# PTA-427
# BAROMETRIC PRESSURE TRANSDUCER
# OPERATOR'S MANUAL

**REVISION: 4/95**

## WARRANTY AND ASSISTANCE

The **PTA-427 Barometric Pressure Transducer** is warranted by CAMPBELL SCIENTIFIC, INC. to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise. Batteries have no warranty. CAMPBELL SCIENTIFIC, INC.'s obligation under this warranty is limited to repairing or replacing (at CAMPBELL SCIENTIFIC, INC.'s option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return such products by surface carrier prepaid. This warranty shall not apply to any CAMPBELL SCIENTIFIC, INC. products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CAMPBELL SCIENTIFIC, INC. is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 753-2342. After an applications engineer determines the nature of the problem, an RMA number will be issued. Please write this number clearly on the outside of the shipping container. CAMPBELL SCIENTIFIC's shipping address is:

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

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

Non-warranty products returned for repair should be accompanied by a purchase order to cover the repair.


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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 |

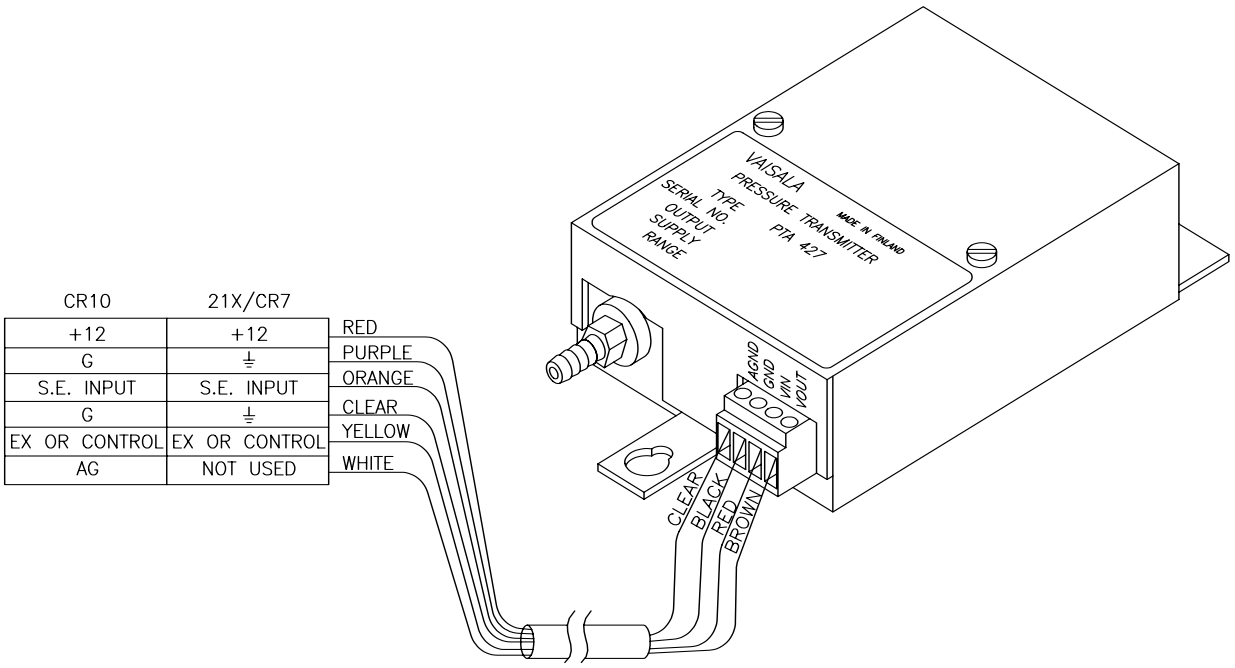
Stability

| | |
|---|---|
| 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.