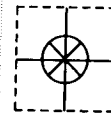
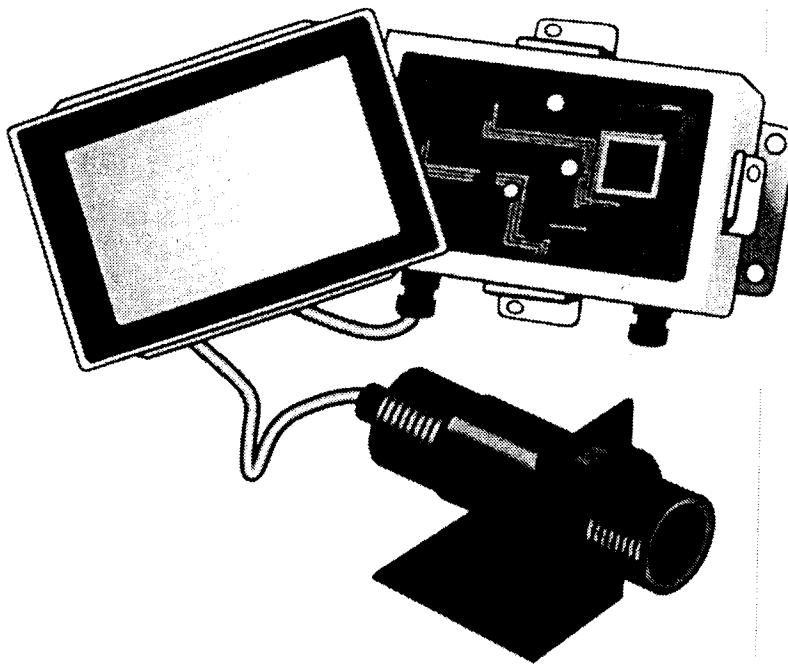


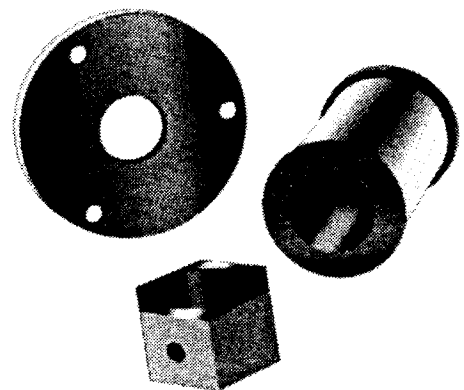
⚠ CAUTION! - This product is not intended for medical use or use on humans



User's Guide



<http://www.omega.com>
e-mail: info@omega.com



OS65 SERIES Infrared Pyrometers

omega.com™

ΩOMEGA®

OMEGAnet™ 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
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1
Tel: (514) 856-6928 FAX: (514) 856-6886
e-mail: canada@omega.com

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 and Latin America: Tel: (95) 800-TC-OMEGASM FAX: (95) 203-359-7807
En Español: (203) 359-1660 ext: 2203 e-mail: espanol@omega.com

Servicing Europe:

Benelux: Postbus 8034, 1180 LA Amstelveen, The Netherlands
Tel: (31) 20 6418405 FAX: (31) 20 6434643
Toll Free in Benelux: 06 0993344
e-mail: nl@omega.com

Czech Republic: Ostravska 767, 733 01 Karvina
Tel: 42 (69) 6311899 FAX: 42 (69) 6311114
e-mail: czech@omega.com

France: 9, rue Denis Papin, 78190 Trappes
Tel: (33) 130-621-400 FAX: (33) 130-699-120
Toll Free in France: 0800-4-06342
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
e-mail: germany@omega.com

United Kingdom: ISO 9002 Certified
25 Swannington Road, P.O. Box 7, Omega Drive,
Broughton Astley, Leicestershire, Irlam, Manchester,
LE9 6TU, England M44 5EX, England
Tel: 44 (1455) 285520 Tel: 44 (161) 777-6611
FAX: 44 (1455) 283912 FAX: 44 (161) 777-6622

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.

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OS65 Series

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Section 1: Introduction

1.1 General Description

The OMEGA® OS65 Series Infrared Pyrometers are designed to measure the temperature of targets rapidly and accurately. This includes difficult targets that are moving, inaccessible, fragile, or unsafe to touch. The OS65 Series can be installed in your existing equipment or mounted with its own hardware for continuous monitoring of a process line. Since the OS65 Series instruments do not use chopper motors or vibrator mechanisms, they can be mounted in any position and in hostile environments without suffering any loss in performance. This includes installations that are moving, vibrating, or subject to mechanical shock. This rugged design, coupled with their relatively small dimensions, make these instruments ideally suited for a wide variety of applications where durability, size, and low cost are important.

The OS65 Series are advanced non-contact measurement systems. They utilize microprocessor-based electronic circuitry that insures accuracy and repeatability. There are six different outputs available, which can feed directly into computers, data loggers, or other instrumentation.

1.2 Available Models

Model Number	Output Type
OS65-J(*)†	J
OS65-K(*)†	K
OS65-MV(*)†	1 mV/degree
OS65-MA1(*)†	4-20 mA
OS65-MA2(*)†	0-20 mA
OS65-V(*)†	0-5 VDC

* Insert temperature range code from range table below.

† Insert optics code from optical table below. See optical diagrams for details.

Range Table

Ordering Suffix	Temperature Range
-R1	-70° to 250°F
-R2	-57° to 125°C
-R3	0 to 250°F
-R4	0 to 125°C
-R5	-70° to 500°F
-R6	-57° to 250°C
-R7	0 to 500°F
-R8	0 to 250°C
-R9	-70° to 1000°F
-R10	-57° to 500°C
-R11	0 to 1000°F
-R12	0 to 500°C

* J or K thermocouple outputs only available with tanges R9 and R10.

Optical Table

Ordering Suffix	Field of View at Focus
-1	3:1 (Minimum spot size 1/4" at 3/4")
-2	7:1 (Minimum spot size 1" at 7")
-3	15:1 (Minimum spot size 1" at 15")
-4	24:1 (Minimum spot size 1/4" at 6")

Each unit is supplied with sensor mounting bracket and nut, 15-foot interconnecting cable and electronics housed in NEMA 4 (IEC529, IP66) enclosure.

To order a bare bones operating system, including just the infrared sensing head and electronics card (without NEMA 4 enclosure and sensor mounting bracket and nut), add suffix "BB" to model number.

