



CS210

Enclosure Relative Humidity Sensor



Please read first

About this manual

Please note that this manual was produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this. In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users. Differences include the U.S. standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. Please note, however, *that when a power supply adapter is ordered from Campbell Scientific it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials (antennas) may also not be applicable according to your locality. Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered.

Recycling information for countries subject to WEEE regulations 2012/19/EU



At the end of this product's life it should not be put in commercial or domestic refuse but sent for recycling. Any batteries contained within the product or used during the products life should be removed from the product and also be sent to an appropriate recycling facility, per [The Waste Electrical and Electronic Equipment \(WEEE\) Regulations 2012/19/EU](#). Campbell Scientific can advise on the recycling of the equipment and in some cases arrange collection and the correct disposal of it, although charges may apply for some items or territories. For further support, please contact Campbell Scientific, or your local agent.

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1. Introduction

NOTE:

The CS210 was formerly known as the 10162.

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

Features:

- Allows enclosure RH to be monitored remotely
- Used to schedule desiccant replacement
- Compatible with Campbell Scientific CRBasic data loggers: CR6, CR1000Xe, CR1000X, CR350 series, CR300 series, CR800 series, CR3000, and CR1000

NOTE:

This manual provides information only for CRBasic data loggers. For retired Edlog data logger support, see an older manual at www.campbellsci.com/old-manuals .

2. Precautions



- READ AND UNDERSTAND the [Safety](#) section at the back of this manual.
- Although the CS210 is rugged, it should be handled as a precision scientific instrument.
- Santoprene® rubber, which composes the black outer jacket of the 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

- Upon receipt of the CS210, inspect the packaging and contents for damage. File damage claims with the shipping company.
- Immediately check package contents against the shipping documentation. Contact Campbell Scientific about any discrepancies.

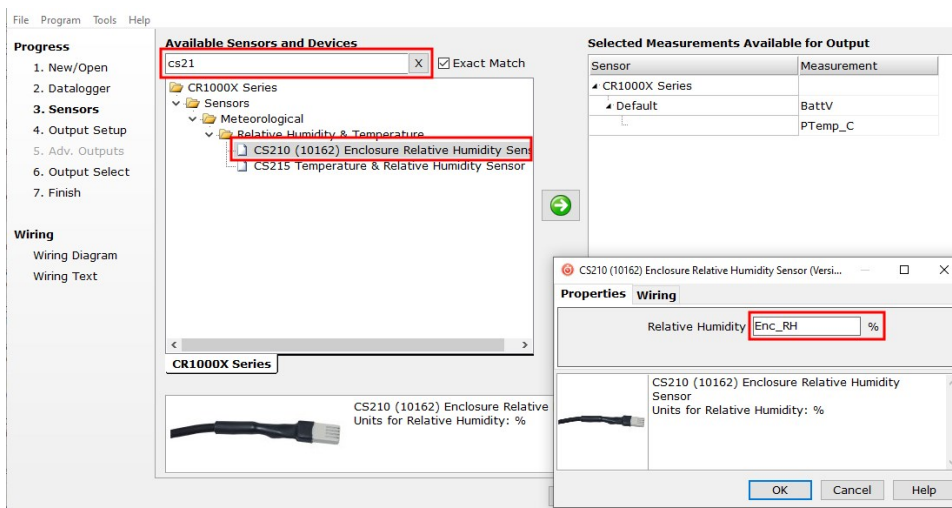
4. QuickStart

A video that describes data logger programming using *Short Cut* is available at:

