APPROVAL REPORT

MODEL TFX8000
MINIATURE TWO WIRE P/I PRESSURE TRANSDUCER
FOR HAZARDOUS (CLASSIFIED) LOCATIONS

Prepared For:

Fairchild Industrial Products 3920 West Point Blvd. Winston-Salem, NC 27103

J.I. 0W5A8.AE (Class 3615) June 23, 1992



Factory Mutual Research

1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, Massachusetts 02062



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from

FAIRCHILD INDUSTRIAL PRODUCTS 3920 WEST POINT BLVD. WINSTON-SALEM, NC 27103

I INTRODUCTION

- 1.1 Fairchild Industrial Products requested Factory Mutual Research Corporation (FMRC) Approval of their Model TFX8000 Miniature Two Wire P/I Pressure Transducer as explosionproof for Class I, Division 1, Groups B, C, and D and dust-ignitionproof for Class II, Division 1, Groups E, F, & G hazardous (classified) locations; indoor and outdoor (NEMA Type 4X).
- 1.2 The transducer will be listed in the Factory Mutual Research Corporation Approval Guide as follows:

HAZARDOUS (CLASSIFIED) ELECTRICAL EQUIPMENT

EXP/I/1/BCD: DI/II/1/EFG

Miniature Two Wire P/I Pressure Transducer. Model TFX8001a1-bc1de

a = Channel 1 pneumatic input 3, 4, 5, 6 or 7.

b = Channel 1 current output 1 or 2.

c = Channel 2 pneumatic input 3, 4, 5, 6, 7 or 00.

d = Channel 2 current output 1, 2 or 0.

e = Options U or blank.

1.3 As described by this report, the construction of the subject equipment provides the degree of protection against electrical shock, fire and injury required for hazardous (classified) locations. Installation shall be in accordance with the manufacturer's instructions and the National Electrical Code.

JOB IDENTIFICATION 0W5A8.AE

1.4 The equipment described by this report was determined to comply with the applicable requirements of the following standards.

approaut to function		
TITLE	AUTHOR-NUMBER	DATE
Explosionproof Electrical Equipment	FMRC-3615	March 1989
Electrical Equipment For Use In Hazardous Locations	FMRC-3600	March 1989
Electrical and Electronic Test, Measuring, and Process Control Equipment *	FMRC-3810	March 1989
Enclosures For Electrical Equipment	ANSI/NEMA-250	March 1987

^{*} This standard is based in large part on the ANSI/ISA-S82 standard

1.5 The explosion proof enclosure used for the Model TFX8000 Transducer is identical to that of the Model TFXPD-6000 which is Factory Mutual Research Corporation Approved as described by FMRC Report J.I. 2R2A4.AE, dated August 16. 1990.

II DESCRIPTION

- 2.1 The Model TFX8000 transducer is a process control device which accepts a pressure from a pneumatic line and converts it to either a 4-20 mA or 10-50 mA current output.
- 2.2 The explosion proof transducer enclosure is constructed of cast aluminum and consists of a cover and base, in which the electronics are enclosed. The aluminum alloy contains less than 6% magnesium. The cover threads to the base with at least 10 full threads of engagement. The base has machined holes for input and output process and electrical connections. Two flame arrestors are installed in the base. A breather assembly threads into the base and utilizes two flame arrestors. Wiring provisions are furnished by a 1/2 inch NPT conduit connection. The enclosure cover is equipped with an o-ring seal to prevent the ingress of dust and water. The transducer is rated for installation in ambient temperatures up to 66°C.
 - 2.3 For additional information, see the attached sales literature.

III MARKINGS

The manufacturer's metallic label is permanently attached to the instrument housing. Label drawing EC18542 is included as an attachment to this report.

IV EXAMINATION AND TEST

4.1 Because the electronics housing used to house the subject device has been previously tested and approved as described in paragraph 1.5, no additional ignition, dust, hydrostatic, process pressure or NEMA testing was considered necessary.

JOB IDENTIFICATION OW5A8.AE

- 4.2 PROTECTION FROM ELECTRICAL SHOCK The following tests verify the protection afforded by all the subject transducer against electrical shock.
- 4.3.1 <u>Dielectric Tests</u> The insulation of all primary circuits on the transducer was tested by applying a test voltage of 707 Vdc. During the test the potential held for one minute without dielectric breakdown of the insulation occurring. This is satisfactory.
- 4.3.2 <u>Protective Grounding</u> The transducers are supplied with an internal enclosure grounding screw which is properly marked. It has been verified by measurement that all accessible conductive components of the transducer that could be otherwise become energized in the event of a fault are bonded to this point with a resistance of less than 0.1 ohm. This is satisfactory.
- 4.3.3 <u>Protection from Accessible Live Parts</u> There are no live parts accessible on the transducer when tested with the IEC rigid and articulated finger probes. This is satisfactory.