1.3 Accessories

OS65-APC	Air Purge Collar
OS65-AWC	Air/Water Cooling Jacket
OS65-MF	Mounting Frame
OS65-RAB	Right Angle Mounting Bracket
OS65-MN	Mounting Nut
OS65-NEMA4	NEMA 4 Electronics Enclosure
OS65-NEMA12	NEMA 12 Electronics Enclosure

Options

C50	50-foot cable (in place of the 15-foot cable)
NIST	NIST Traceable Calibration Certificate

Section 2: Installation

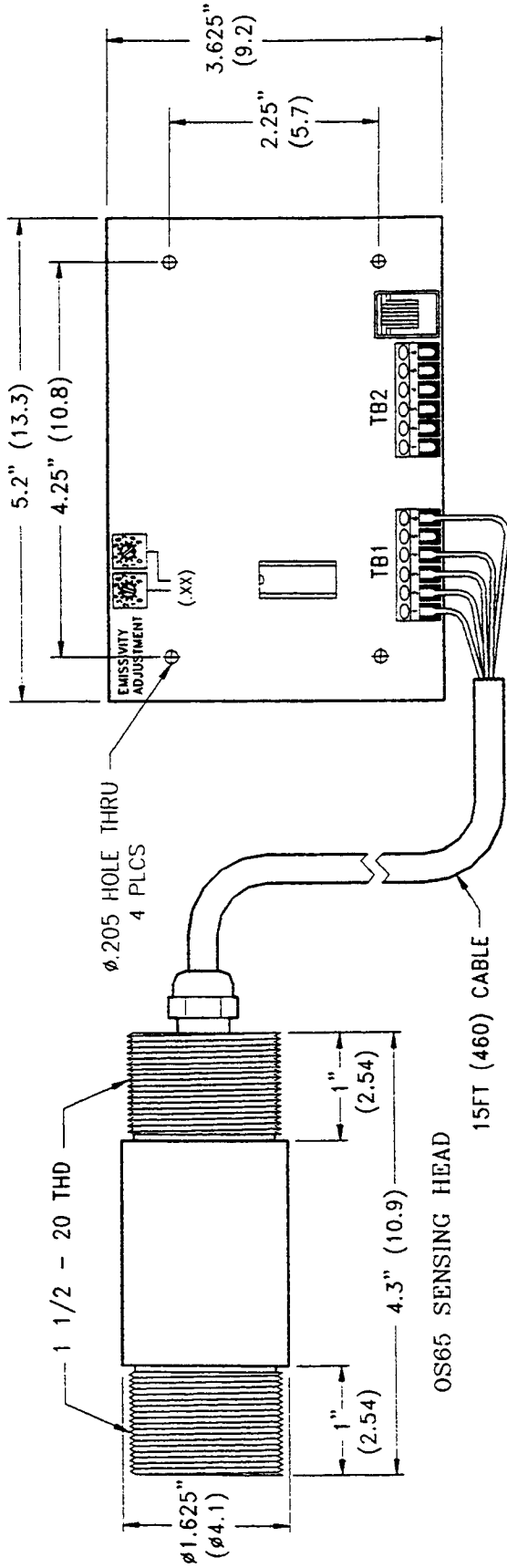
2.1 Unpacking

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 claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

DIMENSIONS



OS65 ELECTRONICS

OS65 SENSING HEAD

15FT (460) CABLE

Ø.205 HOLE THRU
4 PLCS

EMISSIVITY
ADJUSTMENT
(XX)

TB1

TB2

5.2" (13.3)

4.25" (10.8)

3.625" (9.2)

2.25" (5.7)

⊕

⊕

⊕

⊕

⊕

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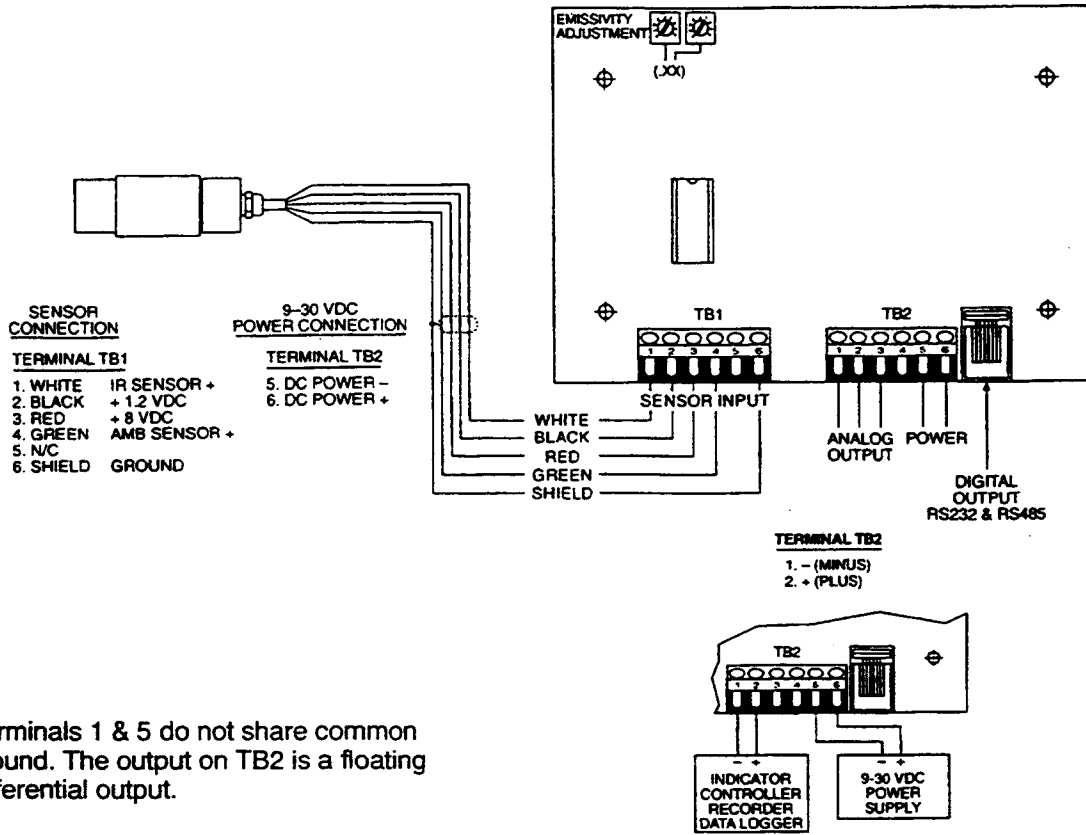
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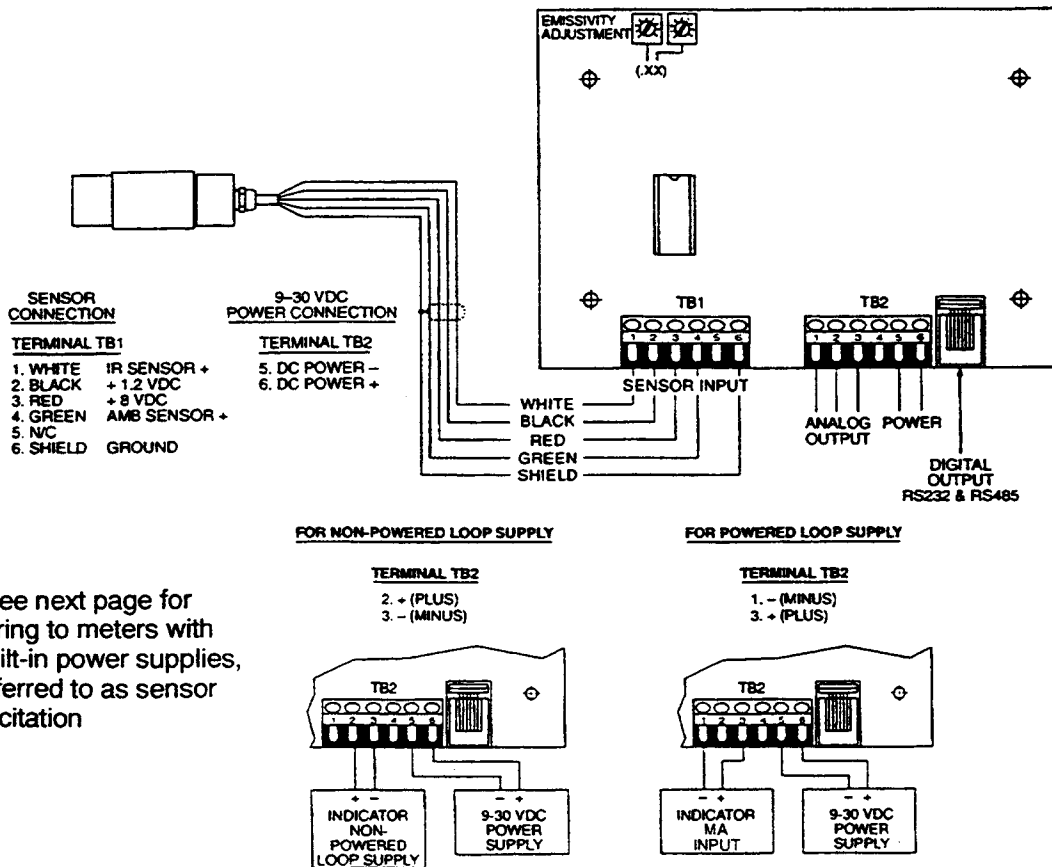
⊕

