

CE



# OMEGA® User's Guide

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The information contained in this document is believed to be correct, but OMEGA 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, human applications.

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## NOTES, WARNINGS and CAUTIONS

Information that is especially important to note is identified by the following labels:

- **NOTE**
- **WARNING or CAUTION**
- **IMPORTANT**
- **TIP**



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



**CAUTION or WARNING:** Tells you about the risk of electrical shock.



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



**TIP:** Provides you helpful hints.

## PART 1 INTRODUCTION

### 1.1 Description

This device is a compact, wall-mountable controller/monitor that can be used for applications that need a fixed location, when a control panel is not required. The controller/monitor supports a variety of temperature and process inputs. The flip-top enclosure makes programming and wire access easy to use.



*For complete specifications or setup and programming of the controller/monitor refer to the main operator manual.*

## 1.2 Safety Considerations

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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).

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This device 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 device should be done by qualified personnel. In order to ensure safe operation, the following instructions should be followed.



This device 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 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 device housing.
- Always disconnect power before changing signal and power connections.
- Do not use this device on a work bench without its case for safety reasons.
- Do not operate this device in flammable or explosive atmospheres.
- Unit mounting should allow for adequate ventilation to ensure device 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 device if EMC problems persist.

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

## 1.3 Before you Begin

### Inspecting Your Shipment:

Remove the packing slip and verify that you have received everything listed. 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.

### Customer Service:

If you need assistance, please call the nearest Customer Service Department, listed in this manual.

### Manuals, Software:



The latest Operation and Communication Manual as well as free configuration software are available from the **website listed in this manual**.

**Tip**


If you have the Serial Communications you can easily configure the device on your computer or on-line.

### To Disable Outputs:

To ensure that menu changes are properly stored, Standby Mode should be used during setup of the device. During Standby Mode, the device remains in a ready condition, but all outputs are disabled. Standby Mode is useful when maintenance of the system is necessary.


When the device is in "RUN" Mode, **push**  **twice** to disable all outputs and alarms. It is now in "STANDBY" Mode. **Push**  **once** more to resume "RUN" Mode.

**Tip**

**PUSH**  **TWICE** to disable the system during an **EMERGENCY**.

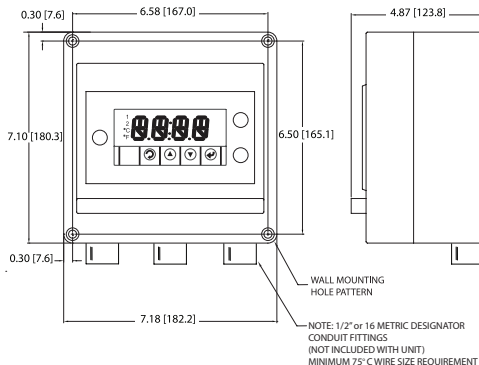
### To Reset the Meter:

When the device is in the "MENU" Mode, **push**  **once** to direct device one step backward of the top menu item.

**Push**  **twice** to reset device, prior to resuming "Run" Mode except after "Alarms", that will go to the "Run" Mode without resetting the device.

## PART 2 SETUP

### 2.1 Front Panel



**Figure 2.1 Front Panel Display**

To maintain the NEMA 4X rating on the enclosure mounting: use the Wall Mounting Hole Pattern as dimensioned.

