

# FAIRCHILD T7800 EXTENDED RANGE MINIATURE ELECTRO-PNEUMATIC TRANSDUCER

## Installation, Operation and Maintenance Instructions

**Identification Number** T    7800 -

**Electrical Connections**

- 1/2 NPT Conduit (A)
- Fitting with Pigtail
- Terminal Block (T)
- DIN 43650 Connection (D)
- Rack Mount (R)

**Underwriting Group**

- Factory Mutual (F)
- Canadian Standard (C)
- ATEX (E)

**Approval Class**

- Intrinsically Safe <sup>1</sup>
- Non-Incendive (Division 2) <sup>2</sup> (I)
- (N)

**Input**

- 4-20 mA (4)
- 1-5 VDC (5)
- 0-5 VDC (7)
- 1-9 VDC (9)
- 0-10 VDC (0)

**Output** *Select appropriate psig, [BAR] or (kPa).*

- 0-30 psig (04)
- 0-60 psig (05)
- 0-120 psig (06)
- [0-2.0 BAR] (14)
- [0-4.0 BAR] (15)
- [0-8.0 BAR] (16)
- (0-200 kPa) (24)
- (0-400 kPa) (25)
- (0-800 kPa) (26)

<sup>1</sup> Intrinsically Safe approval, including Non-Incendive (Division 2), on 4-20 mA units only.  
<sup>2</sup> Non-Incendive (Division 2) approval on FM voltage input units only.

**Figure 1.** Model T7800 Extended Range Transducer Identification Number System.

### GENERAL INFORMATION

The Model T7800 Series of Electro-Pneumatic Transducer converts a DC input signal to a linearly proportional pneumatic output pressure.

### SPECIFICATIONS

Functional Specifications			
	psig [BAR] (kPa)	psig [BAR] (kPa)	psig [BAR] (kPa)
<b>Output Range</b>	0-30 [0-2.0] (0-200)	0-60 [0-4.0] (0-400)	0-120 [0-8.0] (0-800)
<b>Input Range</b>	4-20 mA DC, 0-10 VDC, 1-9 VDC, 0-5 VDC, 1-5 VDC		
<b>Supply <sup>1</sup> Pressure</b>	35-150 [2.5-10] (250-1000)	65-150 [4.6-10] (460-1000)	125-150 [8.8-10] (880-1000)
<b>Minimum Span</b>	12.5 [0.85] (85)	25 [1.5] (150)	50 [3.0] (300)

<sup>1</sup> Supply Pressure must be no less than 5 psig, [0.35 BAR], (35 kPa) above maximum output.

Air Consumption	Set Point				
	0 psig [0 BAR] (0 kPa)	15 psig [1.0 BAR] (100 kPa)	30 psig [2.0 BAR] (200 kPa)	60 psig [4.0 BAR] (400 kPa)	120 psig [8.0 BAR] (800 kPa)
<b>0- 30 psig SCFH</b>	3.1 (.09 m <sup>3</sup> /HR)	7.81 (.22 m <sup>3</sup> /HR)	11.8 (.33 m <sup>3</sup> /HR)		
<b>0- 60 psig SCFH</b>	1.6 (.04 m <sup>3</sup> /HR)	4.7 (.13 m <sup>3</sup> /HR)	7.8 (.22 m <sup>3</sup> /HR)	13.3 (.37 m <sup>3</sup> /HR)	15.1
<b>0-120 psig SCFH</b>	0.5 (.01 m <sup>3</sup> /HR)		3.8 (.11 m <sup>3</sup> /HR)	7.6 (.21 m <sup>3</sup> /HR)	(42 m <sup>3</sup> /HR) <sup>3</sup>
<b>Flow Rate SCFM</b>	11.0 (18.7m <sup>3</sup> /HR) @150 psig, [10 BAR], (1000 kPa) supply & midscale output.				
<b>Temperature Range</b>	Operating . . . . . -40°F to +160°F (-40°C to +71.2°C) Storage . . . . . -40°F to +180°F (-40°C to +82.2°C)				
<b>Span/Zero Adjustments</b>	Screwdriver adjustments located on front of unit.				
<b>Required Operating Voltages</b>	<b>Two Wire Current Input</b> 7.2 VDC @ 20 mA (4-20 mA signal)				
<b>Supply Voltage</b>	<b>Three Wire Voltage Input</b> 7-30 VDC, less than 3 mA				
<b>Signal Impedance</b>	<b>Three Wire Voltage Input</b> 10 Kilohms				

**Specifications (continued)**

Performance Specifications			
Accuracy (ISA S51.1)	± 0.25% Full Scale Guaranteed ± 0.15% Full Scale Typical		
Hysteresis (ISA S51.1)	0.25% Full Scale		
Deadband	0.02% Full Scale		
Repeatability (ISA S51.1)	0.1% Full Scale		
Position Effect	0.125% @ 90° & 0.25% @ 180°		
Vibration Effect	Less than ± 1% of Span under the following conditions: 5-15 Hz @ 0.8 inches constant displacement 15-500 Hz @ 10 g's.		
Reverse Polarity Protection	No damage occurs from reversal of normal supply current (4-20 mA) or from misapplication of up to 60 mA.		
RFI/EMI Effect	Less than 0.5% of span @ 30 V/m class 3 Band ABC (20 to 1000 mHz) per SAMA PMC 33.1 1978 and less than 0.5% of span @ 10 V/m level, to 2 Ghz band per EN 61000-4-3:1998+A1 EMC Directive 89/336/EEC European Norms EN 61326.		
Supply Effect Pressure	0.1 psig Change for 10 psig Supply Change.		
Temperature Effect	± [0.5% + 0.06% /°F Temperature Change] of Span Typical.		
Frequency Response	psig [BAR] (kPa)	psig [BAR] (kPa)	psig [BAR] (kPa)
	0-30 [0-2.0] (0-200)	0-60 [0-4.0] (0-400)	0-120 [0-8.0] (0-800)
	-3 db @ 2 Hz per ISA S26.4.3.1 load configuration A.		
Materials of Construction	Body and Housing . . . . . Chromate Treated Aluminum Orifice . . . . . Nickel Plated Brass & Sapphire Trim . . . . . Stainless Steel Elastomers . . . . . Brass & Zinc Plated Steel Finish . . . . . Nitrile Epoxy Powder Coating		

**HAZARDOUS AREA CLASSIFICATION**

**FM (Factory Mutual) Approvals:**

**Intrinsically Safe: (4-20 mA only)**  
**(TDFI7800, TAFI7800)**

Class I, Division 1, Groups C and D;  
Class II, Division 1, Groups E, F, and G;  
Class III, Division 1, Fibers;  
NEMA 4X Enclosure;  
Temperature Code T4.

