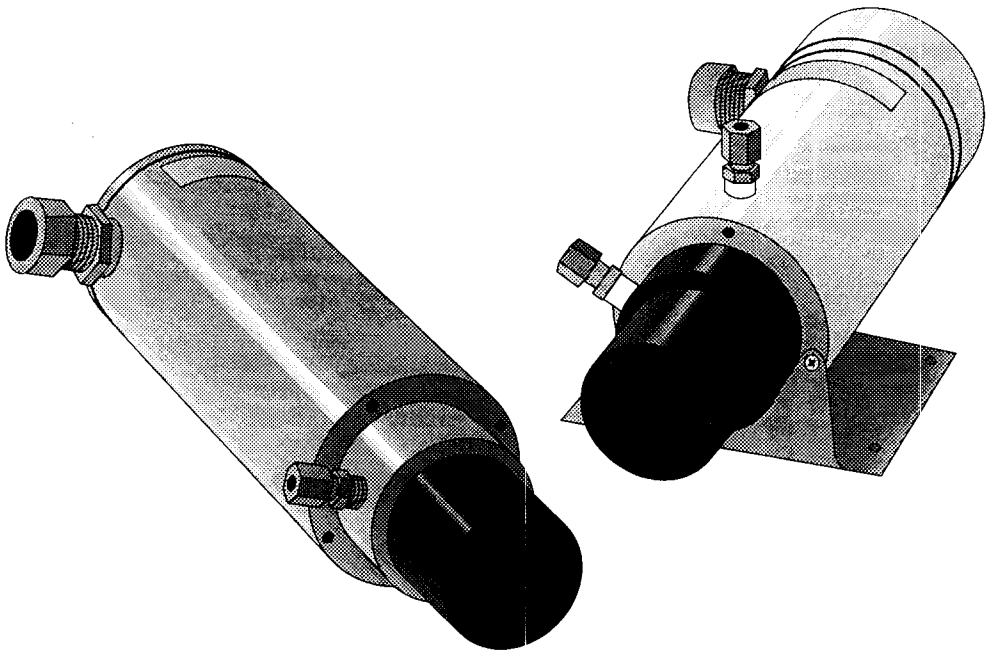
# OS1551/OS1552

## Infrared Temperature Transmitters



OMEGA®

*An OMEGA Technologies Company*

## Operator's Manual

# UNPACKING

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

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 items are supplied in the box:

- OS1551 or OS1552 Infrared Temperature Transmitter
- Operator's Manual

# TABLE OF CONTENTS
# OS1551/OS1552 INFRARED TEMPERATURE TRANSMITTERS

# Section 1

# Introduction

The OMEGA® OS1551 and 1552 Series 2-Wire Infrared Temperature Transmitters are rugged, self-contained temperature transducers, designed to provide a 4-20 mA linear output. They are compatible with any process control instrumentation such as recorders, dataloggers, meters, or temperature controllers. They have an exceptionally fast response time of 50 milliseconds, which makes them ideal for use in fast changing processes, or to capture quick temperature changes. They can be used in a variety of process applications from 32 to 2500°F (0 to 1370°C). With the optional watercooled shell, the OS1551 or OS1552 can withstand ambient temperatures to 300°F (149°C). Typical applications include low temperature measurements in textile manufacturing, printing, paper laminating, thick plastics, or measuring products heated by radiant heat sources.

The OS1551/OS1552 may be connected to any standard commercial or industrial recorder, controller or indicator that accepts a 4-20 mA output over the transmitter's temperature range. A power supply that provides between 20 and 40 volts at 20 mA completes the installation. The unit's mechanical design provides a rugged, lightweight unit with a built-in purge air cooling passage. Cooling with standard tap water is required only if the ambient temperature exceeds 122°F. The electrical connections are made to a terminal strip in the rear. These are protected by a gasketed cover with a strain relief bushing for the 2 wire cable.

