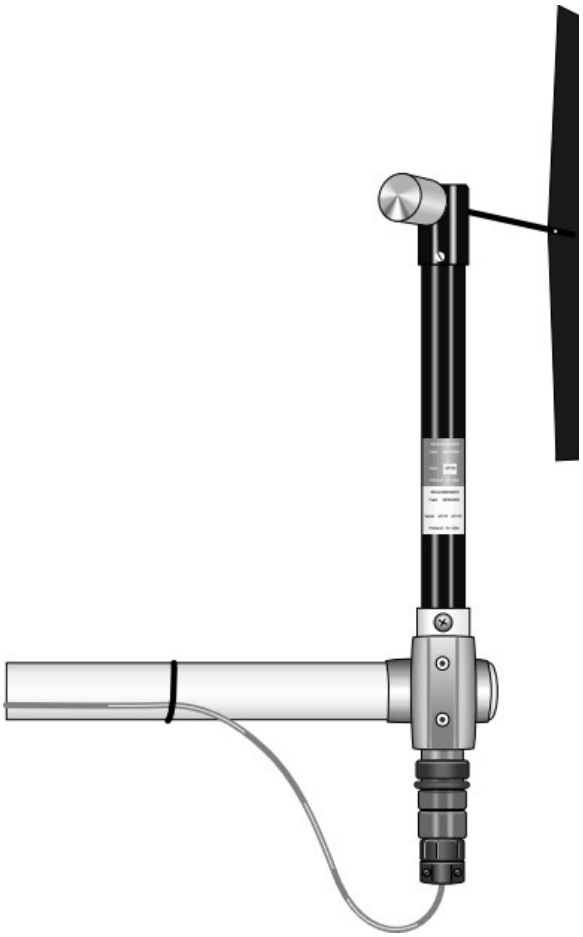
# Product Manual

Sensor

# 024A

## Met One Wind Direction Sensor



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# Guarantee

This equipment is guaranteed against defects in materials and workmanship. We will repair or replace products which prove to be defective during the guarantee period as detailed on your invoice, provided they are returned to us prepaid. The guarantee will not apply to:

- Equipment which has been modified or altered in any way without the written permission of Campbell Scientific
- Batteries
- Any product which has been subjected to misuse, neglect, acts of God or damage in transit.

Campbell Scientific will return guaranteed equipment by surface carrier prepaid. Campbell Scientific will not reimburse the claimant for costs incurred in removing and/or reinstalling equipment. This guarantee and the Company's obligation thereunder is in lieu of all other guarantees, expressed or implied, including those of suitability and fitness for a particular purpose. Campbell Scientific is not liable for consequential damage.

Please inform us before returning equipment and obtain a Repair Reference Number whether the repair is under guarantee or not. Please state the faults as clearly as possible, and if the product is out of the guarantee period it should be accompanied by a purchase order. 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 a "Declaration of Hazardous Material and Decontamination" form will be issued for completion.

When returning equipment, the Repair Reference Number must be clearly marked on the outside of the package. Complete the "Declaration of Hazardous Material and Decontamination" form and ensure a completed copy is returned with your goods. Please note your Repair may not be processed if you do not include a copy of this form and Campbell Scientific Ltd reserves the right to return goods at the customers' expense.

Note that goods sent air freight are subject to Customs clearance fees which Campbell Scientific will charge to customers. In many cases, these charges are greater than the cost of the repair.


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# About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. primarily for the North American 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 ($lb/in^2$) = 68.95 mb

**Volume:** 1 UK pint = 568.3 ml
1 UK gallon = 4.546 litres
1 US gallon = 3.785 litres

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 it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials 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. Details of the alternatives will be covered in separate manuals.

Part numbers prefixed with a "#" symbol are special order parts for use with non-EU variants or for special installations. Please quote the full part number with the # when ordering.

## Recycling information

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.

Campbell Scientific Ltd 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 advice or support, please contact Campbell Scientific Ltd, or your local agent.

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# *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.eu or by telephoning +44(0) 1509 828 888 (UK). 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**

- 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, or 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 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.

# Table of contents

# 1. Introduction

The 024A is a wind vane manufactured by Met One. It measures wind direction only and is traditionally used in tandem with the 014A wind speed sensor.

> 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 front of this manual.
- The 024A is a precision instrument. Please handle it with care.
- The black outer jacket of the cable is Santoprene® rubber. This compound was chosen for its resistance to temperature extremes, moisture, and ultraviolet (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.

