SERVICE REPAIR

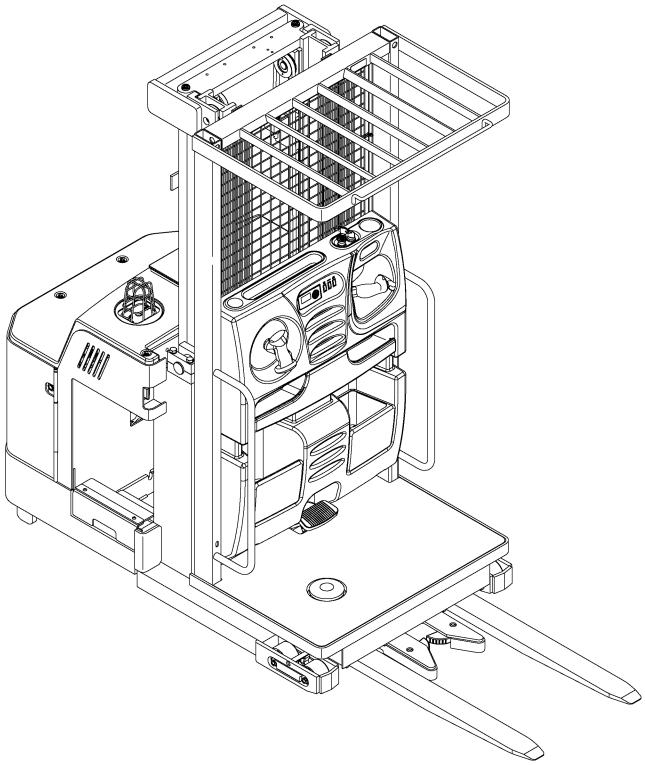
MANUAL

Hyster H118 (R30XM3) Forklift

HYSTER

AC MOTOR CONTROLLER

R30XMF3 [A169];
R30XMA3 [A185];
R30XMS3 [E174];
R30XM3 [H118]



HYSTER

PART NO. 4031796

2200 SRM 1466

SAFETY PRECAUTIONS
MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

NOTE: The following symbols and words indicate safety information in this manual:

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the WARNING symbol and word are on orange background. The CAUTION symbol and word are on yellow background.

TABLE OF CONTENTS

This section is for the following models:

(R30XMF3) [A169];
(R30XMA3) [A185];
(R30XMS3) [E174];
(R30XM3) [H118]

"THE QUALITY KEEPERS"

HYSTER APPROVED PARTS

General

INTRODUCTION

Procedures are outlined for controller programming and troubleshooting.

DISCHARGING THE CAPACITORS

WARNING

DO NOT make repairs or adjustments unless you have been properly trained and authorized to do so. Improper repairs and adjustments can create dangerous operating conditions. DO NOT operate a lift truck that needs repairs. Report the need for repairs to your supervisor immediately. If repair is necessary, attach a DO NOT OPERATE tag on the steering wheel and disconnect the battery.

Disconnect the battery and allow the capacitors to discharge before opening any compartment covers or inspecting or repairing the electrical system. DO NOT place tools on top of the battery. If a tool causes a short circuit, the high current flow from the battery can cause personal injury or property damage.

Some checks and adjustments are performed with the battery connected. DO NOT connect the battery until the procedure instructs you to do so. Never wear any metallic items on your fingers, arms, or neck. Metal items can accidentally make an electrical connection and cause injury.

Before performing any tests or adjustments, block the lift truck to prevent unexpected movement.

The capacitor in the transistor controller(s) can hold an electrical charge after the battery is disconnected. To prevent an electrical shock and personal injury, discharge the capacitor(s) before inspecting or repairing any component in the drive unit compartment. Make certain that the battery has been disconnected.

DO NOT short across the motor controller terminals with a screwdriver or jumper wire.

1. To avoid injury and prevent electrical shock, perform Step 2 through Step 6 to discharge the capacitors before troubleshooting, making adjustments or repairs, or connecting or disconnecting a PC service tool:
2. Turn the key or keyless switch to the **OFF** position and **DISCONNECT THE BATTERY** by pushing forward on the battery disconnect lever.
3. Block the lift truck so the drive wheels are off the floor to prevent lift truck from moving.
4. Remove the electrical compartment cover to access the lift controller.

NOTE: The lift and traction controllers are wired parallel. Connecting the resistor across the lift controller will also discharge capacitors in the traction controllers if they are properly connected. To discharge the capacitors in each controller individually, refer to **Periodic Maintenance** 8000SRM1472.

5. Discharge the capacitors in the controllers by connecting a 200-ohm, 2-watt resistor across the lift controller's negative (B-) and positive (B +) terminals. Wait at least 20 seconds to be sure that the capacitors are fully discharged. See Figure 1.
6. Remove the resistor from the controller and reinstall the electrical compartment cover before returning the lift truck to service.

There are two controllers used for the Order Selectors. The application of each controller is based on the truck voltage. The traction controller manages the CANbus traffic for the truck. In addition the traction controller has significant I/O responsibility. the hydraulic coils, horn, back-up alarm, mast prox sensor, parking brake, and the traction motor are managed by the traction controller.