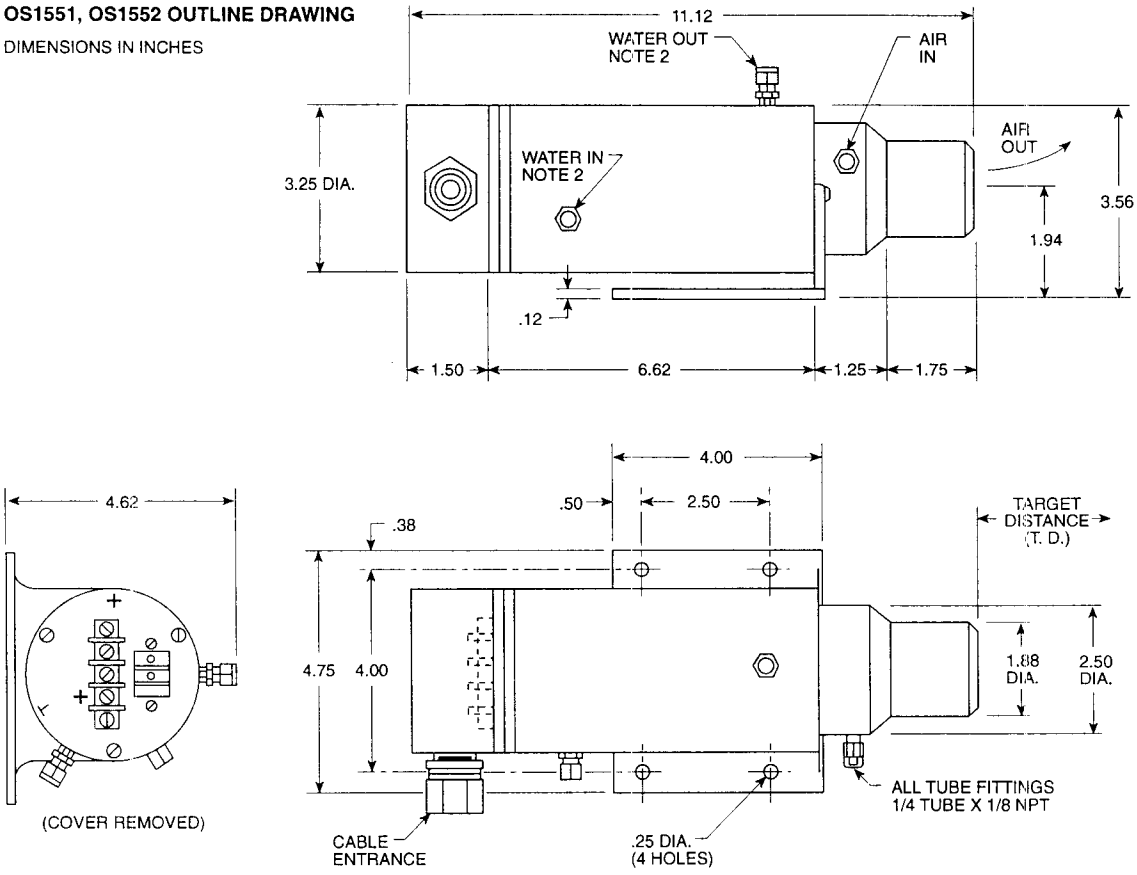
# Section 2

## OS1551, OS1552 Specifications

| | |
|---|---|
| Temperature Ranges | |
| OS1551: | 32 to 1022°F (0 to 500°C) |
| OS1552: | 1000 to 2500°F (538 to 1371°C) |
| Accuracy: | ±1.0% reading or 3°F (1.7°C), whichever is greater |
| Spectral Response | |
| OS1551: | 6 to 14 microns |
| OS1552: | 0.75 to 1.09 microns |
| Repeatability: | ±1°C or less |
| Response Time: | 50 milliseconds, 99% change |
| Output: | 4 to 20 mA |
| Power: | 18 to 40 Vdc, 100 mA regulated |
| Load Resistance: | 0 to 1100 ohms @ 40 Vdc |
| Emissivity: | 0.05 to 0.99, adjustable in 0.01 steps |
| Housing: | Anodized aluminum |
| Ambient Operating Temperature: | 32 to 122°F (0 to 50°C);<br>32 to 300°F (0 to 149°C) with water cooling shell |
| Dimensions: | 3.56"H x 4.75"W x 11.12"D; 4.62"H with water cooling<br>(90mm H x 121mm W x 282mm D; 117 mm H with water cooling |
| Weight: | 4 lbs. (1.8 kg) |

