



**OMEGA**  
**ENGINEERING, INC.**  
*An OMEGA Technologies Company*



**CN800**  
**Temperature Controller**



**Series:**  
**CN872      CN882**  
**CN873      CN883**  
**CN874      CN884**



**Operator's Manual**



## WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of two (2) years from date of purchase. If the unit should malfunction, it must be returned to the factory for evaluation. Our 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. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

THESE UNITS ARE INHERENTLY DANGEROUS AND ARE INTENDED TO BE INSTALLED AND USED ONLY BY QUALIFIED PERSONNEL. NO WARRANTY EXTENDED HEREIN WILL APPLY IF SUCH UNIT IS INSTALLED OR USED BY UNQUALIFIED PERSONNEL. THERE ARE NO WARRANTIES EXCEPT AS STATED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE. OMEGA ENGINEERING, INC. IS NOT RESPONSIBLE FOR ANY DAMAGES OR LOSSES CAUSED TO OTHER EQUIPMENT, WHETHER DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, WHICH THE PURCHASER MAY EXPERIENCE AS A RESULT OF THE INSTALLATION OR USE OF THE PRODUCT. THE BUYER'S SOLE REMEDY FOR ANY BREACH OF THIS AGREEMENT BY OMEGA ENGINEERING, INC. OR ANY BREACH OF ANY WARRANTY BY OMEGA ENGINEERING, INC. SHALL NOT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER TO OMEGA ENGINEERING, INC. FOR THE UNIT OR UNITS OR EQUIPMENT DIRECTLY AFFECTED BY SUCH BREACH.

EVERY PRECAUTION FOR ACCURACY HAS BEEN TAKEN IN THE PREPARATION OF THIS MANUAL, HOWEVER, OMEGA ENGINEERING, INC. NEITHER ASSUMES RESPONSIBILITY FOR ANY OMISSIONS OR ERRORS THAT MAY APPEAR NOR ASSUMES LIABILITY FOR ANY DAMAGES THAT RESULT FROM THE USE OF THE PRODUCTS IN ACCORDANCE WITH THE INFORMATION CONTAINED IN THE MANUAL.



One Omega Drive, Box 4047  
Stamford, Connecticut 06907-0047

Call OMEGA Toll Free\*

Sales: 1-800-82-66342 / 1-800-TC-OMEGA

Customer Service: 1-800-622-2378 / 1-800-622-BEST

Engineering Assistance: 1-800-872-9436 / 1-800-USA-WHEN

\*In CT: (203) 359-1660      CABLE: OMEGA      EASYLINK: 62968934  
And International      TELEX: 996404      FAX: (203) 359-7700

### Return Requests/Inquiries

Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department, telephone number (203) 359-1660. BEFORE RETURNING ANY INSTRUMENT, PLEASE CONTACT THE OMEGA CUSTOMER SERVICE DEPARTMENT TO OBTAIN AN AUTHORIZED RETURN (AR) NUMBER. The designated AR number should then be marked on the outside of the return package.

To avoid processing delays, also please be sure to include:

1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

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

OMEGA\* is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 1990 OMEGA ENGINEERING, INC. All rights reserved including illustrations. Nothing in this manual may be reproduced in any manner, either wholly or in part for any purpose whatsoever without written permission from OMEGA ENGINEERING, INC.

**TABLE OF CONTENTS**  
**CN800 SERIES**  
**DEVIATION DISPLAY CONTROLLER**

<b>SECTION</b>	<b>PAGE</b>
<b>SECTION 1</b>	
INTRODUCTION .....	1
<b>SECTION 2</b>	
INSTALLATION .....	3
2.1 UNPACKING .....	3
2.2 PANEL MOUNTING .....	3
<b>SECTION 3</b>	
INPUT POWER: 115V/230V VOLTAGE CONVERSION .....	5
<b>SECTION 4</b>	
DEVIATION DISPLAY .....	6
<b>SECTION 5</b>	
MANUAL RESET (OFFSET ADJUSTMENT) .....	7
<b>SECTION 6</b>	
SCALE LOCK .....	8
<b>SECTION 7</b>	
SP2 ADJUSTMENT .....	8
<b>SECTION 8</b>	
CN800 RECALIBRATION PROCEDURE .....	10
<b>SECTION 9</b>	
WIRING .....	13
<b>SECTION 10</b>	
SPECIFICATIONS .....	14

## SECTION 1 INTRODUCTION

The OMEGA<sup>®</sup> CN800 Series Deviation Display Controller is a compact 1/16 DIN controller. It provides high quality and high performance at an economical price. The series is designed to be reliable in industrial applications, providing extremely accurate control.

