



Precise Sensors
"Defining Higher Expectations"

INSTALLATION, CALIBRATION & TROUBLESHOOTING

Model 4863CE

4863CE Loop Powered 4-20 mA Module Display and Transducer



(ACTUAL SIZE)

DISPLAY: 4863-115-GA-BM-CE; TRANSDUCER: 4863-115-GA-4IM-CE

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WARRANTY

Precise Sensors, Inc. warrants that, within 4 years from the date of shipment, if the product(s) manufactured by us and sold by us are in the possession of the original buyer from us (or from an authorized distributor), we will replace or repair, at our option, free of charge, any part or parts, which upon examination we find defective in workmanship or material, provided that, upon our request, the product or parts are returned to our plant, transportation charges prepaid, along with satisfactory documentation that the product has been installed, used, and maintained in accordance with the instructions in this Installation Guide and has not been subject to abuse. We shall not be liable or responsible for any expense or liability of repairs, additions, or modifications made upon the product without our written consent. Any unauthorized disassembly or attempt to repair the product shall void this warranty. No agent is authorized to assume any liability except as set forth above.

Warranty specifications and qualitative calibration data, as supplied with each product, are based on tests performed on and values obtained with N.I.S.T. traceable laboratory standards and test equipment of Precise Sensors, Inc.

THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). IN NO EVENT SHALL WE BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOST PROFITS OR OTHER DAMAGES FROM LOSS OF PRODUCTION) CAUSED BY DEFECTIVE MATERIAL, OR BY UNSATISFACTORY PERFORMANCE OF THE PRODUCT, OR BY ANY OTHER BREACH OF CONTRACT BY US.

DISCLAIMER

No representations or warranties are made with respect to the contents of this Installation Guide. Precise Sensors, Inc. reserves the right to revise this guide and to make changes from time to time in the content hereof, without obligation to notify any person of such revision.

WARNING

Pressurized vessels and associated equipment are potentially dangerous. The product described in this guide should be operated only by personnel trained in procedures that will assure safety to themselves, to others, to the equipment, and to the product. Before performing any maintenance, turn off the power.

The transducer shall not be used in a manner not specified by the manufacturer.



ACHTUNG

Unter Druck stehende Gefäße und Zubehör können gefährlich sein. Die hier beschriebenen Geräte dürfen nur von speziell auf persönliche Sicherheit, die Sicherheit anderer, die Sicherheit der Geräte und der Produkte ausgebildetem Personal bedient werden. Vor jeglichen Wartungsarbeiten ist das Gerät auszuschalten.

Der Transducer ist für keine anderen als die vom Hersteller genannten Zwecke zu benutzen.

4863CE Transducer and Loop Powered 4-20 mA Display

I. INTRODUCTION

The PSI Model 4863CE display and pressure transducer uses a two-wire loop powered pressure controlled current source. The calibrated current source contained in the display yields an output proportional to the applied pressure between 4 mA DC (at Zero pressure) to 20 mA DC (at Full pressure). The display incorporates a red, 3 ½ digit 7-segment LED digital panel meter. The electrical connection is made through an integral shielded cable.

The pressure transducer is available in Flow Thru or Dead End configuration and several pressure ranges. Some of the Transducer pressure connection options available include 1/4" and 1/2" male and female face seals with swivel nuts, 1/4" male face seal with straight male thread, and 1/4" OD tube stubs or tees. Other process connections are available.

II. DECLARATION of CONFORMITY

The 4863CE Display and Transducer have been tested and approved to meet the EMC Directive 89/336/EEC Product Standards EN 55011:1991, Class A, and EN 50082-2:1995.



III. SPECIFICATIONS

PERFORMANCE

- 1. Accuracy, Linearity, Hysteresis & Repeatability (BFSL):**
160 - 3000 PSI: $\pm 0.15\%$ of span typical
($\pm 0.25\%$ of span max.)
45 - 150 PSI: $\pm 0.35\%$ of span typical
($\pm 0.50\%$ of span max.)
- 2. Resolution:**
 ± 1 Count
- 3. Zero Adjustability:**
 $\pm 2\%$ of span
- 4. Span Adjustability:**
 $\pm 20\%$ of span
- 5. Stability:**
 $< \pm 0.25\%$ of span over 1 year typical

GENERAL SPECIFICATIONS

- 1. Transducer type:**
Four Active Arm Bonded Strain Gage.
- 2. Power Supply Effect:**
 $< \pm 0.005\%$ /Volt change at full scale pressure.
- 3. Circuit Protection:**
Reversed polarity protection.
- 4. Shunt Cal:**
Approximately 50% of span, activated by a momentary switch on the display panel. Specific value noted on transducer certification.
- 5. Electrical Connection:**
Two (2) conductor shielded pigtail cable.

