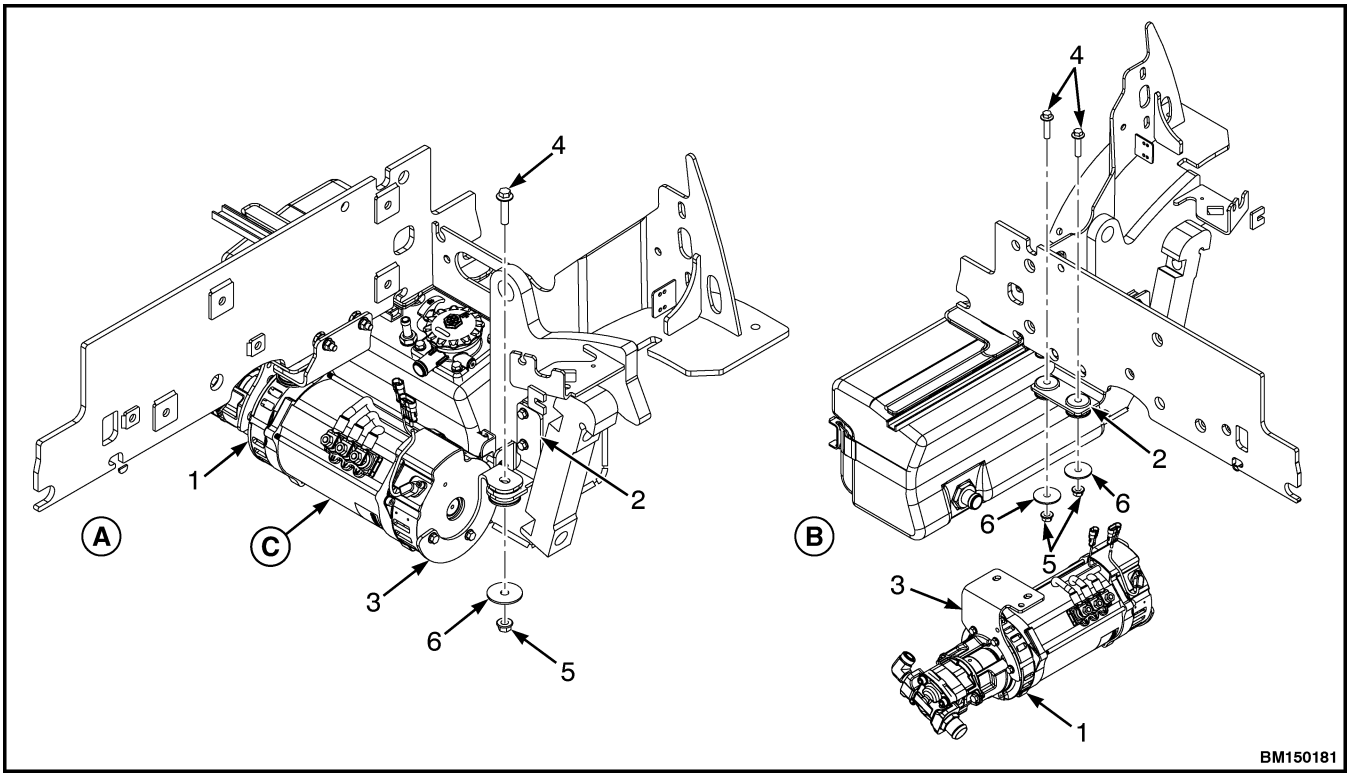
STEERING CONTROL UNIT

Fittings and Special Screws
30 ±3 N•m (266 ±27 lbf in)

STEERING COLUMN

Steering Wheel Hex Nut
40 to 54 N•m (30 to 40 lbf ft)

Cowl Attachment
52 N•m (38 lbf ft)



NOTE: MAJOR COMPONENTS OF FRAME NOT SHOWN FOR CLARITY. STANDARD MOTOR SHOWN.

A. FRONT VIEW
B. REAR VIEW
C. FLOOR JACK PLACEMENT

1. PUMP AND MOTOR ASSEMBLY
2. MOTOR SUPPORT BRACKET
3. MOTOR MOUNT BRACKET
4. MOTOR MOUNT BOLT
5. NUT
6. SNUBBING WASHER

Figure 3. Pump and Motor Support for Lift Truck Models ERC22-35VG (ERC045-070VG) (A968)

Lift Truck Models ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

1. Lubricate new quad seal with clean hydraulic oil and install on hydraulic filter housing. Install hydraulic filter housing, four lockwashers, and four capscrews into hydraulic tank. Tighten capscrews to 10 N•m (89 lbf in). See Figure 39.

2. Install gauge onto hydraulic filter housing.

NOTE: Perform the following step if lift truck is equipped with pressure switch.

3. Install pressure switch onto hydraulic filter housing. Tighten pressure switch to 25 N•m (221 lbf in). See Figure 39.

4. Lubricate new O-ring with clean hydraulic oil and install on breather. Install breather onto hydraulic tank. Tighten breather to 10 N•m (89 lbf in). See Figure 39.

5. Lubricate new O-ring with clean hydraulic oil and install on fitting. Install fitting into hydraulic tank. Tighten fitting to 45 N•m (33 lbf ft).

NOTE: Perform the following step if lift truck is equipped with tank level sensor.

6. Lubricate new O-ring with clean hydraulic oil and install on tank level sensor. Install tank level sensor into hydraulic tank. Tighten tank level sensor to 4 to 7 N•m (35 to 62 lbf in). See Figure 39.

7. Install temperature sensor into hydraulic tank. Tighten temperature sensor to 19 to 21 N•m (168 to 186 lbf in). See Figure 39.

8. Install drain valve onto hydraulic tank. Tighten drain valve to 40 N•m (30 lbf ft). See Figure 39.

9. Install drain hose onto drain valve. Move hose clamp to hold drain hose on drain valve and tighten hose clamp. See Figure 39.

10. Lubricate new O-ring with clean hydraulic oil and install on suction strainer. Install suction strainer into hydraulic tank. Tighten suction strainer to 135 N•m (100 lbf ft). See Figure 39.

11. Lubricate new O-ring with clean hydraulic oil and install on dipstick. Install dipstick into hydraulic tank. See Figure 39.

INSTALL

Lift Truck Models ERC22-35VG (ERC045-070VG) (A968)

1. Install hydraulic tank in lift truck.

2. Wrap tank retention strap around hydraulic tank and install capscrew to hold strap to mounting bracket on truck frame. See Figure 29.

NOTE: Perform step below for lift trucks equipped with nylon tank.

3. Install breather hose onto breather fitting. Move hose clamp over flanged end of fitting and tighten. See Figure 27.

NOTE: Perform step below for lift truck equipped with metal tank.

4. Install breather hose onto breather tube. Move hose clamp over flanged end of tube and tighten. See Figure 28.

5. Install hydraulic filter element into hydraulic filter housing. See Hydraulic Filter Replacement section of this manual for procedure.

6. Install return line onto hydraulic filter housing. Move hose clamp on return line over end of hydraulic filter housing port and tighten.

   For lift trucks equipped with a nylon tank, see Figure 27.

   For lift trucks equipped with a metal tank, see Figure 28.

7. Install hydraulic pump and motor. See Hydraulic Pump and Motor, Install section of this manual for procedures.

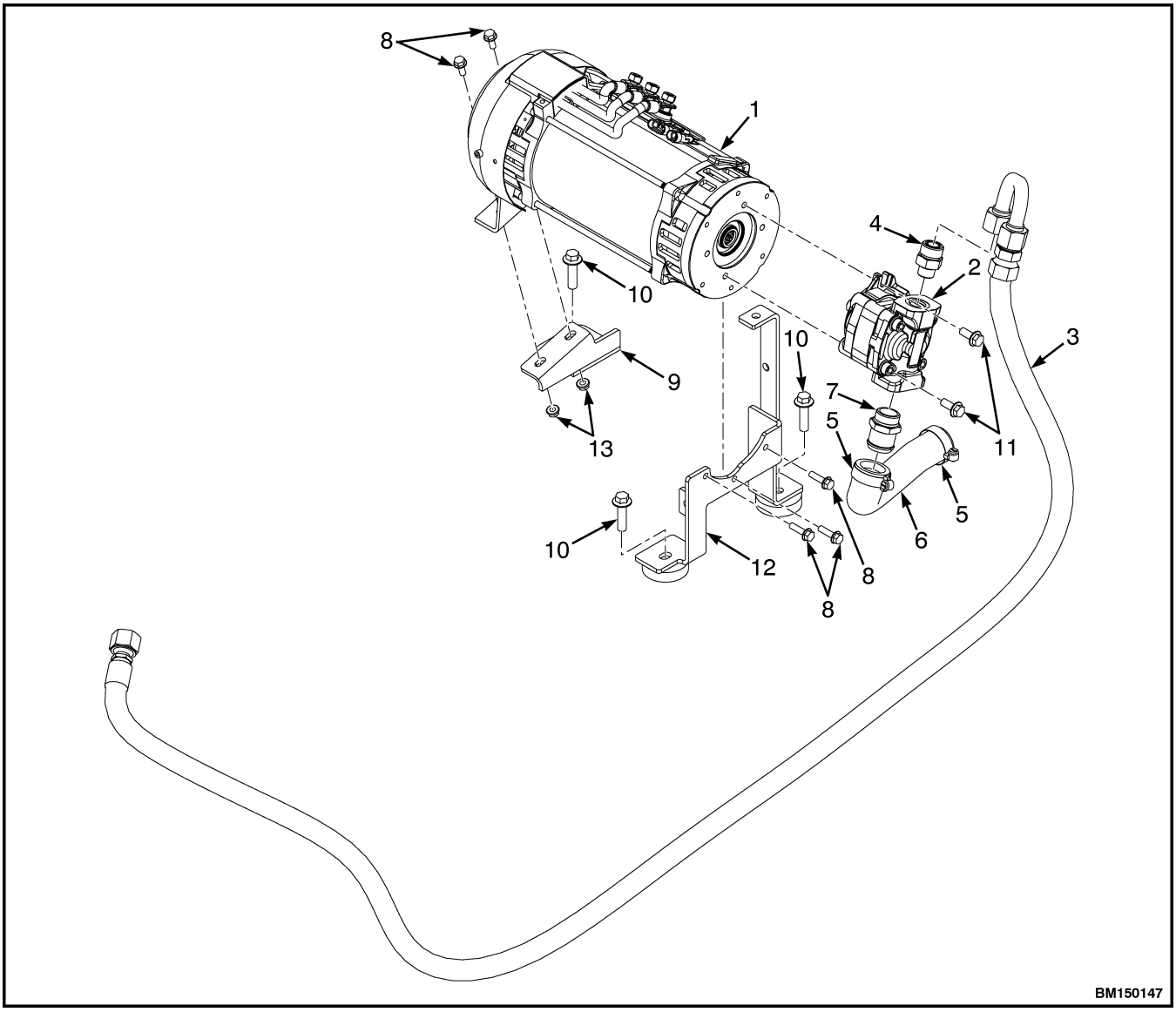
8. Fill hydraulic tank with hydraulic oil. See Add Hydraulic Oil section of this manual for procedure.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

9. Remove container and dispose of hydraulic oil.

10. Remove lift truck from blocks. See **Operating ManualPeriodic Maintenance** 8000YRM1364 for procedure to remove lift truck from blocks.



1. MOTOR
2. HYDRAULIC PUMP
3. PRESSURE LINE HOSE
4. FITTING
5. HOSE CLAMP
6. SUCTION HOSE
7. SUCTION ADAPTER
8. CAPSCREW
9. MOTOR MOUNT BRACKET
10. MOUNTING CAPSCREW
11. CAPSCREW
12. PUMP END MOTOR MOUNT BRACKET
13. NUT

Figure 16. Hydraulic Pump and Motor Assembly for Lift Truck Models ERP22-35VL (ERP045-070VL) (A976)

7. Loosen and move hose clamp up suction hose until suction adapter end is cleared, tighten hose clamp enough to keep suction hose and hose clamp together.

8. Disconnect suction hose from suction adapter. See Figure 14, Figure 15, and Figure 16. Plug suction adapter and suction hose.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

WARNING

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

WARNING

Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

3. Wash breather in solvent and use compressed air to dry.

4. Inspect breather for wear or damage. Replace if damaged. See **Parts Manual** if new part is required.

5. Lubricate new O-ring with clean hydraulic oil and install on breather.

NOTE: Remove plugs during installation.

6. Install breather onto breather adapter.

   See Figure 44 for lift truck models

   - ERC22-35VG (ERC045-070VG) (A968)

   See Figure 45 for lift truck models

   - ERC16-20VA (ERC030-040VA) (A969)

7. Install floor plate and floor mats.

Lift Truck Models ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

1. Remove floor mats and floor plates for access to breather.

2. Remove breather from surge tank. Discard O-ring. Plug surge tank to prevent foreign material from entering hydraulic system. See Figure 33.

WARNING

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

WARNING

Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

3. Wash breather in solvent and use compressed air to dry.

4. Inspect breather for wear or damage. Replace if damaged. See **Parts Manual** if new part is required.

5. Lubricate new O-ring with clean hydraulic oil and install on breather.

NOTE: Remove plugs during installation.

6. Install breather onto surge tank. See Figure 33.

7. Install floor plate and floor mats.

Lift Truck Models ERP22-35VL (ERP045-070VL) (A976)

1. Remove tow pin from counterweight cover.

2. Remove two capscrews, two washers, and counterweight cover from counterweight.

3. Remove breather from hydraulic tank. Discard O-ring. Plug hydraulic tank to prevent foreign material from entering hydraulic system. See Figure 41.

WARNING

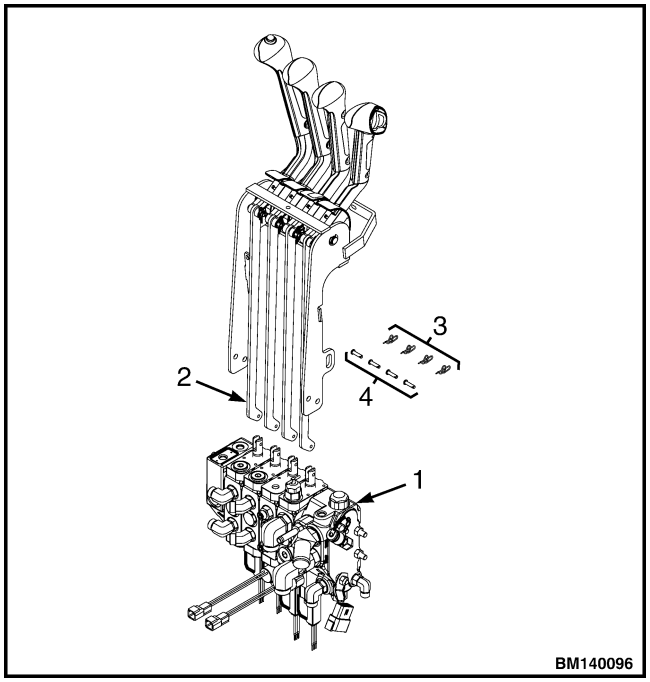
Cleaning solvents can be flammable and toxic, and can cause skin irritation. When using cleaning solvents, always follow the recommendations of the manufacturer.

WARNING

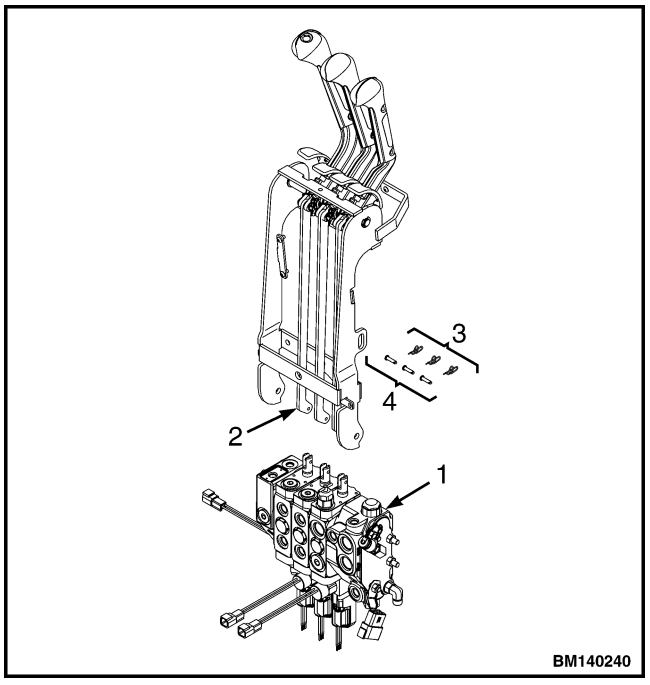
Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

4. Wash breather in solvent and use compressed air to dry.

STEP 14.
Remove locking ring cotter pin, rod end pin, and link from manual control valve. Repeat for all links. Discard locking ring cotter pin.



1. MANUAL CONTROL VALVE
2. LINK
3. LOCKING RING COTTER PIN
4. ROD END PIN

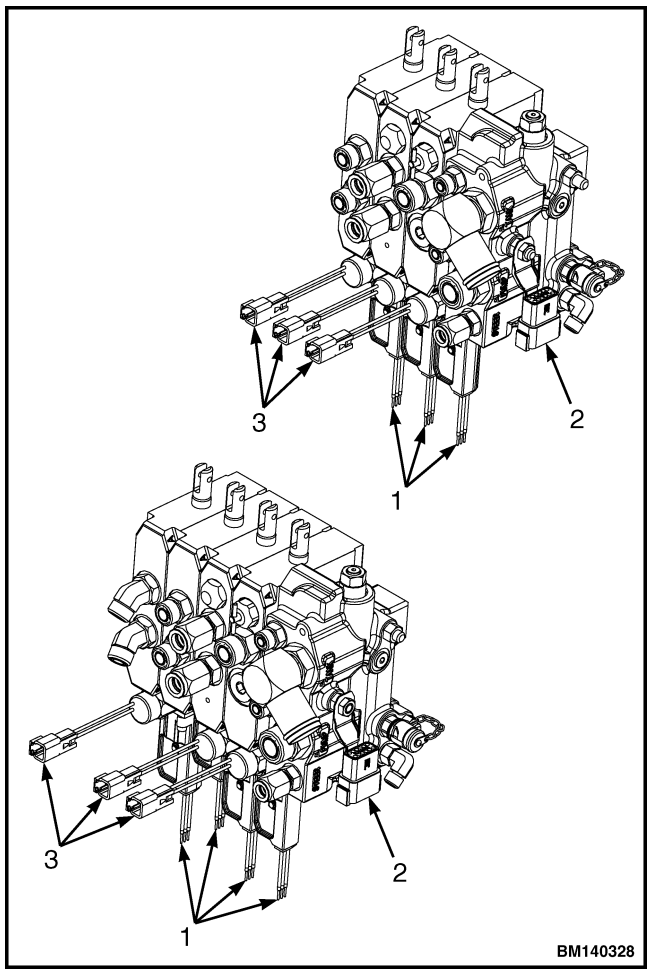


1. MANUAL CONTROL VALVE
2. LINK
3. LOCKING RING COTTER PIN
4. ROD END PIN

Legend for Figure 40.

A. 3-FUNCTION MANUAL CONTROL VALVE
B. 4-FUNCTION MANUAL CONTROL VALVE

1. POSITION SENSOR WIRES
2. POSITION SENSOR ELECTRICAL CONNECTOR
3. OPS SOLENOID



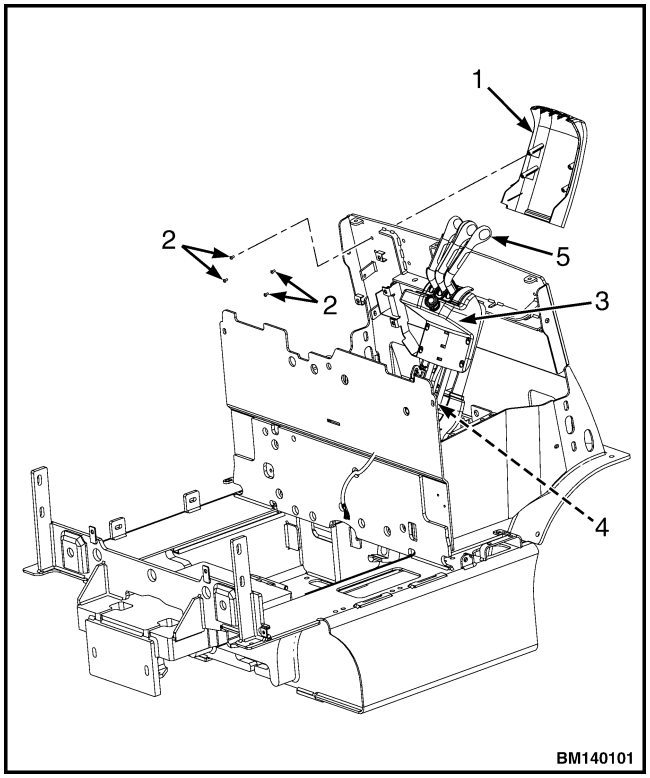
A. 3-FUNCTION MANUAL CONTROL VALVE
B. 4-FUNCTION MANUAL CONTROL VALVE

1. POSITION SENSOR WIRES
2. POSITION SENSOR ELECTRICAL CONNECTOR
3. OPS SOLENOID

Figure 41. Manual Control Valve Electrical Connections, Lift Truck Models Manufactured After November, 2014ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

7. Disconnect OPS solenoids from manual hydraulic wire harness.

STEP 15.
Install upper front cover and four button-head capscrews onto rear cover. Tighten capscrews to 2.82 to 3.16 N•m (24.96 to 27.97 lbf in). Pull manual hydraulic linkage and handles upright and secure with latch handle.



1. UPPER FRONT COVER
2. BUTTON-HEAD CAPSCREW
3. REAR COVER

Ending Steps

1. Connect spool lock solenoids to manual hydraulic wire harness. See Figure 39, Figure 40, or Figure 41.

2. Connect position sensor connector to manual hydraulic wire harness. See Figure 39, Figure 40, or Figure 41.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

NOTE: Remove caps from hydraulic hoses and control valve fittings as connections are made.

3. Connect hydraulic hoses to control valve fittings as tagged during removal. Dispose of drain pan contents.

4. Install floor plates and floor mats.

5. Install battery into lift truck. See **How to Change Battery** in **Operating Manual** or

Periodic Maintenance 8000YRM1364 for lift truck models

- ERC22-35VG (ERC045-070VG) (A968)

Periodic Maintenance 8000YRM1372 for lift truck models

- ERP22-35VL (ERP045-070VL) (A976)

Periodic Maintenance 8000YRM1541 for lift truck models

- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

6. Turn lift truck **ON**, operate hydraulic functions, then check for leaks.

7. Calibrate manual control valve as outlined in Calibration Procedure.

E-Hydraulic Control Valve Repair for 1.5-2.0T Trucks

REMOVE

WARNING

Before making repairs to the control valve, fully lower all parts of the mast and tilt it fully forward. This action will prevent the mast from lowering suddenly when hydraulic lines are disconnected.

NOTE: Only perform those steps below necessary for required repair or replacement.

1. Lower mast and tilt forward.
2. Remove battery from lift truck. See **How to Change Battery** in **Operating Manual** or

   Periodic Maintenance 8000YRM1339 for lift trucks

   - ERP15-20VT (ERP030-040VT) (G807)

   Periodic Maintenance 8000YRM1373 for lift trucks

   - ERP16-20VF (ERP30-40VF) (A955)
3. Discharge capacitors by following steps shown in Discharging the Capacitors in **General** section of this manual.
4. Remove floor mats and floor plates.

WARNING

Hydraulic oil is hot after system operation and can cause burns. DO NOT disconnect any hydraulic hoses until the oil in the system is cool.

NOTE: Tag hydraulic lines during removal to aid in installation.

5. Put a drain pan under the area of the hydraulic control assembly. Disconnect hydraulic lines from E-hydraulic control assembly. Cap hydraulic lines.

NOTE: Note placement and orientation of fittings prior to removal to aid in installation.

NOTE: Note placement of O-rings on fittings prior to removal to aid in installation.

6. Remove fittings from inlet, lift, tilt, and auxiliary section(s). Remove and discard O-rings from fittings.

   See Figure 97 for lift truck models

   - ERP15-20VT (G807) manufactured before November, 2014
   - ERP030-040VT (G807) and ERP16-20VF (ERP30-40VF) (A955)

   See Figure 98 for lift truck models

   - ERP15-20VT (G807) manufactured after November, 2014

NOTE: Perform Step 2 if control valve is equipped with first auxiliary section.

2. Install new O-rings onto first auxiliary fittings. Install first auxiliary fittings into first auxiliary section. See Figure 144.

3. Install new O-rings onto tilt fittings. Install tilt fittings into tilt section. See Figure 144.

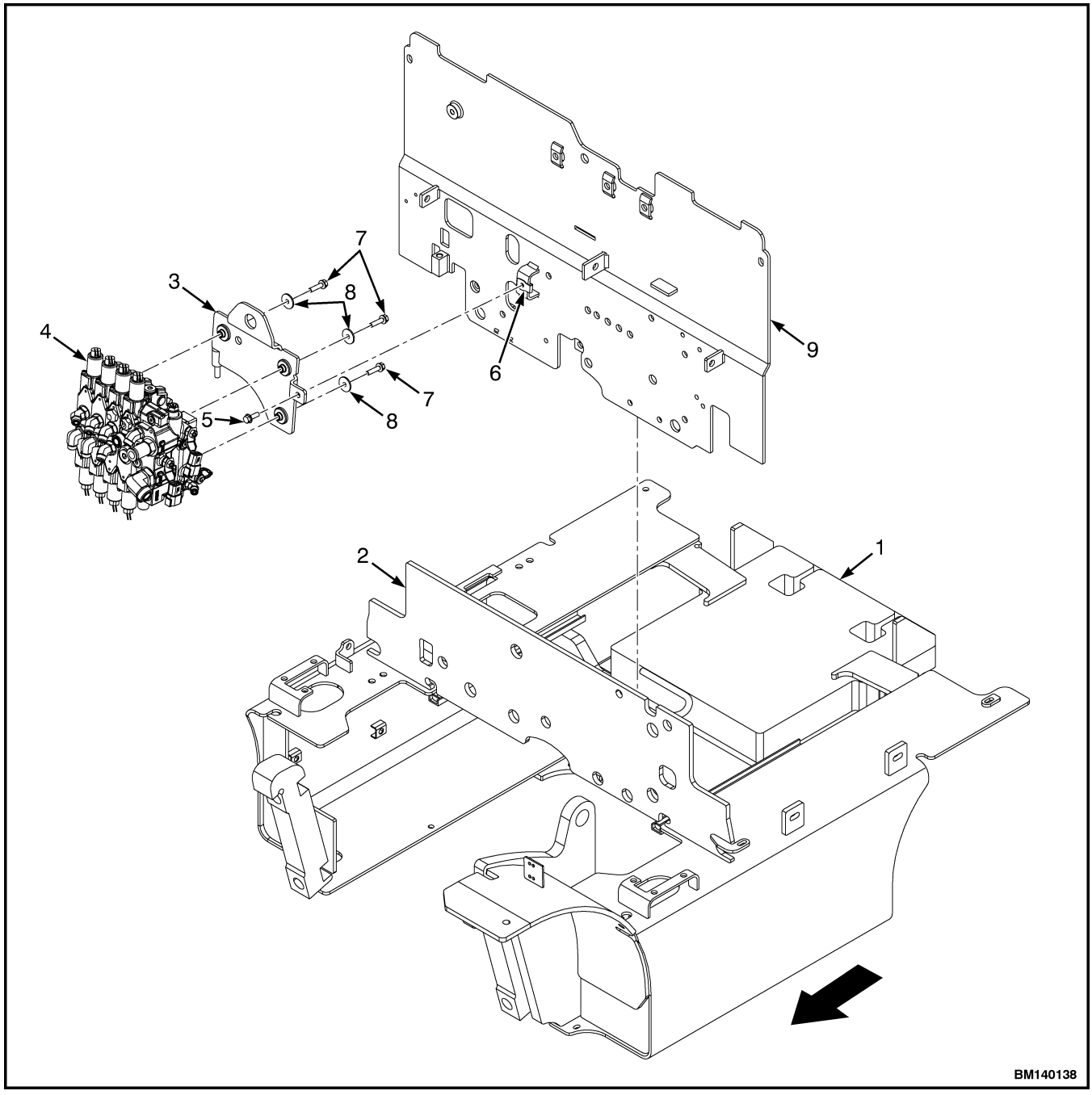
4. Install new O-ring onto lift/lower fitting. Install lift/lower fitting into lift section. See Figure 144.

