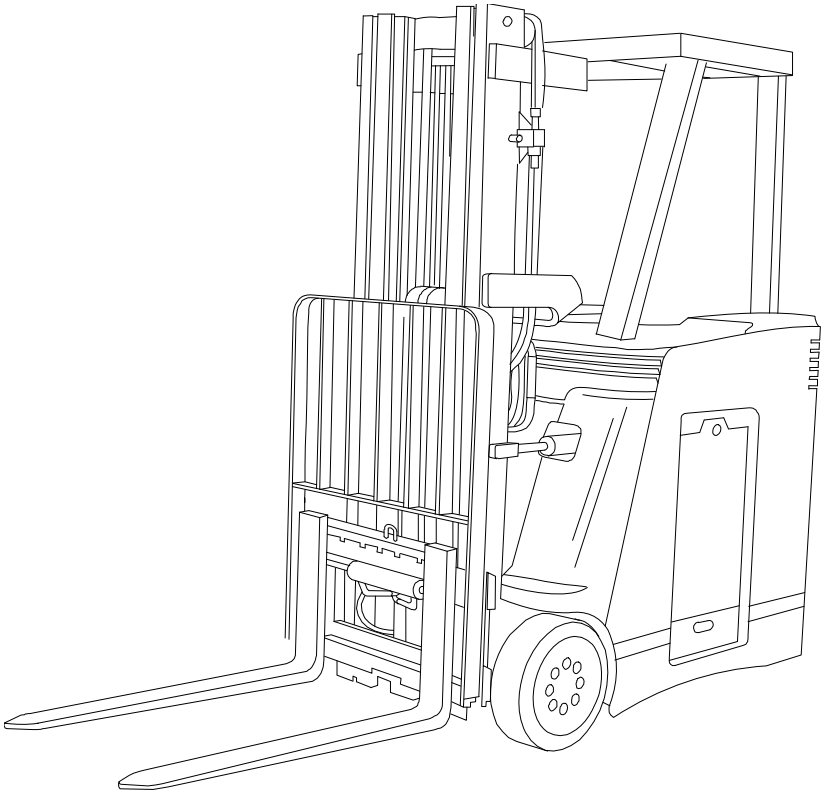
RAYMOND

Maintenance Manual

Model DSS300/350 Counterbalanced Truck



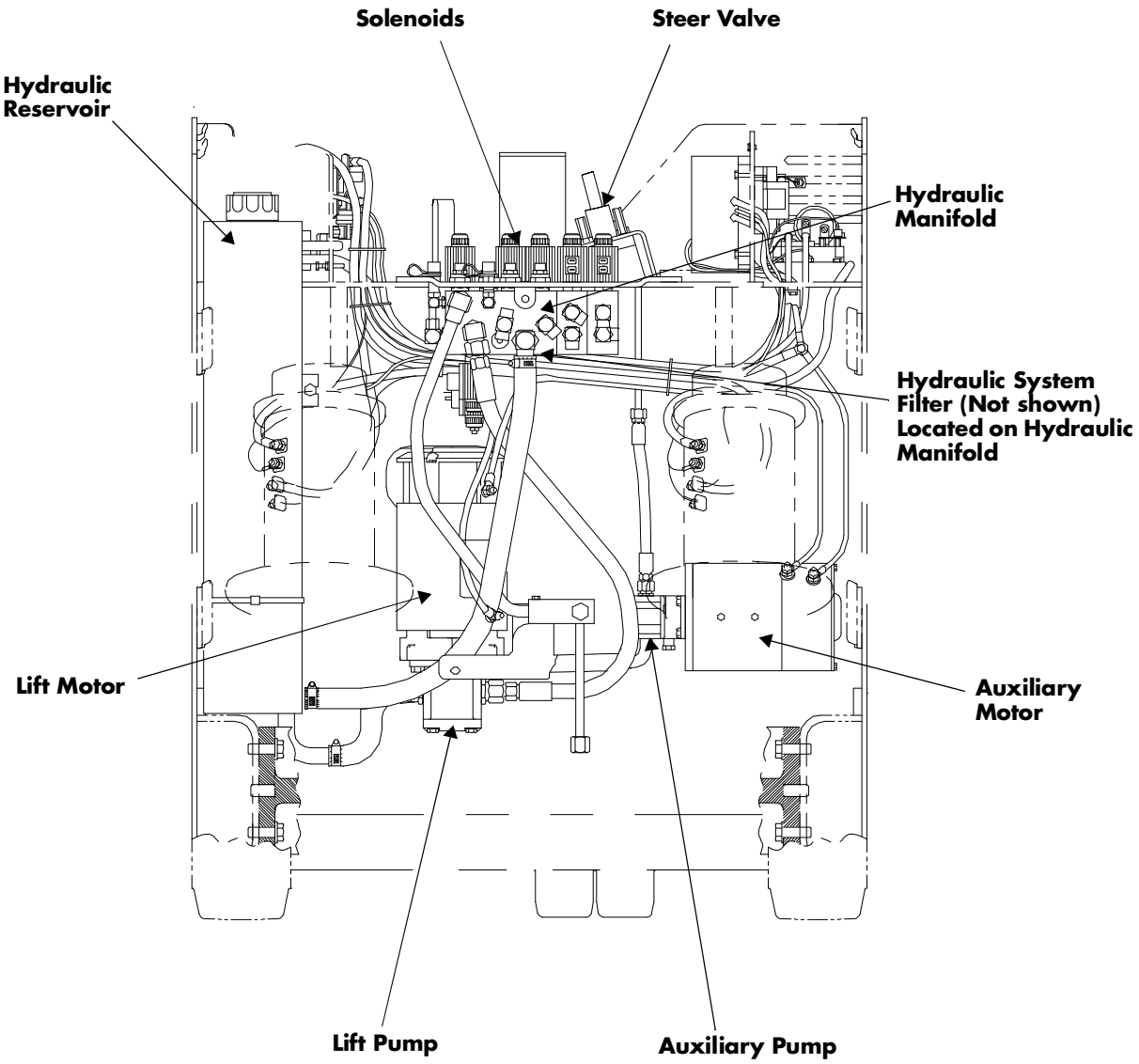
Model

Serial No.