**(TTFI7800, TRFI7800)**

Class I, Division 1, Groups C and D;  
Temperature Code T4.

Entity Parameters	
V <sub>max</sub> <sup>1</sup> = 30 VDC	C <sub>i</sub> <sup>3</sup> = 0 μF
I <sub>max</sub> <sup>2</sup> = 200 mA	Li <sup>4</sup> = 0 mH
<sup>1</sup> V <sub>max</sub> = Maximum Voltage	<sup>3</sup> C <sub>i</sub> = Capacitance
<sup>2</sup> I <sub>max</sub> = Maximum Current	<sup>4</sup> L <sub>i</sub> = Inductance

**FM Approval (continued):**

**Non-Incendive: (4-20 mA and voltage input units)**  
**(TDFI7800, TAFI7800, TDFN7800, TAFN7800)**

Class I, Division 2, Groups A, B, C and D;  
Class II, Division 2, Groups F, and G;  
Class III, Division 2;  
NEMA 4X Enclosure;  
Temperature Code T4.

**(TTFI7800, TRFI7800, TTFN7800, TRFN7800)**

Class I, Division 2, Groups A, B, C and D;  
Temperature Code T4.

**CSA (Canadian Standards Association) Approvals:**

**Intrinsically Safe: (4-20 mA only)**  
**(TDCI7800, TACI7800)**

Class I, Division 1, Groups C and D;  
Class II, Division 1, Groups E, F, and G;  
Type 4 Enclosure;  
Rated 4-20 mA, 30 VDC Maximum;  
Temperature Code T6.

**(TTCI7800, TRCI7800)**

Class I, Division 1, Groups C and D;  
Temperature Code T6.

**Approvals are valid when connected through a Shunt Zener Diode Safety Barrier meeting the following parametric requirements:**

System Type 1:	Single Channel Polarized Rated: 28.5V Max. 300 Ohm Min.
System Type 2:	Dual Channel Polarized Rated: 28.5V Max. 300 Ohm Min. and 10V Max. 50 Ohm Min.
System Type 3:	Dual Channel Polarized Rated: 28.5V Max. 300 Ohm Min. and 28V Diode return per channel.

**Division 2 Approvals: (4-20 mA only)**

**(TDCI7800, TTCI7800, TRCI7800)**

Class I, Division 2, Groups A, B, C and D;  
Rated 4-20 mA, 30 VDC Maximum;  
Temperature Code T6.

**(TACI7800)**

Class I, Division 2, Groups A, B, C and D;  
Class II, Division 2, Groups E, F, and G;  
Type 4 Enclosure;  
Rated 4-20 mA, 30 VDC Maximum;  
Temperature Code T6.

**ATEX Approvals:**

**Intrinsically Safe: (4-20 mA only)**  
**(TAEI7800, TDEI7800, TTEI7800, TREI7800)**

Ex II 1G (T4)

EEx ia IIB, T4 (-20°C to +72°C Ambient).

**(TAEI7800, TDEI7800)**

IP65 Enclosure.

Transducer Parameters	
U <sub>max</sub> <sup>1</sup> (U <sub>i</sub> ) = 28 V	W <sub>max</sub> <sup>3</sup> (W <sub>i</sub> ) = 0.7 W
I <sub>max</sub> <sup>2</sup> (I <sub>i</sub> ) = 100 mA	C <sub>eq</sub> <sup>4</sup> (C <sub>i</sub> ) = 0
	Leq <sup>5</sup> (L <sub>i</sub> ) = 0
<sup>1</sup> U <sub>max</sub> = Maximum Voltage	<sup>3</sup> W <sub>max</sub> = Maximum Power
<sup>2</sup> I <sub>max</sub> = Maximum Current	<sup>4</sup> C <sub>eq</sub> = Capacitance
	<sup>5</sup> Leq = Inductance



**INSTALLATION**

The Model T7800 can be mounted directly onto a flat surface using two 10-32 Screws. For more information, see Figure 2. "TA7800 Outline Dimensions".

The Model T7800 is supplied with a Mounting Kit 16799-1 for Panel or Wall Mounting and a Mounting Bracket Kit 16893 for Din Rail Mounting. For more information, see Figure 3. on page 3 and Figure 7. on page 5.

An Optional Mounting Kit 19254-1 is available when installing the unit on a 2" pipe. For more information, see Figure 8. on page 5.

**NOTE:** The TR7800 Transducer is designed for use with the TR Rack Kit. Physically, it is the same as the TT7800 (Terminal Block) Unit except that the terminal block has been rotated to the rear. For more information, see Figure 6. "TR7800 Outline Dimensions" on page 4.

**ATEX Directive - Special Conditions for Safe Use:**  
The enclosure is manufactured from aluminum alloy. In rare cases, ignition sources due to impact and friction sparks could occur. This shall be considered when the equipment is installed in locations that specifically require Group II, category 1G equipment.