5. Install new O-ring onto steer load sense fitting. Install steer load sense fitting into inlet section. See Figure 144.

6. Install new O-rings onto steer fittings. Install steer fittings into inlet section. See Figure 144.

7. Install new O-ring onto inlet fitting. Install inlet fitting into inlet section. See Figure 144.

8. Install new O-ring onto return line fitting. Install return line fitting into inlet section. See Figure 144.



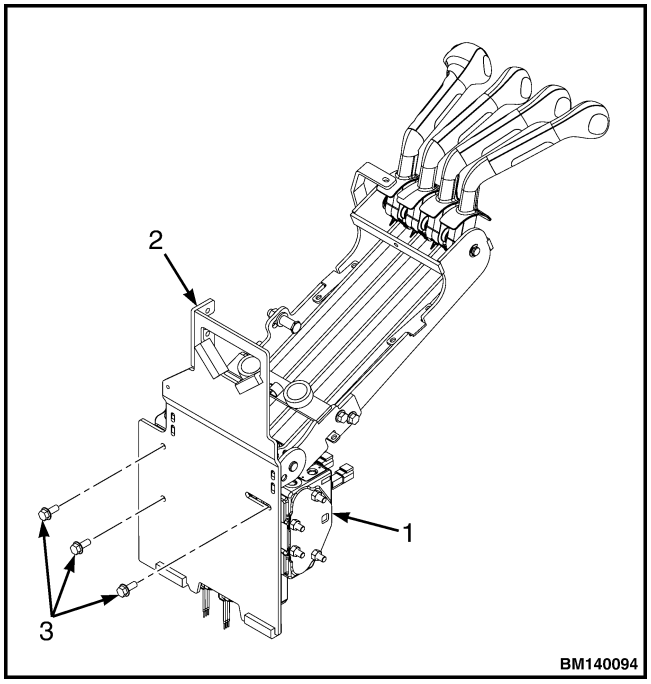
NOTE: MAJOR COMPONENTS NOT SHOWN FOR CLARITY.

NOTE: ARROW POINTS TOWARD FRONT OF LIFT TRUCK.

1. FRAME
2. FRONT BULKHEAD
3. VALVE MOUNTING BRACKET
4. E-HYDRAULIC CONTROL VALVE
5. MOUNTING CAPSCREW
6. CLIP NUT
7. CAPSCREW
8. SPECIAL WASHER
9. BULKHEAD

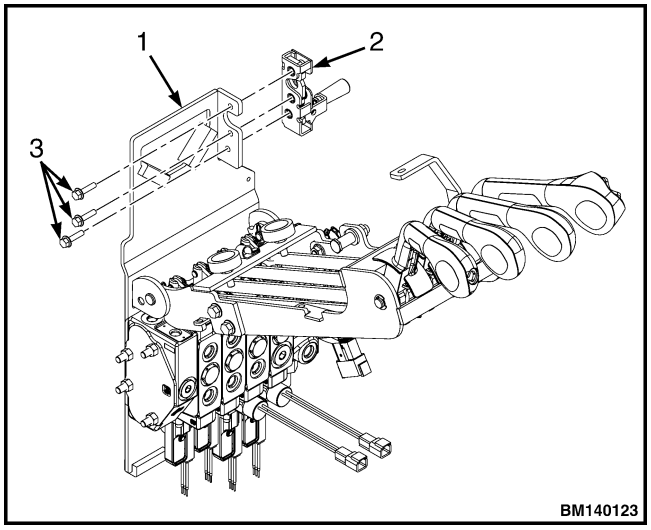
Figure 4. E-Hydraulic Control Valve Mounting for Lift Truck ERC22-35VG (ERC045-070VG) (A968), ERP22-35VL (ERP045-070VL) (A976), and ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

STEP 5.
Install three hex capscrews into mounting plate and manual control valve.



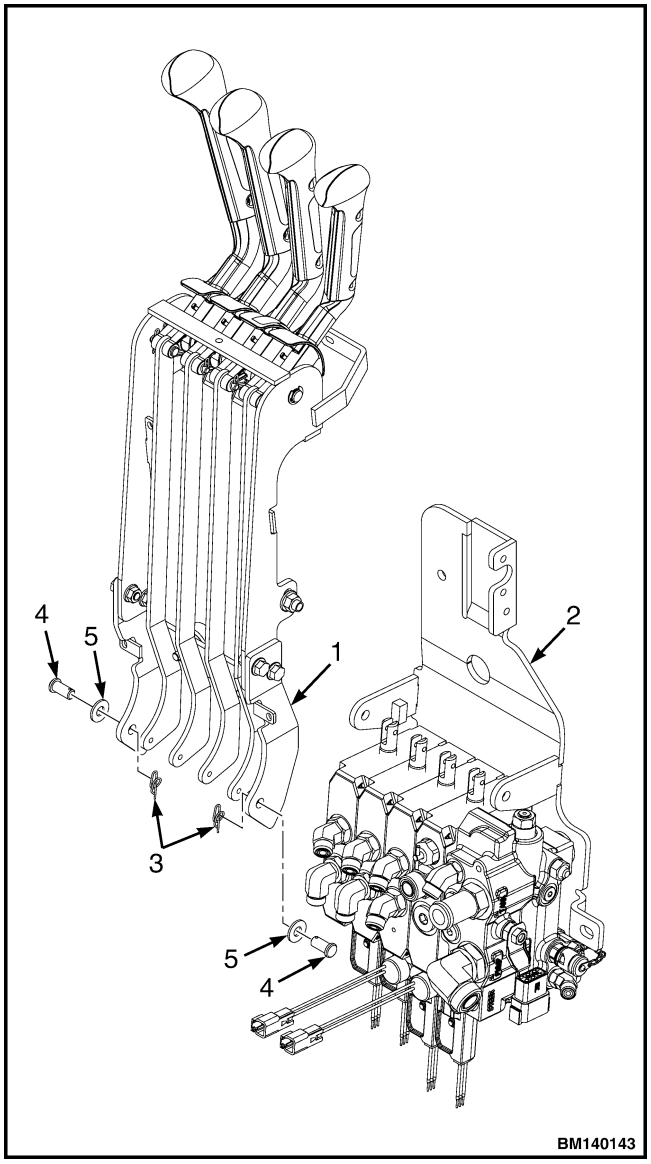
1. MANUAL CONTROL VALVE
2. MOUNTING PLATE
3. HEX CAPSCREW

STEP 6.
Install latch assembly and three capscrews onto mounting plate.



1. MOUNTING PLATE
2. LATCH ASSEMBLY
3. CAPSCREW

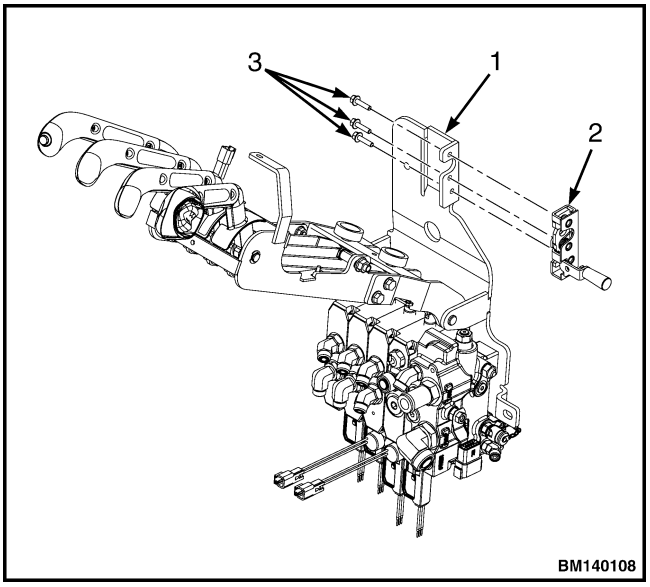
STEP 5.
Install mounting bracket, two nylon washers, two rod end pins, and two locking ring cotter pins onto lower bracket.



NOTE: CONTROL VALVE MANUFACTURED BEFORE OCTOBER, 2012 SHOWN.

1. LOWER BRACKET
2. MOUNTING BRACKET
3. LOCKING RING COTTER PIN
4. ROD END PIN
5. NYLON WASHER

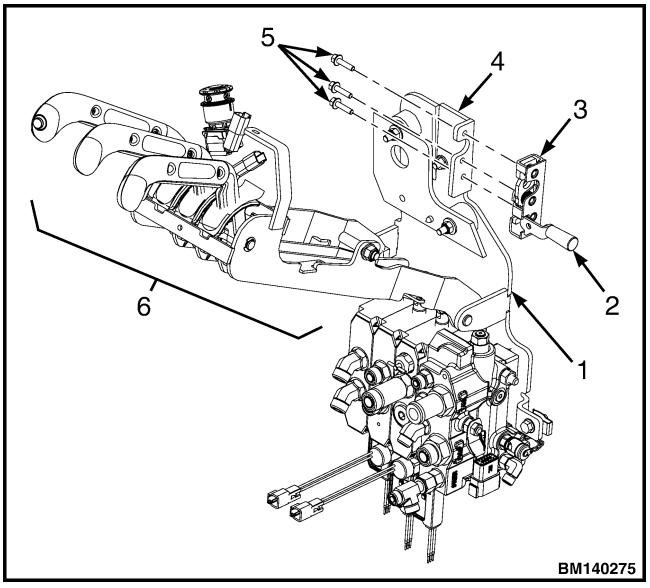
STEP 7.
Install latch assembly and three capscrews onto mounting bracket.



NOTE: CONTROL VALVE MANUFACTURED BEFORE OCTOBER, 2012 SHOWN.

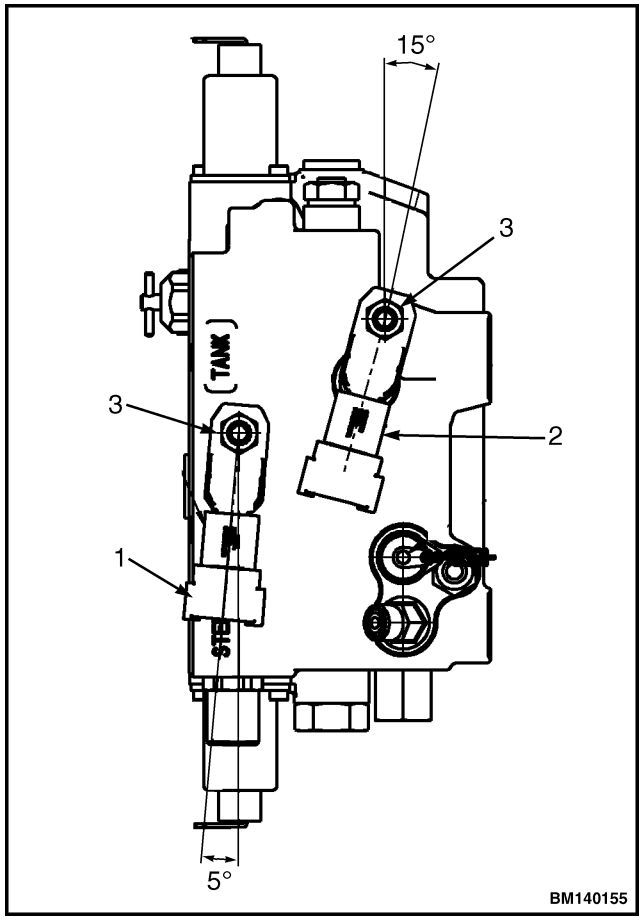
1. MOUNTING BRACKET
2. LATCH ASSEMBLY
3. CAPSCREW

STEP 8.
Raise hydraulic linkage and handles upright against mounting bracket. Ensure latch handle fastens securely.



NOTE: CONTROL VALVE MANUFACTURED BEFORE OCTOBER, 2012 SHOWN.

1. CONTROL VALVE MOUNTING PLATE
2. LATCH HANDLE
3. LATCH ASSEMBLY
4. LATCH ASSEMBLY MOUNTING PLATE
5. CAPSCREW
6. HYDRAULIC LINKAGE AND HANDLES



1. UPPER SOLENOID ELECTRICAL CONNECTOR
2. LOWER SOLENOID ELECTRICAL CONNECTOR
3. (JAM) NUT

Figure 141. E-Hydraulic Solenoid Electrical Connectors

INSTALL

Electrical Connect and Control Valve Mount

1. Connect lower solenoid wires to lower solenoid connector as tagged during removal. See Table 9 and Figure 140.

2. Connect upper solenoid wires to upper solenoid connector as tagged during removal. See Table 10 and Figure 140.

3. Install three special washers, valve mounting bracket, and three capscrews onto E-hydraulic control valve. See Figure 143.

Table 9. Lower Solenoid Connector Pin Layout

Pin	Socket	Pin	Socket
PIN 8	1B NEG	**PIN 1**	1B POS
PIN 7	2B NEG	**PIN 2**	2B POS
PIN 6	3B NEG	**PIN 3**	3B POS
PIN 5	4B NEG	**PIN 4**	4B POS

Table 10. Upper Solenoid Connector Pin Layout

Pin	Socket	Pin	Socket
PIN 8	1A NEG	**PIN 1**	1A POS
PIN 7	2A NEG	**PIN 2**	2A POS
PIN 6	3A NEG	**PIN 3**	3A POS
PIN 5	4A NEG	**PIN 4**	4A POS

4. Install clip nut onto bulkhead. See Figure 143.

5. Install valve mounting bracket, with E-hydraulic control valve attached, onto bulkhead. Install mounting capscrew into clip nut and bulkhead. See Figure 143.

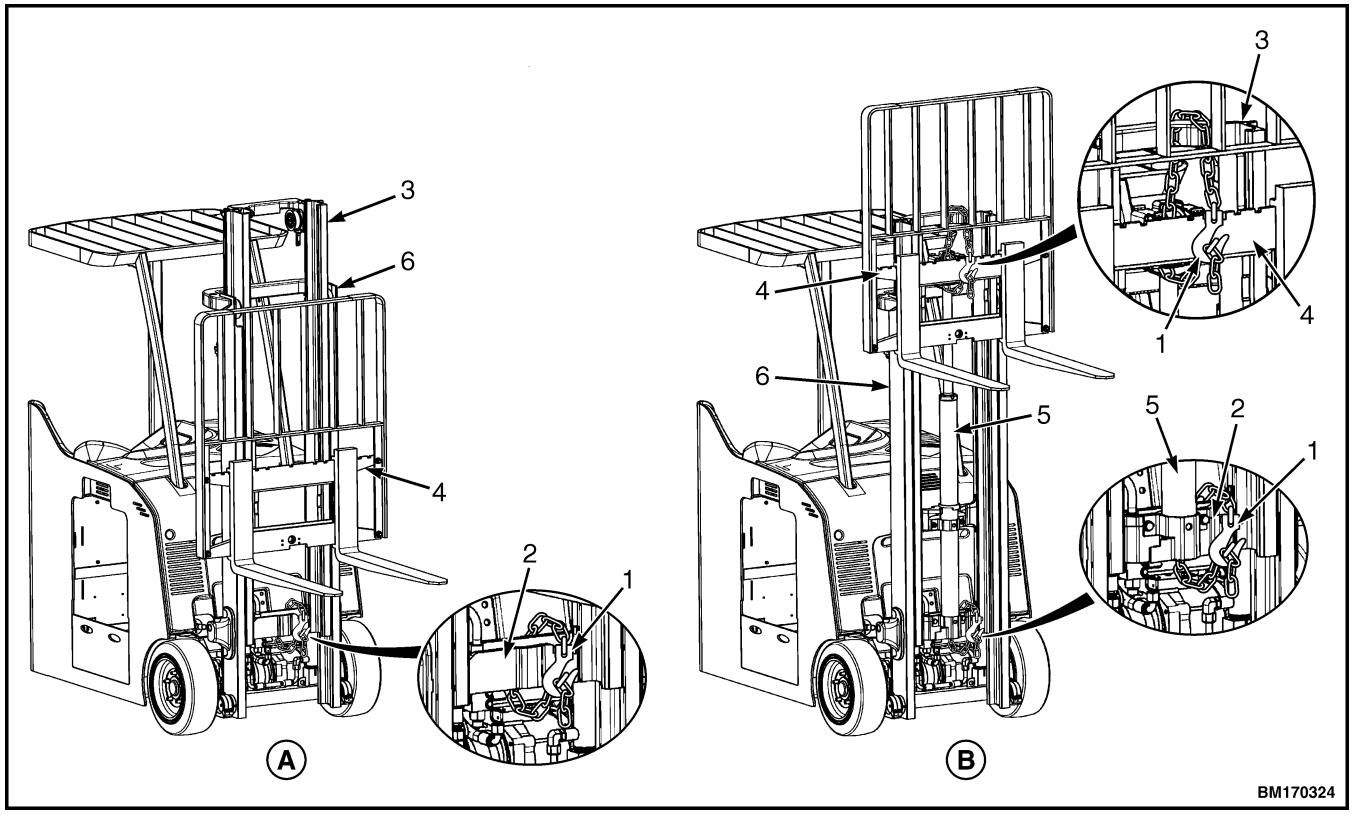
6. Connect upper solenoid electrical connector to e-hydraulic main wire harness.

7. Connect lower solenoid electrical connector to e-hydraulic main wire harness.

Fitting Installation for Lift Truck ERC22-35VG (ERC045-070VG) (A968)

NOTE: Lubricate new O-rings with clean hydraulic oil prior to installation.

1. Install new O-rings onto 4th function fittings. Install 4th function fittings into auxiliary section. See Figure 144.



NOTE: TWO-STAGE MASTS SHOWN. FOR THREE-STAGE MAST, ALIGN THE CROSSEMEMBER OF INTERMEDIATE WELDMENT ALONG WITH INNER AND OUTER WELDMENTS WHEN CHAINING THE MAST.

A. LIMITED FREE-LIFT MAST
B. FULL FREE-LIFT MAST

1. SAFETY CHAIN AND HOOK
2. MAST CROSSMEMBERS ALIGNED
3. INNER WELDMENT
4. CARRIAGE (TOP BAR)
5. FREE-LIFT CYLINDER
6. OUTER WELDMENT

Figure 2. Safety Chaining the Masts (Stand-Up Lift Trucks)

General

CAUTION

Before working on any components of the hydraulic system, see Hydraulic Cleanliness Procedures 1900YRM1620 **for procedures to prevent dirt and debris from entering the hydraulic system and cause damage.**

This section contains repair procedures for tilt cylinders, main lift cylinders, free-lift cylinders, sideshift cylinders, and fork positioner cylinders. The number and the design of the parts can be different, but the operation of the cylinders is the same.

Legend for Figure 30.

NOTE: CROSSMEMBER REMOVED FOR CLARITY.
NOTE: TWO-STAGE FFL MAIN LIFT CYLINDER SHOWN.

1. LEFT-HAND MAIN LIFT CYLINDER
2. RIGHT HAND MAIN LIFT CYLINDER
3. FITTING WITH O-RING
4. SNAP RING
5. WASHER
6. SHIMS
7. CAPSCREW
8. SPACER
9. NUT
10. FILL SCREW
11. SEAL
12. LOWERING CONTROL VALVE
13. LOWERING CONTROL HOUSING
14. FITTING
15. HOSE ASSEMBLY

Four-Stage FFL

1. Insert 5 x 10 cm (2 x 4 in.) wood block between lower crossmembers of outer and outer intermediate masts to prevent movement out the bottom of mast assembly. See Figure 31.

2. Lay mast assembly face down on wood blocks as shown in Figure 31. Ensure mast assembly is level, and inner masts move freely.

WARNING

Hydraulic oil is hot after system operation and can cause burns. DO NOT disconnect any hydraulic hoses until the oil in the system is cool.

3. Place drain pan under the area of the hydraulic fittings. Disconnect cylinder supply hoses from special long fittings. See Figure 31.

4. Remove special long fitting from cylinder inlet ports and install plugs. See Figure 31.

WARNING

Be careful when removing or installing snap rings. These snap rings can come loose during removal or installation with enough force to cause an injury. Always use the correct snap ring pliers, and wear eye and face protection during removal or installation.

5. Remove snap ring from top of left-hand cylinder rod. See Figure 31.

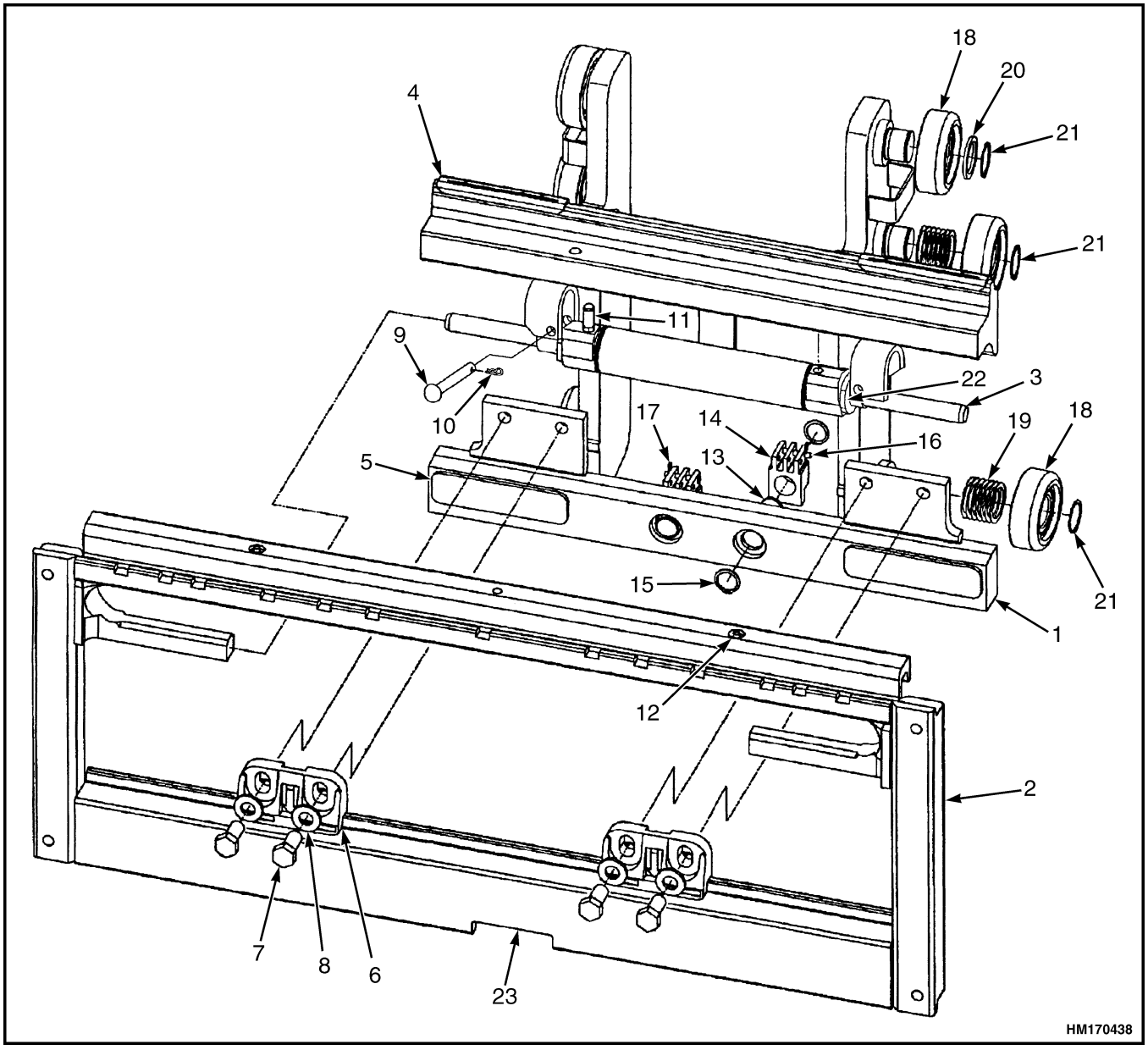
6. Remove fitting and tube from top of right-hand cylinder rod. See Figure 31.

7. Pull inner, inner intermediate, and outer intermediate masts from outer mast 30 to 60 cm (1 to 2 ft) and disengage cylinder rods from outer intermediate mast.

8. Lift cylinders from mounting boss of outer mast and angle inward. Remove cylinders through sides of the masts.

NOTE: Note number of shims at top of each rod to aid in installation.

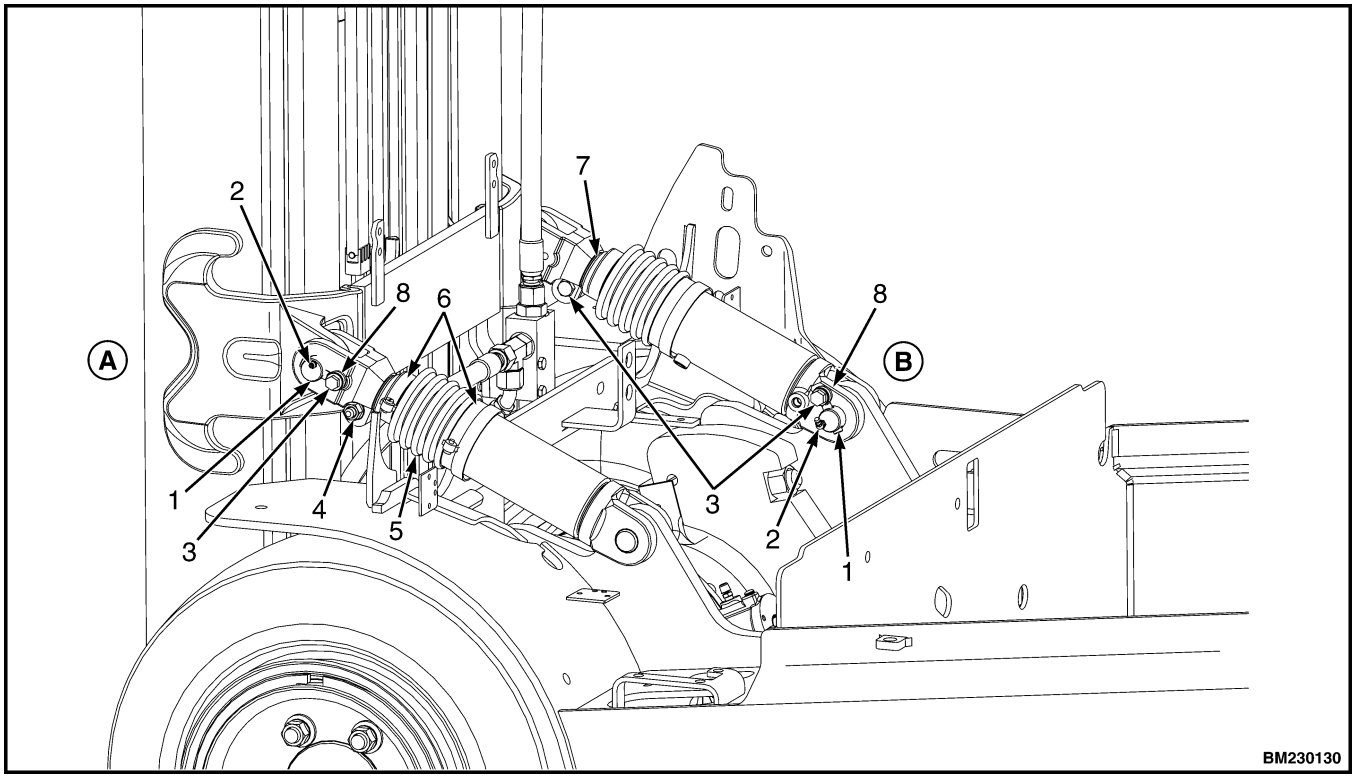
9. Remove shims, if present, from tops of cylinders.