# 3. Initial inspection

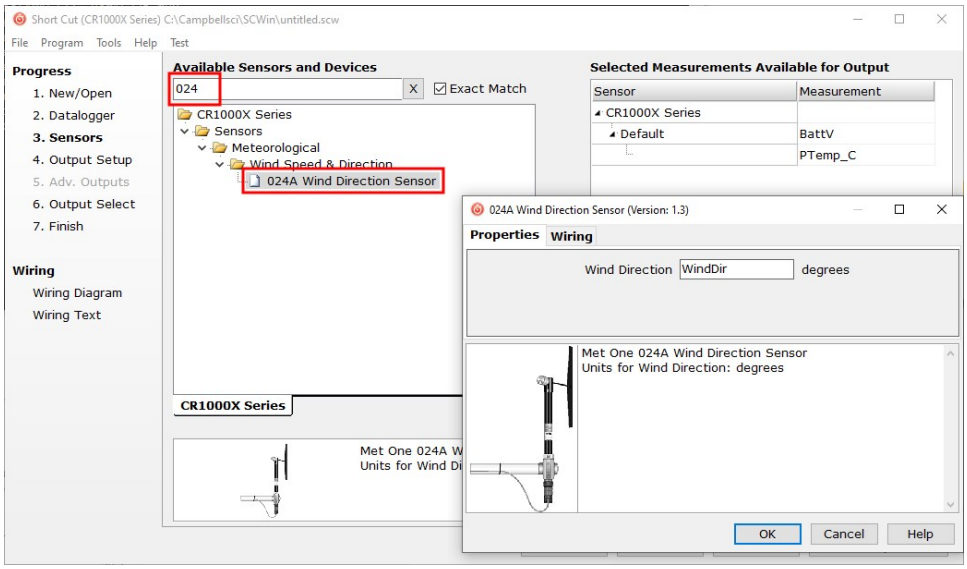
- Upon receipt of the 024A, inspect the packaging and contents for damage. File damage claims with the shipping company. Immediately check package contents against the shipping documentation. Contact Campbell Scientific about any discrepancies.
- The model number and cable length are printed on a label at the connection end of the cable. Check this information against the shipping documents to ensure the expected product and cable length are received.

# 4. QuickStart

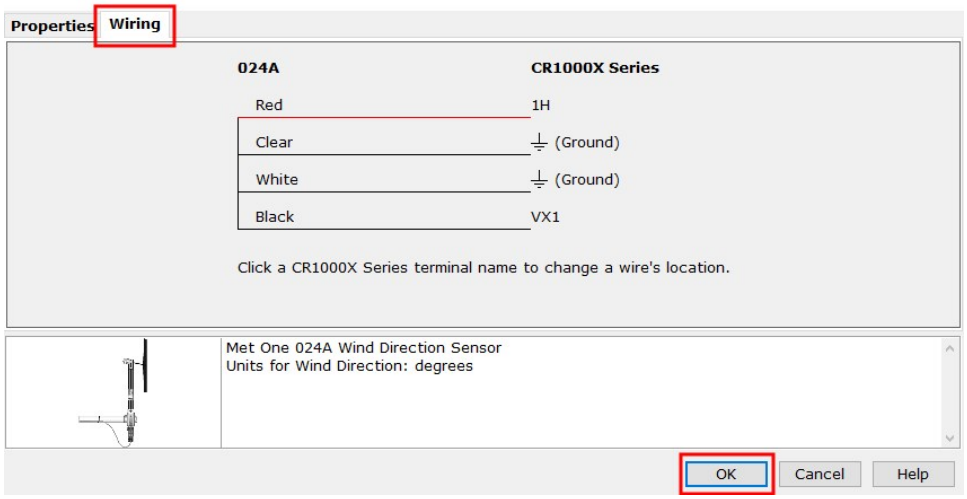
A video that describes data logger programming using ***Short Cut*** is available at: www.campbellsci.eu/videos/cr1000x-datalogger-getting-started-program-part-3. ***Short Cut*** is an easy way to program your data logger to measure this sensor and assign data logger wiring terminals. ***Short Cut*** is available as a download on www.campbellsci.eu. It is included in installations of ***LoggerNet***, ***RTDAQ***, or ***PC400***.