Type	DC Battery Voltage	AC RMS Current Rating
ACE0	24	320
ACE0	36	280

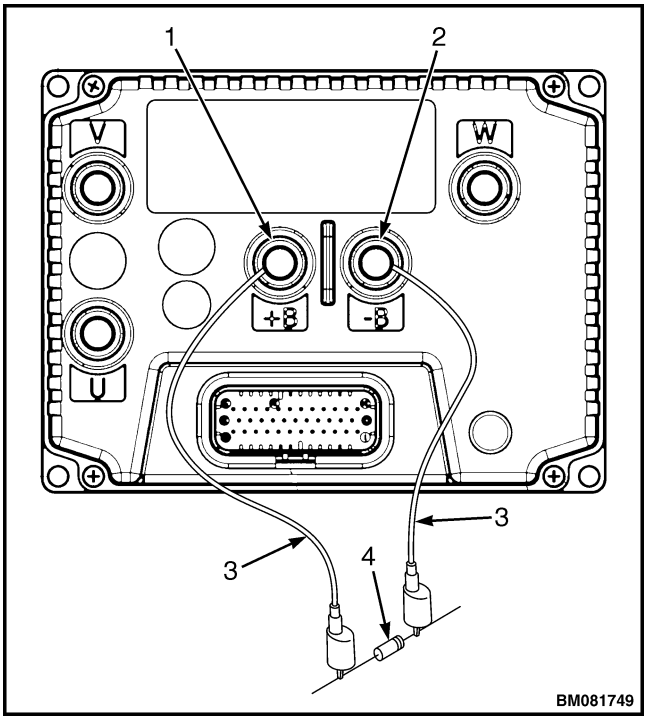


Figure 1. Discharging the Capacitors

Legend for Figure 1

1. B- TERMINAL
2. B+ TERMINAL
3. JUMPER LEADS
4. 200-OHM, 2-WATT RESISTOR

Parameters

A parameter is a measurement or a setting that defines a lift truck function. A specific function parameter works with other function parameters to control the operation of the lift truck.

WARNING

The parameter for each function has a value range so the motor controller can be used on different models of lift trucks. This variation is needed for lift trucks of different capacities and operational needs. Adjustment of a function to the wrong number value for your lift truck model can cause the truck to operate differently than normal. Always test operational characteristics of a lift truck when operating for the first time.

NOTE: Table 1 shows the factory default setting and total range for each parameter that is adjustable by the user.

Parameters can be adjusted through the dash display. The factory default values listed in Table 1 are the recommended settings for new units. These settings will give satisfactory performance for most applications.

WARNING

If any of the parameter values are changed, the operators must be told the lift truck will operate differently.

NEVER adjust any of the following parameters without using the procedures and settings given in this section.

Parameter Descriptions in this section contain descriptions for the different parameters. These parameters can also be accessed using the ZAPI Handset tool.

Table 1. Parameter Values

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
Truck Setup				
SERIAL NUMBER	Truck serial number, 11 digits, alpha-numeric	A-Z or 0-9	Serial Number assigned at production	Serial Number assigned at production
BATTERY TYPE	Sets battery type	Flooded or Maintenance Free	Varies depending on ordered option	Varies depending on ordered option
BDI MAX ADJUST	Adjusts the battery voltage which the truck software considers to be "10" BDI bars. "0 " = lower voltage to "9" = higher voltage.	0 to 9	3	3
BDI MIN ADJUST	Adjusts the battery voltage that would correspond to "0" BDI bars. "0 " = lower voltage to "9" = higher voltage.	0 to 9	1	1
BDI ADJUST STARTUP	Used to set the number of BDI bars which the display will show immediately after rekey based on battery voltage. "0" = lowest voltage setting for a given number of bars to "9" = highest voltage setting for a given number of bars	0 to 9	7	7

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
BDI DELTA RESET	Adjusts the change in battery state-of-charge required to reset the BDI back to 10 bars.	0 to 9	4	4
LIFT INTERRUPT	Toggle on or off. If on, the percentage of battery discharge (0-10% charge remaining) is set. This limit determines at what battery discharge point the lift function is prevented. The lift interrupt feature is controlled by the master CAN I/O controller and prevents lift	ON/OFF	ON	OFF
AUD MOTION ALARM	Sets conditions when audible alarm will sound or visual alarm will flash.	0 to 15	Varies depending on ordered option	Varies depending on ordered option
SERVICE REMINDER	Sets hour meter increment for reminder on dash display, enter hours 0 hours will = off	0 to 65535 hours	0	0
TRUCK INSPECTION	Enables the operator checklist which is required to be completed prior to operating the truck.	ON/OFF	OFF	OFF
SPEED UNIT	Toggles between MPH and KPH.	MPH/KPH	MPH	MPH

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
TEMP UNIT	Toggles between Farenheit and Celcius.	°C/°F	°F	°F
POWER TIME OUT	Sets time period that truck will remain operational with foot pedal switch not depressed.	1 to 60 minutes	10	10
WIRE GUIDANCE	Enables/disables wire guidance functionality. If "off", the "WG Config" menu is hidden.	1 = ON 2 = OFF 0 = OFF	Varies depending on ordered option	Varies depending on ordered option
RESTORE DEFAULTS **WARNING** **Restore Defaults will take all calibration values to the factory default values. Wire guidance and the proportional valve will require recalibration. The Traction, Hoist and RTC Hall sensors will require recalibration.** **For all Trucks record SET STEER 0 POS and for those trucks with wire guidance record WG REV OFFSET prior to selecting Restore Defaults.**	Restores all technician modifiable parameters to factory default settings.	YES/NO	NO	NO

