



## MODEL 850 DIGITAL PRESSURE TRANSDUCER



The Perma-Cal® Industries, Inc. Model 850 Digital Pressure Transducer family consists of four low cost, accurate, pressure sensors available in ranges from  $\pm 15$  psig through -15 to 100 psig. These compact 3" x 3" x 1" powder coated aluminum devices can be mounted in any position and feature accuracies near 0.05% of full scale and include an integrated ambient temperature sensor. Designed for use in R & D, Laboratory and equivalent environments, the Transducer communicates through a standard RS232 interface and derives its power from any spare USB port. Windows® compatible software, available online, controls all transducer functions and displays pressure in PSI, kPa, BAR, kg/cm<sup>2</sup>, FSW, inH<sub>2</sub>O, inHg, mmHg and Atmospheres.

### Features ...

- $\sim \pm 0.05\%$  of F.S. accuracy @ 20°C
- $\pm 2^\circ\text{C}$  Integral Ambient Temperature Sensor
- RS232 compatible serial interface
- USB Powered .. no messy power cords / transformers
- Minimum 150% over pressure without calibration shift

## Pressure Ranges ...

Pressure Range	Code <sup>1</sup>	Accuracy <sup>2</sup>	Over Pressure <sup>3</sup>	Zero Deadband <sup>4</sup>
-15 - 0 - 15 psig	26	±0.020 psi	> 25 psig	±0.02 psi
-15 - 0 - 30 psig	27	±0.030 psi	> 50 psig	±0.03 psi
-15 - 0 - 60 psig	28	±0.040 psi	> 100 psig	±0.05 psi
-15 - 0 - 100 psig	29	±0.060 psi	> 150 psig	±0.07 psi

Figure 1

Notes:

1. The Code that is placed in the part number to indicate the pressure range desired. See Figure 5.
2. At 20°C ±1°C excluding hysteresis. Positive pressure only.
3. The pressure at which the accuracy of the device may be affected.
4. If the pressure is within this range of zero, the transducer indicates 0.
5. Specifications subject to change without notice.

## Case Dimensions ...

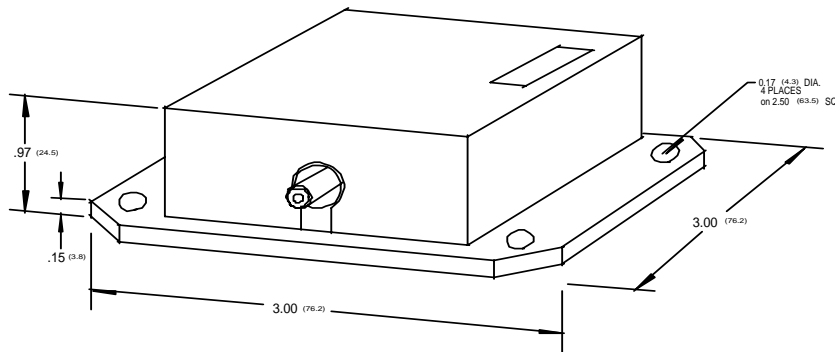


Figure 2

## Pressure Port ...

The pressure port is made of a modified ETFE fluoropolymer and is designed to accept .187" (4.75mm) ID elastomeric tubing with an OD no greater than .313" (7.95mm). To avoid damage to the port while installing the tubing, lightly lubricate the port with a media compatible grease, and apply direct pressure with a slight twist while installing. Use a twisting motion also when removing the tubing.

## PC Interface ...

The computer interface uses a standard 9pin D connector. Serial data is transmitted in an asynchronous format of 8N1 (8 data bits, no parity and 1 stop bit) at a rate of 9600 baud. The data is output in a continuous stream with no handshaking. For more detailed information, see the pin 2 function details below. **Caution:** Since this port also serves functions beyond serial communication, you should not use a cable that utilizes all 9 wires connected straight through from transducer to PC. It is recommended that you use the cable supplied or one that conforms to Figure 4.

Software to monitor the output of the Transducer on a Windows® PC is available online at [www.perma-cal.com/TRInfo.htm](http://www.perma-cal.com/TRInfo.htm) . This software can convert the native output of the Transducer, which is psig, to many common engineering units including kPa, BAR, inH<sub>2</sub>O, inHg, mmHg, FSW, kg\cm<sup>2</sup> and ATM.

## D Connector Pin Functions ...

Pin #	Function	Pin #	Function
1	No connection	6	Do Not Connect - Factory use only
2	Serial data out	7	No connection
3	Serial data in	8	+5v ±.3v - from USB port
4	Do Not Connect - Factory use only	9	Do Not Connect - Factory use only
5	Signal common / ground		

When looking at the connector on the Transducer, pins are numbered left to right, bottom to top.

