

Specification

Features and Benefits

- *Patented smart key menu programming.*
- *Superior accuracy in low conductivity and pure water applications.*
- *Two fully programmable isolated outputs:*
Zero to 20 mA/four to 20 mA.
- *Three fully programmable relay outputs.*
- *Compatible with complete line of ABB two-electrode conductivity sensors.*
- *Back-lit display for easy viewing.*
- *Adjustable damping.*
- *Hold output function:* Holds all outputs or any individual output.
- *Programmable security codes and configuration lockout.*
- *Universal power supply:* 120/240 VAC, 50/60 Hz. Voltage range is 94 to 276 VAC.
- *Many modes of temperature compensation:*
Includes three for pure water.
- *NEMA 4X/IP65 housing:* Cast aluminum with corrosion resistant powder coat finish.
- *CE Mark.*



TC02662A

TB84TE - a leap forward in two-electrode conductivity analyzer technology.

The ABB Type TB84TE Advantage™ Conductivity Analyzer is a unique and advanced microprocessor-based instrument. Smart keys on the front panel provide local programming of all analyzer functions. Easy-to-follow instructions appear above each smart key. A secondary display clearly defines each menu option during programming. When the analyzer is in the normal operating mode, the secondary display shows several useful parameters. This innovative, user-friendly interface provides straightforward analyzer operation, configuration, and calibration. Standard outputs include two isolated analog (current) outputs and three relay outputs. The analog outputs can be configured for the process variable (PV) and/or temperature. The relay outputs can be configured for the PV, temperature, diagnostics, cycle timer controller, or sensor cleaner.

The Type TB84TE analyzer is compatible with all ABB two-electrode conductivity sensors. It automatically ranges itself across three decades of conductivity resolution for any single cell constant. Two-electrode sensors provide accurate conductivity measurements in lower conductivity solutions and pure water. Precalibration is accomplished by programming the cell constant of the sensor during configuration. Careful selection of electrode materials (316 stainless steel standard), insulator materials, and electrode spacing provides rugged sensors and reduced sensor maintenance. Sensor diagnostics include sensor polarization, and open or shorted temperature compensator/cabling.

The Type TB84TE analyzer meets current CE, NEMA 4X, and IP65 requirements.

Two-Electrode Sensor Compatibility

The analyzer accepts inputs from all ABB two-electrode sensors. A menu choice during configuration makes changing from one cell constant to another easy. No jumpers or manual adjustments are required.

Two-Electrode Sensor Ranges

Cell Constant	Conductivity Range	Display Resolution	Autorange
0.01	0 to 199 $\mu\text{S/cm}$	0.001 $\mu\text{S/cm}$	1.999 to 19.99 to 199.9 $\mu\text{S/cm}$
0.10	0 to 1,999 $\mu\text{S/cm}$	0.01 $\mu\text{S/cm}$	19.99 to 199.9 to 1,999 $\mu\text{S/cm}$
1.00	0 to 19.99 mS/cm	0.1 $\mu\text{S/cm}$	199.9 $\mu\text{S/cm}$ to 1,999 $\mu\text{S/cm}$ to 19.99 mS/cm

Basic or Advanced Programming

The basic or advanced programming mode can be chosen at the time of purchase. The advanced mode has

an expanded set of functions intended for complex applications. Separating the basic and advanced modes simplifies setup and calibration activities. The advanced configuration choices are:

- **Concentration analyzer:** User-defined through a six-point conductivity versus concentration linear curve fit where output follows concentration. Engineering unit choices are percent (%), parts per million (ppm), parts per billion (ppb), and user-defined.
- **Temperature compensation types:** Pure water neutral salt, pure water trace base, pure water trace acid, user-defined function generator.
- **Analog pulse diagnostic output.**
- **Nonlinear output:** User-defined through a six-point conductivity versus desired current output that best fits the nonlinear relationship.
- **Expanded relay functions and flexibility.**

Analog Outputs

The analyzer has two isolated analog outputs (AO1 and AO2). Each is user-configurable as either a zero to 20 or a four to 20-milliampere signal. AO1 is dedicated to the PV while AO2 is configurable for either the PV or temperature. A two-point calibration method applies to both analog outputs. This allows adjustment of the analog outputs to compensate for other devices in the loop that may not be calibrated. Entering the PV or temperature endpoints in reverse order allows for reverse-acting outputs.