NOTE: TWO- AND THREE-STAGE FFL IS SHOWN. INTEGRAL SIDESHIFT CARRIAGE ASSEMBLY FOR FOUR-STAGE FFL AND TWO-STAGE LFL IS SIMILAR.

1. INNER FRAME
2. OUTER FRAME
3. SIDESHIFT CYLINDER
4. UPPER BEARING
5. LOWER BEARING
6. LOWER HOOK
7. CAPSCREW
8. WASHER
9. CLEVIS PIN
10. HAIRPIN
11. PIN
12. LUBE FITTING
13. PIN
14. CHAIN ANCHOR
15. SNAP RING
16. PIN
17. COTTER PIN
18. LOAD ROLLER
19. SHIMS
20. SPACER
21. SNAP RING
22. SPACER
23. FORK REMOVAL NOTCH

Figure 62. Integral Sideshift Carriage and Cylinder, Lift Truck Models ERC22-35VG (ERC045-070VG) (A968) and ERP22-25VL (ERP045-070VL) (A976)



NOTE: HYDRAULIC HOSES AND OTHER COMPONENT PARTS OMITTED FOR CLARITY.

A. MAST END
B. TRUCK END

1. ANCHOR PIN
2. GREASE FITTING
3. CAPSCREW
4. NUT
5. BOOT
6. CLAMP
7. SPACER
8. RETAINER

Figure 4. Tilt Cylinder Removal, Tilt Cylinder With Boot, Lift Truck Models Manufactured After November, 2014 and ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985) ERP22-25VL (ERP045-070VL) (A976)

DISASSEMBLE

NOTE: The following steps have detailed disassembly instructions. Perform only those steps required to repair the tilt cylinder.

NOTE: Note position of rod end and number of turns used to remove it from rod.

1. Place tilt cylinder in a soft jaw vise.

a. Tilt cylinder not equipped with optional boot: Remove rod end and, if equipped, tilt spacer from rod. See Figure 3.

b. Tilt cylinder equipped with optional boot: Remove rod end and, if equipped, shim(s). Remove two clamps and boot from tilt cylinder. Remove tilt spacer from rod. See Figure 4.

2. Using a pin-type spanner wrench, remove gland from rod and shell. Remove rod and piston assembly from shell.

1. Remove snap ring, washer, and shims, if installed, from top of cylinder. See Figure 30.

WARNING

Hydraulic oil is hot after system operation and can cause burns. DO NOT disconnect any hydraulic hoses until the oil in the system is cool.

2. Put a drain pan under the area of the hydraulic fittings. Disconnect hydraulic lines at cylinder and drain oil from cylinder. Cap hydraulic lines and cylinder ports.

3. Remove nut, spacer, capscrew, and washer at mounting plate. See Figure 30.

4. Disconnect main lift chain at mount.

5. Using a lifting device, remove lift cylinder from mast.

NOTE: Raise the mast high enough for the bottom of the cylinder to clear the crossmember on the outer mast weldment and push the rod back into the cylinder being removed.

6. Repeat Step 1 through Step 5 for opposite cylinder.

Two-Stage LFL

WARNING

Be careful when removing or installing snap rings. These snap rings can come loose during removal or installation with enough force to cause an injury. Always use the correct snap ring pliers, and wear eye and face protection during removal or installation.

1. Remove snap ring and shims from top of cylinder. See Figure 30.

WARNING

Hydraulic oil is hot after system operation and can cause burns. DO NOT disconnect any hydraulic hoses until the oil in the system is cool.

2. Put a drain pan under the area of the hydraulic fittings. Disconnect hydraulic line at cylinder and drain oil from cylinder. Cap hydraulic lines and cylinder ports.

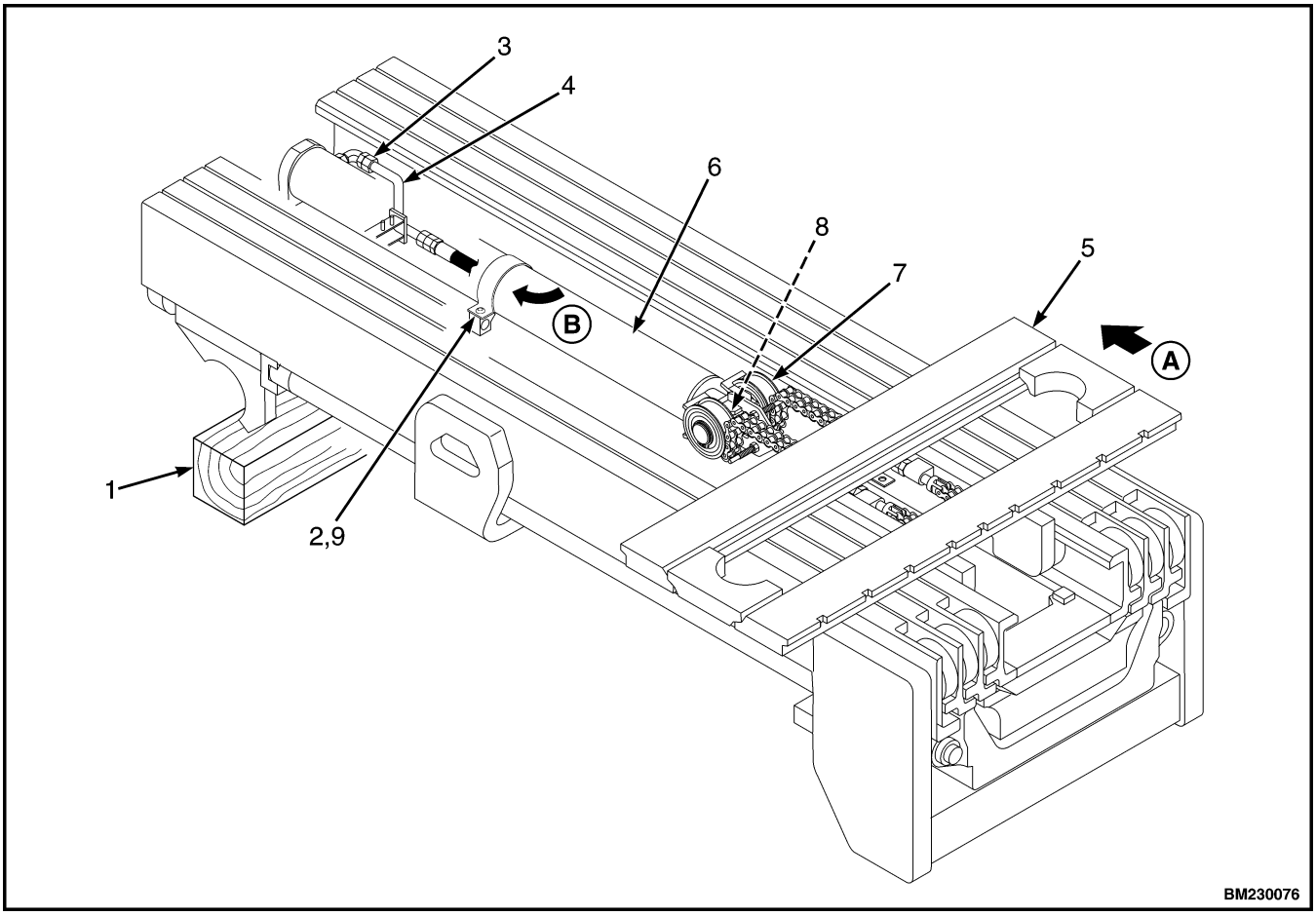
3. Remove nut, two washers, spacer, and capscrew at mounting plate. See Figure 30.

4. Disconnect main lift chain at mount.

5. Using a lifting device, remove lift cylinder from mast.

NOTE: Raise the mast high enough for the bottom of the cylinder to clear the crossmember on the outer mast weldment and push the rod back into the cylinder being removed.

6. Repeat Step 1 through Step 5 for opposite lift cylinder.



A. CARRIAGE ROLL DIRECTION

B. CYLINDER INSTALL DIRECTION

1. BLOCK
2. CYLINDER MOUNTING STRAP
3. CYLINDER FITTING
4. TUBE
5. CARRIAGE
6. FREE-LIFT CYLINDER
7. CROSSHEAD
8. SNAP RING
9. ALLEN SCREW

Figure 59. Free-Lift Cylinder - Install (Mast on Floor)

10. Install roll pin into mast and bottom of free-lift cylinder.

11. Install cylinder mounting strap and Allen screws onto free-lift cylinder. See Figure 59.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

12. Uncap and connect tube to cylinder fitting. See Figure 59. Dispose of drain pan contents.

13. Roll carriage into position above free-lift cylinder as shown in Figure 59.

14. Install crosshead, with chains and hoses, onto cylinder rod.

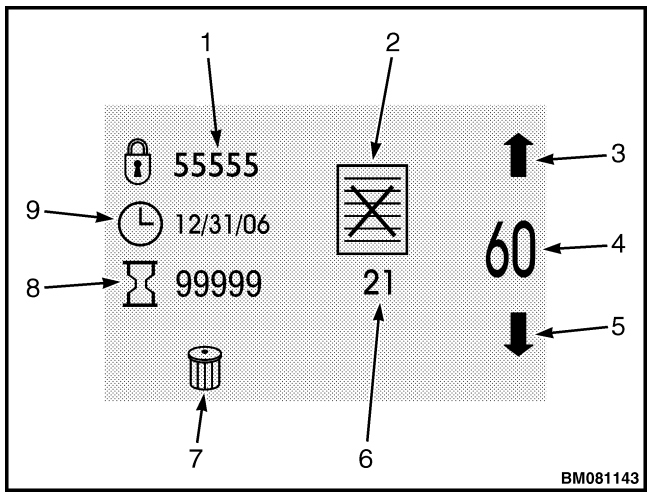
15. Install snap ring securing crosshead to cylinder rod. See Figure 59.

16. Roll carriage downward to tighten free-lift chains and hoses.

17. Using lifting device raise mast upright and install onto lift truck.

TABLE OF CONTENTS (Continued)

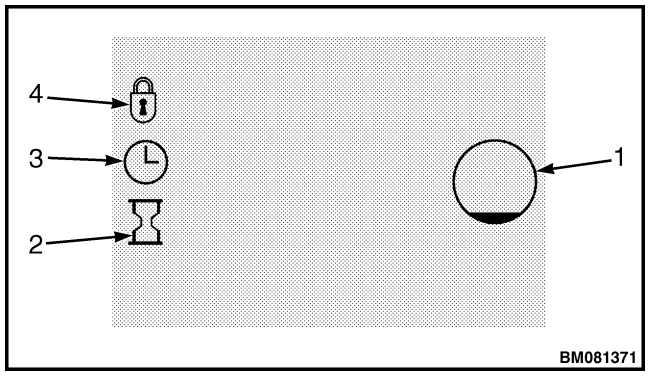
Figure 23 shows a failed Checklist Log Entry.



1. PASSWORD VALUE AT LOG OCCURRENCE
2. TYPE OF ENTRY (PASS/FAIL)
3. UP ARROW SOFT KEY ICON
4. CURRENT LOG ENTRY (OR "EMPTY" SYMBOL)
5. DOWN ARROW SOFT KEY ICON
6. CHECKLIST ITEM THAT FAILED
7. TRASH CAN SOFT KEY (USED TO EMPTY LOG)
8. TRACTION HOURS AT LOG OCCURRENCE
9. SYSTEM DATE AT LOG OCCURRENCE

Figure 23. Failed Checklist Log Entry

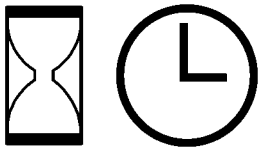
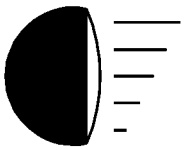
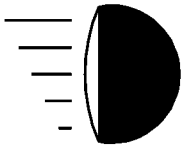
If there are no log entries or the final log entry has been scrolled past, an empty log screen is displayed, as shown in Figure 24.



1. EMPTY SYMBOL
2. SYSTEM TIME ICON
3. SYSTEM DATE ICON
4. PASSWORD ICON

Figure 24. Empty Log Screen

Table 2. Soft Key Icons (Continued)

Icon	Description
	Enable Current Item Icon. When the * key is pressed, the current item displayed will appear during the Operator Checklist sequence.
	Deactivate Soft Key Icon. Indicates function is deactivated. Press the * key to deactivate.
	“Enable” Traction and Hydraulics for Forklift Icon. Press the **2** key to enable.
	“Disable” Traction and Hydraulics for Forklift Icon. Press the **4** key to disable.
	Hazard Flashers Icon. Press the **#** key to toggle the hazard flashers on and off.
	Select system time for Fault Log event. Press the **1** key to select system time (this soft key toggles between system times and hour meters).
	Front Truck Lights Icon. Only available with CAN light controller. Press the **4** key to turn truck lights on.
	Rear Truck Lights Icon. Only available with CAN light controller. Press the **2** key to turn truck lights off.

OVERLAY ICONS

Icons that look like they are placed over another icon are called overlay icons. This type of icon always appears in conjunction with another icon, not by itself. Table 3 shows the overlay icons and describes how they are used.

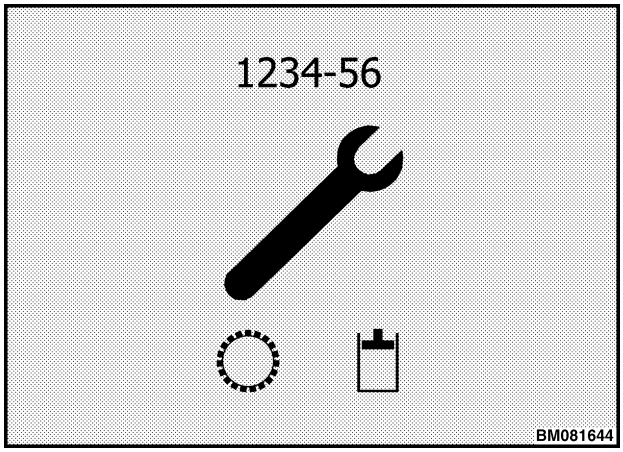
Table 3. Overlay Icons

Icon	Description
	Null Symbol Icon. When this icon overlays another icon it indicates that a setting value is invalid or out-of-range.
	X Icon. This icon indicates that a feature has been deactivated (disabled).

ICONS ON SYSTEM OFF SCREEN AND ALERT SCREENS

The System Off Screen and the various Alert Screens appear only briefly. These screens also show interlocks such as Operator Not in Seat. Refer to System Off/Alert Screens for more information on these screens. The icons used in alert screens identify either status or warning conditions. Table 4 shows the icons that can appear on these screens.

Table 4. Alert Screen Icons

Icon	Description
Alert	
	

a. Use the number keys to enter the correct value and press the **Enter Key**. If the current value for the left segment of the date is correct, simply press the **Enter Key**.

b. Repeat step a. for the middle and right segments of the date.

The system will put the new system date into effect immediately.

SET UNITS MENU

A Supervisor or a Service Technician can use this menu to set the type of units the system will use to either Imperial or Metric. Figure 43 shows the Set Units submenu.

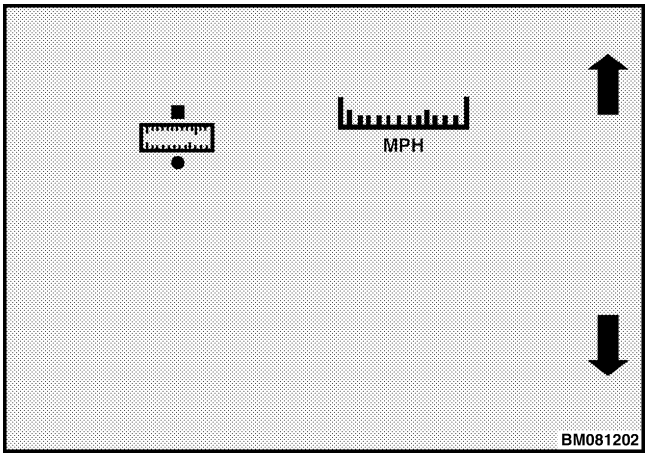


Figure 43. Set Units Menu

To set the type of units the system will use, either Imperial or Metric, enter the Set Units Menu. Use the **2** Up Arrow or **3** Down Arrow soft key to select Imperial or Metric. When the corresponding icon for the type of units desired is displayed on the screen, press the **Enter Key** and the system will begin using the units selected immediately.

Table 10. Calibration Submenus and Icons (Continued)

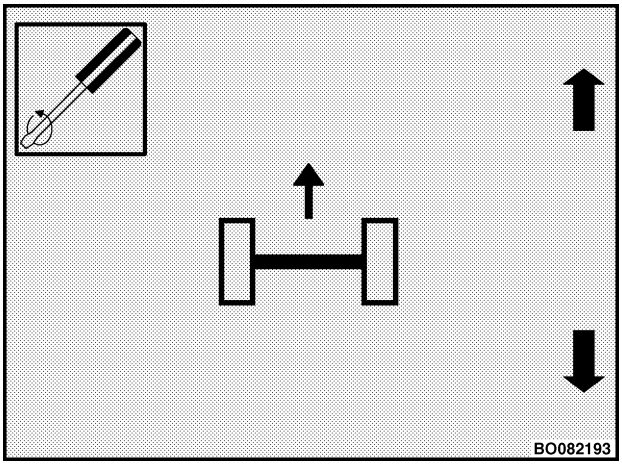
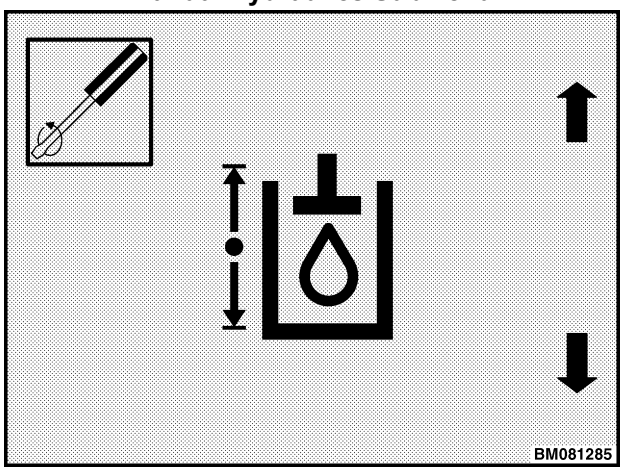
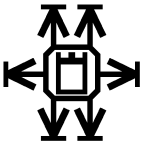
Icon	Description
	Steering Wheel Full Right Prompt Icon
	This icon points to the * key and is used for steer axle position calibration in this submenu.
Steer Axle Center Point 	
	Steer Axle Center Point Icon
	This icon points to the * key and is used for steer axle center point calibration in this submenu.

Table 10. Calibration Submenus and Icons (Continued)

Icon	Description
Manual Hydraulics Submenu 	
	Main Manual Hydraulic End Point Calibration Prompt Icon
	This icon points to the * key and is used for manual hydraulic end point calibration in this submenu.

Display Menu

INTRODUCTION

The Display Menu is a main menu (top-level menu) that is visible at Service Technician and Supervisor password access levels. To access this menu, cycle through the main menu title screens by pressing the **Scroll Back Key** (◂—) or **Scroll Forward Key** (—▸) until the Display Title Screen is displayed, as shown in Figure 37.

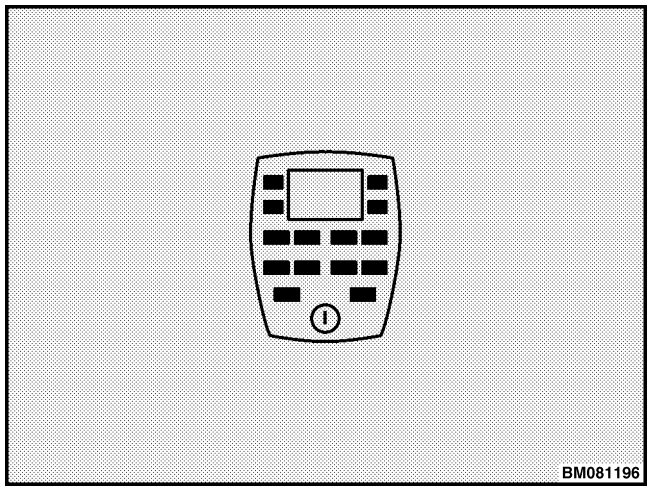


Figure 37. Display Title Screen

Press the **Enter Key** (*****) to enter the Display Menu and the system will display the Set Date and Time Format screen as shown in Figure 38. Press the **Enter Key** again to enter this submenu. For a different submenu, use the **Scroll Back Key** or **Scroll Forward Key** to move to the desired submenu and press the **Enter Key**.

To return to the Display Menu, press the **Scroll Back Key** or **Scroll Forward Key**. Press the **Scroll Back Key** or **Scroll Forward Key** a second time to return to the main menu.

The Display Menu offers these submenus (see the Display Submenus and Icons topic):

- Set Date and Time Format Menu
- Set Daylight Saving Time Menu
- Set Time and Date Menu
- Set Units Menu

The sections that follow describe these submenus.

SET DATE AND TIME FORMAT MENU

A Supervisor or a Service Technician can use this menu to define the system date and time format. Figure 38 shows the title screen for this menu.

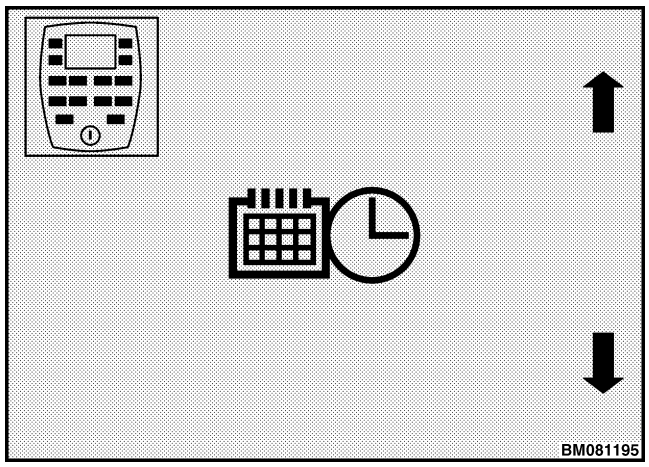
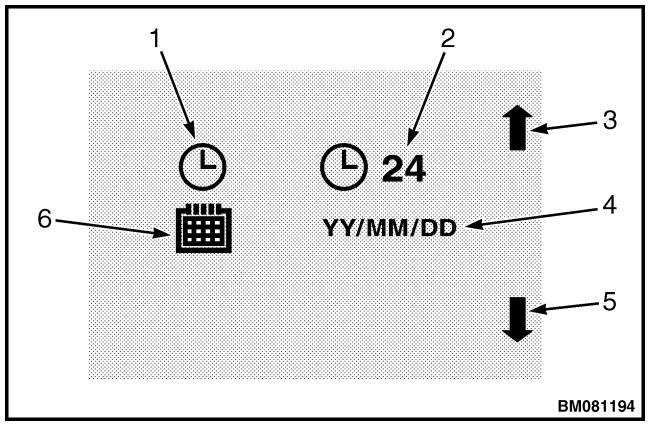


Figure 38. Set Date and Time Format Menu

To enter this submenu, press the **Enter Key**. Figure 39 shows the Set Date and Time Format screen that will appear.



1. CLOCK ICON
2. CLOCK HOUR FORMAT
3. UP ARROW SOFT KEY ICON
4. CURRENT DATE FORMAT
5. DOWN ARROW SOFT KEY ICON
6. CALENDAR ICON

Figure 39. Set Date and Time Format Screen

TABLE OF CONTENTS (Continued)

Table 14. Diagnostic Submenu Icons (Continued)

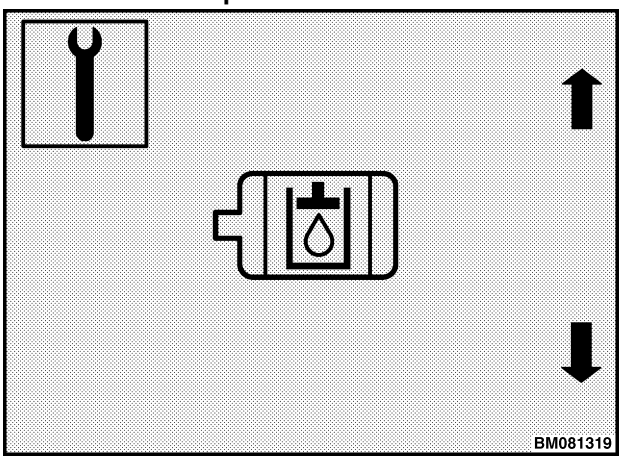
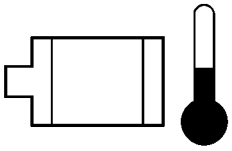
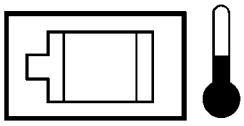
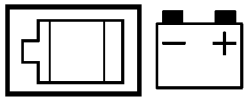
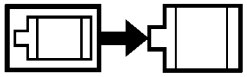
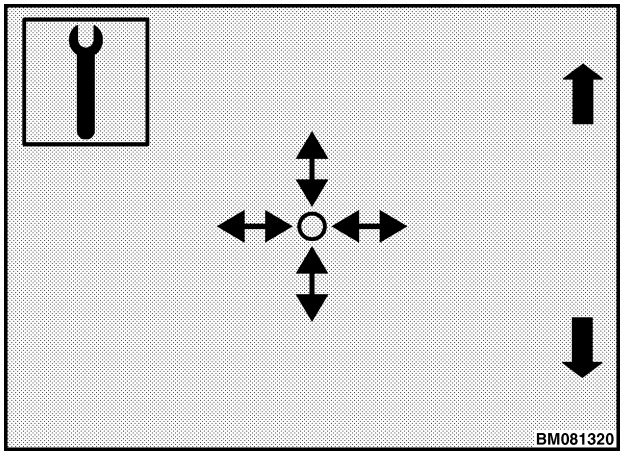
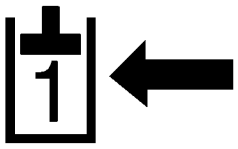
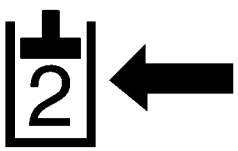
Icon	Description
Pump Status Submenu 	
°C	Temperature in degrees Celsius
°F	Temperature in degrees Fahrenheit
	Forklift Truck Enabled Icon
	Forklift Truck Disabled Icon
	RPM Indicator Icon
	Motor Temperature Indicator Icon
	Motor Controller Temperature Indicator Icon

Table 14. Diagnostic Submenu Icons (Continued)

Icon	Description
	Motor Controller Voltage Indicator Icon
	Motor RMS Current Indicator Icon. (RMS = Root Mean Square)
Hydraulic Control Inputs Submenu 	
	Forklift Truck Enabled Icon
	Forklift Truck Disabled Icon
	Hydraulic Function 1 Input Indicator Icon
	Hydraulic Function 2 Input Indicator Icon

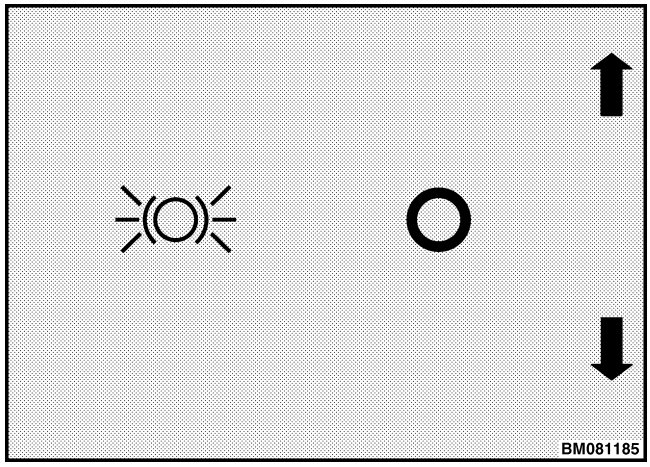


Figure 71. Rear Lights Control Setup Screen

Press the **2** or **3** soft key to set the outputs that control the rear lights to Enabled or Disabled.

