



**MITSUBISHI
FORKLIFT TRUCKS**

SERVICE MANUAL

Reach Trucks

ESR	1ESR240501-up 1ESR360501-up
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Mechanical**Compartment Floor**

The center section of the floor is plated steel. It is covered by a rubber cushion.

Overhead Guard

The overhead guard (shown in Figure 1-2) is constructed of steel tubing and bar stock. The overhead guard covers the floor area to protect the operator and complies with ANSI specification B56.1.

Operator's Controls

The operator's compartment provides the operator with complete control of the truck (see Figure 1-3 and Figure 1-4). The controls have been designed for operator safety, efficiency, and comfort.

Deadman Pedal

The deadman pedal is spring loaded. When the pedal is released, the travel circuit is disabled (turning the power off) and the brake is applied.

Operator Compartment Options

Additional options, such as fans and working lights, are available by customer request.

Electrical

This figure shows the electrical components.

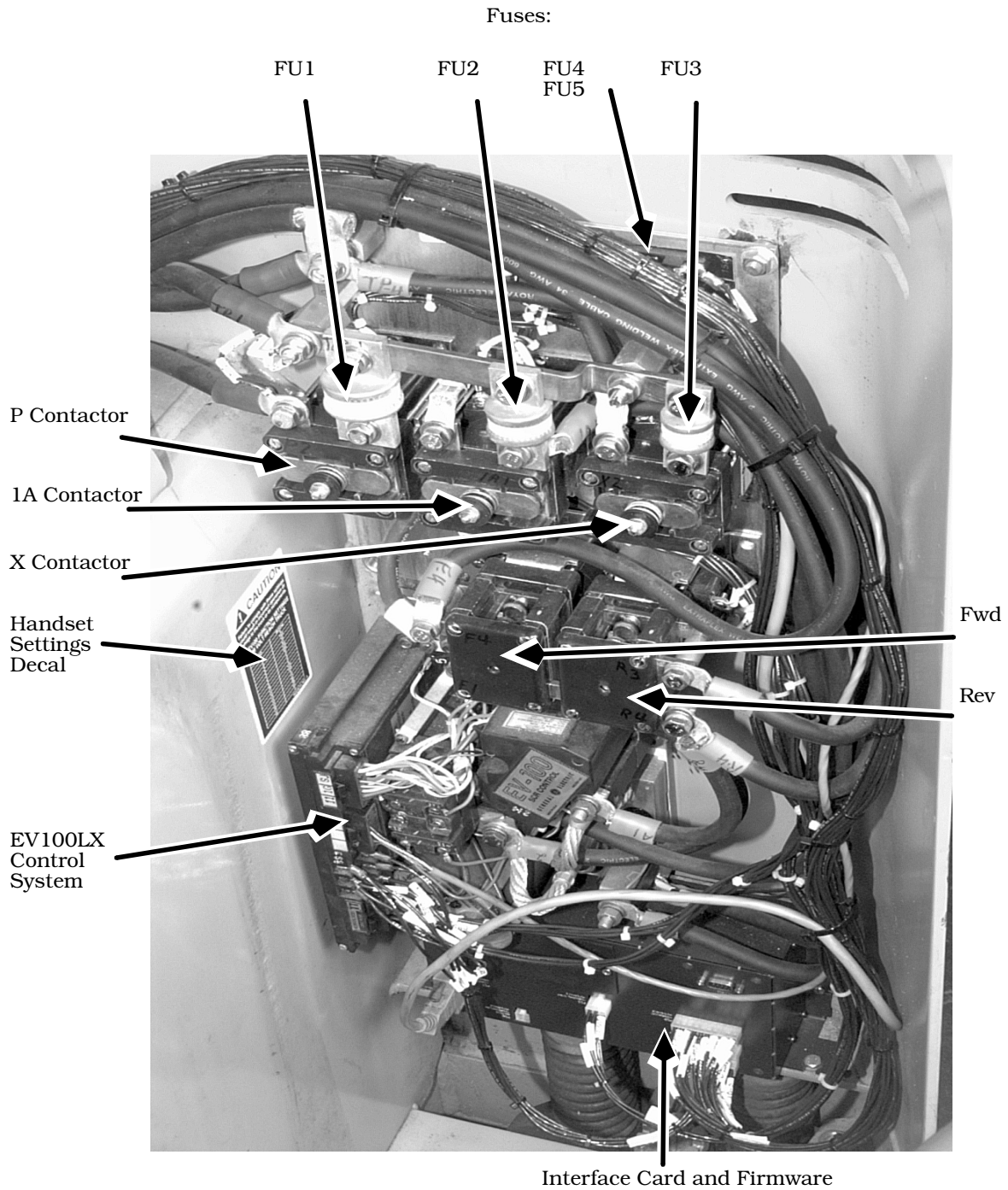


Figure 1-7: Platform Components (Electrical)

Inspecting the Truck

Table 2-1: Visual Inspection Checklist

Visual Inspection Checklist			
		Responsibility of:	
Item	Description of Problem	Shipper	Mitsubishi
Attachment Options			
Auxiliary Control Handles			
Battery			
Battery Charger			
Battery Disconnect			
Directional/Speed Control Handle			
Electrical Power Cables			
Elevating Assembly			
Hoses and Cables Along Mast			
Hydraulic Hoses			
Hydraulic Lines			
Lift Chains			
Lift/Lower Control Handles			
Loose Hardware			
Mast			
Missing Decals			
Overhead Guard			
Paint Condition			
Tires			
Tractor Assembly			
Underside of Truck (if cradled)			
Welds			

Preparing the Truck for Storage

Changing the Hydraulic System Oil

To change the oil in the hydraulic system, do the following:

1. Be sure the truck is in a clean area, away from any possible contaminating elements that could enter the hydraulic system during the changing process.
2. Drain the hydraulic reservoir completely. **Be sure to drain as much oil as possible from the hydraulic lines and cylinders.**
3. Fill the hydraulic reservoir with the proper oil in accordance with Figure 2-1 and Figure 5-10, "Lubrication/Inspection Points," on page 5-18. Also see the "Lubrication Equivalency Chart" on page A-2.
4. Operate all truck functions and check for possible hydraulic leaks.
5. Bleed the entire hydraulic system before placing the truck into service.
6. Check the reservoir oil level. The remainder of the original hydraulic oil left in the system, (approximately 5%) should not be detrimental to the operation of the truck.

