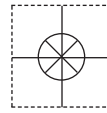


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DP1531 **High Speed Infrared Monitor** **(With Mating OS1532 Line of Sight** **and OS1533 Fiber Optic Sensors)**



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It is the policy of OMEGA Engineering, Inc. 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 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.



UNPACKING

Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

DP1531 Infrared Monitor
Operator's Manual

If you have any questions about the shipment, please call the OMEGA Customer Service Department. When you receive the shipment, inspect the container and equipment for 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 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.



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1.1 GENERAL

The OMEGA® DP1531 High Speed Thermal Monitor is a non-contact temperature measuring system with a standard response time of 1.5 msec. An internal shutter automatically zeroes the system approximately every 30 seconds, eliminating any potential drift problems.

Infrared heat radiation emitted by the target is collected by a detector which generates a signal. Detectors may be line of sight OS1532 sensors with built in focusing optics, or OS1533 fiber compatible units that connect to various available fiber optics. The signal is amplified in the detector head. An interconnecting cable carries the signal from the head to the chassis where it is processed into a linear output and displayed digitally.

1.2 SPECIFICATIONS

Temperature Range:	75-2300°C (165-4172°F) in sub ranges
Environmental temperature for:	
Electronic console:	10-50°C (50-122°F)
Detector Head:	30°C ±20°C
Detector Head:	Model OS1532 or OS1533 as specified
Response time:	1.5 milliseconds standard
Output:	Digital panel meter readings in °F or °C. 1 mV per degree (on rear terminals). Optional outputs as ordered.
Resolution:	1° (F or C)
Accuracy:	±1% of reading
Repeatability:	±0.5% of reading
Power:	115 VAC ±10%, 50/60 Hz
Power Dissipation:	50 watts
Display:	3-3/4 digit, maximum reading 3999
Emissivity:	.05 -.99, adjustable in .01 steps
Signal Processing	
Adjustment:	0.5-10 seconds hold/delay time
Dimensions:	5.25" H x 19" W x 12" D (133 H x 483 W x 305 D mm)
Weight:	12 lbs. (5.4 kg)

