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# User's Guide

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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.



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# PREFACE

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## Preface to the Operator's Manual

The latest additions to the digital panel meter series are the **VRMS** and **CRMS True RMS Volt / Current meters**. Both the VRMS (voltage meter) and the CRMS (current meter) may be ordered with the isolated analog output, and/or dual relay option. These options are *not field installable* and must be ordered at the time of purchase. The VRMS measures voltages from 100mV to 750V (see CE Approvals section for full details) in five ranges. All ranges are pre-calibrated and selected via the rear dip switch. The CRMS can measure currents from 1mA to 5amp. The current meter has an internal built in shunt for the 5amp range. The 5amp and the 1amp range have dedicated inputs. The 1mA through 100mA ranges may be selected via the rear dip switch. Again, the meter is shipped pre-calibrated for all the ranges. Users need only connect the meter to the signal source and select the proper range from the menu. The meter will then start measuring and displaying the voltage or current present at its inputs.

The RMS meters are ideal for monitoring complex voltage or current waveforms generated by SCR banks to control the motor speed/torque. If the dual relay option is used, the meters can be programmed to provide an alarm when the motor is overloaded or when the load is disengaged from the motor.

Other typical applications would be to monitor the line voltage or current and use the isolated analog output to transmit the information to a chart recorder. The meters can also communicate with PLC's and computers via an optional *isolated* serial RS232 or RS485 board. This option may be added at any time as it is field installable.

Range switching for both models is done by selecting the proper opened/closed position for the SW1 DIP switches (*see section 2.2*) accessible from the back of the meter. Once the SW1 switches have been set to the desired voltage or current range, the same range must also be selected from the Range (RNGE) submenu of the Input (INPT) main menu (*see the menu section 2 configuration flowchart*).

You must decide whether the signal is to be AC or DC coupled. AC coupling is the preferred method when the input signal is ridding on some undesirable DC voltage. To AC couple the voltage signal, connect the input signal to the P6 terminal labeled AC (*see section 1.4.2*), and change the Coupling (CPLG) submenu of the Input (INPT) main menu to AC. To remove the DC component of the current signal, SW1-5 DIP switch must be opened (*see section 2.2*). If the measurement is being done directly on the local power where the frequency may be 50Hz or 60Hz, set the Frequency (FREQ) submenu of the Input (INPT) main menu to the local power frequency for increased accuracy. If the frequency of the input signal is not known, select ALL from the Frequency (FREQ) submenu. The second part of this manual, *Operation*, explains menu configuration in detail.

**Note**

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When rescaling the meter either with or without known loads, if a high degree of accuracy is required, do not apply 0 volts or use 0 as a reference point (see section 2.6.2). For any rescaling, the minimum signal should always be 3 to 5% of the full scale of the signal range. The same is true for scaling the analog output option. Do not use a value of 0 on the display if a high degree of accuracy is required, but instead use a value slightly higher than 0 counts on the display.

---

**NOTES, WARNINGS and CAUTIONS**

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

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

**Note**

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



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



**CAUTION, RISK OF DANGER:** tells you of circumstances or practices that can effect the meter's functionality and documentation needs to be consulted in all cases, in order to find out the nature of potential hazards and actions.



# CONTENTS

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# Section 1: Setup



Before You Begin  
Features and Options  
Safety Considerations  
Getting Started

## 1.1 Before You Begin

### 1.1.1 Customer Service

If there are any questions about the shipment, use the phone number for the Customer Service Department nearest you.

### 1.1.2 Inspecting Your Shipment

Remove the packing slip and verify that you have received everything listed, including:

- True RMS Meter
- Operator's Manual
- Quick Start Pamphlet
- Connectors



---

Inspect the container and equipment for signs of damage as soon as you receive the shipment. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent. The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing the contents, save the packing material and carton in the event reshipment is necessary.

---

### 1.1.3 What You Will Need

In addition to the meter and connectors, you will need the following items to setup your unit:

- 110V three-prong power cord
- 1/8" flat head screwdriver

## 1.2 Features and Options

### 1.2.1 Basic Features

Your meter has several basic features, some of which are listed below. For more detailed information on specifications and factory defaults, see Section 4: Specifications.

- 4 Digit, 14 segment LED display
- NEMA 4 / Type 4 Front Bezel
- Peak and Valley detection
- Nonvolatile memory — no battery backup necessary
- 115Vac or 230Vac 50/60 Hz power source

### 1.2.2 Factory Configurations

There are two models available — a current meter and a volt meter. Both of these models are available from the factory in the following configurations:

- Basic Unit
- Basic Unit with Dual Relay Output
- Basic Unit with Isolated Analog Output
- Basic Unit with Dual Relay and Isolated Analog Output

#### Note

The relay and analog outputs are not field installable options. They must be requested at time of purchase. Menus will only be available for those options that are supported by that meter.

### 1.2.3 Field Installable Options

The models can accommodate a communication board, which can be installed at any time. There are two different communication boards available:

- Isolated RS232 Output
- Isolated RS485 Output

#### Note

If your meter has a communication board installed, then you may control all functions of the meter through a serial communications connection with your computer. The book, *Serial Communications*, that comes with the communication board itself, has detailed information on setup and configuration procedures. Note that this manual, the *Operator's Manual*, explains only the more basic options available to users whose meters are equipped with the communication board.

## 1.3 Safety Considerations



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

### Unpacking & Inspection

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

#### Note

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 mains supply cord.

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



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

#### Note

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

### EMC Considerations

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

## 1.4 Getting Started

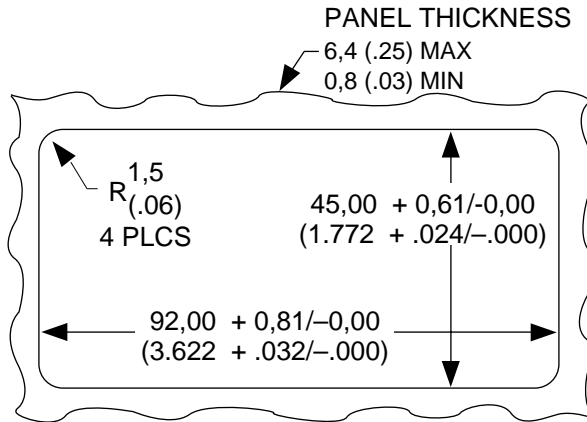
**Overview**

Follow these steps to start using your meter right away:

- Mount the meter (section 1.4.1)
- Connect the signal source (section 1.4.2)
- Connect outputs (section 1.4.3)
- Set DIP switches for your input level (section 1.4.4)
- Connect the AC power cord to the meter (section 1.4.5)
- Turn on the meter (section 1.4.6)

### 1.4.1 Mount the Meter

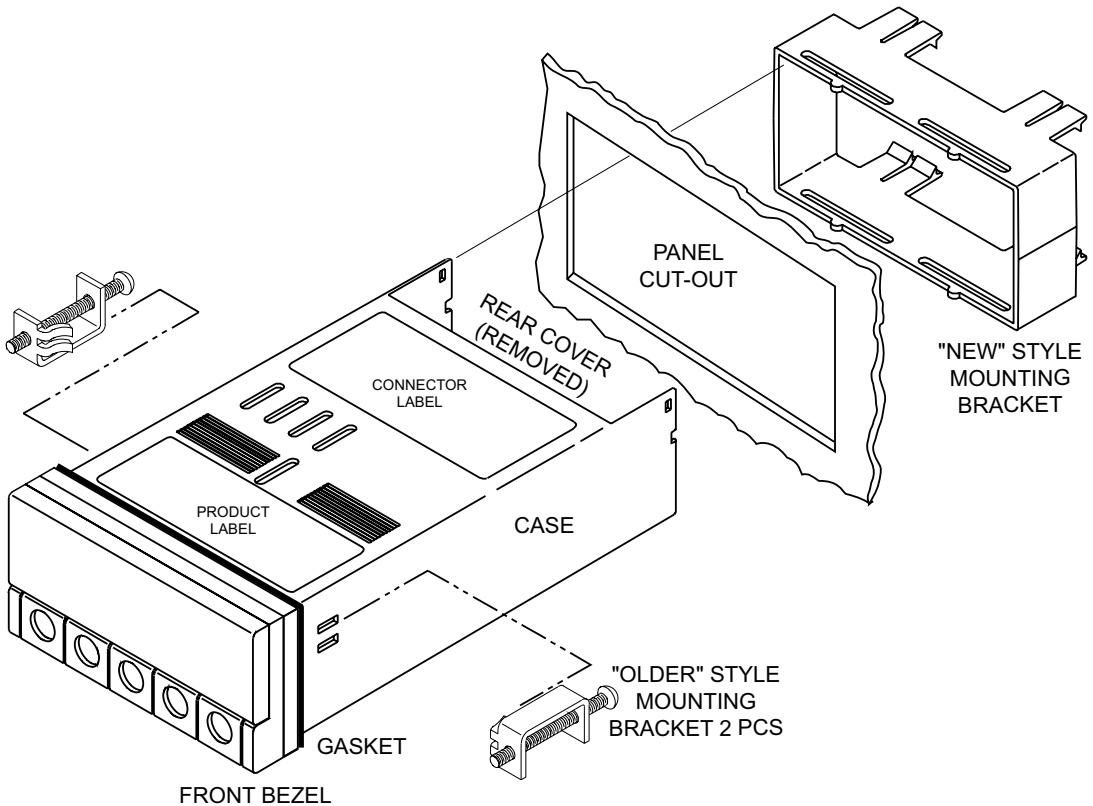
1. Remove the rear cover at the back of the unit.
2. Cut a hole in your panel, as shown. (see Figure 1.1)



NOTE: Dimensions in Millimeters (Inches)

**Figure 1.1 — Panel Cut-out Dimensions**

3. Insert the meter into the hole. Be sure the front bezel is flush to your panel. (see Figure 1.2)



**Figure 1.2 — Exploded View of the Meter**

1.4.2 Connect  
Signal Source



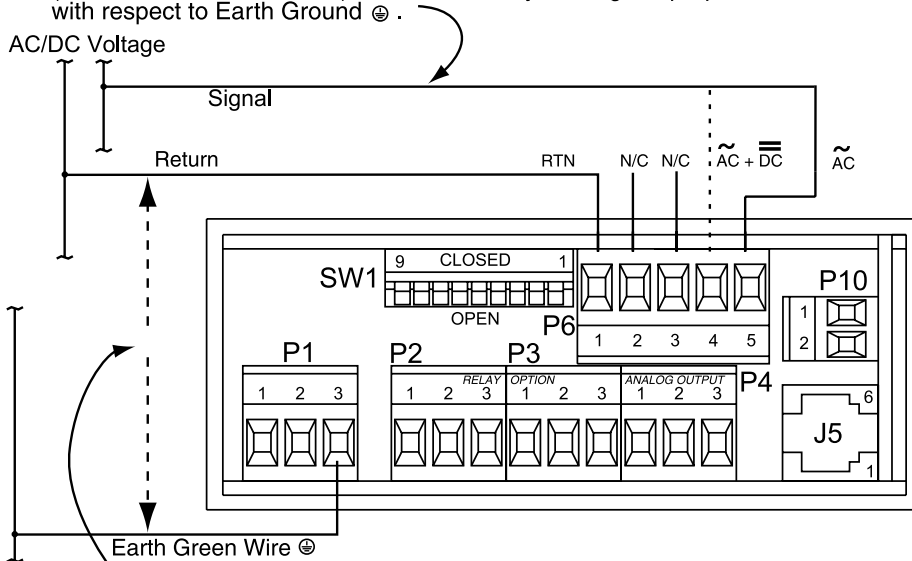
**WARNING:** Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury!



**IMPORTANT:** This device must only be installed electrically by specially trained electrician with corresponding qualifications. The mains power input to the unit as well as the AC input signal to be measured must agree with the wiring instruction.

1. Locate the P6 connector. (see Figures 1.3 and 1.4)
2. Make sure the signal source is off.
3. Insert the correct wire in each terminal and tighten the lockdown screw. Tug gently on the wires to verify that the connections are secure.

**Warning:** "Hi side of the AC Signal" must always be connected to the "AC" input (Pin 5 or 4 of connector P6), double check by making the proper measurements with respect to Earth Ground ⊕ .

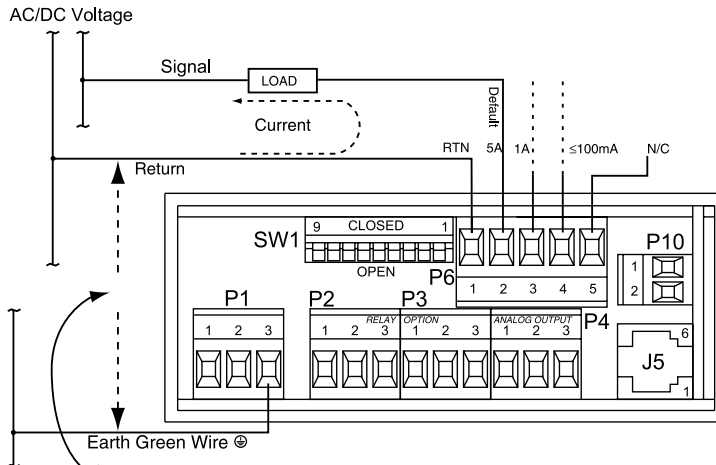


**Important:** make sure that the return (RTN) terminal of P6 (pin 1) is connected to the return side of the AC input signal. For proper operation and Low Earth leakage, the voltage of the the RTN pin with respect to Earth Ground ⊕ can not exceed 25Vrms.

Measurement Category II. Rated Maximum Working Voltage: 300 Vac/dc. No CE compliance from 300V - 750V. See CE Approvals section for more details.