The time proportional or on-off control circuits (depending on the model) gives accurate, reliable control. The controllers are available in Type J,K,T,R,S, thermocouple and 100 ohms Pt RTD ( $\alpha = 0.00385$ ) models with temperature ranges up to 1600°C.

The following models are available from OMEGA Engineering.

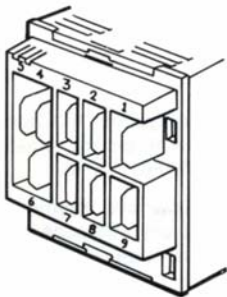
### CN800 SERIES MODELS

PART NUMBER	OUTPUT 1 TYPE	OUTPUT 2 TYPE	REAR CONNECTION
CN872 (*)	Proportional	-	Socket
CN873 (*)	Proportional	-	Push-on
CN874 (*)	Proportional	On - Off	Socket
CN882 (*)	On - Off	-	Socket
CN883 (*)	On - Off	-	Push-on
CN884 (*)	On - Off	On - Off	Socket

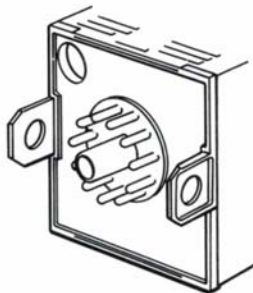
\* Specify range code from range table that follows  
- Not available

### RANGE TABLE

RANGE CODE	INPUT TYPE	TEMPERATURE RANGE	DIAL GRADUATION
J-200F	J	0 to 200°F	5°
J-300F	J	0 to 300°F	5°
J-300C	J	0 to 300°C	5°
J-500F	J	0 to 500°F	10°
J-1200F	J	0 to 1200°F	20°
K-500F	K	0 to 500°F	10°
K-1200F	K	0 to 1200°F	20°
K-1200C	K	0 to 1200°C	20°
T-NF	T	-100 to 200°F	5°
T-NC	T	-100 to 200°C	5°
T-300C	T	0 to 300°C	5°
R-1600C	R	0 to 1600°C	20°
S-1600C	S	0 to 1600°C	20°
RTD-NC	RTD	-100 to 200°C	5°
RTD-500C	RTD	0 to 500°C	10°



Panel Mount with Push-on Connectors (supplied) on CN873 and CN883 models



Plug-in or Panel Mount with Socket Mount Design on CN872, CN874, CN882 and CN884 models. Mating Socket and Push-on Connectors included

Manual Reset and Setpoint 2 Adjustment Behind Top Removable Face

Plug-in Module with Output Relay(s)

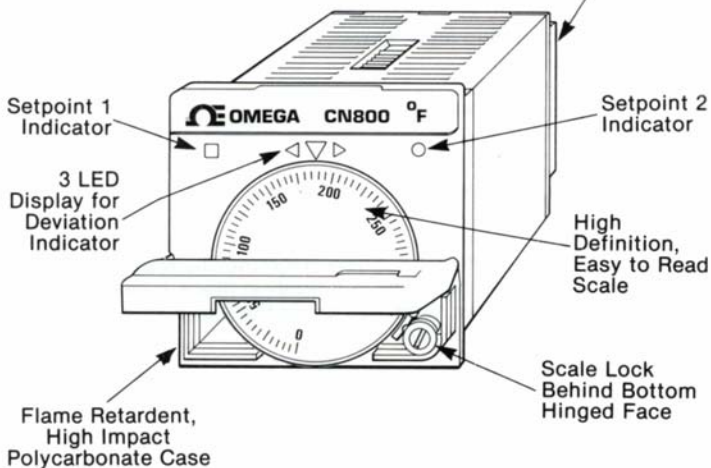


Figure 1-1 CN800 Series Controller

## SECTION 2 INSTALLATION

### 2.1 UNPACKING

Remove the packing list and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at 1-800-622-2378.

