INSTRUCTION MANUAL

CS210 Enclosure Relative Humidity Sensor

Revision: 10/07

Warranty and Assistance

The **CS210 ENCLOSURE RELATIVE HUMIDITY SENSOR** 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.

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CS210 Enclosure Humidity Sensor

1. General

The CS210 Enclosure Humidity sensor contains an Elan HM2000 series precision bulk-polymer relative humidity sensor. It is used to monitor the relative humidity inside an equipment enclosure deployed in the field.

NOTE The CS210 was once known as the 10162.

2. Specifications

Sensor: Elan HM2000 series precision bulk-polymer

Relative Humidity Measurement Range: 0 to 100% non-condensing

RH Output Signal Range: 0 to 1.0 VDC

Accuracy at 25°C
unspecified (0 to 10% Relative Humidity)
±3% RH (10 to 90% Relative Humidity)
unspecified (90 to 100% Relative Humidity)

Typical Long Term Stability: Better than 3% RH per year

Response Time (at 25°C, 90% response): 10 seconds for a 30% to 90% RH step change

Operating Temperature: 0°C to +50°C

Storage Temperature: -40°C to +80°C

Probe Length: 2.6 cm (1.02 in.)

Probe Cross Section Area: 0.6 cm x 1.1 cm (0.23 in. x 0.43 in.)

Current Consumption: <0.5 mA

Supply Voltage: 5 ± 0.25 VDC

Settling Time: 10 seconds

3. Installation

Mount the CS210 inside the environmental enclosure or onto a datalogger using the mounting block and the wire tie included with the sensor (Figure 1).

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.

FIGURE 1. CS210 Installed on a CR1000

4. Wiring

Connections to Campbell Scientific dataloggers are given in Table 1 and Figure 2. The probe is measured by a single-ended analog input channel.

TABLE 1. Datalogger Connections

Description	Color	CR200-series	CR800, CR850, CR1000, CR3000, CR5000, CR9000(X), CR10(X), CR500, CR510, CR23X	21X
Relative Humidity	White	Single-Ended	Single-Ended Input	Single-Ended Input
Signal and Power Reference	Clear	G	G	⏚
Power	Black	C2	5 V	Control Port

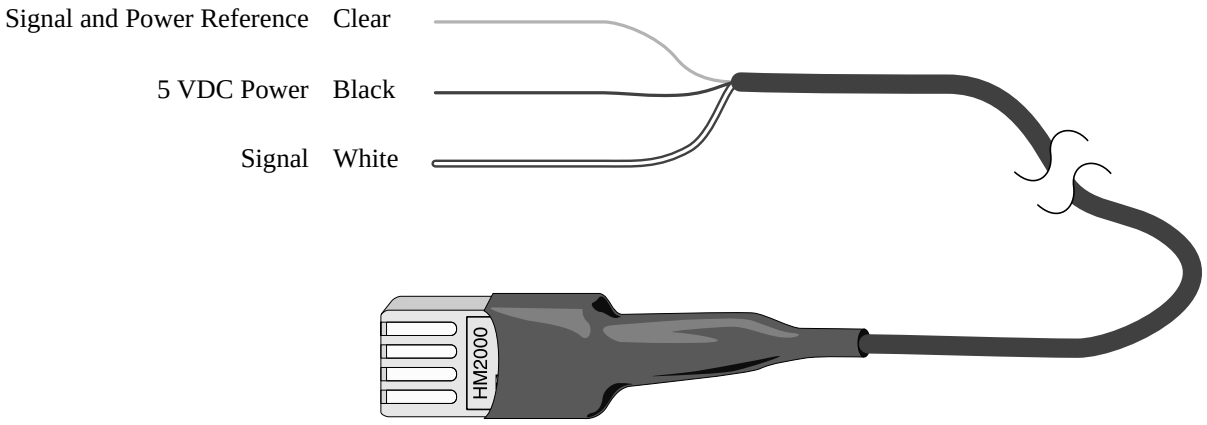

FIGURE 2. CS210 Wiring

5. Programming

This section is for users who write their own datalogger programs. A datalogger program to measure this sensor can be created using Campbell Scientific's Short Cut Program Builder Software. You do not need to read this section to use Short Cut.

The relative humidity signal from the CS210 is measured using a single-ended analog measurement (CRBasic instruction SEVolt or Edlog Instruction 1). The CR200 series and 21X use a control port to power the CS210. At the beginning of the program, the control port needs to be turned on, and the port should remain on. It takes the CS210 approximately 10 seconds for the reading to become stable after the port has been turned on. Depending on the scan rate, the first few measurements from the CS210 could be low.

The probe output scale is 0 to 1000 millivolts for the relative humidity range of 0 to 100%. Table 2 provides calibration information for relative humidity.

TABLE 2. Calibration for Relative Humidity

Units	Multiplier (% mV^{-1})	Offset (%)
Percent	0.1	0

5.1 CRBasic Examples

Example 1 is a sample CRBasic program written for a CR1000, but our CR800, CR850, CR3000, CR5000, and CR9000(X) dataloggers are programmed similarly.

Example 2 is a CRBasic program written for a CR200 datalogger. The CR200 program turns on control port 2 to power the CS210. Notice that the scan rate is set at 10 seconds. The sensor won't give a good reading until the second scan.

