INSTRUCTION MANUAL

HC2S3 Temperature and Relative Humidity Probe

Revision: 4/17

®

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.

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

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CAMPBELL® SCIENTIFIC

Campbell Scientific (Canada) Corp.
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Assistance

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CAMPBELL SCIENTIFIC (CANADA) CORP.
RMA#_____
14532 131 Avenue NW
Edmonton, Alberta T5L 4X4
Canada

For all returns, the client must fill out a "Statement of Product Cleanliness and Decontamination" form and comply with the requirements specified in it. The form is available from our web site at *www.campbellsci.ca/repair*. A completed form must be either emailed to *repair@campbellsci.ca* or faxed to (780) 454-2655. Campbell Scientific (Canada) Corp. is unable to process any returns until we receive this form. If the form is not received within three days of product receipt or is incomplete, the product will be returned to the client at the client's expense. Campbell Scientific (Canada) Corp.f reserves the right to refuse service on products that were exposed to contaminants that may cause health or safety concerns for our employees.

Precautions

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND **TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC**. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.ca or by telephoning (780) 454-2505 (Canada). You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified personnel (e.g. engineer). If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General

- Prior to performing site or installation work, obtain required approvals and permits.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a **hardhat** and **eye protection**, and take **other appropriate safety precautions** while working on or around tripods and towers.
- **Do not climb** tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- **You can be killed** or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in **contact with overhead or underground utility lines**.
- Maintain a distance of at least one-and-one-half times structure height, 6 meters (20 feet), or the distance required by applicable law, **whichever is greater**, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CLIENT ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.

PLEASE READ FIRST

About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. (CSI) primarily for the US market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

Area:	1 in^2 (square inch) = 645 mm^2
Length:	1 in. (inch) = 25.4 mm
	1 ft (foot) = 304.8 mm
	1 yard = 0.914 m
	1 mile = 1.609 km
Mass:	1 oz. (ounce) = 28.35 g
	1 lb (pound weight) = 0.454 kg
Pressure:	1 psi (lb/in2) = 68.95 mb
Volume:	1 US gallon = 3.785 litres

In addition, part ordering numbers may vary. For example, the CABLE5CBL is a CSI part number and known as a FIN5COND at Campbell Scientific Canada (CSC). CSC Technical Support will be pleased to assist with any questions.

About sensor wiring

Please note that certain sensor configurations may require a user supplied jumper wire. It is recommended to review the sensor configuration requirements for your application and supply the jumper wire is necessary.

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Model HC2S3 Temperature and Relative Humidity Probe

1. Introduction

The HC2S3 is a rugged, accurate temperature and relative humidity probe that is ideal for long-term, unattended applications. The probe uses Rotronic's IN1 capacitive sensor to measure relative humidity and a 100 Ω PRT to measure temperature. For optimum results, the HC2S3 should be recalibrated annually.

Before using the HC2S3, please study

- Section 2, *Precautions (p. 1)*
- Section 3, *Initial Inspection (p. 1)*
- Section 4, *QuickStart (p. 2)*

For Edlog datalogger support, check the availability of an older manual at *www.campbellsci.com/old-manuals*, or contact a Campbell Scientific application engineer for assistance.

2. Precautions

- READ AND UNDERSTAND the *Safety* section at the front of this manual.

- When opening the shipping package, do not damage or cut the cable jacket. If damage to the cable is suspected, consult a Campbell Scientific application engineer.

- Although rugged, the HC2S3 should be handled as a precision scientific instrument.

- Do not touch the sensor element.

- Santoprene® rubber, which composes the black outer jacket of the HC2S3 cable, will support combustion in air. It is used because of its resistance to temperature extremes, moisture, and UV degradation. It is rated as slow burning when tested according to U.L. 94 H.B. and passes FMVSS302. However, local fire codes may preclude its use inside buildings.

3. Initial Inspection

- Check the packaging and contents of the shipment. If damage occurred during transport, immediately file a claim with the carrier. Contact Campbell Scientific to facilitate repair or replacement.

- Check model information against the shipping documents to ensure the expected products and the correct lengths of cable are received. Model numbers are found on each product. On cables and cabled items, the model number is usually found at the connection end of the cable. Report any shortages immediately to Campbell Scientific.

- Refer to Section 3.1, *Ships With* *(p. 2)*, to ensure that parts are included. The HC2S3 probe and its calibration card are shipped in a small box, with the box and pn 27731 Hex Plug attached to the cable.

3.1 Ships With

The HC2S3 ships with:

(1) 27731 Gill Radiation Shield Hex Plug
(1) Calibration Card
(1) *ResourceDVD*

4. QuickStart

Short Cut is an easy way to program your datalogger to measure the HC2S3 sensor and assign datalogger wiring terminals. *Short Cut* is available as a download on *www.campbellsci.com* and the *ResourceDVD*. It is included in installations of *LoggerNet*, *PC200W*, *PC400*, or *RTDAQ*.

Use the following procedure to get started.

1. Open *Short Cut*. Click **New Program**.
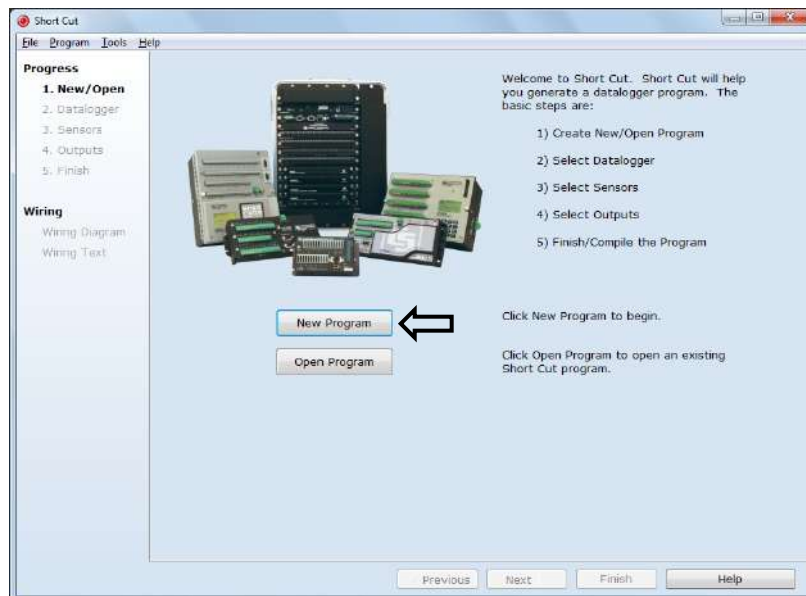
2. Select **Datalogger Model** and **Scan Interval** (default of **5** seconds is OK for most applications). Click **Next**.
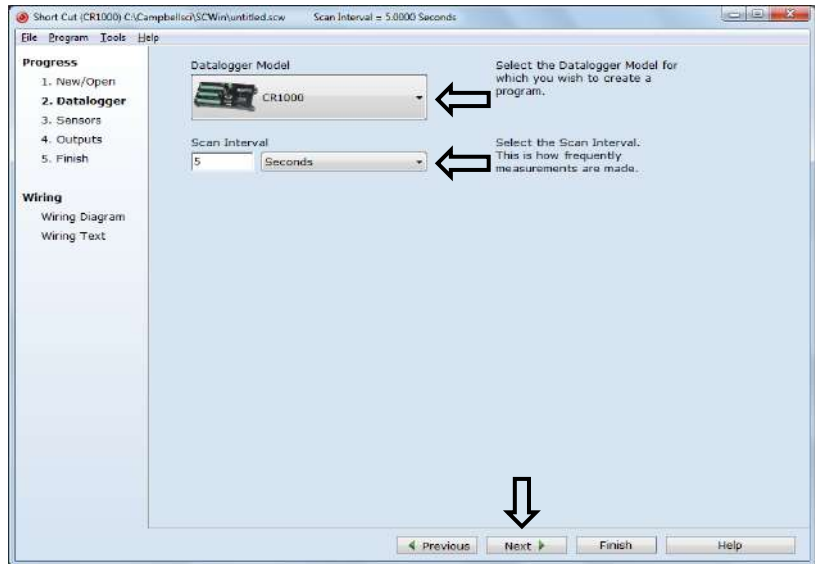
3. Under the **Available Sensors and Devices** list, select the **Sensors** | **Meteorological | Relative Humidity & Temperature | HC2S3 Temperature and Relative Humidity Sensor** folder. Choose either