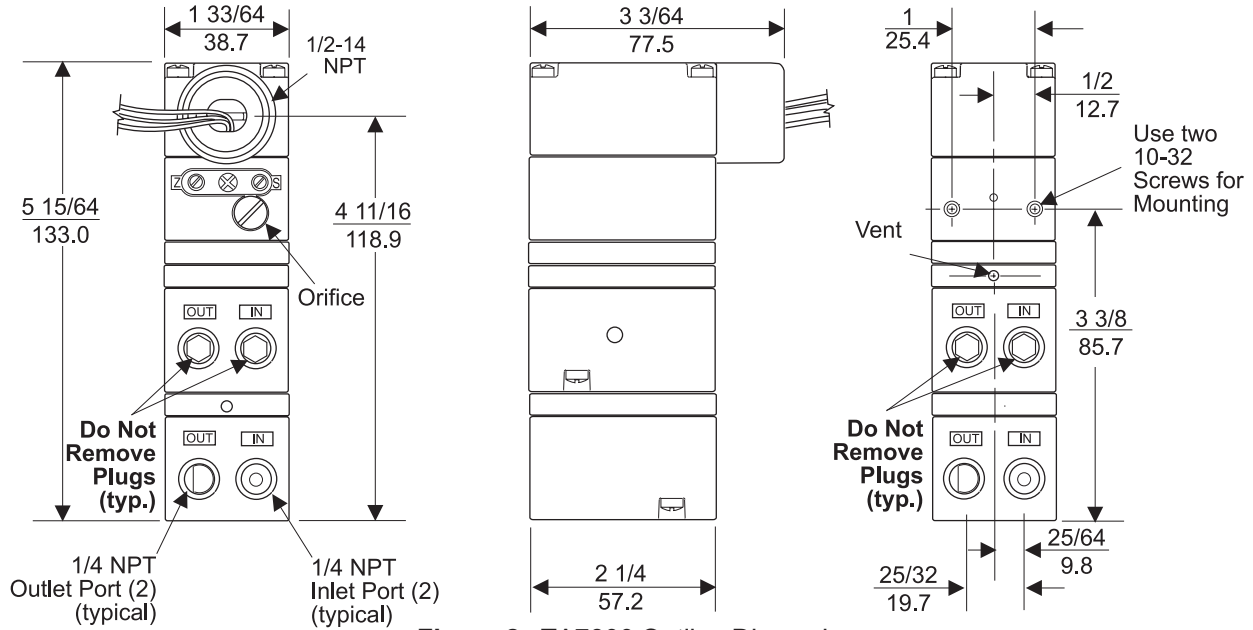


Figure 2. TA7800 Outline Dimensions.

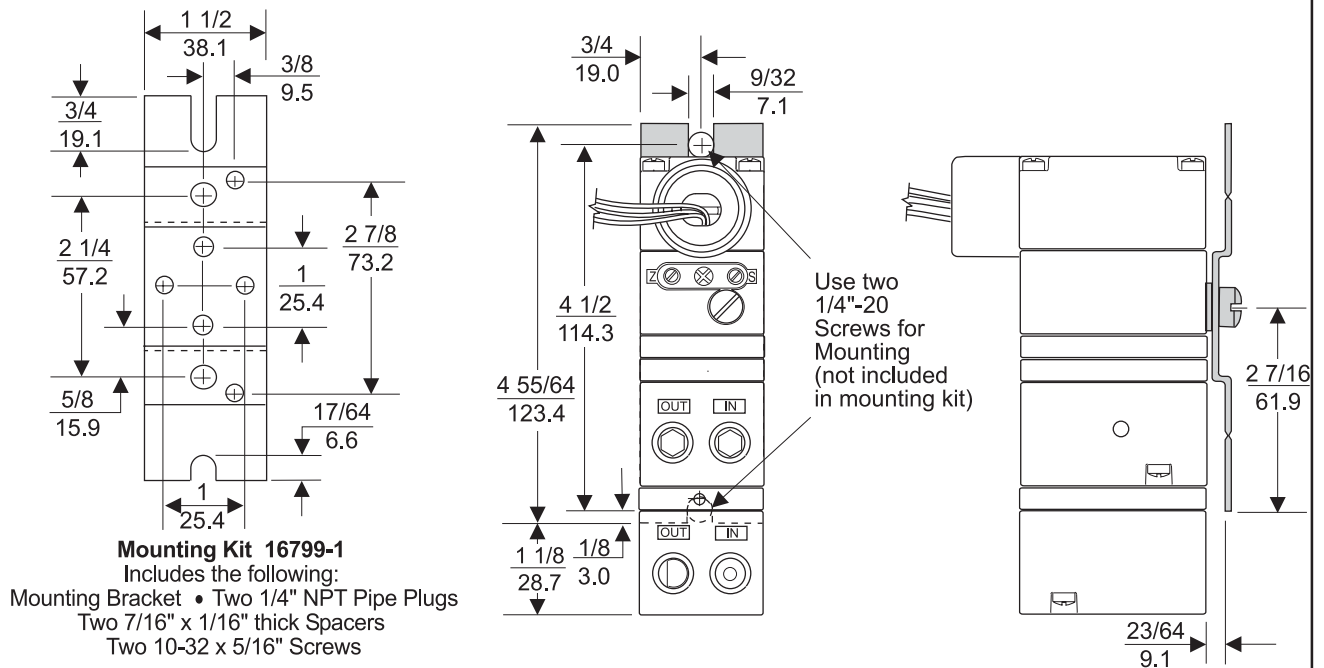


Figure 3. Mounting Kit 16799-1. (Included with Unit)

Installation (continued)

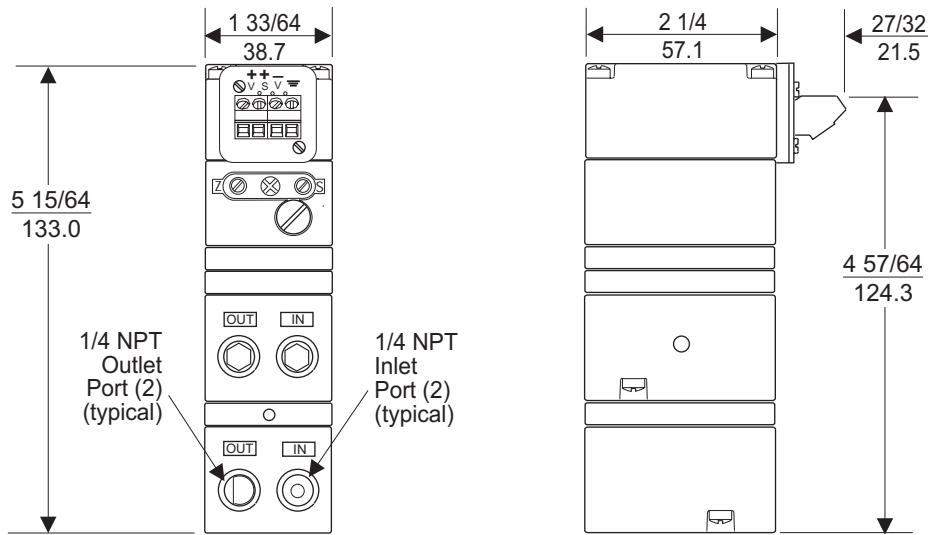


Figure 4. TT7800 Outline Dimensions.

