

TB84PH

pH / ORP / pION transmitter

Hazardous area rated transmitter with intuitive user interface



Simple menu programming

Online continuous sensor diagnostics

Two fully programmable isolated outputs

Three fully programmable relay outputs

Pt 100 and 3 kohm Balco temperature sensor compatibility

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

NEMA 4X/IP65 housing

— Cast aluminum with corrosion resistant polyester powder coat finish

CE Mark

— Complies with all applicable European Community product requirements, specifically those required to display the CE marking on the product nameplate

Three standard modes of automatic temperature compensation

— Manual Nernstian, standard automatic Nernstian, and automatic Nernstian with solution compensation coefficient

Advantage Series™ pH/ORP/plon Analyzer

The ABB TB84 Advantage™ pH/ ORP/plon Analyzer is an advanced microprocessor-based instrument. Smart keys on the front panel provide for local programming of all analyzer functions. Easy-to-follow instructions appear above each smart key. A unique secondary display clearly defines each menu option during programming. During normal operation, the secondary display can show temperature, milliampere output, and several other useful parameters. This innovative, user-friendly interface provides for straightforward operation. Standard outputs include two isolated analog (current) outputs and three relay outputs. The analog outputs can be configured for the PV (process variable) and/or temperature. The relay outputs can be configured for the PV, temperature, diagnostics, cycle timer controller, or sensor cleaner.

The analyzer is compatible with all ABB pH/ ORP/plon sensors, including those with the advanced Next Step™ reference technology. The Next Step Advantage™ series sensors with solution ground enable the analyzer to perform online sensor diagnostics. Asymmetry and isopotential points are analyzer adjustable, insuring flexibility and compatibility with all types of sensors.

The TB84pH analyzer meets all CE and NEMA 4X/IP65 requirements.

Calibration

Smart key programming makes analyzer calibration accurate and efficient. One or two-point calibration routines automatically calculate and display the slope and offset of the sensor. Slope and offset information is useful as a diagnostic tool or to alert the user of the need to replace the sensor. The analyzer is shipped calibrated to 100-percent efficiency and with no offset. Choosing *RESET CAL* returns the calibration to those theoretically perfect values. This eliminates the need for external millivolt calibrations. Analysis of calibration information by the analyzer helps insure correct calibration.

Programmable Security Code

The analyzer has a single three-digit security code. Menu-selectable choices allow the security code to be applied to none or any combination of the following choices: calibrate, output/hold, configure, and set point/tune.

Basic or Advanced Programming

The analyzer has two programming modes: Basic and Advanced. 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 Basic and Advanced programming modes are nomenclature options selected at the time of purchase. The Advanced configuration choices are:

- Adjustable asymmetry and isopotential points for compatibility with sensors with nonglass electrodes.
- Nonlinear output function generator.
- User-entered, solution specific, temperature compensation coefficient.
- Analog pulse diagnostic output.
- Adjustable reference impedance alarming.
- plon (specific ion) concentration.
- Refer to **Analog Outputs** and **Relay Outputs** for the Advanced programming features for the analog and digital outputs.

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 and RO3). Each is jumper selectable as either NO (normally open) or NC (normally closed). A corresponding relay icon 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.

The high and low PV alarms are a function of the PV, deadband, and delay values. 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. This feature works best with processes that have poor mixing or a long lag or dead 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 Safe-T-Clean valve easy and trouble free.

Table 1. Relay Output Functionality ¹

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

Diagnosics

The TB84pH analyzer constantly monitors both the sensor and the analyzer. This helps 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 the icon 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:

- Broken glass electrode.
- High reference impedance.
- Shorted or open cable.
- Sensor out of solution.
- Shorted or open temperature sensor.
- Ground loop detection (patent pending).

The diagnostics can be turned on or off. Sensor diagnostics require an Advantage Series sensor for everything but a shorted or open temperature sensor. Other sensor diagnostics, that work with all sensors, result during and after sensor calibration. Reported conditions such as bad calibration, large sensor offset, high or low sensor efficiency, slope, and offset calculation and display, and other predictive information aid in determination of sensor related conditions.

