1 YEAR
WARRANTY

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User's Guide

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MODEL PHTX-11
pH Two Wire Transmitter

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MODEL PHTX-11 SPECIFICATIONS

Spans:	Any 1 thru 14, jumper programmable zero and span adjustable
Input Impedance:	1×10^{13} ohm
Output Current:	4 to 20mA
Power Supply:	12 to 80 VDC
	10 to 50mA 10 to 40 VDC >OPTIONAL
Load Resistor:	0 to 3400 ohms
Linearity:	±.01 pH
Temperature Coefficient:	±.02%/°C (Display and current out)
Accuracy:	±.01 pH
Repeatability:	±.01 pH
Output meter:	3½ digit LCD
Supply Voltage Effect:	.01%/Volt
Operating Temperature:	-10 to +60°C
R.H.:	0 to 95%
Isolation:	600 VDC or peak
Common Mode Rej.:	-120dB @ 60 Hz
Temperature Compensation:	Manual or auto

PART I - INTRODUCTION

General description

The OMEGA™ Model PHTX-11 is a 2-wire pH/ORP transmitter featuring input-output isolation, wide power supply range, high input impedance, LCD digital display, modular construction, programmable span selection, manual/automatic temperature compensation and a NEMA 4X housing as a standard enclosure.

The Model PHTX-11 accepts as its input any pH probe via a BNC co-axial connector. It transforms the probe signal to a 4 to 20mA D.C. signal that may be transmitted over 2-wires to a control location. The signal wires also provide power to the transmitter. The output is monitored by placing a load resistor in the current loop. Any D.C. power supply from 12 to 80 volts may be used. The input is isolated from the output to prevent accidental damage of sensitive data gathering equipment at the control location.

The pH level is constantly displayed on a 3½ digit L.C.D. A push button switch allows the display to indicate the mA output on command.

The user can change the range of output signal by utilizing jumpers on one of the circuit boards and adjusting the zero and span pots. The 4 to 20mA output can be for the full 0 to 14 pH range or as little as 1 pH unit, for example 6 to 7 pH.

PART II - INSTALLATION

1. Unpacking

After unpacking, remove instrument cover, remove shipping ties or clamp. Note any special instructions included in the package.

2. Mounting

2.0 Before mounting the signal conditioner enclosure, remove the assembled circuit boards by removing the two phillips head screws in the bottom of the enclosure.

2.1 Conduit Mounting - the unit can be supported by ridged conduit using the appropriate size hubs in the ends of the box (ie: 1/2" or 3/4"). Cut the threaded male portion to allow room for the circuit board.

2.2 Flat Surface - mounting to a flat surface requires the heavy PVC mounting feet be attached to the box. The surface should be drilled and the feet mounted with #10 screws and nuts.

2.3 Pipe Mounting - attachment to a round pipe requires "U" bolts and nuts. The "U" bolts should bolt to the heavy PVC mounting feet.

2.4 Panel Mounting - refer to Table II for hole sizes and locations. This mounting requires the PVC mounting feet and four PVC mounting blocks. The blocks are drilled and tapped for #10-24 screws.

3. Wiring

3.1 After the enclosure is properly mounted the wires for input, output, ground and remote temperature sensing should be routed through the enclosure hubs. These connections should be trimmed to the proper length and connected to the circuit board assembly. The circuit board assembly should then be placed in the enclosure and fastened to the bottom of the enclosure with the two phillips head screws supplied.

3.2 **The input probe** connector is a BNC jack mounted on the input circuit board. Use only a coaxial cable that has isolation around the shield. **The shield is isolated from ground** and this isolation should be maintained for proper operation. For best results, the probe cable should not be longer than 10 feet. Long cables result in slow response because the probe must charge the cable capacitance through the high probe source resistance.

3.3 **The output wires** are isolated from the input and ground, connections are made to the terminal strip observing polarity to the terminals marked +, - out. These wires are to be connected to a D.C. power supply through a load resistor. The wires can be as long as necessary.

3.4 **The Loop resistor** can be either in the positive or negative power supply lead. The value of the loop resistor depends on the voltage required at the monitoring location. Calculate the required power supply voltage from the following equation: Minimum power supply voltage = 12 + (.02 x RL). A convenient value for the loop resistor might be 250 ohms, resulting in a 1V to 5V output signal using this as an example: RL = 250 ohms, VO = 1V to 5V. Minimum supply voltage = 12 + (.02 x 250) = 17V. The maximum supply voltage is 80V.

