Instruction Sheet
PN 51A-Xmt-P-HT/rev.I
January 2010

HART SMART® Two-Wire pH/ORP Transmitter

For additional information, visit our website at *www.emersonprocess.com/raihome/liquid/*.

ESSENTIAL INSTRUCTIONS

READ THIS PAGE BEFORE PROCEEDING!

Your purchase from Rosemount Analytical, Inc. has resulted in one of the finest instruments available for your particular application. These instruments have been designed, and tested to meet many national and international standards. Experience indicates that its performance is directly related to the quality of the installation and knowledge of the user in operating and maintaining the instrument. To ensure their continued operation to the design specifications, personnel should read this manual thoroughly before proceeding with installation, commissioning, operation, and maintenance of this instrument. If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

- Failure to follow the proper instructions may cause any one of the following situations to occur: Loss of life; personal injury; property damage; damage to this instrument; and warranty invalidation.
- Ensure that you have received the correct model and options from your purchase order. Verify that this manual covers your model and options. If not, call 1-800-854-8257 or 949-757-8500 to request correct manual.
- For clarification of instructions, contact your Rosemount representative.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Use only qualified personnel to install, operate, update, program and maintain the product.
- Educate your personnel in the proper installation, operation, and maintenance of the product.
- Install equipment as specified in the Installation section of this manual. Follow appropriate local and national codes. Only connect the product to electrical and pressure sources specified in this manual.
- Use only factory documented components for repair. Tampering or unauthorized substitution of parts and procedures can affect the performance and cause unsafe operation of your process.
- All equipment doors must be closed and protective covers must be in place unless qualified personnel are performing maintenance.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by it against hazards may be impaired.

⚠ WARNING

EXPLOSION HAZARD.

DO NOT OPEN WHILE CIRCUIT IS LIVE.

DO NOT RUB OR CLEAN WITH SOLVENTS.

9241589-00/A

CAUTION

If a Model 375 Universal Hart® Communicator is used with these transmitters, the software within the Model 375 may require modification.

If a software modification is required, please contact your local Emerson Process Management Service Group or National Response Center at 1-800-654-7768.

ROSEMOUNT® Analytical

EMERSON Process Management

SPECIFICATIONS - GENERAL

Case: ABS. Pipe, surface, and panel mount versions are NEMA 4X/CSA 4 (IP65)

Dimensions

Panel (code -10): 6.10 x 6.10 x 3.72 in. (155 x 155 x 94.5 mm)

Surface/Pipe (code -11): 6.23 x 6.23 x 3.23 in. (158 x 158 x 82 mm); see page 15 for dimensions of pipe mounting bracket.

Conduit openings: Accepts PG13.5 or 1/2 in. conduit fittings

Ambient Temperature: 32 to 122°F (0 to 50°C). Some degradation of display above 50°C.

Storage Temperature: -4 to 158°F (-20 to 70°C)

Relative Humidity: 10 to 90% (non-condensing)

Weight/Shipping Weight: 2 lb/3 lb (1 kg/1.5 kg)

Display: Two line, 16-character display. Character height: 4.8 mm; first line shows process variable (pH, ORP, conductivity, % concentration, oxygen, ozone, chlorine, or monochloramine), second line shows process temperature and output current. For pH/chlorine combination, pH may also be displayed. Fault and warning messages, when triggered, alternate with temperature and output readings.

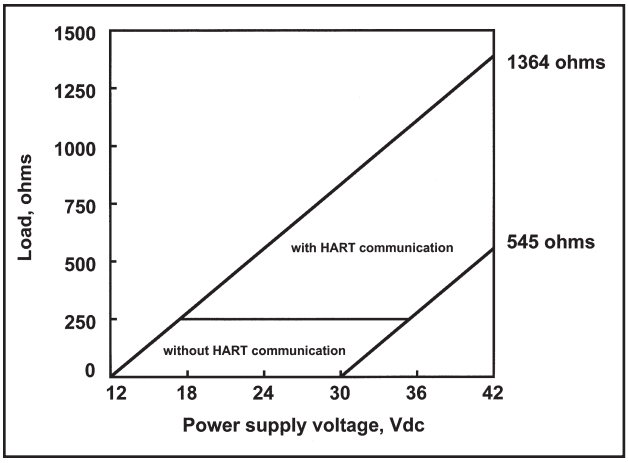
During calibration and programming, messages, prompts, and editable values appear on the two-line display.

Temperature resolution: 0.1°C (≤99.9°C); 1°C (≥100°C)

Hazardous Location Approval: For details, see specifications for the measurement of interest.

RFI/EMI: EN-61326 CE

mCERTS
Sira MC070113/00



DIGITAL COMMUNICATIONS:

HART —

Power & Load Requirements: Supply voltage at the transmitter terminals should be at least 12 Vdc. Power supply voltage should cover the voltage drop on the cable plus the external load resistor required for HART communications (250 Ω minimum). Minimum power supply voltage is 12 Vdc. Maximum power supply voltage is 42.4 Vdc. The graph shows the supply voltage required to maintain 12 Vdc (upper line) and 30 Vdc (lower line) at the transmitter terminals when the current is 22 mA.

Analog Output: Two-wire, 4-20 mA output with superimposed HART®3 digital signal. Fully scalable over the operating range of the sensor.

Output accuracy: ±0.05 mA

FUNCTIONAL SPECIFICATIONS

pH Range: 0 to 14

ORP Range: -1400 to +1400mV

Calibrations/standardization: The automatic buffer recognition uses stored buffer values and their temperature curves for the most common buffer standards available worldwide. The transmitter also performs a stabilization check on the sensor in each buffer.

A manual two-point calibration is made by immersing the sensor in two different buffer solutions and entering the pH values. The microprocessor automatically calculates the slope which is used for self-diagnostics. An error message will be displayed if the pH sensor is faulty. This slope can be read on the display and/or manually adjusted if desired.

An on-line one-point process standardization is accomplished by entering the pH or ORP value of a grab sample.

Preamplifier Location: A preamplifier must be used to convert the high impedance pH electrode signal to a low impedance signal for transmitter use. The integral preamplifier of the Model Xmt-P may be used when the sensor to transmitter distance is less than 15 ft (4.5 m). Locate the preamplifier in the sensor or junction box for longer distances.

Automatic Temperature Compensation: External 3-wire Pt100 RTD or Pt1000 RTD located in the sensor, compensates the pH reading for temperature fluctuations. Compensation covers the range -15 to 130°C (5 to 270°F). Manual temperature compensation is also selectable.

Accuracy: ±1 mV @ 25°C ±0.01 pH

Repeatability: ±1 mV @ 25°C ±0.01 pH

Diagnostics: The internal diagnostics can detect:

Calibration Error	Sensor Failure
High Temperature Warning	CPU Failure
Low Temperature Warning	Input Warning
ROM Failure	Glass Warning
Glass Failure	Reference Warning
Reference Failure	

Once one of the above is diagnosed, the display will show a message describing the problem.

DIGITAL COMMUNICATIONS:

HART (pH): PV assigned to pH. SV, TV, and 4V assignable to pH, temperature, mV, glass impedance, reference impedance, or RTD resistance.

HART (ORP): PV assigned to ORP. SV, TV, and 4V assignable to ORP, temperature, reference impedance, or RTD resistance.

Fieldbus (pH): Four AI blocks assigned to pH, temperature, reference impedance, and glass impedance.

Fieldbus (ORP): Three AI blocks assigned to ORP, temperature, and reference impedance.

Fieldbus (pH and ORP): Execution time 75 msec. One PID block; execution time 150 msec. Device type 4088. Device revision 1. Certified to ITK 4.6.

HAZARDOUS LOCATION APPROVALS

Intrinsic Safety (with appropriate safety barrier):

FM APPROVED

Class I, II, III, Div. 1
Groups A-G
T4 Tamb = 50°C

Class I, II, III, Div. 1
Groups A-G
T4 Tamb = 50°C

ATEX CE 1180 II 1 G
Baseefa04ATEX0213X
EEx ia IIC T4
Tamb = 0°C to 50°C

Non-Incendive:

FM APPROVED

Class I, Div. 2, Groups A-D
Dust Ignition Proof
Class II & III, Div. 1, Groups E-G
NEMA 4/4X Enclosure

Class I, Div. 2, Groups A-D
Dust Ignition Proof
Class II & III, Div. 1, Groups E-G
NEMA 4/4X Enclosure
T4 Tamb = 50°C

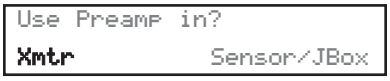
QUICK START GUIDE

FOR MODEL SOLU COMP Xmt-P-HT TRANSMITTER

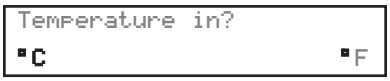
1. Refer to page 5 for installation instructions.
2. Wire pH or ORP sensor to the transmitter. See Figure 6 for panel mount; Figure 7 for pipe or surface mount. Refer to the sensor instruction sheet for details.
3. Once connections are secure and verified, apply power to the transmitter.
4. When the transmitter is powered up for the first time, **Quick Start** screens appear. Using **Quick Start** is easy.
   a. A blinking field shows the position of the cursor.
   b. Use the ⇦ or ⇨ key to move the cursor left or right. Use the ⇧ or ⇩ key to move the cursor up or down or to increase or decrease the value of a digit. Use the ⇧ or ⇩ key to move the decimal point.
   c. Press ENTER to store a setting. Press EXIT to leave without storing changes. Pressing EXIT also returns the display to the previous screen.

5. Choose the desired language. Choose **>>** to show more choices.

6. Choose measurement: **pH, ORP,** or **Redox**.



7. Choose preamplifier location. Select **Xmtr** to use the integral preamplifier in the transmitter; select **Sensor/JBox** if your sensor has an integral preamplifier or if you are using a remote preamplifier located in a junction box.



8. Choose temperature units: **°C** or **°F**.

9. To change output settings, to scale the 4-20 mA output, to change measurement-related settings from the default values, and to set security codes, press MENU. Select Program and follow the prompts. Refer to the appropriate menu tree (page 11).