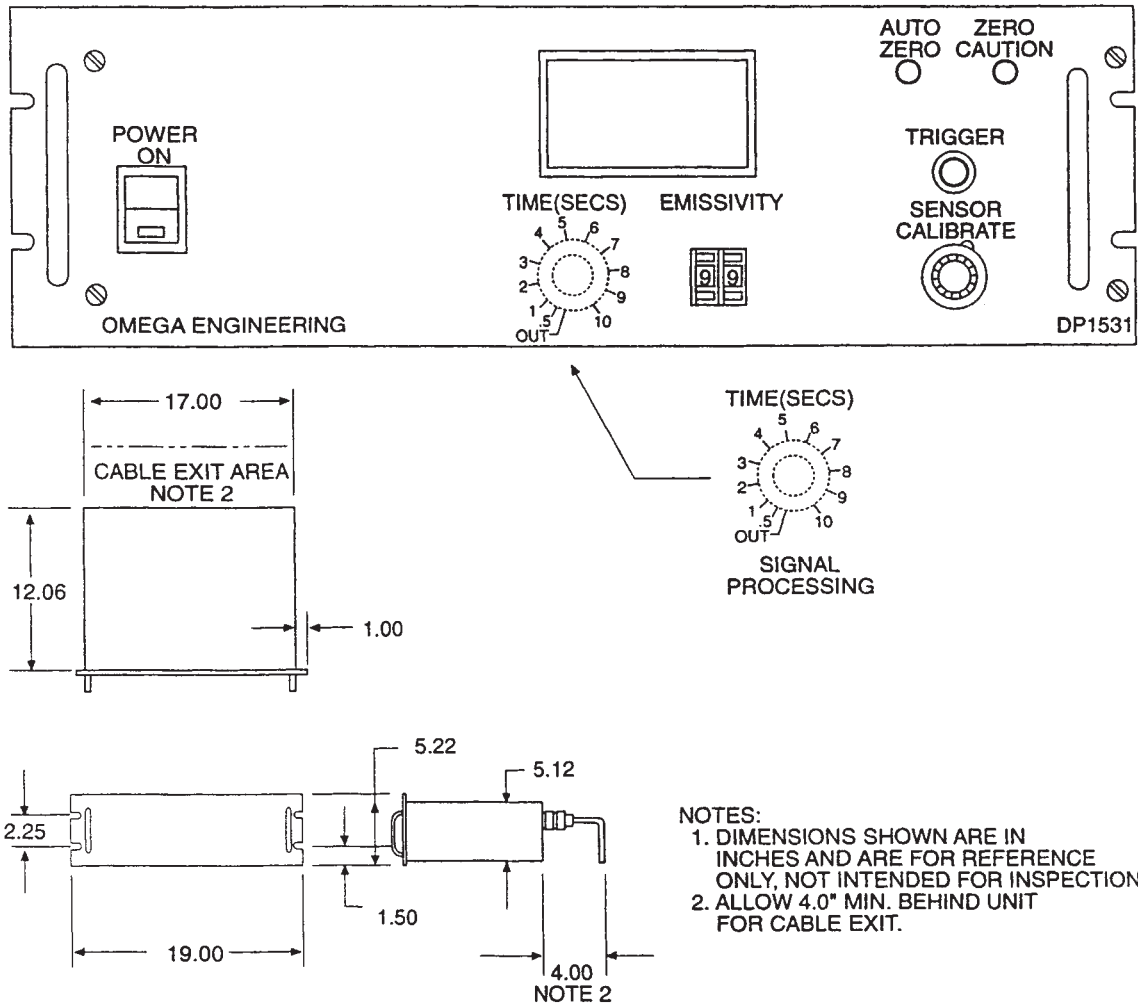


Figure 1-1. Outline Dimensions

INSTALLATION

The electronic console may be mounted in a 19-inch rack or placed in any other permanent location and the following installation steps carried out. If a tabletop installation is desired, a custom tabletop enclosure is available from OMEGA (P/N 3000-0003).

A NEMA style enclosure for wall mounting is also available to mount up to two units per enclosure. The part number is P/N 2006.

2.1 Cable Connections

The detector head should be connected to the electronic console by use of the detector cable which is supplied (part number OS1500-C31). The cable connectors are keyed so that the connections cannot be made improperly.

If a permanent type installation is to be made, we recommend that the cable be installed in steel conduit for protection and for further shielding.

2.2 Detector Head Mounting (OS1532)

Mount the detector head by its bracket in the vicinity of the measurement area. On OS1532 line-of-sight infrared sensors, the appropriate (marked on head) target distance and aiming should be observed.

Although the detector head is temperature-compensated for gain change, it is preferably mounted where it is shielded from direct thermal radiation or conduction in fluctuating thermal environments. A cool location is preferred to a warm one, but a stable location is most important.

A variety of heavy duty water or air purge enclosures are available from OMEGA for installation in ambient temperatures hotter than 50°C (122°F).

2.3 Fiber Optic Sensor (OS1533) and Cable

The end of the fiber optic cable with lens cell is for viewing the target. The other end of the fiber optic cable with the knurled brass fitting, is for insertion into the OS1533 detector head.

The detector head end of the fiber optic cable should be rotated during the insertion to ensure proper keying. The knurled retaining nut should be tightened hand tight.

2.4 Power Connection

Connect the power cable to a suitable power source with a grounding pin receptacle. If only a two-pin receptacle is available, a grounding adapter should be used with its grounding connection connected to a good building ground such as a water pipe. Failure to provide a good ground connection can cause erratic behavior of the output signal, especially in an electrically-noisy environment.

2.5 Optical Alignment of OS1533 Fiber Optic Sensors

Alignment of the fiber cable assembly and lens cell with the target is best performed by "back illuminating" the fiber assembly.

