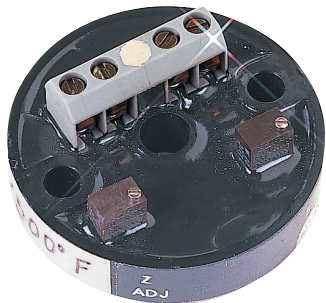


**1 YEAR**  
WARRANTY



# TX94 RTD Temperature Transmitter

## User's Guide

Shop online at

**omega.com**<sup>®</sup>

Ω OMEGA<sup>®</sup>

*omega.com*

*e-mail: info@omega.com*

*For latest product manuals:*

*omegamanual.info*



OMEGAnet® On-Line Service  
omega.com

Internet e-mail  
info@omega.com

**Servicing  
North America:**

U.S.A.:

ISO 9001 Certified

OMEGA Engineering, Inc., One Omega Drive,

P.O. Box 4047, Stamford, CT 06907-0047 USA

Toll-Free: 1-800-826-6342

TEL: (203) 359-1660

FAX: (203) 359-7700

e-mail: info@omega.com

**Canada:**

976 Bergar

Laval (Quebec), H7L 5A1 Canada

Toll-Free: 1-800-826-6342

TEL: (514) 856-6928

FAX: (514) 856-6886

e-mail: info@omega.ca

**For immediate technical or  
application assistance:**

U.S.A. and Canada:

Sales Service: 1-800-826-6342/1-800-TC-OMEGA®

Customer Service: 1-800-622-2378/1-800-622-BEST®

Engineering Service: 1-800-872-9436/1-800-USA-WHEN®

**Mexico/Latin America**

En Español: 001 (203) 359-7803

FAX: 001 (20) 359-7807

e-mail: info@omega.com.mx

espanol@omega.com

## Servicing Europe:

### Benelux:

Managed by the United Kingdom Office  
Toll-Free: 0800 099 3344 TEL: +31 20 347 21 21  
FAX: +31 20 643 46 43 e-mail: sales@omegaeng.nl

### Czech Republic:

Frystatska 184, 733 01 Karviná, Czech Republic  
Toll-Free: 0800-1-66342 TEL: +420-59-6311899  
FAX: +420-59-6311114  
e-mail: info@omegashop.cz

### France:

Managed by the United Kingdom Office  
Toll-Free: 0800 466 342 TEL: +33 (0) 161 37 29 00  
FAX: +33 (0) 130 57 54 27 e-mail: sales@omega.fr

### Germany/Austria:

Daimlerstrasse 26  
D-75392 Deckenpfronn, Germany  
Toll-Free: 0800 6397678 TEL: +49 (0) 7056 9398-0  
FAX: +49 (0) 7056 9398-29 e-mail: info@omega.de

### United Kingdom: ISO 9001 Certified

OMEGA Engineering Ltd.  
One Omega Drive, River Bend Technology  
Centre, Northbank, Irlam, Manchester  
M44 5BD United Kingdom  
Toll-Free: 0800-488-488  
TEL: +44 (0) 161 777-6611  
FAX: +44 (0) 161 777-6622  
e-mail: sales@omega.co.uk

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 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.

## 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. OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2010 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

**TX94**  
**RTD Two-Wire Temperature Transmitter**

---

	<b>Page</b>
<b>Section 1 Introduction</b>	<b>1</b>
1.1 General Description .....	1
1.2 Features .....	6
1.3 Models Available .....	7
<b>Section 2 Unpacking Instructions</b>	<b>9</b>
<b>Section 3 Installation</b>	<b>10</b>
3.1 Mounting the TX94 .....	10
3.2 Wiring the TX94 .....	11

**TX94**  
**RTD Two-Wire Temperature Transmitter**

---

	<b>Page</b>
<b>Section 4 Calibration Instructions</b>	<b>18</b>
4.1 Equipment Required .....	18
4.2 Calibration Procedures .....	19
<b>Section 5 Troubleshooting Guide</b>	<b>23</b>
<b>Section 6 Accessories</b>	<b>25</b>
<b>Section 7 Specifications</b>	<b>26</b>

# 1

## Introduction

---

### 1.1 General Description

The OMEGA® TX94 Two-Wire RTD Transmitter will produce a standard 4-20 mA output signal proportional to that produced by its RTD input temperature sensor. Transmission of the proportional current output may be accomplished by using inexpensive copper wire. The TX94 RTD Transmitter accepts two-wire or three-wire Ohm Platinum RTD sensors (PT100,  $\alpha = 0.00385$ ).