3.5 **The temperature probe** is optional. If the probe is used, it should be connected to the terminal strip connection marked with the resistor symbol. The probe cable should be shielded and the shield connected to the ground terminal.

3.6 **Manual temperature compensation** requires only a resistor at the terminal strip connection marked with a resistor symbol. Refer to Table I for the value vs. temperature. An 8.66K resistor is normally supplied with the transmitter, this value is correct for 25°C compensation. The resistor used should be metal film ±50 ppm/°C or wire wound ± ppm/°C.

PART III - OPERATING INSTRUCTIONS & TECHNICAL INFORMATION

1. Controls

1.1 **Display switch** is labeled "Press for mA" on the cover. The display will indicate 0.00 pH to 14.00 pH when the switch is in the relaxed position. When the switch is pressed and held, the display will indicate the output current to mA, normally 4.0 mA to 20.0 mA.

1.2 **"pH CAL"** potentiometer is an offset adjustment for the pH probe on the input circuit board. This adjustment allows standardization of different probes, it affects the displayed readout and the output current.

1.3 **"Slope"** potentiometer is a gain adjustment on the input circuit board. This adjustment is used to standardize the readings for probes with less than 100% efficiency, it affects the displayed readout and the output current.

1.4 **"R19"** potentiometer is a gain adjustment on the output circuit board. This adjustment is factory set and should not need adjustment in the field, it affects the displayed pH readout only.

1.5 **"ZERO"** potentiometer is an offset adjustment on the output board. This adjustment sets the 4 mA output current level for the desired pH level, it is used in conjunction with the range switch. The "Zero" pot affects the output current only. There is interaction between the "Zero" and "Span" pots.

1.6 **"SPAN"** potentiometer is a gain adjustment on the output board. This adjustment sets the 20 mA output current level for the desired pH level, it is used in conjunction with the range switch. The "Span" pot affects the output current level only. There is interaction between the "Zero" and "Span" pots.

1.7 **Range jumpers** are located on the output board. These jumpers allow the user to increase the sensitivity of the output. There are 4 jumper pairs of pads, the uppermost position is not used; there are no traces connected to this pair of pads. Jumper #1 is located in the pair of pads second from the top, and this jumper is for full scale output currents of 6 to 14 pH units. Jumper #2 is located in the third pair of pads, it may be added to obtain a full scale output of 2 to 6 pH units. Jumper #3 is added for a full scale output of 1 to 2 pH units.

2. Operation

2.1 **Initialization** of the transmitter consists of making the connections described in the wiring (section II-3) of this manual and placing the sensor in a known buffer solution and turning the power on. The display should indicate the pH value of the buffer solution.

2.2 **Probe standardization** is accomplished by adjusting "pH CAL" with the probe in a 7.0 pH buffer solution for a reading of 7.0 and the "Slope" adjustment when the probe is in a 4.0 pH or a 10.0 buffer solution. The choice of a 4.0 or 10.0 is up to the user.

2.3 **Test the display** by pressing the display switch. The display should indicate mA and the decimal point should shift one place to the right.

PART IV - CALIBRATION

1. **The recommended calibration interval** for the transmitter is six months under normal operating conditions, and assuming the sensor is in good condition. This system may need adjustment to compensate for reduced efficiency of the sensor before the calibration interval.

2. Equipment Required
   2.1 pH Simulator or a millivolt source.

   2.2 Precision digital multimeter.

   2.3 D.C. power supply 24 to 30 volts.

   2.4 Load resistor 250 ohm or 500 ohm.

3. Calibration Procedure
   3.1 **Connect the equipment** as shown in block diagram. Use an 8.66K resistor for manual temperature compensation at the terminals with the resistor symbol (25°C compensation). Refer to Table I for resistance values and input millivolt values for other temperatures.

   3.2 **Before making any adjustments,** the output jumper should be in the full range position (Range #1). Input adjustments should not be made while the output is in an over current condition (ie: greater than 20mA). Remove the cover from the range switch and turn all switches "Off".

   3.3 **"pH CAL"** adjustment is made with the input at zero volts from the millivolt source or a pH of "7" on the pH Simulator. Adjust the pot until the display reads 7.00.

   3.4 **"SLOPE"** adjustment is made with the input at "14" pH on the pH Simulator. Refer to Table I for the millivolt equivalent if a millivolt source is used. Adjust "Slope" for a reading of 14.00.

   3.5 **Output ranging** is accomplished with the jumpers described in Section 1.7, they are used in conjunction with the Span and Zero adjustments.

