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User's Guide

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FLSC90-A
Fiber Optic Flow Transmitter

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Table of Contents

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Section 1 - General Description

The OMEGA® FLSC90-A Fiber Optic Flow Signal Conditioner/Transmitter has been designed for use with the patented LIGHTSPEED™ Paddlewheel flow Sensors and will provide a linearized output signal of 4 to 20 mA or 1 to 5 Vdc. The output signal is scaled and directly proportional to the rate of flow measured by the paddlewheel sensor when installed in a FP9000 SERIES installation fitting. The transmitter is mounted in a die cast aluminum housing (NEMA4 rated).

Section 2 - Unpacking

Remove the packing list and verify that you have received all your equipment. If you have any questions about the shipment, please call our Customer Service Department at

1-800-622-2378 or 203-359-1660. We can also be reached on the Internet at
www.omega.com
e-mail: info@omega.com

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE:

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

The following following items are supplied in the box with your FLAC90-A.

- This Manual, #M-3586 (1 ea.)
- Fiber Optic Cable Sealing Washer (2 ea.)
- 249 Ohm Shunt Resister For Voltage Output Operation (1 ea.)

Section 3 - Theory of Operation

The FLSC90-A has been designed to interface directly with OMEGA's FP9000 Series LIGHTSPEED™ Paddlewheel flow sensors. The FLSC90-A signal conditioner / transmitter provides a high intensity light source to the patented paddlewheel flow sensor through a semi-rigid, duplex, fiber optic cable. Returning light pulses are measured and converted by the signal conditioner to an analog output current or voltage output that is directly proportional to the flow rate being measured by the paddlewheel.

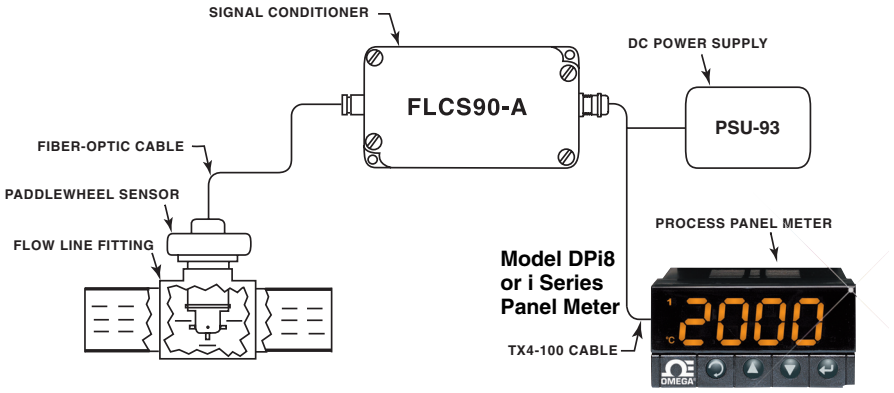

Figure 1 - Basic System Setup

Paddlewheel Flow Sensor: Use Model: FP9001 for pipe / fitting sizes 1 / 2" to 3"

Installation Fittings Available: see table below

Model No.	Pipe Size	Flow Range (GPM)
FP9005	½"	1.0 - 20
FP9007	¾"	2.0 - 30
FP9010	1"	4.0 - 55
FP9012	1 ¼"	4.5 - 90
FP9015	1 ½"	8.0 - 125
FP9020	2"	15 - 200
FP9025	2 ½"	20 - 300
FP9030	3"	25 - 500

Complimentary Instruments

Power Supply, OMEGA® Model No.: PSU-93
OMEGA® iSeries Panel Meters and Controllers

Accessories

Shielded Transmitter Cable, OMEGA® Model No.: TX4-100 (100 ft)
Fiber Optic Extension Cable, OMEGA® Model No.: FLSC90-CA9

Section 4 – Mounting

The FLSC90-A is mounted by using the internal mounting holes located inside the aluminum enclosure with the lid removed. Refer to figure below for mounting dimensions.