V MANUFACTURER'S RESPONSIBILITIES

- 5.1 The manufacturer shall advise Factory Mutual Research Corporation of all proposed changes to the documentation file in Section VIII.
- 5.2 On 100% of production, the transducers shall be dielectric tested. The power input leads and associated circuitry shall withstand for one minute, with no insulation breakdown, the application of 707 Vdc or 500 Vac, 60 Hz with respect to the protective ground lead. Alternatively, test potentials 20% higher may be applied for at least one second.
- WARNING: The dielectric test required may present a hazard of injury to personnel and/or property and should only be performed under controlled conditions, and by persons knowledgeable of the potential hazards of such testing to minimize the likelihood of shock and/or fire.
- 5.3 On 100% of production, the manufacturer shall conduct routine continuity inspection of the protective grounding system.

VI FACILITIES AND PROCEDURES AUDIT

The manufacturer's design and manufacturing facilities in Winston-Salem, North Carolina are subject to follow-up audit inspections by Factory Mutual Research Corporation. The facilities and quality control procedures in place have been found to be satisfactory to manufacture the Model TFX8000 Pressure Transducers identical to those tested and Approved.

JOB IDENTIFICATION 0W5AB.AE

VII CONCLUSION

The Model TFX8000 Miniature Two Wire P/I Pressure Transducer, as described in this report, meets Factory Mutual Research Corporation Approval requirements. Approval is effective when the Approval Agreement is signed and received by Factory Mutual Research Corporation.

VIII DOCUMENTATION FILE

The following documentation is applicable to this equipment and is on file at Factory Mutual Research Corporation. No changes of any nature shall be made unless notice of the proposed change has been given and written authorization obtained from Factory Mutual Research Corporation. The Approved Product - Revision Report, FMRC From 797, shall be forwarded to Factory Mutual Research Corporation as notice of proposed changes.

D	Description	Rev.
Document No. CS 5000-T8000 EA-1174 EA-13784 EB-130 EB-16609 EB-16964 EB-16965 EB-18057 EB-18147 EB-18148 EC-16960 EC-16961 EC-16962 EC-18033 EC-18542 ED-16963 ED-18541	PRODUCT LITERATURE 1/4 NPT PLUG FLAME ARRESTOR O-RING SPEC VENT ASSY PLUG BODY ASSY FLAME ARRESTOR FITTING BREATHER ASSY BONNET MACHINING BONNET CASTING BODY CASTING PARTS LIST NAMEPLATE BODY MACHINING TX8000 FINAL ASSEMBLY	10/91 J B E C A G B B C D C B F A J

EXAMINATION AND TESTING BY: D. C. Anderson

ORIGINAL DATA: Test notebook No. 92-224

ATTACHMENTS: Nameplate - EC-18542 (Rev. A)

Product Literature - CS 5000-T8000 (10/91)

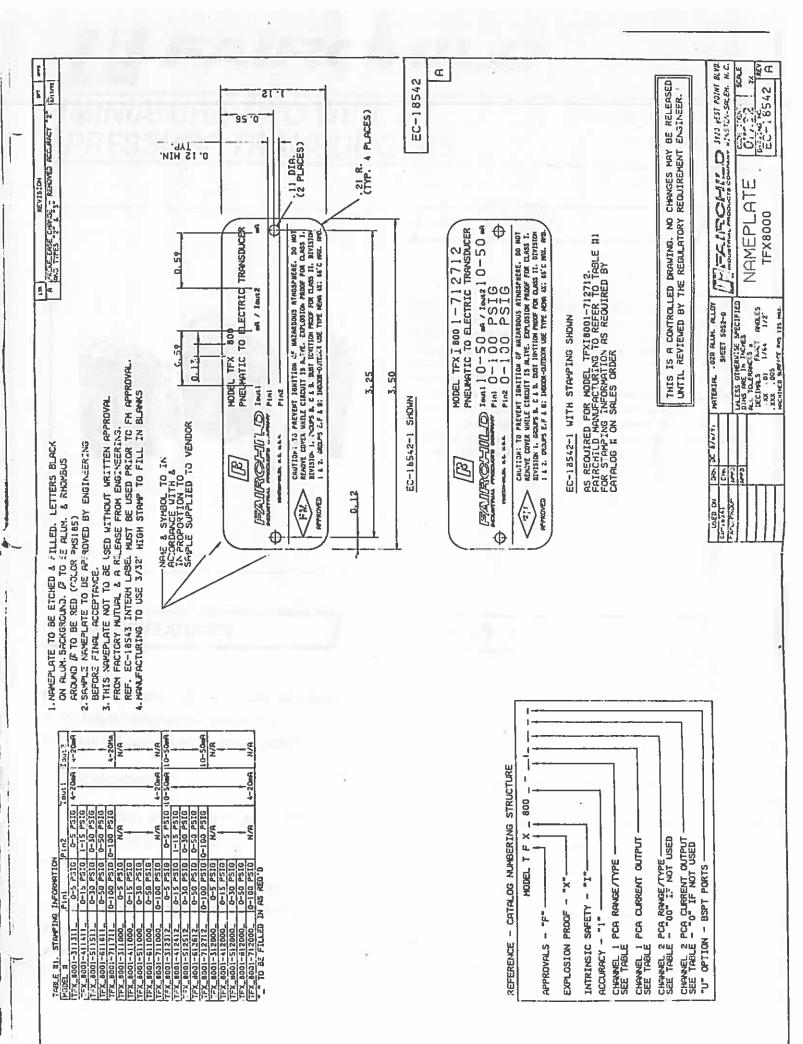
REPORT REVIEWED BY:

REPORT BY:

David C. Anderson Electrical Engineer

Roger P. Lutfy Electrical Sect

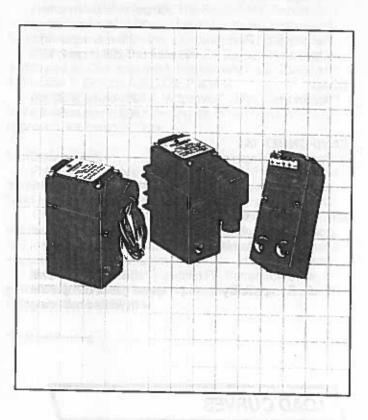
Electrical Section Manager



LE FAIRCHILD

MINIATURE TWO WIRE P/I PRESSURE TRANSDUCERS

MODEL T8000 SERIES



APPLICATIONS

These inexpensive high quality rapid response controls are designed for precision applications and provide maximum versatility in installations requiring operation of electrical devices from an existing pneumatic control line, including feedback from an I/P source to close a control loop, acquisition of data from pneumatic controls, and remote monitoring of processes.

Modular construction permits use of one basic unit in all applications or use in an explosion proof housing.

Compact size and convenient location of adjustments and ports increases accessibility of controls in small spaces and simplifies piping layout to the unit.

MAJOR FEATURES

- May be wall, panel, pipe, rack or DIN rail mounted
- PC Board burned in prior to assembly
- P NEMA 4X* case (TA and explosion proof)*
- F RFI/EMI protected
- F Compact Size; one or two units per housing
- Five Input Ranges Available
- # 4-20 or 10-50 mA Outputs
- Conduit, Terminal Strip or DIN connections
- External Zero and Span Adjustments on same plane
- F Input Ports on both ends
- F Field Reversible

*Approval Pending

BENEFITS

- F Easily suited to most installations
- Built-in consistent reliability
- Corrosion protected in windblown dust and direct water sprays
- F Reduced susceptibility to electromagnetic and radio interference
- F Permits high density mounting saves space
- Covers all standard process inputs
- F Covers standard loop outputs
- F Allows easy wiring to units
- F Increases accessibility in close spaces
- F Simplifies pneumatic piping
- Provides output directly or inversely proportional to input signal

SPECIFICATIONS

PNEUMATIC INPUT Range

	· idingo
psig	(kPa)
0-5	0-35
0-15	0-105
0-30	0-210
0-60	0-420
0-120	0-840

CURRENT OUTPUT

4-20 mA or 10-50 mA

SUPPLY VOLTAGE

12-50 VDC for 4-20 mA range 12-30 VDC for 10-50 mA range

INDEPENDENT LINEARITY (Accuracy)

+0.1% Full Scale

HYSTERESIS AND REPEATABILITY

Less than 0.1% Full Scale

RESOLUTION

Infinite (less than 0.05% Full Scale)

STABILITY

Compensated Range 0°-50 °C Temperature Compensation Zero +/- 0.5% FS(0°-50° C) Span +/- 0.5% FS(0°-50° C) Drift less than 0.25% Full Scale/30 days

ELECTRICAL

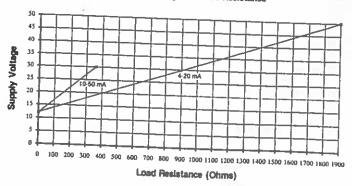
Calibration

Zero: -12.5 to 125% FS: Span: -25 to 50% FS: Response Time: Output less than 10 m-seconds from 10-90% input Damping: 7 secs 10%-90% FS Jumper Selectable Reverse Polarity protected Output Ripple less than 5mV peak to peak

MECHANICAL	
Damage Pressure 3 times rated input	0
200 psi, whichever is les	UI Cc
20 pei for 5 pei pe	
recalibiation Pressure 2 times rated:	Τ.
Vibration No effect 10-200 Hz at 2-10	G
LOAD	
Maximum	
360 ohms at 50 m	A
	^
ENVIRONMENTAL	
Operating Temperature25° to 80° (C
Humidity (13° to 176° F	7
Humidity	y
MATERIALS OF CONSTRUCTION	
Body and Housing	n
""" · · · · · · OldIIIIBSS STAAL Brace Zing Digaga ou	
Wolled Malerials Aluminum, Glass, Ceramic	1
Silico- DT/ Alt. I	
Media Compatibility Liquids and gases compatible	9
with wetted materials	3

LOAD CURVES

Supply Voltage Vs. Load Resistance



SPECIFICATIONS

Hazardous Area Classification

Instrinsically Safe

Factory Mutual Approval.* The Fairchild P/I Transducers may be purchased as Factory Mutual Approved, Instrinsically Safe, Class I and II, Division 1, Groups A,B,C,D,E,F and G.