Environmental Conditions

- 1. Storage Temperature Range:**
 $-40\text{ }^{\circ}\text{F}$ to $185\text{ }^{\circ}\text{F}$ ($-40\text{ }^{\circ}\text{C}$ to $85\text{ }^{\circ}\text{C}$).
- 2. Compensated Temperature:**
 $0\text{ }^{\circ}\text{F}$ to $160\text{ }^{\circ}\text{F}$ ($-17.8\text{ }^{\circ}\text{C}$ to $71\text{ }^{\circ}\text{C}$).

3. Relative Humidity:

Maximum relative humidity 80% for temperatures up to $88\text{ }^{\circ}\text{F}$ ($31\text{ }^{\circ}\text{C}$), decreasing linearly to 50% relative humidity at $104\text{ }^{\circ}\text{F}$ ($40\text{ }^{\circ}\text{C}$).

DISPLAY SPECIFICATIONS

- 1. Polarity:**
Automatic (-) Displayed.
- 2. Over Range:**
3 lower digits blank for readings greater than 1999.
- 3. Current Output:**
4 - 20 mA.
- 4. Current Limiting:**
34 mA typical.
- 5. Supply Voltage:**
15 to 30 VDC, unregulated.
- 6. Loop Resistance:**
 $0\ \Omega$ @ 15 VDC to $750\ \Omega$ @ 30 VDC.
- 7. Temperature Coefficient:**
 $< \pm 0.011\%$ F.S.R./ $^{\circ}\text{F}$
 $< \pm 0.02\%$ F.S.R./ $^{\circ}\text{C}$
- 8. Display:**
 $3\ \frac{1}{2}$ Digits (1999), 7 Segment Red L.E.D.
 $3\ \frac{1}{2}$ Digits W/Dummy zero (19990)
0.37 " High.

TRANSDUCER SPECIFICATIONS

- 1. Proof Pressure:**
200% of F.S. Range
- 2. Burst Pressure:**
>400% of F.S. Range
- 3. Pressure Range:**
See Pressure Table.
- 4. Display Housing Material:**
Conductively coated aluminum.
- 5. Transducer Housing Material:**



300 series SST.

Megohms/cm, and double bag in class 100 environment.

- 6. **Transducer Wetted Material:**
316L VAR.
- 7. **Surface Finish (Wetted Surfaces):**
Electropolish to 7Ra (μin) $\pm 20\%$ unilateral tolerance.
- 8. **Cleaning/Packaging:**
Clean using 140°F hot D.I. water with resistivity equal to or greater than 17.5

Note:

Transducer is supplied with N.I.S.T. traceable Certificate of Conformance.

DIMENSIONS

- 1. See Figure 1 for dimensions.