RESTORE DEFAULT SETTINGS

NOTE: This submenu is available on all trucks to logged in Service Technicians and Supervisors.

This menu allows a Service Technician or Supervisor to change all adjustable truck settings back to their factory default settings. Calibrations are NOT reset when this function is used. Figure 72 shows the Restore Defaults Screen.

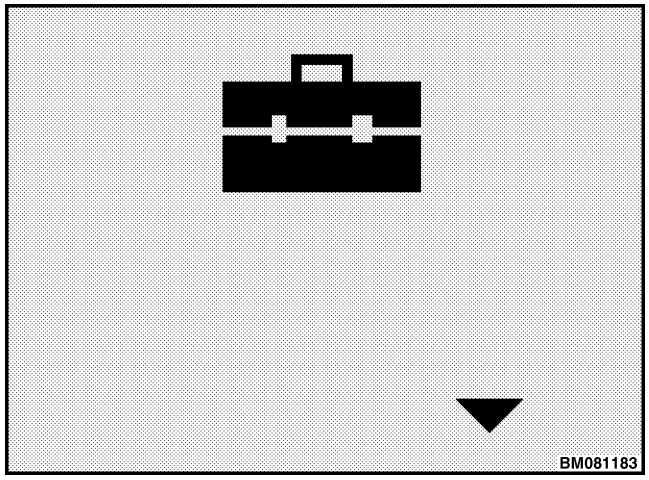


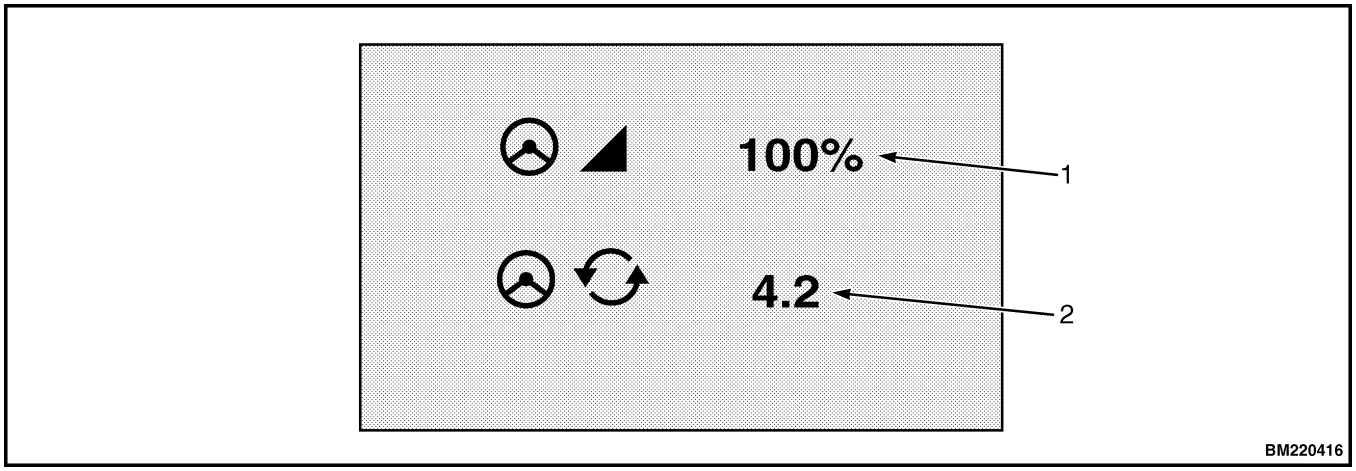
Figure 72. Restore Defaults Screen

While in this menu, press the **Enter Key** to restore all truck settings, except hour meters and system time, to their factory default settings. The system then returns to the Truck Setup Menu.

STEERING WHEEL FRICTION AND STEERING TURNS ADJUSTMENT

NOTE: This submenu is available to logged in Service Technicians and Supervisors.

On trucks equipped with electronic steering or "E-Steer", this screen allows the operator to adjust the friction on the steering wheel and the number of steering wheel turns from stop to stop.



1. STEERING WHEEL FRICTION SETTING IN %
2. STEERING WHEEL NUMBER OF TURNS LOCK TO LOCK

Figure 73. Steering Wheel Friction and Steering Turns

Push Button (push (override) button)

1. Validate that push button operates properly by operating applicable function (push (override) button).

2. If system does not function, see procedures below for repair or replacement. Upon completion, rerun the test.

3. If push button continues to not function properly, contact your local **Yale** dealer or see **Yale Axcess Online**.

MINI-LEVERS, REMOVE AND INSTALL

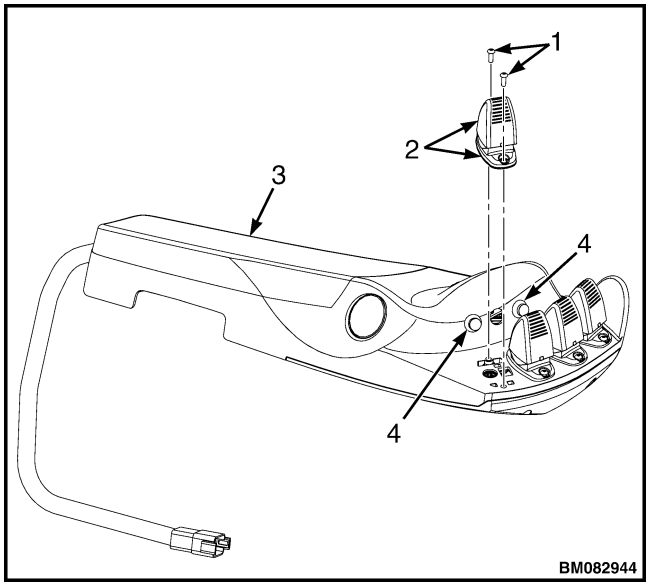
NOTE: Prior to performing the following procedures, the E-Hydraulic Controls - TEST must be performed first.

NOTE: The mini-levers do not need to be calibrated.

CAUTION

The following procedure should only be performed by Yale trained certified technicians. The removal and replacement of the mini-levers should be done in a clean environment whenever possible and on an electrically grounded surface. Do not touch any printed circuit board (PCB) surface to prevent damage from electrostatic voltage.

1. Remove two capscrews and mini-lever from armrest. See Figure 29.



1. CAPSCREWS
2. MINI-LEVER
3. ARMREST
4. PUSH (OVERRIDE) BUTTON

Figure 29. Mini-Lever Removal

NOTE: Before installing new mini-lever, check **Parts Manual** for correct part number to be sure correct mini-lever is being installed.

2. Install new mini-lever onto armrest using two capscrews. See Figure 29.

ARMREST ASSEMBLY

Remove

1. Disconnect the battery.

2. Remove two capscrews and washers from cover plate and remove seat box. Disconnect the main E-Hydraulic control wire harness from E-Hydraulic armrest harness. See Figure 30.

LOW LEVEL BRAKE FLUID SWITCH FOR LIFT TRUCK MODELS ERC22-35VG (ERC045-070VG) (A968), ERC16-20VA (ERC030-040VA) (A969), ERP22-35VL (ERP045-070VL) (A976), AND ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

NOTE: The low level brake fluid switch is a component of the master brake cylinder reservoir and is located on bottom of reservoir.

Remove

1. Read and follow **WARNING** and **CAUTION** section in General section above.

NOTE: Perform Step 2 to Step 4 for lift truck models ERC22-35VG (ERC045-070VG) (A968) manufactured before June 2012 and ERC16-20VA (ERC030-040VA) (A969) , ERP22-35VL (ERP045-070VL) (A976) , and ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985) .

2. Remove floor mat and rear floor plate.

3. Remove capscrews and washers from front floor plate and lift front floor plate up enough to disconnect accelerator pedal or Foot Directional Control pedal. See Figure 44.

4. Remove front floor plate with accelerator or Foot Directional Control pedal still attached.

NOTE: Perform Step 5 to Step 7 for lift truck models ERC22-35VG (ERC045-070VG) (A968) manufactured after June 2012.

5. Remove floor mat and rear floor plate.

6. Lift front floor plate up enough to disconnect accelerator pedal or Foot Directional Control pedal. See Figure 45.

7. Remove front floor plate with accelerator or Foot Directional Control pedal still attached.

8. Disconnect main wire harness from low brake fluid level switch connector.

   See Figure 77 for lift truck models

   - ERC22-35VG (ERC045-070VG) (A968)
   - ERC16-20VA (ERC030-040VA) (A969)
   - ERP22-35VL (ERP045-070VL) (A976)
   - ERP40-80VM (ERP080-100VM) (A985) manufactured before November 2014

   See Figure 78 for lift truck models

   - ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985) manufactured after November 2014

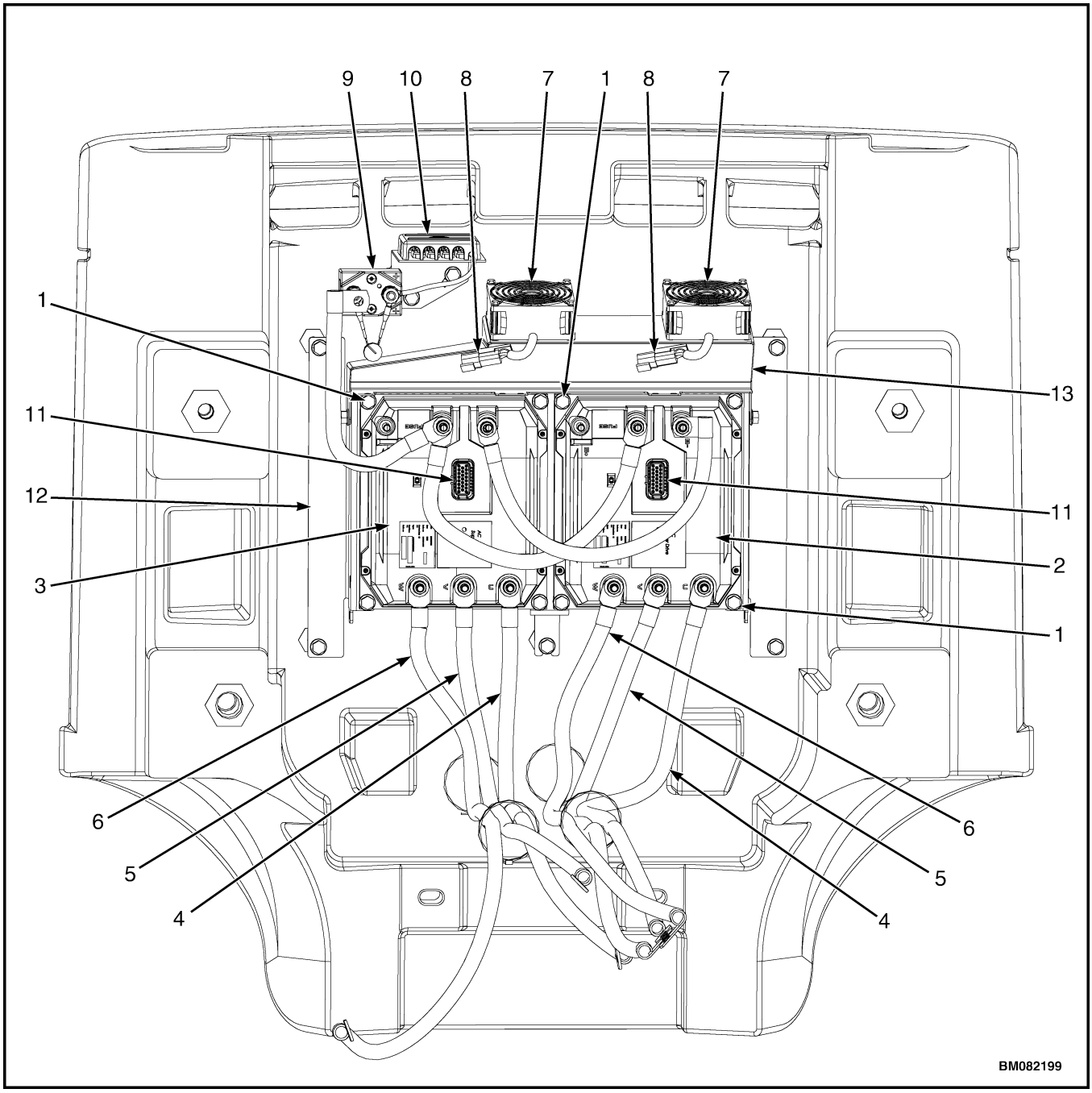


Figure 122. Motor Controllers Replace for Lift Truck Models , Manufactured After November 2014ERC045-070VG (A968)

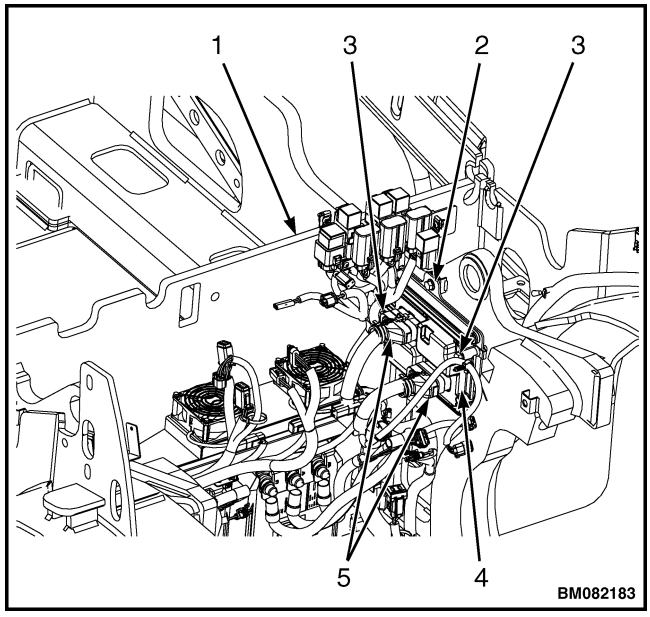
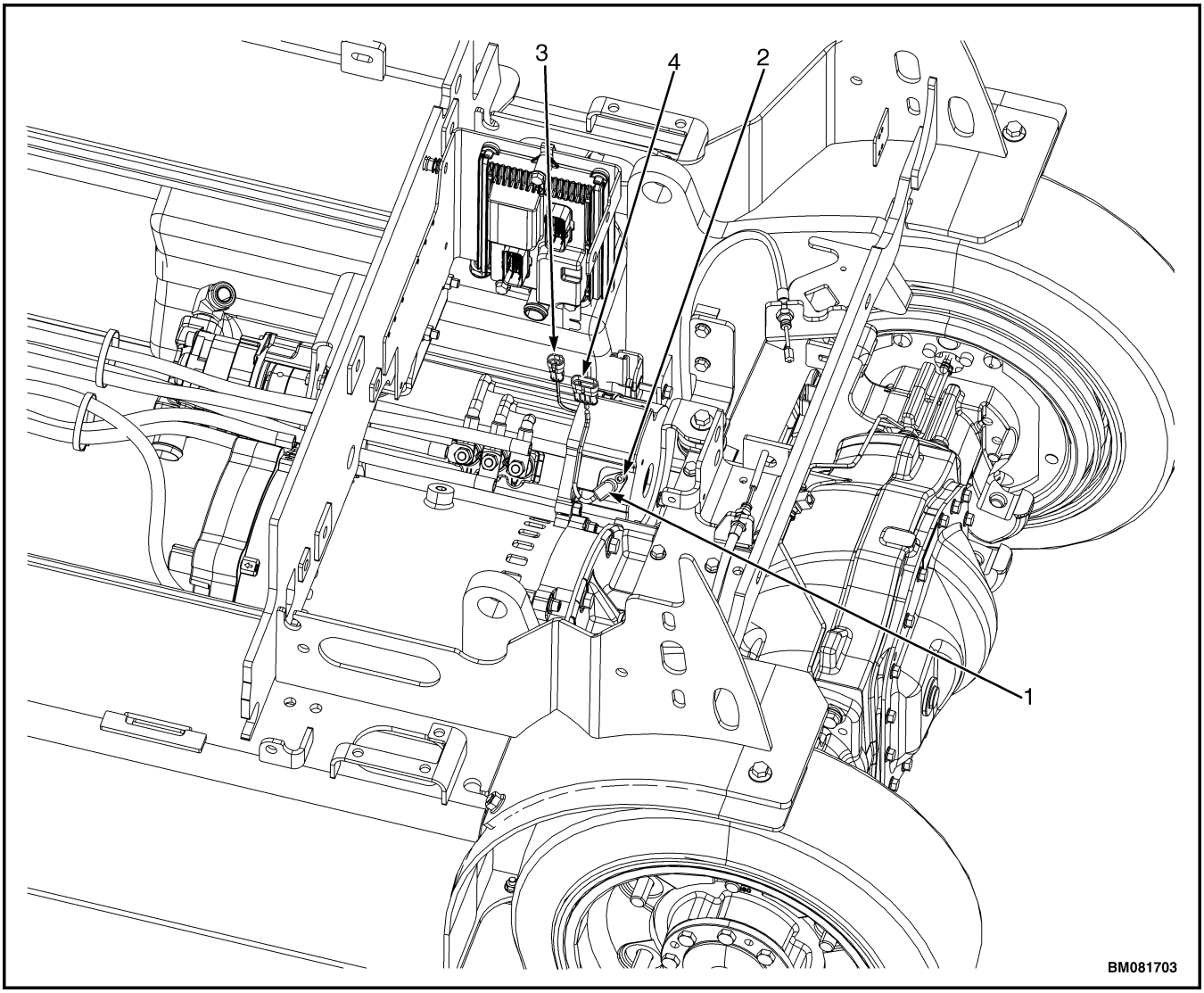


Figure 165. Vehicle System Manager Removal, Lift Truck Models Manufactured After November 2014ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

Legend for Figure 165.

1. FRONT BULKHEAD
2. VSM MOUNTING BRACKET
3. BOLTS
4. VEHICLE SYSTEM MANAGER
5. MAIN HARNESS ELECTRICAL CONNECTORS

TABLE OF CONTENTS (Continued)



1. HYDRAULIC MOTOR SPEED SENSOR
2. SOCKET HEAD SCREW
3. HYDRAULIC MOTOR TEMPERATURE SENSOR CONNECTOR
4. HYDRAULIC MOTOR SPEED SENSOR CONNECTOR

Figure 47. Hydraulic Motor Speed Sensor, Lift Truck Models ERC22-35VG (ERC045-070VG) (A968)

Install

1. Install new hydraulic motor speed sensor and hydraulic motor speed sensor connector into hydraulic motor. See Figure 47.

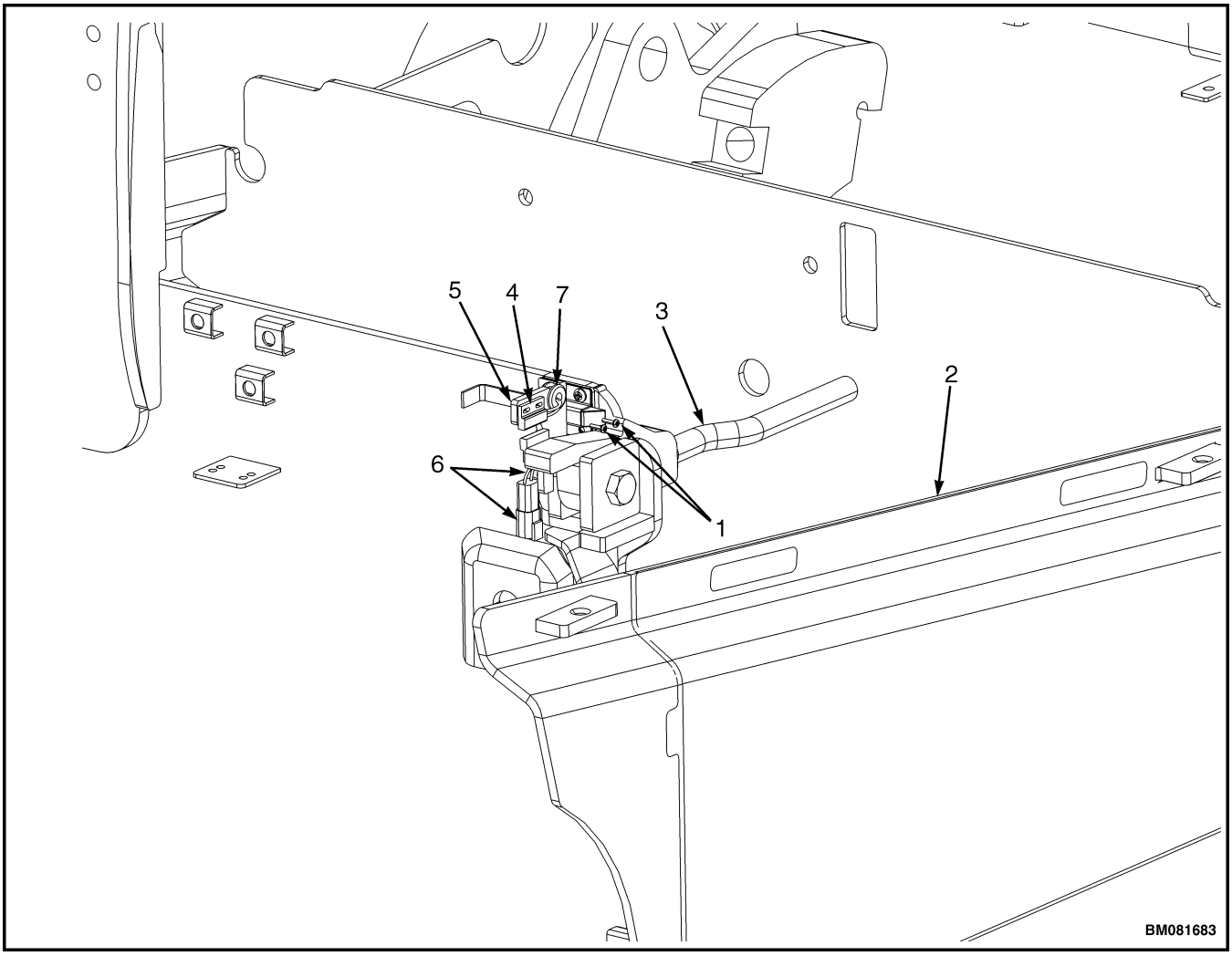
2. Attach hydraulic motor speed sensor to hydraulic motor with socket head screw.

3. Connect main wire harness to hydraulic motor speed sensor.

4. If lift truck is equipped with an 80 volt hydraulic pump motor, install shroud over the hydraulic motor speed sensor. To install shroud, perform the following:

a. Install shroud to hydraulic pump motor using two Allen head screws. See Figure 46.

b. Install mounting bracket to bottom of shroud using three hex bolts and hex nuts. See Figure 46. Tighten hex nuts and bolts to 60 to 70 N•m (44 to 52 lbf ft).



1. CAPSCREWS
2. LIFTOUT BATTERY GATE
3. BATTERY RETENTION ROD
4. BATTERY GATE SWITCH
5. BRACKET
6. BATTERY GATE SWITCH CONNECTOR AND WIRE HARNESS
7. GROMMET

Figure 93. Liftout Battery Gate Switch Replace, Lift Truck Models ERP22-35VL (ERP045-070VL) (A976)

5. Install the brake pedal assembly. For installation procedure

   See **Transaxle** 1300YRM1370 for lift truck models

   - ERP22-35VL (ERP045-070VL) (A976)

   See **Transaxle** 1300YRM1539 for lift truck models

   - ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

6. Connect the accelerator pedal or Foot Directional Control pedal, (see Figure 132) and install the front floor plate using capscrews and washers. Install rear floor plate.

7. Connect motor controller connector to main wiring harness.

8. Install belly pan and two bolts onto underside of lift truck.

9. Connect the battery.

10. For lift truck models ERP22-35VL (ERP045-070VL) (A976) , equipped with Outdoor Protection/Wash-down Package, spray battery connector terminals with rust inhibitor-ignition sealer, after tightening terminals.

11. After install complete, perform ground test. See **Frame** 0100YRM1342, Ground Test section.

LIFT TRUCK MODEL ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

Traction Motor and Hydraulic Pump and Motor Controllers

Remove

1. Read and follow the **WARNING** and **CAUTION** section in the General section above.

2. Remove the battery for access to the motor controllers. See the **Operating Manual** or service manual **Periodic Maintenance** 8000YRM1577.

NOTE: Make sure all power cables and electrical connections are clearly marked before disconnecting them to help in reconnecting.

3. Disconnect the power cables and all electrical connections from the motor controllers. See Figure 138.

   See Figure 138 for lift truck models

   - ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938) manufactured before November 2014

   See Figure 139 for lift truck models

   - ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938) manufactured after November 2014

NOTE: Step 4 through Step 6 apply to lift truck models manufactured before November 2014.

4. Remove 12 flange capscrews from motor controllers. See Figure 138.

5. Remove motor controllers and heatsink from air duct as an assembly. See Figure 138.

6. Remove 16 screws securing motor controllers to heatsink. See Figure 138.

NOTE: Step 7 applies to lift trucks manufactured after November 2014.

7. Remove eight flange capscrews from motor controllers. Remove motor controllers from mounting bracket. See Figure 139.

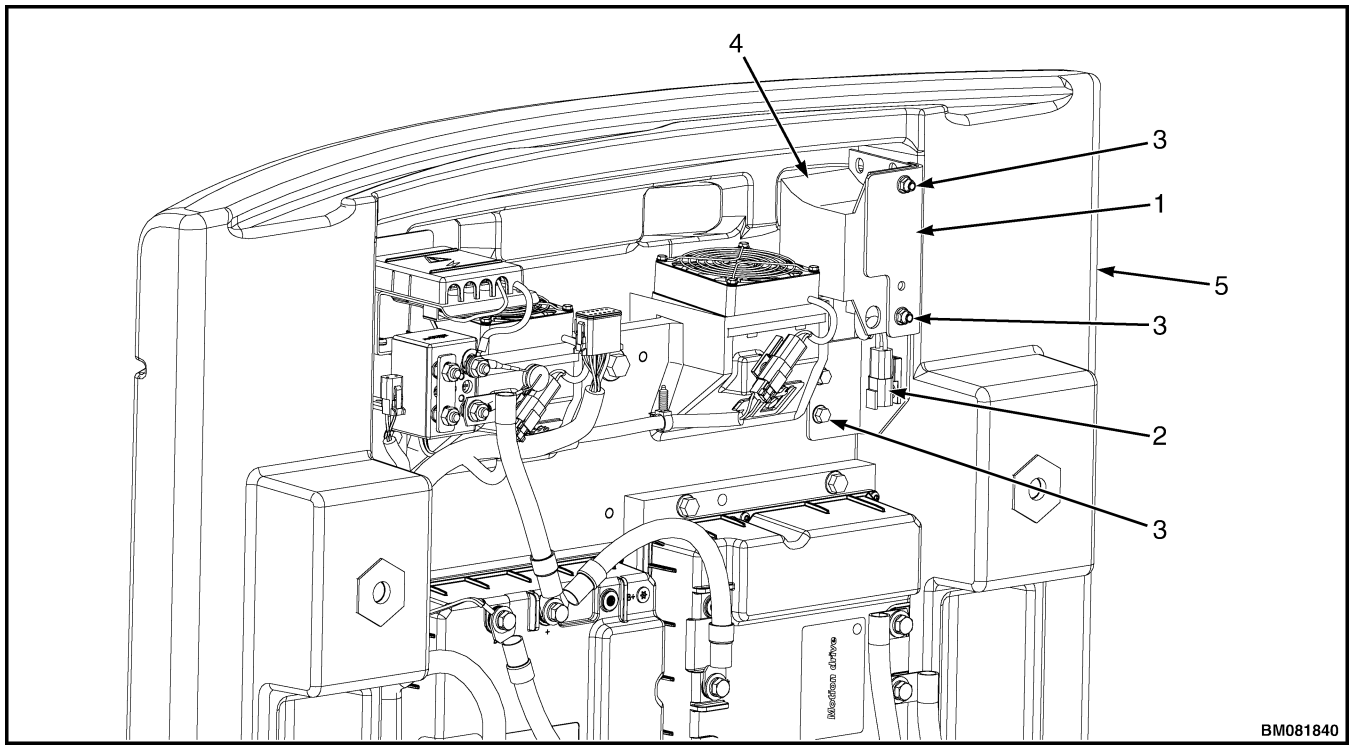
Legend for Figure 181.

