INFINITY® SERIES
THE NEW STANDARD FOR QUALITY

CE

INFS

INFINITY® Strain/DC Current/Voltage Meter

Operator's Manual

MADE IN THE U.S.A.

NEWPORT Electronics, Inc.

Additional products from

NEWPORT Electronics, Inc.

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It is the policy of NEWPORT to comply with all worldwide safety and EMC/EMI regulations that apply. NEWPORT is constantly pursuing certification of its products to the European New Approach Directives. NEWPORT will add the CE mark to every appropriate device upon certification.

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

PATENT NOTICE: The "Meter Case Bezel Design" is a trademark of NEWPORT Electronics, Inc., registered in the U.S.
PATENT NOTICE: This product is covered by one or more of the following patents: U.S. Pat. No. Des. 336,895; 5,274,577 / Canada 2052599; 2052600 / Italy 1249456; 1250938 / France Brevet No. 91 12756 / Spain 2039150; 2048066 / UK Patent No. GB2 249 837; GB2 248 954 / Germany DE 41 34398 C2. Other International Patents Pending.

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.

Table of Contents - Digital Panel Meter

This Manual is applicable to all meters with serial number 1520525 and larger.

Page

l. Introduction

1.1 DESCRIPTION

The Newport INFINITY series is a complete line of process indicators/controllers, offering exceptional performance.

The "INFS" INFINITY strain gauge meter is front panel configurable to accept 0-20 and 4-20 mAdc current inputs, unipolar and bipolar DC voltage inputs and potentiometer inputs. The "INFS" meter will accept inputs from most of the process sensors in use today such as transmitters, pressure transducers, and potentiometers.

Configuring the INFS is accomplished through the 5 front panel buttons. If the optional RS-232 or RS-485 communications are installed, the user may remotely set the display parameters.

Options for the INFS 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 INFS.

- 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 or isolated BCD 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

1.3 AVAILABLE MODELS

Introduction

The following INFS models are available from NEWPORT ELECTRONICS, INC. or one of their AUTHORIZED STOCKING DISTRIBUTORS:

MAIN ASSEMBLIES

MODEL NUMBER	DESCRIPTION
INFS0	Red LEDs, 115 V ac, 50/60Hz
INFS1	Green LEDs, 230 V ac, 50/60Hz
INFS2	Red LED's, 115 V ac, 50/60 Hz
INFS3	Green LED's, 230 V ac, 50/60Hz

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, BCD Output Board, RelayOutput Board, RS-232 Communications Board, and RS-485 Communications Board.

CONTROL / BCD OUTPUT OPTIONS

MODEL NUMBER	DESCRIPTION
"0"	Standard four open-collector outputs are standard
"1" (BCD1)	Isolated BCD Output Board
"2" (REL1)	Dual 7A Form-C Relays

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
"0"	None
"1" (ANO2)	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
"1" (RS20)*	Isolated RS-232 Communications
"2" (RS40)**	Isolated RS-485 Communications

NOTES: Choose only one option per meter.Both computer communications come with 3.5" and 5.25" set/programming disks (1 each) and one 6 ft.communications cable with phone plug termination.

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

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

OPTIONS

MODEL NUMBER	DESCRIPTION
FS	Custom Calibration/configuration
H5	50 Hz line frequency (Requires"FS")
H6	60 Hz line frequency (Requires"FS")
BL	Blank lens
OH	Optional housing
FP3	Front panel for "OH" housing without pushbuttons
9SC2	9-pin Serial Connector for RS-232
9SC4	9-pin Serial Connector for RS-485
25SC2	25-pin Serial Connector for RS-232
25SC4	5-pin Serial Connector for RS-485
SB03	Setup & configurations diskettes
RP18	19" Rack panel for one (1) meter
RP28	19" Rack panel for two (2) meters
RP38	19" Rack panel for three (3) meters
TP1	Trimplate adapter

Notes:

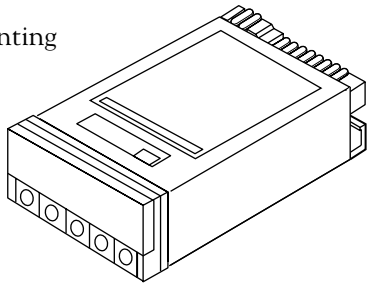
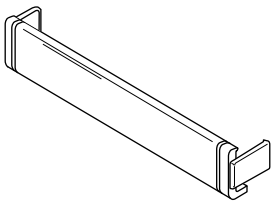
2. Unpacking

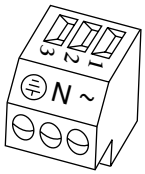
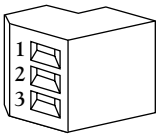
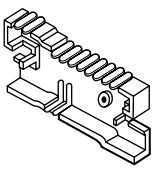
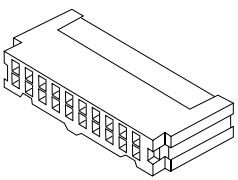
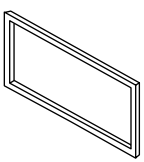
Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call the NEWPORT Customer Service Department at 1-800-NEWPORT (800) 639-7678 or (714) 540-4914.

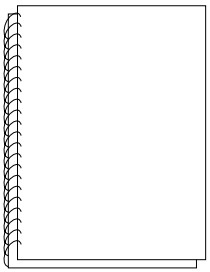
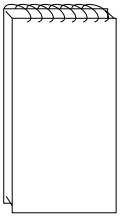
Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

When you ordered your INFINITY strain gauge meter, you will receive the following items in the shipping box:

QTY	DESCRIPTION	ILLUSTRATION
1	Basic Meter in a Mounting Sleeve with Gasket	
1	Optional Front-Panel Button Cover available with return of the postcard included in meter box	

QTY	DESCRIPTION	ILLUSTRATION
1	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)	

QTY	DESCRIPTION	ILLUSTRATION
1	Strain Gauge Owner's Guide	
1	Quick Reference Guide	

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

Notes:

3. Safety Considerations

The meter is protected in accordance with Class II of IEC 348 and VDE 0411.

WARNING: If your meter is to be wired to sensors or control inputs which could have hazardous potentials, these potentials will be carried through to the 20-pin digital output connector at the rear, and will be present on the meter's circuit boards. Install the rear 20-pin mating connector and insert the electronics into the case ***before*** *connecting the meter to any source of possible high voltage.*

DO NOT contact any exposed metal parts or interconnect any option board(s) or change any jumpers on this meter while it is connected to AC voltage.

To provide safe operation, follow these guidelines:

3.1 POWER WIRING

The meter has no power-on switch, so it will be in operation as soon as power is applied.

3.2 HUMIDITY

Do not expose your meter to rain or condensing moisture.

3.3 FUMES AND GASES

Do not operate your meter in flammable or explosive atmospheres.

Notes:

4. Parts of the Meter

4.1 FRONT OF THE METER

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

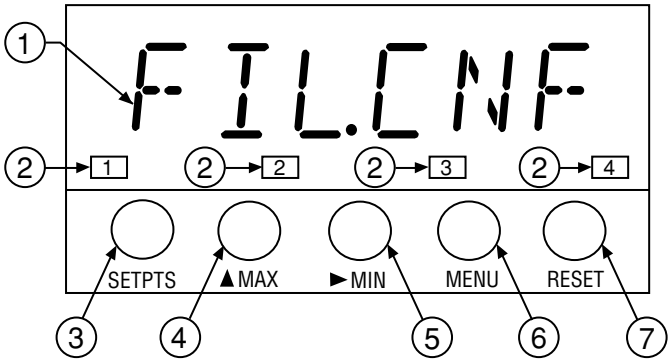


Figure 4-1. Front Detail

ITEM	DESCRIPTION
1	–.8.8.8.8.8. or 8.8.8.8.8.8. 6-digit, 14 segment, alphanumeric 0.54" high LED display with programmable decimal point.
2	SETPOINT LED These LEDs, labeled 1 through 4, display the status of setpoints 1, 2, 3 (Alarm 1), and 4 (Alarm 2).
3	SETPTS BUTTON 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. 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

ITEM	DESCRIPTION
4	▲ /MAX BUTTON 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. To return to display of the current readings without resetting the peak-value memory to zero (0), press the ‘MAX’button once again. To reset the peak-value memory (start a new peak determining period), press the ‘RESET’button once. 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”. 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.”) 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 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. 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. 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. In the SETPT mode, the 'MIN'button advances the flashing digit to the right.
6	MENU BUTTON In the run mode, this button terminates the measurement process and allows you to enter the configuration mode, advancing through the configuration menus. 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 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 4-2 shows this label.

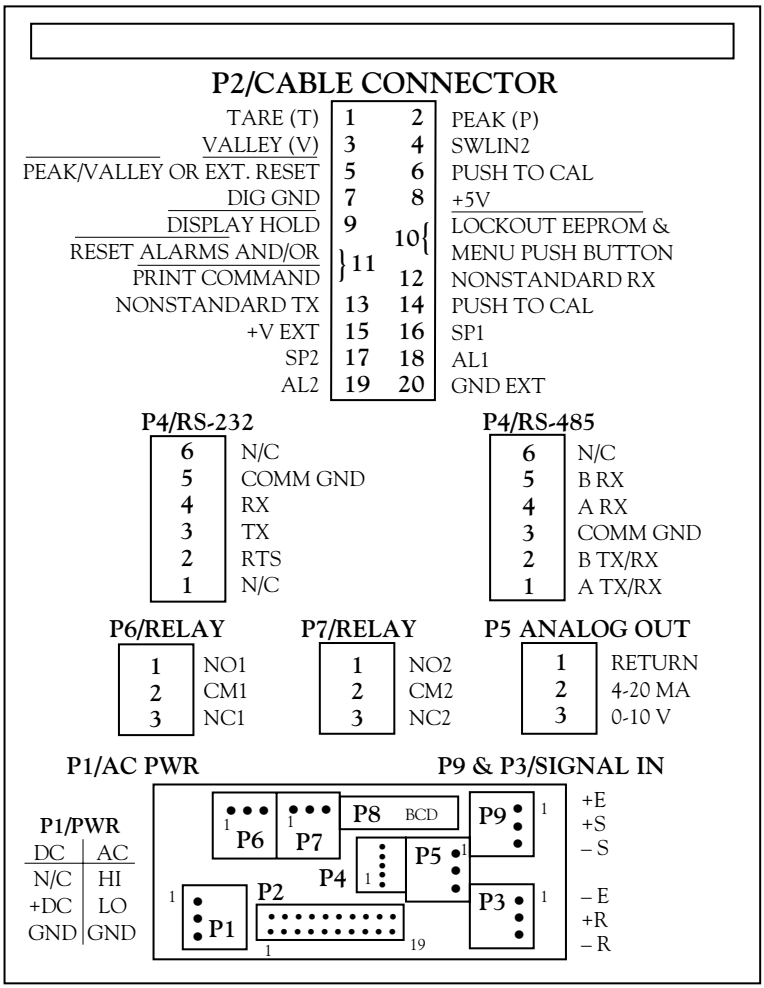


Figure 4-2. Connector Label for Rear Connectors

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

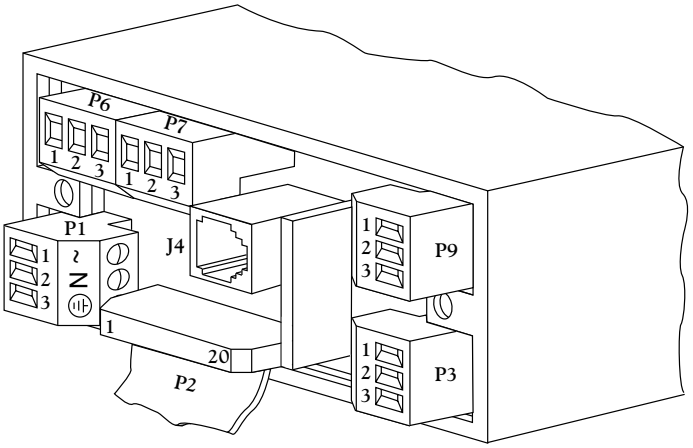


Figure 4-3. Rear View

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

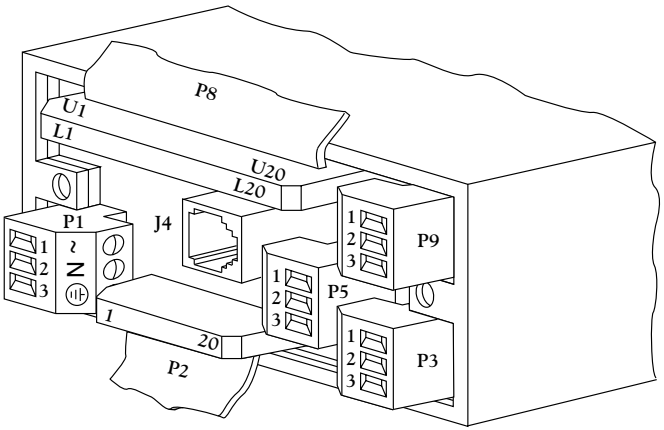


Figure 4-4. Rear View

TABLE 4-1
REAR CONNECTOR DESCRIPTIONS

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

Notes:

5. Setup

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 DISASSEMBLY

The following procedure describes how to open the meter. Figure 5-1 shows the meter with the standard bezel and Figure 5-2 shows the meter with the optional housing.

1. Make sure the AC power plug is removed from the meter.

2. Remove the cover mounting screw and set aside.

3. Remove the rear protective cover and set aside.

4. Remove all wiring connectors from the rear of the meter.

5. Remove both thumbnuts and set aside.

6. Remove the sleeve and set aside.

7. Bend the side panel detents on the case (shown in Figure 5-3) outward to release the boards. Pull the board assembly out of the case by the mounting screw stem.

NOTE: From this point forward, these 7 steps are referred to as "Reveal the main board".