⊕

WIRING DIAGRAM FOR OS65-J, OS65-K, OS65-MV and OS65-V

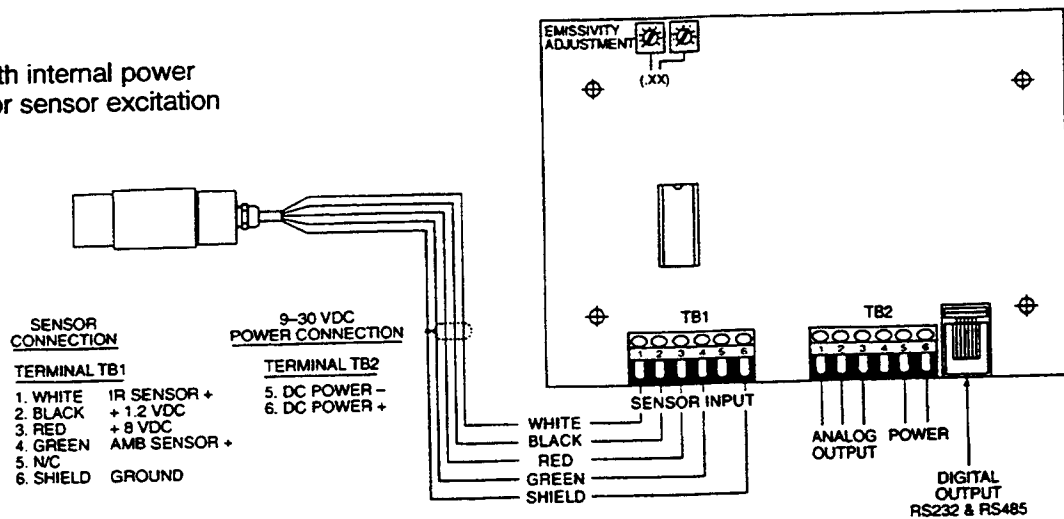


WIRING DIAGRAM FOR OS65-MA1 and OS65-MA2



WIRING DIAGRAM FOR OS65-MA1 and OS65-MA2

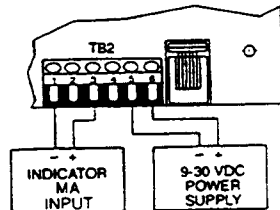
Meter with internal power supply for sensor excitation



FOR POWERED LOOP SUPPLY

TERMINAL TB2

- 1. - (MINUS)
- 3. + (PLUS)



(Note for TB-2 wiring terminals. 1 and 3 are not at common ground with terminal 5, and must have a separate isolated power supply from the power supply on terminals 5 and 6.)

Section 3: Operation

3.1 Emissivity

A blackbody is defined as an object that emits the maximum theoretical amount of radiation at a given temperature and has an emissivity at 1.0. The name blackbody is misleading because it is not the color of the object, as much as the material and the surface finish of the material that determines the emittance value.

The emittance of most organic substances (wood, cloth, plastic, and most paints) is approximately 0.95. Metals with smooth, polished surfaces will have emittance values much lower than 1.0.

3.2 Emissivity Adjustment

When using an OS65 Series model to measure shiny, metallic objects, the proper emissivity adjustment must be made. This is easily accomplished by adjusting the emissivity pots on the electronics board. One of the pots allows a coarse adjustment of the emissivity and has a range from 0.10 to 0.90 in 0.10 steps. The second pot allows a fine adjustment of the emissivity and has a range of 0.00 to 0.09 in 0.01 steps. To make the adjustment, use a small screwdriver to turn the pots until the arrows are aligned with the proper setting. Determining the proper setting can be done as follows.