CSA Approval.* The Fairchild P/I Transducers may be purchased as CSA approved, Intrinsically Safe Class I and II, Division 1, Groups A,B,C,D,E,F and G.

BASEFA/CENELEC Approval.* The Fairchild P/I Transducers may be purchased as BASEFA/CENELEC approved, Intrinsically Safe.

Explosion Proof

Factory Mutual Approval.* The Fairchild P/I Transducers may be purchased as FM approved, Explosion Proof Class I and II, Division 1, Groups B,C,D,E,F and G and NEMA 4X.

CSA Approval.* The Fairchild P/I Transducers may be purchased as CSA explosion proof Class I, Division 1, Groups B,C and D and Class II, Division 1, Groups E,F and G and enclosure 4.

BASEEFA Approval.* Fairchild P/I Transducers may be purchased as BASEEFA approved explosion proof operation category (Exds II CT6).

*Approval Pending







OUTLINE DIMENSIONS

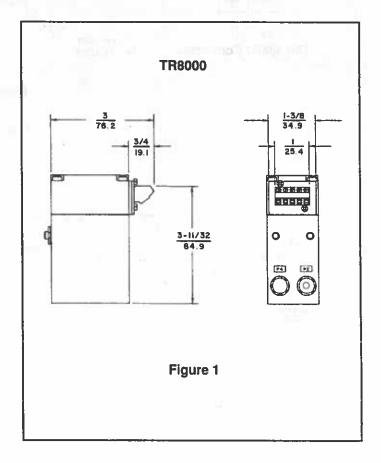
Outline Dimensions

The Basic Model T8000 is a two section unit consisting of the cover on which is mounted the various output connectors for obtaining the loop current output, and the bottom section which houses the printed circuit board(s).

Zero and Span controls are located under the plate in the bottom section which allows access to these controls.

There are three versions of the cover: (TD) DIN 43650 connector, (TA) conduit connector with wires brought outside the unit and (TT) terminal strip connector. The bracket furnished with the unit can be mounted in a vertical or horizontal position. A pipe clamp for 1-1/2" pipe is also available. An optional DIN rail mounting kit Part No. EA-16893 is available (see mounting dimensions).

NOTE: The TR-8000 units are used in the rack mounted kits. Standard mounting hardware cannot be used with this unit.



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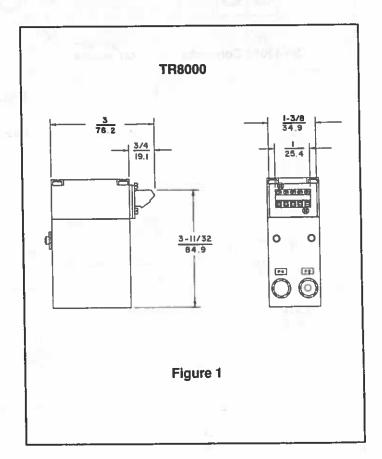
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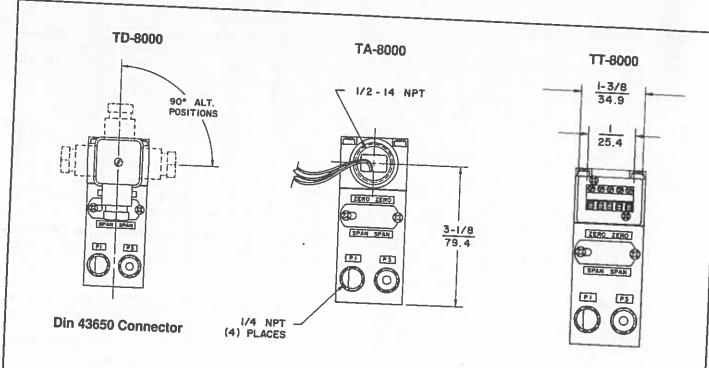
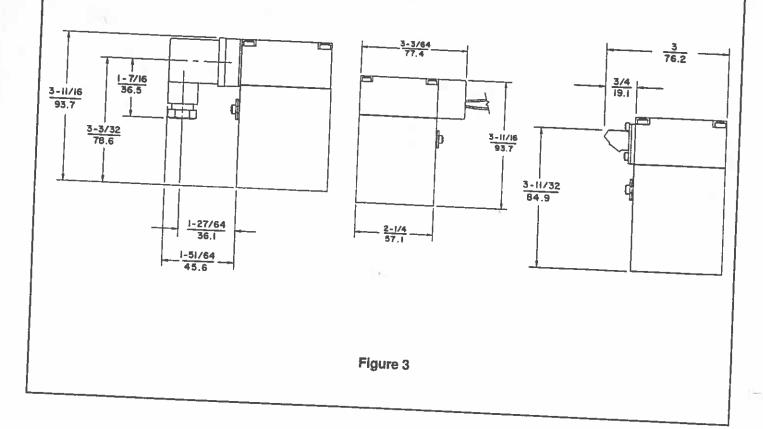