10. To return the transmitter to default settings, choose **ResetAnalyzer** in the Program menu.

UNPACKING AND INSPECTION

Inspect the shipping container. If it is damaged, contact the shipper immediately for instructions. Save the box. If there is no apparent damage, unpack the container. Be sure all items shown on the packing list are present. If items are missing, notify Emerson Process Management immediately.

INSTALLATION

1. Although the transmitter is suitable for outdoor use, do not install it in direct sunlight or in areas of extreme temperatures.
2. Install the transmitter in an area where vibrations and electromagnetic and radio frequency interference are minimized or absent.
3. Keep the transmitter and sensor wiring at least one foot from high voltage conductors. Be sure there is easy access to the transmitter.
4. The transmitter is suitable for panel (Figure 3), pipe (Figure 4), or surface (Figure 5) mounting.
5. The transmitter case has two 1/2-inch (PG13.5) conduit openings and either one or four 1/2-inch knockouts. The panel mount Xmt-P-HT has four knockouts. The pipe/surface mount transmitter has two knockouts*. One conduit opening is for the power/output cable; the other opening is for the sensor cable.

   Figure 1 shows how to remove a knockout. The knockout grooves are on the outside of the case. Place the screwdriver blade on the inside of the case and align it approximately along the groove. Rap the screwdriver sharply with a hammer until the groove cracks. Move the screwdriver to an uncracked portion of the groove and continue the process until the knockout falls out. Use a small knife to remove the flash from the inside of the hole.
6. Use weathertight cable glands to keep moisture out to the transmitter. If conduit is used, plug and seal the connections at the transmitter housing to prevent moisture from getting inside the instrument.
7. To reduce the likelihood of stress on wiring connections, do not remove the hinged front panel (-11 models) from the base during wiring installation. Allow sufficient wire leads to avoid stress on conductors.

**NEMA plug may be supplied instead of knockout for pipe/surface version.*

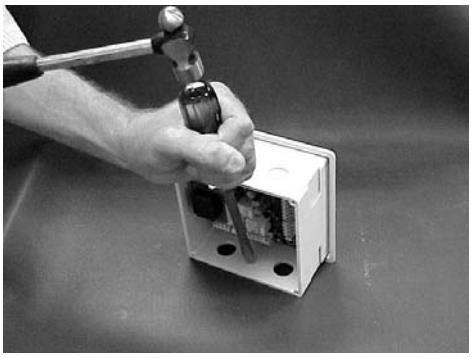


FIGURE 1. Removing the Knockouts

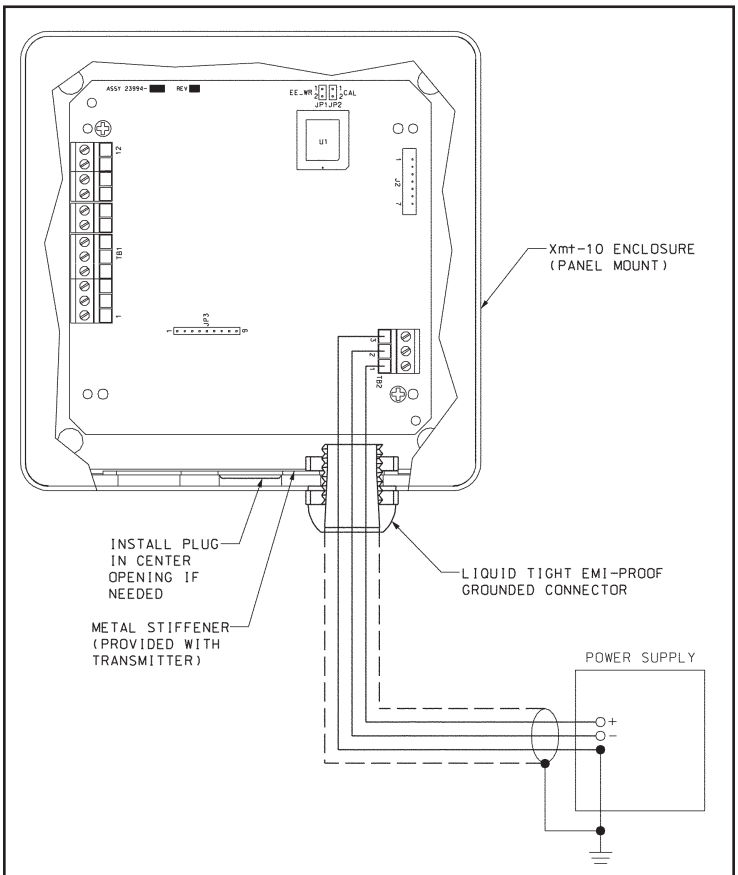


FIGURE 2. Power Supply/Current Loop Wiring

Panel Mounting.

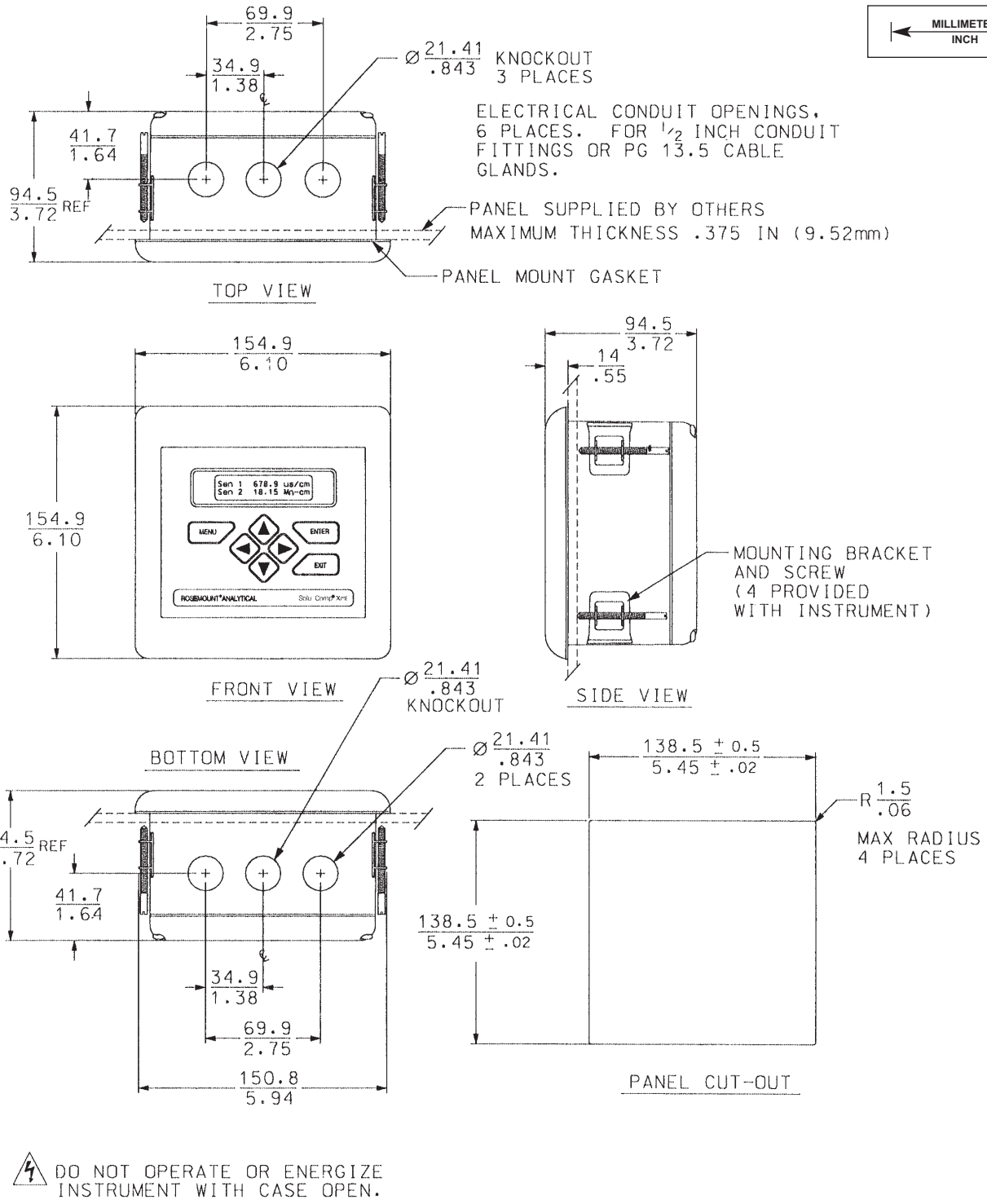


FIGURE 3. Panel Mount Installation

Access to the wiring terminals is through the rear cover. Four screws hold the cover in place.

Pipe Mounting.

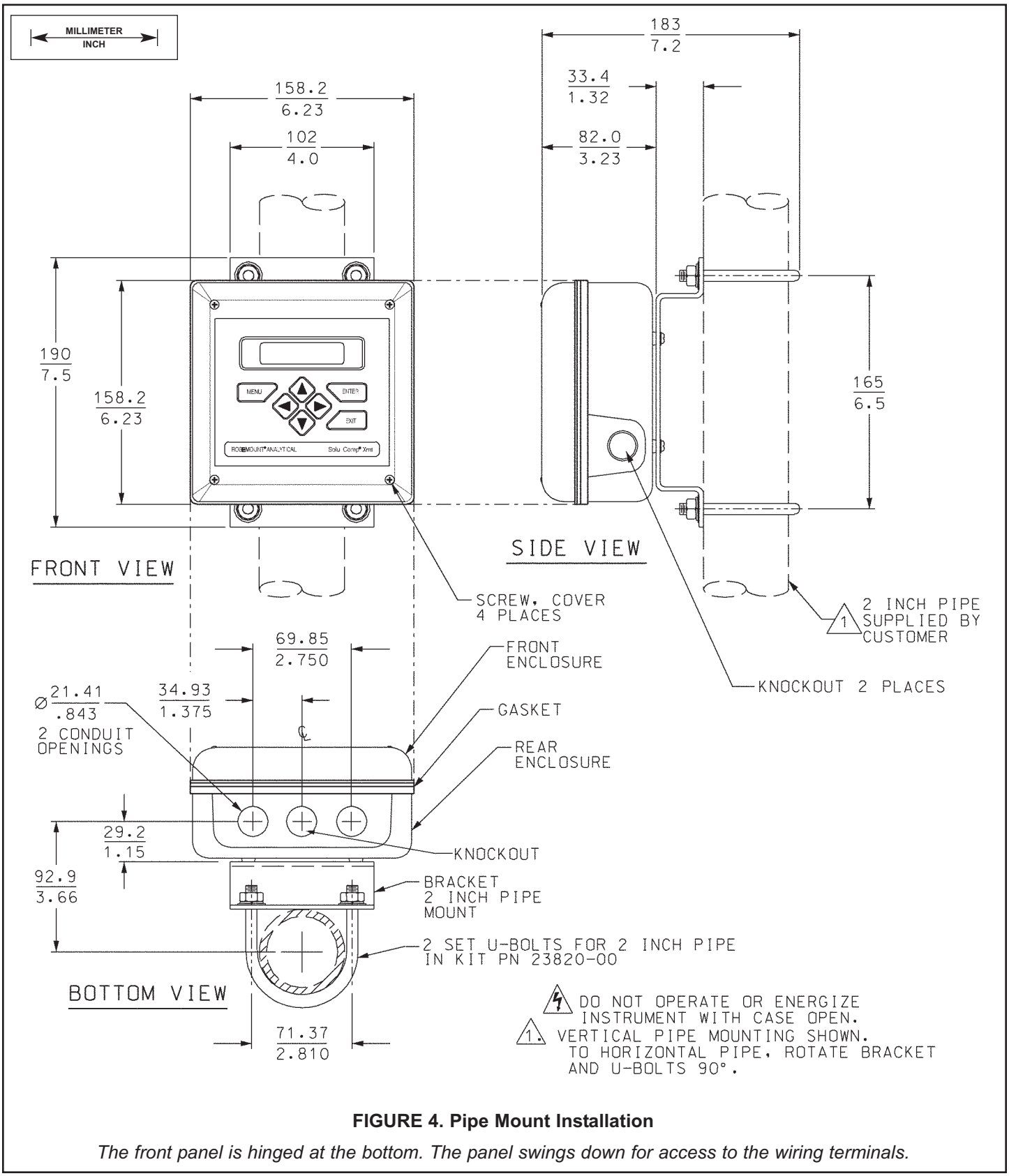


FIGURE 4. Pipe Mount Installation

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.

Surface Mounting.

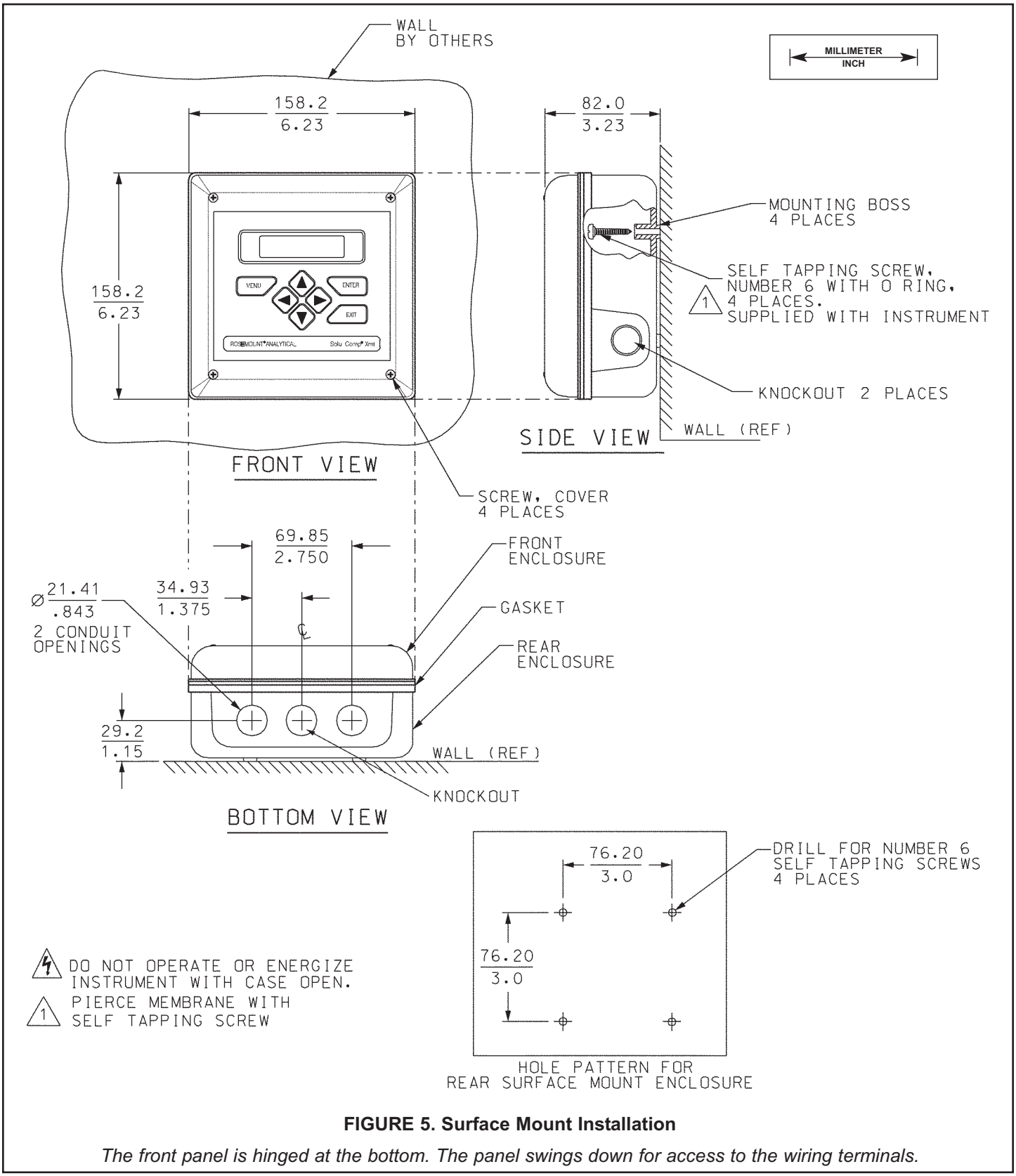
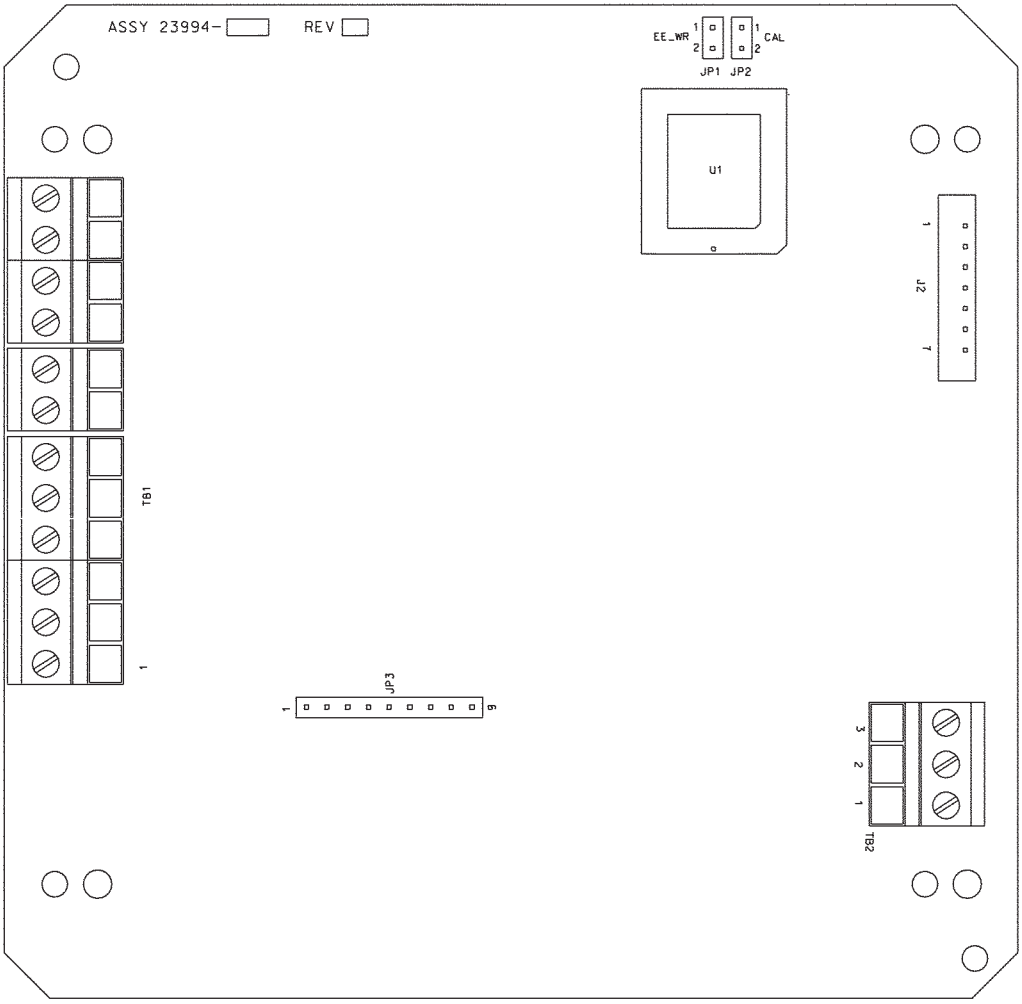


FIGURE 5. Surface Mount Installation

The front panel is hinged at the bottom. The panel swings down for access to the wiring terminals.



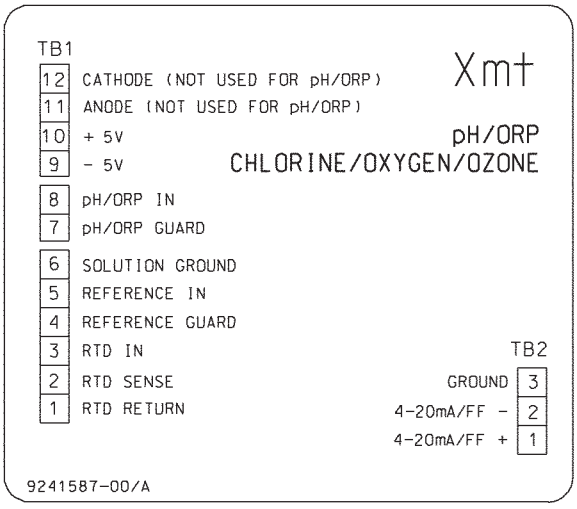
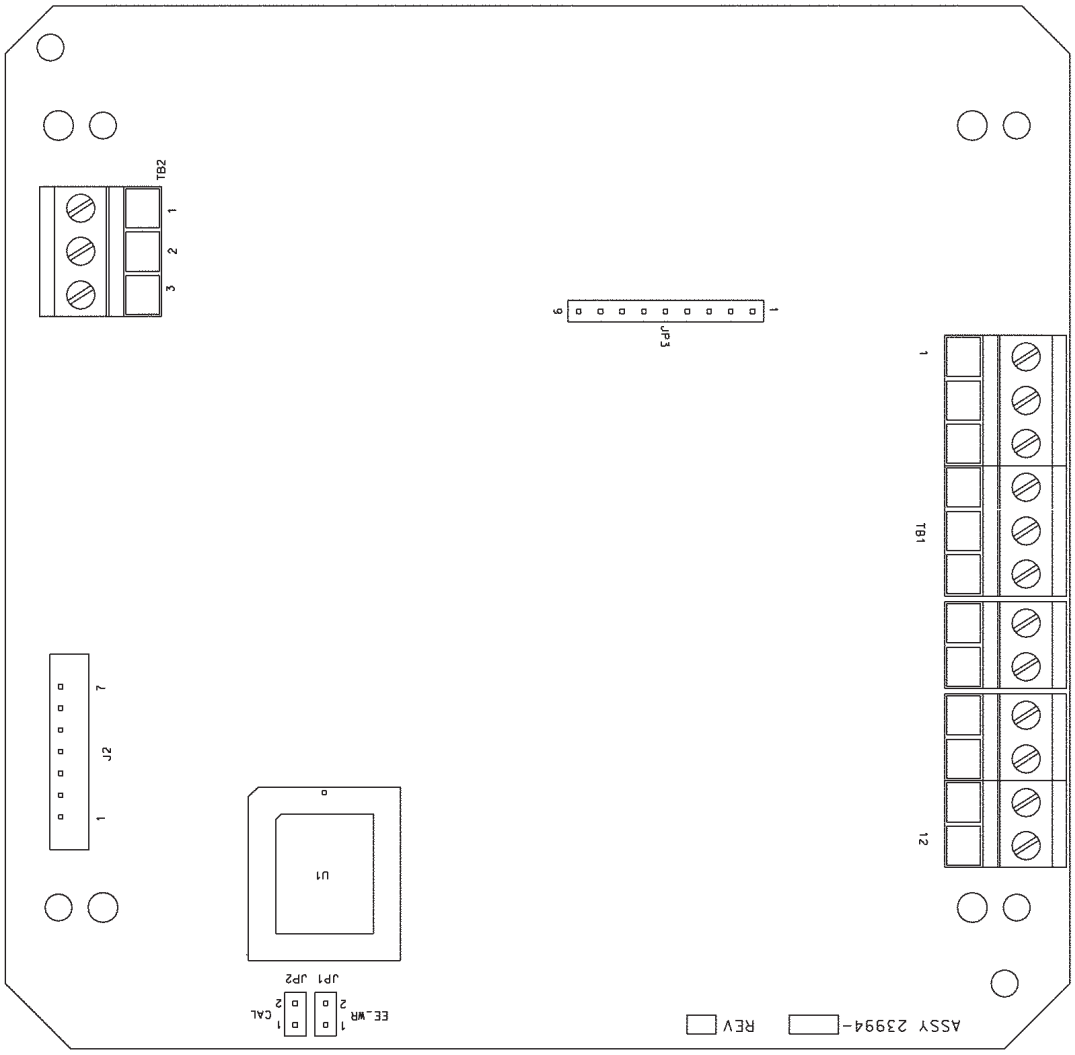


FIGURE 6. Loop Power and Sensor Wiring - Panel Mount



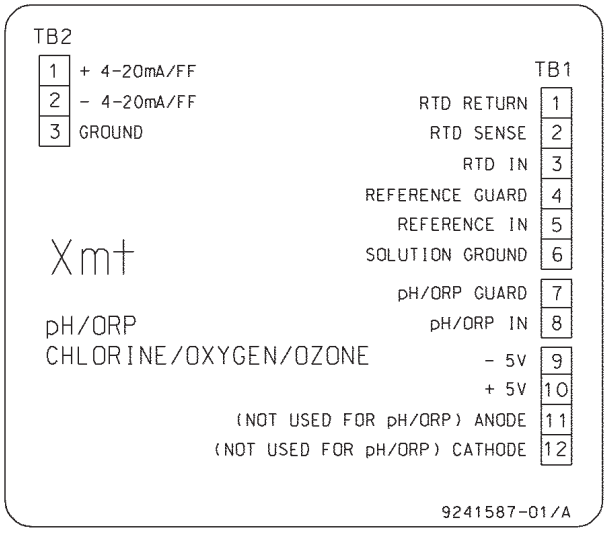


FIGURE 7. Loop Power and Sensor Wiring - Pipe/Surface Mount

HAZARDOUS AREA INSTALLATION

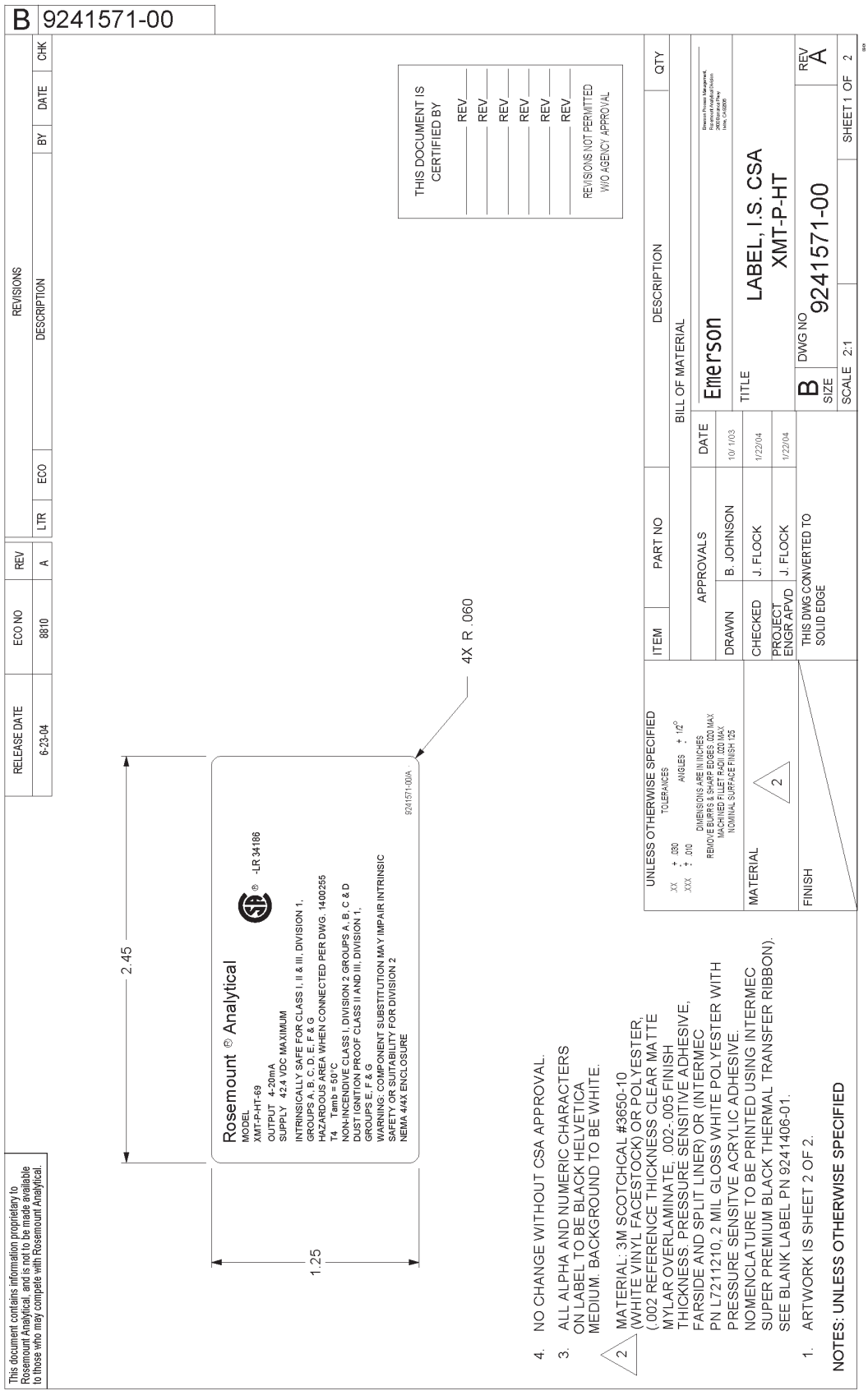


FIGURE 8. CSA Intrinsically Safe Installation Label

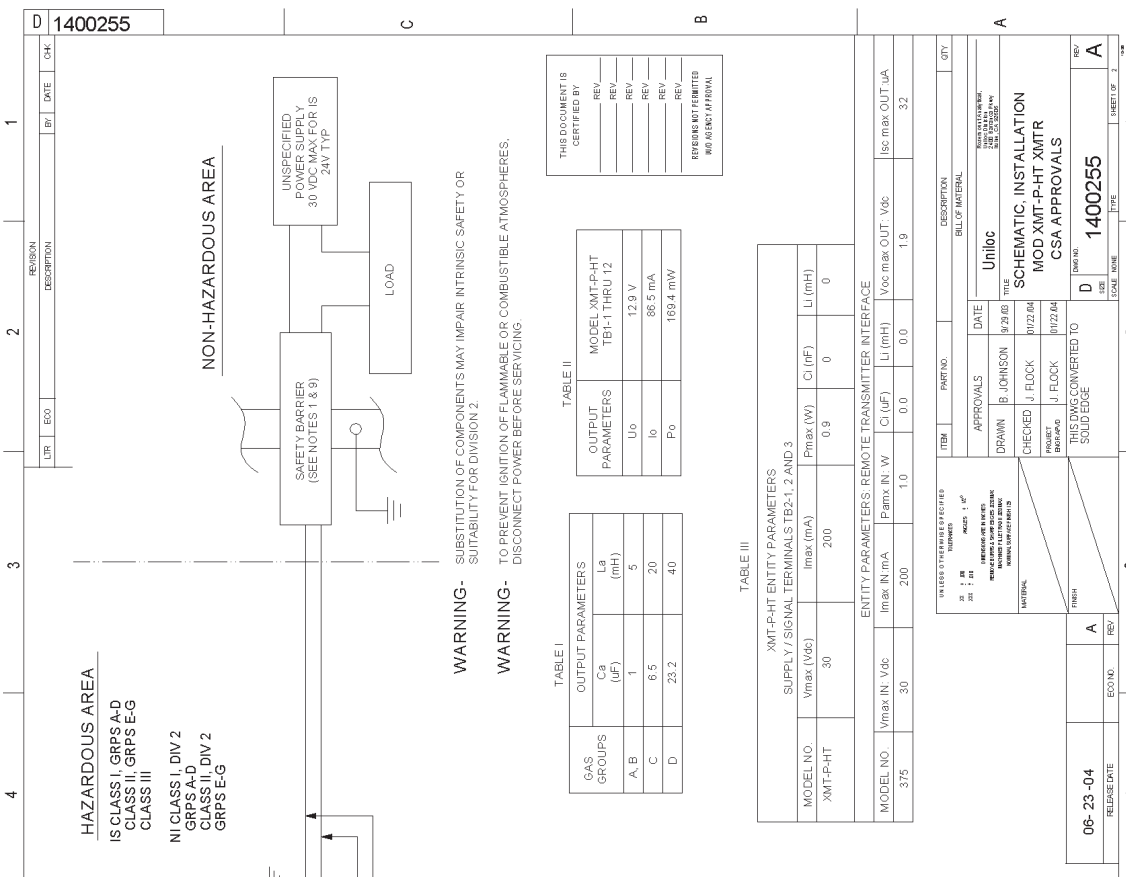


FIGURE 9. CSA Intrinsically Safe Installation Wiring (1 of 2)

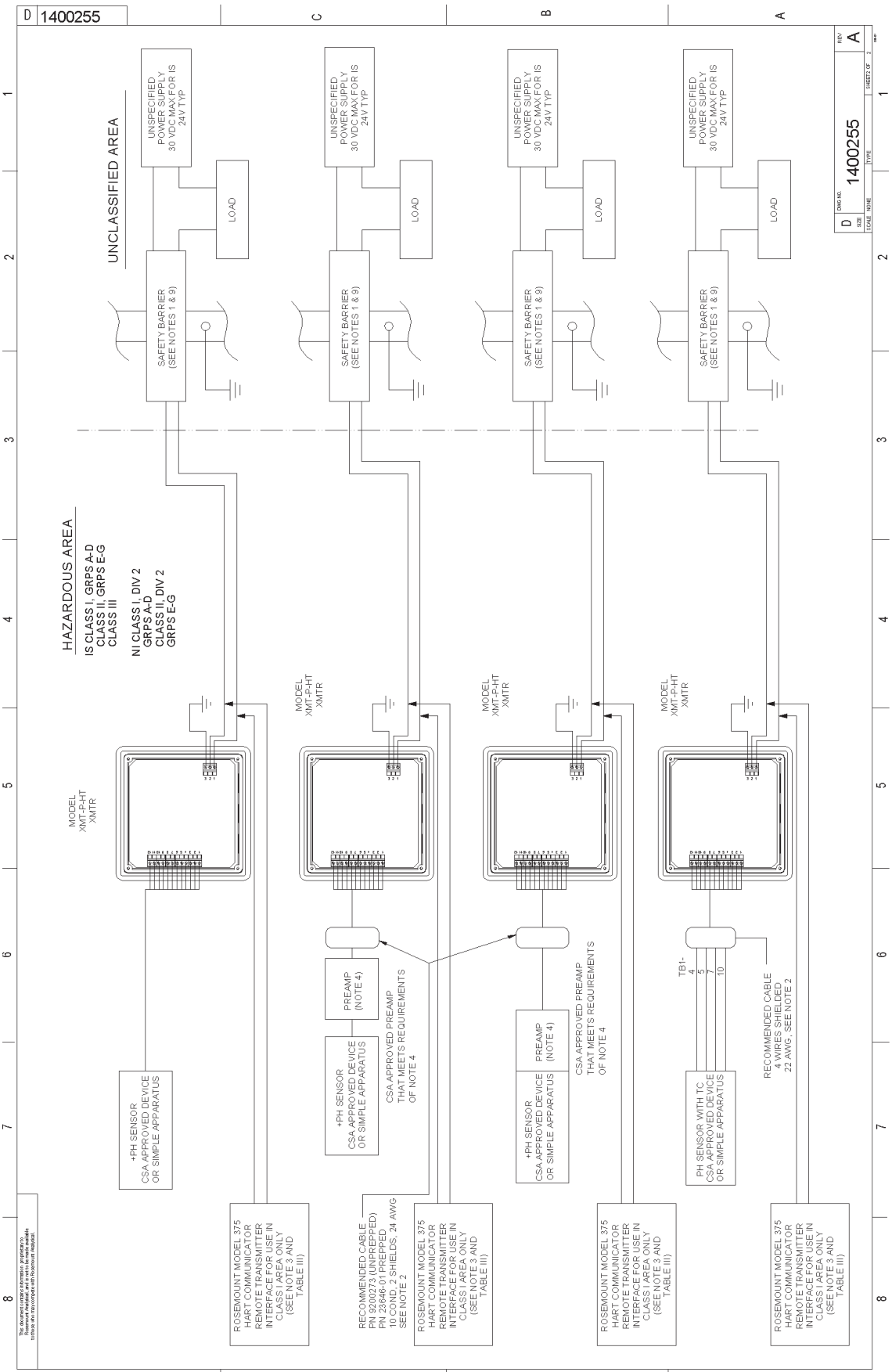


FIGURE 9. CSA Intrinsically Safe Installation Wiring (2 of 2)

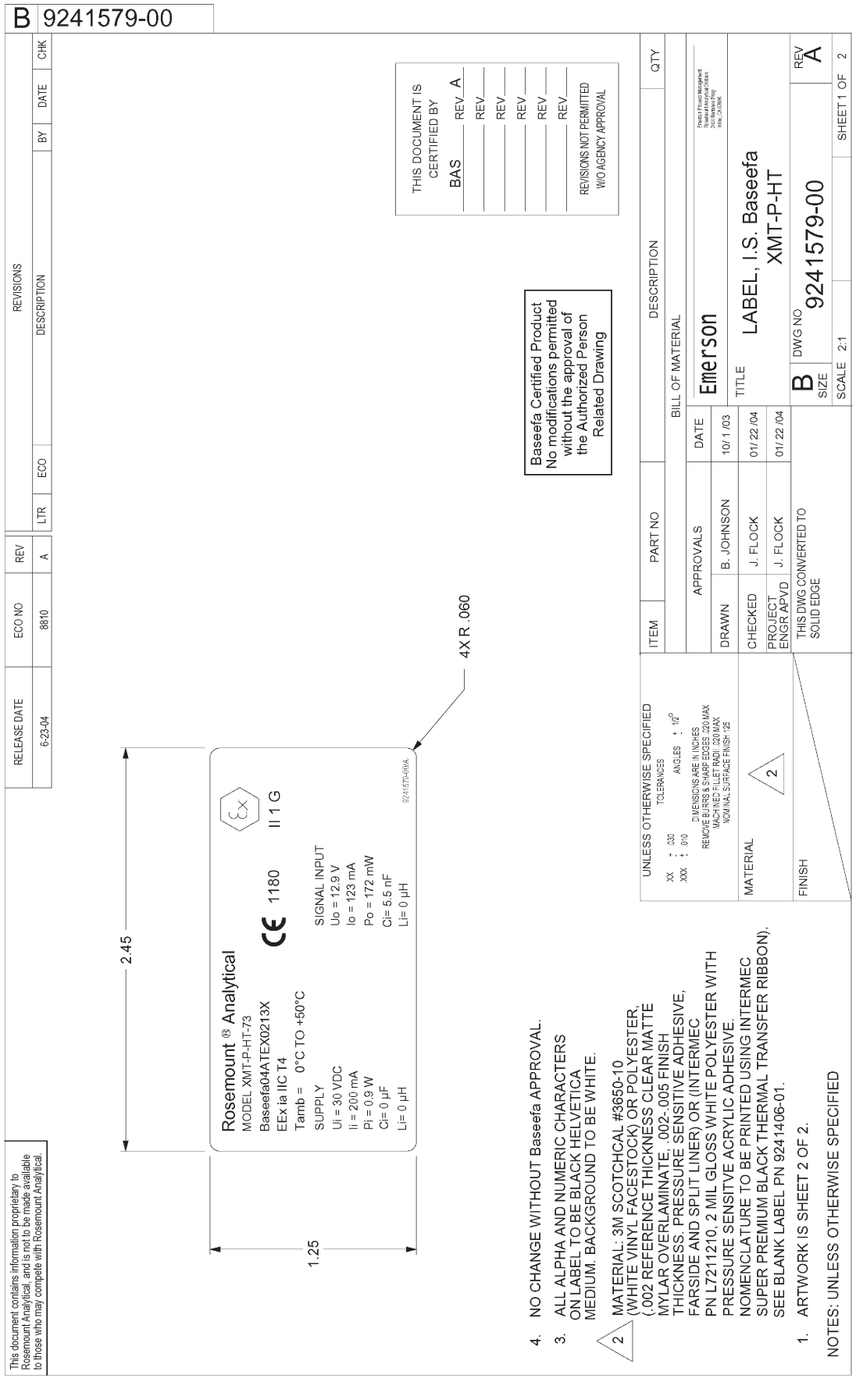


FIGURE 10. Baseefa/ATEX Intrinsically Safe Installation label

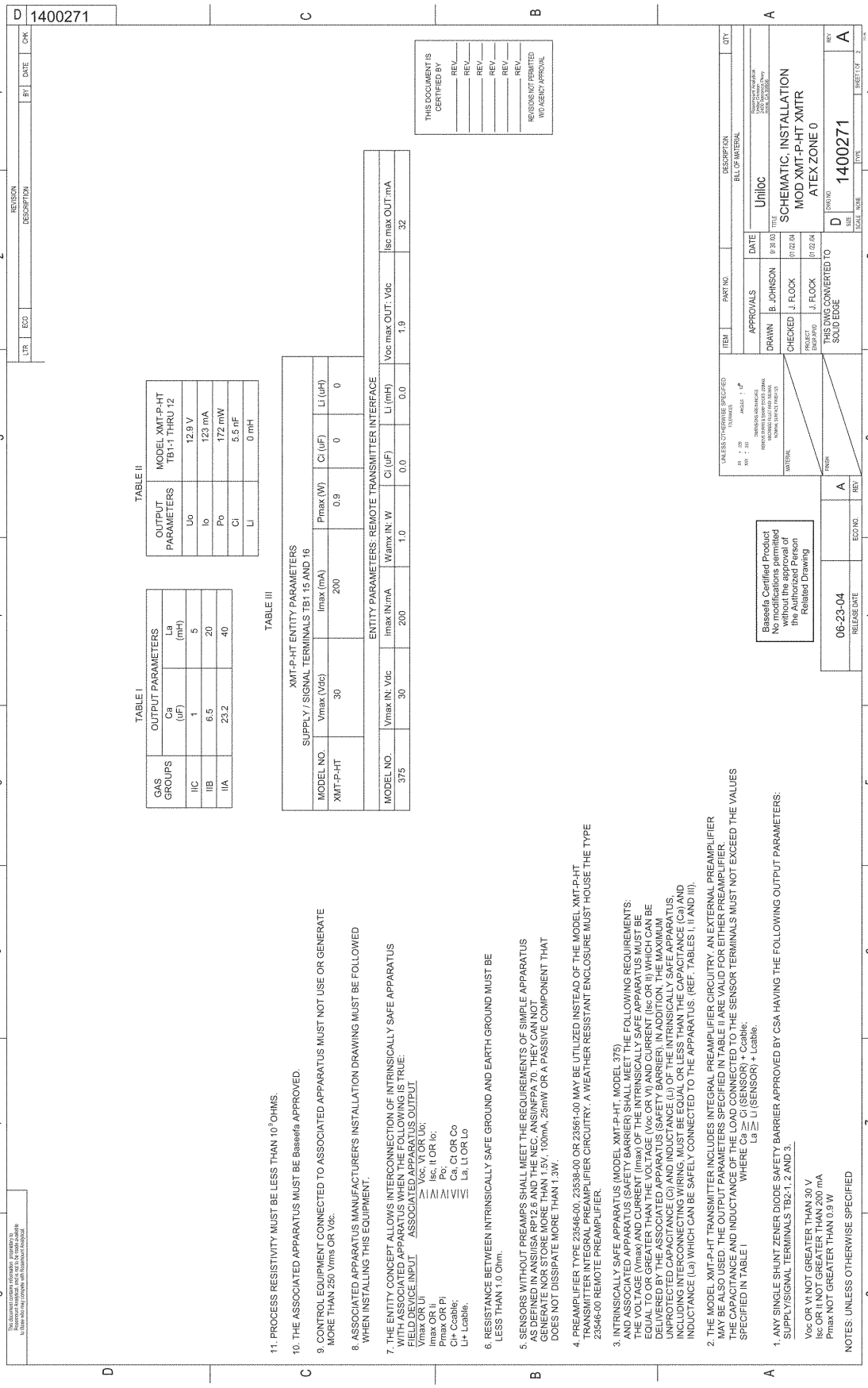


FIGURE 11. Baseefa/ATEX Intrinsically Safe Installation Wiring (1 of 2)

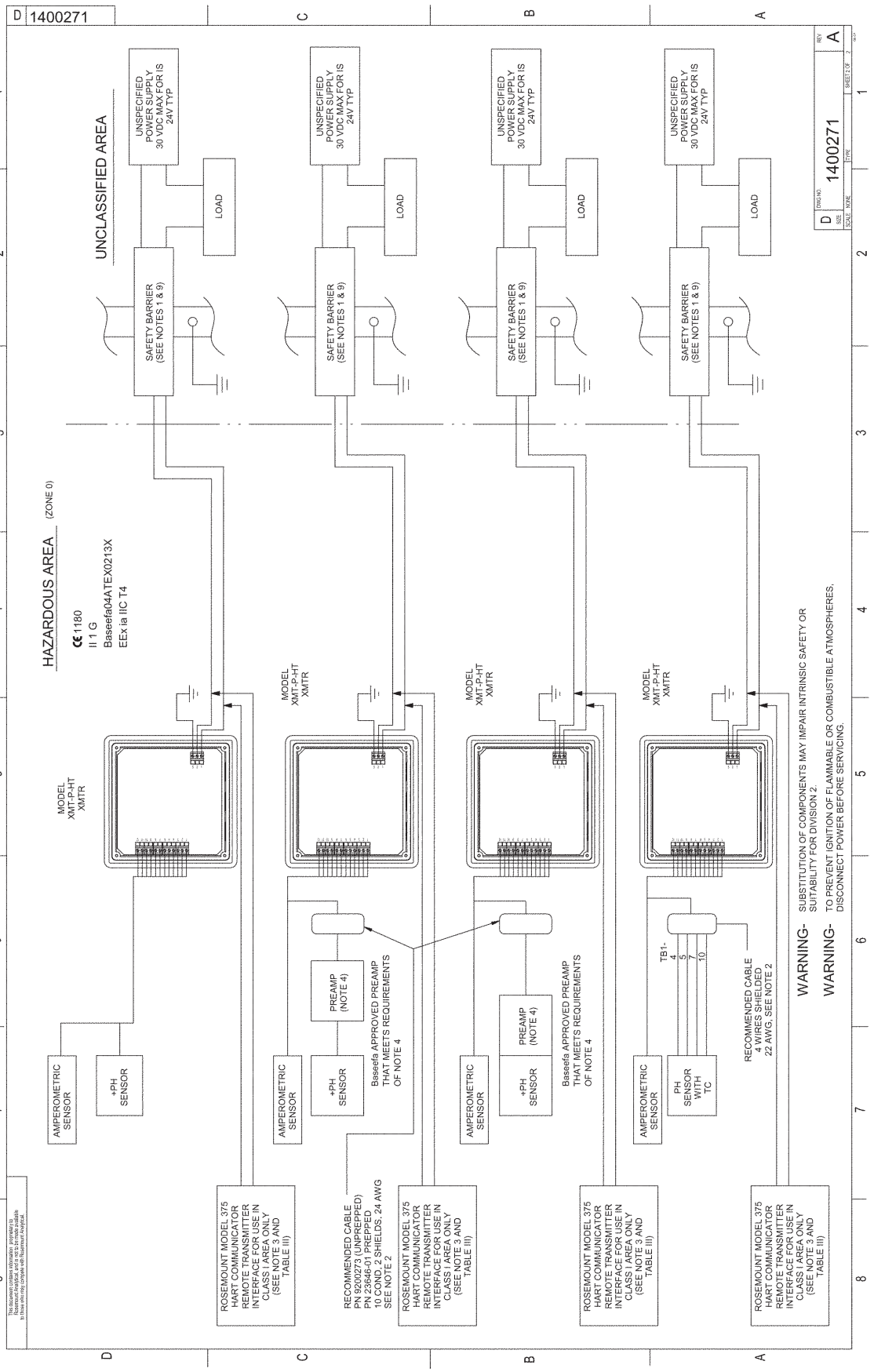
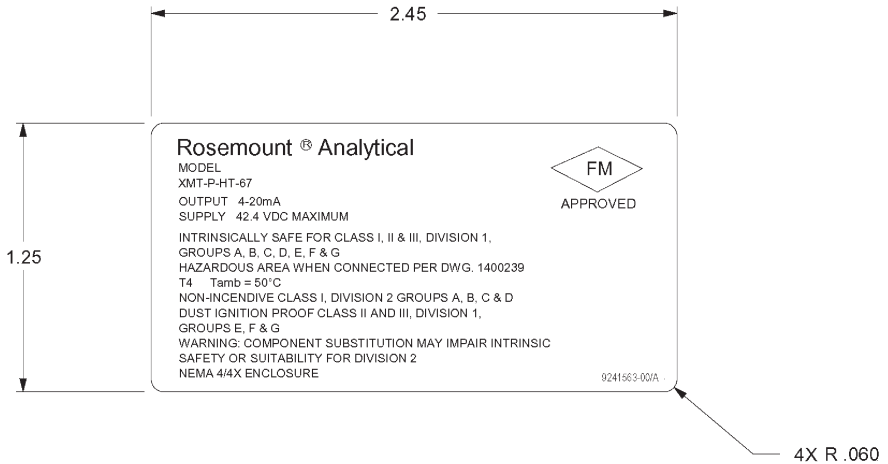


FIGURE 11. Baseefa/ATEX Intrinsically Safe Installation Wiring (2 of 2)

RELEASE DATE	ECO NO	REV
1-22-04	8810	A

REVISIONS					
LTR	ECO	DESCRIPTION	BY	DATE	CHK

B 9241563-00



THIS DOCUMENT IS CERTIFIED BY

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REVISIONS NOT PERMITTED W/O AGENCY APPROVAL

4. NO CHANGE WITHOUT FM APPROVAL.
3. ALL ALPHA AND NUMERIC CHARACTERS ON LABEL TO BE BLACK HELVETICA MEDIUM. BACKGROUND TO BE WHITE.
2. MATERIAL: 3M SCOTCHCAL #3650-10 (WHITE VINYL FACESTOCK) OR POLYESTER, (.002 REFERENCE THICKNESS CLEAR MATTE MYLAR OVERLAMINATE, .002-.005 FINISH THICKNESS. PRESSURE SENSITIVE ADHESIVE, FARSIDE AND SPLIT LINER) OR (INTERMEC PN L7211210, 2 MIL GLOSS WHITE POLYESTER WITH PRESSURE SENSITVE ACRYLIC ADHESIVE. NOMENCLATURE TO BE PRINTED USING INTERMEC SUPER PREMIUM BLACK THERMAL TRANSFER RIBBON). SEE BLANK LABEL PN 9241406-01.
1. ARTWORK IS SHEET 2 OF 2.

NOTES: UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED
TOLERANCES
.XX ± .030
.XXX ± .010
ANGLES ± 1/2°
DIMENSIONS ARE IN INCHES
REMOVE BURRS & SHARP EDGES .020 MAX
MACHINED FILLET RADII .020 MAX
NOMINAL SURFACE FINISH 125

MATERIAL 2

FINISH

ITEM	PART NO	DESCRIPTION	QTY
BILL OF MATERIAL			

APPROVALS		DATE
DRAWN	B. JOHNSON	9/24/03
CHECKED	J. FLOCK	1/22/04
PROJECT ENGR APVD	J. FLOCK	1/22/04

THIS DWG CONVERTED TO SOLID EDGE

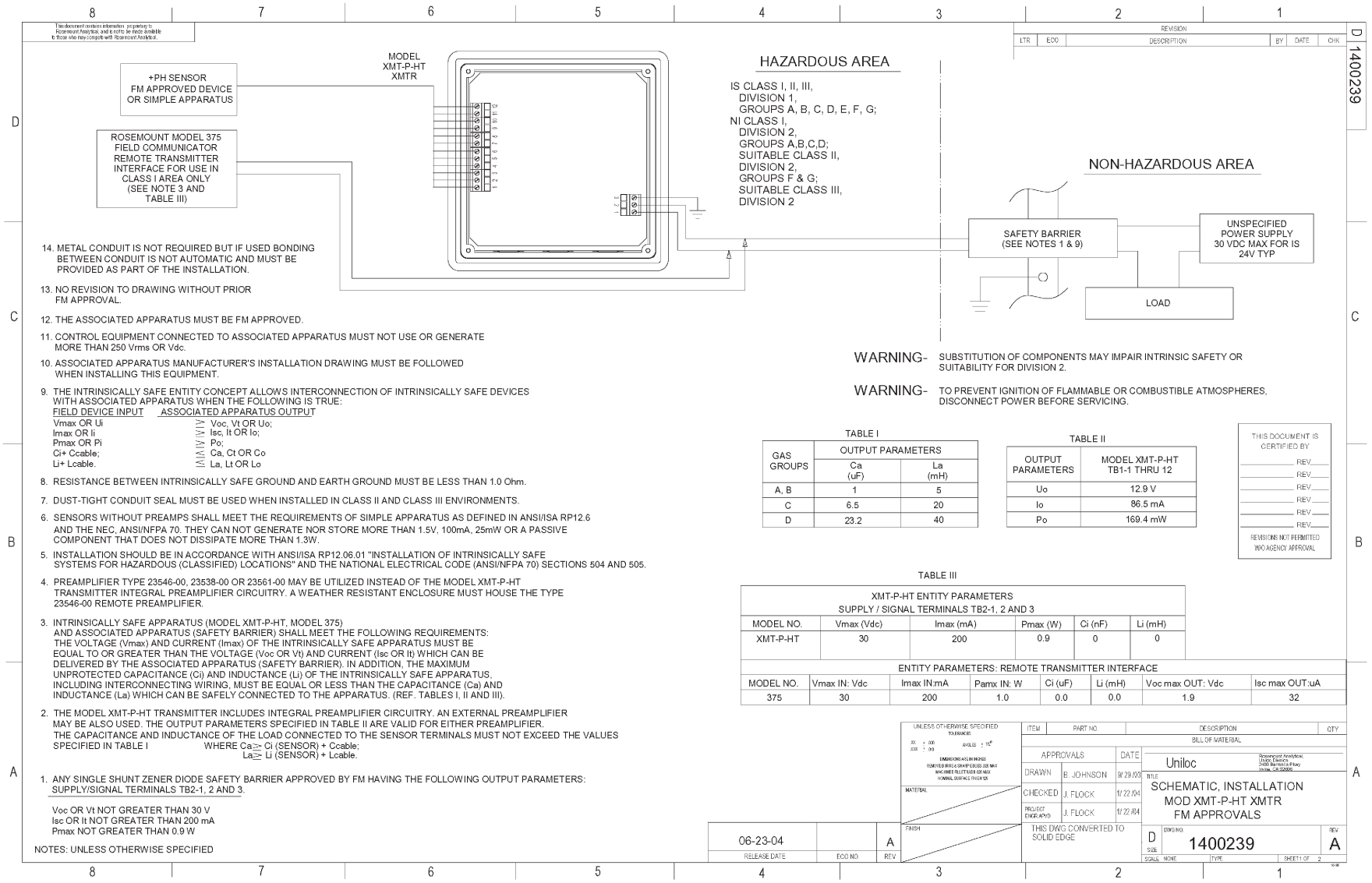
Emerson
Emerson Process Management
Rosemount Analytical Division
2400 Barranca Pkwy
Irvine, CA 92606

TITLE
LABEL, I.S. FM
XMT-P-HT

SIZE	DWG NO	REV
B	9241563-00	A

SCALE 2:1 SHEET 1 OF 2

FIGURE 12. FM Intrinsically Safe Installation label



14. METAL CONDUIT IS NOT REQUIRED BUT IF USED BONDING BETWEEN CONDUIT IS NOT AUTOMATIC AND MUST BE PROVIDED AS PART OF THE INSTALLATION.
13. NO REVISION TO DRAWING WITHOUT PRIOR FM APPROVAL.
12. THE ASSOCIATED APPARATUS MUST BE FM APPROVED.
11. CONTROL EQUIPMENT CONNECTED TO ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc.
10. ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.
9. THE INTRINSICALLY SAFE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE DEVICES WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:

FIELD DEVICE INPUT		ASSOCIATED APPARATUS OUTPUT
Vmax OR Ui	$\geq$	Voc, Vt OR Uo;
Imax OR Ii	$\geq$	Isc, It OR Io;
Pmax OR Pi	$\geq$	Po;
Ci+ Ccable;	$\geq$	Ca, Ct OR Co
Li+ Lcable.	$\geq$	La, Lt OR Lo

8. RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 Ohm.
7. DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.
6. SENSORS WITHOUT PREAMPS SHALL MEET THE REQUIREMENTS OF SIMPLE APPARATUS AS DEFINED IN ANSI/ISA RP12.6 AND THE NEC, ANSI/NFPA 70. THEY CAN NOT GENERATE NOR STORE MORE THAN 1.5V, 100mA, 25mW OR A PASSIVE COMPONENT THAT DOES NOT DISSIPATE MORE THAN 1.3W.
5. INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70) SECTIONS 504 AND 505.
4. PREAMPLIFIER TYPE 23546-00, 23538-00 OR 23561-00 MAY BE UTILIZED INSTEAD OF THE MODEL XMT-P-HT TRANSMITTER INTEGRAL PREAMPLIFIER CIRCUITRY. A WEATHER RESISTANT ENCLOSURE MUST HOUSE THE TYPE 23546-00 REMOTE PREAMPLIFIER.
3. INTRINSICALLY SAFE APPARATUS (MODEL XMT-P-HT, MODEL 375) AND ASSOCIATED APPARATUS (SAFETY BARRIER) SHALL MEET THE FOLLOWING REQUIREMENTS: THE VOLTAGE (Vmax) AND CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc OR Vt) AND CURRENT (Isc OR It) WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS (SAFETY BARRIER). IN ADDITION, THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF THE INTRINSICALLY SAFE APPARATUS, INCLUDING INTERCONNECTING WIRING, MUST BE EQUAL OR LESS THAN THE CAPACITANCE (Ca) AND INDUCTANCE (La) WHICH CAN BE SAFELY CONNECTED TO THE APPARATUS. (REF. TABLES I, II AND III).
2. THE MODEL XMT-P-HT TRANSMITTER INCLUDES INTEGRAL PREAMPLIFIER CIRCUITRY. AN EXTERNAL PREAMPLIFIER MAY BE ALSO USED. THE OUTPUT PARAMETERS SPECIFIED IN TABLE II ARE VALID FOR EITHER PREAMPLIFIER. THE CAPACITANCE AND INDUCTANCE OF THE LOAD CONNECTED TO THE SENSOR TERMINALS MUST NOT EXCEED THE VALUES SPECIFIED IN TABLE I WHERE Ca $\geq$ Ci (SENSOR) + Ccable; La $\geq$ Li (SENSOR) + Lcable.
1. ANY SINGLE SHUNT ZENER DIODE SAFETY BARRIER APPROVED BY FM HAVING THE FOLLOWING OUTPUT PARAMETERS: SUPPLY/SIGNAL TERMINALS TB2-1, 2 AND 3.

Voc OR Vt NOT GREATER THAN 30 V
Isc OR It NOT GREATER THAN 200 mA
Pmax NOT GREATER THAN 0.9 W

NOTES: UNLESS OTHERWISE SPECIFIED

WARNING- SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY OR SUITABILITY FOR DIVISION 2.

WARNING- TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES, DISCONNECT POWER BEFORE SERVICING.

TABLE I

GAS GROUPS	OUTPUT PARAMETERS	
	Ca (uF)	La (mH)
A, B	1	5
C	6.5	20
D	23.2	40

TABLE II

OUTPUT PARAMETERS	MODEL XMT-P-HT TB1-1 THRU 12
Uo	12.9 V
Io	86.5 mA
Po	169.4 mW

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REVISIONS NOT PERMITTED W/O AGENCY APPROVAL

TABLE III

XMT-P-HT ENTITY PARAMETERS SUPPLY / SIGNAL TERMINALS TB2-1, 2 AND 3					
MODEL NO.	Vmax (Vdc)	Imax (mA)	Pmax (W)	Ci (nF)	Li (mH)
XMT-P-HT	30	200	0.9	0	0

ENTITY PARAMETERS: REMOTE TRANSMITTER INTERFACE							
MODEL NO.	Vmax IN: Vdc	Imax IN:mA	Pamx IN: W	Ci (uF)	Li (mH)	Voc max OUT: Vdc	Isc max OUT:uA
375	30	200	1.0	0.0	0.0	1.9	32

UNLESS OTHERWISE SPECIFIED TOLERANCES
DIMENSIONS ARE IN INCHES
REMOVE BURRS & SHARP EDGES .005 MAX
MACHINE FILLETS R.010 MAX
NOMINAL SURFACE FINISH 125
MATERIAL
FINISH

ITEM	PART NO.	DESCRIPTION	QTY
BILL OF MATERIAL			

APPROVALS		DATE
DRAWN	B. JOHNSON	9/ 29/03
CHECKED	J. FLOCK	11/ 22/ 04
PROJECT ENGR APVD	J. FLOCK	11/ 22/ 04

THIS DWG CONVERTED TO SOLID EDGE

Uniloc
Rosemount Analytical
Daisy Division
2400 Barranca Pkwy
Irvine, CA 92606

TITLE
SCHEMATIC, INSTALLATION
MOD XMT-P-HT XMTR
FM APPROVALS

SIZE	DWG NO.	REV
D	1400239	A

SCALE: NONE TYPE SHEET 1 OF 2

RELEASE DATE	ECO NO.	REV.
06-23-04		A

FIGURE 13. FM Intrinsically Safe Installation Wiring (1 of 2)

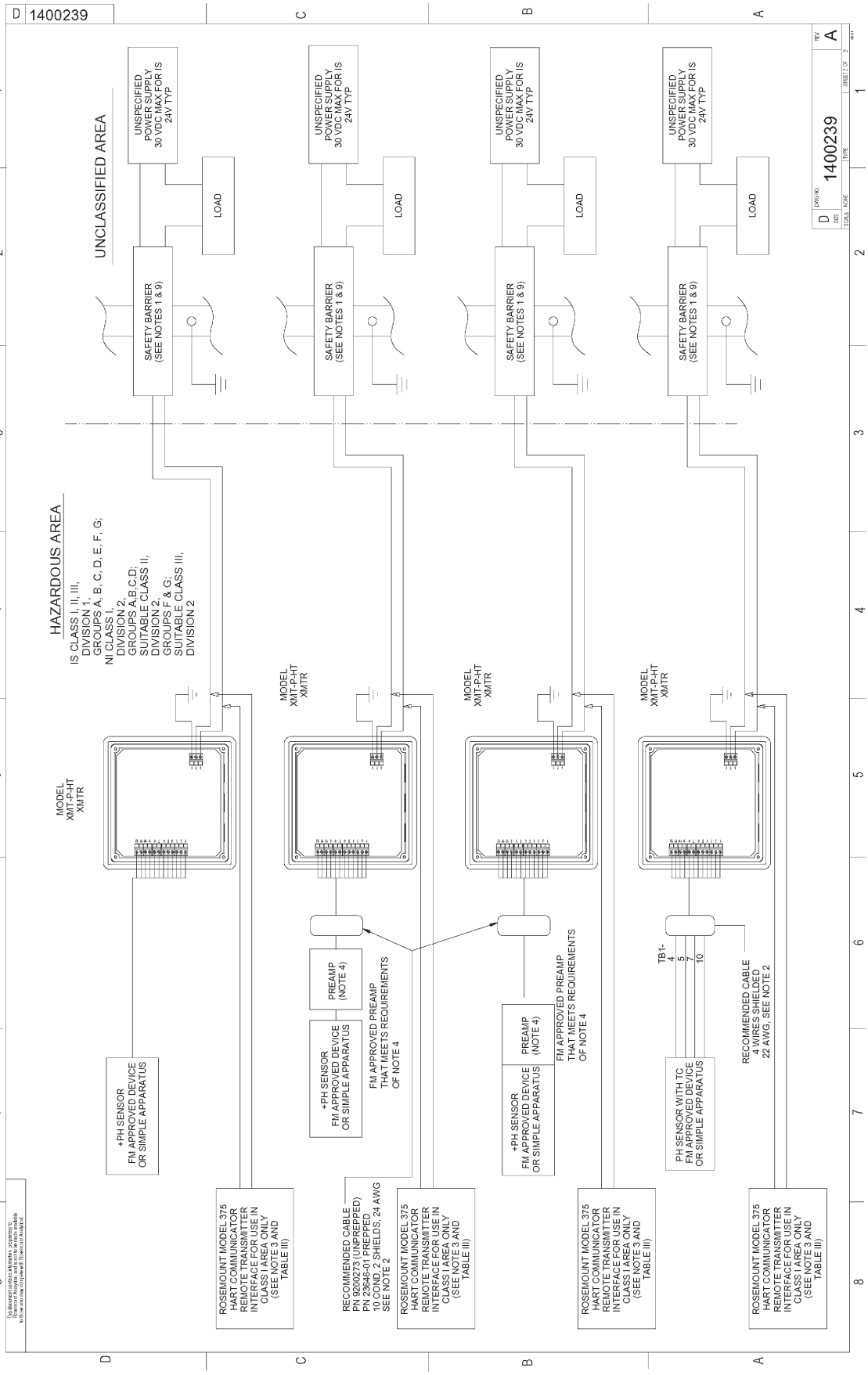
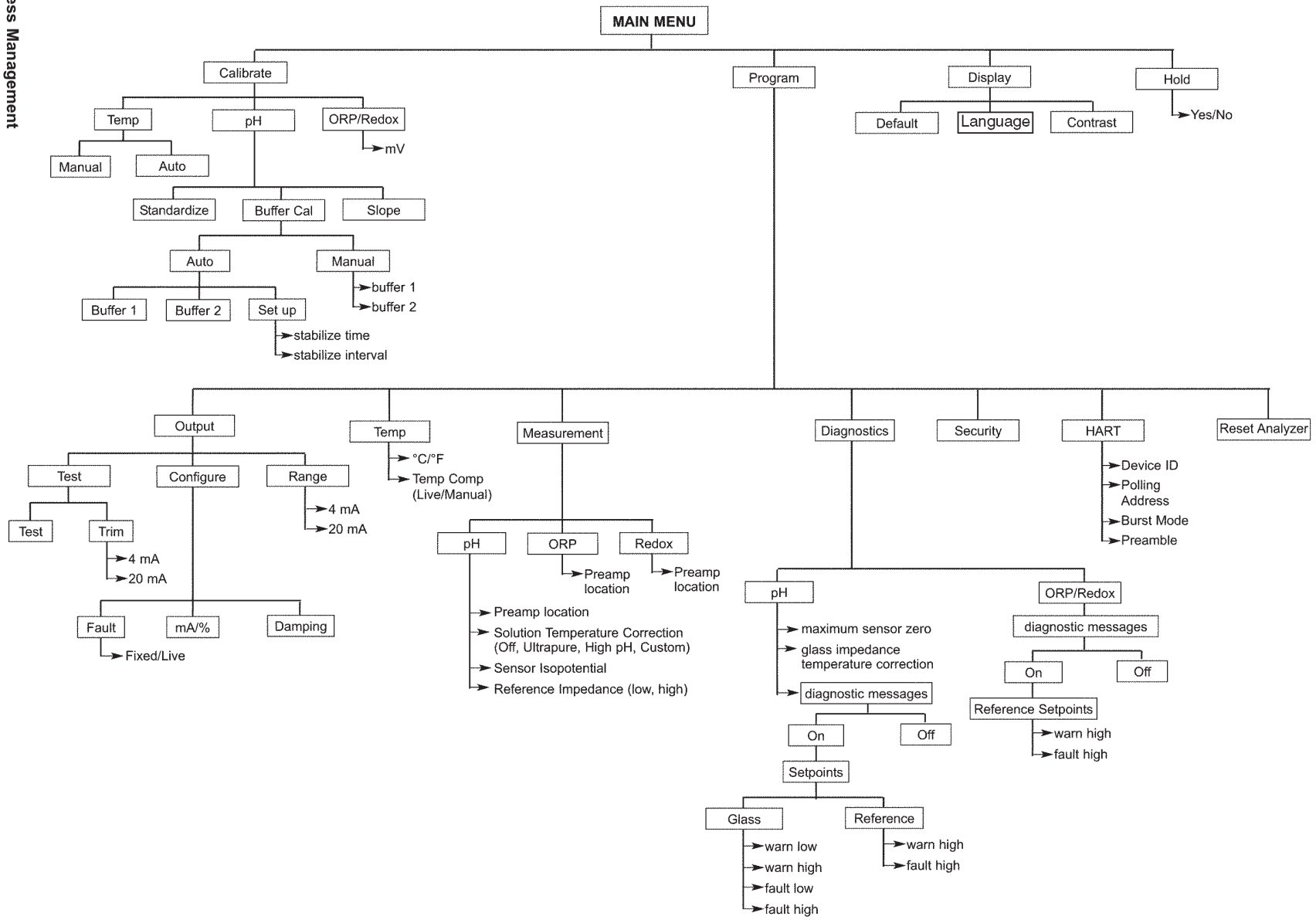


FIGURE 13. FM Intrinsically Safe Installation Wiring (2 of 2)

MAIN MENU

MENU TREE FOR MODEL SOLU COMP Xmt-P-HT TRANSMITTER



Emerson Process Management

2400 Barranca Parkway
Irvine, CA 92606 USA
Tel: (949) 757-8500
Fax: (949) 474-7250
http://www.raihome.com

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