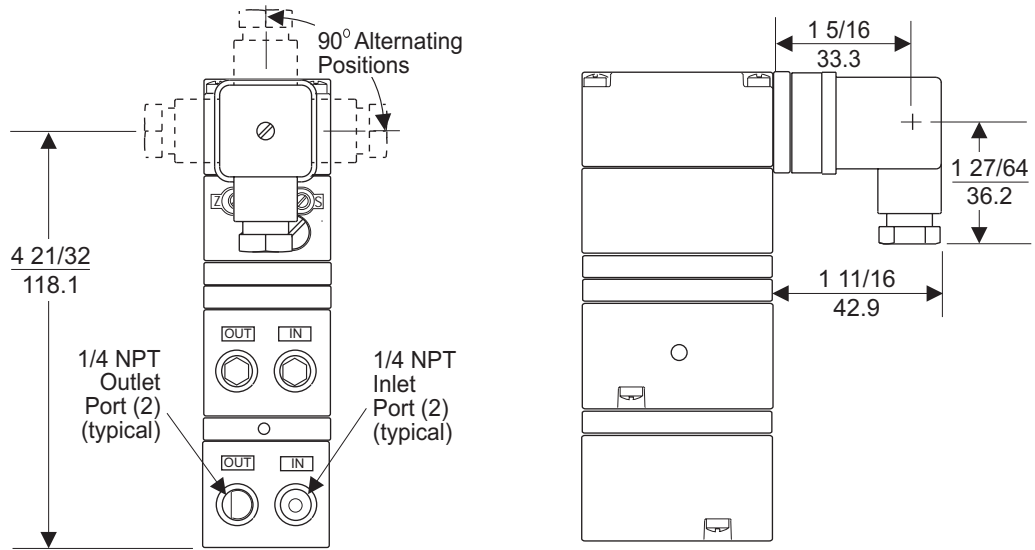


Figure 5. TD7800 Outline Dimensions.

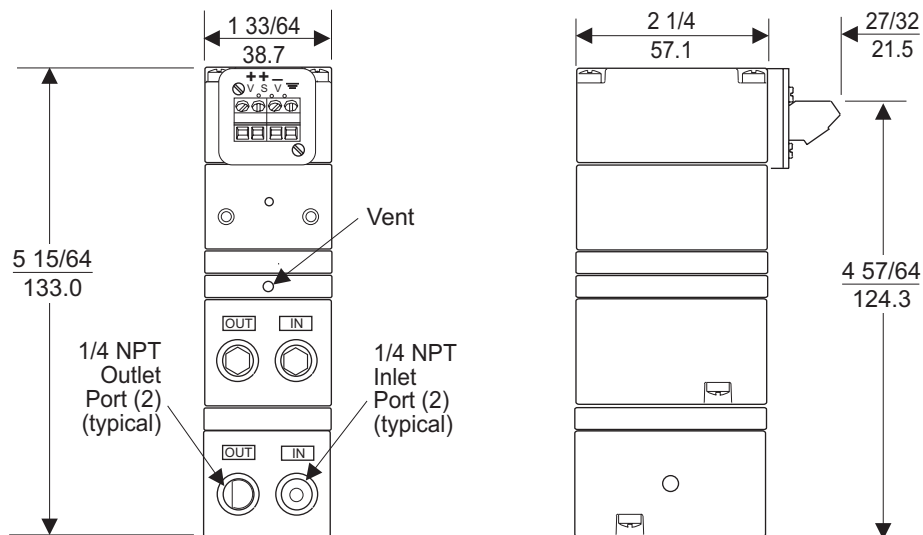


Figure 6. TR7800 Outline Dimensions.

Installation (continued)