**Figure 1.3 — P6 Volt Meter Connection**

## SETUP

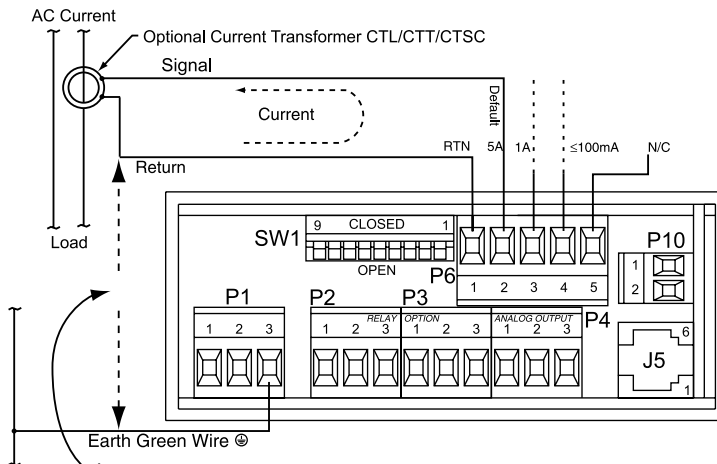


**⚠ Important:** always monitor your current in the return side of the input signal so that the AC voltage respect to Earth ground can not exceed 25Vrms Ⓢ for proper operation and low Earth leakage current.

The meter is connected in series.

Measurement Category II. Rated Maximum Working Current: 5A.

**Figure 1.4 — P6 Current Meter Connection**



**⚠ Important:** always monitor your current in the return side of the input signal so that the AC voltage respect to Earth ground can not exceed 25Vrms Ⓢ for proper operation and low Earth leakage current.

The meter is connected in series.

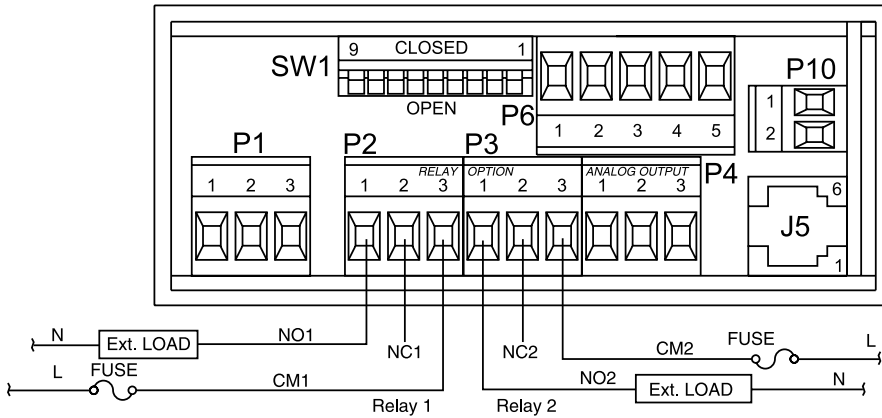
Measurement Category II. Rated Maximum Working Current: 5A.

**Figure 1.4.1 - P6 Current Meter Connection with Optional Current Transformer**

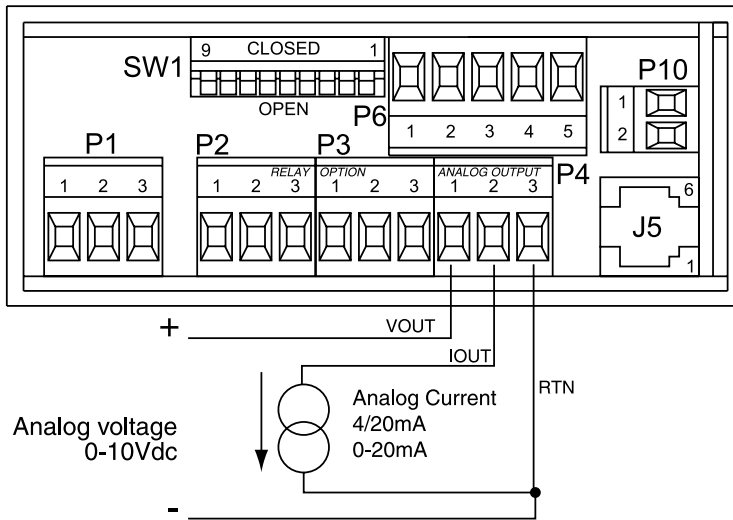


**1.4.3 Connect Outputs**

Your meter may have one or more factory installed outputs. The Dual Relay Output Connection and the Analog Output Connection are shown below. (see Figures 1.5 and 1.6)

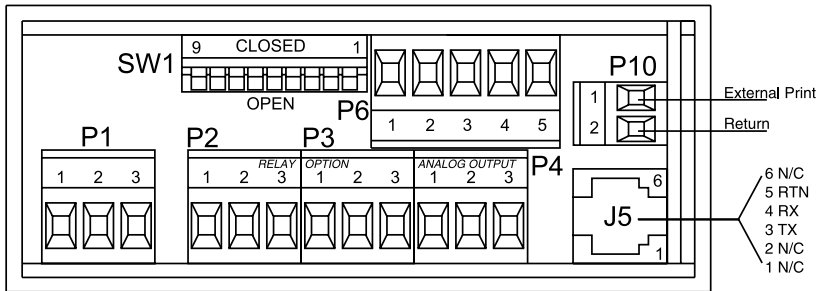


**Figure 1.5 — P2 & P3 Dual Relay Output Connection**



**Figure 1.6 — P4 Analog Output Connection**

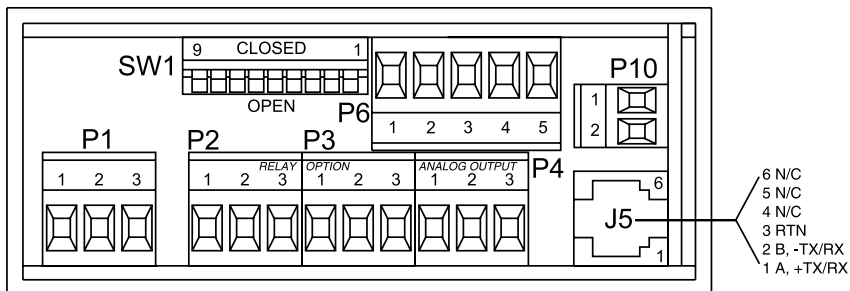
Your meter may also have one of two field installable communication outputs — either a RS232 or RS485 Output Connection. (see Figures 1.7 and 1.8)



**Figure 1.7 — P10 & J5 RS232 Output Connections**

Pin Signal / Function	Meter (DCE)		Computer (DTE)	
	RJ12	D9	D9	D25
RTS, meter from computer	2	7		4
TX, meter = RX, computer	3	2		3
RX, meter = TX, computer	4	3		2
GND	5	5		7
NC (not connected)	1,6			(all others)

**Table 1.1 — RS232 Meter Connection to the Computer**



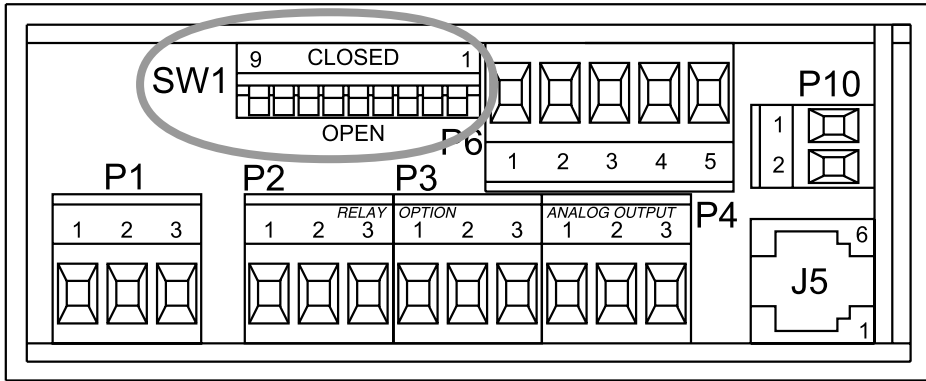
**Figure 1.8 — J5 Half-duplex RS485 Output Connections**

**1.4.4 Set DIP Switches**

Locate the SW1 DIP switch on the back of the meter. (see Figure 1.9) To select an input range, SW1-1 through SW1-9 must be in the correct position.



Please refer to the tables on page 16 for the switch positions that match your desired input range. Note that you must also configure the Input menu to reflect your desired input range.



**Figure 1.9 — SW1 Input Range Selection**

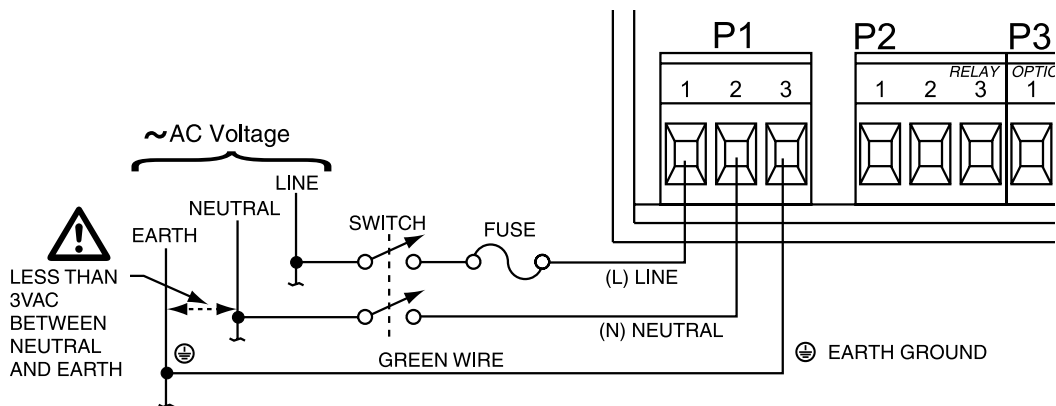
**1.4.5 Connect the AC Power Cord to the Meter**

1. Remove the panel at the back of the meter.
2. Locate the P1 connector. (see Figure 1.10)



**WARNING:** Do not connect AC power to your meter until all input and output connections have been properly established. Failure to do so may result in injury.

3. Insert the correct wire in each terminal and tighten the lockdown screw. See Table 1.2, for wire color definitions. Tug gently on the wires to verify that the connections are secure.



**Figure 1.10 — P1 AC Power Connection**

CONNECTION	EUROPE	USA
AC-Line	Brown	Black
AC-Neutral	Blue	White
AC-Earth Ground	Green/Yellow	Green

**Table 1.2 — P1 AC Power Wire Color & Terminal Connections**

#### 1.4.6 Turn On the Meter

1. Plug the unit into a properly grounded 115V power supply. The unit will initialize, scrolling one of the following messages on the front panel:

```
TRUE...RMS...VOLT...VERX
TRUE...RMS...CURRENT...VERX
```

X = the version number

2. The present value should then display. If a value does *not* display, follow these steps:
  - Unplug the unit
  - Verify the P1 power connections
  - Check your power source
  - Plug the unit in again

---

## Section 2: Operation



Introduction  
SW1 DIP Switch Positions  
Front Panel Display  
Meter Buttons  
Flow Charts  
Menu Configurations

## 2.1 Introduction

The meter has two different modes of operation. The first, *Run Mode*, is used to display values for setpoint 1 and setpoint 2 and display or clear peak and valley values. The other mode, *Configuration Mode*, is used to navigate through the menu options and configure the meter.



### Overview

This section of the manual, *Operation*, will explain both the *Run Mode* and the *Configuration Mode* and is divided into the following sections:

- SW1 DIP Switch Positions (Section 2.2)
- Front Panel Display (Section 2.3)
- Meter Buttons (Section 2.4)
- Menu Flow Charts (Section 2.5)
- Menu Configurations (Section 2.6)



### Note

There are two meter models available — a current meter and a volt meter. Both of these models are available from the factory in the following configurations:

- Basic Unit
- Basic Unit with Dual Relay Output
- Basic Unit with Isolated Analog Output
- Basic Unit with Dual Relay and Analog Output

---

The relay and analog outputs are **not** field installable options. They **must** be requested at time of purchase. Menus will only be available for those options that are supported by that meter.

---

## 2.2 SW1 DIP Switch Positions for Input Ranges

Before you change the input range of the meter, set the SW1 DIP switches to the correct positions. These switches are located at the back of the meter. Refer to the following tables for the volt meter and current meter settings.

### 2.2.1 Adjusting SW1 DIP Switches for Volt Meter

Range	SW1-1 to SW1-5	SW1-6	SW1-7	SW1-8	SW1-9
750V	Open	Open	Closed	Open	Closed
100V	Open	Closed	Closed	Open	Open
10V	Open	Closed	Open	Closed	Open
1V	Open	Closed	Open	Open	Open
0.1V*	Open	Open	Open	Open	Open

\* This range is fully calibrated only when ordered as an FS option. Otherwise only a coarse calibration  $\pm 2\%$  applies.

