

**MODEL 014A  
MET ONE WIND SPEED SENSOR  
INSTRUCTION MANUAL**

**REVISION: 5/01**

**COPYRIGHT (c) 1980-2001 CAMPBELL SCIENTIFIC, INC.**



# Warranty and Assistance

---

The **014A MET-ONE WIND SPEED SENSOR** is warranted by CAMPBELL SCIENTIFIC, INC. to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise. Batteries have no warranty. CAMPBELL SCIENTIFIC, INC.'s obligation under this warranty is limited to repairing or replacing (at CAMPBELL SCIENTIFIC, INC.'s option) defective products. The customer shall assume all costs of removing, reinstalling, and shipping defective products to CAMPBELL SCIENTIFIC, INC. CAMPBELL SCIENTIFIC, INC. will return such products by surface carrier prepaid. This warranty shall not apply to any CAMPBELL SCIENTIFIC, INC. products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied, including warranties of merchantability or fitness for a particular purpose. CAMPBELL SCIENTIFIC, INC. is not liable for special, indirect, incidental, or consequential damages.

Products may not be returned without prior authorization. To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 753-2342. After an applications engineer determines the nature of the problem, an RMA number will be issued. Please write this number clearly on the outside of the shipping container. CAMPBELL SCIENTIFIC's shipping address is:

**CAMPBELL SCIENTIFIC, INC.**  
RMA# \_\_\_\_\_  
815 West 1800 North  
Logan, Utah 84321-1784

CAMPBELL SCIENTIFIC, INC. does not accept collect calls.

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



## **CAMPBELL SCIENTIFIC, INC.**

815 W. 1800 N.  
Logan, UT 84321-1784  
USA  
Phone (435) 753-2342  
FAX (435) 750-9540  
www.campbellsci.com

Campbell Scientific Canada Corp.  
11564 -149th Street  
Edmonton, Alberta T5M 1W7  
CANADA  
Phone (780) 454-2505  
FAX (780) 454-2655

Campbell Scientific Ltd.  
Campbell Park  
80 Hathern Road  
Shepshed, Loughborough  
LE12 9GX, U.K.  
Phone +44 (0) 1509 601141  
FAX +44 (0) 1509 601091



# MODEL 014 MET-ONE SPEED SENSOR INSTRUCTION MANUAL TABLE OF CONTENTS

	PAGE
<i>WARRANTY</i>	
<b>1. FUNCTION</b> .....	1
<b>2. SPECIFICATIONS</b> .....	1
<b>3. PHYSICAL CONNECTIONS</b> .....	2
<b>4. DATALOGGER INSTRUCTION</b> .....	2
<b>5. THEORY OF OPERATION</b> .....	2
5.1 Mechanical .....	2
5.2 Calibration .....	2
<b>6. MAINTENANCE</b> .....	2
6.1 Suggested Maintenance Schedules .....	2
6.2 Reed Switch Replacement Procedure.....	3
6.3 Bearing Replacement Procedure .....	4

## LIST OF FIGURES

1. Met-One 014A Wind Speed Sensor .....	1
2. Schematic of 014A Wind Speed Sensor .....	2
3. Reed Switch Assembly.....	3
4. Cable Diagram.....	4
5. Parts Diagram.....	5

## TABLE

1. Met-One Parts List.....	6
----------------------------	---



# Met-One 014A Wind Speed Sensor

---

## 1. Function

The Met-One 014A Anemometer measures wind speed in the range of 0-45 meters/sec. The 014A is a 3-cup anemometer utilizing a magnet activated reed switch whose frequency is proportional to wind speed.

This manual is written for implementation with Campbell Scientific's CR10(X), CR23X, 21X, and CR7 Dataloggers.

## 2. Specifications

Threshold	0.45 m/s (1 mph)
Calibrated Range	0-45 m/s (0-100 mph)
Gust Survival	0-53 m/s (0-120 mph)
Accuracy	1.5% or .11 m/s (0.25 mph)
Temperature Range	-50 C to +70 C
Distance Constant*	
Standard:	Less than 4.6m (15 ft.) (Aluminum Cups)
Optional Fast Response:	Less than 1.5 m (5 ft.) (Lexan Cups)
Output Signal	Contact Closure, Reed Switch
Weight	680 grams (1.5 lbs)

\* The distance traveled by the air after a sharp-edged gust has occurred for the anemometer to reach 63% of the new speed.