   constant power or **panel-switched power** (uses less current). Click ➡ to move the selection to the **Selected** device window. Data defaults to degree Celsius. This can be changed by clicking the **Deg C** box and selecting **Deg F**, for degrees Fahrenheit, or **K** for Kelvin.
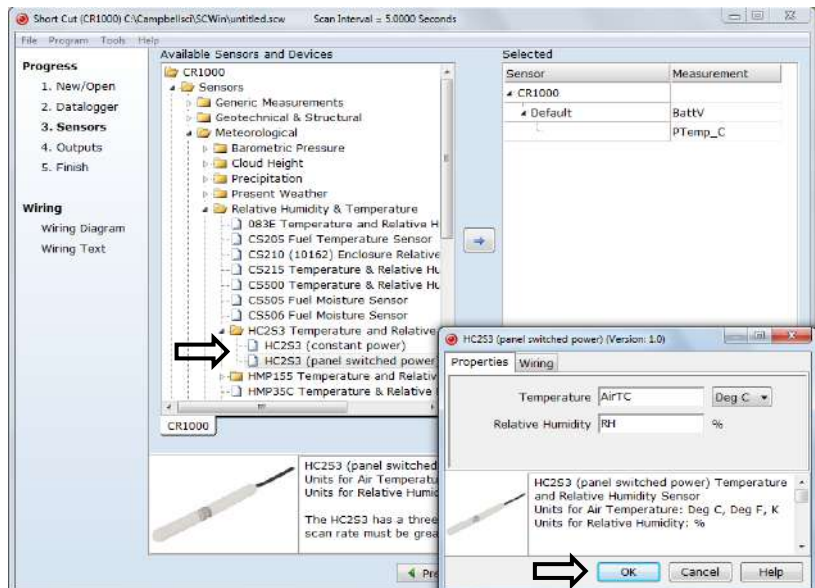
4. After selecting the sensor, click at the left of the screen on **Wiring Diagram** to see how the sensor is to be wired to the datalogger. The wiring diagram can be printed out now or after more sensors are added.
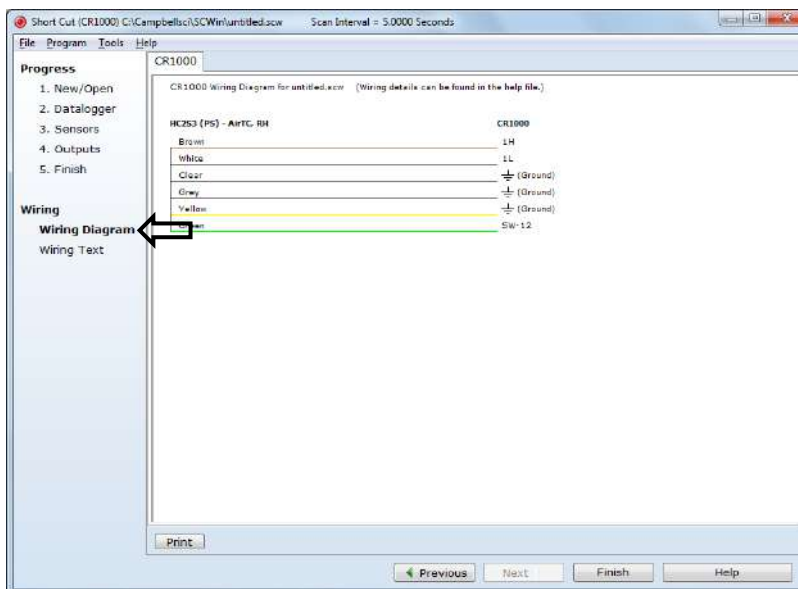
5. Select any other sensors you have, then finish the remaining *Short Cut* steps to complete the program. The remaining steps are outlined in *Short Cut Help*, which is accessed by clicking on **Help | Contents | Programming Steps**.

6. If *LoggerNet*, *PC400*, *RTDAQ*, or *PC200W* is running on your PC, and the PC-to-datalogger connection is active, you can click **Finish** in *Short Cut* and you will be prompted to send the program just created to the datalogger.

7. If the sensor is connected to the datalogger, as shown in the wiring diagram in step 4, check the output of the sensor in the datalogger support software data display to make sure it is making reasonable measurements.

5. Overview

The HC2S3 is a digital probe with linear voltage outputs for temperature and humidity and a UART serial interface. Its voltage signals can be measured with two single-ended or two differential inputs on the datalogger. Interfacing with the UART is described in Appendix E, *HC2S3 Digital Communications (p. E-1)*.

The digital-to-analog converter used to generate the analog output signals has 16-bit resolution. Temperature range and other default settings can be changed as described in Appendix D, *Changing the HC2S3 Settings (p. D-1)*.

A cable ordered through Campbell Scientific for the HC2S3 includes an internal voltage regulator that applies 3.3 V to the probe from a 5 to 24 V power source. 12V power is recommended for use with Campbell Scientific dataloggers. When minimizing power use is important, power can be switched on and off for the measurement, provided there is a three-second warm-up delay. Switching power avoids constant current flow through datalogger

ground, which can affect the accuracy of low-level single-ended voltage measurements.

Probes are polarity-protected by a keyed connector and diode in the connector interface provided with the Campbell Scientific cable.

Campbell Scientific offers two filters:

Polyethylene filter: Default filter, protection against fine dust particles, no water absorption or retention, good response time.

Teflon filter: Recommended for marine environments, slower response time than the polyethylene filter, ordered separately.

6. Specifications

Features:

- Well-suited for long-term, unattended applications
- Accurate and rugged
- Compatible with the following CRBasic dataloggers: CR200(X) series, CR6, CR800 series, CR1000, CR3000, CR9000(X)

Operating Limits:	–40 to 100 °C
Storage Temperature:	–50 to 100 °C
Probe Length:	85 mm (3.3 in), 183 mm (7.25 in) including connector
Probe Diameter:	15 mm (0.6 in)
Probe Weight:	10 g (0.35 oz)
Filter:	Polyethylene, optional Teflon ordered separately
Power Consumption:	<4.3 mA at 5 V <2.0 mA at 12 V
Supply Voltage (using CSI cable):	5 to 24 Vdc (12 Vdc recommended)
Start-Up Time:	1.5 s typical (Rotronic specification) Campbell Scientific recommends: 2 s at 60 °C 3 s at 0 °C 4 s at –40 °C
Maximum Startup Current:	<50 mA during 2 µs
Maximum Cable Length:	300 m (1000 ft) with 12 V power, 3 m (10 ft) with 5 V power

Analog outputs
    Offset at 0 V:
    Deviation from Digital Signal:
	±3 mV (maximum)
	< ±1 mV (0.1 °C, 0.1% RH)

6.1   Temperature Measurement

Sensor:	PT100 RTD, IEC 751 1/3 Class B, with calibrated signal conditioning
Measurement Range:	−50 to 100 °C (default −40 to 60 °C)
Output Signal Range:	0 to 1.0 V
Accuracy at 23 °C:	±0.1 °C with standard configuration settings
Long Term Stability:	<0.1 °C/year

Sensor Time Constant [63% step change (1 m/s air flow at sensor)]

Standard PE Filter:	≤22 s
Optional Teflon Filter:	≤30 s

Accuracy over Measurement Range:

Temperature Accuracy Graph
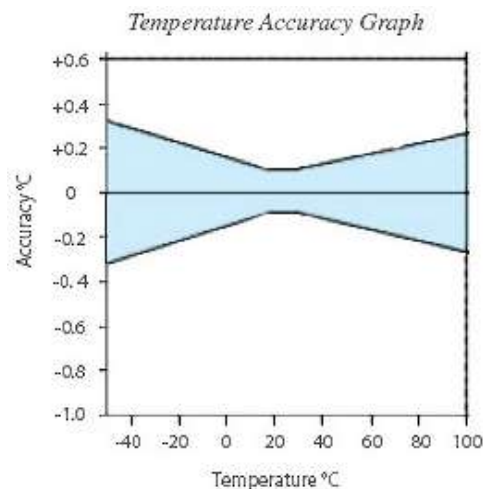
6.2   Relative Humidity Measurement

Sensor:	ROTRONIC Hygromer® IN1
Measurement Range:	0 to 100% non-condensing
Output Signal Range:	0 to 1.0 Vdc
Accuracy at 23 °C:	±0.8% RH with standard configuration settings
Typical Long-Term Stability:	<1% RH per year

Sensor Time Constant [63% of a 35 to 80% RH step change (1 m/s air flow at sensor)]

Standard PE Filter:	≤22 s
Optional Teflon Filter:	≤30 s

Accuracy over Temperature Range:
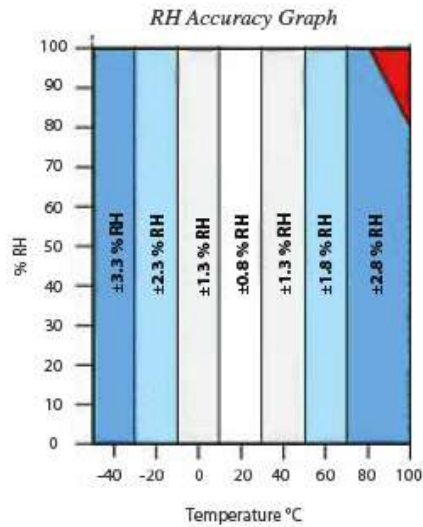
See Appendix D, *Changing the HC2S3 Settings (p. D-1)*, for default settings and digital interface information.

7. Installation

If you are programming your datalogger with *Short Cut*, skip Section 7.1, *Wiring to Datalogger (p. 7)*, and Section 7.2, *Datalogger Programming (p. 9)*. *Short Cut* does this work for you. See Section 4, *QuickStart (p. 2)*, for a *Short Cut* tutorial.

7.1 Wiring to Datalogger

Connections to Campbell Scientific dataloggers for measuring humidity and temperature using two single-ended or two differential analog inputs are given in TABLE 7-1 and TABLE 7-2. Use a single-ended analog measurement when the cable length is less than 6.1 m (20 ft), or if power is switched off between measurements. Otherwise, use a differential analog measurement. See Section 8.3, *Long Cable Lengths (p. 13)*, for a discussion on errors caused by long cable lengths.

	TABLE 7-1. Wire Color, Function, and Datalogger Connection for Single-Ended Measurement	
Wire Color	**Wire Function**	**Datalogger Connection Terminal**
Brown	Temperature signal	**U** configured for single-ended analog input[1], **SE** (single-ended, analog-voltage input)
White	Relative humidity signal	**U** configured for single-ended analog input, **SE**
Yellow	Signal reference	⏚ (analog ground)
Gray	Power ground	⏚
Clear	Shield	⏚
Green	Power	**12V** or **SW12V**
[1]U channels are automatically configured by the measurement instruction.		

CAUTION   When measuring the HC2S3 with single-ended measurements, the yellow and gray leads must both be connected to ⏚ on the datalogger. Doing otherwise will connect the datalogger's analog and power ground planes to each other, which in some cases can cause offsets on low-level analog measurements. To avoid 2 mA flowing into analog ground, switch power on/off for its measurement.

	TABLE 7-2. Wire Color, Function, and Datalogger Connection for Differential Measurement	
Wire Color	**Wire Function**	**Datalogger Connection Terminal**
Brown	Temperature signal	**U** configured for differential analog input H[1], **Diff H**
Jumper to Yellow	Temperature signal reference	**U** configured for differential analog input L, **Diff L**
White	Relative humidity signal	**U** configured for differential analog input H, **Diff H**
Yellow	Signal reference	**U** configured for differential analog input L, **Diff L**
Gray	Power ground	**G**
Clear	Shield	⏚
Green	Power	**12V** or **SW12V**
[1]U channels are automatically configured by the measurement instruction.		

7.2 Datalogger Programming

Short Cut is the best source for up-to-date datalogger programming code. Programming code is needed when:

- Creating a program for a new datalogger installation
- Adding sensors to an existing datalogger program

If your data acquisition requirements are simple, you can probably create and maintain a datalogger program exclusively with *Short Cut*. If your data acquisition needs are more complex, the files that *Short Cut* creates are a great source for programming code to start a new program or add to an existing custom program.

NOTE	*Short Cut* cannot edit programs after they are imported and edited in *CRBasic Editor*.

A *Short Cut* tutorial is available in Section 4, *QuickStart (p. 2)*. If you wish to import *Short Cut* code into *CRBasic Editor* to create or add to a customized program, follow the procedure in Appendix A, *Importing Short Cut Code Into CRBasic Editor (p. A-1)*. Programming basics for CRBasic dataloggers are provided in the following sections. Complete program examples for select dataloggers can be found in Appendix B, *Example Programs (p. B-1)*.

7.2.1 VoltSE() Instruction

When cable lengths are shorter than 6.1 meters or when power is switched, the **VoltSE()** measurement instruction is used with CRBasic dataloggers (CR200(X)-, CR6-, and CR800-series, CR1000, CR3000) to measure both temperature and relative humidity from the HC2S3 sensor. The output scale is 0 to 1000 mV for the temperature range of –40 to 60 °C and 0 to 1000 mV for the relative humidity range of 0 to 100%.

```
VoltSE(Dest, Reps, Range, SEChan, MeasOff, SettlingTime,
Integ/FNotch, Mult, Offset)
```

Variations:

- Temperature reported as °C ― set **Mult** to **0.1** and **Offset** to **-40**

- Temperature reported as °F ― set **Mult** to **.18** and **Offset** to **-40**

- Humidity reported as a percent – set **Mult** to **0.1** and **Offset** to **0**

- Humidity reported as a fraction – set **Mult** to **0.001** and **Offset** to **0**

NOTE	When the probe is connected to a CS110 Electric Field Meter, the probe is measured by the CS110's internal CR1000 datalogger module using **VoltSE()** instructions. Relative humidity and temperature signals are measured on single-ended channels 1 and 2, respectively. 250 μs integration should be used in the **VoltSE()** instructions.

7.2.2 VoltDiff() Instruction

When cable lengths are longer than 6.1 meters or when the sensor is constantly powered, the **VoltDiff()** measurement instruction is used to measure the HC2S3 sensor. The output scale is 0 to 1000 mV for the temperature range of –40 to 60 °C and 0 to 1000 mV for the relative humidity range of 0 to 100%.

```
VoltDiff(Dest, Reps, Range, DiffChan, RevDiff, SettlingTime,
Integ/FNotch, Mult, Offset)
```

Variations:

- Temperature reported as °C — set **Mult** to **0.1** and **Offset** to **-40**

- Temperature reported as °F — set **Mult** to **.18** and **Offset** to **-40**

- Humidity reported as a percent – set **Mult** to **0.1** and **Offset** to **0**

- Humidity reported as a fraction – set **Mult** to **0.001** and **Offset** to **0**

7.3   Installation

Sensors should be located over an open, level area at least 9 m (EPA) in diameter. The surface should be covered by short grass or the natural earth surface where grass does not grow. Sensors should be located at a distance of at least four times the height of any nearby obstruction and at least 30 m (EPA) from large, paved areas. Sensors should be protected from thermal radiation and adequately ventilated. Protect the filter at the top of the sensor from exposure to liquid water. The hydrophobic nature of the filter repels light rain, but driving rain can force itself into the pore structure of the filter and take time to dry out.

