Limited Warranty

“Products manufactured by CSI are warranted by CSI to be free from defects in materials and workmanship under normal use and service for twelve months from the date of shipment unless otherwise specified in the corresponding product manual. (Product manuals are available for review online at www.campbellsci.com.) Products not manufactured by CSI, but that are resold by CSI, are warranted only to the limits extended by the original manufacturer. Batteries, fine-wire thermocouples, desiccant, and other consumables have no warranty. CSI’s obligation under this warranty is limited to repairing or replacing (at CSI’s option) defective Products, which shall be the sole and exclusive remedy under this warranty. The Customer assumes all costs of removing, reinstalling, and shipping defective Products to CSI. CSI will return such Products by surface carrier prepaid within the continental United States of America. To all other locations, CSI will return such Products best way CIP (port of entry) per Incoterms ® 2010. This warranty shall not apply to any Products which have been subjected to modification, misuse, neglect, improper service, accidents of nature, or shipping damage. This warranty is in lieu of all other warranties, expressed or implied. The warranty for installation services performed by CSI such as programming to customer specifications, electrical connections to Products manufactured by CSI, and Product specific training, is part of CSI’s product warranty. **CSI EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** CSI hereby disclaims, to the fullest extent allowed by applicable law, any and all warranties and conditions with respect to the Products, whether express, implied or statutory, other than those expressly provided herein.”
Assistance

Products may not be returned without prior authorization. The following contact information is for US and international customers residing in countries served by Campbell Scientific, Inc. directly. Affiliate companies handle repairs for customers within their territories. Please visit www.campbellsci.com to determine which Campbell Scientific company serves your country.

To obtain a Returned Materials Authorization (RMA), contact CAMPBELL SCIENTIFIC, INC., phone (435) 227-9000. Please write the issued RMA 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

For all returns, the customer 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 website at www.campbellsci.com/repair. A completed form must be either emailed to repair@campbellsci.com or faxed to (435) 227-9106. Campbell Scientific 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 customer at the customer’s expense. Campbell Scientific reserves the right to refuse service on products that were exposed to contaminants that may cause health or safety concerns for our employees.
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 or by telephoning (435) 227-9000 (USA). 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, 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.
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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.

NOTE
This manual provides information only for CRBasic dataloggers. It is also compatible with most of our retired Edlog dataloggers. For Edlog datalogger 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 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**

*Short Cut* is an easy way to program your datalogger to measure the A100LK and assign datalogger wiring terminals. *Short Cut* is available as a download on [www.campbellsci.com](http://www.campbellsci.com) and the ResourceDVD. It is included in installations of LoggerNet, PC200, PC400, or RTDAQ.

Use the following procedure to get started.

1. Open *Short Cut*. Click **New Program**.

![Image of Short Cut software](image)

2. Select **Datalogger Model** and **Scan Interval** (default of 5 seconds is **OK** for most applications). Click **Next**.

![Image of Short Cut software](image)
3. Under the **Available Sensors and Devices** list, select the **Sensors | Meteorological | Wind Speed & Direction** folder. Select **A100LK Wind Speed Sensor** and click to move the selection to the selected device window. The units default to **meters/second**, which can be changed by clicking the **Wind Speed** box and selecting one of the other options. If the sensor is calibrated, click the **Calibrated** box and enter the **Multiplier** and **Offset**.

4. After selecting the sensor, click **Wiring Diagram** to see how the sensor is to be wired to the datalogger. The wiring diagram can be printed 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 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 with Campbell Scientific CRBasic dataloggers: CR200(X) series, CR300 series, CR6 series, CR800 series, CR1000, CR3000, CR5000, and 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% ±0.1 ms\(^{-1}\)
Distance Constant: 2.3 m ±10%

Calibration Data: Supplied for anemometer and rotor at one test speed to an accuracy of ±1% at +15 °C, 12 Vdc supply and an analog output load of 1 MΩ

Temperature Range: –30 to 70 °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. Installation

If you are programming your datalogger with Short Cut, skip Section 7.3, Wiring (p. 6), and Section 7.4, Programming (p. 7). Short Cut does this work for you. See Section 4, QuickStart (p. 2), for a Short Cut tutorial.

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 9, References (p. 9), 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 Assembly and Mounting

To mount the sensor, refer to FIGURE 7-1 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-inch 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 7-1. A100LK mounted to a crossarm via the CM220**

### 7.3 Wiring

TABLE 7-1 shows the connections to Campbell Scientific dataloggers.
### TABLE 7-1. Wire Color, Wire Function, and Datalogger Connection

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Wire Function</th>
<th>Datalogger Connection Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Signal</td>
<td>U configured for pulse input¹, P (pulse input) or C (control port)</td>
</tr>
<tr>
<td>Red</td>
<td>Power</td>
<td>12V</td>
</tr>
<tr>
<td>Blue</td>
<td>Ground</td>
<td>G</td>
</tr>
<tr>
<td>Clear</td>
<td>Shield</td>
<td>AG or ☲ (analog ground)</td>
</tr>
</tbody>
</table>

¹U channels are automatically configured by the measurement instruction.

### 7.4 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 in the following section. A complete program example for a select CRBasic datalogger can be found in Appendix B, *Example Program* (p. B-1). Programming basics and programming examples for Edlog dataloggers are provided at [www.campbellsci.com/old-manuals](http://www.campbellsci.com/old-manuals).

#### 7.4.1 PulseCount

For CRBasic dataloggers, wind speed is measured using the **PulseCount()** instruction. Syntax of the **PulseCount()** instruction is:

**PulseCount**( Dest, Reps, PChan, PConfig, POption, Mult, Offset )

The **PConfig** parameter should be set to 0 *(High Frequency)* and the **POption** parameter should be set to 1 *(Frequency)*.

#### 7.4.2 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.

8. Troubleshooting and Maintenance

NOTE All factory repairs, replacements, and calibrations 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.

8.1 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.

8.2 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.
9. References


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)-series datalogger code)
- .CR300 (CR300-series datalogger code)
- .CR6 (CR6-series datalogger code)
- .CR8 (CR800-series datalogger code)
- .CR1 (CR1000 datalogger code)
- .CR3 (CR3000 datalogger code)
- .CR5 (CR5000 datalogger code)
- .CR9 (CR9000(X) 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, .CR300, .CR6, .CR8, .CR1, .CR3, .CR5, or .CR9 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.

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.

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.
Appendix B. Example Program

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.

CRBasic Example B-1. CR1000 Program Measuring the A100LK

```
'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
```
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<tr>
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<th>Address</th>
<th>Country</th>
<th>Website</th>
<th>Contact Email</th>
</tr>
</thead>
<tbody>
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<td>CANADA</td>
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<td>BRASIL</td>
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<td><a href="http://www.campbellsci.de">www.campbellsci.de</a></td>
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<td>SPAIN</td>
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</tr>
</tbody>
</table>

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