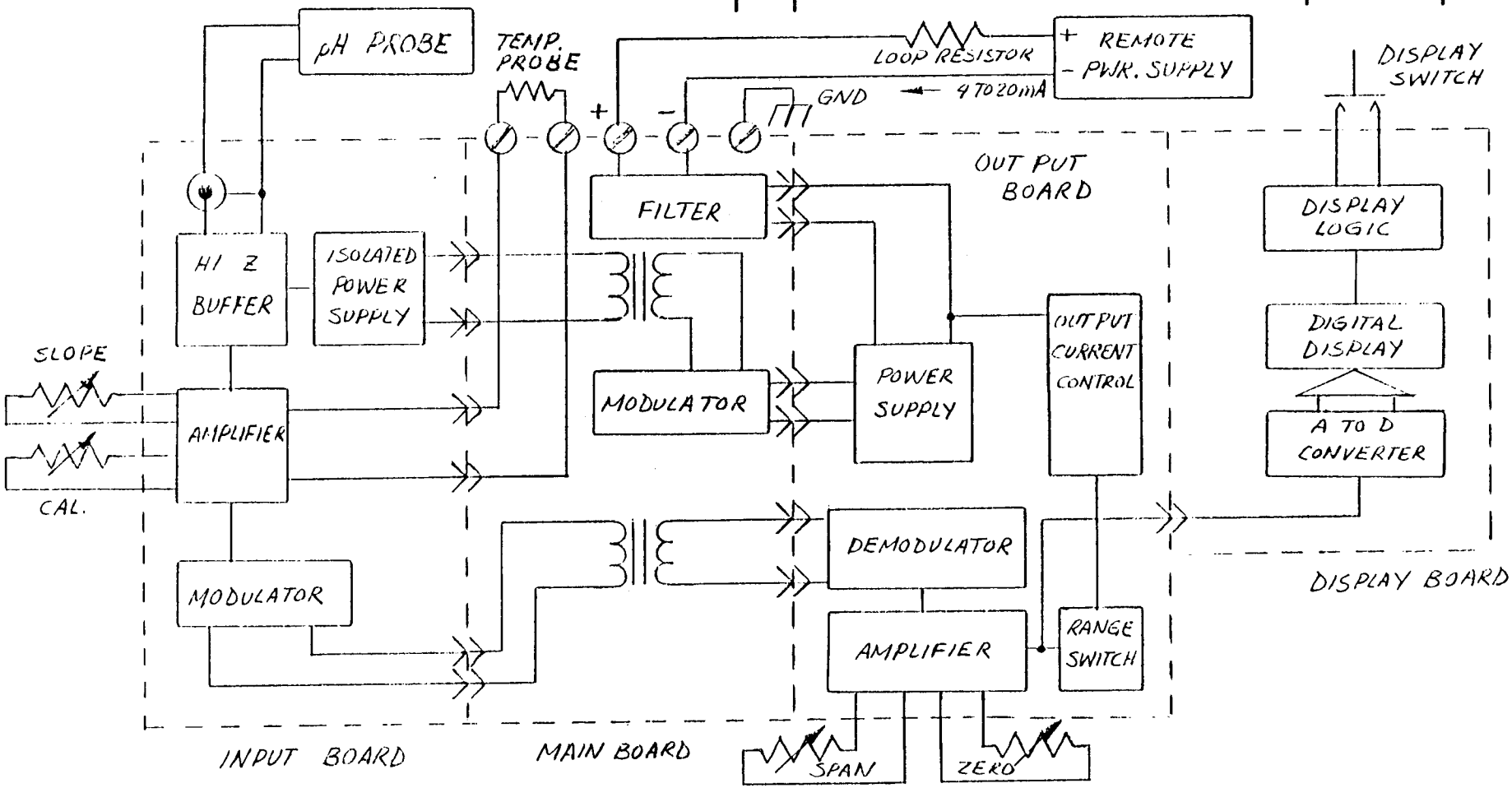
   RANGE #1 is with Jumper #1 in place. The PHTX-11 is shipped with this jumper in place. The output is adjustable for a span of 6 to 14 pH units, for spans of less than 14 pH, the "Zero" adjust sets for the 4 mA point at the lowest pH point of the range, and the "Span" sets the 20 mA point at the highest pH point of the range. The adjustments are sensitive and interactive, do not attempt large changes, work both adjustments in turn with small changes.

   RANGE #2 is with jumpers #1 and #2 in place. The output is adjustable for a span of 2 to 6 pH units.

