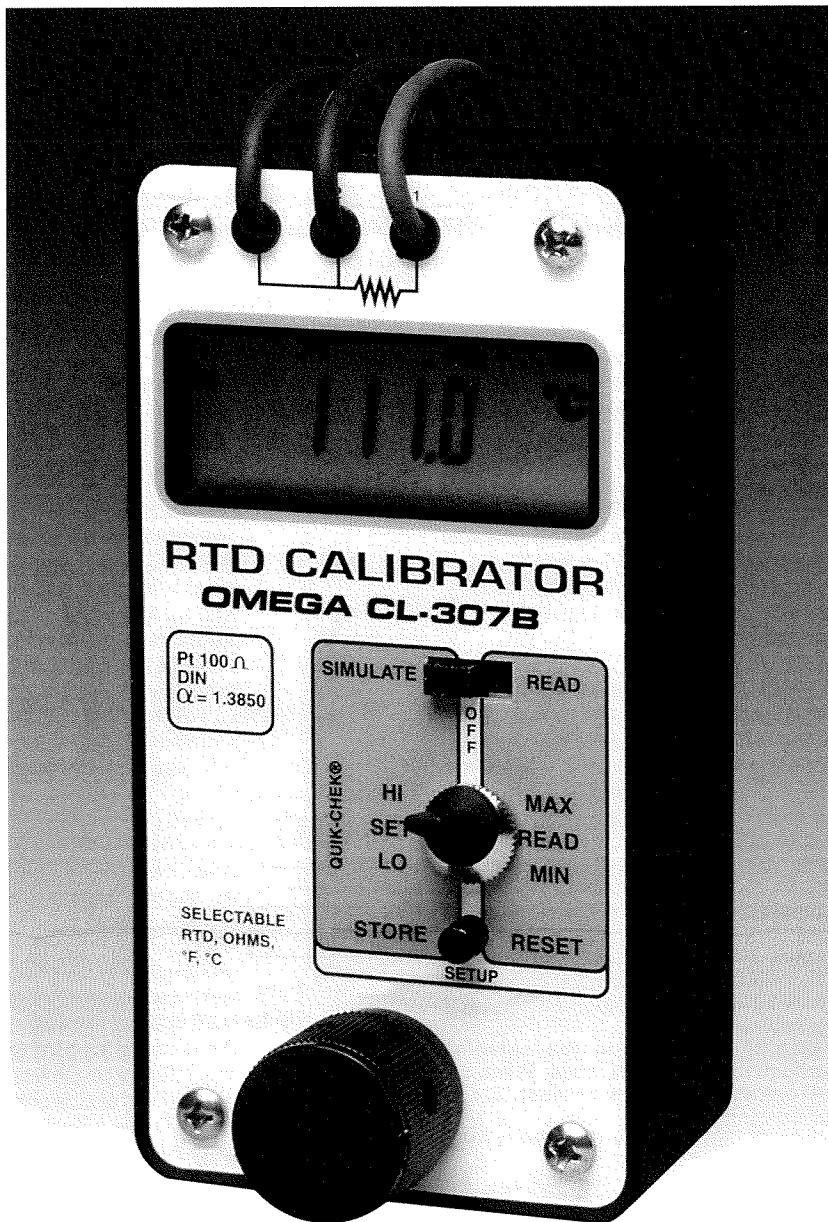




CL307B



RTD Calibrator



Operator's Manual

GENERAL DESCRIPTION

Omega Engineering's CL-307B RTD Calibrator lets you SIMULATE and READ RTDs over the entire industrial temperature range. Use with transmitters, single & dual channel recorders, controllers, alarms and indicators.

Field customize the Model CL-307B to lock-in 0.1° or 1° resolution, fixed °C or °F or front selectable °F/°C operation. Read and simulate 2-Wire and automatically compensate for 3-Wire RTDs with built-in leads.

