

INTRODUCTION

GENERAL

This section has the description, checks, adjustments and repairs of the control cards for the EV-100 **LX/LXT/LXP/LXM** and the EV-200 **LX/LXT/LXP** motor controllers. The **LX/LXT/LXP/LXM** is the nomenclature to identify the controllers that have the “**LX**” series of diagnostic control cards. There is a description of the hand set and how it is used to check and adjust the control cards. A description and the replacement of the instrument panel display is also included.

The operation and most components of these controllers are basically the same as the EV-100 and EV-200 motor controllers. All of the power components used with this EV100/200 “**LX**” series are the same as used with other EV-100/200 motor controllers. The control cards are the major differences. The “**LX**” series of diagnostic control cards have the basic control features of the other EV-100/200 cards and some additional features. Not all control features are available on all of the different types of control cards of the series. Some control cards can have multiple features. These features include the following:

- Static Return to Off (SRO)(includes Start Sw.)
- Pulse Monitor Trip (PMT)(Traction Only)
- Pedal Position Plugging
- Field Weakening (FW)
- Regenerative Braking (RB)
- Creep Speed (C/S)
- Controlled Acceleration (C/A)
- Current Limit (C/L)
- 1A Timed Pick-Up (1A P.U.)
- 1A Drop Out (1A D.O.)
- 1A Thermal Hold-Off
- Ramp Start
- Full Power Transition
- Stored Status Code (Diagnostics)

DIAGNOSTIC CONTROL CARD

The control card is a printed circuit board with electronic parts in a plastic case. The control card has four

- Speed Limits
- Internal Resistance Compensation
- Steer Pump Time Delay
- Pump Motor Control (PX card only)

Some of the differences between the EV-100/200 control cards and the EV100/200 “**LX**” series of diagnostic control cards are given in the following list:

- Contactor coil drivers within the control card
- Diagnostics (automatic tests or checks)
- Hourmeter function (control card display for the instrument panel is not installed on all units)
- Battery Discharge Indicator function (LXT card only) (control card display for the instrument panel is not installed on all units)

The “**LX**” series of controllers have an output to operate a digital display with four digits. A digital display unit (instrument panel display) is available for the instrument panel of some lift trucks. A hand set with a digital display is also available. All of the control settings are set using the hand set. There are NO manual adjustments (trim pots) on these control cards.

The basic (motor speed and direction) operation of the EV-100/200 “**LX**” series of motor controllers is the same as the EV-100 controller. For an operational description of the traction or pump motor controllers, see the section **EV-100 MOTOR CONTROLLER, 2200 SRM 287**. For repairs, see the sections **EV-100 MOTOR CONTROLLER, 2200 SRM 288** or **EV-200 MOTOR CONTROLLER, 2200 SRM 414**. These motor controllers are made for Hyster Company by the General Electric Company.

Hyster electric lift trucks use a two-wire electrical system. There is no common ground connection through the frame. Both the positive supply and the negative return current flows are through wires and cables. There must be a minimum resistance of 50 000 ohms between the electrical circuits and the frame of the lift truck.

DESCRIPTION

plug connectors and a terminal strip with six screw connections. The control wires of the plugs and terminal

strips connect the control card to the lift truck circuits and the other circuits of the motor controller. The screw connections of the terminal strips are inputs from control components of the lift truck. The plugs for the control card are plug A, plug B, plug Y and plug Z. See FIGURE 3. Plugs A and B are six pin plugs. The purpose of the wires connected to these plugs can be different for different control cards. Plug Y is a 14 pin plug that connects the instrument panel display or hand set to

the control card. Some pins of plug Y are also used to connect the control card to the Truck Management Module or other auxiliary control cards. Plug Z is also a 14 pin plug that connects the oscillator part of the control card to other circuit components. The 14 pins on plug Z have the same functions as the pins of other EV-100/200 control cards. The pin numbers are also the same, for the same function, for both the EV100/200 “LX” series and the other EV-100/200 control cards.

TABLE 1. STATUS CODES LIST

STATUS CODE	DESCRIPTION	STATUS CODE	DESCRIPTION
	CARD INPUTS		REGENERATIVE BRAKING
BLANK	No input voltage to card and/or display	-70	Current sensor input missing (yellow wire)
-01	No seat switch input	-71	Current sensor input missing (green wire)
-02	FWD switch closed on initial start	-72	Regenerative braking contactor does not energize
-03	REV switch closed on initial start	-73	Regenerative braking contactor does not deenergize or deenergizes slowly
-04	Start switch input low after start	-74	Regenerative braking contactor energizes too slowly
-05	Start or brake switch did not close	-75	SCR 1 does not turn off during regenerative braking
-06	Accelerator depressed – no direction selected	-76	C1 voltage too high during regenerative braking
-07	Accelerator input voltage too high		TRUCK MANAGEMENT*
-08	Accelerator input voltage too low or power to control card after key sw. ON	-90	Traction Motor Over Temperature*
-09	Both FWD and REV switches closed at same time	-93	Pump Motor Over Temperature*
-15	Battery volts too low	-94	Traction Brush Wear*
-16	Battery volts too high	-95	Pump Motor Brush Wear*
-17	Wrong card type selection		PUMP CONTROL
	CONTACTOR PANEL	-117	Wrong card type selection
-23	Forward or reverse contactor coil current low	-123	Pump contactor coil current low
-24	Voltage at T2 too high	-124	Voltage at T2 too high
-25	1A contactor does not open or opens too slowly	-141	Open thermal protector or control over temperature
-26	Shorted coil driver for RB, SP or FW contactor	-142	Motor sensor input missing (green wire)
	SCR PANEL	-143	Motor sensor input missing (yellow wire)
-41	Open thermal protector or control over temperature	-144	SCR 1 did not turn off correctly
-42	Motor sensor input missing (green wire)	-145	SCR 1 did not turn on correctly
-43	Motor sensor input missing (yellow wire)	-146	“Look ahead” (T2 volts high)
-44	SCR 1 did not turn off correctly	-147	SCR 2 does not turn on correctly
-45	SCR 1 did not turn on correctly	-148	“Look ahead” (T2 volts low)
-46	“Look ahead” (T2 volts high)	-149	SCR 5 does not turn on correctly
-47	SCR 2 does not turn on correctly	-150	C1 volts low
-48	“Look ahead” (T2 volts low)	-151	C1 volts high with high motor current
-49	SCR 5 does not turn on correctly	-152	C1 volts high with low motor current
-50	C1 volts low	-154	Shorted #2 PUMP driver
-51	C1 volts high with high motor current	-157	Current sensor output voltage polarity check
-52	C1 volts high with low motor current		
-53	SCR 1 does not turn off during plugging		
-54	Shorted F, R or 1A driver		
-57	Current sensor output voltage polarity check		
<p>* Not used on all models of lift trucks. Status Codes in this group will flash on the display. NOTE: Motor speed is decreased with a Motor Over Temperature code at the normal function setting.</p>			

The diagnostics circuits of the control card check the static and operating conditions of the control and power circuits for the motor. The control card will show a status code on the display connected to plug Y if the diagnostic circuits find a condition that is not correct. The display connections are at plug Y of the control card. Some lift trucks can have a instrument panel display that will show the status codes from the traction and pump control cards.

Status Codes (See Table 1)

The Status Codes are code numbers for different symptoms that the control card can sense. The control card will show this code number on the digital display of the instrument panel display (optional on some units) or the hand set. The control card will flash the status code on the display. Every third display will show the battery charge instead of the status code.

The control card senses the following incorrect inputs: inputs that are too high or too low, inputs that have the wrong polarity, inputs in the wrong sequence or correct inputs that occur at the wrong time.

NOTE: A status code display does not always mean that there is a malfunction. A temporary operating condition can cause a status code display.

The status codes all have a (-) before the numbers. If the battery is disconnected, the “-” will be missing on the hand set display when a battery is connected again. If a status code number is flashing on the digital display, checks and adjustments cannot be done. Refer to Table 1 and Troubleshooting to find and correct the malfunction. There are no checks or adjustments for the status codes. These code numbers are only codes to help identify a possible malfunction. Table 1 has a short description of the different status codes.

TRUBLESHOOTING in this section has a table for each status code. The tables have a more complete description of the status code, the circuit that has the incorrect input, the symptom and the possible causes.

HAND SET

The hand set is a tool with many functions. The tool can be used ONLY with the EV-100 or 200 “LX” series SCR motor controllers. The hand set is used to monitor traction or pump motor functions, show status codes (possible fault symptoms) and adjust the settings of the control cards. The hand set **must** be used to set the values for the control card functions. It consists of a Light

Emitting Diode (LED) display, a keyboard for data entry and an adjustment knob for changing function values. See FIGURE 1. The purpose of the hand set is to allow **Authorized Personnel** to monitor and adjust the following:

- Monitor system status codes for both traction and pump SCR systems
- Monitor the intermittent status codes
- Monitor the state of charge of the battery on systems with LXT control cards
- Monitor the hourmeter readings on the traction and pump SCR systems

NOTE: These first four function values above will also show on the instrument panel display.

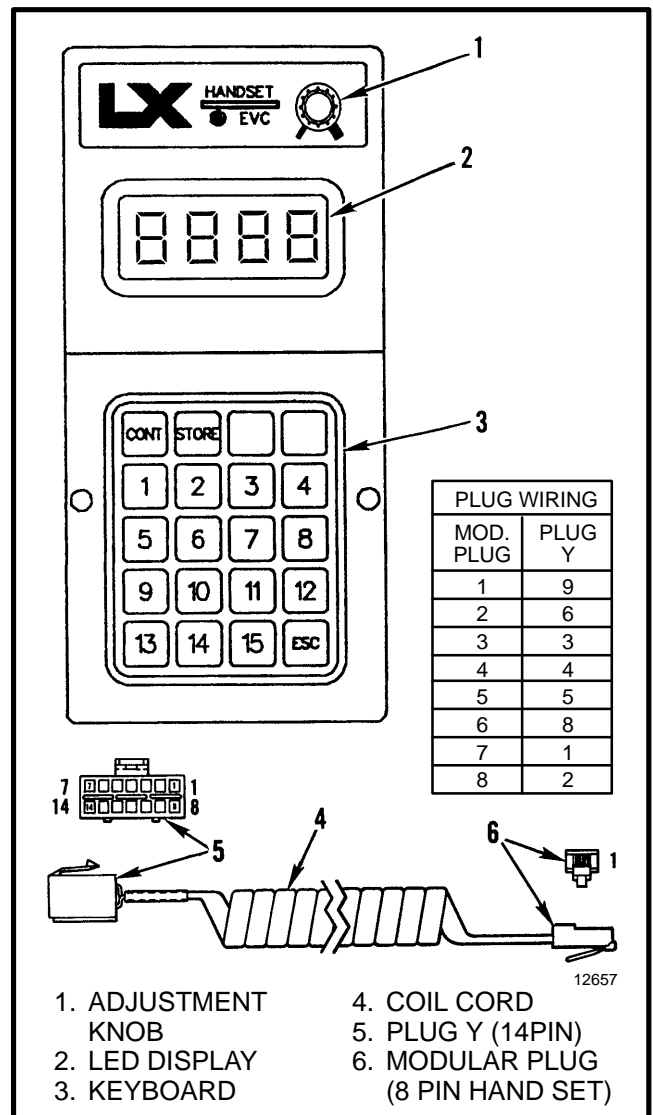


FIGURE 1. HAND SET

- Monitor or adjust the following control functions:
 - Creep Speed
 - Controlled Acceleration and 1A Time
 - Current Limit
 - Steering pump time delay and define signal input (seat sw. or directional sw.)
 - Plugging distance (Current)
 - Pedal position plug range or disable
 - 1A drop out current or disable
 - Field Weakening drop out
 - Field Weakening pick up
 - Regenerative Braking current limit
 - Regenerative Braking drop out
 - Speed limit points (SL1, SL2 and SL3)
 - Internal resistance compensation for battery state of charge indication
 - Battery voltage (36/48V is auto ranging)
- Selection of type of card operation:
 - Traction with Field Weakening
 - Traction with speed limits
 - Traction with Regenerative Braking and Field Weakening
 - High or low current limit for all of the above

NOTE: The vehicle will operate with the hand set connected, however, the adjustment knob **MUST be set fully clockwise** to make sure the control can operate at top speed.

INSTRUMENT PANEL DISPLAY (Optional On Some Units)

The instrument panel display, for these control cards, is a display unit with four digits and three indicators. See FIGURE 2. The indicators show which function value is displayed by the digits. The unit is available for the instrument panel of some lift trucks. Not all functions are available on all lift truck models. The following functions are available: Battery Indicator, Status Codes, Traction Hourmeter and Pump Hourmeter.

The digits show the operating hours when the function indicator (FIGURE 2.) on the left-hand side is ON. When the middle indicator is ON, the digits show the

charge condition of the battery. The right-hand indicator is ON when the digits show the status code.

Hourmeter Functions

The hourmeter function of the instrument panel display is controlled by the EV-100/200 “**LX**” series control card. There can be a display for the operating time of the traction circuit. On some units, there can also be a display for the operating time of the pump circuit. Only those units that have the EV-100 “**LX**” series pump control card can have the optional pump hourmeter function.

The instrument panel display shows the operating time of 0000 to 9999 hours. The traction time is shown for four seconds after the lift truck has been operating and the key is turned to the **OFF** position. If there is a pump hourmeter, the pump time will now be shown for another four seconds.

Battery Indicator Function

This battery indicator uses the traction control shunt to measure the current during operation. This current and battery voltage are checked at the same time for an accurate reading of battery voltage with a load (during use). This method is much more accurate than other battery indicators used on earlier lift trucks. This method can also make operation of the lift truck different when the battery is low or a different battery is connected. This method allows more usage of the battery.

The battery indicator function shows the battery charge represented by numbers between 0 and 100. The digital display will flash when the digital display reads 19. At a display of 9 (80% discharged), the control will disable the lift pump circuit. After the circuit has disabled the lift pump, charge or change the battery.

The control also checks the battery voltage each time a battery is connected. The traction control will prevent lift truck operation if the battery voltage is not correct as set by traction function 15. A status code of -16 (too high) or -15 (too low) will show on the instrument panel display. The battery can have a voltage that is too high or too low. A battery with the correct voltage can also be over discharged from use or other reasons and have a voltage that is less than the minimum of the voltage range.

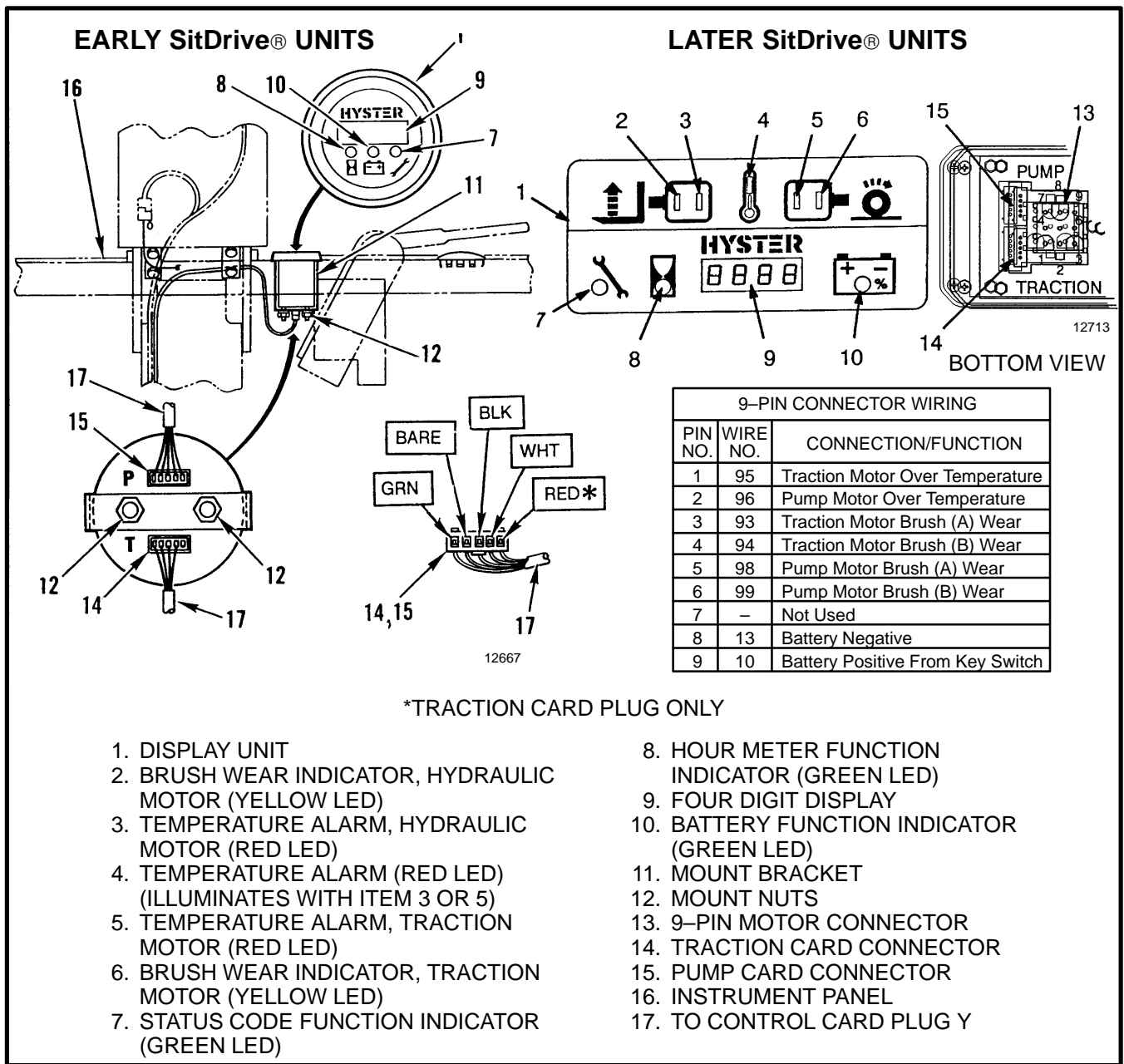


FIGURE 2. INSTRUMENT PANEL DISPLAY

Batteries that have different amp hour ratings or are of different ages can sometimes be used in the same lift truck. It can be necessary to adjust traction function 14 so that the weakest battery is not damaged. Follow the procedure for adjusting traction function 14 in the Checks And Adjustments.

CONTROL CARD CONNECTIONS

All connections between the control card or control cards and any other electrical component are made at the

edge of the card. See FIGURE 3. These connections are made at the four connector plugs: Plug A (PA 1 through 6), Plug B (PB 1 through 6), Plug Y (PY 1 through 14) or Plug Z (PZ 1 through 14). There are also six screw terminals for connections (TB 1 through 6).

Plugs A and B and the screw terminals have some of the same function as on the earlier EV-100 and EV-200 control cards. The Plug Z has basically the same connections as the Plug C on the earlier (before "LX") control

cards. Plug Y is an additional plug and has the connections for the diagnostics and digital display signals.

Tables 2 through 5 show the connections for the single

motor control card, the pump control card and the dual motor control card.

