# User's Guide

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# DP41-S
## High Performance Strain Gage Indicator

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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply.
OMEGA is constantly pursuing certification of its products to the European New Approach Directives.
The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, patient connected applications.

⚠ This device is marked with the international hazard symbol. It is important to read the Setup Guide before installing or commissioning this device as it contains important information relating to safety and EMC.

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# Notes, Warnings, and Cautions

Information that is especially important to note is identified by these labels:

- **NOTE**
- **WARNING**
- **CAUTION**
- **IMPORTANT**

**NOTE:** provides you with information that is important to successfully setup and use the Programmable Digital Meter.

**CAUTION or WARNING:** tells you about the risk of electric shock.

**CAUTION, WARNING or IMPORTANT:** tells you of circumstances or practices that can effect the meter's functionality and must refer to accompanying documents.

For Alternating Voltage (AC) GND Ground or Protective Conductor Terminal

| | |
|---|---|
| | Alternating Current |
| | Protective Conductor Terminal |

# Introduction 1

## 1.1 DESCRIPTION

This Strain Gage meter is part of a complete line of process indicators/ controllers, offering exceptional performance.

The strain gage meter is front panel programmable to accept unipolar and bipolar DC voltage inputs and 0-20 or 4-20 mAdc inputs. The meter will accept inputs from most of the process sensors in use today such as transmitters, pressure transducers, and potentiometers.

Configuring the meter is accomplished through the 5 front panel buttons. If the RS-232 or RS-485 communication option is installed, the user may remotely set the display parameters.

Options for the meter include analog and BCD outputs, relay outputs, and RS-232 or RS-485 communications.

## 1.2 FEATURES

The following is a list of features of the meter.

- 6-digit LED display in red or green
- 0.005% accuracy of reading
- 12 DC input ranges: 0-100 mV, 0-1 V, 0-5 V, 1-5 V, 0-10 V, 0-100 V, ±50 mV, ±500 mV, ±5 V, ±50 V, 0-20 mA, or 4-20 mA
- 1.5 to 11 or 24 V dc sensor excitation
- Peak & Valley detection and memory
- Tare
- Up to 13 readings per second
- 4 isolated open collector outputs (standard) and optional isolated relay and isolated analog outputs
- Optional isolated RS-232 or RS-485 communications
- NEMA 4 Front Panel/IP65
- Non-volatile memory without battery back-up
- 115 Vac, 50/60 Hz, 230 Vac, 50/60 Hz power supply
- Optional 10-32 Vdc power supply

## 1.3 AVAILABLE MODELS

The following models and options are available. Optional boards are either installed at the time of purchase, or available as separate items and installed by the user after purchase.

### MAIN ASSEMBLIES

| MODEL NUMBER | DESCRIPTION |
|---|---|
| DP41-S | Red LEDs, 115 V ac, 50/60Hz |
| DP41-S-230 | Red LEDs, 230 V ac, 50/60Hz |
| DP41-S-GN | Green LED's, 115 V ac, 50/60 Hz |
| DP41-S-230-GN | Green LED's, 230 V ac, 50/60Hz |
| DP41-S-DC | Red LEDs, 10-32 V dc |
| DP41-S-DC-GN | Green LED's, 10-32 V dc |

Note ☞

**NOTE:** The following options are available installed at the time of purchase or as separate items installed by the user after purchase:

Analog Output Board, Relay Output Board, RS-232 Communications Board, and RS-485 Communications Board.

### CONTROL/BCD OUTPUT OPTIONS

| MODEL NUMBER | DESCRIPTION |
|---|---|
| - | Standard four open-collector outputs are standard |
| DP40-R4 | Dual 5A Form-C Relays |

Note ☞

**NOTE:** Choose only one Control/BCD output option per meter. A 40-pin mating connector is included with the BCD option.

### ANALOG OUTPUT

| MODEL NUMBER | DESCRIPTION |
|---|---|
| - | None |
| DP40-A | Isolated configurable analog (4-20 mA, 0-1, 0-5, 1-5, 0-10 V dc, 0-20 mA) output |

## SERIAL COMMUNICATIONS OPTION

| MODEL NUMBER | DESCRIPTION |
|---|---|
| DP40-S2 * | Isolated RS-232 Communications |
| DP40-S4 ** | Isolated RS-485 Communications |

Note ☞

**NOTES:** Choose only one option per meter. Both computer communications comes with 6 ft. communications cable with phone plug termination.

Free configuration software is available from ***www.omega.com*** **or on the CD-ROM enclosed with your shipment**.

* Recommend purchase of DP40-9SC2 or DP40-25SC2 (see OPTIONS below)

** Recommend purchase of DP40-9SC4 or DP40-25SC4 (see OPTIONS below)

## OPTIONS

| MODEL NUMBER | DESCRIPTION |
|---|---|
| DP40-9SC2 | 9-pin Serial Connector for RS-232 |
| DP40-9SC4 | 9-pin Serial Connector for RS-485 |
| DP40-25SC2 | 25-pin Serial Connector for RS-232 |
| DP40-25SC4 | 25-pin Serial Connector for RS-485 |
| SPC4 | 1/8 DIN NEMA 4 heavy duty cover with thumb screws |
| SPC18 | 1/8 DIN NEMA 4 Splash Proof lens cover with spring clip |

# 2 Unpacking

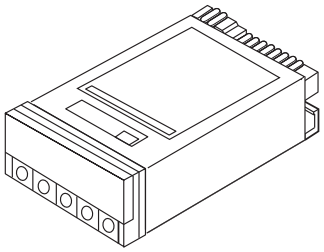
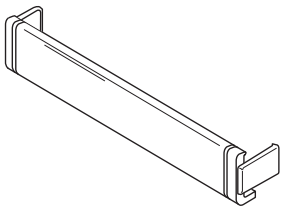
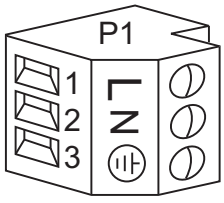
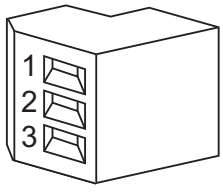
Unpack all items and make sure that every item on the packing list is present. The items you should receive are listed below. If something is missing, use the phone number for the Customer Service Department nearest you.

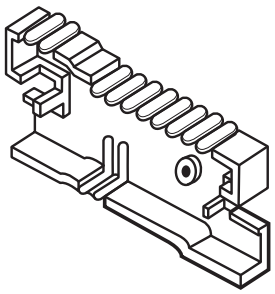
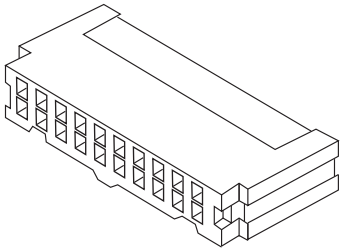
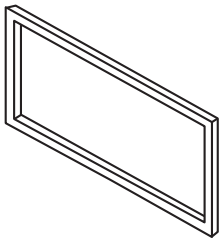
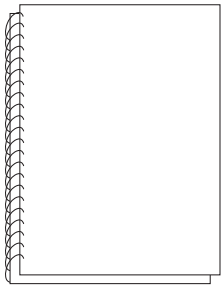
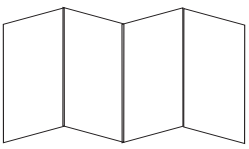
Also, inspect the shipping container and enclosed equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

*Note* ☞

**NOTE:** The shipping agent will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save all packing material and containers in the event that reshipment is required.

When you ordered your process meter, you will receive the following items in the shipping box:

| QTY | DESCRIPTION | ILLUSTRATION |
|---|---|---|
| 1 | Basic Meter in a Mounting Sleeve with Gasket |  |
| 1 | Front-Panel Button Cover |  |
| | AC Power Connector (orange - P1) |  |
| 2 | Input Connectors (gray - P3 and P9) |  |

| | | |
|---|---|---|
| 1 | Rear Protective Cover with Screw |  |
| 1 | 20-Socket Ribbon Connector (P2 Connector) |  |
| 2 | Panel-Mounting Gaskets (1 Spare) |  |
| 1 | Strain Gage Owner's Guide |  |
| 1 | Quick Start Manual |  |

Other items may also be in the box depending on the options ordered. Refer to specific options described previously.

# 3 Safety Considerations

## 3.1 SAFETY CONSIDERATIONS

This device is marked with the **international caution symbol**. It is **important to read** this manual before installing or commissioning this device as it contains important information relating to **Safety and EMC** (Electromagnetic Compatibility).

**Unpacking & Inspection**

Note ☞ Unpack the instrument and inspect for obvious shipping damage. Do not attempt to operate the unit if damage is found.

This instrument is a **panel mount device** protected in accordance with **Class I** of EN 61010 (115/230 AC power connections), **Class III** for the DC power option (10-32Vdc). Installation of this instrument should be done by Qualified personnel. In order to ensure safe operation, the following instructions should be followed.

This instrument has **no power-on switch**. An external **switch or circuit-breaker** shall be included in the building installation as a disconnecting device. It shall be marked to indicate this function, and it shall be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker shall not interrupt the Protective Conductor (Earth wire), and it shall meet the relevant requirements of IEC 947–1 and IEC 947-3 (International Electrotechnical Commission). The switch shall not be incorporated in the mains supply cord.

Furthermore, to provide protection against **excessive energy** being drawn from the mains supply in case of a fault in the equipment, an **overcurrent** protection device shall be installed.

- The Protective Conductor must be connected for safety reasons. Check that the power cable has the proper Earth wire, and it is properly connected. It is not safe to operate this unit without the Protective Conductor Terminal connected. Conductor Terminal connected.

Note ☞

- Do not exceed voltage rating on the label located on the top of the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.
- Unit mounting should allow for adequate ventilation to ensure instrument does not exceed operating temperature rating.
- Use electrical wires with adequate size to handle mechanical strain and power requirements. Install without exposing bare wire outside the connector to minimize electrical shock hazards.

**EMC Considerations**

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

**Failure to follow all instructions and warnings may result in injury!**

## 4.1 FRONT OF THE METER

The following is a brief description of each part of the front of the meter.

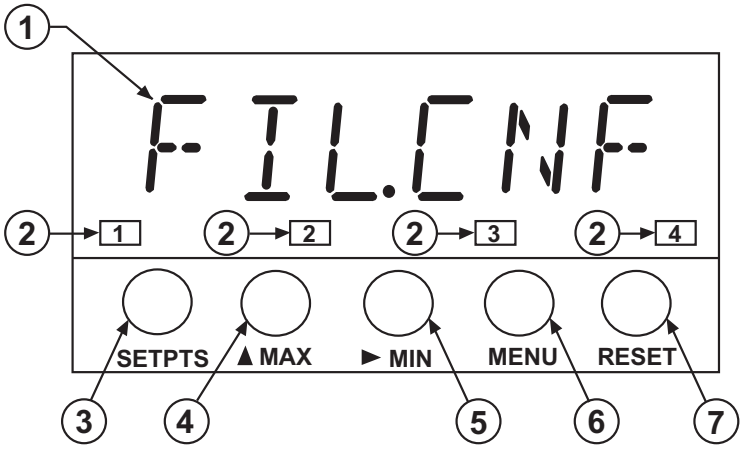



**Figure 4-1. Front Detail**

| ITEM | DESCRIPTION |
|---|---|
| 1 | –.8.8.8.8.8. or 8.8.8.8.8.8.<br><br>6-digit, 14 segment, alphanumeric 0.54” high LED display with programmable decimal point. |
| 2 | SETPOINT LED<br><br>These LEDs, labeled 1 through 4, display the status of setpoints 1, 2, 3 (Alarm 1), and 4 (Alarm 2). |
| 3 | **SETPTS** BUTTON<br><br>This button functions only in the run mode. When the Setpoint/Alarm features are unlocked, pressing this button sequentially recalls the previous setpoint settings to the display. After the **‘MIN’** and **‘MAX’** buttons are used to alter those values as desired, pressing the ‘SETPTS’ button, again, stores these new values.<br><br>Unless the ‘SETPTS’ button is pressed, each of the four setpoint values is displayed for approximately 10 seconds after the last press of the ‘SETPTS’ button. Holding the ‘SETPTS’ button depressed stalls this automatic sequence, retaining the most recent setpoint number on the display. |

# 4 Parts of the Meter

| ITEM | DESCRIPTION |
|---|---|
| 4 | ▲ /**MAX** BUTTON<br><br>During run mode, pressing this button displays the “HI RDG” (peak reading) value that has occurred up to the moment the **‘MAX’** button is pressed. This peak reading flashes, to distinguish its value from the current readings. Since this is a dynamic peak reading, the value will change if the value increases while reviewing it.<br><br>To return to display of the current readings without resetting the peak-value memory to zero (0), press the **‘MAX’** button once again.<br><br>To reset the peak-value memory (start a new peak determining period), press the **‘RESET’** button once.<br><br>During the configuration mode, the **‘MAX’** button is used to change the numerical value of the flashing digit displayed. For submenu items, such as “L1C.1=0”, pressing the **‘MAX’** button toggles the choice from “0” to “1”.<br><br>The meter allows rapid changes of a displayed numerical value by making “0” the first value to occur when the **‘MAX’** button is pressed. After that, the numbers increase to “9” and then roll over to “0” again. A negative (“–”) symbol may be displayed in the most significant digit (i.e. the digit at the far left such as shown here “–.8.8.8.8.8.”)<br><br>In the **SETPT** (SETPOINT) mode (SP1, SP2, etc), pressing the **‘MAX’** button causes the flashing digit to increment by 1 from 0 to 9. |
| 5 | ▶ /**MIN** BUTTON<br><br>During run mode, pressing the **‘MIN’** button recalls the “LO RDG” (valley reading) measured since the last press of the **‘RESET’** button. This lowest value flashes, to distinguish it from the current process display. Since this is a dynamic valley reading, the value will change if the value decreases while reviewing it. |

| ITEM | DESCRIPTION |
|---|---|
| | To return to the actual process display, without resetting the low-value memory, press the **'MIN'** button once again.<br><br>To reset the memory for current-value readings (start a new observation period), press the **'RESET'** button once and the meter will return to the run mode.<br><br>In the configuration mode, once in a submenu (like input type) the **'MIN'** button allows you scroll through the available choices such as, 0-20 mA or 4-20 mA, etc.<br><br>In the **SETPT** mode, the **'MIN'** button advances the flashing digit to the right. |
| 6 | **MENU** BUTTON<br>In the run mode, this button terminates the measurement process and allows you to enter the configuration mode, advancing through the configuration menus.<br><br>In the configuration mode, this button will store changes in the non-volatile memory at the same time advancing the display to the next menu item. |
| 7 | **RESET** BUTTON<br>In the run mode, pressing the **'RESET'** button once erases the memories of peak ("HI RDG"), valley ("LO RDG"), and ALARM latches. The display then returns to the run mode. |

**WARNING:** Pressing the **'RESET'** button two (2) times will result in a hard reset of the meter. This will clear the Peak & Valley, Alarm latches and meter reading and immediately begin a new measurement.

In the configuration mode, pressing the **'RESET'** button once, displays the previous selection. For example, if you were in "IN CNF" then pressed the **'RESET'** button once, the display will then show "RD.SC.OF". Press the **'RESET'** button two times to return to the run mode.

## 4.2 REAR OF THE METER

The following is a brief description of each part of the rear of the meter. The label on the top of the mounting sleeve (not the case) identifies the location of the connectors found at the rear of the meter. Figure 4-2A & figure 4-2B shows this label.

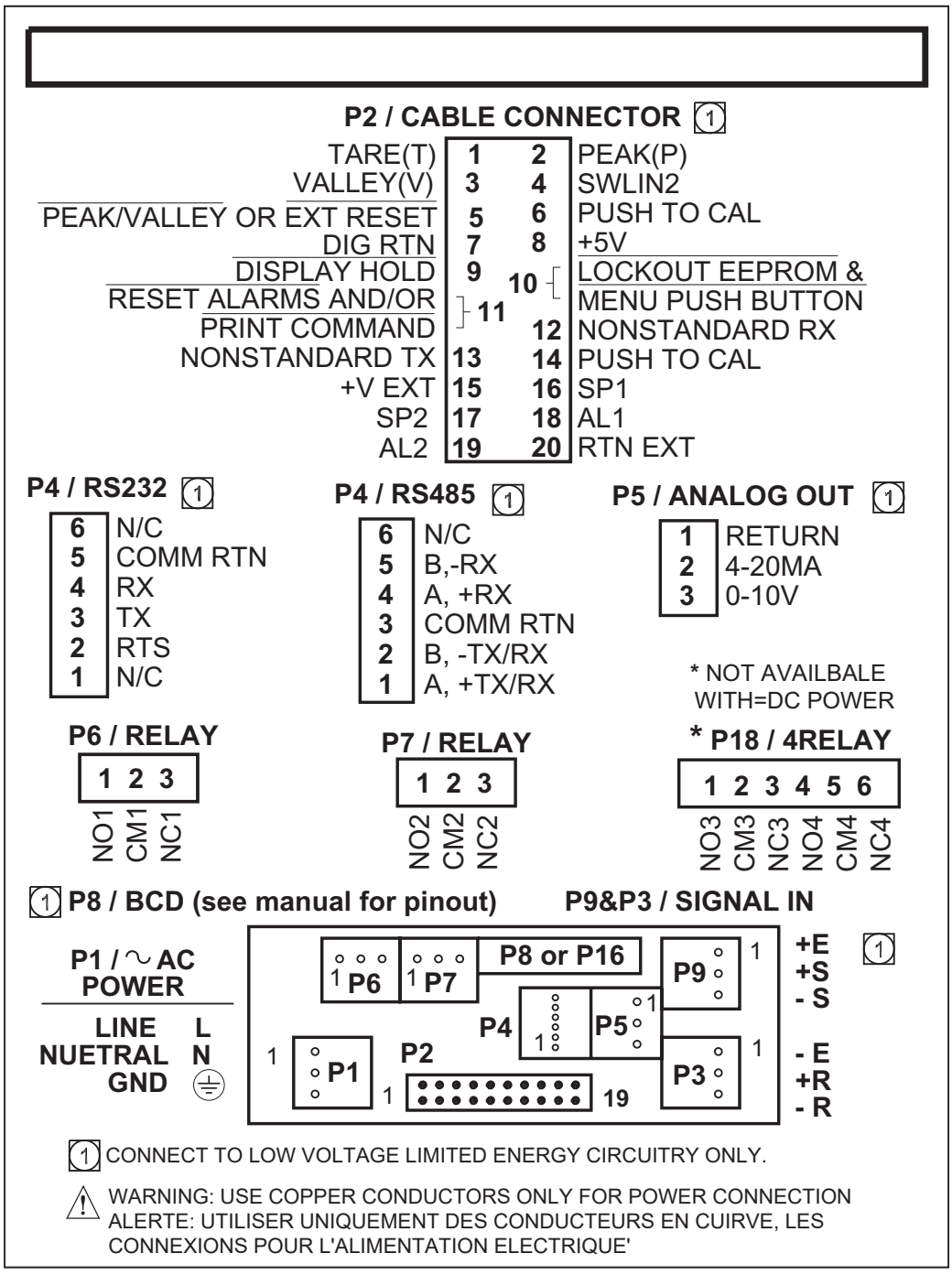



**Figure 4-2A. AC Power - Connector Label for Rear Connectors**

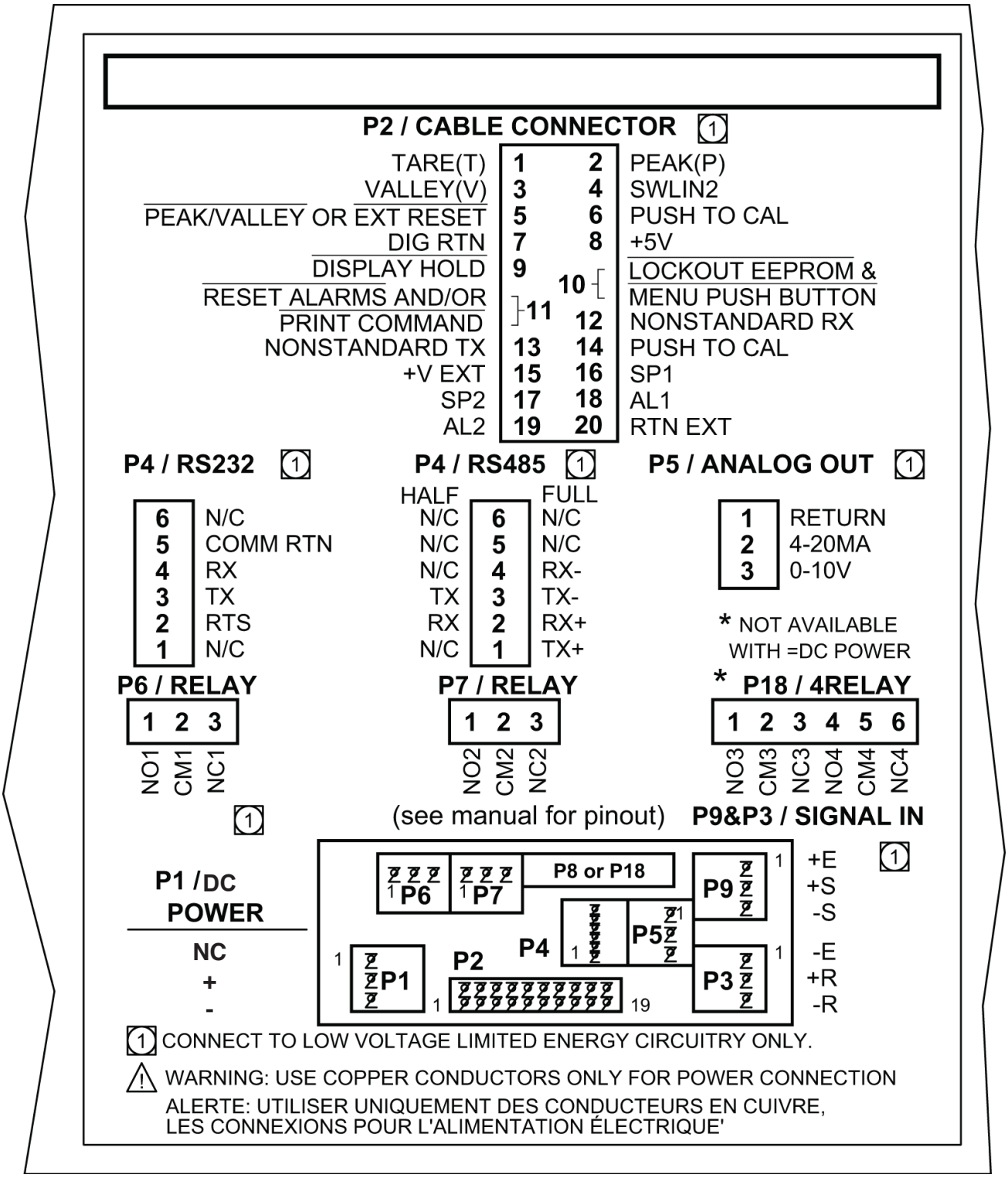



**Figure 4-2B. DC Power - Connector Label for Rear Connectors**

# 4 Parts of the Meter

Figure 4-3 shows the rear of the meter with the optional 4-relay output board and a serial communications board installed.

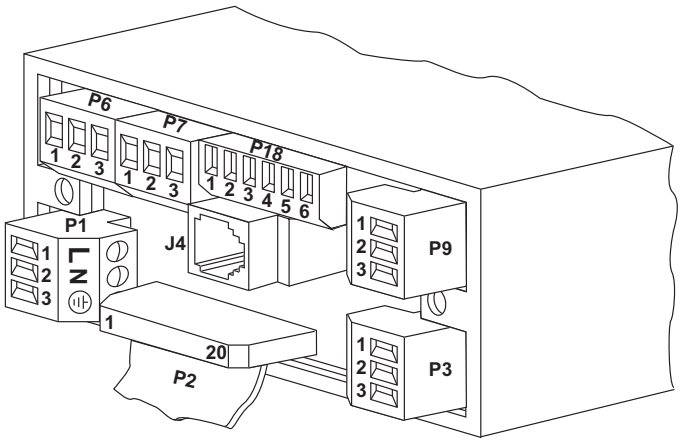



**Figure 4-3. Rear View**

| CONNECTOR # | DESCRIPTION |
|---|---|
| P1 | AC Power Connector |
| P2 | External I/O Connector |
| P3 | Input Connector, –E, +R, –R |
| J4 | Optional RS-232 or RS-485 Phone Jack Connector |
| P5 | Optional Analog Out Connector |
| P6 | Optional Form-C Relay #1 Connector |
| P7 | Optional Form-C Relay #2 Connector |
| P8 | Optional BCD Connector |
| P9 | Input Connector, +E, +S, –S |
| P18 | Optional Form-C Relay #3 and #4 Connector |

**TABLE 4-1 Rear Connector Descriptions**

## 5.1 CONDITIONS REQUIRING DISASSEMBLY

You may need to remove the sleeve or open the meter for several reasons:

1. To inspect the rating label on the case (not the same label as on the sleeve) (Section 5.2.1).
2. To check or change the 115 V ac or 230 V ac or main board jumpers (Sections 5.2.2 and 5.2.4).
3. To install optional output board(s) (Section 5.2.3).
4. To mount the meter in a panel (Section 5.2.5).

## 5.2 ASSEMBLY/DISASSEMBLY OPENING

### OPENING THE METER

Your meter is fully assembled, but not wired. See Section 7 for wiring connection for power and sensor inputs. In most cases, if you have ordered optional boards with the meter, these boards will already be installed.

You will need to remove only the rear cover to complete wiring, but you will have to open the meter to do one or more of the following:

**WARNING!:** You must disconnect and turn-off the power and connector signals before accessing the unit and installing optional boards. Failure to do so may result in injury!

a. Check or reconfigure the Transformer Jumpers on the Main Board so that they correspond to your line voltage (W1 and W2 for 115 V ac, or W3 for 230 V ac). See Section 5.2.2.

b. Install optional boards. See Section 5.2.3.

c. Access jumpers on the Main and optional boards. See Section 5.2.4.

**WARNING!:** Class 1 and Class 2 field installed wires should be segregated with at list 6 mm spacing, failure to do so may result in injury or damaged equipment

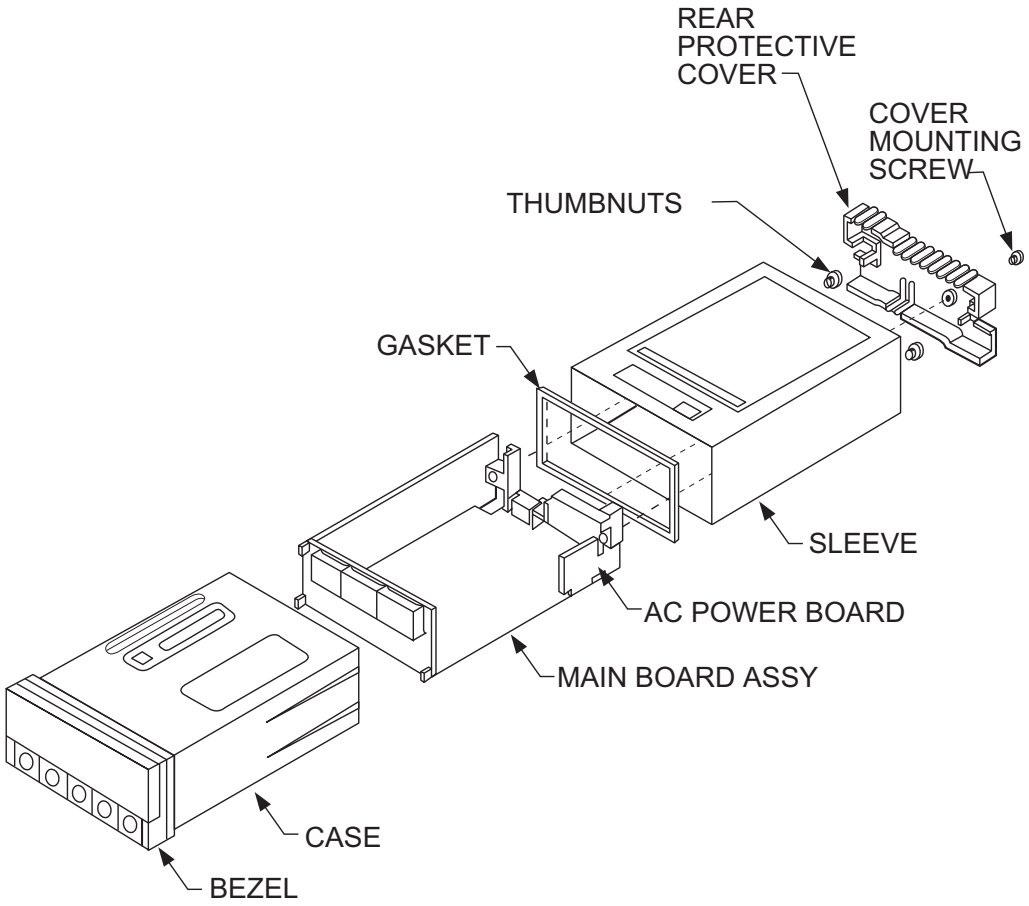



**Figure 5-1. Meter Exploded View**

Using Figures 5-1 as a guide, follow these simple instructions to open the meter:

**IMPORTANT:** Turn-off the power and input signals from the unit before proceeding. Failure to do so may result in injury!

1. Remove the cover mounting screw that secures the rear protective cover to the meter, and remove the Rear Protective Cover.

   If you are simply wiring the meter–but not checking jumpers or installing or removing boards–this is as far as the meter needs to be disassembled. Go to Section 5.2.1.

2. Remove all wiring connectors from the rear of the meter.
3. Remove the two thumbnuts that secure the case to the sleeve.
4. Remove the sleeve completely by sliding it back from the front bezel.

5. Using Figure 5-2 as a guide, bend the side-panel detents on the case outward and pull the board assembly out of the case by the mounting screw stem.

Note ☞

**NOTE:** From this point forward, these 5 steps are referred to as “Reveal the main board”.

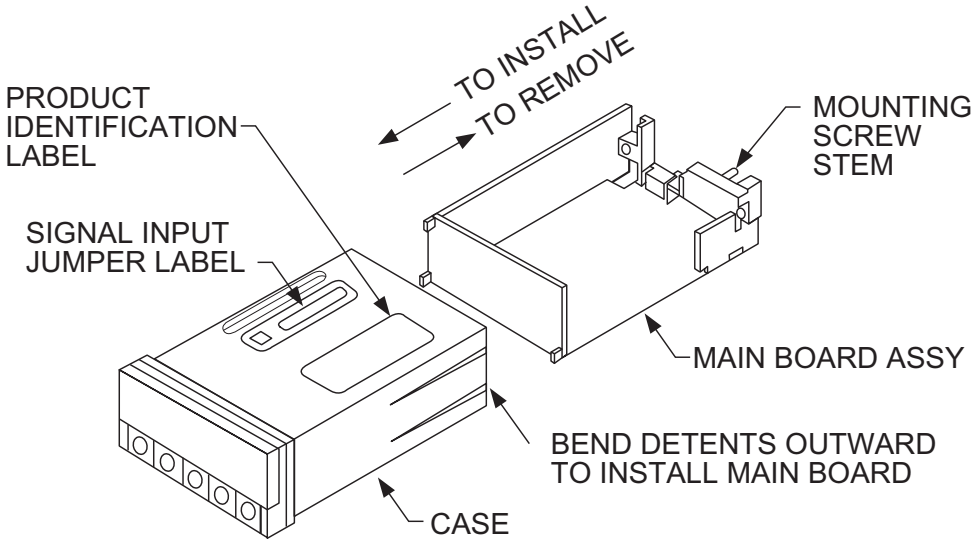



**Figure 5-2. Board Assembly Removing/Installing Detail**

The meter is now disassembled to the point where you can check and configure jumpers and install boards.

## REINSERTING THE MAIN BOARD ASSEMBLY INTO THE CASE

Reinsert the Main Board into the case once jumpers and optional boards have been configured and installed.

Spread the side-panel detents of the case, and carefully slide the main board all the way in.

### 5.2.1 Safety Precaution/Product ID Label

To look at the Rating/Product ID label on the case, you must follow the first step as described in Section 5-2. Refer to Figure 5-2 for the location of the Product Identification label.

The meter is protected in accordance with Class I of EN61010. Refer to Safety Considerations page.

**WARNING:** If your meter is to be wired to sensors to control inputs that could be hazardous potentials, these potentials will be carried to the 20-pin output connector (P2) at the rear. They will also be present on the meter's circuit boards. Follow all instructions carefully BEFORE connecting the meter to any source of power.

DO NOT contact any exposed metal parts, install optional board(s), change jumpers, or in any way disassemble or assemble the meter while it is connected to AC voltage.

Note the following information and guidelines for safe operation of your meter:

### Power Voltage

Your power source voltage rating should agree with the voltage under which the meter has been configured to operate. The first thing you should do is verify this.

The meter's operating voltage is shown in the VOLTS: entry of the Product Identification and Serial Number Label. It is located on the case, as shown in Figure 5-2, and is clearly visible on the meter packing box.

**EXTERNAL FUSE WIRED**

115 Vac IEC127-2/III, 125mA, 250V (Time-Lag)
or UL Slow-Blow, 125mA, 250V
230 Vac IEC127-2/III, 63mA, 250V (Time-Lag)
or UL Slow-Blow, 63mA, 250V

Power wires should be at list 18 AWG

External power switch or circuit breaker that is UL Listed must be used!

### 5.2.2 Main Board Power Jumpers

To check voltage jumpers or to change from 115 V ac to 230 V ac:

**CAUTION:** The meter has no power-on switch; it will be in operation as soon as you apply power. To change the factory preset jumpers, disconnect the power from the unit. Failure to do so may result in injury! The jumpers must be changed by specifically trained personnel.

1. "Reveal the Main Board" (refer to Section 5.2, Disassembly).
2. Locate the main board assembly and position it in front of you the same way as shown in Figure 5-3.
3. On the main board, locate the transformer jumpers W1, W2, and W3 near the transformer T1.
   If your power requirement is 115 V ac, jumpers W1 and W2 should be installed. (DO NOT INSTALL W3)

   If your power requirement is 230 V ac, jumper W3 should be installed. (DO NOT INSTALL W1 OR W2)

If product is 115 V ac, jumpers W1 and W2 are installed.
If product is 230 V ac, jumper W3 is installed
If somehow the jumpers are wrongly installed the product should be return back to factory.

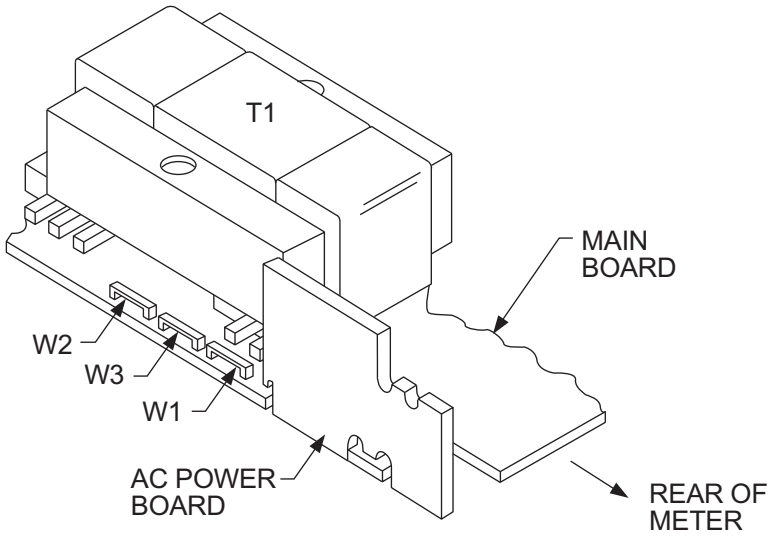



**Figure 5-3. Transformer Jumpers**

# 5 Setup

## FEATURES OVERVIEW:

The 4 Relay Output Board provides four isolated Form-C electro-mechanical relays that enable setpoint-triggered switching to an external device. Each relay can accommodate a single setpoint. 200 W, 2500pf snubbers are provided for each normally open contact.