Preparing the Truck for Storage

This section describes how to prepare the truck for storage.

Storage Warranty

If the truck is going to be stored for any length of time, the following procedure should be used. A Certified *Mitsubishi* Dealer should contact the *Mitsubishi* Warranty Division for the proper warranty procedures.

General Storage Tips

Try to keep the truck in a dry and covered area. Cover the truck using plastic or canvas. Keeping the truck in a low moisture, temperature controlled environment will greatly reduce problems.

If the truck is going to be stored for longer than 30 days, jack it up and block it off the floor.

⚠ WARNING

Use extreme care whenever the truck is jacked up for any reason. Never block the truck between the telescopic and the floor. Use a suitable hoist to stabilize the mast. Keep hands and feet clear from beneath the truck while jacking. Use jack stands or solid blocks to support the truck; do not rely on jacks. See "Jacking the Truck" on page 5-3.

Chapter 4: Theory of Operation

In this Chapter

This chapter contains the following topics:

Topic	See Page
EV100LX Control Panel	4-1
System Components	4-3
Control Features	4-6
Basic SCR Controller Circuit Operation	4-11
Wiring Conventions	4-13
Operation of the Travel System	4-14
Lift/Lower System	4-23
Braking	4-25

EV100LX Control Panel

The Reach Truck has variable speed ranges in both forward and reverse directions. Infinite selection of speeds is obtained through the use of a main Silicon Controlled Rectifier (SCR).

The SCR is turned ON and OFF to control the flow of electricity to the drive motor; the ON and OFF time varies from 1.8 to 20 milliseconds as shown in the following table:

	Creep Speed	Top Speed
ON	1.8 milliseconds	20 milliseconds
OFF	20 milliseconds	1.8 milliseconds

Because of a small voltage drop across the SCR, maximum speed is obtained by bypassing the SCR and connecting the drive motor directly across the battery using the 1A contactor.

See the following:

- Figure 4-1, "System Identification (EV100LX Control Panel)," on page 4-2
- Figure 4-2, "Travel System Simplified Schematic (EV100LX)," on page 4-14

Basic SCR Controller Circuit Operation

The following paragraphs provide a brief overview of the SCR controller operating cycle. Refer to the basic schematic drawing (Figure 4-2, "Travel System Simplified Schematic (EV100LX)," on page 4-14).

Energizing the Control Circuit

The control circuit is energized by closing the key switch, the deadman switch, and moving the control handle to forward or reverse command position. This applies power to the EV100LX Controller and turns on the PMT driver, which closes the selected directional contactor and completes the circuit to the drive motor.

Gate Pulse to REC2

The control circuit then supplies a gate pulse to REC2, turning it on to a conducting state, allowing current to flow from the battery through 1C, 1X, REC2, motor field, motor armature, sensor, and back to the battery. After 1C charges, REC2 shuts OFF through lack of holding a current. The control card checks that 1C is charged and unlocks the gate to REC1 and REC5.

Gate Pulse to REC1

The control card then supplies a gate pulse to REC1, turning it on to a conducting state, allowing current to flow from the battery through REC1, motor field, motor armature, sensor, and back to the battery. REC5 turns on and allows current to flow to T4-T3, 1C, REC1, REC5 to T4-T3. This current charges the bottom of 1C positive with respect to the battery positive bus. This charging cycle occurs in less than 1 millisecond (.001 second), and REC5 shuts OFF. The charge is stored on the capacitor until it is time to turn OFF REC1.

Firing REC2

Current continues to flow in REC1 until the control card fires REC2. When REC2 conducts, capacitor 1C discharges around the circuit composed of 1C, 1X, REC2, and REC1. This discharge current opposes the battery current through REC1 so that the resultant current is zero. With reverse voltage across REC1, REC1 is turned OFF. Current continues to flow in the REC2, 1C, motor, and battery loop until the capacitor (card terminal 14) is fully charged negative. This charge exceeds battery voltage by an amount which is a function of peak motor current, and REC2 turns OFF.

Sequence 11: 1A or Bypass Contactor Operation

All electrical devices have some resistance, and semi-conductors (like SCRs) have more resistance than simple power tips on a contactor. To get the maximum possible speed, the SCR type system uses a contactor to bypass the SCR system and connect the battery directly to the drive motor. This also allows the SCR system components an opportunity to cool down and helps prevent failures due to excessive heat. This is done by:

1. The control looks at the throttle voltage on pin 10 at TB1 to verify that full speed is being requested. When the throttle voltage falls below .5 volts, control will allow the bypass timer to start.
2. When controlled acceleration has achieved maximum REC1 ON time, the card will complete the connection to battery negative and energize the 1A contactor coil. The time it takes is determined by the preset programming in the card.
3. The REC1 continues to pulse until the 1A contactor has had time to close. This prevents arcing and burning of the power tips. The control also uses this full power transition when the operator lifts his foot up and the 1A contactor opens.
4. The current path is through the FU2 fuse, 1A contactor tips, normally open (now closed) forward contactor tips, the drive motor fields, the normally closed reverse contactor tips, the drive motor armature, and the sensor back to battery negative.
5. The control monitors the current going through the drive motor at all times by the voltage drop across the sensor. Because there is no control over the current when the truck is in 1A or bypass, there is a potential for abuse resulting in motor damage.

If a truck being operated in 1A encounters a situation where current levels get to the point of possible motor damage, the control would drop out the 1A contactor and put the truck back in SCR mode. The motor then will be limited to the current levels programmed into the card. The point at which the control drops out the 1A contactor is preset by the programming in the card.