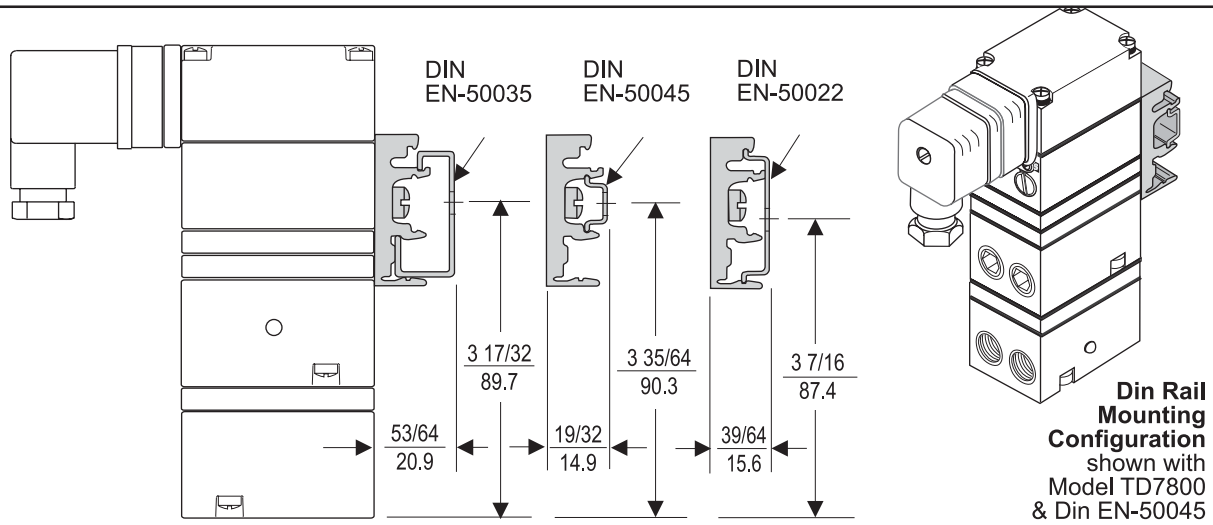
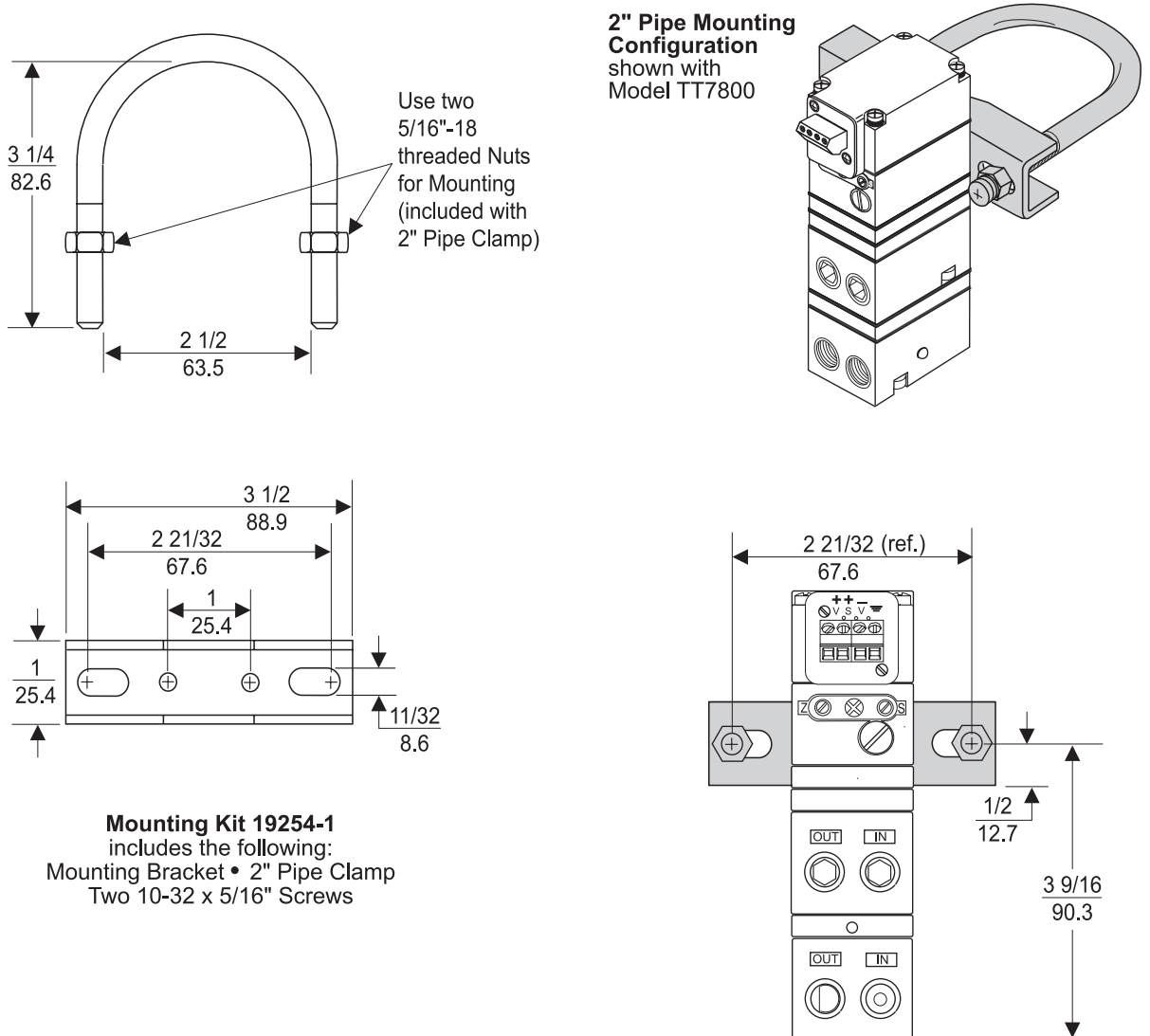


Figure 7. Din Rail Mounting Kit 16893. (Included with Unit)



**Mounting Kit 19254-1**  
includes the following:  
Mounting Bracket • 2" Pipe Clamp  
Two 10-32 x 5/16" Screws

Figure 8. Optional Mounting Kit 19254-1. (Sold Separately)

## Pneumatic Connections

Clean all pipelines to remove dirt and scale before installation.

Apply a minimum amount of pipe compound to the male threads of the fitting only. **Do Not use teflon tape as a sealant.** Start with the third thread back and work away from the end of the fitting to avoid the possibility of contaminating the transducer. Install the transducer in the air line.

The inlet and outlet ports, in the lower valve body, are labeled on the ends of the transducer. Tighten connections securely. Avoid undersized fittings that will limit the flow through the transducer and cause a pressure drop downstream. For more information, see Figure 2. "Outline Drawing" on page 3.

**NOTE: Instrument quality air, per ISA Standards S7.3-1981, is required. Use a filter to remove dirt and liquid in the air line ahead of the transducer for correct performance. If an air line lubricator is used, it MUST be located downstream, beyond the transducer.**

The user is responsible for insuring that the environment in which the unit will be installed, and the operating gas, are compatible with the materials in the transducer.

## Electric Connections

Make connections to the Terminal Block, Conduit Connector or the DIN Connector as shown below in Figure 9. "Electrical Connections".

### Wiring in Hazardous Areas

Wiring in hazardous areas should be performed in accordance with the table 1. and any local codes that apply.

Country	Agency	Code
U.S.	FM	ANSI/ISA RP 12.6 ANSI/NFPA70
Canada Europe	CSA ATEX	CED Part 1 EN 50 039, EN 60079-14, IEC 60079-14

### Intrinsically Safe Connections

Refer to the latest revision of the indicated drawing.