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
Traction Setup				
TOP SPEED FWD	Sets the top forward speed of the truck.	0.1 to 6.5	6	6.5
TOP SPEED REV	Sets the top reverse speed of the truck.	0.1 to 6.5	6	6.5
ACCEL MODE 1	Percent of maximum acceleration.	0 to 100%	60%	60%
ACCEL MODE 2	Percent of maximum acceleration.	0 to 100%	80%	80%
ACCEL MODE 3	Percent of maximum acceleration.	0 to 100%	80%	80%
ACCEL MODE 4	Percent of maximum acceleration.	0 to 100%	100%	100%
AUTO DECEL	Sets the maximum deceleration rate when the joystick is released.	0.3 to 10	2.8	2.8
PLUGGING REGEN	Determines the maximum deceleration rate when plugging.	0 to 10	1.7	1.7
TRACTION CALIB	Starts traction/ throttle calibration routine.	ON/OFF	OFF	OFF
Steering Setup				
MTS GAIN	Sensitivity control for the steering stepper motor. Higher gain settings make the steer control more sensitive, lower settings make it less sensitive.	0 to 9	2	2

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
AUTO-CTR STR CAL	Activates the RTC calibration program by pressing Right Arrow key on display.	ON/OFF	OFF	OFF
SET STEER 0 POS **WARNING** **If Restore Defaults is selected from the Dash menu then SET STEER 0 POS will require recalibration. Record SET STEER 0 POS value prior to selecting restore defaults.**	Fine increments to center the drive wheel to track straight. Increasing the value steers truck more to the right, decreasing steers more to the left.	2342 to 2653 in 1mV increments	2529	2529
MAX CW ANGLE C	Coarse angle adjustment for max CW steer angle: 0=decrease angle, 9=increase angle	0 to 9	RTC = 2	RTC = 2
MAX CW ANGLE F	Fine angle adjustment for max CW steer angle: 0=decrease angle, 9=increase angle	0 to 9	RTC = 8 MTS = 3	RTC = 8 MTS = 3

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
MAX CCW ANGLE C	Coarse angle adjustment for max CCW steer angle: 0=decrease angle, 9=increase angle	0 to 9	RTC = 2	RTC = 2
MAX CCW ANGLE F	Fine angle adjustment for max CCW steer angle: 0=decrease angle, 9=increase angle	0 to 9	RTC = 8 MTS = 3	RTC = 8 MTS = 3
Hydraulic Setup				
DC MAX LIFT SPD	For DC Hoist trucks this parameter setting determines the hydraulic pump motor high speed.	0 to 100%	N/A	100
DC LIFT ACCEL	For DC Hoist trucks this parameter setting determines the rate of increase of lifting.	0 to 100%	N/A	6.5
DC LIFT DECEL	For DC Hoist trucks this parameter setting determines the rate of increase of lowering.	0 to 100%	N/A	5
AC MAX LIFT SPD	For AC Hoist trucks this parameter setting determines the hydraulic pump motor high speed.	0 to 100%	N/A	**36V R30XM3/XMA3** 100

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
AC LIFT ACCEL	For AC Hoist trucks this parameter setting determines the rate of increase of lifting.	0 to 100%	N/A	**36V R30XM3/XMA3**
				5
AC LIFT DECEL	For AC Hoist trucks this parameter setting determines the rate of decrease of lifting.	0 to 100%	N/A	**36V R30XM3/XMA3**
				5
MAX LOWER SPEED	Determines the lower speed.	0 to 100%	N/A	**24V R30XM3/XMA3/ XMF3**
				95.2
				36V R30XM3/XMA3
				AC=100 DC=83.5
				36V R30XMF3
				83.5
LOWER ACCEL	This parameter setting determines the rate of increase of lowering.	0 to 100%	N/A	**24V/36V R30XM3/XMA3**
				AC = 8 DC = 15
				24V R30XMF3
				DC = 15
				36V R30XMF3
				DC = 15

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
LOWER DECEL	This parameter setting determines the rate of decrease of lowering.	0 to 100%	N/A	**24V/36V R30XM3/XMA3**
				AC = 5 DC = 8
				24V R30XMF3
				DC = 8
				36V R30XMF3
				DC = 8
LIFT LIMIT	Sets lift limit height in inches (measured at top of forks).	0 to 300	100	100
LIFT LIMIT ENABLE	Turns lift limit functionality on or off.	ON/OFF	Varies depending on ordered option	Varies depending on ordered option
LOWER LIMIT	Sets lower limit height in inches (measured at top of forks).	0 to 300	26	26
LOWER LIMIT ENABLE	Turns lower limit functionality on or off.	ON/OFF	Varies depending on ordered option	Varies depending on ordered option
HOIST CALIB	Starts hoist calibration routine.	ON/OFF	N/A	OFF
PROP VALVE CALIB	Starts proportional valve calibration routine	ON/OFF	N/A	OFF