## BOARD INSTALLATION:

To install optional Relay Output printed circuit board:

1. Refer to “Reveal the Main Board” in Main Operator’s Manual **Section 5.2**, Disassembly.
2. Using figure below as a reference, insert relay option board(s) into J10 connector on the main board.

---

**WARNING**: To avoid electrical shock be sure to disconnect the unit from its power supply. After you have opened the meter you are ready to install option card.

---

**To install:**

1. Hold relay board with components facing the main board.
2. Position the P10 connector to mate with the J10 connector on the main board (at rear of unit).
3. Push the board downward, guiding relay board edges through the rear panel guides until it rests on the upper rear panel and the main board.

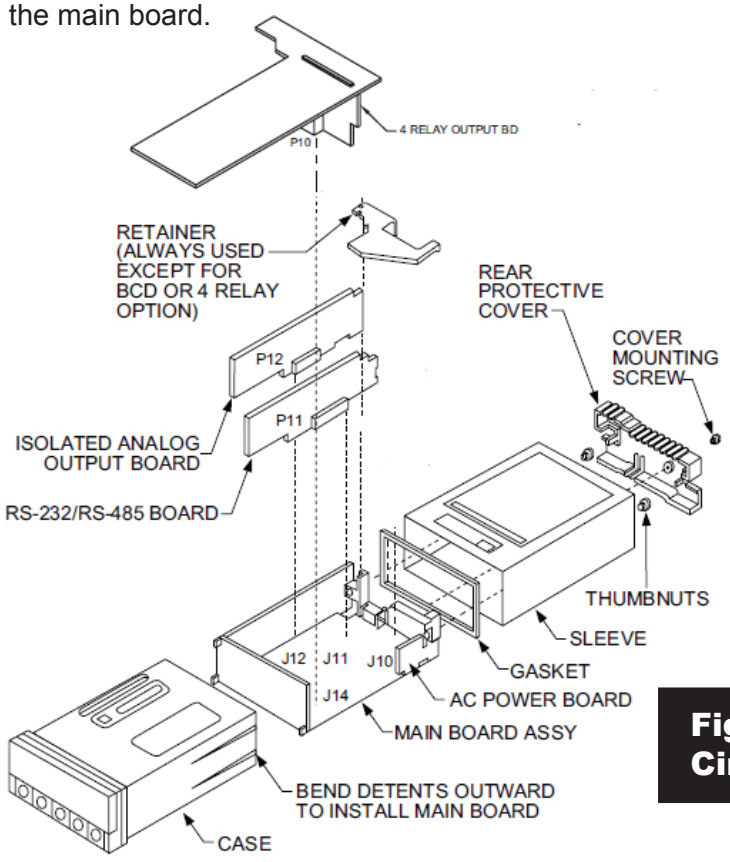



**Figure 5-4. Circuit Board Locations**

### 5.2.4 How to Access Jumpers

To gain access to jumper S1 and S2 used to configure input type remove the mounting sleeve. The jumpers may be accessed through the slot in the case.

To gain access to jumpers on the main board for power, excitation and lockout selection:

1. “Reveal the main board” (refer to Section 5.2, Disassembly).

Note ☞

**NOTE:** To access the S1 and S2 jumpers on the Signal Input Board, you only need to remove the mounting sleeve.

2. To re-assemble the meter, follow the steps in reverse order.

Figures 5-5 through 5-13 show the layout of the seven (7) printed circuit boards with respective jumper blocks, where applicable, used in the meter. Figures 5-7 through 5-13 show the optional boards.

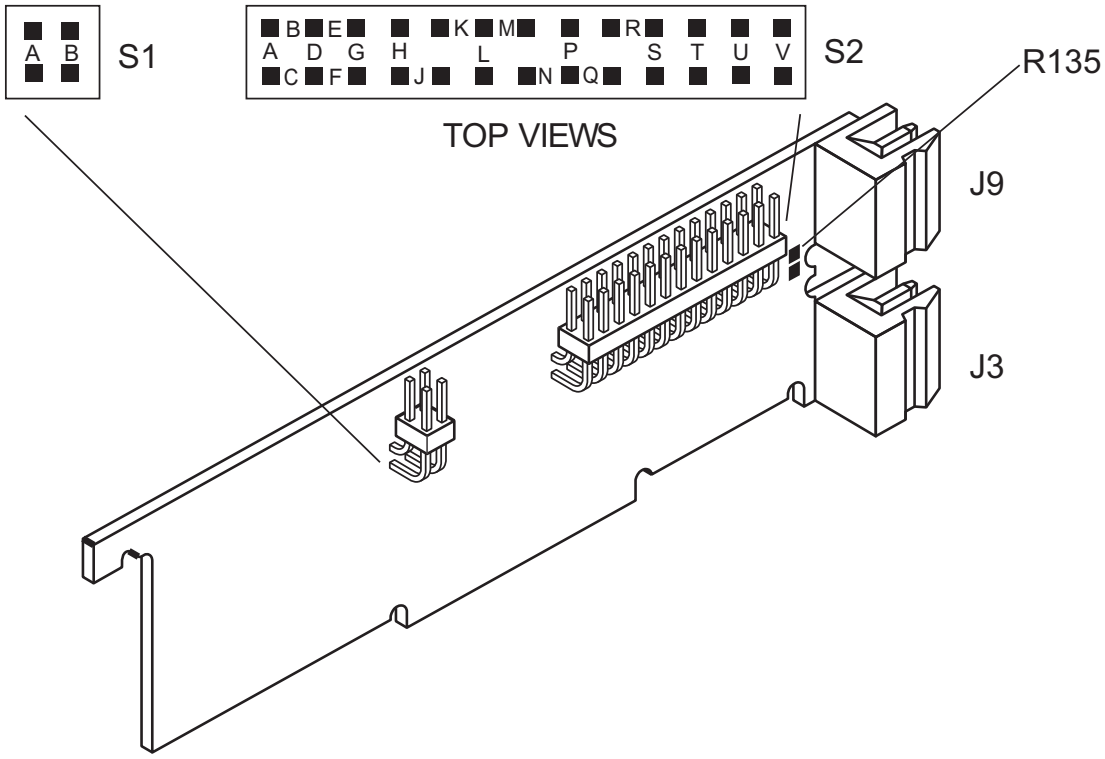



**Figure 5-5. Signal Input Board**

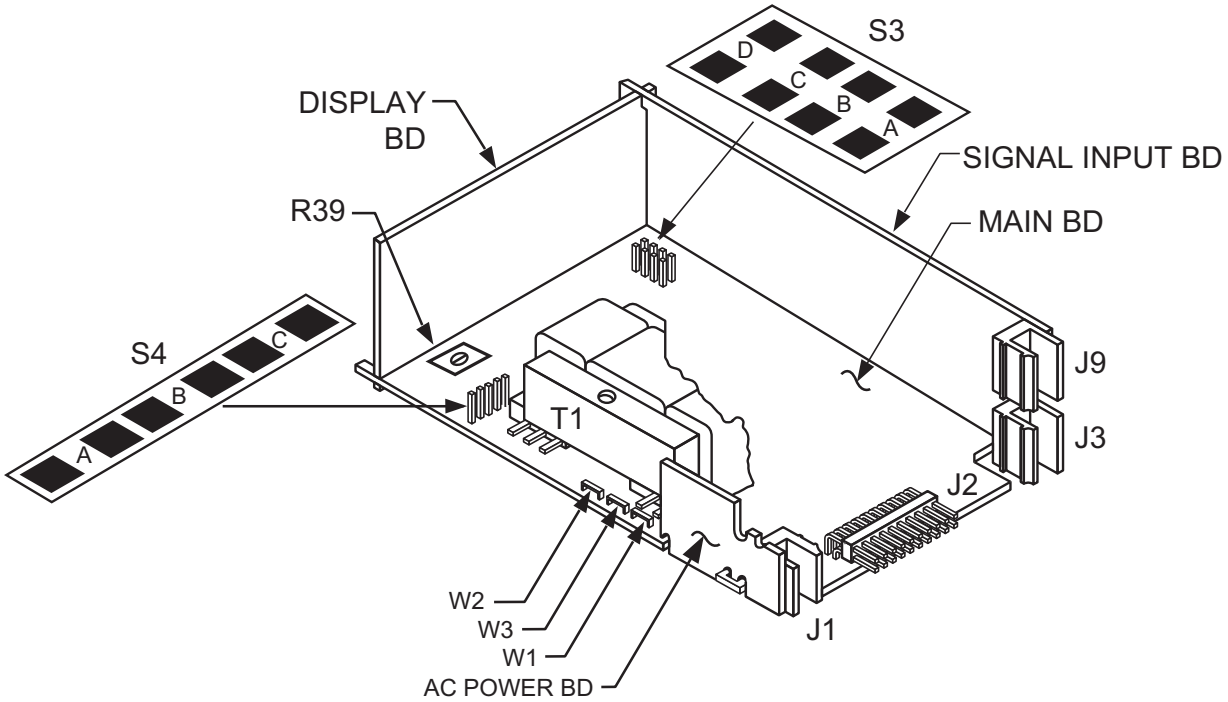



**Figure 5-6. ac-Powered Main Board**

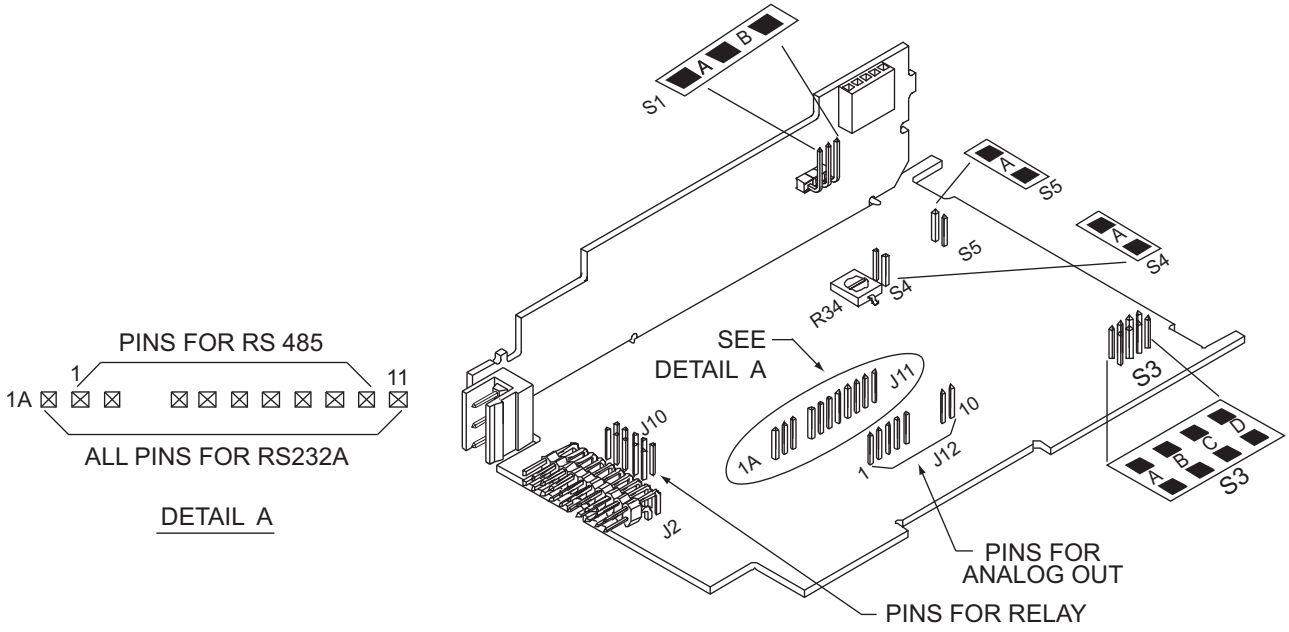



**Figure 5-7. dc-Powered Main Board**

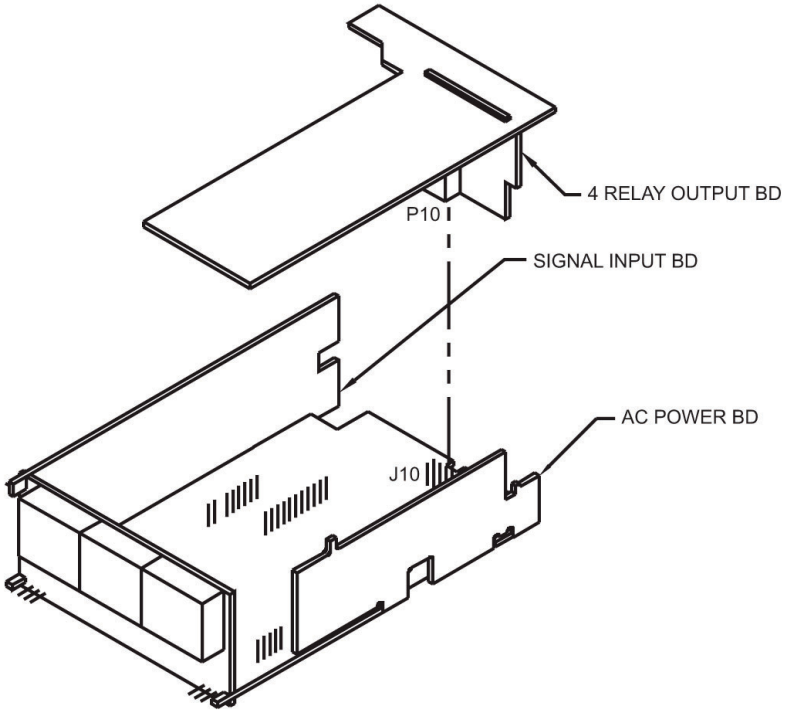
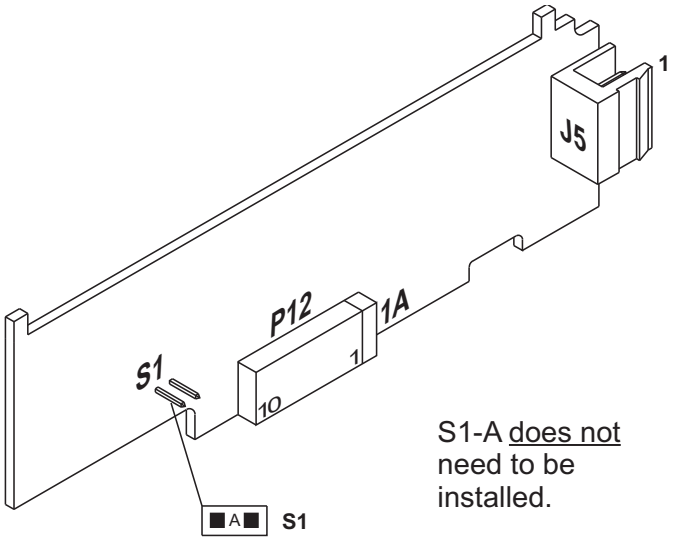



**Figure 5-9. Option Board Installation**

Note ☞

**NOTE:** 4 Relay Output Board can be installed at J10. However, only one option board can be installed at a time.



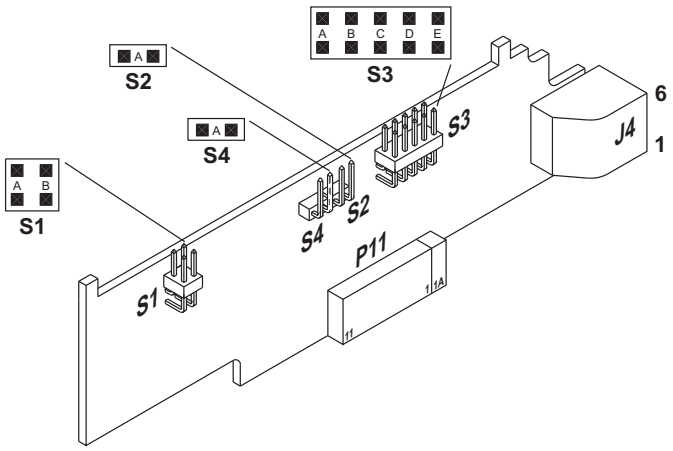

S1-A does not need to be installed.

The Analog option board has been updated. The figure shown is the latest version.

Some older versions of the analog output cards are not compatible with dc-powered meters.

Check the J12 connector on the main board to ensure it has a 10 position connector.

**Figure 5-10. Analog Output Option Board**

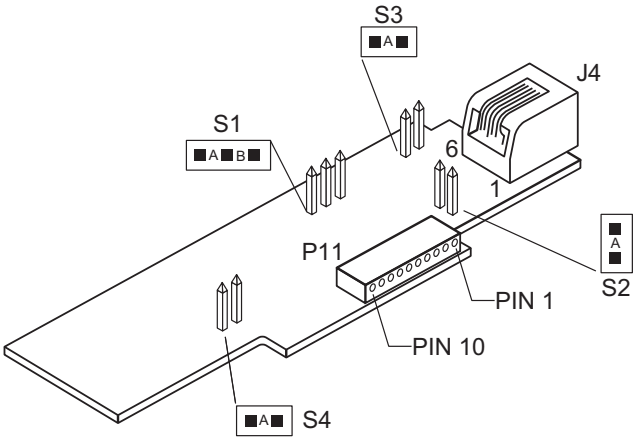



The RS-232 option board has been updated. The figure shown is the latest version.

Some older versions of the RS-232 cards are not compatible with dc-powered meters.

Check the J11 connector on the main board to ensure it has a 12 position connector.

**Figure 5-11. RS-232 Option Board**




The RS-485 option board has been updated. The figure shown is an older version, the newer version is the same figure as the RS-232 option card shown above.

**Figure 5-12. RS-485 Option Board**

### 5.2.5 PANEL-MOUNT ASSEMBLY

The meter can be mounted in a panel so that the front of the meter is flush with the vertical panel surface. Panel mounting can be seen as simply “sandwiching” the panel between the inner case and the outer sleeve in the last phases of assembly. **Figure 5-14** shows the panel cutout dimensions, and the dimensions for the panel thickness. It requires that the following already be done:

1. Your line voltage rating has been checked against the meter rating on the Product ID and serial number label on the meter case. See Section 5.2.1.
2. You have configured all jumpers–those on the main board as well as those on any optional boards. See Section 5.2.2 for main board jumper configuration and the appropriate sections for optional board jumper configuration.
3. You have installed all optional boards and inserted the main board assembly back into the case. See Section 5.2.3.
4. You have wired P1, the AC power connector, and P2 the input output control connector; connectors are not installed in the meter, but are ready to be installed. See Section 7.
5. You have wired all connectors for optional boards; connectors are not connected to the meter, but are ready to be installed.

If all of these steps are done, use **Figure 5-14** as a guide:

**CAUTION:** Connectors with the wiring connections will be installed after mounting the unit.

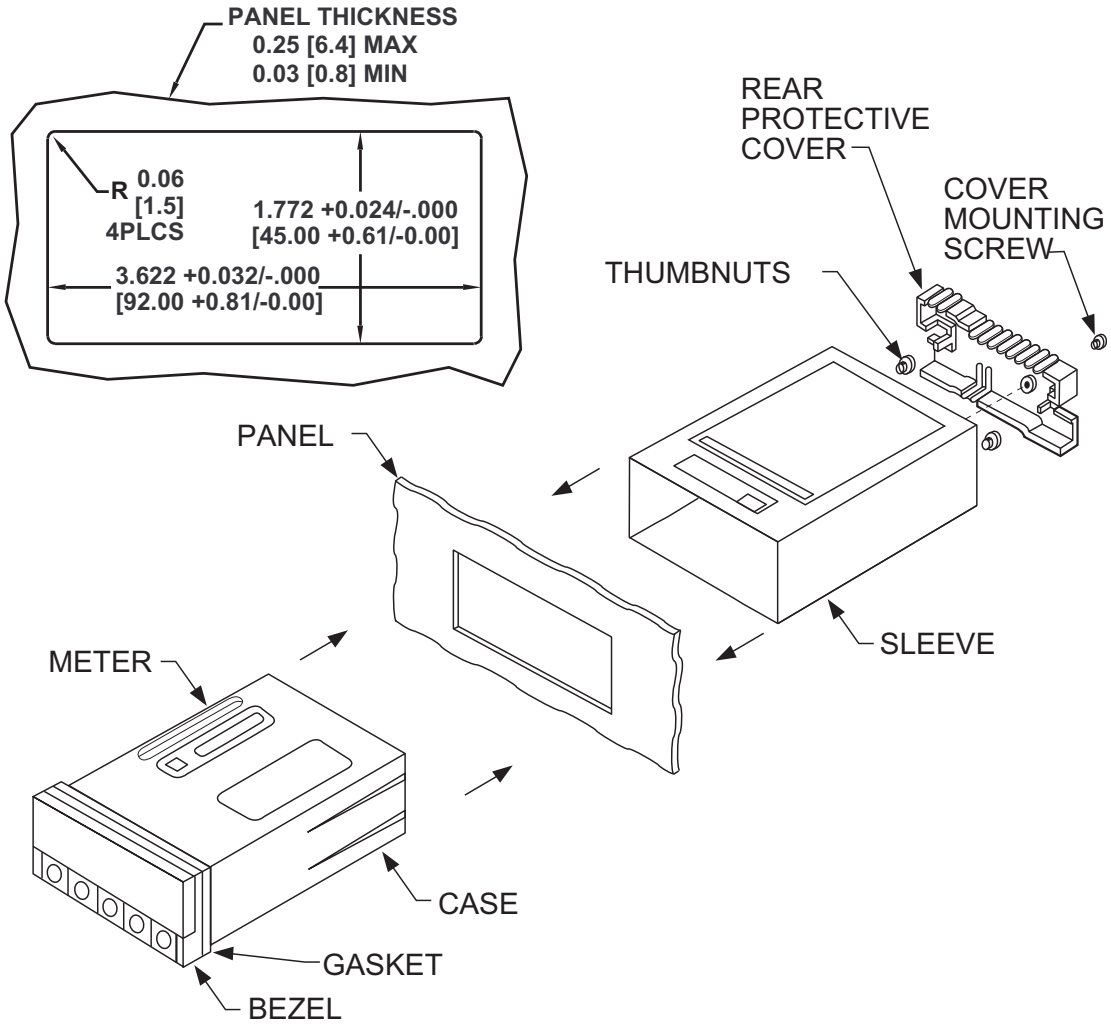



**Figure 5-14. Panel Mounting Assembly**

6. Punch or cut a hole in the panel using the panel cutout dimensions in **Figure 5-14**. Remove burrs and paint the panel as required.
7. Insert the panel-mount gasket around the rear of the case and slide it forward to the bezel (if it's not already in place).
8. Working from the front of the panel, insert the case assembly, rear end first, all the way into the panel cutout such that the gasket firmly backs the panel surface.
9. Working from the rear of the panel, slide the sleeve forward over the case and up to the panel surface.

The panel should now be sandwiched between the bezel-backed gasket in front and the sleeve in back.

10. Replace the thumbnuts that secure the sleeve tabs to the case.

**WARNING:** Do not “turn-on” the ac power and input signals until all connections are connected to the meter.

11. Set P1, the AC power connector, aside and connect or reconnect all other connectors to the back of the meter using Figures 4-3 and 4-4 in Section 4.2 as guides.

    Connect P1 last.

Note ☞

**NOTE:** The P1 connector is “keyed”; it is shaped in such a way that it fits only the J1 male pins.

12. Replace the rear protective cover and secure it with the cover mounting screw.

**Your meter is now ready for operation and you can turn-on the power.**

The meter display should light, and pass through “RESET 2” to run or display mode. If the meter flashes an overscale or overload message, press the **‘MENU’** button to advance to the configuration mode. Do not be concerned about overloads (the +S input can stand 120 V continuously and current inputs can handle ten times rated current).

# 6 Jumper Positions

## 6.1 INTRODUCTION

This section is for the configuration and setup of your jumper positions for readrate, unipolar or bipolar signal input, sensor input signal jumpers, sensor excitation jumpers, pushbutton lockouts and lockout of lockout configuration menus.

## 6.2 S1 JUMPER POSITIONS FOR READRATE AND UNIPOLAR OR BIPOLAR INPUT(S)

The typical readrate for your meter is 3/per second. This requires that no jumper has been installed in the S1A position and Input Configuration ("IN CNF") bit "INP.2" has been set to equal "0". Your meter is capable of a fast readrate of 13/per second. This requires that you install a jumper in the S1A position and the Input Configuration ("IN CNF") bit "INP.2" has been set to equal "1". Refer to Figure 6-1 for the location of the S1 jumpers.

The typical setting for your meter is unipolar. For unipolar input, no jumper is installed in the S1B position and Input Configuration ("IN CNF") bit "INP.3" must be set to equal "0". For bipolar inputs, install a jumper in S1B and set Input Configuration ("IN CNF") bit "INP.3" to equal "1".

## 6.3 S2 JUMPER POSITIONS FOR INPUT RANGES

The following are the input signal jumper positions required to be installed in the "S2" position on your meter for the CURRENT or VOLTAGE input ranges you require. These jumper positions include those that are required for sensor excitation. Jumpers S2-N & S2-T are for either 1.5 to 11 Vdc or 24 Vdc sensor excitation. To select desired excitation see Section 6.4. Refer to Figure 6-1 for the location of the S2 jumpers.

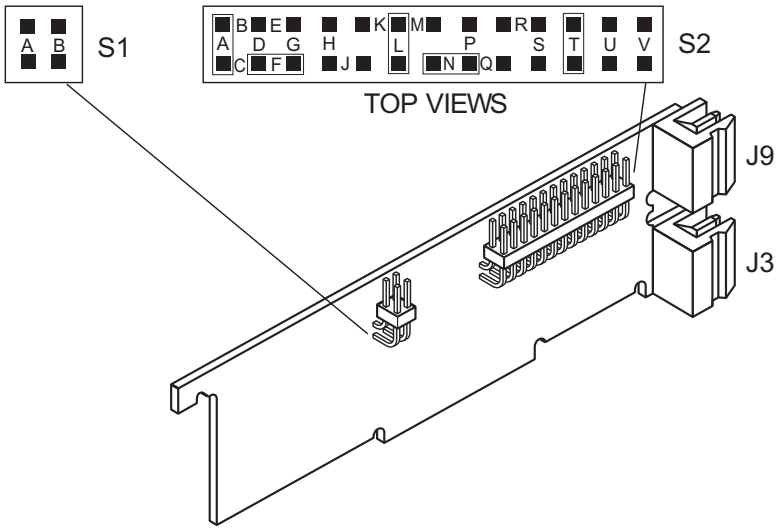
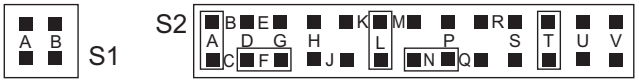


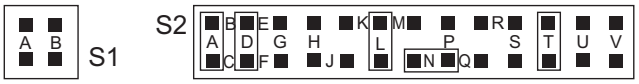

**Figure 6-1. S1 and S2 Jumper Locations on Signal Input Board**

## BRIDGE - UNIPOLAR

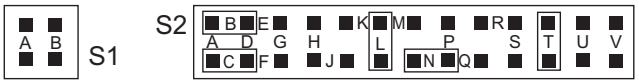
Jumpers for 0 to 100 mV range: (meter supplied excitation)



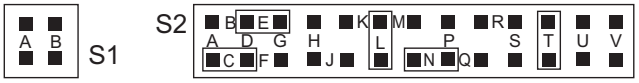

Jumpers for 0 to 1 V range: (meter supplied excitation)




Jumpers for 0 to 10 V range: (meter supplied excitation)

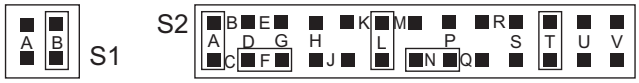



Jumpers for 0 to 100 V range: (meter supplied excitation)

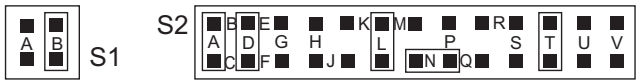



## BRIDGE - BIPOLAR

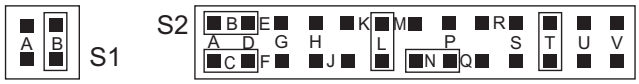
Jumpers for -50 to +50 mV range: (meter supplied excitation)



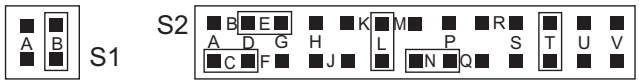

Jumpers for -500 to +500 mV range: (meter supplied excitation)




Jumpers for -5 to +5 V range: (meter supplied excitation)



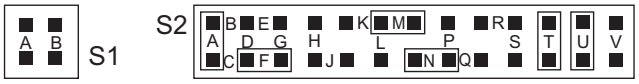

Jumpers for -50 to +50 V range: (meter supplied excitation)




Voltage (Non-Ratiometric) - Unipolar/Bipolar similiar to Bridge inputs above except substitute jumper M for L.

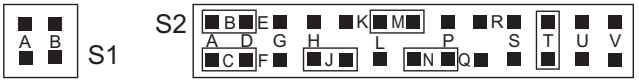
## CURRENT

Jumpers for 0-20 mA or 4-20 mA: (meter supplied excitation)




## POTENTIOMETER

Jumpers for 0 to 10 V range: (using 10 Vdc drive)

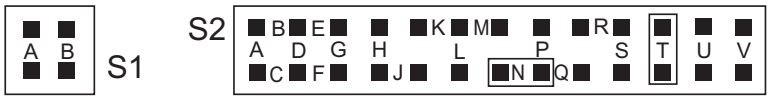



**NOTE**: Remove S2T jumper when you use external sensor excitation.

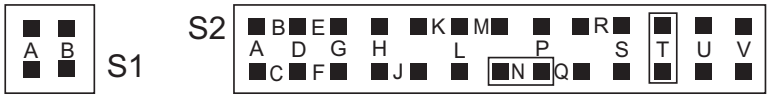
# 6 Jumper Positions

## 6.4 JUMPER SETTING(S) FOR SENSOR EXCITATION

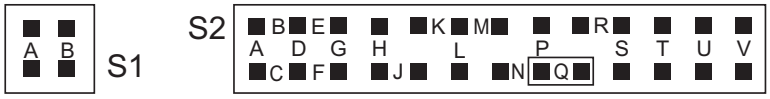
24 Vdc meter excitation (S2N, S2T, & S4B)



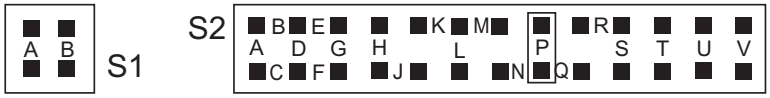

10 Vdc meter excitation (S2N, S2T, & S4A, S4C)



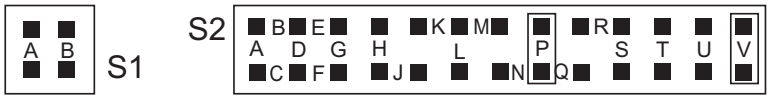

1.25 Vdc meter excitation (S2Q)




160 µA meter excitation (S2P)




1.6 mA meter excitation (S2P, S2V)




**Note ☞**

1). Maximum excitation for “Ratiometric” measurement is 10Vdc.

2). Remove S2T jumper when you use external sensor excitation.

### 6.4.1 JUMPER SETTING(S) FOR SENSOR EXCITATION- ac Powered Unit

Your ac-powered meter is capable of supplying either 1.5 to 11Vdc or 24 Vdc sensor excitation. (refer to Figure 6-2.).

- For 1.5 to 11Vdc excitation, install S4A and C jumpers, then adjust the potentiometer (R39) for proper voltage.

- For 24Vdc excitation, remove S4A and C jumpers and install S4B.

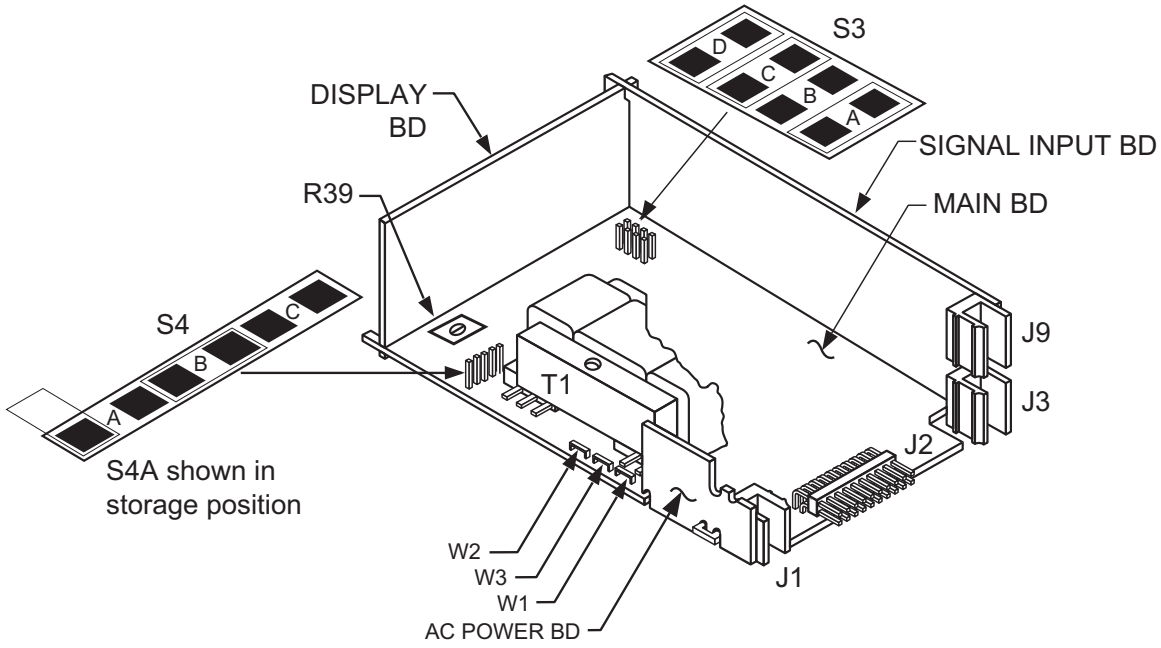



**Figure 6-2. ac-Powered Main Board Jumper Positions S3 and S4**

| | | |
|---|---|---|
| **S4 On ac-powered units, main board** | | |
| S4B | Installed | For 24 Vdc excitation. (S4A located in storage position). |
| S4A ,S4C | Installed | For 1.5 to 10 Vdc excitation. |
| **S3 On ac-powered units, main board** | | |
| S3A | Installed | Unlocks "**MENU**" button for programming. |
| S3B | Omit | See note below. |
| S3C | Installed | Unlocks lockout menu (L1 through L4). |
| S3D | Installed | Unlocks Front pushbuttons. |

Note ☞

**NOTE:** S3B should **NOT** be installed. This jumper is only used when recalibrating the meter (e.g. an annual, careful performance by the calibration lab). When this jumper is installed, calibration coefficients can be changed via digital communications.

# 6 Jumper Positions

### 6.4.2 JUMPER SETTING(S) FOR SENSOR EXCITATION - dc Powered Unit

Your dc-powered meter is capable of supplying either 1.25 to 12Vdc or 24 Vdc sensor excitation. (refer to Figure 6-3).

- For 1.25 to 12Vdc excitation, install S1A and S4A jumpers, then adjust the potentiometer (R34) for proper voltage.
- For 24Vdc excitation, remove S4A jumpers and install S1B.