When this 1A drop out occurs, there is not full power transition. The result is arcing and burning of the 1A tips. This is helpful so that when troubleshooting a truck, you will know if the 1A drop out has been occurring due to excessive current draws.

Maintenance Practices

Discharging the Truck

Before removing a circuit card, disconnect the battery then discharge the truck. Discharge the truck by touching it with your hand or attaching a device to the frame of the truck which is connected to earth ground. The device should have a resistance of 500,000 to 2,000,000 ohms to eliminate any potential for shock hazard.

Removing the Circuit Card

After discharging the truck, the circuit card can be removed as follows:

1. Place the static control wrist strap around your wrist. It should fit snugly.
2. Connect the ground lead to the Electrostatic Discharge (ESD) receptacle on the truck and the loose end to the wrist strap.
3. Get into the correct position to remove the circuit card. **DO NOT** move your feet.
4. Remove the circuit card using the correct card handling method shown in Figure 5-2 on page 5-5.
5. When replacing a circuit card or an EPROM on a card, place the circuit card immediately in an anti-static bag.
6. If replacing an EPROM, take the card to a clean area and place the card on a surface which is conductive to antistatic. Use a wrist strap having a nominal resistance of 1,000,000 ohms (minimum 500,000 ohms) connected to common ground with the work surface.

▲ CAUTION

EPROM pins are delicate, and if mishandled, can be easily bent or damaged. Before removing an EPROM, note the position of the beveled corner. The new EPROM must be installed in the same orientation. Incorrectly installed EPROMS could result in damage.

Planned Maintenance

**Inspection
Schedule**

Use the following schedule for inspecting the truck:

Table 5-3: Inspection Schedule

Refer to Figure 5-10 for Item Number Locations			Time Interval (Hours on Deadman Switch)			
Item	Component	Check:	1 Day	30 Days	180 Days	360 Days
			8 Hrs	200 Hrs	1200 Hrs	2400 Hrs
1	Battery	Check the battery weight against the minimum and maximum allowable weights on the specification plate for the truck. Cleanliness		X	X	X
2	Battery Connector	No damage, solid electrical connections, battery disconnect works properly.	X	X	X	X
3	Battery Gates, Rollers	Gates properly installed, locked securely, horizontal motion of battery limited to 1/2" (13 mm). Check roller condition, lubrication.	X	X	X	X
4	Brake	Pedal moves freely without binding Lift truck stops in specified distance (8 to 10 ft. or 2.5 to 3.0 m) Deadman brake functions properly (travel circuits disabled)	X	X	X	X
5	Contactors Tips	No pitting, burning. Sufficient contact material remaining.		X	X	X
6	Cable, Hoses, Tension Springs	Hoses and cables in good condition. Spring tension adjusted properly?	X	X	X	X
7	Chassis and Mast	Grease as required.		X	X	X
		Guards and covers installed.	X	X	X	X
8	Deadman Switch Pedal	Smooth action, no binding, releases when foot is lifted off pedal.	X	X	X	X
9	Deadman Switch	Disables travel and lift functions and stops truck when pedal is released.	X	X	X	X
10	Drive Unit	• Check fluid level.		X	X	X
		• Change fluid.				X
		• Grease the ring gear.		X	X	X
		• Grease the pivot bearing.		X	X	X
11	Forks	For damage, no modifications	X	X	X	X

Battery Maintenance

Charging the Battery

Consult your battery manual for specific charging procedures.

When a battery is charged, direct current is passed through the battery cells in the direction opposite of discharge.

Before charging a battery, become familiar with the following:

- Charging rate, starting rate, and finish rate.
- Time available for charge.
- Variations in cell voltage.
- Avoiding overheating, excessive gassing, or overcharging.

Precautions

Note the following precautions when charging the battery.

▲WARNING

When charging batteries, observe the following precautions:

- Do not smoke, use open flame, or spark-producing devices near the batteries.
- Charge in a well-ventilated area to avoid hydrogen gas concentration.
- Keep batteries clean; corrosion causes grounds and possibly sparks.
- Charge batteries at the rates shown on the battery.
- Keep plugs, terminals, cables, and receptacles in good condition to avoid shorts and sparks.
- Never lay tools on top of the batteries.
- Wear protective clothing and eye protection when handling, checking, or filling batteries.

NOTE: Get the maximum use out of each battery by recharging the batteries only when they are effectively discharged. DO NOT routinely recharge batteries when they are only partially discharged; this will decrease battery life. At maximum recommended discharge, the specific gravity should read 1.150 or less.

Maintaining the Motor

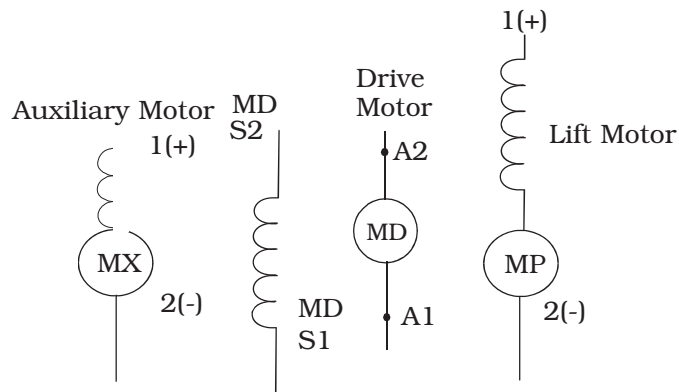


Figure 5-16: Motor Terminals and Circuits

Short Circuits

A short circuited motor is one in which the insulation on the field or armature windings has broken down at two or more points. The breakdown creates a low resistance current path, allowing current to flow from one turn of the coil to another adjacent coil turn, without actually flowing through the coil wire. The result is a decrease in total resistance of the motor winding and an increase in the current flow. Location of the short determines its severity.

A shorted motor might be indicated by:

- Slow or sluggish operation
- Running faster than normal
- Overheating
- Blowing a power fuse

Testing for Short Circuits

Excessive motor current can be caused by abnormally high rolling resistance. Such resistance might be caused by brake dragging, defective wheel bearings, or transmission problems. The devices driven by the motor should be inspected before replacing the motor.

