



Precise Sensors
"Defining Higher Expectations"

INSTALLATION, CALIBRATION & TROUBLESHOOTING

Model 3243, 3245, 3247, 3248, and 3249

Ultra High Purity Flow Thru Pressure Transducer



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REVISION HISTORY MODEL 3243

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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 the power off.

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.

I. INTRODUCTION

The PSI Model 324X Ultra High Purity Flow Thru pressure transducer has a pressure controlled, three-wire amplified output, calibrated to yield an output voltage proportional to the applied pressure between Zero pressure and Full scale pressure.

Electrical connection options include a male connector, or a detachable pigtail cable. The piping connection options available include 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. Other process connections are available.

II. Declaration of Conformity

The 324X Pressure Transducer has 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

Mechanical

- 1. Piping Connections:**
1/4" & 1/2" OD weld stubs, 1/4" face seal w/straight male thread, 1/2" face seal w/male or female swivel nuts, 3/8" & 1/2" OD weld stubs, and 1/4" & 1/2" OD weld stubs & face seal combinations.
- 2. Burst Pressure:**
> 400% of FS range.
- 3. Proof Pressure:**
200% of FS range.

Performance

- 1. Accuracy: Linearity, Hysteresis and Repeatability (BFSL):**
< $\pm 0.50\%$ of FS range for 30-150 psi transducers and < $\pm 0.25\%$ of FS range for 160-5000 psi transducers.
- 2. Resolution:**
Infinite.
- 3. Repeatability:**
 $\pm 0.05\%$ of calibrated span.
- 4. Thermal Zero Shift:**
< $\pm 0.006\%$ FSO/ °F.
- 5. Thermal Sensitivity Shift:**
< $\pm 0.006\%$ FSO/ °F.
- 6. Rise Time:**
<3 msec from 10 to 90% step change.
- 7. Stability:**
< $\pm 0.25\%$ of span over 1 year.

Dimensions

1. See Figure 1 for dimensions of transducer.

Electrical Specifications

- 1. Electrical Connections:**
Four (4) conductor pigtail cable or male Bendix connector (PTO6A-8-4P or equivalent).
- 2. Input Voltage:**
12-30 VDC, unregulated.
- 3. Output Voltage:**
0.1-5.0 VDC, 1-5 VDC, 0.1-10 VDC, 0.2-5.2 VDC, 0.5-10.5 VDC.
- 4. Protection:**
Reverse polarity protected.
- 5. Zero Adjustability:**
+0.05 VDC to 1.10 VDC
- 6. Span Adjustability:**
 $\pm 5\%$ of span.
- 7. Insulation Resistance:**
1000 Megohms min. @ 50 VDC to transducer case.
- 8. Transducer Type:**
Four (4) active arm bonded strain gages.
- 9. Over Current Limit:**
10 mA nominal under normal operating conditions.

Environmental Conditions

- 1. Compensated Temperature:**
0 °F to 160 °F
(-18 °C to 71 °C)
- 2. Operating Temperature:**
-13 °F to 185 °F
(-25 °C to 85 °C)
- 3. Relative Humidity:**
Maximum relative humidity 80% for temperatures up to 88 °F (31 °C), decreasing linearly to 50% relative humidity at 104 °F (40 °C).