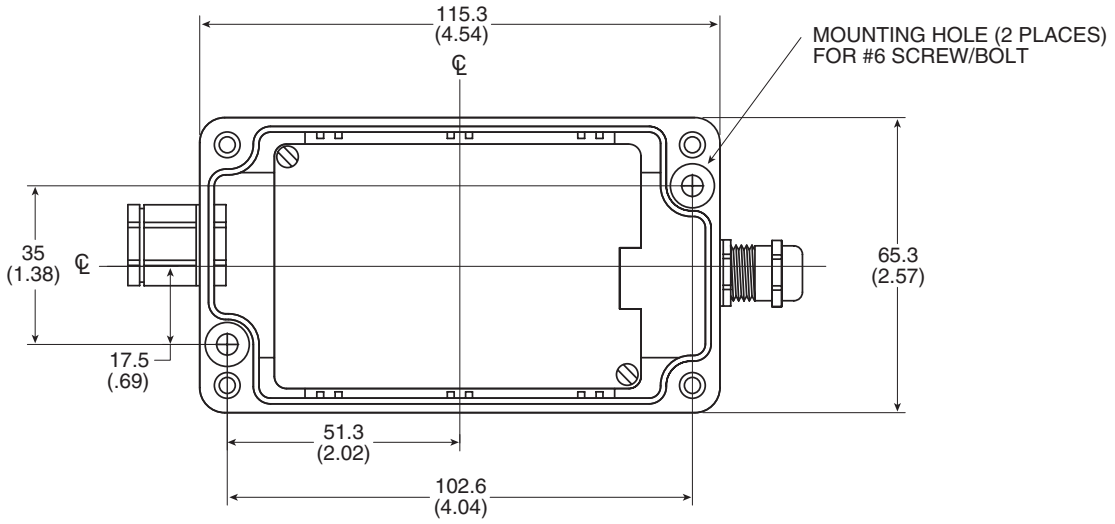

Figure 2 - Mounting Dimensions, mm (inches)