**Table 2.1 — DIP Switch Positions for Voltage Meter**

### 2.2.2 Adjusting SW1 DIP Switches for Current Meter

Range	SW1-1	SW1-2	SW1-3	SW1-4	SW1-5		SW1-6	SW1-7 to SW1-9
					Open	Closed		
5A	Open	Open	Open	Closed	Open	Closed	Open	Open
1A	Open	Open	Open	Open	Open	Closed	Closed	Open
100mA	Closed	Open	Open	Open	Open	Closed	Closed	Open
10mA	Open	Closed	Open	Open	Open	Closed	Closed	Open
1mA	Open	Open	Closed	Open	Open	Closed	Closed	Open

~ AC coupled      || DC coupled

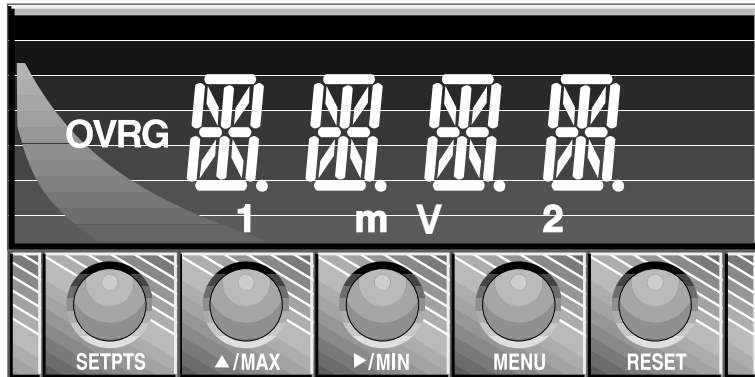
**Table 2.2 — DIP Switch Positions for Current Meter**



**WARNING:** The 5 Amp and 1 Amp ranges have dedicated inputs. You must always choose the input connector that corresponds to your input range. **Failure to do so may result in injury!**

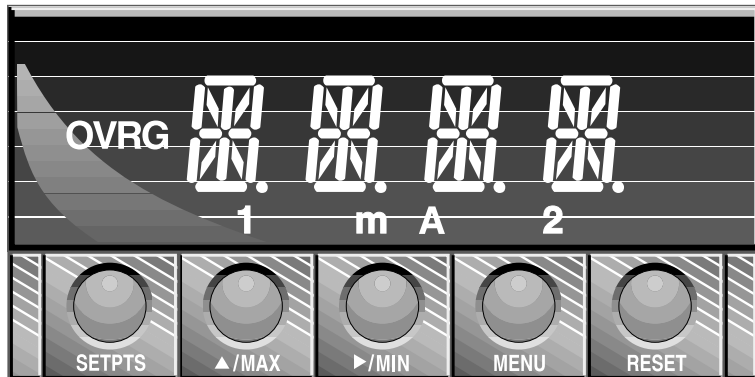
## 2.3 Front Panel Display

### 2.3.1 Volt Meter Display



**Figure 2.1 — Front Panel Display for Volt Meter**

### 2.3.2 Current Meter Display



**Figure 2.2 — Front Panel Display for Current Meter**

### 2.3.3 Indicators

These indicators light when appropriate:	
1	Setpoint 1 indicator
2	Setpoint 2 indicator
mA, A	Milliamp, Amp for Current Meter
mV, V	Millivolt, Volt for Voltmeter
OVRG	Overflow indicator

**Table 2.3 — Display Indicators**



## 2.4 Meter Buttons

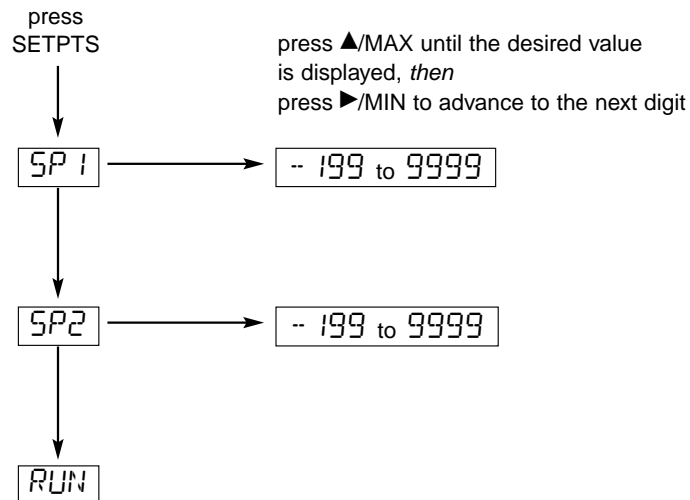
BUTTON	DESCRIPTION
SETPTS	<p>In <b>Run Mode</b> press this button to display the values for setpoint 1 and setpoint 2. Press this button repeatedly to recall the previous setpoint settings. After using the ▲/MAX and ►/MIN buttons to alter these settings, press this button again to store the new values. (Unless you press this button within 20 seconds to store your input, the meter will scroll to setpoint 2 and retain the last value stored.)</p> <p>In <b>Configuration Mode</b> press this button at the level 1 menus only followed by <b>MENU</b> to enter into the level 2 menus.</p>
▲/MAX	<p>In <b>Run Mode</b> press this button to recall the peak reading since the last time the reset button was pressed. Press this button again to return to the current readings without resetting the peak reading.</p> <p>In <b>Configuration Mode</b> press this button to access Level 4 menu items, then press the ►/MIN button to scroll through Level 4 menu items.</p>
►/MIN	<p>In <b>Run Mode</b> press this button to recall the valley reading since the last time the reset button was pressed. Press this button again to return to the current readings without resetting the valley reading.</p> <p>In <b>Configuration Mode</b> press this button to access Level 3 menu items. When configuring setpoint values, press this button to scroll to the next digit.</p>
MENU	<p>In <b>Run Mode</b> press this button to end the current measuring process and enter configuration mode.</p> <p>In <b>Configuration Mode</b> pressing this button will store your selections and then advance you to the next menu item.</p>
RESET	<p>In <b>Run Mode</b> press <b>MENU</b> button, followed by <b>RESET</b> button to reset the latched alarms. (If your meter has this option).</p> <p>In <b>Configuration Mode</b> press this button to go back to the previous menu item. Press this button twice to exit the configuration</p>

**Table 2.4 — Button Functions**

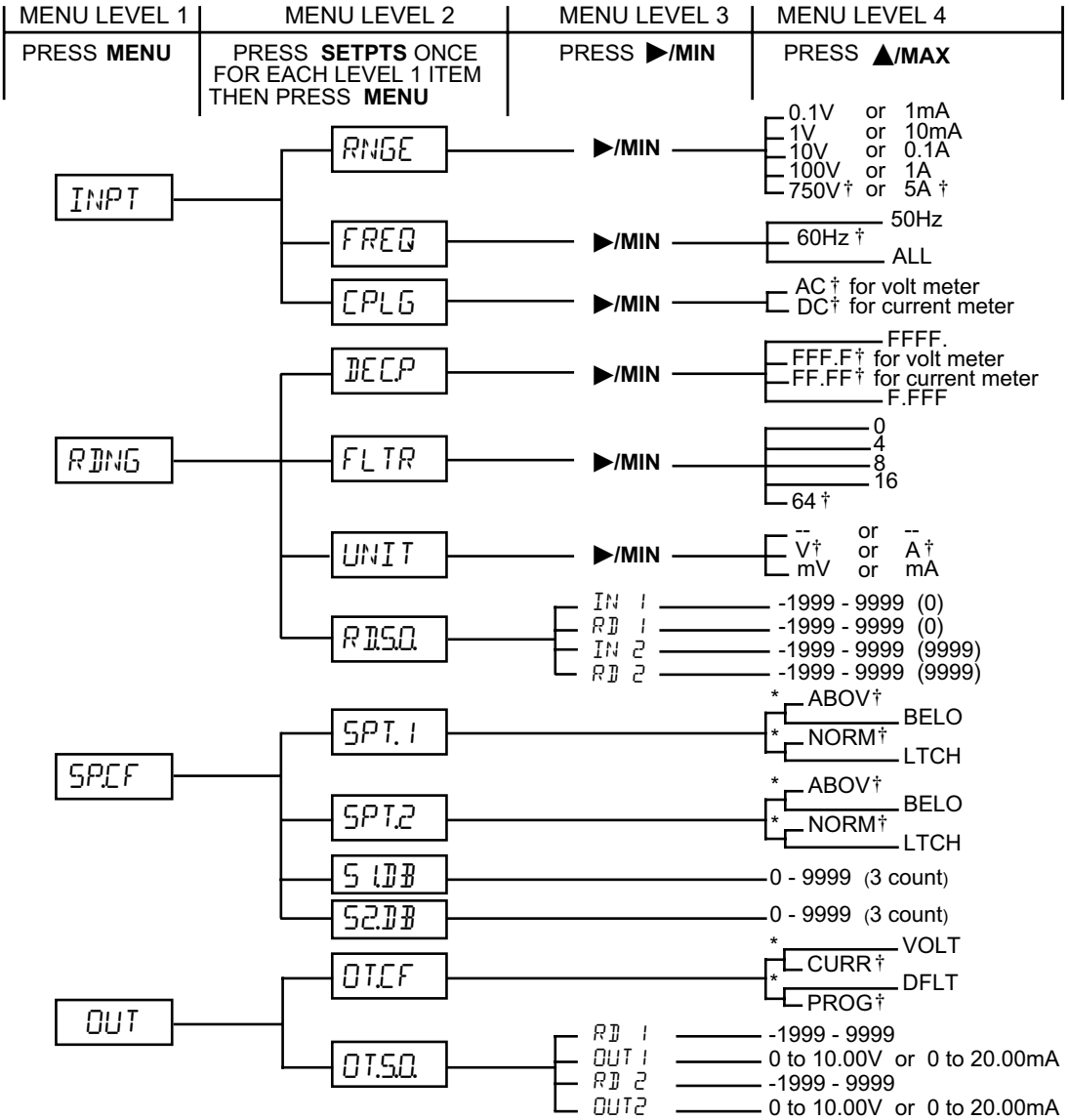
## 2.5 Flow Charts

### 2.5.1 Setpoints and Menu Configuration Flow Charts

The following flow charts list all of the menus, submenus, and their respective ranges. The first flow chart demonstrates how to adjust setpoints while in Run Mode. The second and third charts contains all of the menus available while in Configuration Mode. (The third chart is only for those meters that have a communication board installed.)

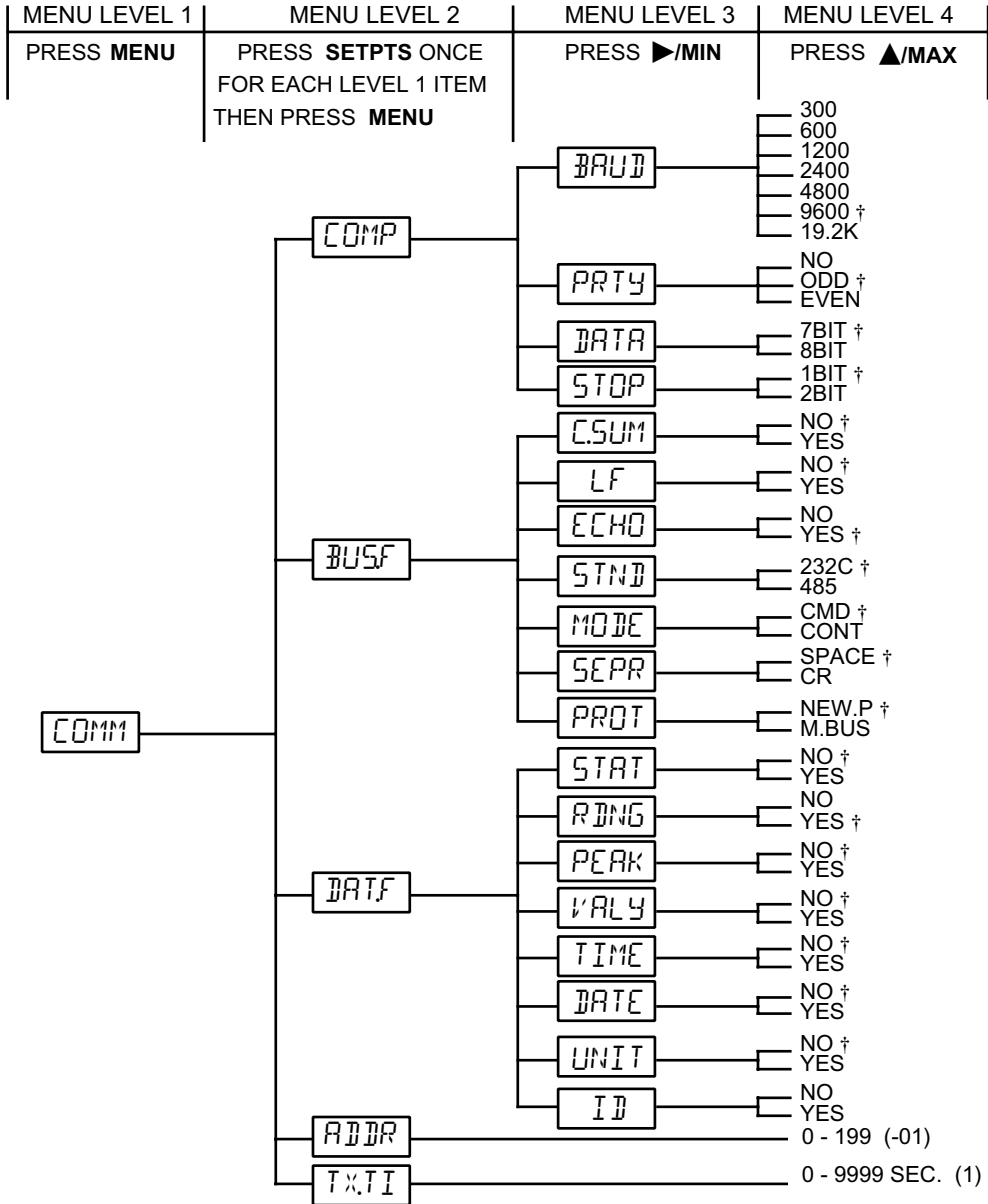


**Figure 2.3 — Flow Chart for Setpoint Configuration (Run Mode)**



\* TO SWITCH BETWEEN FIELDS PRESS ►/MIN  
 ITEMS MARKED WITH "†" OR APPEARING IN PARENTHESIS ARE DEFAULT VALUES

**Figure 2.4 — Flow Chart for Configuration Mode, Part 1**



ITEMS MARKED WITH "†" OR APPEARING IN PARENTHESIS ARE DEFAULT VALUES

**Figure 2.5 — Flow Chart for Configuration Mode, Part 2**

## 2.6 Menu Configurations

Both meters have at least two main menus — **Input** and **Reading**. If your meter includes the Dual Relay capability, then it will have a **Setpoint Configuration** menu. If your meter includes the Analog Output capability, then it will have an **Output** menu. If your meter has the optional communications board installed, then it will have a **Communication Configuration** menu. Each of these main menus has submenus.

Menu Name	Description
<i>INPT</i>	From the <b>Input</b> menu and its submenus you may choose the range, frequency, and input coupling.
<i>RDNQ</i>	From the <b>Reading</b> menu and its submenus you may select decimal point position, filter time constant, display the unit of measure, and adjust the reading scale and offset.
<i>SPCF</i>	From the <b>Setpoint Configuration</b> menu and its submenus you may specify the active above/below or normal/latch for the alarms and their corresponding dead band.
<i>OUT</i>	From the <b>Output</b> menu and its submenus you may choose analog out for current mode or voltage mode and you may adjust the output levels appropriate to your application.
<i>COMM</i>	From the <b>Communication Configuration</b> menu and its submenus you may set the communications parameters for digital output.

**Table 2.5 — Menu Descriptions**

The following pages will show, step by step, how to configure all of the menus for your particular application. You may wish to refer to the flow charts on the previous two pages while configuring the menus.