Figure 2



Mounting Bracket

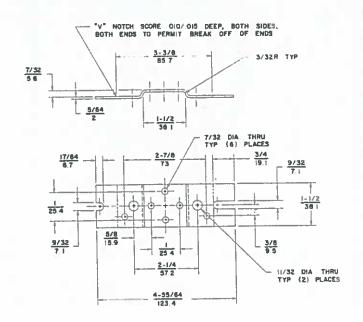
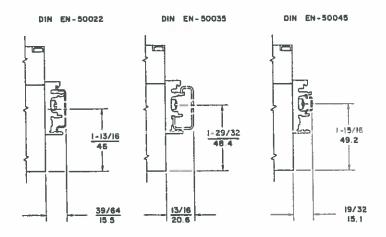


Figure 4

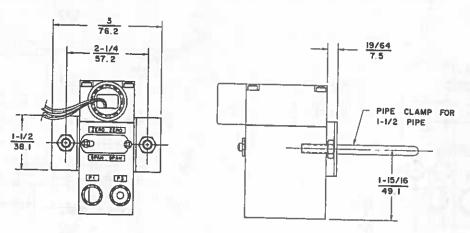


OPTIONAL DIN RAIL MOUNTING KIT EA-16893-1

Shown with Compatible Rails

Figure 5

MOUNTING KITS



STANDARD MOUNTING KIT EA-16799-I BRACKET IN HORIZONTAL POSITION BREAKAWAY TABS REMOVED

Figure 6

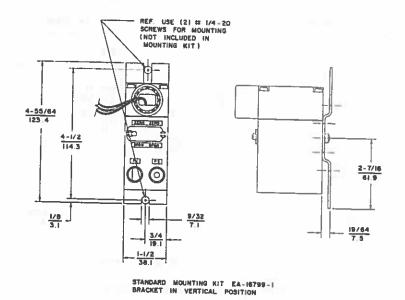
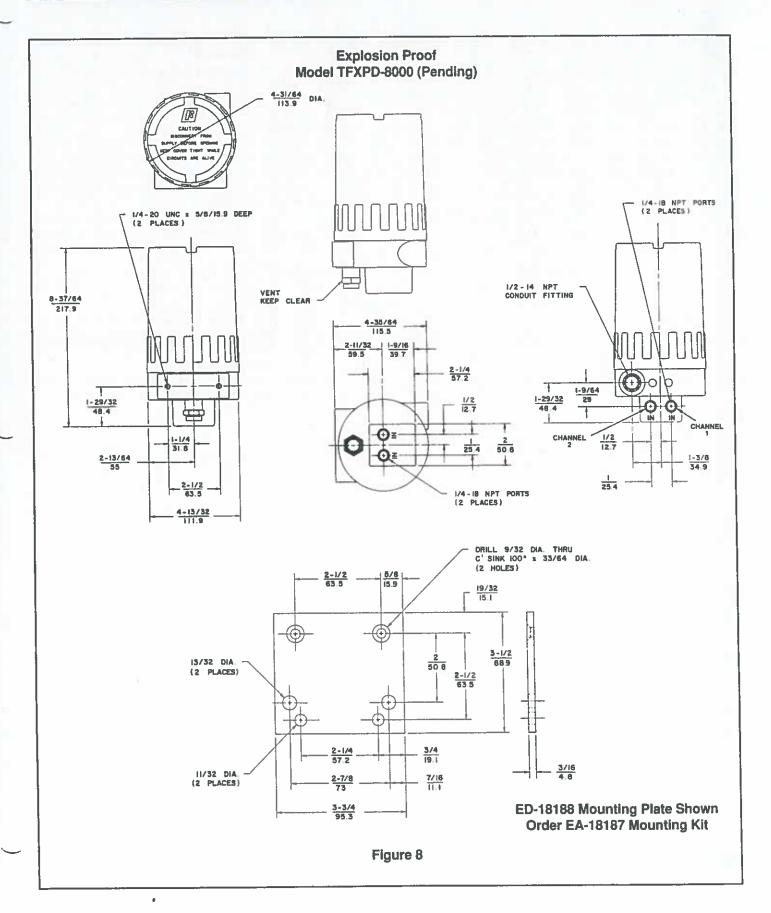
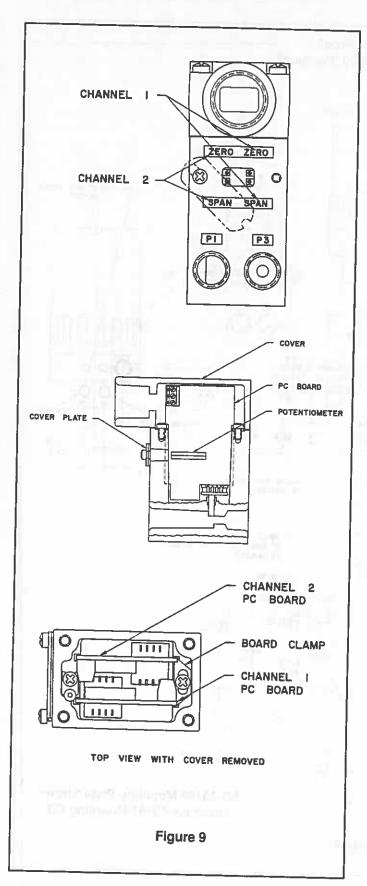


