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# User's Guide

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## ORCN-37

Microprocessor-Based ORP Controller



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The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

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



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

---

## PREFACE

### Manual Objectives

This manual shows you how to set up and use the Programmable Digital Meter.

### Standard Procedures:

- \* Checking voltage jumpers, or changing voltage power
- \* Mounting the panel
- \* Selecting a decimal point position
- \* Configuring calibration parameters
- \* Performing two point calibration
- \* Setting the setpoint's active band
- \* Selecting a latched or unlatched operation
- \* Setting setpoint's deadbands
- \* Enabling/disabling analog output
- \* Selecting analog output as current or voltage
- \* Scaling analog output

**Table A-1. Sections of the Manual**

<b>If you want to read about:</b>	<b>Refer to section</b>	
Unpacking; safety considerations	1	Introduction
Meter description and features	2	About the Meter
Main board power jumpers; panel mounting, input, main power and analog and relay output	3	Getting Started
Setpoint value, decimal point position, calibration, setpoint configuration; setpoint deadbands, analog output configuration and scaling Setpoint values	4	Configuring the Meter
Display messages	5	Selecting Setpoint Values
Meter menu/sub-menu messages	6	Display Messages
Setpoint configuration messages	7	Menu Configuration
Specifications	8	Setpoint Configuration Displays
Factory Preset Values	9	Specifications
	10	Factory Default Setup as Shipped



## Table of Contents

<b>Section</b>	<b>Page</b>
<b>SEC 1 INTRODUCTION</b> .....	1
1.1 Unpacking .....	1
1.2 Safety Considerations .....	2
<b>SEC 2 ABOUT THE METER</b> .....	3
2.1 Description .....	3
2.2 Features .....	3
2.3 Available Accessories .....	4
2.4 Front of the Meter .....	5
2.4.1 Meter Buttons .....	6
2.5 Front Panel Button Lockout .....	8
2.5.1 Jumper Lock Out .....	8
2.5.2 Push Button Lock Out .....	8
2.6 Back of Meter .....	9
2.7 Disassembly .....	11
<b>SEC 3 GETTING STARTED</b> .....	12
3.1 Rating/Product Label .....	12
3.2 Main Board Power Jumpers .....	12
3.3 Main Board Jumpers .....	13
3.4 Panel Mounting .....	15
3.5 Connecting Sensor Inputs .....	16
3.6 Connecting Main Power .....	17
3.7 Connecting Analog and Relay Outputs .....	18
<b>SEC 4 CONFIGURING THE METER</b> .....	20
4.1 Configuring Decimal Point ("DEC.P") .....	20
4.2 Using Reading Configuration ("RD.CF") .....	20
4.3 Performing 2 Point Calibration ("CAL.2") .....	21
4.4 Using Setpoint 1 Configuration ("S1.CF") .....	22
4.5 Using Setpoint 2 Configuration ("S2.CF") .....	23
4.6 Setting Deadband or Hysteresis for Setpoint 1 ("S1.DB") .....	23
4.7 Setting Deadband or Hysteresis for Setpoint 2 ("S2.DB") .....	23



# Preface

---

## Table of Contents

<b>Section</b>		<b>Page</b>
4.8	Using Output Configuration ("OT.CF") .....	25
4.9	Using Output Scale and Offset ("OT.S.O") .....	25
4.10	Using Lockout Configuration .....	27
<b>SEC 5</b>	<b>SELECTING SETPOINT VALUES .....</b>	<b>28</b>
<b>SEC 6</b>	<b>DISPLAY MESSAGES .....</b>	<b>29</b>
<b>SEC 7</b>	<b>MENU CONFIGURATION DISPLAYS .....</b>	<b>30</b>
<b>SEC 8</b>	<b>SETPOINT CONFIGURATION DISPLAYS .....</b>	<b>33</b>
<b>SEC 9</b>	<b>SPECIFICATIONS .....</b>	<b>34</b>
<b>SEC 10</b>	<b>FACTORY PRESET VALUES .....</b>	<b>38</b>
<b>CE APPROVAL SECTION</b>	<b>.....</b>	<b>39</b>



## List of Figures

<b>Figure</b>		<b>Page</b>
2-1	Front of Meter . . . . .	5
2-2	ac Power Connector Label (with dc-Power Detail) . . . . .	9
3-1	Main Board Power Jumpers (W1, W2, W3) . . . . .	12
3-2	Main Board Jumper Positions . . . . .	13
3-3	Upper Option Board Installation . . . . .	13
3-4	Meter - Exploded View . . . . .	15
3-5	Panel Cut-Out . . . . .	15
3-6	pH and RTD Connections . . . . .	16
3-7	Main Power Connections - ac . . . . .	17
3-8	Main Power Connections -dc . . . . .	18
3-9	Relay Output Connections . . . . .	18
3-10	Analog Output Connections . . . . .	19
3-11	Isolated Analog Output Connections . . . . .	19
4-1	Alarm Example . . . . .	24
9-1	Dimensions/Panel Cutout . . . . .	37

## List of Tables

<b>Table</b>		<b>Page</b>
A-1	Sections of the Manuals . . . . .	.ii
2-1	Accessories and Add-Ons . . . . .	4
2-2	Connector Description . . . . .	10
3-1	Jumper Functions . . . . .	14
3-2	ac-Power Connections . . . . .	17
6-1	Display Messages . . . . .	29
7-1	Configuration Menu . . . . .	30
7-2	Run Mode Displays . . . . .	32
8-1	Setpoint Configuration Displays . . . . .	33
10-1	Factory Preset Values . . . . .	38

## NOTES, WARNINGS and CAUTIONS

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

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



**Note** ®

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



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



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



---

## SECTION 1. INTRODUCTION

### 1.1 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, use the phone number for the Customer Service Department nearest you.

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.

Verify that you receive the following items in the shipping box:

<b>QTY</b>	<b>DESCRIPTION</b>
1	Programmable Digital Meter indicator/controller with all applicable connectors attached.
1	Owner's Manual
1	Set Mounting brackets

**Note**

If you ordered any of the available options (except the “BL” blank Lens option), they will be shipped in a separate container to avoid any damage to your indicator/controller.

# Introduction

## 1.2 SAFETY CONSIDERATIONS



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

This instrument is a **panel mount** device protected in accordance with EN 61010-1:2001, electrical safety requirements for electrical equipment for measurement, control and laboratory. Installation of this instrument should be done by qualified personnel. In order to ensure safe operation, the following instructions should be followed.



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



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



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

### EMC Considerations

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

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

---

## SECTION 2. ABOUT THE METER

### 2.1 DESCRIPTION

This Digital Programmable meter is a microprocessor-based ORP controller. This controller includes a fully scalable analog output and also two dual 5 amp, form C relay outputs for alarm or control of acid or base additions.

### 2.2 FEATURES

The following is a list of standard features:

- \* 4-digit 14-segment LED display - red or green display
- \* NEMA-4/Tyoe 4 front panel bezel
- \*  $\pm 0.1$  mV accuracy
- \* online 2 point calibration
- \* Non-volatile memory-no battery backup
- \* Dual 5 amp, form C relay outputs
- \* Scalable non-isolated analog outputs
- \* 115 or 230 Vac 50/60 Hz power supply  
or 10-32 Vdc or 26-56 Vdc

The following is a list of optional features:

- \* Scalable isolated analog output

## 2.3 AVAILABLE ACCESSORIES

**Table 2-1. Accessories and Add-Ons****Add-On Options**

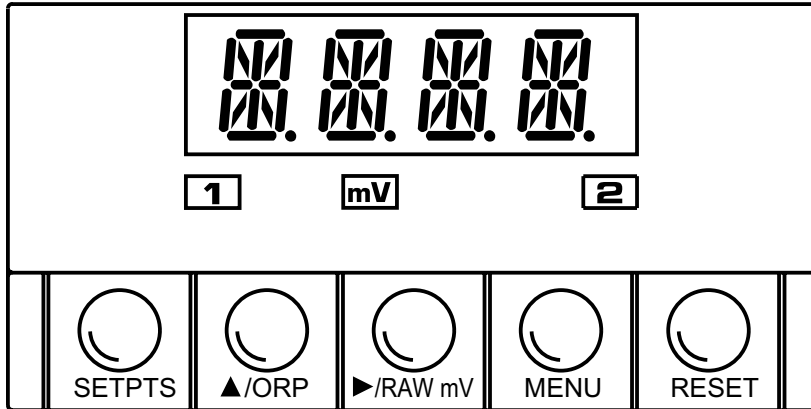
FS	Special Calibration/Configuration
SPC4	NEMA-4 Splash Proof Cover
SPC18	NEMA-4 Splash Proof Cover, NEW

**Accessories**

TP1A	Trimplate panel adaptor. Adapts DIN1A/DIN2A cases to larger panel cutouts
RP18	19-In. Rack Panel for one (1) 1/8 DIN instrument
RP28	19-In. Rack Panel for two (2) 1/8 DIN instrument
RP38	19-In. Rack Panel for three (3) 1/8 DIN instrument

---

## 2.4 FRONT OF THE METER



**Figure 2-1 Front of meter - ORP Controller**

### **METER DISPLAY:**

**Digital LED display** -1.9.9.9. or 9.9.9.9. 4-digit 14 segment, 0.54" high LED display with programmable decimal point.