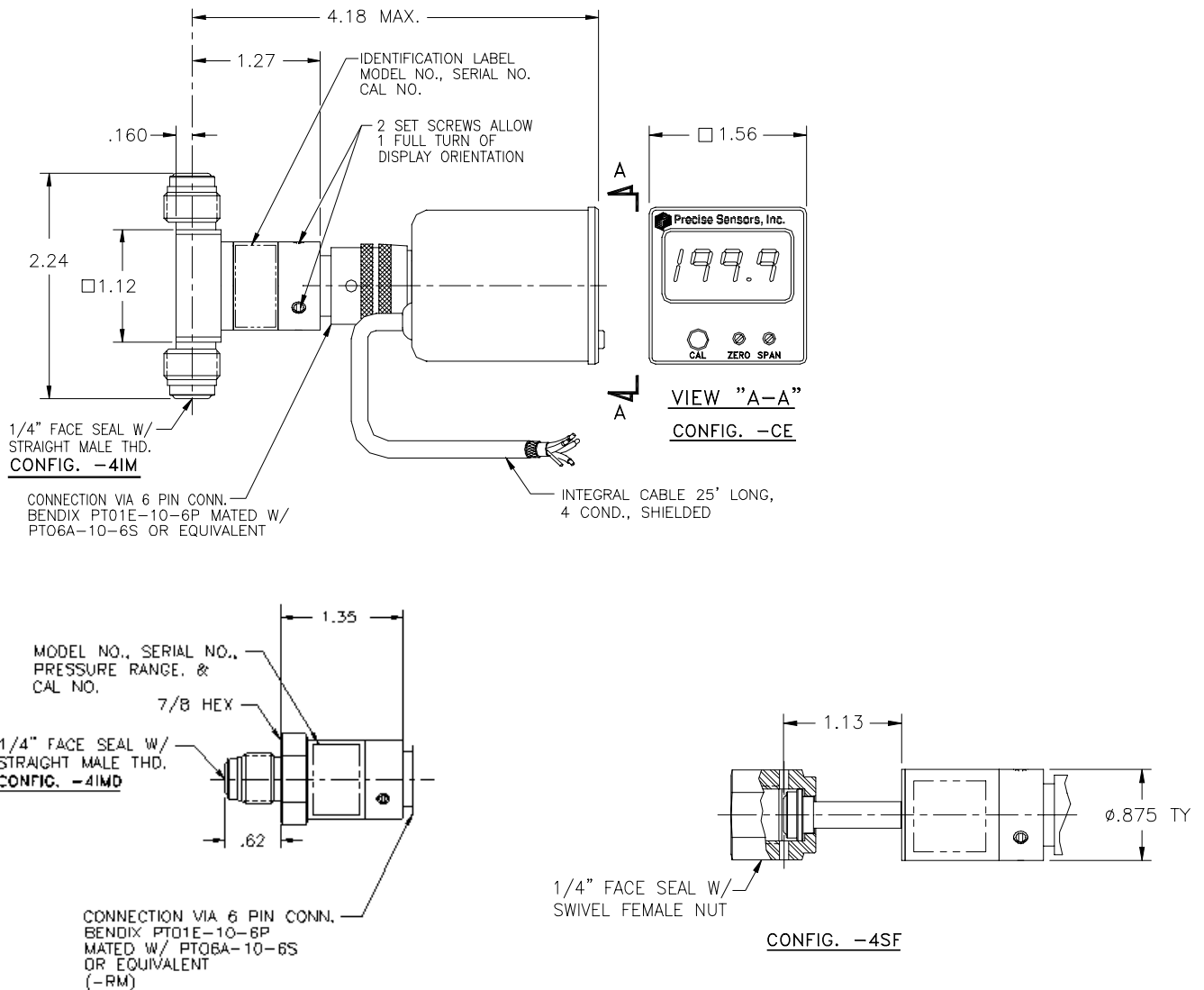
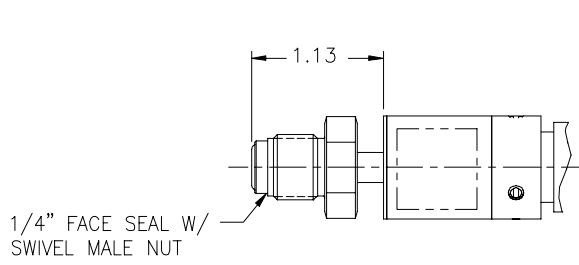
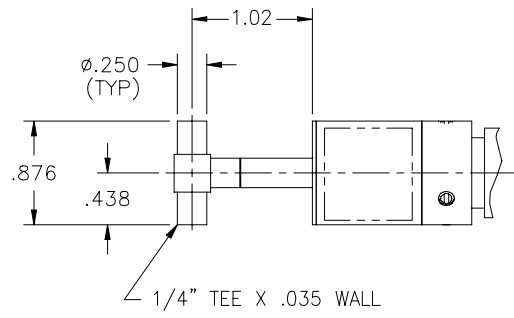