---

**NOTE**

---

Older units only accept two wire RTD's. See wiring diagram on label on actual unit.

## 1

## Introduction



Figure 1-1 TX94 Transmitter

2

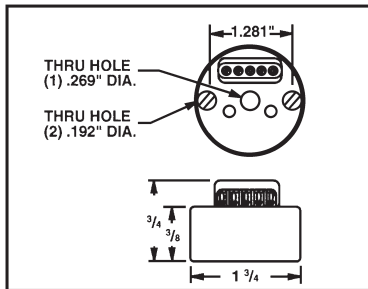


Figure 1-2 Dimensions (in inches)

The TX94 transmitter is normally powered by an unregulated power supply as shown in Figure 1-3. The proportionally-transmitted signal begins at 4 mA, at the low end of its temperature range, and increases to 20 mA, at the high end of its temperature range. (There are various temperature ranges available for the TX94 transmitter. To order, refer to Section 1.3 for correct Model Numbers and Range Codes.)



## 1

## Introduction

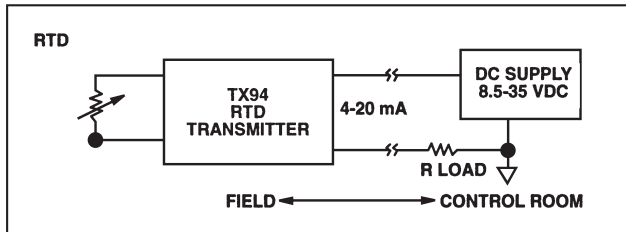


Figure 1-3 TX94 RTD Transmitter

**NOTE**

Older units may accept two wire RTD's only.

---

The TX94 two-wire transmitter works with 2-wire or 3-wire RTDs and provides an output current of 4-20 mA proportional to the RTD Sensor. When the transmitter is mounted inside a protection head (such as the OMEGA NB1 Protection Head) two copper wires now carry the temperature signal and dc voltage to operate the transmitter, thereby reducing possible noise pick-up errors. The TX94 does NOT provide isolation between its input and the 4-20 mA output. Note, however, that the RTD element is electrically insulated.

## 1.2 Features

- 4-20 mA output
- $\pm 0.1\%$  full-scale accuracy (with respect to the RTD input resistance)
- Upscale break protection
- Low Cost

## 1.3 Models Available

**Table 1-1. Range Code**

<b>RANGE</b>	<b>INPUT TYPES</b>		<b>RTD</b>
	<b>RTD</b>	<b>RANGE</b>	
-40 to 120°F	1	50/85°F	71
0 to 200°F	2	0/100°F	72
0 to 300°F	3	20/120°F	73
0 to 500°F	4	0/150°D	74
0 to 750°F	5	0/200°C	75
0 to 1000°F	6	30/100°F	76

---

## TX94 Models Available

Model Number	Description
TX94-(*)	RTD transmitter (100 $\Omega$ , Pt, alpha = 0.00385)
PRTX94-(*)	PR-12 RTD probe, 12" L, 1/4" O.D., 304SS sheath

\*Insert range code from Table 1-1

For complete information on PR-12 RTD Probes, see  
the OMEGA Temperature Handbook.

## 2

# Unpacking Instructions

---

Remove the Packing List and verify that you have received all equipment, including:

- TX94 RTD Two-Wire Temperature Transmitter
- Operator's Manual

If you have any questions about the shipment, please call the 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 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.