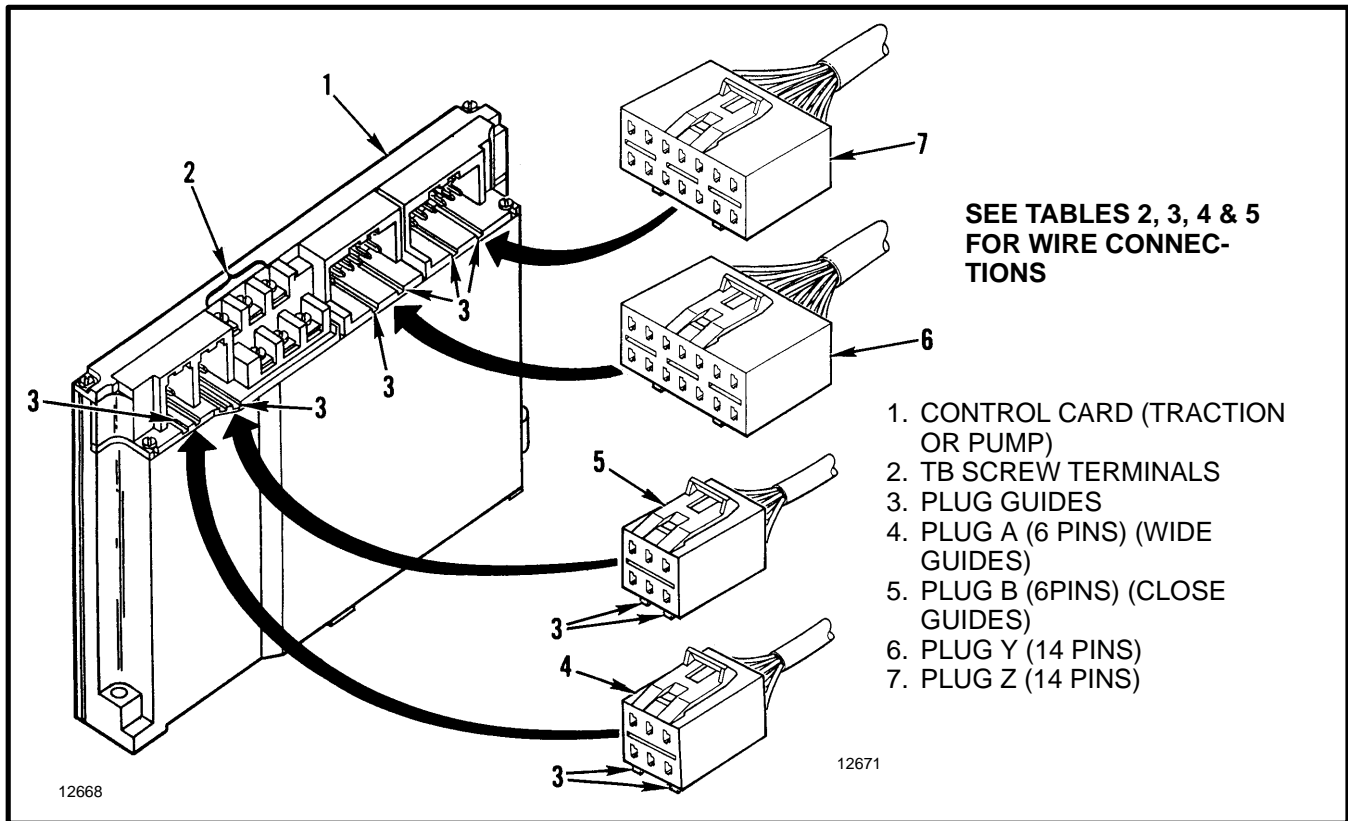


FIGURE 3. CONTROL CARD CONNECTIONS

TABLE 2. TERMINAL AND PLUG WIRE CONNECTIONS FOR SINGLE MOTOR TRACTION CIRCUIT

PLUG OR TERM. NO.	WIRE	FUNCTION
PA1 PA2 PA3 PA4 PA5 PA6	– 50 7 * * *	Not used. BDI pump interrupt signal. Auxiliary hourmeter input. Not used with standard control. Speed Limit 2 input or regen. sensor 2 (YEL). Not used with standard control. Speed Limit 3 input or regen. sensor 2 (GRN). Not used with standard control. Speed Limit 1 input or motor A2 input (w/regen.).
PB1 PB2 PB3 PB4 PB5 PB6	37 31 60 27 23 41	Field Weakening contactor coil driver. Regenerative Braking contactor coil driver (with regenerative braking only). Steering pump motor coil driver. Forward contactor coil driver. Reverse contactor coil driver. 1A contactor coil driver.
TB1 TB2 TB3 TB4 TB5 TB6	29 15A 7 10 6 8	Accelerator potentiometer input. Start switch input. Seat switch input. Voltage input from timer circuit. Key switch input. Battery voltage supply from key switch. FORWARD direction switch input. REVERSE direction switch input.
PY1 PY2 PY3 PY4 PY5 PY6 PY7 PY8 PY9 PY10 PY11 PY12 PY13 PY14	WHT BLK GRN BAR E RED 90 91 92	Instrument panel display number 4 input. Instrument panel display number 3 input. Instrument panel display number 1 input. Instrument panel display number 2 input. Instrument panel display number 5 input. Not used. Not used. Truck Management Module (TMM) 1A 9. Not used on all models of lift trucks. Truck Management Module (TMM) 1A 7. Not used on all models of lift trucks. Truck Management Module (TMM) 1A 2. Not used on all models of lift trucks. Not used. Not used. Not used. Not used.
PZ1 PZ2 PZ3 PZ4 PZ5 PZ6 PZ7 PZ8 PZ9 PZ10 PZ11 PZ12 PZ13 PZ14	BLK BRN YEL GRN GRY – WHT BLU/WHT BLU WHT/RED RED WHT/PUR PUR ORN	Signal wire from SCR 1 thermal protector. Battery negative. Signal wire from current sensor. Signal wire from current sensor. Signal wire from SCR 1 thermal protector. Not used. Battery positive. Signal wire to SCR 1 gate. Signal wire from SCR 1 cathode. Signal wire to SCR 2 gate. Connection between filter for SCR 2 and control card. Signal wire to SCR 5 gate. Connection between filter for SCR 5 and control card. Sensor wire for voltage check across capacitor C1.

* See the **DIAGRAMS** SRM section for your lift truck model for the correct wire number.

TABLE 3. TERMINAL AND PLUG WIRE CONNECTIONS FOR SINGLE MOTOR TRACTION CIRCUIT WITH SCR PUMP MOTOR CONTROLLER

PLUG OR TERM. NO.	WIRE	FUNCTION
PA1 PA2 PA3 PA4 PA5 PA6	– 50 7 22 21 17	Not used Status code 93 input. Status code 90 input. Status code 94 input. Status code 94 input. Status code 91 input.
PB1 PB2 PB3 PB4 PB5 PB6	37 31 60 27 23 41	Status code 95 input. Status code 95 input. Battery Discharge Indicator enable signal input. Pump (PMT) coil driver. 1A coil driver. Status code 92 input.
TB1 TB2 TB3 TB4 TB5 TB6	29 15A 7 10 6 8	Accelerator potentiometer input. SL1 input. SL2 input Key switch input. Battery voltage supply from key switch. SL3 input. SL4 input.
PY1 PY2 PY3 PY4 PY5 PY6 PY7 PY8 PY9 PY10 PY11 PY12 PY13 PY14	WHT BLK GRN BARE RED – – 90 91 92 – – – –	Instrument panel display number 4 input. Instrument panel display number 3 input. Instrument panel display number 1 input. Instrument panel display number 2 input. Instrument panel display number 5 input. Not used. Not used. Signal wire between Traction and Pump Cards. From Pump Card PY12. Signal wire between Traction and Pump Cards. From Pump Card PY11. Signal wire between Traction and Pump Cards. From Pump Card PY10. Not used. Not used. Not used. Not used.
PZ1 PZ2 PZ3 PZ4 PZ5 PZ6 PZ7 PZ8 PZ9 PZ10 PZ11 PZ12 PZ13 PZ14	BLK BRN YEL GRN GRY – WHT BLU/WHT BLU WHT/RED RED WHT/PUR PUR ORN	Signal wire from SCR 1 thermal protector. Battery negative. Signal wire from current sensor. Signal wire from current sensor. Signal wire from SCR 1 thermal protector. Not used at Traction Card. No color or number shown for Pump Card. Battery positive. Signal wire to SCR 1 gate. Signal wire from SCR 1 cathode. Signal wire to SCR 2 gate. Connection between filter for SCR 2 and control card. Signal wire to SCR 5 gate. Connection between filter for SCR 5 and control card. Sensor wire for voltage check across capacitor C1.

TABLE 4. TERMINAL AND PLUG WIRE CONNECTIONS FOR
SCR PUMP MOTOR CONTROLLER

PLUG OR TERM. NO.	WIRE	FUNCTION
PA1	–	Not used
PA2	96	Status code 93 input.
PA3	95	Status code 90 input.
PA4	93	Status code 94 input.
PA5	94	Status code 94 input.
PA6	101	Status code 91 input.
PB1	98	Status code 95 input.
PB2	99	Status code 95 input.
PB3	50	Battery Discharge Indicator enable signal input.
PB4	27	Pump (PMT) coil driver.
PB5	–	1A coil driver (Not used).
PB6	102	Status code 92 input.
TB1	–	Not used.
TB2	51	SL1 input.
TB3	52	SL2 input
TB4	10	Key switch input. Battery voltage supply from key switch.
TB5	55	SL3 input.
TB6	53	SL4 input.
PY1	WHT	Instrument panel display number 4 input.
PY2	BLK	Instrument panel display number 3 input.
PY3	GRN	Instrument panel display number 1 input.
PY4	BARE	Instrument panel display number 2 input.
PY5	–	Not used.
PY6	–	Not used.
PY7	–	Not used.
PY8	–	Not used.
PY9	–	Not used.
PY10	92	Signal wire between Traction and Pump Cards. To Traction Card PY10
PY11	91	Signal wire between Traction and Pump Cards. To Traction Card PY9.
PY12	90	Signal wire between Traction and Pump Cards. To Traction Card PY8.
PY13	–	Not used.
PY14	–	Not used.
PZ1	BLK	Signal wire from SCR 1 thermal protector.
PZ2	BRN	Battery negative.
PZ3	YEL	Signal wire from current sensor.
PZ4	GRN	Signal wire from current sensor.
PZ5	GRY	Signal wire from SCR 1 thermal protector.
PZ6	–	Not used at Traction Card. No color or number shown for Pump Card.
PZ7	WHT	Battery positive.
PZ8	BLU/WHT	Signal wire to SCR 1 gate.
PZ9	BLU	Signal wire from SCR 1 cathode.
PZ10	WHT/RED	Signal wire to SCR 2 gate.
PZ11	RED	Connection between filter for SCR 2 and control card.
PZ12	WHT/PUR	Signal wire to SCR 5 gate.
PZ13	PUR	Connection between filter for SCR 5 and control card.
PZ14	ORN	Sensor wire for voltage check across capacitor C1.

TABLE 5. TERMINAL AND PLUG WIRE CONNECTIONS FOR
DUAL MOTOR CONTROLLER

PLUG OR TERM. NO.	WIRE	FUNCTION
PA1 PA2 PA3 PA4 PA5 PA6	* — * * * *	Power steering contactor coil driver. Not used. Auxiliary hourmeter input. Inside motor reverse switching signal. Right motor drop out switching signal. Left motor drop out switching signal.
PB1 PB2 PB3 PB4 PB5 PB6	* * * * * *	Forward right motor contactor coil driver. Forward left motor contactor coil driver. Reverse right motor contactor coil driver. Reverse left motor contactor coil driver. 1A contactor coil driver. D contactor coil driver.
TB1 TB2 TB3 TB4 TB5 TB6	* * * * * *	Accelerator potentiometer input. Start switch input. Seat switch input. Voltage input from timer circuit. Key switch input. Battery voltage supply from key switch. FORWARD direction switch input. REVERSE direction switch input.
PY1 PY2 PY3 PY4 PY5 PY6 PY7 PY8 PY9 PY10 PY11 PY12 PY13 PY14		Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used. Not used.
PZ1 PZ2 PZ3 PZ4 PZ5 PZ6 PZ7 PZ8 PZ9 PZ10 PZ11 PZ12 PZ13 PZ14	BLK BRN YEL GRN GRY — WHT BLU/WHT BLU WHT/RED RED WHT/PUR PUR ORN	Signal wire from SCR 1 thermal protector. Battery negative. Signal wire from current sensor. Signal wire from current sensor. Signal wire from SCR 1 thermal protector. Not used. Battery positive. Signal wire to SCR 1 gate. Signal wire from SCR 1 cathode. Signal wire to SCR 2 gate. Connection between filter for SCR 2 and control card. Signal wire to SCR 5 gate. Connection between filter for SCR 5 and control card. Sensor wire for voltage check across capacitor C1.

* See the **DIAGRAMS** SRM section for your lift truck model for the correct wire number.

CHECKS AND ADJUSTMENTS

GENERAL

WARNING

When a replacement card is installed, it must be adjusted using the procedures and settings shown in this section. Do NOT operate the lift truck before checking and adjusting the setting for each function. Setting numbers that are not correct for your lift truck can damage the electrical system and cause the truck to operate differently than normal. This different operation of the truck can result in personal injury.

If function settings are changed, tell all operators of the lift truck that the truck can operate differently now.

This section has the control card checks and adjustments that can be made using the hand set. The control card checks and adjustments are usually made with the control card installed in the lift truck. Bench checks and adjustments can also be made with the control card connected as shown in FIGURE 4. The checks show the stored setting numbers that have been stored for the different control card functions. This section also includes a description of each of the different functions. The function settings can be adjusted using the adjustment knob of the hand set. See FIGURE 1.

There are no checks or adjustments in this section for the other traction control components. To check, adjust or repair these other components, see the sections **EV-100 MOTOR CONTROLLER, 2200 SRM 288** or **EV-200 MOTOR CONTROLLER, 2200 SRM 414**.

Function Codes

The Function Codes are code numbers for the different functions that can be set for the “LX” series control cards. The hand set **must** be used to adjust the settings for the control card functions. There is a description of the function settings for the different control cards in CHECKING AND ADJUSTING FUNCTION SETTINGS of this section. Table 6 also has a list and a short description of the different functions. Tables 7 through 19 have the correct setting numbers for the different functions on each control card.

TABLE 6. FUNCTION CODES

FUNCTION CODE	DESCRIPTION
FOR CARDS – EV-100/200 LXT & LX	
1	Stored Status Code
2	Creep Speed
3	Controlled Acceleration and 1A Time
4	Current Limit
5	Plugging Distance (Current)
6	1A Drop Out Current
7	Field Weakening Pick Up (Current)
8	Field Weakening Drop Out (Current)
9	Regen. Braking Current Limit
10	Regen. Start
11	Speed Limit 1 (SL1)
12	Speed Limit 2 (SL2)
13	Speed Limit 3 (SL3)
14	Internal Resistance Compensation BDI
15	Battery Volts – BDI
16	Pedal Position Plug
17	Card Type Selection – Nominal Battery Volts
18	Steer Pump Time Delay
FOR CARD – EV-100 LXM	
1	Stored Status Code
2	Creep Speed
3	Controlled Acceleration and 1A Time
4	Current Limit
5	Plugging Distance (Current)
6	1A Drop Out Current
7	PA4 Input Switch Function Selection
11	Speed Limit 1 (PA5 or PA6)
12	Speed Limit 2 (PA4)
13	Speed Limit 3
14	Internal Resistance Compensation BDI
15	Battery Volts
16	Pedal Position Plug
17	Card Type Selection – Nominal Battery Volts
18	Steer Pump Time Delay
FOR CARD – EV100/200 LXP	
1	Stored Status Code
2	Internal Resistance Compensation Start (Current)
3	Controlled Acceleration And 1A Time
4	Current Limit
7	Controlled Acceleration Compensation
11	Speed Limit 1 (SL1)
12	Speed Limit 2 (SL2)
13	Speed Limit 3 (SL3)
14	Speed Limit 4 (SL4)
16	Internal Resistance Compensation
17	Card Type Selection –

⚠ WARNING

NEVER attempt to adjust any of the function settings without using the procedures and setting numbers given in this section.

Connecting The Control Card For Bench Checks And Adjustments (See FIGURE 4.)

⚠ CAUTION

The control card can be damaged if power is not correctly connected or disconnected. Always disconnect the battery connector before connecting or disconnecting the control card plugs.

NOTE: The bench supply voltage does not need to be the same as the voltage of the lift truck.

The hand set can also be used to check and adjust the functions of the control card when it is connected to a bench power supply for bench checks and adjustments. The following parts are required: (1) a power source to supply a minimum of 24 DC volts at 0.5 Amps (two 12 volt automotive batteries connected in series will work)

(a max. of 84 VDC @ 0.5A can also be used), (2) an electrical plug to connect to the plug Z connector of the control card, (3) a switch for the circuit, (4) approximately 45 cm (18 inches) of 18 gage wire and (5) a hand set. If batteries are not used, the power supply must have a full

bridge rectifier with a filter. Make the connections for the bench checks and adjustments as follows:

1. Connect the switch and a plug Z (Hyster part number 1308651) to the power source using the wire as shown in FIGURE 4.

2. Make sure the switch is in the **OFF** position and connect the wire to TB4 as shown in FIGURE 4.

3. Connect plug Z to the control card plug Z connector and the hand set to the plug Y connector.

NOTE: There are no connections to the plug A or B connectors of the control card.

NOTE: The bench checks and adjustments are done using the same procedures described in the following pages.

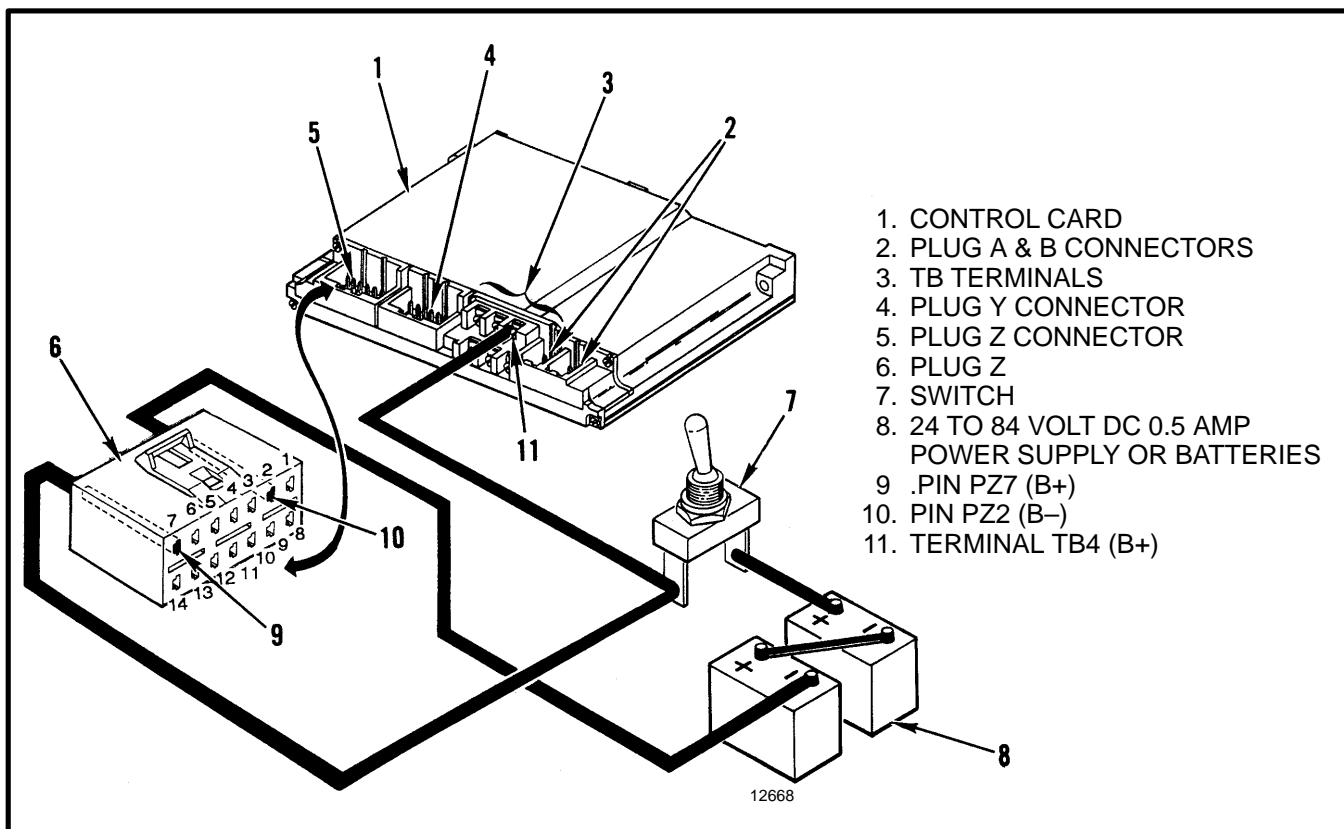


FIGURE 4. BENCH CHECKS AND ADJUSTMENTS

Connecting The Hand Set To A Control Card Installed In A Lift Truck (See FIGURE 1. and FIGURE 3.)

WARNING

Before connecting or disconnecting the hand set to a control card installed in a lift truck, make sure to raise the drive wheel(s). Turn the key to the OFF position, disconnect the battery and discharge capacitors C1.

Make sure the power is off as described in the WARNING. Disconnect plug Y at the SCR control card (Traction or Pump) if the display is connected. See FIGURE 3. Connect the hand set plug at the location Y on the control card. Connect the battery and turn the key to the ON positions. Following is the display sequence that will occur:

- Display of 8888 for one second to check the display segments.
- Status Code display of -01 if seat is in the up position.
- Another Status Code will be displayed if there is, or has been, a possible fault.
- Blank display if the operator is on the seat and there is no Battery Indicator function installed.
- Battery state of charge if the operator is on the seat and there is a Battery Indicator function installed.

Turn the key to the OFF position. Following is the display sequence that will occur:

- Display shows the traction hourmeter reading for four seconds.
- Display shows the pump hourmeter reading for four seconds. If there is no pump SCR control, the display will be blank.

CHECKING AND ADJUSTING FUNCTION SETTINGS

General

WARNING

Each function of each control card has a range of setting numbers so that the control card can be used on different models of lift trucks. This variation is needed for lift trucks of different sizes and operating voltages. However, adjusting the function setting to

the wrong number for your lift truck model can cause the truck to operate differently than normal. This different operation of the truck can result in personal injury.

Do NOT adjust any of the function settings without using the procedures and the settings in Tables 7 through 19.

NOTE: Tables 7 through 19 show the range of settings allowed and the correct setting for each control function. The Factory Setting numbers are the recommended settings for new units as set by the factory. These settings will provide satisfactory performance for most applications.

Some functions can be adjusted within the allowed range to change truck operation for specific applications. Adjusting a setting number to one that is different than the factory setting is allowed, but follow the instructions closely and stay within the minimum and maximum settings. Settings other than the factory settings will cause the lift truck to operate differently and can cause increased wear of parts.

How To Connect And Check Hand Set

WARNING

Before connecting the hand set to the control card, make sure to raise the drive wheel(s). Turn the key to the OFF position, disconnect the battery and discharge capacitors C1.

The functions can be set when sitting on the seat or when off the lift truck. Disconnect plug Y at the SCR control card (Traction or Pump) if the display is connected. See FIGURE 3. Connect the hand set plug at the location Y on the control card (Traction or Pump). Connect the battery. Push and hold the CONT button of the hand set so that it is depressed when power is applied. Turn the key to the ON position or move the power switch of the bench setup to the ON position. The display will show “8888” to check that all segments of the display are working. The Function settings can now be checked or changed.

How To Check And Adjust Functions

To check or adjust the setting for a function, do the following steps:

1. Push the keyboard numbers for the desired function. See Table 6 for the functions and function numbers. **For**

functions 16 or more, think of the CONT key equaling 15. Push and hold the CONT key **plus** the additional key number above 15 to total the required function number. Example: for Function 18, push CONT and key 3 (15+3=18). The display will show the selected function. After one second, the display will show the number that has been set for that function.

2. Push and hold **CONT** for one second. The display number will blink.

3. To change the setting number, **check for the correct setting for that function in Tables 7 through 19**. Change the setting number by turning the Adjustment Knob on the hand set. The display will continue to blink as the setting changes.

4. Push and hold the **STORE** key for one second. When the new setting number is set (stored), the display will stop blinking.

5. Push and hold the **ESC** key for one second. The display will show "8888". To check or set another function, do Steps 1 through 3. To return to normal operation (run mode), push and hold **ESC** again for one second or longer. The display will return to the status code mode or display the state of battery charge if the operator is in the seat. The display can also be blank (no status codes and battery indicator is not installed).

