PTA-427
BAROMETRIC PRESSURE TRANSDUCER
OPERATOR'S MANUAL

REVISION: 4/95

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CAMPBELL SCIENTIFIC, INC.
RMA#_____
815 West 1800 North
Logan, Utah 84321-1784

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MODEL PTA-427
BAROMETRIC PRESSURE TRANSDUCER

1. GENERAL

The PTA-427 Barometric Pressure Sensor is designed to be installed in the same enclosure that the datalogger is housed. The enclosure must be vented to the atmosphere and kept stocked with active desiccant. A two foot power switching cable is provided to connect the sensor to the datalogger. If the PTA-427 is going to be housed outside of the datalogger enclosure, a longer cable must be ordered.

The PTA-427 sensor outputs a 0-5 VDC signal for use with the 21X and CR7. For use with the CR10, a 2 to 1 voltage divider is incorporated into the power switching cable. The voltage divider converts the output from the sensor to 0-2.5 volts.

The PTA-427 uses Vaisala's patented silicon capacitive pressure sensor. A linear output of 0-5 VDC is proportional to 800-1060 millibars (other ranges optional). The transmitter is temperature compensated over an operating range of -40°C to +60°C. The PTA-427 requires 11-30 VDC and a three second warm-up time.

2. PTA-427 SPECIFICATIONS

The following pressure transmitter specifications were provided by Vaisala, Inc.:

TABLE 1. PTA-427 Specifications

OPERATING RANGE

Pressure Range	(1 mb = 1 hPa)
PTA-427	800 to 1060 mb
PTA-427A	600 to 1060 mb
Temperature Range	-40°C to +60°C
Humidity Range	non-condensing

ACCURACY

PTA-427

Linearity*	±0.3 mb
Hysteresis*	±0.03 mb
Repeatability*	±0.03 mb
Calibration uncertainty**	±0.2 mb
Accuracy @ 20°C***	±0.4 mb

PTA-427A

Linearity*	±0.6 mb
Hysteresis*	±0.03 mb
Repeatability*	±0.03 mb
Calibration uncertainty**	±0.2 mb
Accuracy @ 20°C***	±0.6 mb

* Defined as ±2 standard deviation limits of end-point non-linearity, pressure hysteresis error and pressure repeatability error.

** Defined as ±2 standard deviation limits of inaccuracy of the primary and working standards in reference to international standards.

*** Defined as the root sum of the squares of end-point non-linearity, hysteresis error, repeatability error, and calibration uncertainty at room temperature.

Temperature dependence

at 1000 mb	±0.02 mb/°C
at 800 mb	±0.08 mb/°C
at 600 mb	±0.12 mb/°C

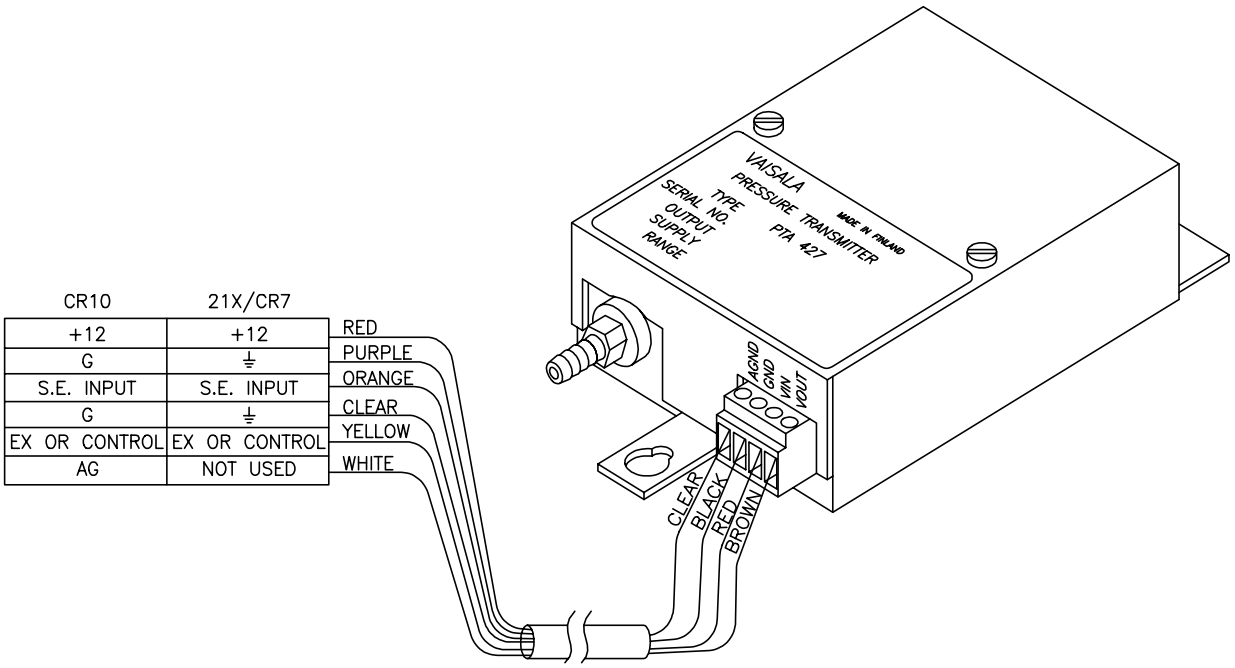
Stability

systematic offset drift	±0.2 mb/year
effect of thermal and mechanical shocks	less than ±0.3 mb