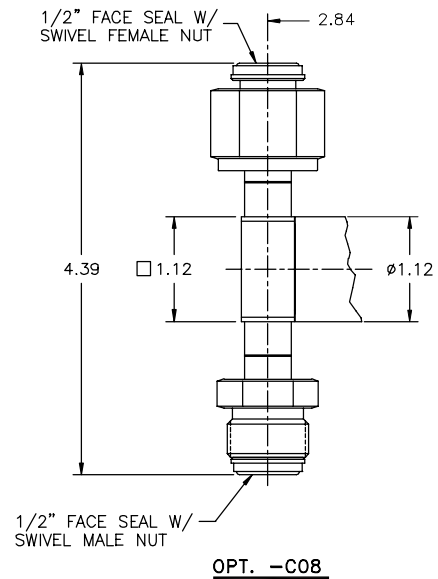
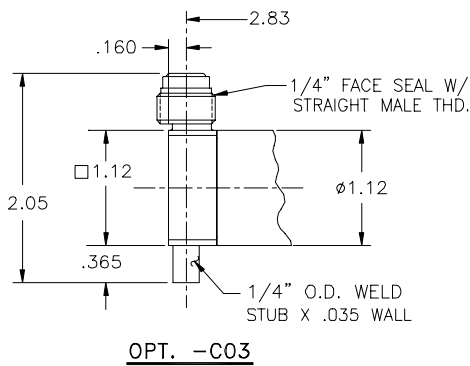
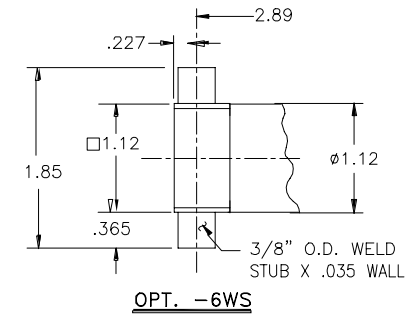
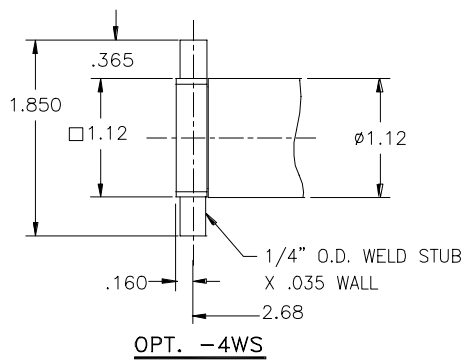
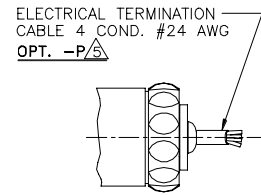
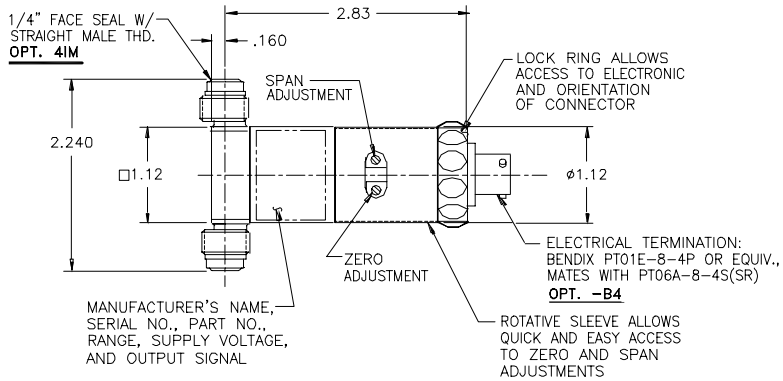
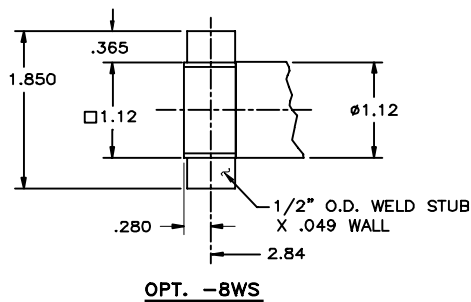
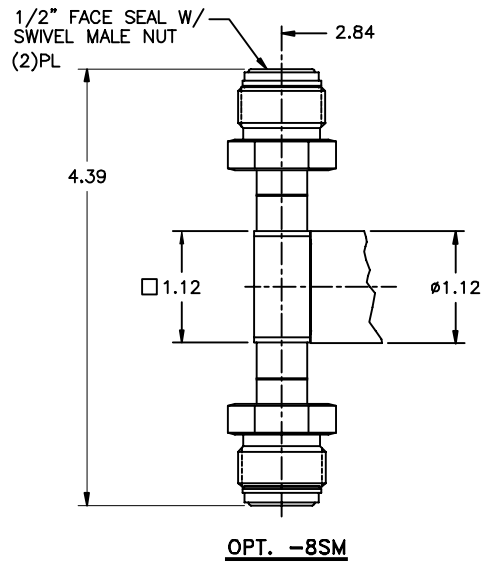
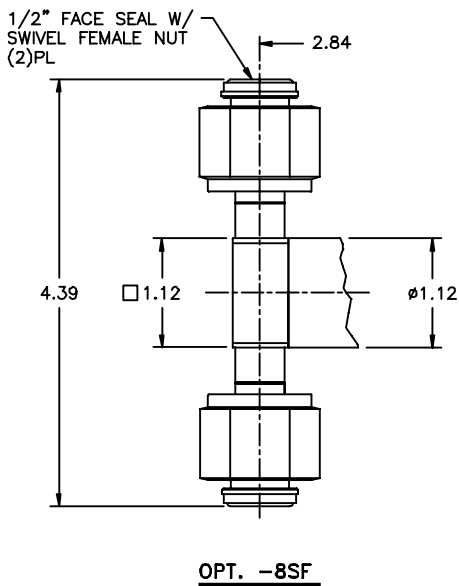


