

INSTRUCTION MANUAL



A100LK Anemometer

7/12



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A100LK Anemometer

1. Introduction

The Windspeed Ltd Model A100LK Anemometer is an IEC and MEASNET rated instrument recommended for wind energy applications where a Class 1 anemometer is required. It is primarily used in wind speed resource assessments and in wind turbine power performance monitoring. The “-L” designation after the A100LK model number designates a cable length.

Before installing the A100LK, please study

- Section 2, *Cautionary Statements*
- Section 3, *Initial Inspection*
- Section 4, *Quickstart*

2. Cautionary Statements

- The A100LK is a precision instrument. Please handle it with care.
- If the A100LK is to be installed at heights over 6 feet, be familiar with tower safety and follow safe tower climbing procedures.
- Danger — Use extreme care when working near overhead electrical wires. Check for overhead wires before mounting the A100LK or before raising a tower.

3. Initial Inspection

- Upon receipt of the A100LK, 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.
- Each A100LK anemometer is shipped with a MEASNET calibration certificate that contains information concerning where the anemometer was calibrated, the calibration procedure used, the calibration equation obtained, and the serial number of the anemometer. Cross check the serial number in the calibration certificate against the serial number on the anemometer to ensure that the given sensitivity value corresponds to your sensor.

4. Quickstart

4.1 Step 1 — Mount the Sensor

To mount the sensor, refer to Figure 4-1 and do the following.

1. Mount a CM202, CM204, or CM206 crossarm to a tripod or tower.
2. Secure the CM220 Mount to the crossarm.
3. Place the 27739 30 in. pole in the bottom of the A100LK and tighten the thumb screws.
4. Place the bottom of the 27739 pole in the CM220's u-bolt and tighten the nuts.
5. Use a bubble level to ensure that the anemometer is level.
6. Route the sensor cable along the underside of the crossarm to the tripod or tower, and to the instrument enclosure.
7. Secure the cable to the 27739 pole, crossarm, and tripod or tower using cable ties.

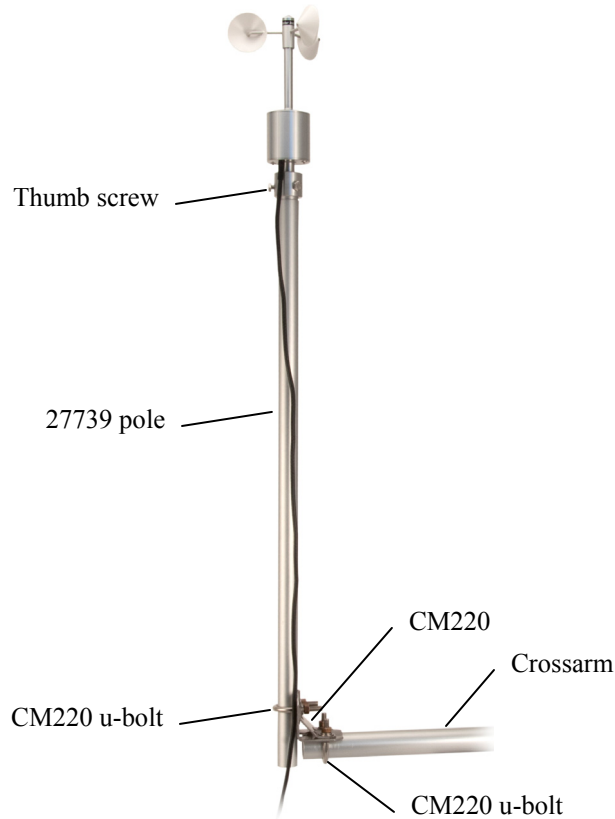


FIGURE 4-1. A100LK mounted to a crossarm via the CM220

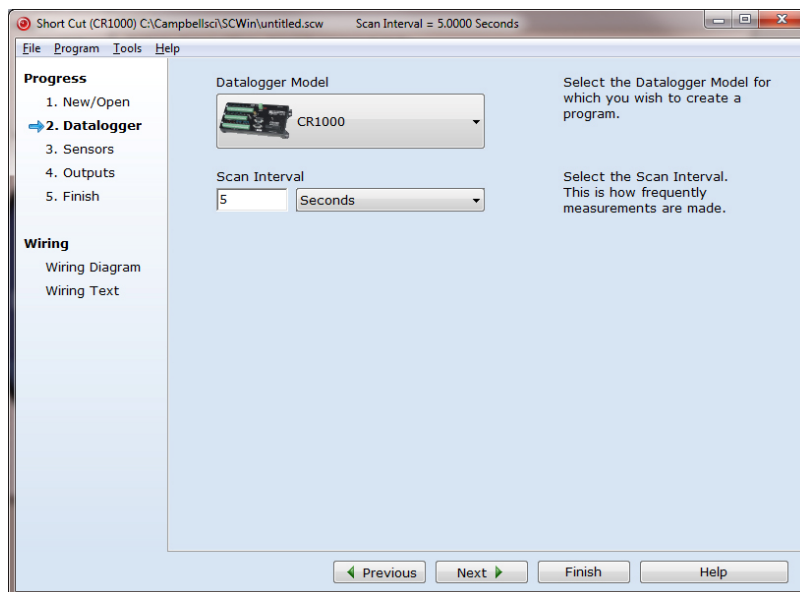
4.2 Step 2 — Use SCWin ShortCut to Program Datalogger and Generate Wiring Diagram