Example 1. Sample CR1000 Program

```
'CR1000 Series Datalogger

'SENSOR WIRING
'CS210
'Black: 5V
'White: SE1
'Clear: G

'Declare Public Variables
Public PanelTempC
Public Batt_Volt
Public Enc_RH
```

```
'Define Data Tables
DataTable (Daily,1,-1)
    DataInterval (0,1,Day,10)
    Minimum (1,Batt_Volt,FP2,0,False)
    Minimum (1,PanelTempC,FP2,False,False)
    Maximum (1,PanelTempC,FP2,False,False)
    Maximum (1,Enc_RH,FP2,False,False)
EndTable

'Main Program
BeginProg
    Scan (10,Sec,0,0)
        PanelTemp (PanelTempC,250)
        Battery (Batt_volt)
        'Measure CS210. Sensor is on all the time. Don't need a delay.
        VoltSe (Enc_RH,1,mV2500,1,1,0,250,0.1,0)
        'Set the sensor to 100% if it exceeds 100%.
        If Enc_RH > 100 Then Enc_RH = 100

        CallTable Daily
    NextScan
EndProg
```

Example 2. Sample CR200 Program

```
'CR200 Series Datalogger
'To create a different opening program template, type in new
'instructions and select Template | Save as Default Template
'date:
'program author:

'SENSOR WIRING
'CS210
'Black: C2
'White: SE1
'Clear: G

'Declare Public Variables
'Example:
Public batt_volt
Public Enc_RH

'Define Data Tables
DataTable (Daily,1,-1)
    DataInterval (0,24,hr)
    Minimum (1,batt_volt,0,0)
    Maximum (1,Enc_RH,False,0)
EndTable
```

```
'Main Program
BeginProg
    Scan (10,Sec)
        Battery (Batt_volt)

        'Power the CS210 using C2 and leave it on.
        PortSet (C2,1 )
        VoltSe (Enc_RH,1,1,0.1,0)
        'Set the sensor to 100% if it exceeds 100%.
        If Enc_RH > 100 Then Enc_RH = 100

        CallTable Daily
    NextScan
EndProg
```

5.2 Edlog Examples

Example 3 is a portion of a CR10(X) program, but our CR500, CR510, and CR23X dataloggers are programmed similarly. Wiring used for the CR10(X) program is included in Table 3.

Example 4 is an Edlog program written for a 21X Micrologger; wiring used for the 21X program is included in Table 3. The 21X program turns on control port 1 to power the CS210. Notice that the scan rate is set at 10 seconds. The sensor won't give a good reading until the second scan.

TABLE 3. Wiring for Examples 3 and 4

Description	Color	CR10(X)	21X
Relative Humidity	White	SE 6 (3L)	SE 1 (1H)
Signal & Power Reference	Clear	G	G
Power	Black	5 VDC	C1

Example 3. Sample CR10(X) Program

```
;Measure the CS210 relative humidity.
;
01:  Volt (SE) (P1)
   1:   1              Reps
   2:   5              2500 mV Slow Range        ;CR510 (2500 mV); CR23X (1000 mV)
   3:   6              SE Channel                ;White wire (SE 6), Clear wire (G)
   4:   3              Loc [ RH_enc    ]
   5:   .1             Mult
   6:   0              Offset
```

Example 4. Sample 21X Program

```
;{21X}
;
*Table 1 Program
  01: 10            Execution Interval (seconds)

1: Batt Voltage (P10)
  1:  1             Loc [ Batt_Volt ]

2: Panel Temperature (P17)
  1:  2             Loc [ PnlTempC  ]

;Turn the CS210 on and leave it on.
;The CS210 needs approximately 10 seconds to stabilize. First scan will be low.

3: Do (P86)
  1:  41            Set Port 1 High

4: Volt (SE) (P1)
  1:  1             Reps
  2:  15            5000 mV Fast Range
  3:  1             SE Channel
  4:  3             Loc [ Enc_RH    ]
  5:  0.1           Multiplier
  6:  0             Offset

5: If time is (P92)
  1:  0             Minutes into a
  2:  1440          Minute Interval
  3:  10            Set Output Flag High

6: Set Active Storage Area (P80)
  1:  1             Final Storage
  2:  100           Array ID

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

8: Minimum (P74)
  1:  1             Reps
  2:  0             Value Only
  3:  1             Loc [ Batt_Volt ]

9: Minimum (P74)
  1:  1             Reps
  2:  0             Value Only
  3:  2             Loc [ PnlTempC  ]

10: Maximum (P73)
  1:  1             Reps
  2:  0             Value Only
  3:  2             Loc [ PnlTempC  ]
```

```
11:  Maximum (P73)
   1:   1              Reps
   2:   0              Value Only
   3:   3              Loc [ Enc_RH    ]

*Table 2 Program
   02:  0.0000         Execution Interval (seconds)

*Table 3 Subroutines

End Program
```

6. Enclosure Humidity

Change the enclosure desiccant packs (model number 4905) when the enclosure relative humidity exceeds 40%.

Campbell Scientific recommends that all cable entry ports, that do not use a sealed bulkhead connector, be sealed with plumbers putty and that desiccant packs be placed inside the enclosure. Spikes in the enclosure humidity are a result of opening the enclosure door and allowing ambient air inside the enclosure. The enclosure relative humidity will return its nominal values (values before the enclosure door was opened) in approximately three to four hours.

7. Maintenance

The CS210 does not have any user serviceable parts nor does it require any routine maintenance.

Replace the CS210 probe every three to five years of continuous use. If the probe fails, replace it with a new one.

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