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

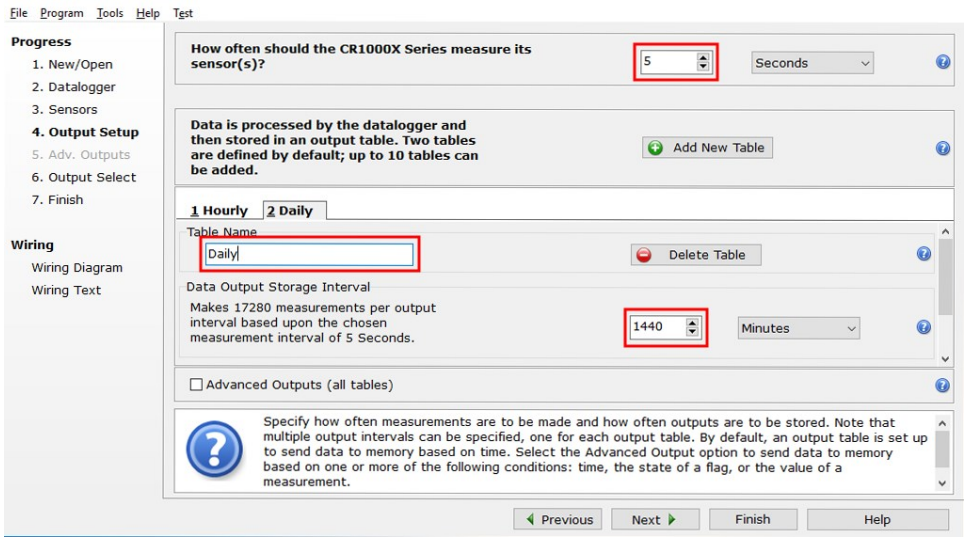
1. Open ***Short Cut*** and create a new program.
2. Double-click the data logger model.
3. In the **Available Sensors and Devices** box, type 024A or find the sensor in the **Sensors** > **Meteorological** > **Wind Speed & Direction** folder. Double-click **024A Wind Direction Sensor**.



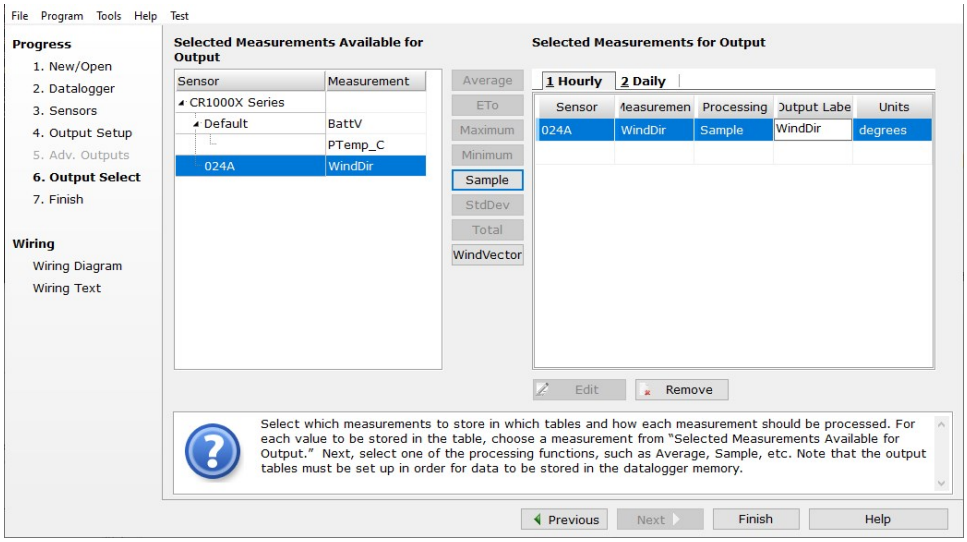
4. Click the **Wiring** tab to see how the sensor is to be wired to the data logger. Click **OK** after wiring the sensor.




5. Select any other sensors you have, then finish the remaining ***Short Cut*** steps to complete the program.
6. In **Output Setup**, enter the scan rate and **Data Output Storage Interval**.



7. Select the output options.




8. Click **Finish** and save the program. Send the program to the data logger if the data logger is connected to the computer.
9. 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. Overview

The 024A is a wind vane that measures wind direction from 0 to 360 degrees with a 5-degree accuracy. It uses a 10-kΩ potentiometer to sense wind direction. A data logger applies a precision excitation voltage to the potentiometer, resulting in an analogue voltage output that is directly proportional to the wind direction's azimuth.