"SIMULATE" MODE ACTS LIKE AN RTD SENSOR

Resolution is 0.1° C or F simulating the full range of Platinum 100 ohm RTDs into devices supplying a continuous excitation current of 0.09 to 1.1 mA. From 1.1 to 5.800 mA continuous excitation current the CL-307B resolution automatically adjusts to 1° C or F. Ohms range provides 0.01 Ohm resolution from 0.00 to 410.00 Ohms which automatically switches to 0.1 Ohm resolution for continuous excitation currents above 1.1 mA.

"QUIK-CHEK" function stores THREE output temperatures for real convenience. The ALTEK Model CL-307B simulates key temperatures for repetitive calibrations. Turn the knob to check trip points, controller

action or hysteresis. The fast response CL-307B sets quickly without overshoot. Memory is retained even when power is off.

"READ" MODE MEASURES RTDs DIRECTLY

The Model CL-307B display gives you fast, accurate temperature measurement with 0.1 and 1 degree or with 0.01 and 0.1 ohm resolution. Two and three wire hookups assure accuracy in short or long cable runs. Open RTDs and leads are detected and indicated on the LCD display. Two readings per second track fast moving temperatures.

RECALL MAXIMUM AND MINIMUM TEMPERATURES

"MAX" and "MIN" memories are continuously updated from turn-on or whenever the "RESET" button is pressed. Model CL-307B gives you a handy tool to monitor temperatures for drift or control deviation. Just flip the QUIK-CHEK switch to display the MINimum and MAXimum temperature measured since reset.

ADDITIONAL RTD TYPES

Additional RTD types and other resistive sensors are also available. The Metal, Base Resistance and Alpha value for the custom RTD curve must be specified.

OPERATING INSTRUCTIONS

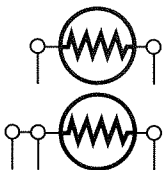
GENERAL

CONNECTIONS



The Model CL-307B accurately simulates and reads 2 and 3 wire RTDs. It has three leads permanently attached which are terminated with spade lugs. All connecting wires must be the same length and of the same material running along the same path to insure maximum accuracy.

TWO OR THREE WIRE



TURN ON

Each time the Model CL-307B is turned on, the LCD will display all segments for about 1 second. It then displays the currently selected RTD or Ohms mode for approximately 3 seconds. The currently selected temperature scale of °C or °F will then display for about 3 seconds. Depending on the configuration, RTD, Ohms, °C or °F may be selected during turn-on.

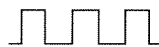
- 1) Move the power switch to SOURCE or READ
- 2) All segments on the LCD are turned on during self test
- 3) The display will indicate the selected RTD type for 3 seconds. Press the SETUP pushbutton to change between RTD and Ohms (based on configuration).
- 4) The display will indicate the selected temperature scale for 3 seconds. Press the SETUP pushbutton to switch between °C & °F (based on configuration).
- 5) The Model CL-307B will now Simulate or Read RTD or Ohms.

Depending on the configuration of the DIP switches the user prompts for RTD, Ohms, °C and °F may be skipped during turn-on.

The three "QUIK-CHEK" temperature values will be the same as previously stored. If a change is made between Ohms and RTD mode 100 Ohms will be stored for Ohms and 0°C (32°F) will be stored in all three "QUIK-CHEK" positions.

Hint: The Model CL-307B will automatically convert the temperatures in memory between °F and °C. For example, if 212.0°F is stored in HI and the Model CL-307B is switched to °C, 100.0°C will be displayed.

OPERATING WITH PULSED EXCITATION CURRENTS



Some distributed control systems, recorders, transmitters and other RTD input devices use intermittent, or pulsed, excitation currents to measure the resistance of the RTD. The Model CL-307B will not simulate correctly with these devices (see CALIBRATING ADDITIONAL INSTRUMENTS on page one).

