INSTRUCTION MANUAL

61205V
Barometric Pressure Sensor

May 2007

WARRANTY AND ASSISTANCE

This equipment is warranted by CAMPBELL SCIENTIFIC (CANADA) CORP. ("CSC") 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 are not warranted.** ***** CSC's obligation under this warranty is limited to repairing or replacing (at CSC's option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CSC. CSC will return such products by surface carrier prepaid. This warranty shall not apply to any CSC 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. CSC is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Return Merchandise Authorization (RMA), contact CAMPBELL SCIENTIFIC (CANADA) CORP., at (780) 454-2505. An RMA number will be issued in order to facilitate Repair Personnel in identifying an instrument upon arrival. Please write this number clearly on the outside of the shipping container. Include description of symptoms and all pertinent details.

CAMPBELL SCIENTIFIC (CANADA) CORP. does not accept collect calls.

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

CAMPBELL SCIENTIFIC
CANADA CORP.
11564 - 149 street - edmonton - alberta - T5M 1W7
tel 780.454.2505 fax 780.454.2655
www.campbellsci.ca

61205V Barometric Pressure Sensor

TABLE OF CONTENTS

1. General Description

The RM Young 61205V Barometric Pressure Sensor is a versatile electronic barometer with low power consumption and wide operating temperature range. It is designed to be installed in a weather-proof enclosure or indoors. Accuracy of better than ±0.5 hPa (mb) is maintained over the entire pressure and temperature range. Signal output is linear 0-2500 mV. It can be operated in a power-up or continuous mode. In the power-up mode, the datalogger must switch 12 VDC to the sensor at least 3 seconds before the measurement, take a reading, then switch the sensor off to conserve power. This can be done using the switched 12V terminal on the CR10X, CR23X , CR800, CR850, CR1000, and CR3000 datalogger. See datalogger manual Section OV1.1.9 for a description of the power up/down programming.

FIGURE 1. 61205V Barometric Pressure Sensor

1.1 Physical Dimensions

Length:	14 cm (5 1/2 inches)
Width:	7.2 cm (2 13/16 inches)
Height:	2.2 cm (14/16 inch)
Weight:	454 g (1 lb)

Dimensions include base plate.

1.2 Specifications

Operating Range

Pressure Range:	600 to 1100 hPa (600 – 1100 mb)
Operating Temperature:	-50 to 60^0 C
Humidity:	Non-condensing

Accuracy

Accuracy:	± 0.5 hPa
Resolution:	0.1 hPa
Update Rate:	2 seconds

Signal Output

Analog	0-2500mV

General

Power Requirement:	7 - 30 VDC
Power Consumption:	9 mA
Warm-up Time:	3 seconds
Case Material:	Fibre-reinforced Thermoplastic

NOTE: The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and UV degradation. However, this jacket will support combustion in air. It is rated as slow burning when tested according to U.L. 94 H.B. and will pass FMVSS302. Local fire codes may preclude its use inside buildings.

2. Installation

2.1 Mounting

The sensor must be protected from the elements either by being placed in a weather proof enclosure or indoors. The 61205V has four mounting holes that are spaced 1" on centre. The screws and grommets shipped with the sensor will aid in mounting the sensor inside one of Campbell Scientific's white fibreglass enclosures. The sensor was shipped with a black rubber boot over the pressure port (upper right corner) for protection. REMOVE this boot before deploying sensor. If the 61205V is being installed in an enclosure, use the poly tube that was shipped with the sensor to vent the pressure port to the outdoors. Vent this tube about 1" out the cable entry port and insert one of the white hydrophobic filters (provided) into the end of the tube.

2.2 Wiring

The recommended measurement method is using a datalogger differential channel. It can be measured using a single-ended channel, but a small measurement error will be introduced due to cable lead length.

Differential Wiring:

Colour	Sensor Terminal	CR10(X), CR510, CR23X	21X, CR7	CR800, CR850 CR1000, CR3000
White	Tx-A-V	Diff H	Diff H	Diff H
Green	Ref	Diff L	Diff L	Diff L
Red	Power	+12V or SW 12V*	+12V	+12V or SW-12
		Jumper from Ctrl Port to SW 12 CTRL*		
Black	Ref	G	⏚	G
Clear	Drain	G	⏚	⏚

* for switching 12V power only

Single Ended Wiring:

Using single-ended measurements may be necessary in certain applications to reduce the number of analog inputs required on the datalogger. It is important to be aware of three issues concerning the 61205V Barometric Pressure Sensor and a single-ended measurement. The single-ended measurement introduces a small measurement error due to cable lead lengths. If this error is unacceptable, or if you will be powering the sensor continuously, you should use a differential measurement.