The simplest method for programming the datalogger to measure an A100LK is to use Campbell Scientific's SCWin Short Cut Program Generator.

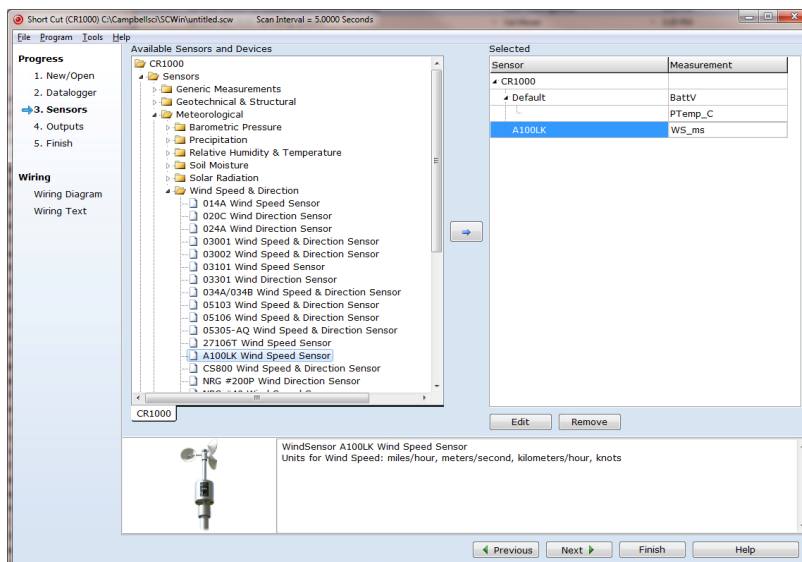
1. Open Short Cut and click on **New Program**.



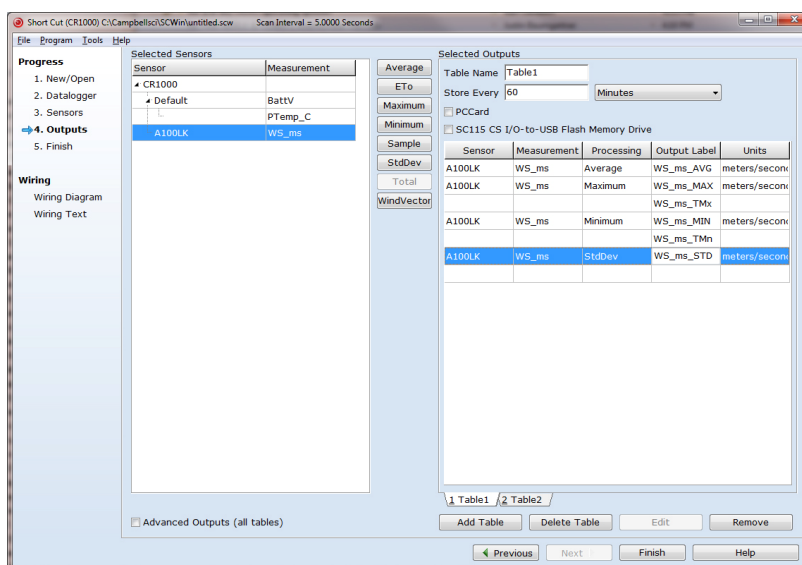
2. Select datalogger and enter scan interval.



