Overload Warning
System DS 50

Trouble Shooting Manual
Level 3
- Calibration Adjustments
-
NOTICE

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## Table of contents

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction to troubleshooting the PAT Overload Warning System DS50</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>System outline</td>
<td>6</td>
</tr>
<tr>
<td>1.2</td>
<td>System operation</td>
<td>8</td>
</tr>
<tr>
<td>1.3</td>
<td>Troubleshooting care</td>
<td>9</td>
</tr>
<tr>
<td>2.1</td>
<td>The hand terminal</td>
<td>11</td>
</tr>
<tr>
<td>2.2</td>
<td>The hand terminal connection</td>
<td>13</td>
</tr>
<tr>
<td>3.1</td>
<td>The start up menu</td>
<td>14</td>
</tr>
<tr>
<td>3.2</td>
<td>Displaying data and messages</td>
<td>15</td>
</tr>
<tr>
<td>3.3</td>
<td>The test program</td>
<td>17</td>
</tr>
<tr>
<td>3.4</td>
<td>The on-line mode</td>
<td>19</td>
</tr>
<tr>
<td>4</td>
<td>Adjusting calibration data</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>Identify the problem</td>
<td>22</td>
</tr>
<tr>
<td>6</td>
<td>Adjusting overload cut off factor</td>
<td>23</td>
</tr>
<tr>
<td>7</td>
<td>Adjusting empty hook load display</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>Adjusting radius display under load</td>
<td>27</td>
</tr>
<tr>
<td>9</td>
<td>Adjusting load display</td>
<td>29</td>
</tr>
<tr>
<td>10</td>
<td>Transferring EEPROM data</td>
<td>31</td>
</tr>
<tr>
<td>11</td>
<td>Error code messages</td>
<td>41</td>
</tr>
<tr>
<td>12</td>
<td>Removing test and calibration Equipment</td>
<td>45</td>
</tr>
</tbody>
</table>
CAUTION !

The use of the equipment and the procedures in the following sections allow data change of the microprocessor system DS50 and its calibration. Therefore only trained and authorized service personnel shall proceed with the procedures and data adjustments described in this manual. Incidental errors in the calibration or software change may result in a fatal accident. Always verify software change or calibration change results.
NOTICE

THIS TROUBLE SHOOTING MANUAL “DS 50 - LEVEL 3” IS DESIGNED TO ASSIST THE SERVICE OR MAINTENANCE PERSONNEL IN ADJUSTING THE EXISTING CALIBRATION DATA AND TRANSFERRING CALIBRATION DATA INTO A REPLACEMENT DS 50 CENTRAL UNIT.

THIS TROUBLE SHOOTING MANUAL DOES NOT REPLACE ANY CALIBRATION INSTRUCTION. THEREFORE IT SHOULD NOT BE USED AS A CALIBRATION MANUAL.

IN ORDER TO PERFORM THE ADJUSTMENTS IN THIS TROUBLE SHOOTING MANUAL YOU REQUIRE A SPECIAL TOOL SET. THE TOOL SET CONSISTS OF A HAND TERMINAL AND A SET OF CABLES FOR COMMUNICATING WITH THE DS50 CPU BOARD. WE ASSUME THAT REGULAR MAINTENANCE AND SERVICE TOOLS AND A DIGITAL VOLTMETER ARE AVAILABLE ON SITE.


WE SUGGEST THAT ONLY TRAINED MAINTENANCE AND SERVICE PERSONNEL PROCEED WITH THE TROUBLE SHOOTING DESCRIBED IN THIS MANUAL.
1. INTRODUCTION TO TROUBLESHOOTING THE PAT DS 50

1.1. SYSTEM OUTLINE

The PAT Overload Warning System Model DS 50 is designed to disable the boom down and up, hoist up and tele out crane functions when the crane attempts to lift over its limits. These limits are specified in the load capacity chart provided by the crane manufacturer.

When the DS 50 system detects an overload condition the following crane functions are disabled immediately.

   a. telescope out
   b. boom up and boom down
   c. hoist up

To remove the overload condition the operator must achieve a safe working condition. This can be achieved by lowering the load and repositioning the crane or decreasing the radius by telescoping in. Observe that the radius can not be decreased by lifting the boom. The boom up function is disabled while attempting to overload the crane.