1. Heat a sample of the material to a known temperature as determined by a precise sensor. Using the emissivity control of your OS65 Series instrument, adjust the indicated temperature until it matches the temperature measured by the contact sensor. This value of emissivity can now be used whenever the same material is measured.
2. For relatively low temperatures (to approximately 500°F, 250°C), a piece of masking tape can be placed on the object and its temperature measured with the OS65 Series instrument. Since the masking tape has an emissivity of approximately 1.0, the measurement you obtain from it can be considered a "true" temperature and the object's emissivity can be determined using the method described as above.
3. For high temperatures, measure the object temperature using a thermocouple. Adjust the emissivity control until the OS65 Series reading equals that of the thermocouple. For exceedingly high temperatures, determine the emissivity using the emissivity value table on page 7 of this manual.
4. When a portion of the surface of the material can be coated, a dull black paint will have emissivity of approximately 1.0 (other non-metallic coatings such as mold release may be used also). Use this "true" temperature to determine the emissivity using the method described in Example 1. Standardized values of emissivity are available for most materials.

A simplified table of emissivities is provided here. For a more detailed listing of emissivities, refer to "Thermal Radiative Properties" (vol. 7, 8, and 9) by Y.S. Touloukian and D.P. DeWitt, published by IFI/Plenum Data Corporation, subsidiary of Plenum Publishing Company, 227 West 17th Street, New York, New York 10011.

3.3 Emissivity Tables

The following tables are provided as a guide for estimating the emissivity of various materials. It is important to note that the actual emissivity, particularly for metals, can vary greatly depending on surface finish oxidation, corrosion, or the presence of dirt, water, or oil. The best determination of emissivity can be made using the techniques described above.

Metals

<u>Materials</u>	<u>Emissivity</u>
Aluminum	
Oxidized	0.20-0.55
Unoxidized	0.09
Polished	0.05
Brass	
Oxidized	0.50
Polished	0.03-0.05
Carbon	
Graphite	0.40
Chromium	0.10
Copper	
Oxidized	0.40-0.80
Polished	0.03
Gold	
Polished	0.02
Iron	
Oxidized	0.50-0.90
Unoxidized	0.15
Rusted	0.50-0.70
Iron, Cast	
Oxidized	0.60-0.95
Unoxidized	0.20
Molten	0.20-0.30
Iron, Wrought	
Dull	0.70
Smooth	0.30
Lead	
Oxidized	0.40-0.60
Polished	0.05-0.10
Monel (NiCu)	0.10-0.40
Nickel	
Oxidized	0.20-0.50
Unoxidized	0.10
Platinum	
Polished	0.30
Black	0.09
Silver	0.03
Steel	
Cold-Rolled	0.70-0.90

Ground Sheet	0.40-0.60
Polished Sheet	0.20
Oxidized	0.70-0.90
Stainless	0.20
Zinc	
Oxidized	0.10
Polished	0.03
Galvanized	0.20

Non-Metals

<u>Materials</u>	<u>Emissivity</u>
Asbestos	0.95
Asphalt	0.95
Brick	0.95
Carborundum	0.90
Ceramic	0.95
Clay	0.95
Concrete	0.95
Cloth	0.95
Grass	
Plate	0.85
Gravel	0.95
Gypsum	0.80-0.95
Ice	0.98
Limestone	0.95
Paint	
Non-Metallic	0.90-0.95
Paper	
Any Color	0.95
Plastic	
Opaque (Over 20 mils thickness)	0.90
Rubber	0.95
Sand	0.90
Snow	0.90
Soil	0.90-0.98
Water	0.93
Wood	
Natural	0.90-0.95

3.4 Comparison Measurements

When making comparison measurements on the same material, an approximation of the emissivity will still give good results. Selecting a relatively low emissivity value will make the difference in compared temperatures slightly larger than actual. When trying to locate a slight temperature difference, setting the emissivity to 0.20 will provide the maximum sensitivity, although the absolute temperature measurement will not normally be correct.

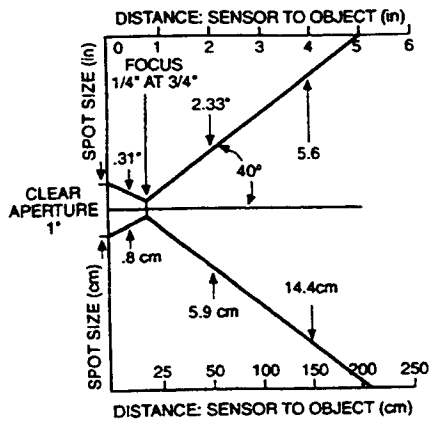
3.5 Maintenance

Due to its solid-state, sealed construction, the OS65 Series instruments require minimum maintenance. The optics may require periodic inspection and cleaning if the sensor is in a dirty environment. Use an optical cleaning solution (e.g. mild detergent) and a cotton swab. Care should be taken to prevent scratching the lens or its coating. If you are operating the instrument in a dirty atmosphere, the optional lens air purge assembly is recommended.

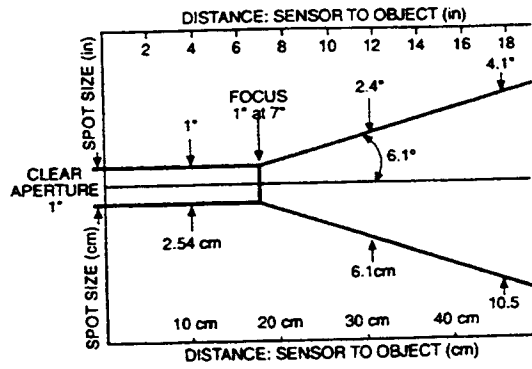
Section 4: Specifications

Accuracy:	±1% of reading or ±2°F (1°C), whichever is greater
Repeatability:	±0.50% of reading, ±1°C
Spectral Response:	8-14 microns
Emissivity Range:	0.10 to 0.99 digitally adjustable
Response Time:	300 msec (10 to 90%)
Field of View (FOV):	3:1, minimum spot size ¼" at ¾" 7:1, minimum spot size 1" at 7" 15:1, minimum spot size 1" at 15" 24:1, minimum spot size ¼" at 6"
Power:	9-30 VDC, 40 mA
Environmental Ratings:	Sensing head NEMA 4, dust-tight and water-tight with either NEMA 4 electronics enclosure or NEMA 12 dust-tight or drip-tight enclosure
Ambient Operating Range-	
Sensing Head:	-18° to 85°C (0 to 185°F)
Electronics:	32° to 120°F
Connection:	4.5 m (15ft. cable standard); Optional 15 m (50 ft. cable)
Max. Lead Wire Resistance- (Ohms, Current Output Mode):	(Supply Voltage – 7)/0.02
Load Current- (mA, Voltage Output Mode):	10 mA maximum
Dimensions-	
Sensing Head:	10.9 cm x 4.1 cm (4.30" x 1.63"); 1-1/2-20 thread
Electronics:	13.3 cm x 9.1 cm (5.25" x 3.62")
Weight-	
Sensing Head:	0.3 kg (8 oz.)
Electronics only (without NEMA 4 enclosure):	0.1 kg (4 oz.)
Electronics mounted in NEMA 4 enclosure:	1.2 kg (43.2 oz.)

