HIRSCHMANN

A Belden Company

LOAD MOMENT INDICATOR SYSTEM

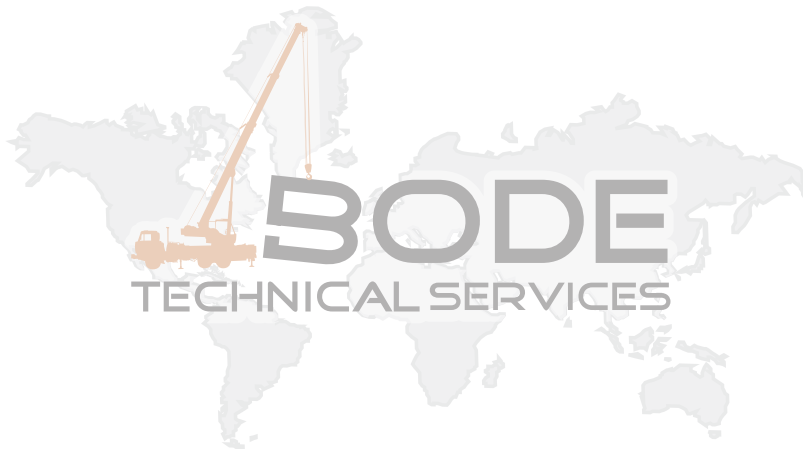# MARK 4E/2

01	12.5ft	40000 lb
04	35.5ft	6800 lb
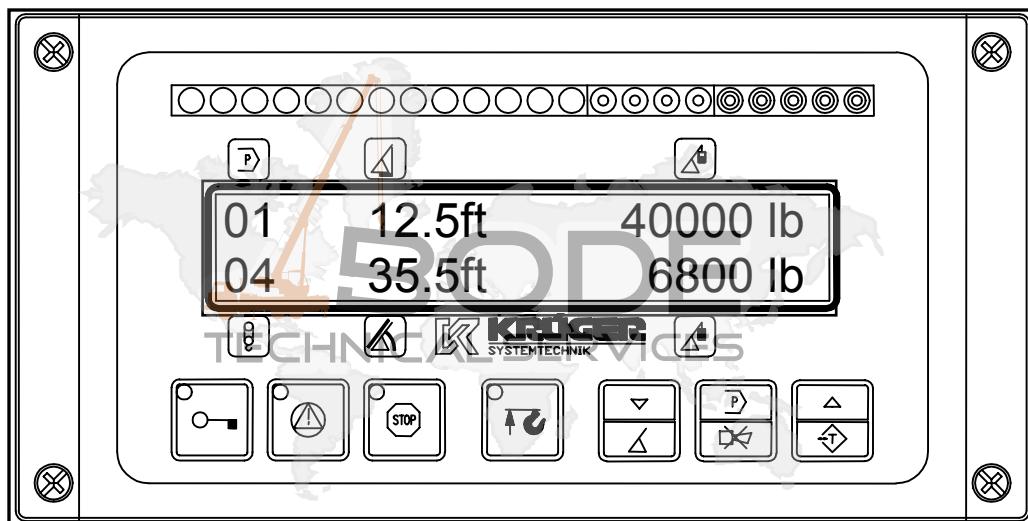
CALIBRATION MANUAL

NOTICE

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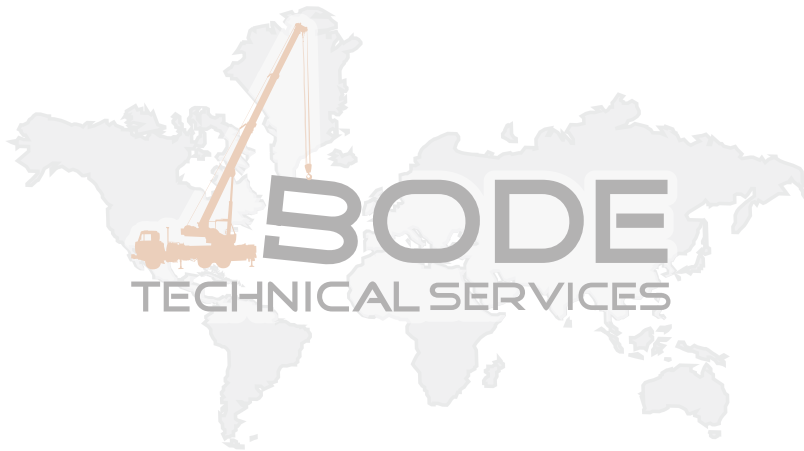Hirschmann shall not be liable for errors contained in this manual or for incidental or consequential damages in connection with the furnishing, performance, or use of this manual. This document contains proprietary information, which is protected by copyright. All rights are reserved.
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TABLE OF CONTENTS

BODE
TECHNICAL SERVICES

1   GENERAL INFORMATION

The Load Moment Indicator System Mark 4E/2 must be calibrated after completing system installation, crane modification, or anytime there is an indication of inaccuracy. The calibration will match the sensors installed on the crane.

Prior to starting the calibration, it is advised to first read over this procedure in its entirety. The purpose of this manual is to provide calibration information required before operating the system. Refer to the Operator's Manual for system description and console controls.

REFERENCE INFORMATION:
Load Moment Indicator System Mark 4E/2 Operator's Manual. 031-300-190-073

2   MATERIAL LIST
- software EPROMs and calibration information package
- EPROM puller
- Inclinometer or Digital Level
- 200' tape measure ft/meters
- digital multimeter a set of leads
- test weights; (Test loads are determined by the Crane Load Charts included with the calibration information).
  NOTE: To comply with the SAE J376 standards the test load must be to a known accuracy of ±1%.

3   WARNINGS

Always refer to operational instructions and load charts that are provided by the crane manufacturer for specific crane operation and load limits.

The Load Moment Indicator System Mark 4E/2 is not and shall not be a substitute for good operator judgment, experience, or use of acceptable safe operating procedures.

The operator is responsible for operating the crane within the manufacturer's specified parameters.

The crane operator shall ensure that all warnings and instructions provided by the manufacturer are fully understood, observed, and remain with the crane.

Prior to operating the crane, the operator must carefully read and understand the information in the Operator's Manual so that he knows the operation and limitations of the Load Moment Indicator System Mark 4E/2.