To test for short circuits, do the following:

1. Refer to the inspection report showing the motor current when the motor was new.
2. Duplicate the same truck conditions (loaded and unloaded) and measure the present current.
3. If the present current reading is 25% more than the original current value, check the entire truck for possible causes, such as:
 - Bad wheel bearings
 - Dragging brake
 - A short circuit within the motor

Mechanical Maintenance

8. Save the main cover shim set (5) so that the replacement can be matched for proper thickness.

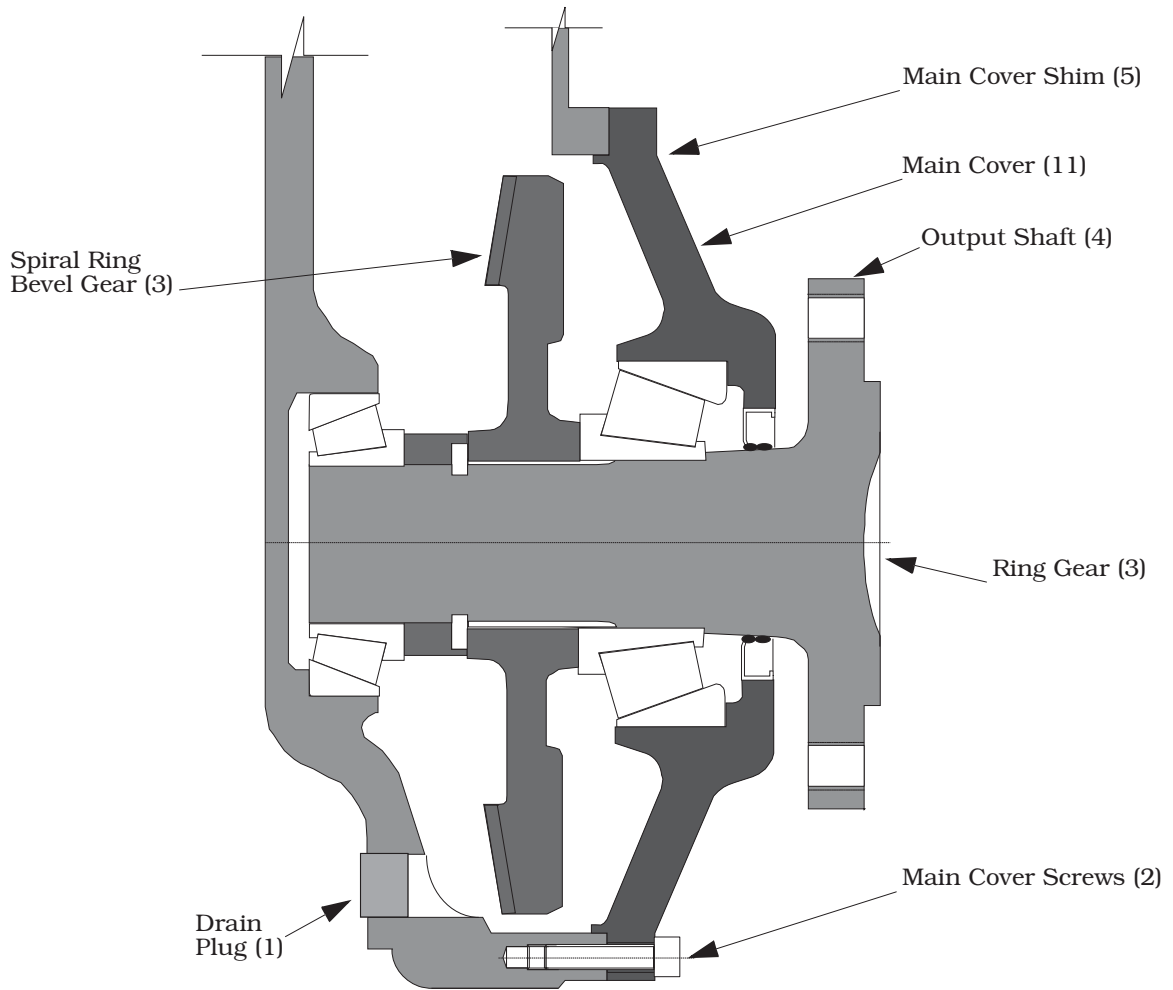


Figure 5-18: Lower End of Drive Unit

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10. Clean the cover plate and mating surface. Apply Permatex 6B to the sealing surface. See Figure 5-35.
11. Install the cover. Tighten all screws equally to 20 ft. lbs. (28 N•m).
12. Apply No.2 Permatex to the drain plug and install.

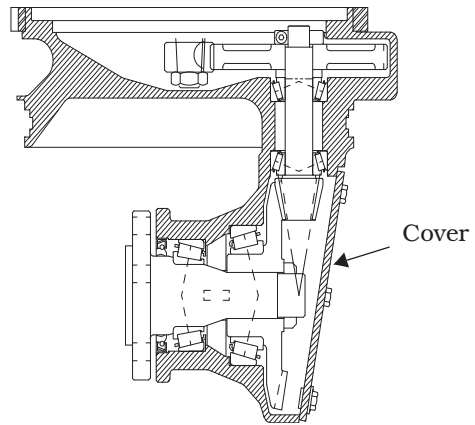


Figure 5-35: Installing Cover

▲ CAUTION

If the three Allen head screws holding the brake assembly together are removed before backing off the torque plate pressure, brake fluid might be forced out of the piston. If the brake assembly is left on the truck, brake fluid could drip on the drive motor.

5. Remove the bolts securing the brake to the drive motor.
6. Remove the brake assembly from the truck. See CAUTION:

▲ CAUTION

Tool, P/N 1129907, must be used to separate the brake assembly from the drive motor. Using any other device will damage the bearing at the top of the drive motor. Any evidence of damage will void the warranty.