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/ XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
Wire Guidance Setup (Not applicable for the R30XMF3)				
FWD ANT FREQ	0=5.2kHz 1=6.2kHz 2=7.0kHz 3=9.1kHz 4=10.0kHz	0 to 4	Varies depending on ordered option	Varies depending on ordered option
REV ANT FREQ	0=5.2kHz 1=6.2kHz 2=7.0kHz 3=9.1kHz 4=10.0kHz	0 to 4	Varies depending on ordered option	Varies depending on ordered option
WG SLOW SET	Toggles between full speed wire approach or automatic slowdown once antenna detects wire is near.	ON/OFF	OFF	OFF
WG REV OFFSET **WARNING** **If Restore Defaults is selected from the Dash menu then wire guidance will require recalibration. Record WG REV OFFSET value prior to selecting restore defaults.**	Adjusts the device wheel angle to maintain straight travel, when traveling forks leading (reverse direction).	0 to 5000mV in 20mV increments	2540	2540
FWD ANT LAG	0=no lag correction 9=max lag correction	0 to 9	4	4
FWD ANT LEAD	0=no lead correction 9=max lead correction	0 to 9	1	1
FWD ANT ACQ AREA	0=least sensitive 9=most sensitive	0 to 9	6	6

Table 1. Parameter Values (Continued)

Parameter	Function	Range	24V Default (R30XMS3)	24V/36V Default (R30XM3/XMA3/XMF3)
NOTE: Certain lift truck models are not capable of operating at the Max range allowed by the Dash Display. If a parameter value higher than the truck's ability is entered, the value will revert to the maximum allowed for that lift truck.				
REV ANT LAG	0=no lag correction 9=max lag correction	0 to 9	4	4
REV ANT LEAD	0=no lead correction 9=max lead correction	0 to 9	1	1
REV ANT ACQ AREA	0=least sensitive 9=most sensitive	0 to 9	6	6
FREQUENCY CALIB	Toggle switch used during wire guidance setup to use the antennas to detect non-standard line driver frequencies.	ON/OFF	OFF	OFF
FIELD STR CALIB	Toggle switch used during setup to calibrate the antennas.	ON/OFF	OFF	OFF
WIRE DEPTH FWD	Measurement (in 5mm increments) from the center of the line driver wire to the center of the coil within the antenna. Coil is 12mm from the bottom of the antenna. 0=30mm and 9=75mm	0 to 9	8	**R30XM3** 8 **R30XMA3** 6
WIRE DEPTH REV	Measurement (in 5mm increments) from the center of the line driver wire to the center of the coil within the antenna. Coil is 12mm from the bottom of the antenna. 0=30mm and 9=75mm	0 to 9	7	**R30XM3** 6 **R30XMA3** 7

Troubleshooting

GENERAL

The controllers are sealed units with no serviceable components. Troubleshooting is usually limited to accessing status codes and following the diagnostic procedures listed in the status code charts.

Use standard testing procedures to verify inputs and outputs when necessary.

CAUTION

Never attempt to probe through the back of the connector plugs of the motor controller. The plugs are special sealed plugs. Probing through the back of the plugs will destroy the seal and can cause a short circuit. If a circuit must be tested for voltage, check for voltage at an amp-type plug, a switch, or a component. If a circuit is suspect, check the circuit for continuity from the front (pin end) of the plug.

Standard probes are too large to be inserted into the center of the female pins (sockets) of the special sealed plugs and can expand the pins. Expanded pins will not provide good connections once the plug is reconnected. The connectors are shaped to allow the insertion of a flat blade screwdriver into the connector. After inserting the screwdriver into the connector, attach probes with alligator clips to the shank of the screwdriver to obtain readings. An additional method would be to use a breakout kit.

If the controller detects an issue, a status code is displayed on the display panel.

Once the status code number is obtained, follow the procedures outlined in the status code charts of this manual to determine the problem.

NOTE: Due to the interaction of the controller with all lift truck functions, almost any status code or controller fault could be caused by an internal failure of the controller. After all other status code procedures have been followed and no problem is found, the controller should be replaced as the last option to correct the problem. A Node shall be given, indicating which device generated the fault.

Tools and test equipment required are:

- Clip Leads
- Digital Multimeter (20,000 ohms per volt)
- Basic Hand Tools

Check resistance on the proper scale from frame to power and controller terminals. Resistance of less than 50,000 ohms can cause misleading symptoms.

The on-board diagnostic system employed on this lift truck can assist in the troubleshooting process. Read and be familiar with the instructions for accessing and using the dash display diagnostic system.

Prior to troubleshooting systems and components on this lift truck, ensure the battery is the correct voltage and is fully charged. Make sure the battery connector contacts are clean of corrosions and the battery polarity within the connector is correct. Inspect to ensure all fuses are correct and have not failed. Ensure the key switch is in the **ON** position when making voltage checks or checking the operator of a component.

Many faults noted by lift truck systems are the result of loose wiring connections and/or broken or shorted wiring within the lift truck. Begin the troubleshooting process by carefully inspecting the wiring involving the device or devices noted by the on-board diagnostics system.

STATUS CODES

Make sure the parameter values are correct for your lift truck to ensure the trouble is not just an incorrect setting. See function settings to set the correct parameter values.

The status codes are numbers for malfunction or lift truck operation that are not correct and that the motor controller can sense. The display will indicate this code number on the LCD screen.