These meter display windows light when appropriate:

- 1 Setpoint 1 status
- 2 Setpoint 2 status
- mV mV displays

## About The Meter

---

### 2.4.1 METER BUTTONS

#### **SETPTS** Button

In the run mode, this button will sequentially recall the previous setpoint settings. As necessary, use the **▲/ORP** and **▶/RAW mV** buttons to alter these settings, then press the **SETPTS** button to store new values.

Unless you press the **SETPTS**, **▶/ORP**, or **▲/RAW mV** button within 20 seconds, the meter will scroll to setpoint 2 and then to the run mode.

---

#### **▲/ORP** Button

In the run mode, this button will view ORP value.

In the configuration mode, press this button to change the value of the flashing digit shown on the display and/or toggle between menu choices, such as "R.1=F" or "R.1=C" on RD.CF menu. When configuring your setpoint values, press the **▲/ORP** button to advance the flashing digit's value from 0 to 9 by 1.

---

#### **▶/RAW mV** Button

In the run mode press the **▶/RAW mV** button to view raw input in millivolts

In the configuration mode, press this button to scroll to the next digit.

---

---

## 2.4.1 METER BUTTONS (Continued)

### **MENU** Button

In the run mode, press the **MENU** button to terminate the current measuring process and enter you into the configuration mode.

In the configuration mode, press the **MENU** button to store changes in the nonvolatile memory and then advance you to the next menu item.

---

### **RESET** Button

If you hard reset (press the **MENU** button followed by the **RESET** button) or power off/on the meter, it shows "**RST**", followed by "**ORP**".

In the run mode, press the **RESET** button to reset the latched setpoints. The meter shows "**SP.RS**" and returns to the run mode.

In the configuration mode, press the **RESET** button once to review the previous menu. Press the **RESET** button twice to perform a hard reset and return to the run mode.

In the setpoint mode, press the **RESET** button to enter the run mode. The meter shows "**RUN**" and enters the run mode.

**Note**

*When in setpoint or configuration mode, if the meter shows 9999 or -1999 with all flashing digits, the value has overflowed. Press the **▲/ORP** button to start a new value.*

---

## 2.5 FRONT-PANEL BUTTON LOCK OUT (For Security Purposes)

### 2.5.1 Jumper Lock Out

To lock all front-panel buttons, remove the S3-A jumper (refer to Figure 3-2).

To lock the **MENU** button only, verify that the S3-B jumper is removed, then install the S3-A and S3-E jumpers (refer to Table 3-1). If you press the **MENU** button, the meter shows "**LOCK**" and returns to the run mode.

### 2.5.2 Push Button Lock Out

To lock the **RESET**, **MENU** and **SETPTS** buttons only, verify that the S3-A jumper is installed and the S3-E jumper is not installed, then follow these steps:

In the run mode -

1. Press and hold down the **RESET** button. The meter shows "**SP.RS**" or "**RUN**". Do not release the **RESET** button.
2. Press the **MENU** button and hold the **RESET** button down (3-5 seconds) until the meter shows "**LOCK**".
3. Release both buttons.

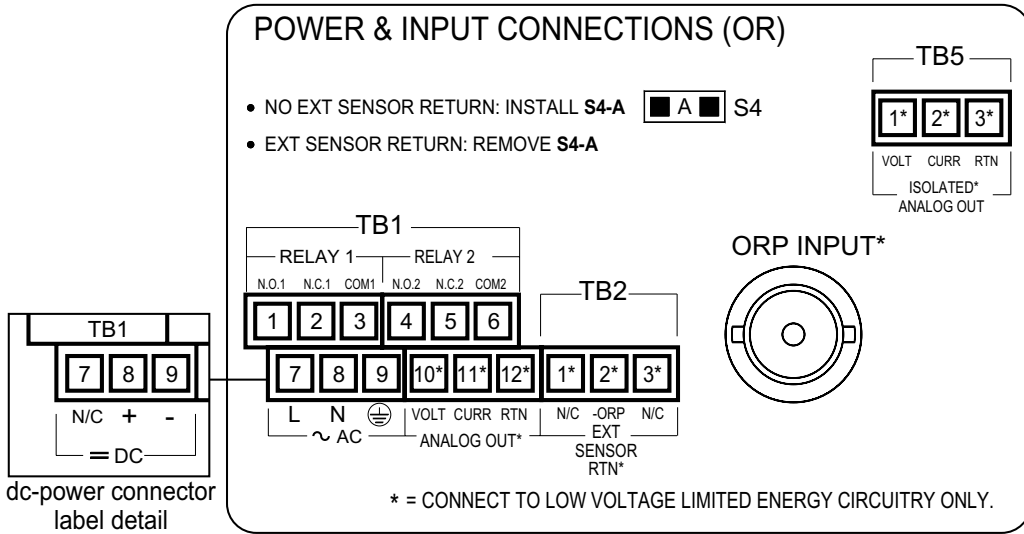
To unlock the **RESET**, **MENU** and **SETPTS** buttons, follow these steps:

1. Press and hold down the **RESET** button. The meter shows "**LOCK**". Do not release the **RESET** button.
2. Press the **MENU** button and hold the **RESET** button down (3-5 seconds) until the meter shows "**UN.LK**".
3. Release both buttons.



## 2.6 BACK OF THE METER

Figure 2-2 shows the label describing the connectors on the back of the meter. Table 2-1 on the following page gives a brief description of each connector at the back of the meter.



**Figure 2-2. ac Power Connector Label (with dc Power detail)**

## 2.6 BACK OF THE METER (Continued)

**Table 2-2. Connector Description**

<b>Connector</b>	<b>Description</b>
TB1-1	Setpoint 1: Normally Open (N.O.1) connection
TB1-2	Setpoint 1: Normally Closed (N.C.1) connection
TB1-3	Setpoint 1: Common (COM1) connection
TB1-4	Setpoint 2: Normally Open (N.O.2) connection
TB1-5	Setpoint 2: Normally Closed (N.C.2) connection
TB1-6	Setpoint 2: Common (COM2) connection
TB1-7	ac Line connection (no connections on dc-powered units)
TB1-8	ac Neutral connection (+ Input on dc-powered units)
TB1-9	ac Earth ground (dc-power Return on dc-powered units)
TB1-10	Analog Voltage Output connection
TB1-11	Analog Current Output connection
TB1-12	Analog Return connection
TB2-1	no connection
TB2-2	-ORP: Electrode solution ground wire connection
TB2-3	no connection
TB5-1	Isolated Analog Voltage Output connection
TB5-2	Isolated Analog Current Output connection
TB5-3	Isolated Analog Output Return connection
J3	Main pH or pH/ORP input BNC connector

## 2.7 DISASSEMBLY

You may need to open up the meter for one of the following reasons:

- To check or change the 115 or 230 Vac power jumpers.
- To install or remove jumpers on the main board.

**Note**

Disconnect the power supply before proceeding.

To remove and access the main board, follow these steps:

- Disconnect the main power from the meter.
- Remove the back case cover.
- Lift the back of the main board upwards and let it slide out of the case.