A capacitive type lag, applied via the damping function, is useful in process environments where noise is present. Damping is supported for both analog outputs and the displayed PV, and has a maximum value of 99.9 seconds. One damping value affects both analog outputs and the displayed PV in basic configurations. Individual damping values affect each analog output and the displayed PV in advanced configurations.

Relay Outputs

The analyzer has three relay outputs available (RO1, RO2, RO3). Each is jumper selectable as either normally open (NO) or normally closed (NC). *RELAY*, followed by the corresponding relay number, appears on the display when a relay activates. The functionality of each relay output depends on the configuration mode. Table 1 shows the possible functionality of each relay output for basic and advanced configurations. Advanced programming allows all function choices shown in Table 1 for each of the three relay outputs.

Table 1. Relay Output Functionality¹

Function	RO1		RO2		RO3	
	Basic	Adv	Basic	Adv	Basic	Adv
High or low PV alarm	•	•	•	•	•	•
High or low temperature alarm (°C or °F)		•	•	•	•	•
Diagnostics alarm		•		•	•	•
High or low cycle timer		•		•		•
Sensor cleaner ²		•		•		•

NOTES:

1. • = available.
2. If a relay output has been configured as a sensor cleaner, no other relay output can be used for this function.

High and low alarms can be chosen for the PV and temperature in either degrees Celsius or degrees Fahrenheit. Each has a user-selectable deadband and time delay designed to control relay functions and prevent problems like relay chatter. The diagnostic relays can be linked to sensor diagnostics, analyzer diagnostics, or all diagnostic conditions. The high and low cycle timer has adjustable set points, cycle time, and on time. The cycle timer allows a waiting period to see the results of chemical addition by interrupting the feed. The sensor cleaner feature provides for cycle time, on time, and recovery time programming. This makes set up and operation of the analyzer with the ABB hydraulic sensor cleaner or Model TB18 Safe-T-Clean® Sensor Valve easy and trouble free.

Diagnostics

The Type TB84TE analyzer constantly monitors both the sensor and the analyzer. This helps to ensure reliability and accuracy. Upon detection of a diagnostic condition, the analyzer provides diagnostic notification by flashing *FAULT* on the display and supplying a pulse on AO1 (if activated). Pressing the *FAULT info* smart key stops *FAULT* from flashing and provides, on the secondary display, a short description and fault code. *FAULT* remains on until resolution of the problem. Sensor faults that activate the diagnostic notification are:

- Sensor polarization.
- Shorted or open temperature compensator.

Hold Output

The analyzer has a hold output state that improves plant safety and process integrity during maintenance and calibration. When activated, *HOLD* appears at the top of the display. Upon release of the hold state, *HOLD* disappears. When the sensor cleaner option is chosen, the analyzer provides the option of holding all analog and relay outputs during the cleaning cycle. The analog outputs can be held to any preselected level. The relay

outputs can be held individually to any active or inactive state. This is useful for checking and exercising any external devices connected to the analyzer.

Diagnostic Pulse

The analog output is fully scalable over any conductivity or concentration range. Advanced configurations allow pulsing of AO1 during a diagnostic condition.

When the diagnostic pulse is active, the output is modulated for one second out of a six-second repeating cycle to a configuration selectable level ranging from one to 100 percent of span (0.16 to 16 milliamperes for a four to 20-milliamper output or 0.20 to 20 milliamperes for a zero to 20-milliamper output). Should the actual output of the analyzer be below 12 milliamperes, the pulse will add current; if the actual output is at or above 12 milliamperes, it will subtract current. This provides remote notification of a problem with proper configuration of a digital control system (DCS), programmable logic controller (PLC), or chart recorder.