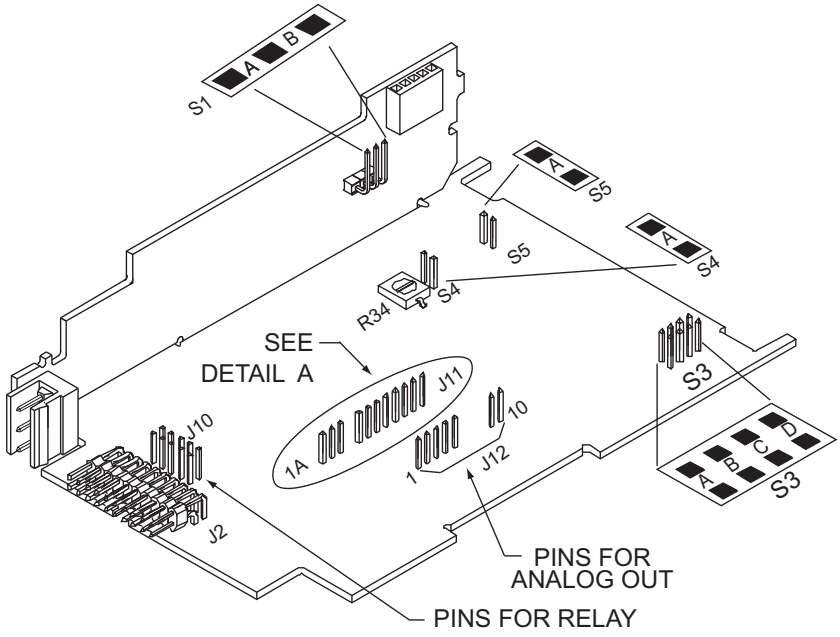



**Figure 6-3. dc-Powered Main Board Jumper Positions S3 and S4**

| | | |
|---|---|---|
| **S1 On dc-powered unit, side power board** | | |
| S1A | Installed | For 1.25 to 12 Vdc excitation at 120 mA. |
| S1B | Installed | For 24 Vdc excitation at 35 mA. |
| **S3, S4, S5 On dc-powered unit, main board** | | |
| S3A | Installed | To store data and setup parameters in nonvolatile memory. |
| S3B | Omit | See note in previous Section 6.4.1. |
| S3C | Installed | Unlocks lockout menu (L1 through L4). |
| S3D | Installed | Unlocks Front pushbuttons. |
| S4A | Installed | Along with the S1 jumper to program the excitation output. Adjust excitation with R34 surface mount pot from 1.25 to 12 volts, with an output current up to 120mA. |
| S4A | Removed | For 24 Vdc excitation. (S4A located in storage position). |
| S5A | Installed | To enable the RESET front panel pushbutton. |
| S5A | Removed | To secure against unauthorized meter reset. |

# Signal and Power Input Connections

## 7.1 INTRODUCTION

The following describes how to connect your sensors to your meter with and without sensor excitation and how to connect the AC power to your meter. Prior to wiring the sensor to the meter, check with a multimeter that a proper excitation exists.

**WARNING:** Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury! This device must only be installed electrically by specially trained electrician with corresponding qualifications.

## 7.2 SIGNAL INPUT CONNECTIONS

The following figures (7-1 through 7-5) show the connections for voltage, current and potentiometer inputs:

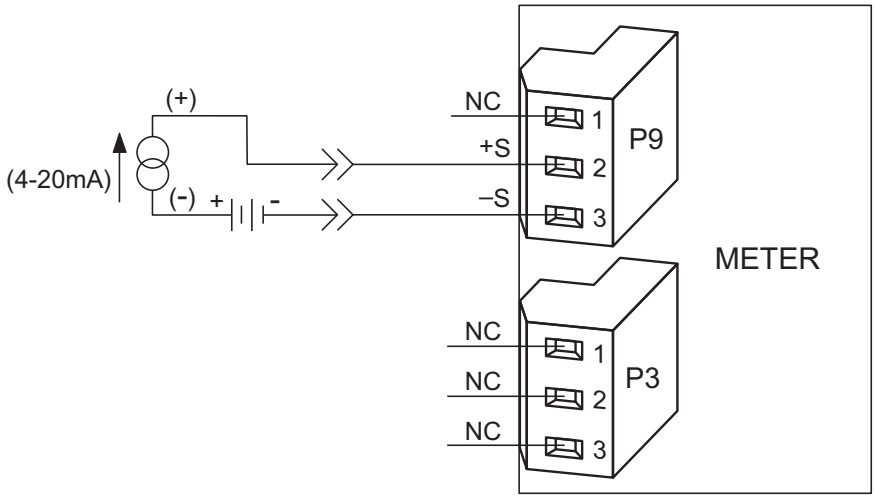



**Figure 7-1. Current Input Without Sensor Excitation**

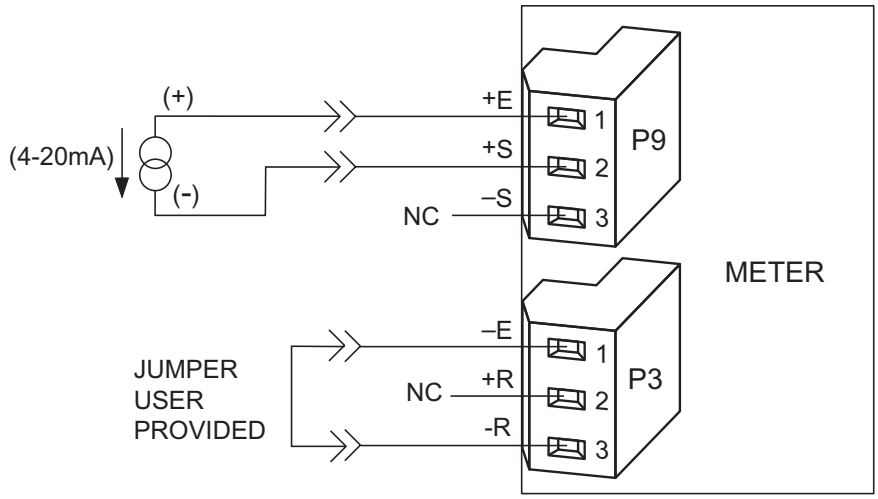



**Figure 7-2. Current Input With Sensor Excitation**

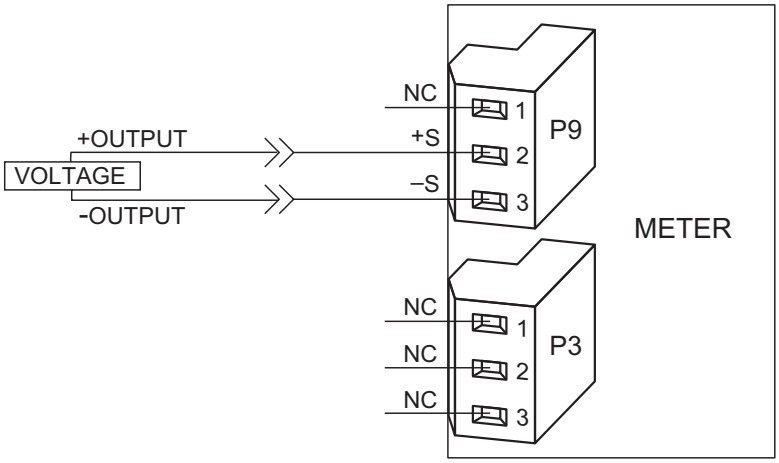



**Figure 7-3. Voltage Input Without Sensor Excitation**

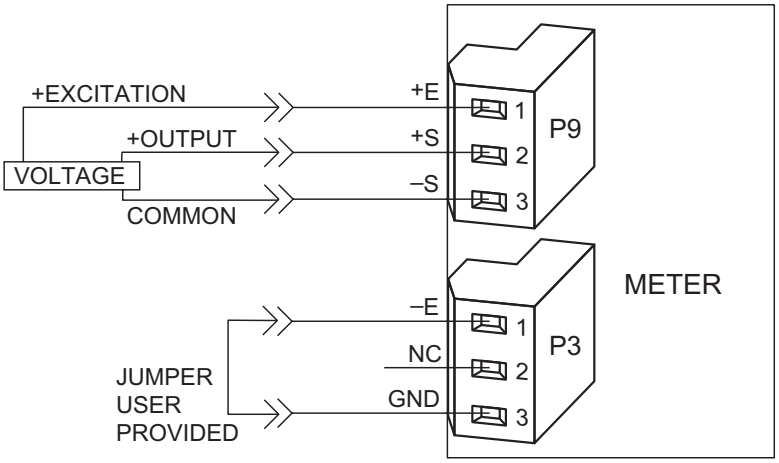



**Figure 7-4. 3-Wire Voltage Input With Sensor Excitation**

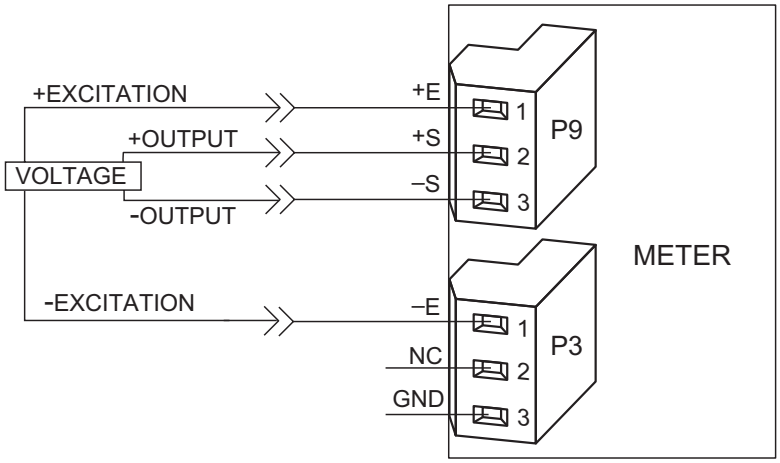



**Figure 7-5 4-Wire Voltage/Bridge Input With Sensor Excitation**

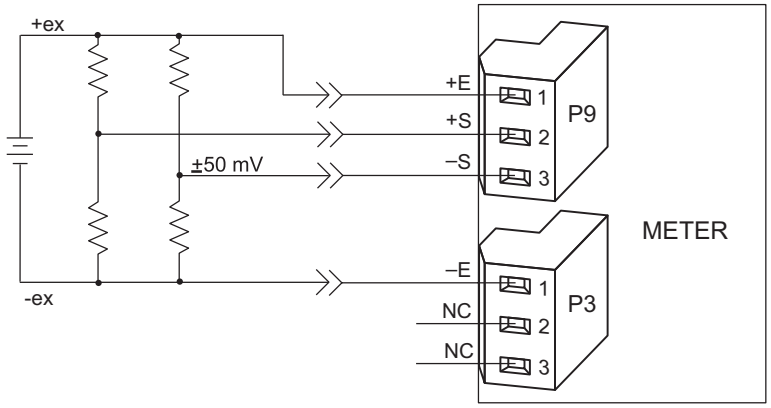



**Figure 7-6 Bridge Input with External Sensor Excitation**

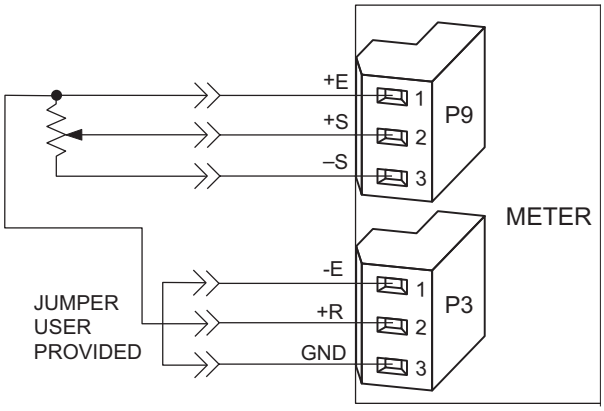



**Figure 7.7**
**Potentiometer Connections with Internal Power Supply & Ratio Measurement.**

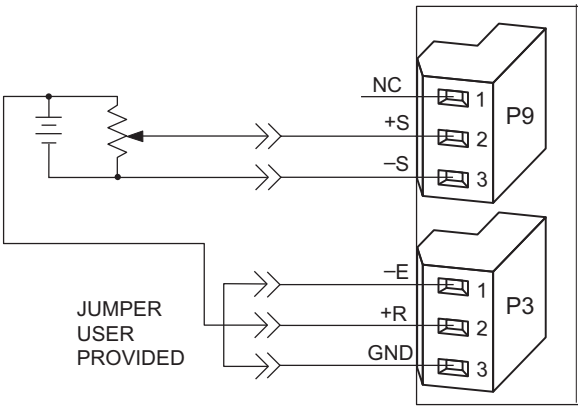



**Figure 7.8**

**Potentiometer Connections with External Power Supply & Ratio Measurement (Remove jumper S2-T)**

## 7.3 CONNECTING MAIN POWER

Wire your power through an external switch or circuit breaker that is UL Listed. Use at least 18 AWG or better. Wire your power (from a wall socket or other source) to P1, the orange,3-socket connector that plugs into the 3 pins on the left side as you view the meter from the rear. The orange (power) connector must be wired according to the following table (also refer to Figure 7-8):

| USA WIRING CODE | EUROPE WIRING CODE | CONNECTION | PIN # ON ORANGE CONNECTOR |
|---|---|---|---|
| Black | Brown | ~ AC Line (L) | 1 |
| White | Blue | ~ AC Neutral (N) | 2 |
| Green | Green/Yellow | ~ AC Protective Earth Ground ⏚ | 3 |

# 7 Signal and Power Input Connections

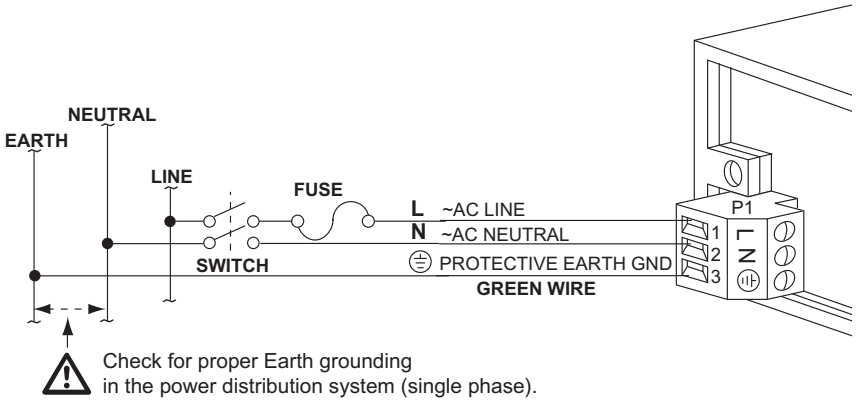



**Figure 7-9. AC Connector Wiring at P1**

Connect your AC meter power as described above.

**CAUTION:** As mentioned in Section 5.2.2, the meter has no power ON/OFF switch. The meter will be ON when power is applied. External power switch or circuit breaker that is UL Listed must be installed.

**WARNING:** Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury! This device must only be installed electrically by specially trained electrician with corresponding qualifications. The main power input to the unit as well as the AC input signal to be measured must agree with the wiring instruction. The meter is factory set to the power specified by the customer at the time of ordering. The voltage is printed on the Product ID Label.

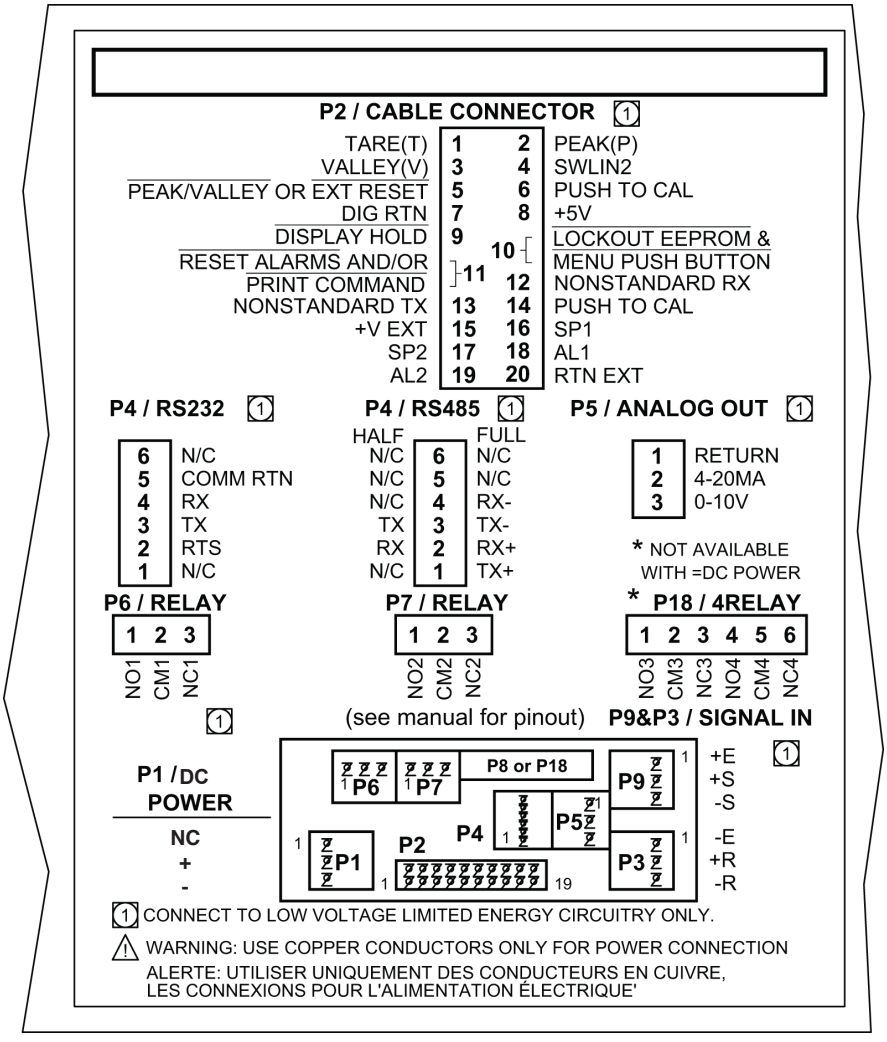



**Figure 4-2B. DC Power - Connector Label for Rear Connectors**

# 8. Methods for Scaling the Meter to Display in Engineering Units

## 8.1 INTRODUCTION

This section is for scaling the meter to read in desired engineering units. This meter is capable of producing any engineering units up to 6 digits regardless of decimal point. Even though this is a strain gauge input meter it is capable of working with high voltage, current and potentiometric inputs. The difference between strain gauge input and a voltage input is ratiometric versus non-ratiometric inputs. A strain gauge based sensor is ratiometric which means its output is directly proportional to the supply voltage powering it. Most millivolt sensors are ratiometric (strain gauge input)

The decimal point is completely programmable.

Performing the following steps will ensure that the meter is properly scaled.

1. Make sure that all jumpers are in their correct location(s). (Refer to Section 6)
2. Provide AC power to the instrument (Refer to Section 7.3)
3. Check with a multimeter that the proper sensor excitation exists.
4. Wire the sensor to the meter (Refer to Section 7.2)
5. Program the unit for the desired display with strain gauge inputs (Bridge inputs, refer to Section 8.2), Voltage inputs (Refer to Section 8.3), Current inputs (Refer to section 8.4), or Potentiometer inputs (Refer to Section 8.5).



## 8.2 STRAIN GAUGE (BRIDGE) INPUT, PROGRAMMING THE METER FOR A DESIRED DISPLAY

An easy way to program your unit is to follow the example and step by step procedure below and just modify it for your exact requirements.

EXAMPLE: An end user wants to scale the meter for a 200 PSI, 0-100 mV voltage output, pressure transducer. You want the meter to display in hundreds of a PSI from 0 to 200.0 PSI. The pressure sensor requires 10 Vdc excitation power.

The two most common methods of scaling, Method I scaling without simulating a known load, and Method II scaling by simulating known loads will be demonstrated. Sometimes end users simulate known voltages instead of known physical standards (pressures); this is covered in Method II. A third method is for a unique case where you are scaling with a known load and you want the display to have 3 or more decimal places. Method III is a little complicated and should only be used, if you are looking for really accurate results and you desire a display with 3 or more places to the right of the decimal point.

A. Set the correct jumpers on the meter. (Refer to Section 6).

Install jumpers S3A & S3C and S4A & S4C on the main board. Installing jumpers S4A and S4C will provide a factory set 10 Vdc. Adjusting R38 will vary the excitation. Use a multimeter while adjusting R38.

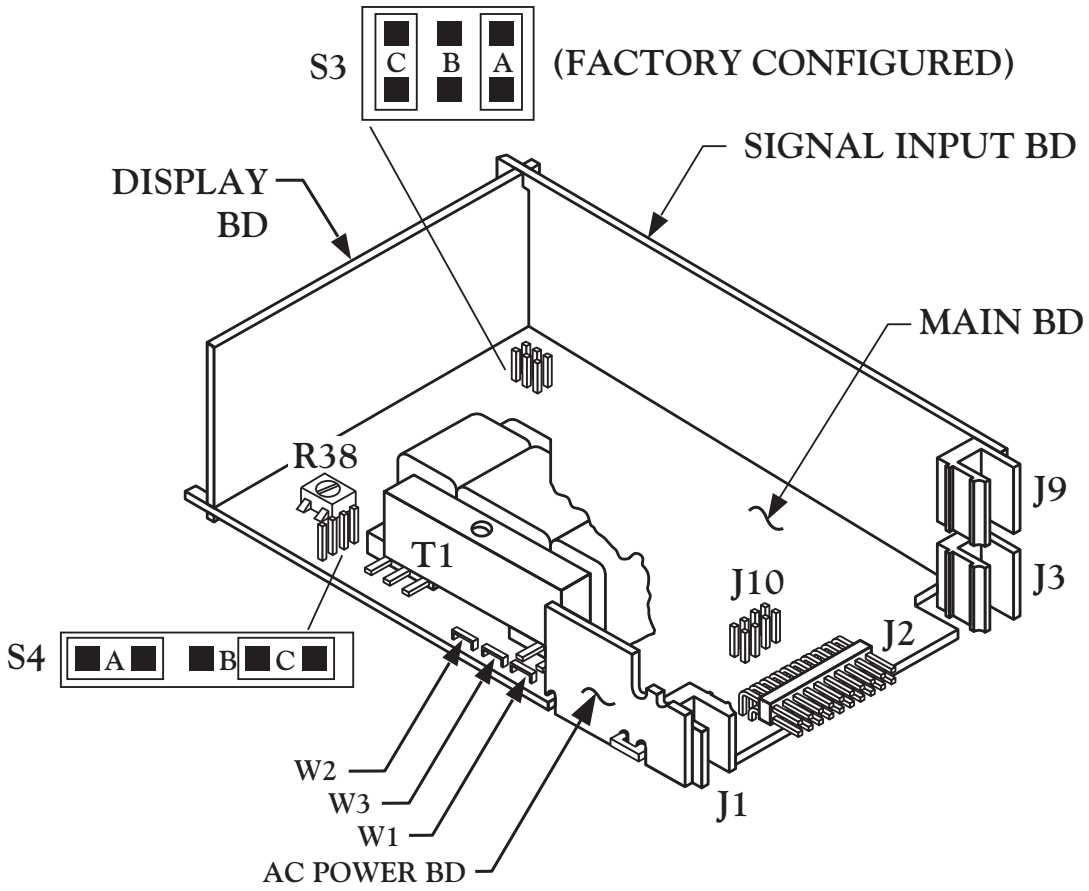



Figure 8-1. S3 and S4 Main Board Jumper Positions

Install jumpers on S1 and S2 as shown in Figure 8-2.

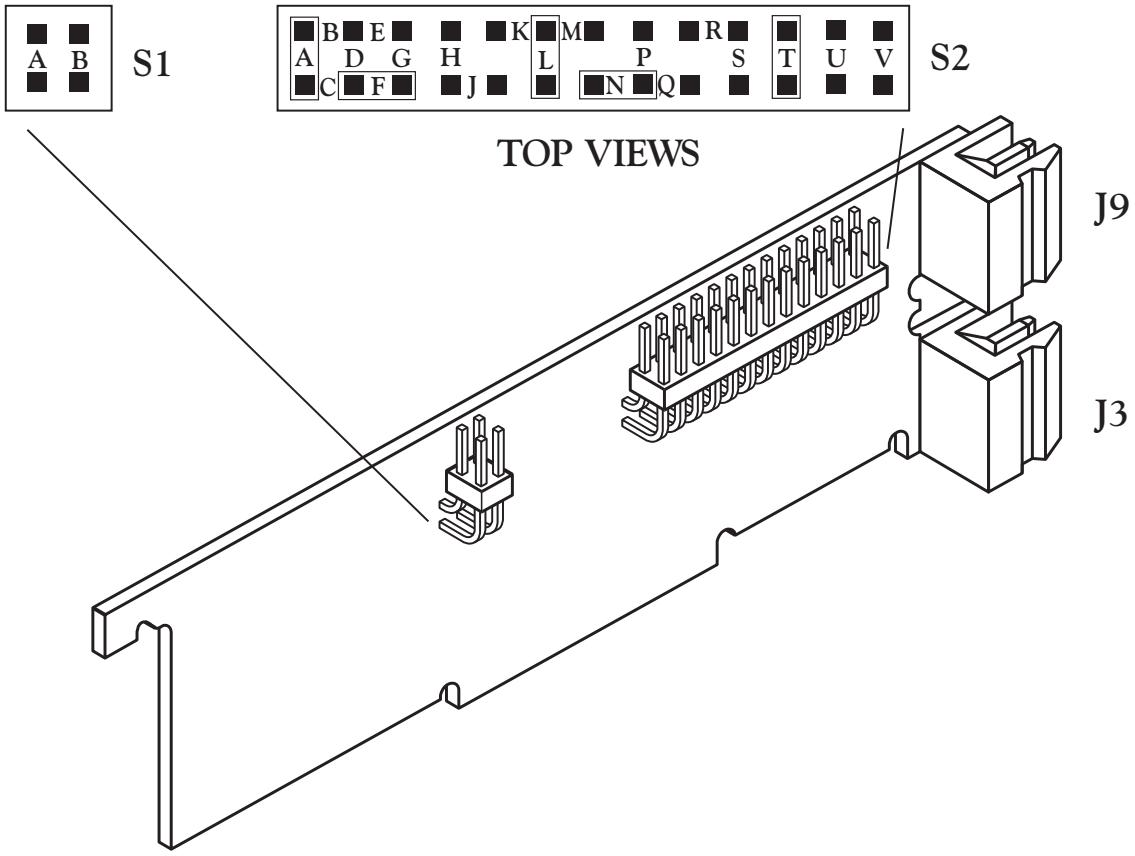



Figure 8-2. S1 and S2 Signal Input Jumper Positions

B. Wire the transducer as shown in Figure 8-3 (Refer to Section 7 for additional information).

Always check the meter's excitation prior to wiring your sensor to the meter.

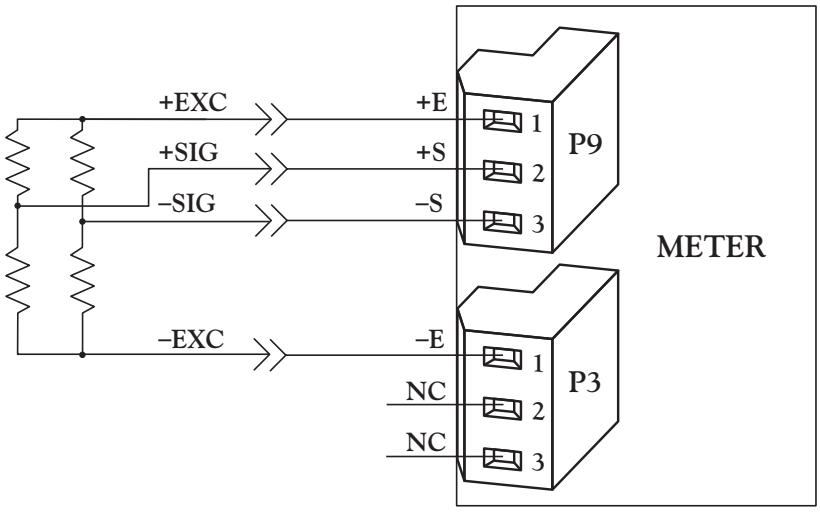



Figure 8-3. Internally-Powered Bridge Input

C. The unit comes with all lockout bytes set in the unlocked position("0"). Refer to Section 9.1 for information on lockout bytes.

If the unit has been programmed previously make sure that at least the following lockout bytes are unlocked. If they are Not unlocked you will not be able to scale the meter.

| MENU | SUBMENU |
|---|---|
| "L1CNF"<br>"L2CNF" | L1C.7=0, L1C.8=0<br>All sub menus must be unlocked "0" |

Scroll to the menu by pressing the 'MENU' button. Enter a submenu by pressing the 'MIN' button. select "0" or "1" by pressing the 'MAX' button. Always press the 'MENU' button when leaving a submenu to store the values you entered.

## METHOD I: SCALING WITHOUT SIMULATING A KNOWN LOAD.

**NOTE:** All of the following steps are accomplished by using the front panel buttons.

1. Scale the instrument by entering only 3 parameters.

The 3 parameters are "RDG SC" (Reading Scale), "RDG OF" (Reading Offset), and "DEC PT" (Decimal Point).
Calculate "RDG SC" using the following formula:

RDG SC= display span/((sensor's mV/Voutput) (natural gain))
RDG SC= 200/(10 x 10000) = 0.002
Where: display span= 200 – 0 = 200
Sensor's output = 100 mV/10V EXC =10 mV/V
Meter's natural gain= 10000 (Obtained from Table 8-1)

**TABLE 8-1**
**METER'S NATURAL GAIN CHART**

| MAX SENSOR OUTPUT (mV/V) | JUMPER RANGE @ 10 V EXC | METER'S NATURAL GAIN |
|---|---|---|
| 10 mV/V, ±5 mV/V | 100 mV, ±50 mV | 10000 |
| 100 mV/V, ±50 mV/V | 1 V, ±500 mV | 1000 |
| 1 V/V, ±0.5 V/V | 10 V, ±5 V | 100000 |
| 10 V/V, ±5 V/V | 100 V, ±50 V | 10000 |

Pressing the 'MENU' button will take you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select use the 'MIN' button to scroll to the next item of choice and again use the 'MAX' button to make your selection.

After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED" on the display. If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to go to submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button. Pressing the 'RESET' button one time brings you back one 'MENU' item, pressing it a second time returns you to the run mode.

*WARNING! this also results in a hard reset of peak and valley and your setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input. |
| RDG.CNF | RDG.1=0 | | Scaling y=mx+b |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs peak reset |
| RDG SC | 0.00200 | | See calculations above |
| RDG OF | 0000000 | | |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S1A jumper omitted) |
| | INP.3=0 | | Unipolar input (S1B jumper omitted) |
| | INP.4=0 | | Std, for BRIDGE inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=1 | | Ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFF.FF | | Sets decimal point |
| CNT BY | | | Press 'RESET' two times to return to the run mode |

2. Now you are in the run mode and the transducer is connected to the meter. Simulate no load on the transducer (just leave the pressure port open to atmosphere) and note the display reading. Assume the display shows "1.25". To make the display indicate zeros you must go to the menu "RDG OF" and enter the value "–001.25". After entering this value press the 'MENU' button to store it, and then press the 'RESET' button two times to return to the run mode. The scaling is now complete.

METHOD II: SCALING BY SIMULATING A KNOWN LOAD.

1. Prior to simulating a known load you must set up the unit as shown below.

The 'MENU' button will take you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select use the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection. After making all of your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED" on the display. If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu item, pressing it two times returns you to the run mode.

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S2A jumper omitted) |
| | INP.3=0 | | Unipolar input (S2B jumper omitted) |
| | INP.4=0 | | Std, for current inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=1 | | Ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFFF | | No decimal point for calibration run (Desired decimal point will be entered later) |
| CNT BY | | | Press 'RESET' two times to get return to the run mode |

2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer and record the meter display as "INPUT1" and "INPUT2" and record what each of these readings ("READ 1" and "READ 2") should display on a piece of scrap paper or in the space provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1" _____ "INPUT2" _____

"READ 1" _____ "READ 2" _____

Assume that you simulate no load and the display indicates "13", and when you simulate 160 PSI the display indicates "80567".

The following data will now be entered into the 2-point scaling "IN.SC.OF" method.

"INPUT1": 13 "READ 1": 000000

"INPUT2": 80567 "READ 2": 000160

Proceed back into the set up mode and follow the flowchart below entering the values in the submenus shown.



| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | | | Skip past (Leave as 1.0000) |
| RDG OF | | | Skip past (Leave as 000000) |
| IN CNF | INP.6=1 | | Activates IN.SC.OF (2-point scaling) |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | 000013<br>000000<br>080567<br>000160 | This is where you enter the data obtained during the calibration run (see above). |
| DEC PT | FFFF.FF | | Decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |

The unit is now completely scaled. If during verifying the calibration, the display is not correct, you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.



METHOD III: SCALING BY SIMULATING A KNOWN LOAD WITH THREE OR MORE DECIMAL POINT POSITIONS.

EXAMPLE: An end user has a 5 pound load cell with a 2 mV/V output. The end user wants to display in ten thousandths of a pound (desired display 0.0000 to 5.0000). Proceed to Section 8.2 performing A, B and C sections.

1. Prior to simulating a known load you must set up the unit as shown below.

Pressing the 'MENU' button will step you through all the different menu's listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select, press the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection.

After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED", on the display.

If the item selected in submenu 1 has a submenu 2 associated with it, you can press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu item, pressing the 'RESET' button two times returns you to the run mode.

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input. |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| IN CNF | INP.1=0<br>INP.2=0<br><br>INP.3=0<br><br>INP.4=0<br>INP.5=<br>INP.6=0<br>INP.7=1 | | 60 Hz ac power<br>Slow reading<br>(S2A jumper omitted)<br>Unipolar input<br>(S2B jumper omitted)<br>Std, for current inputs<br>Disregard not used<br>Disables IN.SC.OF<br>Ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFF.F | | By shifting the decimal point, it makes the meter 10 times more sensitive (desired decimal point will be entered later) |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



2. Now you are in the run mode and the load cell is connected to the meter. Simulate two loads on the transducer and record the meters display as "INPUT1" and "INPUT2" and record what each of these readings ("READ 1" and "READ 2") should display in the spaces provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1" _____ "INPUT2" _____

"READ 1" _____ "READ 2" _____

Assume that you simulate no load the display indicates "–55.6", and when you simulate 4.0000 pounds the display indicates "16136.6".

The following data will now be entered into the 2-point scaling "IN.SC.OF" method.

| | | | |
|---|---|---|---|
| "INPUT1": | –55.6 | "READ 1": | 00000.0 |
| "INPUT2": | 16136.6 | "READ 2": | 04000.0 |

Ignore the decimal point position for the read values. Just note how many zero's (or places to the right of the decimal) you need.

In this example there were 4 decimal places needed and there are 4 zeros after the "4" in the READ 2 value (ignore the decimal point).

You must alter the "RDG SC" factor as follows. Note that the decimal point above in the "READ 1" and "READ 2" values is not in the correct position. You need to move it 3 places to the left to make it correct.

By looking at Table 8-2 below, you can see that a value of 0.00100 must be entered for a new "RDG SC" value.



**TABLE 8-2**
**READING SCALE (RDG SC) vs DECIMAL POINT SHIFT**

| NUMBER OF SPACES DECIMAL POINT MOVES TO THE LEFT | RDG SC VALUE |
|---|---|
| 0 | 1.00000 |
| 1 | 0.10000 |
| 2 | 0.01000 |
| 3 | 0.00100 |
| 4 | 0.00010 |

Proceed back into the setup mode and enter the new "RDG SC" value, the two point calibration data and move the decimal point.

You must proceed as follows.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | 0.00100 | | Enter new scale value from above. |
| RDG OF | | | Skip past (Leave as 000000) |
| IN CNF | INP.6=1 | | Activates "IN.SC.OF" (2-point scaling) |
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | –0055.6<br>00000.0<br>16136.6<br>04000.0 | This is where you enter the data obtained during the calibration run (see above). |
| DEC PT | FF.FFFF | | Correct decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



The unit is now completely scaled. If during verifying the calibration the display is not correct you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.

## 8.3 VOLTAGE INPUT (NON RATIOMETRIC), PROGRAMMING THE METER FOR A DESIRED DISPLAY

An easy way to program your unit is to follow the example and step by step procedure below and just modify it for your exact requirements.