SELECTING °F OR °C

°F
°C

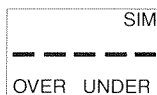
The Model CL-307B may be internally configured in one of three modes. The first two modes are for full-time use in °F or full-time use in °C. The third mode allows front panel selection of °F or °C each time the unit is turned on. If your facility is completely in °F or °C, set the internal DIP switches of the CL-307B to operate as a dedicated °F or °C instrument (see Setting Operating Mode below).

SELECTING AUTORANGING OR 1° RESOLUTION

The Model CL-307B may be internally configured to autorange or to constantly display with fixed resolution. When autoranging is selected, the Model CL-307B will display temperatures with 0.1° or 1° and ohms with 0.01 Ohm or 0.1 Ohm resolution. When fixed range is selected, the Model CL-307B will display temperatures with 1° and ohms with 0.1 Ohm resolution.

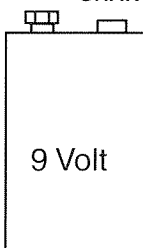
Note: Simulation of Pt 100 Ohm RTD into devices with greater than 1.1 mA of excitation current (and some custom ranges) is displayed with 1° resolution.

OVER RANGE/UNDER RANGE



Out-of-range temperatures are indicated by - - - - and OVER or UNDER on the display during READ mode. If this occurs check for proper connections and RTD type selection. During SIMULATE mode excitation currents below 0.090mA are indicated by the word SIM flashing on the display. Excitation currents above 5.8mA are indicated by - - - - and SIM flashing on the display. Check for proper connections.

CHANGING BATTERY



Low battery is indicated by BAT on the LCD display. Approximately 10 hours of operation remain before the LCD goes blank and the Model CL-307B shuts itself down. Turn the Model CL-307B off. Remove the four corner screws and lift the unit out of the case. The battery is fastened to the bottom printed circuit board and is easily removed.

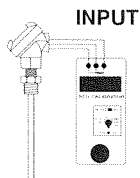
Note: If the new battery is installed within 30 seconds of removing the old battery the "QUIK-CHEK" values will remain in memory.

READ MODE

READ



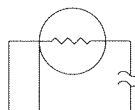
- 1) Set up the Model CL-307B for the RTD, Ohms and temperature scale (°C or °F).
- 2) Disconnect the wires from the resistance sensor to be read or checked.
- 3) Connect the Model CL-307B to the sensor to be measured, being careful to observe proper connections for 2 or 3 Wire hookups.
- 4) Display present reading, Maximum or Minimum temperature.



INPUT

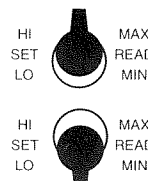
Whenever READ mode is selected the word READ will appear on the LCD. The Model CL-307B can measure temperatures in two ranges with resolution of 0.1° and 1°. The display is updated twice per second to continuously track fast moving temperatures. Using three wire hookups provides accurate readings in long cable runs.

OPEN RTDS



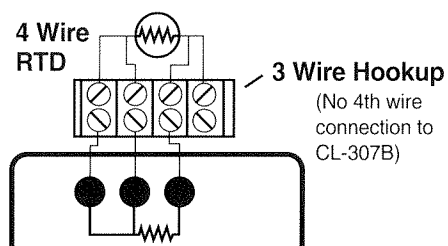
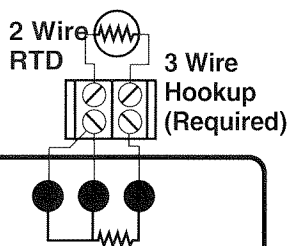
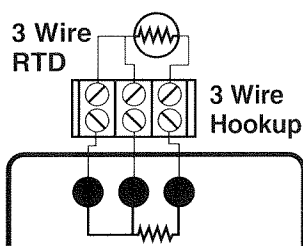
The Model CL-307B checks for open or high resistance connections. Open or burned out RTDS are indicated by - - - - on the display. Temperatures out of range for the RTD selected will be indicated by OVER and UNDER on the display.