Standard measurement heights:

> 1.5 m (AASC)
> 1.25 to 2.0 m (WMO)
> 2.0 m (EPA)

See Section 10, *Attributions and References (p. 15)*, for a list of references that discuss temperature and relative humidity sensors.

When used in the field, the HC2S3 must be housed in a radiation shield such as the 41003-5 or RAD10 naturally aspirated shields, or the 43502 motor-aspirated shield (please refer to the 43502 product manual for installation details).

The white color of these shields reflects solar radiation, and the louvered construction allows air to pass freely through, thereby keeping the probe at or near ambient temperature. The RAD10 uses a double-louvered design that offers improved sensor protection from insect intrusion and driving rain and snow. In addition, the RAD10 shield has lower self-heating in bright sunlight combined with higher temperatures (> 24 °C (75 °F)) and low wind speeds (< 2 m/s (4.5 mph)), giving a better measurement.

The 41003-5 and RAD10 Radiation Shields attach to a crossarm, mast, or user-supplied pipe with a 2.5 to 5.3 cm (1.0 to 2.1 in) outer diameter. See FIGURE 7-1 and FIGURE 7-2 for examples of shield mounting.

Tools required for installing an HC2S3 sensor in a radiation shield to a tripod or tower include:

- 1/2 inch open-end wrench
- small screwdriver provided with datalogger
- UV-resistant cable ties
- small pair of diagonal-cutting pliers
- adjustable wrench with a minimum 1-7/8 inch jaw size

Attach the probe to the cable by aligning the keyed connectors, pushing the connectors together, and tightening the knurled ring.

7.3.1 Installation in a 41003-5 10-Plate Shield

1. The HC2S3 is shipped with an adapter to work with the 41003-5 10-plate shield. Loosely thread the collar adapter into the base of the 10-plate shield.
2. Insert the HC2S3 sensor into the collar. Leave about 2.5 cm (1 in) of the sensor exposed below the collar. See FIGURE 7-1.
3. Hold the collar and sensor, and finish threading the collar into the shield by hand. Tighten the collar around the probe until it firmly grips the body of the probe. Use an adjustable wrench if necessary, but do not overtighten the collar.

7.3.2 Installation in a RAD10 10-Plate Shield

1. Loosen the nut on the entry gland at the bottom of the shield.

2. Insert the sensor up into the gland. Leave about 2.5 cm (1 in) of the sensor exposed below the nut. See FIGURE 7-2.

3. Using an adjustable wrench, tighten the nut on the gland until the sensor is held firmly in place. Do not overtighten.

7.3.3 Mount the Shield

1. Attach the radiation shield to the tripod mast, crossarm, or tower leg using the supplied U-bolt. See FIGURE 7-1 and FIGURE 7-2 for examples of shield mounting.
2. Route the cable to the datalogger, and secure the cable to the mounting structure using cable ties.

FIGURE 7-1. HC2S3 and 41003-5 Radiation Shield on a CM200 Series Crossarm (left) and on a tripod mast (right)

FIGURE 7-2. HC2S3 and RAD10 Radiation Shield on a tripod mast

8. Operation

8.1 Measurement

The probe uses a Rotronic IN1 capacitive sensor to measure RH and a 100 Ω PRT to measure temperature. Campbell Scientific dataloggers measure the analog voltage outputs of the HC2S3 Temperature and Relative Humidity Probe with either **VoltSE()** or **VoltDiff()** measurement instructions.

8.2   Low Power Operation

The HC2S3 draws approximately 2 mA powered from 12V. The HC2S3 can be continuously powered from the 12V terminal, or power can be switched with the SW12V terminal to conserve battery life. When power is switched, a three-second warm-up period is required. This is programmed with the **Delay()** instruction, using 0 for the delay option.

8.3   Long Cable Lengths

For cable lengths longer than 6.1 m (20 ft), Campbell Scientific recommends measuring the voltage signals using differential inputs. Using single-ended measurements with long cable lengths introduces the errors discussed below. Connections for differential inputs are given in TABLE 7-2.

The signal reference (yellow) and the power ground (gray) are connected inside the HC2S3. When the HC2S3 temperature and relative humidity are measured using a single-ended analog measurement, the signal reference and power ground are both connected to ground at the datalogger, and both serve as the return path for power. The voltage will drop along those leads because the wire itself has resistance.

The HC2S3 draws approximately 2 mA when powered with 12 V. The wire used in the HC2S3 (pn 27746) has resistance of 14.74 Ω/304.8 m (1000 ft). Because 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 14.74 Ω/304.8 m (1000 ft), or 7.37 Ω/304.8 m (1000 ft). Using Ohm's law, the voltage drop (V_d), along the signal reference/power ground, is given by Eq. (1).

$$
\begin{aligned}
V_d &= I \times R \\
&= 2\text{ mA} \times 7.37\ \Omega/1000\text{ ft} \\
&= 14.7\text{ mV}/1000\text{ ft}
\end{aligned}
\tag{1}
$$

This voltage drop will raise the apparent temperature and relative humidity because the difference between the signal and signal reference lead at the datalogger has increased by V_d. The approximate error in temperature and relative humidity is 0.15 °C and 0.15% per 30.5 m (100 ft) of cable length, respectively (assuming a temperature range of –40 to 60 °C). When there are not enough inputs available on the datalogger to allow for differential measurements, single-ended measurements can be made and the errors associated with cable length subtracted as offsets.

9.   Toubleshooting and Maintenance

NOTE   All factory repairs and recalibrations require a returned material authorization (RMA) and completion of the "Declaration of Hazardous Material and Decontamination" form. Refer to the *Assistance* page at the beginning of this manual for more information.

9.1   Troubleshooting

Symptom: Relative Humidity is reported as **–9999**, **NAN**, **–40 °C**, or **0 %**

1.   Check that the sensor is wired to the correct analog input channels as specified by the measurement instructions.

2.   Verify the voltage range code for the single-ended or differential measurement instruction is correct for the datalogger type.

3.   Verify the green power wire is connected to the 12V, SW12V, or 5V terminal. Cables longer than 3 m (10 ft) should be powered by the 12V, rather than the 5V terminal.

4.   A voltmeter can be used to check the output voltage for temperature and relative humidity on the brown and white wires respectively (temperature °C = mV * 0.1 – 40.0; relative humidity % = mV * 0.1).

Symptom: Incorrect temperature or relative humidity

1.   Verify the multiplier and offset parameters are correct for the desired units (Section 7.2.1, *VoltSE() Instruction (p. 9)*, and Section 7.2.2, *VoltDiff() Instruction (p. 10)*) and temperature range.

2.   Default settings are listed in Appendix D, *Changing the HC2S3 Settings (p. D-1)*, which include the setting "Limit humidity output to 100%". This setting is "disabled" for probes purchased through Campbell Scientific. Accuracy of the humidity measurement over temperature is shown in the graph in Section 6, *Specifications (p. 5)*. For example, at –20 °C the accuracy is ±2.3%, so a reading of 102.3% at 100% humidity is within the accuracy specification. Programs created by *Short Cut* set humidity values greater than 100% and less than 103% to 100%. Humidity values greater than 103% are left unchanged to indicate a problem with the probe or measurement.

9.2   Maintenance

The HC2S3 probe requires minimal maintenance, but dust, debris, and salts on the filter cap will degrade sensor performance. Check the white filter on the end of the sensor for debris. If dirt or salt is engrained into the filter, it should be cleaned with distilled water or replaced. Make sure the filter is connected firmly with your fingers — do not over tighten.