EXAMPLE: An end user wants to scale the meter for a 4000 PSI, 1-5 Vdc voltage output, pressure transducer. You want the meter to display in tenths of a PSI from 0 to 4000.0 PSI. The pressure sensor requires 12-30 Vdc excitation power.

The two most common methods of scaling, Method I scaling without simulating a known load, and Method II scaling by simulating known loads will be demonstrated. Sometimes end users simulate known voltages instead of known physical standards (pressures); this is covered in Method II. A third method is for a unique case where you are scaling with a known load and you want the display to have 3 or more decimal places. Method III is a little complicated and should only be used, if you are looking for really accurate results and you desire a display with 3 or more places to the right of the decimal point.



A. Set the correct jumpers on the meter. (Refer to Section 6)

Install jumpers S3A, S3C and S4B on the main board.

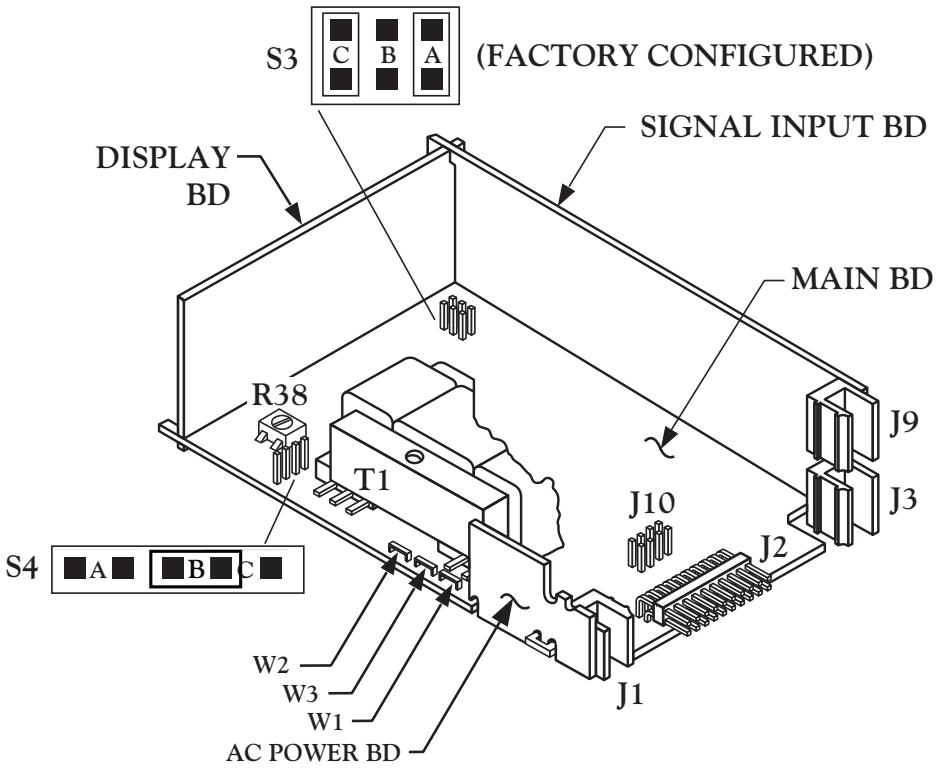



Figure 8-4 S3 Main Board Jumper Positions

Install jumpers on S1 and S2 as shown in Figure 8-2.

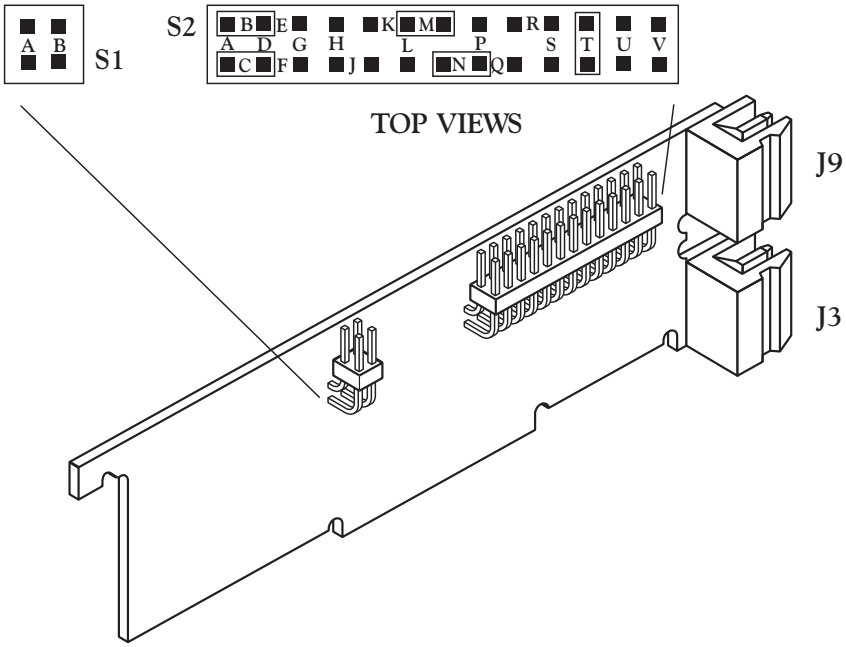



Figure 8-5 S1 and S2 Signal Input Jumper Positions

B. Wire the transducer as shown in Figure 8-6 (Refer to Section 7 for additional information).

Always check the meter's excitation prior to wiring your sensor to the meter.

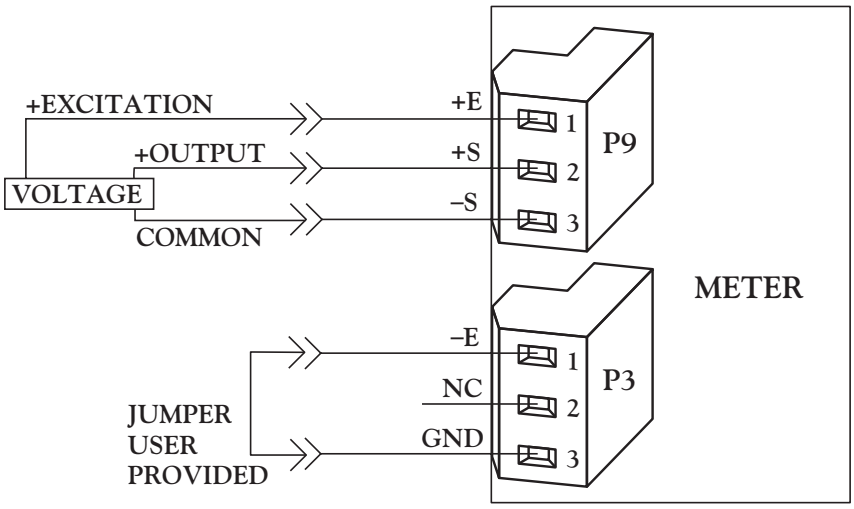



Figure 8-6 Sensor Input Connections

C. The unit comes with all lockout bytes set in the unlocked position("0"). Refer to Section 9.1 for information on lockout bytes.

If the unit has been programmed previously make sure that at least the following lockout bytes are unlocked. If they are Not unlocked you will not be able to scale the meter.

| MENU | SUBMENU |
|---|---|
| "L1CNF"<br>"L2CNF" | L1C.7=0, L1C.8=0<br>All sub menus must be unlocked "0" |

Scroll to the menu by pressing the 'MENU' button. Enter a submenu by pressing the 'MIN' button. select "0" or "1" by pressing the 'MAX' button. Always press the 'MENU' button when leaving a submenu to store the values you entered.

## METHOD I: SCALING WITHOUT SIMULATING A KNOWN LOAD.

**NOTE:** All of the following steps are accomplished by using the front panel buttons.

1. Scale the instrument by entering only 3 parameters.

The 3 parameters are "RDG SC" (Reading Scale), "RDG OF" (Reading Offset), and "DEC PT" (Decimal Point).
Calculate "RDG SC" using the following formula:

RDG SC= display span/((sensor's output span) (natural gain))
RDG SC= 4000/(4 x 10000) = 0.100
Where: display span= 4000 – 0 = 4000
Sensor's output span= 5 Vdc – 1 Vdc = 4 Vdc
Meter's natural gain= 10000 (Obtained from Table 8-1)

| VOLTAGE RANGE | SENSOR'S OUTPUT UNITS | METER'S NATURAL GAIN |
|---|---|---|
| 100 mV, ±50 mV | Millivolts | 1000 |
| 1 V, ±500 mV | Millivolts | 100 |
| 10 V, ±5 V | Volts | 10000 |
| 100 V, ±50 V | Volts | 1000 |

Pressing the 'MENU' button will take you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select you use the 'MIN' button to scroll to the next item of choice and again use the "'MAX'" button to make your selection.



After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED" on the display. If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to go to submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button. Pressing the "'RESET'" button one time brings you back one 'MENU' item, pressing it a second time returns you to the run mode.

*WARNING! this also results in a hard reset of peak and valley and your setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input. |
| RDG.CNF | RDG.1=0 | | Scaling y=mx+b |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs peak reset |
| RDG SC | 0.10000 | | See calculations above |
| RDG OF | 0000000 | | |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S1A jumper omitted) |
| | INP.3=0 | | Unipolar input (S1B jumper omitted) |
| | INP.4=0 | | Std, for voltage inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF. |
| | INP.7=0 | | Non ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFF.F | | Sets decimal point |
| CNT BY | | | Press 'RESET' two times to return to the run mode |

2. Now you are in the run mode and the transducer is connected to the meter. Simulate no load on the transducer (just leave the pressure port open to atmosphere) and note the display reading. Assume the display shows "996.5". To make the display indicate zeros you must go to the menu "RDG OF" and enter the value "–996.5". After entering this value press the 'MENU' button to store it, and then press the 'RESET' button two times to return to the run mode. The scaling is now complete.

METHOD II: SCALING BY SIMULATING A KNOWN LOAD.

1. Prior to simulating a known load you must set up the unit as shown below.

The 'MENU' button will take you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select you use the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection. After making all of your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED" on the display. If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu item, pressing it two times returns you to the run mode

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S2A jumper omitted) |
| | INP.3=0 | | Unipolar input (S2B jumper omitted) |
| | INP.4=0 | | Std, for current inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=0 | | Non ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFFF | | No decimal point for calibration run (Desired decimal point will be entered later) |
| CNT BY | | | Press 'RESET' two times to return to the run mode |

2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer and record the meter display as "INPUT1" and "INPUT2" and record what each of these reading ("READ 1" and "READ 2") should display on a piece of scrap paper or in the space provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1" _____ "INPUT2" _____

"READ 1" _____ "READ 2" _____

Assume that you simulate no load and the display indicates "9997", and when you simulate 3000 PSI the display indicates "40998".



The following data will now be entered into the 2-point scaling "IN.SC.OF" method.

"INPUT1": 9997 "READ 1": 000000

"INPUT2": 40998 "READ 2": 003000

Proceed back into the set up mode and follow the flowchart below entering the values in the submenus shown.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | | | Skip past (Leave as 1.0000) |
| RDG OF | | | Skip past (Leave as 000000) |
| IN CNF | INP.6=1 | | Activates IN.SC.OF (2-point scaling) |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | 009997<br>000000<br>40998<br>003000 | This is where you enter the data obtained during the calibration run (see above). |
| DEC PT | FFFFF.F | | Decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |

The unit is now completely scaled. If during verifying the calibration, the display is not correct, you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.



METHOD III: SCALING BY SIMULATING A KNOWN LOAD WITH THREE OR MORE DECIMAL POINT POSITIONS.

EXAMPLE: An end user has a 3 inch of water pressure transducer with a 1-5 Vdc output. The end user wants to display in ten thousandths of an inch of water (desired display 0.0000 to 3.0000). Proceed to Section 8.2 performing A,B and C sections.

1. Prior to simulating a known load you must set up the unit as shown below.

Pressing the 'MENU' button will step you through all the different menu's listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select, press the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection.

After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED", on the display.

If the item selected in submenu 1 has a submenu 2 associated with it, you can press 'MIN' to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu item, pressing the 'RESET' button two times returns you to the run mode.

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input. |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| IN CNF | INP.1=0<br>INP.2=0<br><br>INP.3=0<br><br>INP.4=0<br>INP.5=<br>INP.6=0<br>INP.7=0 | | 60 Hz ac power<br>Slow reading<br>(S2A jumper omitted)<br>Unipolar input<br>(S2B jumper omitted)<br>Std, for current inputs<br>Disregard not used<br>Disables IN.SC.OF<br>Non ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFF.F | | By shifting the decimal point, it makes the meter 10 times more sensitive (desired decimal point will be entered later) |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer  nd record the meters display as "INPUT1" and "INPUT2" and record what each of these reading ("READ 1" and "READ 2") should display on a piece of scrap paper or in the spaces provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1" _____ "INPUT2" _____

"READ 1" _____ "READ 2" _____

Assume that you simulate no load and the display indicates "9949.5", and when you simulate 2.0000 inches of water and the display indicates "36614.2".

The following data will now be entered into the two point scaling "IN.SC.OF" method.

| | | | |
|---|---|---|---|
| "INPUT1": | 9949.5 | "READ 1": | 00000.0 |
| "INPUT2" | 36614.2 | "READ 2" | 02000.0 |

Ignore the decimal point position for the read values. Just note how many zero's (or places to the right of the decimal) you need.

In this example there were 4 decimal places needed and there are 4 zeros after the "2" in the READ 2 value (ignore the decimal point).

You must alter the "RDG SC" factor as follows. Note that the decimal point above in the "READ 1" and "READ 2" values is not in the correct position. You need to move it 3 places to the left to make it correct.



By looking at Table 8-3 below, you can see that a value of 0.00100 must be entered for a new "RDG SC" value.

**TABLE 8-3**
**READING SCALE (RDG SC) vs DECIMAL POINT SHIFT**

| NUMBER OF SPACES DECIMAL POINT MOVES TO THE LEFT | RDG SC VALUE |
|---|---|
| 0 | 1.00000 |
| 1 | 0.10000 |
| 2 | 0.01000 |
| 3 | 0.00100 |
| 4 | 0.00010 |

Go back into the setup mode and enter the new "RDG SC" value, the two point calibration data and move the decimal point.

You must proceed as follows.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF<br>L2CNF<br>L3CNF<br>L4CNF | | | Skip past<br>Skip past<br>Skip past<br>Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | 0.00100 | | Enter new scale value from above. |
| RDG OF | | | Skip past (Leave as 000000) |
| IN CNF | INP.6=1 | | Activates "IN.SC.OF" (2-point scaling) |
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | 09949.5<br>00000.0<br>336614.2<br>02000.0 | This is where you enter the data obtained during the calibration run (see above). |
| DEC PT | FF.FFFF | | Correct decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



The unit is now completely scaled. If during verifying the calibration the display is not correct you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.

# 8.4 CURRENT INPUT, PROGRAMMING THE METER FOR A DESIRED DISPLAY



An easy way to program your unit is to follow the example and step by step procedure below and just modify it for your exact requirements.

EXAMPLE: An end user wants to scale the meter for a 5000 PSI, 4-20 mA current output, pressure transmitter. He wants the meter to display in tenths of a PSI from 0 to 5000.0 PSI. The pressure sensor requires 12-30 Vdc excitation power.

The two most common methods of scaling, Method I scaling without simulating a known load, and Method II scaling by simulating known loads will be demonstrated. Sometimes end users simulate known currents instead of known physical standards (pressures), which is covered in Method II. A third method, Method III, is for a unique case where you are scaling with a known load and you want the display to have 3 or more decimal places. Method III is a little complicated and should only be used, if you are looking for really accurate results and you desire a display with 3 or more places to the right of the decimal point.

A. Set the correct jumpers on the meter. (Refer to Section 6 for additional information.) Install jumpers S3A & S3C and S4B on the main board.

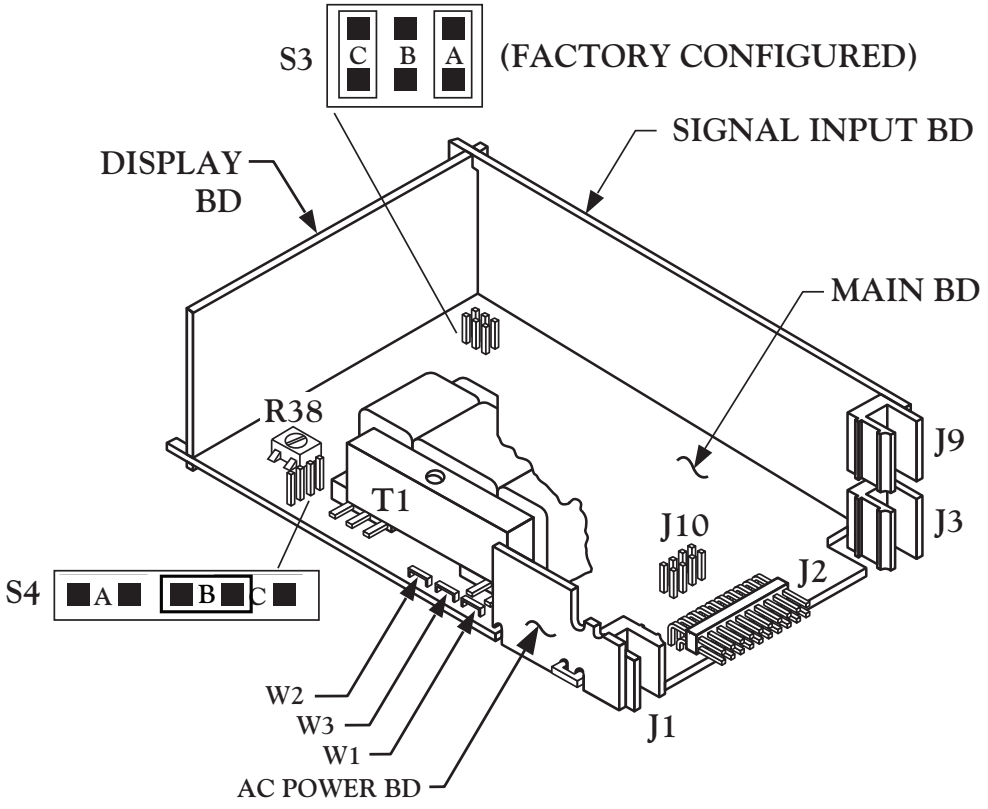



Figure 8-7. S3 and S4 Main Board Jumper Positions

Install jumpers on S1 and S2 as shown in Figure 8-8.

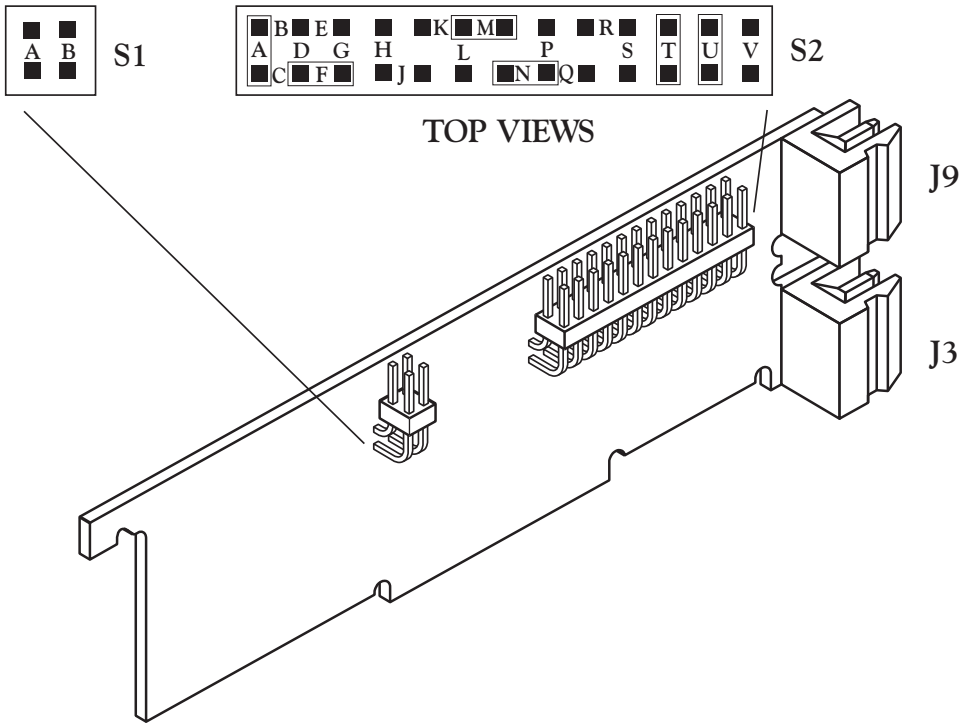



Figure 8-8. S1 and S2 Signal Input Jumper Positions



B. Wire the transducer as shown in Figure 8-9. (Refer to Section 7 for additional information)

Always check the meter's excitation prior to wiring your sensor to the meter.

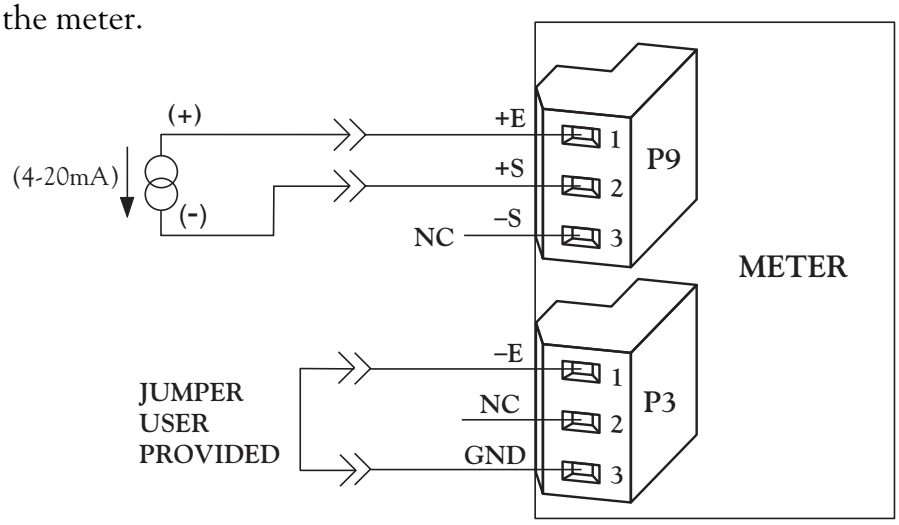



Figure 8-9. Sensor Input Connection

C. The unit comes with all lockout bytes set in the unlocked position("0"). Refer to Section 9.1 for information on lockout bytes.

If the unit has been program previously please make sure that at least the following lockout codes are unlocked. If they are not unlocked you will not be able to scale the meter.

| MENU | SUB MENU |
|---|---|
| "L1CNF"<br>"L2CNF" | L1C.7=0, L1C.8=0<br>All sub menus must be unlocked "0" |

Scroll to the desired menu by pressing the 'MENU' button. You enter a submenu by pressing the 'MIN' button. You select "0" or "1" by pressing the 'MAX' button. Always press the 'MENU' button when leaving a submenu to store the values or parameters you entered.



## METHOD I: SCALING WITHOUT SIMULATING A KNOWN LOAD.

All of the following steps are accomplished by using the front panel buttons.

1. Scale the instrument by entering only 3 parameters. The 3 parameters are "RDG SC" (Reading Scale), "RDG OF" (Reading Offset), and "DEC PT" (Decimal Point).

Calculate your "RDG SC" (Reading Scale) using the following formula:

RDG SC= display span/ ((sensors span normally 16 mA) (5000))

RDG SC= 5000/(16 x 5000) = 0.06250
Where: display span= 5000 – 0 = 5000
Sensor's output span= 20 mA – 4 mA = 16 mA

Pressing the 'MENU' button will take you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select use the 'MIN' button to scroll to the next item of choice and again use the 'MAX' button to make your selection.

After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED" on the display.

If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to go to submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one 'MENU' item, pressing the 'RESET' button two times returns you to the run mode (this also results in a hard reset of peak and valley and your setpoints).

Proceed through the flow chart below entering the values listed in the Sub Menu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input. |
| RDG.CNF | RDG.1=0 | | Scaling y=mx+b |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 0.06250 | | See calculations above |
| RDG OF | 0000000 | | |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| IN CNF | INP.1=0<br>INP.2=0<br><br>INP.3=0<br><br>INP.4=0<br>INP.5=<br>INP.6=0<br>INP.7=0 | | 60 Hz ac power<br>Slow reading<br>(S1A jumper omitted)<br>Unipolar input<br>(S1B jumper omitted)<br>Std, for current inputs<br>Not used<br>Disables IN.SC.OF<br>Non ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFF.F | | Sets decimal point |
| CNT BY | | | Press 'RESET' two times to return to the Run mode |



2. Now you are in the run mode and the transducer is connected to the meter. Simulate no load on the transducer (just leave the pressure port open to atmosphere) and note the display reading. Assume the display shows "1013.3". To make the display indicate zeros you must go to the menu "RDG OF" and enter the value "–1013.3". After entering this value press the 'MENU' button to store it, and then press the 'RESET' button two times to return to the run mode. The scaling is now complete.

METHOD II: SCALING BY SIMULATING A KNOWN LOAD.

1. Prior to simulating a known load you must set up the unit as shown below.

The 'MENU' button will take you through all the different menu's listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select, use the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection.

After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED", on the display. If the item selected in submenu 1 has a

submenu 2 associated with it, press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one 'MENU' item, press the 'RESET' button two times to return to the run mode.

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the following flow chart entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading |
| | | | (S2A jumper omitted) |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| | INP.3=0 | | Unipolar input (S2B jumper omitted |
| | INP.4=0 | | Std, for current inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=0 | | Non ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFFF | | No decimal point for calibration run (Desired decimal point will be entered later) |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer and record the meter's display as "INPUT1" and "INPUT2" and record what each of these readings should display ("READ 1" and "READ 2") on a piece of scrap paper or in the spaces provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1"_____ "INPUT2" _____

"READ 1"_____ "READ 2" _____

Assume that you simulate no load and the display indicates "19590", and when you simulate 4000 PSI the display indicates "80150".

The following data will now be entered into the 2-point scaling "IN.SC.OF" method.

"INPUT1": 019590 "READ 1": 0000

"INPUT2": 080150 "READ 2": 4000

Go back into the set up mode and follow the flow chart below entering the values in the submenus shown.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | | | Skip past<br>(Leave as 1.00000) |
| RDG OF | | | Skip past<br>(Leave as 000000) |
| IN CNF | INP.6=1 | | Activates IN.SC.OF<br>(2-point scaling) |
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | 019590<br>000000<br>080150<br>004000 | This is where you enter the data obtained during the calibration run (see above). |
| DEC PT | FFFFF.F | | Decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |

The unit is now completely scaled. If during verifying the calibration, the display is not correct, you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.

## METHOD III: SCALING BY SIMULATING A KNOWN LOAD WITH THREE OR MORE DECIMAL POINT POSITIONS.

An end user has a 3 inch of water pressure transducer with a 4-20 mA output. The end user wants to display in ten thousandths of an inch of water (desired display 0.0000 to 3.0000). Proceed to Section 8.3 performing A, B and C sections.

1. Prior to simulating a known load you must set up the unit as shown below:

Pressing the 'MENU' button will step you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select press the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection.



After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED", on the display.

If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu, pressing it a second time returns you to the run mode.

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | Skip past | |
| L2CNF | | Skip past | |
| L3CNF | | Skip past | |
| L4CNF | | Skip past | |
| INPUT | BRIDGE | | Meter's input |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 1.00000 | | Enter for IN.SC.OF scaling |
| RDG OF | 0000000 | | Enter for IN.SC.OF scaling |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S2A jumper omitted) |
| | INP.3=0 | | Unipolar input (S2B jumper omitted) |
| | INP.4=0 | | Std, for current inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=0 | | Non ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFF.F | | By shifting the decimal point, it makes the meter 10 times more sensitive (desired decimal point will be entered later) |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |

2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer and record the meter display as “INPUT1” and “INPUT2” and record what each of these readings should display (“READ 1” and “READ 2”) on a piece of scrap paper or in the spaces provided below, these numbers will be the INPUT values entered in the “IN.SC.OF” scaling.

Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

“INPUT1” _____ “INPUT2” _____

“READ 1” _____ “READ 2” _____



Assume that you simulate no load and the display indicates “20054.3”, and when you simulate 2.0000 inches of water, the display indicates “66675.6” .

The following data will now be entered into the 2-point scaling “IN.SC.OF” method.

| | | | |
|---|---|---|---|
| “INPUT1”: | 20054.3 | “READ 1”: | 00000.0 |
| “INPUT2”: | 66675.6 | “READ 2”: | 02000.0 |

Ignore the decimal point position for the READ values. Just note how many zero’s (or places to the right of the decimal) you need.

In this example there were 4 decimal places needed and there are 4 zeros after the “2” (in the “READ 2” value).

You must alter the “RDG SC” factor as follows. Note that the decimal point above in the “READ 1” and “READ 2” values is not in the correct position. You need to move it 3 places to the left to make it correct.

By looking at Table 8-4, you can see that a value of 0.00100 must be entered for a new “RDG SC” value.

TABLE 8-4
READING SCALE (RDG SC) vs DECIMAL POINT SHIFT

| NUMBER OF SPACES DECIMAL POINT MOVES TO THE LEFT | RDG SC VALUE |
|---|---|
| 0 | 1.00000 |
| 1 | 0.10000 |
| 2 | 0.01000 |
| 3 | 0.00100 |
| 4 | 0.00010 |

Go back into the setup mode and enter the new "RDG SC" value, the 2-point calibration data and move the decimal point.

You must proceed as follows:

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | 0.00100 | | Enter new scale value from above. |
| RDG OF | | | Skip past (Leave as 000000) |
| IN CNF | INP.6=1 | | Activates "IN.SC.OF" (2-point scaling) |
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | 20054.3<br>00000.0<br>66675.6<br>02000.0 | This is where you enter the data obtained during the calibration run (see above) |
| DEC PT | FF.FFFF | | Correct decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |

The unit is now completely scaled. If during verifying the calibration the display is not correct you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.

## 8.5 POTENTIOMETER, PROGRAMMING THE METER FOR A DESIRED DISPLAY

An easy way to program your unit is to follow the example and step by step procedure below and just modify it for your exact requirements.

EXAMPLE: An end user wants to scale the meter for a 200 PSI, 0-500 ohms output, pressure transducer. You want the meter to display in hundredths of a PSI from 0 to 200.00 PSI. The pressure sensor requires 10 Vdc excitation power.



The two most common methods of scaling, Method I scaling without simulating a known load, and Method II scaling by simulating known loads will be demonstrated. Sometimes end users simulate known voltages instead of known physical standards (pressures); this is covered in Method II. A third method is for a unique case where you are scaling with a known load and you want the display to have 3 or more decimal places. Method III is a little complicated and should only be used, if you are looking for really accurate results and you desire a display with 3 or more places to the right of the decimal point.

A. Set the correct jumpers on the meter as shown in Figure 8-10. (Refer to Section 6 for additional information)

Configure jumpers on S1 and S2 as shown in Section 6.

Install jumpers S3A & S3C and S4A & S4C on the main board. S4A & S4C will provide a factory set 10 Vdc. Adjusting R38 will vary excitation. Use a multimeter when adjusting R38.

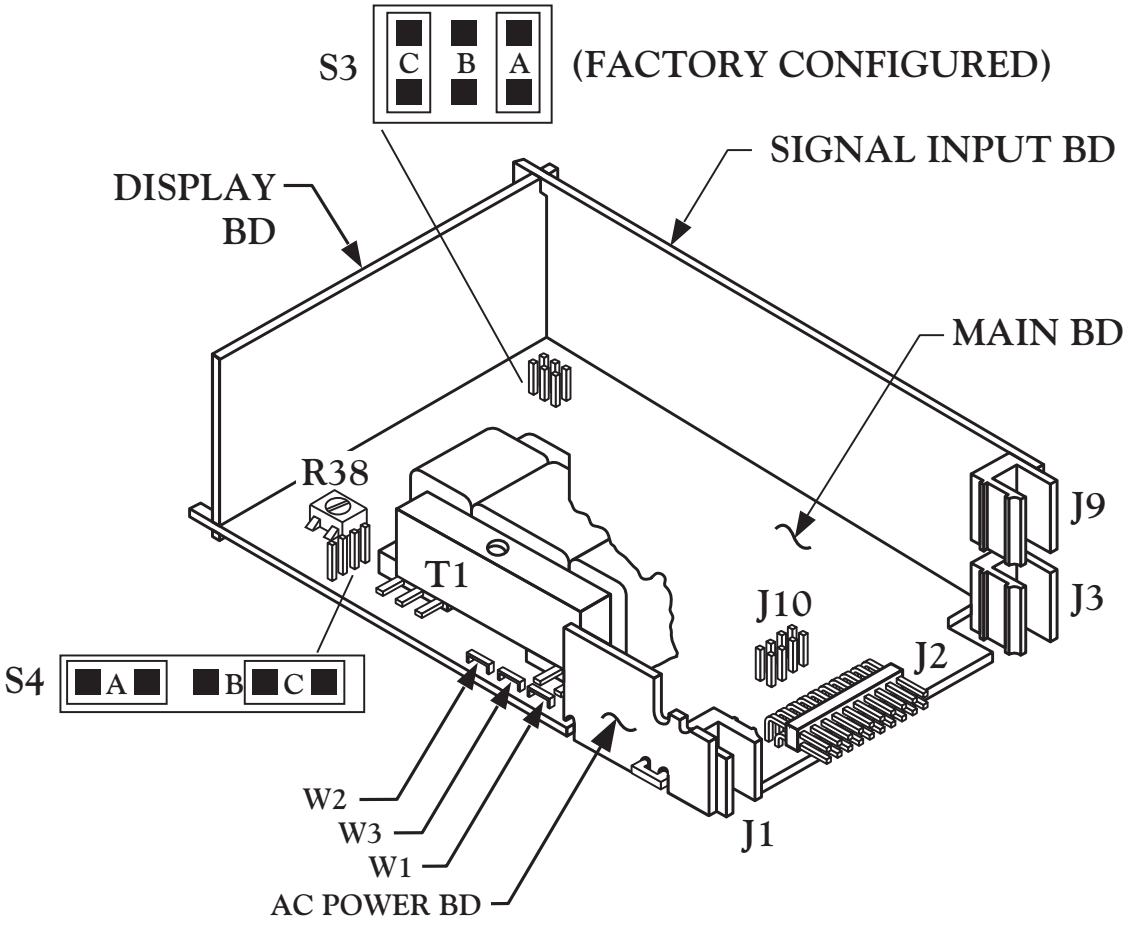



Figure 8-10. S3 and S4 Main Board Jumper Positions

Install jumpers on S1 and S2 as shown in Figure 8-11.

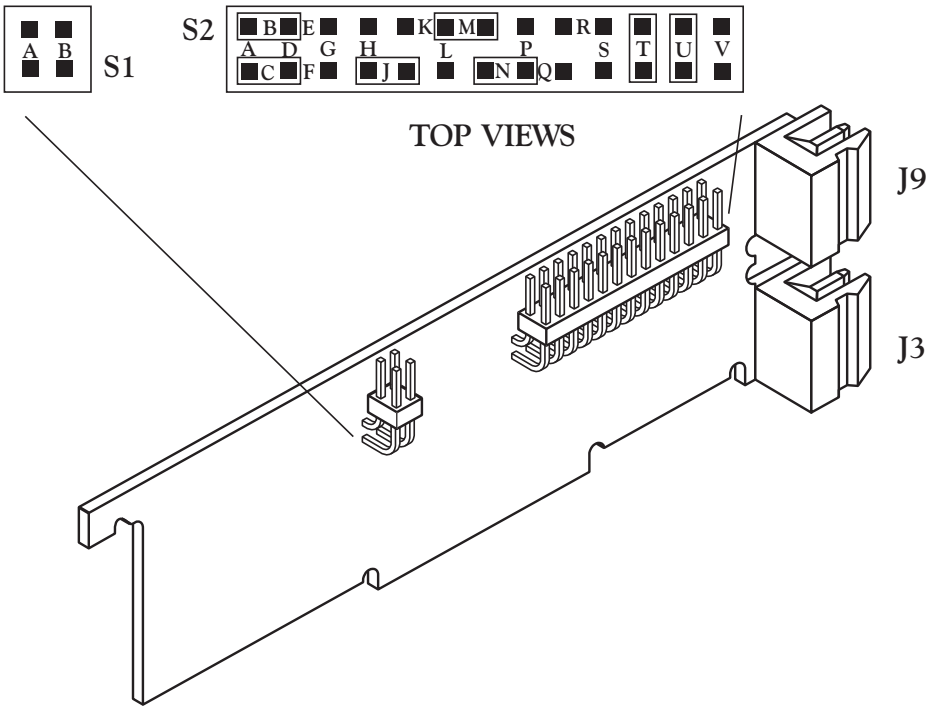



Figure 8-11. S1 and S2 Signal Input Jumper Positions

B. Wire the transducer as shown in Figure 8-12. (Refer to Section 7 for additional information).

Always check the meter's excitation prior to wiring your sensor to the meter.