### 2.6.1.0 INPUT MENU



From this menu you may choose the electrical range, frequency, and input coupling. Follow these steps:

1. Press **MENU** until the meter displays:

INPT

2. Press **SETPTS**, followed by **MENU** until the meter displays:

RNGE

#### 2.6.1.1 Input Menu: Electrical Range



Before selecting a range other than the default range of 750V (5A), refer to the Tables in Section 2.2. to set the SW1 DIP switches. To select an input range, follow these steps.

3. Press **▶/MIN**. The meter flashes the input range. Press **▲/MAX** to scroll through these choices until you find the range that suits your application: **Note that there are default decimal point positions and units of measure associated with each selected range.** If you change the input range, those two items will be updated automatically according to Section 4.7.15, in Table 4.19. **Note that at any time you can change the decimal point position and or the unit of measure to any position or value you want.**

<i>volt meter</i>	<i>current meter</i>
0- IV	1 mA
IV	10mA
10V	0.1 A
100V	1 A
750V	5 A

4. Press **MENU** to select the input range shown. After storing this setting, the meter displays:

FREQ

### 2.6.1.2 Input Menu: Electrical Frequency

INPT  
FREQ

To select an electrical frequency, follow these steps. The factory default for electrical frequency is 60Hz if the meter is powered from a 100V power source and 50Hz if the meter is powered from a 220V power source.

- Press **▶/MIN**. The meter flashes the current frequency selection. Press **▲/MAX** to scroll through these choices:

60HZ	110V Power
50HZ	220V Power
ALL	select if the signal frequency is not the same as the power frequency

- Press **MENU** to select the frequency shown. After storing this setting, the meter displays:

CPLG

### 2.6.1.3 Input Menu: Coupling

INPT  
CPLG

To select AC or DC Coupling, follow these steps. The factory default is AC. Note that volt meters have two different inputs for AC and DC coupling. Current meters have only DC coupling. To AC couple the current meter, SW1-5 DIP should be open. (See Table 2.2)

- Press **▶/MIN**. The meter flashes the existing coupling selection. Press **▲/MAX** to toggle between these choices:

AC	measures only AC component of the input signal
DC	measures AC and DC component of the input signal.

- Press **MENU** to select the coupling shown. After storing this setting, the meter displays:

RING

### 2.6.2.0 Reading Menu

From this menu you may choose the decimal point position, filter time constant, display unit of measure, and adjust reading scale and offset.

1. Press SETPTS, followed by MENU until the meter displays:

DECP

#### 2.6.2.1 Reading Menu: Decimal Point Position

To select the decimal point location, follow these steps. FFF.F is the factory default.

2. Press ►/MIN. The meter flashes the current decimal point position. Press ▲/MAX to scroll through these choices:

FFFF FFFF FFFF FFFF.

3. Press MENU to select the decimal point location shown. After storing this setting, the meter displays:

FLTR

#### 2.6.2.2 Reading Menu: Filter Value

To select a filter value, follow these steps. The factory default is 64.

4. Press ►/MIN. The meter flashes the filter value. Press ▲/MAX to scroll through these choices:

0 4 8 16 64

5. Press MENU to select the filter value location shown. After storing this setting, the meter displays:

UNIT



### 2.6.2.3 Reading Menu: Unit Value



To select a unit value, follow these steps. The factory default is V for volt meters and A for current meters.

- Press **▶/MIN**. The meter flashes the unit value. Press **▲/MAX** to scroll through these choices:  
*volt meter current meter*

—	—	(blank)
V	A	
mV	mA	

- Press **MENU** to select the unit value location shown. After storing this setting, the meter displays:

R150.

### 2.6.2.4 Reading Menu: Reading Scale and Offset

**Note**

This step is generally not required since the meters are precalibrated for all ranges. Rescale only if the desired display is different than the actual voltage or current being measured. Typically, this step would apply only to the 5A or 100mV range.

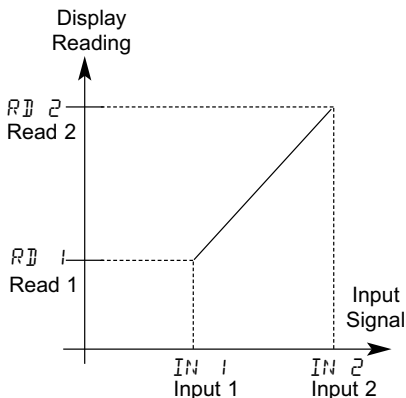
To scale the meter to show readings in engineering units follow these steps. There are two different methods. One method is **on-line scaling**. The other method is **manual scaling**. On-line scaling will be described first.

**ON-LINE SCALING** — This is the most common method since the meter will display actual input from which you may determine the value to be displayed.



- Set the SW1 DIP Switch Positions if necessary.  
**Before you begin this procedure, you must set the SW1 DIP switches to the correct positions. Failure to do so may result in an incorrect reading.** The SW1 DIP switches are located at the back of the meter. For voltage and current input SW1 switch positions, refer to the appropriate Table in Section 2.2. For best resolution, find the maximum signal that will be applied to the meter.

Display Reading versus Input Signal

**Note**

When rescaling the meter either with or without known loads, if a high degree of accuracy is required, do not apply 0 volts or use 0 as a reference point.

For any rescaling, the minimum signal should always be 3 to 5% of the full scale of the signal range. The same is true for scaling the analog output option. Do not use a value of 0 on the display if a high degree of accuracy is required, but instead use a value slightly higher than 0 counts on the display.

- Set decimal point position if necessary. The decimal point is configurable under the first submenu of the Reading menu.
- Press the **MENU** button, if necessary, until the meter shows:

RD 1.50

- Press the **▶/MIN** button. The meter shows:
- IN 1
- Press the **▶/MIN** button to show the existing value at Input 1, with the fourth digit flashing.
  - Apply the low value at the input and press the **▶/MIN** button again to show the actual value at the input without a flashing digit. *Wait until the value has settled. Do not apply zero.*

- Press the **MENU** button. The meter shows:

RD 1

- Press the **▶/MIN** button to show the existing value of Display Reading for Input 1, with the fourth digit flashing.
- Press the **▶/MIN** and **▲/MAX** buttons to enter the desired Display Reading for Input 1.
- Press the **MENU** button. The meter shows:

IN 2

- Press the **▶/MIN** button to show the existing value at Input 2, with the fourth digit flashing.
- Apply the second value at the input and press the **▶/MIN** button again to show the actual value at the input without a flashing digit. *Wait until the value has settled.*

- Press the **MENU** button. The meter shows:

RD 2

- Press the **▶/MIN** button to show the existing value of Display Reading for Input 2, with the fourth digit flashing.
- Press the **▶/MIN** and **▲/MAX** buttons to enter the desired Display Reading for Input 2

16. Press **MENU** to store the values. After storing these settings, the meter will display one of four items.

*If your meter is equipped with a Dual Relay capabilities, then your meter will now display:*

*SPCF      GO TO 2.6.3.0 SETPOINT MENU*

*If your meter does not support Dual Relay capabilities, but has Analog Output capabilities, then you are may skip the next section concerning Dual Relay Output and proceed to the section concerning the Analog Output Menu. Your meter will now display:*

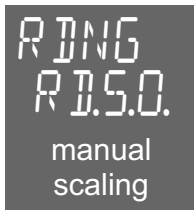
*OUT      SKIP NEXT MENU ITEM AND GO TO  
2.6.4.0 OUTPUT MENU*

*If your meter does not support Dual Relay capabilities or Analog Output capabilities, but has the communications board option installed, then you are may skip the next two sections concerning Dual Relay Output and Analog Output. Proceed to the section concerning the Communications Menu. Your meter will now display:*

*COMM      SKIP NEXT TWO MENU ITEMS AND GO  
TO 2.6.5.0 COMMUNICATIONS MENU*

*If your meter is not equipped with Dual Relay or Analog Output capabilities and does not have a communications board option installed, then you are finished configuring your meter. It will now display:*

*RUN      if no values were changed  
RST      if values were changed  
METER CONFIGURATION IS COMPLETE*



**MANUAL SCALING** — This is used when you want to enter the values for Input 1 (IN1) and Input 2 (IN2) as well as the Display Readings for Input 1 (RD1) and Input 2 (RD2) manually.

1. Press the **▶/MIN** button. The meter shows:  
                   IN 1
2. Press the **▶/MIN** button to show the existing value at Input 1, with the fourth digit flashing.
3. Press the **▲/MAX** button.
4. Press the **▶/MIN** and **▲/MAX** buttons to enter the desired value for Input 1.
5. Press the **MENU** button. The meter shows:  
                   RD 1
6. Press the **▶/MIN** button to show the existing value of Display Reading for Input 1, with the fourth digit flashing.
7. Press the **▶/MIN** and **▲/MAX** buttons to enter the desired Display Reading for Input 1.
8. Press the **MENU** button. The meter shows:  
                   IN 2
9. Press the **▶/MIN** button to show the existing value at Input 2, with the fourth digit flashing.
10. Press the **▲/MAX** button.
11. Press the **▶/MIN** and **▲/MAX** buttons to enter the desired value for Input 2.
12. Press the **MENU** button. The meter shows:  
                   RD 2
13. Press the **▶/MIN** button to show the existing value of Display Reading for Input 2, with the fourth digit flashing.
14. Press the **▶/MIN** and **▲/MAX** buttons to enter the desired Display Reading for Input 2.
15. Press **MENU** to store the values. After storing these settings, the meter will display one of four items.

*If your meter is equipped with a Dual Relay capabilities, then your meter will now display:*

SPCF      go to **2.6.3.0 SETPOINT menu**

If your meter does not support Dual Relay capabilities, but has Analog Output capabilities, then you may skip the next section concerning Dual Relay Output and proceed to the section concerning the Analog Output Menu. Your meter will now display:

**OUT** skip next menu item and go to  
**2.6.4.0 Output menu**

If your meter does not support Dual Relay capabilities or Analog Output capabilities, but has the communications board option installed, then you may skip the next two sections concerning Dual Relay Output and Analog Output. Proceed to the section concerning the Communications Menu. Your meter will now display:

**COMM** GO TO **2.6.5.0**  
**COMMUNICATIONS MENU**

If your meter is not equipped with Dual Relay or Analog Output capabilities and does not have a communications board option installed, then you are finished configuring your meter. It will now display:

**RUN** if no values were changed  
**RST** if values were changed  
**meter configuration is complete**

GAIN MULTIPLIER TABLE

CURRENT MODEL			VOLTAGE MODEL		
RANGE	MULTIPLIER	TOTAL COUNTS	RANGE	MULTIPLIER	TOTAL COUNTS
5 A (10 A f.s.)	1,000 cts/A	10,000 or 9999	750 V (1,000 V f.s.)	10 cts/V	10,000 or 9999
1 A	10,000 cts/A		100 V	100 cts/V	
100 mA	100 cts/mA		10 V	1,000 cts/V	
10 mA	1,000 cts/mA		1 V	10,000 cts/V	
1 mA	10,000 cts/mA		0.1 V	100 cts/mV	

### 2.6.3.0 Setpoint Menu:



This menu is only available for meters equipped with the Dual Relay Output option. From this menu you may set the active band, alarm zones, and deadband values for both setpoints.

1. Press **SETPTS**, followed by **MENU** until the meter displays:  
**SPT. 1**

### 2.6.3.1 Setpoint Menu: Setpoint 1 — Band & Alarm



SP.CF  
SPT.1

To set the active band and alarm zone for setpoint 1, follow these steps. The ABOV active band position sets the band above the setpoint and BELO sets it below the setpoint. The NORM alarm position indicates the alarm is unlatched. The LTCH alarm position indicates the alarm has to be reset if it is energized.

2. Press **▶/MIN**. The meter flashes the last saved active band position. Press **▲/MAX** to toggle between these choices:

ABOV BELO

3. Press **▶/MIN**. The meter flashes the last saved alarm position. Press **▲/MAX** to toggle between these choices:

NORM LTCH

4. Press **MENU** to save the active band and alarm position. After storing these settings, the meter displays:

SPT.2

### 2.6.3.2 Setpoint Menu: Setpoint 2 — Band & Alarm



SP.CF  
SPT.2

To set the active band and alarm zone for setpoint 2, follow these steps.

5. Press **▶/MIN**. The meter flashes the last saved active band position. Press **▲/MAX** to toggle between these choices:

ABOV BELO

6. Press **▶/MIN**. The meter flashes the last saved alarm position. Press **▲/MAX** to toggle between these choices:

NORM LTCH

7. Press **MENU** to save the active band and alarm positions for setpoint 2. After storing these settings, the meter displays:

S LBB

### 2.6.3.3 Setpoint Menu: Setpoint 1 — Deadband

A digital meter display showing 'SP.CF' on the top line and '51.DB' on the bottom line.

To set the deadband value for setpoint 1, follow these steps:

8. Press **▶/MIN**. The meter shows the last saved deadband value, with the left-most digit flashing. Press **▶/MIN** and **▲/MAX** to program a deadband value.
9. Press **MENU** to save the deadband value for setpoint 1. After storing this setting, the meter displays:

52.DB

### 2.6.3.4 Setpoint Menu: Setpoint 2 — Deadband

A digital meter display showing 'SP.CF' on the top line and '52.DB' on the bottom line.

To set the deadband value for setpoint 2, follow these steps:

10. Press **▶/MIN**. The meter shows the last saved deadband value, with the left-most digit flashing. Press **▶/MIN** and **▲/MAX** to program a deadband value.
11. Press **MENU** to save the deadband value for setpoint 2. After storing this settings, the meter will display one of three items.

*If your meter is equipped with the Analog Output option, then your meter will now display:*

OUT      *go to next menu item*

#### 2.6.4.0 Output Menu

*If your meter is not equipped with the Analog Output option, but your meter is equipped with a communications board, then your meter will now display:*

COMM      *SKIP THE NEXT MENU ITEM*

#### GO TO 2.6.5.0 COMMUNICATIONS MENU

*if your meter is not equipped with the Analog Output option, and your meter is not equipped with a communications board, then you are finished configuring your meter. It will now display:*

RUN      *if no values were changed*

RST      *if values were changed*

*METER CONFIGURATION IS COMPLETE*

### 2.6.4.0 OUTPUT MENU

This menu is only available for meters equipped with the Analog Output option. From this menu you may select current or voltage analog output, select regular or programmable analog output. *Note that regular output uses the default ranges for Output Scale and Offset. Programmable output allows you to set up different ranges. If you select programmable output, the OT.S.O. submenu displays, allowing you to enter values manually.*

1. Press **SETPTS**, followed by **MENU** until the meter displays:

OT.CF

#### 2.6.4.1 Output Menu: Analog Power Output Options

To set the power output option to either current or voltage, follow these steps.