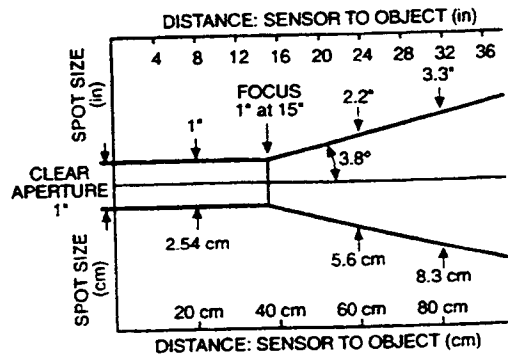
4.2 FIELD OF VIEW DIAGRAMS



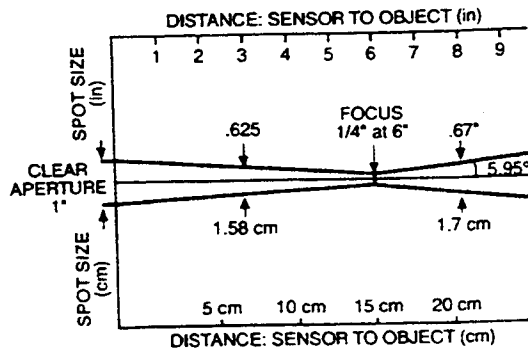
3:1



7:1

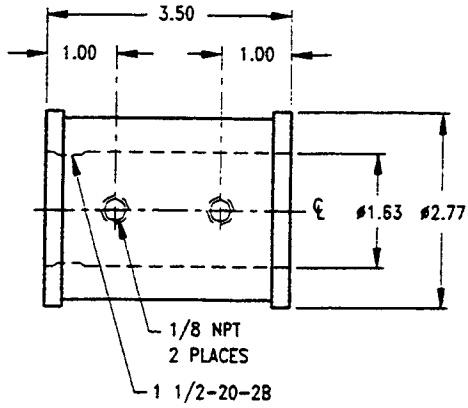


15:1

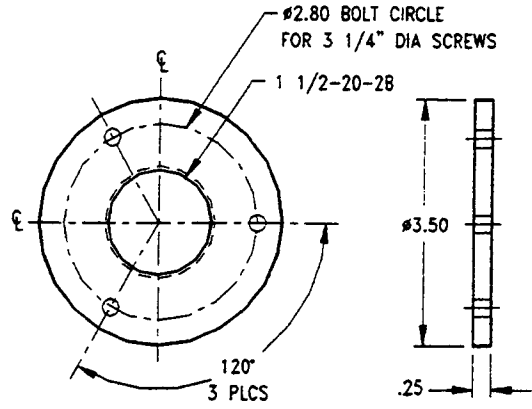


24:1

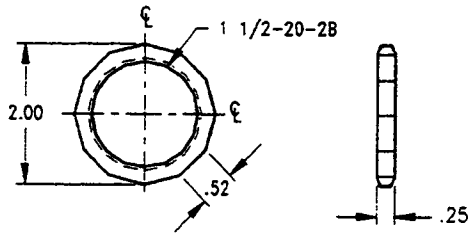
ACCESSORIES - DIMENSIONS (INCHES)