DSS-00-05000 and up

PDMM-0093
PDMM-0093-01

Issued: 11/01/2000
Revised: 01/01/2005



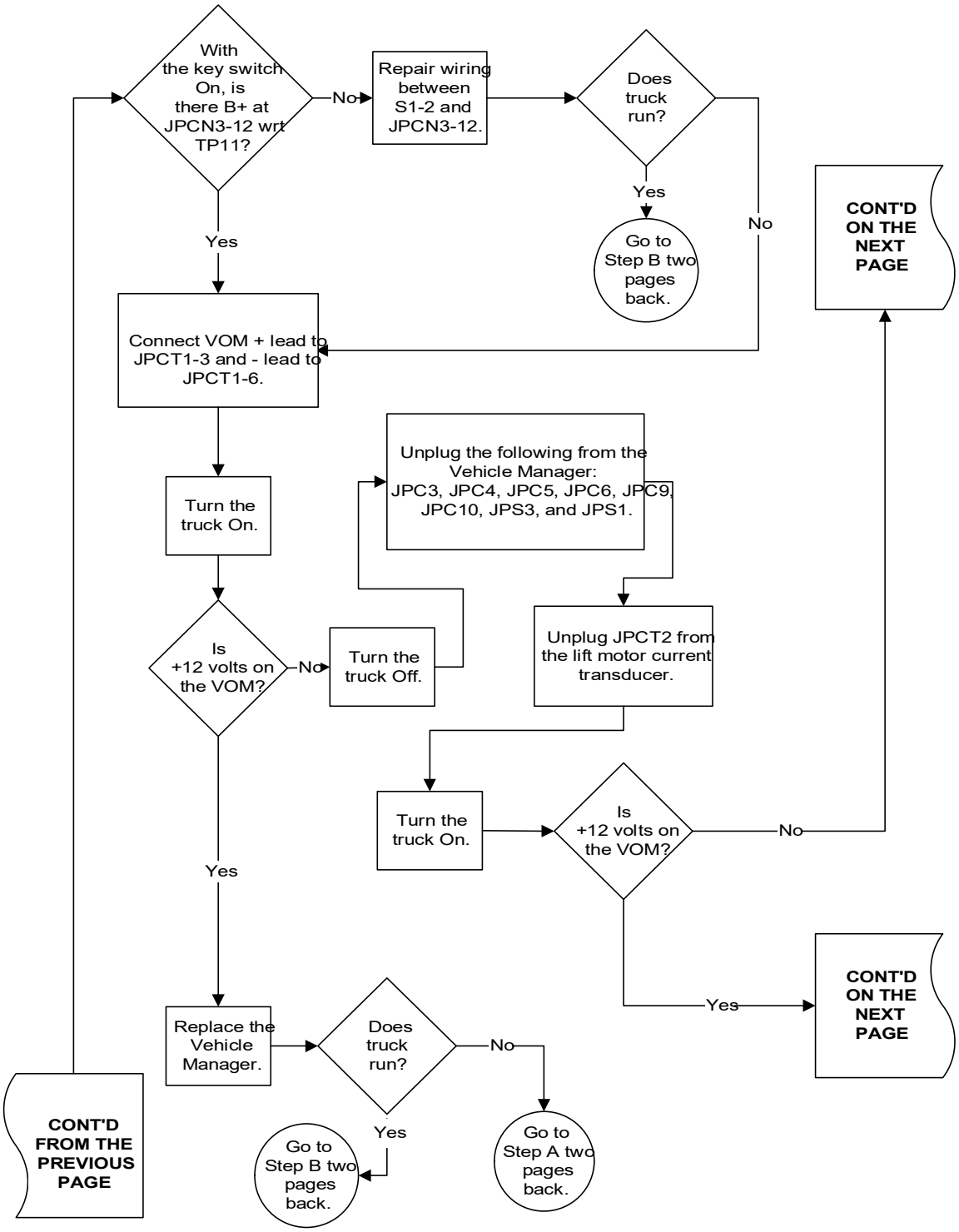
Drive Units and Mast Not Shown

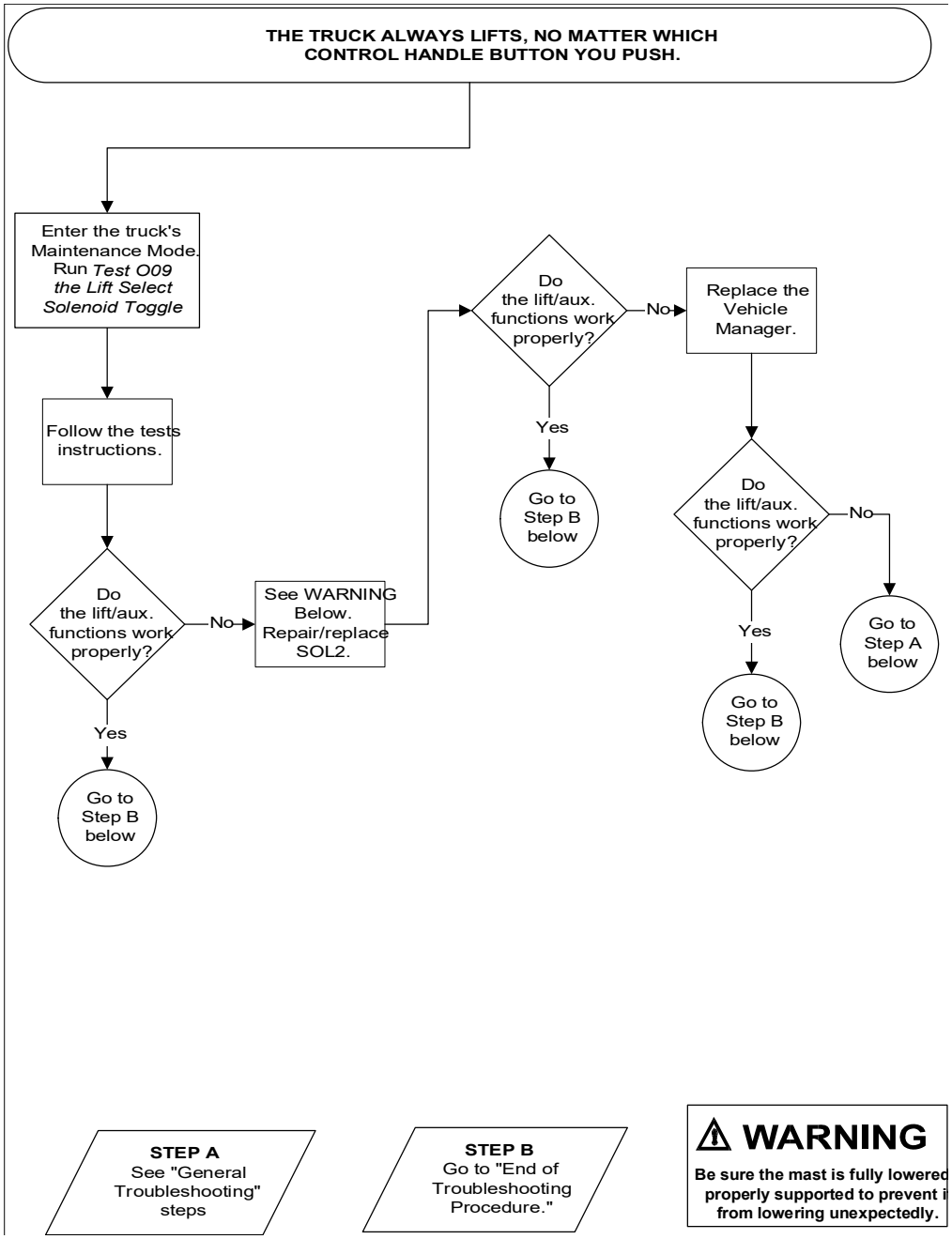
Figure 1-3: Location of Components (Front View)

Scheduled Maintenance Checks*			
Item No.	**Component**	**What to Do**	**Refer to Page**
1	Battery	1. Check the weight stamped on the battery in the truck against the minimum and maximum allowable weights on the specification tag for the truck. Report any trucks that are running with batteries under the minimum, or over the maximum allowable weight. 2. Check the charge of the battery and the water level. Add water as needed. 3. Inspect all battery connectors and leads for damage and cuts in protective coatings. Shorts to the truck frame will cause damage to electronic components if the battery has a direct relationship to them. 4. Make sure the battery gates are in place and not damaged. 5. Make sure the battery has no more than 0.5 inch (13 mm) free play in any direction.	5-3
4	Brakes	1. Check brakes for proper stopping distance. The truck should stop between 8 to 10 feet (2.4 to 3 meters) for a DSS300 and 6.8 to 8.5 feet (2 to 2.6 meters) for a DSS350 if brakes are applied while traveling at full speed with full load. 2. Visually inspect the pads and rotor disc with the brakes released. Minimum thickness of the pad and steel backing plate is 0.236 inches (6mm). 3. The gap between the armature disc and the brake coil must be 0.01 to 0.02 inches (0.25 to 0.5 mm). Failure to keep the brakes shimmed will cause premature wear on the pad and rotor and excessive motor heat.	6-2
5	Electrical Cables	1. Inspect all power cables for nicks or cuts. Give special attention to those cables which are not stationary, for example, cables to the drive motor. Replace any cable that is damaged or shows signs of excessive heat. Failure to do so will cause intermittent system shutdowns and/or electronic failures. 2. Inspect over the mast cables for proper tension. 3. Make sure over the mast pulley's spin freely and show no signs of wear.	—
*** Every 60 Days or 250 hours (whichever occurs first)**			

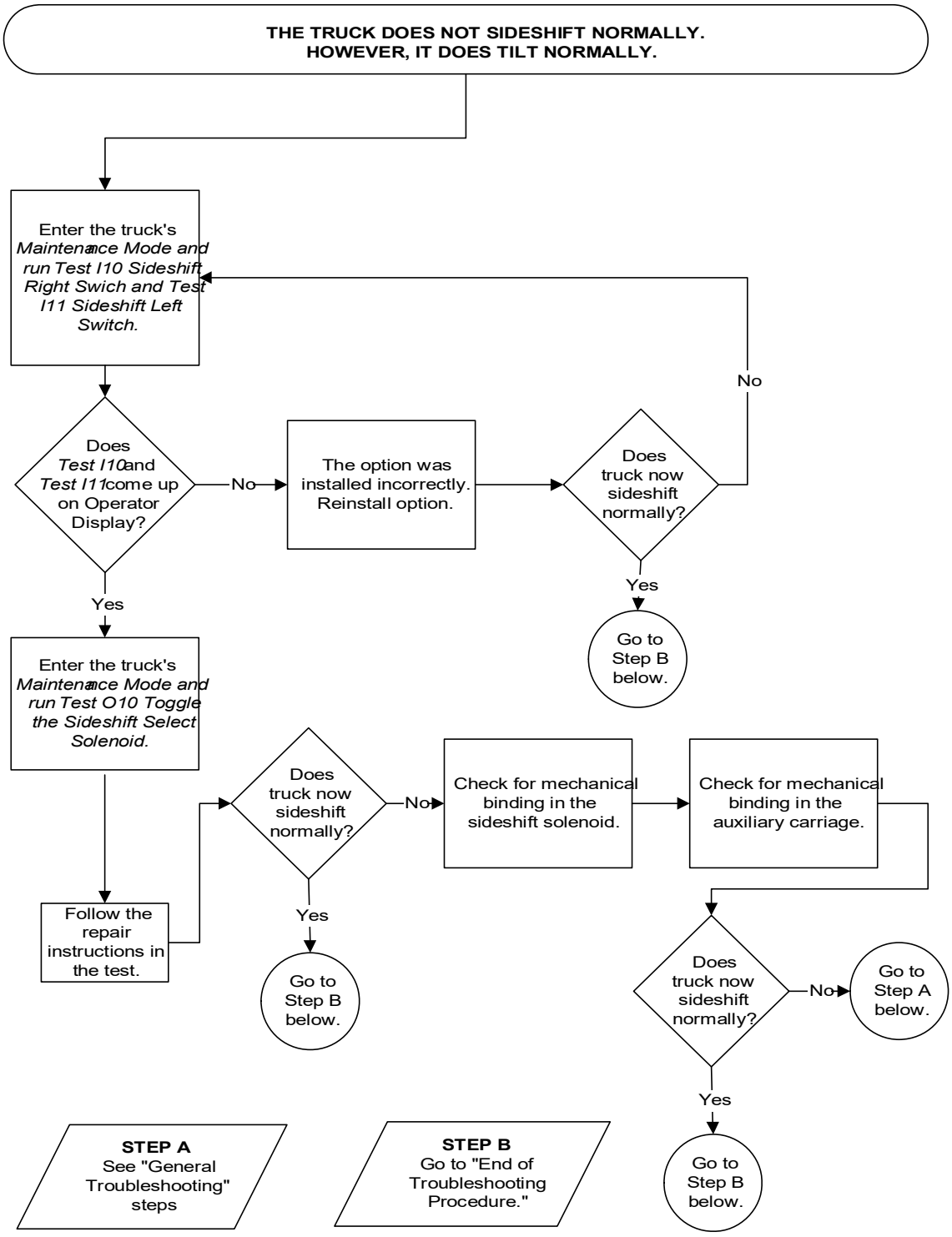
Safety

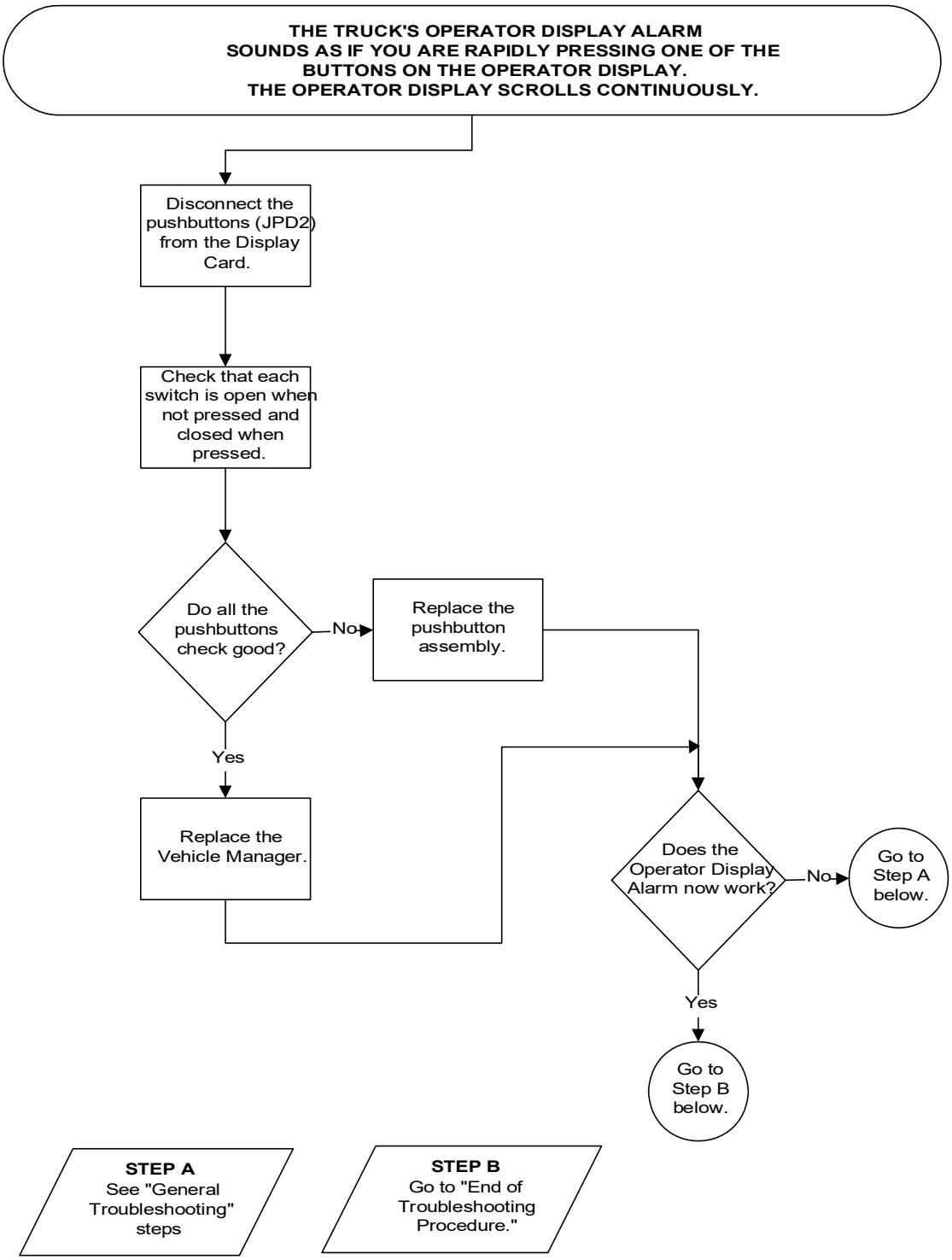
Troubleshooting


With the key switch On, is there B+ at JPCN3-12 wrt TP11?
No
Repair wiring between S1-2 and JPCN3-12.
Does truck run?
Yes
Go to Step B two pages back.
No
CONT'D ON THE NEXT PAGE
Yes
Connect VOM + lead to JPCT1-3 and - lead to JPCT1-6.
Turn the truck On.
Unplug the following from the Vehicle Manager: JPC3, JPC4, JPC5, JPC6, JPC9, JPC10, JPS3, and JPS1.
Is +12 volts on the VOM?
No
Turn the truck Off.
Unplug JPCT2 from the lift motor current transducer.
Turn the truck On.
Is +12 volts on the VOM?
No
Yes
Yes
CONT'D ON THE NEXT PAGE
Replace the Vehicle Manager.
Does truck run?
No
Yes
Go to Step B two pages back.
Go to Step A two pages back.
CONT'D FROM THE PREVIOUS PAGE