NOTE: SEVERAL COMPONENTS OMITTED FOR CLARITY.

A. BACKUP ALARM LOCATION FOR LIFT TRUCK MODELS ERC22-35VG (ERC045-070VG) (A968)

B. BACKUP ALARM LOCATION FOR LIFT TRUCK MODELS ERP22-35VL (ERP045-070VL) (A976) AND ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)

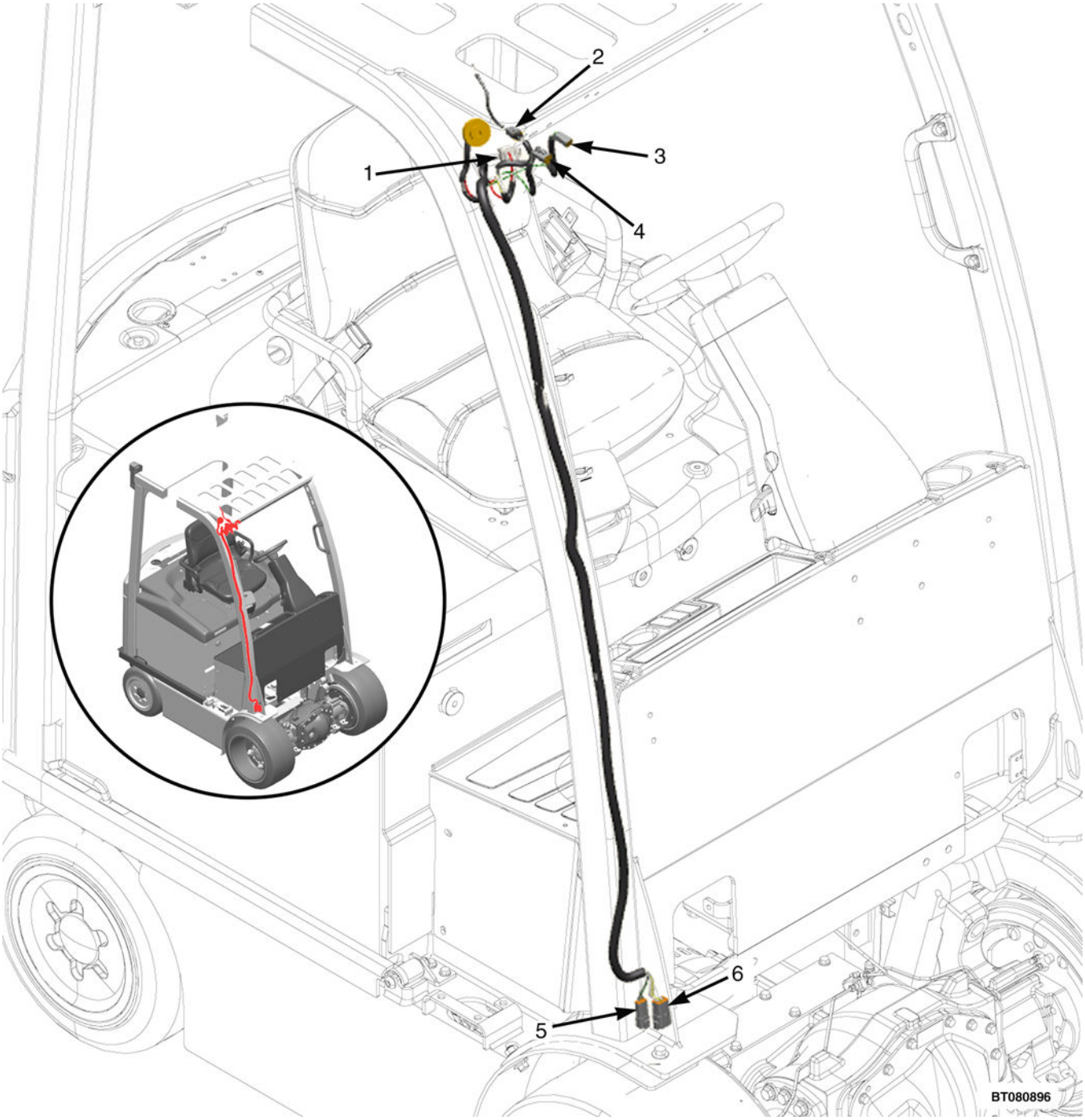
1. MOUNTING PLATE
2. ALARM CONNECTOR
3. CAPSCREW
4. BACKUP ALARM
5. COUNTERWEIGHT
6. CROSSMEMBER



1. MOUNTING PLATE
2. ALARM CONNECTOR
3. CAPSCREW
4. BACKUP ALARM
5. COUNTERWEIGHT

Figure 182. Backup Alarm for Lift Truck Model ERC16-20VA (ERC030-040VA) (A969)

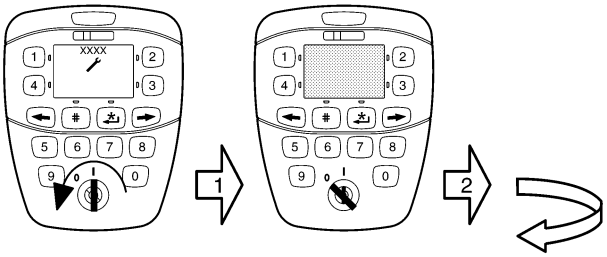
CHECK	PROCEDURE	ACTION
	• Secured capacity load on forks. 1. Raise forks to maximum height of main lift cylinders. 2. Lower forks as fast as possible and observe cylinder rod as main lift cylinders reach bottom of stroke. ***Does fork speed slow and does a hissing sound come from cylinder at bottom of stroke?***	**C661-63, C665, D507-09, D515, D562-64, E509, E564)** 2100YRM1382.
Mast Channel Check	**NOTE:** This is a visual check of the mast to determine if parts are worn or out of adjustment. 1. Raise mast to full height without load and shut lift truck **OFF**. 2. Inspect outer and inner channels for wear pattern and gouging. 3. Move forks to lowered position. 4. Inspect the inner channel wear pattern for wear or gouging. ***Do channels show signs of excess wear?*** *Continue:* 5. Inspect spacing between channels. ***Is the channel spacing even on each side?***	**YES:** Repair mast channels. See **Mast Repair (S/N A270, A271, A272)** 4000YRM1386. **NO:** Mast wear is OK. Continue with this procedure. **YES:** Channel spacing is OK. Go to next check. **NO:** Adjust or repair mast. See **Mast Repair (S/N A270, A271, A272)** 4000YRM1386.
Mast Mounting Check	1. Move mast to lowered position and shut lift ruck **OFF**. 2. Inspect the mounting hardware at axle. 3. Push the top of mast by hand while off the lift truck and note any movement of lift truck. **NOTE:** If the mast mounting is loose, mast will move without moving truck frame. ***Is the mast mounting loose?***	**YES:** Inspect and repair mast mounting. See **Mast Repair (S/N A270, A271, A272)** 4000YRM1386. **NO:** Mast mounting is OK. Go to next check.
Chain and Header Hose Adjustment Check	Ensure the following before starting procedure: • Truck operating on flat surface. • Hydraulic oil at operating temperature. • No load on forks. 1. Install angle meter on mast and position mast at approximately 90° angle to ground. 2. Raise and lower forks through two complete lift cycles. 3. Lower forks to lowest position.	**YES:** Adjust lift chains. See **Mast Repair (S/N A270, A271, A272)** 4000YRM1386. **NO:** Chains are adjusted OK. Continue with this procedure.



1. CPS20 DISPLAY W/KEY SWITCH
2. CPS21 WIRE HARNESS TEMPERATURE SENSOR
3. CPS103 RH FRONT WORK LIGHT
4. CPS166 FRONT MARKER RH
5. CRP180 MAIN LIGHTS HARNESS
6. CRP135 MAIN HARNESS

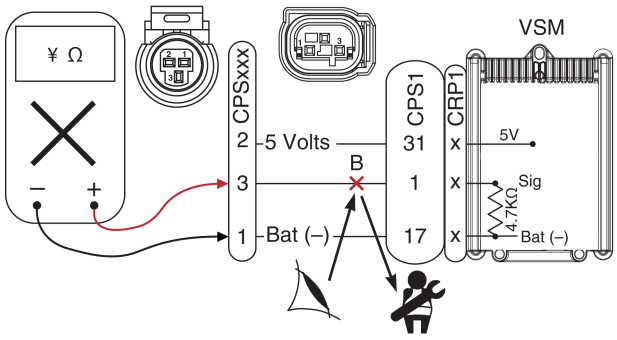
Figure 9030-03-14. ERC22-35VG (ERC045-070VG) (A968); ERP22-25VL (ERP040-070VL) (A976) Wire Harness Display Freezer

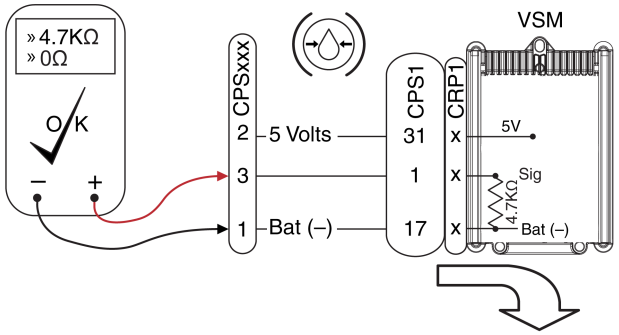
Load Weigh/Service Brake Pressure Sensor Out of Range Low (OORL) (Cont)



Power **OFF**→ ?

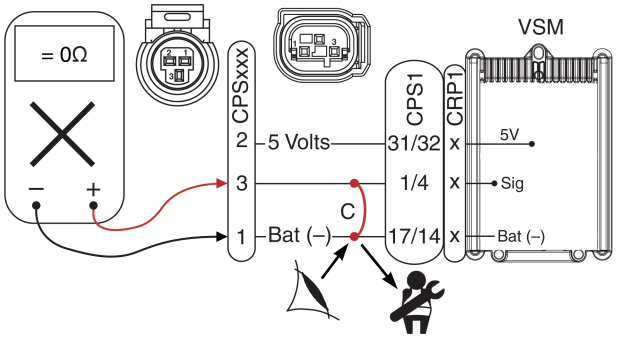
CAUSE B CHECK RESISTANCE - Ω - OHMS

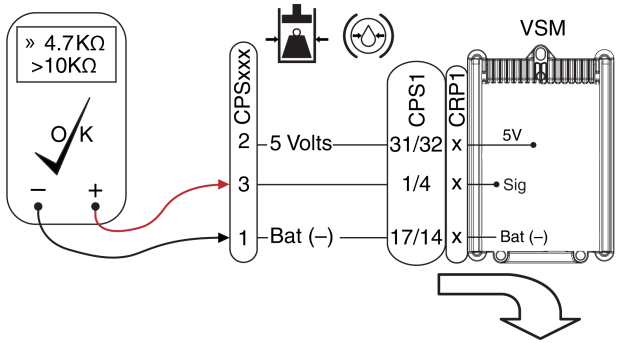




8 ? = Open circuit→Find↑**OPEN** circuit	˜ 4.7K? =	**OK**	Go to CAUSE C.
Repair OPEN circuit. See /**Electrical System** 2200YRM1337**Electrical System** 2200YRM1369.	˜ 0 ? =		?

CAUSE C CHECK RESISTANCE - Ω - OHMS

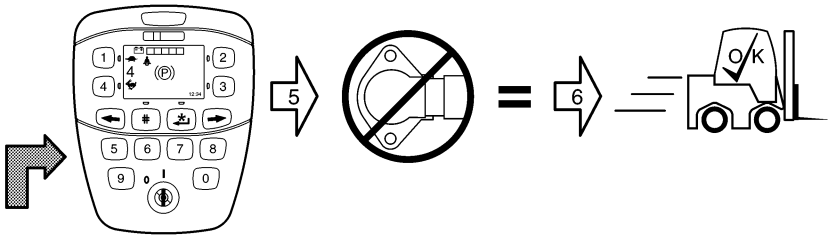




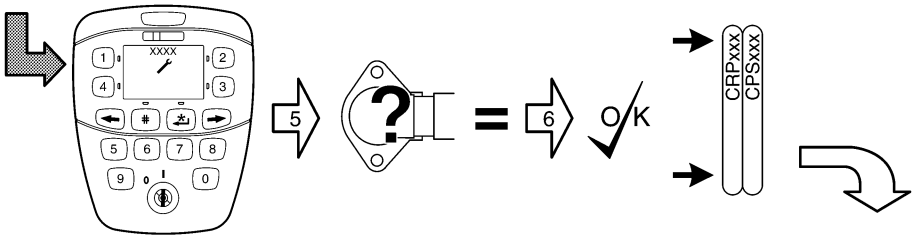
= 0 ? = Short circuit→Find↑**Short** circuit	˜ 4.7K? =	**OK**	For Service Brake Pressure, ?
Repair Short circuit. See /**Electrical System** 2200YRM1337**Electrical System** 2200YRM1369.	> 10K? =	**OK**	For Load Weigh Pressure, ?

Steer Axle Calibration Required (Cont)

CAUSE D5

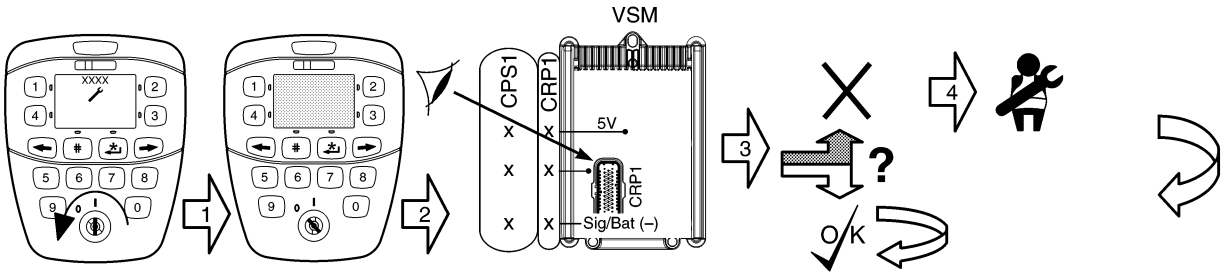


?	Fault DTC gone→	Old sensor faulty→	Resume operation



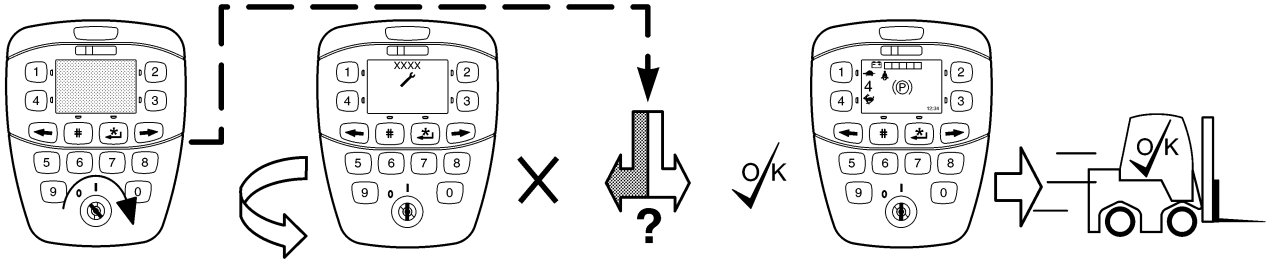
	Fault DTC present→	Old sensor OK/Reinstall old sensor→	Go to CAUSE D.

CAUSE E



Power **OFF**→	Inspect VSM Connections→	OK - Go to Step 1.	Not OK Correct/Repair→Go to Step 1.

CAUSE E1

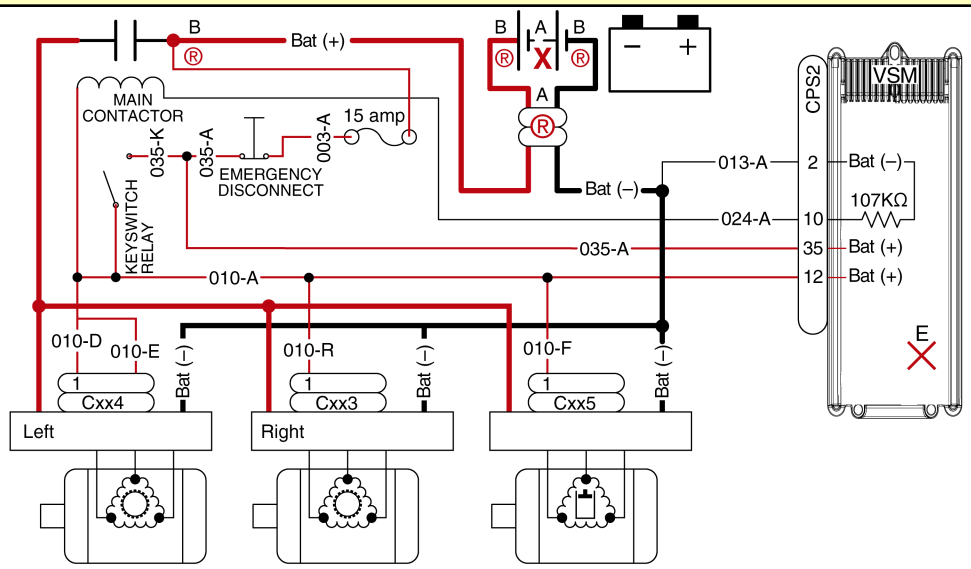


Retest - Power **ON**→	**NO**→Go to VSM Controller Check	Is fault DTC gone? **NO**←**YES**→	Fault corrected→Continue operation.

END FAULT

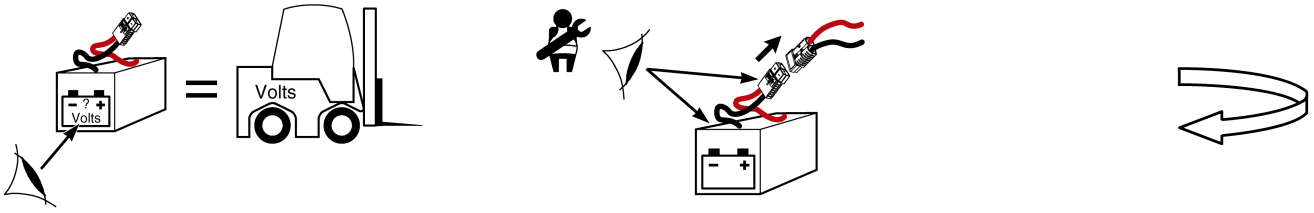
Battery OORH/OORL (Cont)

CBB 3 WHEEL HIGH RESISTANCE CONNECTIONS CAUSES A B C D E > ?



CAUSE A

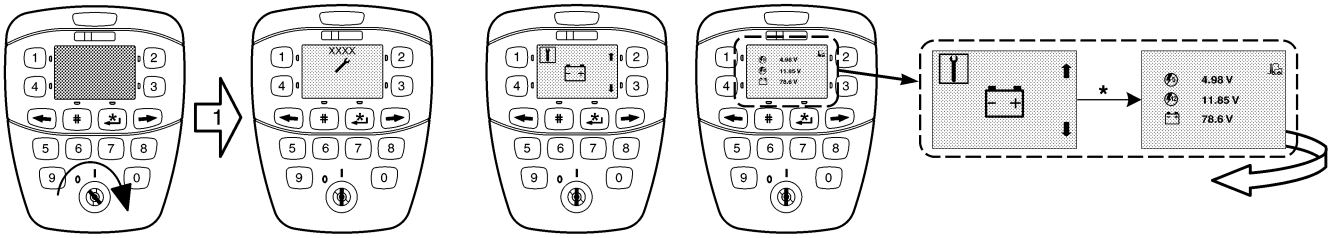
Battery OORH/OORL



Check that correct voltage battery is installed →	Perform battery maintenance, see **Operating Manual**→	?

STEP A1

OORH/OORL

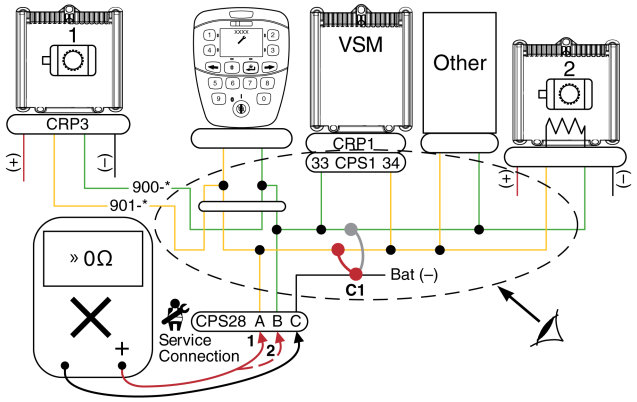


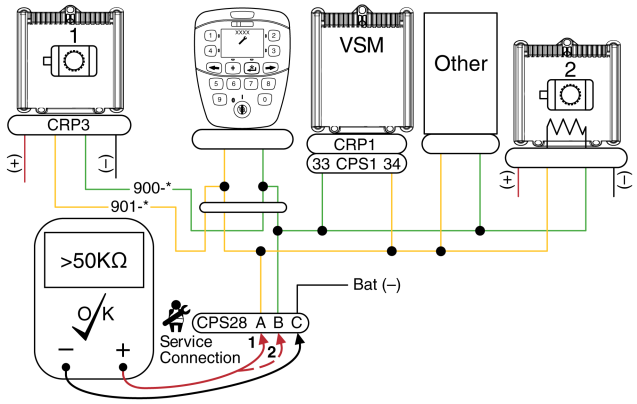
Power **ON**→	Go to Diagnostic→See Display Menu Flowchart	Battery/Supply→View Battery Value	?

A955 – G807 CAN Communication Failure (Cont)

STEP C2

All Device DTCs Short Circuit CAN Hi to Bat (-)CAN Lo to Bat (-) will not Produce a DTC



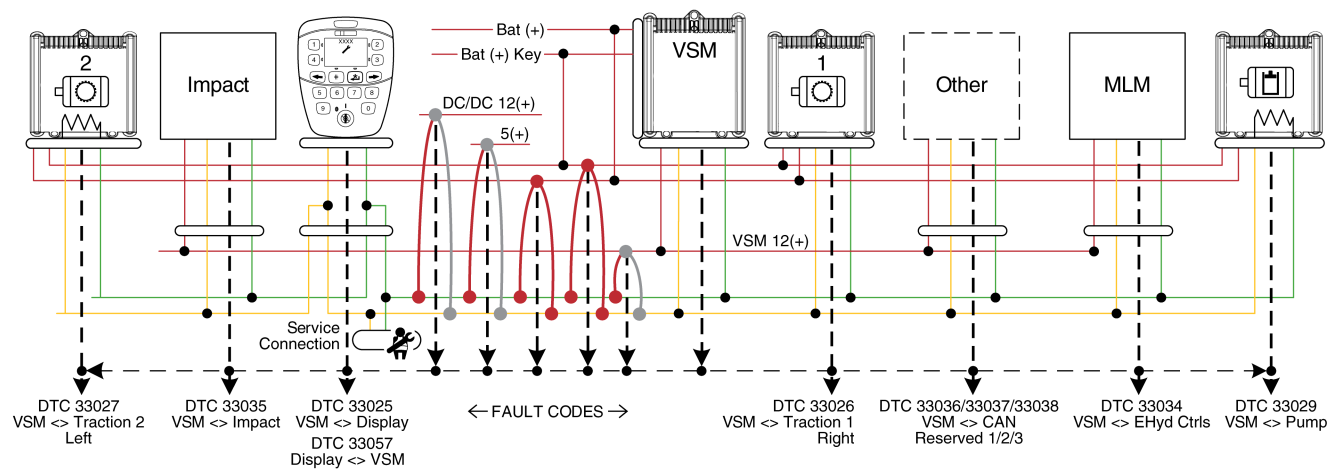


1. 0? = CAN Hi Short Circuit. Go to 3↓	1. > 50K? = OK, Go to 3↓
2. 0? = CAN Lo Short Circuit. Go to 3↓	2. > 50K? = OK, Go to 3 ↓

3. Find/Repair Short Circuit. See /**Electrical System** 2200YRM1337**Electrical System** 2200YRM1369 Re-check ?→Reconnect→Retest, →Step 5

STEP C3

Multiple CAN Device DTCs Displayed > (+) Supply Short Circuit to CAN Hi or CAN Lo

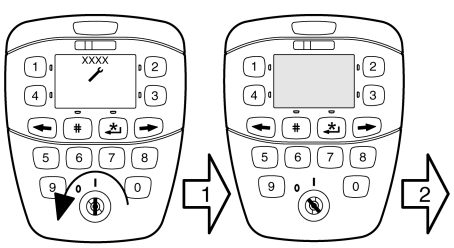


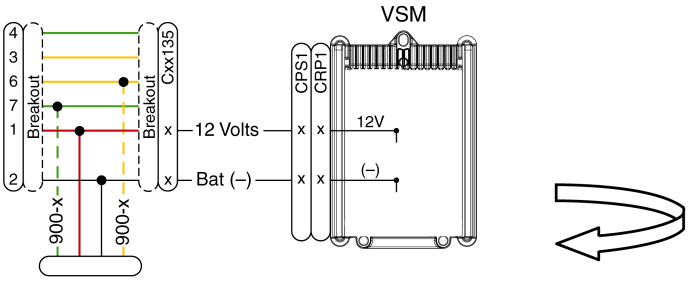
All DTCs→Short Circuit CAN Lo to (+) Supply Sources.