Figure 1
(Continued on Page 5)



PRESSURE RANGE

PSI	BARS
30	2.07
45	3.10
60	4.13
100	6.89
160	11.02
250	17.24
500	34.48
1000	68.96
2000	137.9
2500	172.4
3000	206.88
3500	241.36
5000	344.8

NOTE: OTHER PRESSURE RANGES ARE AVAILABLE UPON REQUEST.

Figure 1
(Continued from Page 4)

IV. UNPACKING & INSPECTION

The Model 324X Ultra High Purity dead end pressure transducer was systematically inspected and tested, then carefully packed prior to shipment. Upon receipt of the

shipment, thoroughly inspect the transducer(s) for obvious shipping damage. If any damage is found, notify the freight carrier immediately.



V. MECHANICAL INSTALLATION

INSTALLATION NOTE: Transducers are precision instruments and should be given the same care as any other precision instrument during installation and operation. The mechanical installation consists of the following items, which are explained below:

- Alignment of piping to transducer to minimize stress.
- Proper welding of piping to transducer tube stub.

External Forces

In order to ensure the best operating results from the transducer, external forces exerted on any plane of the transducer should be kept to a minimum.

Alignment

Once the piping system (manifold) is completed, it must be connected to the transducer **WITHOUT** any stress, or with as **LITTLE** stress as possible.

For the best results, the transducer manifold piping should be clamped, without exerting any forces. Alignment of the piping to the transducer's weld stubs should remain the same before and after clamping 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 electrical device. **DO NOT** let any of the pigtail leads touch a metal surface.

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.

Es ist strikt zu vermeiden, daß Zuleitungen aus der Anschlußlitze mit Metalloberflächen in Berührung kommen.

Welding Recommendations

The weld needs to be fully penetrating, but amperage and heat need to be minimized. Prior to welding tubing to the transducer, test welds should be made. Weld 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 kept at a minimum. We recommend flowing Argon gas through the transducer, from the opposite end, during welding. This will help to cool the transducer. The Argon gas should be allowed to flow for a while, after welding, until the transducer cools.



Post Weld Recommendations

The transducer should be allowed to cool and stabilize for a minimum of ½ hour prior to performing 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).

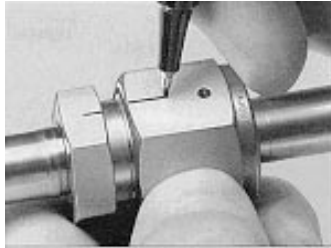


Figure 5

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.

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



Figure 6

Tightening Female Nut

VORSICHT: Überfestes Anziehen beschädigt die Dichtung und führt zu Undichtigkeit im System.