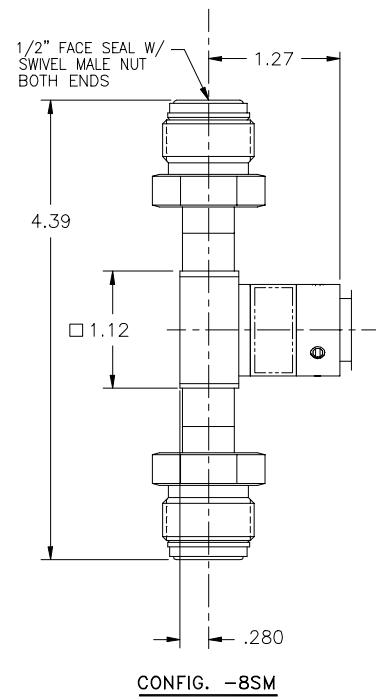
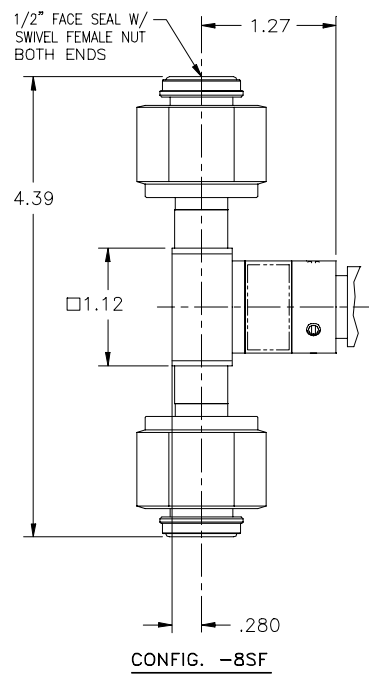
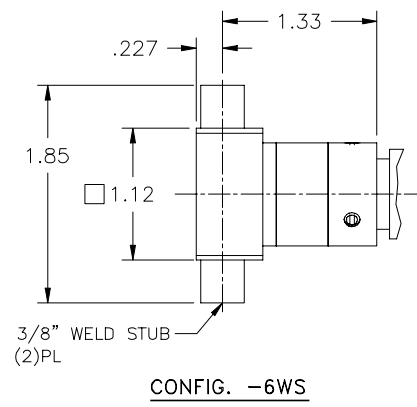
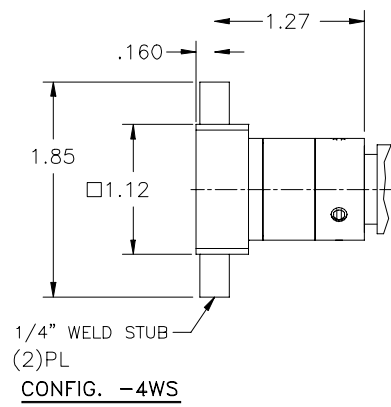
Figure 1
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CONFIG. -4SM



CONFIG. -4WT



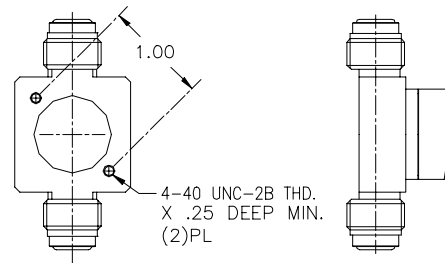
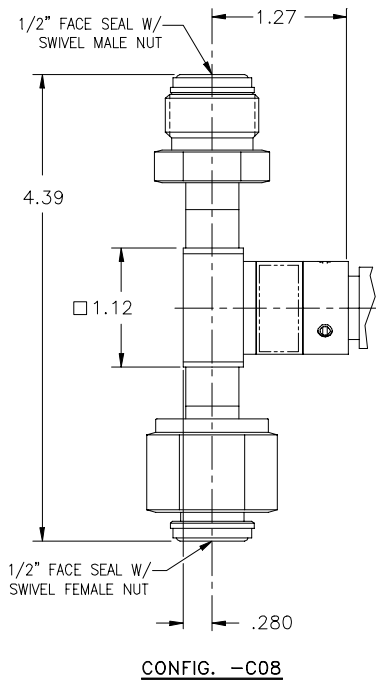
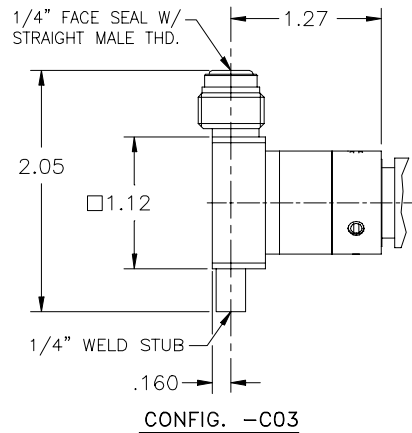
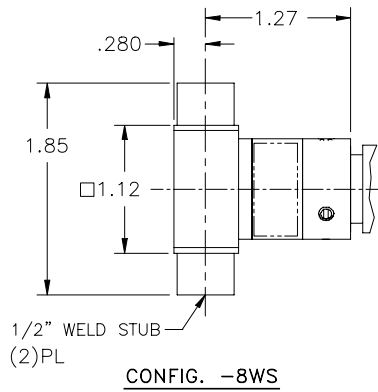