---

### NOTE

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

---

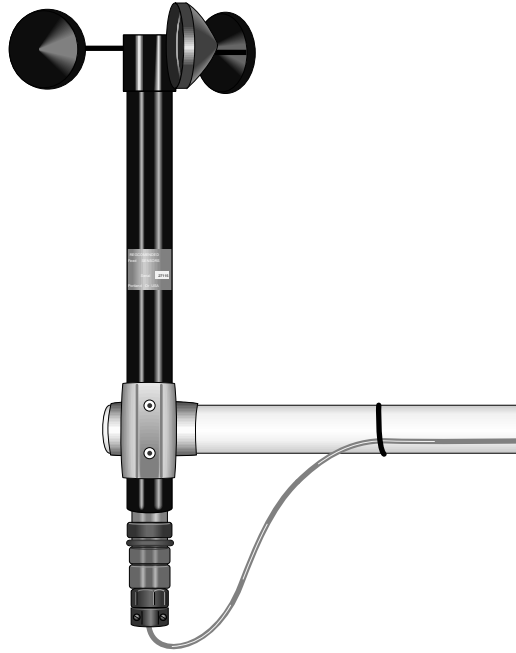


FIGURE 1. Met-One 014A Wind Speed Sensor

### 3. Physical Connections

The black lead connects to a Pulse Count Channel. The clear (ground) lead connects to a Ground terminal (G). The white lead is the shield which also connects to a ground terminal. A schematic of the 014A is shown in Figure 2A, and a diagram of the cable is shown in Figure 4.

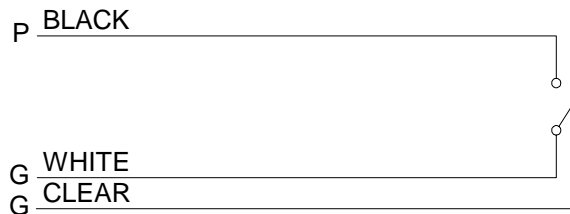


FIGURE 2A. Schematic of 014A Wind Speed Sensor Connected to Pulse Input

The CR10X and CR23X have an option in Instruction 3 to measure a switch closure on a control input. With this measurement the white lead must be connected to +5 volts.



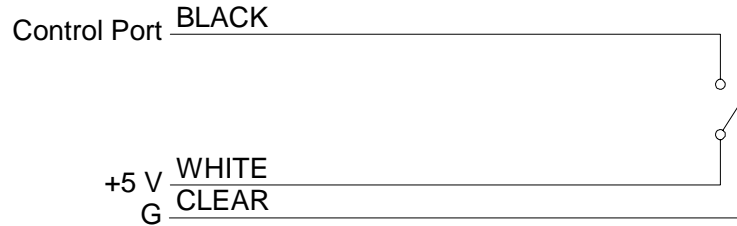


FIGURE 2B. Schematic of 014A Wind Speed Sensor Connected to Control Port

## 4. Datalogger Instruction

Instruction 3 (Pulse Count) is used to measure wind speed with the 014A. Specify a configuration code of 22 (switch closure, discarding counts from excessive intervals, results in Hz). With this configuration code, Instruction 3 divides the number of counts during the execution interval by the interval in seconds before applying the multiplier and offset. Table 4.1 lists the appropriate multipliers (M) and offsets (Off) to obtain m/s or mph when configuration code 22 is used.

Table 4.1 Wind Speed Multipliers and Offsets (with configuration code of 22*)	
<b>m/s output</b> M = 0.800 Off = 0.447	<b>mph output</b> M = 1.789 Off = 1.0
*When a configuration code 2 or 12 is used, the above multiplier must be divided by the execution interval in seconds.	

21Xs without OSX PROMs and CR7s without OS7 PROMS (PROMS purchased prior to March 1989 and August 1991 respectively) do not have the configuration code 22 as an option. Program Instruction 3 with a configuration code of 2 (switch closure) for totalizing or 12 (switch closure, discard counts beyond execution interval) for calculating rates. The multiplier from Table 4.1 will need to be divided by the execution interval (in seconds) to obtain the correct multiplier. The offset remains the same.

## 5. Theory of Operation

### 5.1 Mechanical

The anemometer cup assembly consists of three aluminum cups mounted on a cup assembly hub. A stainless steel shaft, which rotates on precision-sealed ball bearings, connects the cup assembly to a magnet assembly. When the shaft is rotated, the turning magnet assembly causes a reed switch to close. There are two contacts (reed switch closures) per revolution. The frequency of closures is linear from threshold to 45 m/s.