The cable includes a 10 kOhm 1% resistor as shown in Figure 7-1 (p. 6). If the cable was purchased from Met One Instruments, the 10k resistor is not included. The cable can be used without the resistor, but this requires program changes not supported by ***Short Cut*** (Data logger instruction [p. 7]).

Cable length for the 024A is specified when the sensor is ordered. Table 5-1 (p. 5) gives the recommended cable length for mounting the sensor at the top of the tripod/tower with a CM200-series crossarm.

| Table 5-1: Recommended cable lengths | | | | | | |
|---|---|---|---|---|---|---|
| CM106B | CM110 | CM115 | CM120 | UT10 | UT20 | UT30 |
| 4.2 m (14 ft) | 4.2 m (14 ft) | 5.8 m (19 ft) | 7.3 m (24 ft) | 4.2 m (14 ft) | 7.3 m (24 ft) | 11.3 m (37 ft) |

Features:

- Compatible with Campbell Scientific CRBasic data loggers: CR6, CR1000X, CR800 series, CR350 series, CR300 series, CR3000, and CR1000

# 6. Specifications

| | |
|---|---|
| Range: | 0 to 360 degrees |
| Threshold: | 0.447 m/s (1.0 mph) |
| Accuracy: | ±5 degrees |
| Temperature range: | –50 to 70 °C |
| Delay distance: | < 1.5 m (5 ft) |
| Damping ratio | |
| Standard: | 0.25 |
| Optional: | 0.4 |
| Potentiometer specifications | |
| Sand, dust, and fungus: | MIL-E-5272 |
| Salt spray: | MIL-E-12934 |
| Resistance: | 0 to 10,000 Ω |
| Weight: | 450 g (1 lb) |
| Dimensions | |
| Overall height: | 33.8 cm (13.3 in) |
| Overall length: | 44.7 cm (17.6 in) |
| Tail height: | 30.5 cm (12 in) |
| Tail width: | 7.6 cm (3 in) |

# 7. Installation

If you are programming your data logger with ***Short Cut***, skip Wiring (p. 6) and Programming (p. 7). ***Short Cut*** does this work for you. See QuickStart (p. 2) for a ***Short Cut*** tutorial.

## 7.1 Wiring

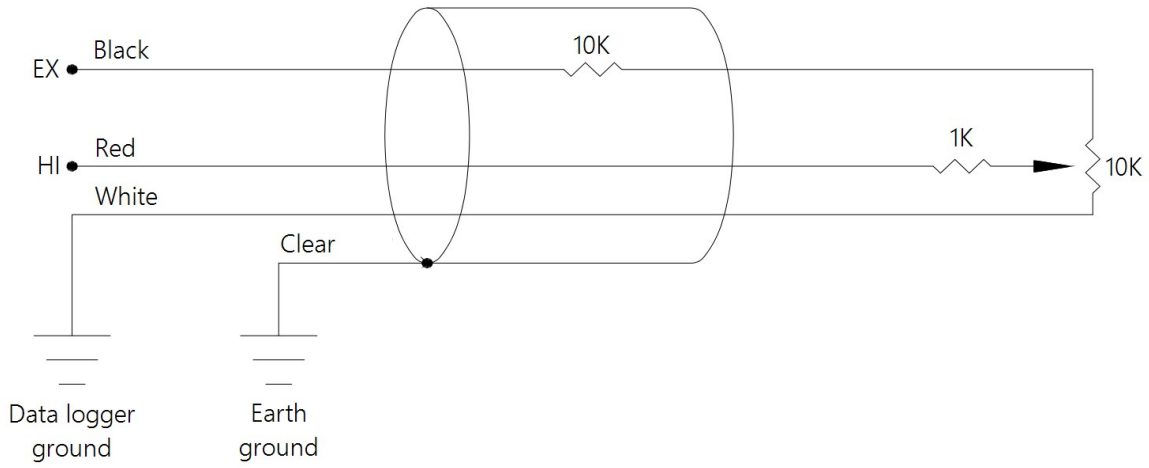



*Figure 7-1. Schematic of 024A wind direction sensor*

Figure 7-1 (p. 6) and Table 7-1 (p. 6) shows wiring.