## SECTION 3. GETTING STARTED



**Caution:** The meter has no power-on switch, so it will be in operation as soon you apply power.

If you power off/on the meter, or perform a hard reset (press the RESET button twice), the meter shows "RST", followed by "ORP".

### 3.1 RATING/PRODUCT LABEL

This label is located on top of the meter housing (refer to Figure 3-4).

### 3.2 MAIN BOARD POWER JUMPERS (refer to Figure 3-1)



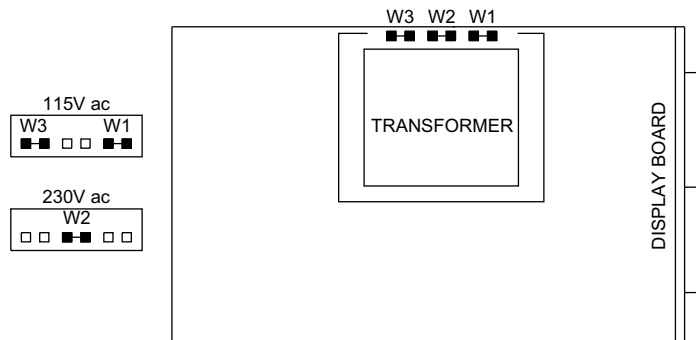
**Important:** If you want to change the Factory preset jumpers, do the following steps; otherwise go to section 3.3.



Disconnect the power from the unit before proceeding.

1. Remove the main board from the case. Refer to Section 2.7.
2. Locate the solder jumpers W1, W2, and W3 (located near the edge of the main board alongside the transformer).
3. If your power requirement is **115 V ac**, solder jumpers **W1 and W3 should be wired, but jumper W2 should not**. If your power requirement is **230 V ac**, solder jumper **W2 should be wired, but jumpers W1 and W3 should not**.

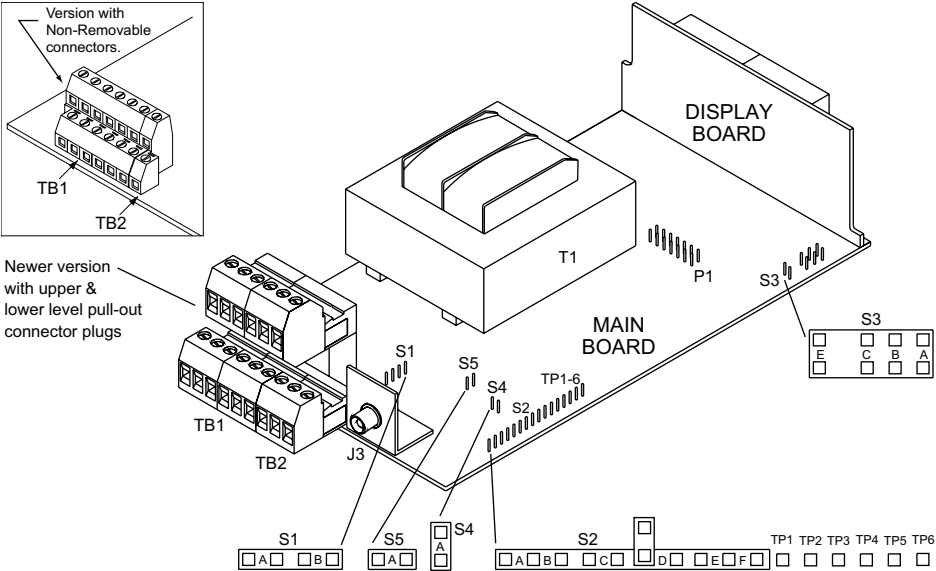
Figure 3-1 shows the location of solder jumpers W1 through W3.



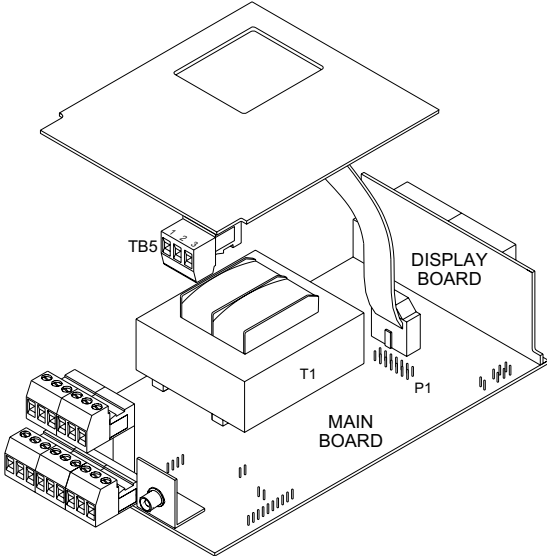
**Figure 3.1 Main Board Power Jumpers**

### 3.3 MAIN BOARD JUMPERS

Figure 3-2 shows the location jumper positions on the main board.



**Figure 3-2. Main Board Jumper Positions**



**Figure 3-3. Upper Isolated Analog Output Option Board Installation**

### 3.3 MAIN BOARD JUMPERS (Continued)

**Note**

S1 and S2 jumpers are for factory use only.  
Do not install or remove them, as reading errors may result

S3 jumpers are used for the following: (Refer to Figure 3-2)

- \* To enable or disable the front panel push-buttons
- \* To allow for an extremely low resistance load for analog output
- \* To disable the MENU button
- \* To perform calibration procedure

S4 jumpers allow you to use electrode solution ground wire or internal ground for measurement purposes.

S5 jumpers allow you to use 100 ohm or 1000 ohm RTD sensors.

**Table 3-1. Jumper Functions**

Jumper	Description
S3-A	Install to enable front panel push-buttons. Remove to disable all front panel push-buttons
S3-B	Removed. Install for meter calibration.
S3-C	Normally removed. Install for analog output when load is less than 1 K $\Omega$ impedance. Care should be taken when installing this jumper.
S3-D	Removed. Not used.
S3-E	If installed without S3-B, the MENU button locks out. If you press the MENU button, the meter shows "LOCK".
S4-A	Install when using internal ground. Remove when using electrode solution ground wire.
S5-A	Install for 100 ohm RTD sensor. Remove for 1000 ohm RTD sensor.

3.4 PANEL MOUNTING

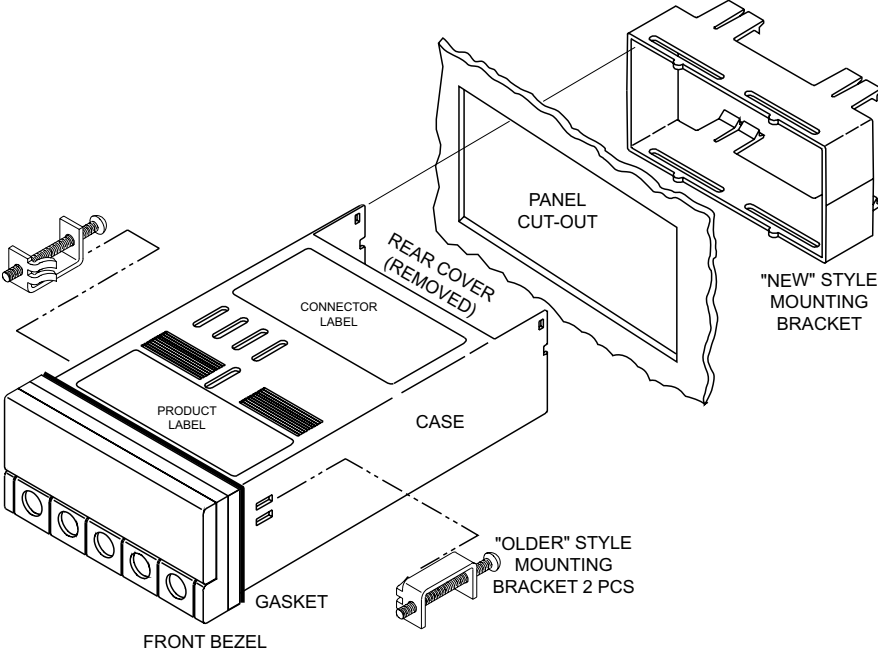
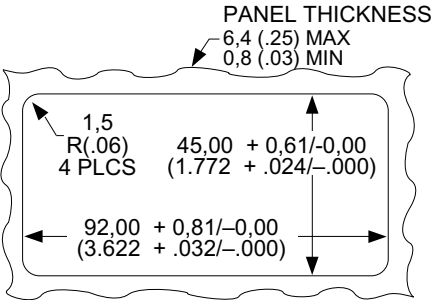