**OS1551, OS1552 OUTLINE DRAWING**

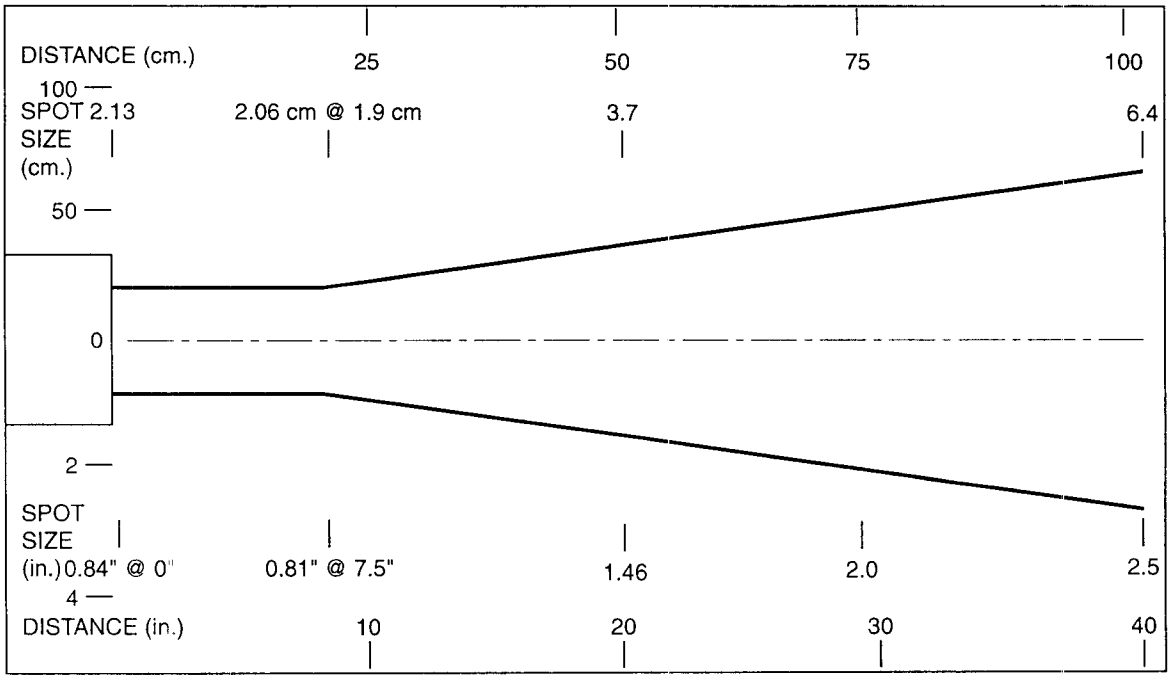
DIMENSIONS IN INCHES



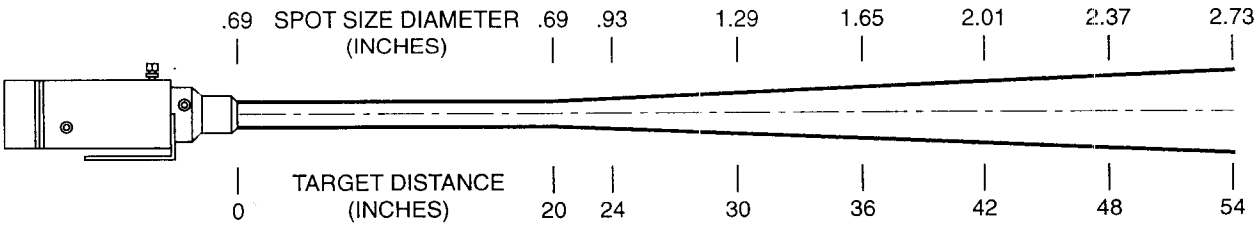

NOTES:

1. ALL DIMENSIONS ARE FOR REF. ONLY.
2. THE WATER OUTLET SHOULD BE HIGHER THAN THE INLET WHEN MOUNTED. IF THE UNIT IS MOUNTED VERTICALLY FACING DOWN, OR UPSIDE DOWN REVERSE INLET AND OUTLET CONNECTIONS.

## OS1551 FIELD OF VIEW




## OS1552 FIELD OF VIEW



# Section 3

## System Interface

The OS1551, OS1552 is a sophisticated infrared temperature transducer designed to be incorporated ina modern 4-20 mA loop control system. Appendix A is a chart of Temperature vs. 4 to 20 milliamp currents. The transducer can be thousands of feet away from its companion equipment and can feed one, two or more instruments at the same time. Typical instruments that can be driven by the transducer include 4-20 mA input recorders, PID controllers (both analog and digital), alarm systems, dataloggers and standard computer interface couplers for IEEE 488 or RS232 busses. The other component required to complete the system is a nominal 24 volt dc regulated power supply to drive the transducer and supply 4-20 mA loop current.