<div style="border:1px solid black; padding:10px;">

<div style="text-align:center; background:black; color:white; display:inline-block; padding:4px 20px;">⚠ **WARNING**</div>
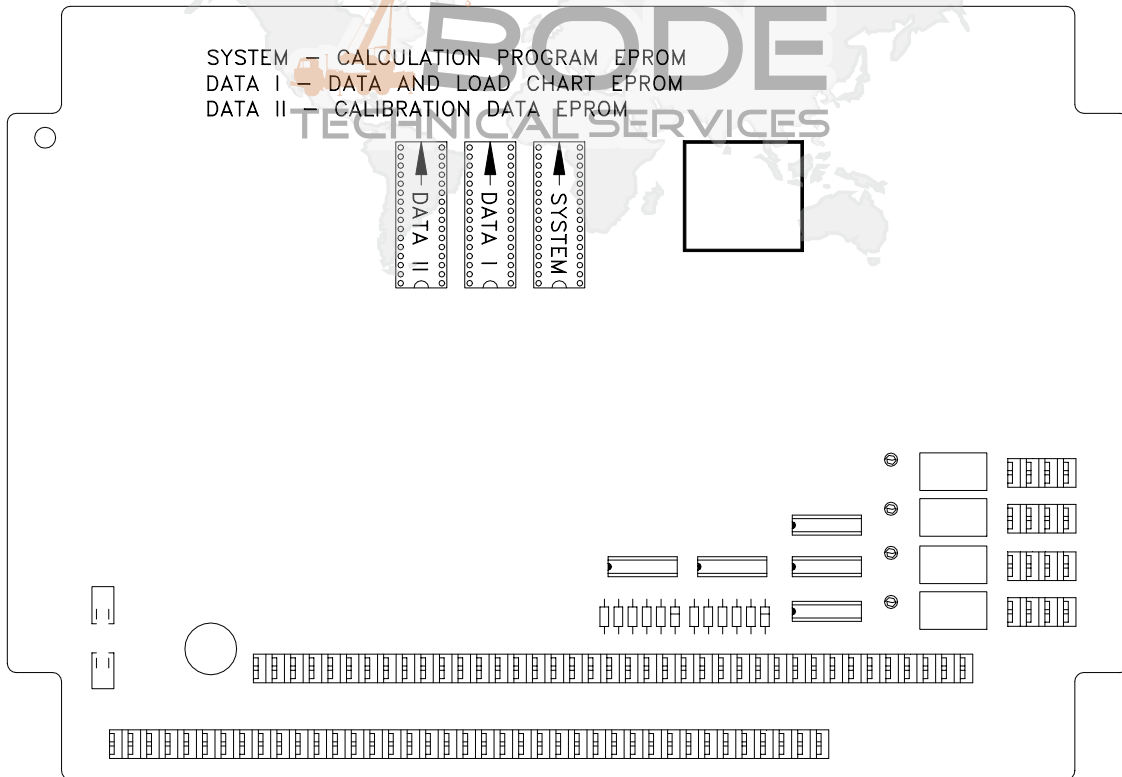
BEFORE OPERATION OF THE CRANE, THE SYSTEM MUST BE CALIBRATED. ALL STEPS MUST BE FOLLOWED AND COMPLETED. TO PREVENT MATERIAL DAMAGE AND SERIOUS, OR EVEN FATAL, ACCIDENTS, THE CORRECT ADJUSTMENT OF THE SYSTEM HAS TO BE ENSURED BEFORE STARTING THE CRANE OPERATION.

</div>

4 CALIBRATION PROCEDURE

4.1 I.C. Installation

4.1.1   Check and verify that the Load Chart in the enclosed booklet matches the Load Chart in the crane. If the Load Charts do not match, please contact PAT America Inc.

4.1.2   Install the EPROMs that are received with the booklet by plugging them into the proper socket and in the proper direction, as shown below.

> **WARNING:**   **If the EPROMs are put into the sockets improperly they will be destroyed and new EPROMs will have to be purchased.**


```
SYSTEM — CALCULATION PROGRAM EPROM
DATA I — DATA AND LOAD CHART EPROM
DATA II — CALIBRATION DATA EPROM
```

CALIBRATION PROCEDURE

4.2 Panel start up

4.2.1 Turn on power to the system. The panel will display **E: 1140, E:1141 or E:1142** (if these error messages do not appear continue to Section 4.3). Push ⬚, then the display will change to:

```
ACCESS CODE
0000000
```

4.2.2 To enter the **ACCESS CODE** push ⬚ button to cursor to each digit and the ⬚ or ⬚ buttons to change number to get the proper menu digit. The **ACCESS CODE** is **001001**.

4.2.3 Push ⬚ button and panel will display:

```
CKSUM EP      CKSUM EEP
CKSUM PRG    RESET
```

4.2.4 To checksum new EPROMs: ⬚ button at EACH of these menu titles, doing a **RESET** last. To select a menu title, use the ⬚ or ⬚ buttons until menu title blinks then push ⬚ button. After check summing EPROMs, **RESET** the system and panel will enter the Program Menu.

4.2.5 Use the ⬚ or ⬚ buttons to select the configuration the crane is configured. Push ⬚ button to get to Operating Screen.

4.3 Angle and length pre-calibration setup (Voltage/Current)

4.3.1 With boom fully retracted and at lowest possible angle, set minimum angle and length voltages to approximately 1V for voltage sensors or 4mA for current sensors. Angle signal can be measured between terminal #44 (GND) and #56 (signal) in the CPU. Length signal can be measured between terminals #44 (GND) and #53 (signal) of the CPU.

4.3.2 **(Voltage) Angle** - voltages are checked in the cable reel with ground lead of voltmeter put on terminal # 1 and the positive lead on terminal # 5 on the terminal strip. Loosen setscrews on angle bracket. Turn angle bracket (allowing pendulum to swing freely as the

boom goes up) until the pendulum and rubber bumper are barely touching. Retighten setscrews. Adjust voltage by loosening the three screws by the angle potentiometer and turning potentiometer until approximately 1.000 VDC is reached.

4.3.3   **(Voltage) Length** - voltages are checked with ground lead of voltmeter put on terminals # 1 and the positive lead on terminal # 2 on the terminal strip. Adjust voltage by turning wiper arm (located behind white nylon gear and on the shaft of the length potentiometer) to approximately 1.000 VDC.

4.3.4   **(Current) Angle** – The angle sensor must be level. Adjust the level of the angle sensor by loosening the socket head cap screws and aligning the top of the angle sensor until parallel with the boom.

The input signal operating window is 4 to 20mA, measured in series at the analog input terminal OR 1V to 5V, measured in parallel between the analog input and ground (GND) terminals. At 4mA the voltage is 1V and at 20mA the voltage is 5V.

4.3.5   **(Current) Length** - Reset length potentiometer in length angle transducer (screw is located in center of white gear); with boom fully retracted, turn potentiometer carefully counter-clockwise until it stops. Recheck length and angle display.

The input signal operating window is 4 to 20mA, measured in series at the analog input terminal OR 1V to 5V, measured in parallel between the analog input and ground (GND) terminals. At 4mA the voltage is 1V and at 20mA the voltage is 5V.