**Table 7-1: Wire colour, function, and data logger connection**

| Wire colour | Wire function | Data logger connection terminal |
|---|---|---|
| Red | Signal | **U** configured for single-ended analogue input[1], **SE** (single-ended, analogue-voltage input) |
| Black | Voltage excitation input | **U** configured for voltage excitation[1], **EX**, **VX** (voltage excitation) |
| White | Wind direction reference | ⏚ (analogue ground) |
| Clear | Shield | ⏚ (analogue ground) |

[1]**U** terminals are automatically configured by the measurement instruction.

# 7.2 Programming

***Short Cut*** is the best source for up-to-date data logger programming code. If your data acquisition requirements are simple and you are connecting the sensor to a pulse terminal, you can probably create and maintain a data logger program exclusively by using ***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. 13). Programming basics for CRBasic data loggers are provided in the following sections. A complete program is provided in Example program (p. 14). Programming basics and programming examples for Edlog data loggers are provided at www.campbellsci.com\old-manuals.

## 7.2.1 Data logger instruction

Wind direction is measured by the `BRHalf()` instruction.

Some CRBasic measurement sequences can cause the measurement of the wind direction to return a negative wind direction (–30°). Overcome this problem by using a delay of 20 ms (20,000 µs) and setting negative wind direction values to 0.0:

```
If WindDir < 0, then WindDir = 0.0
```

The excitation voltage, range codes, and multipliers for the different data logger types are listed in Table 7-2 (p. 7).

Table 7-2: Parameters for wind direction

| | CR300 series | CR800, CR850, CR1000 | CR6, CR1000X | CR3000 |
|---|---|---|---|---|
| Measurement range | mV2500 | mV2500 | mV5000 | mV5000 |
| Excitation voltage[1] | 2500 mV | 2500 mV | 2500 mV | 5000 mV |
| Reverse excitation | NA | True | True | True |

Table 7-2: Parameters for wind direction

| | CR300 series | CR800, CR850, CR1000 | CR6, CR1000X | CR3000 |
|---|---|---|---|---|
| Delay or settling time | 20000 µs | 20000 µs | 20000 µs | 20000 µs |
| Multiplier | 720 | 720 | 720 | 720 |
| Offset | 0 | 0 | 0 | 0 |

[1]For cables purchased from Met One that do not include the 10k-series resistor, reduce the excitation voltages listed in this table by half.

## 7.2.2 Calibration

Conversion of the measurement result (X) to wind direction is done by the multiplier parameter of the measurement instruction. For a more accurate measurement, use Eq. 1 (p. 8) to calculate a multiplier that accounts for cable length and resistor tolerances:

$$\text{Calculated Multiplier} = 360/\text{FSX} \qquad \textbf{Eq. 1}$$

Where,

FSX = full scale measurement result

With a multiplier of 1, the measurement result (X) for the `BRHalf()` instruction is the ratio $V_1/V_X$, where $V_1$ is the voltage measured on the SE channel, and $V_X$ is the excitation voltage.

The full scale measurement result (FSX) is the maximum, X, output from the 024A. To determine the FSX, create a program with the parameters listed in Table 7-2 (p. 7), and a multiplier of 1. The value displayed in the input variable is (X). With the shoulder screw removed, slowly rotate the wind vane to get the maximum value, which is the FSX. With the 10k series resistor, the FSX is approximately 0.5 for the `BRHalf()` instruction. The calculated multiplier is 360/(FSX) and should be close to the multiplier listed in Table 7-2 (p. 7). Keep the offset at 0.

Enter the value calculated in Eq. 1 (p. 8) in the program using ***CRBasic Editor***.

> **NOTE:**
> If the FSX is **NAN** or **–99999**, reduce the excitation voltage by 5 mV and determine the new FSX.

# 7.3 Siting

Locate wind sensors away from obstructions such as trees or buildings. Generally, there should be a horizontal distance of at least ten times the height of the obstruction between the 024A and

the obstruction. If the sensors need to be mounted on a roof, the height of the sensors above the roof, should be at least 1.5 times the height of the building. See References (p. 12) for a list of references that discuss siting wind speed and direction sensors.

# 7.4 Assembly and mounting the sensor

Materials required:

- 5/64-inch hex key wrench
- 1/2-inch open end wrench
- Compass and declination angle for the site (see Wind direction sensor orientation [p. 16])
- Small screwdriver provided with data logger
- UV resistant cable ties
- 6-inch to 10-inch torpedo level
- 1-inch-by-1-inch Nu-Rail crossover fitting
- 024A vane
- Mounting bushing

The following procedure is for assembling the sensor and mounting it to a crossarm.