Figure 3-4. Meter - Exploded View

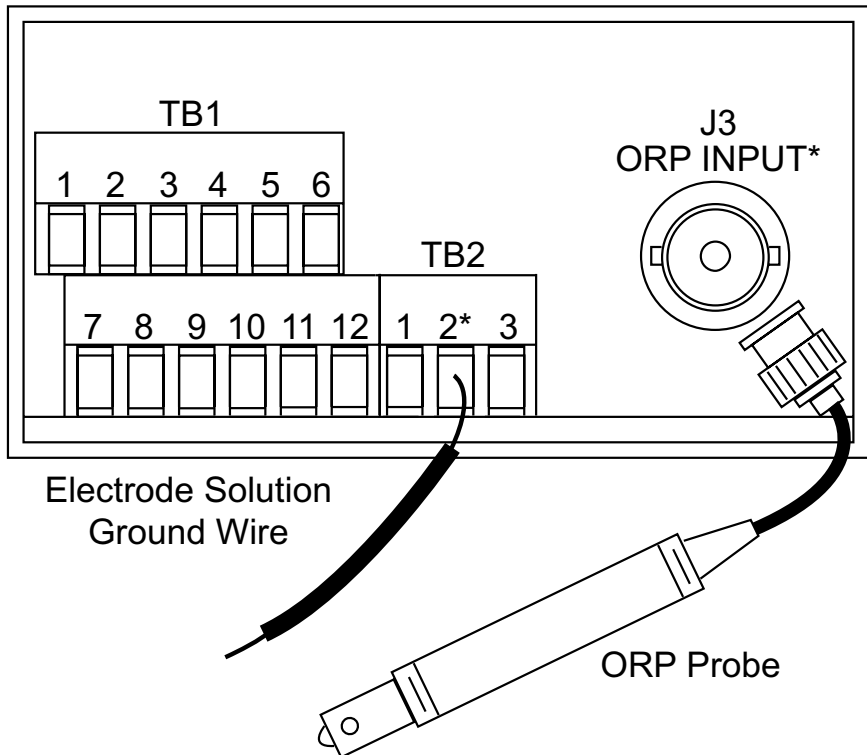
1. Cut a hole in your panel, as shown in Figure 3-4. For specific dimensions refer to Figure 3-5.
2. Insert the meter into the hole. Be sure the front bezel gasket is flush to the panel.
3. Slide on mounting bracket to secure.
4. Proceed to Section 3.5 to connect your sensor input and main power.



NOTE: Dimensions in Millimeters (Inches)

Figure Figure 3-5. Panel Cut-Out

## 3.5 CONNECTING SENSOR INPUTS

**Figure 3-6. ORP Input Connections**



3.6 CONNECTING MAIN POWER

Connect the ac main power connections as shown in Figure 3-7.



**Warning:** Do not connect AC power to your device until you have completed all input and output connections. This device must only be installed by a specially trained electrician with corresponding qualifications. Failure to follow all instructions and warnings may result in injury!

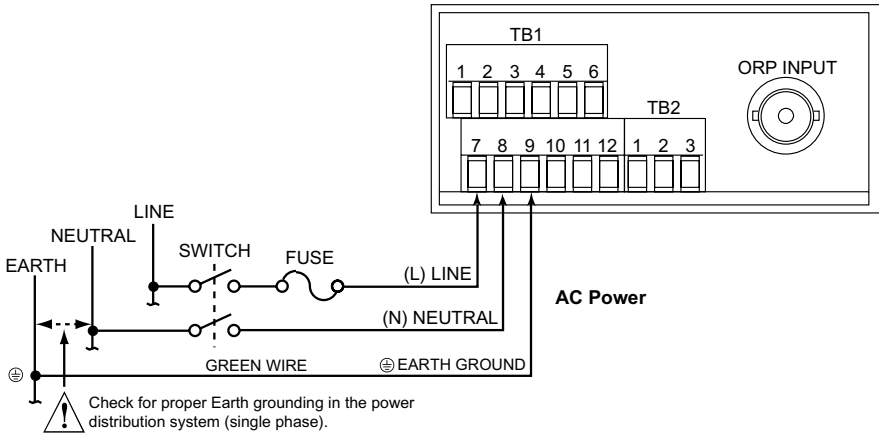


Figure 3-7. Main Power Connections - ac

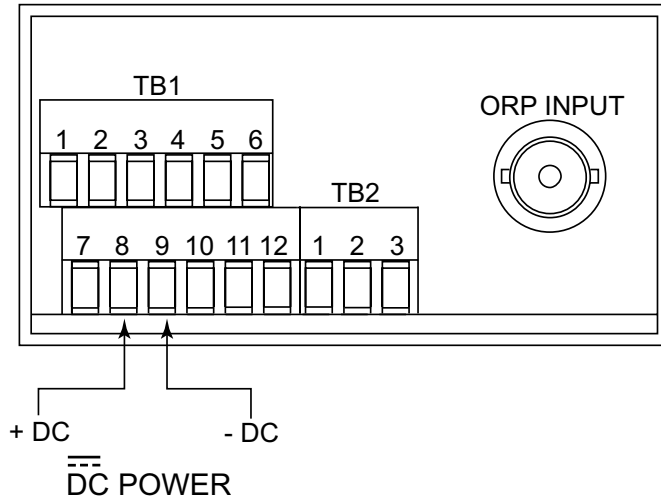
Table 3-2. ac-Power Connections

TB1	AC POWER	WIRE COLORS	
		EUROPE	USA
7	~ ac Line	Brown	Black
8	~ ac Neutral	Blue	White
9	~ ac Earth	Green/Yellow	Green

## Getting Started

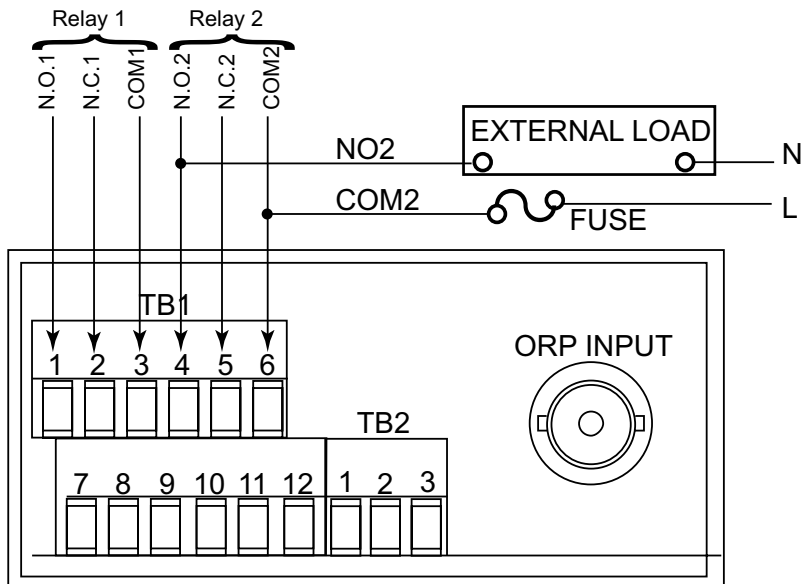
### 3.6 CONNECTING MAIN POWER (Continued)

Connect the dc main power connections as shown in Figure 3-8.