MIN/MAX



To read the Maximum or Minimum temperature since READ mode was entered, simply switch to MAX or MIN. The value will appear on the LCD along with the word MAX or MIN. The MAX/MIN values are automatically updated and may be viewed at any time without disturbing the other values. Press RESET and the Model CL-307B will flash the display once to indicate it has transferred the present temperature into both MAX and MIN and will update them as the measured temperature changes.

HOOKUP READ MODE



SPECIFICATIONS

(Unless otherwise Indicated, specifications are in % of 400 Ohm Span at 1.0 mA excitation current @ 23° C

GENERAL

TEMPERATURE DRIFT: $\pm 0.01\%$ / °C
 OPERATING TEMPERATURE RANGE: -5 to +140° F (-20 to +60° C)
 STORAGE TEMPERATURE RANGE: -22 to +175° F (-30 to +80° C)
 RELATIVE HUMIDITY: 10 to 90%, non-condensing
 WARM UP TIME: 30 seconds to maximum accuracy
 OVERLOAD PROTECTION: Electronically protected to 40 VDC between leads 1 & 2, fuse protected to 125 VAC, 5A between leads 2 & 3
 BATTERY LIFE: 9 Volt Alkaline: 50 hours
 LOW BATTERY: "BAT" indication on LCD at 7 Volts nominal, approximately 10 hours left
 OVERALL SIZE: 2 1/2 x 2 5/8 x 5 1/8 inches (63.5 x 66.7 x 130 mm)
 LEADS: Approximately 18" (0.46m) terminated with spade lugs
 WEIGHT: 11.5 oz. (0.33 kg)
 CARRYING CASE: Included, zippered with belt loop

SIMULATE MODE (SIMULATION OF RESISTANCE OUTPUT)

ACCURACY:
 $\pm 0.05\%$ from 1 mA to 5.8 mA of excitation current
 $\pm (0.05\% + \frac{0.01 \text{ mV}}{\text{mA Excitation Current}})$ from 0.09 to 1 mA of excitation current
 OUTPUT RESISTANCE RANGE: 0.00 to 400.00 Ohms
 ALLOWABLE EXTERNAL EXCITATION CURRENT: 0.090 to 5.800mA continuous DC (See CALIBRATING ADDITIONAL INSTRUMENTS on page one for calibrators compatible with pulsed or intermittent excitation currents)

READ MODE (MEASUREMENT OF RTD SENSOR)

ACCURACY: $\pm 0.05\%$
 EXCITATION CURRENT SUPPLIED: 1 mA, nominal
 NORMAL MODE REJECTION: 50/60 Hz, 50 db
 COMMON MODE REJECTION: 50/60 Hz, 100 db

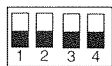
Specifications subject to change without notice

STANDARD 111 RANGES, RESOLUTION AND ACCURACY

RTD Type	ALPHA	RANGE	ACCURACY	RANGE	ACCURACY
Pt 100 Ω (DIN/IEC/JIS 1989)	1.3850	-200.0 to 200.0°C	$\pm 0.5^\circ\text{C}$	-328.0 to 212.0°F	$\pm 0.9^\circ\text{F}$
		200.0 to 700.0°C	$\pm 0.6^\circ\text{C}$	212.0 to 750.0°F	$\pm 1.0^\circ\text{F}$
		700.0 to 850.0°C	$\pm 0.7^\circ\text{C}$	750.0 to 1200.0°F	$\pm 1.1^\circ\text{F}$
				1200.0 to 1562.0°F	$\pm 1.2^\circ\text{F}$
Ohms		0.00 to 410.00	$\pm 0.2\Omega$		

OPERATING INSTRUCTIONS

SETTING OPERATING MODE (DIP SWITCHES)



- 1) Turn the Model CL-307B OFF
- 2) Remove the 4 corner screws and lift faceplate assembly out of the case
- 3) Set the DIP switches for your options as diagrammed below

Note: °C/°F selection is the default for shipments in the U.S.A. °C for all other countries.