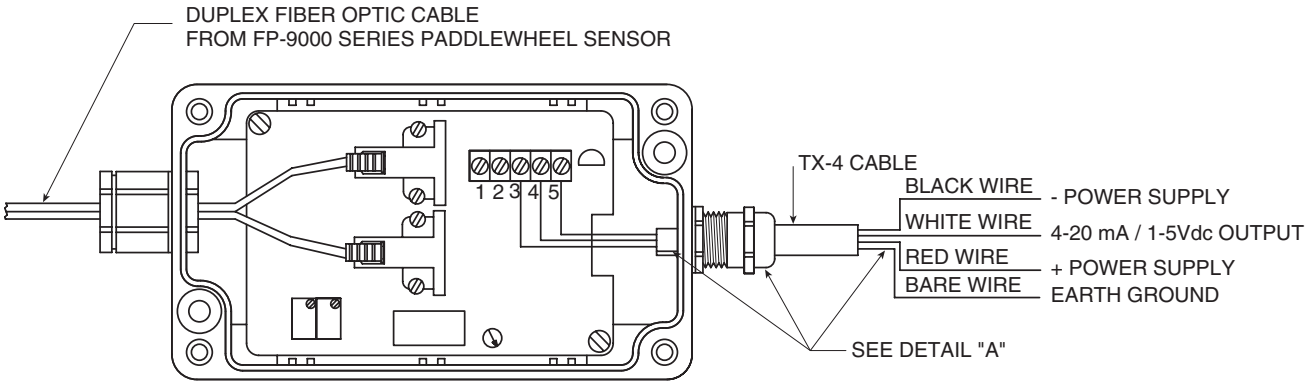

Figure 3 - Basic Connections

Maintaining Electrical Noise Immunity

DETAIL "A" ENCLOSURE TO EARTH GROUND CABLE CONNECTION

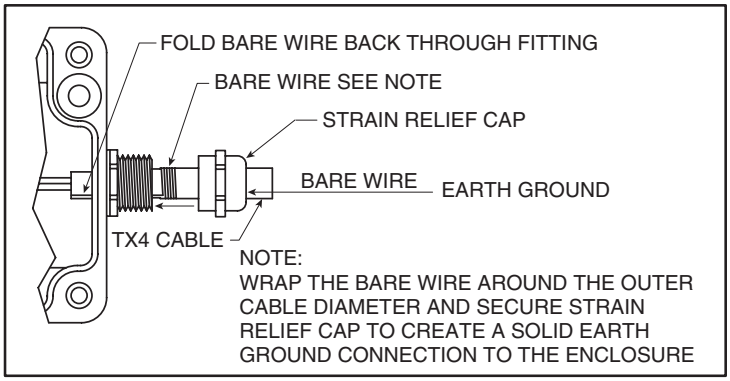

Figure 4 - Enclosure To Earth Ground Cable Connection

NOTE:

To maintain proper electrical noise immunity the shielded cable bare wire must be securley fastened to the enclosure housing as shown above. The other end of the cables bare wire must be connected to earth ground.