## 5.2 Calibration

The 014A Anemometer has a threshold speed of 0.447 m/s and follows the equation:

$$V = 0.447 + f/1.250 \text{ where}$$

V = wind speed (m/s), and  
f = output frequency (hz.)

or,  $V = 1.0 + f/0.5589$   
where V = wind speed (mph), and  
f = output frequency (hz.)

## 6. Maintenance

### 6.1 Suggested Maintenance Schedules

#### 6.1.1 6-12 Month Periodic Service

Visually inspect the anemometer cups for cracks and breaks, and make sure that each arm is securely attached to the cup assembly hub. Also check to see that the vent hole, located at the base of the sensor, is unobstructed.

Special caution is advised under adverse conditions of high winds, heat, and/or sandy areas. Look for abrupt stopping of the cup assembly with slow cup rotation. If this occurs, the bearings may need to be replaced.

#### 6.1.2 12-24 Month Service

Replace sensor bearings.

#### 6.1.3 24-36 Month Service

A complete factory overhaul of the sensor is recommended. Contact Met-One directly for Wind Speed sensor repair and recalibration service. This repair and calibration service includes disassembly and detailed inspection of all moving mechanical parts and all electronic components. Service includes replacement of bearings, shaft, and set screws as well as a functional test of the sensor. Charges above the basic service charge may be added for replacement of additional materials.

Met-One Instruments Inc.  
479 California Avenue  
Grants Pass, OR 97526  
(541) 471-7111  
FAX (541) 479-3057

## 6.2 Reed Switch Replacement Procedure

To verify parts and locations, refer to the parts diagram (Figure 5) and the parts list (Table 1).

- A. Remove sensor from mounting arm and disconnect cable.
- B. Remove the cup assembly.
- C. Remove the three phillips screws at the top of the sensor and lift out the bearing mount assembly.
- D. Unsolder the leads of the reed switch and remove the switch from the two mounting terminals, see the parts diagram.
- E. Solder the new switch onto the sides of the switch mount terminals (form a loop in the relay leads to obtain proper lead length -- **DO NOT CUT THE RELAY LEADS.**) Measure the distance between the bottom of the rotating magnet and the top of the switch envelope, as shown in Figure 3. The spacing should measure between 0.01 and 0.02 inches.
- F. Spin the shaft to verify switch operation by listening for a faint sound of the switch closure. If the switch cannot be heard, move the switch slightly closer to the magnet assembly.
- G. Reassemble sensor.

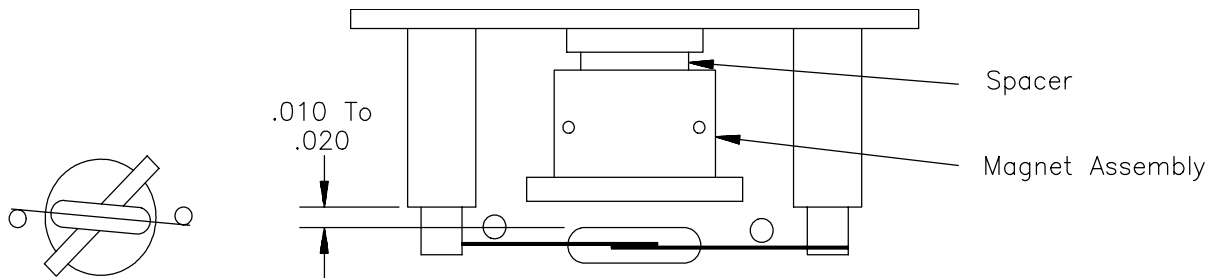


FIGURE 3. Reed Switch Assembly

## 6.3 Bearing Replacement Procedure

The bearings used in the 014A Sensor are special stainless steel ball bearings with a protective shield. Bearings are lubricated and sealed. **DO NOT LUBRICATE BEARINGS AS THE LUBRICATION WILL ATTRACT DUST AND INHIBIT BEARING OPERATION.**

- A. Follow steps 6.2 A, B, and C in reed switch replacement procedures.
- B. Loosen set screws in magnet assembly, lift shaft and collar up and out of bearing mount. Be sure to retain lower spacer.

- C. Insert a right-angle type of tool, such as an allen wrench, into bearing. Cock it slightly to one side and remove both bearings.
- D. Install new bearings. Be careful not to introduce dirt particles into bearings. **CLEAN HANDS ONLY! DO NOT ADD LUBRICATION OF ANY KIND.**
- E. Reassemble the sensor in reverse order. Be sure to include spacers over the bearings when replacing the shaft in the bearing mount. After the magnet assembly has been tightened, a barely perceptible amount of endplay should be felt when the shaft is moved up and down.