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

#### NOTE

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

Make sure the following items are in the shipping box:

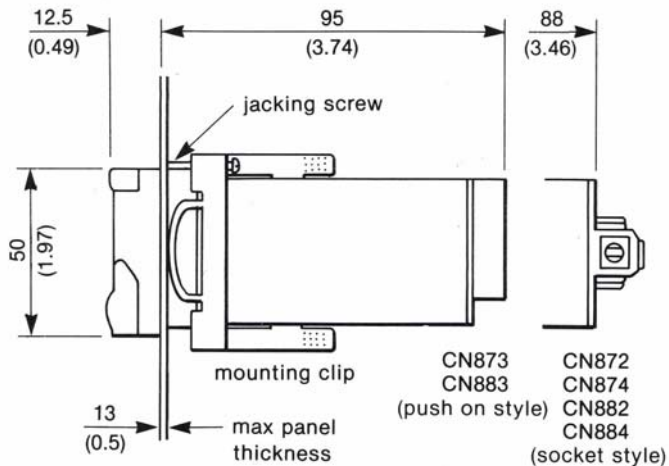
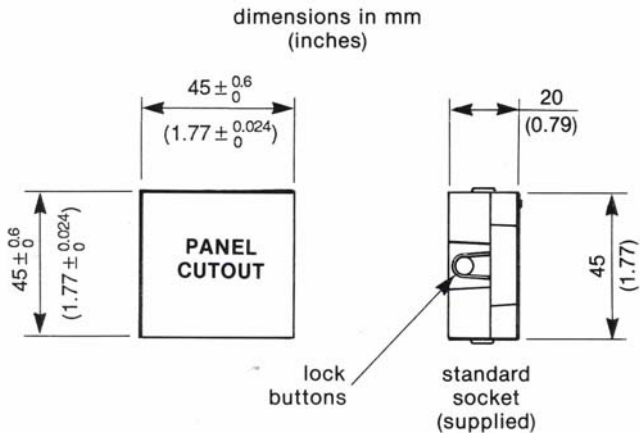
QTY	ITEM
1	CN800 series Deviation Display Controller
1	Accessory kit (containing 2 jacking screws, 1 spare link for changing input power, and a supply of push-on connectors)
1	Panel Mount Bracket
1	Operator's Manual

### 2.2 PANEL MOUNTING

The CN800 Series Controller can be mounted in a panel through a 45 mm square (1/16 DIN) cutout. The mounting clip should be pushed home until the ratchet holds the unit firmly in place. If necessary, the mounting can be further tightened using the 2 jacking screws provided in the accessory kit.

To remove the unit from the panel, separate the legs of the clips to release the ratchet.

Refer to Figure 2-1 for mounting dimensions.

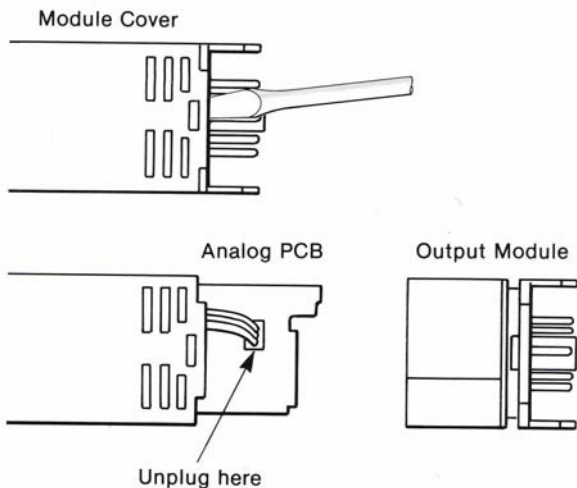


**Figure 2-1** Typical Mounting Dimensions

## SECTION 3 INPUT POWER: 115/230V VOLTAGE CONVERSION

Go through the following steps to convert from 115V  $\pm$ 15% (50/60 Hz) (which is a factory set) to 230V  $\pm$ 15% (50/60 Hz) or vice versa.