2. Press **►/MIN**. The meter shows the last saved power output option. Press **▲/MAX** to toggle between these choices:

VOLT CURR

3. Once the correct power output option is shown, press **►/MIN**. The meter shows the last saved programming option. Press **▲/MAX** to toggle between these choices:

DFLT PROG

4. Press **MENU** to save the Analog Power Output Options. After storing these settings, the meter will display one of three items.

*If you selected the programmable option in step 3, your meter will display:*

OT.50

**GO TO 2.6.5.0  
COMMUNICATIONS MENU**

*If you did not select the programmable option in the previous step, and your meter is equipped with a communications board, then you may skip the next section concerning Output Scale and Offset and proceed to the **Communications section***

**2.6.5.0.** Your meter will now display:

COMM

**GO TO 2.6.5.0  
COMMUNICATIONS MENU**

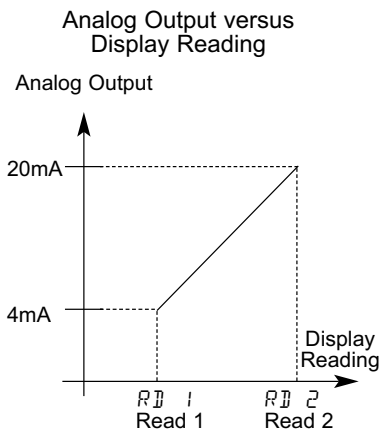
*If you did not select the programmable option in the previous step, and your meter is not equipped with a communications board, then you are finished configuring your meter. It will now display:*

RST

**METER CONFIGURATION IS COMPLETE**



### 2.6.4.2 Output Menu:



### Reading Scale & Offset

Follow these steps to program the Output Reading Scale and Offset.

1. Press **▶/MIN**. The meter shows:

RD 1 (THIS IS YOUR FIRST POINT OF DISPLAY READING.)

2. Press **▶/MIN** again to show the last Read 1 value, with the left-most digit flashing. Press **▶/MIN** and **▲/MAX** to enter the desired value.

3. Press **▶/MIN**. The meter shows:

OUT 1 (THIS STARTING ANALOG SIGNAL CORRESPONDS TO YOUR READ 1 DISPLAY.)

4. Press **▶/MIN** again to show the last Out 1 value, with the left-most digit flashing. Press **▶/MIN** and **▲/MAX** to enter the desired value.

5. Press **▶/MIN**. The meter shows:

RD 2 (THIS IS YOUR SECOND POINT OF DISPLAY READING.)

6. Press **▶/MIN** again to show the last Read 2 value, with the left-most digit flashing. Press **▶/MIN** and **▲/MAX** to enter the desired value.

7. Press **▶/MIN**. The meter shows:

OUT 2 (THIS ANALOG SIGNAL CORRESPONDS TO YOUR READ 2 DISPLAY.)

8. Press **▶/MIN** again to show the last Out 2 value, with the left-most digit flashing. Press **▶/MIN** and **▲/MAX** to enter the desired value.

9. Press **MENU** to save the Reading Scale and Offset Values. After storing these values, the meter will display one of two items.

*If your meter is not equipped with a communications board, then your meter will now display:*

*RST      METER CONFIGURATION IS COMPLETE*

*If your meter is equipped with a communications board, then your meter will now display:*

*COMM      CONTINUE*

#### 2.6.5.0 Communications Menu



The Communications menu is only available if your meter has a communication board installed. There two types of communication items: 1) Items you can access through the front panel or through serial communications; and 2) Items you can access only through serial communications. With the communication board installed, all menu items configurable through the front panel push buttons are configurable through serial communication as well.

---

From this menu you may configure the communications protocol, bus format, data format, address, and transmission time interval.

---

To configure the communications protocol, follow these steps.

---

1. Press **MENU** until the meter displays:

*COMM*

2. Press **SETPTS**, followed by **MENU** until the meter displays:

*COMP*

### 2.6.5.1 Comm Menu: Computer Interface



COMM  
COMP  
BAUD

3. The first submenu item controls the baud rate. Press ►/MIN. The meter will display:

BAUD

Press ▲/MAX to scroll through these choices:

300 600 1200 2400 4800  
9600 192K

Once you have selected the appropriate baud rate, you may choose to store the value and move on to BUS.F, or continue setting the other three submenus for the COM.P menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store the baud rate.



COMM  
COMP  
PTY

4. To adjust parity, press ►/MIN again. The meter will display:

PTY

Press ▲/MAX to scroll through these choices:

NO ODD EVEN

Once you have selected the appropriate parity setting, you may store the value and move on to BUS.F, or continue setting the other two submenus for the COM.P menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store the parity setting.



COMM  
COMP  
DATA

5. To adjust data bits, press ►/MIN again. Meter will display:

DATA

Press ▲/MAX to scroll through these choices:

7BIT 8BIT

**When you 8 bit is selected, you must choose no parity.** Once you have selected one or the other, you may store the value and move on to BUS.F, or set the last submenu for the COM.P menu item. Unless you have chosen 7 data bits and no parity, the number of stop bits should always be 1. The meter will set the appropriate number of stop bits.

COMM  
COMP  
STOP

6. Press **MENU** to store the data bits setting. Press **▶/MIN** again. The meter will display:

STOP

Press **▲/MAX** The meter will automatically select the appropriate number of stop bits based on the parity and data settings you have chosen. *You can not manually change this item.*

Once you have selected one or the other, store the current settings and move on to BUS.F by pressing MENU.

### 2.6.5.2 Comm Menu: Bus Settings

To configure the bus format, follow these steps.

COMM  
BUSF  
C.SUM

7. The first submenu item, checksum, is an error detection scheme that you choose to activate or disable. Press **▶/MIN**. The meter displays:

C.SUM

Press **▲/MAX** to toggle between these two choices:

YES

NO

Once you have activated or disabled error detection, you may choose to store the setting and move on to DAT.F, or continue setting the other six submenus for the BUS.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your checksum selection.

COMM  
BUSF  
LF

8. The second submenu item, linefeed, determines whether the meter will print on every line or on every other line. Choosing yes will cause data to be printed on every other line. Press **▶/MIN**. The meter displays:

LF

Press **▲/MAX** to toggle between these two choices:

YES

NO

Once you have activated or disabled echo, you may choose to store the current settings and move on to DAT.F, or continue setting the other four submenus for the BUS.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

```

COMM
BUS.F
ECHO

```

9. The third submenu item, echo, determines whether the meter will echo the command parameter along with the response. Choosing yes will activate this feature. Press **▶/MIN**. The meter displays:

```
ECHO
```

Press **▲/MAX** to toggle between the two choices:

```
YES NO
```

Once you have activated or disabled echo, you may choose to store the current settings and move on to DAT.F, or continue setting the other four submenus for the BUS.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

```

COMM
BUS.F
STND

```

10. The fourth submenu item, cabling standard, allows you to select the type of communications standard to be used, either RS232C or RS485. Press **▶/MIN**. The meter displays:

```
STND
```

Press **▲/MAX** to toggle between the two choices:

```
232C 485
```

Once you have selected a cabling standard, you may choose to store the current settings and move on to DAT.F, or continue setting the other three submenus for the BUS.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

```

COMM
BUS.F
MODE

```

11. The fifth submenu item, mode, determines whether the meter will operate in command mode (CMD) or continuous data mode (CONT). Note that while in command mode, the meter will only respond to valid commands that are transmitted to it. While in continuous mode, the meter will transmit data for a period of time specified in the last submenu, transmission interval time (TX.TI), of this main menu item (COMM).

*There is no continuous mode for the RS485 standard. This prevents collisions on the bus line if there is more than one meter installed on the bus line. If you want to use the long capability of the RS485 board and you only have one meter on the bus, then set the meter for the RS232 standard and choose continuous mode. Press **▶/MIN**. The meter displays:*

```
MODE
```

continued on next page

Press **▲/MAX** to toggle between the two choices:

CMD CONT

Once you have selected a mode, you may choose to store the current settings and move on to DAT.F, or continue setting the other two submenus for the BUS.F menu item. If you do not want to change the last two submenus under this menu, then press **MENU** to store your selections.



```

COMM
BUS.F
SEPR
  
```

12. The sixth submenu item, separator, determines what character will follow each piece of data when the meter is in continuous mode. Choosing CR will cause a carriage return to be inserted after each piece of data. Choosing SPCE will cause a space to be inserted after each piece of data. See Section 2.6.5.3 for examples of transmitted data. Press **►/MIN**. The meter displays:

SEPR

Press **▲/MAX** to toggle between these two choices:

CR SPCE

Once you have chosen a separator, you may choose to store the current settings and move on to DAT.F, or set the last submenu for the BUS.F menu item. If you do not want to change the last submenu, then press the **MENU** button to store your selections.



```

COMM
BUS.F
PROT
  
```

13. The last submenu item under the BUS.F menu, protocol, allows you to select the type of communications protocol to be used, either Default Protocol or ModBus Protocol to be developed in the future. Press **►/MIN**. The meter displays:

PROT

Press **▲/MAX** to toggle between the two choices:

NEW MBUS

Once you have selected a protocol, store the current settings and move on to DAT.F by pressing **MENU**.

### 2.6.5.3 Comm Menu: Data Format

The third submenu item under the COMM main menu is data format. This item controls which data is to be printed and how when using RS232 continuous mode or when using external print in command mode. (See the explanation of the BUS.F submenus, above, for details.) All items of this submenu have two possible settings — YES to enable or transmit or NO to disable or not transmit. Follow these steps to configure the data format.



```

COMM
DAT.F
STAT
  
```

14. Activating the first submenu item, status, enables the transmission of alarms and peak/valley status characters. Press **▶/MIN**. The meter displays:

STAT (refer to the example at end of Section  
2.6.5.3 for detailed information)

Press **▲/MAX** to toggle between the two choices:

YES NO

Once you have selected *yes* or *no*, you may choose to store the current setting and move on to ADDR, or continue setting the other seven submenus for the DAT.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selection.



```

COMM
DAT.F
RING
  
```

15. Activating the second submenu item, reading, enables the transmission of the reading value. Press **▶/MIN**. The meter displays:

RING

Press **▲/MAX** to toggle between the two choices:

YES NO

Once you have selected *yes* or *no*, you may choose to store the current settings and move on to ADDR, or continue setting the other six submenus for the DAT.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

```

COMM
DAT.F
PEAK

```

16. Activating the third submenu item, peak, enables the transmission of the peak value. Press ►/MIN. The meter displays:

```

PEAK

```

Press ▲/MAX to toggle between the two choices:

```

YES  NO

```

Once you have selected *yes* or *no*, you may choose to store the current settings and move on to ADDR, or continue setting the other five submenus for the DAT.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

---

```

COMM
DAT.F
VALY

```

17. Activating the fourth submenu item, valley, enables the transmission of the valley value. Press ►/MIN. The meter displays:

```

VALY

```

Press ▲/MAX to toggle between the two choices:

```

YES  NO

```

Once you have selected *yes* or *no*, you may choose to store the current settings and move on to ADDR, or continue setting the other four submenus for the DAT.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

---

```

COMM
DAT.F
TIME

```

18. Activating the fifth submenu item, time, enables the transmission of the time of day. Press ►/MIN. The meter displays:

```

TIME

```

Press ▲/MAX to toggle between the two choices:

```

YES  NO

```

Once you have selected *yes* or *no*, you may choose to store the current settings and move on to ADDR, or continue setting the other three submenus for the DAT.F menu item. If you do not want to change any of the other submenus under this menu, then press **MENU** to store your selections.

---





COMM  
DAT.F  
DATE

19. Activating the sixth submenu item, date, enables the transmission of the date. Press ►/MIN. The meter displays:

DATE

Press ▲/MAX to toggle between the two choices:

YES NO

Once you have selected *yes* or *no*, you may choose to store the current settings and move on to ADDR, or continue setting the last two submenus for the DAT.F menu item. If you do not want to change the last two submenus under this menu, then press **MENU** to store your selections.

---

#### Date and Time Formats

*Transmitting both the date and time provides full logging capability. The date will be transmitted in one of the following formats:*

- *month/day/year*
- *day/month/year*

---

Refer to the book *Serial Communication* for further instructions.



COMM  
DAT.F  
UNIT

20. Activating the seventh submenu item, unit, enables the transmission of the unit of measurement. Press ►/MIN. The meter displays:

UNIT

Press ▲/MAX to toggle between the two choices:

YES NO

Once you have selected *yes* or *no*, you may choose to store the current settings and move on to ADDR, or set the last submenu for the DAT.F menu item. If you do not want to change the last submenu under this menu, then press **MENU** to store your selections.

---



21. Activating the last submenu item, ID, enables the transmission of a character representing which value is being sent. Press **►/MIN**. The meter displays:

ID

Press **▲/MAX** to toggle between the two choices:

YES NO

---

Examples of Transmitted Data

- A. *Note that if activated, the following IDs will be sent:*

R: Reading values

P: Peak values

V: Valley values

- B. *Suppose you have the following data:*

Reading Value: 125.4V

Peak Value: 130.8V

Valley Value: 121.2V

Time: 9:32:15 AM

Date: 12/20/94

- C. *Now suppose that you have selected continuous mode (MODE), RS232 cabling (STND), no error detection (C.SUM), and no linefeed (LF) in the bus format (BUS.F) submenus. Suppose you are including the reading, peak, valley, time, and date values.*

- D. *if space is the selected separator (SEPR), and ID (ID) is not enabled, and echo (ECHO) is not enabled, and unit of measure (UNIT) is enabled, then meter will transmit:*

09:32:15 12/20/94 125.4 130.8 121.2 V <CR>

- E. *if carriage return (CR) is enabled then meter will transmit:*

09:32:15

12/20/94

125.4

130.8

121.2 V

F. *if ID (ID) and carriage return (CR) are enabled  
then meter will transmit:*

09:32:15  
12/3/94  
R: 125.4  
P: 130.8  
V: 121.2 V

---

Once you have selected YES or NO, store the current settings and move on to ADDR by pressing **MENU**.