---

# 3

## Installation

---

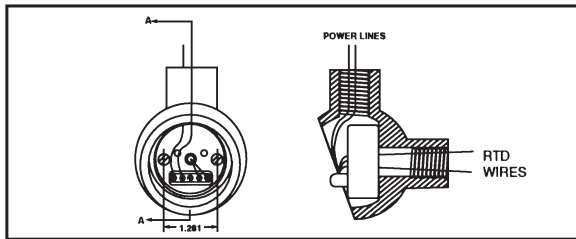
### 3.1 Mounting the TX94

The TX94 transmitter may be:

1. surface mounted,
2. mounted inside a protection head (refer to Figure 3-1), or
3. installed into the OMEGA mounting track (part number RT) using an OMEGA mounting bracket (part number TX90-BR).
4. installed into standard 35mm DIN rail using an OMEGA DIN rail mounting adapter (part number TX-90-DIN).

Figure 3-2 shows the RT mounting track. Figure 3-3 shows the TX90-BR mounting bracket.

Figure 3-4 shows a typical installation using the bracket and mounting track. Figure 3-5 shows the TX90-DIN adapter.

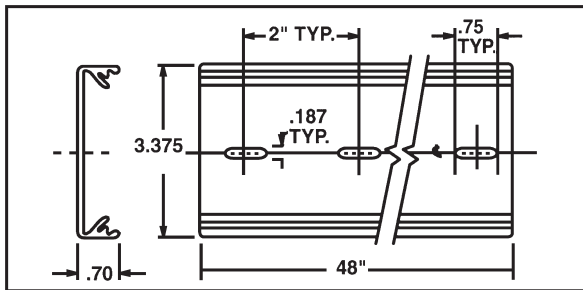


**Figure 3-1 Assembly of the Transmitter inside an OMEGA NB1 Protection Head (Dimensions in inches)**



## 3

## Installation

**NOTE**

Hand tighten transmitter mounting screws only. Do not overtighten.

Figure 3-2 RT Mounting Track (Dimensions in inches)

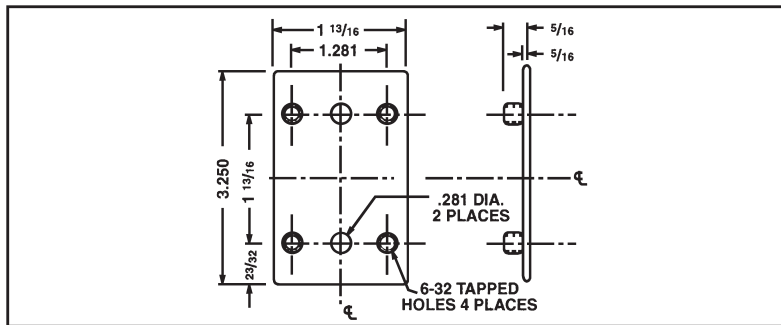


Figure 3-3 TX90-BR Mounting Bracket (Dimensions in inches)

## 3

## Installation

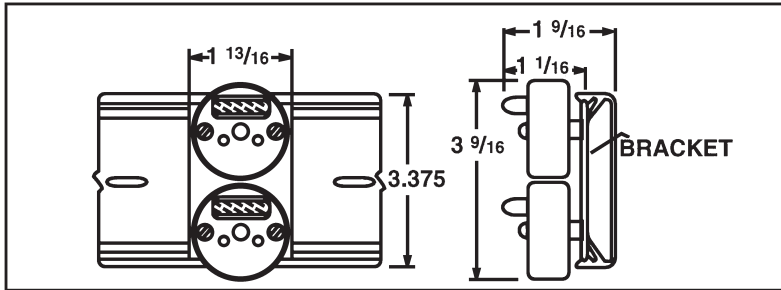


Figure 3-4 Installation with the Bracket and Track (Dimensions in inches)