Section 5 – Fiber Optic Sensor/Cable Installation

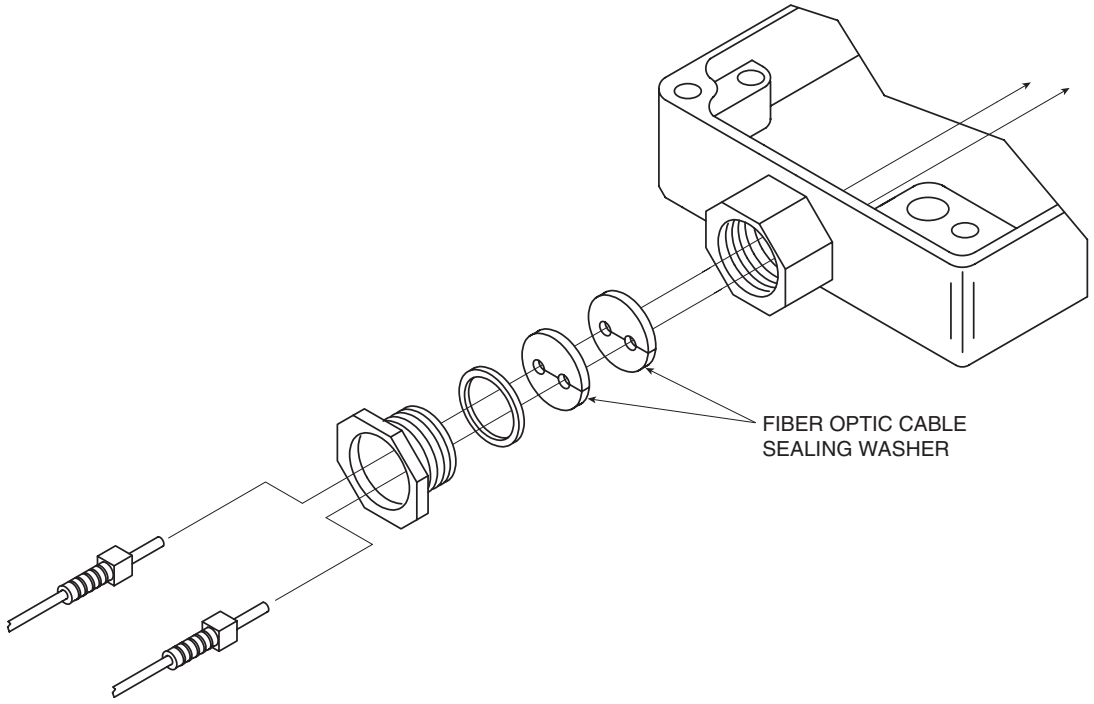

Figure 5 - Sensor Cable/Fitting Installation

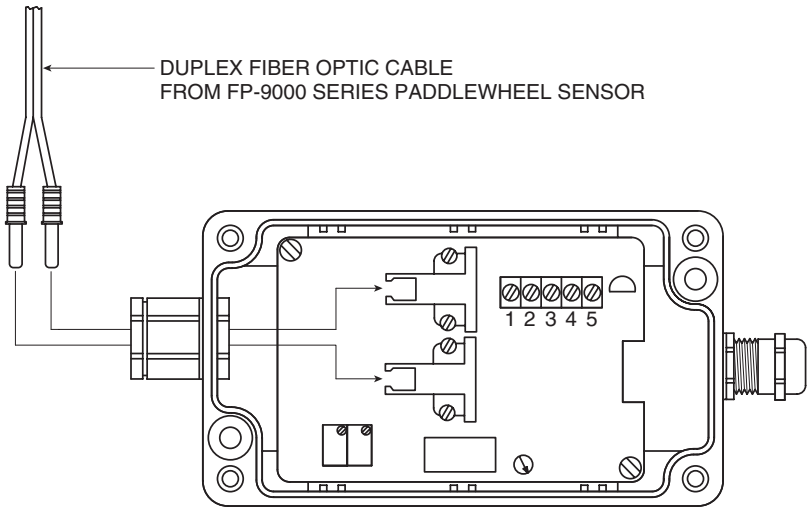

Figure 6 - Sensor Cable Installation

Section 6 – Using the Fiber Optic Extension Cable (FLSC90-CA9)

Where in applications such, that the fiber optic sensor must be installed farther than the attached duplex cable on the sensor will allow, an extension cable is available (Omega Model No. FLSC90-CA9. This accessory extends the total overall distance between the paddlewheel sensor and the signal conditioner to 18'. It is not recommended that more than one extension cable be used in your application. The farther the fiber optic cable is extended, the less the sensors ability to return light pulses that are high enough in amplitude for the signal conditioner to process.

NOTE:

When measuring the flow of dirty, discolored, or cloudy liquids such as, oil, ink, milk or others, if possible, the sensor cable should not be extended beyond the standard 9 feet and may also require to be shortened for proper operation in such applications.

Section 7 – Electrical Power/Output Connection

TB1 Terminal Block Connections

1. Calibration Signal Input (Square wave, 6.5 V TTL)
2. No Connection
3. + Power Supply
4. + mA/Vdc Output
5. – Power Supply

Transmitter Wiring Examples

NOTE:

During normal operation a shielded cable should be used, such as Omega's TX4-100 cable. See figure 4 for proper earth ground wiring connections to the enclosure body.

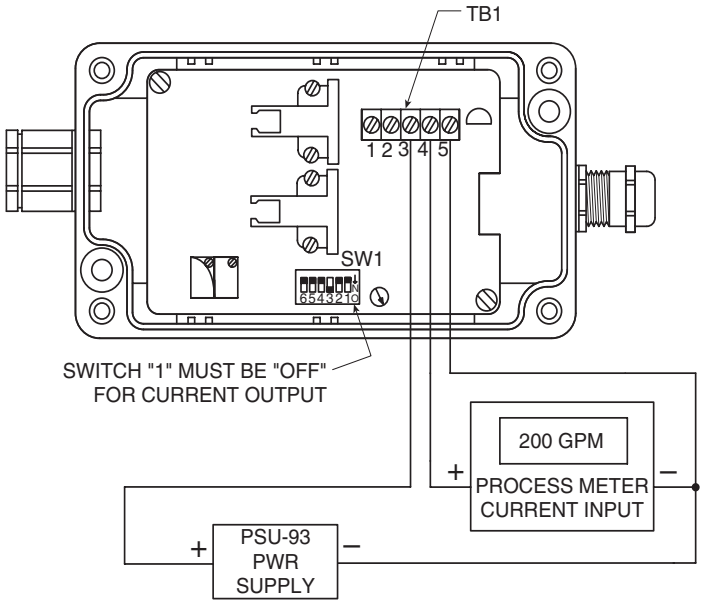

Figure 7 - Current Output (4 to 20 mA)