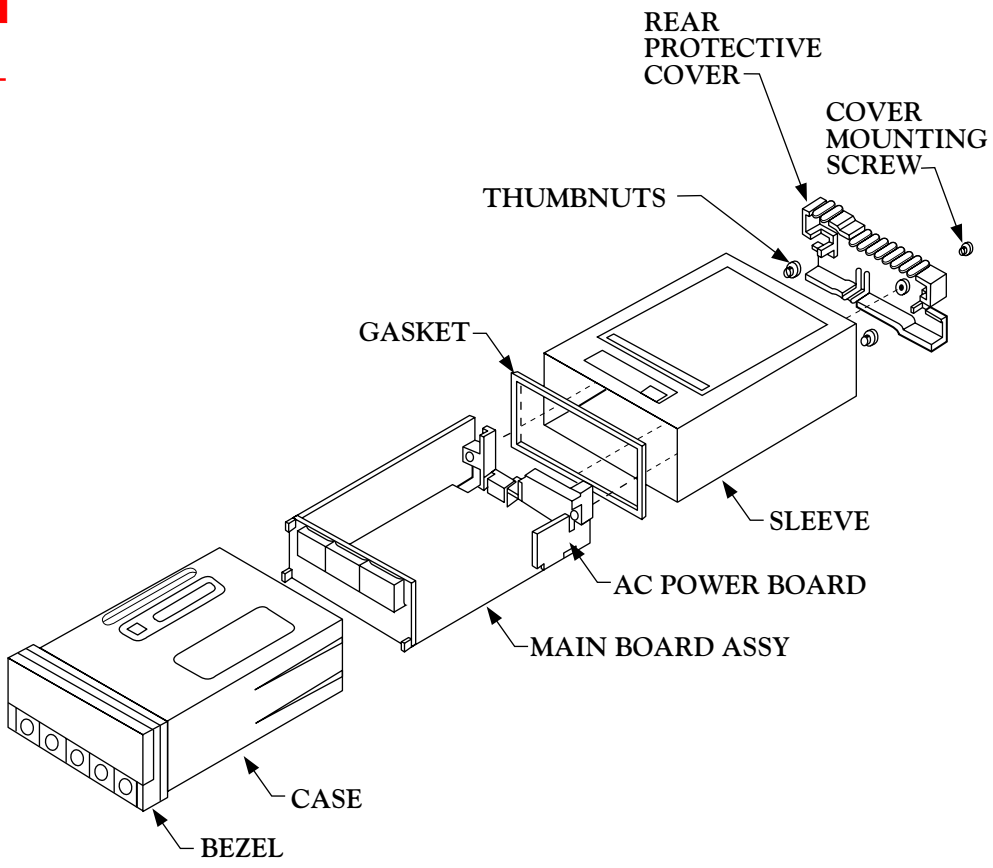


Figure 5-1. Meter Exploded View

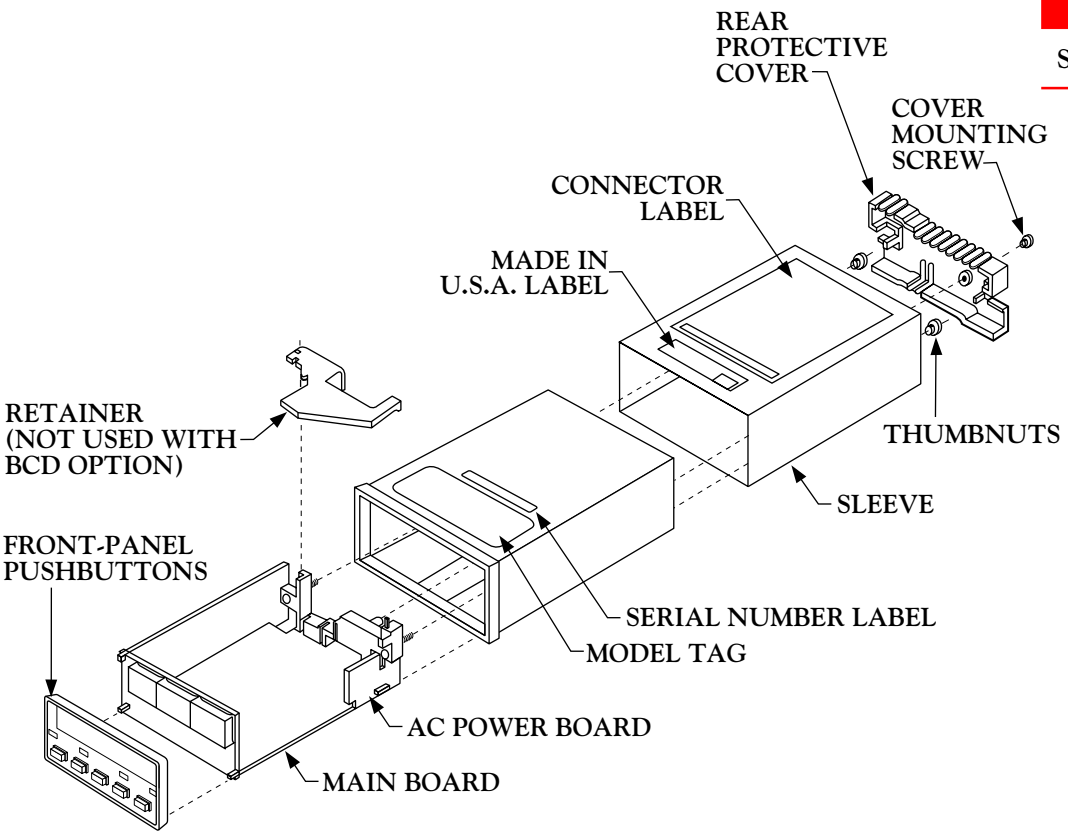


Figure 5-2. Meter Exploded View (with optional housing)

5.2.1 RATING / PRODUCT ID LABEL

To look at the Rating/Product ID label on the case, you must follow the first 6 steps as described in Section 5-2. Refer to Figure 5-3 for the location of the Product Identification Label.

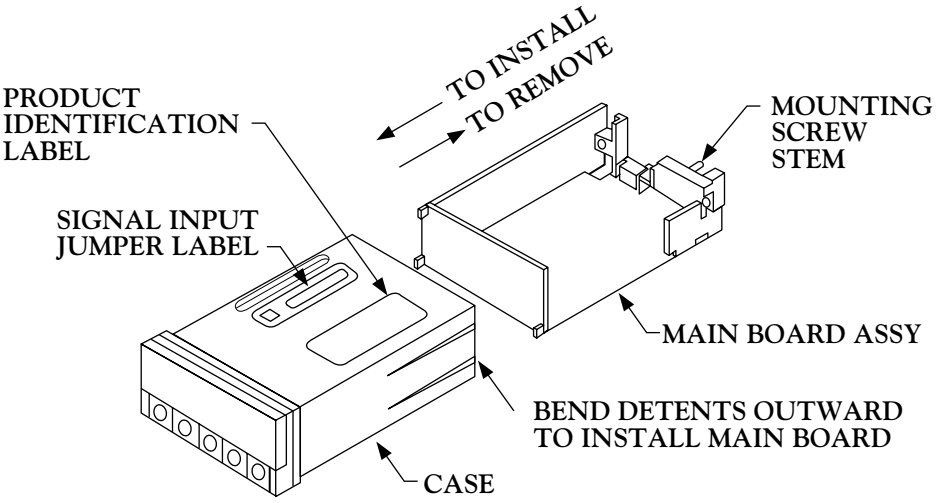


Figure 5-3. Board Assembly Removing/Installing Detail

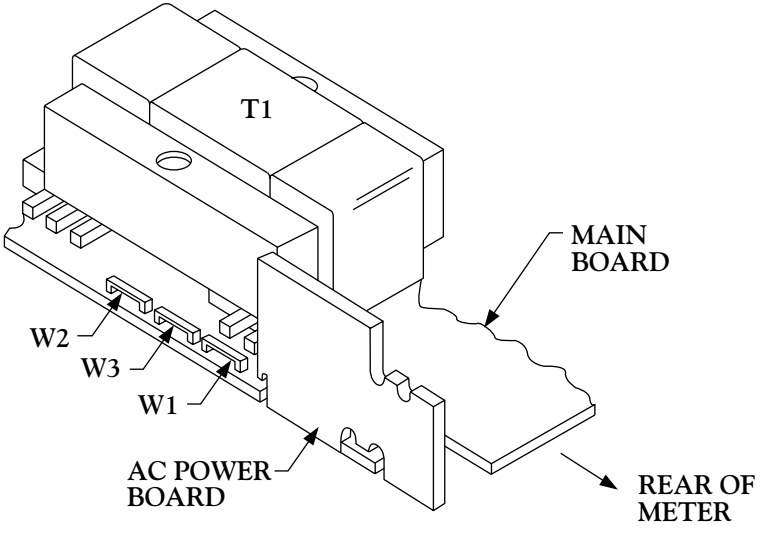


Figure 5-4. Transformer Jumpers

5.2.2 MAIN BOARD POWER JUMPERS

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

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 5-4.

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)

5.2.3 PRINTED CIRCUIT BOARD(S) INSTALLATION

To install optional printed circuit board(s):

1. "Reveal the Main Board" (refer to Section 5.2, Disassembly).

2. Using Figure 5-5 as a reference, insert option board(s) into the corresponding slot(s) on the main board. Each circuit board is keyed to fit in it's own position.

3. To re-assemble the meter, follow the steps in Section 5.2 in reverse order.

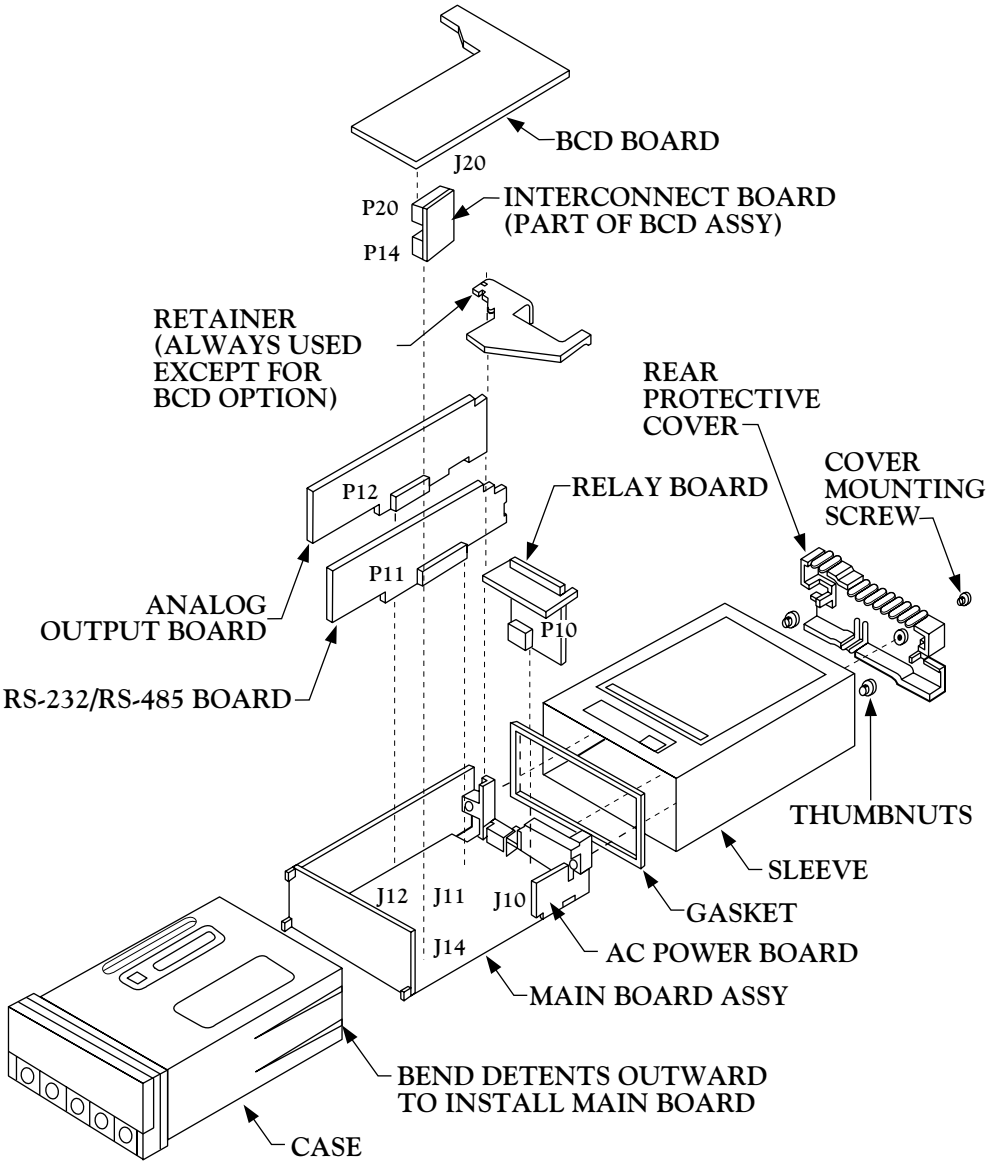


Figure 5-5. Optional Printed Circuit Board Locations

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

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

Figures 5-6 through 5-12 show the layout of the seven (7) printed circuit boards with respective jumper blocks, where applicable, used in the meter. Figures 5-8 through 5-12 show the optional boards.