Temperature Compensation

The Type TB84TE analyzer is compatible with either Pt 100 or PT 1000 temperature compensators. The automatic temperature compensation options are: manual, automatic for potassium chloride (KCl), user-entered coefficient in percent per degree Celsius, a user-defined function generator, and trace acid, trace base, and neutral salt for pure water.

Calibration

Smart key programming makes analyzer calibration accurate and efficient. Process calibration is a straightforward one-point smart calibration resulting in either a slope adjustment, offset adjustment, or a combination of adjustments. Selecting the reset calibration state results in the calibration defaulting to the original factory calibration. A one-point smart temperature calibration also exists. This calibration adjusts either the temperature slope, offset, or a combination. A special edit calibration state allows manual editing or adjusting of the calibration data. This feature is useful during a startup where a large number of similar loops are being set up and calibrated at the same time. Calibration of the zero to 20-milliamper output or four to 20-milliamper output is allowed via an easy two-point procedure.

Programmable Security Code

The analyzer has one three-digit security code. Menu-selectable choices allow the security code to be applied to none of or any combination of these menu choices: calibrate, output/hold, setpoint/tune, and configure.

Specifications

Type	Conductivity analyzer
Input Voltage	120/240 VAC, 50/60 Hz
Range:	94 to 276 VAC
Installation category:	II
Power Consumption	17 VA max.
Input Type	ABB 2-electrode conductivity sensors
Input Range	
Conductivity:	0.000 $\mu\text{S/cm}$ to 19.99 mS/cm
Concentration:	0.000 to 1,999 digits (engineering units configurable)
Display Resolution	
Conductivity:	0.001 $\mu\text{S/cm}$, 0.01 $\mu\text{S/cm}$, 0.1 $\mu\text{S/cm}$ (cell constant dependant)
Concentration:	0.001 digits (configurable)
Temperature:	1°C, 1°F
Temperature Compensation Types	Pt 100, Pt 1000
Temperature Compensation	Manual (0.1N KCl based)
	Automatic, configurable as: standard (0.1N KCl based), user-defined coefficient (0 to 9.99%/°C), pure water - neutral salt, pure water - acid, pure water - base, user-defined function generator
Analog Output Ratings	
	2, completely isolated 0 to 20 mA or 4 to 20 mA outputs, 750 Ω max. load value, AO1 fixed to PV, AO2 configurable to either PV or temperature
AO1	
	Conductivity/concentration - Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, linear and nonlinear, configurable across full range
Minimum span:	
1.00 Cell Constant	100.0 $\mu\text{S/cm}$
0.10 Cell Constant	10.00 $\mu\text{S/cm}$
0.01 Cell Constant	1.000 $\mu\text{S/cm}$
Concentration	5% max. concentration range
Maximum span:	
1.00 Cell Constant	19.99 mS/cm
0.10 Cell Constant	1,999 $\mu\text{S/cm}$
0.01 Cell Constant	199.9 $\mu\text{S/cm}$
Concentration	1,999 digits
AO2	
	Conductivity/concentration/temperature (°C or °F) - Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, configurable across full range
Minimum span:	
1.00 Cell Constant	100.0 $\mu\text{S/cm}$

AO2 (continued)

0.10 Cell Constant	10.00 $\mu\text{S/cm}$
0.01 Cell Constant	1.000 $\mu\text{S/cm}$
Concentration	5% max. concentration range
Temperature	10°C, 18°F
Maximum span:	
1.00 Cell Constant	19.99 mS/cm
0.10 Cell Constant	1,999 $\mu\text{S/cm}$
0.01 Cell Constant	199.9 $\mu\text{S/cm}$
Concentration	1,999 digits
Temperature	300°C, 540°F

Relay Outputs

Form C, SPDT relays that are jumper selectable as either normally open or normally closed. Refer to Table 1 to see functionality of each relay output in basic and advanced configurations.