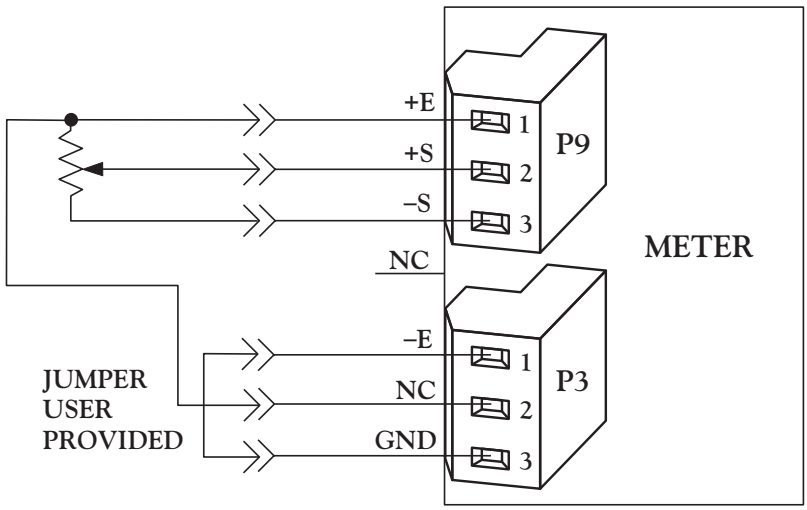



Figure 8-12. Sensor Input Connections

C. The unit comes with all lockout bytes set in the unlocked position ("0"). Refer to Section 9.1 for information on lockout bytes.

If the unit has been programmed previously make sure that at least the following lockout bytes are unlocked. If they are Not unlocked you will not be able to scale the meter.

| MENU | SUBMENU |
|---|---|
| "L1CNF"<br>"L2CNF" | L1C.7=0, L1C.8=0<br>All sub menus must be unlocked "0" |

Scroll to the menu by pressing the 'MENU' button. Enter a submenu by pressing the 'MIN' button. Select "0" or "1" by pressing the 'MAX' button. Always press the 'MENU' button when leaving a submenu to store the values you entered.



## METHOD I: SCALING WITHOUT SIMULATING A KNOWN LOAD.

All of the following steps are accomplished by using the front panel buttons.

1. Scale the instrument by entering only 3 parameters. The 3 parameters are "RDG SC" (Reading Scale), "RDG OF" (Reading Offset), and "DEC PT" (Decimal Point).

Calculate "RDG SC" using the following formula:

RDG SC= display span/((sensor's output span) (natural gain))

RDG SC= 200/(10 x 10000) = 0.002
Where: display span= 200 – 0 = 200
Sensor's output span= 10 volts
Meter's natural gain= 10000 (from Table 8-5)

**TABLE 8-5**
**METER'S NATURAL GAIN CHART**

| VOLTAGE RANGE | SENSOR'S OUTPUT UNITS | METER'S NATURAL GAIN |
|---|---|---|
| 100 mV, ±50 mV | Millivolts | 1000 |
| 1 V, ±500 mV | Millivolts | 100 |
| 10 V, ±5 V | Volts | 10000 |
| 100 V, ±50 V | Volts | 1000 |

Pressing the 'MENU' button will take you through all the different menu's listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more than one item to select use the 'MIN' button to scroll to the next item of choice and again use the 'MAX' button to make your selection.

After making all of your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED" on the display.

If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice with the 'MENU' button. Pressing the 'RESET' button one time brings you back one menu item, pressing the 'RESET' button two times returns you to the run mode.

*WARNING! this also results in a hard reset of peak and valley and your setpoints.*



Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input. |
| RDG.CNF | RDG.1=0 | | Scaling y=mx+b |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |

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| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| RDG SC | 0.00200 | | See calculations above |
| RDG OF | 0000000 | | |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S1A jumper omitted) |
| | INP.3=0 | | Unipolar input (S1B jumper omitted) |
| | INP.4=0 | | Std, for voltage inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=1 | | Ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFF.FF | | Sets decimal point |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



2. Now you are in the run mode and the transducer is connected to the meter. Simulate no load on the transducer (just leave the pressure port open to atmosphere) and note the display reading. Assume the display shows "1.25". To make the display indicate zeros you must go to the menu "RDG OF" and enter the value "–001.25". After entering this value press the 'MENU' button to store it, and then press the 'RESET' button two times to return to the run mode. The scaling is now complete.

METHOD II: SCALING BY SIMULATING A KNOWN LOAD.

1. Prior to simulating a known load you must set up the unit as shown below.

The 'MENU' button will take you through all the different menu's listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more then one item to select use the 'MIN' button to scroll to the next item of choice and

again press the 'MAX' button to make your selection. After making all of your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED", on the display. If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to enter the submenu 2.

Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu item, pressing the 'RESET' button two times returns you to the run mode

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.



| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed. |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |

*continued next page*

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| IN CNF | INP.1=0<br>INP.2=0<br><br>INP.3=0<br><br>INP.4=0<br>INP.5=<br>INP.6=0<br>INP.7=1 | | 60 Hz ac power<br>Slow reading<br>(S2A jumper omitted)<br>Unipolar input<br>(S2B jumper omitted)<br>Std<br>Disregard not used<br>Disables IN.SC.OF<br>Ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFFF | | No decimal point for calibration run<br>(Desired decimal point will be entered later) |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |



2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer and record the meter's display as "INPUT1" and "INPUT2" and record what each of these readings ("READ 1" and "READ 2") should display on a piece of scrap paper or in the spaces provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1" _____ "INPUT2" _____

"READ 1" _____ "READ 2" _____

Assume that you simulate no load and the display indicates "13", and when you simulate 160 PSI the display indicates "80567".

The following data will now be entered into the two point scaling "IN.SC.OF" method.

"INPUT1": 000013 "READ 1": 000000

"INPUT2": 080567 "READ 2": 000160

Proceed back into the set up mode and follow the flow chart below entering the values in the submenus shown.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | | | Skip past<br>(Leave as 1.0000) |
| RDG OF | | | Skip past<br>(Leave as 000000) |
| IN CNF | INP.6=1 | | Activates IN.SC.OF<br>(2-point scaling) |
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | 000013<br>000000<br>080567<br>000160 | This is where you<br>enter the data<br>obtained during the<br>calibration<br>run (see above) |
| DEC PT | FFFFF.F | | Decimal point<br>selection |
| CNT BY | | | Press the 'RESET' button<br>two times to return to<br>the run mode |

The unit is now completely scaled. If during verifying the calibration the display is not correct you can use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.

## METHOD III: SCALING BY SIMULATING A KNOWN LOAD WITH THREE OR MORE DECIMAL POINT POSITIONS.

EXAMPLE: An end user has a displacement sensor with 5 inches of travel and a 500 ohm output. You want to display in one ten thousandths of an inch (desired display 0.0000 to 5.0000). Proceed to Section 8.4 performing A, B and C sections.

1. Prior to simulating a known load you must set up the unit as shown below.

Pressing the 'MENU' button will step you through all the different menus listed below. When you wish to enter a menu, to the submenu 1 stage, press the 'MIN' button. To make a selection, in submenu 1, press the 'MAX' button. If the submenu has more then one item to select press the 'MIN' button to scroll to the next item of choice and again press the 'MAX' button to make your selection.



After making all your choices, in submenu 1, enter these selections by pressing the 'MENU' button which will momentarily flash "STORED", on the display.

If the item selected in submenu 1 has a submenu 2 associated with it, press the 'MIN' button to enter the submenu 2. Select your choice by pressing the 'MAX' button and enter your choice by pressing the 'MENU' button.

Pressing the 'RESET' button one time brings you back one menu item, pressing the 'RESET' button two times returns you to the run mode.

> *WARNING! this also results in a hard reset of your peak and valley and setpoints.*

Proceed through the flow chart below entering the values listed in submenu 1 and 2 columns.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | BRIDGE | | Meter's input |
| RDG.CNF | RDG.1=0 | | 2-point scaling IN.SC.OF |
| | RDG.2=0 | | Active decimal point |
| | RDG.3=0 | | Normal display brightness |
| | RDG.4=1 | | Leading zeros suppressed |
| | RDG.5= | | Disregard not used |
| | RDG.6= | | Disregard not used |
| | RDG.7=0 | | External hard reset vs only peak reset |
| RDG SC | 1.00000 | | Preset for IN.SC.OF |
| RDG OF | 0000000 | | Preset for IN.SC.OF |
| IN CNF | INP.1=0 | | 60 Hz ac power |
| | INP.2=0 | | Slow reading (S2A jumper omitted) |
| | INP.3=0 | | Unipolar input (S2B jumper omitted) |
| | INP.4=0 | | Std, for current inputs |
| | INP.5= | | Disregard not used |
| | INP.6=0 | | Disables IN.SC.OF |
| | INP.7=1 | | Ratiometric input |
| IN.SC.OF | | | Skip past |
| DEC PT | FFFFF.F | | By shifting the decimal point, it makes the meter 10 times more sensitive (desired decimal point will be entered later) |
| CNT BY | | | Press the 'RESET' two times to return to the run mode |

2. Now you are in the run mode and the transducer is connected to the meter. Simulate two loads on the transducer and record the meter displays as "INPUT1" and "INPUT2" and record what each of these readings ("READ 1" and "READ 2") should display on a piece of scrap paper or in the spaces provided below. These numbers will be the INPUT values entered in the "IN.SC.OF" scaling. Normally the two points that are calibrated are the no load condition and 3/4 full scale. However, you may use any two measurements.

"INPUT1" _____ "INPUT2" _____

"READ 1" _____ "READ 2" _____

Assume that you simulate no displacement and the display indicates "-55.6", and when you simulate 4.0000 inches the display indicates "16136.6".

The following data will now be entered into the two point scaling "IN.SC.OF" method.

| | | | |
|---|---|---|---|
| "INPUT1": | -0055.6 | "READ 1": | 00000.0 |
| "INPUT2": | 16136.6 | "READ 2" | 04000.0 |

Ignore the decimal point position for the READ values. Just note how many zero's (or places to the right of the decimal) you need.

In this example there were 4 decimal places needed and there are 4 zeros after the "4" in the "READ 2" value (ignore the decimal point).

You must alter the "RDG SC" factor as follows. Note that the decimal point above in the "READ 1" and "READ 2" values is not in the correct position. You need to move it 3 places to the left to make it correct.

By looking at Table 8-6, you can see that a value of 0.00100 must be entered for a new "RDG SC" value.

TABLE 8-6
READING SCALE (RDG SC) vs DECIMAL POINT SHIFT

| NUMBER OF SPACES DECIMAL POINT MOVES TO THE LEFT | RDG SC VALUE |
|---|---|
| 0 | 1.00000 |
| 1 | 0.10000 |
| 2 | 0.01000 |
| 3 | 0.00100 |
| 4 | 0.00010 |

Proceed back into the setup mode and enter the new "RDG SC" value, the two point calibration data and move the decimal point.

You must proceed as follows.

| MENU | SUBMENU 1 | SUBMENU 2 | DESCRIPTION |
|---|---|---|---|
| L1CNF | | | Skip past |
| L2CNF | | | Skip past |
| L3CNF | | | Skip past |
| L4CNF | | | Skip past |
| INPUT | | | Skip past |
| RDG.CNF | | | Skip past |
| RDG SC | 0.00100 | | Enter new scale value from above. |
| RDG OF | | | Skip past (Leave as 000000) |
| IN CNF | INP.6=1 | | Activates "IN.SC.OF" (2-point scaling) |
| IN.SC.OF | INPUT 1<br>READ 1<br>INPUT2<br>READ 2 | –0055.6<br>00000.0<br>16136.6<br>04000.0 | This is where you enter the data obtained during the calibration run (see above) |
| DEC PT | FF.FFFF | | Correct decimal point selection |
| CNT BY | | | Press the 'RESET' button two times to return to the run mode |

The unit is now completely scaled. If during verifying the calibration, the display is not correct, use the offset function ("RDG OF" if all values read high or low) or perform this calibration again.

# EXPLANATION OF LOCKOUT CONFIGURATIONS AND METER FUNCTION MENUS

| HOW TO USE THE TABLES IN SECTION 9 | |
|---|---|
| MIN/MAX/MENU | These are the buttons on the meter you are to press to access the parameters given in the same column. |
| MAIN MENU/ SUBMENU: | These are headings for the table columns. |
| DISPLAYED INFORMATION: | These are parameters seen on the display after pressing either **'MIN'**, **'MAX'**, or **'MENU'** button(s). |

Note ☞

**NOTE:** If you press the **'RESET'** button two times while the meter is in the run mode, all Setpoints, Alarms, Peak & Valley will be reset and the meter will begin new measurements.

If you press the **'RESET'** button one time while in the configuration mode, you will move one MAIN MENU backwards and any selection will not be saved. If you press the **'RESET'** button two times while in the configuration mode, you will reset the meter and only those menu items saved by pressing the **'MENU'** button will be saved.

## 9.1 Individual Lockout Information

To restrict access to different parameters of the program in the meter, you may want to lockout parts of the meter. When you lock out a parameter, it will no longer appear when you scroll through the menu. To lock out specific parameters of the meter (setpoint, scaling), refer to the following tables.

Once set (to unlock useful features for a given application and to lock out any features), these four "L1C", "L2C", "L3C", and "L4C" can be rapidly skipped over by pressing the **'MENU'** button four times.

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU | CONDITION |
|---|---|---|
| "L1 CNF": | | LOCKOUT CONFIGURATION #1 |
| | "L1C.1=0" | Setpoint 1 change unlocked. |
| | "L1C.1=1" | Setpoint 1 change locked out. |
| | "L1C.2=0" | Setpoint 2 change unlocked. |
| | "L1C.2=1" | Setpoint 2 change locked out. |
| | "L1C.3=0" | Setpoint 3 (Alarm 1) change unlocked. |
| | "L1C.3=1" | Setpoint 3 (Alarm 1) change locked out. |
| | "L1C.4=0" | Setpoint #4 (Alarm 2) change unlocked. |
| | "L1C.4=1" | Setpoint #4 (Alarm 2) change locked out. |
| | "L1C.5=0" | Valley-value (LO RDG) display is permitted. |
| | "L1C.5=1" | Displays microprocessor revision. |
| | "L1C.6=0" | Peak-value (HI RDG) display is permitted. |
| | "L1C.6=1" | Peak-value (HI RDG) display is not permitted. |
| | "L1C.7=0" | INPUT CLASS (BRIDGE) is selected. |
| | "L1C.7=1" | INPUT CLASS is locked out. |
| | "L1C.8=0" | Not used in "BRIDGE" mode, must be set to "0". |
| | "L1C.8=1" | Not used in "BRIDGE" mode. |

*The **'MIN'** button allows you to sequence through L1C.1, L1C.2, L1C.3, L1C.4, L1C.5, L1C.6, L1C.7 and L1C.8.

The **'MAX'** button allows you to select the "0" or "1" state for each "L1C" condition.

The **'MENU'** button stores the selected values for all "L1C" condition(s) changed and advances the meter to "L2 CNF". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

Every underlined "0" or "1" state is the factory preset value.

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU | CONDITION |
|---|---|---|
| "L2 CNF": | | LOCKOUT CONFIGURATION #2 |
| | "L2C.1=0" | RDG.CNF (scale/offset method and display features) may be chosen. |
| | "L2C.1=1" | RDG.CNF (scale/offset method and display features) is locked out. |
| | "L2C.2=0" | Either RDG SC (computed input-to-display scale factor)<br>or<br>RD.SC.OF (two data points, which determine the reading scale/offset) may be entered. |
| | "L2C.2=1" | Either RDG SC (computed input-to-display scale factor)<br>or<br>RD.SC.OF (two data points, which determine the reading scale/offset) is locked out. |
| | "L2C.3=0" | RDG OF (offset computed in display digits) may be entered. |
| | "L2C.3=1" | RDG OF (offset computed in display digits) is locked out. |
| | "L2C.4=0" | INP.CNF (meter rates, front-end features, prelinearizing scale/offset) may be chosen. |
| | "L2C.4=1" | INP.CNF (meter rates, front-end features, prelinearizing scale/offset) may not be locked out. |
| | "L2C.5=0" | IN.SC.OF (two data points for additional scale/offset) may be entered. |
| | "L2C.5=1" | IN.SC.OF (two data points for additional scale/offset) may not be entered. |
| | "L2C.6=0" | DEC PT (decimal-point location) may be chosen |
| | "L2C.6=1" | DEC PT (decimal-point location) may not be chosen. |

*continued next page*

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU | CONDITION |
|---|---|---|
| "L2 CNF" | | |
| | "L2C.7=0" | CNT BY (round off of display) can be specified. |
| | "L2C.7=1" | CNT BY (round off of display) cannot be specified. |
| | "L2C.8=0" | FIL CNF (adaptive/fixed filtering and for which output(s)) can be chosen. |
| | "L2C.8=1" | FIL CNF (adaptive/fixed filtering and for which output(s)) cannot be chosen. |

* The **'MIN'** button allows you to sequence through L2C.1, L2C.2, L2C.3, L2C.4, L2C.5, L2C.6, L2C.7, and L2C.8.

The **'MAX'** button allows you to select the "0" or "1" state for each "L2C" condition.

The **'MENU'** button stores the selected values for all "L2C" condition(s) changed and advances the meter to "L3 CNF". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

Every underlined "0" or "1" state is the factory preset value.

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU | CONDITION |
|---|---|---|
| "L3 CNF": | | LOCKOUT CONFIGURATION#3 |
| | "L3C.1=0" | FIL TI (# of samples in average) can be chosen. |
| | "L3C.1=1" | FIL TI (# of samples in average) cannot be locked out. |
| | "L3C.2=0" | SP CNF (mode of action of setpoints 1 & 2 LEDs, transistors and relays) can be selected. |
| | "L3C.2=1" | SP CNF (mode of action of setpoints 1 & 2 LEDs, transistors and relays) cannot be locked out. |
| | "L3C.3=0" | AL CNF (mode of action of Setpoints 3 & 4, often used as alarms) can be locked out. |

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU | CONDITION |
|---|---|---|
| "L3 CNF" | "L3C.3=1" | AL CNF (mode of action of setpoints 3 & 4, often used as alarms) cannot be locked out. |
| | "L3C.4=0" | AL FNC (Setpoints 3 & 4 independent or ganged with Setpoints 1 and 2) can be selected. |
| | "L3C.4=1" | AL FNC (Setpoints 3 & 4 independent or ganged with Setpoints 1 and 2) cannot be accessed. |
| | "L3C.5=0" | AL RDG (# of out-of-range readings before trip of setpoints 3 & 4) can be selected. |
| | "L3C.5=1" | AL RDG (# of out-of-range readings before trip of setpoints 3 & 4) cannot be accessed. |
| | "L3C.6=0" | SP DB (hysteresis or deadband of Setpoints and Alarms) can be specified. |
| | "L3C.6=1" | SP DB (hysteresis (deadband) of Setpoints and Alarms) cannot be accessed. |
| | "L3C.7=0" | OUT.CNF (analog & BCD outputs, setpoint display flashing) can be specified. |
| | "L3C.7=1" | OUT.CNF (analog & BCD outputs, setpoint display flashing) cannot be accessed. |
| | "L3C.8=0" | OT.SC.OF (2-data-point method for independent analog-output scale/offset) can be entered. |
| | "L3C.8=1" | OT.SC.OF (2-data-point method for independent analog-output scale/offset) cannot be accessed. |

* The **'MIN'** button allows you to sequence through L3C.1, L3C.2, L3C.3, L3C.4, L3C.5, L3C.6, L3C.7, and L3C.8.

The **'MAX'** button allows you to select the "0" or "1" state for each "L3C" condition.

The **'MENU'** button stores the selected values for all "L3C" condition(s) changed and advances the meter to "L4 CNF". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

Every underlined "0" or "1" state is the factory preset value.

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU | CONDITION |
|---|---|---|
| "L4 CNF": | | LOCKOUT CONFIGURATION #4 |
| | "L4C.1=0" | BAUD (communication rate) can be chosen. |
| | "L4C.1=1" | BAUD (communication rate) cannot be accessed. |
| | "L4C.2=0" | SER.CNF (parity/stop-bit length) is selectable. |
| | "L4C.2=1" | SER.CNF (parity/stop-bit length) is not selectable. |
| | "L4C.3=0" | ADDRES (meter address # on a multipoint bus) can be changed. |
| | "L4C.3=1" | ADDRES (meter address # on a multipoint bus) cannot be accessed. |
| | "L4C.4=0" | DAT FT & BUS FT (format of data stream and bus interaction for digital communications) can be altered. |
| | "L4C.4=1" | DAT FT & BUS FT (format of data stream and bus interaction for digital communications) cannot be accessed. |
| | "L4C.5=0" | SERCNT (interval # of readings for the automatic digital output of meter) can be changed. |
| | "L4C.5=1" | SERCNT (interval # of readings for the automatic digital output of meter) cannot be accessed. |
| | "L4C.6=0" | Analog output trim input can be entered. |
| | "L4C.6=1" | Analog output trim input cannot be entered. |

* The **'MIN'** button allows you to sequence through L4C.1, L4C.2, L4C.3, L4C.4, L4C.5 and L4C.6.

The **'MAX'** button allows you to select the "0" or "1" state for each "L4C" condition.

The **'MENU'** button stores the selected values for all "L4C" condition(s) changed and advances the meter to "INPUT". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

Every underlined "0" or "1" state is the factory preset value.

## 9.2 METER FUNCTION MENUS

### 9.2.1 Input

By pressing the **'MAX'** and **'MENU'** buttons you can select "BRIDGE". Refer to the chart below to go the next level of programming of the meter.

**NOTE:** Current, voltage or potentiometer inputs and their respective signal input ranges are selected via the push-on jumpers located at S2 on the top of the meter. Refer to Section 6 for a detailed explanation of these setting and signal ranges.

### 9.2.2 RDG.CNF (Reading Configuration)

Reading configuration is used to select:

- reading scale and offset (direct vs 2-point) [RDG.1]
- active or independent decimal point [RDG.2]
- display brightness [RDG.3]
- leading zero suppression on your meter display [RDG.4]

Direct scale and Offset: these two values are used in the straight line equation, y = mx + b. (RD.SC.OF)

Display = m times input plus b or [ m (input) + b ] (where m is the RDG SC and b is the RDG OF).

RDG.6 enables or disables (RD.SC.OF), (RDG,SC), (RDG.OF).

The 2-data-point method allows the user to use two known points to convert from one scale to another. For example, to convert from degrees Fahrenheit to degrees Celsius, enter two (2) known points, such as 32°F = 0°C and 0°F = 17.77°C. The meter will automatically compute scale and offset and display the correct value.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "RDG.CNF": | | READING CONFIGURATION |
| | | Reading Scale & Offset: |
| | "RDG.1=0" | Direct Format |
| | "RDG.1=1" | 2-Coordinate format |
| | | Decimal point effect: |
| | "RDG.2=0" | Active |
| | "RDG.2=1" | Independent |
| | | Display Brightness: |
| | "RDG.3=0" | Normal |
| | "RDG.3=1" | 50% of Normal |
| | | Leading Zeros on Display: |
| | "RDG.4=0" | Displayed |
| | "RDG.4=1" | Not Displayed |
| | "RDG.5=0" | Unit of Temperature: |
| | "RDG.5=1" | NOT USED WITH |
| | "RDG.5=2" | STRAIN GAGE |
| | | Reading Scale & Offset Functions: |
| | "RDG.6=0" | Disables Reading Scale and Offset (RDG SC=1.0, RDG OF=0.0) |
| | "RDG.6=1" | Enables Reading Scale and Offset (Uses scale and offset values entered by user) |
| | | Resetting Mode: |
| | "RDG.7=0" | Grounding P2-5 causes Hard Reset (RESET 2) |
| | "RDG.7=1" | Grounding P2-5 causes Peak/Valley (HI/LO) Reset |

* The **'MIN'** button allows you to sequence through RDG.1, RDG.2, RDG.3, RDG.4, RDG.5, RDG.6, and RDG.7.

The **'MAX'** button allows you to select the "0" or "1" state for each "RDG" condition.

The **'MENU'** button stores the selected values for all "RDG.CNF" condition(s) changed and advances the meter to "RD SC". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

Every underlined "0" or "1" state is the factory preset value.

### 9.2.3 RDG SC (Reading Scale) And RDG OF (Reading Offset)

Typically, this would be used only when you cannot connect a known load to your meter, you require a display with 3 or more positions to the right of the decimal point position, you have scaled your meter using Input Scale and Offset (“IN.SC.OF”) and want to enter a constant multiplying factor, or you have an extremely large offset.

If “RDG.1=0” were chosen, then you go automatically into “RDG SC” and “RDG OF” where:

“RDG SC” is reading scale from -99999 to +499999 where you set the display to “1.00000” and “RDG OF” is reading offset from -99999 to 999999 when you set the display to “000000”.

When “RDG SC” is displayed, press the **‘MIN’** button to see the previously-set value. Process measurement scale is set to “1.00000” using the ‘**MIN**/**MAX**’ buttons. Store by pressing the **‘MENU’** button.

For “RDG OF”, you may choose to enter a reference temperature offset here (e.g., “-100.00”) so that the display will read deviation of the input from the boiling point (or some other temperature).

If “RDG.1 = 1” were chosen, then you go automatically into “RD.SC.OF”.

*Note* ☞

Direct reading offset “RDG OF” now has programmable decimal point position. This makes the decimal point independent of the display decimal point and allows larger offset values.

| MENU BUTTON MAIN MENU | MIN/MAX* BUTTON SUB MENU 1 | MIN/MAX /MENU** BUTTON SUB MENU 2 | DESCRIPTION |
|---|---|---|---|
| "RD.SC.OF": | | | READING SCALE & OFFSET |
| | INPUT 1 | | Item #1 of Coordinate #1 |
| | | 000000. ("00000.0") | Enter the first value displayed by the meter. |
| | READ 1 | | Item #2 of Coordinate #1. |
| | | 000000. ("00000.0") | Enter first desired value. |
| | INPUT 2 | | Item #1 of Coordinate #2. |
| | | 000000. ("10000.0") | Enter the second value displayed by the meter. |
| | READ 2 | | Item #2 of Coordinate #2. |
| | | 000000. ("10000.0") | Enter second desired value. |

* The **'MIN'** button allows you to sequence through "INPUT 1", "READ 1", "INPUT 2", and "READ 2" headings.

The **'MAX'** button sends you to the value corresponding to "INPUT 1", "READ 1", "INPUT 2", or "READ 2" so you can change it (go to the SUB MENU 2 item).

** The **'MIN'** button allows you to step through the digits of the applicable number being changed.

The **'MAX'** button changes the value of the digit to be displayed.

The **'MENU'** button stores the selected values for each input required in "RD.SC.OF". After the last value ("READ 2") has been entered and the **'MENU'** button is pressed, the meter display will advance to "IN CNF".

Every underlined item is the factory preset value.

Note ☞

Meter now stores all scale and offset values for "IN.SC.OF", "RD.SC.OF", and "OT.SC.OF".

The meter will display previously input values when entering these menus. If system decimal point changes, all values will be modified accordingly; if overflow occurs meter will flash that parameter with 999999.

### 9.2.4 IN CNF (Input Configuration)

Input configuration is used to select:

- 50 or 60 Hz line frequency [INP.1]
- slow or fast read rate [INP.2]
- unipolar or bipolar inputs
- cold junction compensation [INP.5]

INP.1 and INP.2 are related to each other. If your power requirements require 50 Hz, you can have optimum integration in FAST read mode (12/sec). In the FAST mode, you need a jumper in the S1A position on the vertical Signal Input Board. If you set the SLOW read rate, this jumper should be removed to avoid overloading the integrator. SLOW read rate produces less noise.

| MENU BUTTON MAIN MENU | MIN/MAX /MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "IN CNF": | | INPUT CONFIGURATIONS |
| | | Line Frequency: |
| | "INP.1=0" | 60 Hz |
| | "INP.1=1" | 50 Hz |
| | | Read Rate: |
| | "INP.2=0" | Slow |
| | "INP.2=1" | Fast |
| | | Input Voltage: |
| | "INP.3=0" | Unipolar |
| | "INP.3=1" | Bipolar |
| | | Transmitter Type: |
| | "INP.4=0" | No Transmitter |
| | "INP.4=1" | Not used |
| | "INP.4=2" | Not used |
| | "INP.4=3" | Not used |
| | | Bridge Mode: |
| | "INP.5=0" | Normal Operation |
| | "INP.5=1" | Setpoint 1 value would be lower overload limit and Setpoint 2 value would be upper overload limit |
| | "INP.6=0" | Disabled |
| | "INP.6=1" | Enabled |
| | | Type of Reading: |
| | "INP.7=0" | Non Ratiometric |
| | "INP.7=1" | Ratiometric |

* The **'MIN'** button allows you to sequence through INP.1, INP.2, INP.3, INP.4, INP.5, INP.6, and INP.7.

  The **'MAX'** button allows you to select the "0" or "1" state for each "INP" condition.

  The **'MENU'** button stores the selected values for all "IN CNF" condition(s) changed and advances the meter to "IN.SC.OF". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

  Every underlined "0" or "1" state is the factory preset value.

### 9.2.5 IN.SC.OF (Input Scale and Offset)

Refer to Section 8 for a detailed discussion of this feature.

Input scale and offset is typically used when you want to scale your meter (using two input data points):

| MENU BUTTON MAIN MENU | MIN/MAX * BUTTON SUB MENU 1 | MIN/MAX/ MENU ** BUTTON SUB MENU 2 | DESCRIPTION |
|---|---|---|---|
| "IN.SC.OF": | | | INPUT SCALE OFFSET |
| | | | Input scale and offset in |
| | | | 2-Coordinate Format |
| | INPUT 1 | | Item #1 of Coordinate #1. |
| | | 000000. ("<u>000000.</u>") | Enter the first value displayed by the meter. |
| | READ 1 | | Item #2 of Coordinate #1. |
| | | 000000. ("<u>000000.</u>") | Enter first desired value. |
| | INPUT 2 | | Item #1 of Coordinate #2. |
| | | 000000. ("<u>100000.</u>") | Enter the second value displayed by the meter. |
| | READ 2 | | Item #2 of Coordinate #2. |
| | | 000000. ("<u>100000.</u>") | Enter second desired value. |

* The **'MIN'** button allows you to sequence through "INPUT 1", "READ 1", "INPUT 2", and "READ 2" headings.

  The **'MAX'** button sends you to the value that corresponds to "INPUT 1", "READ 1", "INPUT 2", or "READ 2" so you can change it (go to the SUB MENU 2 item).

** The **‘MIN’** button allows you to sequence through the digits of the applicable number being changed.

The **‘MAX’** button changes the value of the digit to be displayed.

The **‘MENU’** button stores the selected values for each input required in “IN.SC.OF”. After the last value (“READ 2”) has been entered and the **‘MENU’** button is pressed, the meter display will advance to “DEC PT”.

Pressing the **‘MENU’** button allows you go to the next SUB MENU 1 item automatically.

After changing the last value at the bottom of the chart, pressing the **‘MENU’** button once more stores everything that was changed and advances the meter to the next configuration (“DEC PT”).

Every underlined item is the factory preset value.

### 9.2.6 DEC PT (Decimal Point)

Refer to Section 8 for a detailed discussion of this feature.

Decimal point is used to select the resolution of your meter display such as in one degree, tenths of a degree, hundredths of a degree or more.

If “ERR 01” is displayed, check that “RDG OF” is within the display range.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON CONDITION | DESCRIPTION |
|---|---|---|
| “DEC PT”: | | DECIMAL POINT POSITION |
| | “FFFFFF.” | Position 1 |
| | “FFFFF.F” | Position 2 |
| | “FFFF.FF” | Position 3 |
| | “FFF.FFF” | Position 4 |
| | “FF.FFFF” | Position 5 |
| | “F.FFFFF” | Position 6 |

* Press the **‘MIN’** button to show all “F’s” on the display.

Press the **‘MAX’** button to move the decimal point.

Press the **‘MENU’** button to store the decimal point location and the meter will advance to “CNT BY”.

The underlined item is the factory preset value.

### 9.2.7 CNT BY (Count By)

Count by is used to round off the meter values by 1's, 2's, 5's, 10's, 20's, 50's, or 100's. This feature is normally set to "001" so that the display shows all possible values for the least-significant digit.

If the combination of input-signal noise and selected resolution is high, however, your meter can round off the display to the nearest 2, 5, 10, 20, 50 or even 100 digits. This can eliminate annoying display jitter without introducing any filter time delays.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "CNT BY": | | COUNT BY ROUNDING OFF THE VALUE |
| | "<u>001</u>" | |
| | "002" | (the decimal point |
| | "005" | position is ignored) |
| | "010" | |
| | "020" | |
| | "050" | |
| | "100" | |

* Press the **'MIN'** button to show "001", "002", "005", "010", "020", "050", or "100".

Press the **'MAX'** button to select one of the above.

Press the **'MENU'** button to store the Count By number and the meter will advance to "FIL.CNF".

The underlined item is the factory preset value.

### 9.2.8 FIL.CNF (Filter Configuration)

Filter configuration is used to select:

- Adaptive Bandwidth Control (ABC) filtering or moving average filter [FIL.1]
- whether the value displayed on the meter is filtered or unfiltered [FIL.2]
- whether the value sent to the optional analog output is filtered or unfiltered [FIL.3]

"FIL.1=0" for Adaptive Bandwidth Control (ABC filtering, which averages over a larger number of samples when the input is not moving, but drops down to no averaging for systematic input changes). "FIL.1=1" is for averaging over a fixed number of samples. The number of samples to be used is selected in "FIL TI".

"FIL.3=0" removes the selected filtering from the analog output (if that option is installed in your meter). "FIL.3=1" puts the selected filtering on that output. Usually you choose "FIL.3=0", relying on the signal conditioning available at the device receiving the analog output data.

| MENU BUTTON MAIN MENU | MIN/MAX/ MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "FIL.CNF": | | FILTER CONFIGURATION |
| | | Filter Type: |
| | "FIL.1=0" | ABC Filter |
| | "FIL.1=1" | Moving Average Filter |
| | | Value to be displayed: |
| | "FIL.2=0" | Unfiltered |
| | "FIL.2=1" | Filtered |
| | | Value to be transmitted on Analog Output: |
| | "FIL.3=0" | Unfiltered |
| | "FIL.3=1" | Filtered |
| | "FIL.3=2" | Peak value |
| | "FIL.3=3" | Valley value |

The **'MIN'** button allows you to sequence through FIL.1, FIL.2, and FIL.3.

The **'MAX'** button allows you to select the "0", "1", "2", or "3" state for each "FIL" condition.

The **'MENU'** button stores the selected values for all "FIL.CNF" condition(s) changed and advances the meter to "FIL TI". Do not press the **'MENU'** button after each change within the submenu or the meter will advance to the next menu item.

Adaptive Bandwidth Control takes the average of the samples except when the input is rapidly changing. Patent applied for.

Every underlined "0", "1", "2", or "3" is the factory preset value.