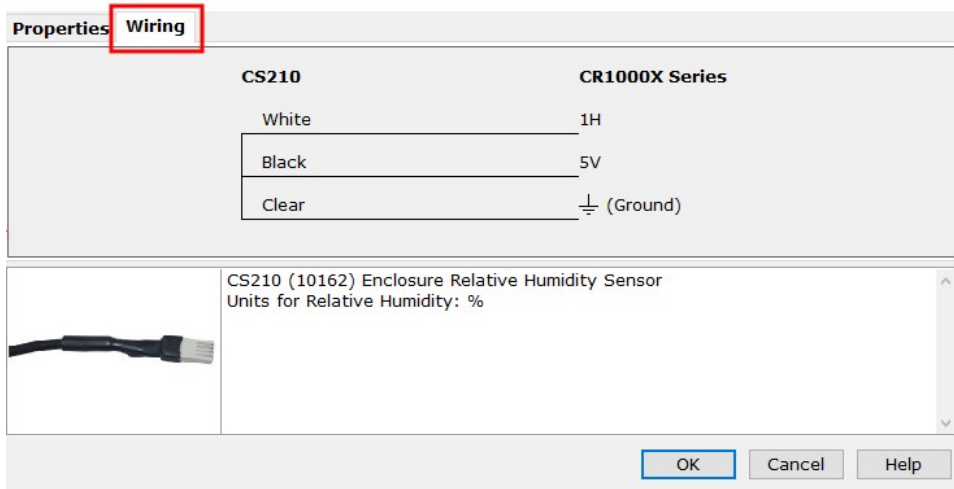
www.campbellsci.com/videos/cr1000x-data-logger-getting-started-program-part-3 . *Short Cut* is an easy way to program your data logger to measure the sensor and assign data logger wiring terminals. *Short Cut* is available as a download on www.campbellsci.com . It is included in installations of *LoggerNet*, *RTDAQ*, and *PC400*.

The following procedure also shows using *Short Cut* to program the sensor.

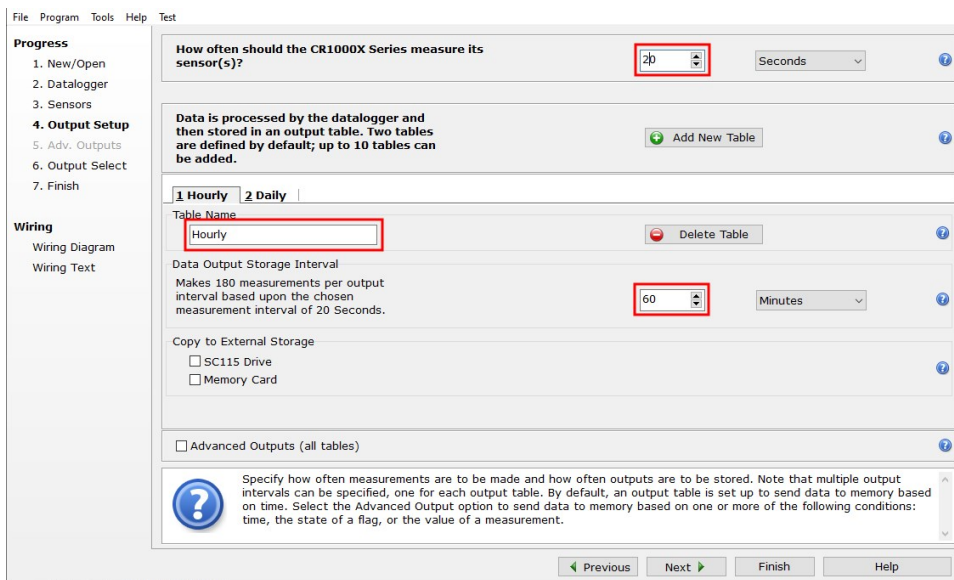
1. Open *Short Cut* and click **Create New Program**.
2. Double-click the data logger model.
3. In the **Available Sensors and Devices** box, type CS210 or locate the sensor in the **Sensors > Meteorological > Relative Humidity & Temperature** folder. Double-click the CS210. The units are percent.



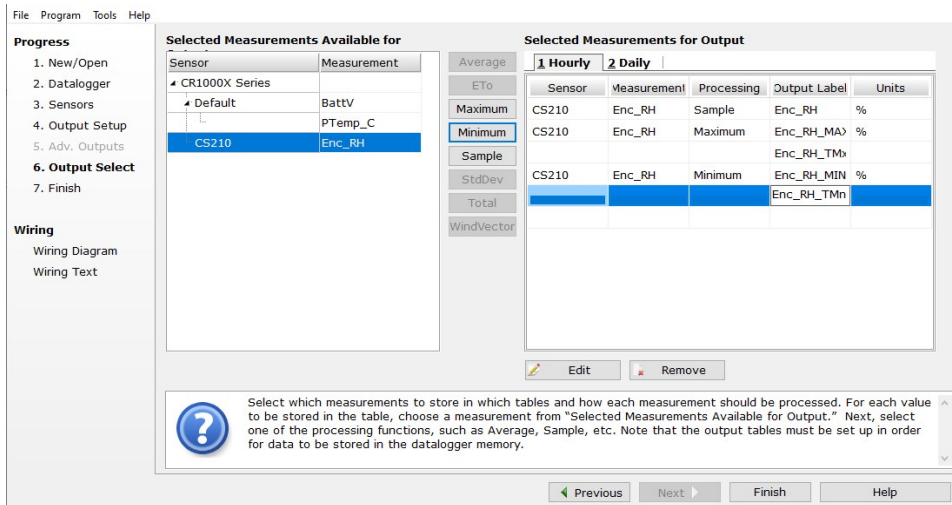
- Click the **Wiring** tab to see how the sensor is to be wired to the data logger. Click **OK** after wiring the sensor.