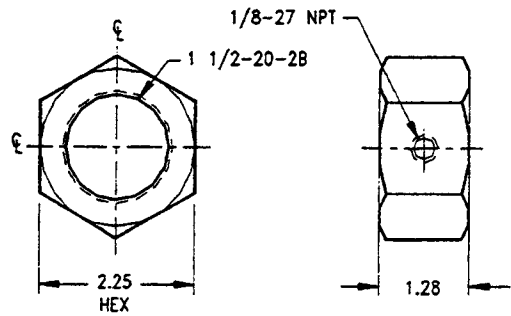
OS65-AWC
WATER COOLING JACKET



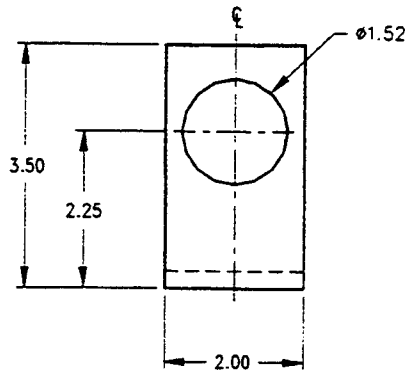
OS65-MF
MOUNTING FRAME



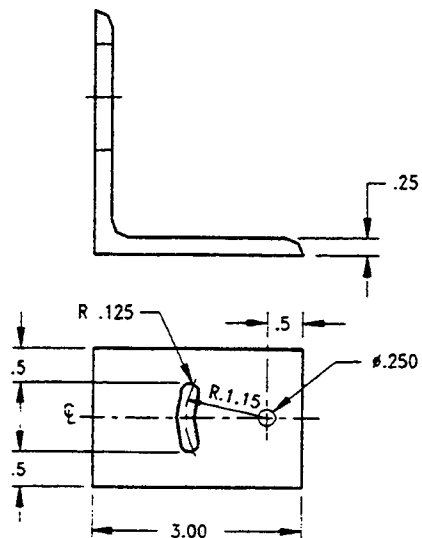
OS65-MN
MOUNTING NUT



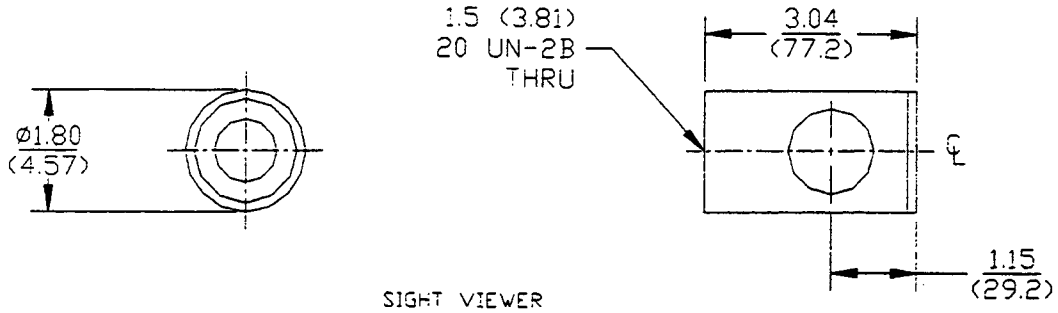
OS65-APC
AIR PURGE COLLAR



OS65-RAB
RIGHT ANGLE MOUNTING BRACKET

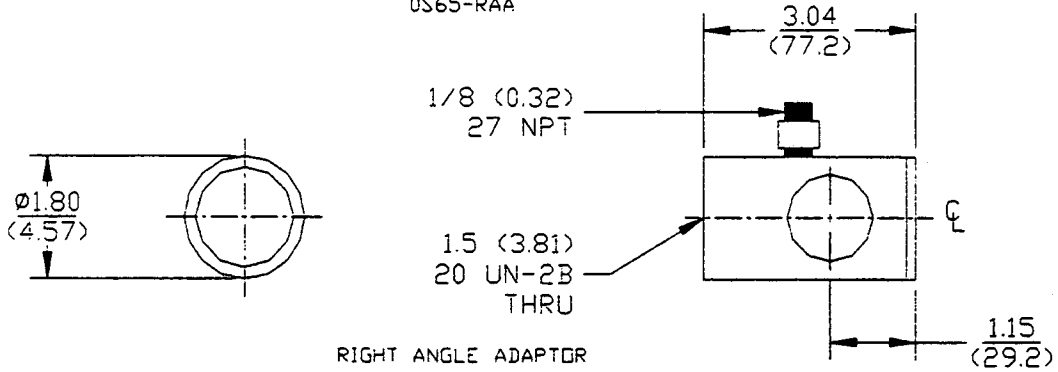


0S65-SV



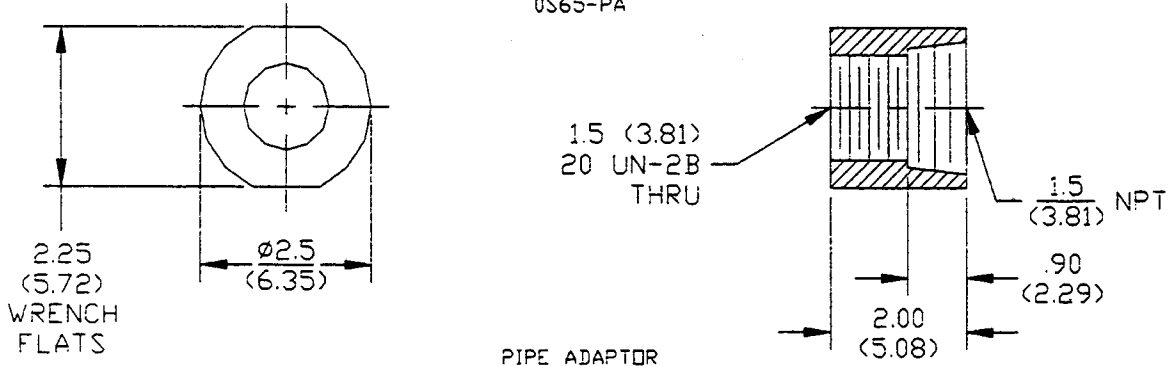
SIGHT VIEWER

0S65-RAA



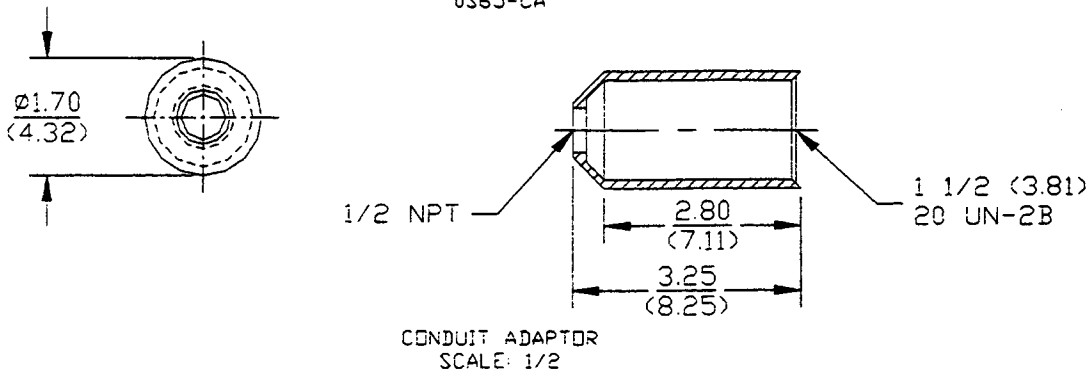
RIGHT ANGLE ADAPTOR

0S65-PA

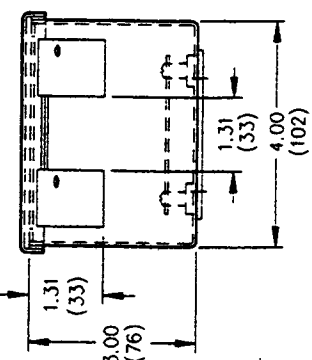
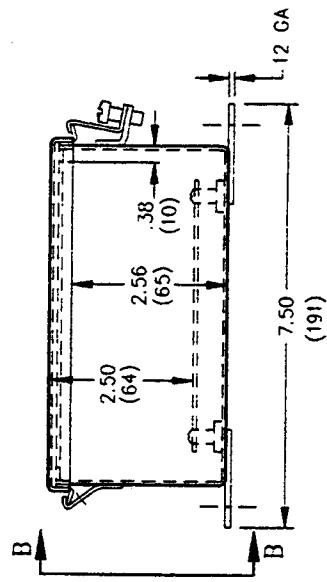
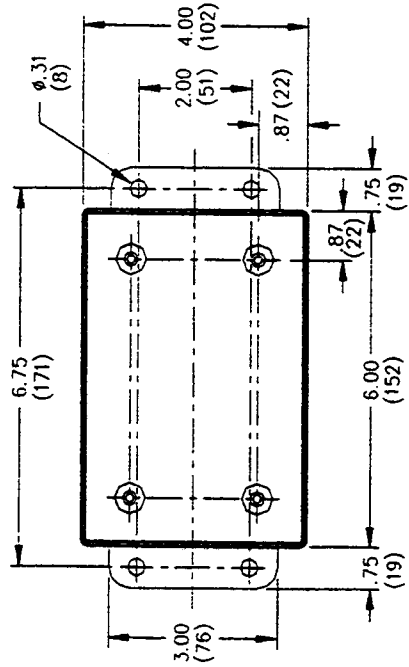
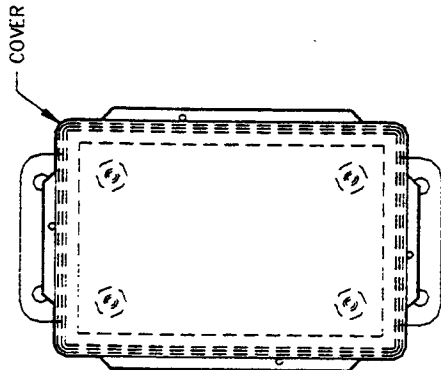