2.5.1 Bifurcated Fibers

In the case of a bifurcated assembly, the appropriate branch to be illuminated is the plain end without the knurled retaining nut. In all cases where a bifurcated assembly is used, the light source must be off while thermal measurements are being made. Otherwise, the light at the target can contribute falsely to the thermal signal. Bifurcated fibers project a doughnut of illumination. The center is the target.

2.5.2 Single Fibers

With a standard fiber assembly, the detector head end should be removed from its receptacle and inserted into a light source such as the OS1500-BLS Variable High Intensity Source. The target spot will be projected.

2.5.3 Optical Alignment of OS1532 Line-of-Sight Detector Heads

On OS1532 line-of-sight detector heads, an available backlighting fiber (OS1500-BLF) assembly should be connected to the fiber optic exiting the head to the right of the electrical connector. The other end is installed in the OS1500-BLS light source. Depending on the detector cell used in the OS1532 that was ordered, in backlighting either a doughnut will be projected on the target or a crosshair will be projected on the target. In the case of the doughnut, the center is the target area. In the case of the crosshair projection, the diameter of the light ring around the crosshair IS NOT related to target size. (The spot or target size is labeled on the head). These heads will also have a doughnut of light focused at some distance between the lens and the true target distance. It has nothing to do with actual target distance or size and should be ignored.

3.1 Front Panel Controls and Indicators

3.1.1 Power Switch

The power switch is located at the lower left and is the only such switch for the system. The indicator light in the switch shows when the power is on. For the most accurate measurements and especially before calibration, the system should be allowed a 30-minute warmup period, or longer if the room temperature is especially low. The warmup period allows ample settling time for the circuitry which compensates for ambient temperature variation.

3.1.2 Digital Panel Meter

Temperature values are read directly on the panel meter in degrees Centigrade or Fahrenheit.

3.1.3 Time(sec) Signal Processing Control (when purchased as an option)

The "time (sec)" control is an optional control which functions differently depending on which signal processing option was installed.

3.1.3.1 Peak, Sense, and Hold (when purchased as an option)

On units with "peak, sense and hold" signal processing, the control knob will be labeled "PSH". The operation of the control is as follows: in the "out" position there is no signal processing. If a time is selected the system will "hold" the "peak" signal for the time selected. If a higher "peak" is "sensed" before the time is up, the system will automatically reset the timer and "hold" the higher peak. This function is used on the display, the one millivolt per degree processed output, and optional outputs.

3.1.3.2 Fast Rise, Variable Decay (when purchased as an option)

On units with fast rise, variable decay the control knob will be labeled "FAVD". The operation of the control is as follows: in the "out" position there is no signal processing. If a time is selected the system will sense peaks very quickly (fast rise). The signal will then decay exponentially. The time selected will control the rate of decay, with the signal decaying 63% during the time interval selected. If a new peak is detected which exceeds the decay curve, the system will reset to the new peak and start the decay over again. If no new peak is detected the signal will decay to zero in about four time periods. This function is used on the display, the one millivolt per degree processed output, and optional outputs.

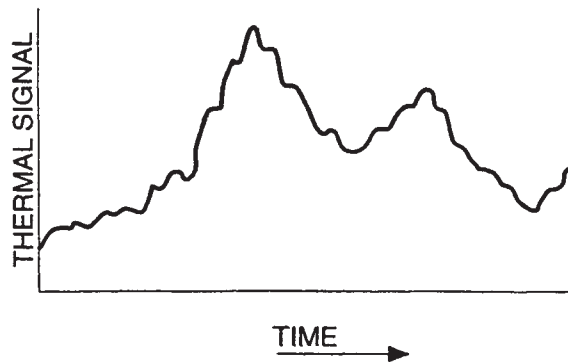
3.1.4 Emissivity Control

This control should be set to .99 for targets which are known to be near-perfect infrared radiators, and at a suitable lesser value if the target emissivity is less than one and is known. The control should be set to .99 during system calibration.