Check the radiation shield monthly to make sure it is free from dust and debris. To clean the shield remove the sensor from the shield. Dismount the shield. Brush all loose dirt off. If more effort is needed, use warm, soapy water and a soft cloth or brush to thoroughly clean the shield. Allow the shield to dry before remounting.

Replace corroded, discolored or clogged filters. To replace the filter, unscrew the filter from the probe and pull it straight away, being careful not to bend or damage the sensors. Before putting on the replacement filter, check the alignment of the sensors with the probe, and if necessary, carefully correct the alignment before installing the filter.

The Teflon filter is recommended when the sensor is installed in close proximity to the ocean or other bodies of salt water. A coating of salt (mostly NaCl) may build up on the radiation shield, sensor, filter and even the sensors. A buildup of salt on the filter or sensors will delay or destroy the response to atmospheric humidity.

Long term exposure of the relative humidity sensor to certain chemicals and gases may affect the characteristics of the sensor and shorten its life. The resistance of the sensor depends strongly on the temperature and humidity conditions and the length of the pollutant influence.

The sensor should be calibrated annually. Please obtain an RMA number before returning the HC2S3 to Campbell Scientific for calibration. Please refer to *Warranty* and *Assistance* sections at the beginning of the manual.

10. Attributions and References

Santoprene® is a registered trademark of Exxon Mobile Corporation.

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Appendix A. Importing Short Cut Code Into CRBasic Editor

This tutorial shows:

- How to import a *Short Cut* program into a program editor for additional refinement

- How to import a wiring diagram from *Short Cut* into the comments of a custom program

Short Cut creates files, which can be imported into *CRBasic Editor*. Assuming defaults were used when *Short Cut* was installed, these files reside in the C:\campbellsci\SCWin folder:

- .DEF (wiring and memory usage information)
- .CR2 (CR200(X) datalogger code)
- .CR6 (CR6 datalogger code)
- .CR8 (CR800 datalogger code)
- .CR1 (CR1000 datalogger code)
- .CR3 (CR3000 datalogger code)
- .CR5 (CR5000 datalogger code)

Use the following procedure to import *Short Cut* code and wiring diagram into *CRBasic Editor*.

1. Create the *Short Cut* program following the procedure in Section 4, *QuickStart (p. 2)*. Finish the program and exit *Short Cut*. Make note of the file name used when saving the *Short Cut* program.

2. Open *CRBasic Editor*.

3. Click **File** | **Open**. Assuming the default paths were used when *Short Cut* was installed, navigate to C:\CampbellSci\SCWin folder. The file of interest has the .CR2, .CR6, .CR8, .CR1, .CR3, or .CR5 extension. Select the file and click **Open**.

4. Immediately save the file in a folder different from C:\Campbellsci\SCWin, or save the file with a different file name.

NOTE	Once the file is edited with *CRBasic Editor*, *Short Cut* can no longer be used to edit the datalogger program. Change the name of the program file or move it, or *Short Cut* may overwrite it next time it is used.

5. The program can now be edited, saved, and sent to the datalogger.

6. Import wiring information to the program by opening the associated .DEF file. Copy and paste the section beginning with heading "-Wiring for CRXXX–" into the CRBasic program, usually at the head of the file. After pasting, edit the information such that an apostrophe (') begins each line. This character instructs the datalogger compiler to ignore the line when compiling.

Appendix B. Example Programs

B.1 Example Program Using Single-Ended Measurement Instructions

The following example can be used directly with CR800 series, CR1000, CR3000, and CR5000 dataloggers.

CRBasic Example B-1. Program Measuring the HC2S3 with Single-Ended Inputs

```
'Program measures HC2S3 with single-ended inputs once every 5 seconds and stores
'the average temperature and a sample of the relative humidity every 60 minutes.

'Wiring Diagram
'==============
'HC2S3
'Wire      CR1000
'Color     Function                  Terminal
'------    --------                  --------
'Brown     Temperature signal        SE2
'White     Relative Humidity signal  SE1
'Yellow    Signal Reference          Ground Symbol
'Gray      Power Ground              Ground Symbol
'Clear     Shield                    Ground Symbol
'Green     Power                     12V

Public AirTC
Public RH

DataTable(Temp_RH,True,-1)
  DataInterval(0,60,Min,0)
  Average(1,AirTC,FP2,0)
  Sample(1,RH,FP2)
EndTable

BeginProg
  Scan(5,Sec,1,0)
    PortSet(9,1)                          'Turn on switched 12V
    Delay(0,3,Sec)                        '3-second delay
    'HC2S3 Temperature & Relative Humidity Sensor measurements AirTC and RH:
    VoltSE(RH,1,mV2500,1,0,0,_60Hz,0.1,0)
    VoltSe(AirTC,1,mV2500,2,0,0,_60Hz,0.1,-40)
    PortSet(9,0                  )   'Turn off switched 12V
    If RH>100 AND RH<103 Then RH=100
    CallTable(Temp_RH)
  NextScan
EndProg
```

B.2 Example Program Using Differential Measurement Instructions

The following example can be used directly with CR800 series, CR1000, CR3000, and CR5000 dataloggers.

CRBasic Example B-2. Program Measuring the HC2S3 with Differential Inputs

---

```
'CR1000 program to measure HC2S3 with differential measurements
'Program measures HC2S3 with differential inputs once every second and stores the
'average temperature and a sample of the relative humidity every 60 minutes.

'Wiring Diagram
'==============
'HC2S3
'Wire        CR1000
'Color       Function                     Terminal
'------      --------                     --------
'Brown       Temperature signal           1H
'Jumper
'to Yellow   Temperature signal reference 1L
'White       Relative Humidity signal     2H
'Yellow      Signal Reference             2L
'Gray        Power Ground                 G
'Clear       Shield                       Ground Symbol
'Green       Power                        12V

Public AirTC
Public RH

DataTable(Temp_RH,True,-1)
  DataInterval(0,60,Min,0)
  Average(1,AirTC,FP2,0)
  Sample(1,RH,FP2)
EndTable

BeginProg
  Scan(1,Sec,1,0)
    'HC2S3 Temperature & Relative Humidity Sensor measurements AirTC and RH:
    VoltDiff (AirTC,1,mV2500,1,True,0,_60Hz,0.1,-40)
    VoltDiff (RH,1,mV2500,2,True,0,_60Hz,0.1,0)
    If RH>100 AND RH<103 Then RH=100
    CallTable(Temp_RH)
  NextScan
EndProg
```

Appendix C. Absolute Humidity

The HC2S3 measures relative humidity. Relative humidity is defined by the equation below:

$$RH = \frac{e}{e_s} * 100 \qquad\qquad (A\text{-}1)$$

where RH is relative humidity, e is vapor pressure in kPa , and e_s is saturation vapor pressure in kPa. Vapor pressure, e, is an absolute measure of the amount of water vapor in the air and is related to the dew point temperature. Saturation vapor pressure is the maximum amount of water vapor that air can hold at a given air temperature. The relationship between dew point and vapor pressure, and air temperature and saturation vapor pressure are given by Goff and Gratch (1946), Lowe (1977), and Weiss (1977). Relative Humidity is relative to saturation above water, even below freezing point. This is why these sensors should not measure 100% RH below zero degrees C, as described in Appendix C.1, *Measurement Below 0 °C (p. C-2)*.

When the air temperature increases, so does the saturation vapor pressure. Conversely, a decrease in air temperature causes a corresponding decrease in saturation vapor pressure. It follows then from Eq. (A-1) that a change in air temperature will change the relative humidity, without causing a change absolute humidity.

For example, for an air temperature of 20 °C and a vapor pressure of 1.17 kPa, the saturation vapor pressure is 2.34 kPa and the relative humidity is 50%. If the air temperature is increased by 5 °C and no moisture is added or removed from the air, the saturation vapor pressure increases to 3.17 kPa and the relative humidity decreases to 36.9%. After the increase in air temperature, there is more energy to vaporize the water. However, the actual amount of water vapor in the air has not changed. Thus, the amount of water vapor in the air, relative to saturation, has decreased.