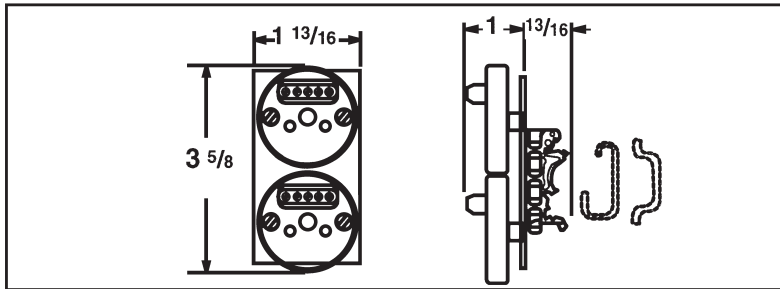


Figure 3-5 TX 90-DIN DIN Rail Mounting Adapter (Dimensions in inches)

### 3.2 Wiring the TX94 (Refer to Figure 3-6)

1. Connect a dc power supply in series with the load to the (+PS) and (-PS) power terminals. Note that the load (usually a monitoring instrument) may be connected to either the (+) or (-) power lead.
2. Connect the RTD element to the input terminals as shown.

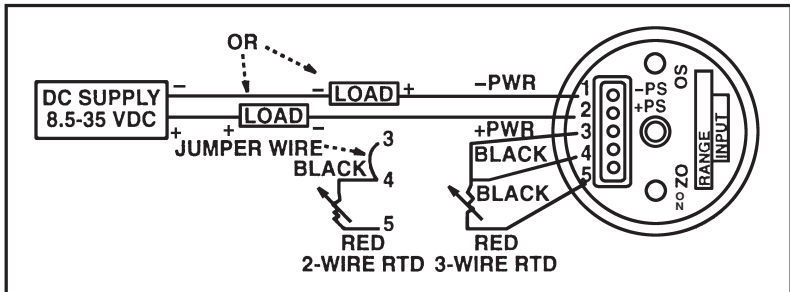


Figure 3-6 Wiring Diagram for the TX 94

**NOTE**

Older units may accept 2-wire RTDs only

# 4

## Calibration Instructions

---

### 4.1 Equipment Required

- Precision Decade Resistance Box, with 0.01 ohm resolution and  $\pm 0.02$  ohm accuracy or
- Precision RTD Simulator, such as the OMEGA Model CL511 Precision Calibrator
- Precision DMM capable of measuring mA, within 0.001 mA resolution and  $\pm 0.002$  mA accuracy

## 4.2 Calibration Procedures (Refer to Figure 4-1)

Connect the calibration equipment according to Figure 4-1. Standard copper test leads are used with RTD instrumentation.

To check or adjust the calibration:

1. Locate the Z (zero) and S (span) potentiometers.
2. Select, from Table 4-1, the correct ohmic values for the Z (zero) and S (span) adjustments that correspond to the Model Number. For example, for Model TX94-2, the Z value is 93.04 ohms, and the S value is 135.97 ohms.



If a Thermocouple/RTD Simulator is used, such as the OMEGA Model CL511 Precision Calibrator, select the Temperature Input Z (zero) and S (span) values.

3. Set the decade box to the selected Z (zero) ohmic value. Adjust the Z potentiometer to read 4.000 mA on the monitoring instrument.
4. Set the decade box to the selected S (span) ohmic value. Adjust the S potentiometer to read 20.000 mA on the monitoring instrument.
5. Repeat steps 3 and 4, as required, until the readings are exactly 4.000 mA and 20.000 mA. This procedure is necessary since there is interaction between the two potentiometers.