### 9.2.9 FIL TI (Filter Time Constant)

Filter time constant is used to determine the number of readings the meter will average before displaying an input value. The choices are 001, 002, 004, 008, 016, 032, 064, or 128.

For fixed filtering, the averaged number of samples is fixed; for Automatic Bandwidth Control, the chosen value is the maximum number of samples in the average computed by ABC when the input is not changing significantly (ABC, for slowly-moving signals, filters by averaging the "TI" number of samples, but follows signal changes rapidly by decreasing that averaging number).

Pressing the **'MENU'** button stores your selection and moves on to "RESET 1" and then to "RUN" (unless setpoints, outputs, or communications have been unlocked for programming change)

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "FIL TI": | | FILTER TIME CONSTANT |
| | "001"<br>"002"<br>"004"<br>"008"<br>"016"<br>"032"<br>"<u>064</u>"<br>"128" | Number of readings used in averaging. |

* Press the **'MIN'** button to show "001", "002", "004", "008", "016", "032", "064" or "128".
Press the **'MAX'** button to select one of the above.
Press the **'MENU'** button to store the selection made and to advance the meter to the next menu ("SP CNF").

The underlined item is the factory preset value.

### 9.2.10 SP CNF (Setpoints 1 & 2 Configuration)

Refer to Section 10 for an in-depth discussion of these features.

Setpoint configuration is used to select:

- the active zone of each setpoint to above and below the setting [SPC.1 & SPC.4]
- whether the open-collector output is on or off [SPC.2 & SPC.5]
- whether the reading compared with the setpoints is filtered or unfiltered [SPC.3 & SPC.6]
- enabled or disabled setpoints [SPC.7]
- enabled or disabled setpoint LED displays [SPC.8]

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "SP CNF": | | SETPOINTS 1 & 2 CONFIGURATIONS |
| | | Setpoint 1 Active Zone: |
| | "SPC.1=0" | Above |
| | "SPC.1=1" | Below |
| | | Setpoint 1 open-collector or relay output Active ON or OFF: |
| | "SPC.2=0" | On |
| | "SPC.2=1" | Off |
| | | Filtered/unfiltered reading compared with Setpoint 1 value: |
| | "SPC.3=0" | Unfiltered |
| | "SPC.3=1" | Filtered |
| | | Setpoint 2 Active zone: |
| | "SPC.4=0" | Above |
| | "SPC.4=1" | Below |
| | | Setpoint 2 open-collector or relay output Active ON or OFF: |
| | "SPC.5=0" | On |
| | "SPC.5=1" | Off |
| | | Filtered/unfiltered reading compared with Setpoint 2 value: |
| | "SPC.6=0" | Unfiltered |
| | "SPC.6=1" | Filtered |
| | | Setpoints 1 & 2 action: |
| | "SPC.7=0" | Enabled |
| | "SPC.7=1" | Disabled |
| | | Setpoint 1 & 2 LEDs action: |
| | "SPC.8=0" | Enabled |
| | "SPC.8=1" | Disabled |

* The **'MIN'** button allows you to sequence through SPC.1, SPC.2, SPC.3, SPC.4, SPC.5, SPC.6, SPC.7 and SPC.8.

The **'MAX'** button allows you to select the "0" or "1" state for each "SPC" condition.

The **'MENU'** button stores the selected values for each "SPC" condition changed and advances the meter to the next configuration ("AL CNF").

Every underlined "0" or "1" is the factory preset value.

### 9.2.11 AL CNF (Alarm Configuration)

Refer to Section 10 for an in-depth discussion of these features.

Alarm configuration is used to select:

- the active zone for each alarm point to above or below the setting [ALC.1 & ALC.4]
- whether the open-collector output is on or off [ALC.2 & ALC.5]
- whether the readings compared with the alarm points are filtered or unfiltered [ALC.3 & ALC.6]
- enabled or disabled alarm points [ALC.7]

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "AL CNF": | | ALARMS 1 & 2 (SETPOINTS 3 & 4) CONFIGURATIONS |
| | | Alarm 1 Active zone (Setpoint 3): |
| | "ALC.1=0" | Above |
| | "ALC.1=1" | Below |
| | | Alarm 1 open-collector or relay output Active ON or OFF: |
| | "ALC.2=0" | On |
| | "ALC.2=1" | Off |
| | | Filtered/unfiltered reading compared with Alarm 1 (Setpoint 3) value: |
| | "ALC.3=0" | Unfiltered |
| | "ALC.3=1" | Filtered |
| | | Alarm 2 Active zone (Setpoint 4): |
| | "ALC.4=0" | Above |
| | "ALC.4=1" | Below |

*continued next page*

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| | | Alarm 2 open-collector or relay output Active ON or OFF: |
| | "ALC.5=0" | On |
| | "ALC.5=1" | Off |
| | | Filtered/unfiltered reading compared with Alarm 2 (Setpoint 4) value: |
| | "ALC.6=0" | Unfiltered |
| | "ALC.6=1" | Filtered |
| | | Alarms 1 & 2 (Setpoints 3 & 4) action and LEDs: |
| | "ALC.7=0" | Enabled |
| | "ALC.7=1" | Disabled |
| | | Alarm reset at P2-11 connector: |
| | "ALC.8=0" | Disabled |
| | "ALC.8=1" | Enabled |

* The **'MIN'** button allows you to sequence through ALC.1, ALC.2, ALC.3, ALC.4, ALC.5, ALC.6, ALC.7 and ALC.8.

The **'MAX'** button allows you to select the "0" or "1" state for each "ALC" condition.The **'MENU'** button stores the selected values for each "ALC" condition changed and advances the meter to the next configuration ("AL FNC").

Every underlined "0" or "1" is the factory preset value.

### 9.2.12 AL FNC (Alarm Function)

Refer to Section 10 for an in-depth discussion of these features.

Alarm function is used to select:

- whether the alarms are used in the process, high-deviation, low-deviation or band deviation modes [ALF.1 & ALF.3]
- whether or not to latch the alarms [ALF.2 & ALF.4]

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "AL FNC": | | ALARMS 1 & 2 FUNCTION |
| | | Alarm 1 State: |
| | "ALF.1=0" | Process Mode |
| | "ALF.1=1" | High Deviation Mode |
| | "ALF.1=2" | Low Deviation Mode |
| | "ALF.1=3" | Band Deviation Mode |
| | | Alarm 1 Latch Action: |
| | "ALF.2=0" | Unlatched |
| | "ALF.2=1" | Latched |
| | | Alarm 2 State: |
| | "ALF.3=0" | Process Mode. Process Mode means the deadband is equally above and below the setpoint. |
| | "ALF.3=1" | High Deviation Mode |
| | "ALF.3=2" | Low Deviation Mode |
| | "ALF.3=3" | Band Deviation Mode |
| | | Alarm 2 Latch Action: |
| | "ALF.4=0" | Unlatched |
| | "ALF.4=1" | Latched |

* The **'MIN'** button allows you to sequence through ALF.1, ALF.2, ALF.3 and ALF.4.

The **'MAX'** button allows you to select the "0", "1", "2", or "3" state for each "ALF" condition.

The **'MENU'** button stores the selected values for each "ALF" condition changed and advances the meter to the next configuration ("AL RDG").

Every underlined item is the factory preset value.

### 9.2.13 AL RDG (Alarm Readings)

Refer to Section 10 for an in-depth discussion of these features.

Alarm reading is used to select the number of readings (from 01 to 15) the meter must make prior to activating the alarms.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "AL RDG": | | ALARM NUMBER OF READINGS |
| | "00 00" ("03 03") | Number of readings to delay activation of Alarms 1 & 2 (from "01" to "15") (AL1), (AL2) |

* Press the **'MIN'** button to show the current number of readings on the display (left pair of digits are flashing).

The **'MAX'** button is used to change the value of the flashing digits (from 01 to 15).

Pressing the **'MIN'** button allows you go to the second set of digits.

The **'MAX'** button is used to change the value of the flashing digits.

After changing the last number, if necessary, pressing the **'MENU'** button stores everything that was changed and advances the meter to the next configuration ("SP DB").

The underlined item is the factory preset value.

### 9.2.14 SP DB (Setpoint Deadband)

Refer to Section 10 for an in-depth discussion of these features.

Setpoint deadband is used to select the amount of hysteresis for the setpoints (programmable from “0000” to “9999”).

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| “SP DB”: | | SETPOINTS 1 & 2 DEADBAND |
| | “0000” (“0020”) | Hysteresis for (with system decimal points) Setpoints1 and 2 (Programmable from”0000” to “9999”) |

* Press the **‘MIN’** button to show the value on the display.

The **‘MIN’** button also allows you to sequence through the digits of the number being changed.

The **‘MAX’** button changes the value of the digit to be displayed.

The **‘MENU’** button stores the selected values for each “SP DB” condition changed and advances the meter to the next configuration (“AL DB”):

The underlined item is the factory preset value.

### 9.2.15 AL DB (Alarm Deadband)

Refer to Section 10 for an in-depth discussion of these features.

Alarm deadband is used to select the amount of hysteresis for the alarms (programmable from “0000” to “9999”).

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| “AL DB”: | | ALARMS 1 & 2 DEADBAND |
| | “0000” (“0020”) | Hysteresis for (with system decimal points) Alarms 1 & 2 (Programmable from “0000” to “9999”) |

* Press the **‘MIN’** button to show the value on the display.

The **‘MIN’** button also allows you to sequence through the digits of the number being changed.

The **‘MAX’** button changes the value of the digit to be displayed.

Press the **‘MENU’** button to store the changes and advances the meter to the next configuration (“OUT.CNF”).

The underlined item is the factory preset value.

### 9.2.16 OUT.CNF (Output Configuration)

Output configuration is used to select:

- whether or not to send data to the optional analog output board [OUT.1]
- the analog output signal of 0-10 V dc or 4-20 mA DC [OUT.2]
- whether or not to send data to the optional BCD output board [OUT.3]
- to send peak value via the optional BCD output board [OUT.4]
- to select type of BCD output [OUT.5]
- enable or disable the flashing display [OUT.6]

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "OUT.CNF": | | OUTPUT CONFIGURATION |
| | | Data on the Analog Output Board: |
| | "OUT.1=0" | Disabled |
| | "OUT.1=1" | Enabled |
| | | Analog Output Mode: |
| | "OUT.2=0" | 0-1 V, 0-5 V, 1-5 V, 0-10 V |
| | "OUT.2=1" | 0-20 mA or 4-20 mA |
| | | Data out on Parallel BCD Board: |
| | "OUT.3=0" | Disabled |
| | "OUT.3=1" | Enabled |
| | | Type of data out on BCD Board: |
| | "OUT.4=0" | Display |
| | "OUT.4=1" | Peak |
| | | BCD Output: |
| | "OUT.5=0" | Used for standard parallel printers. |
| | "OUT.5=1" | Used for Specialty printers. |
| | | Type of Display Flashing: |
| | "OUT.6=0" | Disabled - display flashing. |
| | "OUT.6=1" | SP1 active - display flashing. |
| | "OUT.6=2" | SP2 active - display flashing. |
| | "OUT.6=3" | SP3 active - display flashing. |
| | "OUT.6=4" | SP4 active - display flashing. |
| | "OUT.6=5" | any SP active - display flashing. |

* The **'MIN'** button allows you to sequence through OUT.1, OUT.2, OUT.3, OUT.4, OUT.5, and OUT.6.

The **'MAX'** button allows you to select the "0", "1", "2", "3", "4" or "5" state for each "OUT" condition.

The **'MENU'** button stores the selected values for each "OUT" condition changed and advances the meter to the next configuration ("OT.SC.OF").

Every underlined item is the factory preset value.

### 9.2.17 OT.SC.OF (Output Scale and Offset)

Output scale and offset is used to calibrate your optional analog output to correspond to the engineering units you desire.

| MENU BUTTON MAIN MENU | MIN/MAX * BUTTON SUB MENU 1 | MIN/MAX/ MENU ** BUTTON SUB MENU 2 | DESCRIPTION |
|---|---|---|---|
| "OT.SC.OF": | | | OUTPUT SCALE & OFFSET |
| | READ 1 | | Item #1 of Coordinate #1. |
| | | 000000. ("000000.") | Enter the first value displayed by the meter. |
| | OUTPT1 | | Item #2 of Coordinate #1. |
| | | 00.0000 ("04.0000") | Enter first desired output value. |
| | READ 2 | | Item #1 of Coordinate #2. |
| | | 000000. ("100000.") | Enter the second value displayed by the meter. |
| | OUTPT2 | | Item #2 of Coordinate #2. |
| | | 00.0000 ("20.0000") | Enter second desired output value. |

* The **'MIN'** button allows you to sequence through "READ 1", "OUTPT1", "READ 2", and "OUTPT2" headings.

The **'MAX'** button sends you to the value corresponding to "READ 1", "OUTPT1", "READ 2", and "OUTPT2" so you can change it (go to the SUB MENU 2 item).

** The **'MIN'** button allows you to step through the digits of the applicable number being changed.

The **'MAX'** button changes the value of the digit to be displayed.

The **'MENU'** button stores the selected values for each input required in "OT.SC.OF". After the last value ("READ 2") has been entered and the **'MENU'** button is pressed, the meter display will advance to "BAUD".

Every underlined item is the factory preset value.

### 9.2.18 BAUD (Baud Rate)

Baud is used to select the baud rate for communication via the optional RS-232 or RS-485 communications boards. The choices are 300, 600, 1200, 2400, 4800, 9600, and 19200.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "BAUD": | | BAUD RATE |
| | "00300" | |
| | "00600" | |
| | "01200" | Select baud rate for |
| | "02400" | communications via |
| | "04800" | RS-232 or RS-485 |
| | "09600" | |
| | "19200" | |

* Press the **'MIN'** button to show "00300", "00600", "01200", "02400", "04800", "09600", or "19200".

Press the **'MAX'** button to select one of the above.

Press the **'MENU'** button to store the changes and the meter advances to the next configuration ("SERCNF").

The underlined item is the factory preset value.

### 9.2.19 SERCNF (Serial Communication Configuration)

Serial communication configuration is used to select:

- no parity, odd parity, or even parity for communications [SER.1]
- 1 stop bit or 2 stop bits [SER.2]
- No parity, 1 stop is not allowed

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "SERCNF": | | SERIAL COMMUNICATION CONFIGURATION |
| | | Select parity for communications via RS-232 or RS-485: |
| | "SER.1=0" | No parity |
| | "SER.1=1" | Odd parity |
| | "SER.1=2" | Even parity |
| | | Select stop bits for communications via RS-232 or RS-485: |
| | "SER.2=0" | 1 Stop Bit |
| | "SER.2=1" | 2 Stop Bits |

* The **'MIN'** button allows you to toggle between SER.1 and SER.2.

The **'MAX'** button allows you to select the "0", "1", or "2" state for each "SER" condition.

The **'MENU'** button stores the selected values for each "SER" condition changed and advances the meter to the next configuration ("ADDRES").

Every underlined "0", "1" or "2" is the factory preset value.

Note ☞

**NOTE:** Only 7 data bit communication is supported

### 9.2.20 ADDRESS (Multipoint Communications Device Address)

Address is used to give each meter a unique address while on a local area network using the optional RS-485 board.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "ADDRES": | | MULTIPOINT COMMUNICATIONS DEVICE ADDRESS |
| | "000" ("001") | Enter address as an integer value: "000" to "199" |

* Press the **'MIN'** button to show the value on the display.

The **'MIN'** button also allows you to change the position of the digit being changed.

The **'MAX'** button changes the value of the digit to be displayed.

Press the **'MENU'** button to store the changes and advances the meter to the next configuration ("DAT FT").

The underlined item is the factory preset value.

### 9.2.21 DAT FT (Data Format)

Data format is used to set all the parameters to be transmitted via the optional RS-232 or RS-485 serial communications board.
Data format allows you to select:

- whether to transmit Alarm 1 or 2 status character [DAT.1]
- whether to transmit peak and valley status character [DAT.2]
- whether or not the data transmitted is filtered or unfiltered [DAT.3 & DAT.4]
- whether or not to transmit the peak and valley readings [DAT.5 & DAT.6]
- the type of separator [DAT.7]
- whether or not to transmit the unit of measure [DAT.8]

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "DAT FT": | | DATA FORMAT |
| | | Alarms 1 & 2 Status Character: |
| | "DAT.1=0" | Excluded |
| | "DAT.1=1" | Included |
| | | HI/LO (Peak/Valley) Status Character: |
| | "DAT.2=0" | Excluded |
| | "DAT.2=1" | Included |
| | | Filtered Value to be transmitted: |
| | "DAT.3=0" | No |
| | "DAT.3=1" | Yes |
| | | Filtered value to be transmitted: |
| | "DAT.4=0" | No |
| | "DAT.4=1" | Yes |
| | | Peak value to be transmitted: |
| | "DAT.5=0" | No |
| | "DAT.5=1" | Yes |
| | | Valley value to be transmitted: |
| | "DAT.6=0" | No |
| | "DAT.6=1" | Yes |
| | | Separator for above items: |
| | "DAT.7=0" | Space |
| | "DAT.7=1" | <CR> |
| | | Unit of measurement to be transmitted: |
| | "DAT.8=0" | No |
| | "DAT.8=1" | Yes |

* The **'MIN'** button allows you to sequence through DAT.1, DAT.2, DAT.3, DAT.4, DAT.5, DAT.6, DAT.7, and DAT.8.

The **'MAX'** button allows you to select the "0" or "1" state for each "DAT" condition.

The **'MENU'** button stores the selected values for each "DAT" condition changed and advances the meter to the next configuration ("BUS FT").

Every underlined "0" or "1" is the factory preset value.

### 9.2.22 BUS FT (Bus Format)

Bus format is to select:

- whether or not to include check sum with reading [BUS.1]
- whether or not to include line feeds [BUS.2]
- whether or not to have the meter respond in echo mode [BUS.3]
- multipoint or point-to-point mode [BUS.4]
- (if in point-to-point mode) select whether to communicate continuously or on command [BUS.5]
- whether a message character is used in handshake or continuous mode [BUS.6]
- whether or not you have installed the RS-485 board [BUS.7]
- whether or not to enable the external print command at P2-11.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| "BUS FT": | | BUS FORMAT |
| | | Check sum with reading: |
| | "BUS.1=0" | Excluded |
| | "BUS.1=1" | Included |
| | | Line feed following all <CR>'s: |
| | "BUS.2=0" | Excluded |
| | "BUS.2=1" | Included |
| | | Response from the meter (echo): |
| | "BUS.3=0" | No |
| | "BUS.3=1" | Yes |
| | | Point to Point mode or Multipoint mode: |
| | "BUS.4=0" | Pt-Pt |
| | "BUS.4=1" | Multi-Pt |
| | | Point-to-Point mode only: |
| | "BUS.5=0" | Continuous |
| | "BUS.5=1" | On Command |
| | | Handshake if continuous mode: |
| | "BUS.6=0" | Message |
| | "BUS.6=1" | Character |
| | | RS-485 Board installed: |
| | "BUS.7=0" | Not installed |
| | "BUS.7=1" | Installed |
| | | Print Command at P2-11: |
| | "BUS.8=0" | Disabled |
| | "BUS.8=1" | Enabled |

* The **‘MIN’** button allows you to sequence through BUS.1, BUS.2, BUS.3, BUS.4, BUS.5, BUS.6, BUS.7 and BUS.8.

The **‘MAX’** button allows you to select the “0” or “1” state for each “BUS” condition.

The **‘MENU’** button stores the selected values for each “BUS” condition changed and advances the meter to the next configuration (“SERCNT”).

Every underlined “0” or “1” state is the factory preset value.

### 9.2.23 SERCNT (Serial Count)

Serial count is used to program the number of readings the meter must take (programmable from “00001” to “59,999”) between transmissions of data via the optional RS-232 or RS-485 serial communications board.

Once you are done with the changes, press the **‘MENU’** button to display the normal operating display. The meter advances to run mode showing the currently measured values. Pressing the **‘RESET’** button two times allows you to return to the run mode.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| “SERCNT”: | | SERIAL COUNT |
| | | This specifies the number of readings between data transmissions: |
| | “00000” (“00001”) | “00001” to “59999” |

* Press the **‘MIN’** button to show the value on the display.

The **‘MIN’** button also allows you to change the position of the digit being changed.

The **‘MAX’** button changes the value of the digit to be displayed.

Press the **‘MENU’** button to store the changes and advances the meter to “RESET 2” and returns to the run mode.

The underlined item is the factory preset value.

Note ☞

**NOTE:** After you complete your programming you may want to go back and remove the jumper in S3A position on the main board to insure against any unauthorized changes.

### 9.2.24 ANALOG OUTPUT CALIBRATION NUMBERS

The analog output calibration numbers (see Figure 12-1) are printed on the optional analog output board. These four numbers (CAL VZ, CAL VS, CAL mAS), must be entered into the meter to ensure that the analog output board is calibrated with the microprocessor.

| MENU BUTTON MAIN MENU | MIN/MAX/MENU * BUTTON SUB MENU | DESCRIPTION |
|---|---|---|
| “CAL VZ” | 0 to 59999 | Calibration number marked on the analog output board must be entered for voltage zero. |
| “CAL VS” | 0 to 59999 | Calibration number marked on the analog output board must be entered for voltage span. |
| “CAL mAZ” | 0 to 59999 | Calibration number marked on the analog output board must be entered for current zero. |
| “CAL mAs” | 0 to 59999 | Calibration number marked on the analog output board must be entered for current span. |

Note ☞

**NOTE:** After you complete your programming you may want to go back and remove the jumper in S3A position on the main board to insure against any unauthorized changes.

Once you are done with the changes, press the **‘MENU’** button to display. The meter advances to run mode showing the currently measured values.

# SETPOINTS/ALARMS

Setpoints 1 through 4 can be configured for a very large variety of zone and level signalling.

SP1 and SP2 have balanced configurable hysteresis and are non-latching, suitable for control-level signalling. SP3 and SP4 are often used as ALarm 1 and ALarm 2, because they have single-sided hysteresis and can be configured for latching action.

The levels of these setpoints are entered during run mode via the front-panel pushbuttons (refer to Section 10.11). Many performance options are entered during the configuration mode (refer to Sections 10.2 through 10.10).

## 10.1 FEATURES OVERVIEW

1. Four full-range levels with many menu programmable features.
2. Independent operation or ganged action (including guard-band assignments).
3. Active above or below level, outside or inside band.
4. SP1 and SP2 have configurable hysteresis, 50% on either side of setpoint.
5. SP3 and SP4 have configurable hysteresis, 100% on inactive side.
6. SP3 and SP4 is configurable for latching action.
7. Setpoint levels can be compared to the unfiltered or filtered input signal measurements.
8. Configurable delays in alarm action.
9. Individual front-panel LED indicators.
10. Four (4) open-collector transistor outputs with clamping diodes, are isolated from signal input.
11. Setpoints can be displayed and reset as desired without interrupting measurements.

Setpoints 1 and 2 have selectable hysteresis, allocated 50% on either side of the setpoint level. A single setpoint can now generate on/off control signals for an operating region defined by the hysteresis. Refer to Figures 10-1 and 10-2 to understand how hysteresis works:

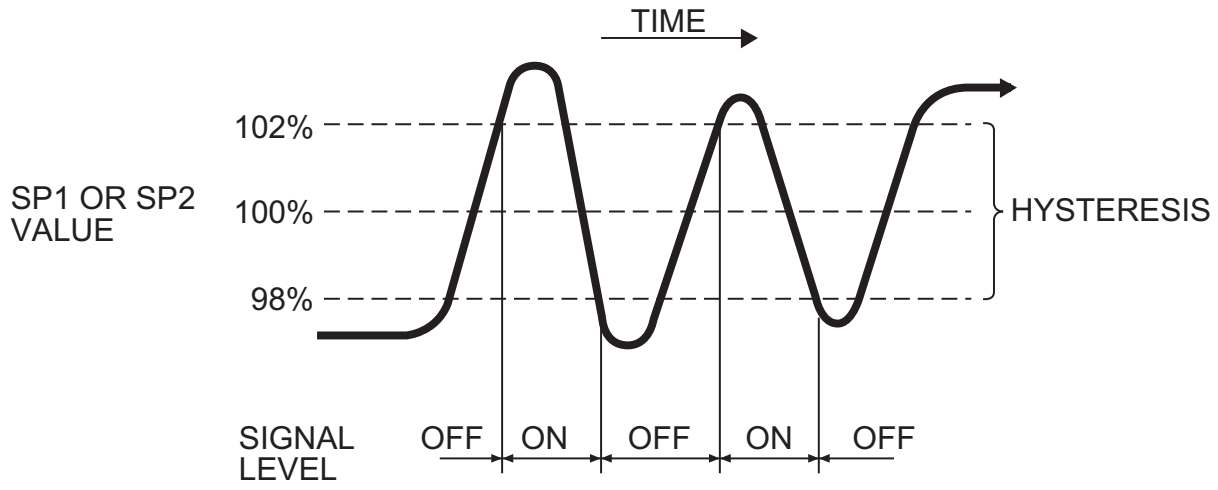



**Figure 10-1. Setpoints 1 & 2 Action (Setpoint at 100 with 4% hysteresis)**

These two setpoints have selectable single-sided hysteresis. When used as alarms, the action is immediate (unless a delay is programmed) going into the alarm zone but turning off is deferred (if latching is not programmed) by the hysteresis amount.

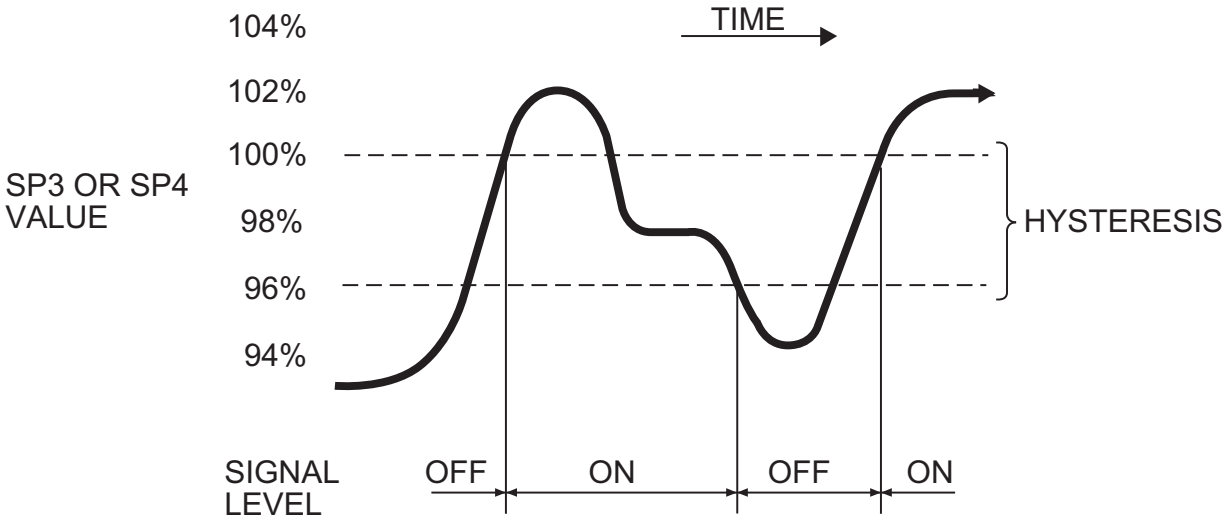



**Figure 10-2. Setpoints 3 & 4 Action**
**(for Low Alarm with Relay on at -100, relay off at -96 with a hysteresis of 4)**

You are now able to program the setpoint features (as described in the following sections).

## 10.2 UNLOCKING THE FEATURES

All setpoint values and features can be set via the front-panel buttons or the optional serial communications boards (RS-232 or RS-422/485). Control from the front-panel buttons can be locked out by jumpers on S3A and S3C on the main board or by setting lockout bits “L3C.2”, and “L3C.6” in Lockout configuration “L3 CNF”.

1. Check that main board jumpers S3A and S3C are installed (to permit memory storage of program and data along with button controls).

*Note* ☞

**NOTE:** Jumper S3B should NOT be installed. This jumper is reserved for factory recalibration!

2. Press the **‘MENU’** button to see “L1 CNF” and then press the **‘MIN’** button to view “L1C.1=0” if “SP 1” is unlocked. If “L1C.1=1”, change to equal “0” by pressing the **‘MAX’** button.
3. Press the **‘MIN’** button again to advance to “L1C.2” and set equal to “0” to unlock “SP 2”.
4. Repeat for “L1C.3=0” and “L1C.4=0” to access “SP 3” and “SP 4”.
5. Press the **‘MENU’** button to save these choices and advance to “L2 CNF”. Skip over “L2 CNF” by pressing the **‘MENU’** button and advance to “L3 CNF”.
6. Press the **‘MIN’** and **‘MAX’** buttons to set “L3C.2=0”, “L3C.3=0”, “L3C.4=0”, “L3C.5=0”, “L3C.6=0”, “L3C.7=0” to gain access to the programming for the setpoints. All changes are then saved by pressing the **‘MENU’** button.

## 10.3 SELECTING “SP CNF” SETPOINT CONFIGURATION FEATURES

These eight bits select the modes for “SP 1” and “SP 2” (see Section 10.5 for “SP 3” and “SP 4”).

1. Press the **‘MENU’** button until “SP CNF” is displayed, then press the **‘MIN’** button to sequence through the selections. Use the **‘MAX’** button to choose alternate choice.
2. “SPC.1=0” makes “SP 1” active ABOVE its level;
   “SPC.1=1” sets “SP 1” active BELOW.
3. “SPC.2=0” turns “SP 1” transistor ON when “SP 1” is active.
   “SPC.2=1” turns it OFF.
4. “SPC.3=0” compares the “SP 1” level to the UNFILTERED measurements.
   “SPC.3=1” compares “SP 1” to the FILTERED measurements.
5. “SPC.4=0” makes “SP 2” active ABOVE setpoint.

   “SPC.4=1” makes “SP 2” active BELOW setpoint.
6. “SPC.5=0” turns “SP 2” transistor ON when “SP 2” is active.
   “SPC.5=1” turns it OFF.

7. “SPC.6=0” compares the “SP 2” level to the UNFILTERED measurements.
   “SPC.6=1” compares “SP 2” to the FILTERED measurements.
8. “SPC.7=0” Enables both setpoints 1 and 2.

   “SPC.7=1” Disables both setpoints 1 and 2.
9. “SPC.8=0” ENABLES the two front-panel LED indicators for setpoints 1 and 2 when you have chosen “SPC.7=0”.

   “SPC.8=1” DISABLES the two front-panel LED indicators for setpoints 1 and 2. (use with caution; recommended only when other external over-range indicators are present).
10. Press the **‘MENU’** button to store your selections and advance to “AL CNF” (Alarm Configuration).

## 10.4 DEVIATION FUNCTION FOR ALARMS

Deviation functions apply to Alarms 1 and 2 (Setpoints 3 and 4) and act as buffer zones to control setpoint action. The Alarm 1 deviation is the sum of the Alarm 1 value plus the Setpoint 1 value; the Alarm 2 deviation is the Alarm 2 value plus the Setpoint 2 value. The four types of deviation functions are Process (no deviation), High, Low, and Deadband. The following illustrate the ways in which the deviation function alters the alarm response.

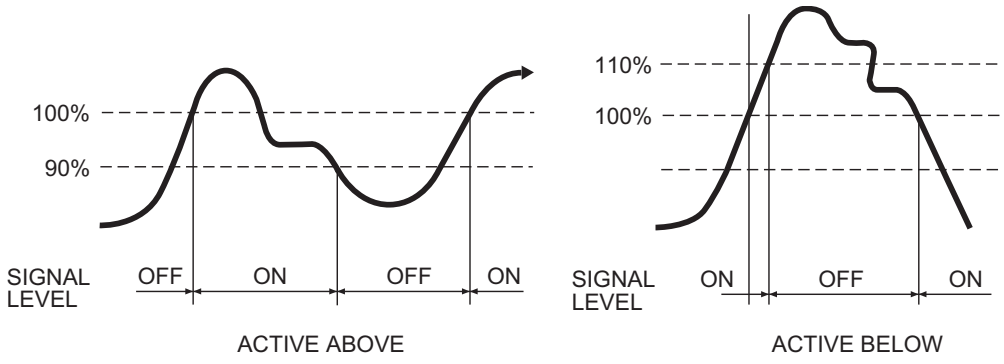



**Figure 10-3. Process Deviation**

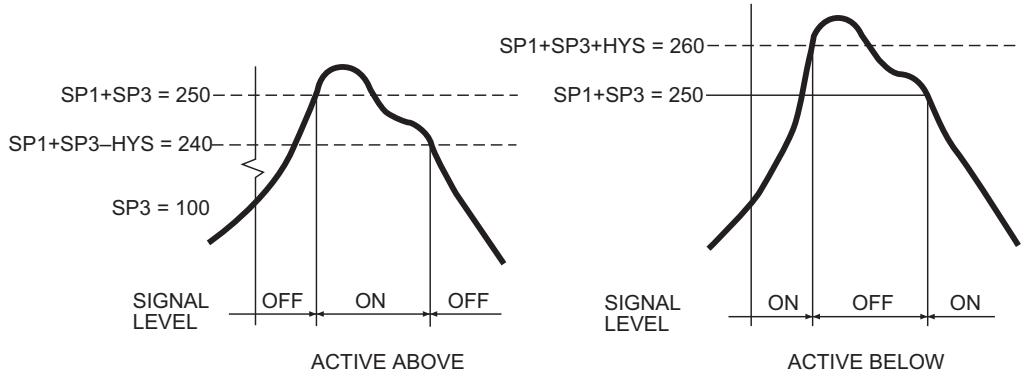



**Figure 10-4. High Deviation for both Active Above and Active Below**

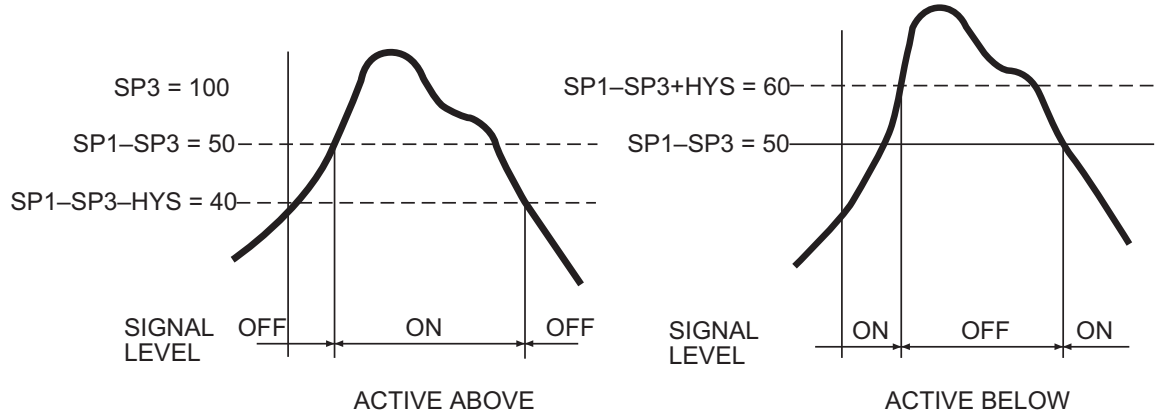



**Figure 10-5. Low Deviation for both Active Above and Active Below**

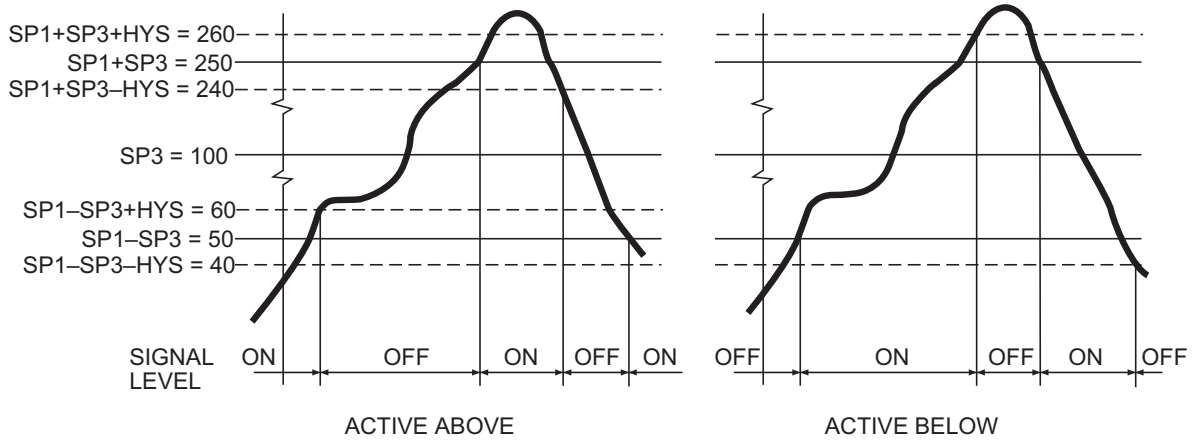



**Figure 10-6. Band Deviation for both Active Above and Active Below**

## 10.5 SELECTING "AL CNF" ALARM CONFIGURATION FEATURES

These bits offer the same selections for "SP 3" and "SP 4" as "SP CNF" did for "SP 1" and "SP 2", except for the last bit, which controls "SP 3" and "SP 4" LATCH reset.