---

#### 2.6.5.4 Comm Menu: Multipoint Address

The fourth submenu item under the COMM main menu is the multipoint address. This item has no submenus. Follow these steps to configure the multipoint address.



22. When choosing RS485 (485) in the Standard (STND) submenu of the Bus Format (BUS.F) menu item, an address will be included in the transmitted data. Any command transmitted by DTE should include the address to ensure a proper response from the addressed meter.

Press **▶/MIN** and the meter shows a value from 001 to 199 with the third digit flashing. You may choose any address from 001 to 199 for the meter. Use **▲/MAX** to change the value of the flashing digit and **▶/MIN** to change which digit flashes.

---

*The 00 address is reserved by the host for broadcasting. Any command from the DTE with an address of 00 will be performed without a response by all the meters on that bus.*

---

Once you have selected an address, store the address and move on to TX.TI by pressing **MENU** to store the address.

### 2.6.5.6 Comm Menu: Transmission Time Interval

The last submenu item under the COMM main menu is the transmission time interval. This item has no submenus. Follow these steps to configure the transmission time interval.



23. When choosing continuous mode (CONT) in the mode (MODE) submenu of the Bus Format (BUS.F) menu item, **and** RS232 (232C) in the Cabling Standard (STND) submenu of the Bus Format (BUS.F) menu item, you may specify the period of transmission in seconds.

Press **▶/MIN** and the meter will show a value from 0000 to 5999 with the fourth digit flashing. You may choose any number from 0000 to 5999 for a transmission time. Use **▲/MAX** to change the value of the flashing digit and **▶/MIN** to change which digit flashes.

*Setting the time to 0000 (zero) seconds will cause data to be transmitted after each reading.*

Once you have selected a transmission time, store all values by pressing MENU. After storing your settings, the meter displays RST indicating that the meter is initializing itself with the new values. It will now enter run mode.

### 2.6.5.7 Comm Menu: Items not displayed by the meter

**Communications Items Not Displayed by the Meter.** For complete information on communication items not displayed by the meter, refer to Serial Communications, the book that came with your communication board. These items are not accessible through the meter display, but are accessible through serial communications:

1. Recognition character:  
Any command issued by the computer should be preceded by the recognition character otherwise the meter ignores the command and chooses any character in the ASCII table except "A, A, E".
2. Time and date:  
These should be set or initialized through serial communication.
3. External Print:  
The P10 connector at the rear of the meter is for sending print commands from the meter. Whenever Pin 1 to Pin 2 of P10 are connected, a string of data is transmitted according to how the DAT.F submenu of the communication menu is programmed.

### **2.6.5.8 Accessing the Communication Board From Your Computer**

To access any menu item via the communication board, you must establish serial communication between the meter and your computer. To do this, plug in either a RS232 or RS485 board into the meter and connect the board to the communication port on your computer. If you have a RS232 connection, then either serial port 1 or 2 will work. If you have a RS485 connection, then either you have to install a RS485 card inside your computer, or use a stand alone box which converts RS232 to RS485. Call our Sales Department for a high quality converter box for this purpose.

After configuring the communication menus (as described in the previous section) and connecting the cables, either, 1) use a communication software package (terminal emulator) like PROCOM and set the same parameters on your computer as your meter; or, 2) write your own software that satisfies your application needs. The following is an example of a QuickBasic program for communicating with the meter.

### 2.6.5.9 QuickBasic Program for Communicating with the Meter

Items in the brackets are comments only.

```
1000 CLS [Clear screen command]
1010 COMM$ = "COM1:" [Label for communications port
COM1]
1020 BAUD$ = "9600" [Label for choice of 9600 baud]
1030 PARITY$ = "O" [Label for odd parity]
1040 STOPBT$ = "1" [Label for one stop bit]
1050 CLOSE#1 [Get ready to reopen number 1]
1060 OPEN COMM$ + BAUD$ + "," + PARITY$ + ",7," +
STOPBT$ + "," + "CS,DS,RS" FOR RANDOM 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 N = 0 [Initialize watchdog]
1120 SOUND 32767,27:SOUND 32767,1:
SOUND 32767,1 [Delay 0.5 seconds]
1130 N = N + 1 [Increment watchdog]
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
```

---

# Section 3: About True RMS Measurement



## Introduction

True RMS versus  
Rectified-average Readings

Voltage-Divider Action of Leads  
and Meter Input Impedance

Input Current Effects

Overvoltage Heating

Guarding Against AC Pickup

Common-Mode Voltage Effects

### 3.1 Introduction

When voltage is applied across a resistor, the power supplied is:

$$P = \frac{I^2}{R}$$

Similarly, if a resistor is fed a current, the power supplied is:

$$P = \frac{V^2}{R}$$

For a voltage or current that has AC components, the true average power supplied is according to the formulas above, integrated and averaged over a time interval considerably longer than the period of the lowest AC component. This power, then, is proportional to the Mean Square of the voltage or current waveform.

This true power is always equal to, or greater than, that power computed from the average of the rectified voltage or current. Any AC voltage or current components when squared do not average to zero but add to the DC component squared. Correspondingly, the most useful value for a voltage or current is its Root Mean Square. RMS is the “heating” capability of the waveform.

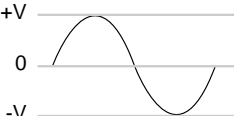
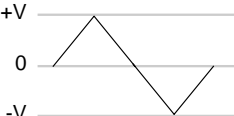
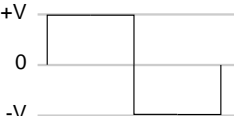


## ABOUT TRUE RMS MEASUREMENT

### 3.2 True RMS versus Rectified-average Readings

Rectify-and-average meters are less complex to build than true RMS meters. A meter with a waveform of only a single frequency (pure sine wave without DC) can be calibrated to read out the equivalent RMS value. A meter with waveforms of more than one frequency component, however, make significant errors and a true RMS meter is required for accuracy.

The figure below illustrates some examples of true RMS versus rectified-average readings for sample waveforms.

Waveform Pattern 1 Volt Peak	Crest Factor	RMS	Average Responding Error
	1.414	0.707	Calibrated for 0 error
	1.732	0.580	-3.9%
	1.000	1.000	-48% for C.F. = 4

**Figure 3.1 — True RMS versus Rectified-average Readings**

Our meter has a complete waveform input, AC plus DC, for total RMS measurements, and another input, AC-Coupled, for measurements if the DC component is to be ignored, as when measuring a DC power supply ripple.

### 3.3 Voltage-Divider Action of Leads and Meter Input Impedance

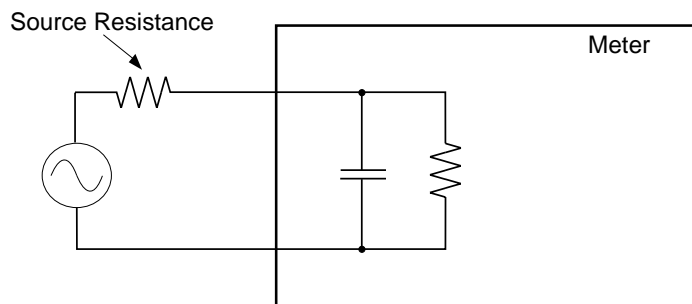
The meter's voltage input impedance is nearly one meg ohm in parallel with 10pF of capacitance, drawing negligible current from most voltage sources.

Significant impedance from high-frequency sources should be taken into account when the greatest possible accuracy is needed. Also, consider the capacity from lead to lead and leakage resistance, if significant.

Table 3.1 below gives the net loading impedance of the meter at different frequencies.

INPUT FREQUENCY	INPUT IMPEDANCE
100 Hz	1 M $\Omega$
1 kHz	940 k $\Omega$
10 kHz	614 k $\Omega$

**Table 3.1 — Meter Net Loading Impedance**



**Figure 3.2 — Approximate Input Resistance**

## 3.4 Input Current Effects

The meter's input amplifier has a DC bias current less than 350pA for an ambient temperature less than 30°C (86°F). This current doubles about every 8°C above this point. This small current can produce small DC offset voltages in the impedance of the source. These offsets are readily measured by the meter when the AC stimulus is removed or a dummy source impedance is connected across the input terminals. The resulting offsets can be added or subtracted from the DC source value to increase the data accuracy.

**Note** 

---

Any AC pickup voltages measured in the above condition must not be added or subtracted linearly from the AC source value. They must be RMS-combined.

---

## 3.5 Overvoltage Heating

If you apply more than the rated voltage on any range it will increase the heating in the meter's signal conditioner. The effects of momentary overvoltage will not add more than 0.02%. This overvoltage error will dissipate in a few minutes after removal of the overvoltage.

## 3.6 Guarding Against AC Pickup

The meter has a high input impedance to accurately measure sources which have high source impedance of up to 100kΩ. This means that the meter can respond to extraneous sources of AC voltage or current if they have significant capacitance or mutual inductance to the input leads.

For example, the space surrounding florescent lighting usually has a strong alternating electrostatic field (volts per meter). This field will push and/or pull charge in any nearby exposed conductor. Within its vicinity, use shielded cable for input leads to drain away any capacitive current to ground. (Tie the shield to the input RTN terminal.) This is particularly important when measuring small signals at line frequency. Be especially careful to shunt away any pickup currents.

If the signal leads must pass by equipment with large AC currents, use twisted-pair cable to minimize induced currents. You may also use magnetic shielding materials to reduce these effects, but the best solution is to reroute the signal wires away from such currents.

Ground-loop currents are another possible source of error. If the AC signal source has resistive or capacitive coupling to an AC power source, and that source is not supplying the meter, current can flow in the loop formed by the source, meter and power circuits, causing a reading error.

Whenever possible, drive the meter and the signal source from the same power outlet. When different outlets must be used, both should be from the same AC line-power phase. A convenient way to check for outlet voltage differences is with a hand-held multimeter.

### **3.7 Common-Mode Voltage Effects**

Although DC-isolated, the meter's RTN terminal has approximately 100pF of capacity to power-supply ground. If the signal source return has an AC voltage with respect to that ground, some current will flow in that lead, and possibly degrade the data. In this situation, reverse the connections of the source to the INPUT and RTN leads, then observe any differences in meter output. These differences in meter output may show which polarity offers superior performance.

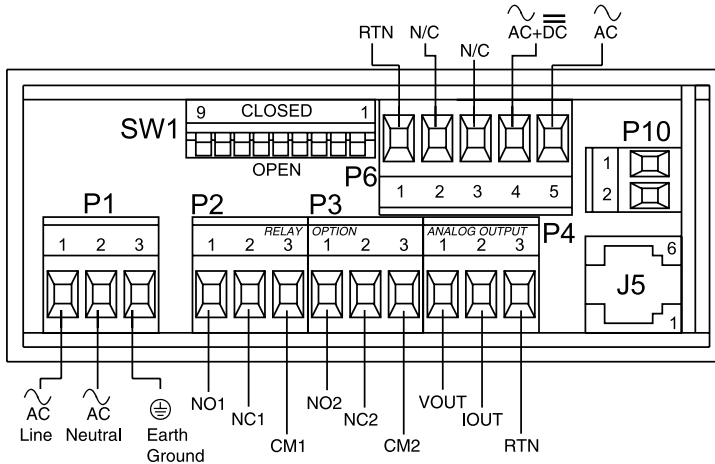
---

## Section 4: Defaults and Specifications

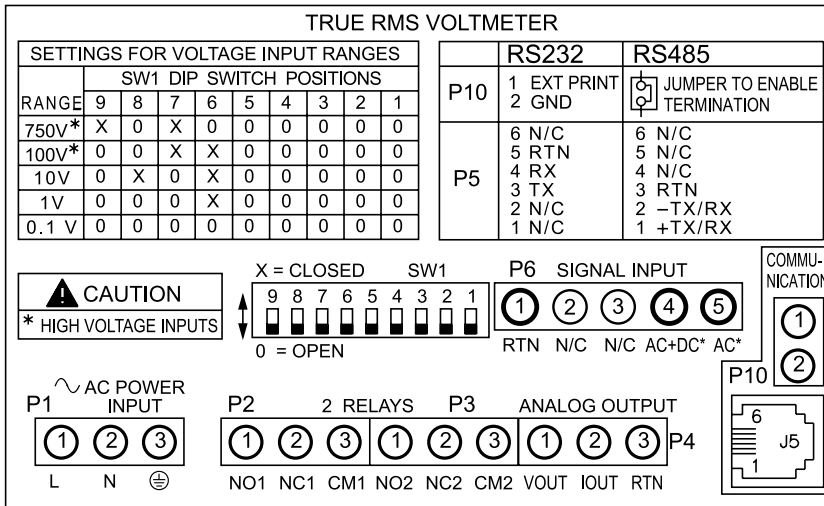


Back of the Meter  
Main Board  
W1–W3 Solder Jumpers  
Signal Board  
Meter Housing  
Factory Default Values  
Meter Specifications  
Glossary