- Repeat steps three and four for other sensors.
- In **Output Setup**, type the scan rate, meaningful table names, and **Data Output Storage Interval**.



7. Select the measurement and its associated output option.



- Click **Finish** and save the program. Send the program to the data logger if the data logger is connected to the computer.
- If the sensor is connected to the data logger, check the output of the sensor in the data display in *LoggerNet*, *RTDAQ*, or *PC400* to make sure it is making reasonable measurements.

5. 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:	±3% RH (10 to 90% RH) unspecified (0 to 10% RH and 90 to 100% RH)
Typical long term stability:	Better than 3% RH per year
Response time (at 25 °C, 90% response):	10 s for a 30% to 90% RH step change
Operating temperature:	0 to 50 °C
Storage temperature:	-40 to 80 °C
Probe length:	2.5 cm (1.0 in)

Probe cross section area: 0.8 cm x 1.3 cm (0.3 in x 0.5 in)
Current consumption: <0.5 mA
Supply voltage: 5 ± 0.25 VDC
Settling time: 10 s

6. Installation/Operation

If you are programming your data logger with *Short Cut*, skip [Wiring](#) (p. 5) and [Programming](#) (p. 6). *Short Cut* does this work for you. See [QuickStart](#) (p. 2) for a *Short Cut* tutorial.

6.1 Mounting

Mount the CS210 inside the environmental enclosure or onto a data logger using the mounting block and the wire tie included with the sensor ([Figure 6-1](#) [p. 5]). The probe has a 28 cm (11 in) cable length, which should be adequate to place the probe near the enclosure conduits.

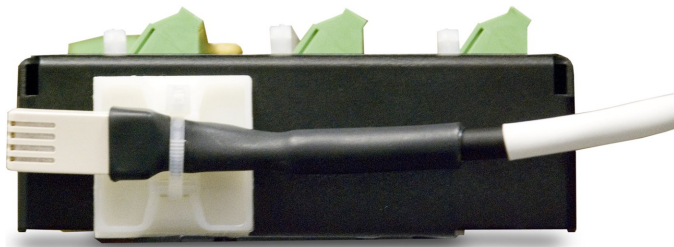


Figure 6-1. CS210 installed on a CR1000

6.2 Wiring

Connections to Campbell Scientific data loggers are given in [Table 6-1](#) (p. 6) and [Figure 6-2](#) (p. 6).

Wire color	Wire function	Data logger connection terminal
White	Signal	U configured for single-ended analog input ¹ , SE (single-ended, analog-voltage input)
Clear	Signal reference	AG or \perp (analog ground)
Black	Power	U configured for 5 V source ¹ , 5V, C (control port)

¹U channels are automatically configured by the measurement instruction.