NOTE: There are identifiers to determine which device generated the code:

Node X = XXXX (12544 Node 3)

Node 2 = Traction

Node 5 = Pump

Node 6 = Steer Master

Node 7 = CAN I/O Master

Node 8 = CAN I/O Slave

Node 11 = Forward Antenna

Node 12 = Reverse Antenna

Node 16 = Display

There is a Steer Master Node and a Steer Slave Node similar to the CAN I/O unit. The software revision level is noted in the Display menu structure for the Steer Master and the Steer Slave Nodes. The Steer Master Node reports the fault codes for the EPS unit.

The controller senses the following types of malfunction:

- Input voltages that are too high or too low
- Input voltages in the wrong sequence or
- Correct input voltages that occur at the wrong time
- Internal software checksum errors

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

These code numbers are only indicators that may help diagnose a possible malfunction. A short description of the different status codes is shown in Table 3.

The Fault Message charts in this section have a more complete description of the status code, the circuit that has generated the input for the status code, the symptom, and the possible cause.

Table 2. Warning Messages

Display	
Message	**Description**
STEER UNDERTEMP	Steer controller has indicated internal temperature is lower than -40°C (-40°F).
STEER OVERTEMP	Steer controller has indicated internal temperature exceeds 78°C (172°F).
HOIST CONTROL UNDERTEMP	Hoist controller has indicated internal temperature is lower than -40°C (-40°F).
HOIST CONTROL OVERTEMP	Hoist controller has indicated internal temperature exceeds 92°C (198°F).
TRACT UNDERTEMP	Traction controller has indicated internal temperature is lower than -40°C (-40°F).
TRACT OVERTEMP	Traction controller has indicated internal temperature exceeds 92°C (198°F).
FOOT SW OPEN	The system has detected that the foot switch on pedal is open.
FOOT SW CLOSED	The system has detected that the foot switch on pedal is closed.

Table 2. Warning Messages (Continued)

Display	
Message	**Description**
LOWER SW CLOSED	The system has detected that the lowering switch on control handle is closed.
LIFT SW CLOSED	The system has detected that the lifting switch on control handle is closed.
SLACK CHAIN SW OPEN	The system has detected that at least one of the switches that detect slack chain condition are open.
SIDE GATE SW OPEN	The system has detected that at least one of the side gate switches on the platform circuit are open.
TRACT THROT NOT NEUTRAL	The system has detected that the traction hall sensor is not in neutral position.
SERVICE KEY SW OPEN	System is not detecting battery voltage at pin 17 of the AC traction controller.
OVERRIDE SW CLOSED	The system has detected that the override switch is closed.
HYD THROT NOT NEUTRAL	System has detected that the hydraulic throttle located on the control handle is not in neutral position.
AUTO-CTR STEER NOT NEUTRAL	System has detected that Auto Center steering control handle is not in neutral position.

DISPLAY MESSAGE	**RECOVERY METHOD**	**CIRCUIT**
STEER UNDERTEMP	**Re-key only**	**Steer**
DESCRIPTION	**BEHAVIOR**	
Steer controller has indicated internal temperature is lower than -40°C (-40°F).	**No traction, no steer.**	
Probable Causes and Test Procedures		
1. Remove truck from cold or freezer environment. 2. Verify for reasonable controller temperature by using another accurate method to measure the temperature of the controller heat sink and compare with the reading from the display diagnostic. If the difference is greater than 4°C (40°F), then use Field Service tool to download software and parameters. If warning message does not clear up, possible faulty controller, contact Service Engineer to confirm failure. 3. Ensure truck is operating within its operating specification.		

DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
STEER OVERTEMP	**Re-key only**	**Steer**
DESCRIPTION	**BEHAVIOR**	
Steer controller has indicated internal temperature exceeds 78°C (172°F).	**No traction, no steer.**	

Probable Causes and Test Procedures

1. Perform basic checks.
2. Verify steer controller temperature by using another accurate method to measure the temperature of the controller heat sink and compare with the reading from the display diagnostic. If the difference is greater than 4°C (40°F) it may be a faulty controller, contact Service Engineer to confirm failure.
3. Ensure truck is operating within its capacity.
4. Power cables and NEG (battery connector) checks:
   - **a.** Check the cables for proper crimping, seating and torque value.
   - **b.** Ensure the lug contact surfaces are clean.
5. Steer controller studs checks:
   - **a.** Ensure the U, V, W, B+ and B- contact surfaces are clean and secure.
6. Mechanical checks:
   - **a.** Ensure truck has correct tire type on the drive wheel.
   - **b.** Lift drive wheel off the ground and remove ONLY the steer unit assembly from truck. Rotate the MDU with hand to ensure there is no binding in the turn table bearing.
   - **c.** Place back the steer unit assembly and lift drive wheel off the ground, turn steer wheel from one extreme to the other while observing the steer motor current from RUN DIAGNOSTIC. If the current constantly stays above 60 amps there may be possible binding in the turn table bearing.
7. If the following checks do not fix/identify the issue a new steer controller may be needed.

DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
HOIST CONTROL UNDERTEMP	**Re-key only**	**Hoist**
DESCRIPTION	**BEHAVIOR**	
Hoist controller has indicated internal temperature is lower than -40°C (-40°F).	**Limping traction, no lifting.**	

Probable Causes and Test Procedures

1. Remove truck from cold or freezer environment.
2. Verify steer controller temperature by using another accurate method to measure the temperature of the controller heat sink and compare with the reading from the display diagnostic. If the difference is greater than 4°C (40°F) it may be a faulty controller, contact Service Engineer to confirm failure.

DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
HOIST CONTROL OVERTEMP	**Re-key only**	**Hoist**
DESCRIPTION	**BEHAVIOR**	
Hoist Controller has indicated internal temperature exceeds 92°C (198°F).	**No lifting, traction limited to limp home mode.**	

Probable Causes and Test Procedures

1. Perform basic checks.
2. Ensure the controller temperature is below 90°C (194°F).
3. Verify steer controller temperature by using another accurate method to measure the temperature of the controller heat sink and compare with the reading from the display diagnostic. If the difference is greater than 4°C (40°F) it may be a faulty controller, contact Service Engineer to confirm failure.
4. Ensure truck is operating within its capacity.
5. Power cables and NEG (battery connector) checks:
   a. Check the cables for proper crimping, seating and torque value.
   b. Ensure the lug contact surfaces are clean.
6. Hoist controller studs checks:
   a. Ensure the U, V, W, B+ and B- contact surfaces are clean and secure.
7. If the following checks do not fix/identify the issue a new steer controller may be needed.

DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
TRACT UNDER TEMP	**Re-key only**	**Traction**
DESCRIPTION	**BEHAVIOR**	
Traction controller has indicated internal temperature is lower than -40°C (-40°F).	**Maximum current limit will be linearly reduced until temperature returns above -40°C (-40°F). Lift, lower and steer enabled.**	

Probable Causes and Test Procedures

1. Remove truck from cold or freezer environment.
2. Verify for reasonable controller temperature by using another accurate method to measure the temperature of the controller heat sink and compare with the reading from the display diagnostic. If the difference is greater than 4°C (40°F), then use Field Service tool to download software and parameters. If warning message does not clear up, possible faulty controller, contact Service Engineer to confirm failure.
3. Ensure truck is operating within its operating specification.

DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
TRACT OVER TEMP	**Re-key only**	**Traction**
DESCRIPTION	**BEHAVIOR**	
Traction controller has indicated internal temperature exceeds 92°C (198°F).	**Maximum current limit will be linearly reduced until temperature drops below 90°C (194°F). Lift, lower, and steer enabled.**	