### 4.1 Back of the Meter

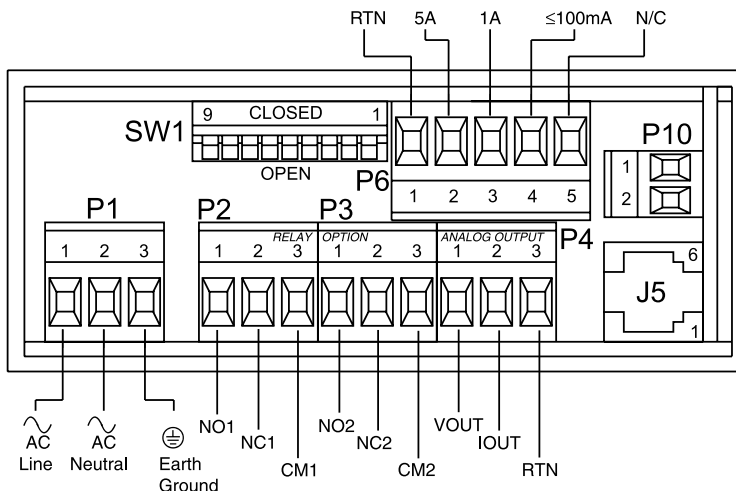


**Figure 4.1 — Volt Meter Connections**

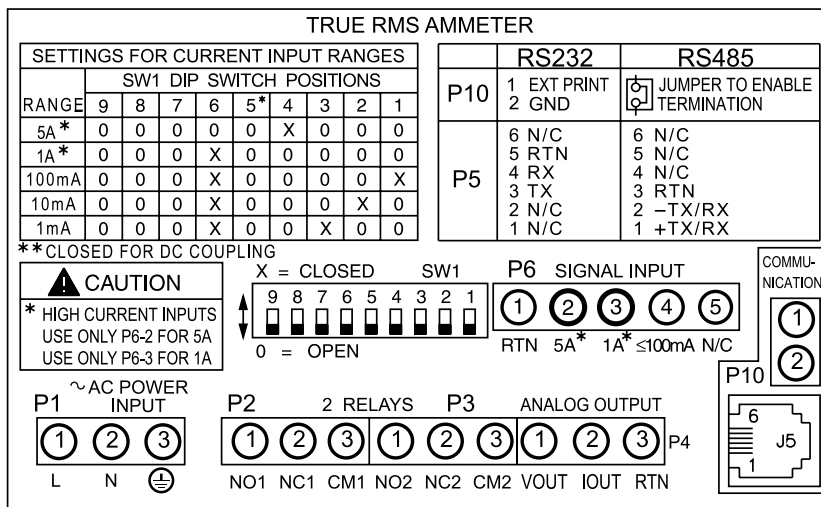


**Figure 4.2 – Volt Meter Label**

# DEFAULTS AND SPECIFICATIONS

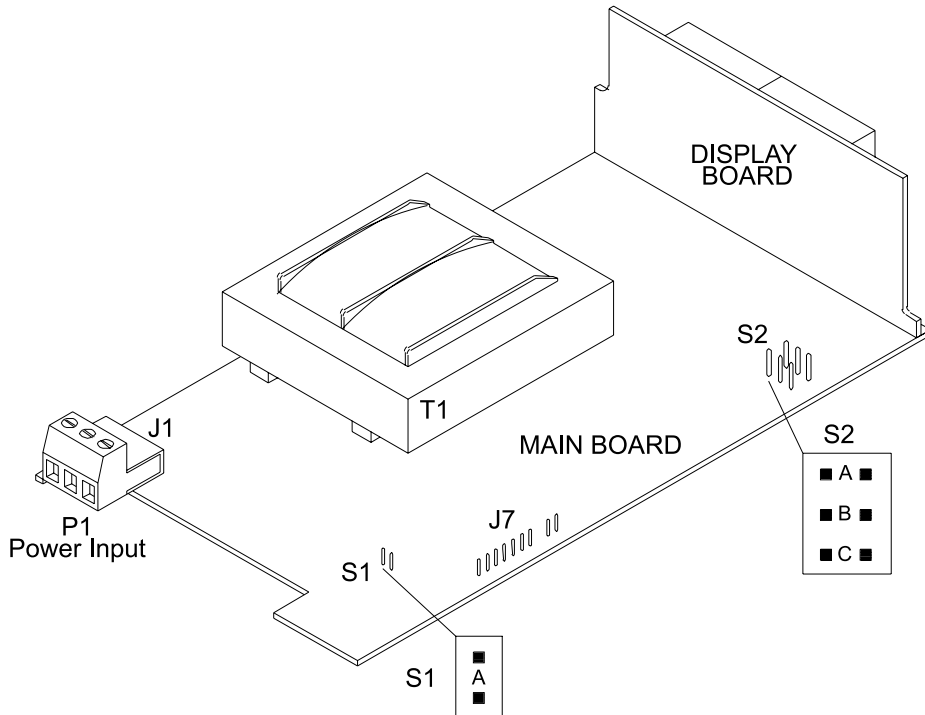


**Figure 4.3 — Current Meter Connections**



**Figure 4.4 – Current Meter Label**

## 4.2 Main Board



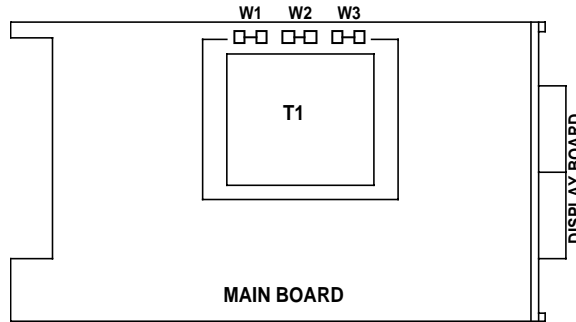
**Figure 4.5 — Jumper Positions on the Main Board**

<b>Jumper</b>	<b>Function</b>
J7	Used for the optional serial communications card. The default is not installed.
S1	Install where load impedance of analog output voltage is $<1K\Omega$ .
S2A	Install to prevent access to menu items. If S2A is installed you may change setpoints only and view peak and valley. The default is not installed.
S2B	Install to enable access to all front panel push-buttons. Remove to disable access to all front-panel push-buttons. The default is installed.
S2C	Install S2C for calibration and make sure that S2A is removed if you want to calibrate the meter. The default is not installed.

**Table 4.1 — Jumper Functions**



## 4.3 W1–W3 Solder Jumpers



**Figure 4.6 — W1–W3 Jumper Locations**

Figure 4.6 shows the location of solder jumpers W1 through W3.



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



**IMPORTANT:** These changes must be performed by a qualified technician. If you want to change the Factory preset jumpers, do the following steps; otherwise go to Section 4.5.

*Disconnect the power from the unit before proceeding.*

1. Remove the main board from the case. (See Figure 4.8)
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**, wire jumpers **W1 and W3** should be wired, but jumper **W2** should not.

If your power requirement is **230 V ac**, wire jumper **W2** should be wired, but jumpers **W1 and W3** should be open. (See Table 4.2)

AC VOLTAGE	INSTALL	REMOVE
115VAC	W1, W3	W2
230VAC	W2	W1, W3

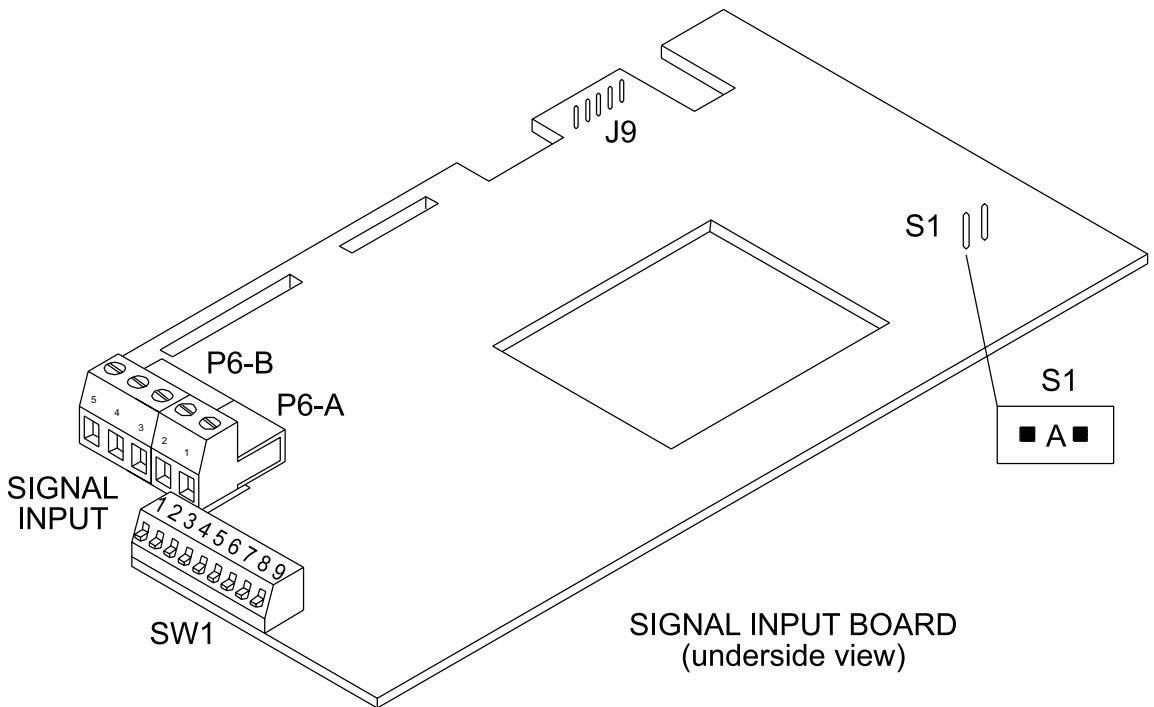
**Table 4.2 W1-W3 Jumper wiring**

## 4.4 Signal Board

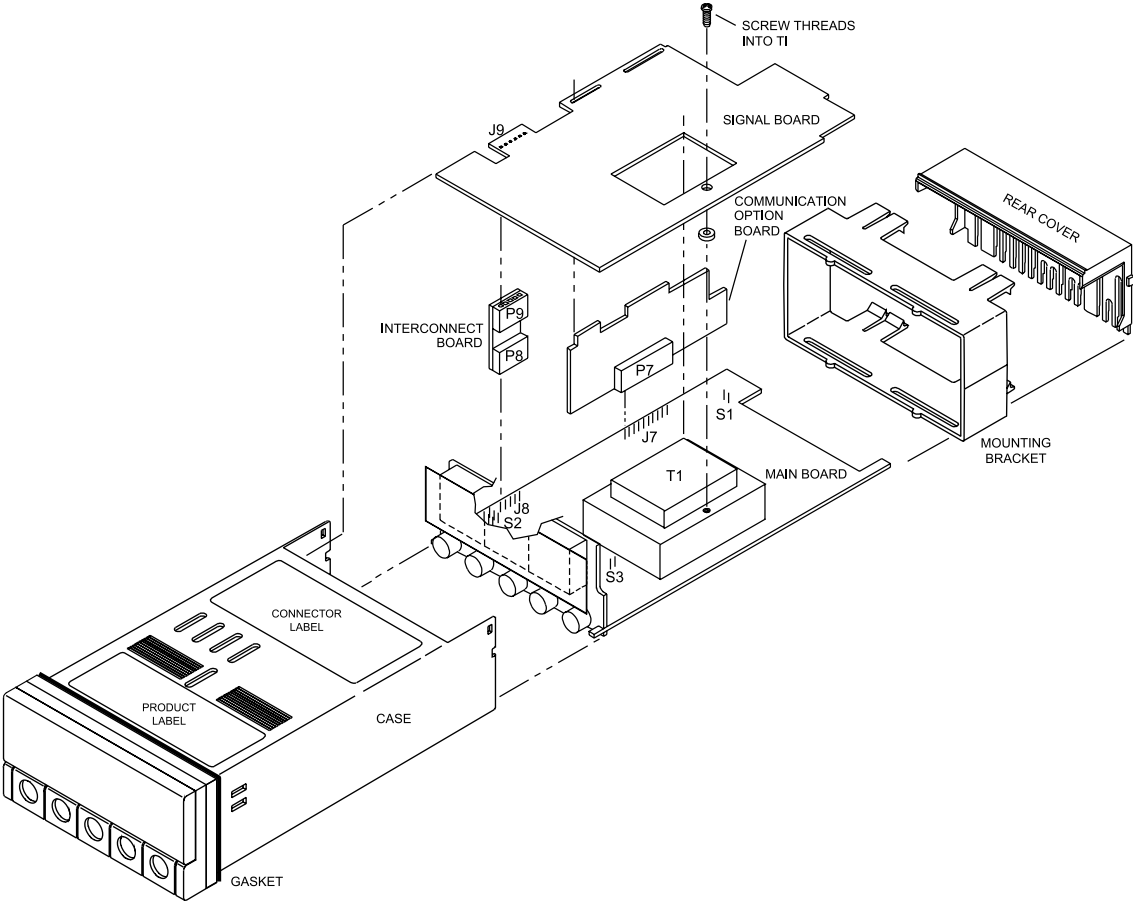
The signal board fits on top of the main board and must be properly secured to the main board for the meter to function. See Figure 4.8.

**Note** 

For faster response time, remove the S1 jumper. The default is jumper installed.