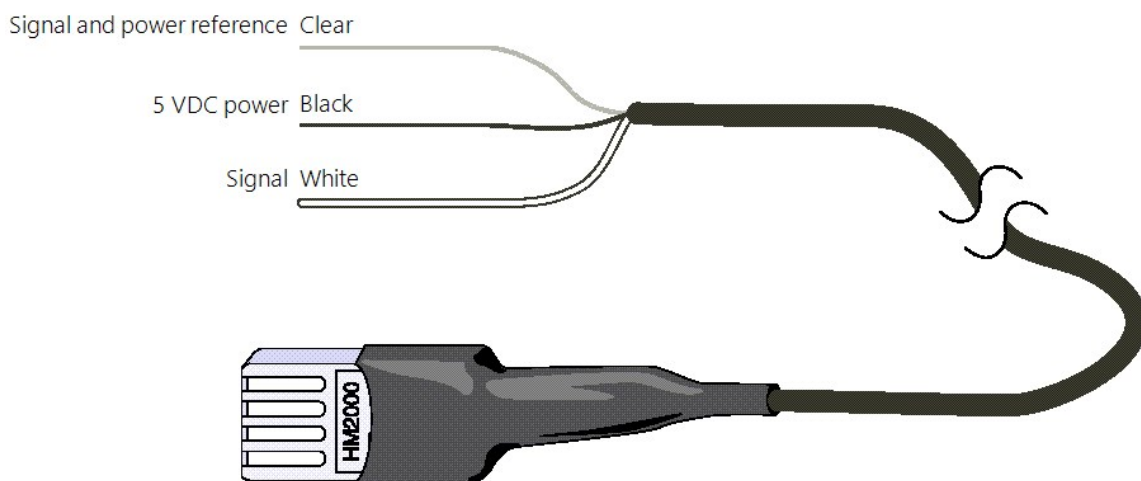


Figure 6-2. CS210 wiring

6.3 Programming

Short Cut is the best source for up-to-date programming code for Campbell Scientific data loggers. If your data acquisition requirements are simple, you can probably create and maintain a data logger 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 [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 [Importing Short Cut code into CRBasic Editor](#) (p. 8). Programming basics for CRBasic data loggers are

provided in the following section. A complete program example for a select CRBasic data logger can be found in [Example program](#) (p. 9).

6.3.1 CRBasic instructions

The relative humidity signal from the CS210 is measured using the `Vo1tSE()` CRBasic instruction.

The `Vo1tSE()` instruction has the following format:

```
Vo1tSE (Dest, Reps, Range, SEChan, MeasOff, SettlingTime, Integ/fnotch, Mult, Offset)
```

For **Range**, use `mV2500` (CR300, CR350) or `mV5000` (CR6, CR1000X series). If the sensor will be in electrically noisy environments, use 50 Hz or 60 Hz rejection for **Integ/f_{notch}**.

The probe output scale is 0 to 1000 millivolts for the relative humidity range of 0 to 100%. [Table 6-2](#) (p. 7) provides calibration information for relative humidity.

Units	Multiplier (%/mV)	Offset (%)
Percent	0.1	0

6.4 Enclosure humidity

Change the enclosure desiccant packs when the enclosure relative humidity exceeds 40%.

Campbell Scientific recommends placing desiccant packs inside the enclosure and sealing all cable entry ports that do not use a sealed bulkhead connector with plumber's putty. 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.

Appendix A. Importing *Short Cut* code into *CRBasic Editor*


Short Cut creates a .DEF file that contains wiring information and a program file that can be imported into *CRBasic Editor*. By default, these files reside in the C:\campbellsci\SCWin folder.

Import *Short Cut* program file and wiring information into *CRBasic Editor*:

1. Create the *Short Cut* program, then save it. Click the **Advanced** tab then the **CRBasic Editor** button. Your program file will open in CRBasic with a generic name. Provide a meaningful name and save the CRBasic program. This program can now be edited for additional refinement.

NOTE:

Once the file is edited with *CRBasic Editor*, *Short Cut* can no longer be used to edit the program.

2. To add the *Short Cut* wiring information into the new CRBasic program, open the .DEF file located in the C:\campbellsci\SCWin folder. Copy the wiring information found at the beginning of the .DEF file.
3. Go into the CRBasic program and paste the wiring information at the beginning of the program.
4. In the CRBasic program, highlight the wiring information, right-click, and select **Comment Block**. This adds an apostrophe (') to the beginning of each of the highlighted lines, which instructs the data logger compiler to ignore those lines when compiling. The **Comment Block** feature is demonstrated at about 5:10 in the [CRBasic | Features](#) video .

Appendix B. Example program

Our other data loggers are programmed similarly to the CR1000X example.

CRBasic Example 1: Example CR1000X program

```
'CR1000X Series Data Logger

'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,mV5000,1,1,0,60,0.1,0)
  'Set the sensor to 100% if it exceeds 100%.
  If Enc_RH > 100 Then Enc_RH = 100

  CallTable Daily
NextScan
EndProg
```


Limited warranty

Covered equipment is warranted/guaranteed against defects in materials and workmanship under normal use and service for the period listed on your sales invoice or the product order information web page. The covered period begins on the date of shipment unless otherwise specified. For a repair to be covered under warranty, the following criteria must be met:

1. There must be a defect in materials or workmanship that affects form, fit, or function of the device.
2. The defect cannot be the result of misuse.
3. The defect must have occurred within a specified period of time; and
4. The determination must be made by a qualified technician at a Campbell Scientific Service Center/ repair facility.