The system design allows you to operate the crane in an emergency situation or system failure without the DS 50 system in operation. In this situation leave the crane electric switch in the off position and press the override button while you operate the crane manually. The DS 50 Overload Warning System is not operative and can not warn the operator with the electric power switch in off position.

Warning
Bypassing the DS 50 Overload Warning system may results in property damage, injury or death.

The DS 50 system contains a central unit with integrated length and angle sensor. The load cell is supporting the hoist drum and used to measure the load on hook.
1. INTRODUCTION TO TROUBLESHOOTING THE PAT DS 50

Note: The drawing shows the model FMTV-W. The FMTV-C has only single line capability.

DRAWING 1.1 - SYSTEM LOCATION (FMTV-WRECKER)
1. INTRODUCTION TO TROUBLESHOOTING THE PAT DS 50

1.2 SYSTEM OPERATION

The Microprocessor Central Unit operates as the control center of the system. The length cable is connected to the boom nose. During telescoping the length cable spools off a drum which turns the length potentiometer using a gear assembly. The length potentiometer is a variable resistor which varies linearly with the boom length. An angle sensor is built into the central unit which senses the boom angle. The load cell provides the signal to calculate the load on hook. The proximity switch located on the hoist drum switches to a different calibration factor during spooling off the hoist rope. This will allow a steady load calculation and compensates for the difference in the lever arm. All together the signals get processed in the central Microprocessor unit where actual and rated load are compared. The system de-energizes a relay and disables the appropriate crane functions when the actual load exceeds the rated load by more than 10%.
1. INTRODUCTION TO TROUBLESHOOTING THE PAT DS 50

1.3. Troubleshooting Care

• Keep in mind while troubleshooting high quality electronic components to use caution and necessary care while testing and measuring DS 50 components and circuits of the crane electric's.

• Tools and test equipment must be in good order and shall be inspected on a regular basis.

• Follow all safety instructions according to crane manufacturer's handbooks and safety instructions. Obey recommended practice and safety standards applying to the job site.

• Secure the working area prior to testing and servicing the system.

• Never remove the load cell without firm support holding the hoist drum.

• Never let the length cable snap back to the central unit. The length sensor drum is under high tension.

Warning

DS 50 Overload Warning System service and repair work shall be performed by trained and authorized personnel only.
1. INTRODUCTION TO TROUBLESHOOTING THE PAT DS 50

DRAWING 1.2 - Crane storage position

Note: The drawing shows the model FMTV-W. The FMTV-C has only single line capability.

Caution!
Crane is shown folded for transportation. For lifting operations the mast has to be in full upright position and the hook lifted out of the transportation storage.
2.1 THE HAND TERMINAL

The key board of the hand terminal is divided in three main areas. Refer to drawing 2.1.1 and locate the keys which are described in the text below.

- **Numerical key pad:** Used to enter numerical data.
- **Alphabetical key pad:** Used to enter commands (letters).
- **Function keys:** Used to correct, delete or confirm an entry or display.

Some keys are assigned to special hand terminal functions.

- **Control LEDs:** The LEDs above the numerical key pad light up to confirm the on-line status and various key function. In example the green file LED lights up after the shift key was pressed.

- **The display (LCD):** Indicates data and messages.

The use of the hand terminal in connection with the DS 50 System is described in the course of the following instructions. Part of the hand terminal is a cable. The DB9 connector at the end of the cable shall be connected to the DS 50 main board. Refer to section 2.2 and drawing 2.2.1 and 2.2.2 for hand terminal connection.

**CAUTION:** The DB 9 connector is wired especially for the DS 50 interface. Do not attempt to connect the hand terminal to any device other than the DS 50.
2.1 THE HAND TERMINAL

[Image of a hand terminal with labels:
- LCD indication of data and messages
- Control LEDs
- Alphabetical key pad
- Numerical key pad
- Plus / Minus

Drawing 2.1.1]
2.2 THE HAND TERMINAL CONNECTION

In order to connect and use the hand terminal for data read-out or data adjustment the DS 50 hardware must be prepared as follows:

• Switch the truck power off. Remove both the DS 50 central unit cover and the CPU board cover carefully as described in manual level 1&2.