1. "ALC.1=0" makes Alarm 1 (Setpoint 3) active above the Setpoint value.

   "ALC.1=1" makes Alarm 1 (Setpoint 3) active below the Setpoint value.

When Alarm 1 (Setpoint 3) is assigned to place a band about the Setpoint 1 level (by setting "ALF.1=3", described in Section 10.6), "ALC.1=0" makes Alarm 1 (Setpoint 3) active ABOVE and BELOW the band (OUTSIDE the band), with the chosen hysteresis for Alarm 1 (Setpoint 3) now inside the band. If "ALC.1=1", Alarm 1 (Setpoint 3) is active INSIDE the band, with the chosen hysteresis for Alarm 1 (Setpoint 3) now outside the band.

Figure 10-7 Illustrates the Alarm configuration for hysteresis.

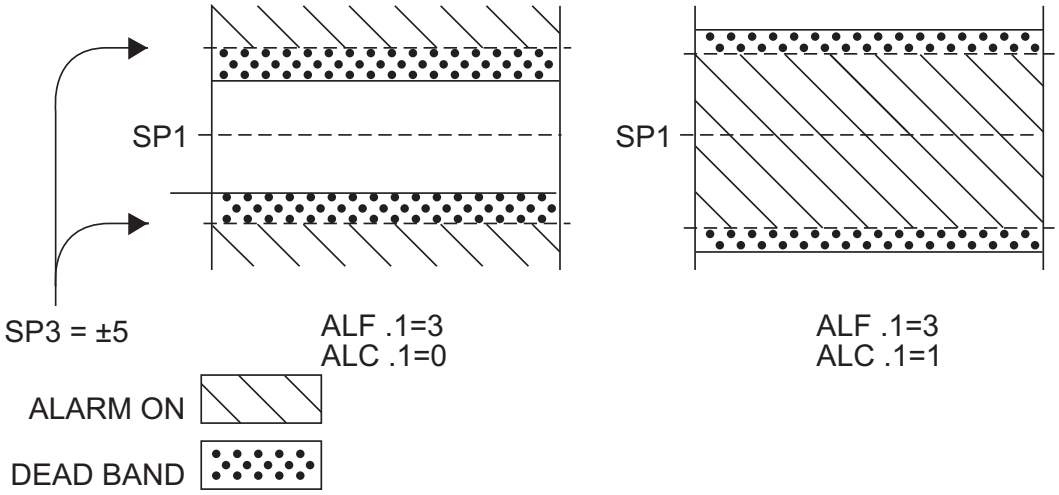



**Figure 10-7. AL CNF Hysteresis**

2. "ALC.2=0" turns the Alarm 1 (Setpoint 3) open-collector output ON when Setpoint 3 is active.

   "ALC.2=1" turns it OFF.

3. "ALC.3=0" compares the Alarm 1 (Setpoint 3) level to the UNFILTERED measurements.

   "ALC.3=1" compares the Alarm 1 (Setpoint 3) level to the FILTERED measurements.

4. "ALC.4=0" makes Alarm 2 (Setpoint 4) active ABOVE the Setpoint value.

   "ALC.4=1" makes Alarm 2 (Setpoint 4) active BELOW the Setpoint value.

When Alarm 2 (Setpoint 4) is assigned to place a band about the Setpoint 4 level (by setting "ALF.1=3", described in Section 10.6), "ALC.4=0" makes Alarm 2 (Setpoint 4) active ABOVE and BELOW the band (OUTSIDE the band), with the chosen hysteresis for Alarm 2 (Setpoint 4) now inside the band. If "ALC.4=1", Alarm 2 (Setpoint 4) is active INSIDE the band, with the chosen hysteresis for Alarm 2 (Setpoint 4) now outside the band.

5. "ALC.5=0" turns the Alarm 2 (Setpoint 4) open-collector output ON when Setpoint 1 is active.

   "ALC.5=1" turns it OFF.

6. "ALC.6=0" compares the Alarm 2 (Setpoint 4) level to the UNFILTERED measurements.

   "ALC.6=1" compares the Alarm 2 (Setpoint 4) level to the FILTERED measurements.

7. “ALC.7=0” ENABLES both Alarms 1 and 2 (Setpoints 3 and 4) action and LEDs.

   “ALC.7=1” DISABLES both Alarms 1 and 2 (Setpoints 3 and 4) action and LEDs.

8. “ALC.8=0” DISABLES Alarm reset at the P2-11 connector.

   “ALC.8=1” ENABLES Alarm reset at the P2-11 connector.

Press the **‘MENU’** button to store any changes and advance to “AL FNC” (Alarm Function).

## 10.6 SELECTING “AL FNC” ALARM FUNCTION FEATURES

This byte allows you to select independent or ganged operation for “SP 3” and “SP 4”, and whether or not they should latch once triggered.

1. “ALF.1=0” makes Alarm 1 (Setpoint 3) INDEPENDENT, with a level equal to the value inserted for Setpoint 3.

   “ALF.1=1” assigns Setpoint 3 (“SP 3”) to Setpoint 1 (“SP 1”), placing it ABOVE Setpoint 1 (“SP 1”) by the amount entered for Setpoint 3 (“SP 3”).

   “ALF.1=2” places “SP 3” BELOW “SP 1” by the amount entered for “SP 3”.

   “ALF.1=3” places “SP 3” ON BOTH SIDES OF “SP 1” by the amount entered for “SP 3”.

2. “ALF.2=0” makes Alarm 1 (Setpoint 3) a NON-LATCHING Alarm.

   “ALF.2=1” makes Alarm 1 (Setpoint 3) LATCHING. This means that once Alarm 1 (Setpoint 3) is triggered it will remain active until it is reset by pressing the **‘RESET’** button one time or by grounding P2-11 when configuration bit “ALC.8=1” is set. Reset can also be accomplished via the optional RS-232 or RS-485 serial communication board.

3. “ALF.3=0” makes “SP 4” INDEPENDENT, with a level equal to the value inserted for “SP 4”.

   “ALF.3=1” assigns “SP 4” to “SP 2”, placing it ABOVE “SP 2” by the amount entered for “SP 4”.

   “ALF.3=2” places “SP 4” BELOW “SP 2” by the amount entered for “SP 4”.

   “ALF.3=3” places “SP 4” ON BOTH SIDES OF “SP 2” by the amount entered for “SP 4”.

4. “ALF.4=0” makes Alarm 2 (Setpoint 4) a NON-LATCHING Alarm.

   “ALF.4=1” makes Alarm 2 (Setpoint 4) LATCHING. This means that once Alarm 2 (Setpoint 4) is triggered it will remain active until it is reset by pressing the **‘RESET’** button one time or by grounding P2-11 when configuration bit “ALC.8=1” is set. Reset can also be accomplished via the optional RS-232 or RS-485 serial communication board.

Press the **‘MENU’** button to store any changes and advance to “AL RDG” (Alarm Reading).

## 10.7 “AL RDG”: ALARM READINGS-SELECT DELAY IN ALARM ACTION

This byte allows you to select the number of input readings required to trigger Alarm 1 (Setpoint 3) and Alarm 2 (Setpoint 4) action.

When “AL RDG” is displayed, press the **‘MIN’** button to see two

2-digit numbers, with the first one flashing, indicating that you can reset the delay for SP3 by pressing the **‘MAX’** button.

After choosing “SP 3” delay, press the **‘MIN’** button and select the delay for “SP 4” by pressing the **‘MAX’** button.

Store your selections or changes by pressing the **‘MENU’** button and advance to “SP DB” (Setpoint Deadband).

## 10.8 “SP DB”: SELECT “SP 1” AND “SP 2” DEADBAND (HYSTERESIS)

The deadband (hysteresis) for Setpoint 1 (“SP 1”) and Setpoint 2 (“SP 2”) is displayed with the same decimal point location as chosen for run mode.

This selected hysteresis value is EVENLY SPLIT on both sides of the levels chosen for “SP 1” and “SP 2”.

View the value by pressing the **‘MIN’** button, reset by pressing the **‘MAX’** button, and store by pressing the **‘MENU’** button. Advance to “AL DB” (Alarm Deadband).

## 10.9 “AL DB”: SELECT ALARM 1 (“SP 3”) AND ALARM 2 (“SP 4”) DEADBAND (HYSTERESIS)

This selected deadband (hysteresis) for Alarm 1 (“SP 3”) and Alarm 2 (“SP 4”) is placed on the INACTIVE side of the selected levels. This results in immediate action (if zero (0) delay is selected in “AL RDG”) when an alarm limit is exceeded, but defers recovery when the input returns to pre-alarm levels.

Press the **‘MIN’** button to view the values, change the values of each flashing digit by pressing the **‘MAX’** button, store any changes by pressing the **‘MENU’** button. Advance to “OUT.CNF” (Output Configuration).

## 10.10 "OUT.CNF": CONTROL FLASHING OF THE DISPLAY

You may wish to bring abnormal conditions to immediate attention by causing the display to flash.
Press the **'MIN'** button to see "OUT.6".
Press the **'MAX'** button to select "0", "1", "2", "3", "4", or "5".

"OUT.6=0" disables display flashing.
"OUT.6=1" flashes the display if SP1 is active.
"OUT.6=2" flashes the display if SP2 is active.
"OUT.6=3" flashes the display if SP3 is active.
"OUT.6=4" flashes the display if SP4 is active.
"OUT.6=5" flashes the display if any SP is active.

Save your choice or changes by pressing the **'MENU'** button and the meter will momentarily display "STORED", then "RUN" and proceed with normal operation ( go into run mode).

## 10.11 ENTERING SETPOINT LEVELS (IN RUN MODE)

When you have completed selecting the setpoint(s) (and other features), the last press of the **'MENU'** button stores any changes and the meter will automatically return to the run mode (the display will momentarily display "RESET2"). The stored values are placed into operation, and the meter proceeds with normal measurements.

Now you can view and reset all four setpoint levels.

1. Press the 'SETPTS' button. The meter now starts its setpoint display cycle; every 15 seconds, the display flashes the SP number, and then displays the value of that setpoint, with a flashing left-hand digit.
2. You can restart the time-out of any of these display intervals by pressing the **'MIN'** button (to shift the flashing [alterable] digit position), or by pressing the **'MAX'** button (to increment the value of that digit).
3. When you change the value of any setpoint and then decide to revert to the original value instead, just press the **'RESET'** button or allow the display to return to "RUN" at the end of its cycle. The meter does not store a new value for the setpoint in either case.
4. To save a newly-entered setpoint value, press the 'SETPTS' button again.
5. You may return to viewing the measurements by pressing the **'RESET'** button or repeatedly pressing the 'SETPTS' button (or by letting the meter complete its setpoint display cycle).

# 11 Peak and Valley Readings

## PEAK AND VALLEY READINGS

The meter examines every new reading to see if it is greater than the stored PEAK or less than the stored VALLEY readings.

If you have unlocked access to these values with “L1C.5=0” and “L1C.6=0” (part of the first lockout byte “L1 CNF”), you can view the PEAK (“HI RDG”) by pressing the **‘MAX’** button, or the VALLEY (“LO RDG”) by pressing the **‘MIN’** button while in the run mode.

Selection of either PEAK or VALLEY causes the display to flash giving the indication that it is NOT the current measurement value. If the meter measures a more extreme value while displaying the PEAK or VALLEY measurement, the new value will immediately replace the old.

Unlike the setpoint display, there is no time out period. Press the ‘SETPTS’ button or **‘MENU’** button to return to current-value display WITHOUT resetting the PEAK or VALLEY memory.

Press the **‘RESET’** button to return to run mode and start a new PEAK/VALLEY measurement period.

The BCD option can be programmed to read the PEAK (but not the VALLEY) instead of the current measurement (refer to Section 13).

Both PEAK and VALLEY readings (and/or a PEAK/VALLEY status summary character) can be transmitted by the RS-232 or RS-422/485 digital communications (refer to Section 15).

The PEAK or VALLEY value can be transmitted via the optional analog output board (refer to Section 12).

# ANALOG OUTPUT OPTION

If you received your meter with the optional analog board installed, you should not have to enter the trim data as described in Section 12.5.

Your meter converts display readings into an independently-scaled-and-offset isolated voltage and/or current analog output. Isolation is accomplished via opto-isolators on the board. Your meter has the capability of transmitting SIMULTANEOUS voltage and current outputs although when this is done, the current analog output is not as accurate.

## 12.1 FEATURES OVERVIEW

1. Precise analog levels are generated from digital code using a proprietary ASIC chip.
2. Voltage (to 10 V) is available at the same time as current (to 22 mA), but the total current drawn should not exceed 24 mA.
3. Load resistance for the voltage output can be as low as 500 ohms (20 mA at 10 V out) when current output is not used.
4. Loop resistance for the current output can be as high as 600 ohms (12 volts compliance) with negligible current from the voltage output.
5. Both outputs are galvanically isolated from both power and measurement circuits of the meter: 354 V per IEC spacing, 500 V test.
6. Precision calibration is applied by the meter to either the voltage output or the current output (but not to both simultaneously). When both outputs are used simultaneously, the non-calibrated output is stable but does require external adjustment if fine-trimming is required.
7. Independent, 15-bit resolution OuTput SCale and OFfset (OT.SC.OF) can convert a wide range of meter readings to the desired current or voltage output span.
8. The output resolution permits good accuracy for turndown ratios (offset/span) as high as 100:1.
9. 50° to 104°F (10° to 40°C) accuracy within 0.1% after installation calibration.
10. 10% to 90% step response time is 50 milliseconds (plus filter delay, if any, programmed for the analog output).
11. Configurable so that output will track the PEAK or VALLEY measurement.

# 12 Analog Output Options

## 12.2 UNLOCKING

1. Press the **'MENU'** button until "L3 CNF" is displayed, then press the **'MIN'** button until "L3C.7" is displayed.
2. Press the **'MAX'** button (if required) to set "L3C.7=0", unlocking the choice of current or voltage as the calibrated output.
3. Press the **'MIN'** button (and the **'MAX'** button if required) to set "L3C.8=0", unlocking OT.SC.OF.
4. Press the **'MENU'** button to store these choices.
5. If your analog board is NEWLY INSTALLED, you will need to enter the four trimming constants (refer to the one-time only procedure in Section 12.5). To unlock this feature, press the **'MIN'** button and then the **'MAX'** button to set "L4C.6=0" and store by pressing the **'MENU'** button.

## 12.3 "OUT.CNF": CONFIGURING THE OUTPUT

1. Press the **'MENU'** button until "OUT.CNF" is displayed, then press the **'MIN'** button to display "OUT.1=0" or "OUT.1=1".
2. Press the **'MAX'** button to set "OUT.1=1" if you wish the analog output to be driven at once when you return to run mode. (You can leave this as "OUT.1=0" and complete all the other programming if you wish to activate the analog output at a later time by returning to this configuration bit).
3. Press the **'MIN'** button (and the **'MAX'** button if required) and set "OUT.2=0" for calibrated VOLT output (0-1 V, 0-5 V, 1-5 V, or 0-10 V) or "OUT.2=1" for calibrated CURRENT (0-20 mA or 4-20 mA) output.
4. Press the **'MENU'** button to store these choices (the rest of the "OUT.CNF" byte controls BCD and display-flashing features).

   After pressing the **'MENU'** button again, you advance to "OT.SC.OF" (Output Scale and Offset).

## 12.4 "OT.SC.OF": SETTING OUTPUT SCALE AND OFFSET

Any two data points can be used here: a data point is specified by a value of the display ("READ") and the desired output ("OUTPT") for that display.

1. Press the **'MIN'** button to see "READ1" and then use the **'MIN'** and **'MAX'** buttons to enter a small display value, for example, "000.000", where the center decimal point position is used as an example.
2. Store this value by pressing the **'MENU'** button and then you see "OUTPT1". Use the **'MIN'** and **'MAX'** buttons to specify the desired output value, for example, "04.0000" if current calibration had been selected ("OUT.2=1"), or "00.0000" for voltage.
3. Store this value by pressing the **'MENU'** button and then advance to "READ2". Use the **'MIN'** and **'MAX'** buttons to enter a large display value, for example, "123.456", for the display that you want the analog output at full scale.

4. Store this value by pressing the **'MENU'** button and then advance to "OUTPT2". Use the **'MIN'** and **'MAX'** buttons to enter the desired output for the display value in step 3. For example, enter "20.0000" for calibrated current or "10.0000" for calibrated voltage.
5. Press the **'MENU'** button to store. Press the **'RESET'** button two times to return to run mode and check calibration points, unless your analog output board is newly installed; in this case, follow Section 12.5.

## 12.5 BOARD INSTALLATION; ENTERING THE TRIM DATA

To precisely calibrate your analog output board with your meter, each analog output board has been supplied with voltage and current zero trim values printed on the board. "CAL VZ" is for the voltage output and "CALmAZ" is for the current output.

Similarly, the fine trim for output gain is "CAL VS" for the voltage output and "CALmAS" for the current output.

These 4 data points are obtained from the factory calibration of each analog output board and are inscribed on the edge of each board, as shown in Figure 12-1.

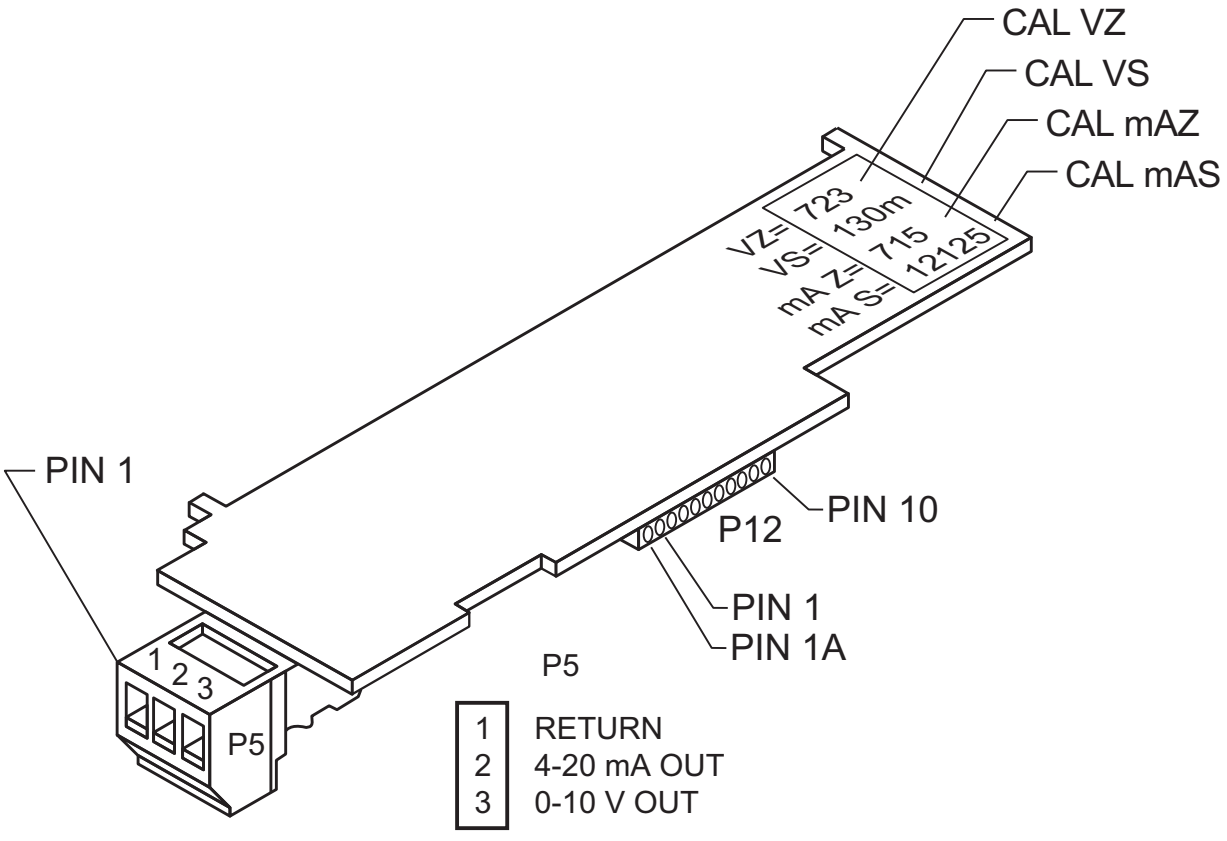



**Figure 12-1. Analog Option Board and Connection Diagram at P5.**

# 12 Analog Output Options

If you are installing an analog output board, follow this “one time only” procedure:

1. Write down the four (4) numbers inscribed on the top edge of your analog output board below:

   CAL VZ = _____

   CAL VS = _____

   CALmAZ = _____

   CALmAS = _____

2. “Reveal the main board” and install the analog output board using the procedures outlined in Section 5.2.
3. Attach connector wires, insert connectors, and apply power to the meter as described in Section 5.3.
4. If not already unlocked, press the **‘MENU’** button until “L4 CNF” is displayed and press the **‘MIN’** button six times. Now press the **‘MAX’** button to set “L4C.6=0”.
5. Press the **‘MENU’** button to store and advance to “CAL VZ”. Use the **‘MIN’** and **‘MAX’** buttons to enter the value (recorded from the edge of the board).
6. Press the **‘MENU’** button to store and advance to “CAL VS”. Use the **‘MIN’** and **‘MAX’** buttons to enter the value.
7. Repeat for “CALmAZ”.
8. Repeat for “CALmAS”.
9. Press the **‘MENU’** button to store your entries and then you will see “C.JUN.OF”. Press the **‘RESET’** button two times and you will see “RESET2”, followed by “RUN”. Verify your calibration points for the analog output.

## 12.6 FILTER CONFIGURATION "FIL.CNF" VALUE TO BE TRANSMITTED ON ANALOG OUTPUT

1. Press the **'MENU'** button until the display shows "FIL.CNF".
2. Press the **'MAX'** button until the display shows "FIL.3=0", "FIL.3=1", "FIL.3=2", or "FIL.3=3".
3. "FIL.3=0" Transmits the unfiltered value of your signal input.
   "FIL.3=1" Transmits the filtered value of your signal input.
   "FIL.3=2" Transmits the recorded PEAK ("HI RDG") value(s).
   "FIL.3=3" Transmits the recorded VALLEY ("LO RDG") value(s).
4. Press the **'MENU'** button to store your selection or changes and the meter will advance to "FIL TI" (Filter Time Constant). Press the **'RESET'** button two times to return to the run mode.

## 12.7 WIRING/CONNECTIONS

**WARNING:** Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury! This device must only be installed electrically by specially trained electrician with corresponding qualifications.

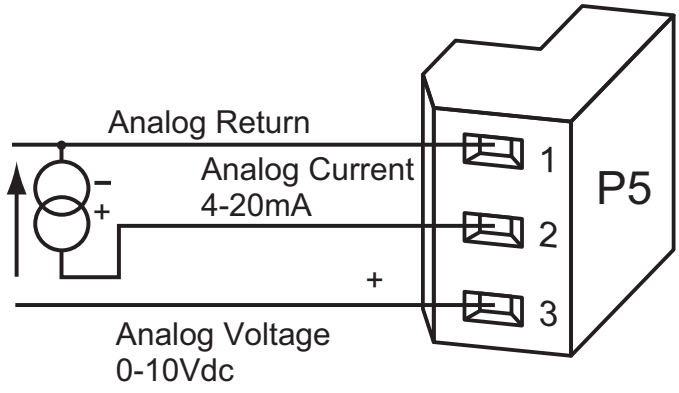



**Figure 12-2. Isolated Analog Output Board Wiring Connections.**

# 13 Relay Options

## 13.1 FEATURES OVERVIEW

The Dual Relay Output Board and 4 Relay Output Board provides two isolated (354 V per IEC spacing, 500 test), 5-ampere Form-C
electro-mechanical relays that enable setpoint-triggered switching to an external device (plus two 5-ampere Form-C electro-mechanical relays for 4 Relay Option). Each relay can accommodate a single setpoint. 200 W, 2500pf snubbers are provided for each normally open contact.

## BOARD INSTALLATION:

To install optional Relay Output printed circuit board:

1. Refer to “Reveal the Main Board” in Main Operator’s Manual Section 5.2, Disassembly.
2. Using figure below as a reference, insert relay option board(s) into J10 connector on the main board.

**WARNING:** To avoid electrical shock be sure to disconnect the unit from its power supply. After you have opened the meter you are ready to install option card.

**To Install:**

1. Hold relay board with components facing the main board.
2. Position the P10 connector to mate with the J10 connector on the main board (at rear of unit).
3. Push the board downward, guiding relay board edges through the rear panel guides until it rests on the upper rear panel and the main board.

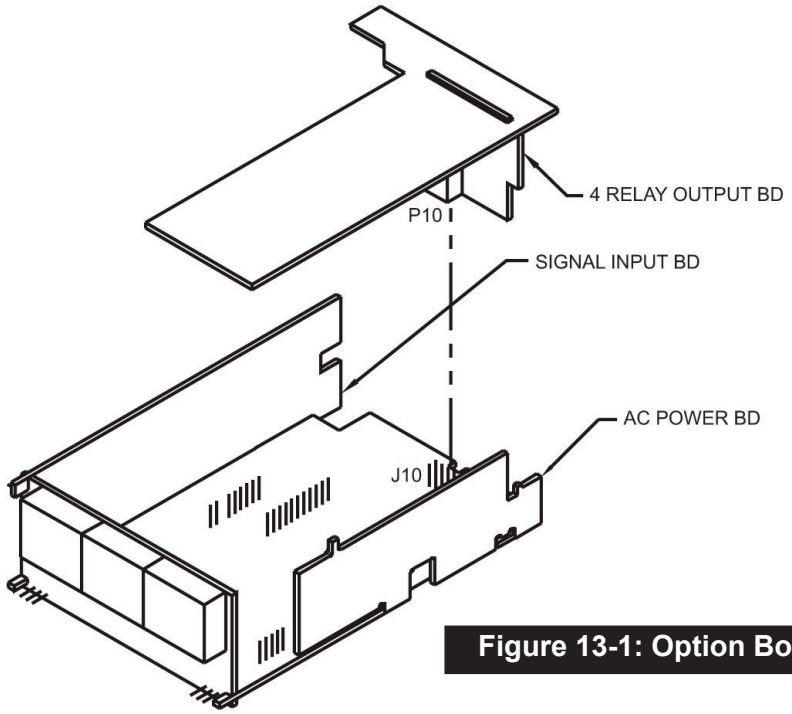



**Figure 13-1: Option Board Installation**

## JUMPER CONFIGURATION:

The figure below shows the locations of the 4 Relay Output Board jumpers S1 and S2, the P10 socket connecting the board to the Main Board, and the output plugs P6, P7, P18A and P18B.

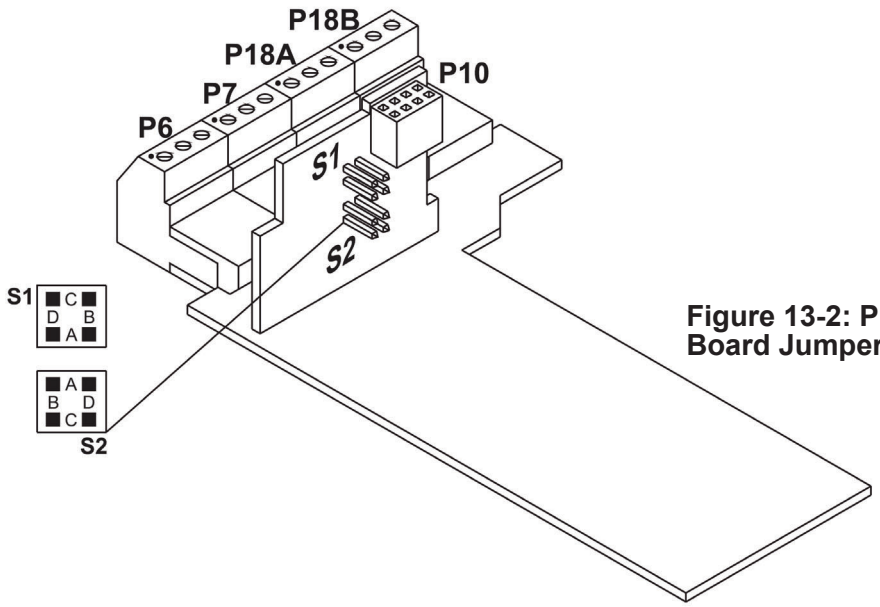



**Figure 13-2: Press This Button 4 Relay Board Jumpers and Plugs**

The table below shows which jumpers are assigned to each relay.
Defaults have asterisks. re 4 Relay Output Board Wiring Connections.

| S1 | S2 | FUNCTION |
|---|---|---|
| | | Assigns SP1 to Relay 1 (P6) |
| A, C* | A, C* | Assigns SP2 to Relay 2 (P7) |
| | | Assigns SP3 to Relay 3 (P18A) |
| | | Assigns SP4 to Relay 4 (P18B) |
| | | Assigns SP1 to Relay 3 (P18A) |
| B, D | A, C | Assigns SP2 to Relay 2 (P7) |
| | | Assigns SP3 to Relay 1 ( P6) |
| | | Assigns SP4 to Relay 4 (P18B) |
| | | Assigns SP1 to Relay 3 (P18A) |
| B, D | B, D | Assigns SP2 to Relay 4 (P18B) |
| | | Assigns SP3 to Relay 1 ( P6) |
| | | Assigns SP4 to Relay 2 ( P7) |
| | | Assigns SP1 to Relay 1 (P6) |
| A, C | B, D | Assigns SP2 to Relay 4 (P18B) |
| | | Assigns SP3 to Relay 3 (P18A) |
| | | Assigns SP4 to Relay 2 (P7) |

**Table 1: 4 Relay Board Jumpers**

# 13 Relay Options

## WIRING CONNECTIONS:

**WARNING:** Do not connect ac power meter until you have completed all input and output connections. Failure to do so may result in injury! This device must only be installed electrically by a specially trained electrician with corresponding qualifications.

**Table 2: Pin Assignments for the P6, P7 and P18**

| CONNECTOR | PIN | FUNCTION |
|---|---|---|
| P6 | 1 | NO1 (Normally Open) |
| (Relay 1 Connection) | 2 | Common 1 |
| | 3 | NC1 (Normally Closed) |
| P7 | 1 | NO2 (Normally Open) |
| (Relay 2 Connection) | 2 | Common 2 |
| | 3 | NC2 (Normally Closed) |
| P18A | 1 | NO3 (Normally Open) |
| (Relay 3 Connection) | 2 | Common 3 |
| | 3 | NC3 (Normally Closed) |
| P18B | 1 | NO4 (Normally Open) |
| (Relay 4 Connection) | 2 | Common 4 |
| | 3 | NC4 (Normally Closed) |

## Output Specifications:

Relay Output: Form -C, SPDT Relays

Power Rating for
**Resistive Loads:** Four relays at P6, P7, and P18 120/240 Vac or 30 Vdc @ 5 A

**Isolation:** Power to Input/Relay Outputs: 2500 Vac per 1 min. test

**Relays to Inputs/Analog, Communication, and Ethernet Outputs:**
2500 Vac per 1 min. test

Outputs should be protected by fuse or circuit breaker that are UL Listed

# RS-232 or RS-485 Option Board

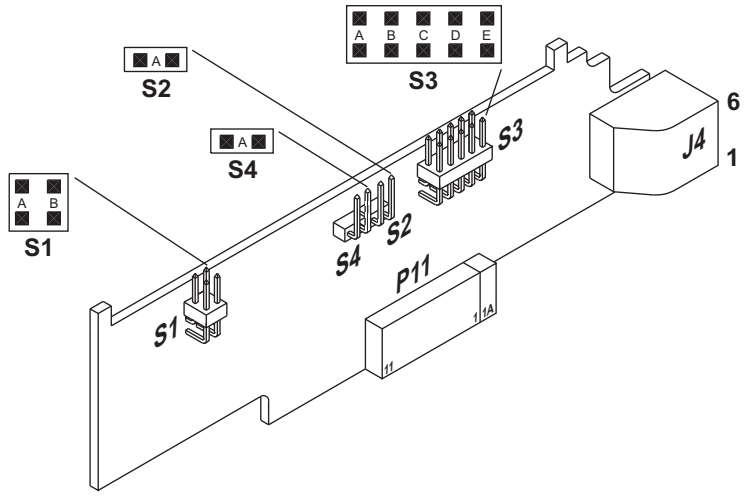
## 14.1 FEATURES OVERVIEW

The Isolated Serial RS-232 Communications Board provides an isolated digital communications channel between a single meter and another meter or device, or between a single meter and a computer. The Isolated Serial RS-485 Communications Board adheres to the IEC standard, providing an isolated channel between up to 32 meters and a single computer or intelligent device–but can actually address up to 199 devices.

1. When you order either option board, you will also receive a six foot communications cable that plugs into J4. Optional female 9-pin and 25-pin “D” computer connector-adapters are offered for either RS-232 or RS-422/485 hookup.
2. The latest Operation and Communication Manual as well as free configuration software and ActiveX controls are available from **the website listed in this manual or on the CD-ROM enclosed with your shipment**.
3. The communications board you ordered, plugs into the main board socket (P11 connects into J11 next to the transformer) with the 6-pin telephone socket. J4 is then protruding out of the rear of the case.
4. Choose baud rate from 300 to 19200. Standard factory setting is 9600.
5. Wide choice of commands and message formats available.

# 14 RS-232 or RS-485 Option Board

Figure 14-1 gives the board connections and pin designators for RS-232/RS-485.




| METER RJ-12 PIN (J4) | RS232 | RS485 HALF DUPLEX | RS485 FULL DUPLEX |
|---|---|---|---|
| 6 | | | |
| 5 | GND | | |
| 4 | RX | | RX- |
| 3 | TX | RX-TX- | TX- |
| 2 | RTS | RX+/TX+ | RX+ |
| 1 | | | TX+ |

**Figure 14-1. RS-232/RS-485 Option Board and Pin Designations**

| JUMPER | RS232 | RS485 HALF DUPLEX | RS485 FULL DUPLEX |
|---|---|---|---|
| S1-A | CLOSE | OPEN | OPEN |
| S1-B | OPEN | CLOSE | OPEN |
| S2-A | OPEN | CLOSE | CLOSE |
| S3-A (CLOSE FOR TERMINAL RESISTOR) | OPEN | * | * |
| S3-B | OPEN | CLOSE | OPEN |
| S3-C (CLOSE FOR TERMINAL RESISTOR) | OPEN | * | * |
| S3-D | OPEN | CLOSE | OPEN |
| S3-E (CLOSE FOR RTS TRUE) | * | OPEN | OPEN |
| S4 (CLOSE FOR CONTINUOUS MODE) | OPEN | * | * |

* = optional, select as required.