Ratings:

Max. AC capacity	100 VA, 240 VAC, 3 A
Max. DC capacity	50 W, 24 VDC, 2 A

High and low set points (basic and advanced configurations):

Source: Conductivity and concentration

High/low/deadband	Software configurable
Delay value range	00.0 to 99.9 min.

Source: Temperature (°C or °F)

High and low range	0° to 300°C or 32° to 572°F
Deadband range	0° to 10°C or 0° to 18°F
Delay value range	00.0 to 99.9 min.

High or low cycle timer (advanced configurations only):

Source: conductivity and concentration

Turn on range	Software configurable
Cycle time and on time range	00.0 to 99.9 min.

Sensor cleaner (advanced configurations only):

Cycle time range	00.0 to 99.9 hr
On time range	00.0 to 99.9 min.
Recovery time range	00.0 to 99.9 min.

Nonlinearity and Repeatability

Conductivity:

Display	$\pm 1.0\%$ of measurement range per decade
Output	± 0.02 mA at full scale output settings

Temperature: 1°C

Maximum Sensor Cable Length

30.5 m (100 ft)

Turn On Time

2 secs typical, 4 secs max.

Load Resistance Range (analog outputs)750 Ω max.**Damping**Continuously adjustable from
00.0 to 99.9 secs**Dynamic Response**3 sec for 90% step change with
00.0 sec damping**Mounting Position Effect**

None

Environmental

Temperature:

Operating

-20° to 60°C (-4° to 140°F)

Storage

-40° to 70°C (-40° to 158°F)

Humidity (operating and storage):

Will meet specifications to 95%
RH**Housing**NEMA 4X and IP65, aluminum alloy with corrosion resis-
tant powder coating**Conduit Connection**5 total, 2 each 0.875-in. holes in enclosure that accept
½-in. hubs, 3 each 0.600-in. holes that accept PG9 hubs**Size (½ DIN)**

h x w x d:

144.0 x 144.0 x 171.0 mm
(5.67 x 5.67 x 6.73 in.)

Min. panel depth:

144.8 mm (5.70 in.)

Max. panel thickness:

9.5 mm (0.38 in.)

Panel cutout:

135.4 (+1.3, -0.8) by 135.4
(+1.3, -0.8) mm
(5.33 (+0.05, -0.03) by 5.33
(+0.05, -0.03) in.)**Weight**2.1 kg (4.6 lbs), 3.4 kg (7.5 lbs)
with pipe mounting hardware**Agency Certifications**

CSA:

Class I; Division 2, Groups A, B, C, and D

Class II; Division 2, Groups E, F, and G

Class III; Division 2

FM: Nonincendive

Class I; Division 2, Groups A, B, C, and D

Class II; Division 2, Groups F and G

Class III; Division 2

EMC RequirementsCE certified - complies with all applicable European Com-
munity product requirements, specifically those required to
display the CE marking on the product nameplate.SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

Installation Accessories

Number	Description
4TB9515-0123	Panel mounting kit
4TB9515-0124	Pipe mounting kit
4TB9515-0125	Hinge mounting kit
4TB9515-0156	Wall mounting kit
4TB9515-0165	Cable grip for ½-in. hubs
4TB9515-0191	Cable grip for PG9 hubs
4TB9515-0198	Complete cable grip kit (2 each ½-in. and 3 each PG9)

Wiring and Installation DiagramsFigures 1, 2, 3, 4, and 5 show the wiring and installation
diagrams.