# Section 4

# Mounting

The OS1551/1552 is mounted by four 1/4 inch machine screws on 4.00" x 2.50" centers. Usually the mounting surface will be grounded metal, which will provide the required shielding for the electronics. If it is necessary to mount the instrument on an insulated surface, the required grounding can be provided by electrical conduit or by shielded cable. Regardless of the method used, it is important to ground the aluminum shell and rear cover to provide a shield from stray RF and power line fields.

OMEGA offers a mounting bracket for the OS1551 which is OS1551-MB, and also offers a mounting bracket for the OS1552, which is OS1552-MB.

# Section 5

# Air Purge

The OS1551/OS1552 is designed to provide a flow of clean air over the entrance window if the unit is installed in a dirty or humid environment. A compression fitting for 1/4 inch O.D. copper or plastic tubing is installed on the front end of the instrument for easy attachment of a compressed air supply. An air flow of 1-2 CFM should be sufficient to maintain a positive pressure in front of the window and ensure the desired purging. This can be achieved with a 5 psi drop through the OS1551/OS1552; 20 psi will provide twice this flow.

Careful filtration is needed in most factory air lines to prevent oil, water and dirt from contaminating the instrument. As a minimum, an oil/water separator and a 1 micron filter should be installed and maintained in the air line feeding the instrument.

# Section 6

## Water Cooling

The transducer is equipped with an aluminum outer sleeve than can be water cooled if the instrument is to be installed in an environment above 122°F. Two compression fittings for 1/4" O.D. copper tubing are provided for water connections. A flow of 5 GPH of clean, room temperature water is sufficient to protect the instrument up to 200°F, 10 GPH for 300°F ambient. The water outlet should always be positioned higher than the input. The preferred orientation for water cooling is horizontal.

# Section 7

## Electrical Connections

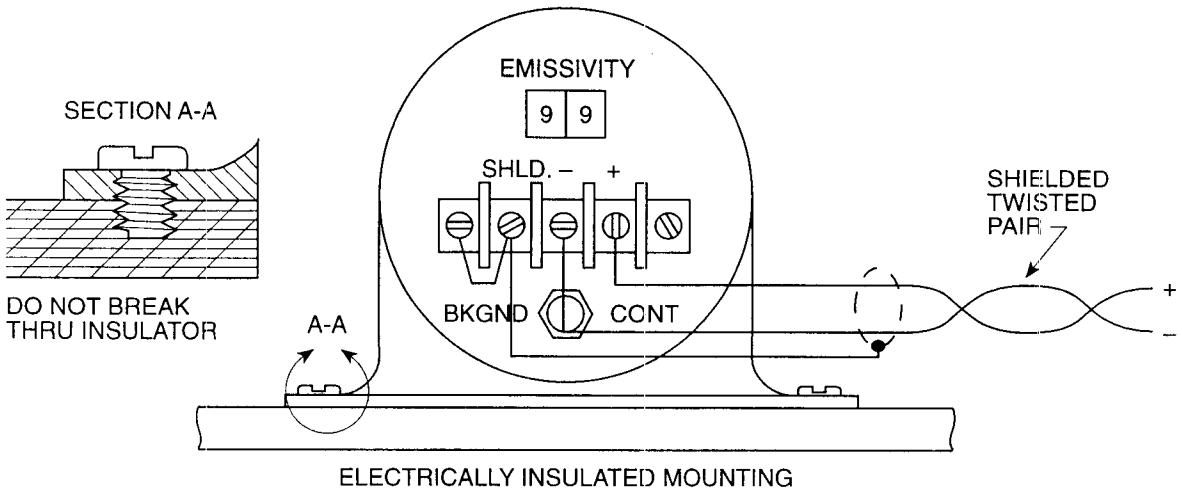
The low voltage electrical connectionsto the transducer may be exposed by removing the protective end cap at the rear of the instrument. This end cap also contains a compression fitting to seal the electrical cable and provide strain relief. Any twisted pair cable with an overall shield and outer jacket up to 0.250 O.D. can be used. Wire sizes of 14 to 18 AWG should be used up to a mile or more if desired, as long as excessive noise pick-up is avoided and at least 18 volts is available at the terminal strip when the instrument is drawing 20 mA. If a regular electrical conduit is to be used for the cable run, replace the gland fitting with standard conduit fittings. Final decisions on shielding and noise immunity requirements should be determined by the requirements of the controller, recorder or other electronic instrumentation that will be fed the signal from the transmitter. Keep cable runs away from high voltage and RF wires if at all possible.