Because of the inverse relationship between relative humidity and air temperature, finding the mean relative humidity is often not useful. A more useful quantity is the mean vapor pressure. The mean vapor pressure can be computed by the datalogger program as shown in the following example.

CRBasic Example C-1. CR1000 Program that Computes Vapor Pressure and Saturation Vapor Pressure

```
'CR1000 program that calculates Vapor Pressure

'Wiring Diagram
'==============
'HC2S3
'Wire      CR1000
'Color     Function                  Terminal
'------    --------                  --------
'Brown     Temperature signal        SE2
'White     Relative Humidity signal  SE1
'Yellow    Signal Reference          Ground Symbol
'Gray      Power Ground              Ground Symbol
'Clear     Shield                    Ground Symbol
'Green     Power                     12V
```

```
Public AirTC
Public RH
Public RH_Frac, e_Sat, e_kPa

DataTable(Temp_RH,True,-1)
  DataInterval(0,60,Min,0)
  Average(1,AirTC,FP2,0)
  Sample(1,RH,FP2)
  Sample(1,e_kPa,FP2)
EndTable

BeginProg
  Scan(5,Sec,1,0)
    PortSet(9,1)                          'Turn on switched 12V
    Delay(0,3,Sec)                        '3-second delay
    'HC2S3 Temperature & Relative Humidity Sensor measurements AirTC and RH:
    VoltSE(AirTC,1,mV2500,2,0,0,_60Hz,0.1,-40.0)
    VoltSE(RH,1,mV2500,1,0,0,_60Hz,0.1,0)
    If RH>100 AND RH<103 Then RH=100
    PortSet(9,0)                          'Turn off switched 12V
    'Calculate Vapor Pressure
    'Convert RH percent to RH Fraction
    RH_Frac = RH * 0.01
    'Calculate Saturation Vapor Pressure
    SatVP(e_Sat, AirTC)
    'Compute Vapor Pressure, RH must be a fraction
    e_kPa = e_Sat * RH_Frac
    CallTable(Temp_RH)
  NextScan
EndProg
```

C.1 Measurement Below 0 °C

The HC2S3 provides a humidity reading that is referenced to the saturated water vapor pressure above liquid water, even at temperatures below 0 °C, where ice might form. This is the common way to express relative humidity and is as defined by the World Meteorological Organization. If an RH value is required referenced to ice, the HC2S3 readings will need to be corrected.

One consequence of using water as the reference is that the maximum humidity that will normally be output by the sensor for temperatures below freezing is as follows:

100%RH at 0 °C	82%RH at –20 °C
95%RH at –5 °C	78%RH at –25 °C
91%RH at –10 °C	75%RH at –30 °C
87%RH at –15 °C	

In practical terms this means that, for instance, at –20 °C the air is effectively fully saturated when the sensor outputs 82% RH.

Appendix D. Changing the HC2S3 Settings

D.1 HC2S3 Default Settings

The HC2S3 probe has the following default settings, which can be changed as described in the following sections. Additional information can be found in Rotronic's User Manual: E-M-HC2 Probes-VXXXX, which can be downloaded from Rotronic's website *www.rotronic-usa.com*.

Default Settings:

Configurable Settings	Factory Default
Unit system (Metric or English)	Metric
Psychrometric calculation	None
Output 1 parameter, scale and unit	Humidity: 0...100% RH
Output 2 parameter, scale and unit	Temperature: –40...+60 deg C
Communications Protocol	RO-ASCII
RS-485 Address	0
Device name	Probe type
Humidity / temperature adjustment	
Device write protection	Disabled
Limit humidity output to 100% RH	Disabled
Out-of-limit value digital alarm	Disabled
Data recording	Enabled (loop mode - 10 min interval)
Automatic humidity sensor test	Disabled
Humidity sensor drift compensation	Disabled
Fail safe mode	Disabled
Simulator mode	Disabled

Digital Interface:

Interface Type: UART (Universal Asynchronous Receiver Transmitter)

Organization: Dialog, duplex

Default Configuration:
> Baud rate: 19200
> Parity: none
> Data bits: 8
> Stop fits: 1
> Flow Control: none

Logical Levels:
> Logical 0: <= 0.3V*VDD
> Logical 1: <= 0.8V*VDD

D.2 Software and Hardware Requirements

For temperature (Analog Output 2), the HC2S3 default range is –40 to 60 °C for 0 to 1V. Changing the range requires Rotronic HW4 Software (Version 2.1.0 or higher), and the Rotronic model AC3001 USB adapter cable. Power to the probe is provided by the USB port.

IMPORTANT

Prior to using the AC3001 cable, the ROTRONIC USB driver must be installed on the PC. Both the driver and the installation instructions (document **E-M-HW4v3-Main**) are located on the HW4 CD.

D.3 Changing the Temperature Range

Install the HW4 software and drivers for the AC3001 USB cable on the PC. Connect the HC2S3 probe to the AC3001 cable, making sure the connectors are properly aligned before tightening the knurled ring. Plug the AC3001 cable into a USB port on the computer.

From the main screen, click on the "devices and groups", search for "master devices", USB masters.
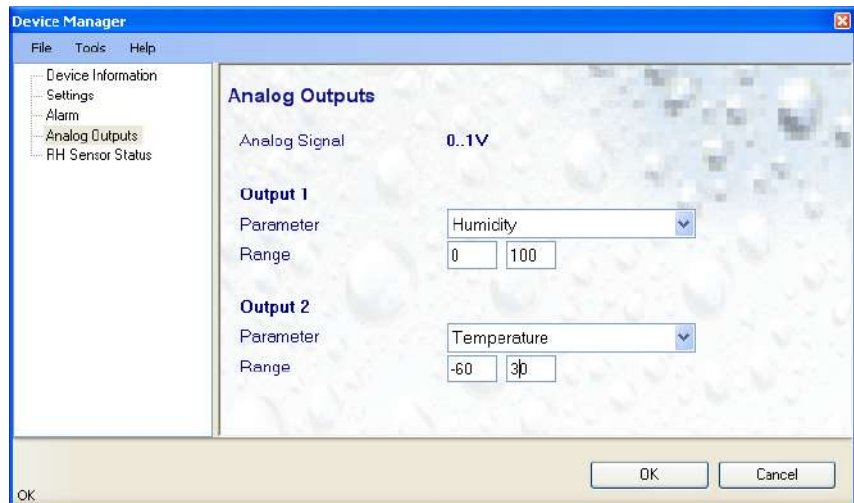
HW4 should find the probe, and show the current values:
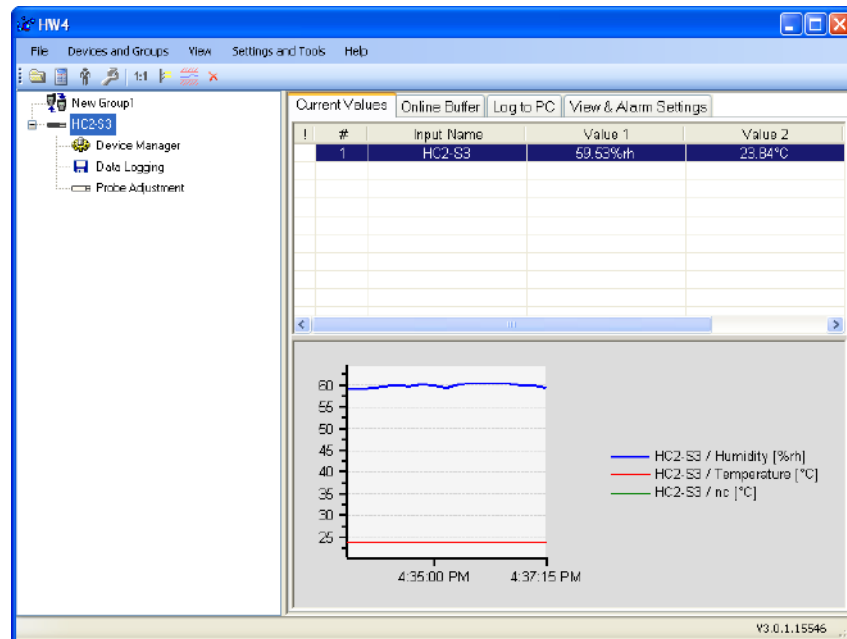
Click on "Device Manager", select "Analog Outputs" to see the following screen:
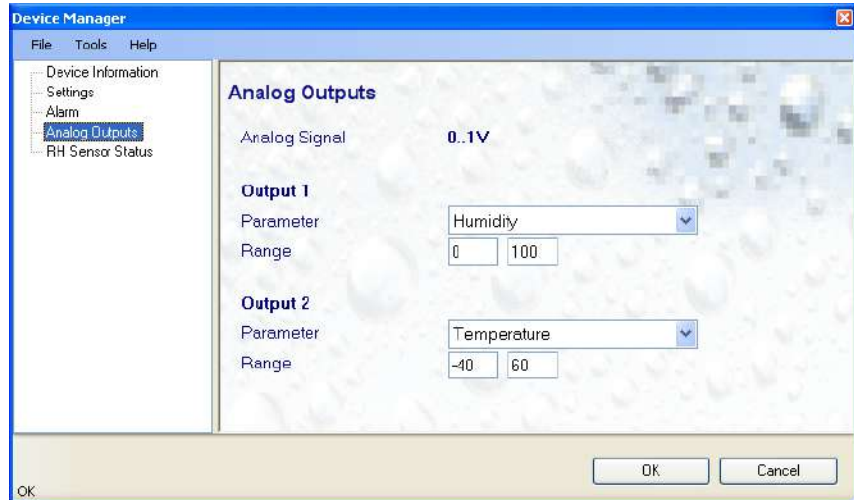
Change the lower and upper range values and click "OK". The following screen shows the range –60 to +30:

D.4 Multiplier and Offsets for Temperature Range

Analog Output 2 is 0 to 1V (1000 mV) for the temperature range. If the range has been changed from the default (–40 to +60), then the multiplier and offset for the measurement instruction will have to be changed from those shown for the program examples in Appendix B, *Example Programs (p. B-1)*. For example, for a range of –60 to 30, the multiplier to convert the measurement result (mV) to temperature, is the full scale range of temperature divided by the full scale range of mV, and the Offset is -60.0 as shown below:

Multiplier = mV * (90°C/1000 mV)
　　　　　= 0.09

Offset　　 = –60.0

Example measurement instructions for CR1000 datalogger, with the sensor wired to SE channel 2:

```
Public AirTC
VoltSe (AirTC,1,mV2500,2,0,0,_60Hz,0.09,-60)
```

Appendix E. HC2S3 Digital Communications

E.1 HC2S3 Digital Interface Specifications

The HC2S3 has a UART (Universal Asynchronous Receiver Transmitter) that provides two-way digital communications with the probe. Interface cables can be ordered through Rotronics for connecting the probe to an RS-485 port (Rotronic pn E2-05XX-MOD), a computer's RS-232 port (Rotronic pn AC3002), or USB port (Rotronic pn AC3001).

Connections to a Campbell Scientific datalogger through an MD485 RS485 Interface or SDM-SIO1 Serial I/O Module with the Rotronic E2-05XX-MOD RS-485 cable are described in Appendix E.3, *RS-485 Communications using an MD485 RS-485 Interface (p. E-3)*, and Appendix E.4, *RS-485 Communications using an SDM-SIO1 Serial I/O Module (p. E-5)*, respectively.

HC2S3 Digital Interface Specifications:

Interface Type: UART (Universal Asynchronous Receiver Transmitter)

Organization: Dialog, duplex

Default Configuration:
Baud rate: 19200
Parity: none
Data bits: 8
Stop fits: 1
Flow Control: none

Logical Levels:
Logical 0: <= 0.3V*VDD
Logical 1: <= 0.8V*VDD

E.2 HC2S3 Communications Protocol

Complete information on the HC2S3 Commands and Communication Protocol can be found in the Rotronic E-M-AC3000-CP_XX manual, available from Rotronic's website *www.rotronic-usa.com*.

The "RDD" command to "Read Values" is used in the example datalogger programs to get temperature and relative humidity values from the probe, and is described below.

RDD command: read values

Returns the measured and calculated values as well as the information necessary to interpret the data (calculated parameter type, engineering units, status, serial number and name of the device, etc.)

Command Format:

{	ID	Adr	RDD	Chksum or }	CR

Answer format:

{	ID	Adr	RDD	Chksum or }	CR

The data are returned according to the following structure:

Example	Type	Description
1..3	Byte	Probe type (1= digital probe, 2=analog probe, 3=pressure probe)
1234.56	Float	Relative humidity or analog value
%RH	String	Humidity or analog value engineering unit
0..1	Bool	Humidity or analog value alarm (out-of-limits)
+	Char	Humidity or analog value trend (+,-,= or " ")
1234.56	Float	Temperature value
°C	String	Temperature engineering unit
0..1	Bool	Temperature alarm (out-of-limits)
=	Char	Temperature trend (+,-,= or " ")
Dp	String	Calculated parameter type (nc: no calculation, Dp: dew point, Fp: frost point)
1234.56	Float	Calculated numerical value
°C	String	Calculated parameter engineering unit
0..1	Bool	Calculated parameter alarm (out-of-limits)
+	Char	Calculated parameter trend (+,-,= or " ")
1..255	Byte	Device type (HygroClip, Logger, HF, HM, …)
V1.0	String	Firmware version
12345678	String	Device serial number
Name	String	Device name
000…255	Byte	Alarm Byte: (Bit0=out-of-limits value, Bit5= sensor quality, Bit6 = humidity simulator, Bit7= temperature simulator)

Example data returned from the RDD command:

{F00RDD} CR

{F00rdd 001; 4.45;%RH;000;=; 20.07;°C;000;=;nc;---.-;°C;000; ;001;V1.7-1;0060568338;HC2-S3 ;000;4

# E.3 RS-485 Communications using an MD485 RS-485 Interface

The HC2S3 can be interfaced to a Campbell Scientific datalogger through an MD485 RS-485 Interface using the Rotronic E2-05XX-MOD RS485 cable as described below. Settings for the RS485 port on the MD485 must be configured to match the configuration of the HC2S3, which are 19200 baud, No Parity, 8 Data Bits, 1 Stop bit, and No Flow Control.