Figure 1
Model 4863CE Loop Powered 4-20 mA Display and Transducer Configurations

IV. UNPACKING & INSPECTION

The Model 4863CE display and transducer have been systematically inspected and tested, then carefully packed prior to shipment. Upon receipt of the shipment, thoroughly

inspect the display(s) and transducer(s) for obvious shipping damage. Notify the freight carrier immediately of any damage to the items.



V. MECHANICAL INSTALLATION

INSTALLATION NOTE:

The display and transducer are precision instruments and require the same care as any other precision instrument during installation and operation. The mechanical installation consists of the following items:

- Alignment of piping to transducer to minimize stress.
- Proper welding of piping to transducer tube stub.
- Display installation and orientation.

External Forces

In order to obtain the best operating results, minimize the external forces exerted on any plane of the transducer.

Alignment

Installation of the transducer in the piping system (manifold) must be **WITHOUT** any stress or with as little stress as possible on the transducer.

For the best results, clamp the transducer manifold piping without exerting any forces on the transducer. Alignment of the piping to the transducer's weld stubs should remain the same before and after the clamping is in place.

Welding Precautions

CAUTION: Make sure the transducer is **NOT** wired into any other device, prior to arc welding.

DISCONNECT the transducer from any and all electrical devices. Disconnect all cables connected to the transducer.

VORSICHT: Vor dem Lichtbogenschweißen ist festzustellen, daß der Transducer an keine anderweitige Geräte angeschlossen ist.

Jegliche anderweitige elektrische Anschlüsse mit dem Transducer sind zu entfernen. Sämtliche an den Transducer angeschlossene Kabel sind zu entfernen.

Welding Cautions/Recommendations

The weld needs to be fully penetrating with minimum amperage and heat. Make test weld samples before welding the tubing to the transducer. Weld sample pieces of tubing together, in order to determine the minimum amperage that will produce a fully penetrating weld. Use that amperage to weld the transducer into the piping system.

Heat to the transducer needs to be at a minimum. We recommend flowing Argon gas into the transducer during welding. This will help to cool the transducer. Allow the Argon gas to flow after welding until the transducer cools.

Post Weld Recommendations

Allow the transducer to cool and stabilize for a minimum of ½ hour before performing the shunt calibration.



Face Seal Connections

CAUTION: Face seal components, with fixed threads, must remain stationary during the installation process. **DO NOT** allow the sealing beads to rotate against the gasket.

VORSICHT: Einzelteile der Stirndichtung mit festem Gewinden während des Einrichtungsvorgangs nicht bewegen. Eine Rotation der Dichtungswülste an der Dichtung ist zu vermeiden.

Original Style Gaskets

If using an original style gasket, place it into the female nut (see Figure 2) whenever possible. No special positioning is required, as the gasket is self-aligning.



Figure 2

Original Style Gasket Placement

Gasket Retainer Assembly

If using a gasket retainer assembly, press the assembly onto the gland (see Figure 3). The retainer assembly will position the gasket over the bead and hold it in place.



Figure 3

Gasket Retainer Assembly Placement

CAUTION: **DO NOT** scratch or nick the bead. Damage to the bead may cause leakage.

VORSICHT: Kratzen oder Ritzen der Wulst ist zu vermeiden. Beschädigungen führen zu Undichtigkeit.

Connection Assembly

To assemble the connection, hold the male nut, or hex body, stationary. Turning the female nut clockwise (see Figure 4), tighten it finger-tight.



Figure 4

Connection Assembly

Mark a reference point on both the female nut and the male nut or body hex (see Figure 5).



Figure 5

Marking Reference Points

Hold the male nut, or body hex, stationary with a backup wrench (see Figure 6). Tighten the female nut 1/8 turn past finger-tight for 316 stainless steel and nickel gaskets, or 1/4 turn past finger-tight for copper and aluminum.



Figure 6
Tightening Female Nut

CAUTION: Excessive over tightening will damage the sealing beads and may cause system leakage.