• Plug the female DB 9 connector of the hand terminal cable into the male DB 9 connector on the DS50 CPU board.

• Secure the hand terminal cable with cable ties to avoid cable stress or pulling off connections while operating the crane.
3.1 THE START UP MENU

Follow the instructions described in section 2.2 to connect the on-line equipment. Switch the truck power on. A cursor appears on the top left of the hand terminal display and the red ‘online’ LED lights up. After the DS 50 system has passed the self test routine, the display shows the start up menu. Refer to drawing 3.1.

The following letters allow the user to select the desired program.

- D = Data output to PC terminal mode. Not used for hand terminal operation.
- H = Data output to hand terminal.
- O = Select the on-line mode. The on-line mode must be selected to adjust calibration data.
- T = Select the test mode. The test mode allows the user to initialize the EEPROM prior to a new calibration only and to test the digital inputs such as the function of the hoist layer switch.

Caution: Do not initialize a calibrated system. Initialization of the EEPROM results in loss of calibration data and a recalibration becomes necessary.

Refer to the appropriate section in this manual to distinguish what letter key of the start up menu to select.

Start up menu after system is powered:

```
D = T.OUT
H = HT.OUT
O = ONLINE
T = TEST
```
3.2 DISPLAYING DATA AND MESSAGES

Follow the instructions in section 2.2 and 3.1
In order to identify the need for a data adjustment, internally calculated data must be compared with the actual measured data.

The DS 50 is an overload shut down system and is not classified as a scale. The consideration of government specified tolerances is part of the trouble shooting process. Crane and truck manufacturing tolerances do not allow calibrating an overload shut down system with 0% tolerance.

To select the read out of geometrical data, load data and error messages press the >H< key of the alphabetical key pad. The following information is now displayed. Refer to drawing 3.2.1 to identify the displays described in the text below.

- Utilization of the lifting capacity in percentage. Overload cut off should be active between 100% and 110%. The sample drawing 3.2.1 indicates an utilization of 84%.
- Maximum load capacity (in lb/1000) for the actual boom position. The sample drawing 3.2.1 indicates a maximum load capacity of 5,000 lb.
- Actual load on hook (in lb/1000). Note that the hook is not part of the load. The sample drawing 3.2.1 indicates an actual load of 4,200 lb.
- Main boom length (in ft). The distance between the center of the boom pivot pin and the center of the sheave wheel pin. The sample drawing 3.2.1 indicates a main boom length of 14.2 ft.

Refer to table below for fully retracted and fully extended boom length indication.

<table>
<thead>
<tr>
<th>Crane model</th>
<th>Indicated length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>retracted</td>
</tr>
<tr>
<td>FMTV Cargo</td>
<td>7.3</td>
</tr>
<tr>
<td>FMTV Wrecker</td>
<td>7.3</td>
</tr>
<tr>
<td>FMTV FRSH</td>
<td>7.3</td>
</tr>
</tbody>
</table>

- Main boom angle (in degree) in reference to the horizontal line. The sample drawing 3.2.1 indicates a boom angle of 65.5 degree.
- Radius (in ft.). Radius is defined as the distance between center line of crane rotation and the center line of the load freely suspended. The sample drawing 3.2.1 indicates a radius of 15.7 ft.
- In the event of a malfunction, an overload condition, or an out of load chart condition, the radius display becomes replaced by the Error message. Refer to the error code list to decode the message.
3.2 DISPLAYING DATA AND MESSAGES

[Diagram showing data display with labels: Utilization, Max. Load, Actual Load, Error message, Boom Length, Boom Angle, Radius, and values 84.0, 5.00, 4.20, 14.2, 65.5, 15.1, EXX]

Drawing 3.2.1
3.3 THE TEST PROGRAM

The test program is designed to initialize the E-EPROM prior to a new calibration and to test the function of the digital inputs such as the hoist layer switch function.

Press the key >T< to start the test program. Refer to drawing 3.3.1 and 3.3.2. The program allows to select the test routine:

- Press 4 to initialize the E-EPROM

CAUTION: DO NOT INITIALIZE A CALIBRATED SYSTEM. YOU WILL LOSE ALL CALIBRATION DATA IF YOU PRESS THE >Y< KEY AFTER THE MESSAGE “OVERWRITE ? (Y/N)”. ALWAYS CONFIRM WITH THE >N< KEY IF YOU ENTERED THE ROUTINE BY MISTAKE. WHEN TRANSFERRING DATA TO A REPLACEMENT SYSTEM IT MAY BECOME NECESSARY TO INITIALIZE THE REPLACEMENT SYSTEM BEFORE DATA TRANSMISSION.