PIPE ADAPTOR

0S65-CA



CONDUIT ADAPTOR
SCALE: 1/2

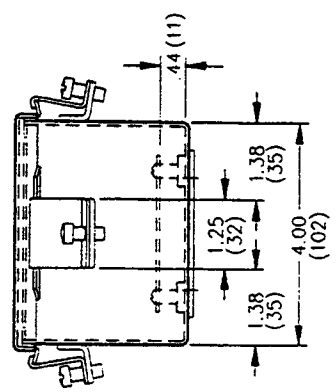
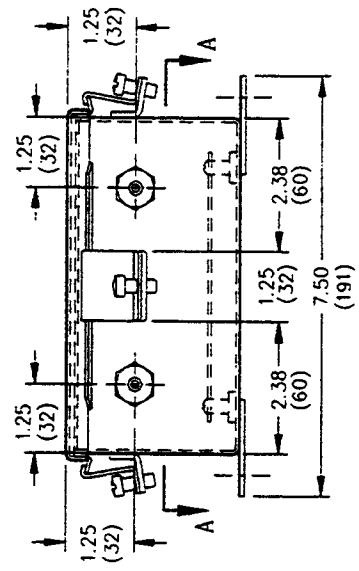


PANELS 14 GAUGE STL.
 FTG FEET 12 GAUGE
 ANS1 61 GRAY
 POLYESTER POWDER COATING
 INSIDE AND OUT

VIEW B-B

VIEW SHOWING HINGE END
 USED ON NEMA-12, N12-MX

SECTION A-A

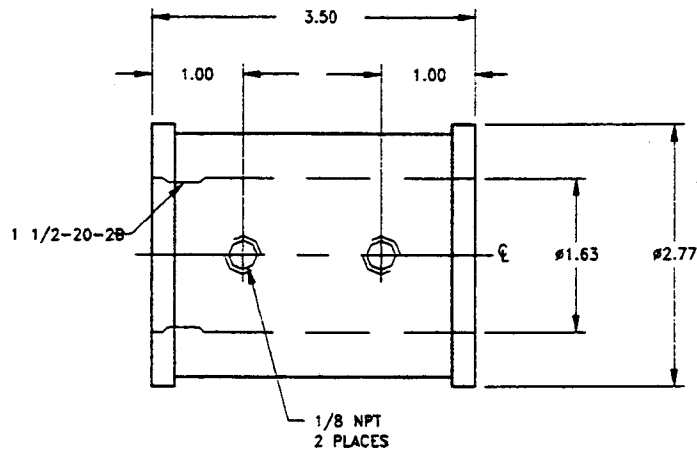


VIEW SHOWING CLAMP END (4 TOTAL)
 USED ON NEMA-4, N4-MX

NEMA 4 & NEMA 12 ENCLOSURE

Sensor (Air/Water-Cooled Housing)

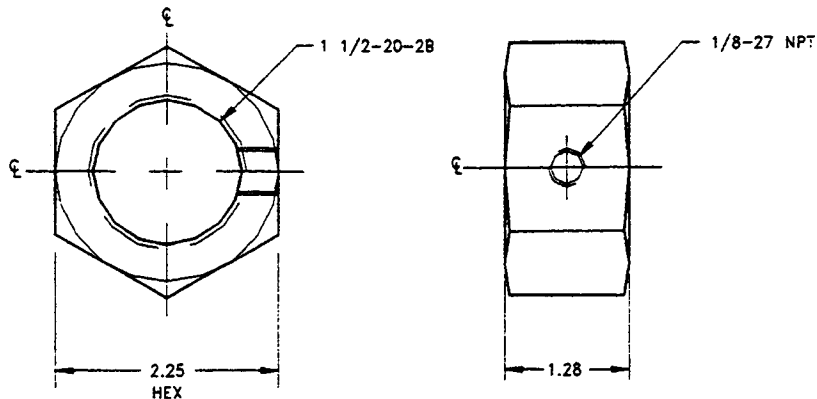
The air/water-cooled housing (AWC) option allows the sensor to be used in ambient temperatures up to 250°F (121°C)/350°F (175°C). It is supplied with two 1/8" NPT threads. Air flow 77°F (25°C) should be 3 to 5 cfm (1.4 to 2.4 liters/sec) with a pressure drop across the housing of 2 to 5 PSID (0.14 to 0.35 Kg/sq cm). Water flow should be approximately 0.5 gallons (2 liters) per minute; water temperature should be 50° to 80°F (10° to 27°C) for efficient cooling. Chilled water, below 50°F (10°C), is not recommended. To avoid condensation and lens damage, it is required to use the APC with the AWC.



OS65-AWC
WATER COOLING JACKET

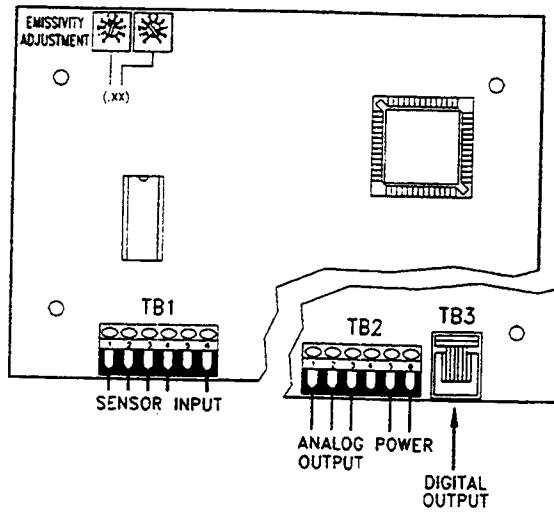
Air Purge Collar (APC)

The APC accessory is used to keep dust, moisture, airborne particles and vapors away from the lens. It may be installed before or after the bracket (see drawing) and screwed in fully. Air flows into the 1/8" NPT thread port and out the front aperture. Air flow should be a maximum of 1 to 3 cfm (0.5 to 1.5 liters/sec.). Clean or "instrument" air is recommended to avoid contaminants from settling on the lens.