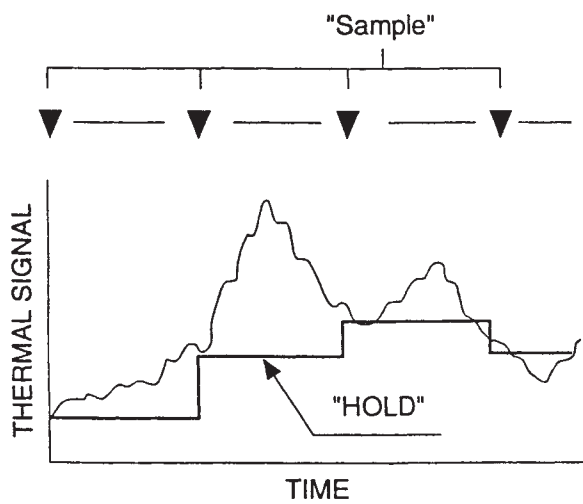
OMEGA can provide assistance in determining the emissivity of a given target, if needed.

3.1.5 Sensor Calibrate (used with optionally purchased calibration equipment)

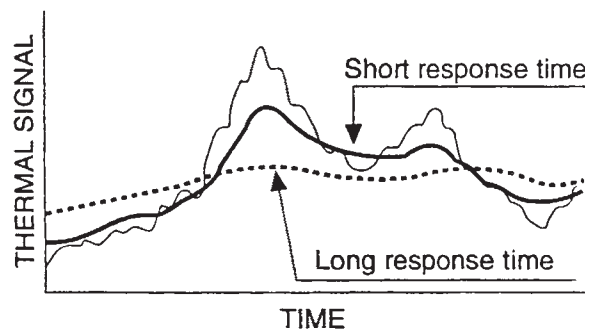
This is a multi-turn potentiometer used to adjust system gain and is mechanically safety latched at the factory. This potentiometer should not be moved except for calibration. See Section 4 for calibration procedure.



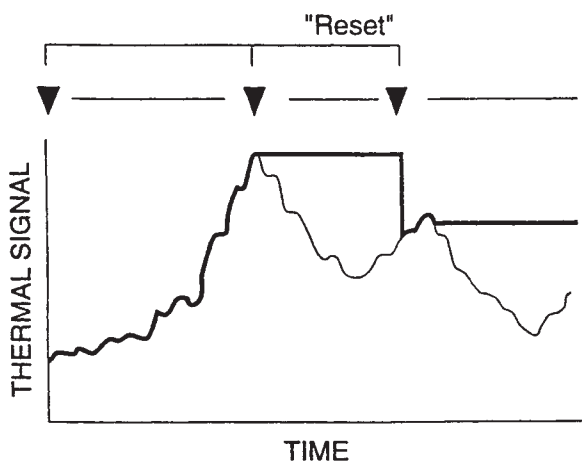
Thermal history of a fictitious target..



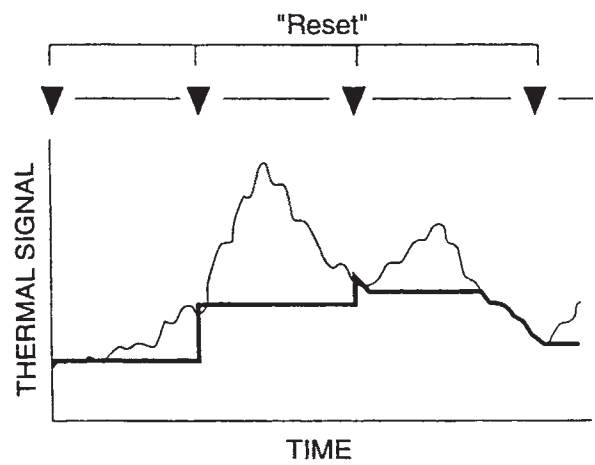
Sample and Hold output signal.



Averaging-function output signal.