- Press 8 to test digital inputs

The hand terminal display indicates the actual status of the digital input.

<table>
<thead>
<tr>
<th>DI 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

A >1< means the digital input is powered on and a >0< means the digital input is not powered on. In the example above the DI 1 is powered by the hoist layer switch. Switch off the hoist layer switch by lowering the hoist and you can see the >1< changing to >0<. For correct adjustment of the switch refer to documentation in level 1 & 2.

To return to the main menu press the >ESC< key or the letter key for the program you wish to select.
3.3 THE TEST PROGRAM

Test menu (refer to text):

Drawing 3.3.1

Submenu to test (4):

Drawing 3.3.2
3.4 THE ON-LINE MODE

The calibration equipment and the system must be switched into on-line mode for calibration adjustments. From the start up menu, select the on-line mode by pressing the >O< key. The hand terminal displays the message >SYSTEM READY<. The operating mode code and the actual length step >OM= 0101, LS = 7.33< confirms the operation of the on-line mode.

Refer to the example in drawing 3.4.1.

A calibration adjustment is possible for a length step only. A length step is the main boom length shown in each load chart column.

You can exit the on-line mode any time. Exit the on-line mode by pressing the >SHIFT< key and then the > ^ < key. The hand terminal confirms with the message >End online mode<.

Once in the start up display of the on-line mode there are two calibration functions available.

• Press the >U< key to change calibration data for the actual length step.
• Press the >V< key to change load calibration data for the actual length step.

Refer to the flowchart diagrams of this manual for detailed information how to use the two calibration functions.

• Press the >K< key to return to the start up menu. Message > End online mode<.
• Press either >U< or >V< key to switch between the two calibration functions.
3.4 THE ON-LINE MODE

Starting the on-line mode

Press the key ‘O’ to activate the on-line mode

Drawing 3.4.1
4. ADJUSTING CALIBRATION DATA

Use the flowcharts in the continuation of this manual to locate the section appropriate for your adjusting needs.

Remember you must be fully familiarized with section 2 and 3 in order to proceed with section 4.

Test the hardware, using trouble shooting manual 2 & 3, before you consider adjusting the calibration data.

Always consider that the system left the crane manufacturer fully calibrated and passed the quality tests. Always consider calibration and crane specification during the adjusting procedure.

Ensure a safe environment. Secure the crane and the surrounding area. Do not overload the crane and truck during the adjusting process. Always consider and refer to the crane load chart. Always measure actual geometrical values. Use only tested, inspected and known test weights for load testing. The load must be freely suspended and lifted in a vertical straight line. Always initially hoist the load of the ground. The use of a “dead eye” (hook in the ground) is not permitted for any adjusting methods.

Use a tested inclinometer (level indicator) with a minimum resolution of 0.25 degree to measure the boom angle.

Ensure that your measuring tape is in good condition. When testing the radius mount the beginning of the tape exactly on the center line of rotation. Note the display indicates the radius or boom length in resolution of 1/10 ft. - not in inches.
5. IDENTIFY THE PROBLEM

Connect the hand terminal and press the >H< key to compare the displayed values with the actual values. Identify the problem. Find a square matching your problem and follow the instructions.

- Overload cut off for the actual length step too early or too late. Go to section 6.
- Radius display under load for the actual length step too high or too low. Go to section 7.
- Empty hook display for the actual length step too low or too high. Go to section 8.
- Load display for the actual length step and angle too high or too low. Go to section 9.
6. ADJUSTING OVERLOAD CUT OFF FACTOR

Problem:
A. The overload cut off for the actual length step is always too early - tested at a high, mid and low boom angle.
B. The overload cut off for the actual length step is always too late - tested at a high, mid and low boom angle.