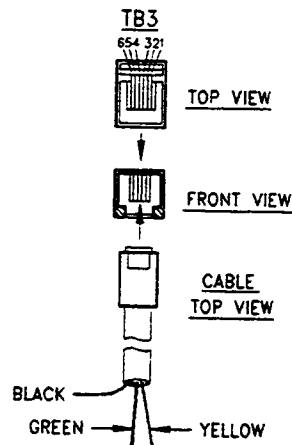
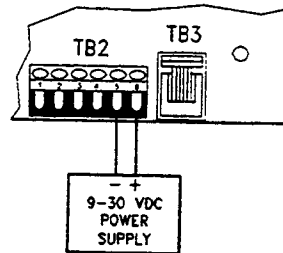


OS65-APC
AIR PURGE COLLAR

DIGITAL OUTPUT WIRING (not field installable)



<u>RS 232</u>	<u>RS 485</u>
<u>TERMINAL TB3</u>	<u>TERMINAL TB3</u>
2 TXD YELLOW	2 TX/RX YELLOW
3 RXD GREEN	3 TX/RX GREEN
5 GND BLACK	



Protocol

9600
no parity
8 data bits
1 start bit
1 stop bit

9600, N, 8, 1

Interrogation

Format: A one character command followed by a two character address and possibly an additional two character address or a two character baud rate code.

The address is two characters between 00 and FF hex. Both characters are required: i.e., 0A rather than just A.

Commands:

#AA	Unit at address AA responds with the IR temperature
@AABB	Unit at address AA gets new address BB
%AA05	Unit at address AA is assigned 4800 baud

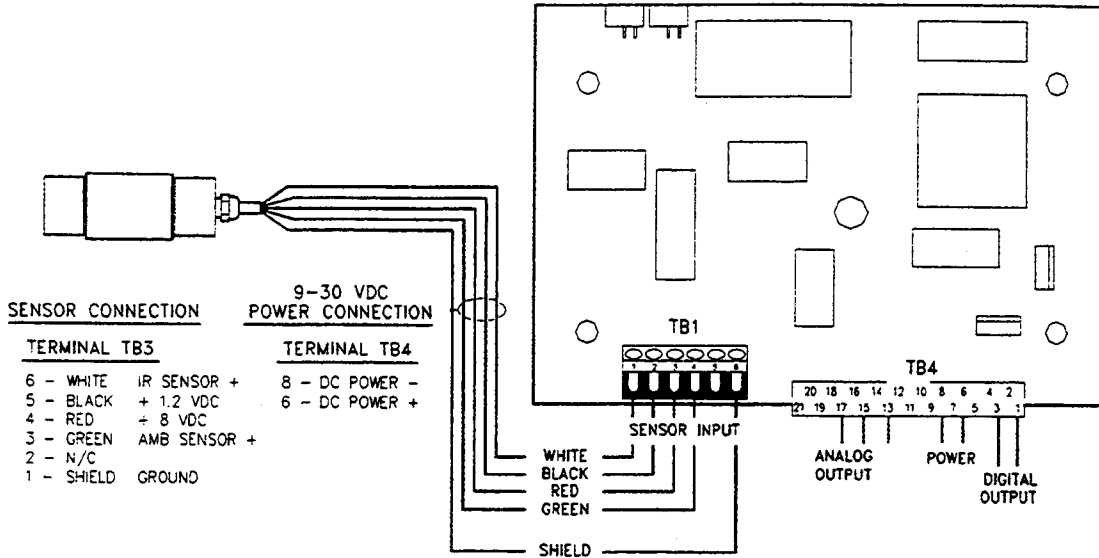
Baud Rate Code:	01	300 baud	02	600 baud
	03	1200 baud	04	2400 baud
	05	4800 baud	06	9600 baud

Reset: Turn unit on with emissivity set at 00.

Default Conditions:

Address:	AA
Baud Rate:	9600

WIRING DIAGRAM

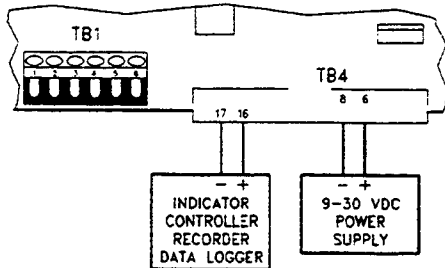


OUTPUT WIRING

OS65-J,K, mV and V

TERMINAL TB4

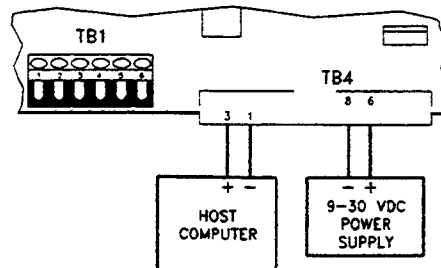
16 + (PLUS)
17 - (MINUS)



RS485

TERMINAL TB4

3 + TX/RX
1 - TX/RX

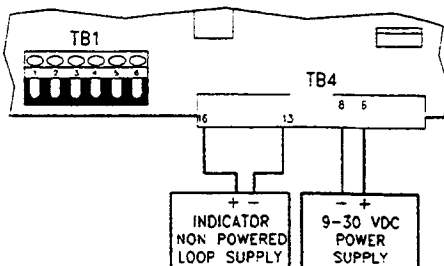


OS65 - MA1 and MA2 with OS65 - CC4 Card Cage

FOR NON-POWERED LOOP SUPPLY

TERMINAL TB4

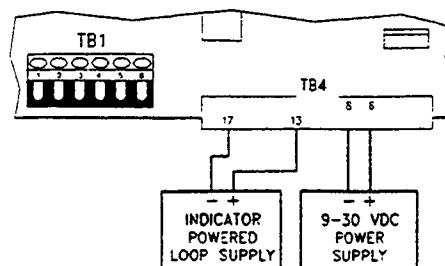
16 + (PLUS)
13 - (MINUS)



FOR POWERED LOOP SUPPLY

TERMINAL TB4

17 - (MINUS)
13 + (PLUS)





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 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. 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 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 are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only 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. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

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. 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 the 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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