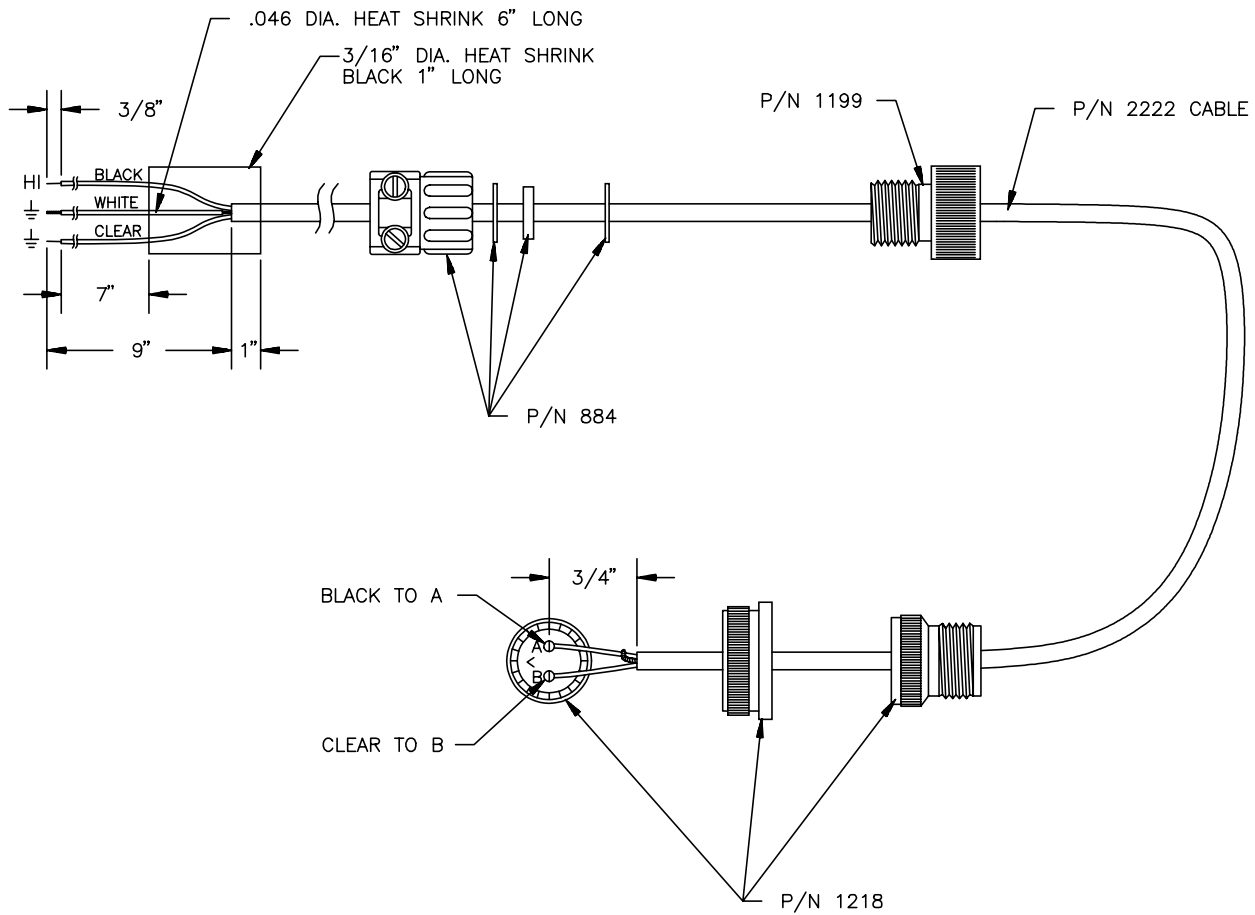


FIGURE 4. Cable Diagram

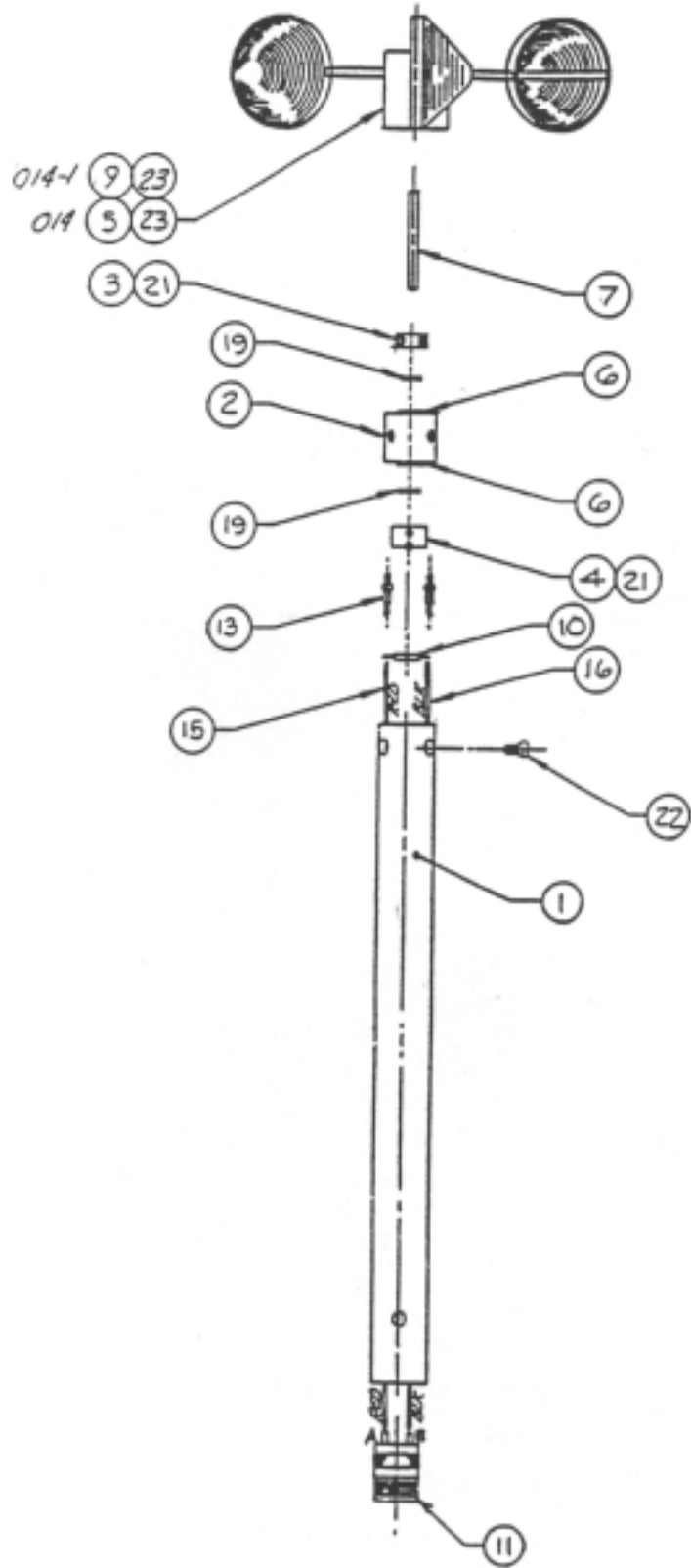


FIGURE 5. Parts Diagram

**TABLE 1. Met-One Parts List**

Reproduced by Campbell Scientific, Inc.

<u>Item</u>	<u>Part No.</u>	<u>Description</u>	<u>Qty./Assy</u>
1	1011685-2	Housing	1
2	101685-4	Bearing Mount	1
3	101685-7	Collar	1
4	101715	Magnet Assembly	1
5	101812	Assy, Cup (Alum)	1
6	101898	Bearing	2
7	86001	Shaft	1
8	101048-2	Label	1
9	1812-1	Assy, Cup (Lexan)	1
10	880160	Switch, Reed	1
11	500295	Conn, 2 Pin Male	1
12	510020	Cap	1
13	970062	Terminal	2
14			
15	9980480	Wire, 22G Red	18"
16	980445	Wire, 22GA Black	18"
17			
18			
19	860250	Spacer	2
20			
21	601250	SCR, SET A/H C/P 4-40x1/8	4
22	601230	SCR,FLT HD PHIL 4-40x1/4	3
23	601680	SCR,SET A/H C/P 8-23x3/8	2
24			
25	995120	Adhesive, (RTV 108)	A/R
26	995100	Adhesive, Epoxy (907)	A/R
27	995425	Locite 222-21	A/R
28	995060	Adhesive, Silicone	5 ml
29	995430	Locite 290-21	A/R
30	400010	Cable, 2 Cond.	REF
31	500372	Conn, 2 Pin Socket	REF
32	480500	Clamp	REF