All DTCs→Short Circuit CAN Hi to (+) Supply Sources.No DTCs for a Short to (+)12 Volts or (+) 5 Volts

VSM 12 Volts Supply OORL/OORH (Cont)

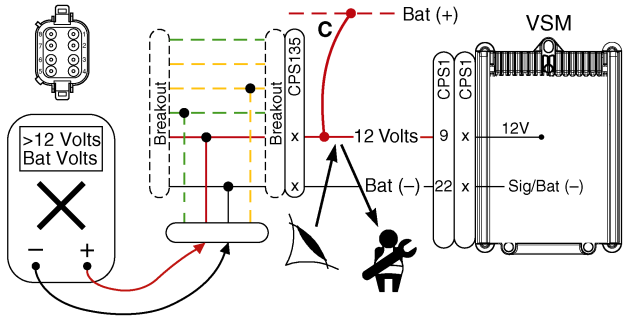
CAUSE C

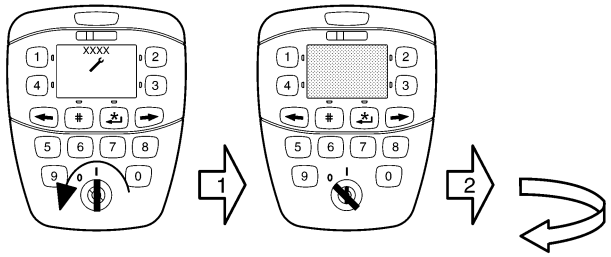




Power **OFF**→	Disconnect Connector Cxx 135 and Install Breakout→		Go to Step 1

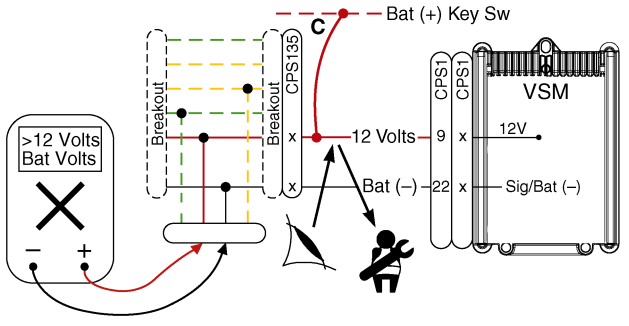
STEP C1 UNSWITCHED VOLTAGES

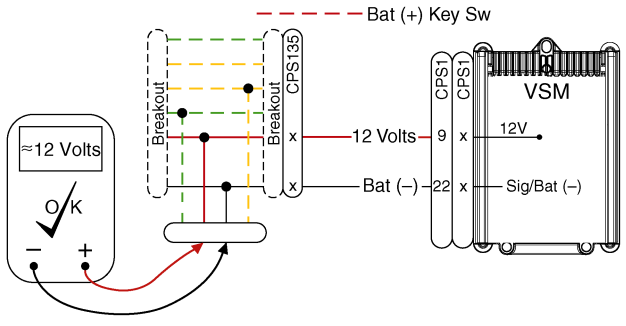




1. ˜ 0 Volts→Step 4↓	
2. ˜ 12 Volts→	Power **ON**→Go to 2↓
3. ˜ Bat Volts = Short Circuit to Unswitched Bat (+)→Go to 4↓	
4. Find/Repair Short Circuit, See /**Electrical System** 2200YRM1337**Electrical System** 2200YRM1369→ ReCheck Voltage↑→Reconnect Go to 5↓	
5. Check correct operation of all 12 volt Devices except Display→CAUSE C↓	

STEP C2

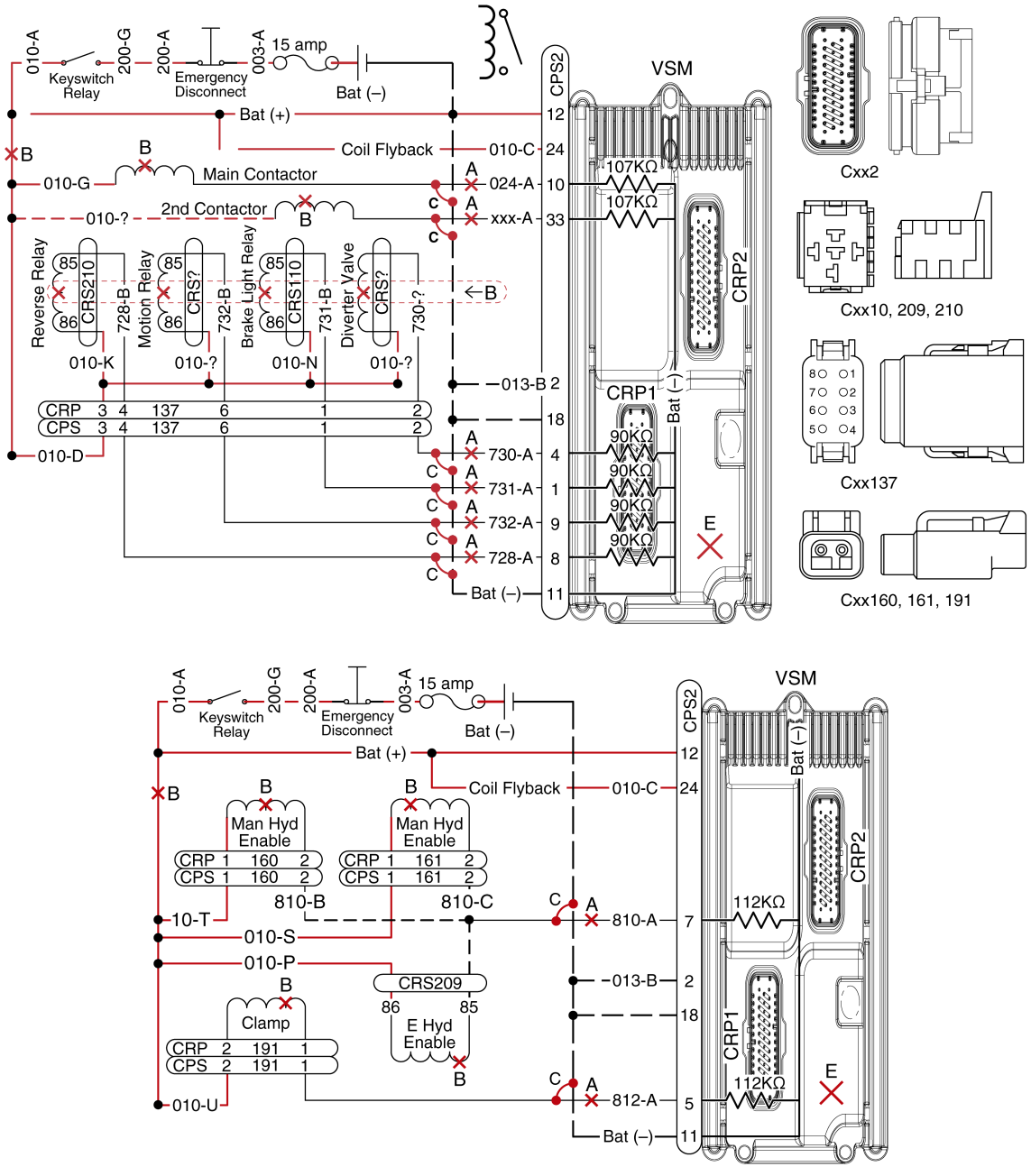




1. ˜ 12 Volts→	˜ 12 Volts →Step 3, CAUSE B↓
2. ˜ Bat Volts = Short Circuit to Switch Bat (+)→Go to 3↓	
3. Find/Repair Short Circuit, See /**Electrical System** 2200YRM1337**Electrical System** 2200YRM1369→ ReCheck Voltage↑→Reconnect Go to 4↓	
4. Check correct operation of all 12 volt Devices except Display→CAUSE C↓	

Contactor/Relay/Valve Coil Short to Battery Negative (STBN)/Open Circuit (OC) (Cont)

CONTACTOR/RELAY/VALVE COILS STBN/(OC) CAUSES A B C D E > ?

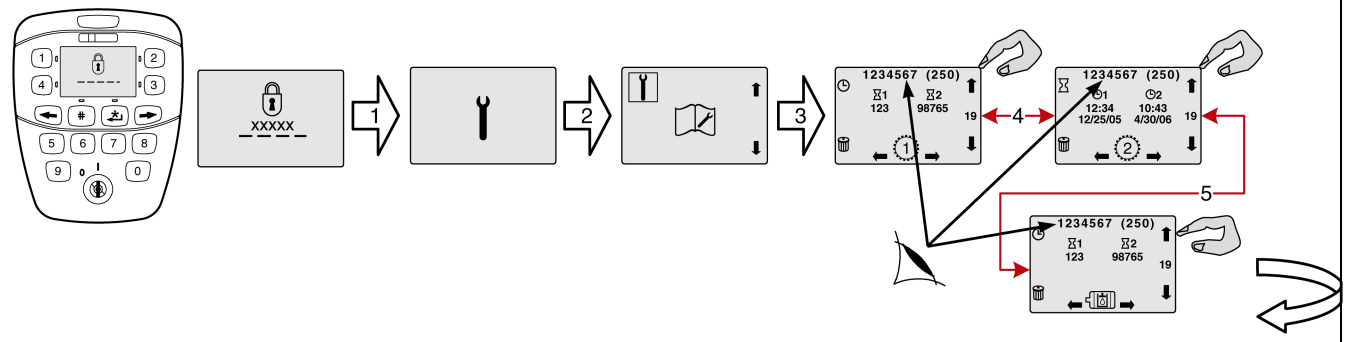


Relay/Coil Function	Coil Voltage	Coil Resistance (?)
Key Switch	12	80
Motion Direction	24	320
Reverse Direction	24	320
Brake Light	24	320
Diverter Valve	24	320

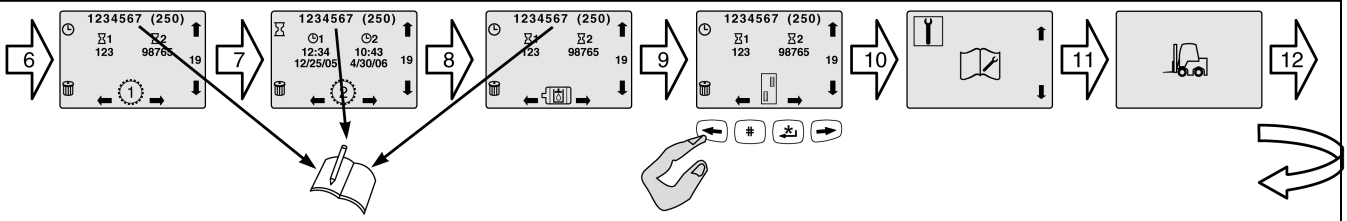
A955 – G807 Motor Auto Brake Failure (Cont)

Check 4

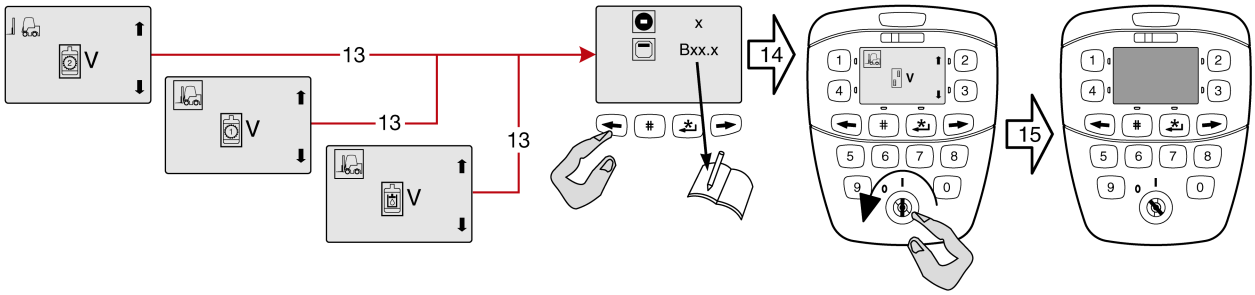
FAULT LOG Review - Go to Display Menu



Enter Service Password→Diagnostic→FAULT LOGs→Motor Fault Log(s)→View all Motor DTCs→?



📋✍ all Motor DTCs→☜Exit Fault Log→Truck Status ?

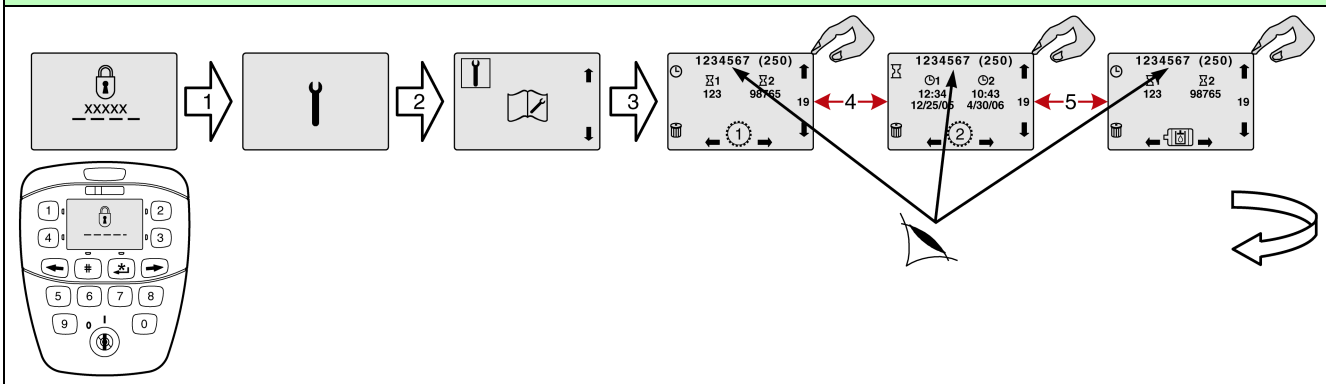


Motor Versions→📋✍Hardware/Software Versions→☜Exit Versions→Power **OFF**?

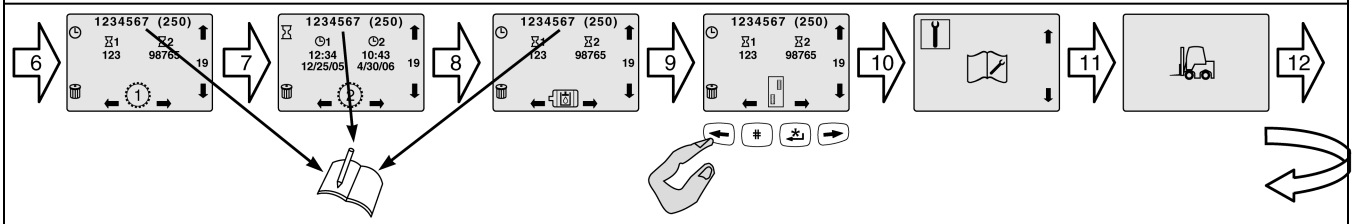
NOTE: Fault Logs will indicate which Motor/Motor Controller has the faulty Component/Connection

CBB/DBB Motor Controller CAN Communication Failure (Cont)

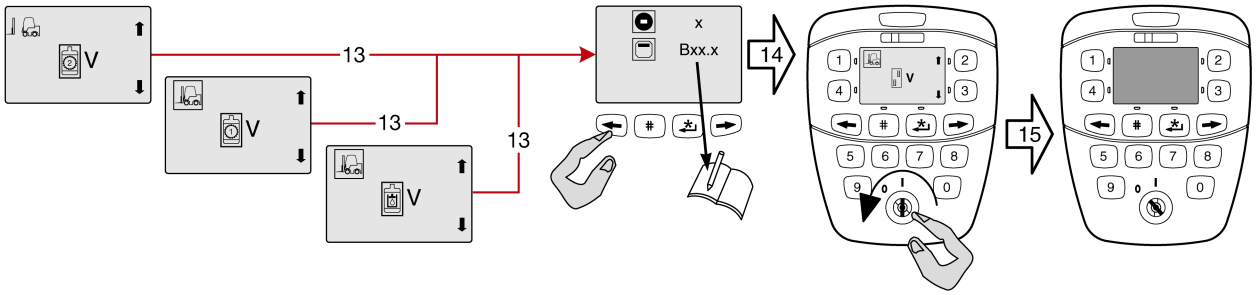
FAULT LOG Review - Go to Display Menu



Enter Service Password→Diagnostic→FAULT LOGs→Motor Fault Log(s)→View all Motor DTCs→?



📝 all Motor DTCs→☜Exit Fault Log→Truck Status ?



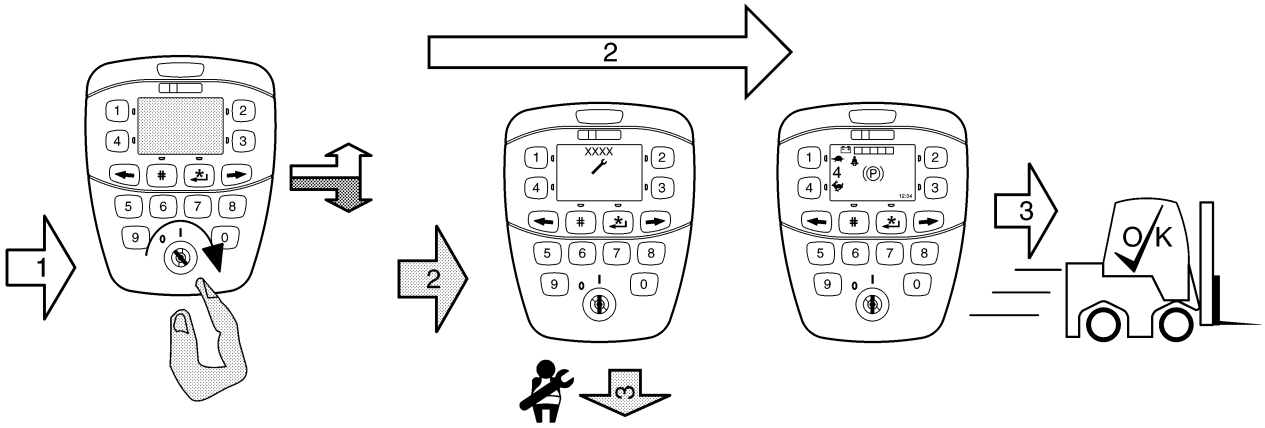
Motor Versions→📝Hardware/Software Versions→☜Exit Versions→Power **OFF**?

NOTE: Fault Logs will indicate which Motor/Motor Controller has the Faulty Component/Connection

POSSIBLE CAUSES X = Open Circuit/Fail) = Short Circuit

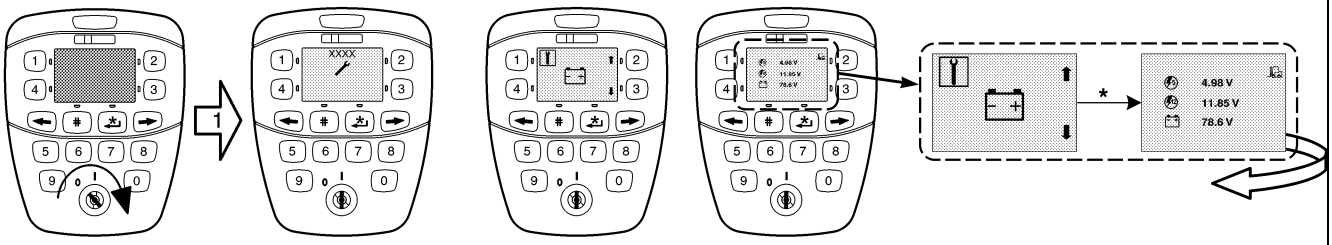
CBB/DBB Motor Controller DC Bus Low/High (Cont)

Check 3



Power **ON**→	Fault Remains Service Required ?	No Fault→Resume Operation

Check 4



Power ON→Go to Diagnostics→Battery/Supply→View Bat Value→Go to Display Menu Flowchart↓

CAUSE C - FAULTY FUSE

PROCEDURE OR ACTION:

1. Inspect appropriate fuse:
   - FU1-10A
   - FU2-10A
   - FU3-10A
   - FU4-5A

   Is fuse blown?
   YES: Inspect circuit for source of short and repair if necessary. Replace fuse, clear DTC, and retest system.
   NO: Proceed to CAUSE D.

CAUSE D - CONTROLLER FAULT

PROCEDURE OR ACTION:

1. Replace faulty controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

END POSSIBLE CAUSES

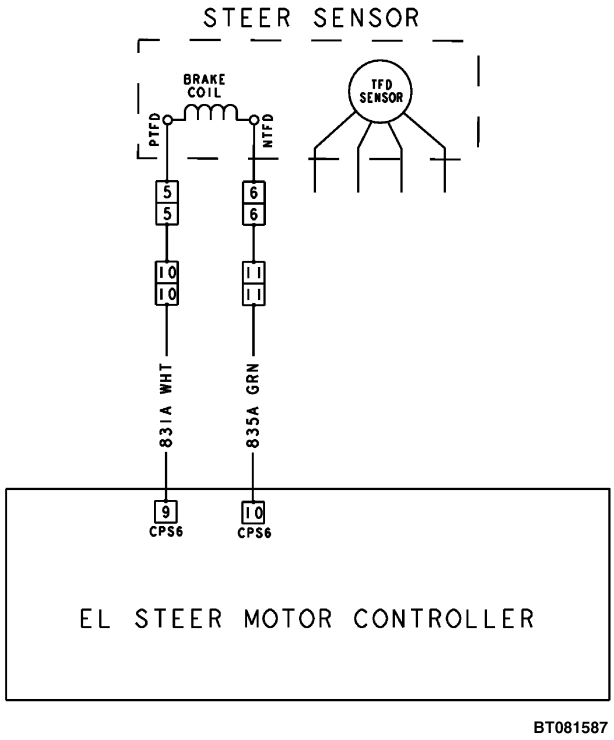
CAUSE C - CONTROLLER FAULT

PROCEDURE OR ACTION:

1. Replace faulty controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

END POSSIBLE CAUSES

DIAGRAMS



Troubleshooting Scenes

END FAULT

DTC 64776
Watchdog

POSSIBLE CAUSE

A. SOFTWARE UPDATE
B. CONTROLLER FAULT

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Prior to performing troubleshooting procedures, verify controller is at the latest revision level. See FOC2 Software Updates.
2. Turn power to OFF for no less than 30 seconds, and then to ON to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Proceed to Step 3.
   NO: Problem not verified, resume operation.
3. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code.
   Are any faults detected/observed?
   YES: Repair/replace connector or wiring associated with faults found. Refer to the appropriate Electrical System manual.
   NO: Proceed to CAUSE A.

CAUSE A - SOFTWARE UPDATE

PROCEDURE OR ACTION:

1. Reprogram controller and retest system.
   Does DTC return after controller has been reprogrammed?
   YES: Proceed to CAUSE B.
   NO: No further service is required.

CAUSE B - CONTROLLER FAULT

PROCEDURE OR ACTION:

1. If DTC returns after reprogramming, replace faulty controller. Make sure to indicate the DTC code(s) on the warranty claim to include an accurate problem description leading to controller replacement.

END POSSIBLE CAUSES

END FAULT

DTC 65259
FOC2 Coil_Short_HW_KO

POSSIBLE CAUSE

A. MAIN CONTACTOR WIRING FAULT
B. MAIN CONTACTOR COIL FAULT
C. SLAVE CONTROLLER FAULT

NOTE
Please refer to the end of this procedure for supporting diagrams.

COMPONENT OPERATIONAL CHECK

PROCEDURE OR ACTION:

1. Prior to performing troubleshooting procedures, verify controller is at the latest revision level. See FOC2 Software Updates.
2. Turn power to OFF for no less than 30 seconds, and then to ON to clear displayed DTC.
   Does reported DTC reoccur?
   YES: Proceed to Step 3.
   NO: Problem not verified, resume operation.
3. Conduct a quick visual inspection of all connectors/wiring associated with the displayed fault code.
   Are any faults detected/observed?
   YES: Repair/replace connector or wiring associated with faults found. Refer to the appropriate Electrical System manual.
   NO: Proceed to CAUSE A.

CAUSE A - MAIN CONTACTOR WIRING FAULT

PROCEDURE OR ACTION:

NOTE: Key in ON position.

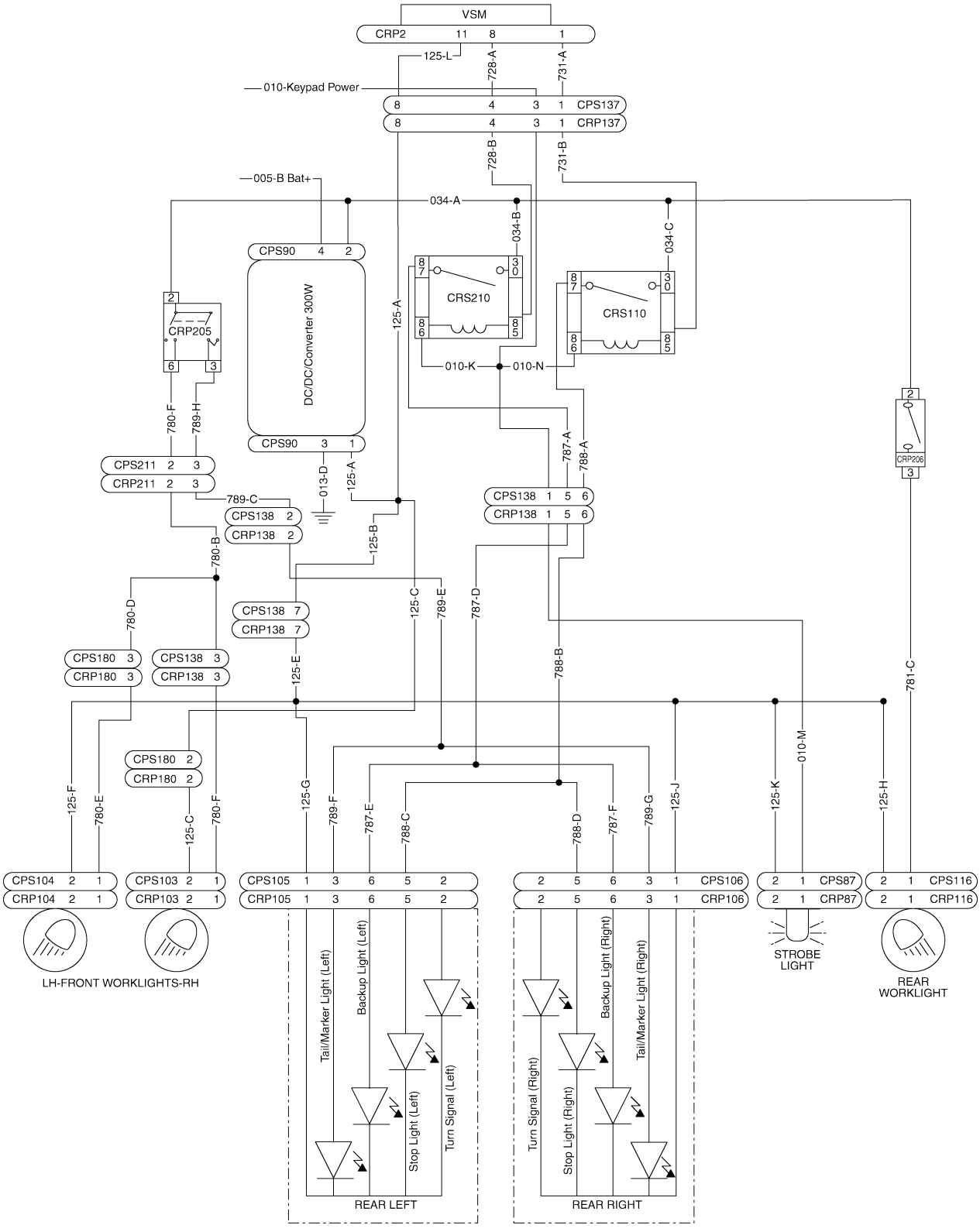
1. Disconnect coil connector TF10 (B+) and TF11 (B-) and measure voltage between TF10 (B+) and B(-).
   Is voltage battery voltage present?
   YES: Proceed to Step 2.
   NO: Inspect input circuit for open or short.
2. Measure voltage between TF10 (B+) and TF11 (B-).
   Is voltage battery voltage present?
   YES: Proceed to CAUSE B.
   NO: Inspect ground control circuit 024A for open, short, or source of excessive resistance.

CAUSE B - MAIN CONTACTOR COIL FAULT

PROCEDURE OR ACTION:

1. Measure resistance across coil terminals.
   Is resistance 20 ± 2 ohms?
   YES: Proceed to CAUSE C.
   NO: Replace faulty coil.