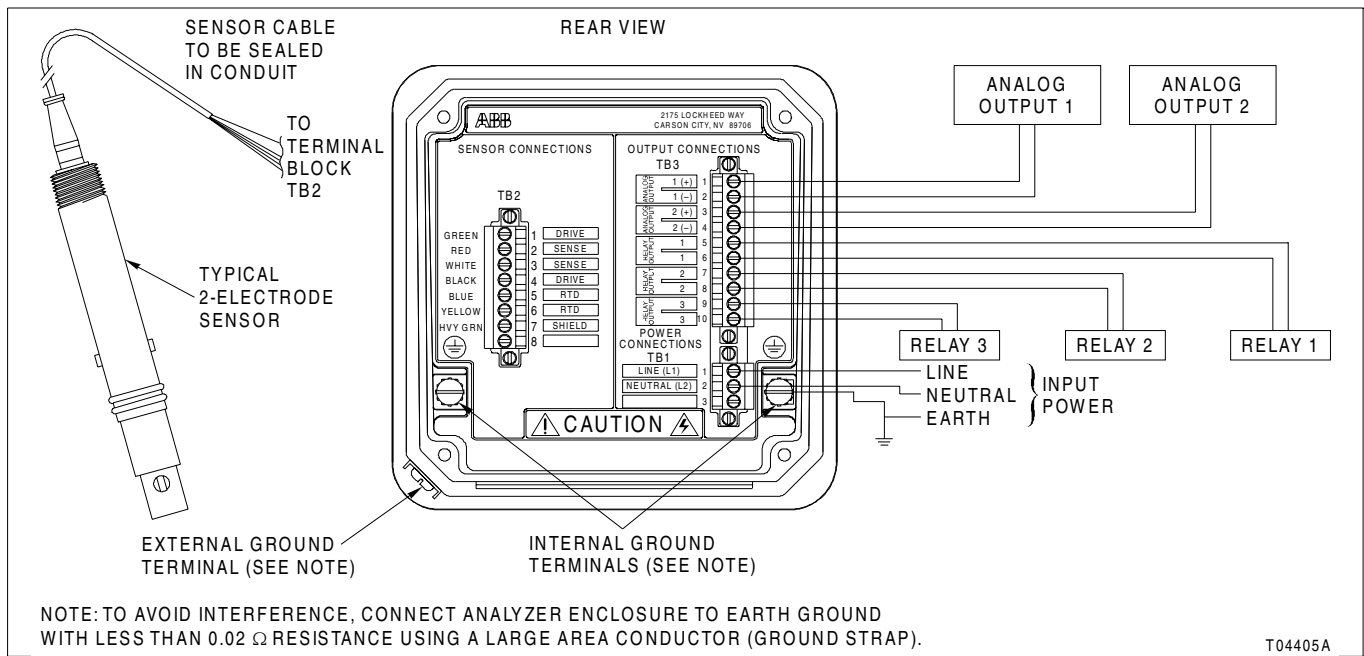


Figure 1. Wiring

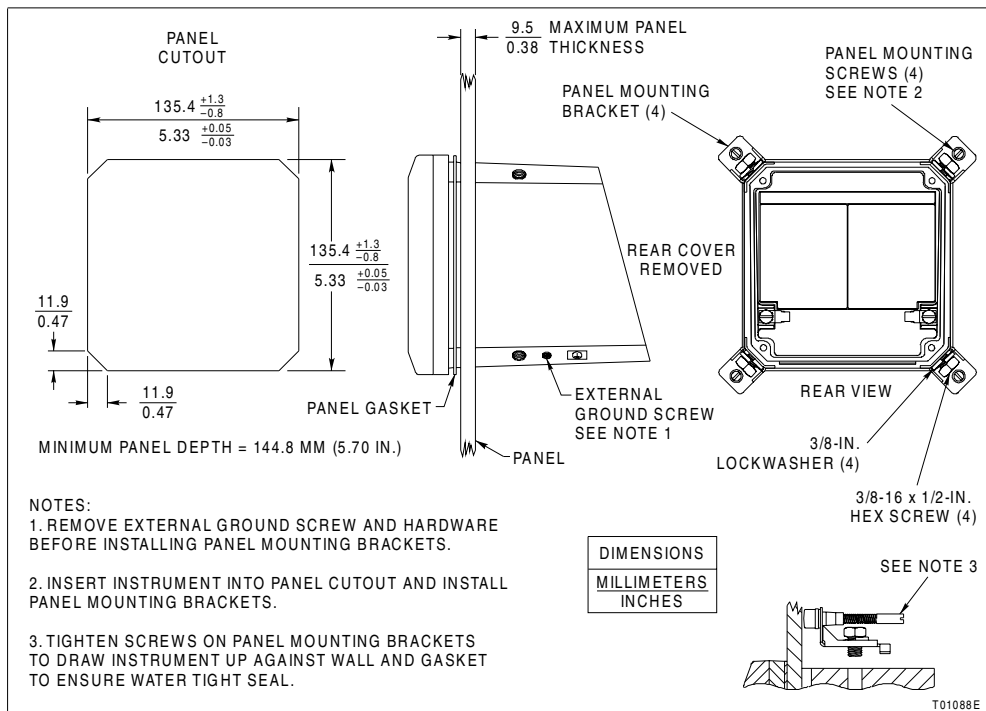


Figure 2. Panel Mounting

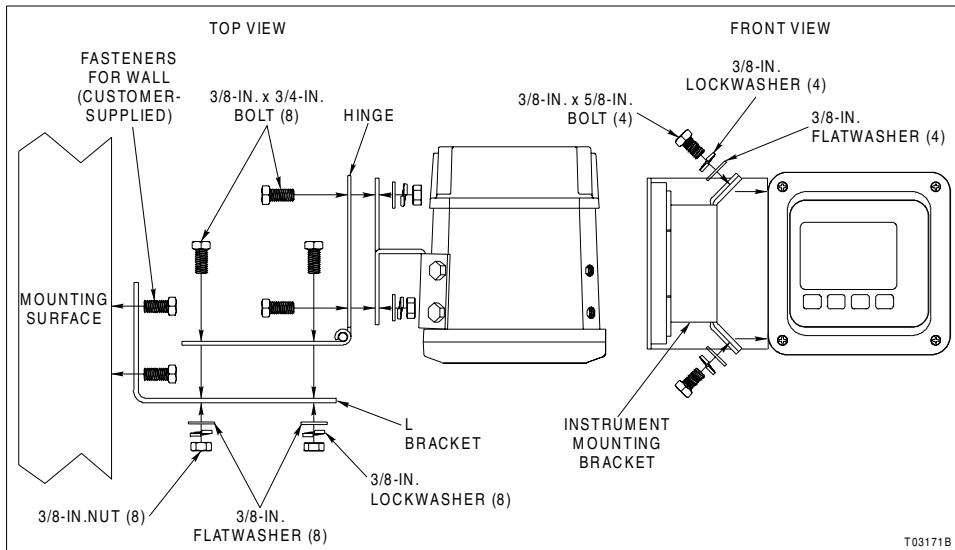


Figure 3. Hinge Mounting

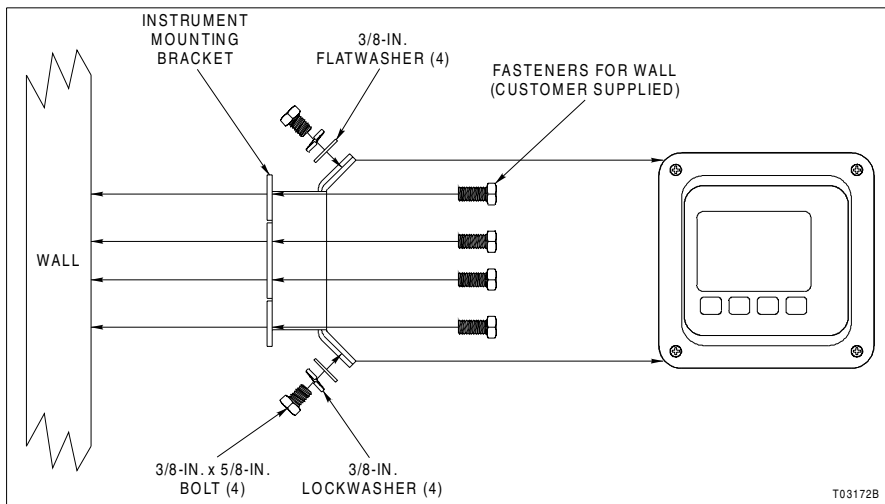


Figure 4. Wall Mounting

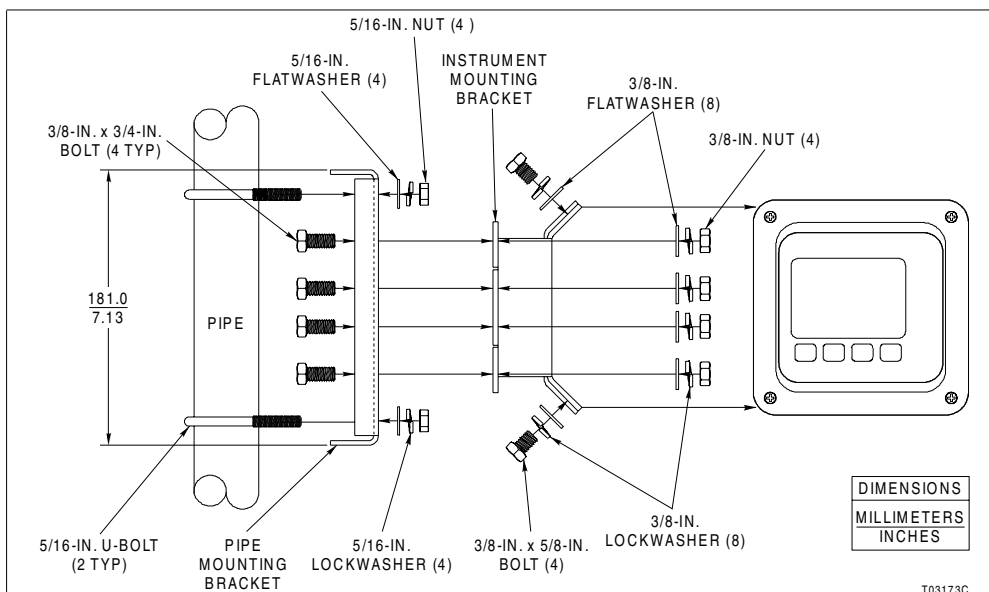


Figure 5. Pipe Mounting

Ordering Guide

Advantage Series Controlling Analyzer	TB84	X	X	X	X	X	X	X	X	X	X
Input¹											
pH/ORP/pION (includes BNC to pin lug adaptor)		P	H								
Four-electrode conductivity		E	C								
Two-electrode conductivity		T	E								
Toroidal conductivity ²		T	C								
Programming Mode											
Basic											1
Advanced											2
Reserved											
Reserved for future use - enter zero											0
Remote Preamplifier²											
None											0
Housing Type											
Anodized aluminum, corrosion resistant powder coat											0
Mounting Hardware											
None											0
Pipe											1
Hinge											2
Panel											3
Wall											4
Agency Approval (pending)²											
None											0
FM											1
CSA											2
Identification Tags											
None											0
Stainless steel											1
Mylar [®]											2

NOTES:

1. This specification covers only the Type TB84TE analyzer.
2. Consult factory for status.

® Mylar is a registered trademark of E. I. DuPont de Nemours Company, Incorporated.



Form WTPEEUS520006A0 Litho in U.S.A. August 2000
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