Peak Sense and Hold output signal.



Valley Sense and Hold output signal.

3.1.6 Trigger

This is a switch which may be used to manually effect an auto-zero. Since a power supply must charge up to allow an auto-zero, allow 5-10 seconds since the last zero before pushing this control. In the normal automatic mode of operation the auto-zero feature happens automatically about every 30 seconds and this control is not used.

3.1.7 Zero Caution Lamp

This lamp comes on about 5 seconds prior to an auto zero, as a warning that the system will zero soon.

3.1.8 Auto Zero Lamp

This lamp comes on when the system is zeroing, about 1 second every 30. See Table 3-1 terminals TB1A-PIN4 and TB1A-PIN5 for Auto Zero timing and control.

3.2 Rear Panel Connections

3.2.1 Power Cable

The power cable should be plugged into a suitable AC outlet as described in Section 2-4.

3.2.2 Detector Connector

The detector cable should be connected as described in Section 2-1.

3.2.3 Terminal Strips

Terminal strips are provided for the customer to connect to system outputs. Shielded pair cable should be used for making signal connections with the shield connected to pins designated "external shield". The terminal pin designations are shown in Table 3-1.

3.3 Calibration Chart(s)

The Calibration Chart or Charts are found at the end of the manual. They are used to convert the voltage or current output scaled into the temperature reading ordered by the user.

TABLE 3-1

Terminal Strip Descriptions

<u>TERMINAL</u>	<u>DESCRIPTION</u>	<u>USE</u>
TB1A-PIN1	External Shield	
TB1A-PIN2	Signal Processing Reset-	External Switch across pins 2 & 3. Will remotely reset signal processing time period.
TB1A-PIN3	Signal Processing Reset+	
TB1A-PIN4	External Auto-Zero Trigger	A clean pulse of +5 or +15 volts for 1 microsecond to 100 milliseconds will externally trigger auto zero.
TB1A-PIN5	External Hold-	An external switch across pins 5 and 6 will prevent auto-zero from occurring; with switch closed.
TB1A-PIN6	External Hold+	
TB1B-PIN7	External Shield	
TB1B-PIN8	Processed 1 mV/degree Common	On units with signal processing only - for connection to 1 mV/degree processed output.
TB1B-PIN9	Processed 1 mV/degree Signal	
TB1B-PIN10	No Connection	
TB1B-PIN11	No Connection	
TB1B-PIN12	Unprocessed 1 mV/degree Common	Standard 1 mV/degree unprocessed output
TB1B-PIN13	Unprocessed 1 mV/degree Signal	

Terminal Strip Descriptions (continued)

<u>TERMINALS</u>	<u>DESCRIPTION</u>	<u>USE</u>
TB1B-PIN14	Optional Linear Output Common	For connection to first optional linear output, if ordered.
TB1B-PIN15	Optional Linear Output Signal	
TB1B-PIN16	External Shield	
TB1C-PIN17	External Shield	
TB1C-PIN18	Optional Linear Output Common	For connection to second optional linear output, if ordered.
TB1C-PIN19	Optional Linear Output Signal	
TB1C-PIN20	No Connection	
TB1C-PIN21	No Connection	
TB1C-PIN22	Data Valid +15 Volt Signal Line	Drops to ground when system auto-zeroes.
TB1C-PIN23	No Connection	
TB1C-PIN24	No Connection	
TB1C-PIN25	No Connection	
TB1C-PIN26	External Shield	

CALIBRATION AND MAINTENANCE

4.1 PREVENTIVE MAINTENANCE

Routine maintenance is not required. Periodic re-calibration and occasional inspection of the input and output ends of the fiber assembly for cleanliness, as well as a check for broken fibers if damage is suspected, can be done.

The optical fibers will provide satisfactory service indefinitely, if handled with normal care. Although the fibers are protected by a jacket, they can be damaged if the jacket is stretched, twisted, shocked or tightly bent to a small radius. The ends should be protected from damage, contaminants and temperatures above 150°C (300°F).