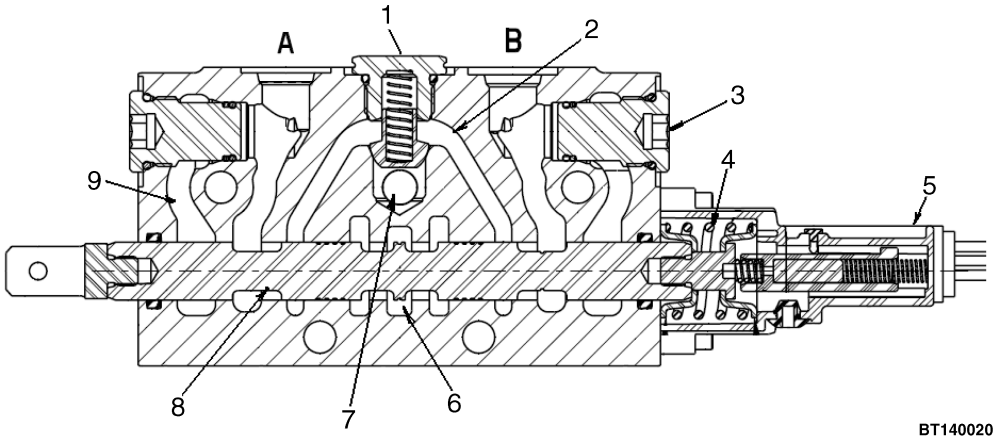
Lights Inoperative



BT081293

Purpose

The auxiliary section is used to control various attachments that can be installed on the vehicle. See Figure 9050-10-10.



1. LOAD CHECK
2. BRIDGE CORE
3. WORK PORT OPTION PLUG
4. SPOOL POSITIONER
5. POSITION SENSOR
6. OPEN CENTER CORE
7. POWER CORE
8. MAIN SPOOL

Figure 9050-10-10. Cross-Section Dual Auxiliary Section

When the spool is in neutral, flow passes through the open-center (OC) passage and downstream to the tank port of the valve.

When the spool is actuated in or out, the open-center (OC) flow path is blocked off and forces the flow through power core across the load check valve into the high pressure bridge core. From the high pressure bridge core, the oil is directed out the selected work port (3A or 3B for three-function valve, 3A, 3B, 4A, or 4B for four-function valve) to the auxiliary attachment. Oil returns from the auxiliary attachment to the opposite work port in that section and is directed to the tank passage.

HYDRAULIC OIL COOLER

Construction and Purpose

The hydraulic oil cooler option consist of an oil cooler, hydraulic oil temperature switch, two 12 volts fans and shroud, and support bracketry. The purpose of the hydraulic oil cooler is to keep hydraulic oil temperature to the hydraulic tank no greater than 60°C (140°F).

Operation

The hydraulic oil cooler is in series with hydraulic supply circuit, between the filter assembly and main control valve. See Figure 9050-10-11. The cooling fans are triggered when the hydraulic oil temperature switch senses a hydraulic oil temperature of a 60°C (140°F).

CAUSE F - TILT CONTROL SPOOL DAMAGED OR LEAKING EXCESSIVELY.

PROCEDURE OR ACTION:

1. Inspect valve section. Depending on your left truck see, **Main Control Valves** 2000YRM1334, **Main Control Valves** 2000YRM1439, or **Electrical System** 2200YRM1337.
   Is spool in good condition?
   YES: See Observed Symptoms-Gear Pump, Forks Raise or Actuate Without Command (E-Valve), Page 9050-33-15.
   NO: Clean or replace spool.

END SYMPTOM

Actuations Do Not Act Simultaneously

POSSIBLE CAUSE

A. LOW PUMP FLOW.
B. SECONDARY RELIEF VALVE SET TOO LOW.

CAUSE A - LOW PUMP FLOW.

PROCEDURE OR ACTION:

1. Check cycle times of lift function.
   Is lift function speed ok?
   YES: Go to CAUSE B.
   NO: Go to Observed Symptoms-Gear Pump, Abnormal Hydraulic Noise and/or Vibration, Page 9050-33-1.

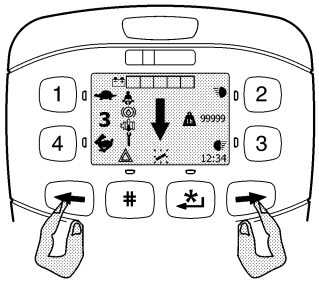
CAUSE B - SECONDARY RELIEF VALVE SET TOO LOW.

PROCEDURE OR ACTION:

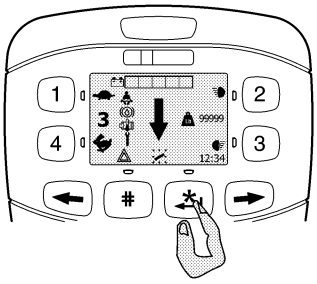
1. Test and adjust secondary relief pressure. See Secondary Relief Valve Test and Adjustment.

END SYMPTOM

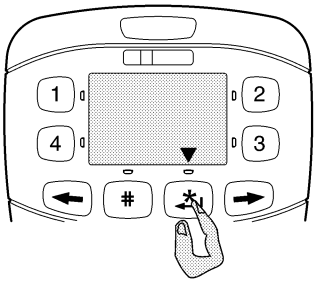
DISPLAY MENU FLOWCHART (Con't)



Return to Previous Menu←



Select/Enter/Accept *



Enter/Accept *

Scroll

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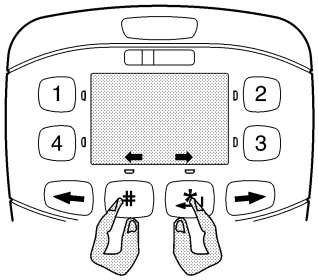

Scroll

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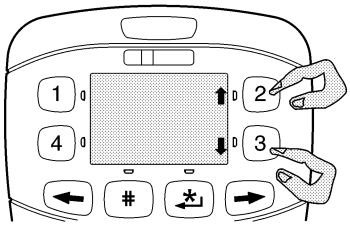
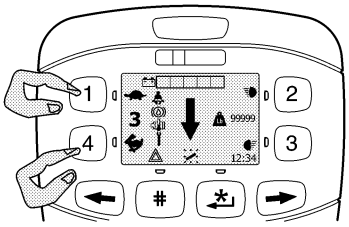


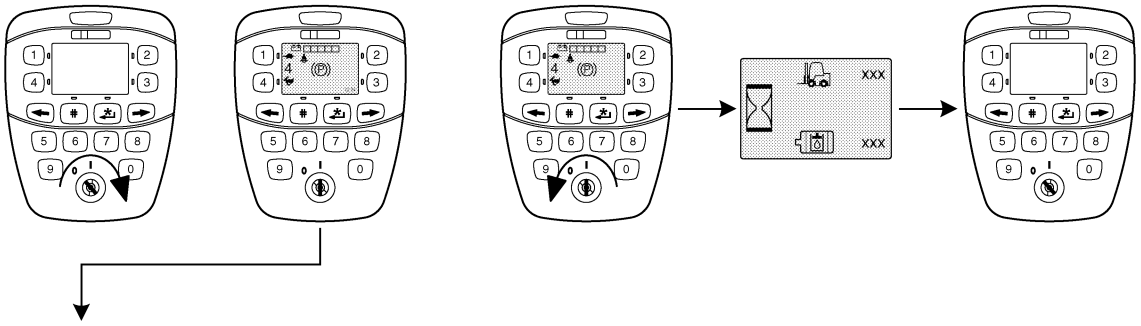
Scroll Up/Down

↑

↓



Increase/Decrease Performance



Power ON

Power OFF

Hour Meter Displayed for 5 seconds

Power ON→

Operator Cycle→

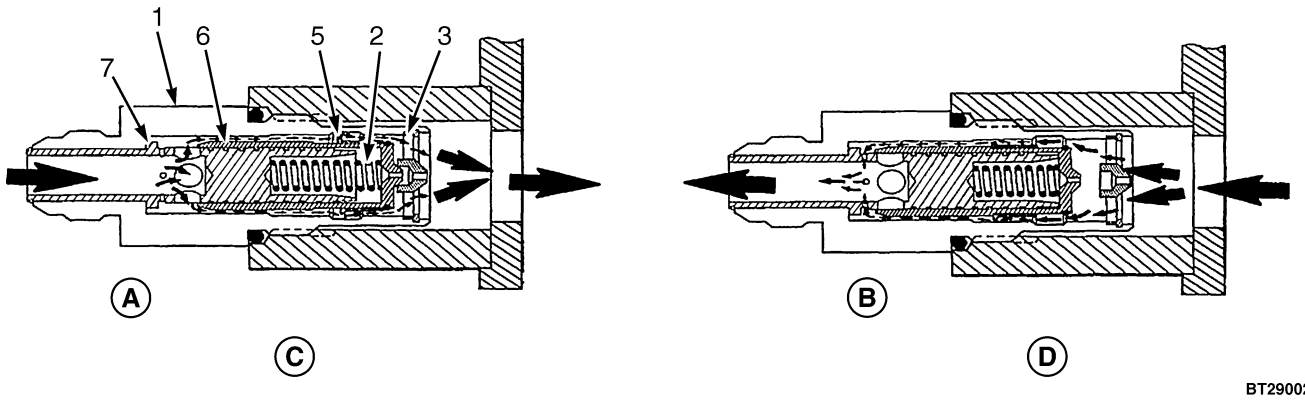
Enter Password→

Supervisor/Service Cycle→

Power OFF→

Power ON→

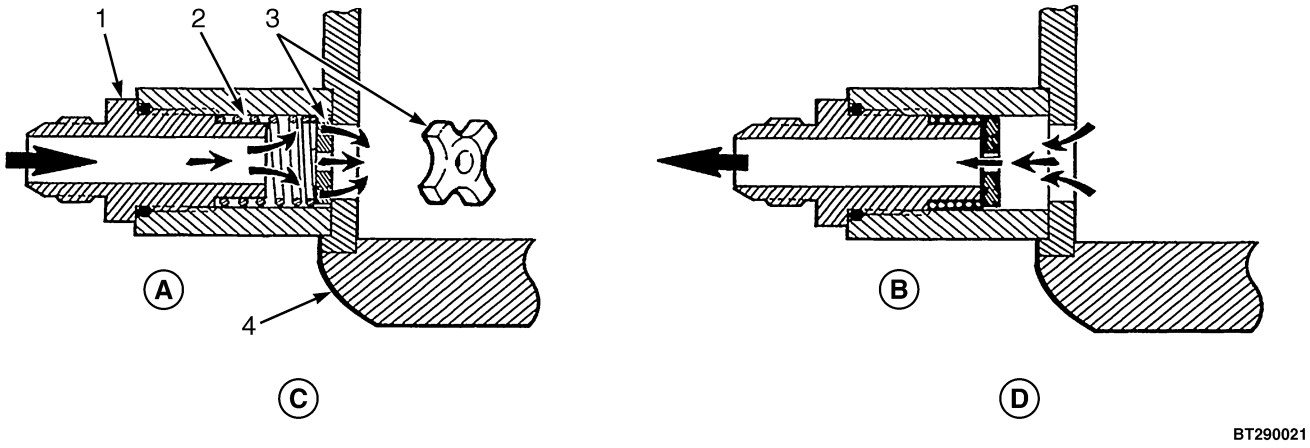
Operator Cycle



A. LIFTING
B. LOWERING
C. FREE FLOW
D. RESTRICTED FLOW

1. SPECIAL FITTING OR VALVE BODY
2. SPRING
3. SPECIAL WASHER
4. NOT SHOWN, CYLINDER (SECONDARY ONLY)
5. ORIFICE SLEEVE
6. PLUNGER
7. MAIN SLEEVE

Figure 9070-10-15. Primary Lowering Control Valve



A. LIFTING
B. LOWERING
C. FREE FLOW
D. RESTRICTED FLOW

1. SPECIAL FITTING OR VALVE BODY
2. SPRING
3. SPECIAL WASHER
4. CYLINDER (SECONDARY ONLY)

Figure 9070-10-16. Secondary Lowering Control Valve

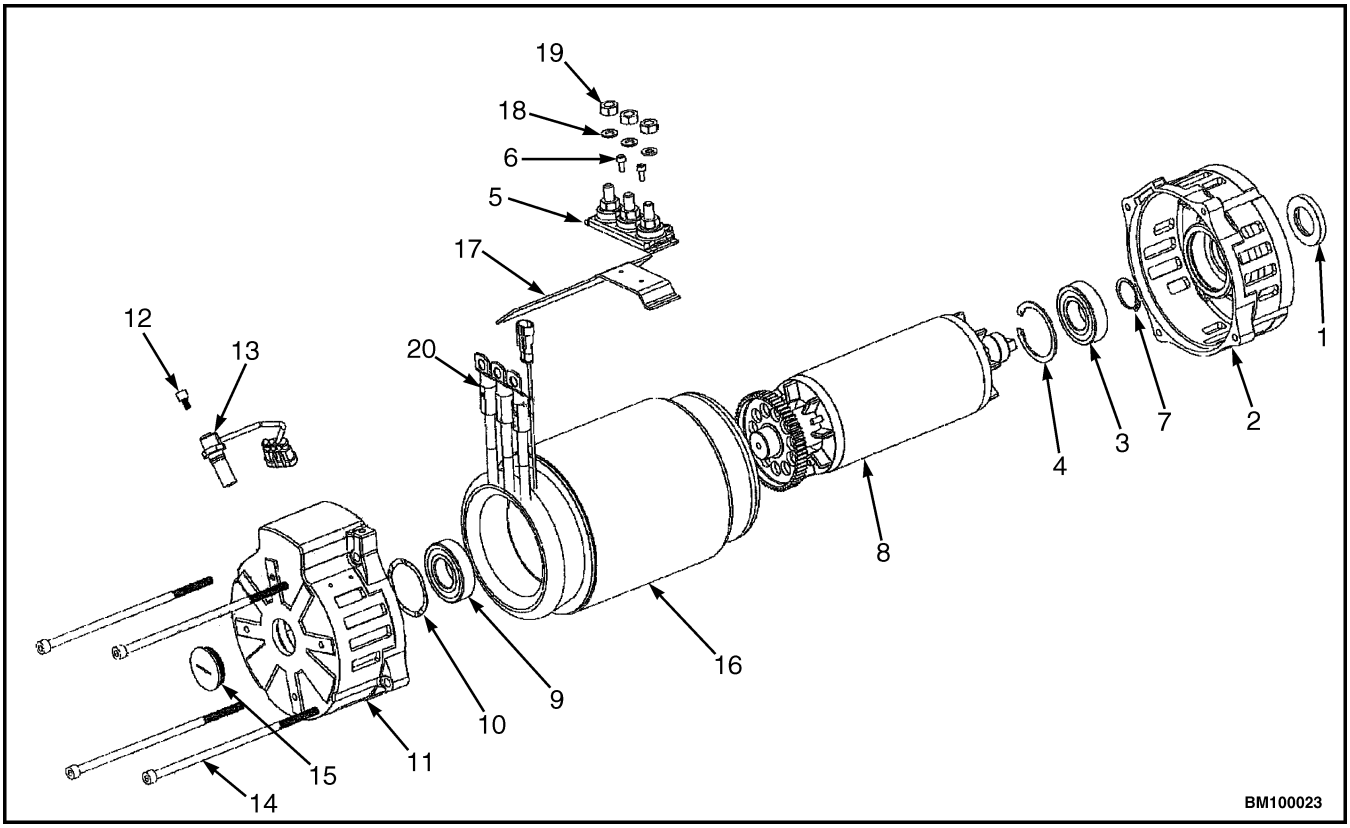
Chassis

DESCRIPTION

The chassis consists of the following components as shown in Figure 9070-10-17. The frame is one weldment which includes the hydraulic tank which can be accessed with removal of the counterbalance. The counterweight is attached to the frame and varies in weight depending on truck capacity.

Table 9080-50-1. Abbreviations and Acronyms (Continued)

Term	Definition or Description
GB	Gigabyte - equal to 1024 Megabytes
H	Henry - Unit of measurement of electrical inductance
HYDR	Hydraulic
Hz	Basic unit of frequency measurement, 1 Hz = 1 periodic interval in one second
IAC	Idle Air Control
IAT	Intake Air Temperature
IBPP	Inching/Brake Pedal Position
ISR	Interrupt Service Routine
kBps	KiloBytes per second
kHz	KiloHertz - common frequency measurement of Hertz X 1000
kilobit	1,000 bits
kilobyte	A standard quantity measurement for disk and diskette storage. One kilobyte of memory equals 1024 bytes (8-bit characters) of computer memory.
kg	Kilogram, equal to 1000 grams
kPa	Kilo-Paschals, metric unit of pressure measurement X 1000
kph	Kilometers per Hour
L	Liter
LAN	Local Area Network
lbf ft	Foot Pounds
lbf in	Inch Pounds
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LFL	Limited Free Lift
MB	Megabyte - 1,048,576 bytes, equal to 1,024 kilobytes. The basic unit of measurement of mass storage
MDU	Master Drive Unit
MHz	Megahertz - a unit of frequency equal to 1024 kilohertz. A common method for describing the speed of a computer CPU
MIL	Malfunction Indicator Lamp
MLCV	Mast Lowering Control Valve
MLM	Mini Lever Module
mH	Milli-Henry, 1 one thousandth of a Henry
Modem	Modulator-Demodulator - a device that adapts a terminal or computer to a telephone line converting the computer’s digital pulses into audio frequencies (analog) for the telephone system and converts the frequencies back into digital pulses at the receiving side
MPH	Miles Per Hour
MRV	Main Relief Valve



1. SHAFT SEALING RING
2. DRIVE END SHIELD
3. DRIVE BALL BEARING
4. LOCKING RING
5. TERMINAL POST
6. CAPSCREW
7. SNAP RING
8. ROTOR
9. NON-DRIVE BALL BEARING
10. WAVED SPRING WASHER
11. NON-DRIVE END SHIELD
12. SENSOR SCREW
13. SPEED SENSOR
14. TIE ROD
15. CAP
16. STATOR HOUSING
17. TERMINAL POST BRACKET
18. SPRING WASHER
19. HEX NUT
20. POWER LEAD

Figure 31. Hydraulic Motor Components

3. Remove two capscrews, terminal posts, and terminal post bracket from stator housing. See Figure 31.

4. Remove four tie rods holding non-drive end shield and drive end shield to stator housing. See Figure 31.

CAUTION

Disposal of silicone sealant must meet local environmental regulations.

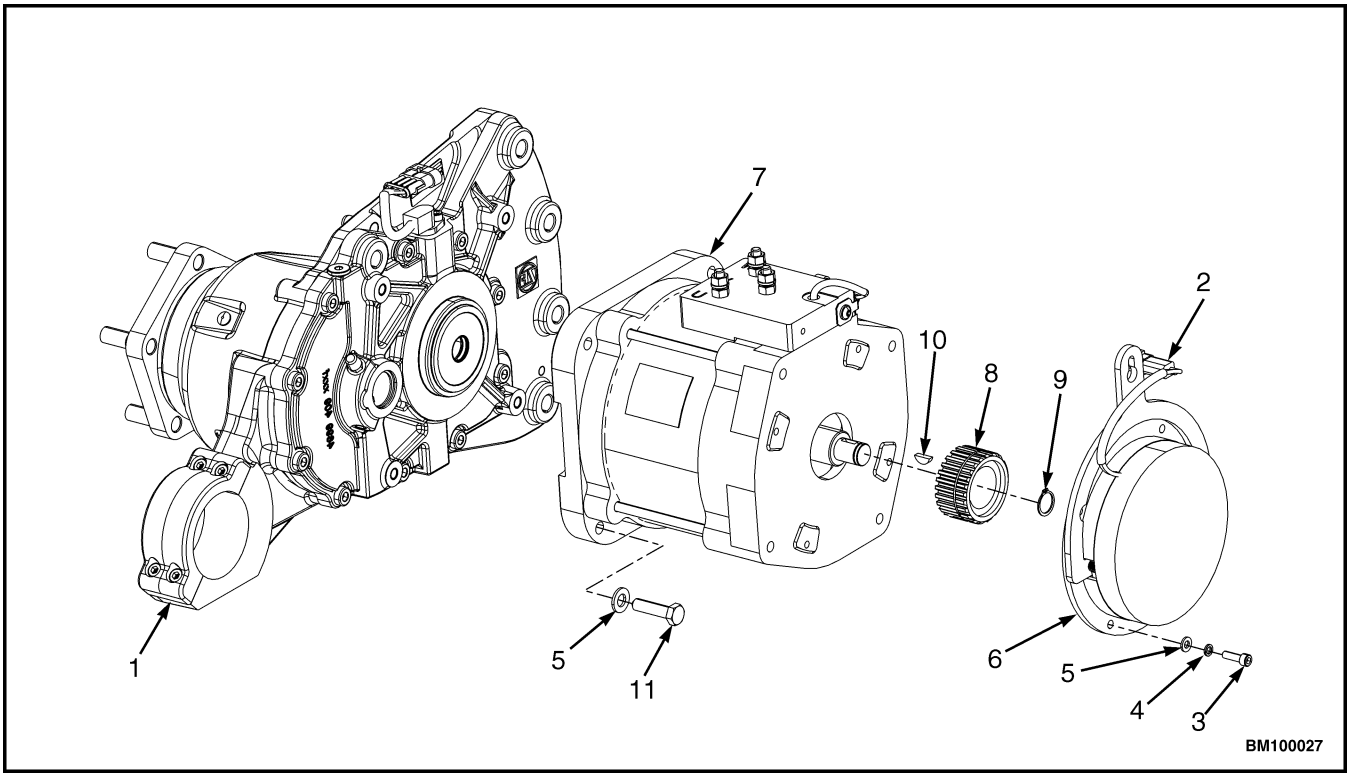
NOTE: Note threading position and orientation of power leads and thermal sensor connector wire through non-drive end shield during disassembly to aid in assembly.

NOTE: Silicone seal for power leads and thermal sensor connector wire must be broken prior to shield removal.

5. Remove non-drive end shield from stator housing. See Figure 31.

6. Using bearing puller, remove non-drive ball bearing from non-drive end shield. See Figure 31.

7. Remove waved spring washer from non-drive end shield. See Figure 31.



1. TRANSAXLE
2. PARKING BRAKE WIRE HARNESS
3. SOCKET HEAD CAPSCREW
4. LOCKWASHER
5. WASHER
6. PARKING BRAKE
7. TRACTION MOTOR
8. SPLINED HUB
9. SNAP RING
10. WOODRUFF KEY
11. TRACTION MOTOR MOUNTING CAPSCREW

Figure 13. Transaxle Assembly

WARNING

The traction motor weighs approximately 18.4 kg (40.6 lb). Make sure lifting device has enough lifting capacity to safely lift motor.

NOTE: Use an approved lifting device to hold and lift traction motor during removal.

9. Remove four traction motor mounting capscrews, washers, and traction motor from transaxle. See Figure 13.

Disassemble

1. Remove four socket-head capscrews and lock-washers from brake end head and transaxle end head. See Figure 14.

8. Install non-drive end shield onto stator housing and place power leads and thermal sensor in the orientation and position as noted during removal.

   See Figure 42 for lift truck models
   - ERP22-35VL (ERP045-070VL) (A976)

   See Figure 43 for lift truck models
   - ERC16-20VA (ERC030-040VA) (A969)

9. Install four tie rods holding end shields to stator housing.

   See Figure 42 for lift truck models
   - ERP22-35VL (ERP045-070VL) (A976)

   See Figure 43 for lift truck models
   - ERC16-20VA (ERC030-040VA) (A969)

NOTE: Perform Step 10 for lift truck models ERP22-35VL (ERP045-070VL) (A976) only.

10. Install fan cover and three socket-head capscrews on non drive end shield. See Figure 42.

11. Using two screws, install terminal strip, terminal post bracket, terminal posts onto stator housing.

    See Figure 42 for lift truck models
    - ERP22-35VL (ERP045-070VL) (A976)

    See Figure 43 for lift truck models
    - ERC16-20VA (ERC030-040VA) (A969)

12. Connect power leads from terminal posts.

    See Figure 42 for lift truck models
    - ERP22-35VL (ERP045-070VL) (A976)

    See Figure 43 for lift truck models
    - ERC16-20VA (ERC030-040VA) (A969)

13. Install three lockwashers and hex nuts onto terminal posts.

    Tighten hex nuts to 14 to 16 N•m (124 to 142 lbf in). See Figure 42 for lift truck models
    - ERP2.2-3.5VL (ERP045-070VL) (A976)

    Tighten hex nuts to 14 to 16 N•m (124 to 142 lbf in). See Figure 43 for lift truck models
    - ERC16-20VA (ERC030-040VA) (A969)

14. Fill the area around the power leads and thermal sensor located on the non-drive end shield with neutral curing, high temperature silicone sealant (rated for at least 260°C (500°F).

Install

1. Place hydraulic motor assembly on a clean workbench or other suitable work surface.

2. Install the hydraulic pump and motor brackets. See **Hydraulic System** 1900YRM1367 for installation instructions.

3. Install hydraulic pump and motor assembly on the lift truck. See **Hydraulic System** 1900YRM1367 for installation instructions.

HYDRAULIC MOTOR REPAIR FOR 4.0-5.5T LIFT TRUCKS

This section covers the hydraulic motor repair procedures for lift truck models:

- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)
- ERC40-55VH, ERC50VHS (ERC80-120VH, ERC100VHS) (A938)

Remove

1. Remove hydraulic pump and motor assembly from lift truck. See **Hydraulic System** 1900YRM1367 for removal instructions.