**Note** This is the same hole pattern for the 4 screws that are used for the disassembly of the enclosure.

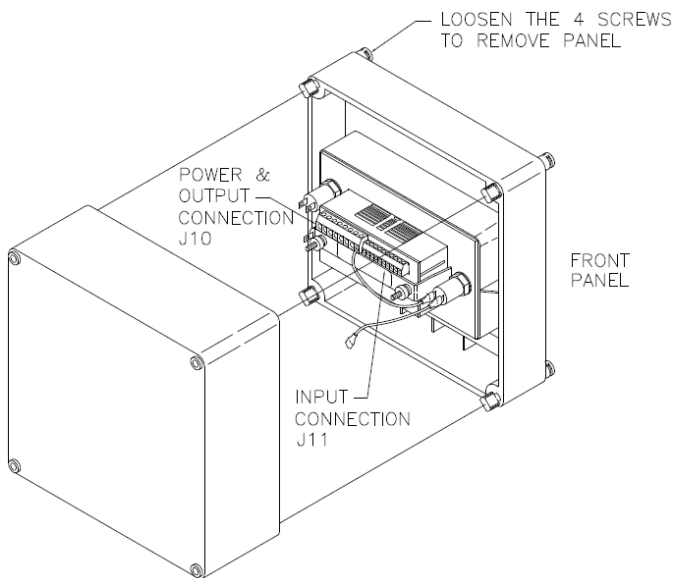
**Table 2.1 Front Annunciators**

1	Output 1/Setpoint 1/ Alarm 1 indicator
2	Output 2/Setpoint 2/ Alarm 2 indicator
°C	°C unit indicator
°F	°F unit indicator
⊕	Changes display to Configuration Mode and advances through menu items*
▲	Used in Program Mode and Peak Recall*
▼	Used in Program Mode and Valley Recall*
⊙	Accesses submenus in Configuration Mode and stores selected values*

\* See Part 3 Operation: Configuration Mode



## 2.2 Disassembly



**Figure 2.2 Disassembly**

## 2.3 Electrical Installation

### 2.3.1 Power Connections



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

The main power has already been connected with power fuse and output fuse (if required).



Use copper conductors only for power connections. Wires to be sized based upon minimum of 75°C (167°F).

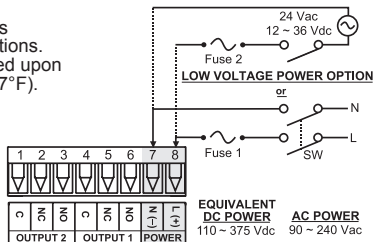


Figure 2.3 Main Power Connections

Table 2.2 Fuse Requirement (see specifications)

FUSE	Connector	Output Type	For 115 Vac	For 230 Vac	DC
FUSE 1	Power	N/A	100 mA(T)	100 mA(T)	100 mA(T)
FUSE 2	Power	N/A	N/A	N/A	400 mA(T)



For the low voltage power option, in order to maintain the same degree of protection as the standard high voltage input power units (90 - 240 Vac), always use a Safety Agency Approved DC or AC source with the same Overvoltage Category and pollution degree as the standard AC unit (90 - 240 Vac).



The Safety European Standard EN61010-1 for measurement, control, and laboratory equipment requires that fuses must be specified based on IEC127. This standard specifies for a Time-lag fuse, the letter code "T". The above recommended fuses are of the type IEC127-2-sheet III. Be aware that there are significant differences between the requirements listed in the UL 248-14/CSA 248.14 and the IEC 127 fuse standards. As a result, no single fuse can carry all approval listings. A 1.0 Amp IEC fuse is approximately equivalent to a 1.4 Amp UL/CSA fuse. It is advised to consult the manufacturer's data sheets for a cross-reference.

### 2.3.1 Power Connections (continued)

#### Rear View for Models:

Two SSR Relay Outputs "22"

SSR Relay and Form "C" Relay Outputs "23"

Two Form "C" Relay Outputs "33"

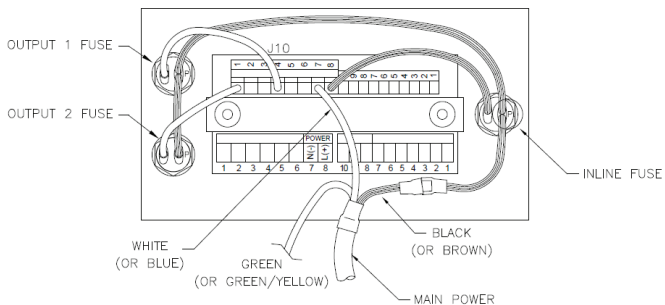


Figure 2.4 Rear View - For Models with Outputs: 22, 23, 33

#### Rear View for Models:

Analog and SSR Relay Outputs "52"