Retightening

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

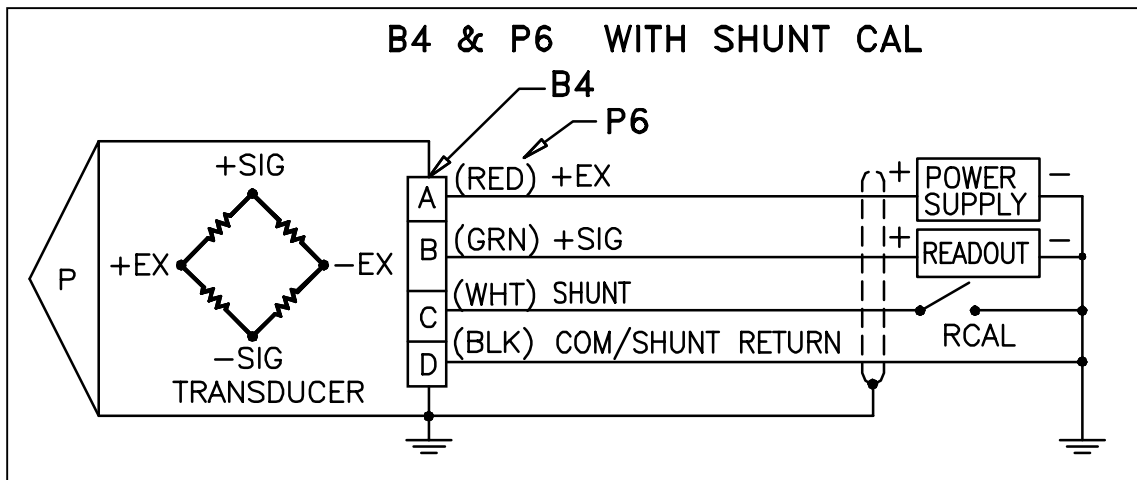


Figure 7

Wiring Diagram for Voltage Output



VI. ELECTRICAL INSTALLATION

Pigtail Cable

Transducers with this termination have a six (6) or ten (10) foot long, four (4) conductor shielded, #24 AWG stranded cable. The four (4) wires are red, green, white, and black. The power wires are red and black, with red being positive and black negative. The output signal is on the green wire and the shunt is on the white wire. Figure 7 shows the wiring diagram.

NOTE: Incorrect wiring of the power leads (red and black) on the transducer, for short periods of time, will not damage the circuitry (see Figure 7).

CAUTION: Protect the output and shunt leads from voltage, or static discharge to prevent possible damage (See Figure 7).

VORSICHT: Zur Vermeidung von Schäden sind Output- und Shuntkabel vor Spannung oder statischer Entladung zu schützen.

Bendix Connector

Transducers with this termination have a four (4) pin connector. The pins are identified A through D. The power input pins are A and D, with pin A being positive and pin D being negative. The output is on pin B and the shunt is on pin C. Figure 7 shows the wiring diagram.

Grounding Shielded Cables

PSI's cables are double shielded with a braided shield around a foil wrap with a drain wire. The integral cable has both shields and the drain wire connected internally to the housing of the transducer. The detachable cable has the shields attached to the body of the cable connector. The transducer has internal EMI filters and Transient Absorption Zener diodes to reduce external interference. This circuitry requires the shields to be grounded for proper operation.

NOTE: To maintain CE compliance, the shields must be connected to Earth ground.

Typical installations have 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 7.

CE Compliance

To maintain CE compliance, a TUV or VDE approved power supply must be used to power the transducer. The Model 324X transducer is designed to operate with an unregulated input voltage of 12-30 VDC.



Thermal Effect

Due to thermal errors, especially in outdoor applications, slight changes in instrument calibration may be seen with small span and zero offsets. The magnitude will be less than 0.006% FSO/ °F of temperature differential from the nominal calibration temperature of 72 °F.

Example: If the ambient temperature is 92°F and the transducer pressure range is 250 PSI, then:

$$\begin{aligned} \text{Max. Thermal Error} &= (\Delta T) \times (0.006\% \text{ FSO}) \times \text{Range} \\ \text{Max. Thermal Error} &= 20 \text{ }^\circ\text{F} \times (0.006\% \text{ FSO}) \times 250 \\ \text{Max. Thermal Error} &= .3 \text{ PSI} \end{aligned}$$

Warm Up

No warm up time is necessary before using the transducer. Apply power to the transducer, perform the shunt calibration and the transducer is ready to use.

VII. SHUNT CALIBRATION

General Information

Shunt calibration is a means by which the span can be monitored and adjusted without performing recalibration of the transducer. Shunt calibration has these attributes:

- Allows a given transducer to be used with various signal conditioners without system recalibration.