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. Individual analog and relay outputs can be held or all of them can be held by choosing *HOLD ALL*. During a two-point calibration the output is automatically held and *HOLD* appears. Additionally, the analog outputs can be held to any preselected level. The relay outputs can be held in their active or inactive states. This is useful for checking and exercising any external devices connected to the analyzer. Advanced programming allows the choice of holding the analog and digital outputs in groups during the sensor cleaning cycle.

Diagnostic Pulse

The analog output is fully scalable over any pH, ORP, or plon 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 0.1 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). The modulation will add current for all outputs below 50 percent (12 milliamperes for a four to 20-milliamper output or 10 milliamperes for a zero to 20-milliamper output). The modulation subtracts current for all outputs above 50 percent. This provides remote notification of a problem.

Temperature Compensation

The analyzer is compatible with either a Pt 100 or three-kilohm Balco RTD (resistive temperature device). The automatic temperature compensation options are: manual Nernstian, standard automatic Nernstian, and automatic Nernstian with solution compensation coefficient ($\pm X.XX \text{ pH}/10^{\circ}\text{C}$).

pH/ORP/plon Sensor Compatibility

The TB84pH analyzer operates with the original ABB solid state pH/ORP sensors as well as the Next Step reference and Next Step Advantage pH/ORP sensors with solution ground. Adjustable asymmetry and isopotential points ensure compatibility with nonglass pH sensor electrodes such as those that are antimony based.

Specifications

Input Voltage: 120/240 VAC, 50/60 Hz.

Range: 93.5 to 276 VAC
Installation category: II

Power Consumption: 17 VA max.

Input Range:

pH: 0 to 14 pH
(with -2 to 16 pH overrange)

ORP and plon: $\pm 1,999$ mV

Display Resolution:

pH: 0.01 pH
ORP and plon: 1 mV
Temperature: 1°C, 1°F

Temperature Compensation Mode:

pH: Manual Nernstian, standard automatic Nernstian, automatic Nernstian with solution compensation coefficient ($\pm XX.XX$ mV/10°C)

Temperature Compensation Types:

Pt 100, 3-k Ω Balco RTD

AO1

pH: Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, linear and nonlinear, configurable across full pH range.

ORP and plon: Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, linear and nonlinear, configurable across full range.

Minimum span:

pH: 1 pH unit
ORP and plon: 100 mV

Maximum span:

pH 14 pH
ORP and plon: 3,998 mV

AO2

pH: Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, linear, configurable across full pH range.

ORP and plon: Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, linear, configurable across full range.

Temperature: Isolated 0 to 20 mA or 4 to 20 mA, direct or reverse-acting, linear, configurable in either °C or °F, configurable across full range.

Minimum span:

pH 1 pH unit
ORP and plon 100 mV
Temperature 10°C, 18°F

Maximum span:

pH 14 pH
ORP and plon 3,998 mV
Temperature 140°C, 284°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.

Contact ratings (max):

AC 100 VA, 240 VAC, 3 A
DC 50 W, 24 VDC, 3A

High and low set points:

(Basic and Advanced configurations):

Source: pH

High pH range -2 to 16 pH
Low pH range -2 to 16 pH
Deadband range 0 to 10 pH
Delay value range 00.0 to 99.9 min.

Source: ORP and plon

High mV range $\pm 1,999$ mV
Low mV range $\pm 1,999$ mV
Deadband range 0 to 200 mV
Delay value range 00.0 to 99.9 min.

Source: Temperature

High range 0 to 140°C or 32 to 284°F
Low range 0 to 140°C or 32 to 284°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: pH

Turn on range -2 to 16 pH
Cycle time and on time range 00.0 to 99.9 min.

Source: ORP and plon

Turn on range $\pm 1,999$ mV
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

pH:

Display ± 0.01 pH
Output ± 0.02 mA at full scale settings

ORP and plon:

Display ± 1.0 mV
Output ± 0.02 mA at full scale settings

Maximum Sensor Cable Length

30.5 m (100 ft) without preamplifier

Turn On Time 2 secs typical, 4 secs max.