4.4   Entering Calibration Menu

4.4.1   From the Operating Screen (shown below **Diagram # 1**) enter the Calibration menu by pushing and holding the [ ] button then push the [ ] button.
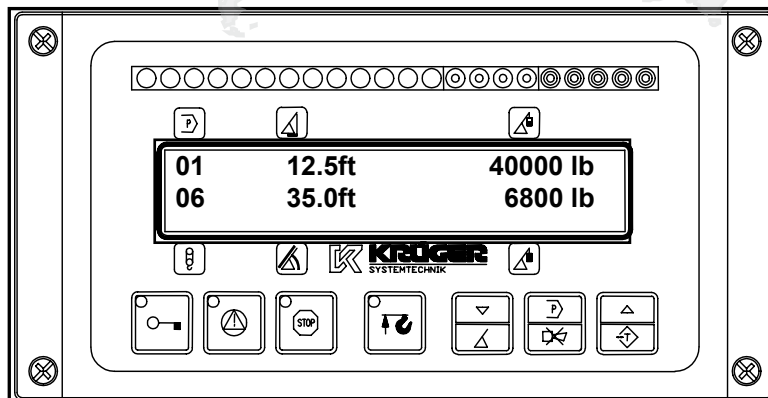
Diagram #   **1**

4.5   Angle Calibration:

4.5.1   <u>With Boom at Zero Degrees.</u>

4.5.2   Go to the **Calibration Menu**. (Refer to Section 4.4)

4.5.3   Push the ▽△ or △◇ button until **NORM** menu title blinks, then push the P button.

4.5.4   Push the ▽△ or △◇ button until **ANGLE** menu title blinks, then push the P button.

4.5.5   Verify boom is at 0 degrees with an inclinometer or digital level.

4.5.6   Push the ▽△ or △◇ button until **MAXIMUM (signal)** menu title blinks, then push the P button. *(note: 20mA at 0°)*

4.5.7   Push the P button until all digits have been verified with the proper value of **000.0** at 0 degrees.

4.5.8   <u>Hoist the boom all the way up and check angle, using an inclinometer or digital level.</u>

4.5.9   Push the ▽△ or △◇ button until **MINIMUM (signal)** menu title blinks, then push the P button. *(note: 4mA at 90°)*

4.5.10 Push the P button to change the first digit of the angle displayed to match the digital level reading. Select the next digit by pushing the ▽△ or △◇ button until the proper number for that digit is reached. Continue this process until all digits have been corrected. <u>For Example, if the angle given by digital level was 76.5 degrees, then the display should read 076.5 before the P button is pushed for the last time.</u>

4.5.11 Push the ▽△ or △◇ button until **ADJUST** menu title blinks, then push the P button.

4.5.12 Push the ▽△ or △◇ button (since **EXIT** menu title is at the end of each menu push ▽△ button) until **EXIT** menu title blinks, then push the P button until you return to the <u>Operating Screen</u>. (diagram # 1)

4.5.13 Boom down to 60 degrees, using crane angle indicator or digital level to verify proper angle indication.

4.6   Length Calibration:

4.6.1   <u>With Fully Retracted Boom</u>

4.6.2   Go to the Calibration Menu. (Refer to Section 4.4)

4.6.3   Push the [▽/△] or [△/⬧] button until **NORM** menu title blinks, then push the [P/⬧] button.

4.6.4   Push the [▽/△] or [△/⬧] button until **LENGTH** menu title blinks, then push the [P/⬧] button.

4.6.5   Verify boom is at fully retracted.

4.6.6   Push the [▽/△] or [△/⬧] button until **MINIMUM** menu title blinks, then push the [P/⬧] button.

4.6.7   Push the [P/⬧] button until all digits have been verified with the proper value, which will be minimum boom length of the load chart.

4.6.8   <u>Fully extend the boom.</u>

4.6.9   Push the [▽/△] or [△/⬧] button until **MAXIMUM** menu title blinks, then push the [P/⬧] button.

4.6.10 Push the [P/⬧] button until all digits have been verified with the proper value, which will be maximum boom length of the load chart

4.6.11 Push the [▽/△] or [△/⬧] button until **ADJUST** menu title blinks, then push the [P/⬧] button.

4.6.12 Push the [▽/△] or [△/⬧] button until **EXIT** menu title blinks, then push the [P/⬧] button until you return to the <u>Operating Screen</u>. (diagram # 1)

4.6.13 Fully retract the boom. <u>Check the cable reel when retracting to verify that the reel is spooling properly. If the reel is not spooling properly, adjust the first roller guide until spooling is correct.</u>

4.7   Ratio Calibration:

4.7.1   Go to the **Calibration Menu**. (Refer to Section 4.4)

4.7.2   Push the ▽ or △ button until **SETUP** menu title blinks, then push the ▷ button.

4.7.3   Push the ▽ or △ button until **RATIO** menu title blinks, then push the ▷ button.

4.7.4   While boom is stopped and load is steady, record ACT. LOAD indication.

4.7.5   Boom down slow and use the ▽ or △ buttons to adjust ACT. LOAD to the ACT. LOAD indication referred to above in 4.7.4.

4.7.6   After the ratio is set, push the ▷ button to exit.

4.7.7   Push the ▽ or △ button until **EXIT** menu title blinks, then push the ▷ button. Until you return to the Operating Screen. (diagram # 1)

4.8   Radius Offset Calibration:

4.8.1   Select program for the cranes configuration. (example: On Outriggers Main Boom)

4.8.2   Go to the **Calibration Menu**. (Refer to Section 4.4)

4.8.3   Push the ▽ or △ button until **RADIUS OFFSET** menu title blinks, then push the ▷ button.

4.8.4   Measure actual radius. Then change RADIUS indicated to actual radius using the ▽ or △ buttons.

4.8.5   After RADIUS is set, push the ▷ button to exit.

4.8.6   Push the ▽ or △ button until **EXIT** menu title blinks, then push the ▷ button. Until you return to the Operating Screen. (diagram # 1)

4.9   **Load Calibration:**

4.9.1   Remove all extension, jibs, etc. from the side of the boom when calibrating Main Boom only configurations.

4.9.2   Select program for the cranes configuration. (example: On Outriggers Main Boom)

4.9.3   Verify **OWN WEIGHT** pressure profile for minimum boom length is correct.

4.9.4   <u>Boom to 15 degrees.</u>

4.9.5   Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.9.14.

4.9.6   Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.7   Push the ▽△ or △◇ button until **SETUP** menu title blinks, then push the P▭ button.

4.9.8   Push the ▽△ or △◇ button until **CORRECTION** menu title blinks, then push the P▭ button.

4.9.9   Select current boom **LENGTH** by pushing the ▽△ or △◇ and push the P▭ button.

4.9.10 Push the ▽△ or △◇ button until **OWN-WEIGHT** menu title blinks, then push the P▭ button.

4.9.11 Push the ▽△ or △◇ button until **P4** menu title blinks, then push the P▭ button.

4.9.12 Push the ▽△ or △◇ button to change **%** until **ACT. LOAD = OWN WEIGHT** (Block Weights + Deducts), then push the P▭ button.