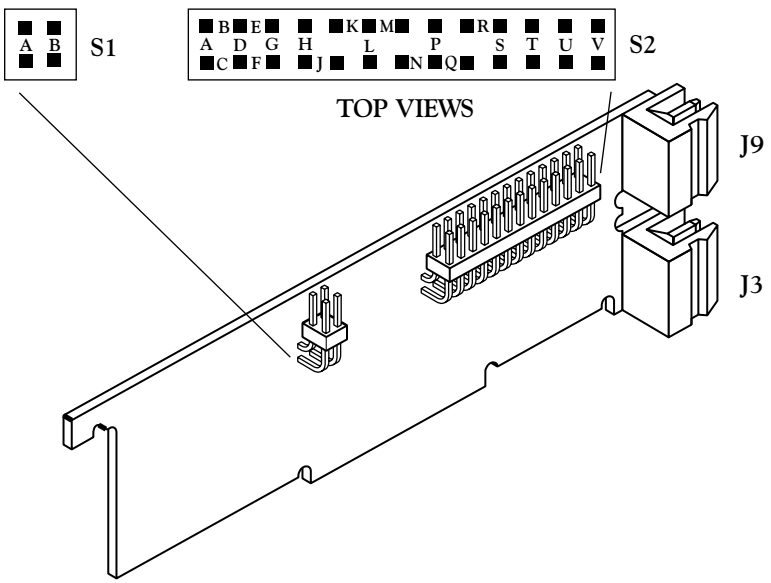


Figure 5-6. Signal Input Board

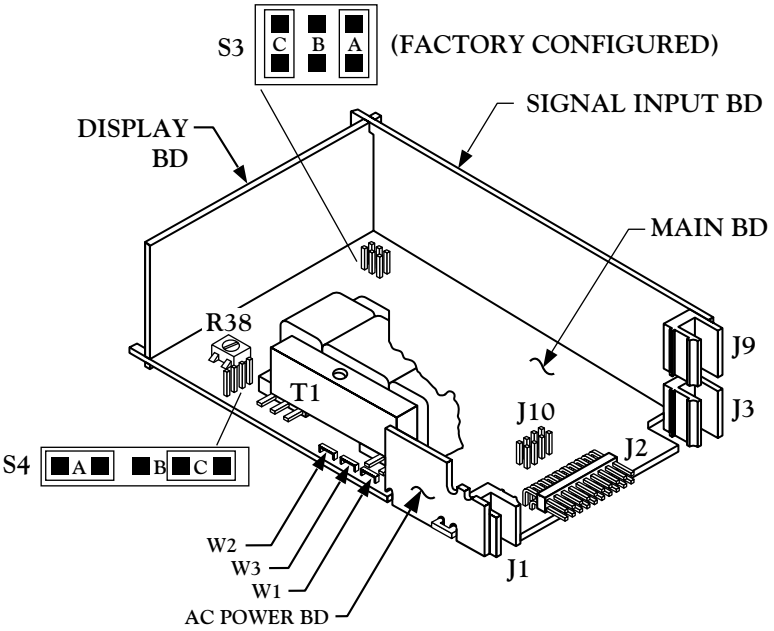


Figure 5-7. Main Board

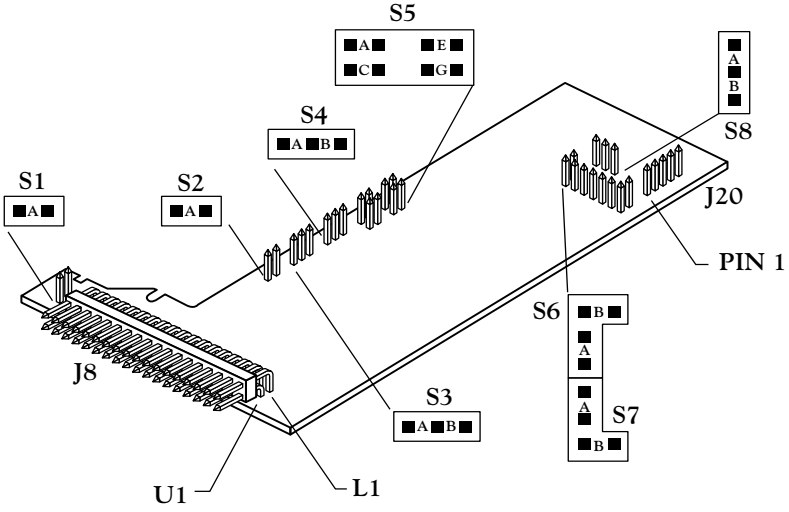


Figure 5-8. BCD Option Board

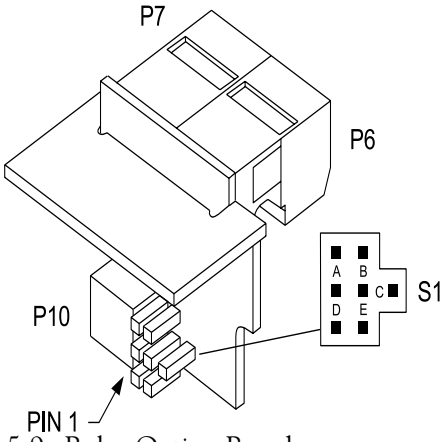


Figure 5-9. Relay Option Board

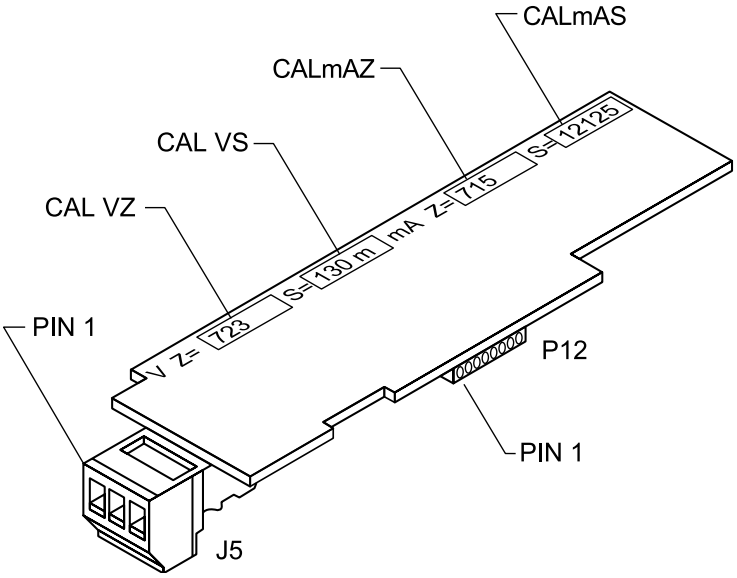


Figure 5-10. Analog Output Option Board

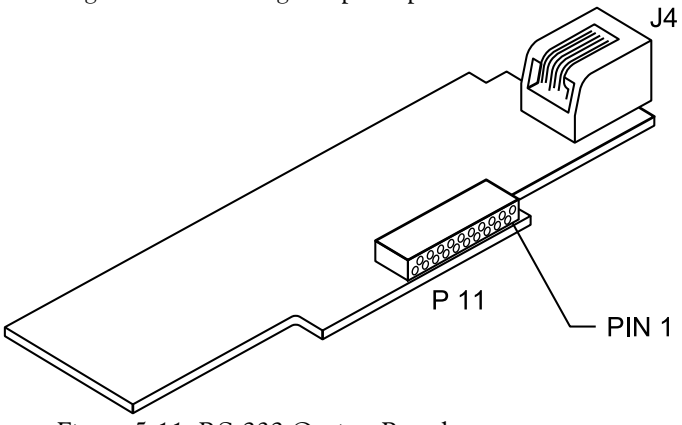


Figure 5-11. RS-232 Option Board

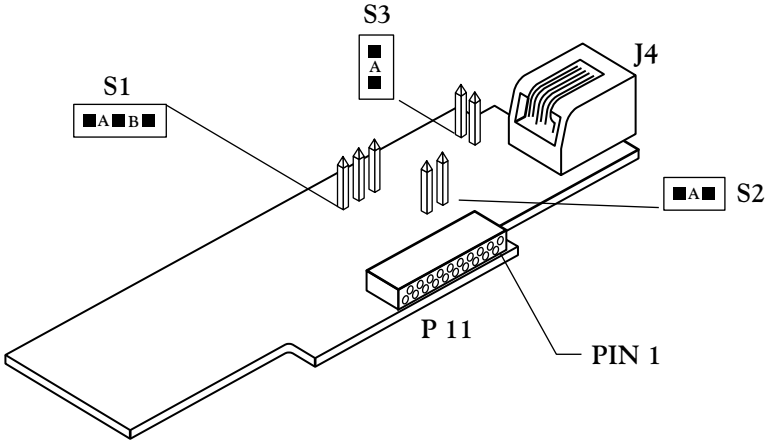


Figure 5-12. RS-485 Option Board

5.2.5 PANEL MOUNTING

To mount the meter in a panel:

1. "Reveal the Main Board" (refer to Section 5.2, Disassembly). You don't need to do step 7.

2. Using the panel cutout diagram shown in Figure 5-13, cut a hole in the panel.

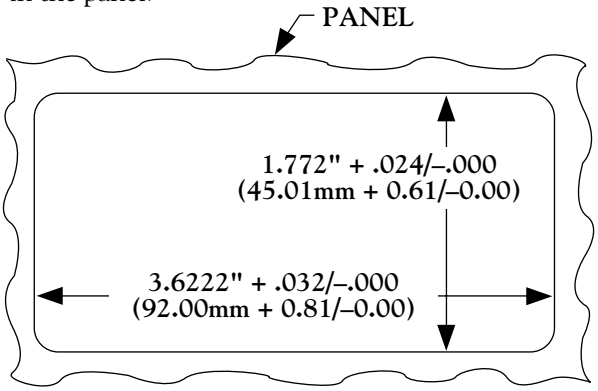


Figure 5-13. Panel Cutout Dimensions

3. Insert the case and meter into the hole from the front of the panel, so that the gasket seals between the bezel and the front of the panel. Refer to Figure 5-14.

4. Slip the sleeve over the rear of the case.

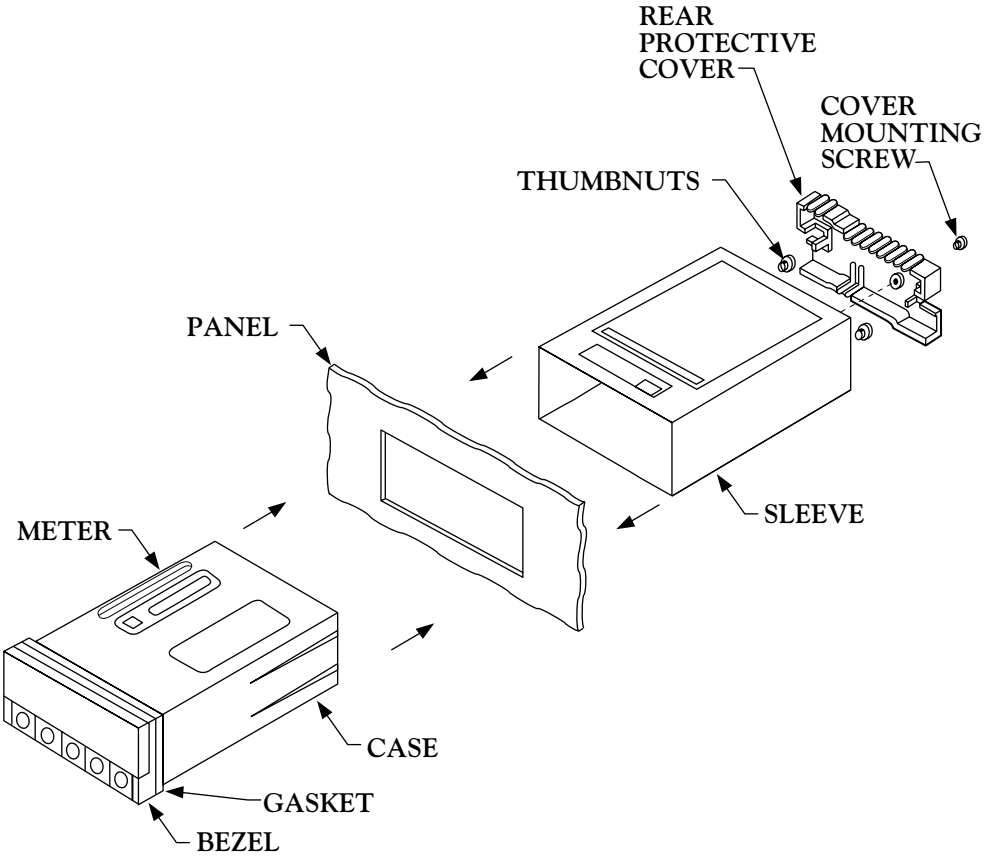


Figure 5-14. Panel Mounting

5. Re-attach and tighten the thumbnuts to hold the meter firmly in the panel.

6. Replace the wire connectors at the rear of the meter.

7. Replace the applicable rear protective cover and secure with the cover mounting screw.

8. Re-apply power. Section 5.3 covers how to wire the power connector, if you haven't already done so.

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).

5.2.6 BENCH TOP USE

The sleeve has no mounting function in bench-top use, but covers the input-jumper opening and provides additional protection. Attach the appropriate wires to the signal connectors P3, P9 and plug them in to the rear of the assembly. The label on the case sleeve shows the connectors and terminal designators.

Plug in the power connector and attach the rear protective cover with the cover mounting screw. Apply power. The meter should light, and display "RESET 2", then return to the run mode. If the meter flashes an overscale or overload message refer to Section 17, Troubleshooting Guide. Do not be concerned about overloads (the +S input can stand 120 Vac continuously and current inputs can handle ten times rated current).

5.3 AC WIRING

The orange (power) connector must be wired according to the following procedure (refer to Figure 5-15):

USA WIRING CODE	INTERN'L WIRING CODE	CONNECTION	PIN # ON ORANGE CONNECTOR
Black	Brown	AC High (HI)	1
White	Blue	AC Neutral(LO)	2
Green	Green/Yellow	AC Ground	3

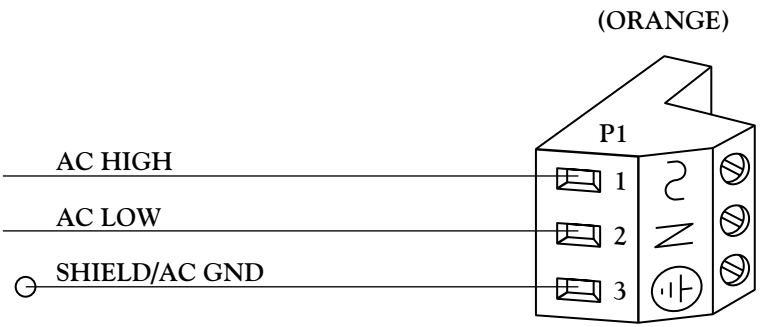


Figure 5-15. AC Connector Wiring

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.

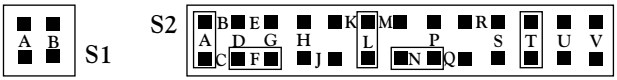
The typical setting for your meter is unipolar. For unipolar input, no jumper is installed in the S2B position and Input Configuration ("IN CNF") bit "INP.3" must be set to equal "0". For bipolar inputs, install a jumper in S1B and set Input Configuration ("IN CNF") bit "INP.3" to equal "1".

6.3 S2 JUMPER POSITIONS FOR INPUT RANGES

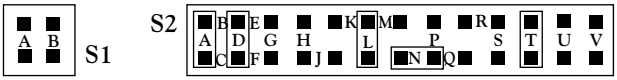
The following are the input signal jumper positions required to be installed in the "S2" position on your meter for the current or voltage input ranges you require. These jumper positions include those that are required for sensor excitation. Jumpers S2-N & S2-T are for either 1.5 to 11 Vdc or 24 Vdc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

BRIDGE - UNIPOLAR

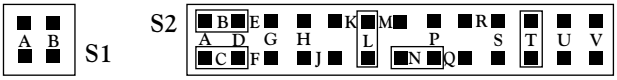
Jumpers for 0 to 100 mV range: (factory preset)
(meter supplied excitation)



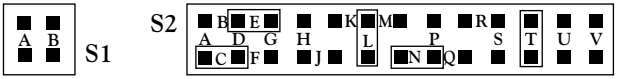
Jumpers for 0 to 1 V range: (meter supplied excitation)



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

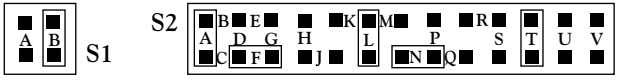


Jumpers for 0 to 100 V range: (meter supplied excitation)

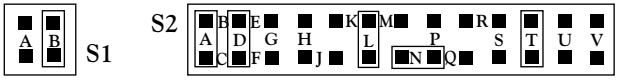


BRIDGE - BIPOLAR

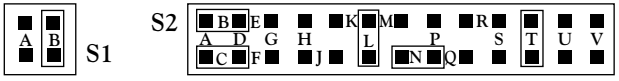
Jumpers for -50 to +50 mV range: (meter supplied excitation)



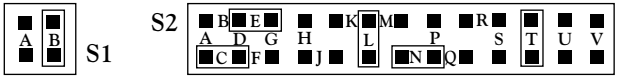
Jumpers for -500 to +500 mV range: (meter supplied excitation)



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



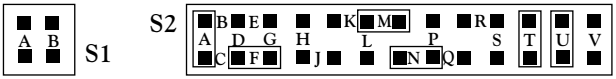
Jumpers for -50 to +50 V range: (meter supplied excitation)



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

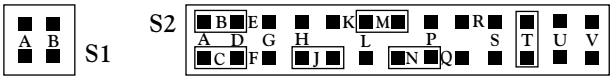
CURRENT

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 the "S2T" jumper when you use external sensor excitation.

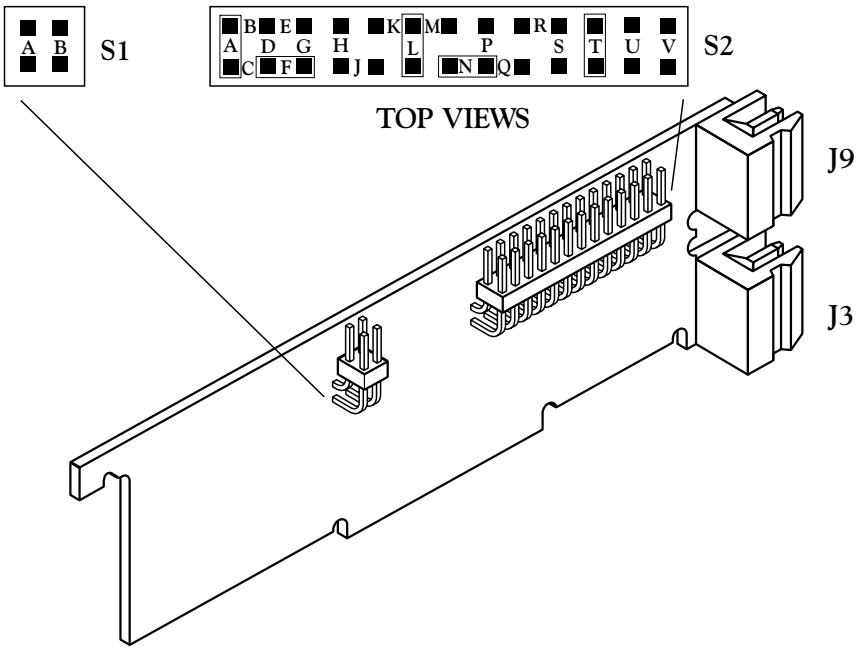


Figure 6-1. S1 and S2 Jumper Locations on Signal Input Board

6.4 JUMPER SETTING(S) FOR SENSOR EXCITATION

The following are the jumper positions that must be installed in the S4 position located on the main board for sensor excitation. Your meter is capable of supplying 1.5 to 11 Vdc or 24 Vdc sensor excitation. Install jumpers S4A & S4C for 1.5 to 11 Vdc and adjust the "R38" potentiometer for the excitation required. (You may require a multimeter, such as the HHM1 to read the excitation output). The typical factory setting is 10 Vdc.

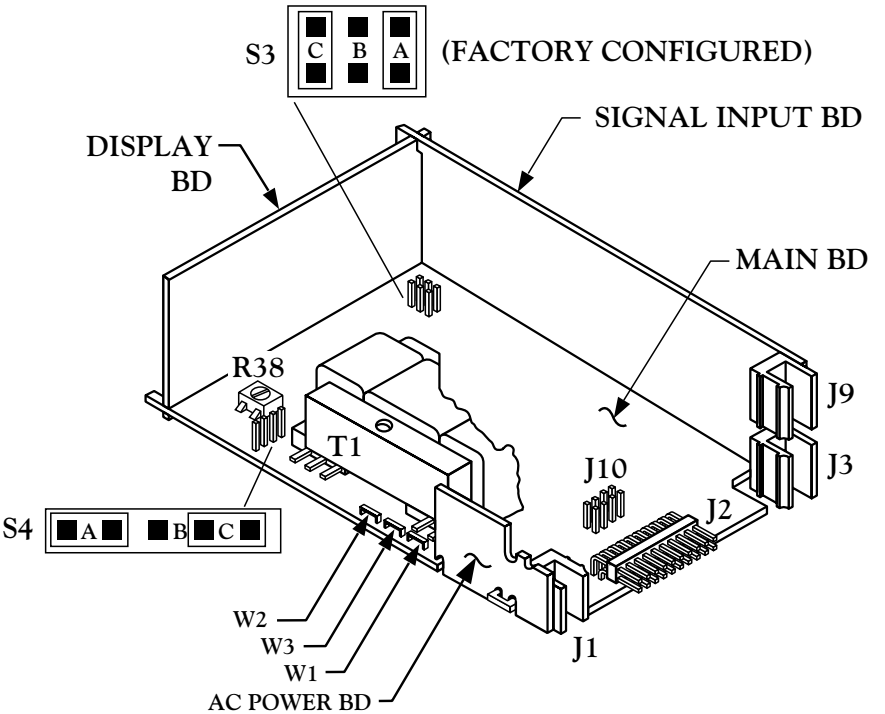
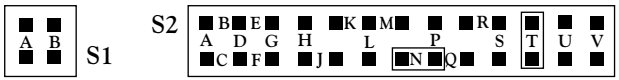


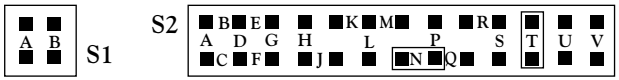
Figure 6-2. Main Board Jumper Positions S3 and S4 for Sensor Excitation and Pushbutton Lockout Menu Control on the Main Board at S4.