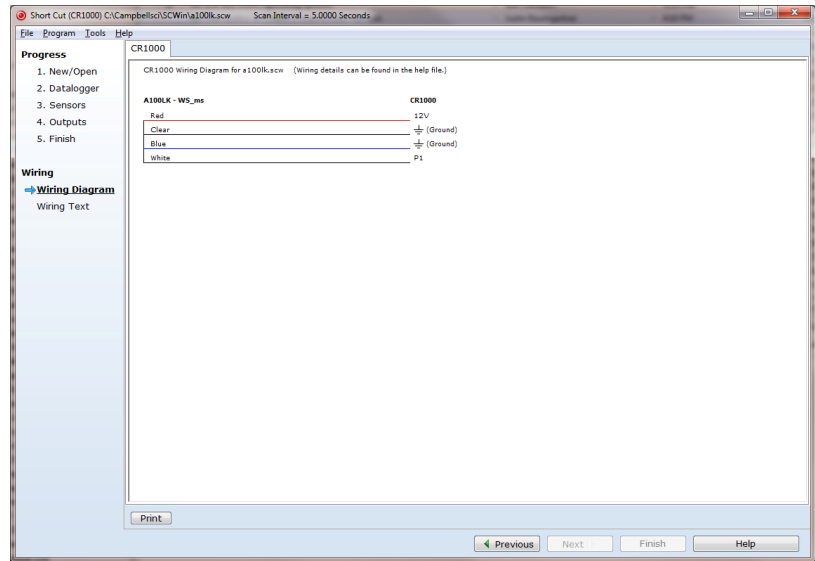
3. Select A100LK and select the right arrow to add it to the list of sensors to be measured then select next.



4. Select the outputs then select finish.



5. Wire according to the wiring diagram generated by SCWin Short Cut.



5. Overview

The A100LK is an IEC Class 1 anemometer. It is a low-power version of the A100L2, which was developed from the proven A100 Porton™ instrument and R30 rotor design. The A100LK consumes little supply current, operating from a supply as low as 5 volts.

Rotation of the A100LK's three-cup rotor is electronically converted to pulse output signals proportional to wind speed. The A100LK produces a higher rate of pulses per revolution (up to 13) compared to relay based sensors, making it suitable for wind surveying where turbulence needs to be estimated.

The A100LK is a rugged instrument, constructed from anodized aluminum alloys, stainless steel, and weather resistant plastics. A stainless steel shaft runs in two precision, corrosion-resistant ball-races. The bearings are protected from the entry of moisture droplets and dust, resulting in an instrument suitable for permanent exposure to the weather.

The low power consumption, wide power supply range, pulse/frequency signal, and first-class performance rating make this anemometer ideal for use with our dataloggers in wind-power site surveying applications.

The A100LK is manufactured by Windspeed Ltd and then cabled by Campbell Scientific.

6. Specifications

Features:

- IEC Class 1 performance
- Low power
- High rate of pulses per revolution (up to 13) produced makes it suitable for wind surveying applications where turbulence is estimated

Compatible Dataloggers:	CR10(X) CR23X CR800 series CR1000 CR3000 CR5000 CR9000(X)
Threshold:	0.15 ms^{-1} (starting speed 0.2 ms^{-1} , stopping speed 0.1 ms^{-1})
Maximum speed:	77.22 ms^{-1}
Accuracy:	$1\% \pm 0.1 \text{ ms}^{-1}$
Distance Constant:	$2.3\text{m} \pm 10\%$
Calibration Data:	Supplied for anemometer and rotor at one test speed to an accuracy of $\pm 1\%$ at $+15^{\circ}\text{C}$, 12V DC supply and an analog output load of $1\text{M}\Omega$
Temperature Range:	-30° to $+70^{\circ}\text{C}$
Height:	19.5 cm (7.68 in.)
Case Diameter:	5.5 cm (2.2 in.)
Rotor:	15.2 cm (6 in.) diameter three-cup rotor
Weight:	490 g (17.3 oz) including 3 m (10 ft) cable
Supply Voltage:	6.5 to 28 Vdc
Current Consumption:	2 mA max., 1.6 mA typical (no output load)
Power-up Time:	5 s
Surge Protection:	Vector PC3L2 anti-surge module fitted

7. Operation

7.1 Siting

Locate wind sensors away from obstructions (e.g., trees and building). As a general rule, there should be a horizontal distance of at least ten times the height of the obstruction between the anemometer and the obstruction. If mounting the sensors on the roof of a building, the height of the sensors, above the roof, should be at least 1.5 times the height of the building. See Section 10, *References* for a list of references that discuss siting wind speed and direction sensors. For power performance applications refer to IEC 61400-12-1 which specifies the mounting and location of anemometers.

7.2 Wiring

When Short Cut for Windows software is used to create the datalogger program, the sensor should be wired to the channels shown on the wiring diagram created by Short Cut.

Tables 7-1 and 7-2 show the connections to Campbell Scientific dataloggers.