Error Caused By Lead Lengths When Using Single-Ended Measurement

1. The signal reference (Green) and the power ground (Black) are in common inside the 61205V. When the barometric pressure is measured using a single-ended analog measurement, both the signal reference and power ground are connected to ground at the datalogger. The signal reference and power ground both serve as the return path for 12V. There will be a voltage drop along those leads because the wire itself has resistance. The 61205V draws approximately 9 mA when it is powered. The wire used in the 61205V (P/N L9720) has a nominal resistance of 17.5 Ω/1000 feet. Since the signal reference and the power ground are both connected to ground at the datalogger, the effective resistance of those wires together is half of 17.5 Ω/1000 feet, or 8.75 Ω/1000 feet. Using Ohm's law, the voltage drop (V_d), along the signal reference/power ground is given by the equation below:

   V_d = I*R
   = 9mA * 8.75 Ohm /1000 ft.
   = 79 mV/1000 ft.

   This voltage drop will raise the apparent barometric pressure because the difference between the signal and signal reference lead at the datalogger has increased by V_d. With an analog output

of 0.2 hPa/ mV, the approximate error in barometric pressure is 1.58 hPa per 100 feet of cable length.

It is not recommended to compensate for this offset in your datalogger program without system testing for two reasons. First, the stated 9mA current draw is a maximum value subject to variation. Second, the stated cable resistance is a nominal value. In order to properly compensate for lead length on a single ended measurement, the actual current draw and cable resistance must be determined.

Important Note:

2. When measuring the 61205V single-endedly, the green and black leads must both be connected to AG on the CR10(X), CR510 or to ⏚ on the CR23X, CR800, CR850, CR1000, and CR3000. Failure to do so will connect the datalogger analog and power ground planes together, which in some cases can cause offsets on low level analog measurements.

3. When using single-ended measurements on a CR10(X), CR510, CR23X, CR800, CR850, CR1000, or CR3000 it is important to ensure that the sensor is powered down prior to making other analog measurements. Failure to turn the sensor off when the 61205V is connected as a single-ended measurement causes the power return to be connected to the analog ground on the datalogger. The return currents from the sensor could cause small offsets on other low-level analog measurements (i.e. radiation sensors).

Colour	**Sensor Terminal**	**CR10(X), CR510**	**CR23X, 21X, CR7**	**CR800, CR850 CR1000, CR3000**
White	Tx-A-V	SE	SE	SE
Green	Ref	AG	⏚	⏚
Red	Power	SW 12V	+12V	+12V or SW-12
		Jumper from Ctrl Port to SW 12 CTRL		
Black	Ref	AG	⏚	⏚
Clear	Drain	G	⏚	⏚

3. Programming

The 61205V draws 9mA of power when activated. Depending on your power supply it may be beneficial to conserve power. This can be achieved by powering the sensors on and off. This is done through the switched 12V port on the CR10X, CR23X, CR800, CR850, CR1000, and CR3000. Other loggers may require a relay (model C1701) when power consumption is a concern.

The sensor is measured using Instruction 1 SINGLE-ENDED VOLTS or Instruction 2 DIFFERENTIAL VOLTS. The reading will be in millivolts and has to be converted to barometric pressure units. 0-2500mV = 600 to 1100 hPa (mb).

MULTIPLIER AND OFFSET CALCULATION

Output from the 61205V is 0-2500mV which corresponds to 600 to 1100 hPa (mb) of pressure. The multiplier and offset used to convert the voltage reading to hPa is:

hPa = (mV x 0.2) + 600 hPa

Multiplier = 0.2

Offset = 600

This results in true barometric pressure in hPa. 1 hPa = 1mb. The weather service and most airports correct the pressure reading at a particular station to what it would be if that station were located at sea level. This is done so that weather forecasters can obtain a clearer picture of what is happening in the atmosphere.

Use the following equation to determine the pressure correction factor. Then add this to the offset (i.e. CorrFactor + 600 = New Adjusted Offset). Because barometric pressure is greatly effected by elevation, the elevation of the site used in the equation should be as accurate as possible.

P = 1013.25 [1 – (1 – Elevation/44307.69231) ^5.253283]

Where Elevation is in meters above sea level.

To convert the reading to units other than hPa, use program instruction Z=X*F(P37) and one of the values from Table 2.