SENSOR EXCITATION

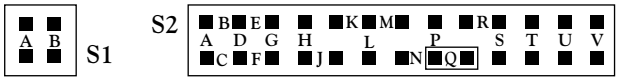
24 Vdc meter excitation (S2N, S2T, Install S4B)



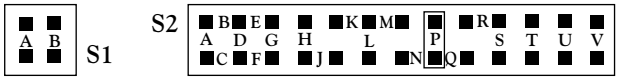
10 Vdc meter excitation (S2N, S2T, S4A, S4C)



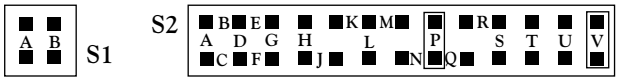
1.25 Vdc meter excitation (S2Q)



160 µA meter excitation (S2P)



1.6 mA meter excitation (S2P, S2V)



NOTES: 1) Maximum excitation for "Ratiometric" measurement is 10 Vdc.
2) Remove the "S2T" jumper when you use external sensor excitation.

S4

S4A & S4C	Installed	For 1.5 to 11 Vdc excitation
S4B	Installed	For 24 Vdc excitation

S3

S3A	Installed	Unlocks "MENU" button for programming
S3B	Omit	
S3C	Installed	Unlocks lockout menu

S3B (the middle jumper), however, 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.

Notes:

7. 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.

7.2 SIGNAL INPUT CONNECTIONS

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

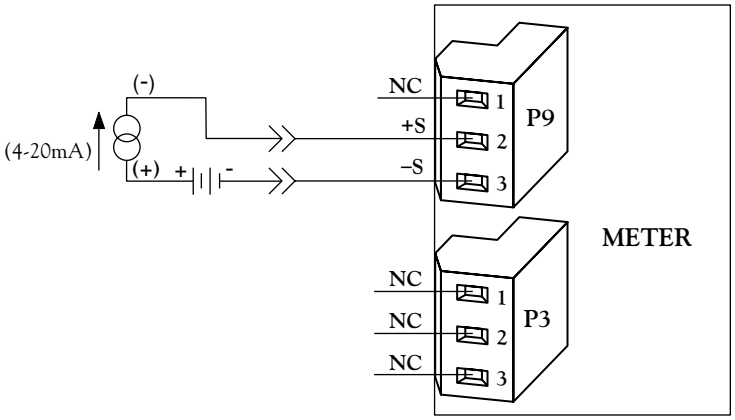


Figure 7-1. Current Input Without Sensor Excitation

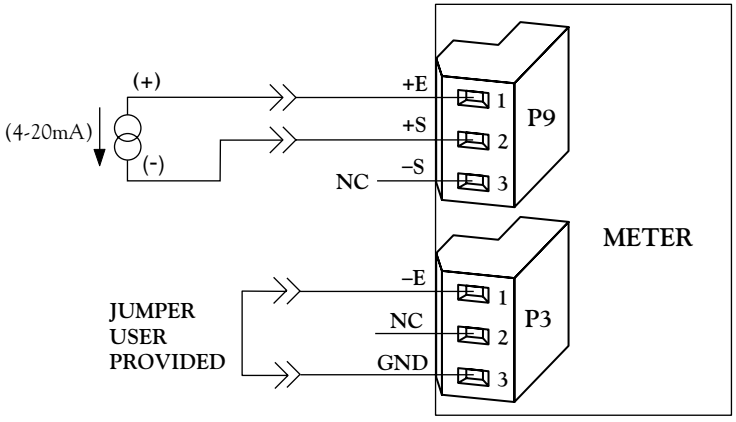


Figure 7-2. Current Input With Sensor Excitation

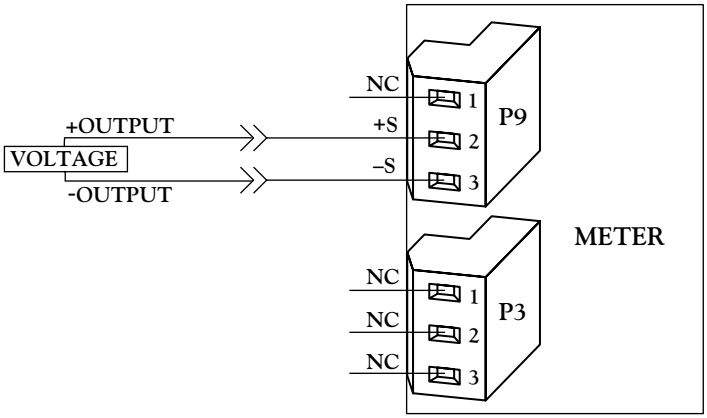


Figure 7-3 Voltage Input Without Sensor Excitation

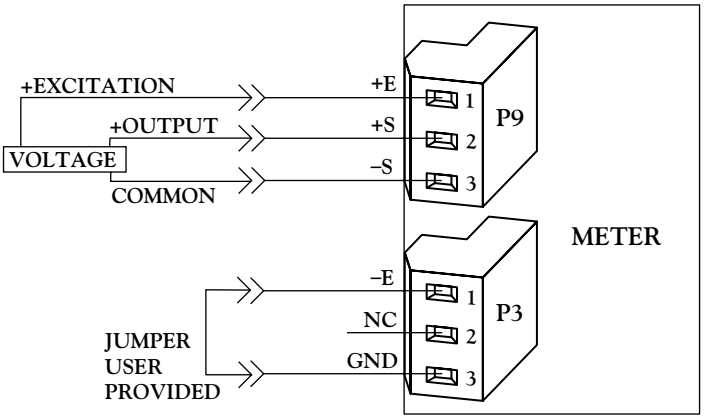


Figure 7-4 3-Wire Voltage Input With Sensor Excitation

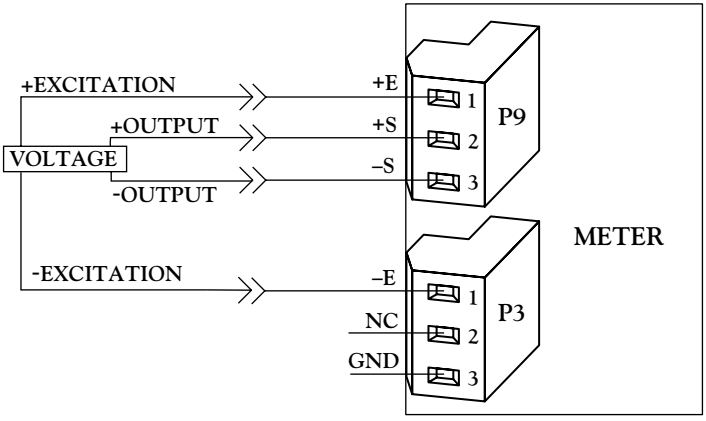


Figure 7-5 4-Wire Voltage/Bridge Input With Sensor Excitation

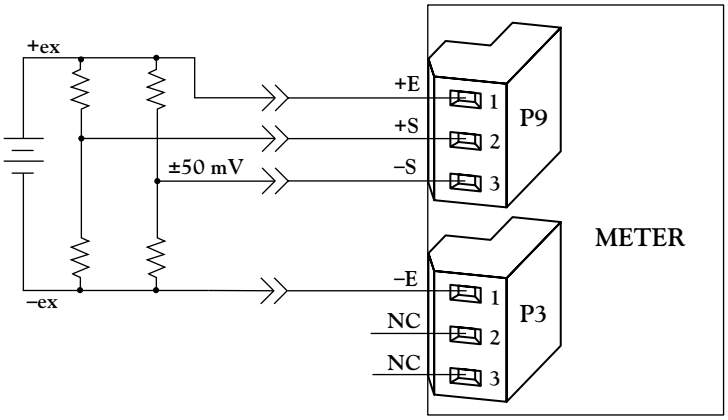


Figure 7-6 Bridge Input With External Sensor Excitation.

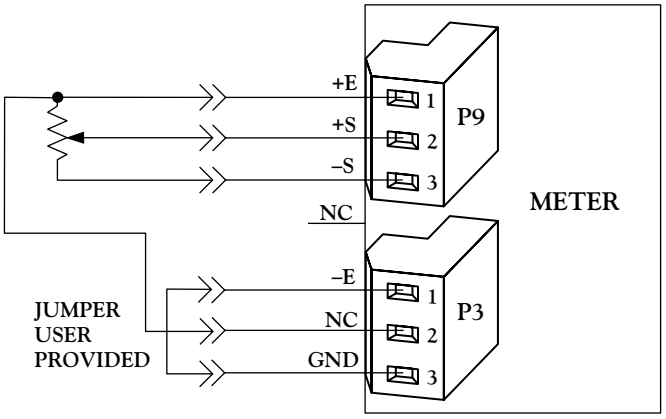


Figure 7-7 Potentiometer Connections with Internal Power Supply and Ratio Measurement.

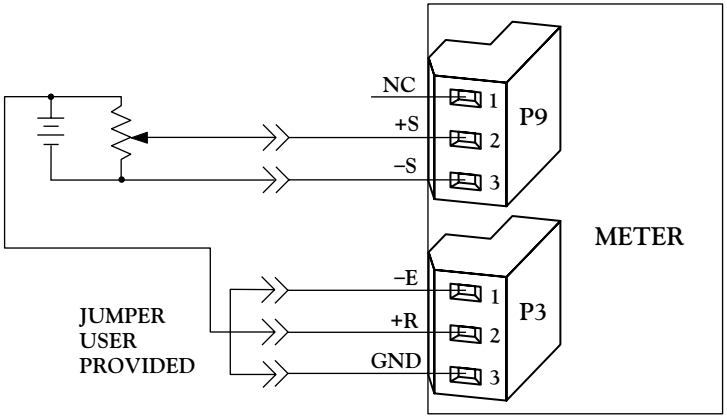


Figure 7-8 Potentiometer Connections With External Power Supply and Ratio Measurement (Remove jumper S2-T)

7.3 AC WIRING CONNECTION

The orange (power) connector must be wired according to the following table (also refer to Figure 7-9).

USA WIRING CODE	INTERN'L WIRING CODE	CONNECTION	PIN # ON ORANGE CONNECTOR
Black	Brown	AC High (HI)	1
White	Blue	AC Neutral(LO)	2
Green	Green/Yellow	AC Ground	3

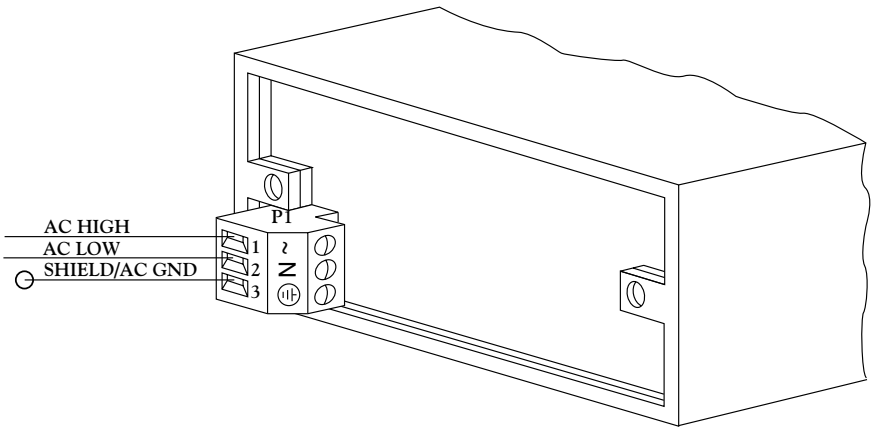


Figure 7-9. AC Connector Wiring at P1

Connect your AC meter power as described above and as shown in Figure 7-9.

WARNING: Do not connect your AC meter power until all input jumpers and sensor input connections are completed. Failure to do so could result in damage to your sensor and/or the meter.

You are now ready to proceed with scaling your meter to display in engineering units as described in Section 8.

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

8.1 INTRODUCTION

There are two basic methods for scaling your meter to display engineering units; scaling by using measured input values or scaling without connecting a sensor using assumed input values. Both methods use the Input Scale and Offset ("IN.SC.OF") method.

8.2 SETUP METER INPUT TYPE AND RANGE

If you have received your meter setup for your required input and do not require changes or rescaling, skip this section entirely and proceed with the normal use of your meter.

If you received your meter and you only require a scaling change, proceed with the steps in Section 8.2.2.

If you received your meter and it is has been configured for an input other than what you require, you must proceed with the following steps before rescaling the display:

> *WARNING: You must set your jumper positions at the S1 and S2 positions* ***BEFORE*** *proceeding. Refer to Section 6 for jumper positions.*

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"INPUT"	Press the 'MENU' button until the display shows "INPUT".
'MIN'		"BRIDGE"	Press the 'MIN' button and the display will show "BRIDGE".
'MENU'		"BRIDGE"	Press the 'MENU' button to store your selection. The display will momentarily show "STORED" only if a change has been made and then will display "RDG.CNF".
For Current Inputs: Install jumpers as described in Section 6.			
For Voltage Inputs: Install jumpers as described in Section 6.			
For Potentiometer Input: Install jumpers as described in Section 6.			

You are now ready to proceed with Input Scale and Offset ("IN.SC.OF")

8.3 SCALING YOUR METER USING 2-COORDINATE INPUT SCALE AND OFFSET (IN.SC.OF) WITH SENSOR CONNECTED TO YOUR METER

The most accurate method for scaling your meter to display engineering units is by connecting your sensor to your meter, apply two known loads, record them as INPUT1 and INPUT2 respectively and use these numbers for entry into 2-coordinate Input Scale and Offset ("IN.SC.OF").

The typical factory calibration and configuration is for the meter to accept a 0-100 mVdc input signal and scaled to display 0 to 100000.

An example would be a 4-wire pressure transducer or load cell that sends an output signal of 0-100 mVdc. With a signal input of "0 mVdc", the display will show "000000"and when a signal input of 100 mVdc is applied, the meter will display "100000".

NOTE: Your display may not show exactly "000000" and may display a negative number such as "–000015" or a positive number such as "000023".

Using Input Scale and Offset ("IN.SC.OF") allows you to accurately scale your input signal to display in any engineering units you require.

NOTE: Although the full span input of your sensor signal is preferred for maximum resolution, you may record any two points within the signal span for scaling accurately into engineering units.

The following will walk you step by step in configuring your meter for scaling your meter using the Input Scale and Offset ("IN.SC.OF") procedure.

8.3.1 SETTING INPUT CONFIGURATION (IN CNF)

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"IN CNF"	Press the 'MENU' button until the display shows "IN CNF".
'MIN'		"INP.3=0"	Press the 'MIN' button until the display shows "INP.3=0" or "INP.3=1".

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MAX'		"INP.3=0"	Press the 'MAX' button to select "INP.3=0"- Unipolar input for current, voltage and potentiometer inputs.
OR			
'MAX'		"INP.3=1"	Press the 'MAX' button to select "INP.3=1"- Bipolar input for voltage or potentiometer inputs.
'MIN'		"INP.6=0" OR "INP.6=1"	Press the 'MIN' button until the display shows "INP.6=0" or "INP.6=1".
'MAX'		"INP.6=1"	Press the 'MAX' button until the display shows "INP.6=1" to enable Input Scale and Offset ("IN.SC.OF").
'MENU'		"IN.SC.OF"	Press the 'MENU' button to store your selection and the display will momentarily show "STORED" then "IN.SC.OF".

If you need to re-scale your meter, you must proceed with the following steps:

8.3.2 SCALING YOUR METER WITH YOUR SENSOR CONNECTED

Before proceeding, you must first apply a low input ("INPUT 1") and a high input ("INPUT 2") into your meter and record the exact display shown. As explained in Section 8.3, the display you will be recording will be 0 and 100000 if your meter has not been changed from the typical factory setup and calibration. The following is an example using the numbers below as the recorded input displayed on the meter. You should use the numbers you have recorded:

Low input:	0 mvdc
Meter display ("INPUT 1"):	000000.
High input:	100 mVdc
Meter display ("INPUT 2"):	100000.

NOTE: If you are using an input signal that is reverse acting (e.g. 100-0 mVdc), then the 100 mV reading would be "INPUT 1" and the 0 mV reading would be "INPUT 2".

In addition to recording your display readings for your two inputs, you must also decide what you want these inputs to display on your meter.