Retract or extend the boom to the length step with the problem. Pick a test load and carefully conduct a cut off test at a high boom angle, mid boom angle and low boom angle. Calculate the cut off percentage manually by using actual measured data for each of the test. The allowable cut off percentage as per government specification is 101% - 110%. You must be able to hoist up at 100% utilization but cut off at latest 110% utilization. Ensure that you do not exceed those two limits by adjusting the overload cut off factor. In example your cut off is at 98%, 97%, 99% - increasing the cut off factor by 4% would enable a new cut off at 102%, 101%, 103% which is acceptable. But if your cut off is 98%, 106%, 103% - increasing by 5% would enable a new cut off at 103%, 111%, 108% which does not meet the specification.

Connect the hand terminal as described in section 2.2. Select the on-line mode as described in section 3.4. Press the key >U<.
6. ADJUSTING OVERLOAD CUT OFF FACTOR

Does the display indicate >D-RLFCT= n: < ?
Note: n= calibration value.

NO

YES

Scroll through the lines by pressing the enter key >CR< until the line is displayed.

Enter your calculated correction factor in % x 100.
Example: +5.00% = +500
     --2.75% = --275
The correction factor is limited to +/- 500.
Then press the >CR< key to enter the value.
Press the key >K< to return to the start up menu.
Go to section 3.2 and observe the display while you repeat the cut off test for the actual length step.

Is the problem corrected now?

NO

YES

Return to section 5 and identify the problem.

The End
7. ADJUSTING EMPTY HOOK LOAD DISPLAY

Problem:
Load displays (hook display) incorrect with no load on hook.

Retract or extend the boom to the length step with the problem.
- Actual boom length must agree with the length step (LS) on the hand terminal display.

Boom down from high boom angle to low boom angle and observe the load (=hook) display. Since you boom down without load, the load displayed should be around 0 LB. Now position the boom at approximate 45 degree boom angle and lower the hook from the boom nose down to ground. Observe the load display on the hand terminal.

Connect the hand terminal as described in section 2.2.
Select the on-line mode as described in section 3.4.
Press the key >U<.

Does the display indicate >C-EMPTY= n: < ?
Note: n = calibration value.

NO

Scroll through the lines by pressing the enter key >CR< until the line is displayed.

YES

continue on next page
7. ADJUSTING EMPTY HOOK LOAD DISPLAY

Enter your calculated correction in +/- LB.
Example: +500 = increases the hook display by 500LB.
-275 = decreases the hook display by 275 LB.
The correction value is limited to +/- 999.
Then press the >CR< key to enter the value.
Press the key >K< to return to the start up menu.
Go to section 3.2 and observe the hook display while you repeat booming down from high to low boom angle.

Is the problem corrected now?

NO

Return to section 5 and identify the problem.

YES

The End
8. ADJUSTING RADIUS DISPLAY UNDER LOAD

Problem:
Radius displays incorrect with load on hook.

Retract or extend the boom to the length step with the problem.
- Actual boom length must agree with the length step (LS) on the hand terminal display. -
Hoist a known test load. The test load shall be \( \geq 75\% \) of the rated capacity for the radius you check out. Refer to the crane load chart. Hoist the load just above the ground and measure the radius with a tape. Compare with the displayed radius. Calculate the difference between the actual measured radius and the displayed radius on the hand terminal.

Connect the hand terminal as described in section 2.2.
Select the on-line mode as described in section 3.4.
Press the key \( >U< \).

Does the display indicate \( >CF\text{-RAD}=n:\text{ < }？\)
Note: \( n \) = calibration value.

NO

YES

Scroll through the lines by pressing the enter key \( >CR< \) until the line is displayed.

continue on next page
8. ADJUSTING RADIUS DISPLAY UNDER LOAD

Adjust the correction factor to increase or decrease the radius. Then press the >CR< key to enter the value. Press the key >K< to return to the start up menu. Go to section 3.2 and repeat testing the radius under load.

Is the problem corrected now?

NO

Return to section 5 and identify the problem.

YES

The End
9. ADJUSTING LOAD DISPLAY

Problem:
Load indication too high or too low.

Retract or extend the boom to the length step with the problem.
-Actual boom length must agree with the length step (LS) on the hand terminal display-. Hoist a known test load. The test load shall be = or > 75% of the rated capacity. Refer to the crane load chart. Hoist the load just above the ground and read the load display on the hand terminal. Compare the displayed load with the actual load. Calculate the difference between the actual load and the displayed load on the hand terminal.