RANGE #3 is with jumpers #1, #2, and #3 in place. The output is adjustable for a span of 1 or 2 pH units.

3.6 **SPAN & ZERO** adjustments interact and require going back and forth between them. Connect a millivolt source, or preferably a pH simulator at the input, a resistor at the temperature compensation terminals. (Refer to Table I for the correct resistor and millivolt values). Adjust the "Zero" for 4 mA and the "Span" for 20 mA at the desired pH levels.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS ±	DEC ±	ANGLES ±

APPROVALS	DATE
DRAWN	5-25-83
CHECKED	
	5/27/83

MODEL PHTX-II pH TRANSMITTER
BLOCK DIAGRAM

SCALE	SIZE	DRAWING NO.
NONE	A	10023

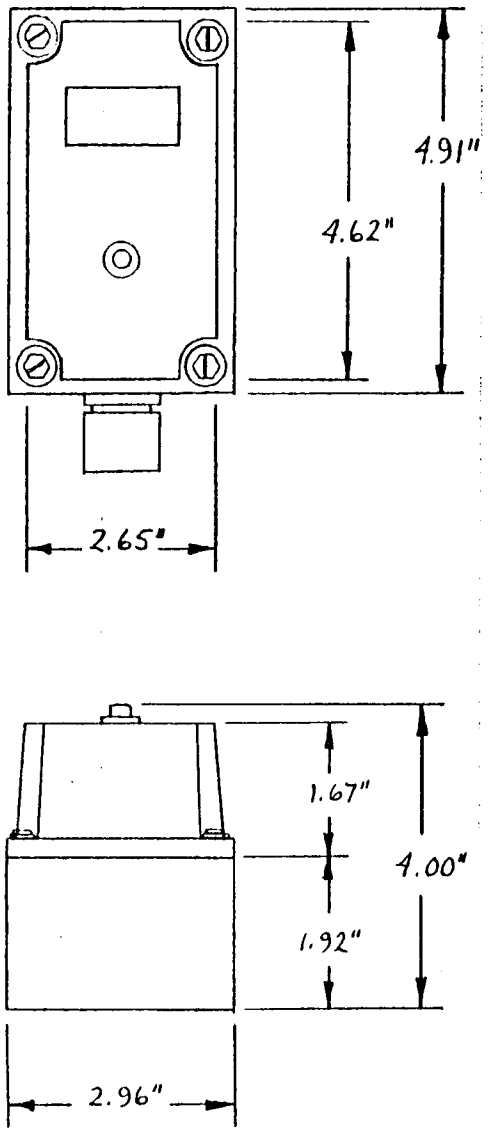
DO NOT SCALE DRAWING | SHEET

TABLE I

Temp.	0°C	25°C	40°C	50°C	70°C	90°C	100°C
pH	mv.	mv.	mv.	mv.	mv.	mv.	mv.
0	+379.3	+414.0	+434.9	+448.8	+476.6	+504.4	+518.2
1	+325.1	+354.9	+372.8	+384.7	+408.5	+432.3	+444.2
2	+270.1	+295.8	+310.7	+320.6	+340.5	+360.3	+370.2
3	+216.8	+236.6	+248.5	+256.5	+272.4	+288.2	+296.1
4	+162.6	+177.5	+186.4	+192.4	+204.3	+216.2	+222.1
5	+108.4	+118.3	+124.2	+128.2	+136.2	+144.1	+148.1
6	+ 54.19	+ 59.15	+ 62.13	+ 64.12	+ 68.09	+ 72.05	+ 74.03
7	0	0	0	0	0	0	0
8	- 54.19	- 59.15	- 62.13	- 64.12	- 68.09	- 72.05	- 74.03
9	-108.4	-118.3	-124.2	-128.2	-136.2	-144.1	-148.1
10	-162.6	-177.5	-186.4	-192.4	-204.3	-216.2	-222.1
11	-216.8	-236.6	-248.5	-256.5	-272.4	-288.2	-296.1
12	-270.1	-295.8	-310.7	-320.6	-340.5	-360.3	-370.2
13	-325.1	-354.9	-372.8	-384.7	-408.5	-432.3	-444.2
14	-379.3	-414.0	-434.9	-448.8	-476.6	-504.4	-518.2