7. After backing off the torque ring, remove the three Allen head screws.
8. Remove the three springs and spacers.
9. Remove the lower brake pad assembly and rotor. See NOTE.

NOTE: Observe the orientation of the rotor with respect to the brake assembly; the higher portion of the hub goes down toward the drive motor (see Figure 5-42 on page 5-67).

10. Remove the three Allen head screws holding the upper brake pad assembly to the piston.
11. Remove the upper brake pad assembly.
12. Using new brake pad assemblies and a new rotor assemble the brakes in the reverse of how you disassembled it.
13. For an approximate adjustment, turn the torque plate until the top is flush with the upper surface of the brake assembly. Make the final brake adjustment after it is installed on the truck. See "Brake Installation" on page 5-67.

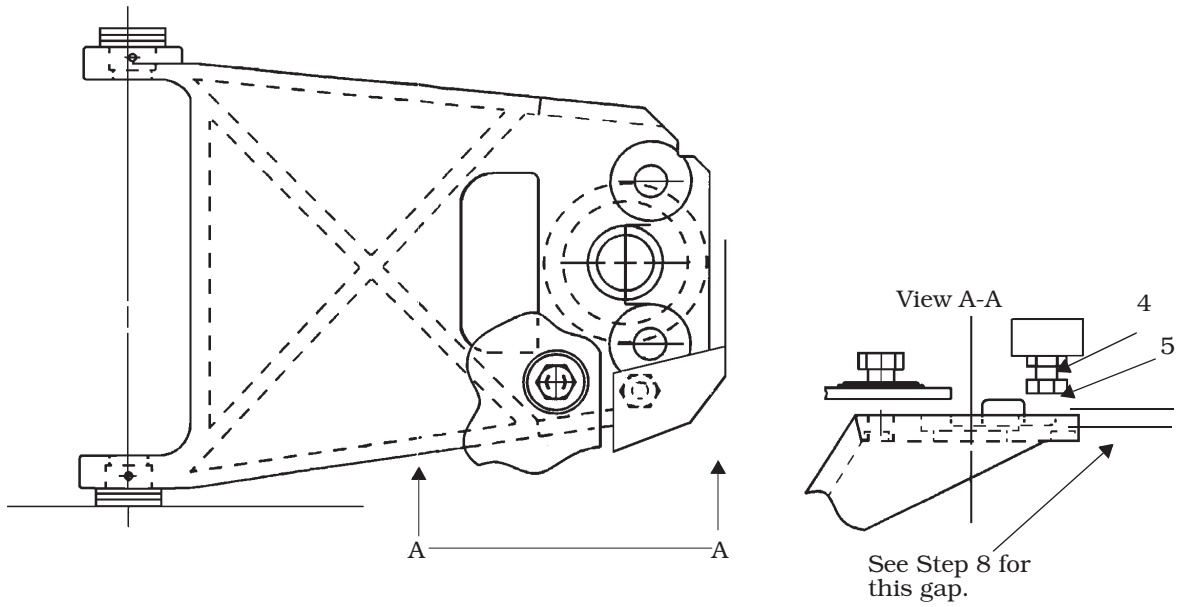


Figure 5-47: Stops Adjustment

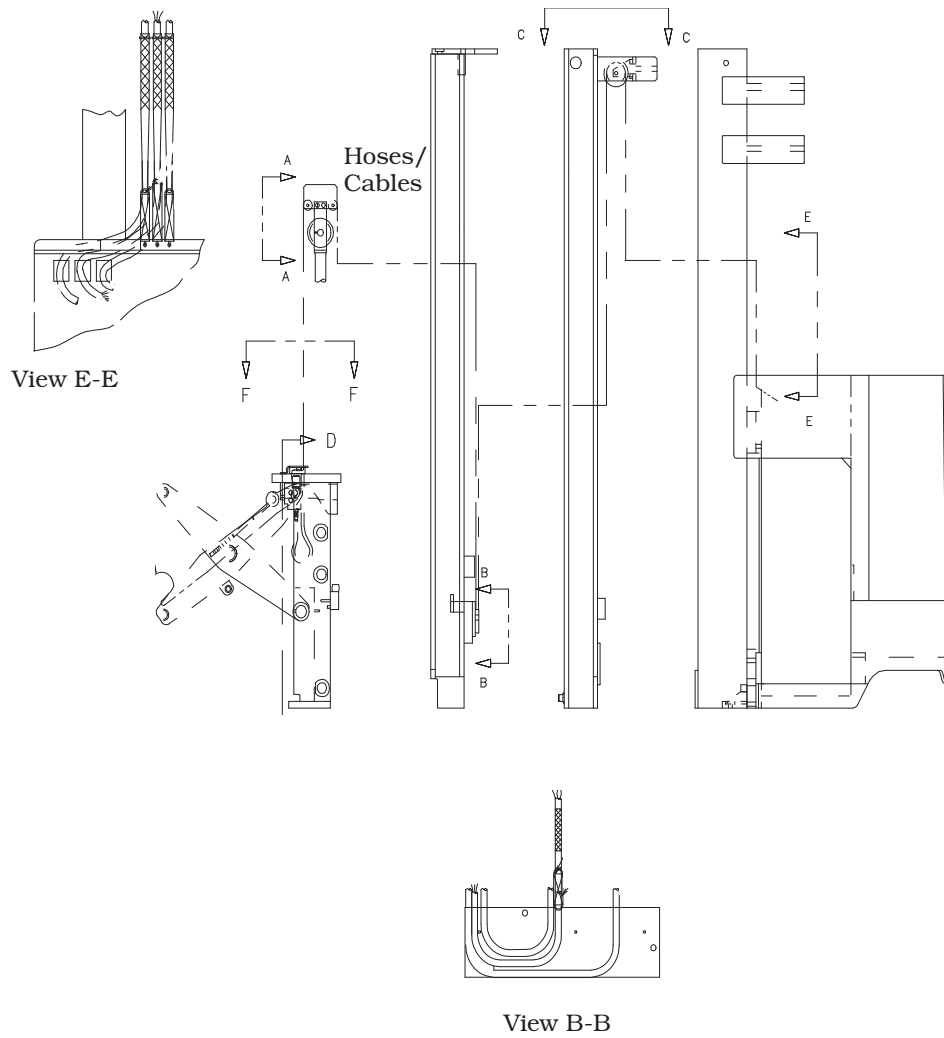


Figure 5-54: Hose Routing Detail

Adjusting the High Pressure Relief Valve

To adjust the high pressure relief valve, do the following:

1. Install a calibrated pressure gauge (3000 psi/20,682 kPa) in a test port.
2. Back-out the high pressure relief valve.
3. Place a rated load on the forks.
4. Start the lift system and turn the pressure relief screw clockwise until the carriage starts to lift.