Connection of the shielded pair cable to the terminal strip on the rear of the instrument depends on the way the instrument is mounted. If the OS1551/1552 is bolted to an insulated base and electric conduit is not used to enclose the cable, tie the cable shield to the SHLD terminal. Do not remove the jumper wire. This insulated configuration with the instrument case grounded back through the shielded cable is recommended for installations where strong RF fields are close by, such as near induction heaters.

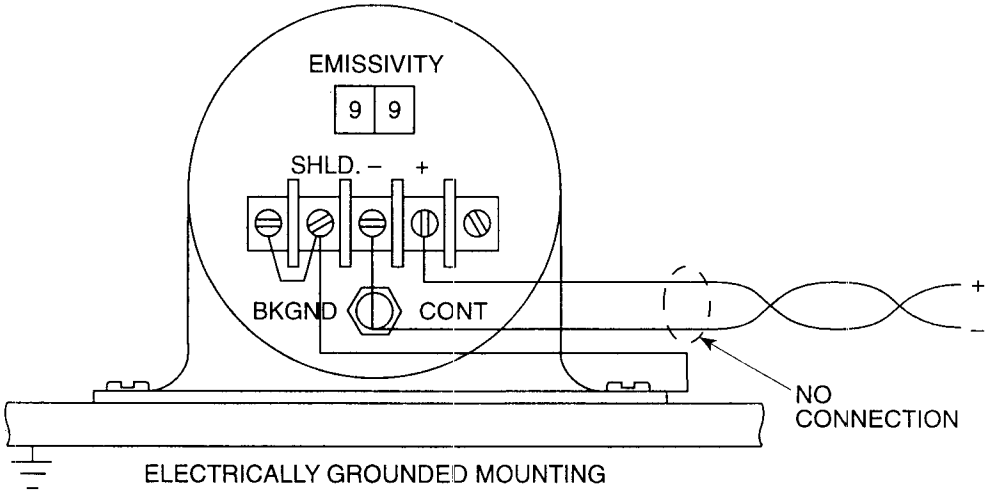
If the transmitter is mounted to a grounded base or if ground conduit is used, do not ground the shield. Instead cut the shield (and the drain wire if it exists) back an inch and wrap with tape or shrink tubing. Attach the twisted pair wires from the power supply and controller to the positive and negative terminals as shown on page 7-2. Note that the positive wire is the wire from the positive terminal of the power supply.

Connections to the power supply and system output units should follow the suggested system wiring shown ion page 7-3 Tie all cable shields together at each junction and to chassis ground at each instrument. Only one common ground point may exist between shield and system ground. Page 7-3 shows this point at the negative terminal of the power supply, which is common practice. This tie point can be placed anywhere in the loop, but only one system circuit ground should exist in a system. The manufacturers' manuals for the controller or other instrument connected to the system should be consulted for further details and recommendations.