Underwriting Group	Drawing Number
FM (Factory Mutual)	EC-18970
CSA (Canadian Standards)	EC-18971
ATEX	EC-18972

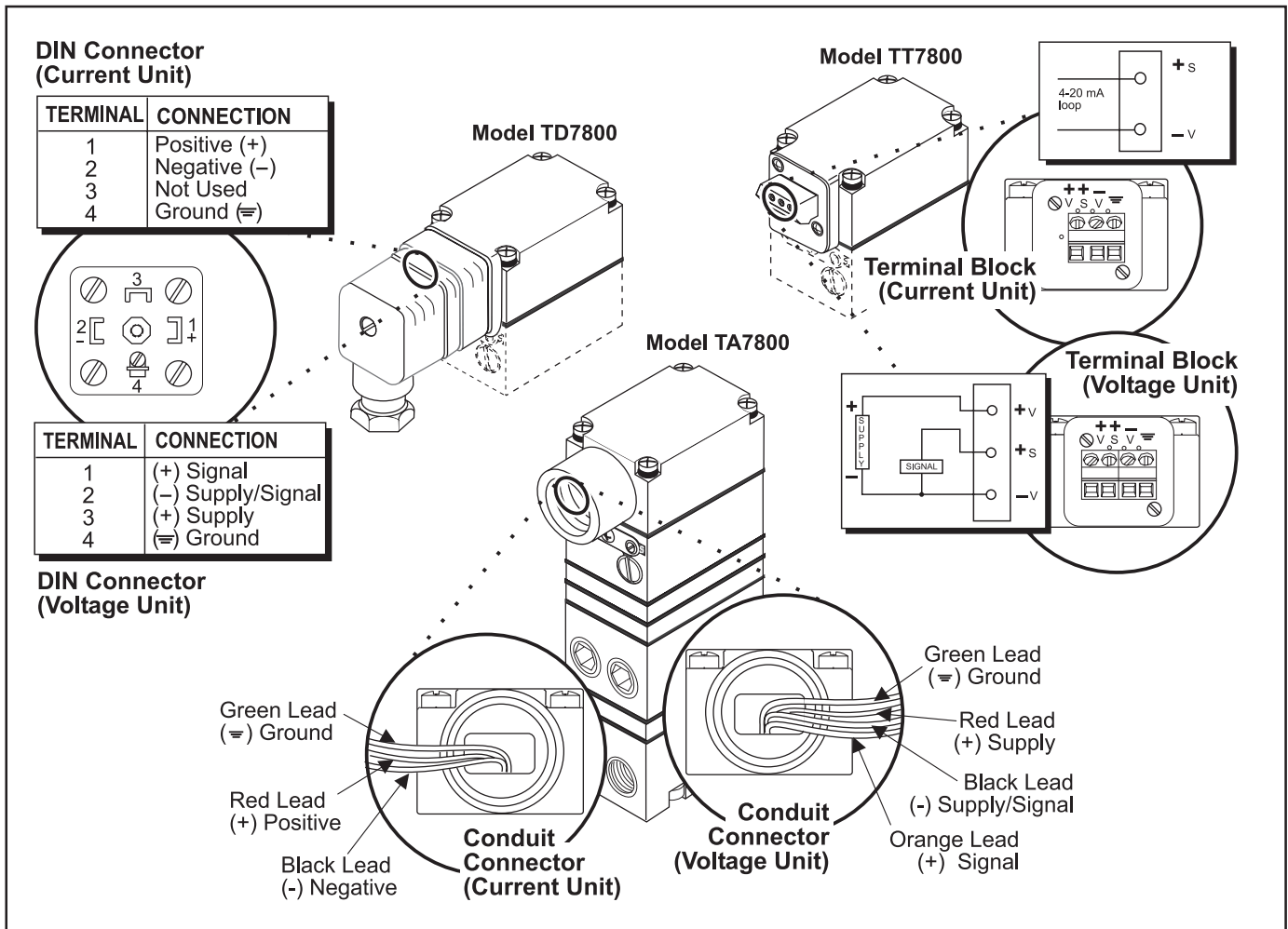


Figure 9. Electrical Connections.

## CALIBRATIONS / ADJUSTMENTS

### Equipment Required for Calibration:

- Pneumatic Supply capable of delivering up to 150 psig.
- Current Supply capable of delivering up to 30 mA.
- Pressure Gage capable of a digital readout up to 150 psig with an accuracy of .1%.
- Digital Volt Meter capable of a readout up to 30 mA with an accuracy of .02%.

### The following adjustments are provided:

Full Range Operation  
Lo/Hi Span  
Forward/Reverse Mode  
Calibration - Zero and Span  
Split Range Operation  
Damping Adjustments

## FULL RANGE OPERATION

### Lo/Hi Span Adjustment

1. Set the Lo/Hi Span Jumper to the **Hi** position for 0-30 psig, 0-60 or 0-120 psig output range. For more information, see Table 3. "Full Range Operation" on page 8.

### Forward Acting Mode Adjustment

2. Set Fwd/Rev Mode Jumper to Forward position.
- **Forward Acting Calibration - Zero**
    3. Apply the minimum input signal and adjust the Zero screw for minimum output pressure.
  - **Forward Acting Calibration - Span**
    4. Apply the maximum input signal and adjust the Span screw for maximum output pressure.
    5. Repeat steps 3-4 until the desired output range is obtained.

### Reverse Acting Mode Adjustment

- NOTE: DO NOT reverse the input leads.**
6. Set Fwd/Rev Mode Jumper to the Reverse position
- **Reverse Acting Calibration - Zero**
    7. Apply the maximum input signal and adjust the Zero screw for minimum output pressure.
  - **Reverse Acting Calibration - Span**
    8. Apply the minimum input signal and adjust the Span screw for maximum output pressure.
    9. Repeat steps 7-8 until the desired output range is obtained.

## SPLIT RANGE OPERATION

### Lo/Hi Span Adjustment

1. Set the Lo/Hi Span switch to the **Lo** position for 0-15 psig, 15-30 psig, 0-30 psig, 30-60 psig, 0-60 psig, or 60-120 psig, output range. For more information, see Table 4. "Split Range Operation" on page 8.

### Forward Acting Mode Adjustment

2. Set Fwd/Rev Mode Jumper to the Forward position.
- **Forward Acting Calibration - Zero**
    3. Apply the minimum input signal and adjust the Zero screw for minimum output pressure.
  - **Forward Acting Calibration - Span**
    4. Apply the maximum input signal and adjust the Span screw for maximum output pressure.
    5. Repeat steps 3-4 until the desired output range is obtained.

### Reverse Acting Mode Adjustment

- NOTE: DO NOT reverse the input leads.**
6. Set Fwd/Rev Mode Jumper to the Reverse position.
- **Reverse Acting Calibration - Zero**
    7. Apply the maximum input signal and adjust the Zero screw for minimum output pressure.
  - **Reverse Acting Calibration - Span**
    8. Apply the minimum input signal and adjust the Span screw for maximum output pressure.
    9. Repeat steps 7-8 until the desired output range is obtained.