Figure 3

## Pin function details ...

Pins 1,4,6,7,9: These pins should be left unconnected. Pins 1 and 7 are not internally connected, however, pins 4, 6 and 9 are used by the factory for diagnostics and calibration and must be left unconnected as any spurious signals will adversely effect the device.

Pin 2: As stated above, the RS232 port transmits data in the standard asynchronous format of 8N1 (8 data bits, no parity and 1 stop bit) at a data rate of 9600 baud. The data is output in a continuous stream of 15 byte packets with an identifying prefix, data, and a carriage return line feed suffix. No handshaking is available.

Output voltage levels are not compliant with the RS-232-E requirement that the signal levels be at ±5 volts minimum when terminated by a 3k ohm load. However, Typically > 4 volts will be present when spacing and < -4 volts will be present when marking. Since most RS-232 receivers will correctly interpret > 2 volts as a space, and < .5 volts as a mark, in most cases there will be no problem reading the data.

The port uses a standard 9 pin serial connector, and only pins 2 and 5 wired straight through are necessary to directly connect to a PC.

Pin 3: This pin is currently not used but has been reserved for later firmware upgrades which may

allow bidirectional communication. It is best to leave this pin unconnected.

**Pin 5:** Signal and power common (ground).

**Pin 8:** DC input. +5v  $\pm$ .3v. When using the factory cable, this power is provided by the USB connector. Note: The USB connector is used for power only. There is no communication through the USB connector.

### Cable Schematic ...

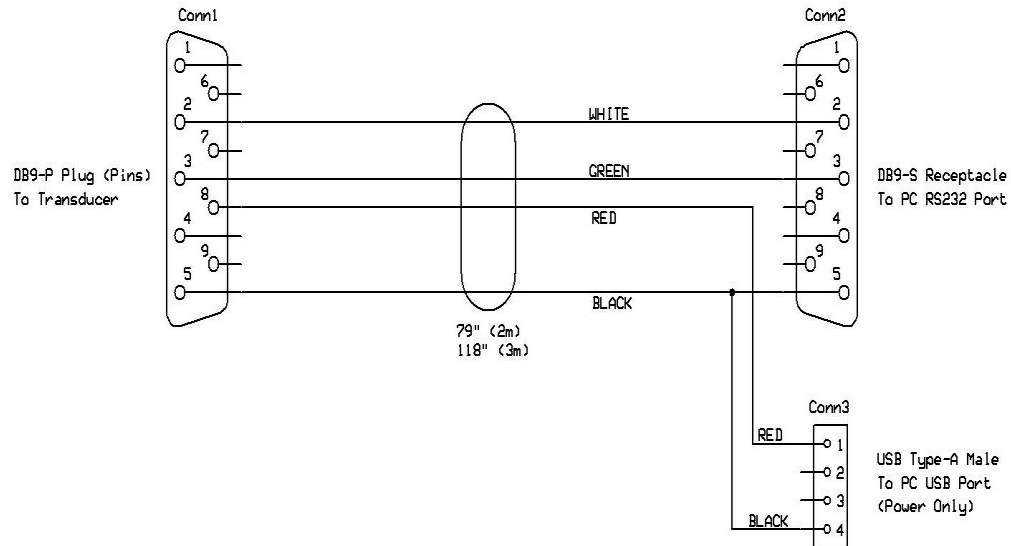


Figure 4

### Software Considerations (If you wish to write your own code) ...

Each 15 byte packet has a unique prefix which indicates the type of data that follows. The Transducer sends out a sequence of 269 total data packets before repeating. The sequence is as follows:

- 23 Pressure Packets
- 1 Temperature Packet
- {The above Pressure/Temperature sequence is repeated 11 times, then }
- 1 Pressure Offset Packet
- 1 Temperature Offset Packet
- 1 Range information packet
- 1 Zero Tare Packet
- 1 Device ID packet
- {End of 269 packet sequence, repeat }

Below are descriptions of the ten possible data packets along with an explanation:

Pressure information:

```
P<SP>=<SP><±>00000000<CR><LF>  
P_Off<SP>=<SP>00000<CR><LF>
```

‘P = ‘ indicates the next 9 bytes contain the encoded pressure information.

‘P\_Off = ‘ indicates the 5 byte calibration code needed to decode the pressure information.

Divide the pressure information by the calibration code x 0.1 to get the pressure in native units.

I.e. ... Actual Pressure = Pressure Information / (P\_Off x 0.1).