THE TRUCK ALWAYS LIFTS, NO MATTER WHICH CONTROL HANDLE BUTTON YOU PUSH.
Enter the truck's Maintenance Mode. Run Test O09 the Lift Select Solenoid Toggle
Follow the tests instructions.
Do the lift/aux. functions work properly?
No
See WARNING Below. Repair/replace SOL2.
Yes
Go to Step B below
Do the lift/aux. functions work properly?
No
Replace the Vehicle Manager.
Yes
Go to Step B below
Do the lift/aux. functions work properly?
No
Go to Step A below
Yes
Go to Step B below
STEP A
See "General Troubleshooting" steps
STEP B
Go to "End of Troubleshooting Procedure."
WARNING
Be sure the mast is fully lowered or properly supported to prevent i from lowering unexpectedly.

Auxiliary Problems (Sideshift, etc.)




THE TRUCK'S OPERATOR DISPLAY ALARM SOUNDS AS IF YOU ARE RAPIDLY PRESSING ONE OF THE BUTTONS ON THE OPERATOR DISPLAY. THE OPERATOR DISPLAY SCROLLS CONTINUOUSLY.
Disconnect the pushbuttons (JPD2) from the Display Card.
Check that each switch is open when not pressed and closed when pressed.
Do all the pushbuttons check good?
No
Replace the pushbutton assembly.
Yes
Replace the Vehicle Manager.
Does the Operator Display Alarm now work?
No
Go to Step A below.
Yes
Go to Step B below.
STEP A
See "General Troubleshooting" steps
STEP B
Go to "End of Troubleshooting Procedure."

End of Troubleshooting Procedure

After you have repaired the problem follow these steps:

1. Make sure that ALL wires, hoses, and cables that you removed have been re-attached correctly.
2. Make sure that all panels are properly reinstalled.
3. Make sure that any component that was drained has been replenished with the correct level of fluid.
4. Create the same scenario that occurred when the problem happened.
5. Operate the truck as it was being operated when the problem occurred to make sure that the problem does not re-occur.
6. Have the driver operate the truck to see if he is doing anything different that would again cause the problem.
7. Fill out any necessary forms that are required.
8. If you contacted Raymond Field Service to discuss the problem, be sure to follow-up and call them again to let them know what fixed the problem. This is especially important if the solution you found is not in the troubleshooting chart.

Active Maintenance Mode

To enter Active Maintenance Mode, you must first enter the Maintenance Mode password and turn the Active Maintenance Mode ON. Then exit the Maintenance Mode.

NOTE: When you are done operating the truck in Active Maintenance Mode, re-enter the Maintenance Mode and turn the Active Maintenance Mode OFF.

If the truck is in Active Maintenance Mode and you turn the truck OFF, the truck will still be in Active Maintenance Mode when you turn the truck back ON.

When you display a test, the number shown on the Operator Display represents a voltage that the truck is reading from the circuit being tested.

What the reading means depends upon the particular test. To make sense of what the Operator Display shows, refer to that particular test in this manual. See the *Numerical Listing of Maintenance Mode Tests* at the front of the *Table of Contents for Entire Manual* Section.

When you operate the truck, the reading should change as you activate the circuit that is being tested.

Fault Codes

A fault code that appears on the truck's Operator Display will help you when troubleshooting the truck's problem.

When the Operator Display shows a fault code, turn to the page in this section that describes the code. This page will give you a list of possible causes of the fault code. After each of these causes you will see a reference to a page number. Turn to that page and you will find repair or test information. Check or test the components in the order listed until you locate and repair the problem.

Code 25 - Drive Shutdown

Short Detected in Field Circuit #1

What you will notice:

- The truck will not travel.

Run these tests in the truck's Maintenance Mode (page 4-6) to help you isolate the problem:

- Test A02 - Field #1 Current (page 4-78)
- Test I03 - Field B+ Sense (page 4-104)
- Test O20 - Field #1 Test (page 4-154)

NOTE: All of the causes listed in the chart below cannot be identified using the above mentioned Maintenance Mode Tests.

Causes	See Page
A short to the truck frame	5-56
Short in the traction motor's field circuit	5-56

Code 2J - Drive Shutdown

Failure Detected in Plugging Circuit

What you will notice:

- The truck will not travel.

Causes	See Page
Inoperative Vehicle Manager	5-90

Code 80 - Drive Shutdown

Throttle Controller Reading Out-of-Range

What you will notice:

- The truck will not travel.

Run these tests in the truck's Maintenance Mode (page 4-6) to help you isolate the problem:

- Test A10 - Throttle Pot (page 4-90) ("Pot" means potentiometer, a variable resistor.)
- Test A14 - Power Supply +12 (page 4-95)

Code F5 - Shutdown

Computer Card Invalid OP Code

What you will notice:

- The truck will not lift or travel.

NOTE: Electrical noise in a truck system is the most likely cause of this fault code. A direct short to the frame or an AC coupled short to the frame can also cause this fault code.

NOTE: Check with the operator to see when the Operator Display shows this code. For example: “Is it when the operator lifts the forks or blows the horn?” Use this information, together with the schematic to check that particular system for a short to frame.

Causes	See Page
Check Fuse (FU6) (10 amp) on the end of the Vehicle Manager	5-28
Shorts between the battery to the truck frame	3-2
Electrical grounds	5-29
Static electricity (Turn the key switch from ON to OFF several times.)	—
+12 Volt supply to the Vehicle Manager dipped	4-95 (Test A14)
Inoperative Vehicle Manager (Before replacing the Vehicle Manager, try turning the key switch ON/OFF several times to clear the code.)	5-90
See NOTE above.	

OP = Operating Properly

Code HB - Speed Limited

Failure Detected in Velocity Feedback Circuit #2

What you will notice:

- The truck has very little power. (Truck speed is limited by decreasing the pulses to the traction motors.)

Run these tests in the truck's Active Maintenance Mode (page 4-9) to help you isolate the problem:

- Test I22 - Traction Motor #2 Velocity (page 4-125)

Test A03 - Field #2 Current

NOTE: This test will show the current through the right drive motor's field circuit.

You should run this test in Active Maintenance Mode. However, if the truck has a failure that prevents it from traveling, you will have to run this test in Maintenance Mode.

If you are troubleshooting a Code H3 Short Detected in Field Circuit #2:

1. Enter this test in the truck's Maintenance Mode (not the Active Maintenance Mode).
2. The Operator Display should read 0 Amps. If it does not, this test has failed. Replace the Vehicle Manager.

If you are troubleshooting a Code H4 Open Detected in Field Circuit #2 or a Code H8 Field Current Sensor #2 Is Out of Range:

If the problem is intermittent:

1. Enter the truck's Active Maintenance Mode.
2. The current should increase as the truck is driven. Current changes should be smooth. If not, go on to step 3.

If the problem is not intermittent:

3. Measure the continuity of the traction motor field. (See page 5-58.) If the continuity is good, go on to the next step.
4. Check the connections at S1 and S2 on the right traction motor for tightness or discoloration. If they are OK, go on to the next step.
5. Check the continuity between S1 and TM4 on the Vehicle Manager and between S2 and TM3 on the Vehicle Manager. Repair the wires as necessary. If there is continuity, go on to the next step.
6. Check the tightness of the cable connections at TM3 and TM4 in the Vehicle Manager.
7. If the connections mentioned in step 6 are tight, run the other tests mentioned in Code H4 (page 4-66) or Code H8 (page 4-68) as applicable.

Test A09 - Battery (BSOC)

(BSOC = Battery State of Charge)

This test shows what the Vehicle Manager is reading from the battery.

You can use this test when troubleshooting problems with battery cutout and reset.

The Vehicle Manager monitors the battery at JPCN4-8.

1. Enter this test. Note the value shown on the Operator Display.

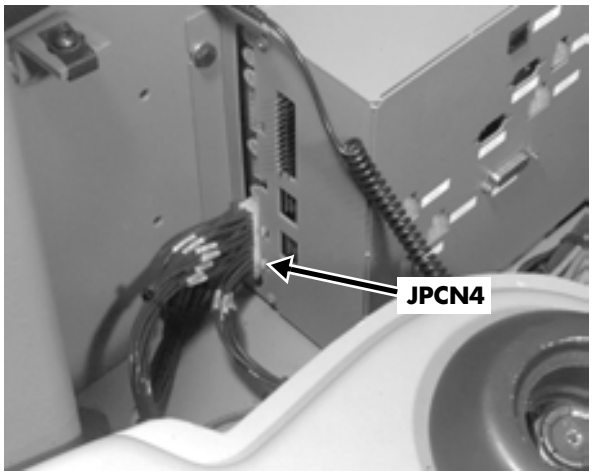


Figure 4-26: Location of JPCN4 on the Vehicle Manager

2. Connect the positive (+) lead of a voltmeter to JPCN7-13. Connect the negative (-) lead to Q1-E.
3. If the voltage shown on the voltmeter is different from the voltage displayed on the Operator Display by more than 6 volts, replace the Vehicle Manager.

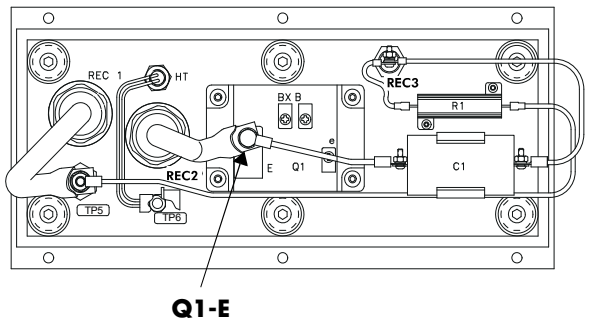


Figure 4-27: Location of Q1-E on the Traction Control Heatsink

Digital Input Tests

Test I08 - Tilt Back Switch

Whenever you push the tilt back switch when you are in this test, the Operator Display will show DOWN.