Fiber or lens damage or contamination should be suspected if there is a sudden change in the calibration of the DP1531 monitor.

Dust and particles on the lens or on the output end of the fiber cable may be removed by use of an air jet or a soft brush. Dirt films and other accumulations should be removed by a soft cotton or a Q-tip moistened with Windex, triple-distilled alcohol or other lighter fluid (Ronsonal). A final wiping with drying cotton, if recommended.

If the fiber bundles are to be removed from the detector head assemblies for extended periods, the fiber bundle receptacles in the head should be taped or capped to prevent the entry of foreign matter.

A periodic check of the electrical ground connection can be helpful in preventing RF-pick up problems.

4.2 CORRECTIVE MAINTENANCE

Except for fuse replacement and a check for possible damage to the power cable, we recommend that any required failure diagnosis and repairs be carried out by OMEGA.

4.3 CALIBRATION PROCEDURE

1. Turn on the DP1531 and let it warm up for 15 minutes in a normal environment or longer in a cool one. Set the emissivity control to .99.
2. Clean both ends of the optical fiber assembly.
3. Align the OS1532 or OS1533 sensor to the blackbody as to ensure that the spot size of the sensor is fully taken up by the blackbody cavity. Set the temperature on the blackbody source and let it stabilize.

If the calibration source power is off and if all radiation is excluded from the fiber assembly, the DP1531 system noise may be displayed on the panel meter. This will happen if the Blanking Switch is off. If the Blanking Switch is turned on, no readings will appear in the TEMP position.

4. The DP1531 reading should agree with the value indicated on the blackbody. If not, the front panel SENSOR CALIBRATE control should be adjusted until agreement is obtained. A clockwise rotation increases the gain.

If it is not possible to achieve calibration by use of the SENSOR CALIBRATE control, or if there has been a sharp change in calibration since the last check, one should suspect damage to or contamination of the OS1532 or OS1533 sensors. OMEGA should be consulted.

5. The calibration procedure is now complete and the DP1531 may be returned to normal use.

ACCESSORY ITEMS

5.1 THE OS1500-BLS LIGHT SOURCE

This light source will be found useful in "back-illuminating" the optical fiber assembly in order to position the target spot precisely. In back-illumination, light is sent into the detector head end and out through the target end of the assembly so as to illuminate and to define the target area visually.

The light source consists of a housing containing a high intensity quartz-iodide lamp, with related items.

The dimmer control operates by variation of the lamp voltage through a rheostat. A "fiber chuck" on the right hand side of the panel serves as the receptacle for the illuminated end of the fiber assembly used on the OS1532 or OS1533 sensors. The lamp has a 200 hour lifetime at full intensity. The lifetime rating is an average value, and statistical fluctuations may be expected, especially as the result of supply-voltage variations. Replacement lamps are available from OMEGA.

No adjustments or preventive maintenance are necessary for the OS1500-BLS Light Source except for ensuring that dirt or oil is not allowed to accumulate in the fiber chuck.

5.2 BB-4 BLACKBODY RADIATION SOURCE

The BB-4 Blackbody is a radiation source which provides an accurate, stable source of infrared radiation of known flux and spectral distribution at temperatures from 400°F to 2000°F (205 to 1093°C). Both the setpoint and actual control element temperature may be digitally displayed on the front panel control unit.

The BB-4 incorporates a new digital setpoint controller. The upper display indicates the blackbody cavity temperature while the lower display indicates the temperature setpoint adjustment.

Basically, the unit consists of a cone-shaped cavity heated by a resistance heater. The voltage input to the heater is controlled by a microprocessor-based auto-tuning control which takes its reference from a Type K thermocouple element.

Housed in a metal table or benchtop cabinet and weighing only 15 pounds, the entire unit is easily transported to the thermal monitor system being calibrated. The BB-4 can be used to calibrate any thermal monitor in the blackbody's temperature range.



NOTES:

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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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 the 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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