**Figure 3-8. Main Power Connections - DC**

### 3.7 CONNECTING ANALOG AND RELAY OUTPUTS



**Figure 3-9. Relay Output Connections**

3.7 CONNECTING ANALOG AND RELAY OUTPUTS (Continued)

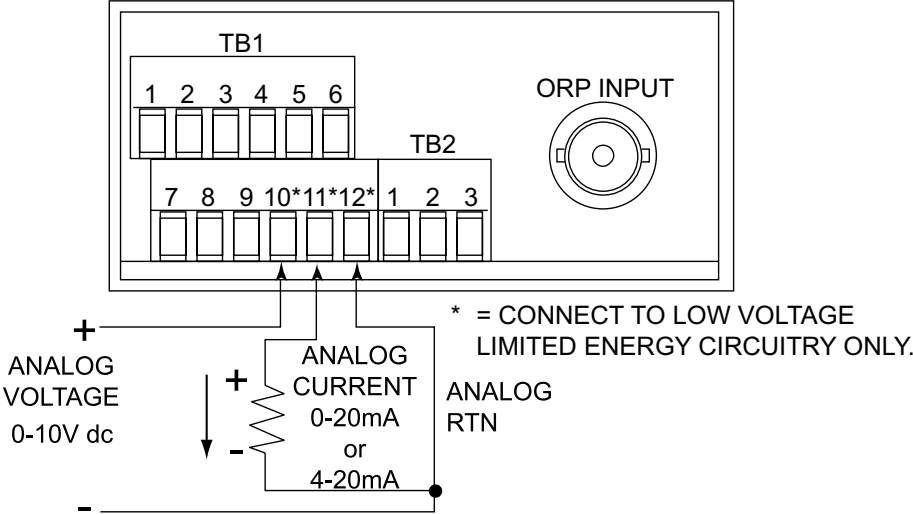


Figure 3-10. Analog Output Connections

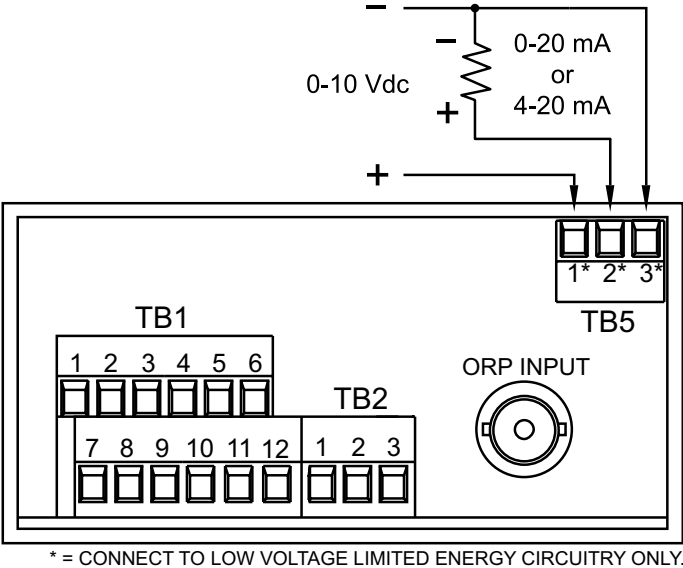


Figure 3-11. Isolated Analog Output Connections

## SECTION 4. CONFIGURING THE METER

**Note**

- Refer to Table 7-1 for a summary list of menu configuration.
- Factory defaults are in bold and italics.

### 4.1 Configuring Decimal Point ("DEC.P")

Under this menu there are two choices:

- FFFF.***     The meter's resolution is configured for mV - default.  
*FFF.F*     The meter's resolution is configured for 0.1 mV.

1. Press the ►RAW/mV button once, the current decimal point resolution is displayed.
2. Press the ▲/ORP button to select the desired resolution, then press the Menu button to store this value. The "**STRD**" momentarily appears then the next menu will automatically appear on the display.

**Note**

Setpoint value and deadband's decimal points are automatically updated when you change the decimal point. If any of these values are overflowed, then the meter will flash "**ER 2**", momentarily warning that one of these values has been corrupted. Then go to the next menu. New decimal point will be substituted.

### 4.2 Using Reading Configuration ("RD.CF")

Under this menu there is 1 submenu and 2 choices for the submenu:

- R.1=F***     For filtered ORP values - default.  
*R.1=U*     For unfiltered values.

1. Press the ►RAW/mV button once. **R.1=F** or **R.1=U** will flash.
2. Press the ▲/ORP button to select desired choice.
3. Press the **MENU** button to store this value. The "**STRD**" momentarily displays, followed by "**CAL.2**".

## 4.3 Performing 2 Point Calibration ("CAL.2")

There are two methods to calibrate the meter to display readings.

### 4.3.1. Online Calibration

In this method, meter will display the actual output values of the ORP probe. You will enter the two desired points for the display reading:

1. Immerse the ORP probe in a known solution (low point).
2. Press the **MENU** button until "**CAL.2**" displays.
3. Press the **▶/RAW mV** button. "**IN 1**" (input 1) displays.
4. Press the **▶RAW/mV** button again. The last input 1 stored value displays with the fourth digit flashing.
5. Press the **▶RAW/mV** button once more. Actual signal being received by your meter displays with no flashing digits.
6. Press the **MENU** button to store this value as "**IN 1**" (input 1).
7. "**RD 1**" displays.
8. Press the **▶RAW/mV** button. The last "**RD 1**" value stored displays with the fourth digit flashing.
9. Press the **▲/ORP** button to change the value of your digits.
10. Press the **▶RAW/mV** button to scroll horizontally to the next digit.
11. Press the **MENU** button to store value as "**RD 1**". "**IN 2**" (input 2) displays.
12. Immerse the ORP probe in the next solution (high point) and wait for it to settle.
13. Press the **▶RAW/mV** button again. The last input 2 stored value displays with the fourth digit flashing.
14. Press the **▶RAW/mV** button once more. Actual signal being received by your meter displays.
15. Press the **MENU** button to store input 2 value, then "**RD 2**" (Read 2) displays.
16. Press the **▶RAW/mV** button. The last "**RD 2**" value stored displays.
17. Press the **▲/ORP** button to change the value of your digits.
18. Press the **▶RAW/mV** button to scroll horizontally to the next digit.
19. Press the **MENU** button to store value as "**RD 2**" (Read 2). "**STRD**" momentarily displays, followed by "**S1.CF**". Meter scaling is now complete.

**Note**

If all digits are flashing during the calibration it means the value is overflowed. Press **▲/ORP** button to start new value.

## Configuring The Meter

### 4.3 Performing 2 Point Calibration ("CAL.2") (Continued)

#### 4.3.2 Manual Calibration

In this method you will enter all four points required for 2 point calibration.

1. Press the MENU button until "CAL.2" displays.
2. Press the ►RAW/mV button. "IN 1" displays.
3. Press the ►RAW/mV button again. Meter displays the last input 1 value, with fourth digit flashing.
4. Press the ▲/ORP button to change the value of your digits.
5. Press the ►RAW/mV button to scroll horizontally to the next digit.
6. Press the MENU button to store this value. "RD 1" displays.
7. Press the ►RAW/mV button. The last read 1 value stored displays.

Repeat steps 4 - 7 until "RD 1", "IN 2", and "RD 2" have been displayed, verified, changed (if necessary), and stored. At the last "menu" the meter momentarily displays "STRD" followed by "S1.CF". The meter scaling is completed.

**Note** If all digits are flashing during the calibration it means the value is overflowed. Press ▲/ORP button to start new value.

### 4.4 Using Setpoint 1 Configuration ("S1.CF")

This menu configures the Setpoint 1 relay. The "S1.CF" has two submenus and there are two choices for each submenu. They are:

- S.1=A** Relay activates above the deadband (Hi alarm) - default.
- S.1=B** Relay activates below the deadband (Low alarm).
- S.2=U** Unlatched (The relay will energize or de-energize normally). On/OFF applications will normally use this mode - default.
- S.2=L** Latched (The relay will remain activated until reset manually). Most applications utilizing audible or visual alarms or batch processing will use this mode.

1. Press the ►RAW/mV button once. The S.1=A or S.1=B submenu will flash.
2. Press the ▲/ORP button until the desired value is selected.
3. Press the ►RAW/mV button once. The S.2=U or S.2=L submenu will flash.
4. Press the ▲/ORP button until the desired value is selected.
5. Press the Menu button once. The meter will display "STRD" momentarily and then will display the "S2.CF" menu.

# Configuring The Meter

## 4.5 Using Setpoint 2 Configuration ("S2.CF")

This menu configures the Setpoint 2 relay. The "S2.CF" has two submenus and there are two choices for each submenu. They are:

- S.1=A** Relay activates above the deadband value (Hi alarm) - default.
- S.1=B Relay activates below the deadband value (Low alarm).
- S.2=U** Unlatched (The relay will energize and de-energize normally. On/Off applications will normally use this mode) - default.
- S.2=L Latched (The relay will remain activated until reset manually. Most applications utilizing audible or visual alarms or batch processing will use this mode).