Analog and Form "C" Relay Outputs "53"

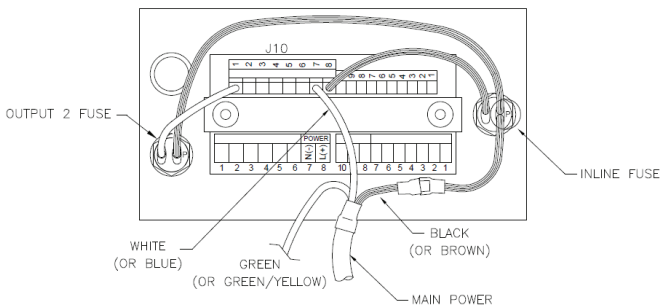


Figure 2.5 Rear View - For Models with Outputs: 52, 53

### 2.3.1 Power Connections (continued)

Rear View for Models:  
Monitor Units

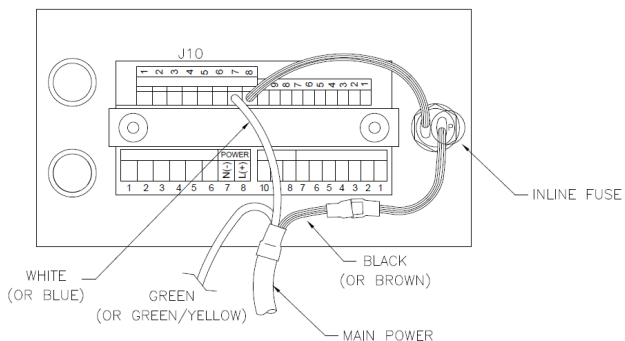


Figure 2.6 Rear View - For Models with no Outputs

### 2.3.2 Rear Panel Connections

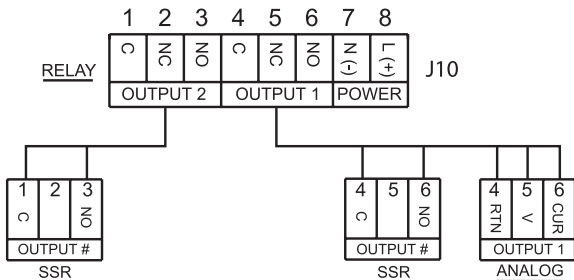


Figure 2.7 Rear Panel Power and Output Connections

## 2.3.2 Rear Panel Connections (continued)

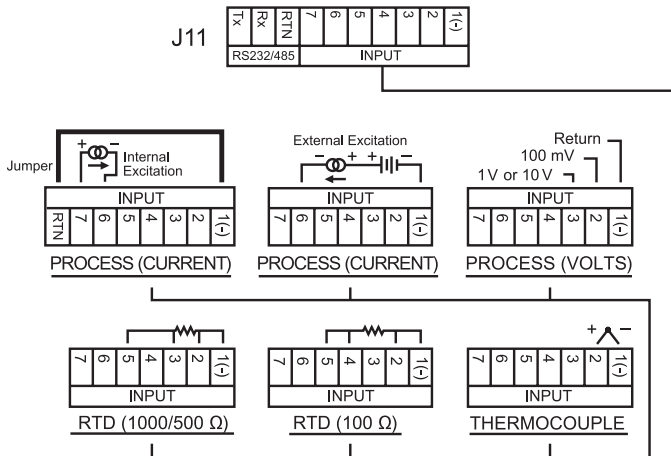


Figure 2.8 Rear Panel Input Connections

Table 2.3 Real Panel Connector

<b>POWER</b>	AC/DC Power Connector: All models
<b>INPUT</b>	Input Connector: All models TC, PR (Process), RTD
<b>OUTPUT 1</b>	Based on one of the following models: Relay SPDT Solid State Relay Analog Output (Voltage and Current)
<b>OUTPUT 2</b>	Based on one of the following models: Relay SPDT Solid State Relay
<b>OPTION</b>	Based on one of the following models: RS232C or RS485 programmable Excitation

### 2.3.3 Thermocouple

The figure below shows the wiring hookup for any thermocouple type. For example, for Type K hookup, connect the yellow wire to the “2” terminal and the red wire to the “1(-)” terminal.