Re-tightening

In order to maintain system reliability and integrity, install a new original style gasket, or gasket retainer assembly on each remake.

DISPLAY INSTALLATION

The display may be directly mounted to the transducer or may be panel mounted using the optional panel mount kit.

Display Panel Mounting

The display may be panel mounted using the panel mounting kit.

Direct Mount Display

Mount the display directly to the pressure transducer by inserting the transducer connector into the display connector.

The viewing angle of the digital display may be changed in the following manner:

1. Connect the display to the transducer.
2. Loosen the two set screws below the transducer connector.
3. Orient the display to the new viewing angle.

Note: The transducer connector has a mechanical stop to prevent over turning of the connector.

4. Tighten the set screws.

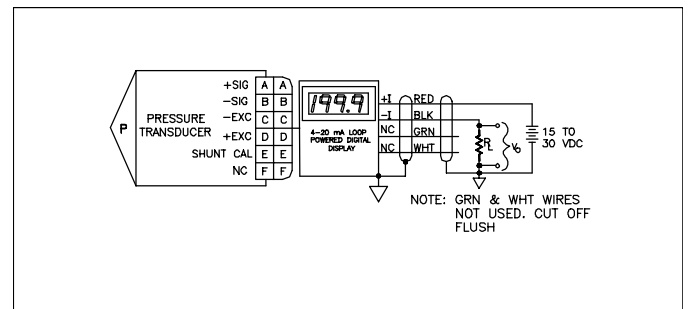


Figure 7
Wiring Diagram For 4863CE



VI. ELECTRICAL INSTALLATION

Display Power Cable

The display electrical cable has a 2-conductor, shielded cable with red and black leads. The red lead is the + power lead, and the black lead is the - power lead. Refer to Figure 2 for the power supply wiring diagram.

NOTE: Incorrect wiring of the display power leads (red and black) on the transducer, for short periods of time, will not damage the circuitry (see Figure 2).

The display power cable is double shielded with a braided shield and a foil wrap with a drain wire. The braided shield, foil and drain wire are internally connected to the display housing.

The display has an internal EMI filter to reduce external interference. The display also has Transient Absorption Zener diodes to reduce interference from high voltage power line spikes. The filter circuit and the TAZ diodes require the shields to be grounded for proper operation.

Typical installations have both the braided shield and drain wire connected to Earth ground. Some installations may require the braided shield connected to Earth ground with the drain wire not connected.

Refer to the Wiring Diagram in Figure 2.

Transducer Connection

The transducer may be connected directly to the display or may be connected to the display through an optional cable.

PSI's optional remote mount cables have the shield connected to the shell of each cable connector.

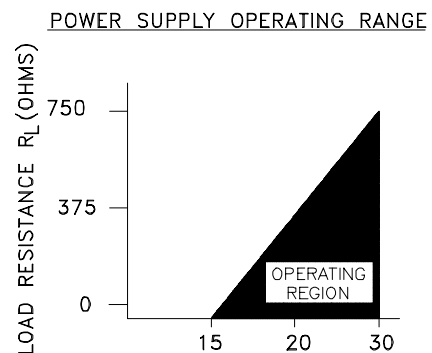
CE Compliance

NOTE: To maintain CE Compliance, the transducer must be direct mounted to the display. The CE Type approval extends only to the direct mounted configuration.

NOTE: To maintain CE compliance, a TUV or VDE approved power supply must be used to power the display and transducer.

Power Supply

The 4863CE is designed to operate with an unregulated input voltage of 15-30 VDC. The minimum input operating voltage is determined by the load resistance (R_L). See Figure 3.



POWER SUPPLY VOLTAGE V_{ps} (VOLTS)
 $R_L \text{ MAX.} = \frac{V_{ps} - 15}{.02} \quad (15 \leq V_{ps} \leq 30)$

NOTE: LOAD RESISTANCE MUST INCLUDE RESISTANCE OF THE BARRIER WHEN USED.

Figure 8
Load Resistance vs. Supply Voltage



VII. SHUNT CALIBRATION

The shunt calibration (Shunt Cal) procedure allows the user to calibrate the 4863CE in the field without the need of a calibrated pressure source. This feature provides a means of periodic calibration maintenance. Each pressure transducer has the Shunt Cal circuit built in and has its own specific Shunt Cal value. The transducer's individual Certificate of Conformance includes the Shunt Cal value. The CAL button on the face of the 4863CE display activates the shunt circuit of the transducer.