1. Press the ►RAW/mV button once. The S.1=A or S.1=B submenu will flash.
2. Press the ▲/ORP button until the desired value is selected.
3. Press the ►RAW/mV button once. The S.2=U or S.2=L submenu will flash.
4. Press the ▲/ORP button until the desired value is selected.
5. Press the Menu button once. The meter will display "STRD" momentarily and then will display the "S1.DB" menu.

## 4.6 Setting Deadband or Hysteresis for Setpoint 1 ("S1.DB")

This menu sets the deadband or hysteresis for Setpoint 1. The deadband's resolution value is dependent upon the decimal point value previously set-up in Section 6.3.

1. Press the ►RAW/mV button once to observe the current value of "S1.DB".
2. Press the ▲/ORP button to select the desired value.
3. Press the ►RAW/mV button once to advance to the next digit.
4. Repeat Steps 2 and 3 until the desired "S1.DB" value is displayed.
5. Press the Menu button once. The meter will momentarily display "STRD" and then will display the "S2.DB" menu.

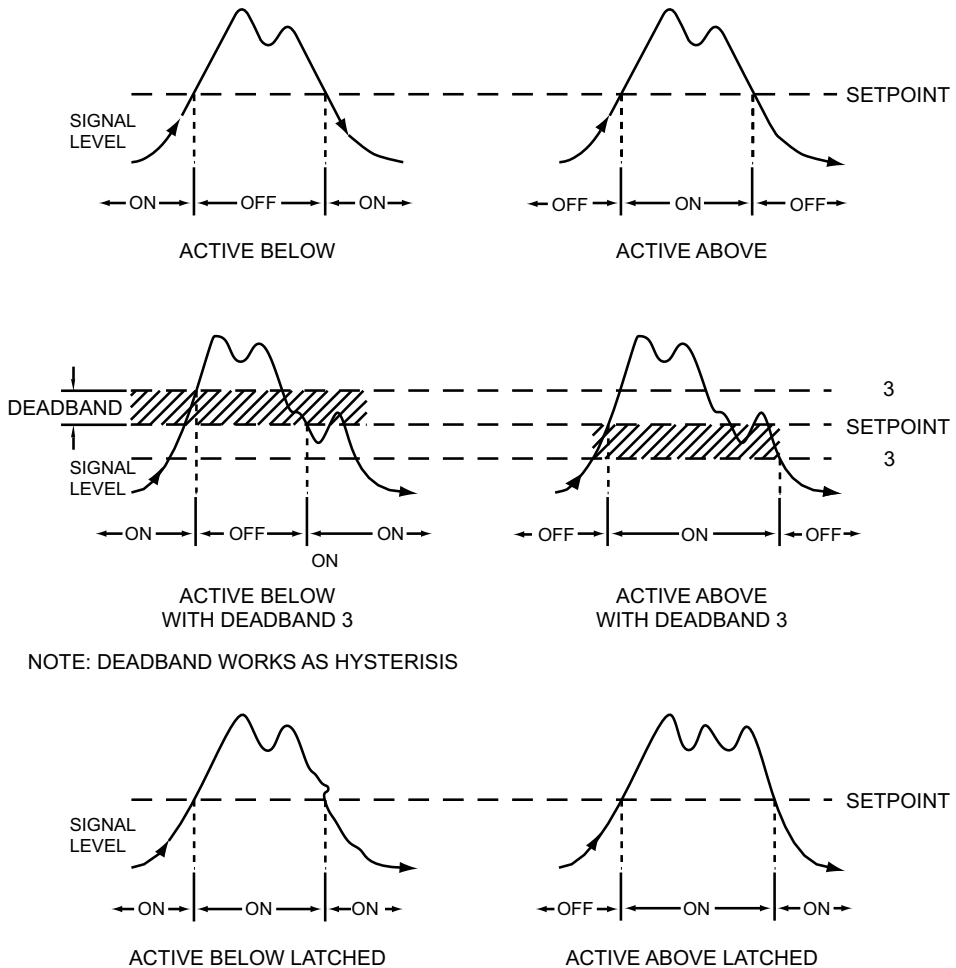
## 4.7 Setting Deadband or Hysteresis for Setpoint 2 ("S2.DB")

This menu sets the deadband or hysteresis for Setpoint 2. The deadband's resolution is dependent upon the decimal point value previously set up in Section 6.3.

1. Press the ►RAW/mV button once to observe the current value of "S2.DB".
2. Press the ▲/ORP button to select the desired value.
3. Press the ►RAW/mV button once to advance to the next digit
4. Repeat steps 2 and 3 until the desired "S2.DB" value is displayed.
5. Press the Menu button once. The meter will momentarily display "STRD" then it will display the "OT.CF" menu.

# 4

## Configuring The Meter



**Note**

To reset latched alarms you must:

1. Input a signal "OUT" of the alarm zone
2. Then press **SETPTS** and then, **RESET** button

**Figure 4-1. Alarm Example**



### 4.8 Using Output Configuration ("OT.CF")

This menu has 2 submenus. There are two choices for each submenu. These 2 submenus disable or enable the meter's output and configures the signal type to be either current or voltage. They are:

0.1=D: Analog out is disabled ( No output ).

0.1=E: Analog out is enabled - default.

and

0.2=V: Analog output type is voltage.

0.2=C: Analog output type is current - default.

1. Press the ►RAW/mV button once. The 0.1=D or 0.1=E submenu will flash.
2. Press the ▲/ORP button until the desired value is selected.
3. Press the ►RAW/mV button once. The 0.2=V or 0.2=C submenu will flash.
4. Press the ▲/ORP button until the desired value is selected.
5. Press the Menu button once. The meter will display "STRD" momentarily, then "OT.S.O" will be displayed.

### 4.9 Using Output Scale and Offset ("OT.S.O")

This menu scales your analog output to be equal to the meter's display and/or any engineering units you require. You may scale the output for direct (4-20 mA, 0-10 V, etc) or reverse acting (20-4 mA, 10-0 V, etc.)

1. Press the Menu button until the "OT.S.O" menu is displayed.
2. Press the ►RAW/mV button once. The meter displays "RD.1" (Reading 1).
3. Press the ►RAW/mV button once. The meter displays the current low value output ORP point with fourth digit flashing.
4. Press the ▲/ORP button until the desired value is selected.
5. Press the ►RAW/mV button to advance to the next digit.
6. Repeat Steps 4 and 5 until the desired value is selected.
7. Press the Menu button once. The meter will display "OUT.1" (Low Output).
8. Press the ►RAW/mV button once. The meter displays the current low volt or current out.
9. Press the ▲/ORP button until the desired value is selected.
10. Press the ►RAW/mV button to advance to the next digit.

## Configuring The Meter

### 4.9 Using Output Scale and Offset ("OT.S.O") (continued)

- 11.Repeat Steps 9 and 10 until the desired value is selected.
- 12.Press the Menu button once. The meter will display "RD.2" (Reading 2).
- 13.Press the ►RAW/mV button once to display the current high output ORP value.
- 14.Press the ▲/ORP button until the desired value is selected.
- 15.Press the ►RAW/mV button to advance to the next digit.
- 16.Repeat Steps 14 and 15 until the desired value is selected.
- 17.Press the Menu button once. The meter will display "OUT.2" (High Output).
- 18.Press the ►RAW/mV button once.
- 19.Press the ▲/ORP button until the desired value is selected.
- 20.Press the ►RAW/mV button to advance to the next digit.
- 21.Repeat Steps 19 and 20 until the desired value is selected.
- 22.Press the Menu button once. The meter will momentarily display

"STRD", then "RST" and then the meter will enter into the "RUN" Mode (Normal Operation).

**Note**

- 1: When all digits flash, it means the value overflowed. Press ▲/ORP to start new value.
- 2: The maximum values that can be entered for Out.1 and Out.2 are 20.00 for current and 10.00 for volt.