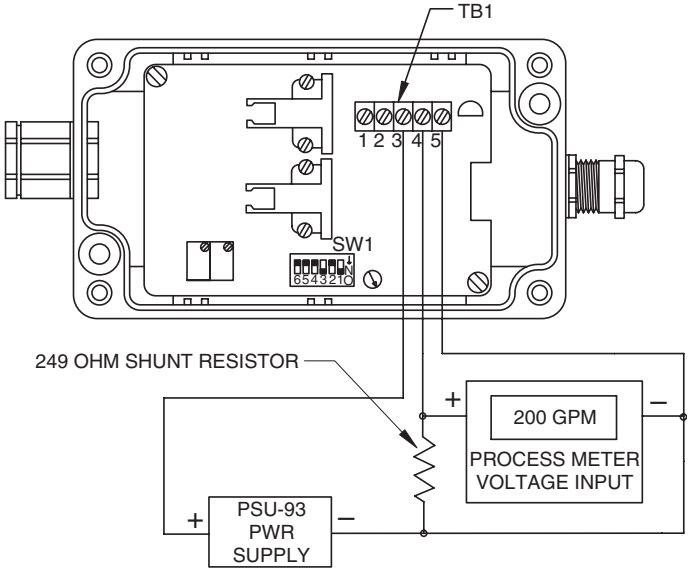

Figure 8 - Voltage Output (1 to 5 Vdc)

Section 8 – Transmitter Scaling

Your transmitter has been factory tested to meet or exceed the specifications outlined in this manual. The FLSC90-A must be scaled to operate for the correct sensor and fitting size you will be using it with to maintain original specifications. This procedure below is for scaling your transmitter. It is generally recommended that your transmitter be re-scaled on an annual basis depending on operating conditions and usage.

Recommended equipment for transmitter scaling.

Omega Model "PSU-93" DC Power Supply, Omega Model "HHM29" Handheld Multi-Meter, Omega Model "CL123" Multi Purpose Calibrator / Simulator

Fitting/K-Factor Chart (Table A)

Model No.	Pipe Size	Flow Range (GPM)	K-Factor
FP9005	½"	1.0 - 20	938
FP9007	¾"	2.0 - 30	528
FP9010	1"	4.0 - 55	322
FP9012	1 ¼"	4.5 - 90	161
FP9015	1 ½"	8.0 - 125	112
FP9020	2"	15 - 200	63.6
FP9025	2 ½"	20 - 300	48.4
FP9030	3"	25 - 500	15.5

SW1 Settings (Table B)

Position	ON	OFF
1		Always Off
2	Run Mode	Calibrate Mode
3	Not Used	
4	251 – 520 Hz Range	
5	65 – 129 Hz Range	
6	130 – 260 Hz Range	

Scaling Procedure:Calibration Frequencies

1. Calculate what your calibration frequencies you will be using in the procedure and formulas below.

a. Find the K-Factor listed in figure Table A for the fitting you will be using, call this "**K**"

b. Determine what your full scale flow rate will be in your application, call this "**MAX FLOW**"

c. Using the formulas below calculate your "**CAL MAX**", "**CAL LOW**", "**CAL MID**" and "**CAL HIGH**" frequencies.

$$\textbf{CAL MAX} = \frac{\textbf{MAX FLOW} \times \textbf{K}}{\textbf{60}}$$

CAL LOW = CAL MAX x .25

CAL MID = CAL MAX x .50

CAL HIGH = CAL MAX x .75

2. Connect the FLSC90-A transmitter as shown in figure 9 (see next page) to the power supply, multi-meter (set to measure milli-amps) and the frequency simulator.

3. Apply power to the FLSC90-A transmitter and allow the unit to warm-up for 10 min.

4. On SW1, (See figure 9), set switch #2 to the "OFF" position.

5. On SW1, using figure 9 as reference, set switch #4, 5 or 6 to the "ON" position based on the "CAL MAX" frequency you calculated in "Step 1".

6. Turn the frequency calibrator to the "ON" position.

7. Set the frequency calibrator for a DC square wave (6.5 V In Amplitude) output equal to the "CAL LOW" calculated in "Step 1".