Figure 7



CROSS-SECTIONS



PRINCIPLES OF OPERATION

Principles of Operation

The T8000 is a two wire pressure transducer that converts a pneumatic signal to a current output.

The PC Board Assembly contains a PIEZO RESISTIVE electric sensor which changes resistance in proportion to the pneumatic pressure applied to the sensor.

The sensor is connected in a Wheatstone bridge configuration. The input air pressure on the sensor induces a PIEZO RESISTIVE change in the sensor which causes a bridge unbalance and results in a differential current flowing into a current source device.

The current source supplies current output proportional to pneumatic input. Zero and Span adjust potentiometers accessible from the front of the unit allow for bridge balance and setting of Span.

The T8000 makes use of two wire transmission principles, drawing current from a remote power supply in proportion to the sensor signals.

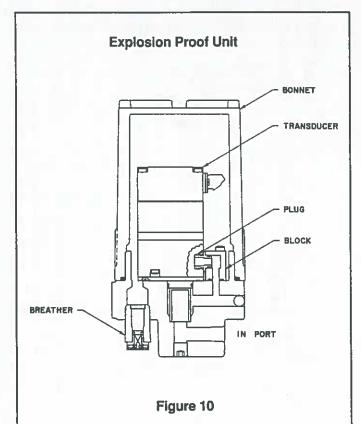
For a standard single channel unit, the PC board is plugged into the right hand side of the transducer case which is ported so that pneumatic input, applied to either the P3 or the P4 port will act on the sensor.

For a two channel unit, the second PC board is plugged on the left hand side and pneumatic input is applied to either the P1 or the P2 port.

TR8000 UNIT

The TR8000 transducer operates in the same manner as the T()8000 transducer. The TR8000 unit is the same as a TT8000 unit (terminal strip) except that the terminal strip faces to the back of the transducer. This unit is designed to plug into a TR8000 Rack Unit and the terminal strip would be accessible at the back of the rack.

CROSS-SECTIONS



PRINCIPLES OF OPERATION

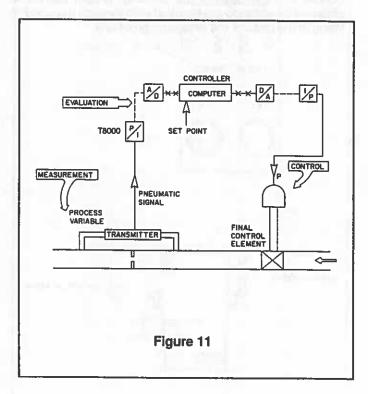
Explosion Proof Unit (Pending)

The T8000 transducer is isolated from an explosive environment by enclosing it in an explosion proof housing. Air pressure is ported through a block which is sealed to the base by O rings and then transmitted through an O ring sealed plug to the input port of the transducer. An O ring seals the bonnet and the base of the housing. Output current is obtained by wiring to the terminal strip through the conduit fitting in the base of the explosion proof unit.

TYPICAL APPLICATIONS

Model T8000 Application

The Model T8000 may be used to convert the output of a pneumatic transmitter (flow, pressure, temperature) to a 4-20 milliampere loop signal for transmission to an electronic central control room, thus eliminating use of an obsolete pneumatic control room.