Connect the hand terminal as described in section 2.2. Select the on-line mode as described in section 3.4. Press the key >V<.

The terminal display indicates >C-LOAD I= n: < or >C-LOAD x= n: <
Note: n = previously entered correction factor, x= a number between 1 and 7.
A load correction value can be entered and stored for the following boom angles(degree).
60...50...40...30...20...10...0
These correspond on the hand terminal display to >C-LOAD 1,............C-LOAD 7<.
If the boom is positioned between two of those angles during the initial start of the >V< function the hand terminal displays >C-LOAD I = n: <.
Enter the calculated or estimated load correction factor in (% x 100) for the initial starting angle.
Note: If the address has already a data you must either subtract or add your calculated correction factor. In example >C-LOAD I= -200< -- with a calculated correction factor of -- 4% enter >C-LOAD I= -600<. Note: The correction value is limited to +/- 1000 = +/- 10%.
The program extrapolates the entry and writes the calculated values into the next stored angles.

continue on next page
9. ADJUSTING LOAD DISPLAY

Press the >CR< key to save the value. Display indicates >C-LOAD I= z <.
Note: z= the value entered previously.
Press the >CR< key to confirm and the display indicates >C-LOAD x= n<
Note: x= the next lower stored angle; n= the correction value entered previously for the x angle.

Do you want to enter correction factors for lower boom angles?

YES

Hand terminal display indicates >C-LOAD x= n:<. Enter the calculated correction factor n for the x angle.
Refer to previous page reference of stored angles. Press the key >CR< to change to the new correction factor.
Repeat until you have entered all previously calculated correction factors for the stored angles.

NO

Press the key >K< to return to the start up menu.
Press the key >H< in the start up menu to verify the load adjustment.

The End
10. TRANSFERRING EEPROM DATA

In the event of DS 50 main board failure it becomes necessary to install a Replacement central unit.

**Note:** All calibration data is stored in the E-EPROM which is installed on the main board and not removable.

By removing the defective central unit the calibration data becomes removed. Extract the data prior to disconnecting the defective DS 50 central unit. Truck voltage is required to extract the data.

Newer units also have the calibration data on a plate on the side of the machine.

---

**Drawing 10.1** DS50A2 CPU board
10. TRANSFERRING EEPROM DATA

1) Initialize the EEPROM: Power on the crane. After the unit starts up, press and hold both the UP and DOWN arrows at once, then press the ENTER key. This changes to the setup menu, with INIT EEPROM displayed. Release all 3 keys. Now, press the ENTER key to initialize the EEPROM. When the menu asks ARE YOUR SURE, use the up or down arrows to display YES, then press the ENTER key. Press the C button to return to the main menu.
10. TRANSFERRING EEPROM DATA

2) Set the crane type: Press and hold both the UP and DOWN arrows at once, then press the ENTER key. This changes to the setup menu, with INIT EEPROM displayed. Release all 3 keys. Press the DOWN key until CRANE TYPE is displayed, then press the ENTER key. Use the UP or DOWN arrows until the appropriate crane type is displayed. Now press the ENTER key to return to the main menu.
10. TRANSFERRING EEPROM DATA

3) Adjust the Length Pot: With the system power ON, retract the crane boom fully. Disconnect the length cable from the boom nose and carefully allow it to slowly retract until the rubber ball stops against the standoff at the reel. Turn the slotted potentiometer in the center of the cable reel CLOCKWISE only until the error E11 is displayed. Pulling the cable out slightly should display error E05 instead of E11. Reconnect the length cable to the boom nose.

<table>
<thead>
<tr>
<th>7.20’</th>
<th>E11</th>
<th>0.02</th>
<th>0 DEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.25’</td>
<td>E05</td>
<td>0.02</td>
<td>0 DEG</td>
</tr>
</tbody>
</table>
10. TRANSFERRING EEPROM DATA

4) Adjust the boom offset: Press the ENTER key to enter the SETUP menu. Press the UP key until LENGTH OFFSET is displayed, then press the ENTER key. Use the UP or DOWN arrows until the exact length is displayed. Now press the ENTER key to return to the setup menu.