In order to simplify this (especially if you want to display numbers to the right of the decimal point position), you should think of your meter as a process indicator and your decimal point as being passive or cosmetic.

As an example, if you wanted your display to read 0.000 to 68.000, you would record and enter your "READ 1" number as 000000. and your "READ 2" number as 068000. Then after storing these numbers, you would then place your decimal point position (refer to Section 8.3.4) so that your display would show 0.000 to 68.000.

Record your "INPUT1" and "READ 1" numbers, and your "INPUT2" and "READ 2" numbers, record them below and proceed as follows:

	Example
INPUT1 = _____	000003.
READ 1 = _____	000000.
INPUT2 = _____	100018.
READ 2 = _____	068000.

For the purpose of this example, we will use the numbers described above for the following procedure:

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"IN.SC.OF"	Press the 'MENU' button until the display shows "IN.SC.OF" Input Scale and Offset.
'MIN'		"INPUT1"	Press the 'MIN' button and the display will show "INPUT1".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"000003."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter your "INPUT 1" number on the display.
'MENU'		"READ 1"	Press the 'MENU' button and the display will show "READ 1".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MAX'	'MIN'	"000000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter the engineering value that you want your "INPUT 1" number to display on the meter.
'MENU'		"INPUT2"	Press the 'MENU' button and the display will show "INPUT2".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"100018."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter your "INPUT 2" number on the display.
'MENU'		"READ 2"	Press the 'MENU' button and the display will show 'READ 2".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MAX'	'MIN'	"068000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter the engineering value you want your "INPUT 2" to display.
'MENU'		"STORED"	Press the 'MENU' button to store your selection and the display will momentarily show "STORED" then "DEC PT".

Now you are ready to position your decimal point position by completing the following steps:

8.3.3 TO SELECT DECIMAL POINT POSITION (DEC PT)

The following is the procedure for selecting your decimal point position.

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"DEC PT"	Press the 'MENU' button until the display shows "DEC PT".
'MIN'	'MAX'	"FFF.FFF"	Press the 'MIN' button and the display will show "FFFFFF."or the previously selected position. Press the 'MAX' button to select the decimal point position you require, the meter displays the previously selected decimal point location within the "F's"
'MENU'		"CNT BY"	Press the 'MENU' button to store your decimal point selection and the meter will momentarily display "STORED" only if you have made a change and then "CNT BY".
'RESET'	'RESET'	"RESET2" then the Measured Value	Press the 'RESET' button two times. The display will momentarily show "RESET2" and then will display the currently measured values.

Your meter is now calibrated. If you need to offset your zero reading on your meter after calibration, you must proceed with the following steps:

8.3.4 ENTERING ZERO OFFSET NUMBERS

You have two (2) ways to enter a zero offset. The first and easiest is using the TARE function. This is accomplished by connecting a momentary contact to the rear P2 connector at P2-1 and P2-4. Each time this momentary contact is activated, the display will automatically display zero.

The second method for entering a zero offset number is Reading Offset ("RDG OF").

The RDG OF (Reading Offset) menu item should be used if the meter shows a nonzero reading with zero input. The offset value zeroes the display by cancelling out the nonzero reading.

If your meter displays a positive reading at zero input, you must enter a negative offset value. If your meter displays a negative reading at zero input, you must enter a positive offset value.

If you are using an active decimal point (RDG.2=0), your offset value will be the negative of the display reading at zero point.

If you are using the more common **independent** decimal point (the factory setting, RDG.2=1), follow these instructions to convert the display reading to the appropriate offset value:

1. Note the display reading at zero input, ignoring the decimal point. This reading represents the count value - the number of whole counts that need to be offset.

2. Shift the count value to the left side of the decimal point.

3. If the count value is positive, make it negative by replacing the leading digit (the left-most digit) with a minus sign. If the count value is negative, make it positive by replacing the negative sign with a zero.

Example 1: Your meter displays 000.003 when the input is zero. The count value is 000003. Shift this value to the left side of the decimal point: 003.000. Change the leading zero to a minus sign: -03.000. This is the "converted offset value" you will use for configuring RDG OF.

Example 2: Your meter displays -00.003 when the input is zero. The count value is -00003. Shift this value to the left side of the decimal point: -03.000. Change the leading minus sign to a zero: 003.000. This is the "converted offset value" you will use for configuring RDG OF.

If the nonzero reading is fluctuating between two numbers, convert the smaller count value to the offset value, then add a 5 just right of the decimal point. This adds half a count to the offset. For example, the display if flucuating between 00.0001 and 00.0002. Calculate the offset using the 000001 count value. The converted offset value is -1.0000. Add a 5 to the right of the decimal point: the final offset value is -1.5000.

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"RDG OF"	Press the 'MENU' button until the display shows "RDG OF".
'MIN'		"000000."	Press the 'MIN' button and the display will show the last offset entered.
'MIN'	'MAX'	"XXXXXX"	Use the 'MIN' to move to each digit and the 'MAX' button to change the flashing digits value and enter your zero offset number.
'MENU'		"STORED" then "IN CNF"	Press the 'MENU' button to store your selection. The display will momentarily show "STORED" then "IN CNF".
'RESET'	'RESET'	"RESET2" the then Measured Value	Press the 'RESET' button two times. The display will momentarily show "RESET2" and then will display the currently measured values.

NOTE: If after zeroing the display with RDF OF, the reading again drifts from zero, the required offset value is the **sum** of the current RDG OF value and the current converted offset value. The examples below illustrate the calculation of required offset values when using an independent decimal. If you are using an active decimal point, the current converted offset value is simply the negative value of the display reading.

Example 1: You use a RDG OF value of –1.0000 to zero the meter. The next morning, the meter displays 00.0008 at zero input; you need to rezero. The current count value is 000008; shifting this value to the left of the decimal makes it 08.0000, and making the value negative makes it –8.0000. The required RDG OF value is the **sum** of the current RDG OF value (–1.0000) and the current converted offset value (–8.0000):

–1.0000 + –8.0000 = –9.0000

Example: You use a RDG OF value of –1.0000 to zero the meter. The next morning, the meter displays –0.0008 at zero input; you need to rezero. The current count value is –00008; shifting this value to the left of the decimal makes it –8.0000, and making the value positive makes it 08.0000. The required RDG OF value is **sum** of the current RDG OF value (–1.0000) and the current converted offset value (08.0000):

–1.0000 + 08.0000 = 07.0000

If you require further configuration(s) for your specific application, refer to Sections 9 through 21.

NOTE: Should you receive an error code of any kind while configuring your meter, refer to Section 17 - Troubleshooting - Display Messages and Troubleshooting Guide.

8.4 SCALING YOUR METER WITHOUT CONNECTING A SENSOR USING CALCULATED VALUES

Your meter can be scaled without connecting a sensor and taking measured values using Input Scale and Offset ("IN.SC.OF").

The typical configuration and scaling of your meter is a 0-100 mVdc input with a display equal to 0 to 100000. If your

meter has not been rescaled and your input is 4-20 mAdc, you can use the factory scaling "0" as your "INPUT1" and "100000" as your "INPUT2" and proceed with the step by step procedure in Section 8.4.1.

If you need to change your input signal, you must rescale your meter as described in the following steps:

8.4.1 PREPARING YOUR METER FOR SCALING WITH INPUT SCALE AND OFFSET

If you are changing your input signal you must follow the instructions for installing the correct jumper positions as described in Section 6 and the sensor connections as described in Section 7.

> *WARNING: Do not connect your AC meter power until all input jumpers and sensor input connections are completed. Failure to do so could result in damage to your sensor and/or the meter.*

The following procedure will direct you step by step in preparing your meter for rescaling using Input Scale and Offset ("IN.SC.OF").

> **NOTE:** The following procedure will scale your meter to display in microvolts and insure that your final scaling is as accurate as possible.

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"IN.SC.OF"	Press the 'MENU' button until the display shows "IN.SC.OF" Input Scale and Offset.
'MIN'		"INPUT1"	Press the 'MIN' button and the display will show "INPUT1".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"IN.SC.OF"	Press the 'MENU' button until the display shows "IN.SC.OF" Input Scale and Offset.
'MIN'		"INPUT1"	Press the 'MIN' button and the display will show "INPUT1".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"000000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter "000000." on the display.
'MENU'		"READ 1"	Press the 'MENU' button and the display will show 'READ 1".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"000000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter "000000" on the meter.

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"INPUT2"	Press the 'MENU' button and the display will show "INPUT2".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"100000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter "000000." on the display.
'MENU'		"READ 2"	Press the 'MENU' button and the display will show "READ 2".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"100000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter "100000." on the display.
'MENU'		"STORED"	Press the 'MENU' button to store your selection and the display will momentarily show "STORED" then "DEC PT".

Proceed with the following steps for positioning your decimal point position:

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"DEC PT"	Press the 'MENU' button until the display shows "DEC PT".
'MIN'	'MAX'	"FFF.FFF"	Press the 'MIN' button and the display will show "FFFFFF." or the previously selected position. Press the 'MAX' button to select the decimal point position you require, the meter displays the previously selected decimal point location within the "F's".
'MENU'		"CNT BY"	Press the 'MENU' button to store your decimal point selection and the meter will momentarily display "STORED" only if you have made a change and then "CNT BY".

Your are now ready to scale your meter using Input Scale and Offset ("IN.SC.OF") without connecting a sensor or signal source to your meter.

8.4.2 SCALING YOUR METER

Scaling your meter without a sensor or a signal source connected is easily accomplished by using one of the calculated scale factors as shown in Figure 8-1.

These calculated scale factors are the numbers that your meter would display if you connected a signal source.

You must complete the procedure for preparing your meter for scaling as described in Section 8.4.1. Failure to complete this procedure will result in erroneous readings.

INPUT SIGNAL	LOW VALUE	HIGH VALUE
0-20 mA	000000	020000
4-20 mA	000000	020000
± 50 mV	–50000	050000
± 500 mV	–50000	050000
0-20 mV	000000	020000
0-30 mV	000000	030000
0-50 mV	000000	050000
0-100 mV	000000	100000
0-1 V	000000	100000
0-5 V	000000	050000
1-5 V	010000	050000
1-6 V	010000	060000
0-10 V	000000	100000
0-50 V	000000	050000
0-100 V	000000	100000
±5 V	–50000	050000
±50 V	–50000	050000

Figure 8-1. Factory Calculated Scale Factors

For the purpose of this procedure, we will use an input of 0-50 mVdc and scale the meter to display 0 to 2500.0.

The calculated scale factors can now be used to scale your meter to display in engineering units using Input Scale and Offset ("IN.SC.OF") as follows:

Record your "INPUT1" and READ 1" numbers, and your "INPUT2" and "READ 2" numbers, record them below and proceed as follows:

		Example
INPUT1 =	_____	000000.
READ 1 =	_____	000000.
INPUT2 =	_____	050000.
READ 2 =	_____	025000.

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"IN.SC.OF"	Press the 'MENU' button until the display shows "IN.SC.OF" Input Scale and Offset.
'MIN'		"INPUT1"	Press the 'MIN' button and the display will show "INPUT1".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"000000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter your "INPUT 1" number on the display.
'MENU'		"READ 1"	Press the 'MENU' button and the display will show "READ 1".

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"000000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter the engineering value that you want your "INPUT 1" number to display on the meter.
'MENU'		"INPUT2"	Press the 'MENU' button and the display will show "INPUT2".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"050000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter your "INPUT 2" number on the display.

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"READ 2"	Press the 'MENU' button and the display will show "READ 2".
'MIN'		"XXXXXX"	Press the 'MIN' button and the display will show some 6-digit number.
'MAX'	'MIN'	"025000."	Using the 'MAX' button to change the value of the flashing digit and the 'MIN' button to scroll to the next digit to the right, enter the engineering value you want your "INPUT 2" to display.
'MENU'		"STORED"	Press the 'MENU' button to store your selection and the display will momentarily show "STORED" then "DEC PT".

Now you are ready to position your decimal point position by completing the following steps:

8.4.3 TO SELECT DECIMAL POINT POSITION

The following is the procedure for selecting your decimal point position.

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"DEC PT"	Press the 'MENU' button until the display shows "DEC PT".

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PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MIN'	'MAX'	"FFFFF.F"	Press the 'MIN' button and the display will show "FFFFFF." or the previously selected position. Press the 'MAX' button to select the decimal point position you require, the meter displays the previously selected decimal point location within the "F's".
'MENU'		"CNT BY"	Press the 'MENU' button to store your decimal point selection and the meter will momentarily display "STORED" only if you have made a change and then "CNT BY".
'RESET',	'RESET'	"RESET2" then the Measured Value	Press the 'RESET' button two times. The display will momentarily show "RESET2" then will display the currently measured values.

Your meter is now calibrated.

You may need to enter a zero offset after scaling your meter. There are two (2) ways to enter a zero offset. The first and easiest is using the TARE function. This is accomplished by connecting a momentary contact to the rear P2 connector at P2-1 and P2-4. Each time this momentary contact is activated, the display will automatically display zero.

The second method for entering a zero offset number is Reading Offset ("RDG OF") which the following procedure explains:

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"RDG OF"	Press the 'MENU' button until the display shows "RDG OF".
'MIN'		"000000."	Press the 'MIN' button and the display will show the last offset entered.

If your meter displays an offset which is a positive number, you must enter a negative "–" offset number into Reading Offset ("RDG OF"). An example would be if your zero input shows "20" on your meter display, you would enter "–00020" in Reading Offset ("RDG OF") and if your zero input shows a negative "–20" you would enter a positive 000020 in Reading Offset ("RDG OF").

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MIN'	'MAX'	"XXXXXX"	Use the 'MIN' button to move to each digit and the 'MAX' button to change the flashing digits value and enter your zero offset number.
'MENU'		"STORED" then "IN CNF"	Press the 'MENU' button to store your selection. The display will momentarily show "STORED" then "IN CNF".
'RESET'	'RESET'	"RESET2" then the Measured Value	Press the 'RESET' button two times. The display will momentarily show "RESET2" and then will display the currently measured values.

8.4.4 ENTERING ZERO OFFSET NUMBERS

The RDG OF (Reading Offset) menu item should be used if the meter shows a nonzero reading with zero input. The offset value zeroes the display by cancelling out the nonzero reading.

If your meter displays a positive reading at zero input, you must enter a negative offset value. If your meter displays a negative reading at zero input, you must enter a positive offset value.

If you are using an active decimal point (RDG.2=0), your offset value will be the negative of the display reading at zero point.

If you are using the more common **independent** decimal point (the factory setting, RDG.2=1), follow these instructions to convert the display reading to the appropriate offset value:

1. Note the display reading at zero input, ignoring the decimal point. This reading represents the count value - the number of whole counts that need to be offset.

2. Shift the count value to the left side of the decimal point.

3. If the count value is positive, make it negative by replacing the leading digit (the left-most digit) with a minus sign. If the count value is negative, make it positive by replacing the negative sign with a zero.

Example 1: Your meter displays 000.003 when the input is zero. The count value is 000003. Shift this value to the left side of the decimal point: 003.000. Change the leading zero to a minus sign: –03.000. This is the “converted offset value” you will use for configuring RDF OF.

Example 2: Your meter displays –00.003 when the input is zero. The count value is –00003. Shift this value to the left side of the decimal point: –03.000. Change the leading minus sign to a zero: 003.000. This is the “converted offset value” you will use for configuring RDG OF.

If the nonzero reading is fluctuating between two numbers, convertthe smaller count value to the offset value, then add a 5 just right of the decimal point. This adds half a count to the offset. For example, the display if flucuating between 00.0001 and 00.0002.

Calculate the offset using the 000001 count value. The converted offset value is -1.0000. Add a 5 to the right of the decimal point: the final offset value is -1.5000.

PRESS	THEN PRESS (TO CHANGE IF REQUIRED)	UNTIL DISPLAY SHOWS	COMMENTS
'MENU'		"RDG OF"	Press the 'MENU' button until the display shows "RDG OF".
'MIN'		"000000."	Press the 'MIN' button and the display will show the last offset entered.
'MIN'	'MAX'	"XXXXXX"	Use the 'MIN' to move to each digit and the 'MAX' button to change the flashing digits value and enter your zero offset number.
'MENU'		"STORED" then "IN CNF"	Press the 'MENU' button to store your selection. The display will momentarily show "STORED" then "IN CNF".
'RESET'	'RESET'	"RESET2" then the Measured Value	Press the 'RESET' button two times. The display will momentarily show "RESET2" and then will display the currently measured values.