1. Make sure that the controller is not plugged into a wall socket.
2. Remove the analog printed circuit board from the controller.
  - a. Separate the output module assembly from the main module by gently levering the retaining clips from both slots in the cover with a screwdriver.
  - b. Remove the output module and then pull the analog printed circuit from the main module as far as possible. Unplug the potentiometer wiring by releasing the plug lock. The analog board can be completely removed. **TAKE CARE NOT TO DAMAGE OR DISTURB ANY OF THE OTHER COMPONENTS.**



**Figure 3-1** Removing PCB



3. The side label shows the power supply voltage. This can be changed by changing the position of the plug-in links (LK1, LK2 and LK3) on the main printed circuit board. Refer to Figure 3-2. A spare link is provided in the accessory kit.

For 230VAC operation — use link 2 only

For 115VAC operation — use links 1 and 3 only

It is advisable to use pliers when removing links or installing new links (make sure that the link is pushed firmly in place).

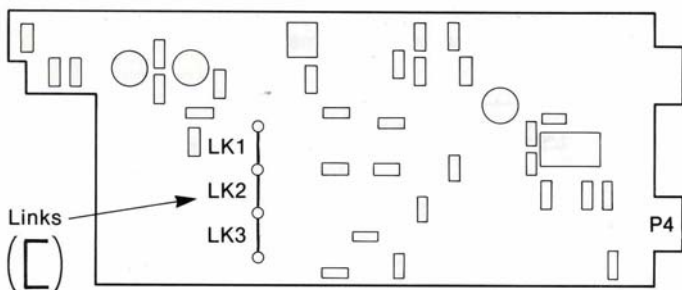


Figure 3-2 Printed Circuit Board Layout

## SECTION 4 DEVIATION DISPLAY

A group of 3 triangular lights on the display panel of the controller indicates the process deviation from the setpoint. Refer to Table 4-1.

TABLE 4-1

DEVIATION FROM SETPOINT 1	◀	▼	▶
Below -3% range	ON	OFF	OFF
Between -1 and -3% range	ON	ON	OFF
Between -1 and +1% range	OFF	ON	OFF
Between +1 and +3% range	OFF	ON	ON
Above +3% range	OFF	OFF	ON

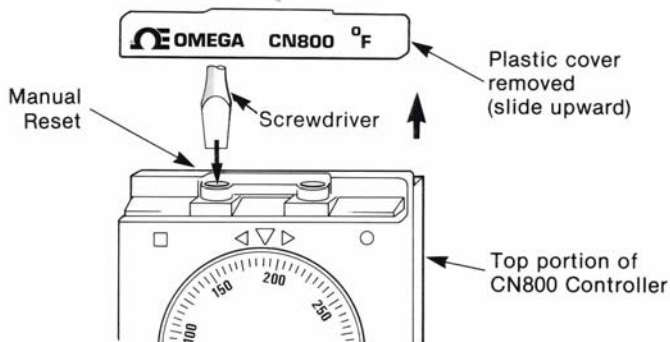
## SECTION 5 MANUAL RESET (OFFSET ADJUSTMENT)

Time proportioning usually gives accurate control, but the actual process temperature may differ slightly from the setpoint for a particular process. This difference is called offset.

In most applications, the offset is small and not important. Usually no adjustment is necessary.

If it is necessary to remove offset:

Slide the protective cover up and out of the CN800 controller, to gain access to the manual reset potentiometer. Refer to Figure 5-1.



**Figure 5-1** Manual Reset Pot Location

For positive offsets, (actual process temperature above setpoint temperature) adjust potentiometer (pot) counter-clockwise.

For negative offsets, (actual process temperature below setpoint temperature) adjust pot clockwise.

## SECTION 6 SCALE LOCK

To operate, raise the lower protective cover. With a screwdriver, rotate the scale lock until the protrusion engages, as shown in Figure 6-1. To unlock, disengage the protrusion either clockwise or counter-clockwise.