Load Resistance Range (analog outputs)

750 Ω max.

Input Impedance $> 10^{12}$ Ω

Mounting Effect None

Damping

Continuously adjustable from 00.0 to 99.9 secs

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 polyester powder coating.

Conduit Connection

5 total, 2 each 0.875-in. holes in enclosure that accept 1/2-in. hubs, 3 each 0.600-in. holes that accept PG9 hubs

Size 1/2-DIN
h x w x d 144.0 x 144.0 x 171.0 mm
(5.67 x 5.67 x 6.73 in.)

Minimum 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 2.2 kg (4.8 lbs)
3.5 kg (7.7 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 Requirements

CE certified - complies with all applicable European Community product requirements, specifically those required to display the CE marking on the product nameplate.

Specifications subject to change without notice.

Installation Accessories

<i>Number</i>	<i>Description</i>
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 1/2-in. hubs
4TB9515-0166	BNC/TC to pin adaptor with cable grip for 1/2-in. hubs
4TB9515-0191	Cable grip for PG9 hubs
4TB9515-0198	Complete cable grip kit (2 each 1/2-in. and 3 each PG9)

Installation and Wiring Diagrams

Figures 1, 2, 3, 4, and 5 show the installation and wiring diagrams

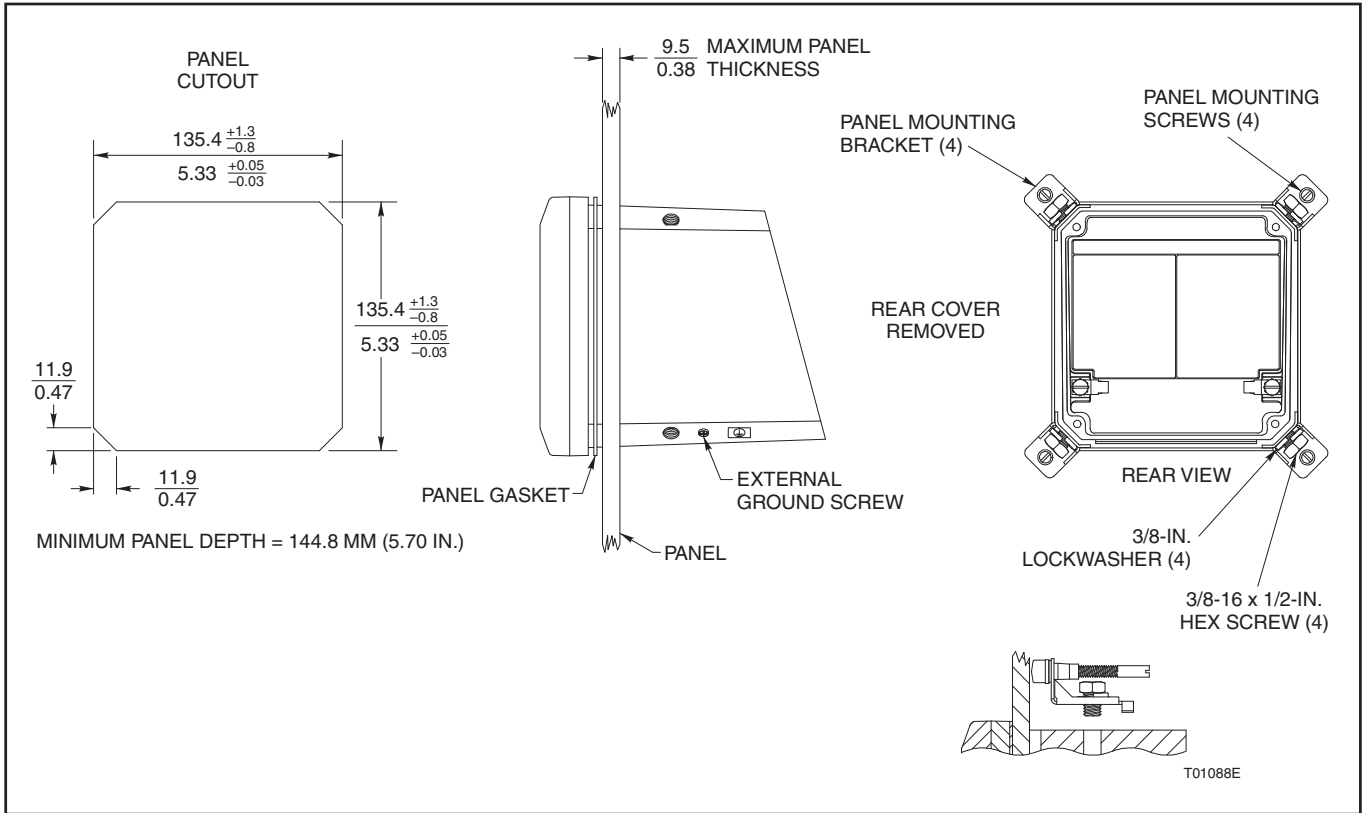


Figure 1. Panel Mounting

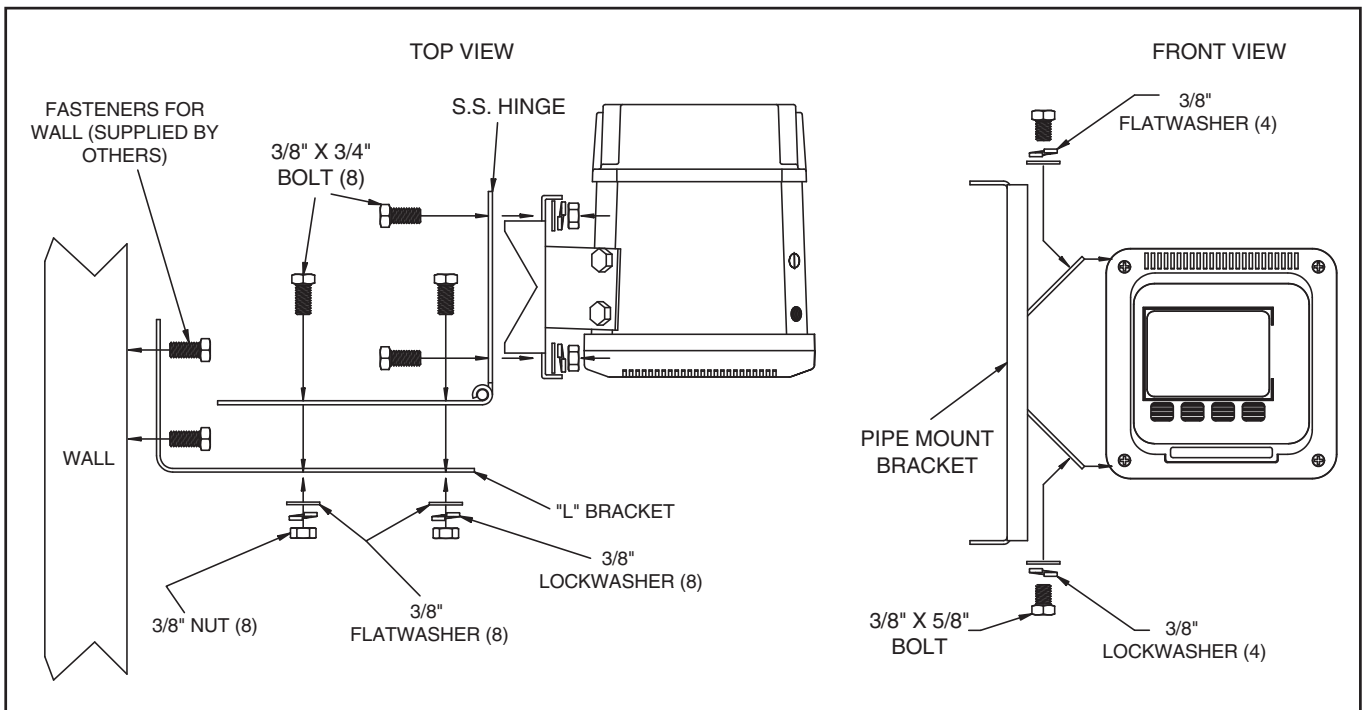


Figure 2. Wall/Hinge (Rear) Mounting

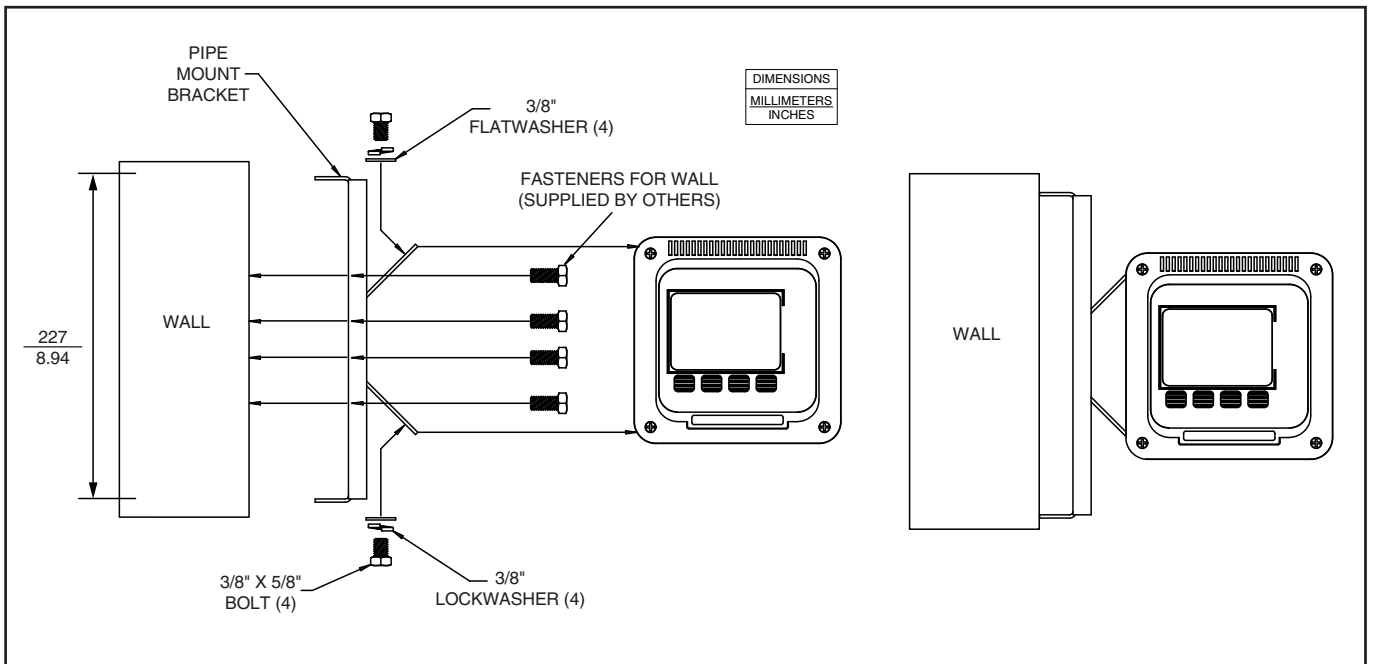


Figure 3. Wall (Side) Mounting

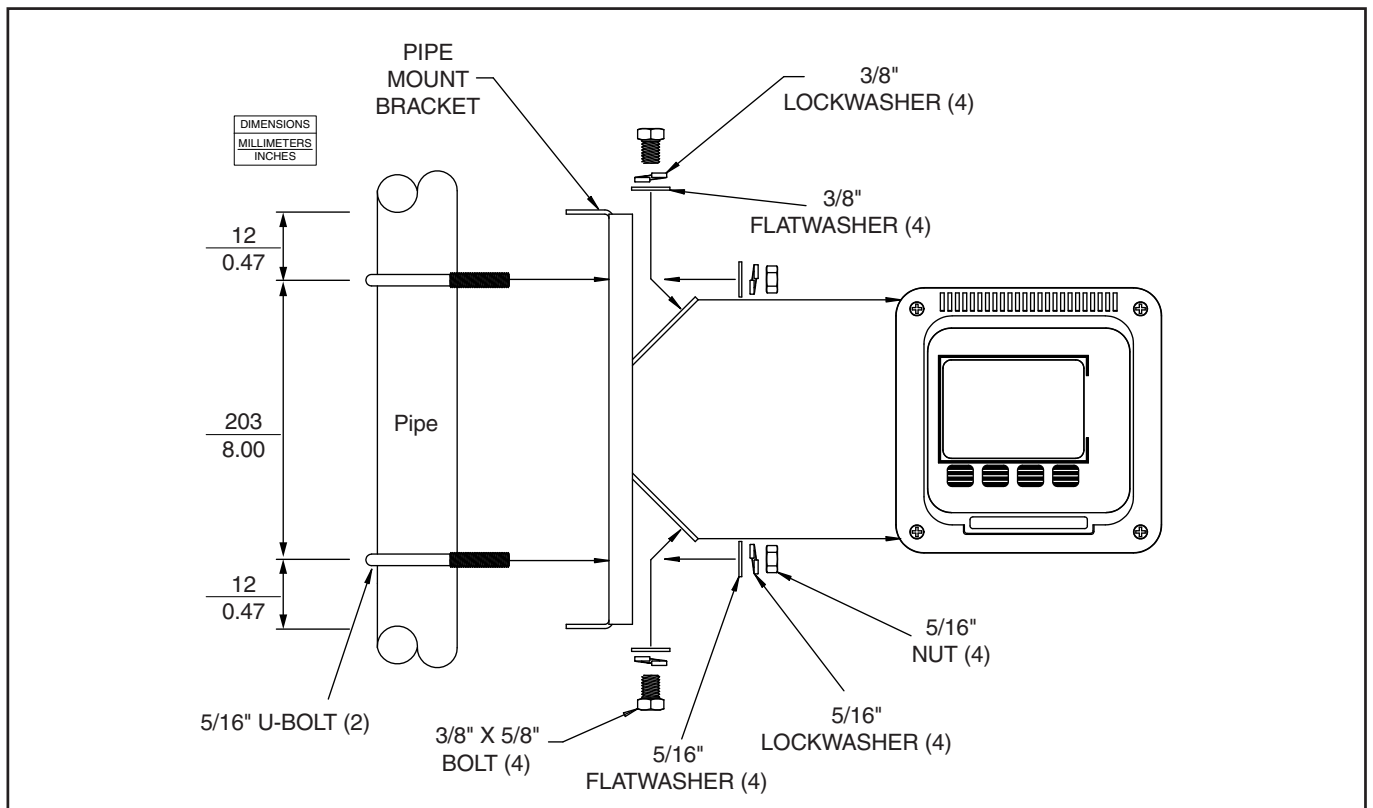


Figure 4. Pipe Mounting

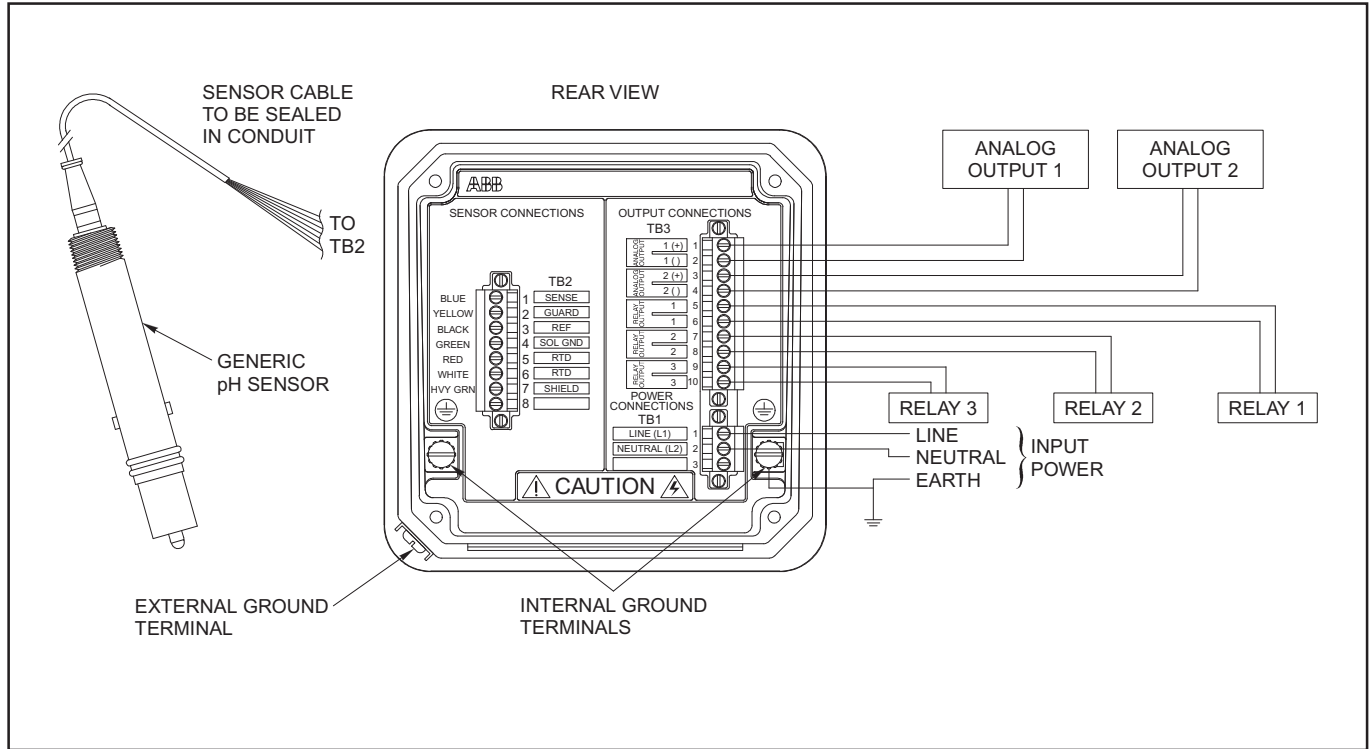


Figure 5. Wiring

Ordering Information	Model Code	TB84PH	<u> </u>	<u>0</u>	<u>0</u>	<u>0</u>	<u> </u>	<u> </u>	<u> </u>
		01 - 06	07	08	09	10	11	12	13
ADVANTAGE SERIES ANALYZER (Note 3)									
Input pH/ORP (REDOX)/ pION (Includes BNC to Pin Lug Adapter (Note 2))		TB84PH							