NOTE: Make sure the control is in the run mode before disconnecting the hand set. If not, the battery must be disconnected and connected again to reset the system.

The vehicle can now be operated with the hand set connected or the hand set can be disconnected.

NOTE: If the vehicle is operated with the hand set connected, **make sure** to set the Adjustment Knob **fully clockwise** to make sure the control can operate at top speed.

WARNING

Before disconnecting the hand set to the control card, make sure to raise the drive wheel(s). Turn the key to the OFF position, disconnect the battery and discharge capacitors C1.

Disconnect the plug at the Y connector on the control card to disconnect the hand set. Connect the plug for the instrument panel display plug at the Y connector.

Function Descriptions

The following pages have descriptions for the different functions. The setting for each function is specific for each control card. To identify the control card, check the label at the top edge of each card case. There are some painted letters and numbers followed by letters on the lower part of the label. The last two letters identify the type of card installed. The following types of control cards are used:

EV-100 or 200 LXT – Traction (With Regen)

EV-100 or 200 LX – Traction (With & Without Regen. & Without BDI)

EV-100 LXM – Dual Motor Traction (Without BDI)

EV-100 or 200 LXP – Pump Control

The same nomenclature is also shown on Tables 7 through 19 and in the following section headings for the traction and pump control cards.

Traction Control Cards (EV-100/200 LXT/LX)

NOTE: These control cards are used with the motor controllers that control the speed of the traction motor(s).

WARNING

If any of the function settings are changed, the operators must be told that the lift truck will operate differently.

Do not adjust the function settings outside of the range of setting numbers shown in the Tables 7 through 19. Settings outside the ranges can cause damage to the components of the traction system and can cause the truck to operate differently than normal. This different operation of the truck can result in personal injury.

FUNCTION 1 STORED STATUS CODE (Push 1)

This function memory contains the last status code of the possible PMT fault that caused the lift truck to stop operation. These codes can be removed from the display by turning the key to the **OFF** position. The code will be stored in memory in the control card. This status code will be written over if a new possible PMT fault occurs. The status code can be cleared from memory by adjusting the setting number to zero. The setting number must be stored by pushing the **STORE** key for one second. Adjustment of this function does not change the operation of the lift truck.

FUNCTION 2 CREEP SPEED (Push 2)

This function permits the adjustment of the creep speed of the lift truck. The range of adjustment is from 0 (5%) to 255 (15%). The percent values are the SCR 1 ON TIME. A constant creep speed frequency will be maintained when the accelerator input voltage is between 3.7 and 3.5 volts (an ohm value between 6K and 4.7K ohms).

FUNCTION 3 CONTROLLED ACCELERATION AND 1A TIME (Push 3)

This function permits the adjustment of the maximum rate of acceleration. The setting determines the time allowed to reach maximum SCR speed after the accelerator is set for maximum speed from stop. The control will stay in SCR acceleration for between 0.77 second (8) and 21.5 seconds (255) before the 1A contactor will close. The numbers in () are the setting numbers for the times shown. The 1A contactor will automatically close 0.2 second after the controlled acceleration stops. The speed control input is less than 0.5 volt (accelerator potentiometer set at less than 50 ohms). Do not adjust the function for a setting less than the minimum setting of 8.

FUNCTION 4 CURRENT LIMIT (Push 4)

This function permits the adjustment of the current limit of the control. The rating of the control will determine the range of adjustment for this function. See Table 7, 8, 10, 11, 12, 14, 15, 18 or 19. Do not adjust the setting to any number other than the factory setting.

FUNCTION 5 PLUGGING DISTANCE (CURRENT) (Push 5)

This function permits the adjustment of the distance it takes to stop the lift truck when plugging by controlling the current. Settings of higher numbers makes the lift truck stop faster. Lower numbers decreases the stopping rate for a longer stopping distance.

CAUTION

Traction motor or controller damage will occur if the setting is above the maximum setting of Table 7, 8, 10, 11, 12, 14, 15, 18 or 19.

The number for the setting for the current value of this function must be found if the Pedal Position Plug (Func-

tion 16) will not be used. To find the number for the current value, use the following information:

Range	200 to 1000 amps (EV-100) 300 to 1500 amps (EV-200)
Setting Range	0 to 255
Resolution	3.14 amps per set unit (EV-100) 4.7 amps per set unit (EV-200)

Example: Setting of 20=263A (EV-100)
 $20 \times 3.14A = 62.8A$ or 63A
 $63A + 200A$ (range min) =
263A

FUNCTION 6 1A DROP OUT CURRENT (Push 6)

This function permits the adjustment of the setting for the current value at which the 1A contactor will de-energize (open). The 1A contactor will open and the motor torque will be limited to SCR current to prevent motor currents that are too high. A setting of 255 will disable the 1A Drop Out.

FUNCTION 7 FIELD WEAKENING PICK UP (Push 7)

CAUTION

A setting **HIGHER** than the setting shown in Table 10, 14 or 15 will make the Field Weakening Contactor energize too soon. This operation can damage the traction motor.

This function permits the adjustment of the setting for the current value at which the FW contactor will energize (close). This setting permits the FW contactor to close when the lift truck has returned to approximately 150% of its running current with a full load on a level surface.

Do NOT set this function to a setting greater than the setting of Function 8.

FUNCTION 8 FIELD WEAKENING DROP OUT (Push 8)

CAUTION

A setting **HIGHER** than the setting shown in Table 10, 14 or 15 will make the Field Weakening Contactor remain energized at high currents. This opera-

tion can cause motor heating and damage the traction motor.

This function permits adjustment of the setting for the current value at which the FW contactor will deenergize (open). This setting permits the FW contactor to open when the lift truck requires more than 300% of the running current with a full load on a level surface.

FUNCTION 9 REGEN. BRAKING C/L (Push 9)

WARNING

A setting greater than the setting shown in Table 7, 10, 11, 14 or 15 will make the lift truck slow at a rate faster than normal. A setting less than the number shown will make the lift truck slow at a slower rate for less braking effect. This different operation of the truck can result in personal injury. A faster slowing rate can also damage the control system or traction motor.

This function permits adjustment of the Regenerative Braking current limit. The higher the current limit setting, the shorter the stopping distance. The shorter stopping distance causes faster wear on the drive train and brushes of the traction motor.

FUNCTION 10 REGEN. START (Push 10)

A setting greater than the setting shown in Table 7, 10, 11, 14 or 15 can prevent regenerative braking. The lift truck will remain in the plugging mode longer and increase brush wear in the traction motor.

This function permits adjustment of the percent **ON** time at which the control will start to energize the regenerative braking circuit. The percent ON time can be between 0% and 95%. This adjustment sets the speed point where regenerative braking will start. This prevents control from trying to energize the regen. circuit when motor current is too low.

FUNCTION 11 SPEED LIMIT 1 (SL1) (Push 11)

This function is the same as Function 13, but uses a SL1 limit switch for an input. Some series of trucks do not use this function.

FUNCTION 12 SPEED LIMIT 2 (SL2) (Push 12)

This function is the same as Function 13, but uses a SL2 limit switch for an input. Some series of trucks do not use this function.

FUNCTION 13 SPEED LIMIT 3 (SL3) (Push 13)

This function permits adjustment of the speed limit (maximum battery volts to the motor). The range is 0% to 96%. The adjustment sets the speed limit for the time when the input signal from the SL3 limit switch is received by the control card. This signal can be a signal from the sensor in the traction or pump motor. If the sensor shows that a motor is too hot, the control will limit maximum motor speed to this speed setting. SL3 limit switch is a normally closed switch connected to battery negative. When the switch opens, it enables the speed limit function. A setting of 0 will disable the speed limit function. This zero setting will permit top speed when no limit switch is connected. A zero setting will not slow the motor with an input from the sensor and can damage the motor.

FUNCTION 14 INTERNAL RESISTANCE COMPENSATION (Push 14)

Adjusting this function setting to the wrong number can cause battery damage.

This function is used when the control card has the Battery Discharge Indicator (BDI) function. Control cards that have BDI are type "LXT" control cards. Tables 7, 8, 10, 11, 12, 14, and 15 show the settings for a battery in average condition.

You can do a quick check to see if the function setting is accurate for your battery. Operate the lift truck until the battery indicator function has a display of approximately 60 (!/2 discharge). Stop the lift truck for 5 minutes. Disconnect the battery connector then connect the battery connector again and check the display for the battery indicator. If the change of display numbers is less than 10, the setting number for this function (14) is correct.

For the best use of your battery energy, the setting can be adjusted using the following procedure. However, you must use the procedure to change the setting as the battery ages or battery damage can occur. Setting the number too low for your battery can allow the battery to discharge below the minimum specific gravity value. This minimum specific gravity is specified by the battery manufacturer to prevent battery damage.

CAUTION

If two or more batteries are normally used in this lift truck, use the oldest battery to make this adjustment. Making this adjustment using a new battery can result in a setting too low for an older battery that is not in as good a condition.

Adjust the setting using the following procedure:

1. Operate the lift truck on a normal work cycle. Travel at medium speeds.
2. When lift interrupt occurs, park the lift truck and wait for approximately 10 minutes.
3. Check the specific gravity of several battery cells. If the specific gravity is between 1.140 and 1.150, the setting is correct for that battery. If the specific gravity reading is high, adjust the function setting for a lower number. If it is low, adjust the setting for a higher number.

NOTE: It can be necessary to charge the battery and do Steps 1 through 3 again to get an accurate setting for your battery.

FUNCTION 15 BATTERY VOLTS (Push 15)

This function permits adjustment for the operating voltage of the lift truck. The adjustment also permits correct operation of the Battery Discharge Indicator function for controls equipped with BDI. For the controller and BDI to operate correctly, the setting number shown in Table 7, 8, 10, 11, 12, 14, 15, 18 or 19 must be entered.

Battery Volts	Setting
24 volts	Between 0 and 31
36 volts	Between 32 and 44
48 volts	Between 45 and 69
72 volts	Between 70 and 80
80 volts	Between 81 and 183
36/48 volts	Between 184 and 250
No BDI	Between 251 and 255

NOTE: Adjusting the function setting to a number other than the number shown for your lift truck in Table 7, 8,

10, 11, 12, 14, 15, 17, 18 or 19 will cause a status code of -15 or -16. Make sure the battery is fully charged and battery connector has good connections before making this adjustment. This is especially important when adjusting for 36/48 volt operation (numbers 184 to 250).

FUNCTIONS GREATER THAN 15

NOTE: For functions 16 or more, think of the CONT key equaling 15. Push and hold the CONT key plus the additional key number above 15 to total the required function number. Example: for Function 18, push CONT key and key 3 (15+3=18). The display will show the selected function. After one second, the display will show the setting number that has been set for that function.

FUNCTION 16 PEDAL POSITION PLUG (Push CONT and 1)

This function permits adjustment of the pedal position plug range. Pedal position will reduce the plugging current to the current value set by this function as the accelerator is returned to the creep speed position. There is maximum plug current when the accelerator is in the top speed position. To disable the pedal position plug function, adjust the current value to the same current value as the plug distance current. See the description of Function 5.

Example: If Plug Distance Current (Function 5) is set at 500 amps, then set pedal plug current at 500 amps. With this setting, pedal position will have no effect on the plugging distance.

Use the following information to adjust the current value:

Range	100 to 930 amps (EV-100) 150 to 1425 amps (EV-200)
Setting Range	0 to 255
Resolution	3.2A per set unit (EV-100) 5.0A per set unit (EV-200)

Example: Setting of 20 = 164 amps
 $20 \times 3.2A = 64A$ (EV-100)
 $64A + 100(\text{range min}) = \underline{164A}$

FUNCTION 17 CARD TYPE SELECTION (Push CONT and 2)

WARNING

Incorrect settings of Function 17 can cause the truck to operate differently than normal. This different operation of the truck can result in personal injury.

NEVER set Function 17 to a setting that is not shown for your lift truck.

This function permits the selection of the card type used for your lift truck application.

FUNCTION 18 STEER PUMP TIME DELAY (Push CONT and 3)

WARNING

A setting lower than the setting shown in Table 7, 8, 10, 11, 12, 14 or 15 can let the steer pump stop if the seat switch opens momentarily during normal operation. There is no power steering if this happens. The sudden and difficult steering effort that is not expected can result in personal injury or property damage.

This function permits the selection of the input for the steering pump contactor. Either the seat switch or FWD/REV switch closing can be the input. The setting also sets the time delay for the contactor to drop out after the switch opens.

NOTE: There is no delay time for contactor closing after getting the input signal from the closing of the seat or FWD/REV switches. Settings in the 0–128 range adjust the delay after the seat switch opens. Settings in the 129–255 range adjust the delay after the FWD/REV switch opens. Adjust the setting to the number shown in Table 7, 8, 10, 11, 12, 14 or 15 for your lift truck.

NOTE: There are function numbers higher than 18. Some function numbers are for the hour meter function and others are not used. Do not adjust these functions. The warranty will no longer apply if these functions are adjusted.

Pump Control Card (EV-100/200 LXP)

NOTE: This control card is used with the motor controller that controls the speed of the motor for the hydraulic pump.

WARNING

If any of the function settings are changed, the operators must be told that the lift truck will operate differently.

Do not adjust the function settings outside of the range shown in Table 9, 13 or 16. Settings outside the ranges can cause damage to the components of the hydraulic system and different truck operation. This

different operation of the truck can result in personal injury.

Connect the Hand Set to the pump control card as described in **How To Connect And Check Hand Set**. See FIGURE 3. Also see FIGURE 1. Push “CONT” on the hand set with the key **OFF** to get the “8888” display. Move the key to the **ON** position or move the power switch of the bench setup to the **ON** position. Follow the procedure described in **How To Check And Adjust Functions** to check or change function values of the pump control card.

FUNCTION 1 STORED STATUS CODE (Push 1)

This function memory contains the last status code of a possible fault that caused the pump motor to run continuously. The battery must be disconnected to stop the motor if it runs continuously. This status code will be written over if a new possible fault occurs and can be cleared from memory by adjusting the setting number to zero. Any new number (including zero) must be stored by pushing the **STORE** key for one second. Adjustment of this function does not change operation of the hydraulic system.

FUNCTION 2 INTERNAL RESISTANCE COMPENSATION START (Push 2)

This function permits adjustment of the current level required to start the internal resistance compensation (Function 16).

FUNCTION 3 CONTROLLED ACCELERATION AND 1A TIME (Push 3)

This function permits the adjustment of the maximum rate of acceleration. The setting determines the time allowed to reach maximum SCR speed after the switch closes. This determines how fast the hydraulic functions operate during start up. The control will stay in SCR operation for between 0.1 and 22 seconds after the switch closes. If there is a 1A contactor, it will automatically close 0.2 second after the controlled acceleration stops.

FUNCTION 4 CURRENT LIMIT (Push 4)

This function permits the adjustment of the current limit of the control.

The rating of the control will determine the range of adjustment for this function. See Table 9, 13 or 16. Do not adjust the setting above the factory setting.

FUNCTION 7 CONTROLLED ACCELERATION COMPENSATION (Push 7)

This function controls the rate at which the internal resistance compensation (Function 16) increases to the maximum value. The setting controls the rate of increase of voltage to the pump motor during the time of “controlled acceleration”. See Controlled Acceleration & 1A Time (Function 3).

NOTE: This function was not available on the earliest control cards. The values of the settings for Functions 2 and 16 also changed with the addition of Function 7. The values shown in Table 9, Table 13 and Table 16 for these functions are acceptable settings for all pump control cards.

FUNCTION 11 SPEED LIMIT 1 (SL1) (Low Speed) – Tilt (Push 11)

This function is the same as Function 14, but uses SL1 limit switch for an input. Some series of trucks do not have this function.

FUNCTION 12 SPEED LIMIT 2 (SL2) (Medium Speed – Slow Lift) (Push 12)

This function is the same as Function 14, but uses SL2 limit switch for an input. Some series of trucks do not have this function.

FUNCTION 13 SPEED LIMIT 3 (SL3) (High Speed) (Push 13)

This function is the same as Function 14, but uses SL3 limit switch for an input. Some series of trucks do not have this function.

FUNCTION 14 SPEED LIMIT 4 (SL4) (Push 14)

This function uses SL4 limit switch for an input. This function permits adjustment of the speed limit (maximum battery volts to the motor). The range is 96% to 0%. The adjustment sets the speed limit for the time when the input signal from the SL4 limit switch is received by the control card. This signal can be a signal from the sensor in the traction or pump motor. If the sensor shows that a motor is too hot, the control will limit maximum motor speed to this speed setting. SL4 limit switch is a normally closed switch connected to battery negative. When the switch opens, it enables the speed

limit function. A setting of 0 will disable the speed limit function. This zero setting will permit top speed when no limit switch is connected. A zero setting will not slow the motor with an input from the sensor and can damage the motor. A setting over the maximum setting of Table 9, 13 or 16 can cause the motor or controller to get too hot.

FUNCTIONS GREATER THAN 15

NOTE: For functions 16 or more, push and HOLD the CONT key and the additional key number above 15 to total the required function number. Example: for Function 18, push **CONT** key and key **3** (15+3=18). The display will show the selected function. After one second, the display will show the number that has been set for that function.

FUNCTION 16 INTERNAL RESISTANCE COMPENSATION (Push CONT and 1)

This function is used to stabilize the pump speed by increasing motor volts during heavy loads. This function is set using the information from the speed torque curve of the motor used. See Table 9, 13 or 16 for your lift truck for the correct setting.

FUNCTION 17 CARD TYPE SELECTION (Push CONT and 2)

 **WARNING**

Incorrect settings of Function 17 can cause the truck to operate differently than normal. This different operation of the truck can result in personal injury. NEVER set Function 17 to a setting that is not shown for your lift truck.

This function permits the selection of the card type used for your lift truck application. Table 9, 13 or 16 shows the setting to select the type of card application depending on which control card is installed.

Settings of 18 to 73 have a BDI Lockout as part of the function. BDI Lockout means that the BDI signal from the traction control must be present so that the pump control can operate. This control will stop operation when the battery state of charge reaches 10%.

Dual Motor Traction Control Card (EV-100 LXM)

NOTE: This control card is used with the motor controller that controls the dual traction motors.

WARNING

If any of the function settings are changed, the operators must be told that the lift truck will operate differently.

Do not adjust the function settings outside of the range shown in Table 17. Settings outside the ranges can cause damage to the components of the traction system and can cause the lift truck to operate differently. This different operation of the truck can result in personal injury.

FUNCTION 1 STORED STATUS CODE (Push 1)

This function memory contains the last status code of the possible PMT fault that caused the lift truck to stop operation. These codes can be removed from the display by turning the key to the **OFF** position. The code will be stored in memory in the control card. This status code will be written over if a new possible PMT fault occurs. The status code can be cleared from memory by adjusting the setting number to zero. The setting number must be stored by pushing the **STORE** key for one second. Adjustment of this function does not change the operation of the lift truck.

FUNCTION 2 CREEP SPEED (Push 2)

This function permits the adjustment of the creep speed of the lift truck. The range of adjustment is from 0 (5%) to 255 (15%). The percent values are the SCR 1 ON TIME. A constant creep speed frequency will be maintained when the accelerator input voltage is between 3.7 and 3.5 volts (an ohm value between 6K and 4.7K ohms).

FUNCTION 3 CONTROLLED ACCELERATION AND 1A TIME (Push 3)

This function permits the adjustment of the maximum rate of acceleration. The setting determines the time allowed to reach maximum SCR speed after the accelerator is set for maximum speed from stop. The control will stay in SCR acceleration for between 0.77 second (8) and 22 seconds (255) before the 1A contactor will close. The numbers in () are the setting numbers for the times shown. The 1A contactor will automatically close 0.2 second after the controlled acceleration stops. The speed control input is less than 0.5 volt (accelerator potentiometer set at less than 50 ohms). Do not adjust the function for a setting less than the minimum setting of 8.

FUNCTION 4 CURRENT LIMIT (Push 4)

This function permits the adjustment of the current limit of the control. The rating of the control will determine the range of adjustment for this function. See Table 17. Do not adjust the setting for any number other than the factory setting.

FUNCTION 5 PLUGGING DISTANCE (CURRENT) (Push 5)

This function permits the adjustment of the distance it takes to stop the lift truck when plugging by controlling the current. Settings of higher numbers makes the lift truck stop faster. Lower numbers decreases the stopping rate for a longer stopping distance.

CAUTION

Traction motor or controller damage will occur if the setting is above the maximum setting of Table 17.

The setting for the current value of this function must be found if the Pedal Position Plug (Function 16) will not be used. To find the number for the current value, use the following information:

Range	200 to 1000 amps (EV-100)
Setting Range	0 to 255
Resolution	3.14 amps per set unit (EV-100)

Example: Setting of 20=263A (EV-100)
 $20 \times 3.14A = 62.8A$ or 63A
 $63A + 200A$ (range min) =
263A

FUNCTION 6 1A DROP OUT CURRENT (Push 6)

This function permits the adjustment of the current value at which the 1A contactor will deenergize (open). The 1A contactor will open and the motor torque will be limited to SCR current to prevent motor currents that are too high. A setting of 255 will disable the 1A Drop Out.

FUNCTION 7 PA4 INPUT SWITCH FUNCTION SELECTION (Push 7)

This function permits the choice of two modes of operation for this function. The operation of a switch connected between PA4 and battery negative makes this function operate. The two modes are shown below:

- 1 Setting of 128 or higher – enables a speed limit when a normally closed switch opens.

 **WARNING**

Settings greater than 127 will prevent the inside motor from operating in reverse during a turn. This different operation of the truck can result in personal injury. NEVER set this function to a number greater than 127.

- 2 Setting of 0 to 127 permits the inside traction motor to reverse direction when a normally open switch closes. The switch also enables a speed limit.

NOTE: Functions 7, 11, 12, 13 and 14 are not used at this time. There are no Functions 8 through 10 for this control card.

FUNCTION 15 BATTERY VOLTS
(Push 15)

This function permits adjustment for the operating voltage of the lift truck. For the lift truck to operate correctly, the setting number shown in Table 17 must be entered.