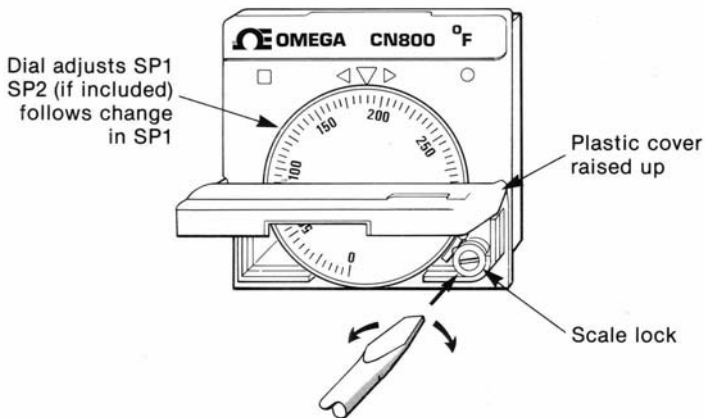


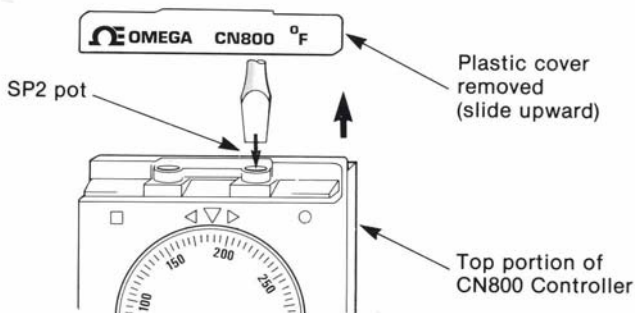
Figure 6-1 Scale Lock Placement

## SECTION 7 SP2 ADJUSTMENT

SP2 operation is slaved to SP1. It remains a fixed positive or negative difference from SP1. SP2 shifts as SP1 is changed by turning the dial. Maximum adjustment from SP1 is 10% of the full range.

SP2 Differential Setting:

Refer to Figure 7-1. Remove (by lifting off entirely) the top protective cover. This enables you to access the SP2 pot. A small flat bladed screwdriver is needed to adjust the pot.



**Figure 7-1** Detail of Top Front of CN800 Controller with Protective Cover Removed

As an example to set up SP2, using the following process temperatures:

SP1 = 200°F and SP2 = 210°F

#### METHOD 1

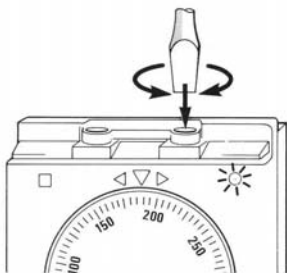
1. With the CN800 controller powered up, allow the temperature to stabilize with SP1 dial set to temperature of 200°F. Thus process temperature is at 200°F.



2. Adjust SP1 to 190° - process temperature will remain at 200° for a period of time depending upon the thermal inertia of the system.



3. Quickly adjust SP2 until the right (round) LED operates.



4. As the process temperature may have cooled down slightly from 200° by the time that SP2 LED is lit, repeat steps 1 through 3 several times until you are confident that SP2 has the 10° differential required.

#### **METHOD 2**

An alternative method is to use a calibrator or sensor simulator to provide the correct sensor input and adjust SP2 until SP2 LED lights.

## **SECTION 8 CN800 RECALIBRATION PROCEDURE**

### **NOTES**

DO NOT RECALIBRATE THE CN800 SERIES CONTROLLER WHEN YOU RECEIVE IT. THE UNIT IS READY TO USE.

After extensive use, calibration may drift out of specs. At that time, recalibration may be performed.

Equipment required:

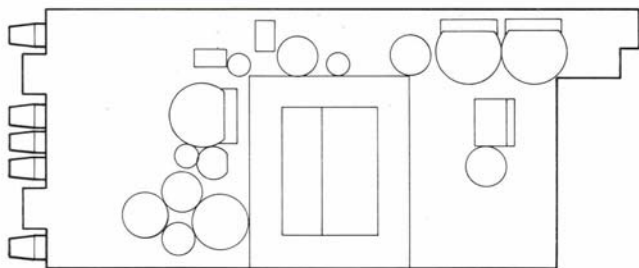
1. Compensated mV source (or resistance box for RTD units)
2. 3-1/2 digit DVM with 20VDC range and
3. Component layout diagram (refer to Figure 8-1)

## PROCEDURE

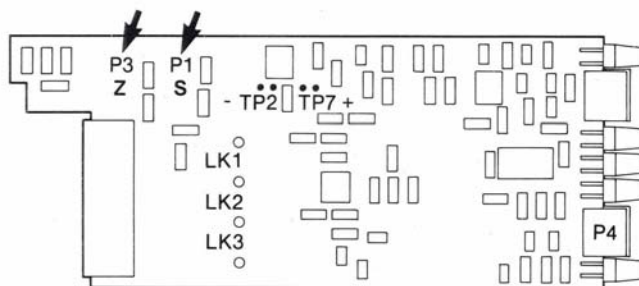
### NOTE

All test points and potentiometers can be accessed through the vents in the plastic casing.