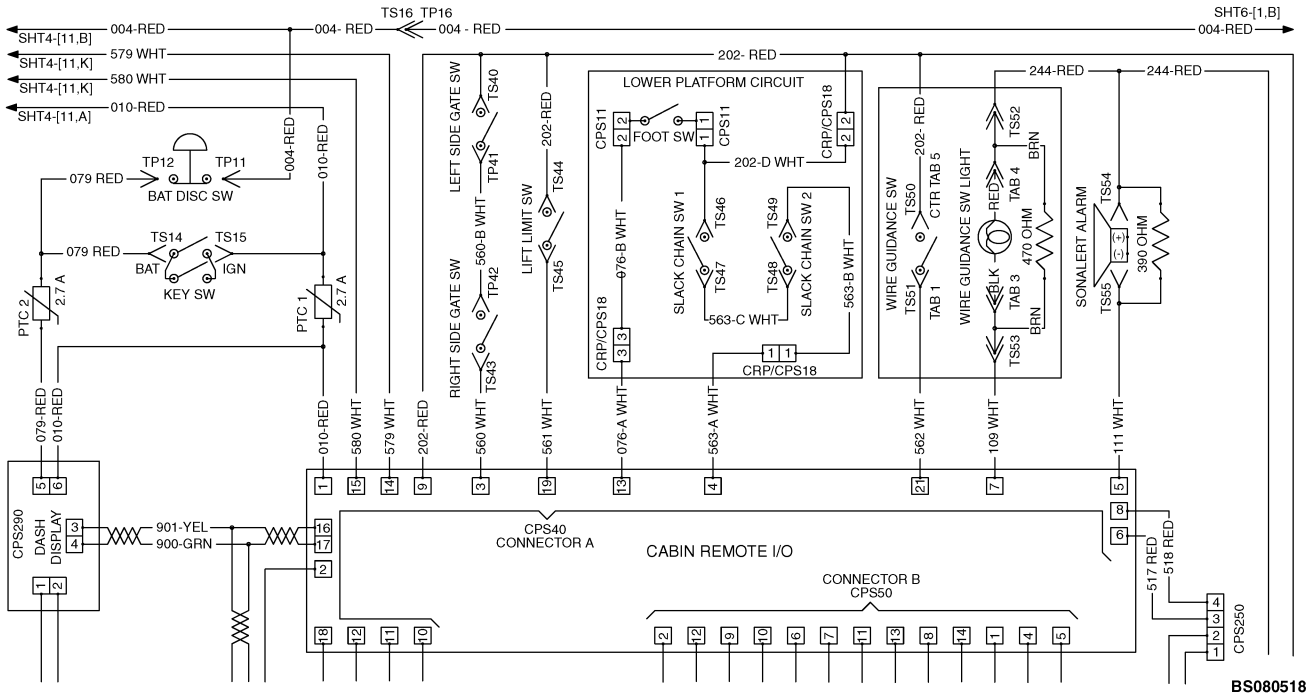
Probable Causes and Test Procedures

1. Ensure truck is operating within its capacity.
2. Perform basic checks.
3. Verify for reasonable controller temperature by using another accurate method to measure the temperature of the controller heat sink and compare with the reading from the display diagnostic. If the difference is greater than 4°C (40°F), then use Field Service tool to download software and parameters. If warning message does not clear up, possible faulty controller, contact Service Engineer to confirm failure.
4. Main contactor checks:
   - **a.** Plunger freely moved.
   - **b.** Tips are clean and making proper contacts.
   - **c.** Coil has proper connection.
   - **d.** Coil resistance approximately 44 ohms for 24V truck and 103 ohms for 36V truck.
   - **e.** Coil voltage should be 24V for 24V truck and 36V for 36V truck.
5. Power cables U, V, W, NEG 1, POS 1, POS and NEG (battery connector) checks:
   - **a.** Properly crimped, seated and torqued.
   - **b.** Lugs contact surfaces are clean.
6. Traction controller stud checks:
   - **a.** B+, B contact surface are clean.
7. Wire harness checks (key off and disconnect traction controller connector):
   - **a.** Check CPS100 pin 2 and 4 for spread socket and socket properly seated.
   - **b.** Check pins and socket of CPS60/CPS61 and brake connector (brake side) for proper connection, seated and sockets are not spread.
   - **c.** Check for shorts between CPS100 pin 4 (harness side) and traction controller B-.
   - **d.** Check continuity between:
     - CPS100 pin 2 and CPS60/CPS61 pin 1
     - CPS100 pin 4 and CPS60/CPS61 pin 2
8. Parking Electric Brake check:
   - **a.** Disconnect the brake and measure its coil resistance, should be approximately 12 ohms.
   - **b.** Check for proper air gap, according **Brake System** 1800SRM1463.
   - **c.** Check for dragging of the brake.
9. Mechanical checks:
   - **a.** Check for binding in drive and load wheels.

DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
FOOT SW OPEN	Re-key only	Platform
DESCRIPTION	**BEHAVIOR**	
The system has detected that the foot switch on pedal is open.	No traction, no lifting, no lowering.	

Probable Causes and Test Procedures

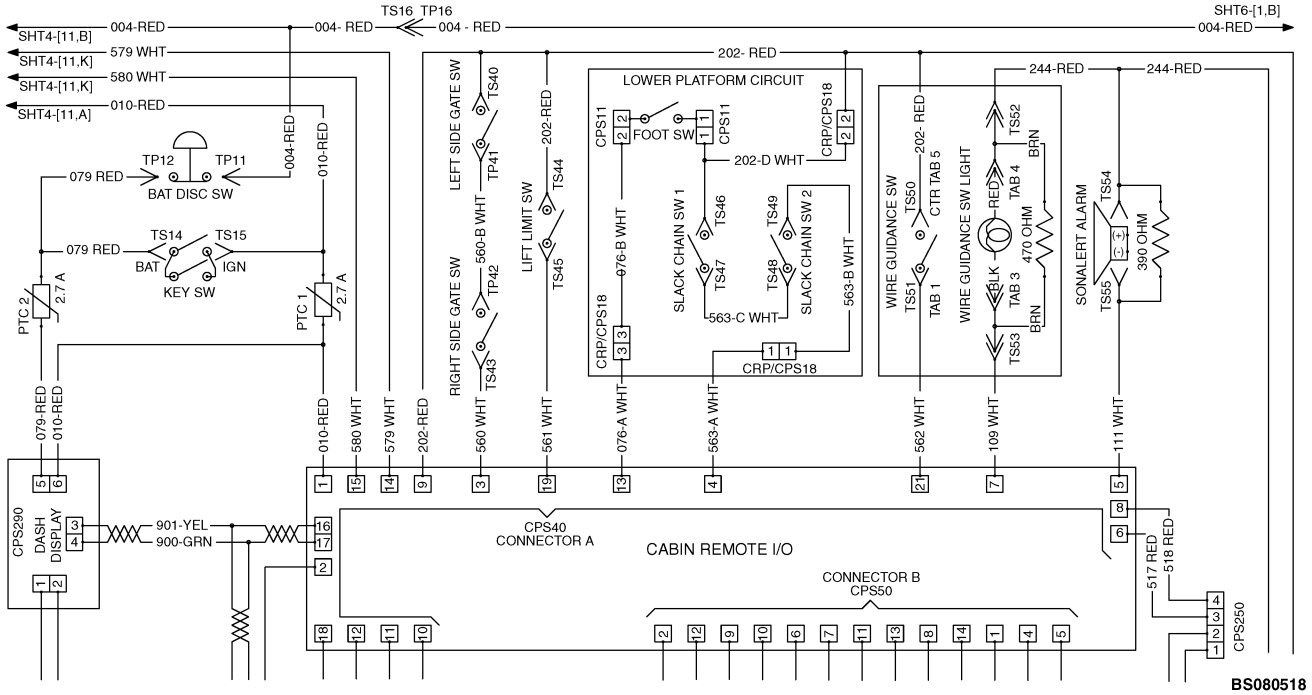
1. Check connections on Lower Platform Circuit between:
   - **a.** CPS40 pin 13 to CRP/CPS 18 pin 3
   - **b.** CRP/CPS 18 to Foot SW CPS11 pin 2
   - **c.** CPS 11 pin 1 and CPS/CRP18 pin 2
2. Check for battery voltage between CPS/CPR 18 (platform harness side) pin 2 and B-. If battery voltage is not seen, then check continuity between CPS/CRP 18 pin 2 and CPS40 pin 9.
3. Check shorts between:
   - **a.** CPS40 pin 13 to B-
4. If harness connections checked good, then check the switch itself.
   - **a.** Measure resistance between CPS11 pin 1 and pin 2 with the foot switch closed, measured value shall be less than 10 ohms. If value is higher, then replace foot switch.
   - **b.** Check for continuity between the two leads of the switch if the foot switch is closed and check for a change of state when switch is pressed and released. If no change in state is seen, then replace foot switch.



DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
FOOT SW CLOSED	Re-key only	Platform
DESCRIPTION	**BEHAVIOR**	
The system has detected that the foot switch on pedal is closed.	No Traction, no lifting, no lowering.	

Probable Causes and Test Procedures

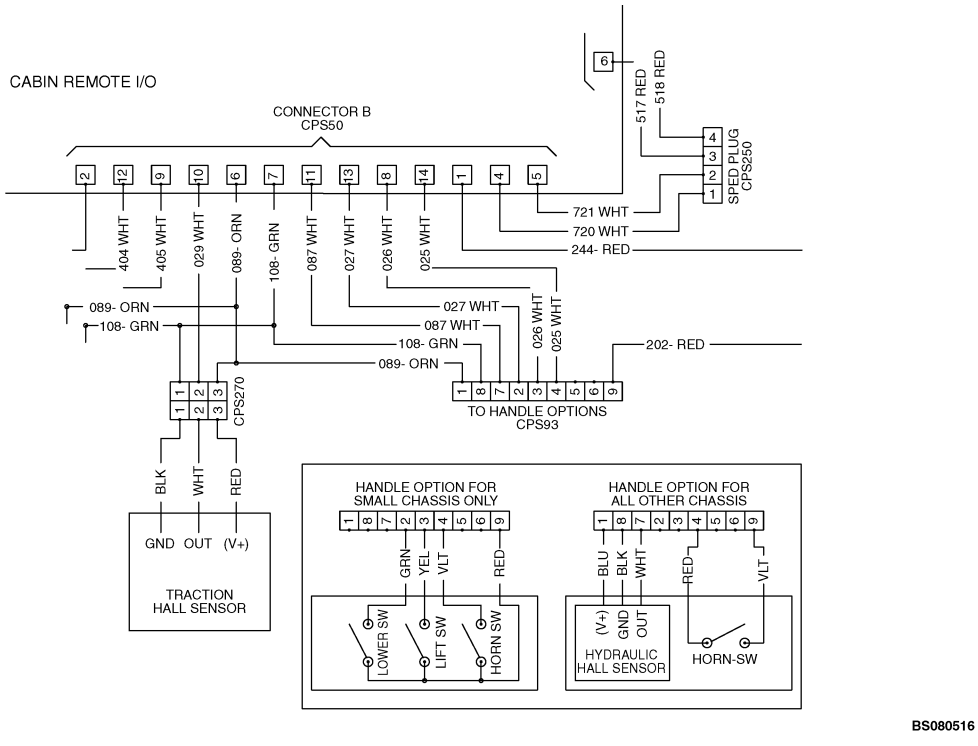
1. Check for shorts between CPS40 pin 13 to key switch and between CPS40 pin 13 and pin 9.
2. If no shorts were seen, then check the switch itself.
   - **a.** Check for continuity between the two leads of the switch if the foot switch is closed and check for a change of state when switch is pressed and released. If no change in state is seen, then replace foot switch.



DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
LOWER SW CLOSED	Re-key only	CAN I/O
DESCRIPTION	**BEHAVIOR**	
The system has detected that the lowering switch on control handle is closed.	If happens at key on system will have no traction, no lifting, and no lowering.	

Probable Causes and Test Procedures

1. Check for shorts between:
   - **a.** CPS50 pin 13 to key switch
   - **b.** CPS93 pin 2 and pin 9
   - **c.** CPS93 pin 2 and pin 1
2. Check for continuity between:
   - **a.** CRP93 pin 2 and pin 9, when the lower switch is pressed and released there shall be a change of state in continuity. If not, switch must be replaced.
3. With the truck in off position, while keeping the lower switch activated measure for lower switch resistance between CRP93 pin 2 and pin 9, resistance shall be below 10 ohms (ideally less than 1 ohm). If resistance is beyond 10 ohms, replace switch.



DISPLAY MESSAGE	RECOVERY METHOD	CIRCUIT
LIFT SW CLOSED	Re-key only	CAN I/O
DESCRIPTION	**BEHAVIOR**	
The system has detected that the lifting switch on control handle is closed.	If happens at key on system will have no traction, no lifting, and no lowering.	

Probable Causes and Test Procedures

1. Check for shorts between:
   - **a.** CPS50 pin 8 to key switch
   - **b.** CPS93 pin 3 and pin 9
   - **c.** CPS93 pin 3 and pin 1
2. Check for continuity between:
   - **a.** CRP93 pin 3 and pin 9, when the lower switch is pressed and release there shall be a change of state in continuity. If not, switch must be replaced.
3. With the truck in off position, while keeping the lower switch activated measure for lower switch resistance between CRP93 pin 3 and pin 9, resistance shall be below 10 ohms (ideally less than 1 ohm). If resistance is beyond 10 ohms, replace switch.