4.9.13 Push the ▽△ or △◇ button until **EXIT** menu title blinks, then push the P▭ button. Until you return to the <u>Operating Screen</u>. (diagram # 1)


4.9.14 <u>Boom to 30 degrees.</u>

4.9.15 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.23.

4.9.16 Go to the **Calibration Menu**. (Refer to Section 4.4)

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4.9.17 Push the ▽△ or △⟡ button until **SETUP** menu title blinks, then push the P⟡ button.

4.9.18 Push the ▽△ or △⟡ button until **CORRECTION** menu title blinks, then push the P⟡ button.

4.9.19 Select current boom **LENGTH** by pushing the ▽△ or △⟡ and push the P⟡ button.

4.9.20 Push the ▽△ or △⟡ button until **OWN-WEIGHT** menu title blinks, then push the P⟡ button.

4.9.21 Push the ▽△ or △⟡ button until **P3** menu title blinks, then push the P⟡ button.

4.9.22 Push the ▽△ or △⟡ button to change **%** until **ACT. LOAD = OWN WEIGHT** (Block Weights + Deducts), then push the P⟡ button.

4.9.23 <u>Boom to 45 degrees.</u>

4.9.24 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.33.

4.9.25 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.26 Push the ▽△ or △⟡ button until **SETUP** menu title blinks, then push the P⟡ button.

4.9.27 Push the ▽△ or △⟡ button until **CORRECTION** menu title blinks, then push the P⟡ button.

4.9.28 Select current boom **LENGTH** by pushing the ▽△ or △⟡ and push the P⟡ button.

4.9.29 Push the ▽△ or △⟡ button until **OWN-WEIGHT** menu title blinks, then push the P⟡ button.

4.9.30 Push the ▽△ or △◇ button until **P2** menu title blinks, then push the P▷ button.

4.9.31 Push the ▽△ or △◇ button to change **%** until **ACT. LOAD = OWN WEIGHT**

(Block Weights + Deducts), then push the P▷ button.

4.9.32 Push the ▽△ or △◇ button until **EXIT** menu title blinks, then push the P▷ button. Until you return to the Operating Screen. (diagram # 1)

4.9.33 Boom to 60 degrees.

4.9.34 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.42.

4.9.35 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.36 Push the ▽△ or △◇ button until **SETUP** menu title blinks, then push the P▷ button.

4.9.37 Push the ▽△ or △◇ button until **CORRECTION** menu title blinks, then push the P▷ button.

4.9.38 Select current boom **LENGTH** by pushing the ▽△ or △◇ and push the P▷ button.

4.9.39 Push the ▽△ or △◇ button until **OWN-WEIGHT** menu title blinks, then push the P▷ button.

4.9.40 Push the ▽△ or △◇ button until **P1** menu title blinks, then push the P▷ button.

4.9.41 Push the ▽△ or △◇ button to change **%** until **ACT. LOAD = OWN WEIGHT**

(Block Weights + Deducts), then push the P▷ button.

4.9.42 Boom to 70 degrees.

4.9.43 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.51.

CALIBRATION PROCEDURE

4.9.44   Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.45   Push the ▽/△ or ⬦ button until **SETUP** menu title blinks, then push the ⬚ button.

4.9.46   Push the ▽/△ or △/⬦ button until **CORRECTION** menu title blinks, then push the ⬚ button.

4.9.47   Select current boom **LENGTH** by pushing the ▽/△ or △/⬦ and push the ⬚ button.

4.9.48   Push the ▽/△ or △/⬦ button until **OWN-WEIGHT** menu title blinks, then push the ⬚ button.

4.9.49   Push the ▽/△ or △/⬦ button until **P1** menu title blinks, then push the ⬚ button.

4.9.50   Push the ▽/△ or △/⬦ button to change **%** until **ACT. LOAD = OWN WEIGHT** (Block Weights + Deducts), then push the ⬚ button.

4.9.51   Boom to various intermediate angles to verify load indication is indicating **OWN WEIGHT** correct. If indication is correct go to Section 4.9.52. If there are variances in the indication this may be do to the cranes hydraulics. If the **OWN WEIGHT** profile is not good go to Section 4.13 – 4.17 to have MEARSURE generate the pressure profiles.

4.9.52   Verify **LOAD** pressure profile for minimum boom length is correct by booming to 15 degrees.

4.9.53   Boom to 15 degrees.

4.9.54   Get **LOAD** value by adding known weight (a weight to allow you to get to longest radius or lowest angle of the load chart) + block weights + deducts. If load indication is correct go to step 4.8.63.

4.9.55   Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.56   Push the ▽/△ or △/⬦ button until **SETUP** menu title blinks, then push the ⬚ button.

4.9.57 Push the [▽/△] or [△/⊕] button until **CORRECTION** menu title blinks, then push the [P/✗] button.

4.9.58 Select current boom **LENGTH** by pushing the [▽/△] or [△/⊕] and push the [P/✗] button.

4.9.59 Push the [▽/△] or [△/⊕] button until **LOAD** menu title blinks, then push the [P/✗] button.

4.9.60 Push the [▽/△] or [△/⊕] button until **P4** menu title blinks, then push the [P/✗] button.

4.9.61 Push the [▽/△] or [△/⊕] button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P/✗] button.

4.9.62 Push the [▽/△] or [△/⊕] button until **EXIT** menu title blinks, then push the [P/✗] button. Until you return to the Operating Screen. (diagram # 1)

4.9.63 Boom to 30 degrees.

4.9.64 Get **LOAD** value by adding known weight + block weights + deducts. If load indication is correct go to step 4.8.72.

4.9.65 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.66 Push the [▽/△] or [△/⊕] button until **SETUP** menu title blinks, then push the [P/✗] button.

4.9.67 Push the [▽/△] or [△/⊕] button until **CORRECTION** menu title blinks, then push the [P/✗] button.

4.9.68 Select current boom **LENGTH** by pushing the [▽/△] or [△/⊕] and push the [P/✗] button.

4.9.69 Push the [▽/△] or [△/⊕] button until **LOAD** menu title blinks, then push the [P/✗] button.

4.9.70 Push the [▽/△] or [△/⊕] button until **P3** menu title blinks, then push the [P/✗] button.

CALIBRATION PROCEDURE

4.9.71 Push the [⤓] or [⤒] button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P] button.

4.9.72 <u>Boom to 45 degrees.</u>

4.9.73 Get **LOAD** value by adding known weight + block weights + deducts. If load indication is correct go to step 4.8.82.

4.9.74 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.75 Push the [⤓] or [⤒] button until **SETUP** menu title blinks, then push the [P] button.