**Table 14-2. RS-232/RS-485 Jumper Selections**

## 14.2 FRONT-PANEL PUSHBUTTON CONFIGURATION

Setup configuration can be accomplished via the front panel buttons or via your computer if you use the configuration setup program. If you are going to use a computer, your choices include “AUTO SET” or “MANUAL SET” for establishing communication with your meter. “AUTO SET” cycles through the possible combinations of baud rate, parity and stop bits to find a match for your meter settings. For faster action, you may enter the values for your meter via “MANUAL SET”.

If your meter communications settings are unknown or need changing, you can insert the factory-set values with the front panel buttons (or, after communications has been established, from your keyboard).

1. Unlock the communications bits by setting “L4C.1=0”, “L4C.2=0”, “L4C.3=0”, “L4C.4=0” and “L4C.5=0”.
2. Press the **‘MENU’** button until “BAUD” is displayed, then press the **‘MAX’** button until the baud rate you require is displayed. Press the **‘MENU’** button to store this choice and your meter will display “SERCNF”.
3. Press the **‘MIN’** button until you see the display show “SER.1=0” for no parity, “SER.1=1” for odd parity, or “SER.1=2” for even parity. Press the **‘MAX’** button to select the parity required for your system. Once you have done that, press the **‘MIN’** button and advance to “SER.2=0” or “SER.2=1”.
4. By pressing the **‘MAX’** button you can select the “SER.2” value. Setting “SER.2=0” picks the value to one stop bit; “SER.2=1” selects two stop bits. Select “SER.2=0”.
5. Pressing the **‘MENU’** button stores these choices and then the meter advances to “ADDRES”. Use the **‘MAX’** button to set to “001” (unless your meter is one of several on an RS-485 bus, in which case you must give a different address to each device and use those addresses when communicating from your computer).
6. Press the **‘MENU’** button again and press the **‘RESET’** button two times to return to the run mode. The remaining communications format and options are set from your keyboard.

## EXTERNAL CONTROL LINES

P2, the 20-pin connector at the rear of the main board, connects to the setpoint transistor collectors and permits remote control of significant meter features.

The meter case label gives the names (abbreviated functions) of each of the twenty pins of P2, the center-bottom connector. Refer to Figure 15-1.

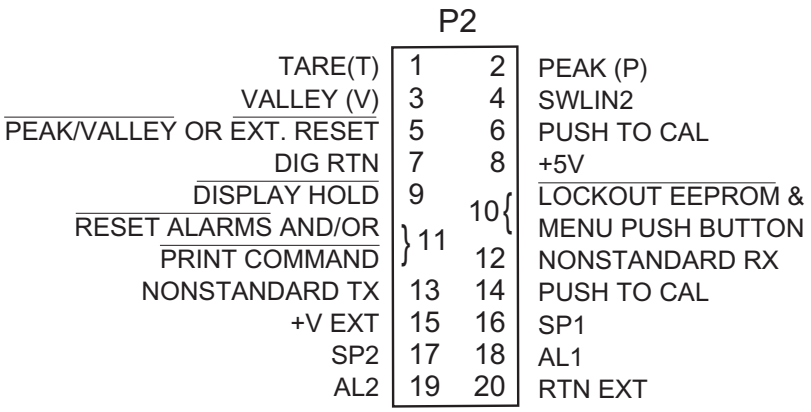



**Figure 15-1. Connector Label Detail**

### 15.1 TARE (PIN 1)

Tare is available when P2-1 and P2-4 are connected to a momentary contact switch. This feature allows you to automatically zero your meter when the switch is activated.

### 15.2 PEAK (PIN 2)

When this is connected to P2-4 by an external switch, the meter displays the stored PEAK ("HI RDG") value rather than the current reading. The display flashes to distinguish this value.

### 15.3 VALLEY (PIN 3)

When this is connected to P2-4 by an external switch, the meter displays the stored valley ("LO RDG") value rather than the current reading. The display flashes to distinguish this value.

### 15.4 SWLIN2 (PIN 4)

Completes the circuit for any of the above three signals.

### 15.5 PEAK & VALLEY OR EXTERNAL RESET (PIN 5)

Connecting this to ground (P2-7) when "RDG.7=0" has been programmed causes a "HARD" **RESET** (when you see "RESET2" on the display). If you set "RDG.7=1", grounding causes only a PEAK/VALLEY **RESET**.

## 15.6 PUSH TO CAL (PIN 6)

The Push To Cal feature is only available for the Strain Gage meter and the Universal meter when configured for the BRIDGE mode.

This feature allows you to connect an external calibration resistor to P2-6 and P2-14 at the rear of the meter. **NOTE**: Use a one-way switch only.

If your selected calibration resistor is to be mounted externally (in series with your switch), install a SHORT in place of R135. **NOTE**: This short is already installed at the factory.

If your selected calibration resistor is to be mounted internally, solder it in the holes of R35 on the input board. See Figure 5.6.

## 15.7 DIGITAL RETURN (PIN 7)

This is a non-isolated return to be used for the digital controls provided on this P2 connector.

**WARNING:** THIS METER RETURN IS NOT ISOLATED FROM THE SIGNAL INPUT AND SHOULD NOT BE CONNECTED TO EXTERNALLY-GROUNDED DEVICES UNLESS ISOLATION IS PROVIDED EITHER AT THE SIGNAL INPUT OR AT THIS EXTERNAL-LOGIC CONNECTION.

## 15.8 +5 V (PIN 8)

Up to 20 mA is available for driving external devices, but isolation should be provided if there is a possibility of common mode (ground) currents, since this supply is NOT isolated from the signal input.

## 15.9 DISPLAY HOLD (PIN 9)

Grounding this pin to P2-7 freezes the display value. However, the meter continues to take new samples and update the other outputs, such as Analog Output, BCD, Setpoints/Alarms, and Peak/Valley.

## 15.10 LOCKOUT EEPROM (AND 'MENU' BUTTON) (PIN 10)

Grounding this pin to P2-7 stops any configuration changes and new storage into the non-volatile memory, and when in run mode does not allow entry into the setup mode when the **'MENU'** button is pressed.

## 15.11 PRINT COMMAND AND/OR RESET OF ALARMS (PIN 11)

Grounding this pin to P2-7 when "BUS.8=1" has been programmed will initiate a meter printout via serial communications in the format previously selected. If "ALC.8=1" it causes the alarm latches to reset.

## 15.12 NONSTANDARD RX (PIN 12) AND NONSTANDARD TX (PIN 13)

These two pins allow digital communications with the meter using 5 V CMOS logic levels and RS-232 protocols and format. This access is normally reserved for specialized equipment communication in a calibration lab or at the factory.

### 15.13 PUSH TO CAL (PIN 14)

See Section 16.6.

### 15.14 +V EXT (PIN 15)

This is the pin on which to bring in isolated external 5 to 30 V to power the snubbing diodes of the four setpoint/alarm open-collector transistors.

### 15.15 SP1 (PIN 16)

The open-collector of the first setpoint transistor (can carry 150 mA).

### 15.16 SP2 (PIN 17)

The open-collector of the second setpoint transistor (can carry 150 mA).

### 15.17 AL1 (PIN 18)

The open-collector of the third setpoint (first alarm) transistor (can carry 150 mA).

### 15.18 AL2 (PIN 19)

The open-collector of the fourth setpoint (second alarm) transistor (can carry 150 mA).

### 15.19 RTN EXT (PIN 20)

This is the return to the external ground (P2-20) of the external power for the setpoint transistors and snubbing diodes brought in on P2-15, 16, 17, 18 and 19. Figure 16-2 shows an example of a circuit using an external relay with SP1 (Setpoint 1). If a solid state relay is used, delete connection to Pin 15.

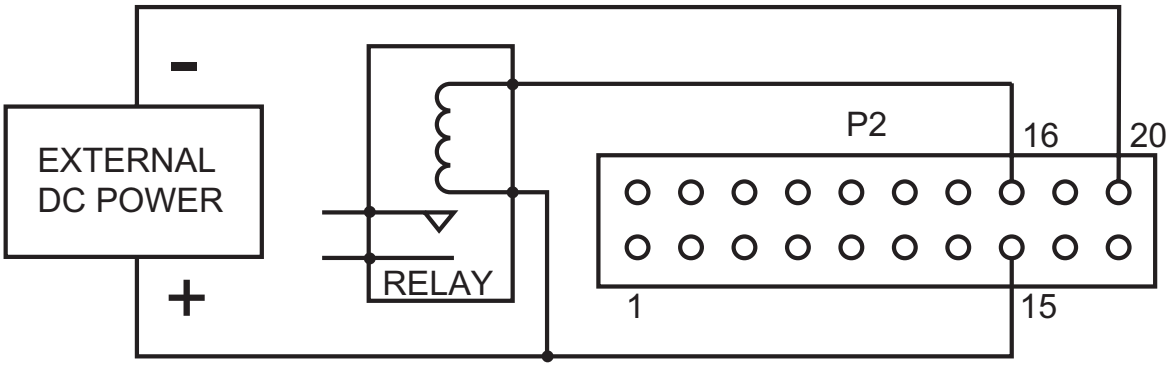



**Figure 15-2. Connection of External Power for Setpoint Transistors**

# TROUBLESHOOTING - DISPLAY MESSAGES AND TROUBLESHOOTING GUIDE

A flashing alpha-numeric message in the display generally indicates an incorrect combination of jumpers and/or configuration values.

## 16.1 ERROR MODE MESSAGES

### 16.1.1 Flashing “999999” (Numerical Overflow)

The maximum number of counts in the display cannot exceed –99999 or 999999. If, by moving the ACTIVE decimal point one or more places to the left, you cause the display to move beyond the maximum number of counts it is capable of showing (for example, 12345.0 to 12345.00), the display will indicate the overflow by flashing “999999”.

### 16.1.2 Flashing “ERR O1” (Offset Overflow)

When an offset value has been entered and then the ACTIVE decimal point has been moved one or more places to the left, causing the offset display reading to move beyond the maximum number of counts it is capable of showing (for example, 1000.00 to 1000.000), the display will go into offset overflow.

Note ☞

**NOTE:** The meter will only display 6 digits (999999) maximum.

### 16.1.3 Flashing “ERR O2” (Setpoint Overflow)

After a Setpoint (or Alarm) value has been entered and then the ACTIVE decimal point has been moved one or more places to the left, causing the setpoint display reading to move beyond the number of counts it is capable of showing (for example, setpoint at 100.00 and then a decimal point change to 100.0000), the display will indicate the SETPOINT OVERFLOW by momentarily flashing “ERR 02” before returning to the run mode.

Note ☞

**NOTE:** The meter will only display 6 digits (999999) maximum.

### 16.1.4 “NOSTOR” & “STORED” (Programming Entries In EEPROM)

If you are in the configuration mode and you make a CHANGE to any setup parameter (for example, changing “RDG.1 = 1” to “RDG.1 = 0”) and press the **‘MENU’** button, the display will MOMENTARILY flash either “STORED” or “NOSTOR” and then go to the next menu item. If you are in a submenu, this will only occur when you press the **‘MENU’** button to go to the next menu item.

### 16.1.5 Flashing “+OVLD” (Positive Input Overload)

If the input signal exceeds the range selected (for example, 0-100 mV range selected and greater than 200 mV is applied to the input), the display will flash a “+OVLD”.

### 16.1.6 Flashing “+OPEN” (Open Sensor Indication)

Coupled with the proper jumper selection, the display will indicate an open sensor.

### 16.1.7 Flashing “-OPEN” (Open Sensor Indication)

Coupled with the proper jumper selection, a “-OPEN” indicates the input is below the bottom limit of the range selected.

### 16.1.8 Flashing “I OVSC” (Input Overscale)

This display occurs when the input scale and/or offset applied to the input signal causes the display to go into a numerical overflow.

### 16.1.9 Flashing “R OVSC” (Reading Overscale)

This display occurs when the reading scale and/or offset applied to the input signal causes the display to go into a numerical overflow.

### 16.1.10 Flashing “CB OVF” (Count By Overflow)

When a display value near the maximum display capability is forced into a numerical overflow by changing the CNT BY menu (for example, the display reads 999997 and the count by is changed from 001 to 005 and rounds the display up to 1000000).

### 16.1.11 Flashing “UOM.OVF” (Unit Of Measure Overflow)

If a unit of measure is selected and you are near the full scale capability of the display and in the ACTIVE decimal mode, the display will shift one digit to the left (for example, to a display of 1065.33 you add a unit of measure such as “F” for a display of 1065.33F), the display will flash “UOM.OVF”.

## 16.2 TROUBLESHOOTING GUIDE

**“99999”**

| | |
|---|---|
| POSSIBLE CAUSE: | Active decimal point change driving the display into numerical overload. |
| TO CORRECT: | Press the **‘MAX’** button to reset the entire display to all zeros, then enter a revised number into the submenu item that caused the overflow. |

**“ERR 01”**

| | |
|---|---|
| POSSIBLE CAUSE: | Active decimal (“RDG.2=0”) has been selected and/or DEC PT (decimal point) position has been moved one or more places to the left driving the programmed offset value into numerical overflow. |
| TO CORRECT: | Press the **‘MENU’** button and the meter will show the left most decimal point position possible for the chosen offset: by pressing the **‘MENU’** button again this revised entry is stored.<br><br>Alternately, the amount of RDG.OF may be reduced to get the decimal point further to the left. |

*continued next page*

**“ERR 02”**

| | |
|---|---|
| POSSIBLE CAUSE: | Active decimal (RDG.2) has been selected and/or DEC PT (decimal point) position has been moved one or more places to the left driving the programmed Setpoint value into numerical overflow. |
| TO CORRECT: | Display will flash “ERR 02” message for a short period of time, then automatically correct the setpoint’s decimal point position and move to the next menu item. Press the ‘**SETPT**’ button until the meter displays flashing “999999”. Then press the **‘MAX’** button to reset the display to “000000” and enter a new valid setpoint value. |

**“+OVLD”**

| | |
|---|---|
| POSSIBLE CAUSE: | The positive input CURRENT & VOLTAGE exceeds the input range selected. |
| TO CORRECT: | Check both the input range and the actual input to find the error condition and either reduce the input or change jumpers to a higher input range for more input attenuation. |

**“-OVLD”**

| | |
|---|---|
| POSSIBLE CAUSE: | The negative input voltage exceeds the input range selected. |
| TO CORRECT: | Check both the input range and the actual input to find the error condition and either reduce the input or change jumpers to a higher input range for more input attenuation. |

**“+OPEN”**

| | |
|---|---|
| POSSIBLE CAUSE: | Input sensor is open or broken, or the connection to the meter is open or broken. Input sensor is not wired to the proper input terminals. |
| TO CORRECT: | Check thermocouple or RTD wiring. |

**“-OPEN”**

| | |
|---|---|
| POSSIBLE CAUSE: | The input sensor is open or broken, or the connection to the meter is open or broken. The input sensor is not wired to the proper input terminals. The input signal is below the minimum specified (refer to Section 17, Specifications). |
| TO CORRECT: | When jumper S2R on the signal input board is used, this will be indicated if a sensor lead is broken or otherwise opened. Check thermocouple or RTD wiring. |

**“I OVSC”**

| | |
|---|---|
| POSSIBLE CAUSE: | The input scale and/or offset values chosen are large enough to drive the display into numerical overflow. |
| TO CORRECT: | Reduce the input and/or the input scaling/offset. Refer to “IN.SC.OF” in Section 8.2.5. |

**“R OVSC”**

| | |
|---|---|
| POSSIBLE CAUSE: | The reading scale and/or offset values chosen are large enough to drive the display into numerical overflow. |
| TO CORRECT: | Reduce the reading scale/offset and/or move the active decimal point to the right. Reducing input scale/offset is not required, because the input overscale message has higher priority than this message and would be displayed if there were an input overscale. |

**“CB OVF”**

| | |
|---|---|
| POSSIBLE CAUSE: | CNT BY (count by value) has been changed causing the display to round up to a numerical overflow. |
| TO CORRECT: | Reduce the “CNT BY” count by value to 001. If you have an active decimal point selected, move the decimal point one or more positions to the right. |

**“UOM.OVF”**

| | |
|---|---|
| POSSIBLE CAUSE: | Selection of unit of measure displayed (“RDG.6=0”) moves the display reading one place to the left causing a numerical overflow. |
| TO CORRECT: | If you have an active decimal point, move the decimal point position one or more positions to the right. |

**“SERIAL”**

| | |
|---|---|
| POSSIBLE CAUSE: | A configuring change has been attempted via the front panel buttons while the serial communications port is actively communicating with the meter. |
| TO CORRECT: | Either lockout the front panel buttons by removing the jumpers S3A & S3C or disconnect the serial communications option. |

## 17.1 CURRENT INPUT

| | |
|---|---|
| INPUT RANGES(+10%): | 0-20 mA and 4-20 mA |
| RESOLUTION: | 1µA |
| MAXIMUM INPUT: | 200 mA |
| INPUT OHMS: | 5 |
| SENSOR EXCITATION: | 10V, to 30 mA<br>24V, to 25 mA |

## 17.2 VOLTAGE INPUT

| | | | | |
|---|---|---|---|---|
| INPUT RANGES: | | | | |
| UNIPOLAR: | 100 mV | 1 V | 10 V | 100 V |
| BIPOLAR: | ±50 mV | ±0.5 V | ±5 V | ±50 V |
| RESOLUTION: | 1 µV | 10 µV | 100 µV | 1 mV |
| MAX INPUT: | 70 Vp | 350 Vp | 350 Vp | 300 Vp |
| INPUT OHMS: | 1G | 1M | 1M | 1M |
| BIAS AMPS: | 50 pA | 5 pA | 1 pA | 1 pA |
| SENSOR EXCITATION: | 10V, to 30 mA<br>24V, to 25 mA | | | |

## 17.3 POTENTIOMETER INPUT

| | |
|---|---|
| INPUT RANGES: | 1 V or 10 V |
| RESOLUTION: | programmed to 0.001% |
| SENSOR EXCITATION: | 1.5 to 11 Vdc, to 60 mA max.<br>24V, to 25 mA max. |

## 17.4 GENERAL

| | |
|---|---|
| SCALE: | +0.000001 to +500000 or<br>–0.0001 to –99999. |
| OFFSET: | Zero to +999999 |
| POLARITY: | Automatic |

## NOISE REJECTION

| | |
|---|---|
| NMR: | 60 dB, 50 or 60 Hz, + selected filter |
| CMR: | 120 dB |
| CMV: | Dielectric strength to 1500 V transient per<br>260 VRMS or DC working voltage. |
| ACCURACY at 25 ºC: | |
| MAX ERROR: | ±0.005% of reading |
| SPAN TEMPCO: | less than 20 ppm/ºC |
| STEP RESPONSE: | 1 second to 99.9% |
| WARMUP: | 55 minutes to rated accuracy. It is recommended that the unit be continuously running to insure its accuracy. |

# 17 Specifications

| | | |
|---|---|---|
| CONVERSION TECHNIQUE: | Dual-slope | |
| | READRATE and DISPLAY UPDATE/Programmable | |
| INTEGRATION TIME: | 3 samples/sec: | 100 msec |
| | 13 samples/sec, 60 Hz: | 16.7 msec |
| | 12 samples/sec, 50 Hz: | 20 msec |
| DISPLAY LEDs: | 6, 0.54” (13.8mm)h, red, 14-segment<br>4, 0.12” x 0.24” (3 x 6mm), red lamp | |
| SYMBOLS: | –.8.8.8.8.8. or 8.8.8.8.8.8. | |
| DECIMAL POINT POSITION: | Programmable | |

## SENSOR EXCITATION

| | |
|---|---|
| AC-POWERED: | 1.5 to 11 Vdc, up to 60 mA max.<br>24 Vdc at 25 mA max. |
| DC-POWERED: | 10 Vdc at 120 mA<br>24 Vdc at 35 mA<br>Can power up to 4 load cells. |

## OUTPUTS

| | |
|---|---|
| (STANDARD): | 4, isolated open collector; 150 mA at 1 V sink; 30 V open |
| BCD OUTPUT: | Tri-state, TTL/CMOS compatible; internal 5 V supply for non-isolated, external 5 V supply for isolated. |
| ANALOG OUTPUT: | 0-5 V, 1-5 V, 0-10 V, 0-20 mA, 4-20 mA level; compliance, 12 V at 20 mA; 15-bit resolution; 0.1% accuracy; programmable zero and span. |

| | |
|---|---|
| RELAY OUTPUT: | 4 Form-C relay |
| POWER RATING FOR RESISTIVE LOADS: | |
| 4 RELAY: | Four relays at P6, P7, and P18<br>Normally open contact, 5 amp; 30Vdc or 230Vac |

## TURNDOWN RATIO

| | |
|---|---|
| (MAX OFFSET-MIN SPAN): | 1000 with 0.1% or 100 with 0.01% resolution |

## COMMUNICATIONS INFORMATION

| | |
|---|---|
| RS-232 COMMUNICATIONS: | RJ11 4-wire connection; complete program setup and message display capability; programmable to transmit current display, alarm status, MIN/MAX, and status |
| BAUD RATES: | 300, 600, 1200, 2400, 4800, 9600, 19200 |
| RS-485 COMMUNICATIONS: | RJ12 6-wire connection; addressable from “000” to “199”. |
| BAUD RATES: | 300, 1200, 2400, 4800, 9600, 19200 |

## POWER

| | |
|---|---|
| ~ AC UNITS: | 115/230 Vac ±10%, 50/60 Hz<br>12 W max power consumption |
| = DC UNITS: | 10-32 Vdc, 3 to 9 W consumption<br>0.001% of span/volt power supply rejection |
| EXTERNAL FUSE REQUIRED: | |
| 115 Vac | IEC127-2/III, 125mA, 250V (Time-Leg)<br>or UL Slow-Blow, 125mA, 250V |
| 230 Vac | IEC127-2/III, 63mA, 250V (Time-Leg)<br>or UL Slow-Blow, 63mA, 250V |

# 17 Specifications

## ENVIRONMENTAL

| | |
|---|---|
| OPERATING TEMP RANGE: | 0 to 50 ºC (32 to 140°F) |
| STORAGE TEMP RANGE: | –40 to 85 ºC (–40 to 202°F) |
| HUMIDITY: | up to 95% non-condensing at 40°C (104°F) |
| FRONT PANEL: | NEMA-4 rated |

## MECHANICAL

| | |
|---|---|
| DIMENSIONS (H x W x D): | 1.89 x 3.78 x 5.86in. (48 x 96 x 145mm) |
| PANEL CUTOUT (H x W): | 1/8 DIN 1.772 X 3.622in. (45 x 92mm) |
| WEIGHT: | 1.316 pounds (600 g) |
| MATERIAL: | 94V-0 UL-rated Polycarbonate |

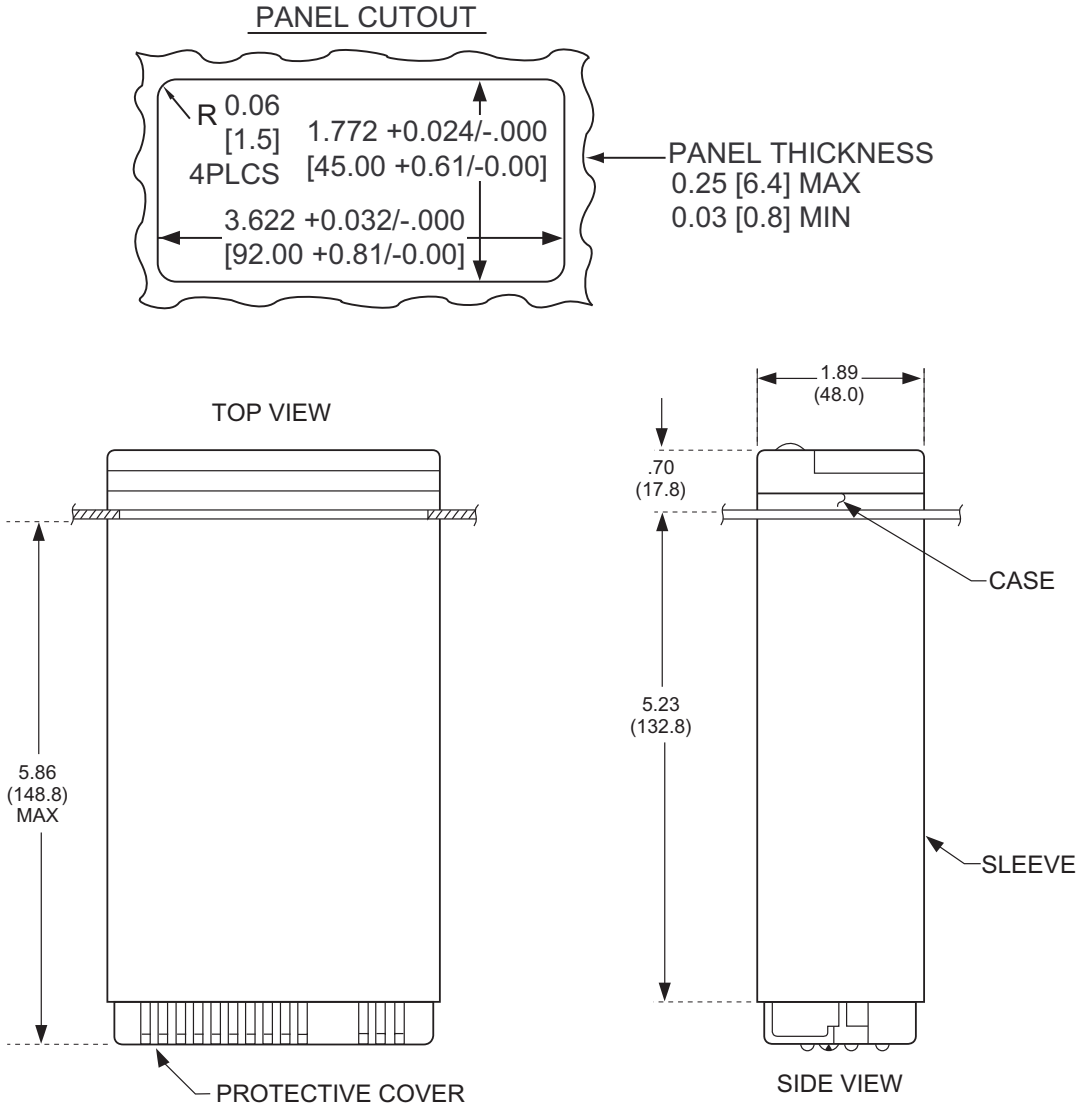



**Figure 17-1. Meter Housing and Panel Cutout.**

## FLASHING MESSAGES

DURING PROGRAMMING (configuration mode)

| | |
|---|---|
| NUMERICAL OVERFLOW: | “999999” |
| OFFSET OVERFLOW: | “ERR 01” |
| SETPOINT OVERFLOW: | “ERR 02” |
| NOT STORED IN EEPROM: | “NOSTOR” |
| VALUE PUT IN EEPROM: | “STORED” |

DURING MEASUREMENT (RUN MODE)

| | |
|---|---|
| INPUT TOO LARGE, POSITIVE: | “+ OVLD” |
| INPUT TOO LARGE, NEGATIVE: | “– OVLD” |
| INPUT OUT OF RANGE, POSITIVE: | “+ OPEN” |
| INPUT OUT OF RANGE, NEGATIVE: | “– OPEN” |
| EXCESS INPUT SCALE/OFFSET: | “I OVSC” |
| EXCESS DISPLAY SCALE/OFFSET: | “R OVSC” |
| COUNT-BY DISPLAY OVERFLOW: | “999999” |

DURING SETPOINT ADJUST (RUN MODE)

| | |
|---|---|
| OUT OF SELECTED DIGIT RANGE: | “999999” |
| NOT STORED IN EEPROM: | “NOSTOR” |
| VALUE PUT IN EEPROM: | “STORED” |

# 18 Factory Preset Values

## JUMPER POSITIONS:

ac Powered unit

S1: NONE S2: A, F, L, N, T,
S3: A, C S4: A, C

dc Powered unit

S1 (dc power board): A
S1: NONE S2: A, F, L, N, T
S3: A, C, D S4: A S5: A

## LOCKOUT CONFIGURATION(S)

| L1 CNF | L2 CNF | L3 CNF | L4 CNF |
|---|---|---|---|
| L1C.1=0 | L2C.1=0 | L3C.1=0 | L4C.1=0 |
| L1C.2=0 | L2C.2=0 | L3C.2=0 | L4C.2=0 |
| L1C.3=0 | L2C.3=0 | L3C.3=0 | L4C.3=0 |
| L1C.4=0 | L2C.4=0 | L3C.4=0 | L4C.4=0 |
| L1C.5=0 | L2C.5=0 | L3C.5=0 | L4C.5=0 |
| L1C.6=0 | L2C.6=0 | L3C.6=0 | L4C.6=1 |
| L1C.7=0 | L2C.7=0 | L3C.7=0 | |
| L1C.8=0 | L2C.8=0 | L3C.8=0 | |

Input Class: Strain Gage: “BRIDGE”
Input Type: 0-100 mV

Reading Configuration “RDG.CNF”:

RDG.1=0 RDG.2=0 RDG.3=0 RDG.4=0
RDG.5=0 RDG.6=0 RDG.7=0

Reading Scale

(“RDG SC”): 1.00000

Reading Offset

(RDG OF”): -00000

Input Configuration “IN CNF”:

INP.1=0 INP.2=0 INP.3=0 INP.4=0
INP.5=0 INP.6=0 INP.7=1

Input Scale and Offset “IN.SC.OF”:

INPUT 1: 000000. READ 1: 000000.
INPUT 2: 100000. READ 2: 100000.

Decimal Point “DEC PT” Position: FFFFFF.
Count By “CNT BY”: 001
Filter Configuration “FIL.CNF”: FIL.1=0 FIL.2=1 FIL.3=1
Filter Time Constant “FIL TI”: 064

Setpoint Configuration “SP CNF”:

| | | | |
|---|---|---|---|
| SPC.1=0 | SPC.2=0 | SPC.3=1 | SPC.4=0 |
| SPC.5=0 | SPC.6=1 | SPC.7=0 | SPC.8=0 |

Alarm Configuration “AL CNF”:

| | | | |
|---|---|---|---|
| ALC.1=0 | ALC.2=0 | ALC.3=1 | ALC.4=0 |
| ALC.5=0 | ALC.6=1 | ALC.7=0 | ALC.8=0 |

Alarm Function “AL FNC”:

| | | | |
|---|---|---|---|
| ALF.1=0 | ALF.2=0 | ALF.3=0 | ALF.4=0 |

Alarm Number of Readings “AL RDG”: 03 03 for (AL1) (AL2)
Setpoints 1 & 2 Deadband “SP DB”: 0020
Alarms 1 & 2 Deadband “AL DB”: 0020

Output Configuration “OUT.CNF”:

| | | | |
|---|---|---|---|
| OUT.1=0 | OUT.2=1 | OUT.3=0 | OUT.4=0 |
| OUT.5=1 | OUT.6=0 | | |

Output Scale and Offset “OT.SC.OF”:

| | |
|---|---|
| READ 1: 000000. | OUTPT 1: 04.0000 |
| READ 2: 100000. | OUTPT 2: 20.0000 |

Baud Rate “BAUD”: 09600

Serial Communication Configuration “SERCNF”:

| | |
|---|---|
| SER.1=1 | SER.2=0 |

Address “ADDRES” (for RS-485): 001

# 18 Factory Preset Values

Data Format “DAT FT”:

| | | | |
|---|---|---|---|
| DAT.1=0 | DAT.2=0 | DAT.3=1 | DAT.4=0 |
| DAT.5=0 | DAT.6=0 | DAT.7=0 | DAT.8=0 |

Bus Format “BUS FT”:

| | | | |
|---|---|---|---|
| BUS.1=0 | BUS.2=0 | BUS.3=1 | BUS.4=0 |
| BUS.5=1 | BUS.6=0 | BUS.7=0 | BUS.8=1 |

Serial Count “SERCNT”: 00001

## ANALOG OUTPUT

CAL VZ: _____

CAL VS: _____

CAL mAZ: _____

CAL mAS: _____

## JUMPER POSITIONS:

Current

S1: _____ S2: _____

S3: _____ S4: _____

Voltage

S1: _____ S2: _____

S3: _____ S4: _____

Potentiometer

S1: _____ S2: _____

S3: _____ S4: _____

## LOCKOUT CONFIGURATION(S)

| L1 CNF | L2 CNF | L3 CNF | L4 CNF |
|---|---|---|---|
| L1C.1=___ | L2C.1=___ | L3C.1=___ | L4C.1=___ |
| L1C.2=___ | L2C.2=___ | L3C.2=___ | L4C.2=___ |
| L1C.3=___ | L2C.3=___ | L3C.3=___ | L4C.3=___ |
| L1C.4=___ | L2C.4=___ | L3C.4=___ | L4C.4=___ |
| L1C.5=___ | L2C.5=___ | L3C.5=___ | L4C.5=___ |
| L1C.6=___ | L2C.6=___ | L3C.6=___ | L4C.6=___ |
| L1C.7=___ | L2C.7=___ | L3C.7=___ | |
| L1C.8=___ | L2C.8=___ | L3C.8=___ | |

Input Class: “BRIDGE”

Input Type: For Current: _____

For Volt: _____

For Pot: _____

Reading Configuration “RDG.CNF”:

RDG.1=___ RDG.2=____ RDG.3=____ RDG.4=____

RDG.5=___ RDG.6=____ RDG.7=____

Reading Scale and Reading Offset “RDG SC” and “RDG OF” (Direct Format):

Reading Scale “RDG SC”: _____

Reading Offset “RDG OF”: _____

# 19 Record your Setup Values

Reading Scale & Offset
(2-coordinate Format):

INPUT 1= _____ READ 1= _____
INPUT 2= _____ READ 2= _____

Input Configuration “IN CNF”:

INP.1=____ INP.2=____ INP.3=____ INP.4=____
INP.5=____ INP.6=____ INP.7=____

Input Scale and Offset “IN.SC.OF”:

INPUT 1: _____ READ 1: _____
INPUT 2: _____ READ 2: _____

Decimal Point “DEC PT” Position: F__F__F__F__F__F__
Count By “CNT BY”: _____
Filter Configuration “FIL.CNF”: FIL.1=___ FIL.2=___ FIL.3=___
Filter Time Constant “FIL TI”: _____

Setpoint Configuration “SP CNF”:

SPC.1=____ SPC.2=____ SPC.3=____ SPC.4=____
SPC.5=____ SPC.6=____ SPC.7=____ SPC.8=____

Alarm Configuration “AL CNF”:

ALC.1=____ ALC.2=____ ALC.3=____ ALC.4=____
ALC.5=____ ALC.6=____ ALC.7=____ ALC.8=____

Alarm Function “AL FNC”:

ALF.1=____ ALF.2=____ ALF.3=____ ALF.4=____

Alarm Number of Readings “AL RDG”: ____ ____
Setpoints Deadband “SP DB”: _____
Alarms 1 & 2 Deadband “AL DB”: _____

Output Configuration “OUT.CNF”:

OUT.1=____ OUT.2=____ OUT.3=____ OUT.4=____
OUT.5=____ OUT.6=____ OUT.7=____ OUT.8=____

Output Scale and Offset “OT.SC.OF”:

READ 1: _____ OUTPT 1: _____

READ 2: _____ OUTPT 2: _____

Baud Rate “BAUD”: _____

Serial Communication Configuration “SERCNF”:

SER.1=____ SER.2=____

Address “ADDRES” (for RS-485): _____

Data Format “DAT FT”:

DAT.1=____ DAT.2=____ DAT.3=____ DAT.4=____

DAT.5=____ DAT.6=____ DAT.7=____ DAT.8=____

Bus Format “BUS FT”:

BUS.1=____ BUS.2=____ BUS.3=____ BUS.4=____

BUS.5=____ BUS.6=____ BUS.7=____ BUS.8=____

Serial Count “SERCNT”: _____

**ANALOG OUTPUT**

CAL VZ: _____

CAL VS: _____

CAL mAZ: _____

CAL mAS: _____

## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **one (1) year** from the date of purchase. In addition to OMEGA's standard warranty period, OMEGA Engineering will extend the warranty period for **four (4) additional years** if the warranty card enclosed with each instrument is returned to OMEGA.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

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