## Additional Adjustments

### • Damping Adjustment

The Damping Adjustment is used so that the transducer can be tuned for optimum response and stability in a particular application.

For best performance start Damping Adjustment at maximum adjustment (fully clockwise). Gradually turn counterclockwise until slight oscillation occurs and then turn back clockwise until oscillation is minimized. For more information, see Figure 10. "T7800 Calibration Configuration"

1. Turn Damping Adjustment clockwise to increase damping function.
2. Turn Damping Adjustment counterclockwise to decrease damping function.

Calibrations / Adjustments (continued)

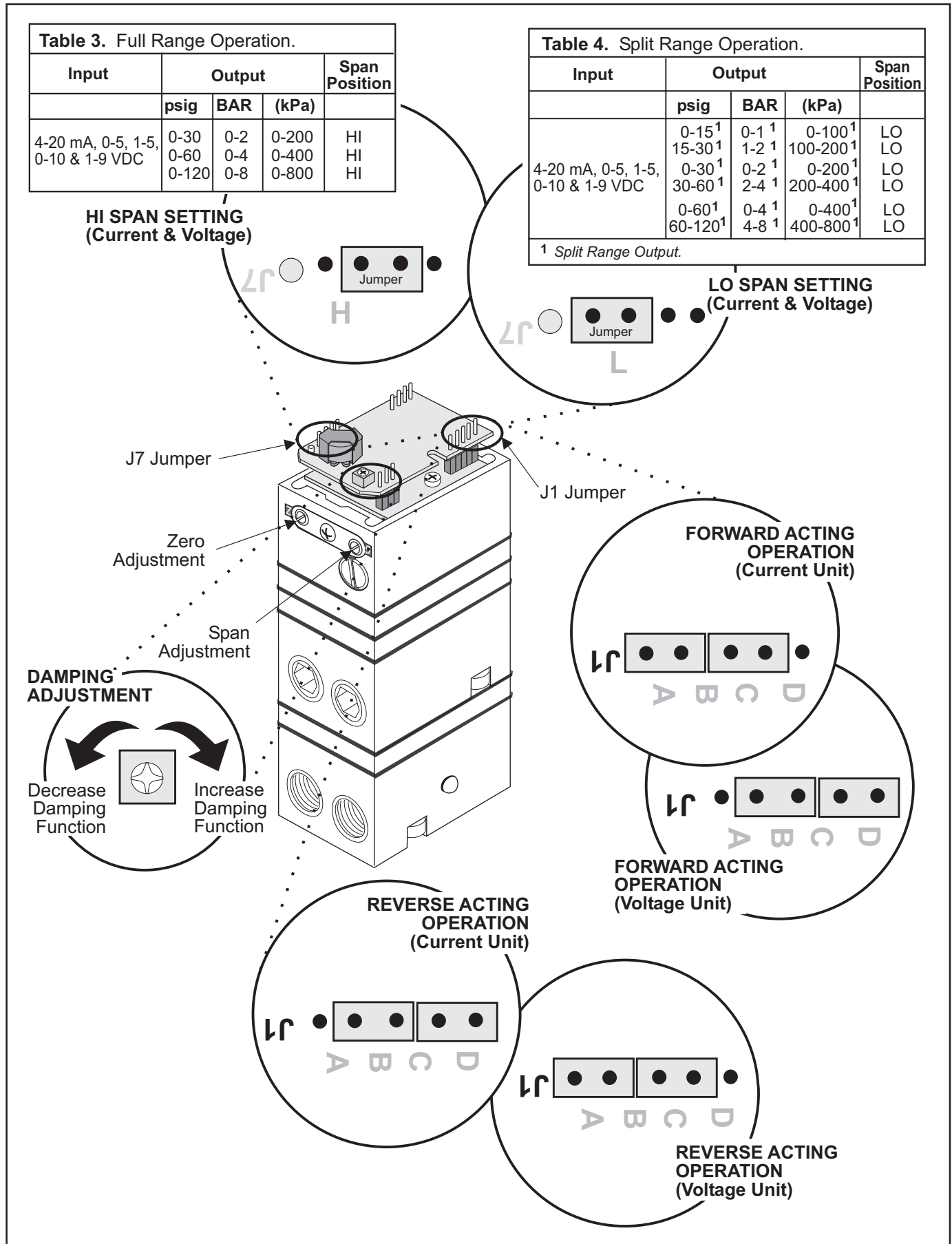
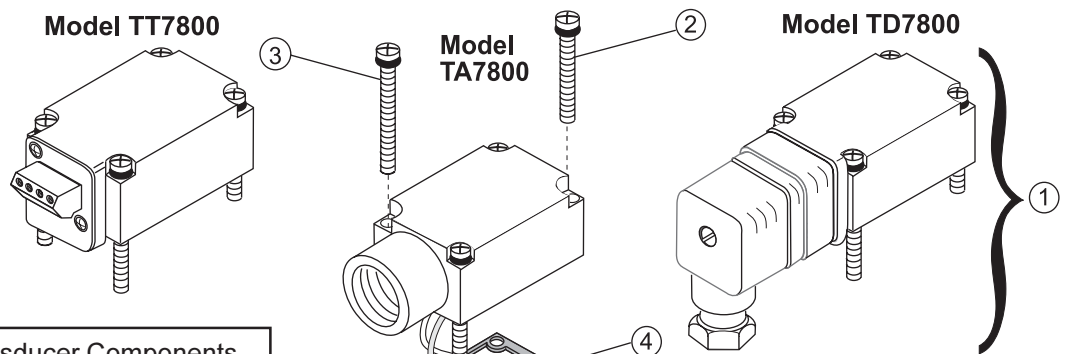