1. Apply power to the CN800 controller and connect sensor terminals to the simulated thermocouple or RTD. Be sure the CN800 is in the horizontal position. Connect the DVM to test points TP2 ( - ) and TP7 ( + ) and set DVM to the 20 volt DC range. Let the controller stay powered and stabilize for 1 hour before continuing.
2. Select convenient low and high calibration points. Normally it is 10% and 90% of range.
3. Adjust main setting thumbwheel to the low calibration point and apply appropriate simulated sensor input. Adjust pot marked 'Z' (P3) until 2.00 volts DC is registered on the DVM.
4. Adjust main setting thumbwheel to the high calibration point and apply appropriate simulated sensor input. Adjust pot marked 'S' (P1) until 2.00 volts DC is registered on the DVM.
5. Repeat steps 3 and 4 until no further adjustment is required to achieve the 2.00 volts DC readings.
6. Set thumbwheel to low position and with appropriate sensor input applied, adjust manual reset pot (P4 — under protective cover in the front of the unit) until Output 1 cycles with a 50% duty ratio. For on/off controllers, adjust the precise point at which the Output 1 switches 'on'.



**Bottom View**



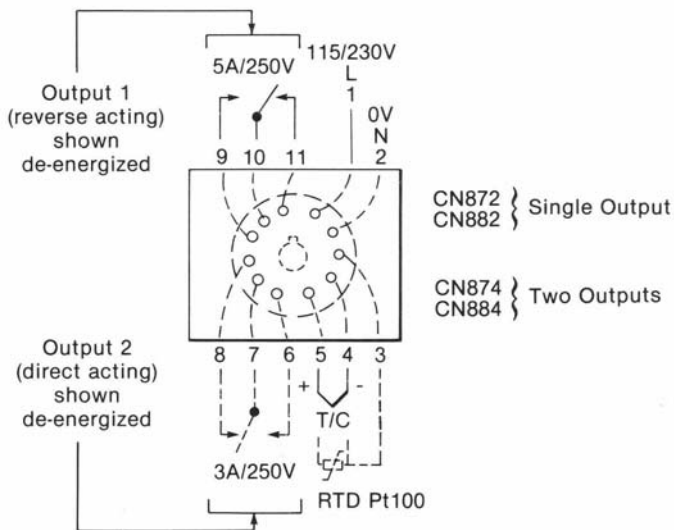
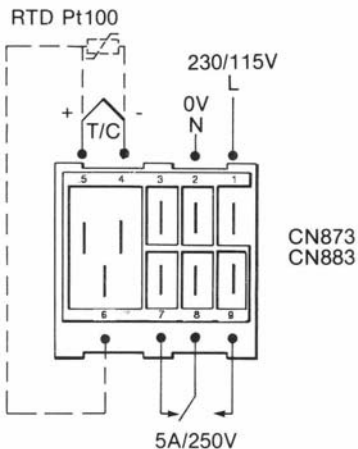
**Top View**

**Calibration points**

- TP2 0 volts DC (-) DVM Connection
- TP7 2 volts DC (+) DVM Connection

**Figure 8-1** Component Layout Diagram

## SECTION 9 WIRING





## SECTION 10 SPECIFICATIONS

### ELECTRICAL

**POWER:** 115VAC/230VAC, user-selectable (50-60 Hz) link changeable; factory set to 115VAC

**POWER CONSUMPTION:** 3VA

### OUTPUT

**OUTPUT 1 RELAY:** SPDT mechanical relay, rated 5A at 250VAC, resistive load

**OUTPUT 2 RELAY:** SPDT mechanical relay, rated 3A at 250VAC, resistive load

### SETPOINT

**SETPOINT 1:** Front dial adjustment

**SETPOINT 2:** Screwdriver adjustment within  $\pm 10\%$  of temperature range relative to setpoint 1

### ACCURACY

**ACCURACY:** 2% of full scale, within 5 to 95% of range for most range codes;  $\pm 4\%$  for range code T-NC

**ACCURACY REFERENCE CONDITIONS:**  $22^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 115/230V  $\pm 5\%$  after 30 minute minimum warm-up time