TABLE 2. Multipliers to convert the hPa reading to different units

For	Multiply by
kPa	0.1
mm of Hg	0.75006
in of Hg	0.02953
mBar	1.0
PSI	0.0145

The following program examples are not to be used verbatim. Input channels, control ports, and location labels must be adjusted for actual circumstances.

3.1 Program Example:

Turn sensor on one minute before the hour then take a reading. This allows enough time for the sensor to warm up and settle (minimum 3 seconds).

Conditions of Example:

- Measure sensor with a differential channel
- Signal wires are connected to Diff Chan #1
- Control Port #1 is jumpered to SW 12V CTRL for CR10X example only
- Red wire is connected to the SW 12V terminal
- Desired output is kPa (Environment Canada standard)
- TO LEAVE THE SENSOR ON CONTINUALLY, CONNECT THE RED WIRE TO +12V AND REMOVE THE PROGRAM INSTRUCTIONS THAT HAVE THE **<><><>** SYMBOLS BESIDE THEM.

CR10X Example

```
; Measure 61205V Barometric Pressure Sensor one minute before the hour and
; output the reading.
;{CR10X}
;
*Table 1 Program
  01: 5            Execution Interval (seconds)

1:  If time is (P92) ;  One minute before the hour, turn on sensor.        <><><><><><>
 1: 59       Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 41       Set Port 1 High

2:  If time is (P92) ;   On the hour take sensor reading.                  <><><><><><>
 1: 0        Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 30       Then Do:

; Measure 61205V Barometric Pressure Sensor...
3:  Volt (Diff) (P2)                          <<<<<<<<<<< For Single-ended Measure-
 1: 1        Reps                                        ment use Volt (SE) P1.
 2: 25       2500 mV 60 Hz Rejection Range
 3: 1        DIFF Channel
 4: 1        Loc [ Air_PRESS ]
 5: .2       Mult
 6: 600      Offset ;  Add necessary sea level correction to offset.

; Convert reading to kPa.
4:  Z=X*F (P37)
 1: 1        X Loc [ Air_PRESS ]
 2: .1       F
 3: 1        Z Loc [ Air_PRESS ]

5:  Do (P86)                                                               <><><><><><>
 1: 51       Set Port 1 Low
```

```
6:  End (P95)                                                    <><><><><><><>

; Hourly data output…
7:  If time is (P92)
 1: 0        Minutes (Seconds --) into a
 2: 60       Interval (same units as above)
 3: 10       Set Output Flag High (Flag 0)

8:  Set Active Storage Area (P80)
 1: 1        Final Storage Area 1
 2: 60       Array ID

9:  Real Time (P77)
 1: 1220     Year,Day,Hour/Minute (midnight = 2400)

10:  Resolution (P78)
 1: 1        High Resolution
11:  Sample (P70)
 1: 1        Reps
 2: 1        Loc [ Air_PRESS ]

12:  Resolution (P78)
 1: 0        Low Resolution


Input Location Labels:
1 AIR_PRESS

SAMPLE OF PROCESSED DATA:
Array ID   YEAR   JULIAN DAY     TIME    AIR PRESSURE
60           2003      172          1300         100.34
60           2003      172          1400         100.39
60           2003      172          1500         100.42
```

CR1000 Example

```
'Measure 61205V Barometric Pressure Sensor one minute before the hour and output
'the reading
'CR1000

'Declare Public Variables
Public Batt_Volt
Public Air_PRESShPa
Public Air_PRESSkPa

'Define Data Tables
DataTable (Table1,True,-1)
DataInterval (0,60,Min,10)
Sample (1,Air_PRESSkPa,FP2)
EndTable

'Main Program
BeginProg
```

```
Scan (5,Sec,0,0)
        'Default Datalogger Battery Voltage measurement Batt_Volt:
        Battery (Batt_Volt)
        'Turn 61205V on one minute before the hour, using SW12V:
        If TimeIntoInterval (59,60,Min) Then SW12 (1 )
        '<><><><><><>
        '61205V air pressure measurement in hPa. Change offset from 600 hPa to the
        'appropriate sea level correction for you site:
        If TimeIntoInterval (0,60,Min) Then
                                        VoltDiff (Air_PRESShPa,1,mV2500,1,True
,0,_60Hz,0.2,600)
                                        'Convert air pressure value to kPa.  Other
conversion factors are found in Table 2.
                                        Air_PRESSkPa = Air_PRESShPa*0.1
                                        'Turn 61205V off after a reading is taken
                                        SW12 (0)
                                                        '<><><><><><>
        EndIf
        'Call Data Tables and Store Data
        CallTable (Table1)
NextScan
EndProg
```