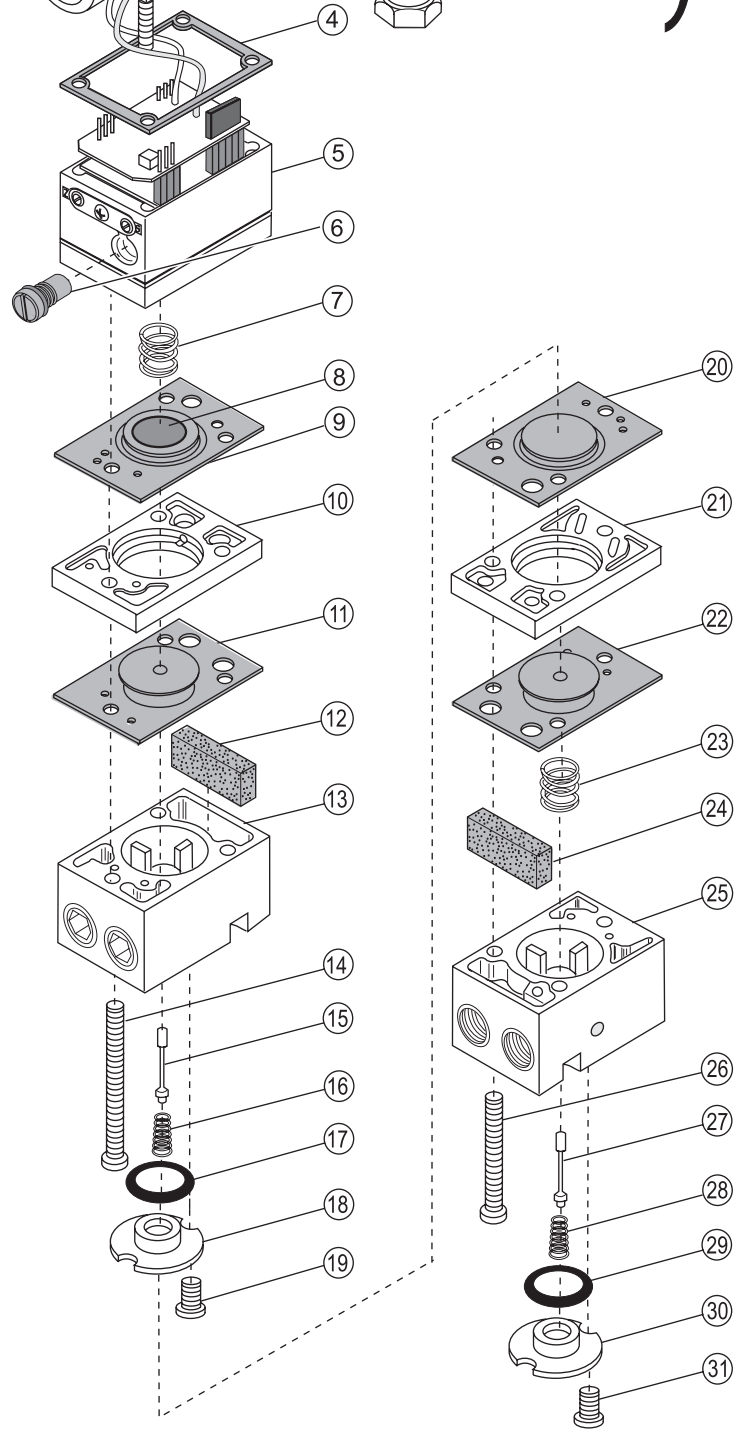
Figure 10. T7800 Calibration Configuration.





**Table 5. T7800 Transducer Components.**

Item	Qty.	Description
1	1	Cover, Machining
2	2	Screw
3	2	Screw
4 <sup>1</sup>	1	Gasket
5	1	Nozzle Body Assembly
6 <sup>2</sup>	1	Orifice Assembly
6 <sup>3</sup>	1	Orifice Assembly
6 <sup>4</sup>	1	Orifice Assembly
7	1	Spring
8 <sup>1</sup>	1	Disk
9 <sup>1</sup>	1	Diaphragm
10	1	Spacer Ring
11 <sup>1</sup>	1	Diaphragm Assembly
12 <sup>1</sup>	1	Foam Block
13	1	Valve Body Assembly
14	3	Screw
15	1	Pintle
16	1	Spring, Pintle
17 <sup>1</sup>	1	O-Ring
18	1	Plug
19	2	Screw
20 <sup>1</sup>	1	Diaphragm
21	1	Spacer Ring
22 <sup>2</sup>	1	Diaphragm Assembly
22 <sup>5</sup>	1	Diaphragm Assembly
23	1	Spring
24 <sup>1</sup>	1	Foam Block
25	1	Valve Body Assembly
26	3	Screw
27	1	Pintle
28	1	Spring, Pintle
29 <sup>1</sup>	1	O-Ring
30	1	Plug
31	2	Screw



<sup>1</sup> For All Service Kits.  
<sup>2</sup> 19267-4 Service Kit Components Only.  
 0-30 psig, [0-2.0 BAR], (0-200 kPa)  
<sup>3</sup> 19267-5 Service Kit Components Only.  
 0-60 psig, [0-4.0 BAR], (0-400 kPa)  
<sup>4</sup> 19267-6 Service Kit Components Only.  
 0-120 psig, [0-8.0 BAR], (0-800 kPa)  
<sup>5</sup> 19267-5 & EA-19267-6 Service Kit

**Figure 11. Exploded Drawing.**

## MAINTENANCE

To clean the Orifice, use the following procedure:

1. Shut off the valve that is supplying air to transducer. **It is not necessary to remove the Transducer from the air line.**
2. Remove the Orifice Assembly (6) from the unit. For more detailed information see Figure 11. "Exploded Drawing" on page 9.
3. Clean with alcohol and dry with compressed air.

**NOTES: Parts must be completely dry before reassembling.**

If the standard maintenance procedure does not correct the trouble, install Service Kit.

## TROUBLE-SHOOTING

Table 6. Trouble-Shooting.	
Problem	Solution (check)
No Output	Supply Pressure Clogged Orifice
Leakage	Connections
Low or Improper Span Adjust	Zero and Span Adjust Supply Pressure Low Output Leakage
Erratic Operation	DC Signal Loose Wires or Connections Liquid in Air Supply

**WARNING: Failure of Transducer could result in output pressure increasing to supply pressure possibly causing personal injury or damage to equipment.**

## LEGAL NOTICE:

The information set forth in the foregoing Installation, Operation and Maintenance Instructions shall not be modified or amended in any respect without prior written consent of Fairchild Industrial Products Company. In addition, the information set forth herein shall be furnished with each product sold incorporating Fairchild's unit as a component thereof.



ISO 9001:2000  
Certified

ISO 9001:2000  
FM NO. 25571

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 **FAIRCHILD**  
precision pneumatic & motion control

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