Note the pressure required when the carriage elevates above the free lift stage (carriage and telescopic elevated).

5. Adjust the pressure relief valve to a pressure 100 - 300 psi (689.4 - 2068 kPa) greater than the values observed in step 4. This can be done by chaining the mast sections together or by adding more weight to the forks.
6. After the adjustment is complete, tighten the relief valve lock nut.
7. Check the lift system for proper operation.

Electrical

Testing Other Electrical Components

Table 6-2 gives the recommended test procedures for electrical components not previously covered. Use an ohmmeter (Fluke 8060A or equivalent) to make the checks.

The readings do not mean components checked will function properly in the system under different current and voltage conditions. The ohmmeter, however, will indicate most shorted or open circuited conditions.

▲ CAUTION

Disconnect the component from the truck for testing.

Component	Meter Setting	Connections	Readings
Relay Coil	R x 1	Between coil terminals	30-60 ohms.
Horn, Contactors, and Solenoids	R x 1		Ohmmeter should give a 10-15 ohm reading, depending on the component tested. <ul style="list-style-type: none"> • If the meter reads 0, the coil is shorted. • If the meter reading is over 100 ohms, the coil is open.
		R x 10,000	Between each coil terminal and truck frame.

Table 6-2: Component Test Procedures

EV100LX Component Tests

This section explains how to test the rectifiers and capacitor.

Testing the REC1, REC2, and REC5 Rectifiers

To test the REC1, REC2, and REC5 rectifiers, do the following:

1. Connect a continuity test light with the positive lead on the Cathode and the negative lead on the Anode. The light should not come on, if it does, replace the rectifier.
2. Reverse the leads and the light should still not come on.
3. Using a jumper wire connected to the positive lead, touch the gate terminal. The light should now come on and should stay on even when you disconnect the gate lead.
4. After the flow has been stopped, the rectifier should have shut off and the light will not come on until positive is applied to the gate again.

Testing the REC3 and REC4 Rectifiers

Since these are simple diodes, the REC3 and REC4 rectifiers can be checked with any of three test instruments.

EV100LX Codes and Tests

Separate codes and tests are required to troubleshoot the EV100LX Solid-State Control System and the Interface Card System. Each series of codes and tests are in this chapter.

The EV100LX codes and tests are displayed on the Operator Display; the Interface Card has a display built into the card. The Interface Card displays are not usually visible to the operator. Any codes associated with the traction and lift systems will be displayed on the Operator's Display. Any codes associated with lift/lower systems and general truck status will be displayed on the Interface Card.

Troubleshooting the EV100LX Solid-State Control System

Follow the instructions outlined in the status code instruction sheets (starting on page 6-31) to troubleshoot the EV100LX Solid-State Control System (Figure 6-1 on page 6-22).

Identifying a Malfunction

If the truck malfunctions, a status code is displayed on the Operator's Display. If the truck is not equipped with a display, plug in a handset into the logic card's plug Y location and read the status code.

With the status code number, follow the procedures outlined in the status code instruction sheets (starting on page 6-31) to determine the problem.

Replacing the Logic Card

Due to the interaction of the logic card with all truck functions, almost any status code or control fault could be caused by the logic card. After all other status code procedures have been followed and no problem is found, the logic card should then be replaced as the last option to correct the problem.

Wire Numbers

The wire labels on your truck should correspond to the labeling on the electrical schematic on page A-13.

Jacking the Truck

Before troubleshooting, jack up the wheels, disconnect the battery, and discharge the capacitor 1C. Reconnect the battery as needed for the specific check.

EV100LX Codes and Tests

System Voltage Drop vs. Function Setting

The following table lists the system voltage drop vs. the function setting:

Table 6-5: System Voltage Drop vs. Function Setting (Internal Resistance)

Function Setting	Voltage Drop	Function Setting	Voltage Drop
2	11.44	12	01.04
2	0.780	13	00.99
4	05.72	14	00.95
5	04.57	15	00.91
6	03.81	16	00.88
7	03.27	17	00.85
8	02.86	18	00.82
9	02.54	19	00.79
10	02.28	20	00.76
11	02.08	21	00.74

EV100LX Codes and Tests

Status Code - 04

Status Code - 04	Start switch input low after initial start up.
Memory Recall	Yes
Circuit	Traction - see Figure 6-8.
Symptom	Forward or reverse contactor will not pick up.
Possible Causes	<p>Forward or reverse directional request on initial start-up.</p> <ul style="list-style-type: none"> • Advance throttle to initiate start. Status code will change to 03 if reverse is requested or to 02 if forward is requested. If either code appears, return directional controller to neutral then select desired direction. • Relay K2 defective. • Open wire. • EV100 Control Card defective. <p>Excessive leakage from TB2 to battery negative.</p> <ul style="list-style-type: none"> • Check voltage at TB2 with key switch and deadman switch closed and directional switch in neutral. Voltage should be greater than 60%, remove wire and measure ohmic value from wire to SCR negative. Value should be less than 22k ohms. • Check for code on Interface Card.
Status Indication Criteria	Status Code 04 indicates that TB2 voltage is less than 60% of battery volts at initial start-up (seat switch closure).