## ELECTRICAL CONNECTIONS

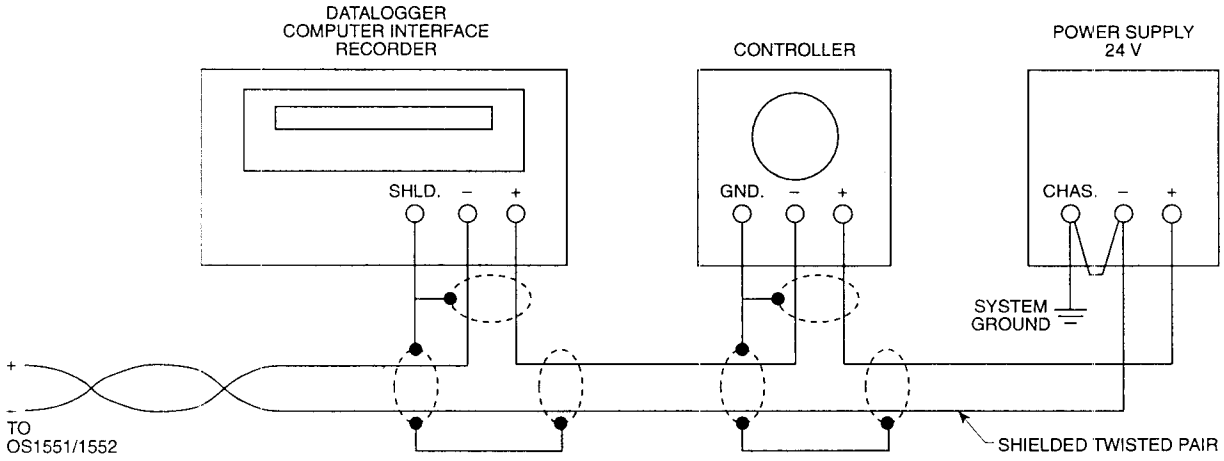



ELECTRICALLY INSULATED MOUNTING




ELECTRICALLY GROUNDED MOUNTING

**SYSTEM CONNECTIONS**



# Section 8

# Operation

Like any precision electronic instrument, the transducer should be allowed to warm up for a period of 10 to 15 minutes after turning on the power, water and purge air before using the data. Since these factors may vary widely from installation to installation, experience may show that this time can be reduced in practice. If the emissivity of the target is a known value, this number may be set into the digital emissivity control located directly above the electrical terminal strip inside the rear cover. When the value is unknown, it may be set initially at 0.99, the value of a near perfect blackbody or 100% IR radiator. Temperature checks with a thermocouple or RTD on the target may be used to verify the readings. If the reading is too low and installation checks have shown all other areas to be correct, change the emissivity control to a lower value to raise the indicated temperature. When the output agrees with the best thermocouple or RTD measurement of the surface temperature of the target, the emissivity control is properly set.

# Section 9

# Background Control

The background control adjustment is used when low emissivity and low temperature measurements are being made.

WHEN NOT IN USE, THE CONTROL SHOULD BE TURNED FULLY COUNTERCLOCKWISE, APPROXIMATELY 25 TURNS.

If the target being measured is not transparent in the wavelength region from 6 to 14 microns (e.g. metals), then the target emissivity is equal to one minus the reflectivity. Therefore, with emissivity equal to one, the reflectivity will equal zero. However, if the emissivity equals 0.1, the reflectivity will equal 0.9, showing that the lower the emissivity, the higher the reflectivity.

This higher reflectivity means that the background temperature around the target will be reflected into the measuring device, adding infrared radiation to the target radiation and creating a measurement error, if the background temperature is different from the target temperature.

The background control is used to subtract out the radiation due to background temperature. If the target is partically transparent in the 6-14 µm wavelength region, extraneous radiation can be gathered from behind the target, radiating through the target to the measuring device. This cause also requires the error subtraction.

## 9.1 Setting the Background Control

First the proper emissivity setting for the particular type of target should be found.

1. Align the OS1551, OS1552 viewing the target in the same manner as will be used in the process (target distance, viewing angle).

2. Set the emissivity control to 0.99, and the background control fully counterclockwise approximately 25 turns.

3. Two measurement points are needed, one near the low end of the operating range, and one near the high end of the operating range.

   Measure the temperature of the target with an accurate thermocouple, RTD or other contact device. Record the target temperatures and the output temperatures at the low and high ends of the temperature range. Call the temperature at the low end TL, and the output at the low end TVL. Call the temperature at the high end TH, and the output at the high end TVH.

4. See Appendix A which charts the non-linear signal vs. temperature in degrees C or F. For the following temperature values (in degrees), TL, TVL, TH, and TVH find the corresponding signal levels (volts) from the chart in Appendix B. These values will be called TLS, TVLS, THS and TVHS, e.g. TLS = Temperature Low Signal (volts).

5. The correct emissivity setting for this type of target can now be found by:

$$\text{Emissivity} = \frac{(TVHS - TVLS)}{THS - TLS}$$

6. Adjust the emissivity control to the setting calculated above.

7. Mount the OS1551, OS1552 in its actual measurement setup (on-line). The target temperature will be preferably near the low end of the operating range.

8. Now determine the actual target temperature with a thermocouple or equivalent.

9. Turn the background control clockwise, until the desired temperature is displayed. This subtracts out the background radiation.

10. The OS1551, OS1552 will now read the temperature of this type of target correctly over the full temperature range (0 - 200°C). The accuracy is dependent on background temperature stability.

    Periodic checks of background control setpoint are recommended, repeating steps 8 and 9.

11. If the OS1551, OS1552 does not track correctly over the desired temperature range, check for correct emissivity setting and background temperature stability. If correct readings cannot be obtained, consult OMEGA.

MADE IN USA

## WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA 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 should malfunction, 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. 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.

**OMEGA is glad to offer suggestions on the use of its various products. Nevertheless, OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.**

**OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.**

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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.

SPECIAL CONDITION: Should this equipment be used in or with any nuclear installation or activity, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the equipment in such a manner.

## RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA ENGINEERING 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.

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 OR **CALIBRATION,** consult OMEGA for current repair/calibration charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

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