8. On SW1, set switch #1 to the "ON" position.

9. Adjust the "ZERO" potentiometer (P1) until the ammeter reads 8.00 mA.

10. Set the frequency calibrator for an output equal to the "CAL HIGH" frequency calculated in "Step 1".

11. Adjust the "SPAN" potentiometer (P2) until the ammeter reads 16.00 mA.

12. Set the frequency calibrator for an output equal to the "CAL MID" frequency calculated in "Step 1", the output should read 12.00 mA ±0.024.

13. Scaling complete.

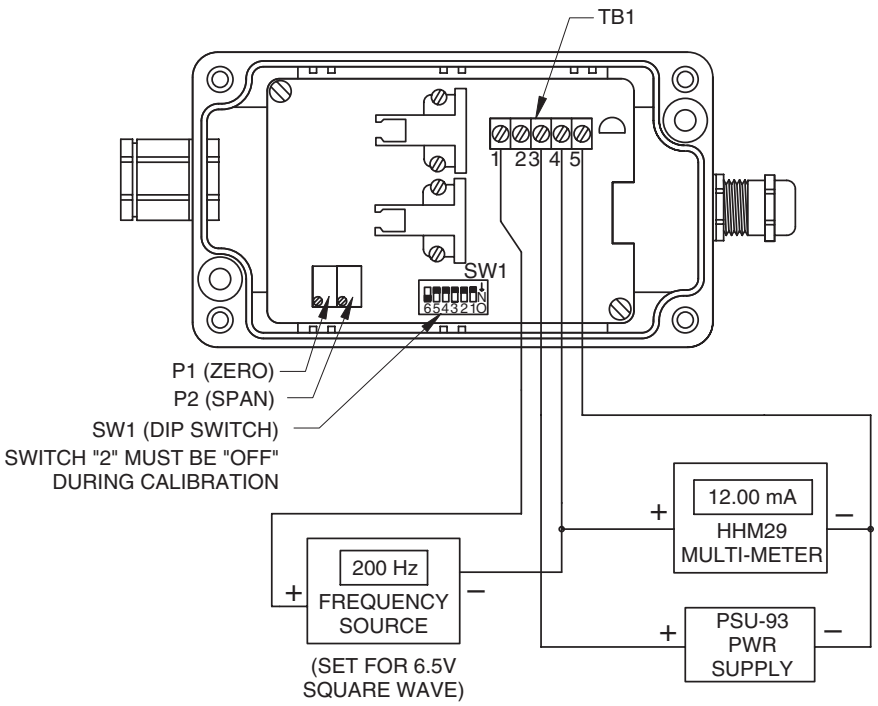

Figure 9 - Calibration Setup

Section 9 - Maintenance

Paddlewheel Sensor

Clean surfaces with warm soapy water, rinse well with clean cool water, air dry.

Signal Conditioner

No service or maintenance required.

Section 10 - Specifications

Accuracy (transmitter only):	±0.25% of full scale @ 22°C (72 ºF)
Repeatability:	±0.05% of full scale
Input:	Light pulses from FP9001 flow sensor
Operating Temperature Range:	0 to 49°C (32 to 120°F)
Storage Temperature Range:	-20 to 65°C (-4 to 149°F)
Output:	User selectable, 4-20mA or 1-5 Vdc
Power:	12 –24 Vdc @ 40mA
Max Loop Resistance:	Ohms = (V supply – 12V) / .02 A
Max Fiber Optic Cable Length	18ft. (clean clear liquids only)
Enclosure Housing:	Painted Diecast Aluminum
Connections	NEMA-4 rated,
Fiber Optic Sensor:	Duplex Cable / Male Fiber Optic Connectors
Power / Output:	Internal 6-Postion Terminal Strip for 14 to 22 gage wire.
Dimensions:	See "Section 4 – Mounting"
Weight:	272 grams (.6 lbs.)

NOTES:

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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 which wear are not warranted, including but 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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