4.9.76 Push the [⤓] or [⤒] button until **CORRECTION** menu title blinks, then push the [P] button.

4.9.77 Select current boom **LENGTH** by pushing the [⤓] or [⤒] and push the [P] button.

4.9.78 Push the [⤓] or [⤒] button until **LOAD** menu title blinks, then push the [P] button.

4.9.79 Push the [⤓] or [⤒] button until **P2** menu title blinks, then push the [P] button.

4.9.80 Push the [⤓] or [⤒] button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P] button.

4.9.81 Push the [⤓] or [⤒] button until **EXIT** menu title blinks, then push the [P] button. Until you return to the <u>Operating Screen</u>. (diagram # 1)

4.9.82 <u>Boom to 60 degrees.</u>

4.9.83 Get **LOAD** value by adding known weight + block weights + deducts. If load indication is correct go to step 4.8.91.

4.9.84 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.85 Push the [▽/△] or [△/✧] button until **SETUP** menu title blinks, then push the [P/✍] button.

4.9.86 Push the [▽/△] or [△/✧] button until **CORRECTION** menu title blinks, then push the [P/✍] button.

4.9.87 Select current boom **LENGTH** by pushing the [▽/△] or [△/✧] and push the [P/✍] button.

4.9.88 Push the [▽/△] or [△/✧] button until **LOAD** menu title blinks, then push the [P/✍] button.

4.9.89 Push the [▽/△] or [△/✧] button until **P1** menu title blinks, then push the [P/✍] button.

4.9.90 Push the [▽/△] or [△/✧] button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P/✍] button.

4.9.91 <u>Boom to 70 degrees.</u>

4.9.92 Get **LOAD** value by adding block weights + deducts. If load indication is correct go to step 4.9.100.

4.9.93 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.94 Push the [▽/△] or [△/✧] button until **SETUP** menu title blinks, then push the [P/✍] button.

4.9.95 Push the [▽/△] or [△/✧] button until **CORRECTION** menu title blinks, then push the [P/✍] button.

4.9.96 Select current boom **LENGTH** by pushing the [▽/△] or [△/✧] and push the [P/✍] button.

4.9.97 Push the [▽/△] or [△/✧] button until **LOAD** menu title blinks, then push the [P/✍] button.

4.9.98 Push the [▽/△] or [△/✧] button until **P1** menu title blinks, then push the [P/✍] button.

CALIBRATION PROCEDURE

4.9.99 Push the [▽] or [△] button to change**%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P] button.

4.9.100 After Load Indication has been calibrated for this length it is recommended that a load moment shutoff be tested. Refer to Section 4.11 Page 22

4.9.101 <u>EXTEND BOOM to the next boom length to be calibrated</u>. (In most cases the next boom length is fully extended, but with cranes with non-synchronized and longer length booms there are middle pressure profiles. To determine this go to steps 4.9.92 – 4.9.95 and use up or down to get all pressure profile lengths)

4.9.102 Verify **OWN WEIGHT** pressure profile for indicated boom length is correct.

4.9.103 <u>Boom to lowest possible angle on load chart for this configuration.</u>

4.9.104 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.113.

4.9.105 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.106 Push the [▽] or [△] button until **SETUP** menu title blinks, then push the [P] button.

4.9.107 Push the [▽] or [△] button until **CORRECTION** menu title blinks, then push the [P] button.

4.9.108 Select current boom **LENGTH** by pushing the [▽] or [△] and push the [P] button.

4.9.109 Push the [▽] or [△] button until **OWN-WEIGHT** menu title blinks, then push the [P] button.

4.9.110 Push the [▽] or [△] button until **P4** menu title blinks, then push the [P] button.

4.9.111 Push the [▽] or [△] button to change **%** until **ACT. LOAD = OWN WEIGHT**

(Block Weights + Deducts), then push the [P] button.

4.9.112 Push the ▽△ or △⟡ button until **EXIT** menu title blinks, then push the P button. Until you return to the Operating Screen. (diagram # 1)

4.9.113 Boom to 30 degrees.

4.9.114 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.122.

4.9.115 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.116 Push the ▽△ or △⟡ button until **SETUP** menu title blinks, then push the P button.

4.9.117 Push the ▽△ or △⟡ button until **CORRECTION** menu title blinks, then push the P button.

4.9.118 Select current boom **LENGTH** by pushing the ▽△ or △⟡ and push the P button.

4.9.119 Push the ▽△ or △⟡ button until **OWN-WEIGHT** menu title blinks, then push the P button.

4.9.120 Push the ▽△ or △⟡ button until **P3** menu title blinks, then push the P button.

4.9.121 Push the ▽△ or △⟡ button to change **%** until **ACT. LOAD = OWN WEIGHT** (Block Weights + Deducts), then push the P button.

4.9.122 Boom to 45 degrees.

4.9.123 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.132.

4.9.124 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.125 Push the ▽△ or △⟡ button until **SETUP** menu title blinks, then push the P button.

CALIBRATION PROCEDURE

4.9.126 Push the [▽△] or [△⊕] button until **CORRECTION** menu title blinks, then push the [P⊠] button.

4.9.127 Select current boom **LENGTH** by pushing the [▽△] or [△⊕] and push the [P⊠] button.

4.9.128 Push the [▽△] or [△⊕] button until **OWN-WEIGHT** menu title blinks, then push the [P⊠] button.

4.9.129 Push the [▽△] or [△⊕] button until **P2** menu title blinks, then push the [P⊠] button.

4.9.130 Push the [▽△] or [△⊕] button to change**%** until **ACT. LOAD = OWN WEIGHT**

(Block Weights + Deducts), then push the [P⊠] button.

4.9.131 Push the [▽△] or [△⊕] button until **EXIT** menu title blinks, then push the [P⊠] button. Until you return to the Operating Screen. (diagram # 1)

4.9.132 Boom to 60 degrees.

4.9.133 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.141.

4.9.134 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.135 Push the [▽△] or [△⊕] button until **SETUP** menu title blinks, then push the [P⊠] button.

4.9.136 Push the [▽△] or [△⊕] button until **CORRECTION** menu title blinks, then push the [P⊠] button.

4.9.137 Select current boom **LENGTH** by pushing the [▽△] or [△⊕] and push the [P⊠] button.

4.9.138 Push the [▽△] or [△⊕] button until **OWN-WEIGHT** menu title blinks, then push the [P⊠] button.

4.9.139 Push the [⯆/⯅] or [⯅/⯁] button until **P1** menu title blinks, then push the [P/⯈] button.

4.9.140 Push the [⯆/⯅] or [⯅/⯁] button to change **%** until **ACT. LOAD = OWN WEIGHT** (Block Weights + Deducts), then push the [P/⯈] button.

4.9.141 <u>Boom to 70 degrees.</u>

4.9.142 Get **OWN WEIGHT** value by adding block weights + deducts. If load indication is correct go to step 4.8.21.

4.9.143 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.144 Push the [⯆/⯅] or [⯅/⯁] button until **SETUP** menu title blinks, then push the [P/⯈] button.