Shunt Calibration Example

The shunt calibration operates by closing a circuit that unbalances the four-arm Wheatstone Bridge to a predetermined value. This value is approximately 50% of the transducer pressure range. For example, a 0 to 114.7 PSIA transducer with a 4863CE display set to read -14.7 @ 0 PSIA, when the transducer is at full vacuum, the display will read -14.7 PSIG in engineering units. Activating the shunt calibration circuit the display will read 42.6 (the sum of -14.7 and 57.3).

NOTE: The shunt calibration adds to the display reading by the same amount whether the transducer is at zero pressure or at any other process pressure. For the same example, if the pressure transducer is at 25 PSIG, activating the shunt circuit will cause the display to read 82.3 PSIG.

Shunt Calibration Procedure

The following procedure applies to pressure systems that can be either vented or fully evacuated.

EXAMPLE: 114.7PSIA transducer and display.

1. Apply recommended 15 to 30 VDC power to the power leads.
2. Refer to the Certificate of Conformance of the specific pressure transducer for the shunt calibration percent of full scale value.
3. Multiply shunt calibration percent, (from #2 above), by the full scale pressure range 114.7 PSIA of the pressure transducer.
4. Subtract 14.7 from the value obtained in step #3 and record this value.
5. Apply a full vacuum to the transducer. Check the LED display reading and adjust the zero potentiometer to read -14.7 PSIG.
6. Depress and hold the CAL button on the face of the 4863 LED display. Adjust the span potentiometer until the displayed value matches the CAL number determined in step #4.
7. Release the CAL button.
8. Verify step #5.
9. Verify step #6
10. Return to step #5. The calibration is complete when steps #5 and #6 do not require any additional adjustment.
11. The digital display may not respond to small turns of the Zero or Span potentiometers if the rotating shaft had been over turned either clockwise or counter-clockwise. To resolve, simply make multiple rotations of the zero or span shaft either clockwise or counter-clockwise until the digital display responds.



Alternate Calibration Procedure

The following procedure applies when the transducer is at a known positive pressure and cannot be vented to 0 PSIG or evacuated to a full vacuum of 0 PSIA.

EXAMPLE: 114.7PSIA transducer and display

NOTE: For a valid shunt calibration, the system pressure must be below 50% of the transducer's calibrated pressure range.

1. Apply recommended 15 to 30 VDC power to the red (positive) and black (negative) power leads.
2. Refer to the Certificate of Conformance of the specific pressure transducer for the shunt calibration percent of full scale value.
3. Multiply the shunt calibration percent (from #2) by the full scale pressure range (114.7 PSIA) of the pressure transducer.
4. Record the known positive pressure.
5. Add the known positive pressure to the value obtained in step #3 and record this value.
6. Set the 4863CE display to the known positive pressure by adjusting the zero potentiometer.
7. Depress and hold the CAL button on the face of the 4863CE display. Adjust the span potentiometer to the value obtained in step #5.
8. Release the CAL button.
9. Verify step #6.
10. Verify step #7.
11. Return to step #6. The calibration is complete when steps #6 and #7 do not require any additional adjustment.



VIII. TROUBLESHOOTING

- | | |
|---|---|
| NO OUTPUT | <ul style="list-style-type: none">• Verify power supply voltage meets transducer requirements.• Check wiring connections.• Verify pressure is being applied. |
| OVER-RANGE INDICATION | <ul style="list-style-type: none">• Verify applied pressure is in transducer pressure range.• Verify transducer is connected to display. |
| INCORRECT ZERO LEVEL | <ul style="list-style-type: none">• Verify system vacuum level for PSIA units or vented system pressure for PSIG units.• Check for pressure on transducer.• Adjust zero control. |
| ERRATIC/INTERMITTENT OUTPUT OR ZERO DRIFT | <ul style="list-style-type: none">• Verify applied pressure is constant.• Verify power supply remains within specifications.• Inspect electrical connections for discontinuity or damage.• Verify output with ammeter.• Check for insulation resistance between amplifier wiring and transducer case. |
| LOOSE OR LEAKING PRESSURE CONNECTION | <ul style="list-style-type: none">• Inspect weld joints or pressure fittings.• Replace metal gasket on face seal connections. |