1. Remove the hex screw in the lower part of the sensor housing (Figure 7-2 [p. 9]).
2. Insert the 024A in the mounting bushing (Figure 7-2 [p. 9]).
3. Tighten the mounting bushing screw onto the sensor housing (Figure 7-2 [p. 9]).

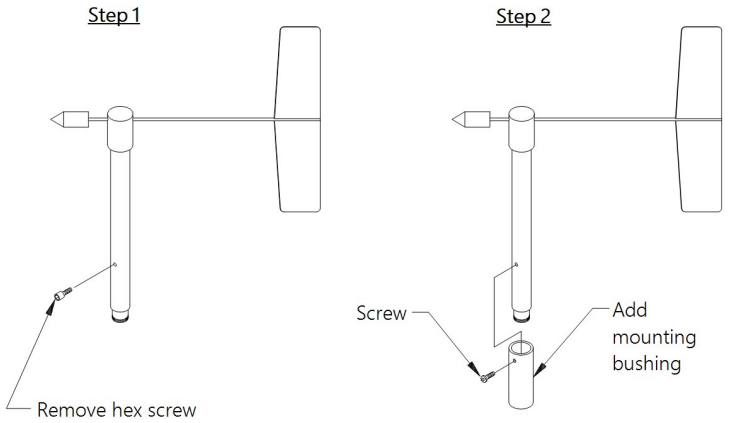



*Figure 7-2. Bushing installation on 024A sensor*

4. Mount a crossarm to a tripod or tower.
5. If a pyranometer is also being mounted on the crossarm, orient the crossarm north-south with the Nu-Rail on the end farthest from the equator. Otherwise, the crossarm may be oriented north-south, east west, or any other angle desired. Wind direction sensor orientation (p. 16) contains detailed information on determining true north by using a compass and the magnetic declination for the site.
6. Insert the sensor in the Nu-Rail fitting.

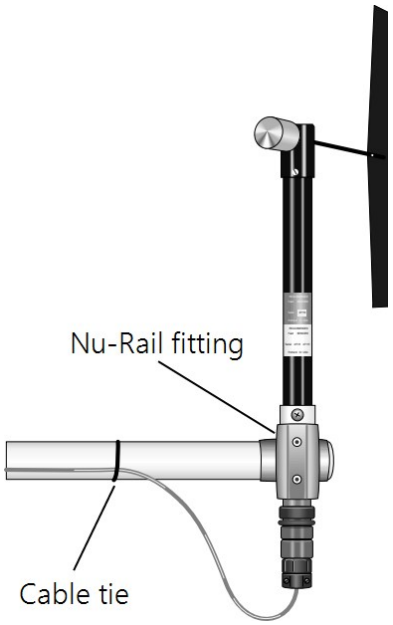



*Figure 7-3. The 024A mounted to a crossarm*

7. Align the sensor so that the counter weight points due south and tighten the set screws on the Nu-Rail fitting.
8. Use the torpedo level to ensure that the sensor is level.
9. Connect the cable assembly to the sensor receptacle.
10. Route the sensor cable along the underside of the crossarm to the tripod or tower, and to the instrument enclosure.
11. Secure the cable to the crossarm and tripod or tower by using cable ties.

The 024A can also use a CM221 Right-Angle Mounting Kit or CM216 Sensor Mounting Kit; see the following figures. The CM221 uses U-bolts to secure the sensor to a crossarm. The CM216 mounts the sensor on top of a CM106B, CM110, CM115, or CM120 tripod. The CM216 extends 10 cm (4 in) above the mast of the tripod.

*Figure 7-4. CM221 Right-Angle Mounting Kit*

*Figure 7-5. The CM216 allows the 024A to mount atop a tripod mast*

# 8. Troubleshooting 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 About this manual page at the front of this manual for more information.

## 8.1 Troubleshooting

Symptom: NAN, –9999, or no change in direction

1. Check that the sensor is wired to the excitation and single-ended terminal specified by the measurement instruction.
2. Verify that the excitation voltage and range code are correct for the data logger type.

## 8.2 Maintenance schedule

The maintenance schedules are for average to adverse environments.

### 8.2.1 6 to 12 month periodic service

Inspect sensor for physical damage and verify that the vane assembly rotates freely.

### 8.2.2 24 to 36 month service

A complete factory overhaul of the sensor, including the replacement of the potentiometer, is recommended. To send the 024A to Campbell Scientific, the customer must receive an RMA number and fill out a "Statement of Product Cleanliness". For more information, refer to the About this manual page at the front of this manual.