4.9.145 Push the [⯆/⯅] or [⯅/⯁] button until **CORRECTION** menu title blinks, then push the [P/⯈] button.

4.9.146 Select current boom **LENGTH** by pushing the [⯆/⯅] or [⯅/⯁] and push the [P/⯈] button.

4.9.147 Push the [⯆/⯅] or [⯅/⯁] button until **OWN-WEIGHT** menu title blinks, then push the [P/⯈] button.

4.9.148 Push the [⯆/⯅] or [⯅/⯁] button until **P1** menu title blinks, then push the [P/⯈] button.

4.9.149 Push the [⯆/⯅] or [⯅/⯁] button to change **%** until **ACT. LOAD = OWN WEIGHT** (Block Weights + Deducts), then push the [P/⯈] button.

4.9.150 Boom to various intermediate angles to verify load indication is indicating **OWN WEIGHT** correct. If indication is correct go to Section 4.9.150. If there are variances in the indication this may be do to the cranes hydraulics. <u>If the **OWN WEIGHT** profile is not good go to Section 4.13 - to have MEARSURE generate the pressure profiles.</u>

4.9.151 Verify **LOAD** pressure profile for maximum boom length is correct.

4.9.152 Get **LOAD** value by adding known weight (a weight to allow you to get to longest radius or lowest angle of the load chart) + block weights + deducts. If load indication is correct go to step 4.8.62.

CALIBRATION PROCEDURE

Boom to lowest possible angle on load chart for this configuration. **WARNING:** Do not exceed Load Chart Capacity for **LOAD**, The operator is responsible for operating the crane within the manufacturer's specified parameters.

4.9.153 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.154 Push the [⽥] or [⽥] button until **SETUP** menu title blinks, then push the [P] button.

4.9.155 Push the [⽥] or [⽥] button until **CORRECTION** menu title blinks, then push the [P] button.

4.9.156 Select current boom **LENGTH** by pushing the [⽥] or [⽥] and push the [P] button.

4.9.157 Push the [⽥] or [⽥] button until **LOAD** menu title blinks, then push the [P] button.

4.9.158 Push the [⽥] or [⽥] button until **P4** menu title blinks, then push the [P] button.

4.9.159 Push the [⽥] or [⽥] button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P] button.

4.9.160 Push the [⽥] or [⽥] button until **EXIT** menu title blinks, then push the [P] button. Until you return to the Operating Screen. (diagram # 1)

4.9.161 Boom to 30 degrees.

4.9.162 Get **LOAD** value by adding known weight + block weights + deducts. If load indication is correct go to step 4.8.170.

4.9.163 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.164 Push the [⽥] or [⽥] button until **SETUP** menu title blinks, then push the [P] button.

4.9.165 Push the [⽥] or [⽥] button until **CORRECTION** menu title blinks, then push the [P] button.

4.9.166 Select current boom **LENGTH** by pushing the [▽/△] or [△/⇕] and push the [P/▷◁] button.

4.9.167 Push the [▽/△] or [△/⇕] button until **LOAD** menu title blinks, then push the [P/▷◁] button.

4.9.168 Push the [▽/△] or [△/⇕] button until **P3** menu title blinks, then push the [P/▷◁] button.

4.9.169 Push the [▽/△] or [△/⇕] button to change % until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P/▷◁] button.

4.9.170 <u>Boom to 45 degrees.</u>

4.9.171 Get **LOAD** value by adding known weight + block weights + deducts. If load indication is correct go to step 4.8.180.

4.9.172 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.173 Push the [▽/△] or [△/⇕] button until **SETUP** menu title blinks, then push the [P/▷◁] button.

4.9.174 Push the [▽/△] or [△/⇕] button until **CORRECTION** menu title blinks, then push the [P/▷◁] button.

4.9.175 Select current boom **LENGTH** by pushing the [▽/△] or [△/⇕] and push the [P/▷◁] button.

4.9.176 Push the [▽/△] or [△/⇕] button until **LOAD** menu title blinks, then push the [P/▷◁] button.

4.9.177 Push the [▽/△] or [△/⇕] button until **P2** menu title blinks, then push the [P/▷◁] button.

4.9.178 Push the [▽/△] or [△/⇕] button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the [P/▷◁] button.

4.9.179 Push the [▽/△] or [△/⇕] button until **EXIT** menu title blinks, then push the [P/▷◁] button. Until you return to the <u>Operating Screen</u>. (diagram # 1)

4.9.180 <u>Boom to 60 degrees.</u>

CALIBRATION PROCEDURE

4.9.181 Get **LOAD** value by adding known weight + block weights + deducts. If load indication is correct go to step 4.8.189.

4.9.182 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.183 Push the ⬇ or ⬆ button until **SETUP** menu title blinks, then push the Ⓟ button.

4.9.184 Push the ⬇ or ⬆ button until **CORRECTION** menu title blinks, then push the Ⓟ button.

4.9.185 Select current boom **LENGTH** by pushing the ⬇ or ⬆ and push the Ⓟ button.

4.9.186 Push the ⬇ or ⬆ button until **LOAD** menu title blinks, then push the Ⓟ button.

4.9.187 Push the ⬇ or ⬆ button until **P1** menu title blinks, then push the Ⓟ button.

4.9.188 Push the ⬇ or ⬆ button to change **%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the Ⓟ button.

4.9.189 <u>Boom to 70 degrees.</u>

4.9.190 Get **LOAD** value by adding block weights + deducts. If load indication is correct go to step 4.8.21.

4.9.191 Go to the **Calibration Menu**. (Refer to Section 4.4)

4.9.192 Push the ⬇ or ⬆ button until **SETUP** menu title blinks, then push the Ⓟ button.

4.9.193 Push the ⬇ or ⬆ button until **CORRECTION** menu title blinks, then push the Ⓟ button.

4.9.194 Select current boom **LENGTH** by pushing the ⬇ or ⬆ and push the Ⓟ button.

4.9.195 Push the ⬇ or ⬆ button until **LOAD** menu title blinks, then push the Ⓟ button.

4.9.196 Push the ⬇ or ⬆ button until **P1** menu title blinks, then push the Ⓟ button.

4.9.197 Push the ▽△ or △◇ button to change**%** until **ACT. LOAD = LOAD**

(Known Weight + Block Weights + Deducts), then push the ☐ button.

4.10 Deflection (radius long boom) Calibration:

4.10.1   With boom fully extended at 60 degrees with no load on the hook.

4.10.2   Go to the **Calibration Menu**.

4.10.3   Push the ▽△ or △◇ button until **SETUP** menu title blinks, then push the ☐ button.

4.10.4   Push the ▽△ or △◇ button until **DEFLECTION** menu title blinks, then push the ☐ button.

4.10.5   Push the ▽△ or △◇ button until **OWN-WEIGHT** menu title blinks, then push the ☐ button.

4.10.6   Measure actual radius with hook block only. Then change RADIUS indicated to actual radius, using the ▽△ or △◇ buttons.