The following is not covered:

1. Equipment which has been modified or altered in any way without the written permission of Campbell Scientific.
2. Batteries; and
3. Any equipment which has been subjected to misuse, neglect, acts of God or damage in transit.


Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of [regional offices](#) or visit www.campbellsci.com/contact  to determine which Campbell Scientific office serves your country. For directions on how to return equipment, see [Assistance](#).

Other manufacturer's products, that are resold by Campbell Scientific, are warranted only to the limits extended by the original manufacturer.

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Campbell Scientific will, as a default, return warranted equipment by surface carrier prepaid. However, the method of return shipment is at Campbell Scientific's sole discretion. Campbell Scientific will not reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This warranty and the Company's obligation thereunder is in lieu of all other

warranties, expressed or implied, including those of suitability and fitness for a particular purpose. Campbell Scientific is not liable for consequential damage.

In the event of any conflict or inconsistency between the provisions of this Warranty and the provisions of Campbell Scientific's Terms, the provisions of Campbell Scientific's Terms shall prevail. Furthermore, Campbell Scientific's Terms are hereby incorporated by reference into this Warranty. To view Terms and conditions that apply to Campbell Scientific, Logan, UT, USA, see [Terms and Conditions](#) . To view terms and conditions that apply to Campbell Scientific offices outside of the United States, contact the [regional office](#) that serves your country.

Assistance

Products may not be returned without prior authorization. Please inform us before returning equipment and obtain a **return material authorization (RMA) number** whether the repair is under warranty/guarantee or not. See [Limited warranty](#) for information on covered equipment.

Campbell Scientific regional offices handle repairs for customers within their territories. Please see the back page of the manual for a list of [regional offices](#) or visit www.campbellsci.com/contact  to determine which Campbell Scientific office serves your country.

When returning equipment, a RMA number must be clearly marked on the outside of the package. Please state the faults as clearly as possible. Quotations for repairs can be given on request.

It is the policy of Campbell Scientific to protect the health of its employees and provide a safe working environment. In support of this policy, when equipment is returned to Campbell Scientific, Logan, UT, USA, it is mandatory that a "[Declaration of Hazardous Material and Decontamination](#)" form be received before the return can be processed. If the form is not received within 5 working days of product receipt or is incomplete, the product will be returned to the customer at the customer's expense. For details on decontamination standards specific to your country, please reach out to your [regional Campbell Scientific](#) office.

NOTE:

All goods that cross trade boundaries may be subject to some form of fee (customs clearance, duties or import tax). Also, some regional offices require a purchase order upfront if a product is out of the warranty period. Please contact your [regional Campbell Scientific](#) office for details.

Safety

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.com 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 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

- Protect from over-voltage.
- Protect electrical equipment from water.
- Protect from electrostatic discharge (ESD).
- Protect from lightning.
- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- 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.
- Only use power sources approved for use in the country of installation to power Campbell Scientific devices.

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.

Internal Battery

- Be aware of fire, explosion, and severe-burn hazards.
- Misuse or improper installation of the internal lithium battery can cause severe injury.

- Do not recharge, disassemble, heat above 100 °C (212 °F), solder directly to the cell, incinerate, or expose contents to water. Dispose of spent batteries properly.

Use and disposal of batteries

- Where batteries need to be transported to the installation site, ensure they are packed to prevent the battery terminals shorting which could cause a fire or explosion. Especially in the case of lithium batteries, ensure they are packed and transported in a way that complies with local shipping regulations and the safety requirements of the carriers involved.
- When installing the batteries follow the installation instructions very carefully. This is to avoid risk of damage to the equipment caused by installing the wrong type of battery or reverse connections.
- When disposing of used batteries, it is still important to avoid the risk of shorting. Do not dispose of the batteries in a fire as there is risk of explosion and leakage of harmful chemicals into the environment. Batteries should be disposed of at registered recycling facilities.

Avoiding unnecessary exposure to radio transmitter radiation

- Where the equipment includes a radio transmitter, precautions should be taken to avoid unnecessary exposure to radiation from the antenna. The degree of caution required varies with the power of the transmitter, but as a rule it is best to avoid getting closer to the antenna than 20 cm (8 inches) when the antenna is active. In particular keep your head away from the antenna. For higher power radios (in excess of 1 W ERP) turn the radio off when servicing the system, unless the antenna is installed away from the station, e.g. it is mounted above the system on an arm or pole.

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 CUSTOMER 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.

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UK

Location: Shephed, Loughborough, UK
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Location: Logan, UT USA
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