Battery Volts	Setting
24 volts	Between 0 and 31
36 volts	Between 32 and 44
48 volts	Between 45 and 69
72 volts	Between 70 and 80
80 volts	Between 81 and 183
36/48 volts	Between 184 and 250
No BDI	Between 251 and 255

NOTE: Adjusting the function setting to a number other than the number shown for your lift truck in Table 17 will cause a status code of -15 or -16. Make sure the battery is fully charged and battery connector has good connections before making this adjustment.

FUNCTIONS GREATER THAN 15

NOTE: For functions 16 or more, think of the CONT key equaling 15. Push and hold the CONT key plus the additional key number above 15 to total the required function number. Example: for Function 18, push CONT key and key 3 (15+3=18). The display will show the selected function. After one second, the display will show the setting number that has been set for that function.

FUNCTION 16 PEDAL POSITION PLUG
(Push CONT and 1)

This function permits adjustment of the pedal position plug range. Pedal position will reduce the plugging current to the current value set by this function as the accelerator is returned to the creep speed position. There is maximum plug current when the accelerator is in the top speed position. To disable the pedal position plug function, adjust the current value to the same current value as the plug distance current. See the description of Function 5.

Example: If Plug Distance Current (Function 5) is set at 500 amps, then set pedal plug current at 500 amps. With this setting, pedal position will have no effect on the plugging distance.

Use the following information to adjust the current value:

Range	100 to 930 amps (EV-100)
Setting Range	0 to 255
Resolution	3.2A per setting unit (EV-100)

Example: Setting of 20 = 164 amps
 $20 \times 3.2A = 64A$
 $64A + 100(\text{range min}) = 164A$

FUNCTION 17 CARD TYPE SELECTION
(Push CONT and 2)

 **WARNING**

Incorrect settings of Function 17 can make the lift truck operate in a way that is not normal. This different operation of the truck can result in personal injury. NEVER set Function 17 to a setting that is not shown for your lift truck.

This function permits the selection of the card type used for your lift truck application. Table 17 shows the correct setting for this control card.

FUNCTION 18 STEER PUMP TIME DELAY
(Push CONT and 3)

 **WARNING**

A setting lower than the number shown in Table 7, 8, 10, 11, 12, 14 or 15 can let the steer pump stop if the seat switch opens momentarily during normal operation. There is no power steering if this happens. The sudden and difficult steering effort that is not expected can result in personal injury or property damage.

This function permits the selection of the input for the steering pump contactor. Either the seat switch or FWD/REV switch closing can be the input. The setting also sets the time delay for the contactor to drop out after the switch opens.

NOTE: There is no delay time for contactor closing after getting the input signal from the closing of the seat or FWD/REV switches. Settings in the 0–128 range adjust the delay after the seat switch opens. Settings in the 129–255 range adjust the delay after the FWD/REV switch opens. Adjust the setting to the number shown in Table 7, 8, 10, 11, 12, 14, 15, 17, 18 or 19 for your lift truck.

NOTE: There are function numbers higher than 18. Some function numbers are for the hour meter function and others are not used. Do not adjust these functions. The warranty will no longer apply if these functions are adjusted.

FUNCTION TABLES (See Tables 7 through 18)

Settings for these functions must be between the minimum and maximum numbers shown. Do **NOT** adjust a function to a setting that is not shown in the correct table. There are 11 tables for the EV–100 control cards and two tables for the EV–200 control card. Only three of the tables (Tables 9, 13 and 16) are for a pump motor control card. Fifteen of the tables are for the different types of control cards for traction motor control with only one traction motor. There is one table (Table 17) for the dual traction motor control. Make sure you use the correct table when you make adjustments. It is always good to check the function setting and compare the setting number to the number in the table before making the adjustment. The correct factory setting, and the value (current, time, etc.) for that setting, are in the columns without the gray background. The minimum and maximum factory setting and value are shown with the gray background.

NOTE: To identify the control card on your lift truck, check the label at the top edge of each card case. There are some painted letters and numbers followed by other numbers and letters on the lower part of the label. The last two letters on the lower part identify the TYPE of

card installed. The table titles show these card types for the EV–100 and EV–200 Motor Controllers.

Make sure to read the WARNINGS and CAUTIONS under each function description and in the section CHECKING AND ADJUSTING FUNCTION SETTINGS. These WARNINGS and CAUTIONS must be read before setting a function to a setting other than the factory setting. Following is a list of the tables for the Function Settings for the different lift truck models:

TABLE 7. EV–100 LXT FUNCTION VALUE SETTINGS – **E/J1.25–1.75XL (E25–35XL) 36/48V** (Traction Card With Regen.)

TABLE 8. EV–100 LX FUNCTION VALUE SETTINGS – **E/J1.25–1.75XL (E25–35XL) 36/48V** (Traction Card Without Regen.)

TABLE 9. EV–100 LXP FUNCTION VALUE SETTINGS – **E/J1.25–1.75XL (E25–35XL) 36/48V** (Pump Card)

TABLE 10. EV–100 LXT FUNCTION VALUE SETTINGS – **E2.00–3.00XL (E/J40–60XL) 36/48V** (Traction Card With Regen.)

TABLE 11. EV–100 LXT FUNCTION VALUE SETTINGS – **E2.00–3.00XL (E/J40–60XL) 72/80V** (Traction Card With Regen.)

TABLE 12. EV–100 LX FUNCTION VALUE SETTINGS – **E2.00–3.00XL (E/J40–60XL) All** (Traction Card Without Regen.)

TABLE 13. EV–100 LXP FUNCTION VALUE SETTINGS – **E2.00–3.00XL (E/J40–60XL)** (Pump Card)

TABLE 14. EV–100 LX FUNCTION VALUE SETTINGS – **E3.50–5.50XL (E70–120XL) 36/48V** (Traction Card With Regen.)(**11 in.** Motor)

TABLE 15. EV–200 LXT FUNCTION VALUE SETTINGS – **E3.50–5.50XL (E70–120XL) 36/48V** (Traction Card With Regen.)(**13 in.** Motor)

TABLE 16. EV–200 LXP FUNCTION VALUE SETTINGS – **E3.50–5.50XL (E70–120XL)** (Pump Card)

TABLE 17. EV–100 LXM FUNCTION VALUE SETTINGS – **J25–35B** (Traction Card)

TABLE 18. EV–100 LX FUNCTION VALUE SETTINGS – **N40–45FR** (Traction Card)

TABLE 19. EV–100 LX FUNCTION VALUE SETTINGS – **R30E/EA/EF** (Traction Card)

TABLE 7. EV-100 LXT FUNCTION VALUE SETTINGS – E/J1.25-1.75XL (E25-35XL) 36/48V
(Traction Card With Regen.)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.94 Sec	008/255	0.77 Sec/21.5 Sec
4	Current Limit C/L	200	180 Amp	000/210	–
5	Plugging Distance (Current)	150	670 Amp	000/160	200 Amp/700 Amp
6	1A Drop Out Current	077	700 Amp	000/250 ²	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	000	–	000/255	–
8	Field Weakening Drop Out (Current)	000	–	000/255	–
9	Regen. Braking C/L	125	350 Amp	000/148	75 Amp/400 Amp
10	Regen. Start (% ON Time)	080	30%	000/255	0%/95% SCR 1 ON Time
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	30%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation	010 ³	–	005/025	–
15	Battery Volts	200	36/48 V	184/250	36 or 48 Volt Operation
16	Pedal Position Plug	040	228 Amp	000/187	100Amp/700 Amp
17	Card Type Selection	042	–	040/044	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 8. EV-100 LX FUNCTION VALUE SETTINGS – E/J1.25-1.75XL (E25-35XL) 36/48V
(Traction Card Without Regen.)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.94 Sec	008/255	0.77 Sec/22 Sec
4	Current Limit C/L	255	235 Amp	000/255	235 Amp
5	Plugging Distance (Current)	065	400 Amp	000/070	200 Amp/416 Amp
6	1A Drop Out Current	077	700 Amp	250 ²	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	000	–	000/255	–
8	Field Weakening Drop Out (Current)	000	–	000/255	–
9	Regen. Braking C/L	000	–	000/255	–
10	Regen. Start (% ON Time)	000	–	000/255	–
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	64%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation	010 ³	–	005/025	–
15	Battery Volts	200	36/48 V	184/250	36 or 48 Volt Operation
16	Pedal Position Plug	040	228 Amp	000/099	100Amp/416 Amp
17	Card Type Selection	002	–	000/004	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 9. EV-100 LXP FUNCTION VALUE SETTINGS – E/J1.25-1.75XL (E25-35XL) 36/48V
(Pump Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Internal Resistance Comp. Start	010	65 Amp	000/255	84.5 Amp/1320 Amp
3	Controlled Acceleration & 1A Time	010	0.31 Sec	000/050	0.1 Sec/1.1 Sec
4	Current Limit C/L (Lift Relief)	255	375 Amp	255	375 Amp
	Current Limit C/L (Tilt Relief)	255	190 Amp	255	190 Amp
7	Controlled Acceleration Compensation	015	–	015	39 Amp ⁷ /249 Amp ⁸
11	Speed Limit 1 (Max mtr, V w/NO sw cl)	035	13%Batt V	035/064	13%/24% Batt Volts
12	Speed Limit 2 (Max mtr, V w/NO sw cl)	055	21%Batt V	035/064	13%/24% Batt Volts
13	Speed Limit 3 (Max mtr, V w/NO sw cl)	255	100%Batt V	305/255	13%/100% Batt Volts
14	Speed Limit 4 (Max mtr, V w/NO sw cl)	180	100%Batt V	305/255	13%/100% Batt Volts
16	Internal Resistance Compensation	010 ³	2.28V	010/025	–
17	Card Type Selection	065	–	063/071	HI with BDI

¹ Any number other than “zero” can be read as a possible fault.

³ Average value for most batteries. See procedure for a more accurate value.

⁷ Open center current (newer card only). Older card value is 44 Amp.

⁸ Current at relief (newer card only). Older card value is 226 Amp..

NOTE: There are no functions 5, 6, 8 through 10, 15 or 18 for the Pump Card. Settings for these functions have no effect on operation.

TABLE 10. EV-100 LXT FUNCTION VALUE SETTINGS – E2.00–3.00XL (E/J40–60XL) 36/48V
(Traction Card With Regen.)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.94 Sec	008/255	0.77 Sec/21.5 Sec
4	Current Limit C/L	255	250 Amp	255	250 Amp
5	Plugging Distance (Current)	100	514 Amp	000/105	200 Amp/530 Amp
6	1A Drop Out Current	138	900 Amp	000/250 ²	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	083	185 Amp	000/110	52 Amp/228 Amp
8	Field Weakening Drop Out (Current)	130	487 Amp	000/140	65 Amp/520 Amp
9	Regen. Braking C/L	115	328 Amp	000/143	75 Amp/390 Amp
10	Regen. Start (% ON Time)	080	30%	000/255	0%/95% SCR ON Time
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	64%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation	020 ³	–	005/025	–
15	Battery Volts	200	36/48V	184/250	36 or 48 Volt Operation
16	Pedal Position Plug	040	228 Amp	000/134	100Amp/530 Amp
17	Card Type Selection	042	–	040/044	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 11. EV-100 LXT FUNCTION VALUE SETTINGS – E2.00-3.00XL (E/J40-60XL) 72/80V
(Traction Card With Regen.)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.94 Sec	008/255	0.77 Sec/22 Sec
4	Current Limit C/L	125	480 Amp	000/130	480 Amp
5	Plugging Distance (Current)	050	357 Amp	000/055	200 Amp/373 Amp
6	1A Drop Out Current	012	489 Amp	000/250 ²	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	000	–	000/255	–
8	Field Weakening Drop Out (Current)	000	–	000/255	–
9	Regen. Braking C/L	102	299 Amp	000/125	75 Amp/349 Amp
10	Regen. Start (% ON Time)	010	3.70%	000/255	0%/95% SCR ON Time
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	64%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation	012 ³	–	005/025	–
15	Battery Volts 72V	075	72V	070/080	72 Volt Operation
	Battery Volts 80V	085	80V	081/183	80 Volt Operation
16	Pedal Position Plug	040	228 Amp	000/085	100 Amp/373 Amp
17	Card Type Selection	042	–	040/044	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 12. EV-100 LX FUNCTION VALUE SETTINGS – E2.00-3.00XL (E/J40-60XL) All
(Traction Card Without Regen.)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.94 Sec	008/255	0.77 Sec/22 Sec
4	Current Limit C/L 36/48V	255	250 Amp	000/255	250 Amp
	Current Limit C/L 72/80V	125	480 Amp	000/130	480 Amp
5	Plugging Distance (Current) 36/48V	065	400Amp	000/070	200 Amp/416 Amp
	Plugging Distance (Current) 72/80V	050	357 Amp	000/055	200 Amp/373 Amp
6	1A Drop Out Current 36/48V	077 ²	700 Amp	000/250 ²	450 Amp/1260 Amp
	1A Drop Out Current 72/80V	012 ²	489 Amp	000/250 ²	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	000	–	000/255	–
8	Field Weakening Drop Out (Current)	000	–	000/255	–
9	Regen. Braking C/L	000	–	000/255	–
10	Regen. Start (% ON Time)	000	–	000/255	–
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	64%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation36/48V	020 ³	–	005/025	–
	Internal Resistance Compensation72/80V	012 ³	–	005/025	–
15	Battery Volts 36/48V	200	36/48V	184/250	36/48 Volt Operation
	Battery Volts 72V	075	72V	070/080	72 Volt Operation
	Battery Volts 80V	085	80V	081/183	80 Volt Operation
16	Pedal Position Plug 36/48V	040	228 Amp	000/099	100 Amp/530 Amp
	Pedal Position Plug 72/80V	040	228 Amp	000/085	100 Amp/373 Amp
17	Card Type Selection	002	–	002	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 13. EV-100 LXP FUNCTION VALUE SETTINGS – E2.00-3.00XL (E/J40-60XL) All
(Pump Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Internal Resistance Comp. Start ⁵	010	65 Amp	000/255	84.5 Amp/1320 Amp
	Internal Resistance Comp. Start ⁶	020	65 Amp	000/255	84.5 Amp/1320 Amp
3	Controlled Acceleration & 1A Time	010	0.31 Sec	000/050	0.1 Sec/1.15 Sec
4	Current Limit C/L (Lift Relief)	255	250 Amp	255	250 Amp ⁸
7	Controlled Acceleration Compensation ⁵	015	–	015	38 Amp ⁷ /270 Amp ⁸
	Controlled Acceleration Compensation ⁶	050	–	050	–
11	Speed Limit 1 (Max mtr, V w/NO sw cl) ⁵	035	13%Batt V	035/064	13%/24% Batt Volts
	Speed Limit 1 (Max mtr, V w/NO sw cl) ⁶	050	26%Batt V	070/096	26%/36% Batt Volts
12	Speed Limit 2 (Max mtr, V w/NO sw cl) ⁵	055	21%Batt V	035/064	13%/24% Batt Volts
	Speed Limit 2 (Max mtr, V w/NO sw cl) ⁶	080	30%Batt V	070/096	26%/36% Batt Volts
13	Speed Limit 3 (Max mtr, V w/NO sw cl)	255	100%Batt V	070/255	26%/100% Batt Volts
14	Speed Limit 4 (Max mtr, V w/NO sw cl) ⁵	180	100%Batt V	035/255	13%/100% Batt Volts
	Speed Limit 4 (Max mtr, V w/NO sw cl) ⁶	180	100%Batt V	070/180	26%/100% Batt Volts
16	Internal Resistance Compensation ⁵	010 ³	2.28V	010/025	–
	Internal Resistance Compensation ⁶	005 ³	2.28V	005/025	–
17	Card Type Selection	065 ⁹	–	063/071 ⁹	HI with BDI

¹ Any number other than “zero” can be read as a possible fault.

³ Average value for most batteries. See procedure for a more accurate value.

⁵ 36/48 volts ONLY

⁶ 72/80 volts ONLY

⁷ Open center current.

⁸ Current at relief.

⁹ MUST be set to 030 if optional PMT kit is installed or system will not operate.

NOTE: There are no functions 5, 6, 8 through 10, 15 or 18 for the Pump Card. Settings for these functions have no effect on operation.

TABLE 14. EV-100 LX FUNCTION VALUE SETTINGS – E3.50-5.50XL (E70-120XL) 36/48V
(Traction Card With Regen.)(11 in. Motor)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.94 Sec	008/255	0.77 Sec/21.5 Sec
4	Current Limit C/L	255	380 Amp	255	380 Amp
5	Plugging Distance (Current)	100	514 Amp	000/105	200 Amp/530 Amp
6	1A Drop Out Current	138 ²	900 Amp	000/250 ²	450 Amp/1260 Amp
7	Field Weakening Pick Up (Current)	083	185 Amp	000/110	52 Amp/228 Amp
8	Field Weakening Drop Out (Current)	130	487 Amp	000/140	65 Amp/520 Amp
9	Regen. Braking C/L	115	328 Amp	000/143	75 Amp/390 Amp
10	Regen. Start (At X% SCR ON Time)	080	30%	000/255	0%/95% SCR ON Time
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	64%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation	017 ³	–	005/025	–
15	Battery Volts 36/48V	200	36/48V	184/250	36/48 Volt Operation
16	Pedal Position Plug	040	228 Amp	000/134	100 Amp/529 Amp
17	Card Type Selection	042	–	040/044	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 15. EV-200 LXT FUNCTION VALUE SETTINGS – E3.50–5.50XL (E70–120XL) 36/48V
(Traction Card With Regen)(13 in. Motor)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	020	1.78 Sec	015/255	1.36 Sec/22 Sec
4	Current Limit C/L	255	380 Amp	255	380 Amp
5	Plugging Distance (Current)	200	1240 Amp	000/210	300 Amp/1288 Amp
6	1A Drop Out Current	108	1200 Amp	000/250 ²	675 Amp/1500Amp
7	Field Weakening Pick Up (Current)	055	210 Amp	000/075	78 Amp/258 Amp
8	Field Weakening Drop Out (Current)	080	488 Amp	000/085	98 Amp/513 Amp
9	Regen. Braking C/L	200	515 Amp	000/223	75 Amp/565 Amp
10	Regen. Start (% ON Time)	100	37%	000/255	0%/95% SCR ON Time
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000	–	000/255	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000	–	000/255	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	120	64%BattV	000/180	96%(Min Limit–Max Spd)/ 0%(Max Limit–Min Spd)
14	Internal Resistance Compensation	017 ³	–	005/025	–
15	Battery Volts 36/48V	200	36/48V	184/250	36/48 Volt Operation
16	Pedal Position Plug	060	450 Amp	000/227	150 Amp/1288 Amp
17	Card Type Selection	106	–	104/108	–
18	Steer Pump Time Delay (Seat Sw)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

³ Average value for most batteries. See procedure for a more accurate value.

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

TABLE 16. EV-200 LXP FUNCTION VALUE SETTINGS – E3.50-5.50XL (E70-120XL)
(Pump Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Internal Resistance Comp. Start	010	65 Amp	000/255	84.5 Amp/1320 Amp
3	Controlled Acceleration & 1A Time	010	0.31 Sec	000/050	0.1 Sec/1.15 Sec
4	Current Limit C/L	255	375 Amp	255	375 Amp
7	Controlled Acceleration Compensation	015	–	015	54 Amp ⁷ /202 Amp ⁸
11	Speed Limit 1 (Max mtr, V w/NO sw cl)	035	13%BattV	035/064	13%/24% Batt Volts
12	Speed Limit 2 (Max mtr, V w/NO sw cl)	055	21%BattV	0350/64	13%/24% Batt Volts
13	Speed Limit 3 (Max mtr, V w/NO sw cl)	255	100%BattV	305/255	13%/100% Batt Volts
14	Speed Limit 4 (Max mtr, V w/NO sw cl)	180	100%BattV	035/255	13%/100% Batt Volts
16	Internal Resistance Compensation	010 ³	2.28 V	010/025	–
17	Card Type Selection	065	–	063/071	HI with BDI

¹ Any number other than “zero” can be read as a possible fault.

³ Average value for most batteries. See procedure for a more accurate value.

⁷ Open center current.

⁸ Current at relief.

NOTE: There are no functions 5, 6, 8 through 10, 15 or 18 for the Pump Card. Settings for these functions have no effect on operation.

TABLE 17. EV-100 LXM FUNCTION VALUE SETTINGS – J25-35B
(Dual Traction Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed 24V	150	9.5%	000/255	5%/15%
	Creep Speed 36V	100	8%	000/255	5%/15%
3	Controlled Acceleration & 1A Time	010	0.9Sec	008/255	0.77 Sec/21.5 Sec
4	Current Limit C/L	255	330 Amp	255	330 Amp
5	Plugging Distance (Current) 24V	120	577 Amp	000/150	200 Amp/671 Amp
	Plugging Distance (Current) 36V	100	514 Amp	000/150	200 Amp/671 Amp
6	1A Drop Out Current 24V	110 ²	806 Amp	000/250 ²	450 Amp/1260 Amp
	1A Drop Out Current 36V	100 ²	774 Amp	000/250 ²	450 Amp/1260 Amp
7	PA4 Input Sw Function	000	–	000/127	(See WARNING below)
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
14	Internal Resistance Compensation	000 ⁹	–	000 ⁹	–
15	Battery Volts 24V	024	24 Volts	000/031	24 Volt Operation
	Battery Volts 36V	036	36 Volts	032/044	36 Volt Operation
16	Pedal Position Plug	040	228 Amp	000/255	100Amp/916 Amp
17	Card Type Selection	002	–	000/004	–
18	Steer Pump Time Delay (w/o Seat Brake)	025	14 Sec	4	4

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

⁹ Not used, set to 000 (zero).

⁴ Setting of 000–128 (1.5–65.0 Sec) with seat brake. Setting of 021–128 (12–65 Sec) without seat brake.

NOTE: There are no functions 8 through 10, for the Dual Traction Card. Settings for these functions have no effect on operation.