Temp. Comp. Res.	20.27K	8.66K	5.94K	4.74K	3.08K	1.98K	1.58K

pH TRANSMITTER DIMENSIONS



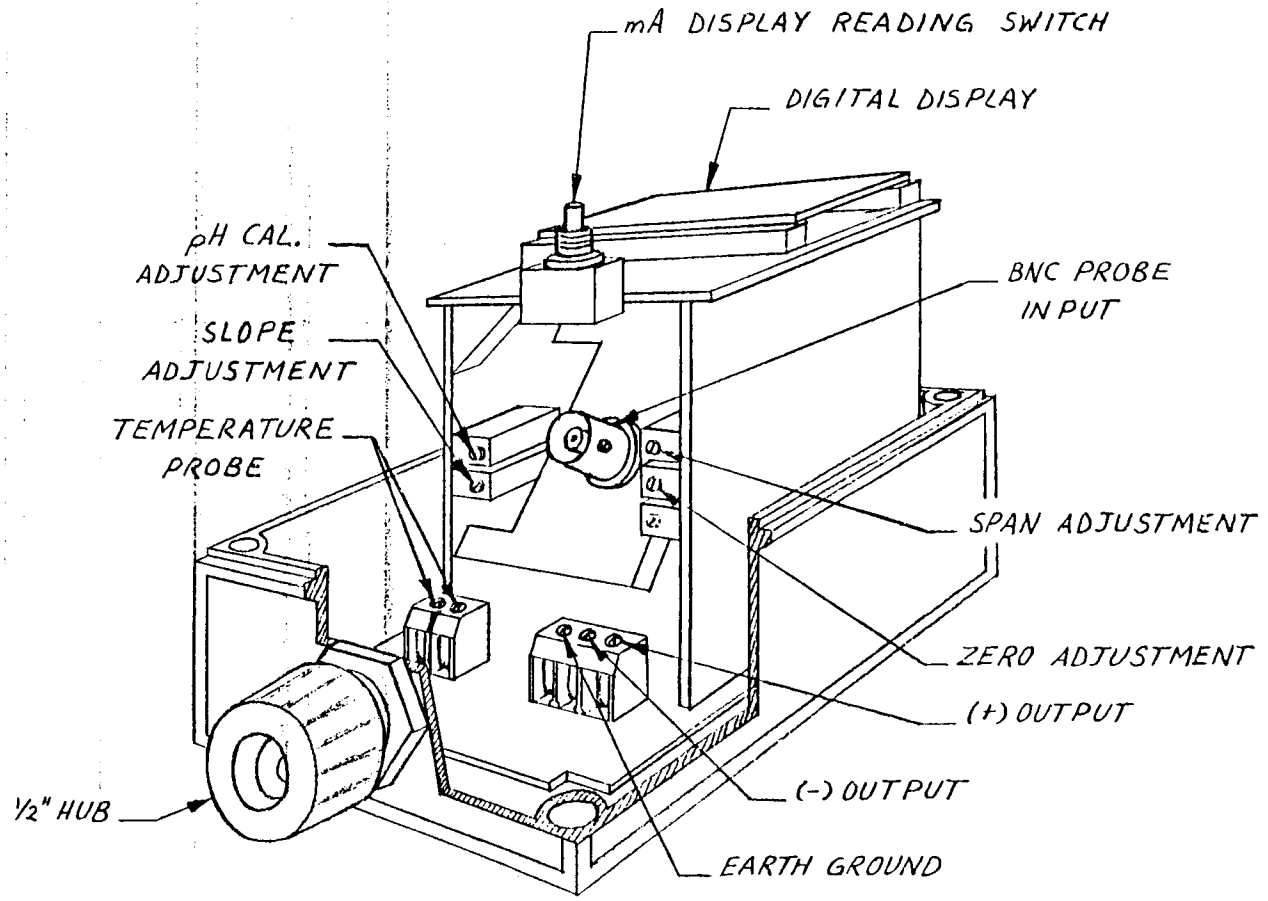
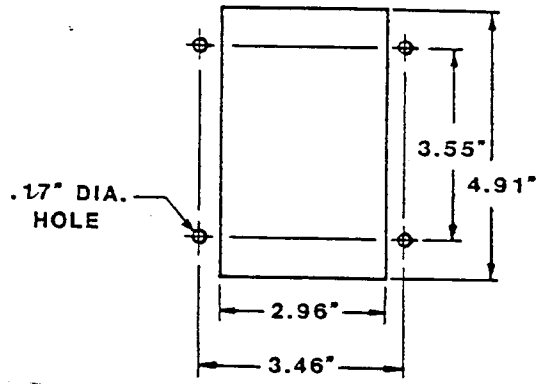


TABLE II

PANEL CUT-OUT



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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

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