When you release the switch, the Operator Display will show UP.

If the display reading is not correct:

1. Remove connector JC5 from the Vehicle Manager.
2. Connect a jumper wire between JC5-14 and JC5-3 on the Vehicle Manager:
   - If the Operator Display now shows DOWN, replace the control handle (page 6-18).
   - If the Operator Display does not change, replace the Vehicle Manager (page 5-91).

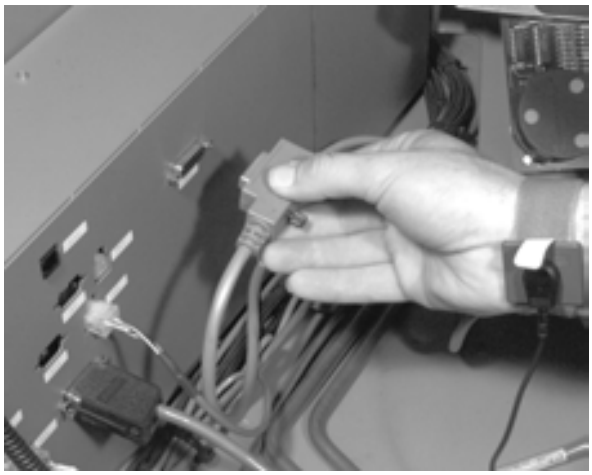


Figure 4-50: Remove JC5 from Vehicle Manager

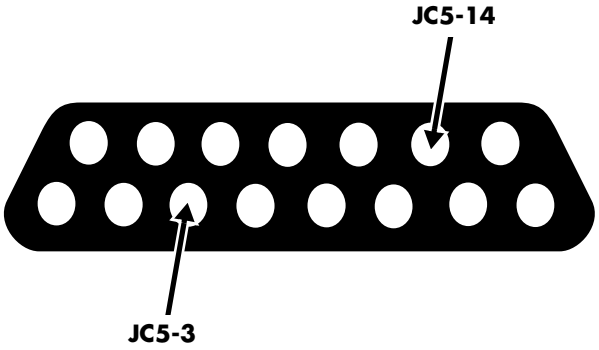


Figure 4-51: End View of JC5 on the Vehicle Manager

If you are troubleshooting a Code 45 (PC Contactor Detected Open when Commanded Closed), run these checks:

1. Remove the console cover (see page 6-22).
2. Inspect the PC contactor. With the truck ON and the EPO switch up, the PC contactor should be closed. If it is not, run Maintenance Mode Test O00 (see page 4-128). If the PC contactor is OK, go on to the next step.
3. Turn the key switch OFF.
4. Disconnect the battery connector. Discharge the capacitor on the lift control heatsink by pressing both the X contactor and the PC contactor tips in and holding them in for one second.
5. Plug in the battery connector. Enter the Maintenance Mode and select this test (I16).
6. Make sure the PC contactor is closed. If the Operator Display shows YES, check the PC contactor for mechanical binding or bad tips (see page 5-13). If the Operator Display does not show YES, go on to the next step.
7. Connect the positive (+) lead of a voltmeter to TP13 and the negative (-) lead to Q3-E. The voltmeter should show positive battery voltage. If it does, go on to the next step. If it does not, go on to step 9.

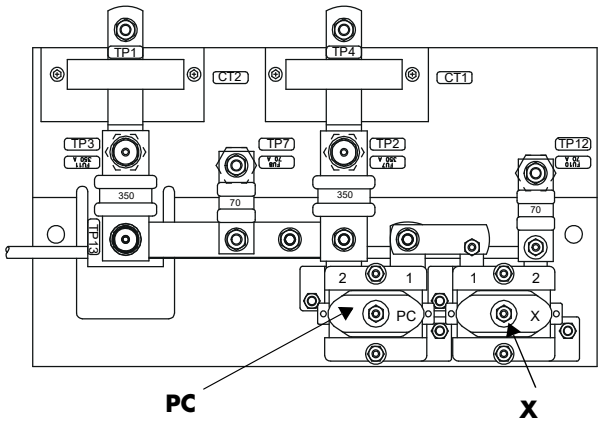


Figure 4-66: Location of the PC and X Contactor

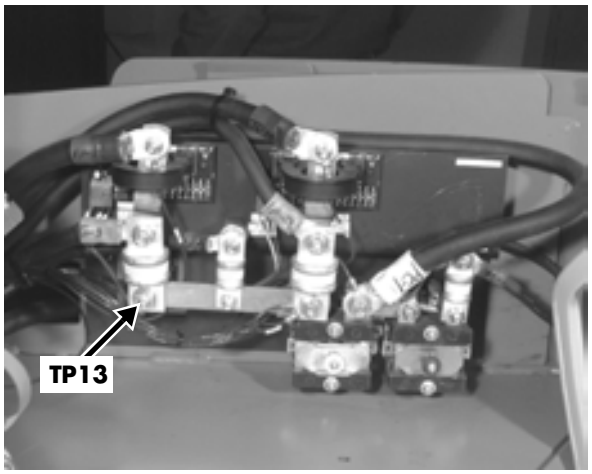


Figure 4-67: Location of TP13

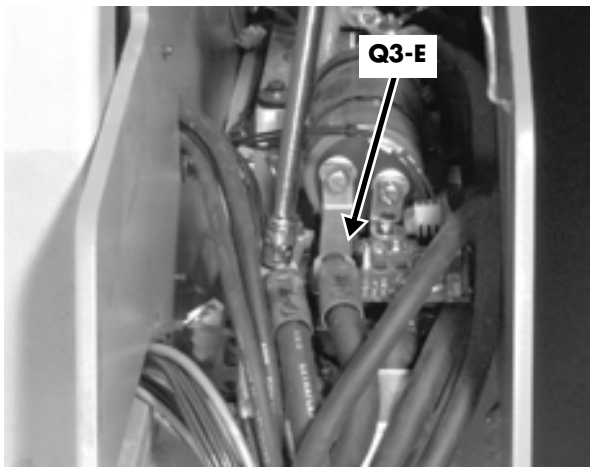


Figure 4-68: Location of Q3-E on the Lift Control Heatsink

4. Connect the positive (+) lead of the voltmeter to JPCN4-3 on the Vehicle Manager. Connect the negative (-) lead to JPCN4-1. If the voltmeter shows battery positive voltage (B+), replace the wires to the PC contactor. If the voltmeter does not show battery positive voltage (B+), replace the Vehicle Manager.

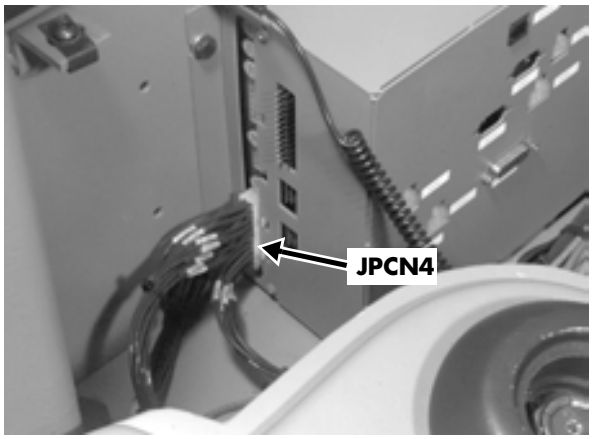


Figure 4-78: Location of JPCN4 on the Vehicle Manager

g. If there was no voltage at the Vehicle Manager, replace the Vehicle Manager.

h. If there is voltage at SOL3 and the truck does not lower, check SOL3 for mechanical binding. Replace as necessary.

6. If the truck has full speed lower with no feathering:

   a. Run the voltage test mentioned in Step 5.

   b. Check SOL3 for mechanical binding. Replace if necessary.

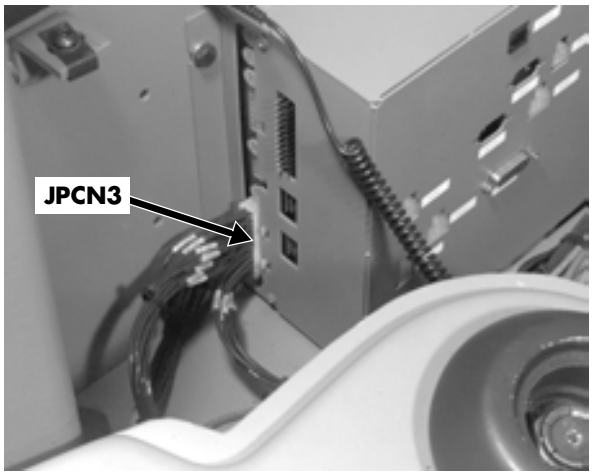


Figure 4-90: Location of JPCN3

9. Connect the positive (+) lead of the voltmeter to the lift motor's A terminal. The voltmeter should read positive battery voltage. If it does, replace the cable between the lift motor's A terminal and Q3-C. If it does not, check the lift motor for continuity (page 4-148).
10. Press the UP button on the Operator's Display to increase the amount of current through the lift motor. A percentage will show on the Operator Display while you're pressing the UP button. This percentage equals the amount of voltage being passed through the lift motor. When you release the UP button, the amperage being drawn through the lift motor is displayed. The more you push the UP button, the more voltage is passed through the motor and the more current is drawn by the motor.
11. As the percentage increases, the current number should increase. When the current gets high enough, the mast should begin to lift and you can hear the lift transistor (Q3) hum. If this happens, the test passes.
12. If the percentage increases, but the current remains at 0 and the mast begins to lift, run Test A12 (page 4-92).
13. If the percentage increases, but the current remains at 0 and the mast does not begin to lift, go on to the next step.
14. Turn the truck OFF and unplug the battery connector.
15. Press and hold both the PC and X contactor tips to discharge the capacitor (C3) on the lift control heatsink.
16. Disconnect JPD2 from the bottom of the lift control circuit card on the lift control heatsink. Connect the positive (+) lead of the voltmeter to JPD2-1 and the negative (-) lead to JPD2-3.
17. Reconnect the battery. Turn the truck ON.
18. The voltmeter should read 11 ± 1.0 volt. If it does, go on to the next step. If it does not, go on to step 22.

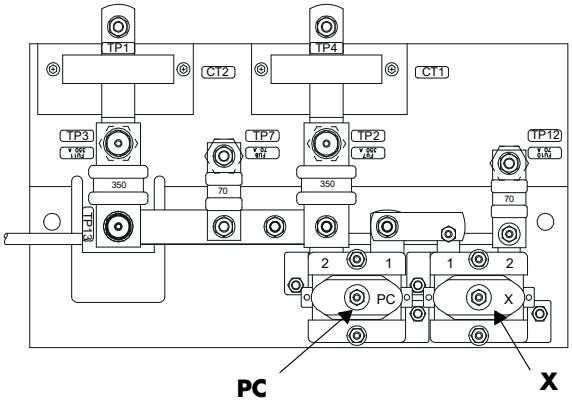


Figure 4-105: Location of PC and X Contactor

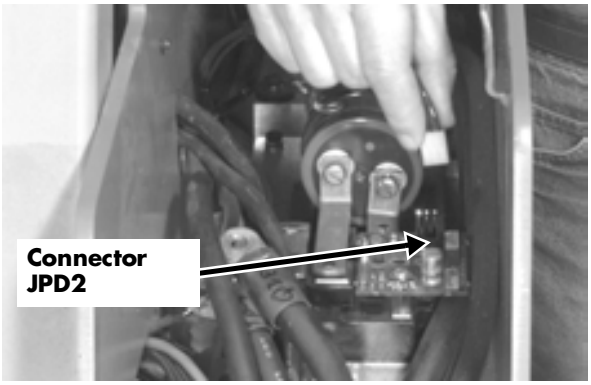


Figure 4-106: Location of JPD2 on the Lift Control Heatsink

c. If the voltages are correct, replace the horn.

d. If the voltages are incorrect, go on to the next step.