# 9. References

The following references give detailed information on siting wind speed and wind direction sensors.

EPA, 1989: *Quality Assurance Handbook for Air Pollution Measurements System*, Office of Research and Development, Research Triangle Park, NC, 27711.

EPA, 1987: *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*, EPA-450/4-87-013, Office of Air Quality Planning and Standards, Research Triangle Park, NC 27711.

The State Climatologist, 1985: *Publication of the American Association of State Climatologists: Height and Exposure Standards*, for Sensors on Automated Weather Stations, vol. 9, No. 4.

WMO, 1983: *Guide to Meteorological Instruments and Methods of Observation*, World Meteorological Organization, No. 8, 5th edition, Geneva, Switzerland.

# 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

The following program example measures the 014A wind speed sensor and the 024A wind direction sensor. Wind speed and direction measurements are processed by the WindVector() instruction, which outputs mean wind speed, mean wind vector direction, and standard deviation of wind direction for the output interval.

**CRBasic Example 1: CR1000X program**

```
'CR1000X

'Declare Variables and Units
Public BattV
Public PTemp_C
Public WS_ms
Public WindDir

Units BattV=Volts
Units PTemp_C=Deg C
Units WS_ms=meters/second
Units WindDir=degrees

'Define Data Tables
DataTable(Hourly,True,-1)
  DataInterval(0,60,Min,10)
  WindVector(1,WS_ms,WindDir,FP2,False,0,0,0)
  FieldNames("WS_ms_S_WVT,WindDir_D1_WVT,WindDir_SD1_WVT")
EndTable

'Main Program
BeginProg
  'Main Scan
  Scan(1,Sec,1,0)
    'Default Data logger Battery Voltage measurement 'BattV'
    Battery(BattV)
    'Default Wiring Panel Temperature measurement 'PTemp_C'
    PanelTemp(PTemp_C,60)
    '014A Wind Speed Sensor measurement 'WS_ms'
    PulseCount(WS_ms,1,P1,1,1,0.8,0.447)
    If WS_ms<0.457 Then WS_ms=0
    '024A Wind Direction Sensor measurement 'WindDir'
    BrHalf(WindDir,1,mV5000,1,Vx1,1,2500,True,20000,250,720,0)
    If WindDir>=360 Or WindDir<0 Then WindDir=0
    'Call Data Tables and Store Data
    CallTable Hourly
```

CRBasic Example 1: CR1000X program

```
  NextScan
EndProg
```

# Appendix C. Wind Direction Sensor Orientation

## C.1 Determining True North and Sensor Orientation

Orientation of the wind direction sensor is done after the datalogger has been programmed, and the location of True North has been determined. True North is usually found by reading a magnetic compass and applying the correction for magnetic declination; where magnetic declination is the number of degrees between True North and Magnetic North. Magnetic declination for a specific site can be obtained from a USGS map, local airport, or through a computer service offered by the USGS at www.ngdc.noaa.gov/geomag. A general map showing magnetic declination is shown in Figure C-1.

Declination angles east of True North are considered negative, and are subtracted from 0 degrees to get True North as shown Figure C-2. Declination angles west of True North are considered positive, and are added to 0 degrees to get True North as shown in Figure C-3. For example, the declination for Logan, Utah is 14° East. True North is 360 - °14°, or 346° as read on a compass.

Orientation is most easily done with two people, one to aim and adjust the sensor, while the other observes the wind direction displayed by the datalogger.

1. Establish a reference point on the horizon for True North.
2. Sighting down the instrument centre line, aim the nose cone, or counterweight at True North. Display the input location or variable for wind direction using a hand-held keyboard display, PC, or palm.
3. Loosen the u-bolt on the CM220 or the set screws on the Nu-Rail that secure the base of the sensor to the crossarm. While holding the vane position, slowly rotate the sensor base until the datalogger indicates 0 degrees. Tighten the set screws.