AUTORANGING

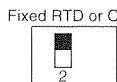
Switches between autoranging 0.1°/1° (0.01 Ohm/0.1 Ohm) and fixed 1° (0.1 Ohm).



*Factory Settings (Switches 1 and 2 Down)

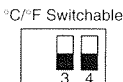
FULL TIME RTD OR OHMS

Switches between full time RTD or Ohms Mode (whichever is currently selected) and selectable modes at turn on.



TEMPERATURE SCALE

Switches between fixed °F, fixed °C or °C/°F selection at turn on.



1 Factory Setting --- USA
2 Factory Setting --- All other countries

OPERATING INSTRUCTIONS

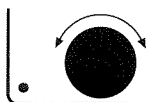
SIMULATE MODE (RESISTANCE OUTPUT OR RTD TEMPERATURE EQUIVALENT)

SIMULATE



- 1) Set up the Model CL-307B for RTD or Ohms and temperature scale (°C or °F).
- 2) Disconnect the input wires from the device to be calibrated or checked.
- 3) Connect the Model CL-307B to the device to be calibrated, being careful to observe proper connections for 2 or 3 Wire hookups.
- 4) Adjust the digital pot to the desired output value.

OUTPUT

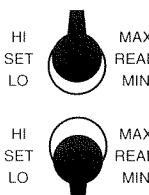


Whenever SIMULATE mode is selected the word SIM will appear on the LCD. SIM will flash when the Model CL-307B is measuring the external excitation current and will be steady when accurately simulating a resistance. To change the output value, turn the speed sensitive digital pot. Turning the pot slowly will cause a gradual change in the output. A faster change will occur when the pot is turned faster. A filter circuit limits response when the pot is turned too fast. This function operates in all three output positions (HI, SET & LO).

STORE



"QUIK-CHEK"



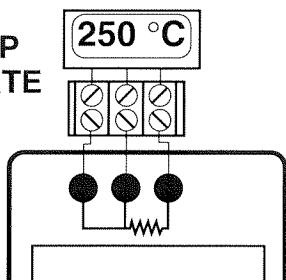
- 1) Switch to HI (or LO).
 - 2) Turn the digital pot to desired value.
 - 3) Press STORE. The LCD will flash once indicating that the value has been stored.
- If a value is in the SET position and you want that value in HI or LO, press and hold the STORE button while moving the switch to HI or LO. The LCD will flash once indicating that the value has been stored. Release the STORE button. When there is no excitation current or the current is less than 0.09 mA SIM will flash on the LCD. "QUIK-CHEK" values may be stored with SIM flashing.

Any time you need a stored value just throw the "QUIK-CHEK" switch. Any value in the RTD range may be stored in HI & LO. The Model CL-307B remembers the HI, LO and SET values for you with the power on or off. The resolution of the stored value is based on the excitation from the receiver. When RTD type is selected after Ohms was selected 0°C or 32°F is stored in all "QUIK-CHEK" positions. When the ohms range is selected, 100 will be the setting for all "QUIK-CHEK" positions.

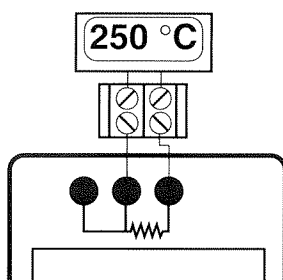
NOTE

SIM constantly flashing on the LCD indicates that the excitation current is missing, out of range or is intermittent. Check to see that the device being calibrated has operating power and that the 307B is properly connected. Also check the manual for the device to make sure that the excitation current is in the range of 0.090 to 5.800 milliamps. The Model 307B will simulate only with instruments that use fixed excitation currents. Some "smart" transmitters and scanning recorders of indicators use intermittent (pulsed) currents to measure RTD's. Try putting recorders into a calibrate mode or lock them into one channel. See CALIBRATING ADDITIONAL INSTRUMENTS on page one for more information.