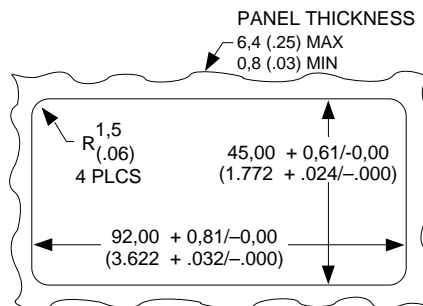
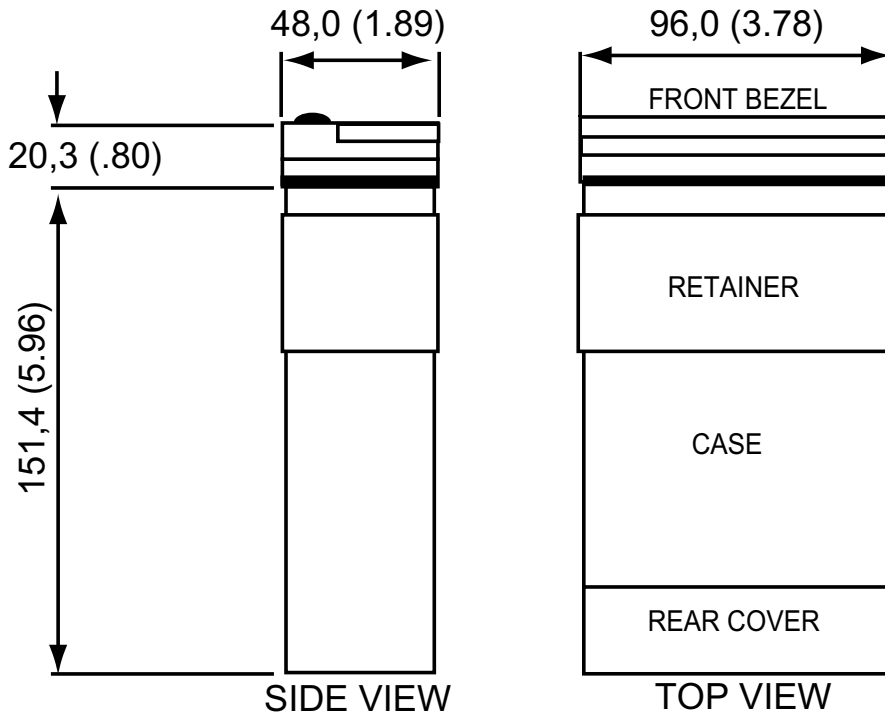


**Figure 4.7 — Signal Board**



**Figure 4.8 — Exploded View of Case and Board Assembly**

### 4.5 Meter Housing



NOTE: Dimensions in Millimeters (Inches)

**Figure 4.9 — Meter Housing and Panel Cut-out Dimensions**

## 4.6 Factory Default Values

### 4.6.1 Menu Item Defaults

<i>Menu Item</i>	<i>Description</i>	<i>Volt</i>	<i>Current</i>
<i>RNGE</i>	Input Type	750 V**	5A
<i>FREQ</i>	Frequency	60 HZ* 50 HZ <sup>†</sup>	60 HZ* 50 HZ <sup>†</sup>
<i>CPLG</i>	Coupling Type	~AC	=DC
<i>DECP</i>	Decimal Point	FFF.F	F.FFF
<i>FLTR</i>	Filter Value	64	64
<i>UNIT</i>	Volt / Amp	V	A

**Table 4.3 — Menu Item Defaults**

### 4.6.2 Analog Output Scale and Offset Defaults

<i>Menu Item</i>	<i>Description</i>	<i>Volt</i>	<i>Current</i>
<i>RD 1</i>	Reading 1	000.0	0.000
<i>OUT 1</i>	Output 1	4.00 (mA)	04.00 (mA)
<i>RD 2</i>	Reading 2	750.0	5.000
<i>OUT 2</i>	Output 2	20.00 (mA)	20.00 (mA)

**Table 4.4 — Analog Output Scale and Offset Defaults**

\* — if powered by 115V, 60 Hz power source

\*\* -- for CE compliance, the max range is 300V, see CE Approvals Section for full details.

† — if powered by 230V, 50 Hz power source

## 4.7 Meter Specifications

### 4.7.1 Signal Input

Input Ranges: Voltage Model: 100mV, 1V, 10V, 100V, 750V\*

Current Model: 1mA, 10mA, 100mA, 1A, 5A

Input Impedance for Volt Meter:

For all voltage ranges 1.0Meg $\Omega$   $\pm$  1%

Input Impedance for Current Meter:

For 5 AMP	0.05 $\Omega$ $\pm$ 5%
For 1 AMP	0.15 $\Omega$ $\pm$ 2%
For 100 mA	1.15 $\Omega$ $\pm$ 1%
For 10 mA	11.1 $\Omega$ $\pm$ 1%
For 1 mA	111.1 $\Omega$ $\pm$ 1%

**Table 4.5 — Signal Input Specifications**

### 4.7.2 Display

4-digit  
 Red or Green  
 LED 14-segment  
 13.8mm (0.54")  
 Symbols: 8.8.8.8.

**Table 4.6 — Display Specifications**

### 4.7.3 Tempco for Volt Meter

100 mV Range	Typical	0.015% / °C
1,10,100, 750V Range	Typical	0.01% / °C

**Table 4.7 — Span Tempco for Voltmeter**

### 4.7.4 Tempco for Current Meter

1, 10, 100 mA Range	Typical	0.015% / °C
1 AMP	Typical	0.02% / °C
5 AMP	Typical	0.025% / °C

**Table 4.8 — Span Tempco for Current Meter**

### 4.7.5 Analog to Digital

Technique	Dual Slope
Internal Resolution	15 bits
Read Rate	2.5 Readings per second
Crest Factor	4
Warm Up Time to Rated Accuracy	30 minutes

**Table 4.9 — Analog to Digital Specifications**

**4.7.6 Isolated Analog Output (If Applicable)**

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	Assigned to a display range	
Linearity	0.2%	
Step Response Time	2–3 seconds to 99% of the final value	

**Table 4.10 — Isolated Analog Output Specifications****4.7.7 Communications Information (If Applicable)**

RS-232:	RJ12 6-wire connection; complete program setup and message display capability; programmable to transmit current display, alarm status, and peak/valley status.	
Baud Rates:	300, 600, 1200, 2400, 4800, 9600, 19200	
RS-485:	RJ12 6-wire connection; addressable from “000” to “199”	
Baud Rates:	300, 1200, 2400, 4800, 9600, 19200	

**Table 4.11 — Communications Information****4.7.8 Input Power Information**

ac Voltage	115/230 Vrms 10%
Frequency	50/60 Hz
Power	7 watts max.

**Table 4.12 — Input Power Specifications**



## 4.7.9 Operating Environment

Operating Temperature:	°0 to 60°C (32 °F to 140 °F) (115/230 Vrms 10%)
	°0 to 40°C (32 °F to 104 °F) (115/230 Vrms 15%) When Relay Output Option is used.
Storage Temperature:	-40°C to 85°C (-40°F to 185°F)
Relative Humidity:	90% at 40°C (non-condensing)

**Table 4.13 — Operating Environment**

## 4.7.10 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

**Table 4.14 — Mechanical Specifications**

## 4.7.11 Alarm Outputs (If Applicable)

2 Form C on/off relays	
Latched and unlatched status configurable by software	
Maximum current:	5 AMPS
Maximum Voltage:	250 Vac or 30 Vdc

**Table 4.15 — Alarm Outputs**

**4.7.12 Voltage Model Accuracy ( =DC coupled inputs)**

Frequency	Accuracy
At 50, 60 Hz	0.1%R ±10 counts
At =DC	0.1%R ±15 counts
from 50Hz To 1 KHz	0.1%R ±20 counts
from 40Hz To 3 KHz	0.1%R ±30 counts
from 25Hz To 5 KHz (except 100mV)	0.1%R ±40 counts
from 25Hz To 4 KHz (100mV only)	0.1%R ±50 counts

The specifications are valid from 5% to 100% of each range.

**Table 4.16 — Voltage Model Accuracy (=DC coupled inputs)**

**4.7.13 Voltage Model ( ~AC coupled inputs)**

Frequency	Accuracy
at 50, 60 Hz	0.1%R ±10 counts
from 50Hz to 1 KHz	0.1%R ±30 counts
from 40Hz to 3 KHz	0.1%R ±40 counts
from 25Hz to 5 KHz (except 100mV)	0.1%R ±50 counts
from 25Hz to 4 KHz (100mV only)	0.1%R ±60 counts

The specifications are valid from 5% to 100% of each range.

**Table 4.17 — Voltage Model Accuracy (~AC coupled inputs)**

## DEFAULTS AND SPECIFICATIONS

### 4.7.14 Current Model ( $\sim$ AC or $=$ DC coupled inputs)

Frequency	Accuracy
at 50, 60 Hz	0.1%R $\pm$ 10 counts
at $=$ DC	0.1%R $\pm$ 15 counts
from 50Hz to 1 KHz	0.1%R $\pm$ 20 counts
from 40Hz to 3 KHz	0.1%R $\pm$ 30 counts
from 25Hz to 5 KHz (except 5 AMP)	0.1%R $\pm$ 40 counts
from 25Hz to 4 KHz (5 AMP only)	0.1%R $\pm$ 50 counts

The specifications are valid from 5% to 100% of each range.

**Table 4.18 — Current Model Accuracy**

### 4.7.15 Decimal Point & Unit of Measure Defaults

	<u>Range</u>	<u>Decimal Point</u>	<u>Unit of Measure</u>
Volt Meter:	100mV	99.99	mV
	1V	999.9	mV
	10V	9.999	V
	100V	99.99	V
	750V*	750.0	V

\* see CE Approvals section for full details.

	<u>Range</u>	<u>Decimal Point</u>	<u>Unit of Measure</u>
Current Meter:	1mA	999.9	no unit
	10mA	9.999	mA
	100mA	99.99	mA
	1A	999.9	mA
	5A	5.000	A

Note that at any time you can change the decimal point position and or the unit of measure to any position or value you want.

**Table 4.19 — Decimal Point & Unit of Measure Defaults**

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**4.7.16 Insulation**

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<b>Power to Input/Output</b>	2500 Vrms per 1 min. test
<b>Power to Relay Outputs</b>	2500 Vrms per 1 min. test
<b>Relays to Inputs/Outputs</b>	2500 Vrms per 1 min. test
<b>RS-232/RS-485 to Inputs/Outputs</b>	500 Vrms (720 Vdc) per 1 min. test
<b>Analog Output to Inputs</b>	500 Vrms (720 Vdc) per 1 min. test

---

**Table 4.20 — Insulation Table**

## 4.8 Glossary


The substantive portion of this glossary lists and defines all of the display messages and error display messages that may appear on your meter. Please keep this information with the Operator's Manual at all times.

<b>Message</b>	<b>Description</b>	<b>Message</b>	<b>Description</b>
232C	RS232C Standard	DATE	Date
485	RS485 Standard	DEC.P	Decimal Point Position
ABOV	Setpoint Active Above	DFLT	Analog Output Default Mode
ADDR	RS485 Device Address	ECHO	Echo Response
ALL	All Input Signal Frequencies other than 50Hz & 60Hz	FLTR	Filter Value
BAUD	Baud Rate	FREQ	Input Signal Frequency
BELO	Setpoint Active Below	ID	Measurement Value ID
BUS.F	Communication Bus Format	INPT	Input Top Menu
C.SUM	Checksum	LF	Linefeed
CMD	Transmission on Command	LTCH	Setpoint Latch
COM.P	Communication Parameters	M.BUS	ModBus Protocol
COMM	Communication Top Menu	MODE	Mode of Communication
CONT	Continuous Transmission	NEW.P	Protocol
CPLG	Input Coupling	NORM	Setpoint Nonlatch
CR	Carriage Return	OT.CF	Analog Output Configuration
CURR	Analog Output Current Mode	OT.S.O	Analog Output 2 Point Calibration
DAT.F	Communication Data Format	OUT	Output Configuration Top Menu
DATA	Data Bits	PEAK	Peak Value

<b>Message</b>	<b>Description</b>	<b>Message</b>	<b>Description</b>
PK.RS	Reset Peak Value	SPT.1	Setpoint 1 Deadband and Alarm
PROG	Analog Output Programming Mode	SPT.2	Setpoint 2 Deadband and Alarm
PROT	Communication Protocol	STAT	Status Character
PRTY	Parity Bit	STND	Communication Standard
RD.S.O	Reading Scale and Offset (2 point Calibration)	STOP	Stop Bits
RDNG	Reading Configuration Top Menu	STRD	Stored
RNGE	Input Signal Range	TIME	Time Value
S1.DB	Setpoint 1 Deadband	TX.TI	Time Between Transmission
S2.DB	Setpoint 2 Deadband	UNIT	Unit of Measurement
SEPR	Data Separator	VALY	Valley Value
SP.CF	Setpoint Configuration Top Menu	VL.RS	Reset Valley Value
SPCE	Space	VOLT	Analog Output Volt Mode

Please note that all of the following error messages *flash* while displayed.

<b>Error Message</b>	<b>Description</b>	<b>Error Message</b>	<b>Description</b>
+OL	Input Signal Overload	RD.OF	The reading output is larger than 11000 due to scaling.
-OL	Input Signal Underload	(value)	If the displayed value is flashing, then the reading is overrange (between 10000 to 11000)
9999	Reading is Overflowed		
ER1	2-Coordinate Programming Error		

 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.

Current Ranges: 1mA, 10mA, 100mA, 1A, and 5A.

Voltage Ranges: 0.1V, 1V, 10V, 100V, and 750V\*.

\*For the 750V range, see the following page of Special Safety Ratings.

### Double Insulation

### Pollution Degree 2

### Dielectric withstand Test per 1 min (50/60 Hz)

- Power to Input/Output: 2500Vrms
- Power to Relay Output: 2500Vrms
- Relay Output to Inputs/Outputs: 2500Vrms
- Isolated RS232/485 to Inputs: 500Vrms (720Vdc)
- Analog Output to Inputs: 500Vrms (720Vdc)

### Measurement Category II

Category II are measurements performed on circuits directly connected to the Mains Supply (power). Maximum Line-to-Neutral working voltage is 100 Vac/dc.

This unit should not be used in Measurement Categories III and IV, but Category I (measurements performed on circuits not directly connected to the Mains Supply) is allowed.

For current and voltage connections, the Installation Requirements of this manual must be followed.

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

- Input Power: 2500V
- Output Relays: 2500V
- Input/Output Signals: 500V

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

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

- EMC Emissions 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.

**CE** 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.

**Voltage Range of 750V** The 750V is de-rated to 300V max. range to meet Double Insulation requirements for CE. No Analog or Serial Communication should be used when operating this de-rated range of 300V.

**Input Range** 300V max. 50/60Hz (on 750V range)

**Double Insulation**

**Pollution Degree 2**

**Dielectric withstand Test per 1 min (50/60 Hz)**

- Power to Input: 2500Vrms
- Power to Relay Output: 2500Vrms
- Relay Output to Inputs: 2500Vrms
- Isolated RS232/485 to Inputs: not used
- Analog Output to Inputs: not used

### Measurement Category II

Category II are measurements performed on circuits directly connected to the Mains Supply (power). Maximum Line-to-Neutral working voltage is 300 Vac/dc.

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

For current and voltage connections, the Installation Requirements of this manual must be followed.



The CE compliance described above are null when Analog or Serial options are used or the Input Voltage is beyond the de-rated 300V max scale range.

This unit will work 300 - 750 V but the isolation is only Basic, provided that the relays are not used to activate DC loads requiring Double Insulation to any hazardous voltages (Mains).

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

- Input Power: 2500V
- Output Relays: 2500V
- Input Signals: 2500V

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

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

- EMC Emissions 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.

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

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

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

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3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order 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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