4.10.7   After RADIUS is set, push the ☐ button to exit.

4.10.8   Push the ▽△ or △◇ button until **LOAD** menu title blinks, then push the ☐ button.

4.10.9   Pick **LOAD** measure actual radius with hook block + test weight. Then change indicated **RADIUS** to actual **RADIUS** using the ▽△ or △◇ buttons.

4.10.10 After **RADIUS** is set, push the ☐ button to exit.

4.10.11 Push the ▽△ button to EXIT then the ☐ button to the Operating Screen and enter the working display.

4.10.12 After Radius and Load Indication has been calibrated for this length it is recommended that a load moment shutoff be tested. Refer to next section .

4.11 Load Moment Shut Off

4.11.1 To perform a load moment shut off for this configuration and length you are at.

4.11.2 You need Known weight + hook blocks + deducts = Test Weight.

4.11.3 After getting test load determine where the load should shut off is at either by radius or angle from the information on the load chart.

4.11.4 Start with the load at a higher angle than shut off and verify load indication is correct.

4.11.5 Slowly boom to the point of shut off. (If load indication is not correct as you are booming down return to section 4.9 and readjust the Ratio).

4.11.6 If system warning and shut off has functioned before calculated shut off point record the information from shut off on *LOAD MOMENT FIELD TEST SHEET* for this configuration provided with technical information booklet. This configuration is complete.

4.11.7 Go to the next configuration and start with section 4.9 – 4.11. Repeat this process until all configurations have been calibrated.

4.12 MEASURE to generate Pressure Profiles

4.12.1 Fully retract and put the boom at 0 degrees.

4.12.2 Go to the **Calibration Menu.**

4.12.3 Push the ▽△ or ⬍ button until **MEASURE** menu title blinks, then push the [P] button.

4.12.4 Push the ▽△ or △⬍ button until **AUTOMATIC** menu title blinks, then push the [P] button.

4.12.5 Push the ▽△ or △⬍ until **CLEAR** menu title blinks, then push the [P] button.

4.12.6 Select current boom **LENGTH** by pushing the ▽△ or △⬍ button and push the [P] button.

4.12.7 Push the ▽△ or △⬍ button until **EXIT** menu title blinks, then push the [P] button.

4.12.8 Push the ▽△ or △⬍ button until **MEASURE** menu title blinks, then push the [P] button.

4.12.9 Push the ▽△ or ⬍ button until **OWN-WEIGHT** menu title blinks, then push the P⬥ button.

4.12.10 Select current boom **LENGTH** by pushing the ▽△ or ⬍ button and push the P⬥ button.

4.12.11 Push the P⬥ button until all digits have been verified to the proper value of the hook block + deducts weight.

4.12.12 Boom UP steady and slow, to highest boom angle before topping out the cylinder.

Before you stop booming up, push the P⬥ button. If this procedure is not done properly the CALCUTION of the pressure profile will not work.

4.12.13 Boom DOWN as close to 0 degrees as possible and select a known weight (load) for the known boom length (radius) that is within the load chart for the lowest boom angle. The larger the angle range with a weight over 1 ton the better the pressure profile.

4.12.14 Push the ▽△ or ⬍ button until **LOAD** menu title blinks, then push the P⬥ button.

4.12.15 Select current boom **LENGTH** by pushing the ▽△ or ⬍ and push the P⬥ button.

4.12.16 Push the P⬥ button until all digits have been verified to the proper value, which will be the hook block + deducts + known weight.

4.12.17 Boom up steady and slow to 75 degrees or maximum angle on the load chart. Before completion of booming up, push the P⬥ button.

4.12.18 Push the ▽△ or ⬍ button until **EXIT** menu title blinks, then push the P⬥ button.

4.12.19 Push the ▽△ or ⬍ button until **CALCULATION** menu title blinks, then push the P⬥ button.

4.12.20 Select current boom **LENGTH** by pushing the ▽△ or ⬍ button and push the P⬥ button.

4.12.21 Push the ▽△ button to **EXIT** then the P⬥ button to the Operating Screen and enter the working display.

CALIBRATION PROCEDURE

4.12.22 Verify pressure profiles are correct by checking the load indication at angle 0, 15, 30, 45, 60 and 70° with maximum boom length. If load indications are within 200 lbs., skip to **Step 4.9**. If indications are NOT correct, continue with the following procedure, which uses the MEASURE selection in the Calibration menu. Use the boom lengths specified in the Calibration Booklet to generate good profiles.

4.12.23 Fully extend and put the boom at lowest angle of the load chart for that boom length.

4.12.24 Go to the **Calibration Menu**.

4.12.25 Push the ▽△ or △◇ button until **MEASURE** menu title blinks, then push the ⓟ button.

4.12.26 Push the ▽△ or △◇ button until **AUTOMATIC** menu title blinks, then push the ⓟ button.

4.12.27 Push the ▽△ or △◇ button until **CLEAR** menu title blinks, then push the ⓟ button.

4.12.28 Select boom **LENGTH** by pushing the ▽△ or △◇ button and push the ⓟ button.

4.12.29 Push the ▽△ or △◇ button until **EXIT** menu title blinks, then push the ⓟ button.

4.12.30 Push the ▽△ or △◇ button until **MEASURE** menu title blinks, then push the ⓟ button.

4.12.31 Push the ▽△ or △◇ button until **OWN-WEIGHT** menu title blinks, then push the ⓟ button.

4.12.32 Select current boom **LENGTH** by pushing the ▽△ or △◇ button and push the ⓟ button.

4.12.33 Push the ⓟ button until all digits have been verified to the proper value, which will be the hook block + deducts weight.

4.12.34 Boom up steady and slow, to 75 degrees or maximum angle on the load chart. Before completion of booming up, push the ⓟ button.

4.12.35 Put the boom at lowest angle of the load chart for that boom length and pick up hook block + deducts + known weight less than the maximum capacity of the load chart.

4.12.36 Push the ▽△ or △◇ button until **LOAD** menu title blinks, then push the ⓟ button.

4.12.37 Select current boom **LENGTH** by pushing the ▽/△ or △/⇕ button and push the P⟩ button.

4.12.38 Push the P⟩ button until all digits have been verified to the proper value, which will be the hook block + deducts + known weight.

4.12.39 Boom up steady and slow, to 75 degrees or maximum angle on the load chart. Before completion of booming up, push the P⟩ button.