6. Connect the positive (+) lead of the voltmeter to HSUP-2 at the horn suppressor and the negative (-) lead to K1-3.

   a. When the Operator's Display shows ON, the voltmeter should show positive battery voltage.

   b. When the Operator's Display shows OFF, the voltmeter should show zero voltage.

   c. If the voltages are correct, check the wiring from Horn - to K1-3 and from Horn + to HSUP-4. Check the horn suppressor module as follows using a digital voltmeter set on diode check.

      - Turn the truck's key switch to OFF.
      - Unplug the horn suppressor module.
      - Connect the positive (+) lead to pin 2 and the negative (-) lead to pin 4 of the suppressor module. The voltmeter should read less than 1.0 volt. Reverse the voltmeter's leads, the meter should read O.L.
      - Connect the positive (+) lead to pin 5 and the negative (-) lead to pin 4 of the suppressor module. The voltmeter should read less than 1.0 volt. Reverse the meter's leads, the voltmeter should read O.L.
      - If either reading is higher than 1.0 volt, replace the suppressor module.

   d. If the voltages are incorrect, move the voltmeter negative (-) lead to K1-4 and check for positive battery voltage.

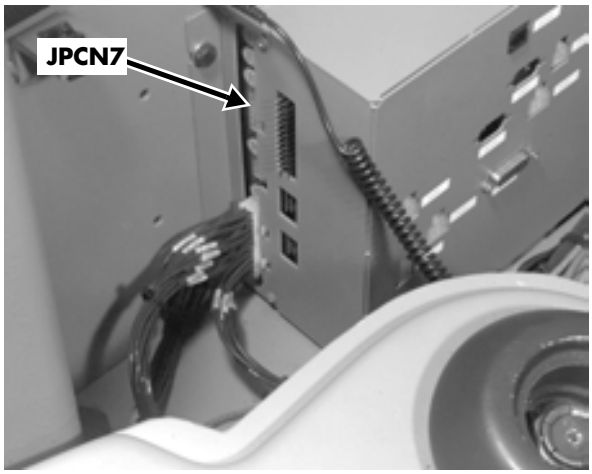


Figure 4-119: Location of JPCN7 on the Vehicle Manager

Electrical

Battery Connector

Location

The battery connector is located on the right side of the truck, above the battery.

One-half of the battery connector is attached to the battery cables. The other half of the battery connector is secured to the right side of the truck, above and slightly forward of the battery.

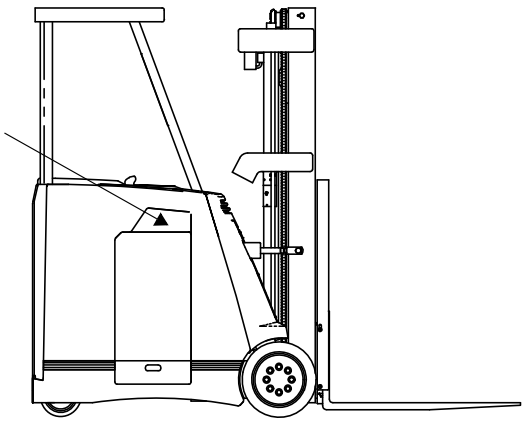


Figure 5-20: Location of the Battery Connector

Inspection

1. Check the battery connector for damaged wires.
2. Check to see if the battery cables are pulling out of the connector.
3. Check the cables where they go into the battery terminals. They should be tight and there should be no corrosion.
4. Look inside the connector. Check the internal contacts for damage, dirt, or corrosion. **Do not use a metal object to clean the connector.**

Figure 5-21: Removing Cable from the Battery Connector

Replacement

The cables to either half of the connector have a lip on their forward end.

This lip snaps over a spring-loaded retainer that is part of the battery connector.

To remove a cable from the connector, you must push this retainer down while pulling the battery cable rearward, out of the connector.

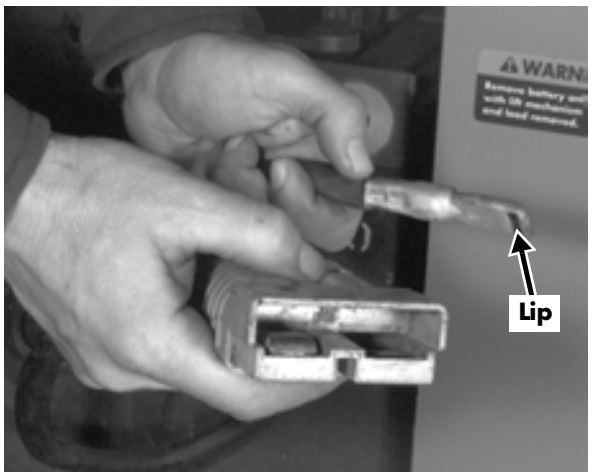


Figure 5-22: Cable Removed from the Battery Connector

6. Remove the copper bus bar.

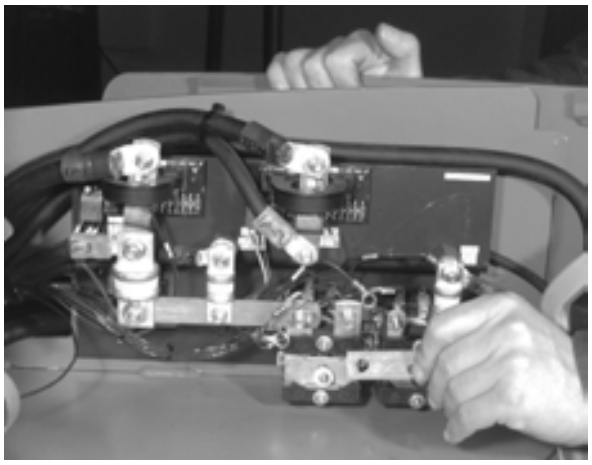


Figure 5-45: Remove Copper Bus Bar

7. Remove the two nuts that secure the X contactor to the contactor panel.

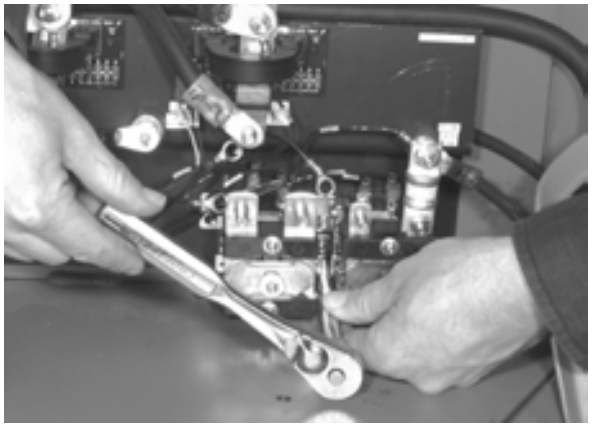


Figure 5-46: Remove the Nuts that Hold the X Contactor in Place

8. Lift the X contactor out, away from the contactor panel. Remove wires X-X and X-Y from the terminals on the base of the X contactor.

NOTE: Terminals X and Y are different sizes.

Figure 5-47: Disconnect Wires from Terminals

Lift Heatsink Assembly

Function

The lift heatsink provides a mounting place for components related to turning the lift motor on and off. These components are:

- HT, the temperature sensor for the heatsink
- The lift circuit card
- Q3, the lift motor transistor
- REC5, the rectifier for the lift control
- C3, the capacitor for the lift control

Since heat is generated as the lift motor transistor is used, the heatsink dissipates heat.

System Relationship

The components on the heatsink assembly are used to control the speed of the lift pump motor, which in turn controls how fast the forks are raised.

Requesting the forks to lift by turning VR2 (on the control handle) sends a signal to the Vehicle Manager. The Vehicle Manager processes this request and sends it to the lift card on the lift control heatsink.

The lift card processes the signal from the Vehicle Manager and forwards it to the “gate” (G) on lift motor transistor. This signal turns Q3 on. This supplies current to the lift pump motor.

Traction Control Heatsink Assembly

Function

The traction control heatsink provides a mounting place for components related to controlling the current sent to the traction motors. These components are:

- Q1, the traction control transistor
- Rectifier REC1
- Rectifier REC2
- Rectifier REC3
- C1, the capacitor for the traction control
- HT, the traction control heatsink temperature sensor
- Resistor R2

Since heat is generated as current flows through the traction control transistor, the heatsink itself is used to dissipate heat.

Motors (General Maintenance)

Tightening Motor Terminal Nuts

Whenever you disconnect any power leads from a motor, always tighten the nuts with a torque wrench to prevent over-tightening them and damaging the motor.

Also check the torque on these nuts each time you check the motor brushes.

Torque the traction motor terminal nuts as shown in Figure 5-98.

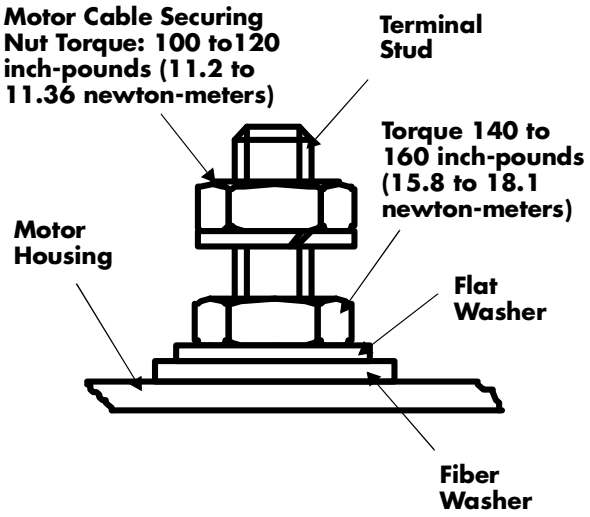


Figure 5-98: Traction Motor Armature Terminal – Proper Torque

Brushes

Inspecting Brushes

How frequently you check the brushes depends upon how severely the truck is used. The more severe usage, the more frequently you should check the brushes.

Check the brushes for:

- Damage
- Freedom of movement within the holders
- Overheating
- Spring pressure and spring alignment
- Wear (see chart below for minimum allowable brush length)

NOTE: You can view the rear brushes of the lift and steer motors by removing the truck battery and looking through the cutouts in the forward bulkhead.

Motor	Type	Brush Set P/N	Minimum Length
DS225068	Traction	DS225081	0.62 in. (16 mm)
DS223045	Steering	DS225075	0.60 in. (15.2 mm)
DS223044	Lift	DS225074	0.62 in. (16 mm)

5. Disconnect the two power cables from the steer motor terminals.

Figure 5-105: Remove the Power Cables

6. Remove the four screws that attach the pump to the right side of the steer motor.
7. Separate the pump from the steer motor.