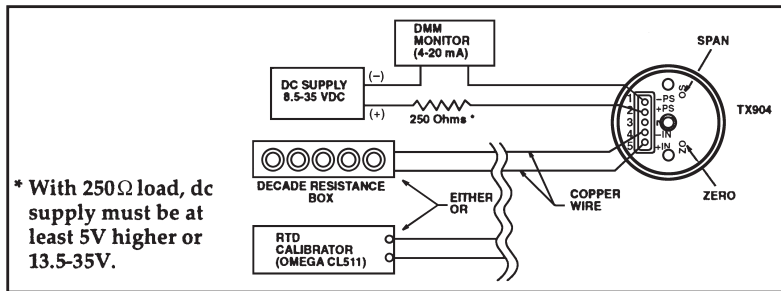


Figure 4-1 TX94 RTD Calibration Set-Up

**NOTE**

Older units may accept 2-wire RTDs only

## 4

## Calibration Instructions

Table 4-1. Calibration Values for the TX94

Temperature Input Range Zero/Span	Model TX94	Resistance Input (Ohms) Alpha = 0.00385 Zero/Span	Temperature Input Range Zero/Span	Model TX94	Resistance Input (Ohms) Alpha = 0.00385 Zero/Span
-40/120°F	-1	84.27/118.97	50/85°F	-71	103.90/111.46
0/ 200°F	-2	93.04/135.97	0/100°F	-72	93.04/114.68
0/ 300°F	-3	93.04/156.90	20/120°F	-73	84.27/118.97
0/ 500°F	-4	93.04/197.69	0/150°F	-74	93.04/125.37
0/ 750°F	-5	93.04/246.65	0/200°C	-75	93.04/175.84
0/1000°F	-6	93.04/293.39	30/100°F	-76	99.57/114.68



# 5

## Troubleshooting Guide

---

Malfunction or incorrect operation may be caused by:

1. Incorrect Readings:

Check for improper wiring (Refer to Figure 3-6)

2. Loose or broken wires:

Check each terminal connection for tightness. Move each wire back and forth and note any changes in operation.

3. Too high a load resistance in the output current loop or too low a current rating on the power supply:

- a) Measure the total resistance of each device (excluding the transmitter and power supply) in the 20 mA loop, including the resistance of the lead wires.
- b) Calculate maximum allowable loop resistance using the formula: Loop Resistance (maximum) = 
$$\frac{V_{\text{supply}} - 8V}{0.020A}$$

For example, a 24V power supply would give a maximum loop resistance of:  $16V / 0.020A = 800$  ohms.

- c) Make sure the power supply is rated for at least 28 mA times the number of TX94 transmitters being powered. For example, if the supply is powering five transmitters, the supply should be rated for at least 140 mA.

**6****Accessories**

---

<b>Model No.</b>	<b>Description</b>
TX90-BR	Mounting Bracket
PSU-24B	Unregulated Power Supply, 24 Volts
TX828	Process Loop-Powered Indicator
RT	48" Mounting Track
TX90-DIN	DIN Rail Mounting Adapter
RAIL -35-2	6.5' Section 35mm DIN Rail

---

### General

---

Size:	1.75" dia. X 0.75" high (includes terminal strip)
Zero/Span Adjustment	
Range:	$\pm 20\%$
Power Supply Voltage	
Operating Range:	+8 Vdc to +35 Vdc, 28 mA max required per transmitter
Accuracy:	$\pm 0.1\%$ of full scale (includes effects of hysteresis, repeatability and linearity proportional to the T/C)

---

Frequency Response:	2dB@ 3Hz
Ambient Temperature:	-13°F to 185°F (-25°C to 85°C)
Storage Temperature Range:	-85°F to 257°F (-65°C to 125°C)
Thermal Zero Shift:	<0.01%/°F of span (span >10 mV) <0.02%/°F of span (4-10 mV span)
Thermal Span Shift:	<0.01%/°F of span
Weight:	1.0 oz (28g)

---

**Output**

---

Current Output Span: 4-20 mA dc



Current Output

Limits: 3 to 28 mA, typical

Maximum Loop

Resistance:  $(V_{\text{supply}} - 8V)/0.020A = \text{ohms}$

Load Resistance Effect: 0.01% of span per 300 ohms change

Power Supply Effect: 0.002% of output span per volt

---

**Input**

---

Sensor: 2 or 3-wire RTD

Maximum Bridge

Current: 2 mA



## 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. The 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 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; or 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.

**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 the company 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.

# Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

*Shop online at [omega.com](http://omega.com)<sup>SM</sup>*

## TEMPERATURE

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

## PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

## FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

## pH/CONDUCTIVITY

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

## DATA ACQUISITION

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Data Logging Systems
- ☑ Recorders, Printers & Plotters

## HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

## ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments

M2226/0605