### CONTROL MODES

#### OUTPUT 1

**PROPORTIONAL BAND:** 3% full scale, fixed

**CYCLE TIME:** 25 seconds, nominal, fixed

**ON-OFF DEADBAND:** 2% of full scale, fixed

#### OUTPUT 2

**ON-OFF DEADBAND:** 2% of full scale

## SPECIFICATIONS (Cont'd)

### INPUT

<b>THERMOCOUPLE *:</b> <b>or RTD *:</b>	J,K,T,R, or S as ordered Pt 100/100 ohms at 0°C, ( $\alpha = 0.00385$ ), 2 or 3 wire connections
<b>SENSOR BURNOUT:</b>	upscale; automatic
<b>COMMON MODE:</b>	negligible effect to 264 V <sub>RMS</sub> , 50/60 Hz
<b>NORMAL MODE:</b>	negligible effect to full scale mV, 50/60 Hz

\* see range table in Section 1

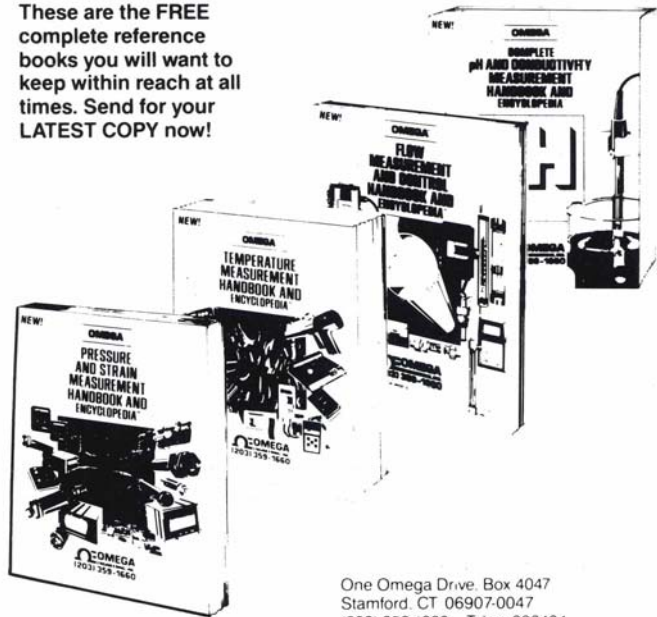
### GENERAL

#### AMBIENT TEMPERATURE

<b>RANGE:</b>	32 to 130°F (0 to 50°C)
<b>DIMENSIONS:</b>	1.89"H x 1.89"W x 3.8"D (48 x 48 x 97 mm)
<b>CONSTRUCTION:</b>	Flame retardant polycarbonate plastic
<b>PANEL CUTOUT:</b>	1.772" square (45 mm square)
<b>WEIGHT:</b>	9 ounces (250 grams)

# OMEGA... YOUR SOURCE FOR PROCESS MEASUREMENT AND CONTROL

These are the FREE  
complete reference  
books you will want to  
keep within reach at all  
times. Send for your  
LATEST COPY now!



One Omega Drive, Box 4047  
Stamford, CT 06907-0047  
(203) 359-1660 Telex 996404  
FAX: (203) 359-7700

**OMEGA**  
ENGINEERING, INC.  
*An OMEGA Technologies Company*

# OMEGA® ... Your Source for Process Measurement and Control

## TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors

## PRESSURE/STRAIN

- Transducers & Strain Gauges
- Load Cells & Pressure Gauges
- Instrumentation

## FLOW

- Rotameters & Flowmeter Systems
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Vortex Meters and Flow Computers

## pH

- Electrodes & Transmitters
- Benchtop/Laboratory Meters
- Controllers, Calibrators & Simulators

## DATA ACQUISITION

- Data Acquisition and Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Data Logging Systems
- Recorders, Printers & Plotters

## HEATERS

- Heating Cable
- Strip Heaters
- Cartridge Heaters
- Immersion Heaters
- Tubular & Band Heaters

**OMEGA**  
ENGINEERING, INC.

*An OMEGA Technologies Company*

One Omega Drive, Box 4047

Stamford, CT 06907-0047

(203) 359-1660 Telex: 996404 Cable: OMEGA FAX: (203) 359-7700