GENERAL

Supply voltage	11 to 30 VDC
Supply voltage sensitivity	less than 0.1 mb
Current consumption	7 mA typical
Output voltage	0 to 5 VDC
Load resistance	10 kohm minimum
Settling time full accuracy after power on	2 seconds to reach
Warm-up shift	less than 0.1 mb
Acceleration sensitivity	less than ±0.05 mb/g
Housing material	aluminum
Pressure fitting	barbed fitting for 1/8" I.D. tubing
Overpressure limit	2000 mb
Electrical connector	screw terminals
Weight	160 g
Dimensions:	128 mm x 69 mm x 31 mm (5.0 in. x 2.7 in. x 1.2 in.)

3. WIRING



WHITE is not used on the 21X or the CR7 installation; it should be taped or cut to protect from shorting.

FIGURE 3-1. Wiring for the PTA-427

4. DATALOGGER PROGRAMMING

Instruction 4 is used to measure the PTA-427 barometric pressure transmitter.

Instruction 4 excites the switching circuit which provides 12 VDC power to the sensor. The instruction delays three seconds after power-up and then makes a single-ended measurement of the output signal.

Sample program for a 21X or CR7:

```
01:      P4       Excite-Del-SE
  01:      1      Rep
  02:      5      5000 mV slow range
  03:      1*     In Channel
  04:      1*     Excit all reps w/EXchan1
  05:    300      Delay (units = 0.01 Sec.)
  06:   5000      Excit mVolts
  07:      1*     Loc[:Press mbar]
  08:      0.052  Mult (Range in mbar / Output)
  09:    800      Offset (Low Range of PTA-427)
```

* Proper entries will vary depending on the program and datalogger channel usage.

Sample program for the CR10:

```
01:      P4       Excit-Del-SE
  01:      1      Rep
  02:      5      2500 mV slow range
  03:      1*     In Channel
  04:      1*     Excit all reps w/EXchan1
  05:    300      Delay (units = 0.01 Sec.)
  06:   2500      Excit mVolts
  07:      1*     Loc[:Press mbar]
  08:      0.104  Mult (Range in mbar / Output)
  09:    800      Offset (Low Range of PTA-427)
```

* Proper entries will vary depending on program and datalogger channel usage.

5. MULTIPLIER AND OFFSET CALCULATIONS

Output from the PTA-427 is 0-5 VDC, which corresponds to 800-1060 millibars (other ranges optional). The multiplier and offset used to convert the voltage measurements to millibars of pressure are:

Multiplier = Pressure range/output voltage range

$$= \frac{1060 \text{ mbar} - 800 \text{ mb}}{5000 \text{ mV} - 0 \text{ mV}}$$

$$= 260 \text{ mb} / 5000 \text{ mVolts} = 0.052$$

The offset of the PTA-427 sensor is equal to the lower limit of the sensor range (i.e., the sensor range is 800 to 1060 mb, the offset is 800 mb).

The measurement result using a multiplier of 0.052 and an offset of 800 is true barometric pressure in millibars.

The weather service and most airports, radio stations and TV stations correct the pressure recorded at a particular station to what it would be if the station was located at sea level. This is done so that weather forecasters can obtain a clearer picture of what is happening as a storm crosses over mountains or high plateaus.

The following equation is used to determine the pressure correction factor, which is added to the 800 mbar offset in Instruction 4 to have the datalogger output barometric pressure corrected to sea level. Because barometric pressure is strongly affected by elevation, the elevation of the site should be as accurate as possible.

$$P=1013.25[1-(1-E/44307.69231)^{5.25328}]$$

where E is the elevation in meters above sea level. For example, the correction factor (P) for Logan, Utah, at 4450 Ft elevation is:

4450 ft * m/3.281 ft = 1356.29m

Pressure correction factor (P) = 152.68 mbar
Transducer offset = 800.00 mbar
Pressure correction factor (P) = 152.68 mbar
Offset for sea level correction = 952.68

CR10 example with pressure correction factor:

```
01:      P4          Excit-Del-SE
  01:     1          Rep
  02:     5          2500 mV slow range
  03:     1*         In Channel
  04:     1*         Excit all reps w/EXchan1
  05:   300          Delay (units = 0.01 Sec.)
  06:  2500          Excit mVolts
  07:     1*         Loc[:Press mbar]
  08:     0.104      Mult (Range in mbar / Output)
  09:   952.68       Offset
```

CONVERSION FACTORS

mbar * 0.0145 = PSI
mbar * 0.75006 = mm of Hg
mbar * 0.02953 = in. of Hg
mbar * 0.00102 = kg/cm^2
mbar * 0.1 = kPa

REFERENCES

Wallace, J.M., and Hobbes, P.V., Atmospheric Science an Introductory Survey, Academic Press, New York, N.Y., 1977, pp. 59-61.