**When configuring your device, select Thermocouple and Thermocouple Type in the Input Type menu (see Part 3).**

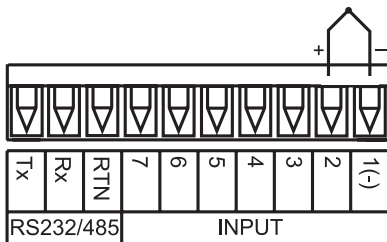


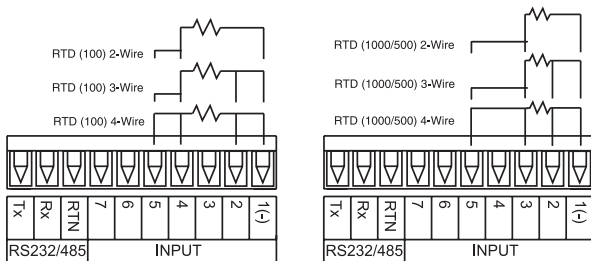
Figure 2.9 Thermocouple Wiring Hookup

Table 2.4 TC Wire Color Chart

Type	Input Connector		Jacket (External Insulation)	
	Terminal 1 (-)	Terminal 2 (+)	Extension	Grade
J	Red	White	Dark-Brown	Black
K	Red	Yellow	Dark-Brown	Yellow
T	Red	Blue	Dark-Brown	Blue
E	Red	Purple	Dark-Brown	Purple
N	Red	Orange	Dark-Brown	Brown
R	Red	Black	-	Green
S	Red	Black	-	Green
B	Red	Gray	-	Black

### 2.3.4 Two/Three/Four-Wire RTD

The figures below show the input connections and input connector jumpers (shown in bold lines) required to hookup a 2-, 3- or 4-wire RTD.



**Figure 2.10 a) RTD-100 ohm and 500 ohm Wiring Hookup**

**b) RTD-100 ohm Wiring Hookup**

The **two-wire** connection is simplest method, but does not compensate for lead-wire temperature change and often requires calibration to cancel lead-wire resistance offset.

The **three-wire** connection works best with RTD leads closely equal in resistance. The device measures the RTD, plus upper and lower lead drop voltage and the subtracts twice the measured drop in the lower supply current lead producing excellent lead-resistance cancellation for balanced measurements.

The **four-wire** RTD hookup is applicable to unbalanced lead resistance and enables the device to measure and subtract the lead voltage, which produces the best lead-resistance cancellation.

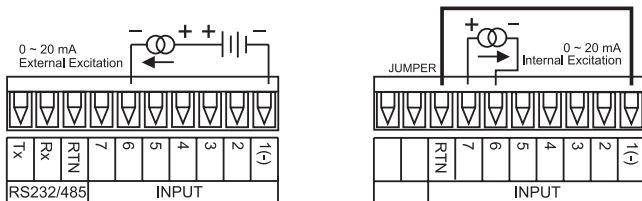
**When configuring your device, select RTD type and RTD value in the Input Type menu (see Part 3).**

**Note**

If the input wires of the meter get disconnected or broken, it will display **+OPN** "Input (+) Open" message except in case of 500/1000  $\Omega$  2-wire RTD. In this case the display shows **-OPN** "Input (-) Open" message. For safety purpose you may want to set up your alarm to be triggered when input is open.

### 2.3.5 Process Current

The figure below shows the wiring hookup for Process Current 0 – 20 mA.

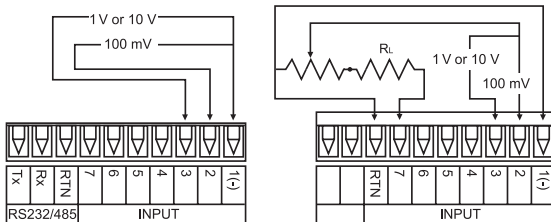


**Figure 2.11 Process Current Wiring Hookup (Internal and External Excitation)**

When configuring your device, select **Process Type** in the **Input Type Menu** (see Part 3).