WARNING

Settings greater than 127, for function 7, will prevent the inside motor from operating in reverse during a turn. This different operation of the truck can result in personal injury. NEVER set function 7 to a number greater than 127.

TABLE 18. EV-100 LX FUNCTION VALUE SETTINGS – N40-45FR 24 or 36 V
(Traction Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000/255	–
2	Creep Speed	100	8%	000/255	5%/15%
3	Controlled Acceleration & 1A Time 24V	017	1.5 Sec	005/255	0.5 Sec/22 Sec
4	Current Limit C/L	255	650 Amp	000/255	375/650 Amp
5	Plugging Distance (Current)	100	514 Amp	000/207	200 Amp/850 Amp
6	1A Drop Out Current	255 ²	1260 Amp	000/255 ²	450/1260 Amp
7	Field Weakening Pick Up (Current)	000 ⁹	–	000 ⁹	–
8	Field Weakening Drop Out (Current)	000 ⁹	–	000 ⁹	–
9	Regen. Braking C/L	000 ⁹	–	000 ⁹	–
10	Regen. Start (% ON Time)	000 ⁹	–	000 ⁹	–
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
14	Internal Resistance Compensation	000 ⁹	–	000 ⁹	–
15	Battery Volts	255	No BDI	251/255	No BDI
16	Pedal Position Plug	020	164 Amp	000/255	100Amp/930 Amp
17	Card Type Selection	002	–	000/004	–
18	Steer Pump Time Delay	010	6.5 Sec	000/128	1.5 Sec/65 Sec

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

⁹ Not used, set to 000 (zero).

TABLE 19. EV-100 LX FUNCTION VALUE SETTINGS – R30E/EA/EF
(Traction Card)

FUNCTION		RECOMMENDATION		ALLOWED RANGE	
No.	Description	Factory Setting	Factory Value	Setting Min/Max	Value Min/Max
1	Stored Status Code	000 ¹	–	000 ¹ /255	–
2	Creep Speed	000	5%	000/255	5%/15%
3	Controlled Acceleration & 1A Time 24V	025	2.2 Sec	010/255	0.94 Sec/21.5 Sec
4	Current Limit C/L	255	330 Amp	255	330 Amp
5	Plugging Distance (Current)	105	530 Amp	000/125	200 Amp/592 Amp
6	1A Drop Out Current	000 ²	–	000 ²	–
7	Field Weakening Pick Up (Current)	000 ⁹	–	000 ⁹	–
8	Field Weakening Drop Out (Current)	000 ⁹	–	000 ⁹	–
9	Regen. Braking C/L	000 ⁹	–	000 ⁹	–
10	Regen. Start (% ON Time)	000 ⁹	–	000 ⁹	–
11	Speed Limit 1 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
12	Speed Limit 2 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
13	Speed Limit 3 (Max mtr, V w/NC sw open)	000 ⁹	–	000 ⁹	–
14	Internal Resistance Compensation	000 ⁹	–	000 ⁹	–
15	Battery Volts 24V	015	24 Volts	000/031	24 Volt Operation
	Battery Volts 36V	038	36 Volts	032/044	36 Volt Operation
16	Pedal Position Plug	040	260 Amp	000/134	100Amp/529 Amp
17	Card Type Selection	002	–	002	–
18	Steer Pump Time Delay	000 ⁷	–	000 ⁷	–

¹ Any number other than “zero” can be read as a possible fault.

² Settings greater than 250 will disable the 1A Drop Out function.

⁹ Not used, set to 000 (zero).

REPAIRS

GENERAL

NOTE: Do **NOT** remove the circuit board from the case when replacing a control card. There are no internal repairs that can be made by service personnel. The control card and case must be replaced as a unit and sent to be repaired.

CAUTION

ALWAYS replace all of the contactor contacts of a contactor at the same time. Replace the Pump contactor contacts after 1000 hours of operation. Replace other contactor contacts when the thickness

of any area of a contact is 30% of the thickness when new or there is any transfer of contact material.

See the section **EV-100 Repair, 2200 SRM 288** to repair the components of the EV-100 Motor Controllers. See the section **EV-200 MOTOR CONTROLLER, 2200 SRM 414** to repair the components of the EV-200 Motor Controllers.

CONTROL CARD PLUGS (See FIGURE 5.)

All control card connections are made at plugs A, B, Y or Z or at the six screws of TB terminals. If a wire

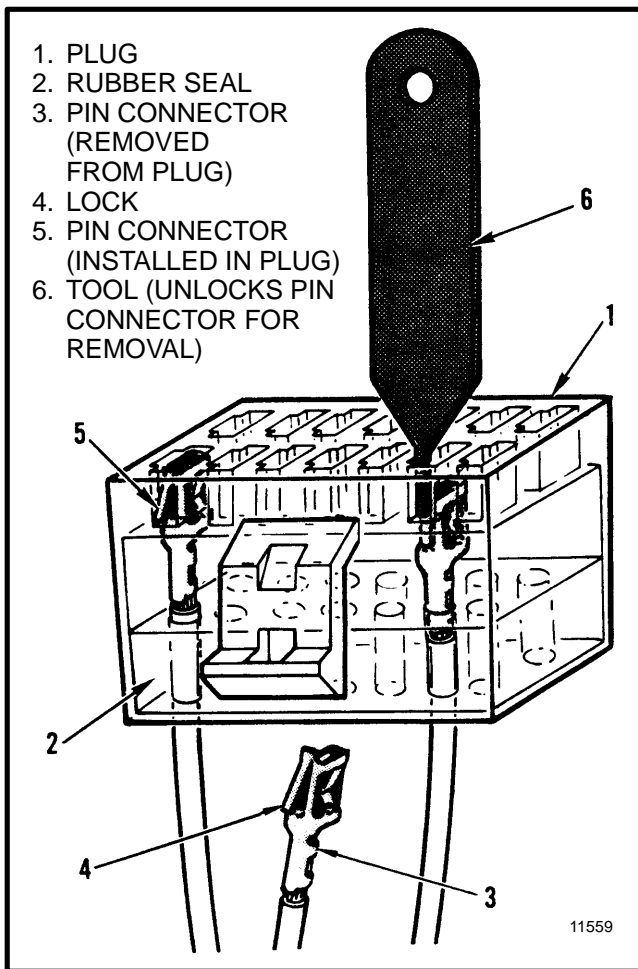


FIGURE 5. CONTROL CARD PLUG

of one of the plugs must be replaced, the operation to remove a pin connector must be done carefully. A special tool, Hyster part number 897408, must be used to remove the pin connector from the plug. FIGURE 5. shows how the pin connectors are held in the plug. Use the tool as shown to release the lock so that the pin connector can be removed from the plug. If a pin connector must be removed, the service person must work carefully so that the pin connectors and the plug are not damaged.

When a new pin connector is installed in the plug, make sure it is not damaged and is locked into the correct position in the plug. If the pin connection becomes loose during operation of the lift truck, the malfunction is not regular and is very difficult to find and repair.

TROUBLESHOOTING

GENERAL

Many electrical malfunctions of the lift truck will be shown in the status code number on the digital display. There is a digital display on the hand set or instrument panel display (optional on some units). There is a table, in this troubleshooting section, for each status code with a description of the malfunction, the circuit that has the incorrect input, the symptom and the possible causes. THESE TABLES ARE FROM THE GE MANUAL SO SOME OF THE NOMENCLATURE IS DIFFERENT THAN IS NORMALLY USED BY HYSTER COMPANY.

NOTE: Make sure to check that the Function Codes are correct for your lift truck to **make sure the trouble is not just a wrong setting**. See Tables 7 through 18 for the correct values. If there is no status code display and

the lift truck does not operate correctly, there can be a fault in the control card.

Connect the hand set as follows:

Disconnect plug Y at the SCR control card (Traction or Pump) if the display is connected. Connect the hand set plug at the location "Y" on the control card. Connect the battery, push and hold the **CONT** button and turn the key to the **ON** position. The display will show "8888" to check that all segments of the display are working. The status codes have a (-) in front of the display number. If there is no (-), the hourmeter function, battery indicator function or a function setting is displayed.

NOTE: If the battery is disconnected when there is a stored status code, the status code "-" will be missing on the hand set display when a battery is connected.

The following Status Codes indicate possible faults in these areas:

AREA OF FAULT
STATUS CODE #

Card Inputs
Blank through -17

Contactor Panel
-23 through -26

SCR Panel
-41 through -57

Regenerative Braking
-70 through -76

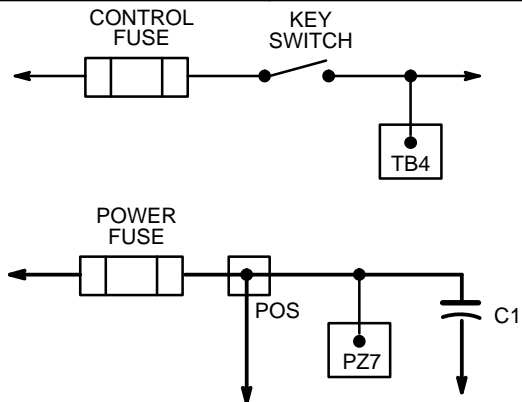
Truck Management
-90 through -95

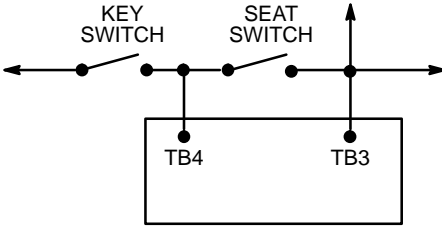
Pump Control
-117 through -157

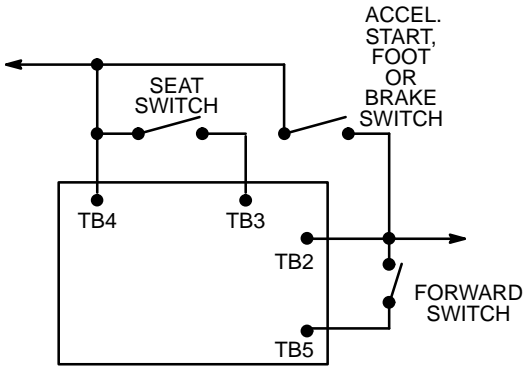
NOTE: 1. A blank display, during operation, can mean that the regenerative braking diode is shorted. The symptom for this malfunction is; no operation and traction power fuse open. If the diode is shorted, there is a short-circuit across the battery as soon as the regen. contactor closes and the fuse will open. If the regenerative braking diode is open, there will be no symptoms except that there will be stiff plugging and no regenerative braking.

2. Another malfunction that can cause the lift truck to go dead when operating at the higher speeds, is an shorted 1A coil. The lift truck operates normally until the 1A contactor is normally energized. At this time the traction motor has no power and the traction contactor contacts will open.

3. If the coil of the FW contactor has a short-circuit, the lift truck will operate normally until the FW contactor is energized. The lift truck will then lose power and the traction contactor contacts will open.

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
BLANK DISPLAY	Display of instrument panel or Hand Set is blank.	CIRCUIT	Traction and Pump
<p align="center">INDICATION OF FAULT</p> <p>No status code shown on instrument panel or Hand Set display.</p> <p align="center">POSSIBLE CAUSE</p> <p>Positive or negative control volts missing.</p> <ul style="list-style-type: none"> Make sure that the key switch ON and there is voltage between PZ7 and PZ3 (NEG). Check for voltage between TB4 and PZ3 (NEG). <p>Open circuit between logic card plug "Y" and Instrument Panel Display or Hand Set.</p> <ul style="list-style-type: none"> Check for an open circuit or loose connections between each wire going between logic card plug "Y" and the Instrument Panel Display or Hand Set. <p>Malfunction of Instrument Panel Display or Hand Set.</p> <ul style="list-style-type: none"> Replace Instrument Panel Display or Hand Set. <p>Also see NOTES 1, 2 and 3 above.</p>		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>No input voltage to the control card or the display unit.</p>	

STATUS CODE -01	DESCRIPTION	MEMORY RECALL	No
	No voltage signal from seat switch		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward and reverse contactor will not energize.</p> <p align="center">POSSIBLE CAUSE</p> <p>Seat switch is damaged or needs adjusting.</p> <ul style="list-style-type: none"> • Check that seat switch operates correctly <p>Open circuit between battery positive and TB3 of control card</p> <ul style="list-style-type: none"> • Check for loose connections or broken wires between the seat switch and TB3. • Check for loose connections or broken wires between the key switch and the battery positive side of the seat switch. • Check for loose connections or broken wires between the key switch or seat switch and TB4. <p>On units without a seat switch, there is no connection between TB4 and TB3 of control card.</p> <ul style="list-style-type: none"> • Check for loose connections or broken wires between the terminals TB4 and TB3 of the control card. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at TB3 is less than 50% of battery voltage.</p>	

STATUS CODE -02	DESCRIPTION	MEMORY RECALL	No
	Forward switch is closed when the key is moved to the ON position.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward contactor will not energize. Static Return to Off (SRO) circuit is activated.</p> <p align="center">POSSIBLE CAUSE</p> <p>Forward switch is closed when the key is move to the ON position and,if installed, the Start switch is closed.</p> <ul style="list-style-type: none"> • Move the Monotrol, Direction Lever or Direction and Speed control to the NEUTRAL position. Now select a direction. <p>Forward switch is damaged so that it has a short-circuit in the open position. Forward switch needs to be adjusted.</p> <ul style="list-style-type: none"> • Replace or adjust the Forward switch so that it opens when the Monotrol, Direction Lever or Direction and Speed control is in the NEUTRAL position. <p>Short-circuit between TB2 and TB5</p> <ul style="list-style-type: none"> • Disconnect the wire from TB5 and check for a short-circuit between TB2 and the wire. <p>Malfunction of the control card</p> <ul style="list-style-type: none"> • Disconnect the wire from TB5 and check for less than 60% of battery voltage at TB5. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at TB5 is more than 60% of battery voltage when the key is moved to the ON position.</p>	

STATUS CODE -03	DESCRIPTION	MEMORY RECALL	No
		Reverse switch is closed when the key is moved to the ON position.	CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Reverse contactor will not energize. Static Return to Off (SRO) circuit is activated.</p> <p align="center">POSSIBLE CAUSE</p> <p>Reverse switch is closed when the key is move to the ON position and,if installed, the Start switch is closed.</p> <ul style="list-style-type: none"> Move the Monotrol, Direction Lever or Direction and Speed control to the NEUTRAL position. Now select a direction. <p>Reverse switch is damaged so that it has a short-circuit in the open position. Reverse switch needs to be adjusted.</p> <ul style="list-style-type: none"> Replace or adjust the Reverse switch so that it opens when the Monotrol, Direction Lever or Direction and Speed control is in the NEUTRAL position. <p>Short-circuit between TB2 and TB6</p> <ul style="list-style-type: none"> Disconnect the wire from TB6 and check for a short-circuit between TB2 and the wire. <p>Malfunction of the control card</p> <ul style="list-style-type: none"> Disconnect the wire from TB6 and check for less than 60% of battery voltage at TB6. 		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at TB6 is more than 60% of battery voltage when the key is moved to the ON position.</p>	

STATUS CODE -04	DESCRIPTION	MEMORY RECALL	Yes
		Low voltage when the Accelerator Start or Foot switch is closed after the Key switch and, if installed, the Seat switch is closed.	CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactor will not energize.</p> <p align="center">POSSIBLE CAUSE</p> <p>Forward or Reverse switch is closed when the key is move to the ON position and, if installed, the Start or Foot switch is closed.</p> <ul style="list-style-type: none"> Push the Monotrol or Accelerator pedal or move the Direction and Speed control for creep speed. The Status Code will change to -03 if the Reverse direction switch is closed. The Status Code will change to -02 if the Forward direction switch is closed. Move the Monotrol, Direction Lever or Direction and Speed control to the NEUTRAL position. Now select a direction. <p>Short-circuit between TB2 and battery negative.</p> <ul style="list-style-type: none"> Check the voltage at TB2 when the Key switch is moved to the ON position and, if installed, the Start or Foot switch is closed with the Monotrol, Direction Lever or Direction and Speed control moved to the NEUTRAL position. The correct voltage is greater than 60% of battery voltage. I the voltage is less than 60% of battery voltage, disconnect the wire from TB2. Measure the resistance between the wire and the negative side of SCRI. The correct resistance is less than 22K ohms. 		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at TB2 is less than 60% of battery voltage. The voltage must be low when the key is moved to the ON position for the following conditions: the Accelerator Start or Foot switch closed, if installed, the Seat switch is closed .</p>	

STATUS CODE -05	DESCRIPTION	MEMORY RECALL	No
	Accelerator Start, Foot or Brake switch circuit is not complete.		CIRCUIT
<p>INDICATION OF FAULT Forward or Reverse contactor does not energize.</p> <p>POSSIBLE CAUSE Malfunction of the circuit for the Accelerator Start, Foot or Brake switch</p> <ul style="list-style-type: none"> • Check to make sure switch does not have a malfunction (mechanical/electrical operation is correct). • Check for an open circuit or loose connections in the wiring on both sides of the switch. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at TB1 is less than 2.5 volts and TB2 is less than 60% of battery voltage.</p>	

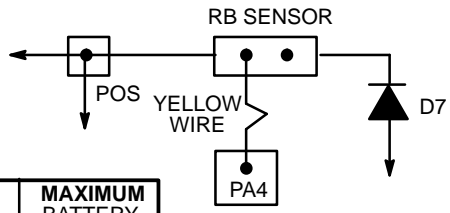
STATUS CODE -06	DESCRIPTION	MEMORY RECALL	No
	Wiper of accelerator potentiometer moves before a direction is selected.		CIRCUIT
<p>INDICATION OF FAULT Forward or Reverse contactor does not energize. Static Return to Off (SRO) circuit is activated.</p> <p>POSSIBLE CAUSE Forward or Reverse switch does not closed before wiper of Accelerator Potentiometer is moved. Status code will change to blank if a direction switch is closed or accelerator is released (returns to NEUTRAL).</p> <ul style="list-style-type: none"> • Check for correct adjustment of the Forward or Reverse switches and Accelerator Potentiometer. <p>Malfunction of the Forward or Reverse switch circuit</p> <ul style="list-style-type: none"> • Check to make sure switch, or switches, do not have a malfunction (mechanical/electrical operation is correct). • Check for an open circuit or loose connections in the wiring on both sides of the switch or each switch. Circuit must be complete to TB5 and TB6. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at TB5 or TB6 is less than 60% of battery voltage when TB1 is less than 2.5 volts.</p>	

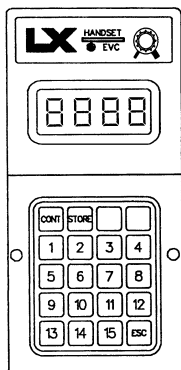
STATUS CODE -07	DESCRIPTION	MEMORY RECALL	No
		Input voltage from Accelerator Potentiometer is too high.	CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactor energizes, but truck will not move OR status code -07 clears as truck begins to accelerate.</p> <p align="center">POSSIBLE CAUSE</p> <p>Accelerator Potentiometer has a malfunction or needs adjustment.</p> <ul style="list-style-type: none"> The correct input voltage at TB1 is more than 3.0 volts at the slowest speed. Replace or adjust the Accelerator Potentiometer so that the voltage changes from 3.5 volts to less than 0.5 volt as the wiper moves through the range. <p>Open circuit between battery negative and TB1</p> <ul style="list-style-type: none"> Check for broken wires or loose connections in the Accelerator Potentiometer circuit. <p>Short-circuit from battery positive to a point in the Accelerator Potentiometer circuit</p> <ul style="list-style-type: none"> Disconnect the wire from TB1 and measure the voltage between the end of the wire and battery negative. The correct voltage is zero for an Accelerator Potentiometer and less than 3.7 volts for an accelerator with a solid-state type of input. 		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at TB1 is more than 3.7 volts and a direction contactor is energized.</p>	

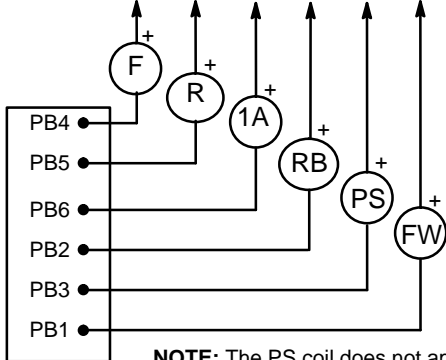
STATUS CODE -08	DESCRIPTION	MEMORY RECALL	No
		Input voltage from the Accelerator Potentiometer is too low after the key is moved to the ON position.	CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactor will not energize. Static Return to Off (SRO) circuit is activated.</p> <p align="center">POSSIBLE CAUSE</p> <p>Accelerator Potentiometer has a malfunction or needs adjustment.</p> <ul style="list-style-type: none"> The correct input voltage at TB1 is more than 3.0 volts before accelerator or Monotrol pedal is moved from the NEUTRAL position. Replace or adjust the Accelerator Potentiometer so that the voltage changes from 3.5 volts to less than 0.5 volt as the wiper moves through the range. <p>Short-circuit between battery negative and TB1 of Accelerator Potentiometer input circuit</p> <ul style="list-style-type: none"> Disconnect the wire from TB1 and measure the voltage between the end of the wire and battery negative. The correct voltage is zero for an Accelerator Potentiometer and less than 3.7 volts for an accelerator with a solid-state type of input. Resistance of Accelerator Potentiometer must be more than 4.7K ohms. <p>Control card malfunction</p> <ul style="list-style-type: none"> Disconnect wire from TB1. Measure voltage from TB1 to battery negative. Voltage must be more than 4.5 volts, if not, replace control card. 		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at TB1 is less than 3.0 volts and any of the following components are opened then closed:</p> <ul style="list-style-type: none"> Battery Connector Seat Switch Accelerator Start, Foot or Brake Switch Key Switch 	