Programming Options Basic Advanced (Note 1)			1 2						
Reserved For Future Use				0					
Reserved None					0				
Housing Type Anodized Aluminum, Powder Coat Polyester						0			
Mounting Hardware None Pipe (4TB9515-0124) Hinge (4TB9515-0125) For Pipe or Wall Panel (4TB9515-0123) Wall (4TB9515-0156)							0 1 2 3 4		
Agency Approval None FM (Factory Mutual) CSA (Canadian Standards Association)								0 1 2	
Identification Tags None Stainless Steel (4TB5003-0007) Mylar									0 1 2

Notes:

- 1 See TB84PH/EC/TE/TC product specification sheets for details on Advanced programming options.
- 2 Although the features of the TB84PH Advantage transmitter are best utilized by using a TBX5 Series Advantage sensor, this unit is compatible with all ABB pH/ORP/plon sensors.
To connect existing sensors with BNC connectors on them use:
Part Number 4TB9515-0166 BNC/TC to pin TB84 adapter with cable grip or
Part Number 4TB9515-0164 (BNC/TC to pin adapter)
Cable grip available separately, Part Number 4TB9515-0165 (Note that cable grip will not grip sensor cables with TC).
One adapter and cable grip are included with each TB84PH.
- 3 One instruction manual included. Additional copy, Part Number 4TB9800-84PH

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