### 2.3.6 Process Voltage

The figure below shows the wiring hookup for Process Voltage 0 – 100 mV, 0 – 1 V, 0 – 10 V.



**Figure 2.12 a) Process Voltage Wiring Hookup with Sensor Excitation**

**b) Process Voltage Wiring Hookup without Sensor Excitation**

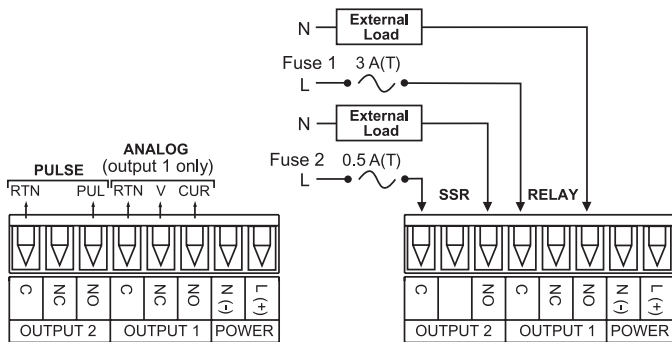
$R_L$  - Voltage limited resistor, which allows to convert 24 Vdc internal excitation voltage to the appropriate process input value. For instance: if the potentiometer value is equal to 10 k $\Omega$ , the minimum  $R_L$  is 14 k $\Omega$  for 10 V process input.

When configuring your device, select **Process Type** in the **Input Type Menu** (see Part 3).



## 2.3.7 Wiring Outputs

This meter has two factory installed outputs. The SPDT Mechanical Relay, SPST Solid State Relay and Analog Output Connection are shown below.



**Figure 2.13 a) Mechanical Relay and SSR Outputs Wiring Hookup**

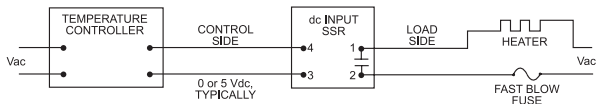
**b) Analog Output Wiring Hookup**

**Note**

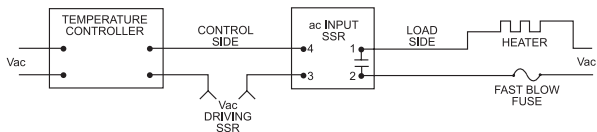
The Fuse has already been connected, it is shown for reference only.

## 2.3.7 Wiring Outputs (continued)

dc CONTROLLED SSR USED WITH TEMPERATURE CONTROLLER WITH dc VOLTAGE SSR DRIVER OUTPUT



ac CONTROLLED SSR USED WITH TEMPERATURE CONTROLLER WITH MECHANICAL RELAY OUTPUT



ac CONTROLLED SSR USED WITH TEMPERATURE CONTROLLER WITH TRIAC OUTPUT

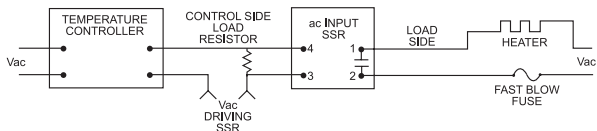


Figure 2.14 Typical Applications

RS485

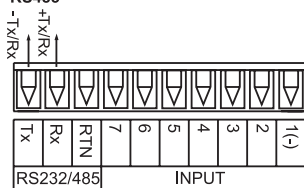
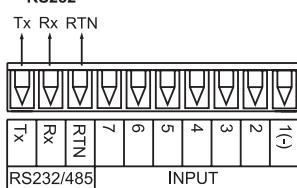


Figure 2.15 a) RS232 Output Wiring Hookup

RS232



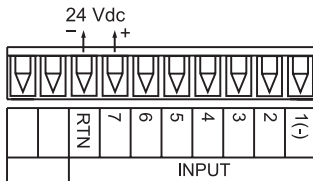
b) RS485 Output Wiring Hookup

## 2.3.7 Wiring Outputs (continued)

This device may also have an excitation output.