#### 4.9.1 Example for Output Scale and Offset

You want to send 4-20 mA output for 0.00 to 2000 mV. The meter has 1 mV resolution. Complete the following steps:

1. Press the **MENU** button until the meter shows "OT.S.O".
2. Press the ►RAW/mV button. The meter shows "RD 1" (Read 1).
3. Press the ►RAW/mV button again to show the existing value.
4. Change the value of "RD 1" to 00 by pressing the ▲/ORP and ►RAW/mV buttons.
5. Press the **MENU** button to store your selection. The meter shows "OUT.1" (Output 1).
6. Press the ►RAW/mV button again to show the existing value.

# Configuring The Meter

## 4.9.1 Example for Output Scale and Offset (continued)

7. Change the value of “**OUT.1**” to 04.00 by pressing the **▲/ORP** and **▶RAW/mV** buttons.
8. Press the **MENU** button to store your selection. The meter shows “**RD 2**” (Read 2).
9. Press the **▶RAW/mV** button to show the existing value.
10. Change the value of “**RD 2**” to 2000 mV by pressing the **▲/ORP** and **▶RAW/mV** buttons.
11. Press the **MENU** button to store your selection. The meter shows “**OUT.2**” (Output 2).
12. Press the **▶RAW/mV** button to show the existing value.
13. Change the value of “**OUT.2**” to 20.00 by pressing the **▲/ORP** and **▶RAW/mV** buttons.
14. Press the **MENU** button to store your selection. The meter shows “**STRD**”.

## 4.10 Using Lockout Configuration

To lock the RESET, MENU, and SETPTS buttons, follow these steps:

### In the RUN mode-

1. Press and hold down the RESET button. The meter shows “SP.RS”. Do not release the RESET button.
2. Press the MENU button while continuing the hold the RESET button down (3 - 5 seconds) until the meter shows “LOCK”.
3. Release both buttons. Meter goes into the Run mode.

To unlock the RESET, MENU, and SETPTS buttons, follow these steps:

1. Press and hold down the RESET button. The meter shows “LOCK”. Do not release the RESET button.
2. Press the MENU button while continuing the hold the RESET button down (3 - 5 seconds) until the meter shows “UN.LK”.
3. Release both buttons. Meter goes into the Run mode.

## SECTION 5. SELECTING SETPOINT VALUES

Follow the steps below to select values for Setpoint 1 and Setpoint 2.

1. Press the **SETPTS** button. The meter momentarily shows “**SP1**” (Setpoint 1), followed by the last stored value with flashing 4th digit. The factory default for “**SP1**” is 000.0.
2. Press the **▲/ORP** button to change the value of Setpoint 1.
3. Press the **►RAW/mV** button to scroll to the next digit.
4. Press the **SETPTS** button to store your selection. The meter momentarily shows “**SP2**” (Setpoint 2), followed by the last stored value with flashing 4th digit. The factory default for “**SP2**” is 000.0.
5. Press the **▲/ORP** button to change the value of Setpoint 2.
6. Press the **►RAW/mV** button to scroll to the next digit.
7. Press the **SETPTS** button to store new values. The meter momentarily shows “**STRD**”, “**RUN**” and then enters the run mode.

**Note**

You may press the **RESET** button anytime during this routine to return to the run mode.

## SECTION 6. DISPLAY MESSAGES

**Table 6-1. Display Messages**

MESSAGE	DESCRIPTION
CAL.2	2 point Calibration
DEC.P	Decimal point
ORP	Oxidation Reduction Potential
OT.CF	Output configuration
OT.S.O	Output scale and offset
RAW.V	Raw Value Direct from the Probe in mV
RD.CF	Reading configuration
RST	Hard (power-on) Reset
S1.CF	Setpoint 1 configuration
S2.CF	Setpoint 2 configuration
S1.DB	Setpoint 1 deadband
S2.DB	Setpoint 2 deadband
SP.RS	Reset setpoints
SP1	Setpoint 1 value
SP2	Setpoint 2 value
±LMT	±ORP over limit-flashing
9999	Value overflow in setpoint/menu routines-flashing
-1999	Value overflow in setpoint/menu routines-flashing
ER1	2 coordinate format programming error-flashing
ER2	One of setpoint values or setpoint deadbands overflowed due to decimal point change-flashing
OV.SC	Reading Over Scale-flashing
RS.OF	Reading Over Flow-flashing
±OL	±Overload Signal-flashing
LOCK	Lock for RESET, MENU and SETPTS buttons
UN.LK	Unlock for RESET, MENU and SETPTS buttons

## SECTION 7. MENU CONFIGURATION DISPLAYS

**Table 7-1. Configuration Menu**

(Defaults in Bold and

MENU	►/RAW/mV	▲/ORP
<b>DEC.P</b> Decimal Point	Show decimal point position	<b>FFFF.</b> FFF.F
<b>RD.CF</b> Reading Configuration	<b>R.1</b>	<b>F: Filtered ORP</b> U: Unfiltered ORP
<b>S1.CF</b> Setpoint 1 Configurations	<b>S.1</b>  <b>S.2</b>	<b>A: Active above</b> B: Active below  <b>U: Unlatched</b> L: Latched
<b>S2.CF</b> Setpoint 2 Configurations	<b>S.1</b>  <b>S.2</b>	<b>A: Active above</b> B: Active below  <b>U: Unlatched</b> L: Latched
<b>S1.DB</b> Setpoint 1 Configurations	Scroll right one digit	Change flashing digit's value
<b>S2.DB</b> Setpoint 2 Configurations	Scroll right one digit	Change flashing digit's value
<b>CAL.2</b> Two-Point Calibration		
<b>IN 1</b> Input new value and show "RD 1"	Show <b>IN 1</b> , prior and actual value Scroll right one digit	Change flashing digit's value
Enter new value and show "IN 2"	Show prior value Scroll right one digit	Change flashing digit's value
Enter new value and show "RD 2"	Show prior value Scroll right one digit	Change flashing digit's value

# Menu Configuration Displays

**Table 7-1. Configuration Menu (continued)**

(Defaults in Bold and Italics)

MENU	▶RAW/mV	▲/pH
<b>OT.CF</b> Output Configuration	0.1	D: Disabled <b><i>E: Enabled</i></b>
Analog Output Option	0.2	V: Voltage Analog out <b><i>C: Current Analog out</i></b>
<b>OT.S.O</b> Output Scale & Offset		
Enter new value & show "OUT1"	Show " <b>RD 1</b> " & prior value	Change flashing digit's value
	Scroll right one digit	
Enter new value & show "RD 2"	Show prior value	Change flashing digit's value
	Scroll right one digit	
Enter new value & show "OUT2"	Show prior value	Change flashing digit's value
	Scroll right one digit	

**Table 7-2. Run Mode Display**

<b>DISPLAY</b>	<b>▶RAW/mV</b>	<b>▲/ORP</b>
<b>RAW.V</b> Raw Input		Shows raw value direct from probe in mV.
<b>SP.RS</b>  <b>LATCHED RESET</b>  Press <b>RESET</b> button to reset your setpoints.		



## SECTION 8. SETPOINT CONFIGURATION DISPLAYS

**Table 8-1. Setpoint Configuration Display**

<b>MENU</b>	<b>▶RAW/mV</b>	<b>▲/ORP</b>	<b>DESCRIPTION</b>
<b>SP 1</b> Setpoint 1	Scroll right one digit	Change flashing digit's value	Select from -1999 through 9999
<b>SP 2</b> Setpoint 2	Scroll right one digit	Change flashing digit's value	Select from -1999 through 9999

---

**SECTION 9. SPECIFICATIONS**
**INPUT SIGNAL****ORP Specification**

Range:	- 2V to + 2V
Resolution:	0.1mV or 1mV
Accuracy:	± 0.1mV
Calibration:	Two Point online or manual
Decimal Point:	2 position
Input Impedance:	>10 <sup>12</sup> ohm

**ISOLATION**

Isolation:	Dielectric strength to 2500V transient per 3mm spacing based on EN 61010 for 260Vrms or dc working voltage
Noise Rejection:	Normal Mode Rejection (NMR) = 60dB Common Mode Rejection (CMR) = 120dB

**DISPLAY**

Display:	LED 14-segment, 13.8 mm (0.54")
Symbol:	

## SECTION 9. SPECIFICATIONS (Continued)

### ANALOG TO DIGITAL

Technique: Dual Slope  
 Internal Resolution: 15 bits  
 Read Rate: 3 per second

2 Form "C" on/off relays. Configurable for latched and unlatched by software.

Max current: 5 A, resistive load  
 Max voltage: 250 Vac or 30 Vd

### ANALOG OUTPUT

Signal Type: Current or voltage

Signal Level: Current: 10 V max compliance at 20 mA output  
 Voltage: 20 mA max for 0-10 V output

Function: May be assigned to a display range or proportional control output with setpoint #1 when used as a control output.