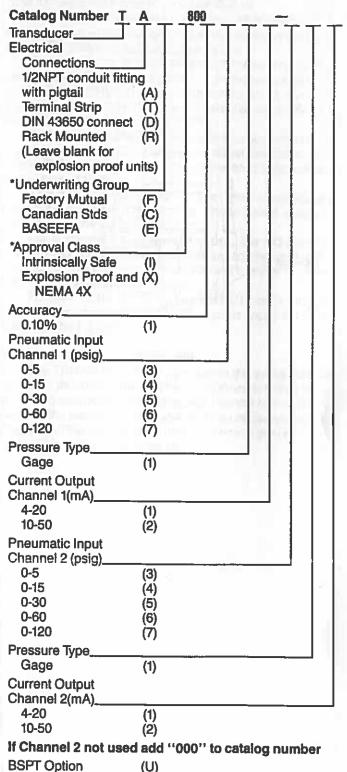


SERVICE INFORMATION

Parts are available for repairing the T8000 transducer. Please refer to the Installation, Operation and Maintenance Instructions for this unit.

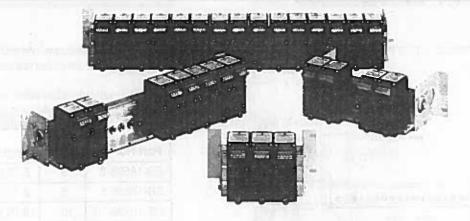
ORDERING INFORMATION

To order, please refer to the example outlined below and specify input range and electrical connections with appropriate numbers or letters.



*All Approval Pending

T8000 TRANSDUCER MANIFOLD KITS



Specifications

Manifolds

Materials of Construction

Manifold and brackets	านทา
Screws Zinc Plated S	iteel
Valves	rass
Elastomers	na N

Outline Dimensions

The Manifold Assemblies may be flush mounted or mounted away from a wall (See Figure 12). The Table gives the overall length and mounting centers of the assembly for the transducer configuration (3,5,10 or 15) selected by the user.

The Front View indicates the distance from the edge of the mounting bracket to the mounting slot. Four bolts or screws are used.

NOTE: Figure 12 shows manifold assemblies after brackets are installed.

Manifold Assembly

The Manifold Assembly Kits are supplied with brackets for mounting a wiring duct (not supplied). The Standard Unit Mounted is a composite view of the Flush Mount and the Extended Wall Mount Manifold Assemblies including the wiring duct brackets, a recommended 1 inch by 2 inch wiring duct and a TT-8000 transducer. These views are included to indicate the mounting envelope required for the units.

Installation instructions are detailed in the IS 4000-MFLD8 Installation, Operating and Maintenance Instructions.

CROSS-SECTIONS

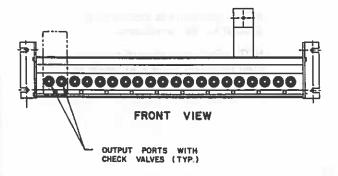


Figure 14

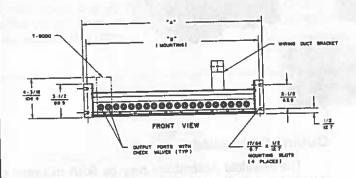
PRINCIPLES OF OPERATION

Manifold Assembly

1/8 NPT inlet ports in the manifold are located vertically on the bottom and horizontally in the rear of the manifold. Dual channel and single channel P/I units can be plugged into a T8000 manifold. Features of the manifold include check valves at the P/I ports so that individual units may be plugged in or removed without affecting the process being monitored.

There are two mounting brackets for the wall and panel mount versions. One set mounts the manifold flush to the wall while the other extends the manifolds about 2" from the mounting surface.

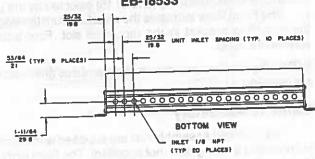
Manifold Assemblies



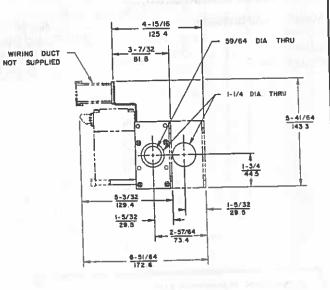
Manifold Dimensions for NPT Ports

Part No.	No. of Units	Length "L"
EB-18538-3	3	5.55 (140.97 mm)
EB-18538-5	5	8.75 (222.25 mm)
EB-18538-10	10	16.75 (425.45 mm)
EB-18538-15	15	24.75 (628.65 mm)

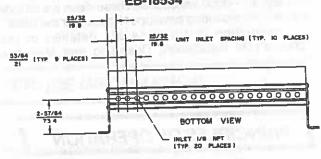
Flush Mount EB-18533



Standard Unit Mounted



Extended Wall Mount EB-18534



NOTE: Manifold kits include plug-in adapter kits for transducers.

NOTE: End views show dimensions from mounting surface to center of large center hole for flush mount and extended wall mount.