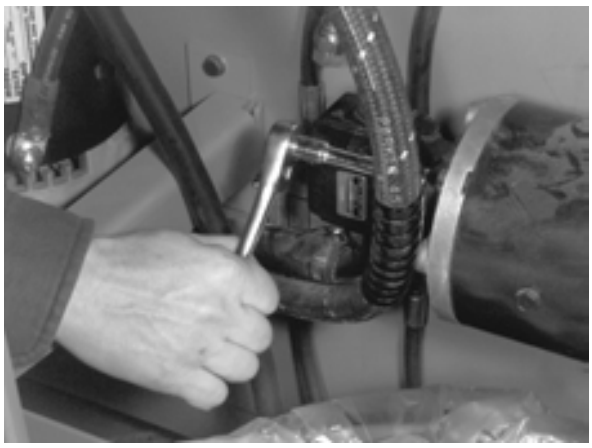


Figure 5-106: Remove the Four Screws that Secure the Pump to the Steer Motor

Maintenance Mode Tests Related to the Lift Motor

Instructions for using the truck's Maintenance Mode are on page 4-6.

- Test A12 - Lift Motor Current
- Test I05 - Lift B+ Sense
- Test I15 - Lift Motor Current Limit

Switch, Speed Feedback Prox, Drive Motor

Location

A speed feedback prox (proximity) switch is located on the top of each of the truck's drive motors.

Function

These prox switches monitor the speed of the drive motors and transmit a signal back to the Vehicle Manager. The Vehicle Manager compares the speeds of both drive motors. If there is a significant difference in the speeds, the truck will apply minimum power to the traction system.

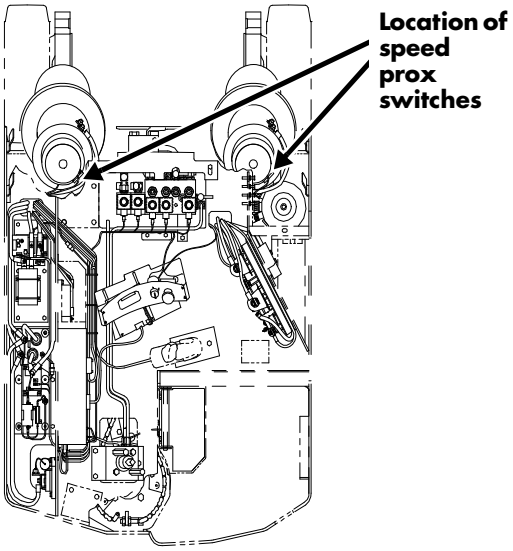


Figure 5-133: Location of the Speed Feedback Prox Switch

Replacement of a Drive Motor Speed Feedback Prox Switch

Removal of Drive Motor Speed Feedback Prox Switch:

1. Turn the truck's key switch to OFF. Disconnect the truck's battery connector.
2. Remove the bolt that secures the velocity disc to the top of the brake.

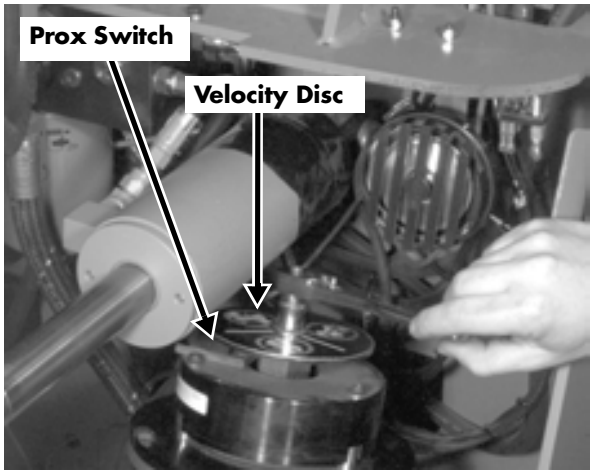


Figure 5-134: Remove Velocity Disc Bolt

Removal of the Vehicle Manager

1. Turn the truck's key to OFF. Disconnect the truck's battery connector.
2. Remove the console cover (page 6-22 in the Mechanical Section).
3. Spread open the antistatic mat on a convenient flat surface.
4. To prevent damage to the Vehicle Manager components from static electricity:
   a. Place a static discharge wrist band around your wrist.
   b. Connect the ground lead from the wrist band to the jack above the Vehicle Manager. [This jack is marked *"ESD Common Ground Point"* (ESD = Electrostatic Discharge).]

NOTE: Manually push the contacts of the PC and X contactors together. Hold them in the closed position for approximately 1 second. (This discharges the large blue capacitor on the lift heatsink.)

NOTE: As you disconnect wires and unplug harnesses from the Vehicle Manager, make sure that the labels are still in place and legible. If any are not, re-label them with the masking tape and marker.

Figure 5-148: Attaching the Static Discharge Wrist Band and Plugging It In

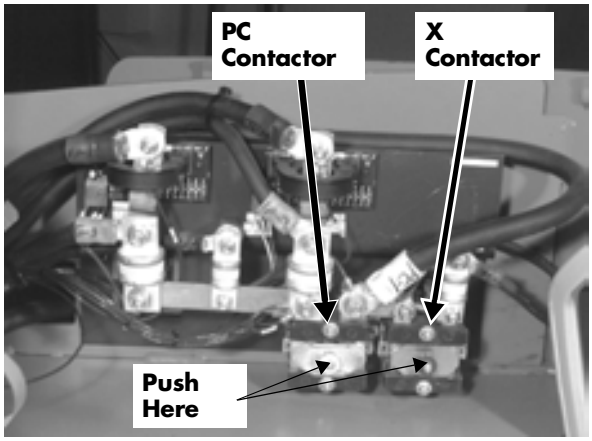


Figure 5-149: Location of the PC and X Contactors

12. You must Learn the control handle as follows:
    a. Enter the truck's maintenance password.
    b. Follow the instructions on the Operator Display.
13. The truck will then complete its start-up sequence.

NOTE: If the truck's start-up sequence does not complete, try turning the truck's key switch to OFF and back to ON.

NOTE: If this does not let the truck complete its start-up sequence, the firmware may have been installed incorrectly. Repeat steps 7 through 12.

14. Test all truck functions.
15. Reinstall the firmware access cover on the Vehicle Manager.
16. Place the new sealing tape included in the kit over the firmware access door.
17. Re-enter the truck's Configuration Mode and reset the operating limits that you wrote down in step 1.

Wiring Harness

General

Whenever you replace a wiring harness, be sure to note how it is routed through the truck. Also be sure to note where any tie-straps are used to secure the wiring harness to keep it out of the way.

Before disconnecting any wires, make sure you turn the truck's key switch to OFF and disconnect the truck's battery connector.

9. If the brake is not going back on the truck, remove the proximity sensor switch.

NOTE: Keep track of the number and thickness of shims under the proximity sensor switch.

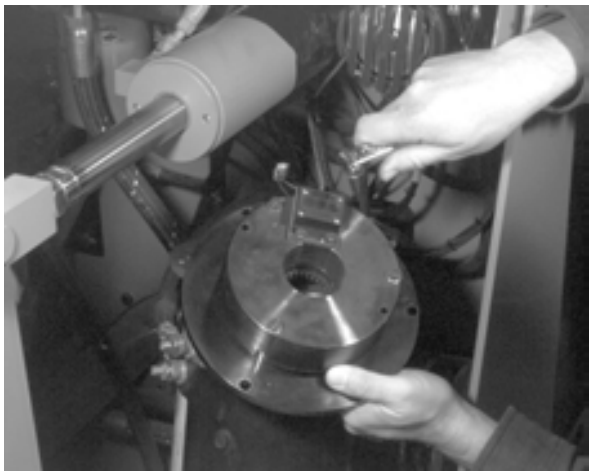


Figure 6-13: Remove Prox Sensor Switch

Installation of Control Handle

1. Insert the shaft of the control handle assembly into the support bracket.
2. Apply Loctite 242 (DS223074) to the threads of the Allen head screw.
3. Hold the control handle in place.
4. Align the hole in the shaft with the setscrew hole. Torque the setscrew to 30 ft. lbs. (42 Nm).
5. Thread the control handle wiring harness up and plug it into JC5 on the Vehicle Manager.
6. Secure the control handle wiring harness in place with tie-straps. Ensure the cable extends out of the handle as straight as possible.
7. Reconnect the truck's battery connector, turn the key to ON, and run the Learn Mode (page 4-6).

NOTE: When you run the Learn Mode, be sure to follow the instructions shown on the Operator Display.

8. Reinstall the console cover (page 6-22).

Deadman Pedal

Location

The deadman pedal is located on the left side of the operator's compartment floor.

Function

When the key switch is ON and the deadman switch is closed (by stepping on the deadman pedal), the truck is ready for operation.

When the deadman switch is open (by stepping off the deadman pedal), both brakes are applied and travel is disabled.

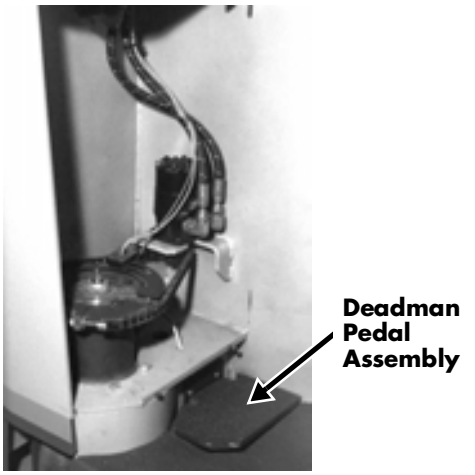


Figure 6-36: Deadman Pedal Location

Mast Installation

NOTE: For this procedure, you will need a hoist or another lift truck. Whichever device you use, make sure that it has the capacity to lift and support the mast.

1. Wrap a chain or lifting strap around the top of the mast. Attach the chains or straps to the lifting device.
2. Slowly lift the mast up and off the wooden blocks.
3. Slowly move the mast towards the truck.
4. Position the lower pivot bearings on the mast at the same height of the pivot yokes on the drive units.
5. Carefully engage the mast pivot bearings with the yokes on the drive unit.
6. Install the upper screw in both mast bearing caps.
7. Attach each tilt ram to the pivot points on the mast. Orient the anchor as shown in Figure 6-54.