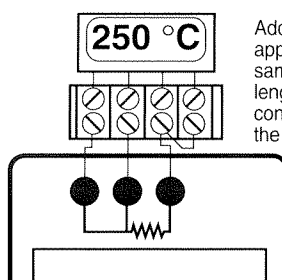
**HOOKUP
SIMULATE
MODE**



2 Wire Receiver



4 Wire Receiver



Add a jumper approximately the same gauge and length as the wires connected to the 307B

OMEGA CL-307B FIELD CALIBRATION PROCEDURE

Suggested Equipment:

- 1) 7½ digit volt meter (accuracy $\pm 0.004\%$ of reading at 400mV).
- 2) Current Source (accuracy $\pm 0.01\%$ of setting at 1mA).
- 3) Decade box. Read resistance's with a 7½ digit ohm meter (4-wire mode) and record the following values on a copy of Table 1. (400.0 Ω and 100.0 Ω)

Precautions:

- 1) Please observe anti-static procedures.
- 2) Avoid touching the connections, to limit errors in calibration.
- 3) Before any adjustments to the model CL-307B are made, remove the four corner screws and install a fresh 9-volt battery.

CALIBRATION PROCEDURE

Record the position of the DIP switches on a copy of Table 1.

SIMULATE MODE - To start calibration, place the DIP switches in the up position. The unit is now in a special test/calibrate mode.

- a) Turn unit on to **simulate** and press the STORE / RESET push-button to scroll unit until the **OHM** symbol is displayed on the LCD.
- b) Connect the inside leads of the CL-307B (1 & 2) to the current source. Connect the 3rd wire (3) to the negative of the DVM and connect the positive lead of the DVM to TP on the CL-307B (See Figure 1).
- c) Set the Current Source to 1.0mA.
- d) Dial the CL-307B until the LCD displays 400.00 ohms, then place switches 1 and 2 of the DIP switch in the down position and allow the unit to settle for approximately 10 seconds.

e) Adjust pot R108 (see Figure 2) until the **DVM READS THE SAME AS THE CL-307B**.

Adjustment Tolerance: $\pm 0.1\text{mV}$.

Note: Allow 10 seconds for both the DVM and the CL-307B to settle after each adjustment.

- f) Place DIP switches 1 and 2 up and dial the CL-307B to display 200.00 ohms, then place DIP switches 1 and 2 down.
- g) Set the Current Source to 2.0mA and allow unit to settle for approximately 10 seconds.
- h) Dial the CL-307B so the DVM is as close to 400.00mV as possible.
- i) Adjust pot R117 (see Figure 2) until the **CL-307B DISPLAYS 200.0**.
- j) Place DIP switches 1 and 2 up. Dial the CL-307B and set the Current Source to the following values:

CL-307B setting:	Current Source setting:	DVM should read:	Spec.
(Ω)	(mA)	(mV)	(mV)
10.00	1.00000	10.00	
100.00	1.00000	100.00	± 0.20
400.00	1.00000	400.00	
10.0	2.00000	20.00	
100.0	2.00000	200.00	± 0.40
400.0	2.00000	800.00	

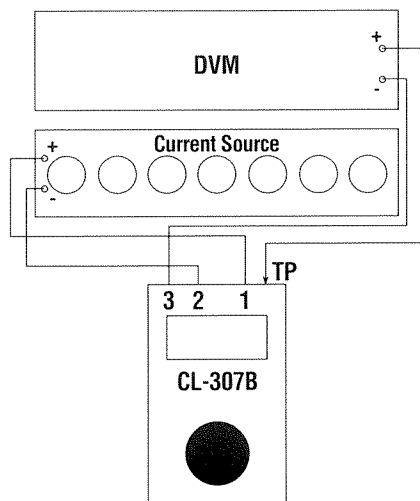
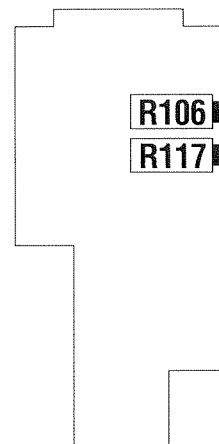


Figure 1



CL-307B Lower PCB

Figure 2

CALIBRATION PROCEDURE

Read Mode - Turn the CL-307B on in read mode. Allow 60 seconds the unit to settle.