NOTE: If after zeroing the display with RDF OF, the reading again drifts from zero, the required offset value is the **sum** of the current RDG OF value and the current converted offset value. The examples below illustrate the calculation of required offset values when using an independent decimal. If you are using an active decimal point, the current converted offset value is simply the negative value of the display reading.

Example 1: You use a RDG OF value of -1.0000 to zero the meter. The next morning, the meter displays 00.0008 at zero input; you need to rezero. The current count value is 000008; shifting this value to the left of the decimal makes it 08.0000, and making the value negative makes it -8.0000. The required RDG OF value is the **sum** of the current RDG OF value (-1.0000) and the current converted offset value (-8.0000):

-1.0000 + -8.0000 = -9.0000

Example 2: You use a RDG OF value of -1.0000 to zero the meter. The next morning, the meter displays -0.0008 at zero input; you need to rezero. The current count value is -00008; shifting this value to the left of the decimal makes it -8.0000, and making the value positive makes it 08.0000. The required RDG OF value is **sum** of the current RDG OF value (-1.0000) and the current converted offset value (08.0000):

-1.0000 + 08.0000 = 07.0000

If you require further configuration(s) for your specific application, refer to Sections 9 through 21.

NOTE: Should you receive an error code of any kind while configuring your meter, refer to Section 17 - Troubleshooting - Display Messages and Troubleshooting Guide.

Notes:

9. Explanation of Lockout Configurations and Meter Function Menus

HOW TO USE THE TABLES IN SECTION 9	
MIN/MAX/MENU BUTTONS	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: 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"	Valley-value (LO RDG) display is not permitted.
	"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	DESCRIPTION
"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) or 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) or RD.SC.OF (two data points, which determine the reading scale/offset) is locked out.

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MENU BUTTON MAIN MENU	MIN/MAX* BUTTON SUB MENU	CONDITION
	"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.
	"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.
	"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.

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MENU BUTTON MAIN MENU	MIN/MAX* BUTTON SUB MENU	CONDITION
	"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	DESCRIPTION
"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.

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MENU BUTTON MAIN MENU	MIN/MAX* BUTTON SUB MENU	DESCRIPTION
	"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, L4C.6 and L4C.7.

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

NOTE: Sections 9.2.1 through 9.2.23 are also shown in the Quick Reference Guide.

9.2.1 INPUT

By pressing the 'MAX' and 'MENU' buttons you 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.

Display = m times input plus b or [m (input) + b] (where m is the RDG SC and b is the 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 Celcius, 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
		Unit of Temperature:
	"RDG.5=0"	NOT USED
	"RDG.5=1"	WITH
	"RDG.5=2"	STRAIN GAUGE
		Temp. Unit on Display:
	"RDG.6=0"	NOT USED
	"RDG.6=1"	WITH STRAIN GAUGE
		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".

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.

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MENU BUTTON MAIN MENU	MIN/MAX* BUTTON SUB MENU 1	MIN/MAX /MENU** BUTTON SUB MENU 2	DESCRIPTION
		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.

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.

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MENU BUTTON MAIN MENU	MIN/MAX /MENU * BUTTON SUB MENU	DESCRIPTION
	"INP.6=0"	Disabled
	"INP.6=1"	Enabled
		Type of Reading:
	"INP.7=0"	Non Ratiometric
	"INP.7=1"	Ratiometric

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.

* 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. ("000000.")	Enter the first value displayed by the meter.
	READ 1		Item #2 of Coordinate #1.
		000000. ("000000.")	Enter first desired value.
	INPUT 2		Item #1 of Coordinate #2.
		000000. ("100000.")	Enter the second value displayed by the meter.
	READ 2		Item #2 of Coordinate #2.
		000000. ("100000.")	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":	"<u>001</u>" "002" "005" "010" "020" "050" "100"	COUNT BY ROUNDING OFF THE VALUE (the decimal point position is ignored)

* 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"	
	"002"	
	"004"	
	"008"	Number of readings
	"016"	used in averaging.
	"032"	
	"<u>064</u>"	
	"128"	

* 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

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MENU BUTTON MAIN MENU	MIN/MAX/ MENU * BUTTON SUB MENU	DESCRIPTION
		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
		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 deaband 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" ("<u>03 03</u>")	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 (w/system decimal points) Setpoints 1 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 cahnged 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 (w/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

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

* 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]

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.

9.2.20 ADDRES (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":	"000" ("001")	MULTIPOINT COMMUNICATIONS DEVICE ADDRESS 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
		Type of data to be transmitted:
	"DAT.3=0"	Unfiltered
	"DAT.3=1"	Filtered
		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 coomand 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

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MENU BUTTON MAIN MENU	MIN/MAX/ MENU * BUTTON SUB MENU	DESCRIPTION
		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":	"00000" ("<u>00001</u>")	SERIAL COUNT This specifies the number of readings between data transmissions: "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: 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 mAZ, and 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: 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.

Notes:

10. 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:

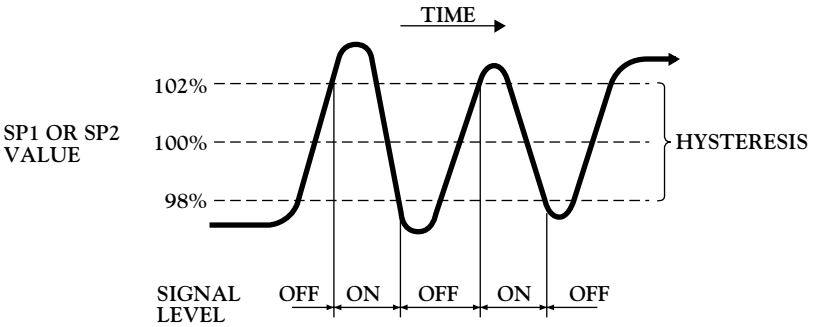


Figure 10-1. Setpoints 1 & 2 Action
(Setpoint at 100 with 4% hysteresis)

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.

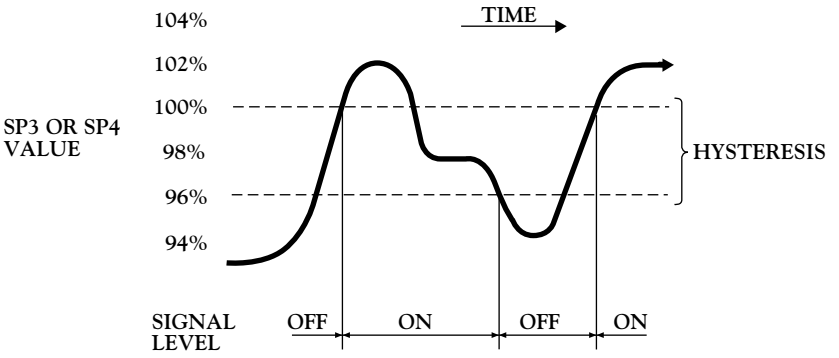


Figure 10-2. Setpoints 3 & 4 Action
(for Low Alarm with Relay on at -100, relay off at -96
with a hysteresis of 4)

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: 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.

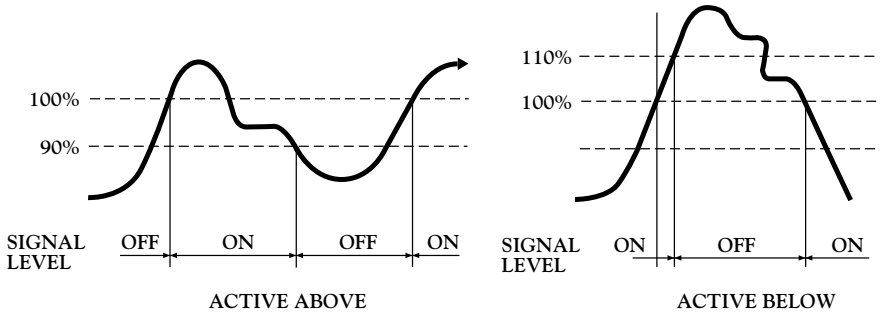


Figure 10-3. Process Deviation

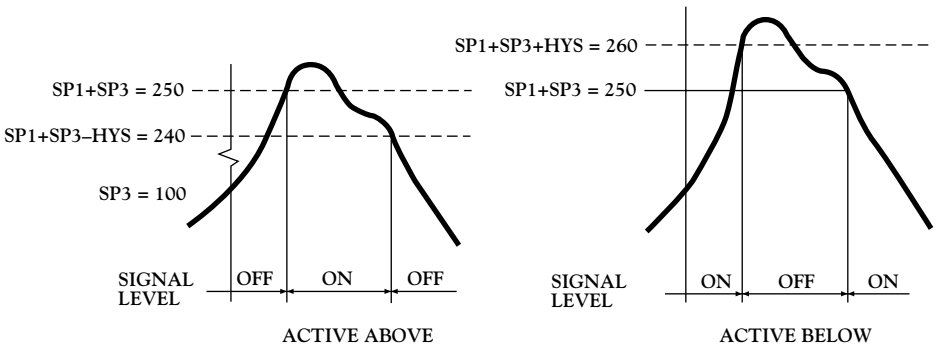


Figure 10-4. High Deviation for both Active Above and Active Below

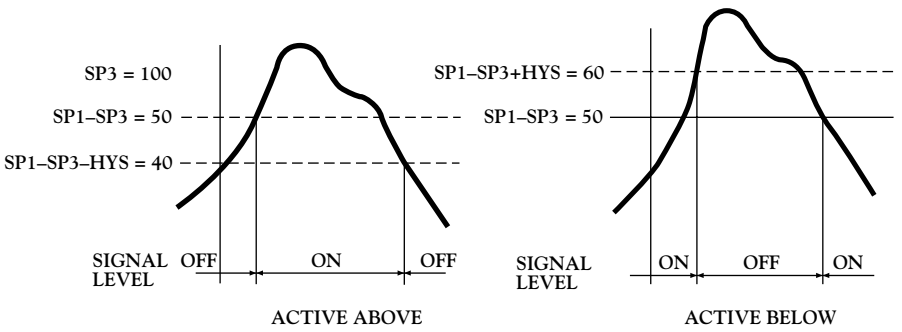


Figure 10-5. Low Deviation for both Active Above and Active Below

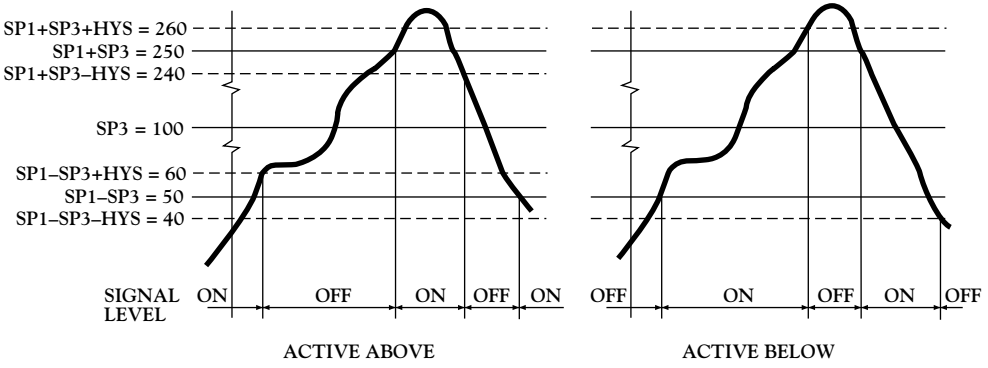


Figure 10-6. Band Deviation for both Active Above and Active Below

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.

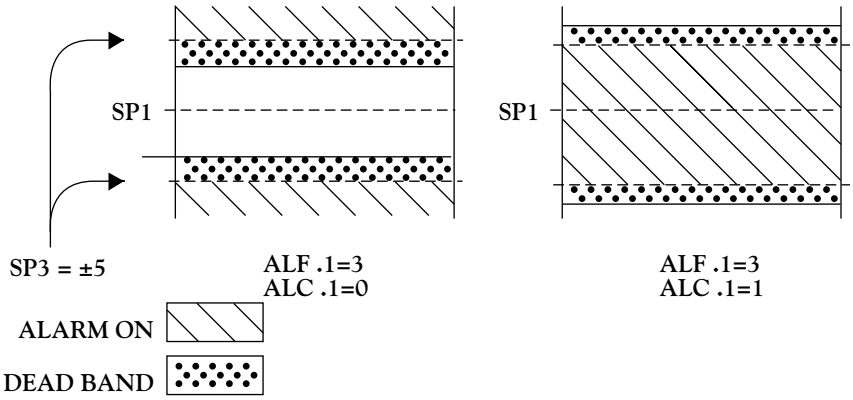


Figure 10-7. AL CNF Hysteresis

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 Alarm2 (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).

Notes:

11. 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).

Notes:

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.

12.2 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 top edge of each board, as shown in Figure 12-1.

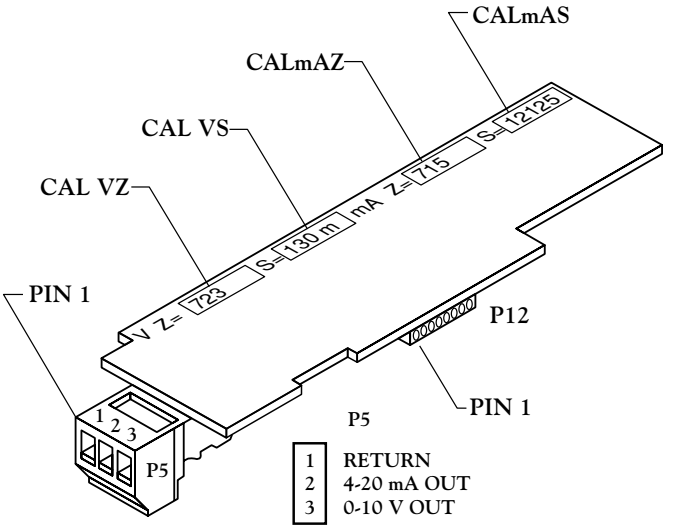


Figure 12-1. Analog Option Board and Connection Diagram at P5.

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.

Notes:

13. BCD Option

13.1 FEATURES OVERVIEW

1. 6 BCD digits (24 lines plus 1 polarity, 3 decimal-point location code, 1 overflow, 1 timing, 1 control, 4 card address, and 3 isolation power lines).

2. Furnished 40-line mass-terminated connector: pin compatibility with 50-pin BCD cable assignments.

3. Can be jumpered for internal, non-isolated drive or external power with isolation (354 V per IEC spacing, 500 V test).

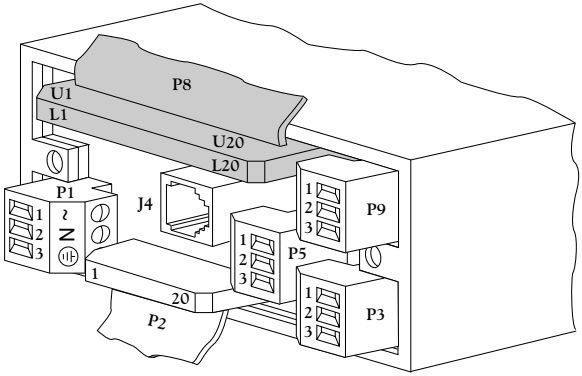
4. Upper 3 BCD digits can be multiplexed onto lower 3 BCD lines for 3 digits at a time readout.

5. All outputs tri-state, TTL/CMOS compatible, 10 LSTTL loads.

6. Data always valid (stored, buffered).

7. Selectable 4-line card address (with internal pull-ups) or single-line activation.

Figure 13-1 shows the rear of the meter case with the 40-line edge connector highlighted and the upper and lower pin assignments.



P8

BCD 400K	L1	U1	BCD 800K
BCD 100K	L2	U2	BCD 200K
ISO GND	L3	U3	SPARE
BCD 40K	L4	U4	BCD 80K
BCD 10K	L5	U5	BCD 20K
BCD 4K	L6	U6	BCD 8K
BCD 1K	L7	U7	BCD 2K
D.P. 2	L8	U8	D.P. 4
BCD 400	L9	U9	BCD 800
BCD 100	L10	U10	BCD 200
BCD 40	L11	U11	BCD 80
BCD 10	L12	U12	BCD 20
BCD 4	L13	U13	BCD 8
BCD 1	L14	U14	BCD 2
ISO GND	L15	U15	D. P. 1
DATA READY	L16	U16	POLARITY
ISO V+	L17	U17	HOLD
SPARE	L18	U18	OVERFLOW
ADDRESS B4	L19	U19	ADDRESS B8
ADDRESS B1	L20	U20	ADDRESS B2

Figure 13-1. BCD 40-Pin Cable Connector (P8)

Figure 13-2 shows the board connections and pin designators. The locations of the jumpers are also shown.