Device Configuration Utility (Campbell Scientific software available as a free download) is used to configure the MD485. Configuration settings for the MD485 are shown below:

    MD485 Tab: CS I/O AND RS-485
    CS I/O Tab: SDC Address 7
    RS485 Tab: RS485 baud 19200
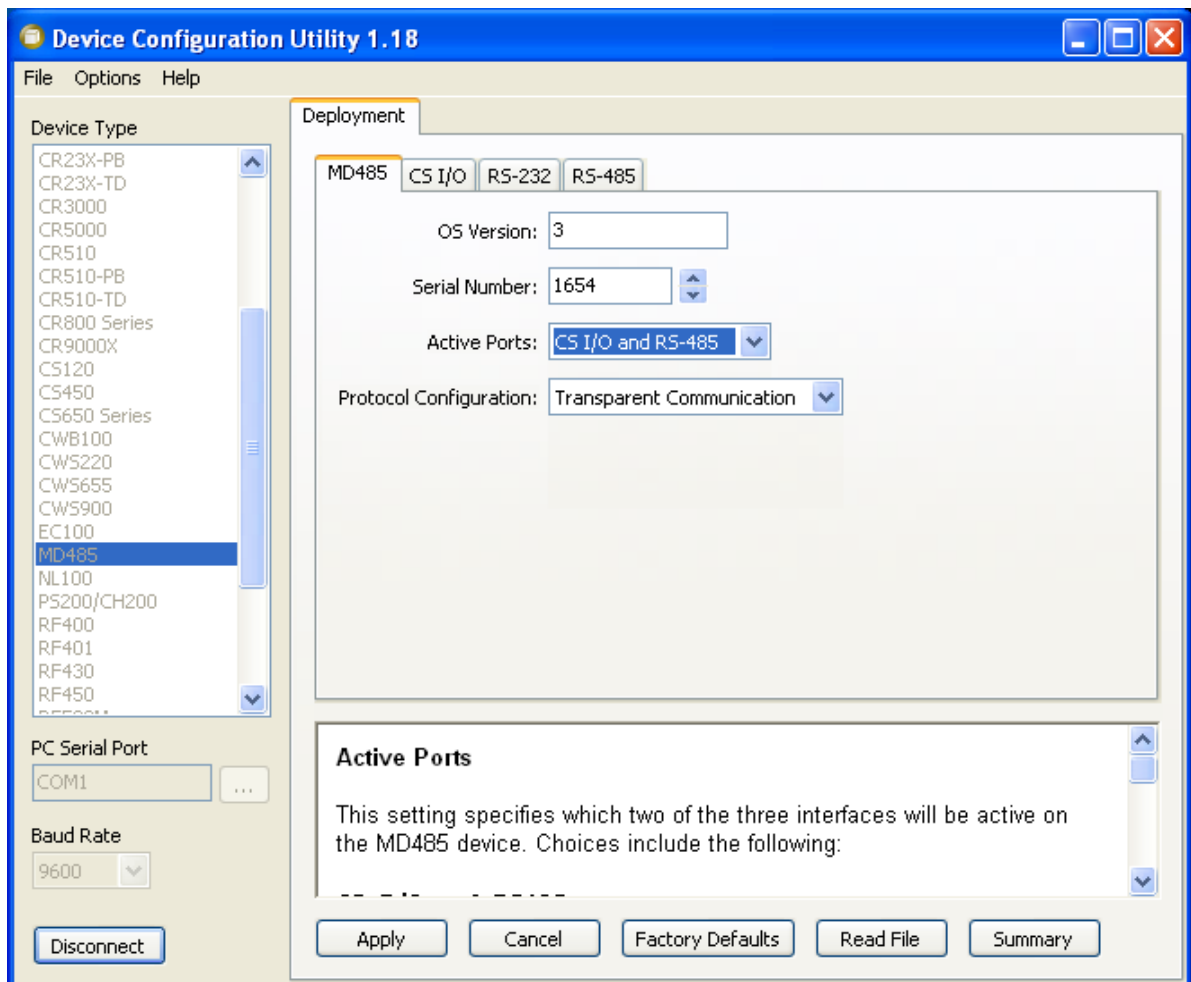
Sensor Wiring:

E2-05XX-MOD Cable	MD485	CR1000
Blue	A	
Red	B	
Green		12V
Gray/Yellow		G
Clear		Ground Symbol

NOTE	If the Rotronic cable includes brown and white wires (voltage signals for temperature and humidity), Campbell Scientific recommends "capping" them with pn 27749 or equivalent insulated caps to prevent the possibility of shorting.

Connect the CS I/O port of MD485 to CS I/O port on CR1000 with an SC12 cable.

The following example CR1000 program configures the CS I/O port as COMSDC7 using the SerialOpen instruction, sends the RDD (Read Values) command "|{F00RDD}CR" to the probe, and parses temperature and relative humidity values from the data string returned by the probe.

CRBasic Example E-1. Program Measuring the HC2S3 Using RS-485

```
'CR1000 Program
'Declare variables

Public SerialIndest As String * 100
Dim String_1 As String
Const CRLF=CHR(13)+CHR(10)
Dim HC2S3_Split(17) As String * 40
Alias HC2S3_Split(2) = RH_Str                'RH string.
Alias HC2S3_Split(6) = TempC_Str             'Temp string.
Alias HC2S3_Split(17) = HC2S3_SN_Str         'HC2S3 serial number string.
Public TempC, RH, NBytesReturned

DataTable (Table1,1,-1)
  DataInterval (0,15,Min,10)
  Average (1,TempC,FP2,False)
  Sample (1,RH,FP2)
EndTable

BeginProg
  SerialOpen (ComSDC7,19200,0,0,100)         'Configure CS I/O port
  String_1 = "|{F00RDD}"+CRLF                'RS485 command to send data

  Scan (5,Sec,0,0)
    SerialFlush (34)
    SerialOut (ComSDC7,String_1,0,2,100)     'Send command to send data
    Delay (0,500,mSec)
    'Get data from probe
    SerialInRecord (ComSDC7,SerialIndest,&H6464,0,&H3B48,NBytesReturned,01)
    'Parse RH and temp from string
    SplitStr (HC2S3_Split(),SerialIndest,";",17,7)
    RH=RH_Str
    TempC=TempC_Str

    CallTable Table1
  NextScan
EndProg
```

E.4 RS-485 Communications using an SDM-SIO1 Serial I/O Module

The HC2S3 can be interfaced to a Campbell Scientific datalogger through an SDM-SIO1 Serial I/O Module using the Rotronic E2-05XX-MOD RS485 cable as described below.

The example program uses the SerialOpen instruction to configure the SDM-SIO1 for RS-485 half duplex, "COMport 32" at 19200 baud, no parity, 1 stop bit, and 8 data bits, and serial instructions to send the RDD command to get temperature and relative humidity data from the probe.

Sensor Wiring:

E2-05XX-MOD Cable	SDM-SIO1	CR1000
Blue	Z	
Red	Y	
Gray/Yellow		G
Green		12V
Clear		Ground

SDM-SIO1 Wiring:

SDM-SIO1	CR1000
C1	C1
C2	C2
C3	C3
G	G
12V	12V

NOTE   If the Rotronic cable includes brown and white wires (voltage signals for temperature and humidity), Campbell Scientific recommends "capping" them with pn 27749 or equivalent insulated caps to prevent the possibility of shorting.

CRBasic Example E-2. Program Measuring the HC2S3 Using the SDM-SIO1

```
'CR1000 Program
'Declare variables
Public SerialIndest As String * 100
Dim String_1 As String
Const CRLF=CHR(13)+CHR(10)
Dim HC2S3_Split(17) As String * 40
Alias HC2S3_Split(2) = RH_Str                   'RH string.
Alias HC2S3_Split(6) = TempC_Str                'Temp string.
Alias HC2S3_Split(17) = HC2S3_SN_Str            'HC2S3 serial number string.
Public TempC, RH, NBytesReturned
Const SensorPort=32                             'SDM-SIO1 rotary switch set at 0

DataTable (Table1,1,-1)
  DataInterval (0,15,Min,10)
  Average (1,TempC,FP2,False)
  Sample (1,RH,FP2)
EndTable

BeginProg
  SerialOpen (SensorPort,19200,51,100,200)     '51 is for half duplex
  String_1 = "|{F00RDD}"+CRLF                   'RS485 command to send data

  Scan (5,Sec,0,0)
    SerialFlush (SensorPort)
    SerialOut (SensorPort,String_1,0,1,100)     'Send command to send data
    Delay (0,500,mSec)
    'Get data from probe
    SerialInRecord (SensorPort,SerialIndest,&H6464,0,&H3B48,NBytesReturned,01)
    'Parse RH and temp from string
    SplitStr (HC2S3_Split(),SerialIndest,";",17,7)
    RH=RH_Str
    TempC=TempC_Str

    CallTable Table1
  NextScan
EndProg
```

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