2. Place hydraulic pump and motor assembly on a clean workbench or other suitable surface.

3. Remove the hydraulic pump and motor brackets. See **Hydraulic System** 1900YRM1367 for removal instructions.

Disassemble

1. Place motor in a vise with terminal posts on top and carefully clamp vise on stator housing.

2. Remove three hex nuts and lockwashers from terminal posts. See Figure 47.

3. Disconnect terminal cables from terminal posts. See Figure 47.

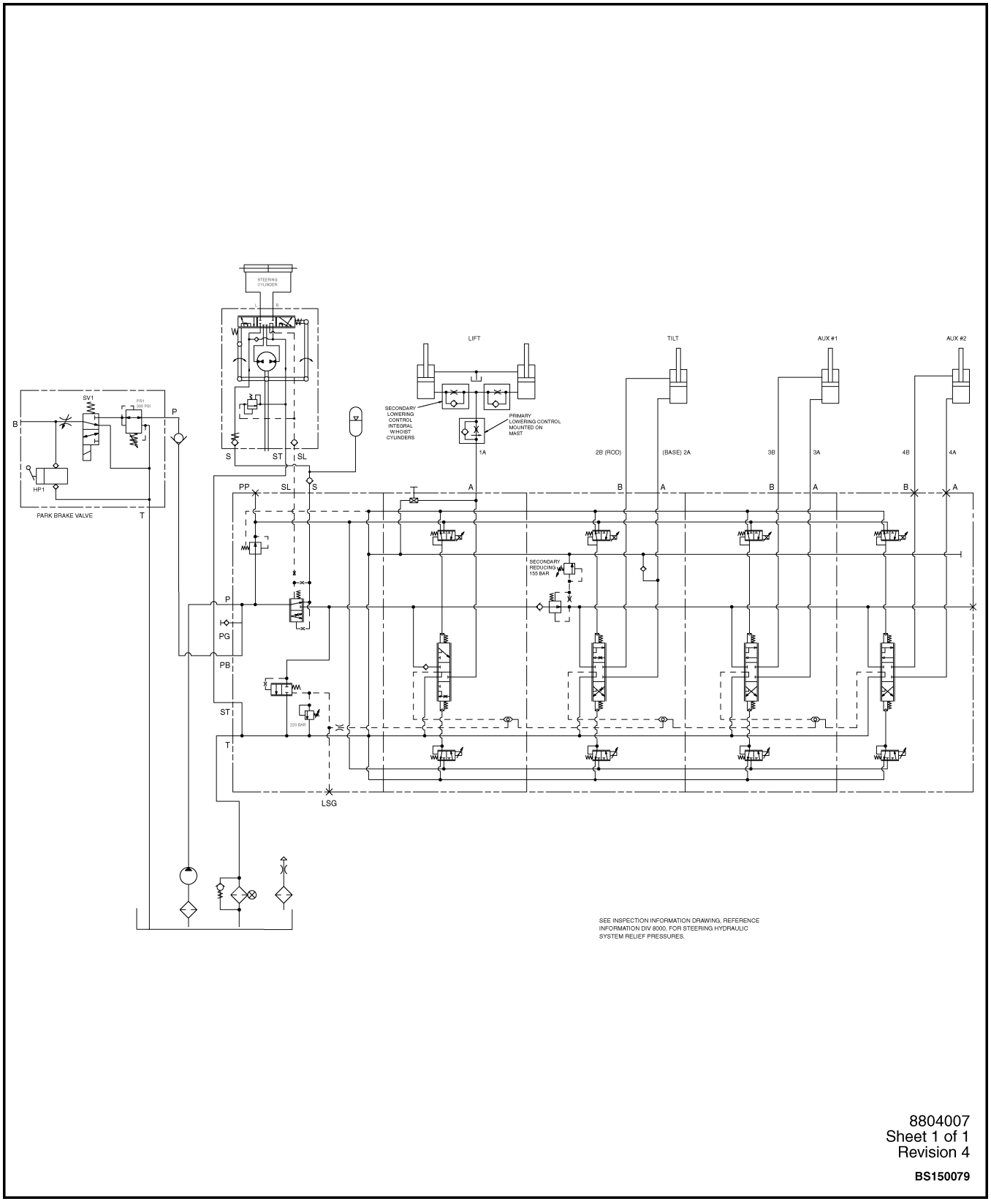


Figure 11. E-Hydraulic Schematic for ERC40-55VH, ERC45VHS (ERC80-120VH, ERC100VHX) (A938)

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Table 1. Connector C1

Pin #	Connector Function
1	Driver Low Power
2	Driver Full Power
3	Incoming Ground (-)
4	Incoming Ground (-)
5	Incoming Power (+)

Table 2. Connector C2

Pin #	Connector Function
1	+ 12 V
2	+ From Start Key
3	Control Output for Defroster
4	Ground (-)

Table 3. Connector C3

Pin #	Connector Function
1	Overheat Sensor (+5V)
2	Overheat Sensor (Sense)

Table 4. Connector C4

Pin #	Connector Function
1	Thermostat Sensor (+5V)

Table 4. Connector C4 (Continued)

Pin #	Connector Function
2	Thermostat Sensor (Sense)
3	Ground (-) Not Connected

Table 5. Connector C5

Pin #	Connector Function
1	+12V
2	RS485B
3	RS485A
4	Ground (-)

Table 6. Connector C6

Pin #	Connector Function
1	Fan -
2	Fan +

Table 7. Connector C7

Pin #	Connector Function
1-6	Programming Connector

NOTE: Perform Step 13 only if heater fan motor is inoperative prior to removing from lift truck.

13. Remove 25 Amp fuse from fuse holder and inspect for broken element. Replace as necessary. See Figure 24.

See Figure 24 for lift truck models

- ERP15-20VT (G807) manufactured before November, 2014
- ERP030-040VT (G807)
- ERP16-20VF (ERP30-40VF) (A955)
- ERC22-35VG (ERC045-070VG) (A968)
- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)
- ERP13VC, ERP15VC (B888)
- ERP22-35VL (ERP045-070VL) without Outdoor Protection/Wash-down package

See Figure 25 for lift truck models

- ERP15-20VT (G807) manufactured after November, 2014

See Figure 26 for lift truck models ERP22-35VL (ERP045-070VL) (A976), equipped with Outdoor Protection/Wash-down package.

Clean

WARNING

Compressed air can move particles so that they cause injury to the user or to other personnel. Make sure that the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

1. Using compressed air, blow dirt and debris from cab heater, heater control, air filters and all other components as necessary.

2. Using a lint free cloth, wipe down components as needed.

Inspect

1. Inspect components for damage and cracks. Replace as needed.

2. Inspect air filters after cleaning, replace as necessary.

3. Inspect wiring harness for damage and exposed wires. Replace as necessary.

Install

NOTE: Perform Step 1 only if Step 13 in Remove section was performed.

1. Install new 25 Amp fuse into fuse holder.

See Figure 24 for lift truck models

- ERP15-20VT (G807) manufactured before November, 2014
- ERP030-040VT (G807)
- ERP16-20VF (ERP30-40VF) (A955)
- ERC22-35VG (ERC045-070VG) (A968)
- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)
- ERP13VC, ERP15VC (B888)
- ERP22-35VL (ERP045-070VL) without Outdoor Protection/Wash-down package

See Figure 25 for lift truck models

- ERP15-20VT (G807) manufactured after November, 2014

See Figure 26 for lift truck models ERP22-35VL (ERP045-070VL) (A976), equipped with Outdoor Protection/Wash-down package.

2. Install heater wiring harness on lift truck.

3. Connect wiring harness to contactor.

See Figure 24 for lift truck models

- ERP15-20VT (G807) manufactured before November, 2014
- ERP030-040VT (G807)
- ERP16-20VF (ERP30-40VF) (A955)
- ERC22-35VG (ERC045-070VG) (A968)
- ERP40-50VM, ERP50-55VM6 (ERP080-120VM, ERP100VML) (A985)
- ERP13VC, ERP15VC (B888)
- ERP22-35VL (ERP045-070VL) without Outdoor Protection/Wash-down package

See Figure 25 for lift truck models

- ERP15-20VT (G807) manufactured after November, 2014

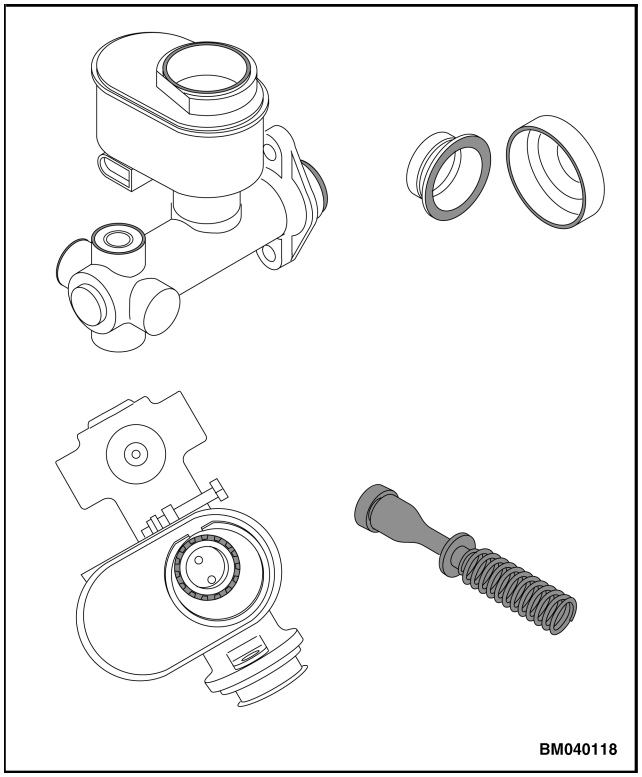

Figure 25. Cleaning Components

Inspect

1. Inspect exterior of master cylinder assembly for damage. Replace assembly if damaged.
2. Inspect bore of master cylinder for holes or scratches. Replace master cylinder assembly if damaged.

Assemble

1. Install brake pressure sensor. Tighten sensor to 23 to 28 N•m (203 to 247 lbf in). See Figure 24.
2. Install gasket and cap to reservoir. See Figure 24.

CAUTION

When piston is installed, make sure the cylinder bore and piston are not scratched or damaged.

3. Install piston assembly into cylinder. See Figure 24.

WARNING

Use care when installing snap ring to avoid possible injury.

4. Install snap ring into cylinder. See Figure 24.
5. Install boot and push rod into cylinder. See Figure 24.

Bench Bleed Master Cylinder

NOTE: Master cylinder must be bench bled before installing it on lift truck.

1. Place master cylinder, horizontally, in a soft-jawed vise.
2. Remove plugs from tube assembly ends. Connect tube assembly to master cylinder.
3. Place other end of tube assembly in a clear container of brake oil.
4. Fill reservoir with Dexron® III transmission fluid, as needed.
5. Stroke master cylinder until all air is purged from master cylinder.
6. Install gasket and cap to reservoir. See Figure 24.
7. Plug open end of tube assembly.

Install and Adjust

1. Install master cylinder with tube assembly attached, two capscrews, and two nuts onto mounting plate. Tighten nuts to 19 N•m (168 lbf in). See Figure 23.
2. Remove plug from tube assembly and connect to T-fitting. See Figure 23.
3. Install pin, washer, and cotter pin through master cylinder clevis and bottom of brake pedal weldment. See Figure 23.
4. Connect wire harness to brake pressure sensor.
5. Connect reservoir level sensor switch to wire harness.
6. Adjust brake pedal height. See Brake Pedal Adjustment.

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11. Connect lift chains to the mounts at the top of the outer mast.

12. Connect lift chains to the chain anchors at the mount on the inner mast. Attach wires between the ends of the lift chains and the bottom crossmember to control the lift chains during installation.

13. Install lowering control valve on the outer mast. Tighten capscrew to 38 N•m (28 lbf ft).

INSTALL

1. Install pivot pins in the mounts in the outer mast. See Figure 32. Make sure grease fittings are toward the center of the truck. Connect a lifting device to the top of the mast assembly. Make sure all weldments are fastened together. Make sure the chains **DO NOT** damage any of the hydraulic lines or other parts.

2. Raise mast assembly to a vertical position. Move mast assembly into position on the lift truck.

3. Make sure the pivot pins are in the correct position and install capscrews. See Figure 32. Tighten capscrews to 522 to 572 N•m (385 to 422 lbf ft).

4. Install the lift, tilt, and free-lift cylinders following procedures found in **Cylinder Repair (Mast S/N A270-72, A551, A555, A559, A626, A627, A751-52, B551, B555, B586-91, B749-54, C661-63, C665, D507-09, D515, D562-64, E509, E564)** 2100YRM1382.

5. Connect hydraulic hoses and fittings between lowering control valve and lift cylinders to the mast assembly. See Figure 34.

6. Install header hoses. See Figure 40.

7. Adjust lift chains, carriage, and tilt cylinders as described in sections Lift Chains Adjustment, Carriage Adjustments, and Tilt Cylinders Adjustment.

NOTE: Before checking for mast side kicking, the mast must be fully assembled to include the carriage, forks, load backrest and any attachments if the lift truck is equipped with one.

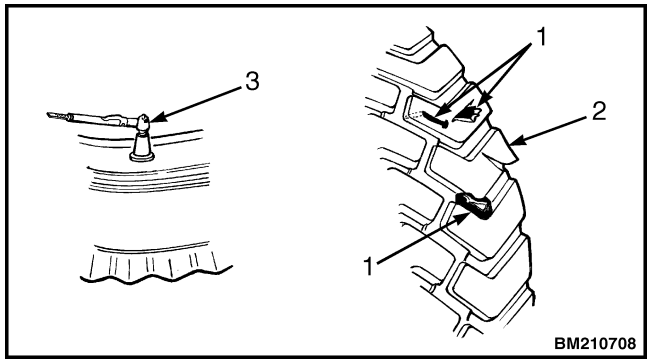
8. Raise the mast, without a load to its full height and check for side kicking. Mast side kicking is when the mast moves either to the right or left as it is being raised. If the mast is side kicking, see the Mast Adjustments section for procedures to correct mast side kicking.

Table 2. Standard Mast Height; Header Hose Tension Mark Location, Lift Truck Models ERP40VM (ERP080VM)

Lift Height		Channel Length (Reference)		Tension Marker from Carriage End Dimension "E"	
mm	in.	mm	in.	mm	in.
3000	118.1	2020	79.5	2469	97.2
3200	126.0	2120	83.5	2567	101.0
3400	133.9	2220	87.4	2665	105.0
3800	149.6	2420	95.3	2861	112.6
4200	165.4	2620	103.1	3057	120.3

Table 3. Standard Mast Height; Header Hose Tension Mark Location, Lift Truck Models ERP45-50VM, ERP50-55VM6 (ERP090-120VM, ERP100VML)

Lift Height		Channel Length (Reference)		Tension Marker from Carriage End Dimension "E"	
mm	in.	mm	in.	mm	in.
2740	107.9	2020	79.5	2473	97.4
2940	115.7	2120	83.5	2572	101.3
3140	123.6	2220	87.4	2669	105.1
3540	139.4	2420	95.3	2865	112.8
3940	155.1	2620	103.1	3061	120.5



1. CHECK FOR DAMAGE AND REMOVE NAILS, GLASS, METAL, AND OTHER OBJECTS FROM TREAD
2. CHECK EDGES FOR WEAR
3. CHECK TIRE PRESSURE

Figure 5. Tires Check

Forks, General

NOTE: The information in this section includes steps to remove and install forks on lift trucks equipped with a standard carriage or integral sideshift carriage. If lift truck is equipped with an optional fork positioner attachment, go to Forks, Remove for procedures to remove and install the forks.

The identification of a fork describes how the fork is connected to the carriage. These lift trucks have hook forks.

Forks, Inspect

WARNING

DO NOT try to correct fork tip alignment by bending the forks or adding shims. Replace bent forks.

Never repair damaged forks by heating or welding. Forks are made of special steel using special procedures. Replace damaged forks. Forks are to be replaced only in sets and not individually.

1. Inspect the forks for cracks and wear. Check that the fork tips are aligned as shown in Figure 6. Check that the bottom of the fork is not worn (item 4 in Figure 6).

2. Replace any damaged or broken parts that are used to keep the forks locked in position.

3. Inspect fork wear. Ensure the heel wear is not more than 10% of original thickness. If fork wear is more than 10%, the fork must be replaced or rerated. Perform the fork wear inspection using a BOL256N1 caliper ruler, Yale P/N 550088603 , as follows. See Figure 7.

a. Determine the normal thickness of the "N" of the fork using the scale or ruler portion of the caliper ruler. Measurement has to be done on the fork shank using the caliper ruler.

b. Position the caliper at the end of the heel internal radius (item 4, Figure 6) with the opening corresponding to the measure thickness of the fork shank in Step a above (e.g. N 1.75 use N 1.75 opening). This is typically the section of the fork where wear is the greatest. Note that the opening distance has been reduced by 10% from the nominal thickness.

c. If the fork enters the opening, it is mandatory to replace it. DANGER OF BREAKING. Furthermore, a 10% reduction in fork blade thickness results in 20% reduction in operating capacity.

10. Inspect magnet gear teeth (see Figure 59). Replace sensor assembly if magnet teeth are cracked or missing. See **Electrical System** 2200YRM1369 for sensor replacement procedures.

11. Reconnect battery connector, turn lift truck **ON**, and rotate steering column to fully inspect column gear teeth (see Figure 59). Replace column gear if teeth are cracked or missing. See **Steering System** 1600YRM1363 for column gear replacement procedure. Disconnect battery connector.

12. Swing sensor assembly back to original position.

13. Connect spring to sensor assembly.

14. Install steering column upper cover, washer, and capscrew onto telescopic steering column. See Figure 60.

15. Install steering column telescoping cover onto telescopic steering column. See Figure 60.

16. Install steering column top cover, by pressing down onto telescopic steering column. See Figure 60.

17. Lower telescopic steering column to fully **DOWN** position.

18. Install steering wheel and hex nut onto steering column. See Figure 57. Tighten hex nut to 40 to 54 N•m (30 to 40 lbf ft).

19. Install rod, nut, and horn button onto steering wheel. See Figure 57.

20. Connect battery connector.

Telescopic Steering Column Lubrication

NOTE: Tag all electrical connectors during removal to aid in installation.

1. Disconnect battery connector. Discharge the capacitors. See Discharging the Capacitors in the General section of this manual.

2. Remove horn button, nut, and rod from steering wheel. See Figure 57.

3. Remove hex nut and steering wheel from steering column. If necessary, use puller tool to remove steering wheel. See Figure 57.

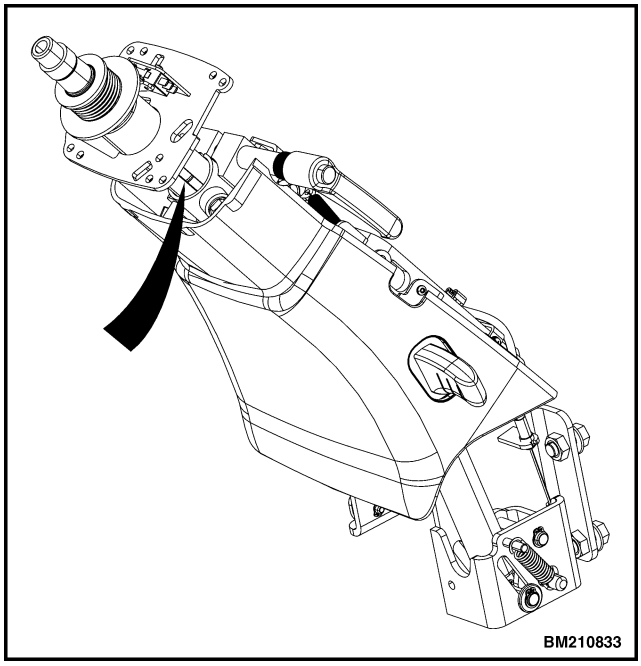
4. Telescope column to fully **UP** position.

5. Remove steering column top cover from telescopic steering column by pressing both sides near the bottom and pulling up. Clips should remain attached to cover. See Figure 60.

6. Remove steering column telescoping cover from telescopic steering column. See Figure 60.

7. Remove capscrew, washer, and steering column upper cover from telescopic steering column. See Figure 60.

8. Lubricate telescopic steering column with manual steering gear grease. See the Maintenance Schedule. See Figure 61.



NOTE: BOLD ARROW INDICATES GREASE APPLICATION LOCATION.

Figure 61. Telescopic Steering Column Lubrication

9. Install steering column upper cover, washer, and capscrew onto telescopic steering column. See Figure 60.

10. Install steering column telescoping cover onto telescopic steering column. See Figure 60.

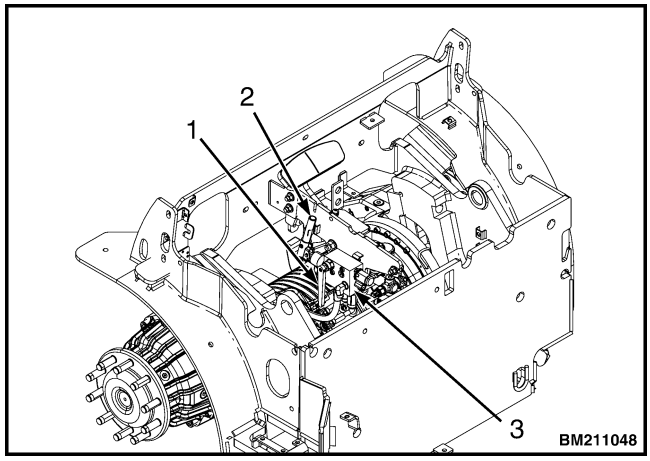
11. Install steering column top cover, by pressing down onto telescoping cover. See Figure 60.

3. Tow with another lift truck of *equal* or *greater* capacity than the disabled lift truck. Install a load of approximately half-capacity on the forks of the lift truck that is being used to tow the disabled lift truck. The half-capacity load will increase the traction of the lift truck. Keep the load as low as possible.

4. Use a towing link made of steel that fastens to the tow pins in the counterweights of both lift trucks.

5. Remove the floor mat and floor plates. Swing the Automatic Park Brake valve handle up to close the Automatic Park Brake valve. Pump the handle on the hand pump 15 times. The Automatic Park Brake actuator releases, disengaging the Automatic Park Brake. See Figure 2.

6. Tow the lift truck slowly.



1. AUTOMATIC PARKING BRAKE VALVE HANDLE
2. HAND PUMP
3. AUTOMATIC PARKING BRAKE VALVE

Figure 2. Automatic Park Brake Release

HOW TO PUT LIFT TRUCK ON BLOCKS

How to Raise Drive Tires

WARNING

The lift truck must be put on blocks for some types of maintenance and repair. The removal of the following assemblies will cause large changes in the center of gravity: mast, drive axle, battery, or counterweight. When the lift truck is put on blocks, put additional blocks in the following positions to maintain stability:

Before removing the mast and drive axle, put blocks under the counterweight so the lift truck cannot fall backward.

Before removing the counterweight, put blocks under the mast assembly so the lift truck cannot fall forward.

The surface must be solid, even, and level when the lift truck is put on blocks. Make sure that any blocks used to support the lift truck are solid, one-piece units.

NOTE: Some lift trucks have lifting eyes. These lift points can be used to raise the lift truck so that blocks can be installed.

1. Put blocks on each side (front and back) of the steering tires to prevent movement of the lift truck. See Figure 3.

2. Put the mast in a vertical position. Put a block under each outer mast channel.

3. Tilt the mast fully forward until the drive tires are raised from the surface.

4. Put additional blocks under the frame behind the drive tires.

5. If the hydraulic system will not operate, use a hydraulic jack under the side of the frame near the front. Make sure that the jack has a capacity equal to at least half the weight of the lift truck as shown on the Nameplate.

How to Raise Steering Tires

1. Make sure the Automatic Park Brake is applied before putting blocks on both sides (front and back) of the drive tires to prevent movement of the lift truck. See Figure 3.

2. Use a hydraulic jack to raise the steering tires. Make sure that the jack has a capacity of at least 2/3 of the total weight of the lift truck as shown on the Nameplate.

3. Put the jack under the steering axle or frame to raise the lift truck. Put blocks under the frame to support the lift truck.

Maintenance Procedures Every 2000 Hours or Yearly

Perform the Maintenance Procedures Every 8 Hours or Daily and Maintenance Procedures Every 500 Hours or Three Months prior to performing the procedures in this section.

HYDRAULIC SYSTEM

Hydraulic Filter Element, Replace

WARNING

At operating temperature, the hydraulic oil is HOT. DO NOT permit the hot oil to touch the skin and cause a burn.

CAUTION

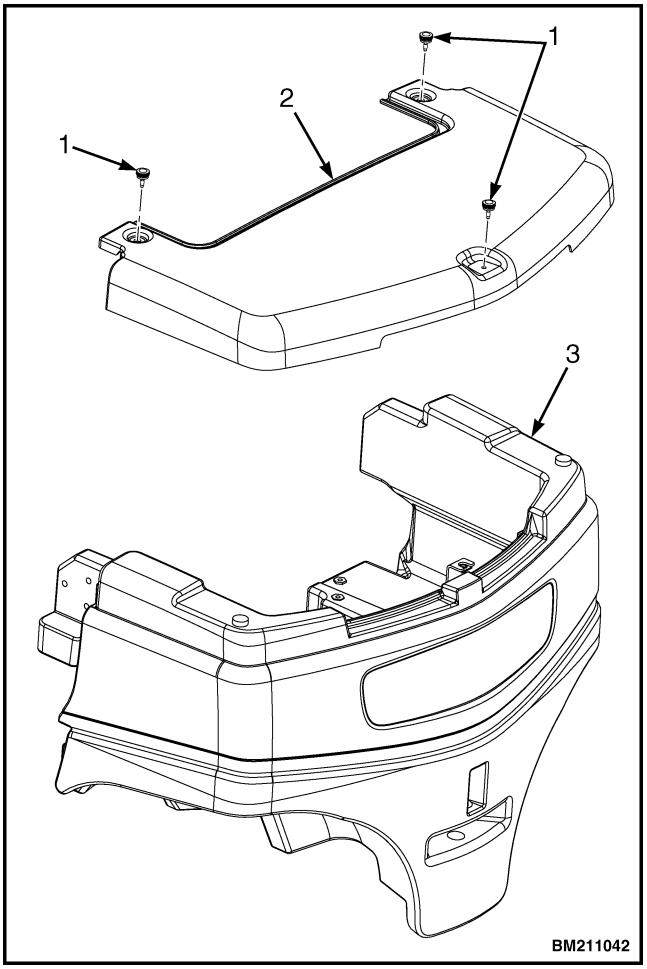
DO NOT permit dirt to enter the hydraulic system when the oil level is checked or the filter is changed. Dirt can cause damage to the components of the hydraulic system.

Never operate the hydraulic pump without oil in the hydraulic system. The operation of the hydraulic pump without oil will damage the pump.

CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

1. Put lift truck on a level surface and lower the carriage. Remove three captive capscrews and counterweight cover from the counterweight for access to the hydraulic filter (see Figure 50). Unscrew and remove filter lid with spring and O-ring from head. See Figure 51.



NOTE: SHORT WHEEL BASE COUNTERWEIGHT SHOWN, LONG WHEEL BASE COUNTERWEIGHT SIMILAR.

1. CAPTIVE CAPSCREW
2. COUNTERWEIGHT COVER
3. COUNTERWEIGHT

Figure 50. Counterweight Cover Removal

NOTE: Have a container large enough to hold the filter assembly and allow for hydraulic oil draining from element.

2. Remove the hydraulic filter element from the filter housing and place into the container. Cover the head to prevent any foreign materials from getting into the hydraulic tank.

3. Install the new hydraulic filter element into filter housing.

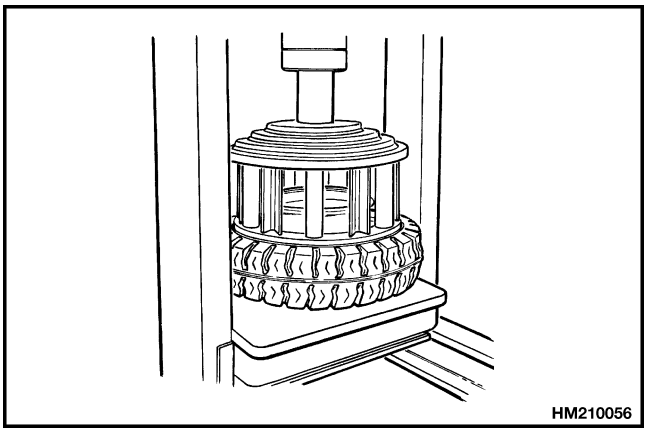
WARNING

Wheels must be changed and tires repaired by trained personnel only.

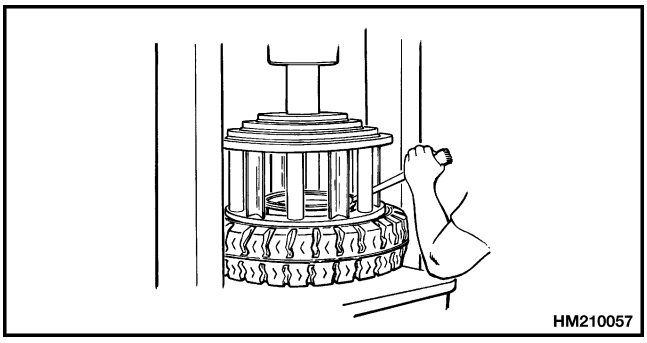
Always wear safety glasses.

Disassemble the wheels as follows:

STEP 1.
Put wheel rim on bed of press. Put cage in position on tire. Use press to push tire away from side flange.



STEP 2.
Put tire tool into slot between lock ring and wheel rim. Remove lock ring and side flange.



STEP 3.
Turn tire over. Put a support under wheel rim. Make sure wheel rim is at least
150 to 200 mm (6 to 8 in.) from bed of press.