4.12.40 Push the ▽/△ or △/⇕ button until **EXIT** menu title blinks, then push the P⟩ button.

4.12.41 Push the ▽/△ or △/⇕ button until **CALCULATION** menu title blinks, then push the P⟩ button.

4.12.42 Select current boom length by pushing the ▽/△ or △/⇕ button and push the P⟩ button.

4.12.43 Push the ▽/△ button to **EXIT** then the P⟩ button to the operating screen and enter the working display.

4.12.44 If all load indications are correct go to steps 4.10 and 4.11 to complete the calibration for this configuration. If load indication is not correct go to steps 4.9, 4.10 and 4.11 to complete the calibration for this configuration

5   MENU FLOW CHART

Access Code

- **Exit**
- **Reset**
- **Setup** — Dynamic Menu Point
  - EXIT
  - RATIO
  - DEFLECTION
    - OWN-WEIGHT
    - LOAD
    - EXIT
  - CORRECTION
    - P1
    - P2
      - OWN-WEIGHT
      - LOAD
      - EXIT
    - P3
    - P4
    - EXIT
- **Service** — Analog and Digital Input
  - ANALOG INPUTS (1-4) (5-8)
  - DIGITAL INPUTS (1-16)
  - DIGITAL OUTPUTS (1-16)
  - EXIT
- **Measure** — Measures Room
  - EXIT
  - MANUAL
  - AUTOMATIC
    - START
    - DISPLAY
    - EXIT
    - LENGTH
    - ALL
    - EXIT
      - CALCULATION
      - CLEAR
    - OWN-WEIGHT
    - LOAD
    - EXIT
      - MEASURE
      - EXIT
- **Checksum**
  - CKSUM-PRG
  - CKSUM-EEP
  - CKSUM-EP
  - EXIT
- **LED Brightness**
- **NORM** — Analog Input Adjust
  - PRESSURE PISTON
  - PRESSURE ROD
  - LENGTH (Main Boom)
  - ANGLE (Main Boom)
  - EXIT
    - ADJUST
    - MAXIMUM
    - MINIMUM
    - EXIT

6   CALIBRATION SUMMARY TABLE

This table is a summary of the calibration procedure and is not recommended for the first time user. Use this procedure as reference after reading, completing the calibration procedure and becoming familiar with console operation.

STEP	DESCRIPTION	REFERENCE
1.	Check that load chart booklet matches load chart in crane	Page 2
WARNING: If the EPROMs are put into the sockets improperly they will be destroyed and new ones will have to be purchased.		
2.	Install System, Data I, and Data II EPROMS	
3.	Enter Access Code: The ACCESS CODE Is **001001**.	Page 2
4.	CHECKSUM NEW EPROMs: CKSUM EP → CKSUM EEP → CKSUM PRG → RESET	Page 3
5.	Position Boom At 0° → **Voltage sensor** – mechanically adjust angle sensor to 1.0 VDC at terminal #1 and terminal # 5 (angle signal) in the cable reel. **Current sensor –** Use adjustment screws to align top of angle sensor parallel with boom at exactly 0°. (*The measurement should read 20mA at 0°)*	Page 3 & 4
6.	Fully Retract Boom → **Voltage sensor** – mechanically adjust length sensor to 1.0 VDC at terminal #1 and terminal #2 (length signal) in the cable reel. **Current sensor –** Adjust length potentiometer by turning center screw counter clockwise to a soft stop. The measurement should read between 4 20mA. *(1V = 4mA and 5V = 20mA)*	Page 3 & 4
7.	Set Angle (refer to flow chart) → select: • NORM, ANGLE, MINIMUM (match display with actual angle at 0°) • Boom to max angle • MAXIMUM (match display with the crane's actual maximum angle) • ADJUST • EXIT	Page 4
8.	Set Length (refer to flow chart) → select: NORM, LENGTH, MINIMUM-signal (match display with actual length), boom to max length, MAXIMUM-signal (match display with actual length), ADJUST, EXIT and fully retract boom.	Page 5
9.	Set Ratio → From the operating screen (refer to flow chart) → • Select: SETUP, • RATIO, while boom is stopped and load is steady, • Record the ACT. LOAD from the display, • Boom down slow • Adjust the displayed ACT. LOAD to match the ACT. LOAD recorded, and exit.	Pages 5 & 6
Warning: Operator is responsible for operating the crane within manufacturer's specified parameters.		
10.	Select a known load that is within the load chart for the specified boom length or radius. For pressure profiles, the load should be greater than 1 ton and allow the boom to have the greatest range of angle movement. For testing, the load should be at least 75% of the rated load as read from the load chart.	Page 6
11.	Check hook block and/or test load at: 0°, 15°, 30°, 45°, 60°, 75° are within 200lbs. Note: Check the test load in crane configurations permitted by the load chart.	Pages 7-20
12.	If necessary, create pressure profiles using the boom lengths specified with calibration information. Use the same boom length throughout the following procedure and then repeating the procedure for each specified boom length. Refer to flow chart and select: • MEASURE, AUTOMATIC, CLEAR • Select boom length • EXIT • MEASURE, OWN-WEIGHT • Select boom length • Adjust the displayed load to match boom weight (hook block + deducts weight)	Pages 22-25

	• Push PROGRAM button to begin calibration. • Boom up steady and slow • Before you get to the maximum angle and as the boom is moving up • Push the PROGRAM button to create a pressure profile • Pick the known load • LOAD • Select boom length • Adjust the displayed load to match load (hook block + deducts + known weight) • Push PROGRAM button to begin calibration. • Boom up steady and slow • Before you get to the maximum angle and as the boom is moving up • Push the PROGRAM button to create a pressure profile • EXIT • CALCULATION • Select boom length • EXIT • Return to the operating screen.	
13.	Correction of minimum boom length load. Refer to flow chart and select: • SETUP, CORRECTION • Select boom length • OWN WEIGHT, P1 – P4, ACT. LOAD indicates actual load = hook block + deducts • EXIT • LOAD, P1 – P4, ACT. LOAD indicates actual load = hook block + deducts + test weight. • EXIT.	Pages 7 & 8
14.	Set radius offset → refer to flow chart and select: RADIUS OFFSET, measure actual radius and record, change radius to actual radius, and EXIT.	Pages 7
15.	Check load and radius indications and check load moment shut off minimum boom.	Page 22
16.	Correction of middle (if required) and maximum boom length load. Refer to flow chart and select: • SETUP, CORRECTION • Select boom length • OWN WEIGHT, P1 – P4, ACT. LOAD indicates actual load = hook block + deducts • EXIT • LOAD, P1 – P4, ACT. LOAD indicates actual load = hook block + deducts + test weight • EXIT	Page 14
17.	Set deflection → Refer to flow chart and select: DEFLECTION, OWN WEIGHT, measure actual radius with hook block only and record, change radius to actual radius, LOAD, , measure actual radius with load and record, change radius to actual radius, and EXIT	Page 21
18.	Check load and radius indications and check load moment shut off. If load, angle, or length measurements are incorrect, repeat calibration procedure.	Page 22

HANDBOOK REVISIONS

REV	DATE	NAME	DESCRIPTION
-	01/12/00	CSH	Create calibration manual
A	03/08/00	CSH	Added Menu Flow Chart and Calibration Summary Table
B	09/25/00	JF	Added more descriptions to existing calibration procedure, added corrections section and added button symbols.
C	03/02/08	SC	Add reference to calibration of current sensors
D	05/02/08	SC	Revise specs for calibration of current sensors
E	12/17/08	WG	Corrections to angle calibration