- a) Connect the decade box to the CL-307B. (see Figure 3).
- b) Dial the decade box to 100 and 400 ohms. Allow the 211 approximately 10 seconds to settle between each setting. Compare the CL-307B readings to the previously recorded values in Table 2.

Tolerance: ± 0.10 ohms.

Table 1

Dip	1	2	3	4
Up				
Dn.				

Table 2

Decade Box Setting	Actual value in ohms
100.00	
400.00	

Restore to Normal Operation

- a) Place all DIP switches in the DOWN position.
- b) Turn the unit off, then on again.
- c) Press button to scroll the unit to the RTD type.
- d) Turn unit off.
- e) Restore DIP switches to original positions as recorded in Table 2.

NOTE: If the unit fails to meet any of its stated specifications after recalibration, call Omega's Customer Service Department for an Authorized Return (AR) number.

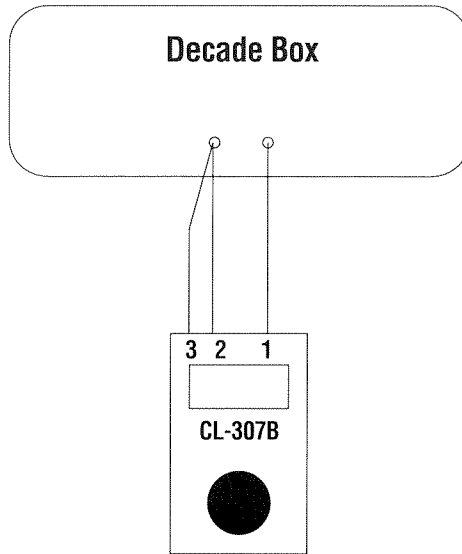


Figure 3



OMEGAnetSM On-Line Service
<http://www.omega.com>

Internet e-mail
info@omega.com

Servicing North America:

USA:
ISO 9001 Certified

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

Canada:

976 Berger
Laval (Quebec) H7L 5A1
Tel: (514) 856-6928 FAX: (514) 856-6886

For immediate technical or application assistance:

USA and Canada:

Sales Service: 1-800-826-6342 / 1-800-TC-OMEGASM
Customer Service: 1-800-622-2378 / 1-800-622-BESTSM
Engineering Service: 1-800-872-9436 / 1-800-USA-WHENSM
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico:

Tel: (95) 800-TC-OMEGASM FAX: (95) 203-359-7807

Servicing Europe:

Benelux:

Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: (31) 20 6418405 FAX: 42 (69) 631114
e-mail: nl@omega.com

Czech Republic:

Ostravska 767, 733 01 Karvina
Tel: 42 (69) 6311899 FAX: 42 (69) 631114
e-mail: czech@omega.com

France:

9, Rue Denis Papin, 78190 Trappes
Tel: 33 (1) 30.62.14.00 FAX: 33 (1) 30.69.91.20
Toll Free in France: 05-4-OMEGA
e-mail: france@omega.com

Germany/Austria:

Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
Tel: 49 (07056) 3017 FAX: 49 (07056) 8540
Toll Free in Germany: 0130 11 21 66

United Kingdom:

ISO 9002 Certified

25 Swannington Road, Broughton Astley, Leicestershire,
LE9 6TU, England
Tel: 44 (1455) 285520 FAX: 44 (1455) 283912
Toll Free in England: 0800-488-488
e-mail: uk@omega.com

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

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

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to @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. P.O. 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. P.O. number to cover the cost of 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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Where Do I find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!**

TEMPERATURE

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

PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gauges
- ☑ Load cells & Pressure Gauges
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

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

HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments