PD6870 Explosion-Proof Loop-Powered Process Meter
Instruction Manual

ProtEx™ FarVu

CSA • Ex • IECEx • CE

- Fully-Approved Explosion-Proof Loop-Powered Process Meter
- 4-20 mA Input
- 1 Volt Drop (4 Volt Drop with Backlight)
- 1.0" (25.4 mm) 3½ Digits LCD Display; -1000 to 1999
- Display Mountable at 0°, 90°, 180°, & 270°
- HART® Protocol Transparent
- Loop-Powered Backlight
- Operating Temperature Range: -40 to 75°C (-40 to 167°F)
- Installation Temperature Range: -55 to 75°C (-67 to 167°F)
- Zero & Span Potentiometer Adjustments for Easy Field Scaling
- Conformal Coated PCBs for Dust and Humidity Protection
- CSA Certified as Explosion-Proof / Dust-Ignition-Proof / Flame-Proof
- ATEX and IECEx Certified as Explosion-Proof
- Wide Viewing Angle
- Built-In Flange for Wall or Pipe Mounting
- Explosion-Proof, IP68, NEMA 4X Die-Cast Aluminum & Stainless Steel Enclosures
- Two 3/4" NPT or M20 Threaded Conduit Openings
- 2" U-Bolt Kits Available
- Stainless Steel Tag Available
- 3-Year Warranty

Disclaimer

The information contained in this document is subject to change without notice. Precision Digital Corporation makes no representations or warranties with respect to the contents hereof; and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose.

⚠ **CAUTION**

- Read complete instructions prior to installation and operation of the meter.

⚠ **WARNINGS**

- Risk of electric shock or personal injury.
- This product is not recommended for life support applications or applications where malfunctioning could result in personal injury or property loss. Anyone using this product for such applications does so at his/her own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.
- Failure to follow installation guidelines could result in death or serious injury. Make sure only qualified personnel perform the installation.
- Never remove the meter cover in explosive environments when the circuit is live.
- Cover must be fully engaged to meet flame-proof/explosion-proof requirements.

⚠ **WARNING**

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

Limited Warranty

Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period under "Specifications" from the date of shipment from the factory. Precision Digital's liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Introduction

The ProtEX-FarVu PD6870 is a rugged, explosion-proof, loop-powered meter with 1" display digits ideal for demanding applications in hazardous areas or in the harshest environmental conditions. The product is CSA Certified as Explosion-Proof, Dust-Ignition-Proof, and Flame-Proof, and ATEX & IECEx Certified as Explosion-Proof. It is available in either an aluminum or stainless steel enclosure. It will operate down to -40°C and is approved for installation in areas where the temperature gets as cold as -55°C, however, the display will cease functioning.

The meter derives all of its power from the 4-20 mA loop with a small 1 volt drop for easy installation in almost any system.

The meter is programmed using four easy to access front-mounted potentiometers with no complex or difficult to read programming menus necessary for setup.

The numeric display will read from -1000 to 1999 over a 2000 count user adjustable scaling span. The backlight feature lets you see the display under any lighting condition and is powered from the 4-20 mA loop with no additional power supply required. The backlight can be enabled or disabled via alternative wiring of the terminal block.

The enclosure is provided with two conduit openings. The built-in mounting flange on the enclosure makes it convenient for pipe or wall mounting.

Ordering Information

Aluminum Enclosure

Model	Description
PD6870-0K0	Explosion-Proof Loop-Powered Process Meter with Backlight and Two 3/4" Conduit Openings
PD6870-0K0-M20	Explosion-Proof Loop-Powered Process Meter with Backlight and Two M20 Conduit Openings

Stainless Steel Enclosure

Model	Description
PD6870-0K0-SS	Explosion-Proof Loop-Powered Process Meter with Backlight and Two 3/4" Conduit Openings
PD6870-0K0-SS-M20	Explosion-Proof Loop-Powered Process Meter with Backlight and Two M20 Conduit Openings

Accessories

Model	Description
PDAPLUG75	3/4" NPT 316 Stainless Steel Conduit Plug with Approvals
PDAPLUGM20	M20 316 Stainless Steel Conduit Plug with Approvals
PDAREDUCER-75M-M20F	M-3/4" NPT to F-M20 Reducer with Approvals
PDAREDUCER-75M-50F	M-3/4" NPT to F-1/2" NPT Reducer with Approvals
PD9501	Multi-Function Calibrator
PD9502	Low-Cost Signal Generator
PDA1001	USB Power Bank
PDA1002	6" DIN Rail Mounting Kit
PDA1024-01	24 VDC Power Supply for DIN Rail
PDA-SSTAG	Custom Stainless Steel Tag (see website for convenient ordering form)
PDA6846-SS	Stainless Steel 2" U-Bolt Kit. All Material: Stainless Steel; (1) U-Bolt for 2" Pipe with (2 each) Washers, Lock Washers, and Nuts

Note: Unless otherwise specified, the above accessories do not carry hazardous area approvals and are thus not suitable for location in hazardous areas.

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Physical Features

The ProtEX-FarVu PD6870-0K0 comes with two ¾" NPT conduit openings and the PD6870-0K0-M20 comes with two M20 conduit openings.

Great for Cold Temperatures

The ProtEX-FarVu PD6870 will operate over a temperature range of -40 to 75°C (-40 to 167°F). Below -40°C, the display will cease functioning, however, the instrument is approved to be installed in locations where the temperature goes down to -55°C.

Wide Viewing Angle

The window and display module have been optimized to provide a wide viewing angle of approximately ±40°; nearly twice that of the competition.

Easy Pipe Mounting

The ProtEX-FarVu comes with a built-in mounting flange. This allows for easy mounting to walls or pipes using the PDA6846-SS Stainless Steel 2" U-Bolt Kit. A slot on the back of the enclosure makes it easy to center the unit on a pipe.

Rotatable Display Module

The display module can be rotated in 90° increments providing added mounting flexibility. Plus the various conduit connections allow a variety of installation options.

Tamper-Proof Capability

The instrument can be made tamper-proof by inserting a wire through the built-in loop on the base of the enclosure and a hole in the lid of the enclosure and securing this wire with a lead seal.

Stainless Steel Tag Attaching Loop

The enclosure is equipped with a loop at the top to easily attach a PDA-SSTAG stainless steel tag.

Accessories

PDA1024-01 24 VDC Power Supply

The PDA1024-01 is a DIN rail mounted 1.5 A, 24 VDC power supply that can be used to power the 4-20 mA transmitter.
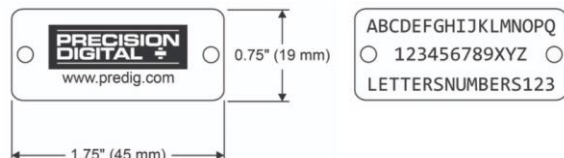
PDA6846-SS 2″ U-Bolt Kit

The PDA6846-SS U-Bolt Kit provides a convenient way to mount the PD6870 to 1.5" or 2" pipes.

PDA-SSTAG Stainless Steel Tag

The PDA-SSTAG is a laser etched stainless steel tag that can be customized with three lines of text. Each tag comes with a stainless steel wire and lead seal for easy mounting wherever you need.

Dimensions

Useful Tools

PD9501 Multi-Function Calibrator

This PD9501 Multi-Function Calibrator has a variety of signal measurement and output functions, including voltage, current, thermocouple, and RTD.

PD9502 Low-Cost Signal Generator

The PD9502 is a low-cost, compact, simple to use 4-20 mA or 0-10 VDC signal generator. It can easily be set for 0-20 mA, 4-20 mA, 0-10 V or 2-10 V ranges. Signal adjustment is made with a one-turn knob. A 15-27 VDC wall plug is provided with the instrument. Optional USB power bank is available.

Specifications

Except where noted all specifications apply to operation at +25°C.

General

Display	3 ½ digit LCD 1" (25.4 mm); -1000 to 1999
Display Orientation	Display may be mounted at 90° increments up to 270° from default orientation.
Display Update Rate	2.5 Updates/Second
Backlight	White; Loop-powered. Backlight can be enabled or disabled via alternative wiring of terminal block. Loop-powered backlight brightness will increase as the input signal current increases.
Display Overrange	Display reads *I* on the left most digit
Programming Method	Four (coarse and fine for zero and span) potentiometers accessed when the cover is removed.
Recalibration	Recalibration is recommended at least every 12 months.
Normal Mode Rejection	60 dB rejection ratio

Environmental	Operating temperature range:
	  -40 to 75°C (-40 to 167°F)
	Storage temperature range:
	  -55 to 75°C (-67 to 167°F)
	Installation temperature range:
	  -55 to 75°C (-67 to 167°F)
	  (The display ceases to function below -40°C)
	Relative humidity: 0 to 90% non-condensing
	Printed circuit boards are conformally coated

Connections	Screw terminals accept 12 to 22 AWG wire
Mounting	May be mounted directly to conduit. Built-in flange for wall mounting or NPS 1½" to 2½" or DN 40 to 65 mm pipe mounting. See *Mounting* on page *11*.
Overall Dimensions	5.25" x 5.65" x 4.80" (133 x 144 x 122 mm) (W x H x D)
Weight	Aluminum: 4.8 lbs (2.18 kg) Stainless Steel: 8.7 lbs (4.3 kg)
Warranty	3 years parts and labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Input

Input	4-20 mA	
Accuracy	±0.1% of full span ±1 count	
Maximum Voltage Drop & Equivalent Resistance	**Without Backlight**	**With Loop-Powered Backlight**
	1 VDC @ 20 mA	4 VDC @ 20 mA
	50 Ω @ 20 mA	200 Ω @ 20 mA
Temperature Drift	150 PPM/°C from -40 to 75°C ambient	
Decimal Point	User selectable decimal point	
Calibration Range	4 mA input: -1000 to +1000; 20 mA between 20 and 2000 counts greater than 4 mA display. Two point linear display span.	
Input Overload	Over current protection to 2 A max.	
HART Transparency	The meter does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption. The meter is not affected if a HART communicator is connected to the loop. The meter does not display secondary HART variables.	

Enclosure

Material	AL Models: ASTM A413 LM6 die-cast aluminum, copper-free, enamel coated SS Models: ASTM A743 CF8M investment-cast 316 stainless steel
Gasket	Fluoroelastomer
Rating	NEMA 4X, IP68 Explosion-proof
Color	AL: Blue SS: Silver
Window	Borosilicate glass
Conduits	PD6870-0K0: Two 3/4" NPT PD6870-0K0-M20: Two M20 PD6870-0K0-SS: Two 3/4" NPT PD6870-0K0-SS-M20: Two M20
Flange	Built-in flange for wall and pipe mounting
Tamper-Proof Seal	Cover may be secured with tamper-proof seal
Instrument Tag Loop	Built-in loop for securing stainless steel tag
ATEX & IECEx	Flame-proof protection ⟨Ex⟩ II 2 G D Ex db IIC Gb Ex tb IIIC Db IP66/IP68 Tamb: -55°C to +85°C Certificate No.: Sira 19ATEX1252U Certificate No.: IECEx SIR 19.0075U
CSA	Class I, Division 1, Groups A, B, C, D Class II, Division 1, Group E, F, G; Class III Ex db IIC Gb Ex tb IIIC Db Class I, Zone 1, AEx db IIC Gb; Zone 21, AEx tb IIIC Db IP66/IP68/TYPE 4X Tamb: -55°C to +85°C Certificate number: CSA 19.80011200U
UL	Class I, Division 1, Groups A, B, C and D Class II, Division 1, Groups E, F and G Class III; Class I, Zone 1, AEx db IIC Gb Zone 21, AEx tb IIIC Ex db IIC Gb Ex tb IIIC Db IP66/IP68/TYPE 4X Tamb: -55°C to +85°C Certificate Number: E518920

Note: The above approvals are for the enclosure only. See *Product Ratings and Approvals* on page *10* for approvals on the entire instrument.

General Compliance Information

Electromagnetic Compatibility

EMC Emissions	• CFR 47 FCC Part 15 Subpart B Class A emissions requirements (USA) • ICES-003 Information Technology emissions requirements (Canada) • AS/NZS CISPR 11 Group 1 Class A ISM emissions requirements (Australia/New Zealand) • EN 55011 Group 1 Class A ISM emissions requirements (EU) • EN 61000-6-4 Emissions requirements for Heavy Industrial Environments - Generic
EMC Emissions and Immunity	EN 61326-1 EMC requirements for Electrical equipment for measurement, control, and laboratory use – industrial use

Product Ratings and Approvals

CSA	Explosion-proof for use in:
	    Class I, Division 1, Groups B, C and D
	    Dust-ignition-proof for use in:
	    Class II/III, Division 1, Groups E, F and G; T6
	    Flame-proof for use in:
	    Zone 1, Ex d IIC T6
	    Ta = -55 to 75°C
	    Enclosure: Type 4X & IP66/IP68
	    Certificate number: CSA 11 2325749

ATEX	Explosion-proof for use in:
	    ⟨Ex⟩ II 2 G D
	    Ex db IIC T6 Gb
	    Ex tb IIIC T85°C Db IP68
	    Ta = -55 to 75°C
	    Certificate number: Sira 10ATEX1116X

IECEx	Explosion-proof for use in:
	    Ex db IIC T6 Gb
	    Ex tb IIIC T85°C Db IP68
	    Ta = -55 to 75°C
	    Certificate number: IECEx SIR 10.0056X

ATEX/IECEx Specific Conditions of Use

1. The equipment label and epoxy coating may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a buildup of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.
2. Flameproof joints are not intended to be repaired.
3. All entry closure devices shall be suitably certified as "Ex d", "Ex t" and "IP66/68" as applicable. Suitable thread sealing compound (non-setting, non-insulating, non-corrosive, not solvent based, suitable for the ambient rating) must be used at the NPT conduit entries to achieve the IPx8 rating while maintaining the Ex protection concept.

Year of Construction

This information is contained within the serial number with the first four digits representing the year and month in the YYMM format.

For European Community:

The PD6870 Series must be installed in accordance with the ATEX directive 2014/34/EU, the product certificate Sira 10ATEX1116X, and the product manual.

EU Declaration of Conformity

For shipments to the EU and UK, a Declaration of Conformity was printed and included with the product. For reference, a Declaration of Conformity is also available on our website www.predig.com/docs.

Safety Information

⚠ **CAUTION**

- Read complete instructions prior to installation and operation of the annunciator.

⚠ **WARNINGS**

- Risk of electric shock or personal injury.
- Hazardous voltages exist within enclosure.
- Installation and service should be performed only by trained service personnel.
- Service requiring replacement of internal components must be performed at the factory.
- In hazardous areas, conduit and conduit/stopping plugs require the application of non-setting (solvent free) thread sealant. It is critical that all relevant hazardous area guidelines be followed for the installation or replacement of conduit or plugs.

Installation

For Installation in USA: The PD6870 must be installed in accordance with the National Electrical Code (NEC) NFPA 70.

For Installation in Canada: The PD6870 must be installed in accordance with the Canadian Electrical Code CSA 22.1. All input circuits must be derived from a CSA approved Class 2 source.

For European Community: The PD6870 must be installed in accordance with the ATEX directive 2014/34/EU and the product certificate Sira 10ATEX1116X.

⚠ **WARNINGS**

- Disconnect from supply before opening enclosure.
- Keep cover tight while circuits are live.
- Conduit seals must be installed within 18" (450 mm) of the enclosure.
- Use suitably certified and dimensioned cable entry device and/or plug.
- Cable must be suitable for 90°C.

All controls and wiring connections are located on the display module that is accessed by removing the enclosure cover. The controls can be accessed without removing the display module. The wiring connections can be accessed by removing the display module which is secured to the enclosure by two captive screws.

Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier. If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

Cover Jam Screw

The cover jam screw should be properly installed once the meter has been wired and tested in a safe environment. The cover jam screw is intended to prevent the removal of the meter cover in a hazardous environment without the use of tools. Using a M2 hex wrench, turn the screw clockwise until the screw contacts the meter. Turn the screw an additional 1/4 to 1/2 turn to secure the cover.

⚠ **CAUTION**

- Excess torque may damage the threads, screw head, or wrench.

Mounting

The PD6870 includes a built-in mounting flange that may be used for pipe mounting or wall mounting. Alternatively, the unit may be supported by the conduit using the conduit holes provided.

Refer to *Figure 1* and *Figure 2*.

⚠ **WARNING**

- Do not attempt to loosen or remove flange bolts while the meter is in service.
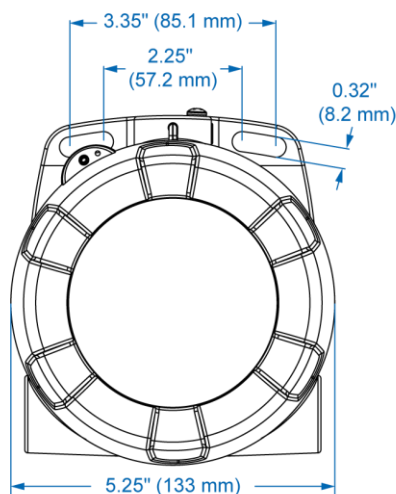
Dimensions

All units: inches (mm)
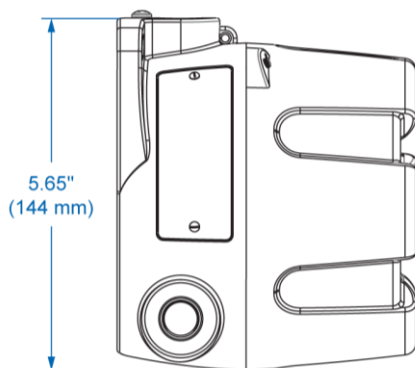

Figure 1. Enclosure Dimensions - Front View
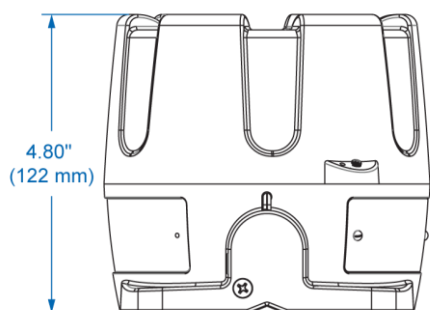

Figure 2. Enclosure Dimensions - Side View

Figure 3. Enclosure Dimensions - Top View

Connections

To access the wiring connections, remove the enclosure cover and unscrew the two captive screws that fasten the display module. Signal connections are made to a three-terminal connector on the rear of the display module. Grounding connections are made to the two ground screws provided on the base – one internal and one external.

S+	4-20 mA signal positive terminal connection
S-	4-20 mA signal return/negative terminal connection
B-	4-20 mA signal return/negative terminal when using the installed loop-powered backlight option.

Refer to *Figure 4* for terminal positions.

⚠ **WARNINGS**

- Observe all safety regulations. Electrical wiring should be performed in accordance with all agency requirements and applicable national, state, and local codes to prevent damage to the meter and ensure personnel safety.
- Static electricity can damage sensitive components.
- Observe safe handling precautions for static-sensitive components.
- Use proper grounding procedures/codes.
- If the meter is installed in a high voltage environment and a fault or installation error occurs, high voltage may be present on any lead or terminal.
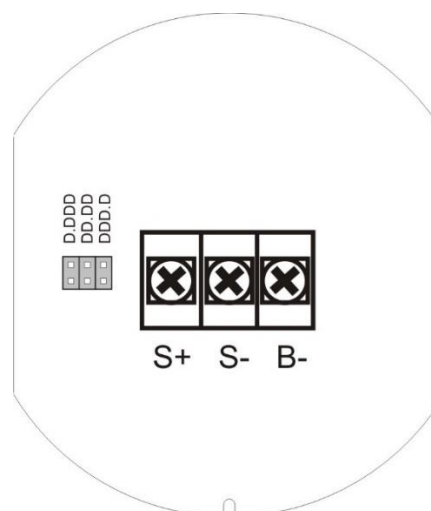

Figure 4. Connector Board

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Wiring Diagrams

Signal connections are made to a three-terminal connector mounted on the rear of the display module. The enclosure also provides one internal and one external earth grounding screw.

The 4-20 mA input with no backlight has a maximum voltage drop of 1 V and is wired as shown in *Figure 5*.

The loop-powered backlight configuration requires a total maximum voltage drop of 4 V. The backlight option is recommended for dim lighting conditions and is enabled when wired as shown in *Figure 6*.
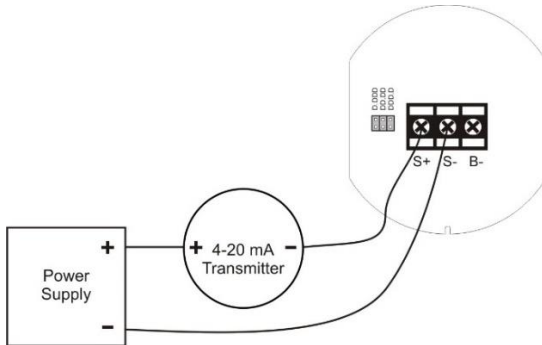

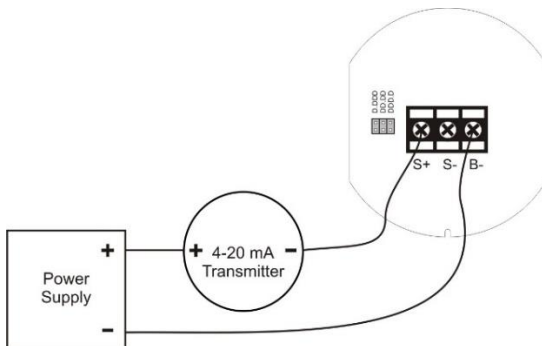**Figure 5. Connections without Backlight**

Figure 6. Connections with Loop-Powered Backlight

Setup

Overview

Setting the 4-20 mA input for the desired display is done using a calibrated 4-20 mA signal source and the four potentiometers located on the front of the display module. The cover must be removed to access these potentiometers. There is also a jumper array for setting the decimal point.

Scaling Controls and Display

Control	Description
LO	4 mA display adjust
LO FINE	4 mA precision display adjust
HI	20 mA display adjust
HI FINE	20 mA precision display adjust

Setting Up the Meter

Setting the Decimal Point

A decimal point may be set using a three-position jumper array located on the rear of the display module. To access the jumper array, unscrew the two captive screws that fasten the display module. Remove the display module and place the jumper on the desired pins as indicated on the board for decimal point locations of D.DDD, DD.DD, DDD.D, or remove it if no decimal point is desired.

Minimum & Maximum Input Span

A minimum input span of 20 counts is required between the 4 mA and 20 mA inputs. A maximum input span of 2000 counts may be setup between the 4 mA and 20 mA input.

The meter will not calibrate properly if these minimum and maximum span ranges are not maintained during scaling.

Calibrating the Meter

The meter is provided factory calibrated to display -50.0 at 4 mA and 150.0 at 20 mA.

Apply a 4 mA signal and adjust the LO potentiometers (coarse and fine) to display the desired reading. Apply a signal between 16 and 20 mA and adjust the HI potentiometers (coarse and fine) to display the desired reading. Complete the calibration procedure by making minor adjustments to the LO and HI fine potentiometers as necessary.

Factory Default & User Settings

The following table shows the factory setting for most of the programmable parameters on the meter. Next to the factory setting, the user may record the new setting for the particular application.

Model: _____

S/N: _____

Date: _____

Parameter	Default Setting	User Setting
Decimal point	*1 place*	
Calibration Settings		
Input 1	*4.00 mA*	
Display 1	*-50.0*	
Input 2	*20.00 mA*	
Display 2	*150.0*	

Troubleshooting

The rugged design and the user-friendly interface of the meter should make it unusual for the installer or operator to refer to this section of the manual. If the meter is not working as expected, refer to the recommendations below.

Troubleshooting Tips

Symptom	Check/Action
No display	Check input signal connections.
Display unsteady during calibration	Adjust LO FINE or HI FINE controls to fine-tune the display.
Meter displays *1* on the left most digit location	Check signal level is not over range. Dial down the HI control and re-calibrate at 20 mA.
Display is faded	Check input signal is not under 1 mA.
Backlight does not appear	Verify backlight is installed. Check signal connections are as shown in *Figure 6* on page *13*.
Other symptoms not described above	Call Technical Support for assistance.

Contact Precision Digital

Technical Support

Call: (800) 610-5239 or (508) 655-7300

Email: support@predig.com

Sales Support

Call: (800) 343-1001 or (508) 655-7300

Email: sales@predig.com

Place Orders

Email: orders@predig.com

For the latest version of this manual please visit

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