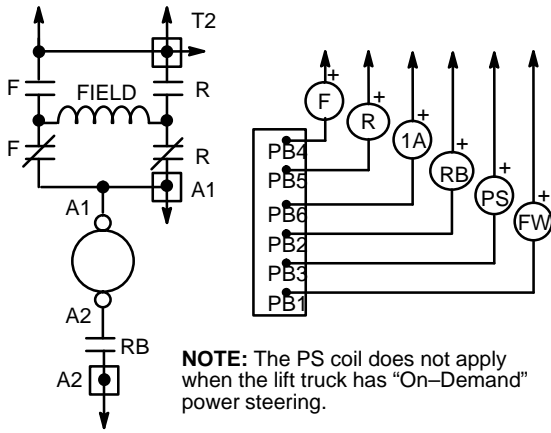
STATUS CODE -09	DESCRIPTION	MEMORY RECALL	No
		Both Forward and Reverse switches are closed at the same time.	CIRCUIT
<p>INDICATION OF FAULT Forward or Reverse contactor will not energize. Static Return to Off (SRO) circuit is activated.</p> <p>POSSIBLE CAUSE Forward or Reverse switch has welded contacts or is adjusted so that contacts are held closed.</p> <ul style="list-style-type: none"> Replace the Forward and Reverse switch or switches or make a correct adjustment or adjustments. <p>Short-circuit between battery positive and TB5 and/or TB6.</p> <ul style="list-style-type: none"> Disconnect wires from TB5 and TB6 and check wires for a short-circuit to any battery positive point. Check at positive side of Forward or Reverse switch or switches. <p>Control card malfunction</p> <ul style="list-style-type: none"> Disconnect wires from TB5 and TB6. Measure voltage at TB5 and TB6. Voltage must be less than 60% of battery volts. If voltage is not correct, replace and adjust control card. 		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at TB5 and TB6 is more than 60% of battery voltage at the same time.</p>	

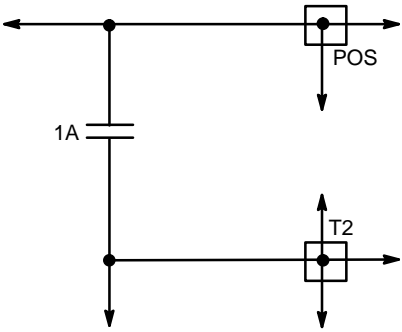
STATUS CODE -15	DESCRIPTION	MEMORY RECALL	No												
		Battery voltage is too low.	CIRCUIT	Traction											
<p>INDICATION OF FAULT Forward or Reverse contactor will not energize.</p> <p>POSSIBLE CAUSE Discharged battery</p> <ul style="list-style-type: none"> Check the battery for the correct open circuit voltage as shown in the table at the right. Replace or charge the battery if necessary. <p>Bad connection at battery connector or in the power cables</p> <ul style="list-style-type: none"> Check the battery connector contacts for corrosion or other problems. Check the power cables. <p>Battery malfunction</p> <ul style="list-style-type: none"> Check each battery cell for the correct voltage (more than 1.95 volts at each cell). Replace or repair the battery if necessary. <p>Control card needs adjustment.</p> <ul style="list-style-type: none"> Check Function 15 for the correct adjustment for the battery that is being used. See CHECKING AND ADJUSTING FUNCTION SETTINGS. Also see the correct table for your unit and battery of Table 7 through Table 19. Adjust to the correct setting. 		<table border="1"> <thead> <tr> <th>NOMINAL BATTERY VOLTS</th> <th>MINIMUM BATTERY VOLTAGE AT 1.95 VOLTS PER CELL</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>23.4</td> </tr> <tr> <td>36</td> <td>35.1</td> </tr> <tr> <td>48</td> <td>46.8</td> </tr> <tr> <td>72</td> <td>70.2</td> </tr> <tr> <td>84</td> <td>81.9</td> </tr> </tbody> </table> <p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at TB6 is more than 60% of battery voltage when the key is moved to the ON position.</p>		NOMINAL BATTERY VOLTS	MINIMUM BATTERY VOLTAGE AT 1.95 VOLTS PER CELL	24	23.4	36	35.1	48	46.8	72	70.2	84	81.9
NOMINAL BATTERY VOLTS	MINIMUM BATTERY VOLTAGE AT 1.95 VOLTS PER CELL														
24	23.4														
36	35.1														
48	46.8														
72	70.2														
84	81.9														

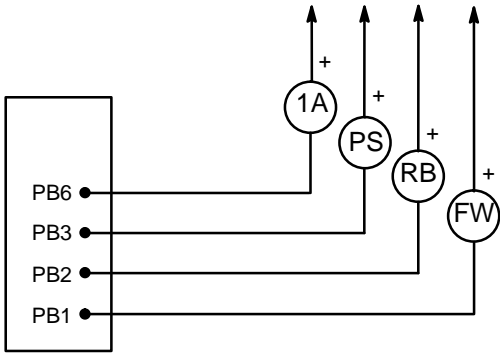
STATUS CODE -16	DESCRIPTION	MEMORY RECALL	No												
	Battery volts too high.		CIRCUIT	Traction											
<p align="center">INDICATION OF FAULT</p> <p>Forward and reverse contactor will not energize.</p> <p align="center">POSSIBLE CAUSE</p> <p>Adjustment of control card is not correct.</p> <ul style="list-style-type: none"> Check Function 15 for correct adjustment for battery being used. See CHECKING AND ADJUSTING FUNCTION SETTINGS. Also see the correct table for your unit and battery of Table 7 through Table 19. Adjust to the correct setting. <p>Open circuit in regen, sensor circuit</p> <ul style="list-style-type: none"> Check for broken yellow wire from sensor #2 to PA4, loose connections or broken spot weld at sensor. Check PA4 for loose plug or pin connection. <p>Battery charged too much or wrong battery used.</p> <ul style="list-style-type: none"> Check battery for correct open circuit voltage. See table at right. If voltage is too high, check the battery charger for the correct output voltage. <p>Battery volts too low on trucks with a <u>48 volt</u> battery (between WHT and BRN wires Plug Z). Control Function 15 set for 36/48 volt operation (184 to 250).</p> <ul style="list-style-type: none"> System thinks battery is a 36V battery that is too high. If voltage at battery half of connector is more than 43.2 but less than 46.8 volts, check for a bad battery connector (truck) or other bad connections. 		 <table border="1" data-bbox="938 478 1209 739"> <thead> <tr> <th>NOMINAL BATTERY VOLTS</th> <th>MAXIMUM BATTERY VOLTAGE AT 2.40 VOLTS PER CELL</th> </tr> </thead> <tbody> <tr> <td>24</td> <td>28.4</td> </tr> <tr> <td>36</td> <td>43.2</td> </tr> <tr> <td>48</td> <td>57.6</td> </tr> <tr> <td>72</td> <td>86.4</td> </tr> <tr> <td>84</td> <td>100.8</td> </tr> </tbody> </table> <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the battery volts are greater than 2.40 volts per cell at initial start up. See table above.</p>		NOMINAL BATTERY VOLTS	MAXIMUM BATTERY VOLTAGE AT 2.40 VOLTS PER CELL	24	28.4	36	43.2	48	57.6	72	86.4	84	100.8
NOMINAL BATTERY VOLTS	MAXIMUM BATTERY VOLTAGE AT 2.40 VOLTS PER CELL														
24	28.4														
36	43.2														
48	57.6														
72	86.4														
84	100.8														

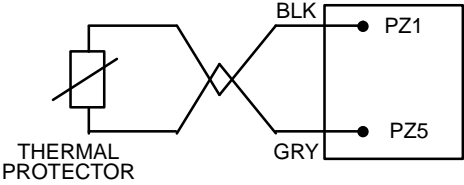
STATUS CODE -17	DESCRIPTION	MEMORY RECALL	No
	Wrong type of selection for control card (Function 17).		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward and reverse contactor will not energize.</p> <p align="center">POSSIBLE CAUSE</p> <p>Wrong type of selection for control card (Function 17).</p> <ul style="list-style-type: none"> Check Function 17. See CHECKING AND ADJUSTING FUNCTION SETTINGS. Also see the correct table for your unit and battery voltage of Table 7 through Table 19. Adjust to the correct setting. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the value for Function 17 is set to the wrong value for the unit.</p>	

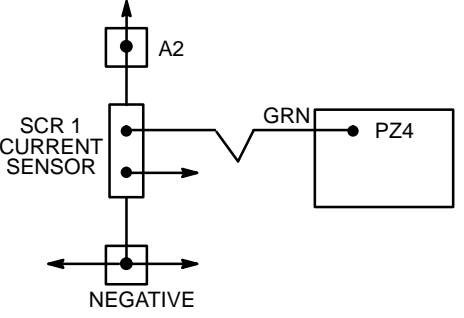
STATUS CODE -23	DESCRIPTION	MEMORY RECALL	No
	Forward, Reverse or other contactor coil has an open circuit or there is low current through the coil.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or reverse contactor will not energize. Status code can change between code -23 and code -24. Do all the "Possible Cause" checks for this Status Code. If the problem is not found, do the checks in code -24.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of coil circuit for forward (F) and reverse (R) contractor.</p> <ul style="list-style-type: none"> • Check for open circuit or loose connection between PB4 and positive side of F contractor coil and between PB5 and positive side of R contractor coil. • Remove plug B. Check resistance from PB4 to positive side of F coil. Value should be 10-14 ohms. Make same check for R coil. • Control fuse (Fuse 3) open. Check for cause of open fuse and replace. <p>Malfunction of 1A, RB, SP or FW contactor coil.</p> <ul style="list-style-type: none"> • Remove plug B from control card. Check the resistance from positive side of each coil to its plug connection. Value should be 10-14 ohms. The coil resistance of the power steering contactor is 52 ohms. 		 <p>NOTE: The PS coil does not apply when the lift truck has "On-Demand" power steering.</p>	
<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the current draw in the forward or reverse contactor coil is less than 100 ma.</p>			

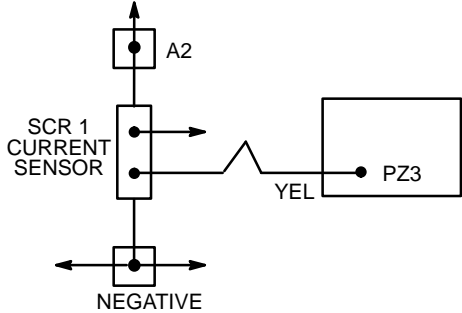
STATUS CODE -24	DESCRIPTION	MEMORY RECALL	No
	Voltage too high (more than 12% of battery voltage) at T2 of the control panel.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Motor controller will not operate. Status code can change between code -23 and code -24. Do all the "Possible Cause" checks for this Status Code. If the problem is not found, do the checks in code -23.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of coil circuit for forward (F) and reverse (R) contractor.</p> <ul style="list-style-type: none"> • F or R power tips fail to close because: <ol style="list-style-type: none"> 1) Power tips (N.C.) are welded. 2) Contactor tip assembly does not move freely. 3) Malfunction of F or R contactor coil. (See Status code 23) <p>Malfunction of coil circuit for Regenerative Braking (RB) contractor.</p> <ul style="list-style-type: none"> • R.B. power tips fail to close because: <ol style="list-style-type: none"> 1) Power tips (N.C.) are welded. 2) Contactor tip assembly does not move freely. <p>Open circuit or loose connections in the traction motor circuit from the A1 connection to the A2 connection of the SCR control panel.</p> <p>Malfunction of coil circuit for the 1A, RB, PS. OR FW contractors.</p> <ul style="list-style-type: none"> • Check the "Possible Causes" of Status Code 23. 		 <p>NOTE: The PS coil does not apply when the lift truck has "On-Demand" power steering.</p>	
<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at T2 of the control panel is greater than 12% of battery voltage.</p>			

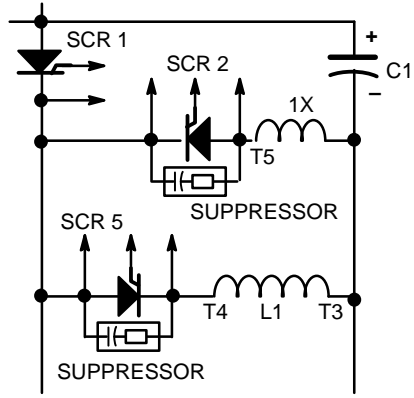
STATUS CODE	DESCRIPTION	MEMORY RECALL	
-25	1A contactor does not open or opens slowly.	Yes	
		CIRCUIT	Traction
<p style="text-align: center;">INDICATION OF FAULT</p> <p>Tips of 1A or Forward and Reverse contactor wear rapidly. Status Code 46 can be on the display, but no fault can be found.</p> <p style="text-align: center;">POSSIBLE CAUSE</p> <p>NOTE: This status code can only be found when the Hand Set is connected. This status code is shown as an additional information for Status Code 46.</p> <p>Malfunction of 1A contactor</p> <ul style="list-style-type: none"> • Check 1A contactor for slow operation as it opens. 			
		<p style="text-align: center;">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the 1A contactor takes more than 0.060 second to open.</p>	

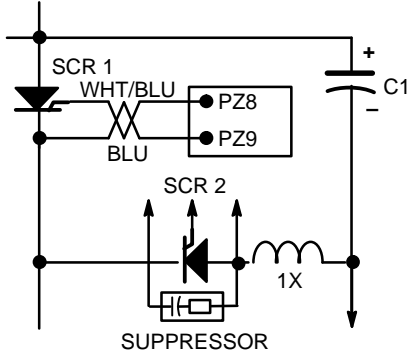
STATUS CODE	DESCRIPTION	MEMORY RECALL	
-26	Electronic driver (in control card) for the 1A, PS, RB or FW contactor has a short-circuit.	Yes	
		CIRCUIT	Traction
<p style="text-align: center;">INDICATION OF FAULT</p> <p>1A, PS, RB or FW contactor energizes as soon as the key is moved to the ON position.</p> <p style="text-align: center;">POSSIBLE CAUSE</p> <p>Malfunction of coil driver in control card</p> <ul style="list-style-type: none"> • Replace control card. 			
		<p style="text-align: center;">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when there is a short-circuit in the electronic driver for the 1A, PS, RB or FW contactor.</p>	

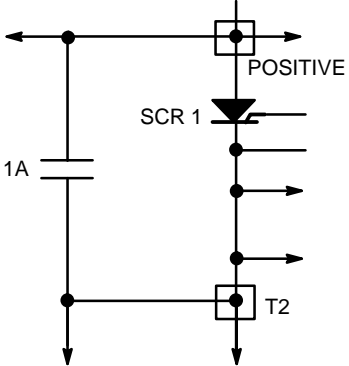
STATUS CODE -41	DESCRIPTION Open thermal protector or controller is too hot	MEMORY RECALL No	
		CIRCUIT	Traction
<p>INDICATION OF FAULT The traction motor has less power or no power during SCR operation.</p> <p>POSSIBLE CAUSE There is an open-circuit in the thermal protector circuit.</p> <ul style="list-style-type: none"> Check for loose connections or a broken wire between: <ul style="list-style-type: none"> Black wire of Thermal Protector and PZ1 Gray wire of Thermal Protector and PZ5 <p>Malfunction of thermal protector</p> <ul style="list-style-type: none"> Disconnect the wires from PZ1 and PZ5. When the temperature is approximately 25°C (75°F), measure the resistance between the black and gray wires. The correct resistance is approximately 300 ohms. 			
<p>Thermal Protector is operating normally and SCR 1 is too hot.</p> <ul style="list-style-type: none"> Let SCR 1 cool. If operation is normal, fault will clear after SCR 1 cools. 		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage between PZ1 and PZ5 is more than 1.8 volts.</p>	

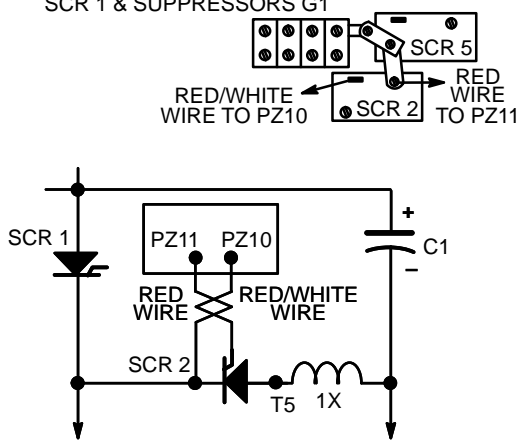
STATUS CODE -42	DESCRIPTION Input is missing from motor current sensor.	MEMORY RECALL No	
		CIRCUIT	Traction
<p>INDICATION OF FAULT Traction motor has no power during SCR operation.</p> <p>POSSIBLE CAUSE There is an open-circuit in the circuit for the motor current sensor.</p> <ul style="list-style-type: none"> Check for loose connections or a broken green wire between the current sensor for SCR 1 and PZ4. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage between PZ4 and battery negative is more than 1.6 volts with no motor current.</p>	

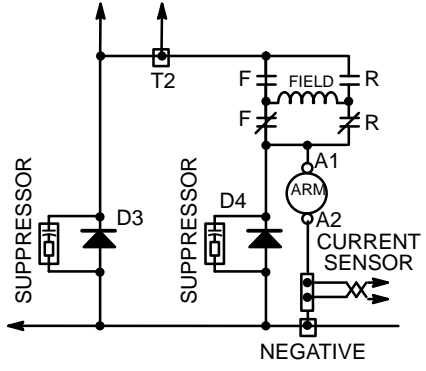
STATUS CODE -43	DESCRIPTION	MEMORY RECALL	No
	Input is missing from motor current sensor.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>The stall currents during SCR operation are higher and can not be controlled with the C/L adjustment.</p> <p align="center">POSSIBLE CAUSE</p> <p>There is an open-circuit in the circuit for the motor current sensor.</p> <ul style="list-style-type: none"> Check for loose connections or a broken yellow wire between the current sensor for SCR 1 and PZ3. 			
		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage between PZ3 and battery negative is less than 0.84 volt with no motor current.</p>	

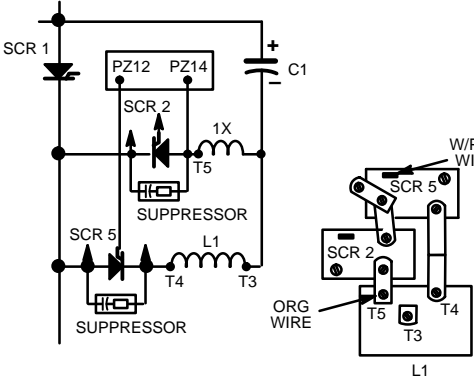
STATUS CODE -44	DESCRIPTION	MEMORY RECALL	Yes
	SCR 1 does not go to OFF correctly.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the OFF then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of SCR 5 circuit.</p> <ul style="list-style-type: none"> Check for a short-circuit of SCR 5. Check for a short-circuit of SCR 5 suppressor. Check for an open SCR 5 or open gate lead. <p>Malfunction of SCR 2 circuit.</p> <ul style="list-style-type: none"> Check for a short-circuit of SCR 2 Check for a short-circuit of SCR 2 suppressor. Check for an open SCR 2 or open gate lead. <p>Open inductor (1X).</p> <ul style="list-style-type: none"> Check for open circuit between T5 and T3. Correct resistance is zero ohms. <p>Malfunction of SCR 1.</p> <ul style="list-style-type: none"> Turn-Off time for SCR 1 is not within specifications. No easy test is possible. Replace SCR 1 after doing the other checks above with no problems found. 			
		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 1 does not go to OFF correctly.</p>	

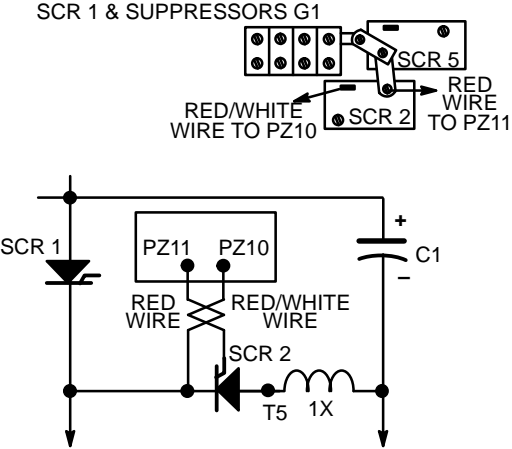
STATUS CODE	DESCRIPTION	MEMORY RECALL	Yes
-45	SCR 1 does not go ON correctly.	CIRCUIT	Traction
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of SCR 2 circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 2 • Check for a short-circuit of SCR 2 suppressor. • Check for an open SCR 2 or open gate lead. <p>Malfunction of SCR 1 circuit.</p> <ul style="list-style-type: none"> • Check for open circuit or loose connections between SCR 1 and PZ8 (white/blue wire). • Check for open circuit or loose connections between SCR 1 and PZ9 (blue wire). <p>Malfunction of SCR 1.</p> <ul style="list-style-type: none"> • Intermittent or open SCR 1 gate. No easy test is possible. Replace SCR 1 after doing the other checks above with no problems found. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 1 does not go ON with a gate signal during operation.</p>	

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
-46	Short-circuit across SCR 1. (See Status Code -25 also.)	CIRCUIT	Traction
<p align="center">INDICATION OF FAULT</p> <p>Reverse contactor will not energize. Static Return to Off (SRO) circuit is activated.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of SCR 1.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 1 • Check for a short-circuit of SCR 1 insulator (co-therm) that can cause a short-circuit of SCR 1 heat sink to base plate. <p>Malfunction of 1A contactor.</p> <ul style="list-style-type: none"> • Check for welded power tips of the 1A contactor. Welded tips will remain closed after contactor is deenergized. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the current flow to the traction motor is not interrupted. This current flow must stop during the OFF time of SCR1 during normal SCR operation.</p>	