TABLE 7-1. Connections to Campbell Scientific Dataloggers Pulse Channels				
Color	Wire Label	CR800 CR850 CR5000 CR3000 CR1000	CR510 CR500 CR10X	21X CR7 CR23X
White	Signal	Pulse	Pulse	Pulse
Red	12V	12V	12V	12V
Blue	Ground	G	G	G
Clear	Shield	Analog Ground	Analog Ground	Analog Ground

TABLE 7-2. Connections to Campbell Scientific Dataloggers Control Ports			
Color	Wire Label	CR800 CR850 CR5000 CR3000 CR1000	CR10X
White	Signal	C1-C8	C6-C8
Red	12V	12V	12V
Blue	Ground	G	G
Clear	Shield	Analog Ground	Analog Ground

7.3 Programming with CRBasic and Edlog

Wind speed is typically measured using a pulse channel. For dataloggers using CRBasic, use the **PulseCount()** instruction with the pulse channel configured for high frequency with frequency counting. For dataloggers programmed with Edlog, use Instruction 3 and for parameter 3 specify configuration code 22 to output frequency in Hertz.

7.3.1 Slope and Offset Calculations

The slope value is entered as the multiplier in the pulse count instruction. For the best accuracy you should always obtain an individual multi-point wind speed calibration in a reputable wind tunnel (such as MEASNET) wherever the highest accuracy results are required.

Calculations for a nominal A100LK suggest that the nominal figures for the datalogger would be: slope = 0.0499, offset = 0.258 (for results in m/s, best fit over 4 to 16 m/s) (ref 2).

However, slope/offset figures from Garrad Hassan quotes consensus figures for the A100LK as: slope = 0.0499, offset = .2400.


The example programs contained in this manual use the calculated offset value.

7.3.2 Example Programs

Pulse Port Example

The following CR1000 example program uses a pulse port to measure the A100LK-L once a second. The program stores the mean, maximum, minimum, and standard deviation of the measured wind speed over a 10 minute interval.

```
'CR1000 Series Datalogger
'Program to measure A100LK-L and store ten minute averages

'Wiring
'White ----- Signal ----- P1
'Red ----- Power ----- 12V
'Blue ----- Power Ground - G
'White ----- Shield ----- 
'Declarations
Const A100LK_L_mult = .0499
Const A100LK_L_offset = .258

Public PTemp, batt_volt
Public WS_ms

'Define Data Tables
DataTable (Test,1,1000)
  DataInterval (0,10,Min,10)
  Minimum (1,batt_volt,FP2,0,False)
  Sample (1,PTemp,FP2)
  Average (1,WS_ms,FP2,False)
  Maximum (1,WS_ms,FP2,False,False)
  Minimum (1,WS_ms,FP2,False,False)
  StdDev (1,WS_ms,FP2,False)
EndTable
```

```

'Main Program

BeginProg
  Scan (1,Sec,0,0)
    PanelTemp (PTemp,250)
    Battery (batt_volt)

    'A100LK Wind Speed Sensor (CSL) measurement 'WS_ms'
    PulseCount(WS_ms,1,2,0,1,A100LK_L_mult,A100LK_L_offset)
    If WS_ms<0.258 Then WS_ms=0

    'Call data tables
    CallTable Test

  NextScan
EndProg

```

8. Troubleshooting

Symptom: No wind speed

1. Check that the sensor is wired to the Pulse channel specified by the Pulse count instruction.
2. Verify that the Configuration Code, and Multiplier and Offset parameters for the Pulse Count instruction are correct for the datalogger type.

Symptom: Wind speed does not change

1. For the dataloggers that are programmed with Edlog, the input location for wind speed is not updated if the datalogger is getting “Program Table Overruns”. Increase the execution interval (scan rate) to prevent overruns.

9. Maintenance

Every month do a visual/audio inspection of the anemometer at low wind speeds. Verify that the anemometer bearings rotate freely. Inspect the sensor for physical damage. Replace the anemometer bearings when they become noisy, or the wind speed threshold increases above an acceptable level.

CAUTION

Disassembling an anemometer to change the bearings will invalidate the MEASNET calibration.

MEASNET calibrations are normally valid for 12 months in the field (assuming the anemometer is installed within 6 months of the calibration test). In high-accuracy applications, Campbell Scientific recommends that the anemometer be returned to us for maintenance/overhaul between deployments; we can arrange for a new MEASNET calibration after maintenance/overhaul where required.

Before an A100LK sensor is sent to Campbell Scientific, the customer must get an RMA (returned material authorization) and fill out the Declaration of Hazardous Material and Decontamination form.

10. References

1. IEC 61400 Part 12-1, “Wind turbine generator systems Part 12: Wind Turbine Power Performance Testing”.
2. <http://www.windspeed.co.uk/ws/index.php?option=faq&task=viewfaq&Itemid=5&artid=29>.

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