<table>
<thead>
<tr>
<th>SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>INIT EEPROM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH OFFSET</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LENGTH OFFSET</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.30’</td>
</tr>
</tbody>
</table>
10. TRANSFERRING EEPROM DATA

5) Adjust the angle offset: Move the boom to zero degrees. Verify this using the most accurate level available. If required, press the ENTER key to enter the SETUP menu. Press the UP key until ANGLE SENS.ZERO is displayed, then press the ENTER key. Use the UP or DOWN arrows until the exact angle is displayed. Now press the ENTER key to return to the setup menu.
10. TRANSFERRING EEPROM DATA

6) Adjust the load offset: Ensure that the hook block is not tight against the hoist. Press the ENTER key to enter the SETUP menu if required. Press the UP key until FORCE SENS.ZERO is displayed, then press the ENTER key. Use the UP or DOWN arrows until zero load is displayed. Now press the ENTER key to return to the setup menu. Press the C button to begin moving to the main menu. Use the UP/DOWN arrows to select YES to save the new values to EEPROM, then press the ENTER key to return to the main menu.
10. TRANSFERRING EEPROM DATA

7) Adjust the radius offset: If the crane has no radius offset or a zero radius offset, skip this step and go to the next step. Press the ENTER key to enter the SETUP menu if required. Press the UP key until RADIUS ADJUSTMENT is displayed, then press the ENTER key. Use the UP or DOWN arrows to display the correct radius adjustment. Now press the ENTER key to return to the setup menu. Press the C button to begin moving to the main menu. Use the UP/DOWN arrows to select YES to save the new values to EEPROM, then press the ENTER key to return to the main menu.

- SETUP
  - INIT EEPROM
- SETUP
  - RADIUS ADJUSTMENT
  - .04'
- SAVE NEW VALUES TO EEPROM: NO
- SAVE NEW VALUES TO EEPROM: YES
8) Adjust the calibration values: Press the ENTER key to enter the SETUP menu. Press the UP key until EDIT VARIABLES is displayed, then press the ENTER key. Use the UP key to select variable number 70, then press the ENTER key to begin editing. For each variable, use the UP/DOWN keys to ensure that the number AND the negative sign match the value from the plate on the crane or from the CD with the calibration values. Note that holding the button will cause the values to scroll more quickly than a single button press. After each value matches the desired value, press the ENTER key to save the value and advance to the next variable.

CONTINUED ON NEXT PAGE
8) When all values are entered, press C to exit to the setup menu. Press the C button once again to begin moving to the main menu. Use the UP/DOWN arrows to select YES to save the new values to EEPROM, then press the ENTER key to return to the main menu.

SAVE NEW VALUES
TO EEPROM:  NO

SAVE NEW VALUES
TO EEPROM:  YES

TRANSFER OF CALIBRATION VALUES IS COMPLETE
## 11. ERROR CODE MESSAGES

Error Code Table for all DS50A2 cranes

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Error</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Over load</td>
<td>Cutoff due to over load limit</td>
<td>Reduce load or reduce radius</td>
</tr>
<tr>
<td>E05</td>
<td>Length pot error</td>
<td>The boom length reported from the length pot is too low:</td>
<td>With the boom fully retracted, use the LCD to adjust the length reading until this error disappears</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clutch between length sensor pot and gear may be defective</td>
<td>Completely replace length pot assembly and readjust length sensor pot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+5V supply to length pot faulty.</td>
<td>Check the +5V supply as described in the troubleshooting manual. Identify either a main board defect or length pot assembly defect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length pot defective</td>
<td>Replace the length pot. Refer to the troubleshooting manual for instructions.</td>
</tr>
<tr>
<td>E11</td>
<td>Length voltage is less than the minimum limit</td>
<td>The voltage level of the length pot is too low</td>
<td>With the boom fully retracted, adjust the length pot until this error disappears, then adjust the length reading with the internal LCD adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clutch between length sensor pot and gear may be defective</td>
<td>Completely replace length pot assembly and readjust length sensor pot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+5V supply to length pot faulty.</td>
<td>Check the +5V supply as described in the troubleshooting manual. Identify either a main board defect or length pot assembly defect.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length pot defective</td>
<td>Replace the length pot. Refer to the troubleshooting manual for instructions.</td>
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## 11. ERROR CODE MESSAGES