STATUS CODE	DESCRIPTION	MEMORY RECALL	
-47	SCR 2 does not go ON correctly.	Yes	
		CIRCUIT	Traction
<p style="text-align: center;">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the OFF then ON position.</p> <p style="text-align: center;">POSSIBLE CAUSE</p> <p>Malfunction of SCR 2 circuit.</p> <ul style="list-style-type: none"> • Check that SCR 2 will go ON with a gate signal. • Check for an open circuit or loose connection between SCR 2 gate and PZ10 (white/red wire). • Check for an open circuit or loose connection SCR 1 and capacitor C1 through the SCR 2 circuit. <p>Tips of Forward or Reverse contactor momentarily opening and closing.</p> <ul style="list-style-type: none"> • Check that power tips do not momentarily open and close when traveling over bumps and dock plates. 		<p style="text-align: center;">SCR 1 & SUPPRESSORS G1</p> 	
		<p style="text-align: center;">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 2 will not go ON during normal operation.</p>	

STATUS CODE	DESCRIPTION	MEMORY RECALL	
-48	Voltage at T2 too low.	No	
		CIRCUIT	Traction
<p style="text-align: center;">INDICATION OF FAULT</p> <p>Forward or Reverse contactor will not energize. Static Return to Off (SRO) circuit is activated.</p> <p style="text-align: center;">POSSIBLE CAUSE</p> <p>Forward or reverse contactor malfunction.</p> <ul style="list-style-type: none"> • Check for welded power tips of Forward or Reverse contactor. • Check for slow operation of Forward or Reverse contactor. <p>Malfunction of diode D3 circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of diode D3. • Check for a short-circuit of suppressor for diode D3. 			
		<p style="text-align: center;">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at T2 is less than 12% of battery voltage.</p>	

STATUS CODE -49	DESCRIPTION SCR 5 does not go ON correctly.	MEMORY RECALL Yes	
		CIRCUIT	Traction
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of SCR 5 circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 5. • Check for a short-circuit of suppressor for SCR 5. • Check that SCR 5 will go ON with a gate signal. • Check for an open circuit or loose connection between SCR5 and PZ12 (white/purple wire). <p>Malfunction of SCR 2 circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 2. • Check for a short-circuit of suppressor for SCR 2. • Check for an open SCR 2 or open gate lead. <p>Malfunction of capacitor C1.</p> <ul style="list-style-type: none"> • Check for open capacitor. • Check for loose connections at capacitor terminals. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 5 does not go ON with a gate signal during operation.</p>	

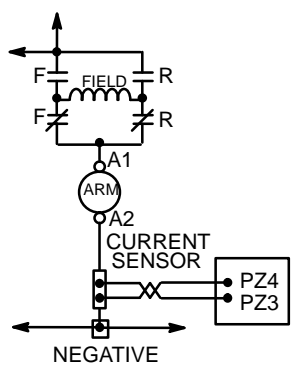
STATUS CODE -50	DESCRIPTION Capacitor C1 volts too low.	MEMORY RECALL No	
		CIRCUIT	Traction
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactor will energize, but controller does not operate. Static Return to Off (SRO) circuit is activated.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of SCR 2 circuit.</p> <ul style="list-style-type: none"> • Open circuit or loose connection between suppressor/SCR 1 assembly and SCR 5 (BUS). • Open circuit or loose connection between SCR 5 and SCR 2 (BUS). • Open circuit or loose connection between SCR 2 and PZ11 (red wire) and between SCR 2 gate and PZ10 (white/red wire). • Check SCR 2 to make sure that it will go ON with a gate signal. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 2 does not go ON at the beginning of the capacitor charge cycle.</p>	

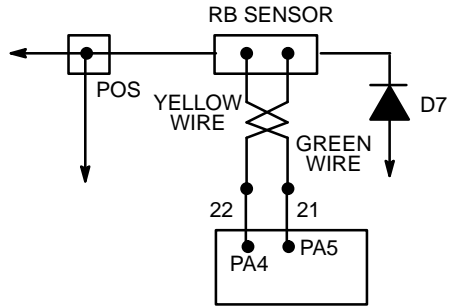
STATUS CODE -51	DESCRIPTION	MEMORY RECALL	Yes
	Capacitor C1 voltage is too high when motor current is high.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>Too much inductance from power cables.</p> <ul style="list-style-type: none"> • Check for battery cables that are too long. • Check for attachments that add too many cables or cables that are too long. <p>Motor current is too high.</p> <ul style="list-style-type: none"> • Check for a short-circuit in the field winding. • Check for a short-circuit in the armature winding. 		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage on capacitor C1 is more than 225 volts and the motor current is more than 300 amps.</p>	

STATUS CODE -52	DESCRIPTION	MEMORY RECALL	Yes
	Capacitor C1 voltage is too high when motor current is high.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>Too much inductance from power cables.</p> <ul style="list-style-type: none"> • Check for battery cables that are too long. • Check for attachments that add too many cables or cables that are too long. <p>Malfunction of diode D4 circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of diode D4. • Check for an open circuit or loose connection in the diode D4 circuit. <p>Malfunction of diode D3 circuit.</p> <ul style="list-style-type: none"> • Check for an open circuit or loose connection in the diode D3 circuit. 		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage on capacitor C1 is more than 225 volts and the motor current is less than 200 amps.</p>	

STATUS CODE -53	DESCRIPTION	MEMORY RECALL	Yes
	SCR 1 does not go OFF during plugging cycle.	CIRCUIT	Traction
<p>INDICATION OF FAULT Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p>POSSIBLE CAUSE SCR 1 failure is not caused by plugging.</p> <ul style="list-style-type: none"> Operate the truck in both directions to stall the traction motor. A new status code number will indicate the failure. Check and correct the malfunctions shown in the new "POSSIBLE CAUSE" list. <p>Plugging caused the failure of SCR 1.</p> <ul style="list-style-type: none"> Check for an open-circuit across diode D4. Check for an open-circuit or loose connection in the diode D4 circuit. Check the current sensor wires at both ends for loose connections. <p>Malfunction in motor circuit.</p> <ul style="list-style-type: none"> Check the motor circuit for an open circuit or loose connections. Check the motor brushes for wear and correct installation. <p>Tips of Forward or Reverse contactor momentarily opening and closing.</p> <ul style="list-style-type: none"> Check that power tips do not momentarily open and close when traveling over bumps and dock plates. 		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when any malfunction keeps SCR 1 from going OFF during the plugging cycle.</p>	

STATUS CODE -54	DESCRIPTION	MEMORY RECALL	Yes
	Short-circuit in an electronic driver for the Forward, Reverse or 1A contactor.	CIRCUIT	Traction
<p>INDICATION OF FAULT Motor controller will not operate.</p> <p>POSSIBLE CAUSE Fuse 7 (if installed) is open.</p> <ul style="list-style-type: none"> Check for a short-circuit that can cause Fuse 7 to open. Replace Fuse 7. <p>Control card malfunction</p> <ul style="list-style-type: none"> Replace control card. 		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the control card has a short-circuit in one of the electronic drivers for the Forward, Reverse or 1A contactor.</p>	

STATUS CODE -57	DESCRIPTION	MEMORY RECALL	Yes
	Polarity check of the output voltage from the current sensor.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>Yellow and green wires of current sensor to the control card are connected wrong.</p> <ul style="list-style-type: none"> • Check that the yellow wire is connected to PZ3 and the green wire is connected to PZ4. • Check that the yellow wire end of the current sensor is connected to battery negative. • Check from the current sensor to the control card for open or loose connections. <p>The power cables are connected wrong in the motor circuit.</p> <ul style="list-style-type: none"> • Check that the power cables are connected as shown at the right. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the input voltage at PZ3 and PZ4 is the wrong polarity.</p>	

STATUS CODE -70	DESCRIPTION	MEMORY RECALL	No
	No input from the current sensor for the regenerative braking circuit (yellow/22 wires).		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Motor controller will not operate.</p> <p align="center">POSSIBLE CAUSE</p> <p>Open circuit in the current sensor circuit for regenerative braking.</p> <ul style="list-style-type: none"> • Check yellow sensor wire and wire 22 for open circuit or loose connection (both ends) between RB Sensor (welded connection) and PA4. • Check for a loose plug or pin connection at PA4. • Check that the control card type (Function 17) is set correctly. See CHECKING AND ADJUSTING FUNCTION SETTINGS. Also see the correct table for your unit and battery of Table 7 through Table 19. Adjust to the correct setting. 		 <p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the input signal to PA4 is missing.</p>	

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
		-71	No input from the current sensor for the regenerative braking circuit (green/21 wire).
<p>INDICATION OF FAULT Motor controller will not operate.</p> <p>POSSIBLE CAUSE Open circuit in the current sensor circuit for regenerative braking.</p> <ul style="list-style-type: none"> • Check green sensor wire and wire 21 for open circuit or loose connection (both ends) between RB Sensor (welded connection) and PA5. • Check for a loose plug or pin connection at PA5. • Check that the control card type (Function 17) is set correctly. See CHECKING AND ADJUSTING FUNCTION SETTINGS. Also see the correct table for your unit and battery of Table 7 through Table 19. Adjust to the correct setting. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the input signal to PA5 is missing.</p>	

STATUS CODE	DESCRIPTION	MEMORY RECALL	No
		-72	Regenerative braking contactor does not energize.
<p>INDICATION OF FAULT Regenerative braking does not operate.</p> <p>POSSIBLE CAUSE Open-circuit in the PA6 circuit</p> <ul style="list-style-type: none"> • Check for an open-circuit or loose connection between PA6 and the A2 connection (positive connection) of the RB Contactor. • Check for an open-circuit or loose connection between diode D7 and the A2 connection (positive connection) of the RB Contactor. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the control card is operating and the voltage at PA6 is 2.5 volts or more.</p>	

STATUS CODE -73	DESCRIPTION	MEMORY RECALL	Yes
	Regenerative braking contactor does not open or opens slowly.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>RB contactor malfunction.</p> <ul style="list-style-type: none"> • Check the RB contactor for smooth operation and wear on the moving parts. <p>Input signal to PA6 is not regular.</p> <ul style="list-style-type: none"> • Check for an open-circuit or loose connections in the PA6 circuit from PA6 to the A2 connection (positive connection) of the RB contactor. 			
		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the RB contactor does not open within 100 milliseconds after power is removed from the coil.</p>	

STATUS CODE -74	DESCRIPTION	MEMORY RECALL	Yes
	Regenerative braking contactor closes too slowly.		CIRCUIT
<p align="center">INDICATION OF FAULT</p> <p>Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p align="center">POSSIBLE CAUSE</p> <p>RB contactor malfunction.</p> <ul style="list-style-type: none"> • Check the RB contactor for smooth operation and wear on the moving parts. <p>Input signal to PA6 is not regular.</p> <ul style="list-style-type: none"> • Check for an open-circuit or loose connections in the PA6 circuit from PA6 to the A2 connection (positive connection) of the RB contactor. <p>RB contactor coil circuit malfunction.</p> <ul style="list-style-type: none"> • Check the resistance of the coil for the RB contactor. The correct resistance is 10–14 ohms. • Check for loose connections from PB2 to the negative side of the RB contactor coil. • Check for loose connections from battery positive to the positive side of the RB contactor coil. 			
		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the RB contactor does not close within 100 milliseconds after power is applied to the coil.</p>	

STATUS CODE -75	DESCRIPTION	MEMORY RECALL	Yes
	SCR 1 does not go OFF during regenerative braking.		CIRCUIT
<p>INDICATION OF FAULT Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p>POSSIBLE CAUSE SCR 1 failure is <u>NOT</u> caused by regenerative braking.</p> <ul style="list-style-type: none"> To check, operate the truck in both directions to stall the traction motor. A new status code number will indicate the failure if the regenerative braking circuit is not the fault. Check and correct the malfunctions shown in the new "POSSIBLE CAUSE" list. <p>Regenerative braking caused SCR 1 failure (Status Code -75 continues)</p> <ul style="list-style-type: none"> Check for an open-circuit or loose connections on all power circuits for regenerative braking. Check for an open-circuit or loose connections in the following input circuits for regenerative braking: <ul style="list-style-type: none"> Yellow wire and wire 22 from RB Sensor to PA4 Green wire and wire 21 from RB Sensor to PA5 Wire 17 from D7/power tips of RB Contactor to PA6 Check motor brushes for wear and correct installation. <p>Malfunction in motor circuit.</p> <ul style="list-style-type: none"> Check motor circuit for an open-circuit or loose connections. Check motor brushes for wear and correct installation. <p>Tips of Forward or Reverse contactor momentarily opening and closing.</p> <ul style="list-style-type: none"> Check that power tips do not momentarily open and close when traveling over bumps and dock plates. 		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when any malfunction keeps SCR 1 from going OFF during regenerative braking.</p>	

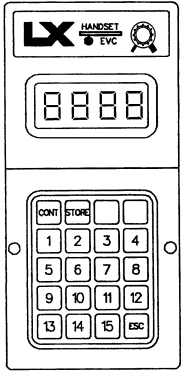
STATUS CODE -76	DESCRIPTION	MEMORY RECALL	Yes
	Voltage on capacitor C1 is too high during regenerative braking.		CIRCUIT
<p>INDICATION OF FAULT Forward or Reverse contactors deenergize and energize, then will only energize when the key is moved to the Off then ON position.</p> <p>POSSIBLE CAUSE Bad connection or a connection that is not always a good connection in the battery power circuit.</p> <ul style="list-style-type: none"> Check battery power circuit for loose connections. Check the Fuse 1 (power fuse) and battery connections that can open during regenerative braking. <p>Too much inductance from power cables.</p> <ul style="list-style-type: none"> Check for battery cables that are too long. Check for attachments that add too many cables or cables that are too long. 		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage on capacitor C1 is more than 225 volts during regenerative braking.</p>	

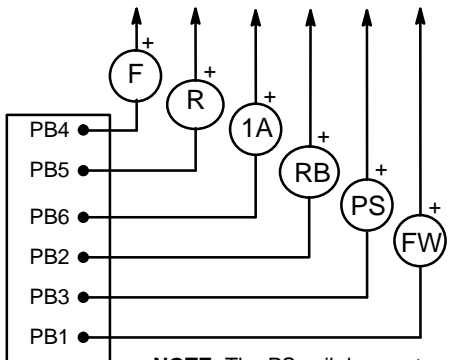
STATUS CODE -90	DESCRIPTION	MEMORY RECALL	No
	Traction motor temperature is too high.		CIRCUIT
<p>INDICATION OF FAULT</p> <p>Status code number is flashing on the instrument panel display. Lift truck speed can be reduced.</p> <p>POSSIBLE CAUSE</p> <p>Traction motor is too hot. Temperature Switch has completed circuit to battery negative.</p> <ul style="list-style-type: none"> • Allow motor to cool. <p>Other Causes:</p> <ul style="list-style-type: none"> • PA3 (wire 95) circuit has a short-circuit to battery negative. • There is a short-circuit of the wires 95 and 13 of the Temperature Switch for the traction motor. • There is a short-circuit or other malfunction of the Temperature Switch for the traction motor. <p>NOTE: When the ITW Instrument Panel Display is installed, there is also a wire 95 from the Temperature Switch to the connector for the ITW Display.</p>			
		<p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at terminal PA3 of the PUMP control card is at zero volts.</p>	

STATUS CODE -93	DESCRIPTION	MEMORY RECALL	No
	Temperature of one or both hydraulic pump motors is too high.		CIRCUIT
<p>INDICATION OF FAULT</p> <p>Status code number is flashing on the instrument panel display. Lift truck speed can be reduced.</p> <p>POSSIBLE CAUSE</p> <p>Hydraulic pump motor or motors is too hot. One or more Temperature Switch for a hydraulic pump motor has completed the circuit to battery negative.</p> <ul style="list-style-type: none"> • Allow motor or motors to cool. <p>Other Causes:</p> <ul style="list-style-type: none"> • PA2 (wire 96) circuit has a short-circuit to battery negative. • There is a short-circuit of wires 96 and 13 of one or both Temperature Switches for the hydraulic pump motor or motors. • There is a short-circuit or other malfunction of one or both Temperature Switches for the hydraulic pump motor or motors. <p>NOTE: When the ITW Instrument Panel Display is installed, there is also a wire 96 from the Temperature Switch, or switches, to the connector for the ITW Display.</p>			
		<p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage at terminal PA2 of the PUMP control card is at zero volts.</p>	

STATUS CODE -94	DESCRIPTION	MEMORY RECALL	No
	Traction motor brushes are too worn.		CIRCUIT
<p>INDICATION OF FAULT Status code number is flashing on the instrument panel display.</p> <p>POSSIBLE CAUSE Traction motor brushes are too worn. A brush sensor has completed the circuit to battery negative.</p> <ul style="list-style-type: none"> • Replace brushes. <p>Other Causes:</p> <ul style="list-style-type: none"> • PA4 (wire 93) or PA5 (wire 94) circuit has a short-circuit to battery negative. • There is a short-circuit of wires 93 and 94 to the brush sensors. • There is a short-circuit or other malfunction of the brush sensors for the traction motor. <p>NOTE: When the ITW Instrument Panel Display is installed, there are also wires 93 and 94 from the brush sensors of the traction motor to the connector for the ITW Display.</p>			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at terminal PA4 or PA5 of the PUMP control card is at zero volts.</p>	

STATUS CODE -95	DESCRIPTION	MEMORY RECALL	No
	The brushes of a pump motor are too worn.		CIRCUIT
<p>INDICATION OF FAULT Status code number is flashing on the instrument panel display.</p> <p>POSSIBLE CAUSE The brushes of a pump motor are too worn. A brush sensor has completed the circuit to battery negative.</p> <ul style="list-style-type: none"> • Replace brushes. <p>Other causes in systems with one pump motor or two pump motors*:</p> <ul style="list-style-type: none"> • Wires between brush sensors and card or display connector plugs have a short-circuit to battery negative. • There is a short-circuit to battery negative at a terminal for the brush sensor at the control card or ITW instrument panel display. • There is a short circuit to battery negative or other malfunction of a brush sensor. <p>NOTE: If there is no SCR pump control card, wires 98 and 99 go to connector for ITW instrument panel display only. There is no status code display without an SCR pump control card.</p>			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at any terminal of the following terminals of the pump control card is at zero volts: Single Pump System – PB1 or PB2 Pump #2 of Two Pump System if installed – PA6 or PB6</p>	

STATUS CODE -117	DESCRIPTION	MEMORY RECALL	No
		Wrong type of selection for control card (Function 17).	CIRCUIT
<p>INDICATION OF FAULT Controller for pump motor(s) will not operate.</p> <p>POSSIBLE CAUSE</p> <p>Wrong card type selection (Function 17) for SCR pump control card.</p> <ul style="list-style-type: none"> Review description of FUNCTION 17 CARD TYPE SELECTION in Pump Control Card (EV100/200 LXP) of Function Descriptions. Also see TABLE 6, 13 or 16. See CHECKING AND ADJUSTING FUNCTION SETTINGS to adjust the function value. <p>NOTE: The function value MUST be set to <u>030</u> if optional PMT kit is installed or <u>system will not operate</u>.</p>		 <p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the card type selection is set to the wrong value for this control card.</p>	

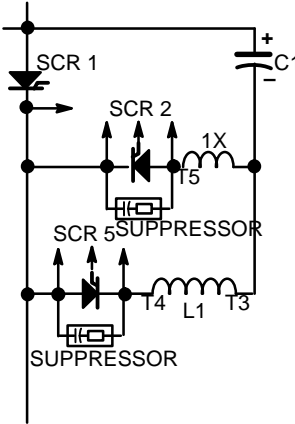
STATUS CODE -123	DESCRIPTION	MEMORY RECALL	No
		Coil current is too low for the Pump Contactor.	CIRCUIT
<p>INDICATION OF FAULT Pump contactor will not energize. Status code can change between code -123 and code -124. Complete the checks for this code -123. If the problem is not found, do the check for code -124.</p> <p>POSSIBLE CAUSE</p> <p>Malfunction of coil circuit for the pump contactor.</p> <ul style="list-style-type: none"> Check for open circuit or loose connection between PB4 and positive side of pump contactor coil. Remove plug B. Check the resistance between PB4 and the positive side of the pump coil. The correct resistance is 10–14 ohms. 		 <p>NOTE: The PS coil does not apply when the lift truck has "On-Demand" power steering.</p> <p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the current for the pump contactor is less than 100 ma.</p>	

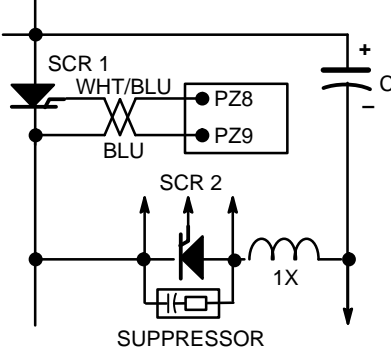
STATUS CODE -124	DESCRIPTION	MEMORY RECALL	No
	Voltage too high (more than 12% of battery voltage) at T2 of the control panel.		CIRCUIT
<p>INDICATION OF FAULT</p> <p>Motor controller will not operate. Status code can change between code -123 and code -124. Do all the "Possible Cause" checks for this Status Code. If the problem is not found, do the checks in code -123.</p> <p>POSSIBLE CAUSE</p> <p>Malfunction of pump contactor.</p> <ul style="list-style-type: none"> Pump power tips fail to close because: <ol style="list-style-type: none"> 1) Contactor tip assembly does not move freely. . 2) Malfunction of pump contactor coil. (See status code -123) <p>Open motor circuit</p> <ul style="list-style-type: none"> Check for open circuit or loose connection in motor circuit from the A1 connection to the A2 connection on the SCR control panel. 			
		<p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when T2 volts is greater than 12% of battery voltage.</p>	