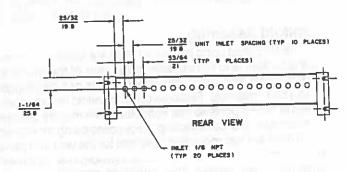


Figure 12

APPLICATIONS

HOW TO ORDER

Fairchild T-8000 Series Manifold Assembly Kits are used to mount T-8000 Series transducers in multiples of 3,5,10 and 15 units.

Check valves are included in the manifold ports so that individual transducers may be plugged in or removed without affecting system operation.

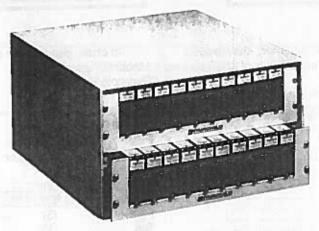
To order, please refer to the example.

Manifold Assemblies

Example EA-18533-5

^{*}Manifold kits include plug in adapter kits for Transducers

TR8000 TRANSDUCER RACK KITS



Specifications

Rack Kits	
Number of units accommodated	up to 10
Check valves	. output ports
Inlet Ports	on the bottom
1/8 NPT horizontal	lly on the rear

Materials of Construction

Manifold and brackets	Aluminum
Screws Zinc P	lated Steel
Valves	Brass
Elastomers	Buna N

Outline Dimensions

Figure 13 is a composite outline drawing of the TR8000 Rack Kit. Also included are the left and right hand mounting brackets required to make up the racks.

Installation instructions for the Rack Kits are outlined in the IS 4000-RACK8 Installation, Operating and Maintenance Instructions.

CROSS SECTIONS

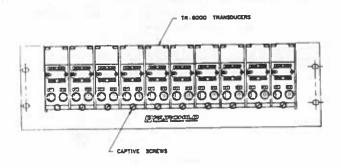


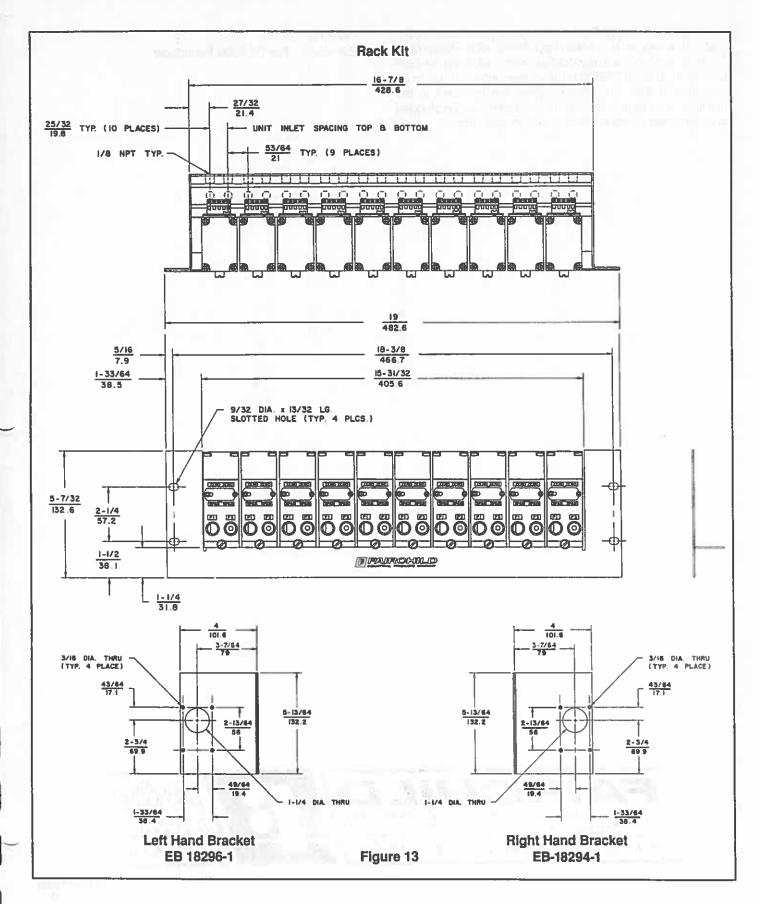
Figure 15

PRINCIPLES OF OPERATION

TR Rack Kit

The TR Rack Kit allows the user to install a manifold assembly in a standard rack. The ten unit manifolds with appropriate mounting brackets are designed to fit into 19 inch racks.

The Rack Unit will accept TR-8000 Transducers only since the terminal block on this transducer is mounted on the rear of the transducer.



APPLICATIONS

HOW TO ORDER

Fairchild TR8000 Rack kits are front panel assemblies that can be mounted in a standard 19 inch rack. Provision is made to incorporate a manifold assembly allowing the user to mount up to 10 TR8000 transducer units with up to 20 channels in the unit. Check valves are included in the manifold ports so that individual transducers may be plugged in or removed without affecting system operation.

Rack Kit EA-18536-1 For TR-8000 Transducer