Linearity: 0.2%

Step Response Time: 2 - 3 seconds to 99% of the final value

### ISOLATED ANALOG OUTPUT (TB5, if applicable)

Same as non-isolated analog output except isolated to 1000 Vdc.

Signal Type: Current or voltage

Signal Level: Current: 10 V max compliance at 20 mA output  
 Voltage: 20 mA max for 0-10 V output

Function: May be assigned to a display range or proportional control output with setpoint #1 when used as a control output.

Linearity: 0.2%

Step Response Time: 2 - 3 seconds to 99% of the final value

#### Note

Only one analog output is available on each unit and it must be factory installed.

**SECTION 9. SPECIFICATIONS (Continued)****INPUT POWER INFORMATION**

~ AC units	115/230 V~(AC) $\pm 10\%$ , 50/60 Hz 7 W max, power consumption (Non-Isolated Analog Output) 8 W max, power consumption (Isolated Analog Output)
— DC units	9.5 at 750 mA to 32 Vdc at 200mA dc 6 W max, power consumption (Non-Isolated Analog Output) 7 W max, power consumption (Isolated Analog Output)

External Fuse Protection Recommended:

IEC 127-2/III	
Power	Fuse
115 V	125 mA @ 250 (T)
230 V	63 mA @ 250 (T)
UL 248-14 (Listed Fuse)	
Power	Fuse
115 V	175 mA @ 250 V Slow-Blow
230 V	80 mA @ 250 V Slow-Blow

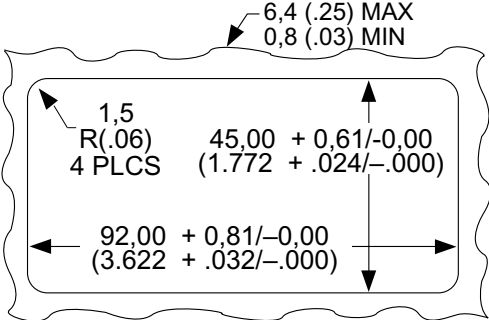
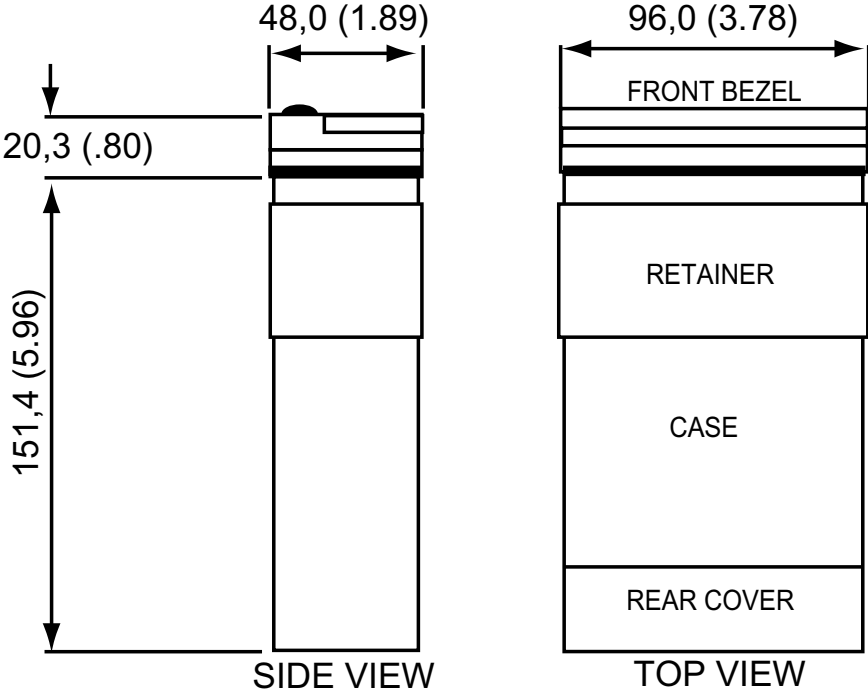
**ENVIRONMENT**

Operating temperature:	0° to 50°C (32° to 122°F)
Storage temperature:	-40° to 85°C (-40° to 185° F)
Relative humidity:	90% at 40°C (non-condensing)

**MECHANICAL**

Panel cutout:	1/8 DIN 3.62 x 1.78" (45 x 92mm)
Weight:	1.27 lb (575 g)
Case material:	Polycarbonate, 94 V-O UL rated

SECTION 9. SPECIFICATIONS (Continued)



NOTE: Dimensions in Millimeters (Inches)

**Dimensions/ Panel Cutout**

## SECTION 10. FACTORY PRESET VALUES

**Table 10-1. Factory Preset Values**

<b>MENU ITEM</b>	<b>FACTORY PRESET VALUES</b>
DEC.P	Decimal Point Position: FFFF.
RD.CF	Reading Configuration: R.1=F
S1.CF	Setpoint 1 Configuration: S.1=A (Setpoint is active above) S.2=U (Setpoint is unlatched)
S2.CF	Setpoint 2 Configuration: S.1=A (Setpoint is active above) S.2=U (Setpoint is unlatched)
S1.DB	Setpoint 1 Deadband: 10
S2.DB	Setpoint 2 Deadband: 10
OT.CF	Output Configuration: O.1=E (Analog output is enabled) O.2=C (Analog output is current)
OT.S.O	Output Scale and Offset: 0-10000. = 4-20 mA
SP1	Setpoint 1 Value: 0000.
SP2	Setpoint 2 Value: 0000.

## CE APPROVALS INFORMATION

 This product conforms to the EMC directive 89/336/EEC amended by 93/68/EEC, and with the European Low Voltage Directive 72/23/EEC.

### Electrical Safety EN61010-1:2001

Safety requirements for electrical equipment for measurement, control and laboratory.

#### Double Insulation

#### Pollution Degree 2

#### Dielectric withstand Test per 1 min

- Power to Input/Output: 2300 Vac (3250 Vdc)
- Power to Input/Output: 500 Vac (720 Vdc)  
(Low Voltage dc Power Option\*)
- Power to Relays Output: 2300 Vac (3250 Vdc)
- Relay 1 to Relay 2: 2300 Vac (3250 Vdc)
- Isolated Analog to Inputs: 1000 Vac (1420 Vdc)
- Analog to Inputs: No Isolation

#### Measurement Category I

Category I are measurements performed on circuits not directly connected to the Mains Supply (power). Maximum Line-to-Neutral working voltage is 50 Vac/dc.

This unit should not be used in Measurement Categories II, III, IV.

#### Transients Overvoltage Surge (1.2 / 50uS pulse)

- Input Power: 2500 V
- Input Power: 500 V  
(Low Voltage dc Power Option\*)
- Isolated Analog: 500 V
- Input/Output Signals: 500 V

**Note:** \*Units configured for external low power dc voltage, 10-32 Vdc (Basic Insulation)

### EMC EN61326:1997 + and A1:1998 + A2:2001

Immunity and Emissions requirements for electrical equipment for measurement, control and laboratory.

- EMC Emissions Table 4, Class B of EN61326
- EMC Immunity\*\* Table 1 of EN61326

**Note:** \*\*I/O signal and control lines require shielded cables and these cables must be located on conductive cable trays or in conduits. Furthermore, the length of these cables should not exceed 30 meters



Refer to the EMC and Safety installation considerations (Guidelines) of this manual for additional information.











## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **one (1) year** from the date of purchase. In addition to OMEGA's standard warranty period, OMEGA Engineering will extend the warranty period for **four (4) additional years** if the warranty card enclosed with each instrument is returned to OMEGA.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
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