**Note 12**

Excitation is not available if communication option is installed.

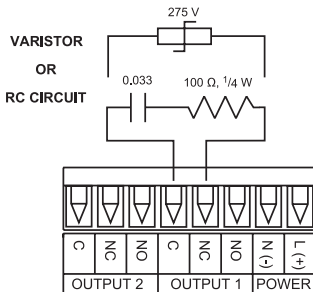


**Figure 2.16 Excitation Output**

This device has snubber circuits designed to protect the contacts of the mechanical relays when it switches to inductive loads (i.e. solenoids, relays). These snubbers are internally connected between the Common (C) and Normally Open (NO) relay contacts of Output 1 and Output 2.

**Note 13**

If you have an inductive load connected between Common (C) and Normally Closed (NC) contacts of the mechanical relays and you want to protect them from the rush current during the switching period, you have to connect an external snubber circuit between Common (C) and Normally Closed (NC) contacts as indicated in **Figure 2.17**.



**Figure 2.17 Snubber Circuits Wiring Hookup**

## **PART 3**

### **OPERATION**

#### **3.1 Introduction**

The device has two different modes of operation. The first, Run Mode, is used to display values for the Process Variable, and to display or clear Peak and Valley values. The other mode, Menu Configuration Mode, is used to navigate through the menu options and configure the device. Part 3 of this manual will explain the Menu Configuration Mode. For your device to operate properly, the user must first “program” or configure the menu options.

#### **Turning your device On for the First Time**

The device becomes active as soon as it is connected to a power source. It has no On or Off switch. The device at first momentarily shows the software version number, followed by reset **RST**, and then proceeds to the Run Mode.



Note

Refer to the Main Operator Manual for complete set-up and programming information.



Note

If you have the Serial Communications Option you can easily configure the device on your computer or on-line.

### 3.1 Introduction (continued)

Table 3.1 Button Function in Configuration Mode

⏪	<ul style="list-style-type: none"><li>• To enter the Menu, the user must first press ⏪ button.</li><li>• Use this button to advance/navigate to the next menu item. The user can navigate through all the top level menus by pressing ⏪.</li><li>• While a parameter is being modified, press ⏪ to escape without saving the parameter.</li></ul>
⏩	<ul style="list-style-type: none"><li>• Press the up ⏩ button to scroll through “flashing” selections. When a numerical value is displayed press this key to increase value of a parameter that is currently being modified.</li><li>• Holding the ⏩ button down for approximately 3 seconds will speed up the rate at which the set point value increments.</li><li>• In the Run Mode press ⏩ causes the display to flash the PEAK value – press again to return to the Run Mode.</li></ul>
⏴	<ul style="list-style-type: none"><li>• Press the down ⏴ button to go back to a previous Top Level Menu item.</li><li>• Press this button twice to reset the device to the Run Mode.</li><li>• When a numerical value is flashing (except set point value) press ⏴ to scroll digits from left to right allowing the user to select the desired digit to modify.</li><li>• When a setpoint value is displayed press ⏴ to decrease value of a setpoint that is currently being modified. Holding the ⏴ button down for approximately 3 seconds will speed up the rate at which the setpoint value is decremented.</li><li>• In the Run Mode press ⏴ causes the display to flash the VALLEY value – press again to return to the Run Mode.</li></ul>
⏵	<ul style="list-style-type: none"><li>• Press the enter ⏵ button to access the submenus from a Top Level Menu item.</li><li>• Press ⏵ to store a submenu selection or after entering a value – the display will flash a <b>STRD</b> message to confirm your selection.</li><li>• To reset flashing Peak or Valley press ⏵.</li><li>• In the Run Mode, press ⏵ twice to enable Standby Mode with flashing <b>STBY</b>.</li></ul>



Reset: Except for Alarms, modifying any settings of the menu configuration will reset the device prior to resuming Run Mode.



## 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
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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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