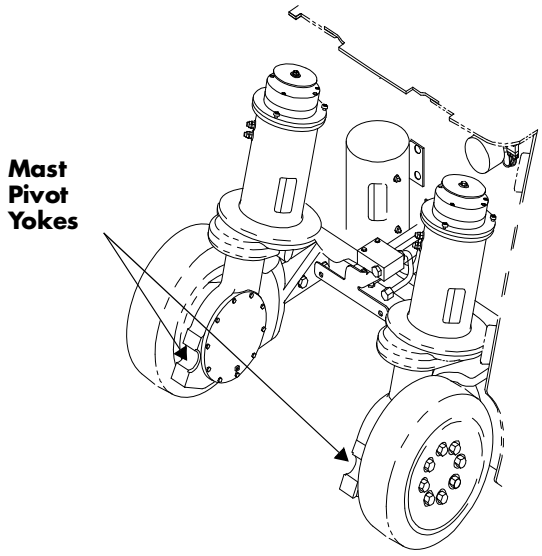


Figure 6-53: Mast Pivot Yokes

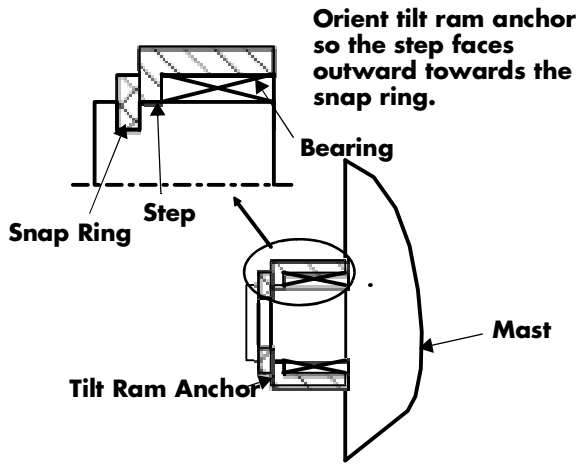


Figure 6-54: Proper Orientation of Tilt Anchor

4. Install the steer plate. Align the scribe marks made during disassembly between the hub and the steer plate. Install the four screws and tighten.

Figure 6-74: Install Steer Plate Bolts

5. Install the steer sensor plate on top of the steer plate.

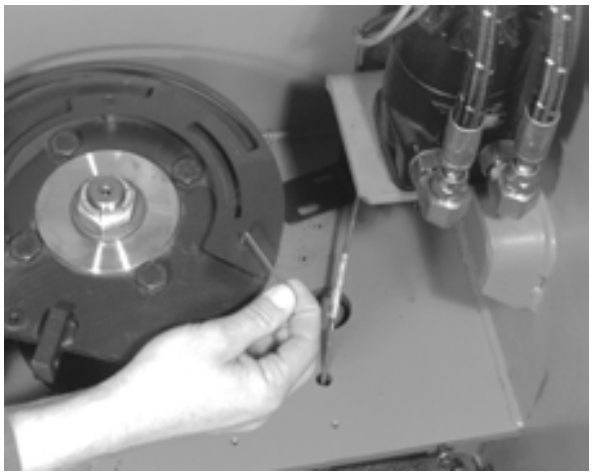


Figure 6-75: Install Steer Sensor Plate

6. Install the steer prox switch bracket. For information on adjusting the steer proximity switch, refer to page 5-85.

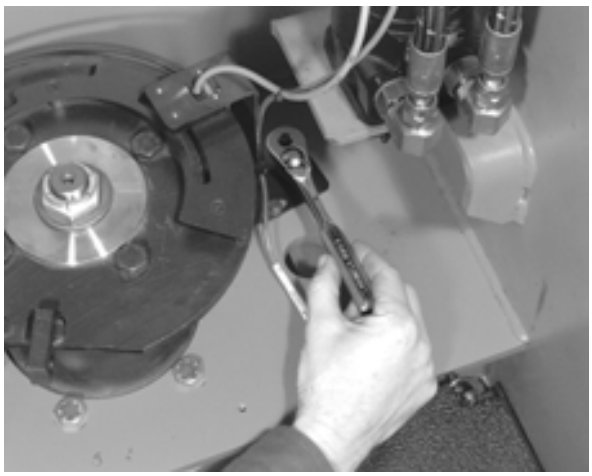


Figure 6-76: Install Steer Prox Switch Bracket

2. Back the axle out slightly and remove the seal tool halves.

Figure 6-96: Remove Seal Tool Halves

3. Push the axle into the housing until the cup and cone contact. Mate axle with the spiral bevel gear.

Figure 6-97: Install Spiral Bevel Gear

4. Clean the threads of the clamp nut locking screw and axle with Loctite primer N or T. Apply Loctite 271 (DS224303) to the axle nut threads and Loctite 242 (DS223074) to the locking screw threads.
5. Screw the nut onto the axle. Install the locking screw as tight as possible without causing any drag on the clamp nut threads. This is to keep the clamp nut from spreading apart during adjustment.

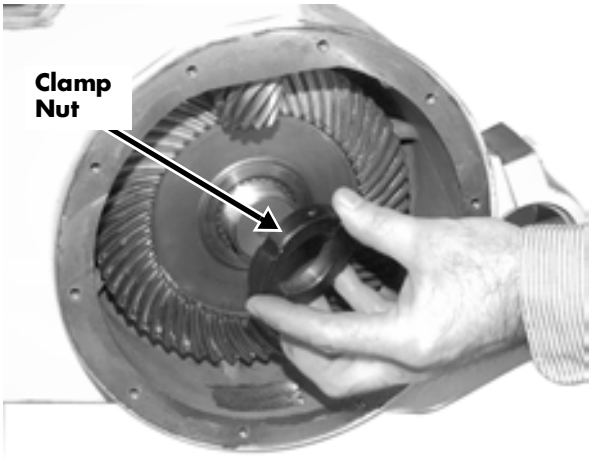
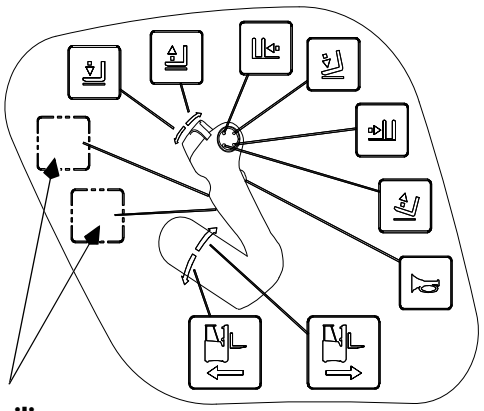


Figure 6-98: Install Clamp Nut

Control Handle Decal Application

1. The appropriate decals must be applied to the control handle decal to indicate optional attachments installed on the truck. Available decals are identified within your parts manual. Each attachment requires two decals.

NOTE: Sideshift decals are already part of the existing decal and are not ordered separately.



Auxiliary Attachment Decals

Figure 7-8: Control Handle Decal

13. Using a wire or rope, tie the lift chains up so they do not rest on the chain pulleys of the free lift cylinder (front ram). With pressure removed from the chain pulleys, slide the free lift pulley pin (Item 21) to the left just far enough to remove the chain pulleys and spacers (Items 22, 23, 24) from the center of the yoke. The pulley pin can remain in the left side of the yoke at this time. The center spacer (Item 23) should be discarded and replaced with two sideshift pulleys (Item 16) as shown. Re-insert the pulleys and end spacers (Items 16, 22, 24) in the yoke and push the pulley pin back through the assembly securing with a new cotter pin.
14. Remove the wire or rope holding the lift chains over the free lift cylinder and place the chains back on the chain pulleys.
15. Attach the two hydraulic hoses (Item 3) to the auxiliary sideshift manifold. Route the hoses through the front of the truck and secure using tie-straps (Item 22) as shown. Both hoses should exit the truck near the left front wheel and attach to the rear bottom of the mast using a hose clamp and screw (Items 10, 21). Route the hoses up over the rear set of ram pulleys and secure midway up the center of the mast using U-Bolt and nuts (Items 17, 11).

NOTE: U-Bolts securing the hoses to the mast must have a small piece (approximately 1.5 to 2.00 inches (38 to 50 mm) of shielding, Item 24) between Item 17 and hose.

16. Locate the weldment near the bottom of the telescopic mast assembly and install the four tubing clamp caps, spacer, and screws (Items 9, 19, 20) as shown in section D-D, Figure 7-27. Do not tighten the clamp screws until the hoses are completely installed and in position.
17. Attach one end of both line assemblies (Item 18) to the open end of each telescopic lift hose (Item 3). Attach the other end of each line assembly to a free lift hose assembly (Item 2) and route underneath the two sets of tubing clamps just installed on the telescopic mast assembly.

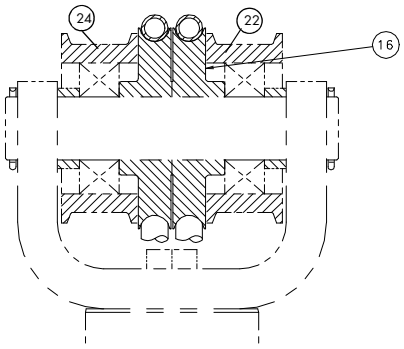


Figure 7-24: Truck with Sideshift

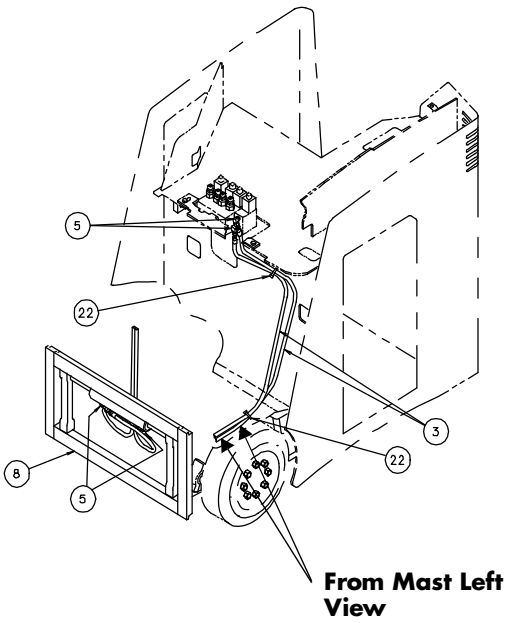


Figure 7-25: Hydraulic Hose Routing

Harness Removal

1. Disconnect the harness from the pressure transducer at JPHS2.
2. Disconnect SPL-8 from SJL-8.
3. Disconnect wire TP-10 from the lift control heatsink terminal TP-10.
4. Disconnect wire TP-11 from terminal TP-11.
5. Disconnect wiring harness from the variable pressure transistor module.

Related tests

- Test A00 - Hydraulic Pressure Sensor

8. Remove the screw holding the main lift piston to the telescopic. Remove the spacer located within the anchor block.
9. Connect the battery, turn the truck ON and move the lift/lower control to lower.

NOTE: If the piston does not lower, have an assistant push down on the piston to force it back into the cylinder housing.

10. Turn the truck OFF and disconnect the battery.
11. Place a pan under the ram to catch any oil that may spill during disassembly.
12. Remove the bleed screw and let the oil drain from the ram. If you have trouble removing the bleed screw, refer to Figure 7-3. Reinstall the bleed screw after all the oil is drained.
13. Using a chain wrench, loosen the piston cap on the main-lift cylinder.