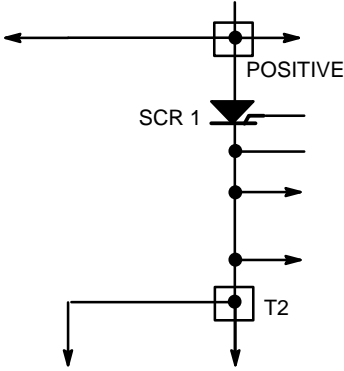
STATUS CODE -141	DESCRIPTION	MEMORY RECALL	No
	Open thermal protector or controller is too hot		CIRCUIT
<p>INDICATION OF FAULT</p> <p>The pump motor has less power or no power during SCR operation.</p> <p>POSSIBLE CAUSE</p> <p>There is an open-circuit in the thermal protector circuit.</p> <ul style="list-style-type: none"> Check for loose connections or a broken wire between: <ul style="list-style-type: none"> Black wire of Thermal Protector and PZ1 Gray wire of Thermal Protector and PZ5 <p>Malfunction of thermal protector</p> <ul style="list-style-type: none"> Disconnect the wires from PZ1 and PZ5. When the temperature is approximately 25°C (75°F), measure the resistance between the black and gray wires. The correct resistance is approximately 300 ohms or less. Replace the thermal protector if the resistance is greater than 300 ohms. <p>Thermal Protector is operating normally and SCR 1 is too hot.</p> <ul style="list-style-type: none"> Let SCR 1 cool. If operation is normal, fault will clear after SCR 1 cools. 			
		<p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage between PZ1 and PZ5 is more than 1.8 volts.</p>	

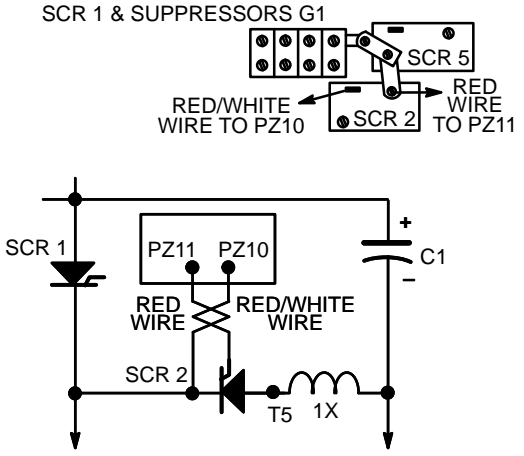
STATUS CODE -142	DESCRIPTION	MEMORY RECALL	No
	SCR motor current sensor input is missing.		CIRCUIT
<p>INDICATION OF FAULT Traction motor has no power during SCR operation.</p> <p>POSSIBLE CAUSE There is an open-circuit in the circuit for the motor current sensor.</p> <ul style="list-style-type: none"> • Check for loose connections or a broken green wire between the current sensor for SCR 1 and PZ4. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage between PZ4 and battery negative is more than 1.6 volts with no motor current.</p>	

STATUS CODE -143	DESCRIPTION	MEMORY RECALL	No
	SCR motor current sensor input is missing.		CIRCUIT
<p>INDICATION OF FAULT Stall currents in SCR range are higher than normal and uncontrollable with C/L adjustments.</p> <p>POSSIBLE CAUSE Open sensor wire circuit to PZ3.</p> <ul style="list-style-type: none"> • Check for loose connections or broken wire (yellow wire) from current sensor to PZ3 on the control card. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage between PY7 and negative is less than 0.84 volt with no current flowing in the motor circuit</p>	

STATUS CODE -144	DESCRIPTION SCR 1 (Pump) will not go OFF correctly.	MEMORY RECALL	No
		CIRCUIT	Pump
<p>INDICATION OF FAULT</p> <p>Pump continues to operate until key is moved to the OFF position.</p> <p>POSSIBLE CAUSE</p> <p>Malfunction of SCR 5 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 5. • Check for a short-circuit of SCR 5 suppressor (D25). • Check for an open SCR 5 or open gate lead. <p>Malfunction of SCR 2 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 2 • Check for a short-circuit of SCR 2 suppressor (D22). • Check for an open SCR 2 or open gate lead. <p>Open inductor (1X).</p> <ul style="list-style-type: none"> • Check for open circuit between T5 and T3. Correct resistance is zero ohms. <p>Malfunction of SCR 1 (Pump).</p> <ul style="list-style-type: none"> • Turn-Off time for SCR 1 is not within specifications. No easy test is possible. Replace SCR 1 after doing the other checks above with no problems found. 		 <p>The diagram shows a power supply with capacitor C1. SCR 1 is connected to the positive supply. Its cathode is connected to a common ground. The anode of SCR 1 is connected to the gate of SCR 2. SCR 2's cathode is connected to the positive supply, and its anode is connected to terminal T5. SCR 5's cathode is connected to the positive supply, and its anode is connected to terminal T4. A suppressor is connected between T4 and T5. Inductor 1X is connected between T5 and T3. Another suppressor is connected between T4 and T3.</p>	
		<p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when, during SCR 1 (Pump) operation, SCR 1 does not go OFF correctly.</p>	

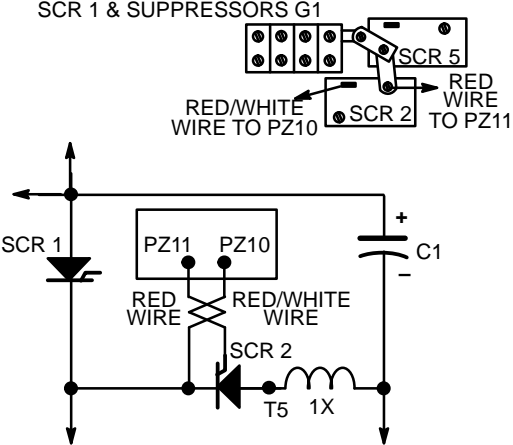
STATUS CODE -145	DESCRIPTION SCR 1 (Pump) does not go ON correctly.	MEMORY RECALL	Yes
		CIRCUIT	Pump
<p>INDICATION OF FAULT</p> <p>The hydraulic pump control will not operate.</p> <p>POSSIBLE CAUSE</p> <p>Malfunction of SCR 2 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 2 • Check for a short-circuit of SCR 2 suppressor (D22). • Check for an open SCR 2 or open gate lead. <p>Malfunction of SCR 1 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for open circuit or loose connections between SCR 1 and PZ8 (white/blue wire). • Check for open circuit or loose connections between SCR 1 (D3 suppressor) and PZ9 (blue wire). <p>Malfunction of SCR 1 (Pump).</p> <ul style="list-style-type: none"> • Intermittent or open SCR 1 gate. No easy test is possible. Replace SCR 1 after doing the other checks above with no problems found. 		 <p>The diagram shows a power supply with capacitor C1. SCR 1's cathode is connected to the positive supply. Its anode is connected to a common ground. The gate of SCR 1 is connected to a junction of two wires: a white/blue wire (PZ8) and a blue wire (PZ9). The blue wire (PZ9) is also connected to a suppressor. SCR 2's cathode is connected to the positive supply, and its anode is connected to terminal T5. A suppressor is connected between T5 and T3. Inductor 1X is connected between T5 and T3.</p>	
		<p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 1 does not go ON with a gate signal during operation.</p>	

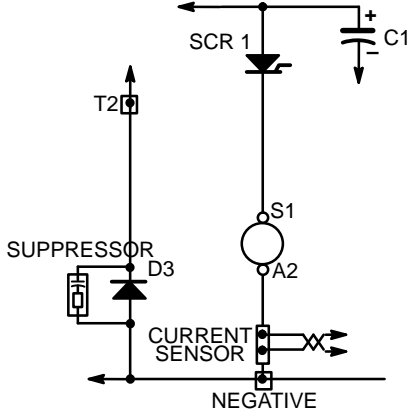
STATUS CODE -146	DESCRIPTION	MEMORY RECALL	No
	Short-circuit across SCR 1. Part of Look-ahead test. T2 voltage is 85% or more of battery voltage.		CIRCUIT
<p>INDICATION OF FAULT</p> <p>There is at least 85% of battery voltage at T2 (Pump) when SCR 1 (Pump) is normally OFF.</p> <p>POSSIBLE CAUSE</p> <p>Malfunction of SCR 1 (Pump).</p> <ul style="list-style-type: none"> • See Status Code -144. <p>Malfunction of SCR 1 (Pump) OFF circuit.</p> <ul style="list-style-type: none"> • See Status Code -144. <p>Short-circuit of SCR 1 (Pump).</p> <ul style="list-style-type: none"> • Check that SCR 1 does not have an internal short-circuit. • Check for a short-circuit of SCR 1 insulator (co-therm) that can cause a short-circuit of SCR 1 heat sink to base plate. 		 <p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the current flow to the pump motor is not interrupted. This current flow must stop during the OFF times of SCR 1 with normal SCR operation.</p>	

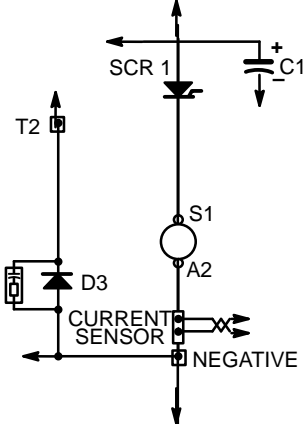
STATUS CODE -147	DESCRIPTION	MEMORY RECALL	Yes
	SCR 2 does not go ON correctly.		CIRCUIT
<p>INDICATION OF FAULT</p> <p>Hydraulic pump motor will not operate or continues to operate until the battery is disconnected.</p> <p>POSSIBLE CAUSE</p> <p>Malfunction of SCR 2 circuit.</p> <ul style="list-style-type: none"> • Check that SCR 2 will go ON with a gate signal. • Check for an open circuit or loose connection between SCR 2 gate and PZ10 (white/red wire). • Check for an open circuit or loose connection SCR 1 and capacitor C1 through the SCR 2 circuit. 		<p>SCR 1 & SUPPRESSORS G1</p>  <p>REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 2 will not go ON correctly during normal operation.</p>	

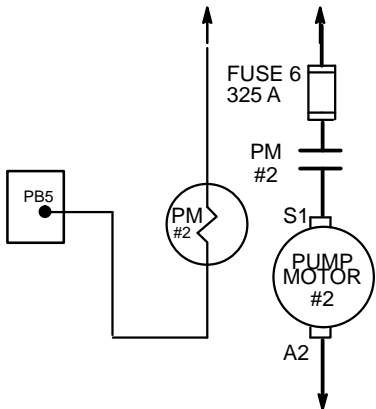
STATUS CODE -148	DESCRIPTION Voltage at T2 is less than 12% of battery voltage.	MEMORY RECALL	No
		CIRCUIT	Pump
<p>INDICATION OF FAULT Hydraulic pump control will not operate.</p> <p>POSSIBLE CAUSE Malfunction of diode D3 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of diode D3. • Check for a short-circuit of suppressor for diode D3. <p>Control card is the wrong type. If the hydraulic pump control is used without a pump contactor, the control card must be set correctly. See Function 17 for the correct setting.</p>			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage at T2 is less than 12% of battery voltage.</p>	

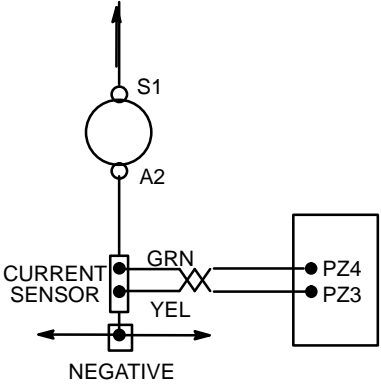
STATUS CODE -149	DESCRIPTION SCR 5 (Pump) does not go ON correctly.	MEMORY RECALL	Yes
		CIRCUIT	Pump
<p>INDICATION OF FAULT Hydraulic pump motor will not operate or continues to operate until the battery is disconnected.</p> <p>POSSIBLE CAUSE Malfunction of SCR 5 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 5. • Check for a short-circuit of suppressor for SCR 5. • Check for an open circuit across SCR 2 or an open gate lead to SCR 5. • Check for an open circuit or loose connection between SCR5 and PZ12 (white/purple wire). <p>Malfunction of SCR 2 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of SCR 2. • Check for a short-circuit of suppressor for SCR 2. • Check for an open circuit across SCR 5 or an open gate lead to SCR 2. <p>Malfunction of capacitor C1 (Pump) .</p> <ul style="list-style-type: none"> • Check for open capacitor. • Check for loose connections at capacitor terminals. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when SCR 5 (Pump) does not go ON with a gate signal during operation.</p>	

STATUS CODE -150	DESCRIPTION	MEMORY RECALL	No
	Capacitor C1 (Pump) volts too low.	CIRCUIT	Pump
<p align="center">INDICATION OF FAULT</p> <p>Hydraulic pump motor will not operate or continues to operate until the battery is disconnected.</p> <p align="center">POSSIBLE CAUSE</p> <p>Malfunction of SCR 2 (Pump) circuit.</p> <ul style="list-style-type: none"> • Open circuit or loose connection between suppressor/SCR 1 assembly and SCR 5 (BUS). • Open circuit or loose connection between SCR 5 and SCR 2 (BUS). • Open circuit or loose connection between SCR 2 and PZ11 (red wire) or between SCR 2 gate and PZ10 (white/red wire). • Check SCR 2 to make sure that it will go ON with a gate signal. 		<p align="center">SCR 1 & SUPPRESSORS G1</p> 	
		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when SCR 2 (Pump) does not go ON at the beginning of the capacitor charge cycle.</p>	

STATUS CODE -151	DESCRIPTION	MEMORY RECALL	Yes
	Capacitor C1 (Pump) voltage is too high when motor current is high.	CIRCUIT	Pump
<p align="center">INDICATION OF FAULT</p> <p>Hydraulic pump motor will not operate or continues to operate until the battery is disconnected.</p> <p align="center">POSSIBLE CAUSE</p> <p>Too much inductance from power cables.</p> <ul style="list-style-type: none"> • Check for battery cables that are too long. • Check for attachments that add too many cables or cables that are too long. <p>Pump motor current is too high.</p> <ul style="list-style-type: none"> • Check for a short-circuit in the field winding. • Check for a short-circuit in the armature winding. 			
		<p align="center">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the voltage on capacitor C1 (Pump) is more than 225 volts and the motor current is more than 300 amps.</p>	

STATUS CODE -152	DESCRIPTION Capacitor C1 (Pump) voltage is too high when motor current is low.	MEMORY RECALL Yes	
		CIRCUIT	Pump
<p>INDICATION OF FAULT Hydraulic pump motor will not operate.</p> <p>POSSIBLE CAUSE Too much inductance from power cables.</p> <ul style="list-style-type: none"> • Check for battery cables that are too long. • Check for attachments that add too many cables or cables that are too long. <p>Malfunction of diode D3 (Pump) circuit.</p> <ul style="list-style-type: none"> • Check for a short-circuit of diode D3. • Check for an open circuit or loose connection in the diode D3 circuit. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the voltage on capacitor C1 (Pump) is more than 225 volts and the motor current is less than 200 amps.</p>	

STATUS CODE -154	DESCRIPTION Shorted pump contactor coil driver (pump #2 E3.50-5.50XL or E70-120XL only).	MEMORY RECALL No	
		CIRCUIT	Pump
<p>INDICATION OF FAULT Control will not operate.</p> <p>POSSIBLE CAUSE Control card malfunction</p> <ul style="list-style-type: none"> • Replace control card. 			
		<p>REASON FOR STATUS CODE DISPLAY This status code is displayed when the the pump #2 coil driver (in control card) has a short-circuit.</p>	

STATUS CODE	DESCRIPTION	MEMORY RECALL	Yes
-157	Polarity check of the output voltage from the current sensor (Pump).	CIRCUIT	Pump
	<p style="text-align: center;">INDICATION OF FAULT</p> <p>Hydraulic pump control will not operate.</p> <p style="text-align: center;">POSSIBLE CAUSE</p> <p>Yellow and green wires of current sensor to the control card are connected wrong.</p> <ul style="list-style-type: none"> • Check that the yellow wire is connected to PZ3 and the green wire is connected to PZ4. • Check that the yellow wire end of the current sensor is connected to battery negative. • Check from the current sensor to the control card for open or loose connections. <p>The power cables are connected wrong in the motor circuit.</p> <ul style="list-style-type: none"> • Check that the power cable at the A2 terminal of the motor is connected to the current sensor. 		
		<p style="text-align: center;">REASON FOR STATUS CODE DISPLAY</p> <p>This status code is displayed when the input voltage at PZ3 and PZ4 (Pump) is the wrong polarity.</p>	

3/20/90

Route copy back from Harold. Making changes from Duane & Harold's (1st route) comments.

3/21/90

Above comments entered. Waiting for GE EV-200 "LX" control card PN to enter on page 9 and 11.

Enter card info and routed (2nd) on 3/28/90.

4/3/90

Back from Ralph Golik. He told me about additional future card types and some European marketing plans that changes my approach – especially Introduction and Description. There is also some newer info available and more art to add. Pulled route copy to make changes. Will route again after additions/changes.

4/18/90

Last worked on 4/11/90. Back into it today after routing the "hot" H40-60XL Caps & Specs SRM 48.

5/23/90

Last worked on 4/25/90. Back into it again today after getting the route & etc changes done and to HRS for the "hot" H40-60XL Caps & Specs SRM 48. Will add info from Ralph Golik on the new digital display Lift Interrupt operation after installing a new battery. This battery indicator operates different than any we have used before. ***Operation differences needs to be in Operating Manuals also.*** E70-120XL EV100LX control released on ECN 54624 12/6/89 (E70-120XL added to box on CONTENTS page). E25-35XL & E40-60XL EV100LXT control released on ECN 54373-07 3/19/90. E70-120XL GE LX Series instrument panel display released on ECN 54373-06 4/24/90

6/8/90

Finished new art and revised text. Routing "new concept" format and additional tables plus a

8/7/90

Finished and routed Final route copy to HRS. Copy sent to Joe Pettitt Danville.

8/21/90

Finished making changes from Final routing (includes DAN comments). Sent to Dean for printing.

9/19/90

Harold ask me to go ahead and finish up the changes so that June (DAN) can print this new version.

2/1/91

Harold ask me to revise per new info/corrections since first printing. New info from schools and usage plus some changes/additional info from GE. Especially revise FUNCTION TABLES and STATUS CODE blocks in Troubleshooting. We also need to add the R30E/EA and J25-35B to the FUNCTION TABLES since the "LX" controllers have been released for them.

3/1/91

Stopped work to revise our E40-60XL "LX" diagrams for the YALE ERC 040-060 RA/ZA so that 8 trucks could be UL inspected and shipped. Gary/Harold wants me to do 8 "Diagram SRM Sections" with "YALE Industrial Trucks" in logo type on the front cover. No SRM or Part #. To do "quick-and-dirty", but as similar to our SRM sections as possible – ASAP.

3/8/91

Finished Yale ERC 040-060 Diagrams and back on this revision. Harold wants me to revise FUNCTION TABLES to agree with proposed GRAM P-1774 from DAN. Also ask me to check and confirm table data in GRAM. Harold/Lloyd have now decided to route due to all the changes additions, so had June (DAN) go ahead and print enough of original printing (9/90) to get her by.

3/12/91

Harold ask me to reformat (save current format/data) FUNCTION TABLES in a format similar to the "Traction Con-

trol Settings” for the R30E/EA EV-100 LX table in Inspection Drawing 137514 R9 (11/90). Will need to also get additional data (included in this format) for the other models.

3/21/91

Had to stop work on terminal to install new Interleaf and terminals on 3/41/91. Got back on this morning, but had to go through complete document to remove the conversion to “CX” in Printer properties. Art from CEBA needed to try a printing to see if printer would work from Dean’s terminal that I’m working at. Inserted new format Function Value tables. In process of entering/changing data.

4/3/91

Finished function value tables (Tables 7-18) and finished adding the function descriptions for the LXM Dual motor control (J25-35B). Was able to print on the CX printer for the first time (without converting document to PX and the resultant scrambled document). Have printed a copy for pasteup and then routing. Gave Harold a copy of the new Function Tables (Tables 7-18) to send to Danville for the LX school.

4/4/91

Harold wants to change the format of all the function table heads. We devised and agreed on the new format. Laid out the new format for him to check. Also move the shaded area from the recommended settings to the ranges. Harold also ask me to add the European designations to the model references tin the table titles where applicable.

4/9/91

Was able to get the last pages out of the “CX” printer at one-page-at-a-time (still having software probs. after the latest Interleaf-4.0- and new equip installation — near end of 3rd week now). Harold said the new routing procedure was still him first then after comment corrections, to John Johnson. First Routing of revised section to him today.

4/12/91

Started making changes from 1st Routing returned from Harold.

4/15/91

Finished changes from First Routing. Routed 2nd to John Johnson PORT and Ser/Tng DAN. Due back 4/30.

5/15/91

2nd routing copy from DAN back 5/1/91. PORT copy back 5/14/91. Finished SRM 401 (ready for printing) today. Starting changes from route copies this section.

5/22/91

Finished rewrite and printed copy for final review. Needs paste-up of art and GE tables to delete all of their “defective” references. Will finish paste-up tomorrow and give to Harold for review.

12/2/92 – Lloyd

Revising to include additional function (Controlled Acceleration Current Limit) and the addition of the Start Sw Ck as part of the SRO circuit as well as adding the N40-45FR table. Also revising to current format.

12/10/92 – Lloyd

Finished revisions. Have NOT created the new FAULT CODE boxes at the rear of the section to replace the photocopy boxes from the GE manual. Harold said to wait on that. Sent to Harold for routing/printing.

12/18/92 – Lloyd

Harold ask me to stop on this and work on Dean’s project – 2200 SRM 134 (revision for H40-65M) so that there would be time for translation.

2/9/93 – Lloyd

Doing some additional work on this while waiting for schematics for H40-65XM.

2/15/93 – Lloyd

Finished 1st draft of schematics for H40-65XM which were sent to Harold for routing. Working on this section again until finished or until Harold says otherwise.

2/16/93 – Lloyd

Finished last of Status Codes. To Harold for routing, or if 12/10/92 routing is sufficient, ready to print.

**EV-100/200 LX SERIES
DIAGNOSTIC MOTOR
CONTROLLER
& HAND SET**

**DESCRIPTION, CHECKS, REPAIRS
ADJUSTMENTS AND TROUBLESHOOTING**

**PART NO. 897409 2200 SRM 460
2200 SRM 460 5/91 (9/90) Litho in U.S.A.**