Temperature information:

```
T<SP>=<SP><±>00000000<CR><LF>  
T_Off<SP>=<SP><±>0000<CR><LF>
```

‘T = ‘ indicates the next 9 bytes contain the temperature information in °F.

‘T\_Off = ‘ indicates the 5 byte offset needed to correct the temperature information. Multiply the offset information by 0.1 then add that number to the temperature information to get the corrected ambient temperature in °F. I.e. ... Corrected Temperature = Temperature information

+ (T\_Off x 0.1).

Device information:

```
RANGE<SP>=<SP>+0000<CR><LF>  
ZTARE<SP>=<SP><±>0000<CR><LF>  
SN:<SP>RXXXXXXXXX<CR><LF>  
ERROR<SP>HIGH<SP><SP><SP><CR><LF>  
ERROR<SP>LOW<SP><SP><SP><SP><CR><LF>  
ERROR<SP>???<SP><SP><SP><SP><CR><LF>
```

‘RANGE = ‘ indicates the maximum pressure range of the Transducer. Note: Since the device reads both positive and negative (vacuum) pressures, add 14.7 to this number to get the full scale pressure.

‘ZTARE = ‘ the value necessary to null the device at zero pressure input. This value is unique to the particular device and is used by the factory during calibration.

‘SN: ‘ indicates the device firmware revision (denoted by ‘R’ above) and its serial number encoded into 8 bytes. The algorithm required to decode this data is beyond the scope of this document.

‘ERROR’ indicates a device error. HIGH / LOW indicate an overpressure or underpressure (unlikely) situation and ??? indicates an unknown occurrence. The red LED will also be illuminated on the device. Once the situation that caused the error is corrected, the device will reset itself and resume sending packets.

Notes:

- 1) <SP> = ASCII space character (20 hex)  
<CR> = ASCII carriage return character (0D hex)  
<LF> = ASCII line feed character (0A hex)
- 2) ‘Native Units’ are the engineering units to which the Transducer was calibrated. I.e. psig, kPa, or mmHg.
- 3) For best results, it is recommended that the pressure data be filtered using an averaging type algorithm. The software available online utilizes this technique to

stabilize the displayed pressure.

### ORDERING INFORMATION ...

Build the desired part number by following the template below:

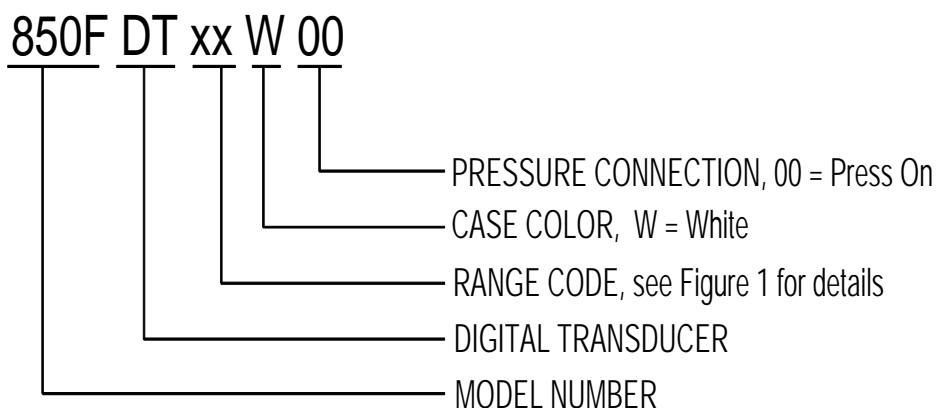


Figure 5

### CHEMICAL COMPATIBILITY ...

Limited to gases which are non toxic, dry and compatible with silicon, silicon dioxide, Fluorosilicone, Neoprene and ETFE. **NOT FOR OXYGEN USE.**

### RoHS COMPLIANCE ...

This device is not RoHS compliant.

### ENCLOSURE RATINGS ...

This device is designed for indoor use only. IP40 OR NEMA 1.

### WARNING ... PERSONAL INJURY ...

**DO NOT USE** this device as safety or emergency device or in any other application where failure of the product could result in personal injury or property damage. **Failure to comply with these instructions could result in serious injury or death.**

### WARRANTY / REMEDY ...

Perma-Cal warrants goods of its manufacture as being free of defective materials and faulty workmanship for a period of one year. If warranted goods are returned to Perma-Cal, freight prepaid, during the period of coverage, Perma-Cal will repair or replace, at its option, without charge those items it finds defective. Over Pressure, even if accidental, is not warranted. The foregoing is buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use. This information was last updated 1 March 2011.