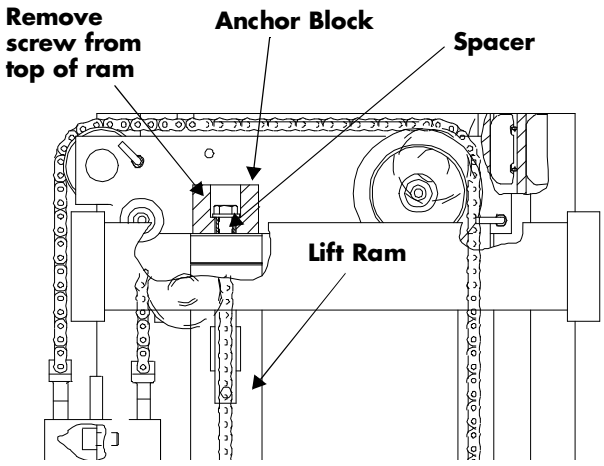


Figure 7-55: Remove Ram Retaining Screw

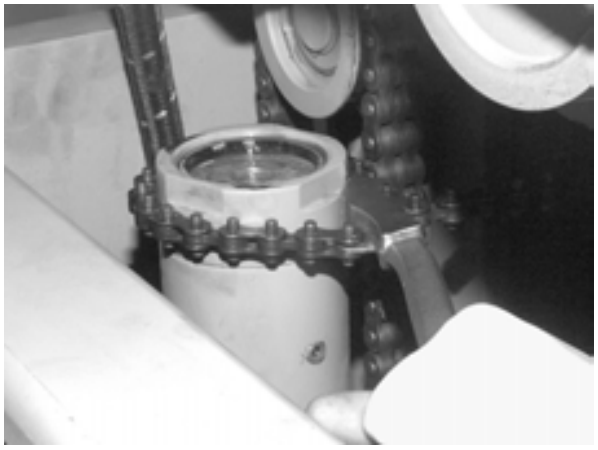


Figure 7-56: Remove Piston Cap

14. Remove the piston cap.

NOTE: Be careful not to damage the machined surfaces of the piston cap when you remove the seals.

Figure 7-57: Piston Cap Removed

Hydraulic Flow Control Valve

Replacement

The hydraulic lift circuit has three flow control valves. There is one flow control valve in each of the ram cylinders regulating the lowering speed for each stage of the mast.

The third flow control valve, mounted in the front lower portion of the truck (as shown), regulates the total flow of both lift cylinders when lowering the mast. When replacing this flow control valve care must be taken as to the direction of flow (indicated as shown) and the mounting of the valve.

⚠WARNING

The internal portion of this valve can be inserted in either direction. Care must be taken to ensure that direction of flow is adhered to as shown. This valve regulates the total flow to 9 GPM and if installed incorrectly the maximum lowering speed of the mast can be exceeded.

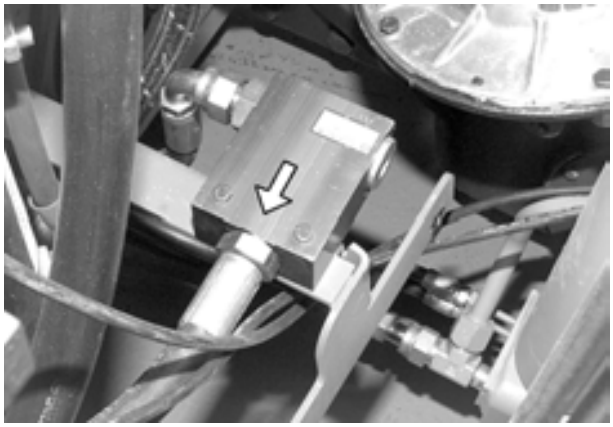


Figure 7-77: Direction of Flow

Appendix

B1	BRAKE ON LEFT DRIVE MOTOR
B2	BRAKE ON RIGHT DRIVE MOTOR
C1	CAPACITOR (TRACTION CONTROL)
C2	CAPACITOR (REGEN)
C3	CAPACITOR (LIFT CONTROL)
CT1	CURRENT SENSOR DRIVE
CT2	CURRENT SENSOR LIFT
FU1	FUSE 10 AMP IN VEHICLE MANAGER
FU2	FUSE 10 AMP IN VEHICLE MANAGER
FU3	FUSE 10 AMP IN VEHICLE MANAGER
FU4	FUSE 10 AMP IN VEHICLE MANAGER
FU5	FUSE 10 AMP IN VEHICLE MANAGER
FU6	FUSE 10 AMP IN VEHICLE MANAGER
FU7	FUSE 350 AMP DRIVE MOTOR FUSE ON CONTACTOR PANEL
FU8	FUSE 70 AMP DRIVE MOTOR FIELD FUSE ON CONTACTOR PANEL
FU9	FUSE2 AMP IN VEHICLE MANAGER (NOT USER SERVICABLE)
FU10	FUSE 70 AMP AUX MOTOR FUSE ON CONTACTOR PANEL
FU11	FUSE 350 AMP LIFT MOTOR FUSE ON CONTACTOR PANEL
FU12	FUSE 1,5 AMP ON ACCESSORY BLOCK (OPT.)
FU13	FUSE 1,5 AMP ON ACCESSORY BLOCK (OPT.)
FU14	FUSE 5 AMP ON COLD STORAGE FUSE BLOCK (OPT.)
FU15	FUSE 5 AMP ON COLD STORAGE FUSE BLOCK (OPT.)
FU16	FUSE 1,5 AMP IN OPTIONS HARNESS (OPT.)
H	HORN
H2	TRAVEL ALARM (OPT.)
HT	TEMP SENSORS
JP1	CONNECTOR ON TRAVEL ALARM
JP2	CONNECTOR ON LIFT TEMP SENSOR
JP3	CONNECTOR ON STROBE LIGHTS
JP4	CONNECTOR ON TRACTION TEMP SENSOR
JPB+	CONNECTOR ON BATTERY
JPB-	CONNECTOR ON BATTERY
JPB1	CONNECTOR ON LEFT BRAKE
JPB2	CONNECTOR ON RIGHT BRAKE
JPC3	CONNECTOR VM TO DISPLAY
JPC4	CONNECTOR VM TO STEER POSITION PROX,
JPC5	CONNECTOR VM TO MUTI-FUNCTION CONTROL HANDLE
JPC6	CONNECTOR VM TO DEADMAN
JPC7	CONNECTOR VM TO HIGH SPEED LIMIT SWITCH
JPC9	CONNECTOR VM TO MD1 LEFT SPEED FEEDBACK PROX,
JPC10	CONNECTOR VM TO MD2 RIGHT SPEED FEEDBACK PROX,
JPC11	CONNECTOR VM TO DIAGNOSTIC INTERFACE
JPC12	CONNECTOR VM TO RS-232
JPCN2	CONNECTOR VM TO OPTIONAL FEATURES
JPCN3	CONNECTOR VM TO KEYSWITCH & SOLENOIDS
JPCN4	CONNECTOR VM TO CONTACTOR PANEL
JPCN7	CONNECTOR VM TO BRAKES
JPCT1	CONNECTOR ON DRIVE CURRENT SENSOR
JPCT2	CONNECTOR ON LIFT CURRENT SENSOR
JPD1	CONNECTOR ON REGEN CARD
JPD2	CONNECTOR ON LIFT CARD
JPHS1	CONNECTOR ON HYDRAULIC PRESSURE MODULE
JPS1	CONNECTOR VM TO HT ON LIFT CONTROL HEATSINK
JPS2	CONNECTOR VM TO CT1 & CT2
JPS3	CONNECTOR VM TO HEATSINKS
JPWL1	CONNECTOR ON RIGHT WORKING LIGHT
JPWL2	CONNECTOR ON LEFT WORKING LIGHT
JPHS1	CONNECTOR ON MODULE FOR PRESSURE SENSOR
JPHS2	CONNECTOR TO PRESSURE SENSOR
K1	HORN RELAY
K2	TRAVEL ALARM RELAY
MD1	LEFT DRIVE MOTOR
MD2	RIGHT DRIVE MOTOR
MP	LIFT PUMP MOTOR
MX	STEER MOTOR
PC	CONTACTOR POWER DISCONNECT
Q1	TRACTION POWER TRANSISTOR
Q2	REGEN POWER TRANSISTOR
Q3	LIFT POWER TRANSISTOR
R2	TRACTION SNUBBER RESISTOR
R3	REGEN SNUBBER RESISTOR
REC1	TRACTION FREEWHEELING DIODE
REC2	REGEN DIODE
REC3	TRACTION SNUBBER DIODE
REC4	REGEN SNUBBER DIODE
REC5	LIFT FREEWHEELING DIODE

S1	KEYSWITCH
S2A	DEADMAN
S3	SWITCH HORN
S4	SWITCH ATTACHMENT 1 (OPT.)
S5	SWITCH ATTACHMENT 2 (OPT.)
S6	SWITCH SIDE SHIFT RIGHT (OPT.)
S7	SWITCH SIDE SHIFT LEFT (OPT.)
S8	SWITCH TILT UP
S9	SWITCH TILT DOWN
S10 & S15	SWITCH FOR WORKING LIGHTS
S21	SWITCH EPO
SOL1 THRU 8	SOLENOIDS
SPL1 THRU 7	SPLICES FOR WORKING LIGHTS
SPL8	SPLICE FOR PRESSURE SENSOR OPTION
SUP1	SUPPRESSOR FOR TRAVEL ALARM
TP1 THRU 13	TY-POINTS
VM	VEHICLE MANAGER
X	STEER CONTACTOR

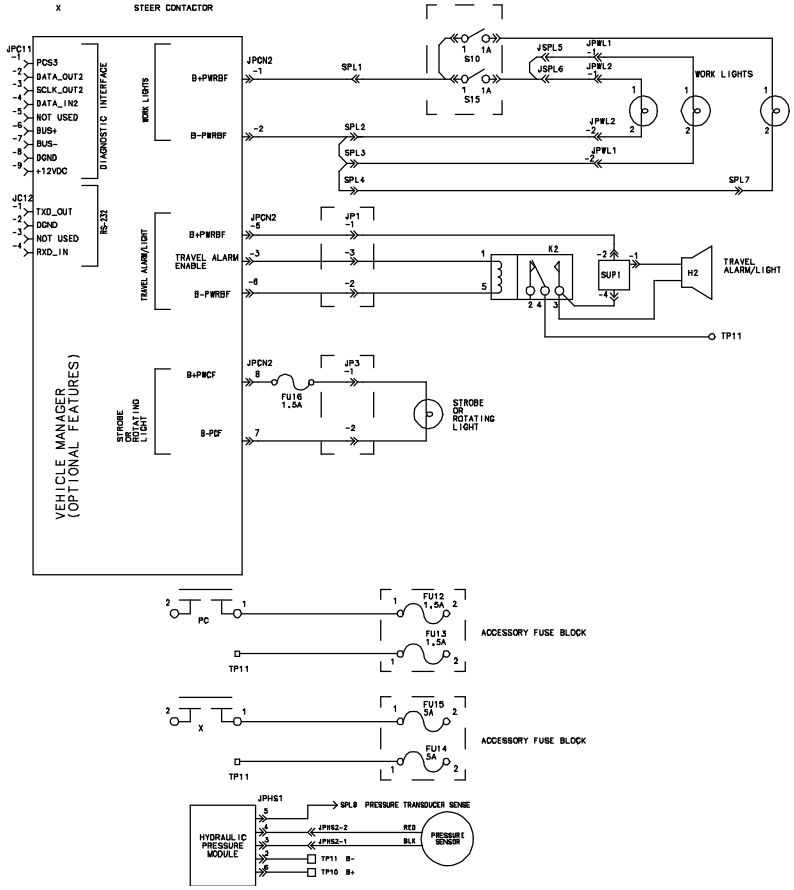


Figure 8-8: Schematic - Electrical (Sheet 2 of 2)

Alphabetical Index

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X