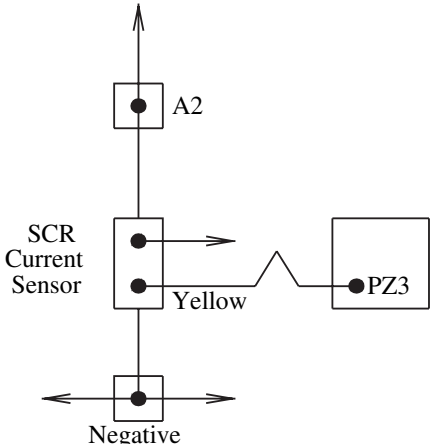
EV100LX Codes and Tests

Status Code - 09

Status Code - 09	Both forward and reverse directional switches are closed at the same time.
Memory Recall	No
Circuit	Traction - see Figure 6-13.
Symptom	Forward or reverse contactor will not pick up.
Possible Causes	<p>Forward or reverse directional switch is welded closed or mis-adjusted to be held close.</p> <ul style="list-style-type: none"> • Replace or adjust directional switches to ensure that they open when directional switch is returned to neutral. <p>Short circuit between battery positive and TB5 or TB6.</p> <ul style="list-style-type: none"> • Disconnect wires from TB5 and TB6. Check for short circuit to positive side of directional switch. <p>Defective card.</p> <ul style="list-style-type: none"> • Disconnect wires and measure voltage at TB5 and TB6. Voltage should be less than 60% of battery volts. <p>Defective EV100 Control Card.</p> <ul style="list-style-type: none"> • Check for code on Interface Card.
Status Indication Criteria	Status Code 09 indicates that TB5 and TB6 are greater than 60% of battery voltage at the same time.

EV100LX Codes and Tests

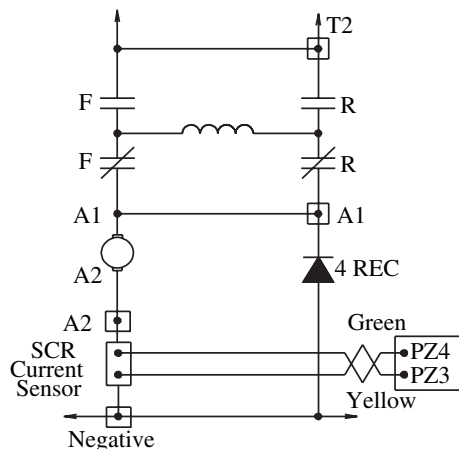
Status Code - 43

Status Code - 43	SCR motor current sensor input missing.
Memory Recall	No
Circuit	Traction
Symptom	Stall currents in SCR range are higher than normal and uncontrollable with C/L adjustment.
Possible Causes	<p>Open sensor wire circuit to PZ3.</p> <ul style="list-style-type: none"> Check for loose connection or broken wire (yellow wire) from current sensor to PZ3 on the logic card.
Status Indication Criteria	Status Code 43 indicates that voltage between PY7 and negative is less than 0.84 volts with no current flowing in the motor circuit.
 <p>The diagram illustrates the electrical connection for the SCR Current Sensor. It features three terminals: A2 at the top, Negative at the bottom, and PZ3 on the right. The SCR Current Sensor is connected to A2 and Negative. A yellow wire connects the sensor to PZ3. Arrows indicate current flow: upwards from A2, downwards to Negative, and from the sensor to PZ3.</p>	

EV100LX Codes and Tests

Status Code - 53

Status Code - 53	REC 1 fails to turn off during plugging cycle.
Memory Recall	Yes
Circuit	Traction
Symptom	Forward or reverse contactor opens, closes, and then opens again and can only be closed by opening and closing the key switch.
Possible Causes	<p>REC 1 turn-off failure not related to plugging.</p> <ul style="list-style-type: none"> Stall truck in both directions and note any status codes displayed that more closely define the failure mode. Troubleshoot per new status code. <p>REC 1 turn-off related to plugging.</p> <ul style="list-style-type: none"> check REC 4 circuit for open REC 4, loose or open cable/bus connections. Check current sensor for loose or open connection in power circuit. Check yellow and green wire from sensor to logic card for open and loose connection. <p>Defective motor circuit.</p> <ul style="list-style-type: none"> Check motor circuit for open or loose connections. Check motor brushes for proper seating. <p>F or R contactor power bouncing open.</p> <ul style="list-style-type: none"> Ensure that F and R contactor does not bounce open during truck operation (i.e., traveling over speed bumps and dock plates).
Status Indication Criteria	Status Code 53 is displayed when capacitor volts exceed 225 volts and motor current is greater than 300 amps.



Troubleshooting the Interface Card System

Code 5

Code Title	Lower Request
Reason	The system has detected a Lower command.
System Response	<ol style="list-style-type: none"> 1. Interface Card Display:5 2. System Response: Load Holding Solenoid is activated.
How to Clear	None
Corrective Actions and Checks	None

Code 7

Code Title	Throttle Potentiometer Out Of Range
Reason	The system has detected that the voltage from potentiometer VR1 is greater than 4.9 volts or less than 0.1 volts.
System Response	<ol style="list-style-type: none"> 1. Interface Card Display: 7 2. System Response: Throttle is disabled. Truck coasts to a stop.
How to Clear	Turn key switch OFF/ON.
Corrective Actions and Checks	<ol style="list-style-type: none"> 1. Try moving the throttle to a different position to see if the code clears. If the problem occurs repeatedly, have a technician check the output of VR1 through the entire range of handle movement. If the voltage is erratic, replace VR1. 2. Check for continuity, loose connections or shorted wires between VR1 and JPS1 on the Interface Card. 3. Check for +5 volts at JPS1-9 on the Interface Card with respect to TP4 on the contactor panel. If the voltage is not approximately +5 volts, replace the Interface Card. <p>Remember to run Learn if VR1, firmware or the Interface Card is replaced.</p>

Troubleshooting the Interface Card

2. Check the contactor coils for opens or shorts.
3. Check the wiring between the GE EV100 controller and the Interface Card for continuity.
4. Check the voltage at TB1 on the GE EV100 controller. With the handle full forward or reverse, voltage should be 0.5 volts (the voltage in the neutral position should be 3.5-3.65 and changes in steps as a faster speed is requested). If voltage is not as specified:
 - a. Check the voltage at TB5 and TB6; B+ should be present on one location. If not check the wiring.
 - b. Disconnect wire from TB1 on the GE controller. Connect the meter to the end of the disconnected wire. If the voltage readings are still not correct, check the throttle potentiometer and wiring.
 - c. If the throttle potentiometer and wiring check OK, replace the Interface Card.
 - d. If the problem is still not corrected, replace the GE EV100 controller.