<table>
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<tr>
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</tr>
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<tbody>
<tr>
<td>E14</td>
<td>Load input voltage is lower than the minimum limit</td>
<td>Cable leading from the central unit to the load cell is defective or has water in it. Load cell defective</td>
<td>If the cable or connector is damaged replace the cable or the load cell. Refer to the troubleshooting manual. Follow the instructions in the troubleshooting manual and use the test fixture to clearly identify a load cell defect. If in doubt contact Hirschmann service support. In the event of a load cell defect replace the load cell referring to the troubleshooting manual and crane service documentation. <strong>WARNING: Support the hoist drum while replacing the load cell.</strong> Clearly identify a main board defect by referring to the troubleshooting manual. If in doubt contact Hirschmann service support. Replace main board or central unit and transfer calibration data. Afterwards, load test the system.</td>
</tr>
<tr>
<td>E15</td>
<td>Communication lost to angle sensor</td>
<td>Angle sensor defective or main board defective</td>
<td>Replace main board and transfer calibration data. Afterwards, load test the system.</td>
</tr>
</tbody>
</table>
11. ERROR CODE MESSAGES

<table>
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<tr>
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<tr>
<td>E21</td>
<td>Length channel voltage is higher than the maximum limit</td>
<td>Cable between the length sensor and main board is defective, shorted, or disconnected.</td>
<td>Check cable and connectors and replace if necessary. Refer to troubleshooting manual.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length sensor pot defective.</td>
<td>Replace length sensor pot. Refer to instructions in the troubleshooting manual.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analog channel on main board defective</td>
<td>Clearly identify a main board defect by referring to the troubleshooting manual. If in doubt contact Hirschmann service for support. Replace main board or central unit and transfer calibration data. Afterwards, load test the system</td>
</tr>
</tbody>
</table>
## 11. ERROR CODE MESSAGES

<table>
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<th>Error Code</th>
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<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>E24</td>
<td>Load input voltage is higher than the maximum limit</td>
<td>Cable leading from the central unit to the load cell is defective or has water in it. Load cell defective</td>
<td>If the cable or connector is damaged replace the cable or the load cell. Refer to the troubleshooting manual. Follow the instructions in the troubleshooting manual and use the test fixture to clearly identify a load cell defect. If in doubt contact Hirschmann service support. In the event of a load cell defect replace the load cell referring to the troubleshooting manual and crane service documentation. <strong>WARNING: Support the hoist drum while replacing the load cell.</strong> Clearly identify a main board defect by referring to the troubleshooting manual. If in doubt contact Hirschmann service support. Replace main board or central unit and transfer calibration data. Afterwards, load test the system.</td>
</tr>
<tr>
<td>E37</td>
<td>Error in the EEPROM</td>
<td>Data in the EEPROM is defective</td>
<td>Initialize the EEPROM, then re-enter calibration data into it. Turn the power on and off several times. If the problem repeats itself, replace the main board.</td>
</tr>
<tr>
<td>E57</td>
<td>EEPROM not initialized</td>
<td>Data in the EEPROM is defective or lost</td>
<td>Initialize the EEPROM, then re-enter calibration data into it. Turn the power on and off several times. If the problem repeats itself, replace the main board.</td>
</tr>
</tbody>
</table>
12. REMOVING TEST AND CALIBRATION EQUIPMENT

Use the following procedure to remove the test equipment after you completed the adjustments or transfer of data.

- Unhook any load and move the boom into a safe position. Select a boom position that allows you to disconnect the calibration equipment safely.

- Switch off the truck power. Disconnect the interface cable from the DB9 connector. Store cable and hand terminal in a secured and protected location.

- Replace the cover on the inner box after checking to ensure that the grounding cable is connected. Fasten it down with the four screws.

- Mount the large cover and carefully tighten the four nuts.

- Re-connect the external cables with the Mil type plugs to the connectors. Refer to the manual level 1 and level 2 for orientation of those connectors. Be sure the plugs are tightened to seal against water ingress.

- Check the system performance by lifting a known test load and a cut off test.

- If the test fails then you should verify the correct removal of test equipment or calibration equipment or repeat trouble shooting as described in the Troubleshooting Manual level 1, 2, and 3.