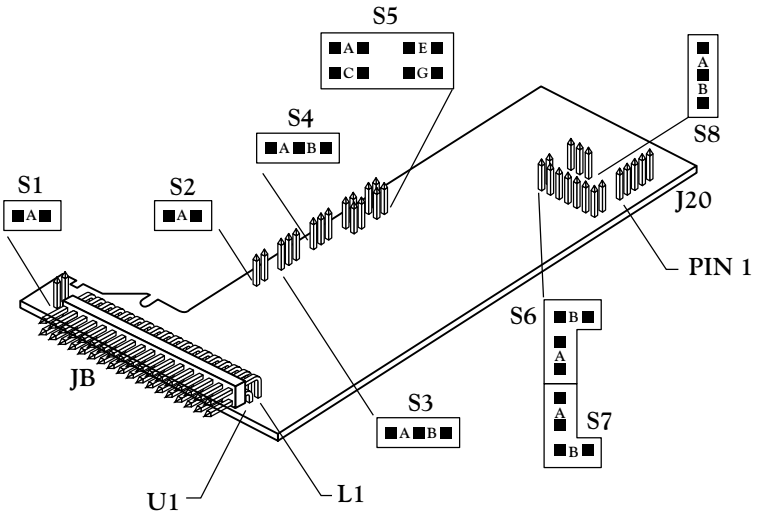


Figure 13-2. BCD Option Board

13.2 BCD CARD JUMPER TABLE

JUMPER	WHEN USED
	S1A Brings OVERFLOW signal to P8-U18
S2A	Insert for 3-digit multiplex Remove for 6-digit readout
S3A	Insert for 3-digit multiplex or one-line card-address enable **OR** 4-line card-address enable
S3B	
S4A	Insert for 3-digit multiplex **OR**
S4B	Insert for 6-digit readout
S5A	P8-U20 must be low to enable card Remove for high or open enable
S5C	P8-L20 must be low to enable card Remove for high or open enable
S5E	P8-U19 must be low to enable card Remove for high or open enable
S5G	P8-L19 must be low to enable card Remove for high or open enable
S6A, S6B, S7A, S7B	Install for internal power Remove for isolated power
S8A	Output data is negative-true **OR**
S8B	Output data is positive-true

13.3 INTERCONNECT BOARD

For mechanical support and electrical interconnection, each BCD board is shipped with a small 5-pin INTERCONNECT board. Insert onto the main board pins immediately behind the right-hand side of the display board. The BCD board itself (component side down) is

then plugged into the interconnect board at J20, with the PCB connection fingers protruding from the case rear. For assembly detail, refer to Figure 5-5 (in Section 5).

13.4 50-LINE CABLE COMPATIBILITY

The 40 lines of the BCD connector are compatible with lines 9 through 48 of some 50-line busses (left-most 8 and right-most 2 are not used by this BCD option).

13.5 SELECTING THE SOURCE OF BCD DATA: "OUT.CNF"

If "L3C.7=0" has been selected to unlock the OUTput CoNFiguration byte, set "OUT.3=1" to send data to this BCD board. "OUT.4=0" selects that data as the DISPLAYED (current) measurement value. "OUT.4=1" sends the PEAK (HI) value to the BCD. Save your selection by pressing the 'MENU' button.

13.6 HOLD CONTROL

P8-U17 is the $\overline{\text{HOLD}}$ line, referenced to the same ground as the BCD outputs (on P8-L15 and P8-L3). Pulling this line low freezes the BCD outputs (useful for a slow reading device or asymmetric cable delays).

When released, all 6 digits of the BCD data are updated together.

13.7 DATA READY TIMING PULSES

The tri-state BCD outputs are always valid (to within a few nanoseconds; a single update pulse controls all the digits).

To generate a timing marker, P8-L16, $\overline{\text{DATA READY}}$, goes active low for approximately 200 microseconds at the time of each BCD update. The polarity of this line is NOT CHANGED by S8, the data polarity control jumper.

13.8 BRINGING OUT THE BCD OVERFLOW LINE

P8-U18 can be used for BCD OVERFLOW by inserting jumper S1A. If this line is used for another purpose by some other equipment on the BCD bus, remove this jumper.

13.9 3 DIGIT AT A TIME MULTIPLEX

When jumpers S2A, S3A, and S4Aare used, P8-L20 and S5C control when the upper 3 digits of the 6-digit BCD value appear on the output line (P8-U9 through P8-L14).

With jumper S5C, a LOW level on P8-L20 activates those upper 3 digit outputs; a high or open level disables those digits.

With jumper S5C removed, a high or open level on P8-L20 enables those upper 3 digits and a low level disables them.

When the upper 3 digits are NOT enabled, the lower 3 digits can be enabled in just the same way by jumper S5A and P8-U20, and they now appear on the same 12 lines.

13.10 6 DIGIT AT A TIME CARD ADDRESS

Jumpers S2A and S4A are removed for full parallel (6-digit output).

If jumper S3A is installed, the outputs are enabled by line P8-L20 ALONE: a low level enables the outputs when jumper S5C is installed, and a high or open level does the job if S5C is removed.

When jumper S3A is removed, the outputs are enabled only when the selected 4-line address is applied to P8-U19, L19, U20 and L20. Each of these four is exclusive-OR'd with its jumper, and the following four outputs are AND'd to create a 1 of 16 enable code.

If jumper S5A is installed, P8-U20 must be LOW to enable the card (BIT 2).
If jumper S5C is installed, P8-L20 must be LOW to enable the card (BIT 1).
If jumper S5E is installed, P8-U19 must be LOW to enable the card (BIT 8).
If jumper S5G is installed, P8-L19 must be LOW to complete enabling the card outputs (BIT 4).

BINARY BIT	1	2	4	8		1	2	4	8
JUMPER S5-D	C	A	G	E		C	A	G	E
00	X	X	X	X	08	X	X	X	
01		X	X	X	09		X	X	
02	X		X	X	10	X		X	
03			X	X	11			X	
04	X	X		X	12	X	X		
05		X		X	13		X		
06	X			X	14	X			
07				X	15				

Figure 13-3. Address Programming Chart for 4-line Address

NOTE: "X" in chart indicates jumper that must be installed.

EXAMPLE: For a positive true address of 03, install jumpers S5-G and S5-E.

If any of these jumpers are removed, the corresponding line must go HIGH or OPEN to assist the card enable; if all four jumpers are missing, for example, the card outputs are enabled ONLY when all four lines are HIGH or OPEN, a ground on any of the four input lines causes the outputs to go to the high impedance state.

13.11 SELECT DATA POLARITY: JUMPER S8

Inserting the jumper in S8B (the usual shipping position) makes the output data (including decimal point code) positive-true.

Placing the jumper in S8A converts the data to negative-true.

13.12 DECIMAL POINT ADDRESS CODE

P8-U15, P8-L8 and P8-U8 output a 3-bit positive-true binary code for the location of the decimal point: “001” for the extreme right position and “110” for the extreme left position (just to the right of the left-hand digit).

Panel-mounted printers, however, may require an inverted/shifted decimal point code. You can create this by setting “OUT.5=1” in the “OUT.CNF” byte (unlocked by setting “L1C.7=0”), rather than the normal “OUT.5=0”.

13.13 APPLYING NON-ISOLATED/ISOLATED POWER

Non-isolated power from the meter is connected to this board by inserting jumpers S6A, S6B, S7A, and S7B (bridging the isolation separation distance on the board). Current drawn is less than 10 mA.

To isolate these outputs from the other meter circuits, remove the four jumpers described earlier, and connect an external, nominal 5 V supply to P8-L17, with its ground return connected to P8-L15.

13.14 DRIVING A PRINTER

Direct connection of the 24 BCD lines and the 3 decimal point address lines is all that is needed for positive-true printers that accept a binary-coded decimal point address (which do not print the decimal point).

If your printer has more than 6 digits, tie the unused inputs to ground or V+ or leave open (whichever produces blanks in those locations).

For negative-true decimal point addresses, found in some panel-mounted printers, set “OUT.5=1” (part of menu item “OUT.CNF”, unlocked by “L1C.7=0”).

14. Relay Option

14.1 FEATURES OVERVIEW

1. Two isolated (354 V per IEC spacing, 500 V test) 7-ampere Form C electro-mechanical relays are provided on a small vertical board that plugs into J10 on the main board.

2. Each relay has its 3-pin screw-terminal connector protruding from the rear of the case. Each connector is keyed to prevent inadvertent insertion of the power screw terminal connector.

3. Clamp diodes to the V+ supply limit coil turn-off spikes.

4. 200 ohm, 2500pf snubbers are provided for each normally open contact.

5. Relay 1 can be driven by either SP1 or SP3.

6. Relay 2 can be driven by either SP2 or SP4.

Figure 14-1 shows the board connections and jumper locations.

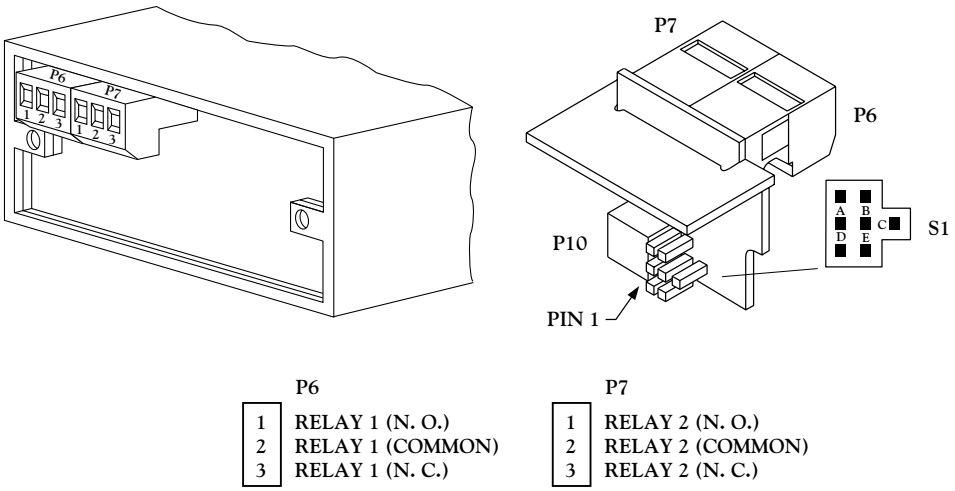


Figure 14-1. Relay Option Board With S1 Jumper Positions and Connection Diagram.

14.2 RELAY BOARD JUMPER TABLE

JUMPER	FUNCTION
S1A*	Drives Relay 1 from SP3
S1B	not used
S1C	Drives Relay 2 from SP2
S1D	Drives Relay 1 from SP1
S1E*	Drives Relay 2 from SP4

* Factory preset jumper locations

Notes:

15. RS-232 or RS-485 Option Board

15.1 FEATURES OVERVIEW

1. When you order either option board, you will also receive 2 software diskettes (one 5-1/4" and one 3-1/2"), a complete configurations setup program, and 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 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.

3. Install, run, establish communication and meter setup information are described in Section 15.3; screen error messages are described in Section 15.4 and a sample basic program to read the meter information to your screen is described in Section 15.5.

4. There are no jumpers on the RS-232 card (all software controlled with or without button programming).

5. Only 3 RS-422/485 jumpers (half/full duplex and impedance-matching resistors).

6. Choose baud rate from 300 to 19200. Standard factory setting is 9600.

7. Wide choice of commands and message formats available.

Figure 15-1 gives the board connections and pin designators for RS-232.

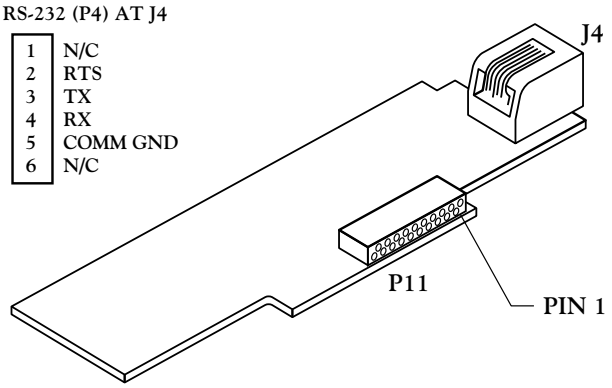


Figure 15-1. RS-232 Option Board and Pin Designations

Figure 15-2 shows board connections and pin designators for RS-485.

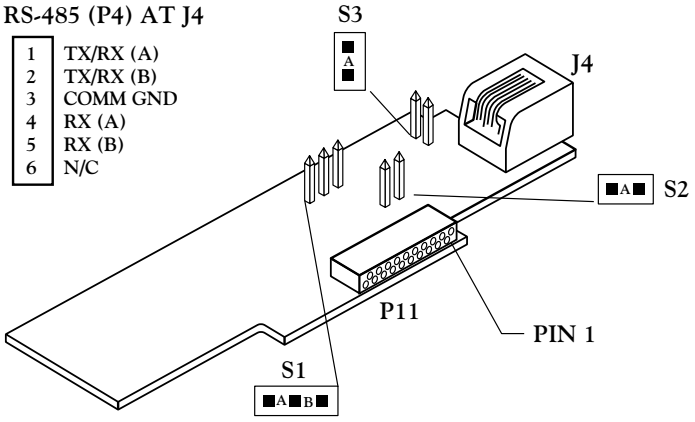


Figure 15-2. RS-485 Option Board and Pin Designations

15.2 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.

15.3 INSTRUCTIONS FOR USING THE SETUP PROGRAM

1. Requirement: 640 K or more RAM and DOS 3.1 or higher.

2. Insert appropriate size diskette into your computer drive.

3. If you are using an LCD screen computer, at the DOS prompt “A:\>”, “B:\>”, or “C:\>”, type “MODE MONO” (or, for some DOS version, type “MODE BW80”), then press ‘ENTER’.

4. If loading from the floppy (rather than moving the program onto your hard disk, if any) with a CRT computer, at the DOS prompt “A:\>” or “B:\>”, type “INF” and then press ‘ENTER’.

5. To copy the program from floppy disk to the hard drive, at the DOS prompt "C:\>", type "MD INF" and press 'ENTER'. Now type "CD\INF" and press 'ENTER' again. Type "COPY A:*.*" (or "COPY B:*.*" for the other floppy drive) and press 'ENTER'.

To start the program, type "INF" and press 'ENTER'.

Your screen now displays a WELCOME message and the program begins to load into your RAM. (**NOTE:** Loading time can vary from seconds to 3 minutes depending on computer speed and the drive chosen; hard disk drives are the fastest).

When loading is completed, the COPYRIGHT screen appears. Press 'ESC' to go to the top level screen.

TOP-LEVEL MENU

GUIDE TO MENUS AND KEYSTROKES

SERIAL COMMUNICATIONS MENU

METER SETUP MENU

QUIT

The GUIDE selection shows you all the different menus and keystrokes used in the program.

The SERIAL COMMUNICATIONS MENU is to be used before the SETUP MENU, to identify your meter, initialize the communication parameters, and establish communication with the meter.

The METER SETUP MENU is used AFTER communication with the meter is established and will lead you through the selection of all the meter features to specialize it to your application.

WARNING: IF YOU ATTEMPT TO SEND THE METER SETUP DATA BEFORE ESTABLISHING COMMUNICATIONS, YOUR COMPUTER MAY LOCK UP (AND THEN YOU MUST START FROM THE BEGINNING BY REBOOTING THE SOFTWARE).

After selecting SERIAL COMMUNICATIONS MENU (by moving the highlight to this line with your arrow keys and then pressing 'ENTER'), the screen shows:

COMMUNICATION PROTOCOL
RS-232 PROTOCOL
RS-485 PROTOCOL

Use your up or down arrow key, highlight your choice and press 'ENTER'. Now the screen shows:

SET RSxxx
AUTO SET
MANUAL SET

(where xxx is either 232 or 485).

If you choose:
AUTO SET with RS-232: the program will cycle through the possible choices of baud rate, parity, stop bits and recognition symbols in trying to talk to the meter.

NOTE: This takes some time, so be patient!

AUTO SET with RS-485: the only item necessary is the meter's address.

If you have selected MANUAL SET and pressed 'ENTER', the screen shows:

RS-232 CONFIGURATION	
COMMUNICATION PORT:	1
BAUD RATE:	9600
PARITY:	ODD
STOP BIT(S):	ONE
TRANSMIT/RECEIVE SWITCHING DELAY:	100 ms

OR

RS-485 CONFIGURATION	
METER ADDRESS:	1
COMMUNICATION PORT:	1
BAUD RATE	9600
PARITY:	ODD
STOP BIT(S):	ONE
TRANSMIT/RECEIVE SWITCHING DELAY	100 ms

The above values are the factory settings. If your meter differs, enter its values on this screen by moving the highlight with the arrow keys, changing values with the number keys, and storing each entry by pressing 'ENTER'.