Remember to run Learn if the firmware or Interface Card is replaced.

Decimal Equivalent Chart

Decimal Equivalent Chart

Table A-3: Decimal Equivalent Chart

4ths	8ths	16ths	32nds	64ths	To 3 Places	To 2 Places	MM Equivalent
				1/64	.016	.02	.397
			1/32		.031	.03	.794
				3/64	.047	.05	1.191
		1/16			.062	.06	1.587
				5/64	.078	.08	1.984
			3/32		.094	.09	2.381
				7/64	.109	.11	2.778
	1/8				.125	.12	3.175
				9/64	.141	.14	3.572
			5/32		.156	.16	3.969
				11/64	.172	.17	4.366
		3/16			.188	.19	4.762
				13/64	.203	.20	5.159
			7/32		.219	.22	5.556
				15/64	.234	.23	5.953
1/4					.250	.25	6.350
				17/64	.266	.27	6.747
			9/32		.281	.28	7.144
				19/64	.297	.30	7.540
		5/16			.312	.31	7.937
				21/64	.328	.33	8.334
			11/32		.344	.34	8.731
				23/64	.359	.36	9.128
	3/8				.375	.38	9.525
				25/64	.391	.39	9.922
			13/32		.406	.41	10.319
				27/64	.422	.42	10.716
		7/16			.438	.44	11.112
				29/64	.453	.45	11.509
			15/32		.469	.47	11.906
				31/64	.484	.48	12.303
1/2					.500	.50	12.700

Hydraulic Schematic

Hydraulic Schematic

The following schematic shows the hydraulic system.

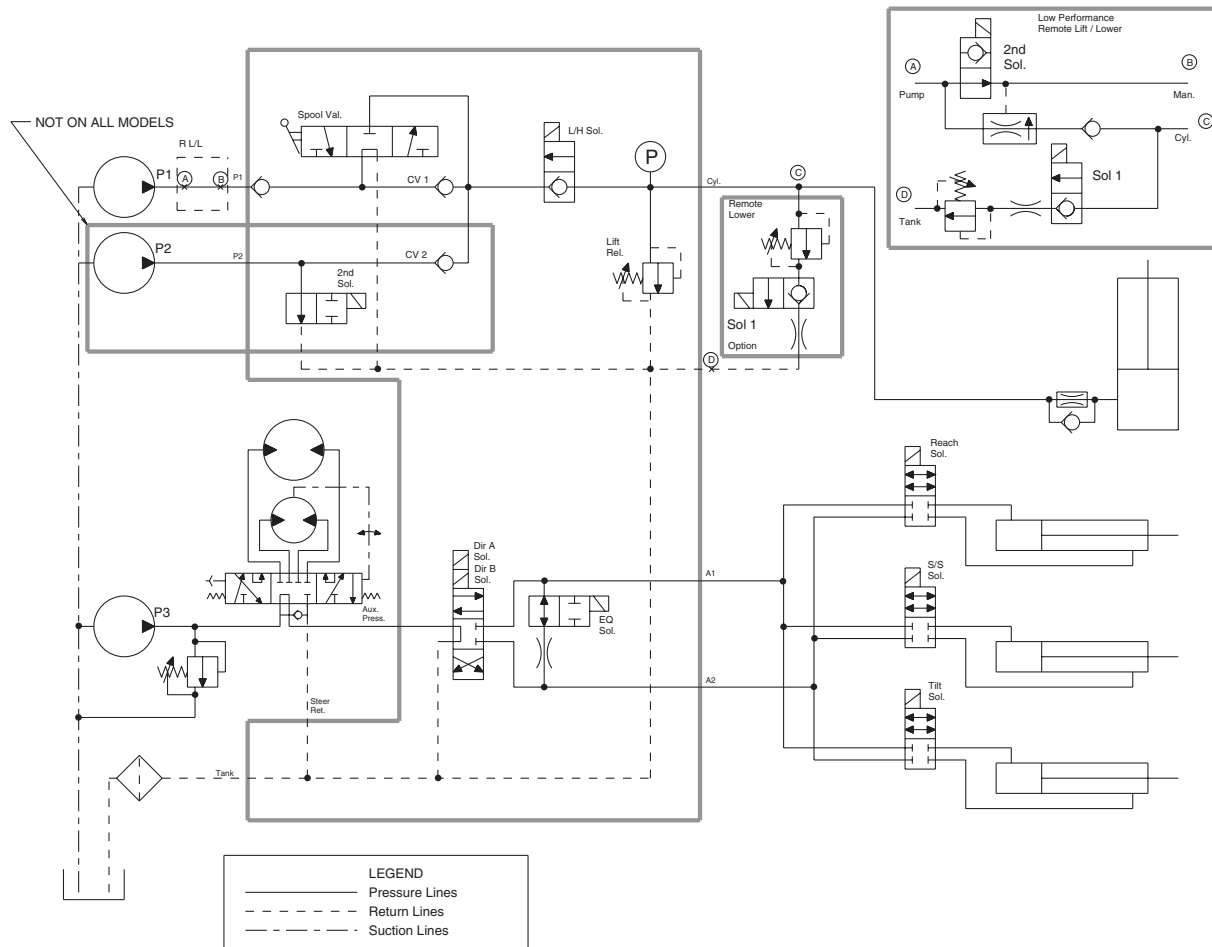


Figure A-5: Hydraulic Schematic

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