- Verifies the accuracy of the instrumentation on a periodic basis.
- Provides the ability to compensate for the minor drift that can occur over a period of time, or between the start and finish of critical testing.

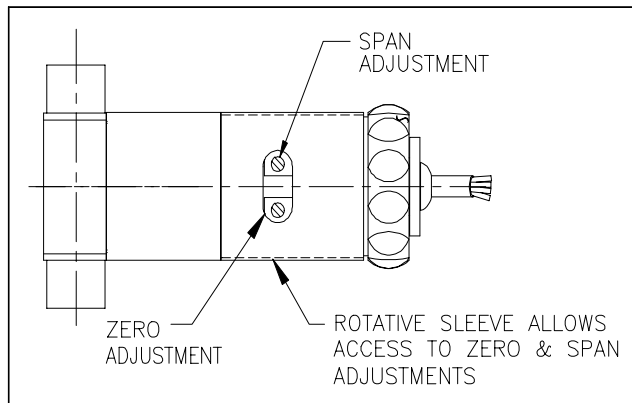


Figure 8
Span & Zero Adjustment Screws



Procedure

The following example uses a Model 3243 transducer (0.1-5 VDC output).

Rotate the sleeve, on the transducer, in order to expose the span and zero adjusting screws (see Figure 8).

1. Evacuate the transducer to zero (0) PSIA for absolute reference transducers or vent to 0 PSIG for gage reference transducers. Monitor the signal output, and adjust the zero screw (see Figure 8) to 0.10 VDC.
2. Refer to the Certificate of Conformance supplied with the transducer for the shunt calibration percent of span value.
3. Multiply the shunt calibration percent (step 2) by the span of 4.90 VDC.

4. Add the product of step 3 to the zero (0) pressure voltage value of 0.10 VDC (step 1), to determine the calibration voltage.
5. Short the shunt lead to the common lead and adjust the span control (see Figure 8) to the calibration voltage value obtained in step 4.
6. Verify zero (0), step 1.
7. Verify span, step 5.

Example:

(Shunt Calibration Percent x Span) +
Zero Pressure Current = Calibration
Voltage.

$$(49.50\% \times 4.900 \text{ VDC}) + 0.10 \text{ VDC} = 2.523 \text{ VDC.}$$

8. Rotate the sleeve to cover the zero and span adjustment crews.



VIII. TROUBLESHOOTING

<u>Symptom/Problem</u>	<u>Action</u>
NO OUTPUT	<ul style="list-style-type: none">• Verify power supply voltage meets transducer requirements.• Check wiring connections.• Verify pressure is being applied.• Verify output load is not shorted.
INCORRECT ZERO LEVEL	<ul style="list-style-type: none">• Verify vacuum level.• 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 voltmeter.• Check insulation resistance between amplifier wiring and transducer case.
LOOSE OR LEAKING PROCESS CONNECTION	<ul style="list-style-type: none">• Inspect weld joint.• Re-torque process connection.• Replace gasket on face seal.



Board Replacement

DISASSEMBLY

1. Unscrew the white delrin lock ring (see Figure 1).
2. Carefully pull the assembly out of the transducer housing, as far as the connector cable will allow.
3. Carefully remove the six (6) pin connector from the universal electronics board assembly.
4. While firmly holding the delrin lock ring, pull the universal electronics board assembly straight off the pigtail, or Bendix termination assembly.

RE-ASSEMBLY

5. Align the pins on the pigtail, or Bendix termination assembly with the sockets on the new universal electronics board assembly.
6. Firmly push the new universal electronics board assembly onto the pigtail, or Bendix termination assembly as far as it will go.
7. Rotate the sleeve (see Figure 8) on the transducer housing to expose the span and zero adjustment slot.
8. Carefully reconnect the six (6) pin connector cable to the connector on the universal electronics board assembly.
9. Slide the universal electronics board assembly back into the transducer housing, making sure the screws on the span and zero alignment pots show through the slot.
10. Hand tighten the white delrin lock ring as far as it will go.