After pressing 'ENTER', the program starts to establish communications with your meter.

When the program successfully establishes communication, your screen shows:

COMMUNICATION ESTABLISHED
PLEASE PRESS 'ESC' TO CONTINUE

If, however, an error message is displayed instead, refer to Section 15.4 to interpret the message and start over again after correcting the error.

When you press 'ESC', the TOP LEVEL MENU is displayed again. Highlight "METER SETUP MENU" and press 'ENTER'.

You will now be guided through the different meter configuration selections required for your application such as "INPUT", "INPUT TYPE[2]", etc.

After completing your selections, select 'SEND TO (THE METER)' on your screen and press 'ENTER'. The program now transmits the proper codes to load the meter's non-volatile memory with your choices.

If there is an error, you will be prompted with the appropriate flashing error message.

If the program completes successfully, you will see:

```
COMMUNICATION COMPLETED
PLEASE PRESS 'ESC' TO CONTINUE
```

You may now start to program another meter, make changes, or select "QUIT" from the TOP LEVEL MENU, and then press 'ENTER'.

15.4 SCREEN ERROR MESSAGES

MESSAGE	PROBABLE SOURCE
COMMUNICATION ERROR:	No meter response, so: 1. Hardware: bad connections, no meter power, bad cable, boards not inserted correctly, defective boards, etc. 2. Baud rate or stop bits mismatched between computer and meter. 3. Computer communications port not correct. 4. RS-485 meter address does not match.
PARITY ERROR:	Meter setting and computer selection do not agree.
COMMAND ERROR:	Command character wrong.
FORMAT ERROR:	Transmitted characters do not have proper length or are not valid characters.
CHECKSUM ERROR:	Noise causing errors in received characters.

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MESSAGE	PROBABLE SOURCE
EEPROM LOCKOUT:	Meter not storing data: jumper S3A on main board is missing, or pin 10 on the meter's P2 rear connector is grounded.
DECIMAL POINT FRACTION TOO LARGE:	Selected decimal point location is too far to the left to permit READING OFFSET or SETPT value storage. Everything is stored here except the decimal point.

NOTE: "ECHO" command mode is recommended for all communications since it always produces a response for successful communication. Otherwise, the program cannot warn you with a COMMUNICATION ERROR message.

15.5 SERIAL COMMUNICATIONS SAMPLE PROGRAM

The following sample program will allow you to send a request for information to the meter and receive a response.

NOTE: The codes in this sample program are found in the serial communications operators guide.

15.5.1 PROGRAM OBJECTIVES

1. Clear screen
2. Print "Enter a Command>"
3. Accept "X01" (requests unfiltered meter reading)
4. Accept "X02" (requests PEAK meter reading)
5. Accept "X03" (requests VALLEY meter reading)
6. Accept "X04" (requests filtered meter reading)
7. Accept any other command code and suffix, ("ccc") from list in the Serial Communications Operator's guide.
8. Screen echoes the chosen command
9. Computer sends request to meter

10. Stall for 0.5 seconds, then look for response
11. Put watchdog message on screen if no response in 10 seconds
12. Print meter response on screen
13. User selects Quit or more commands.

15.5.2 CODE AND [NOTES]

```
1000    CLS [Clear screen command]

1010    COMM$ = "COM1" [Label for communications
        port COM1]

1020    BAUD$ = "9600" [Label for choice of 9600 baud]

1030    PARITY$ = "0" [Label for Odd parity]

1040    STOPBT$ = "1" [Label for one stop bit]

1050    CLOSE #1 [Get ready to reopen #1]

1060    OPEN COMM$ + BAUD$ + "," + PARITY$ + ",7," +
        "CS, DS, RS" AS #1 [OPENS COM1]

1070    INPUT "ENTER A COMMAND >", CMD$
        [Prompts and Labels Input]

1080    IF CMD$ <>"^AE" THEN CMD$ = "*" + CMD$
        [Add recognition character unless command is that for
        setup data]

1090    PRINT CMD$ [Screen echoes command]

1100    PRINT #1, CMD$ [Send command to meter]

1110    N = 0 [Initialize watchdog]

1120    SOUND 32767, 27:SOUND 32767, 1:
        SOUND 32767, 1 [Delay 0.5 seconds]

1130    N = N + 1 [Increment watchdog]
```

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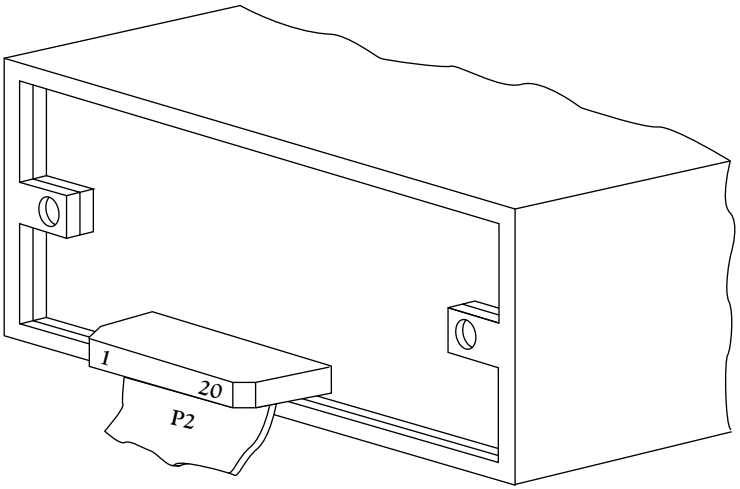
```
1140    IF N <> 20 THEN 1180 [Test for timeout]

1150    INPUT "NO RESPONSE YET: TYPE 'C' TO
        CONTINUE, 'Q' TO QUIT", B$ [10 second timeout]

1160    IF B$ = "Q" THEN 1230 [Exit if desired]

1170    N = 0 [Restart watchdog]

1180    IF LOC(1) = 0 THEN 1120 [Stall until buffer
        has contents]

1190    A$ = INPUT$(LOC(1), #1)
        [Read and label contents of COM1]

1200    PRINT A$ [Put data onto screen]

1210    INPUT "TYPE 'M' FOR MORE COMMANDS OR
        'Q'  TO QUIT", B$

1220    IF B$ = 'M' THEN 1070

1230    END
```

16. 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 16-1.



P2

TARE (T)	1	2	PEAK (P)
VALLEY (V)	3	4	SWLIN2
PEAK/VALLEY OR EXT. RESET	5	6	PUSH TO CAL
DIG GND	7	8	+5V
DISPLAY HOLD	9	10	LOCKOUT EEPROM &
RESET ALARMS AND/OR	11		MENU PUSH BUTTON
PRINT COMMAND		12	NONSTANDARD RX
NONSTANDARD TX	13	14	PUSH TO CAL
+V EXT	15	16	SP1
SP2	17	18	AL1
AL2	19	20	GND EXT

Figure 16-1. Connector Label Detail

16.1 TARE (PIN 1)

Tare is available when pin 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.

16.2 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.

16.3 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.

16.4 SWLIN2 (PIN 4)

Completes the circuit for any of the above three signals.

16.5 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.

16.6 PUSH TO CAL (PIN 6)

The Push To Cal feature is only available for the Strain Gauge 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 R35. **Note**: This short is already installed at the factory.

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

16.7 DIGITAL GROUND (PIN 7)

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

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

16.8 +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.

16.9 $\overline{\text{DISPLAY HOLD}}$ (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.

16.10 $\overline{\text{LOCKOUT EEPROM}}$ (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.

16.11 $\overline{\text{PRINT COMMAND}}$ AND/OR $\overline{\text{RESET}}$ 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.

16.12 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.

16.13 PUSH TO CAL (PIN 14)

The Push To Cal feature is only available for the Strain Gauge 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 R35. **Note**: This short is already installed at the factory.

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

16.14 +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.

16.15 SP1 (PIN 16)

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

16.16 SP2 (PIN 17)

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

16.17 AL1 (PIN 18)

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

16.18 AL2 (PIN 19)

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

16.19 GND 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.

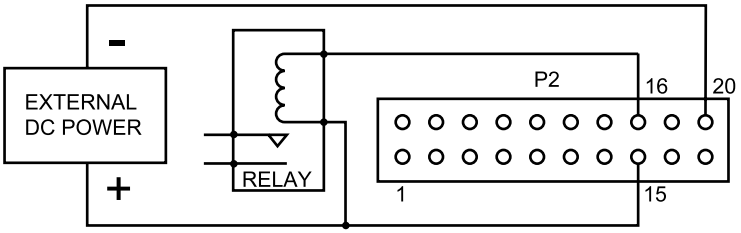


Figure 16-2. Connection of External Relay to Setpoint Transistor

Notes:

17. 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.

17.1 ERROR MODE MESSAGES

17.1.1 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".

17.1.2 FLASHING ERR 01 (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: The meter will only display 6 digits (999999) maximum.

17.1.3 FLASHING ERR 02 (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: The meter will only display 6 digits (999999) maximum.

17.1.4 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.

17.1.5 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".

17.1.6 FLASHING +OPEN (OPEN SENSOR INDICATION)

Coupled with the proper jumper selection, the display will indicate an open sensor.

17.1.7 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.

17.1.8 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.

17.1.9 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.

17.1.10 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).

17.1.11 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".

17.2 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.

Alternately, the amount of RDG.OF may be reduced to get the decimal point further to the left.

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

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'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 18, 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

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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 9.2.5.

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.

Notes:

18. Specifications

18.1 CURRENT INPUT

INPUT RANGES(+10%):	0-20 mA and 4-20 mA
RESOLUTION:	1µA
MAXIMUM INPUT:	200 mA
INPUT OHMS:	5
SENSOR EXCITATION:	10 V, to 30 mA 24 V, to 25 mA

18.2 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:	10 V, to 30 mA 24 V, to 25 mA

18.3 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 24 V, to 25 mA Max

18.4 GENERAL

SCALE:	+0.000001 to +500000 or –0.0001 to –99999.
OFFSET:	Zero to +999999
POLARITY:	Automatic

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NOISE REJECTION

NMR:	60 dB, 50 or 60 Hz, + selected filter
CMR:	120 dB
CMV:	1500 V peak test, 354 V per IEC spacing

18

Specifications

ACCURACY at 25 C:	
MAX ERROR:	±0.005% of reading
SPAN TEMPCO:	less than 20 ppm/deg C
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.
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 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

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.

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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.

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

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"

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DURING SETPOINT ADJUST (RUN MODE)

OUT OF SELECTED DIGIT RANGE:	"999999"
NOT STORED IN EEPROM:	"NOSTOR"
VALUE PUT IN EEPROM:	"STORED"

POWER

AC VOLTAGES:	115 +10%, 50/60 Hz or 230 V +10% (RMS)
AC FREQUENCY:	49 to 100 Hz (to 440 Hz with 110 or 220 V minimum)

ENVIRONMENTAL

OPERATING TEMP RANGE:	0 to 50 degrees C (32 to 140°F)
STORAGE TEMP RANGE:	–40 to 85 degrees C (–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 5.86 (48mm x 96mm x 145mm) (add 0.27 inch or 15mm depth for Cold Junction Compensation Board). Refer to Figure 18-1 for the dimensions of the standard meter with the bezel. Refer to Figure 18-2 for dimensions of the basic meter with the optional bezel.
WEIGHT:	1.316 pounds (600 g)
MATERIAL:	94V-0 UL-rated Polycarbonate

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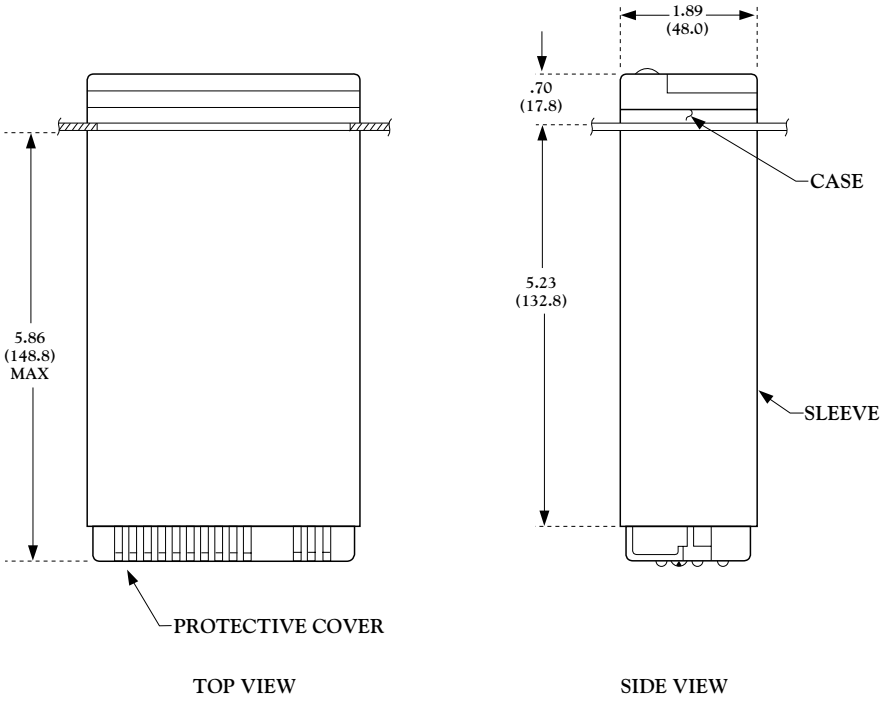

Figure 18-1. Dimensions for Meter Housing.

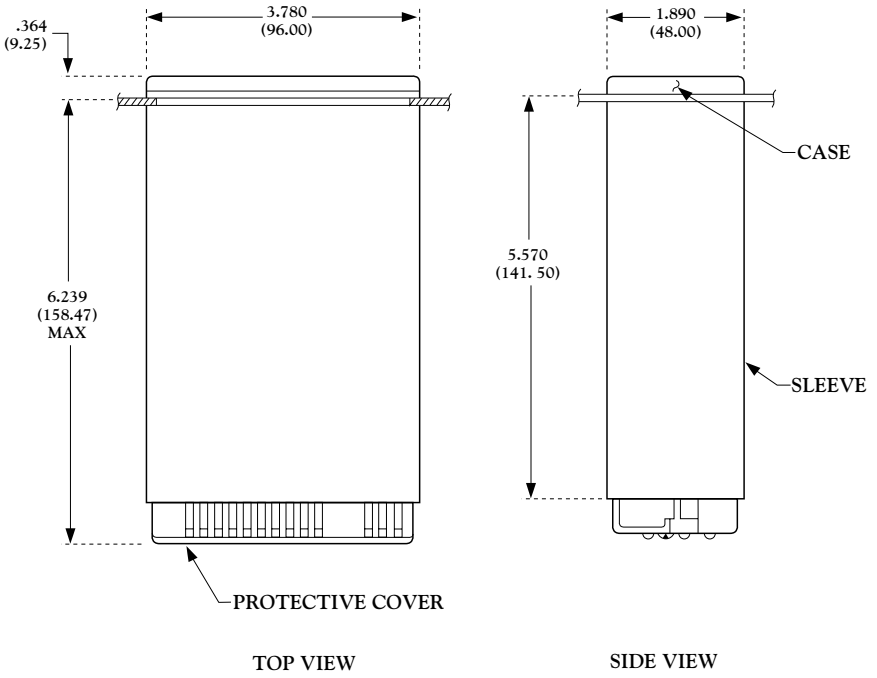

Figure 18-2. Dimensions for Meter in Optional ("OH") Housing.

Notes:

19. Factory Preset Values

JUMPER POSITIONS:

Voltage
S1: NONE S2: A, F, L, N, T
S3: A, C S4: A, C

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	L4C.7=0
L1C.8=0	L2C.8=0	L3C.8=0	

Input Class: Strain Gauge: "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"): 000000

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

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:	_____

Notes:

20. Record Your Setup Values

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=___	L4C.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": _____

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:	_____

Notes:

Warranty/Disclaimer

NEWPORT Electronics, 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 NEWPORT's standard warranty period, NEWPORT Electronics will extend the warranty period for one (1) additional year if the warranty card enclosed with each instrument is returned to NEWPORT.

If the unit should malfunction, it must be returned to the factory for evaluation. NEWPORT's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by NEWPORT, if the unit is found to be defective it will be repaired or replaced at no charge. NEWPORT'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 NEWPORT's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

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2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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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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