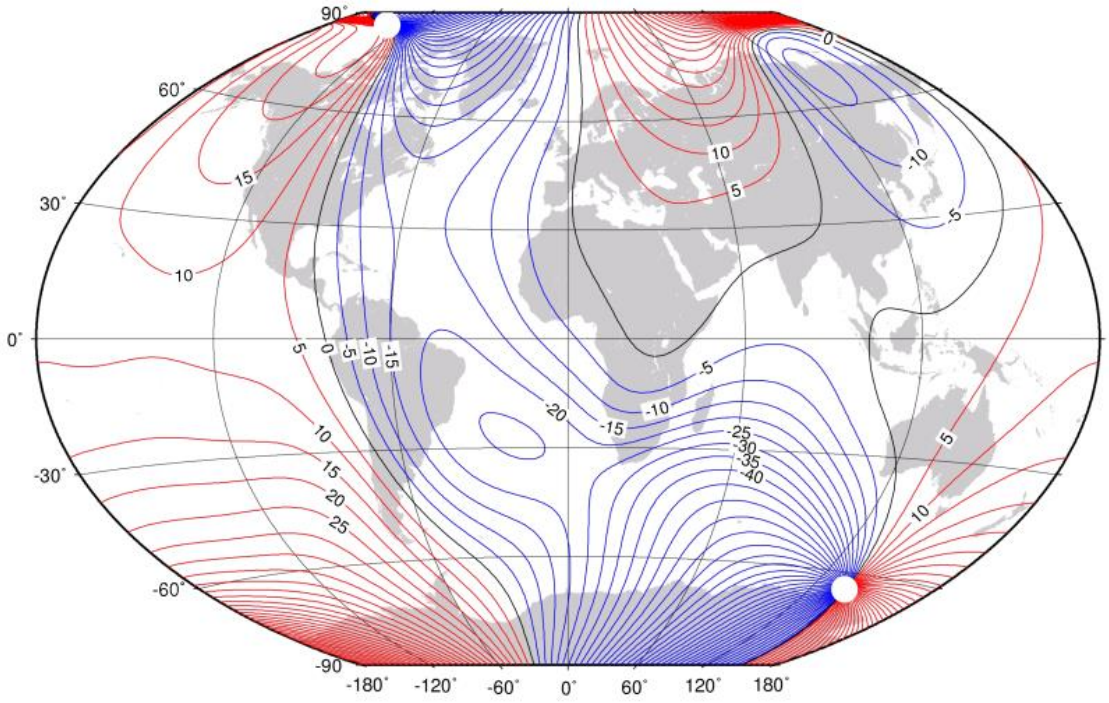



*FIGURE C-1. Magnetic Declination at 2012.5 (degrees relative to true north, positive is east)*

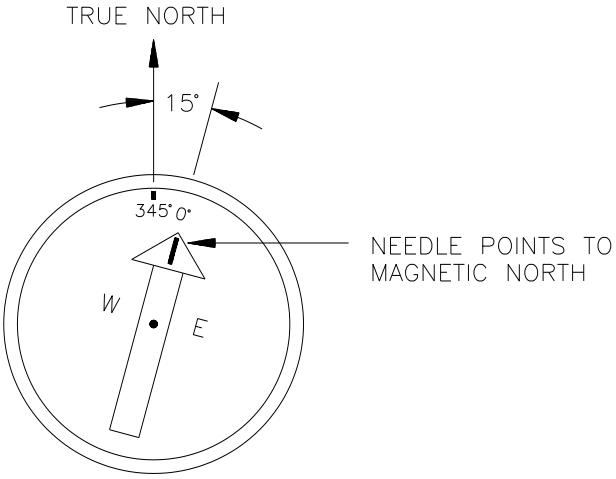



*FIGURE C-2. Declination Angles East of True North are Subtracted from 0 to get True North*

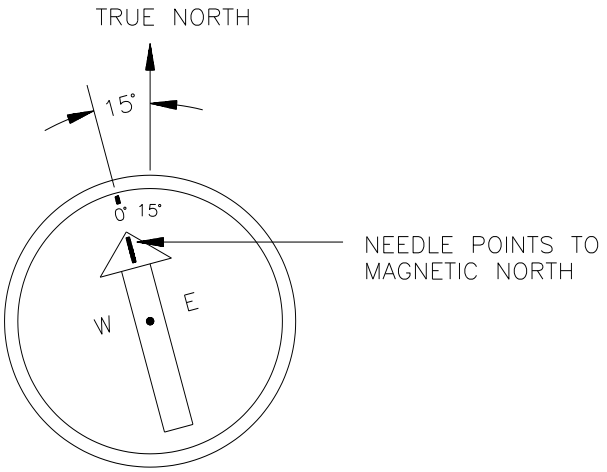



*FIGURE C-3. Declination Angles West of True North are Added to 9 to get True North*

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