



**CAMPBELL
SCIENTIFIC**
WHEN MEASUREMENTS MATTER

Dataloggers, Software, and Communications

Resource Assessment and Power Performance Measurement Systems



For over 40 years, Campbell Scientific has been a worldwide leader in designing and manufacturing rugged measurement and control dataloggers and monitoring systems in environmental, research, and industrial applications, and since 1984 in wind-energy resource assessment.



Campbell Scientific designs, manufactures, and sells rugged dataloggers, data acquisition systems, and measurement and control products used worldwide in environmental, research, and industrial markets. The company was established in 1974 with its corporate headquarters in Logan, Utah, United States. The majority of Campbell Scientific products are manufactured at its U.S. facility, which employs over 300 people in engineering, production, marketing, and administration departments.

Campbell Scientific products are known for their flexibility, precision measurements, and dependability—even in harsh, remote environments. In addition to a family of powerful dataloggers, Campbell Scientific offers a variety of related product lines for the measurement field, including sensors and devices for the collection, storage, communication, and retrieval of data. Using these components, Campbell Scientific employees work with customers to configure unique data acquisition and measurement and control systems that meet specific instrument and application needs.

Contents

- 3 Measurement & Control Dataloggers & Measurement Modules**
- 12 Monitoring & Support Software**
- 14 Telemetry Peripherals**
- 18 Global Sales & Support Network**

Campbell Scientific Datalogger Overview

Campbell Scientific dataloggers are at the center of our rugged, reliable data acquisition systems. They are known for their flexibility, precision measurements, and dependability—even in harsh, remote environments.

As for functionality, all of our dataloggers:

- Measure sensors
- Process data onboard
- Initiate measurement and control functions based on time or event
- Store data in multiple tables that can be individually sized and collected
- Control external devices such as pumps, motors, alarms, freezers, and valves
- Operate independently of ac power, computers, and human interaction
- Use our PC support software to program the datalogger
- Consume minimal power from a 12 Vdc source
- Interface with on-site and telemetry devices
- Perform reliably under adverse conditions



We manufacture a complete line of dataloggers that range in size and complexity. Dataloggers vary in the supported scan rates, number and type of input/output channels, analog resolution, and analog voltage accuracy. All of our dataloggers have a three year warranty.

To help customers choose the best datalogger for their application, this document describes the different components of the datalogger, provides a brief summary of each datalogger model available, and includes charts that compare the datalogger specifications and list the compatible devices.

Communication Protocols

PakBus[®]

With the PakBus protocol, networks have the distributed routing intelligence to continually evaluate links. Continually evaluating links optimizes delivery times and, in the case of delivery failure, allows automatic switch over to a configured backup route.

Modbus

The Modbus RTU protocol supports both floating point and long formats. The datalogger can act as a slave and/or master.

DNP3

The dataloggers are level 2 slave compliant, with some of the operations found in a level 3 implementation.

TCP/IP, FTP, and SMTP

These protocols provide TCP/IP functionality on the CR6 or CR1000X or, when a CR3000 is used in conjunction with an NL116, NL121, or third party serial IP device.

Keyboard Display

The datalogger's keypad display which allows you to display current and recorded data and manually communicate with the datalogger. It consists of a 128-by-64 pixel backlit graphical LCD or with-line numeric display and 16-character keyboard. The CR850 and CR3000 have a built-in keyboard display as part of their

integrated package. The CR6, CR800, and CR1000X use the CR1000KD, a portable keyboard display that can be carried from site to site. The CR300-series datalogger does not have a keyboard display.



Programming

Our family of contemporary dataloggers are programmed using Short Cut, a simple point-and-click software, for most basic applications. For more complex programming, CRBasic provides

special instruction for making measurements and creating tables of output data. CRBasic also supports complex algebraic and conditional expressions.

Input/Output Connections

Switched Excitation Outputs

Provides programmable excitation for resistive bridge measurements

Analog Inputs

For differential, single-ended, and period averaging measurements

5 V Terminal

For sensor or modem power

Switched 12 V Terminal

For switching power to sensors or communication devices

12 V Terminal

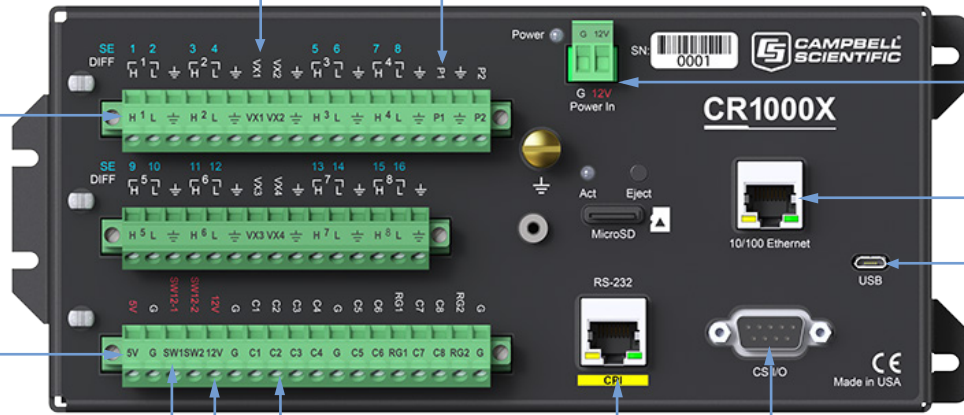
For continuous sensor or modem power

Digital I/O Ports

For controlling external devices, reading SDI-12 sensors or SDM peripherals

Pulse Counters

For measuring switch closures, low-level ac sine waves, or high frequency pulses



Removable Power Terminal

Simplifies connection to external power supply.

10/100 Ethernet

RJ-45 for LAN connection

USB

For direct connection to PC

CS I/O Port

For connecting to Campbell Scientific peripherals

CPI Port

For terminal expansion using Campbell Distributed Modules (CDMs) (CR6 and CR1000X only)

Analog Inputs

Analog inputs measure voltage levels, and can be configured to make single-ended (a voltage measurement compared to ground) or differential (the high side of a voltage output compared to the low side) measurements. Sensors measured by analog inputs include thermocouples, thermistors, resistive bridges, vibrating wire, and 4 to 20 mA outputs. The CR300-series and CR1000X dataloggers can measure the 4 to 20 mA sensors, natively.

Continuous Analog Outputs

Some datalogger models have continuous analog outputs, which provide voltage levels to displays or proportional controllers.

Pulse Counters

Pulse counters measure switch closures, low level ac sine waves, or high frequency pulses. They sum the number of counts over each execution interval (scan rate), and allow the determination of variables such as rpm, velocity, flow, and rainfall intensity. Sensors that use pulse counters include tipping bucket rain gages, flow meters, and anemometers.

Digital I/O Ports

Digital I/O ports detect status, read SDM peripherals or SDI-12 sensors, and control external devices. Each port can be configured separately within the datalogger's program.

CPI Port

Our CR6 and CR1000X dataloggers have a port for directly connecting Campbell Distributed Modules (CDMs) without using an SC-CPI interface.

Power and Ground Inputs

Power and ground inputs allow easy connection of an energy source, typically 12 Vdc nominal, to energize the datalogger. Switched 12 V terminals allow the datalogger to supply power to a peripheral only when the peripheral is being measured, thus reducing power consumption.

Switched Excitation Outputs

All of our dataloggers have switched voltage excitation outputs. These outputs provide programmable excitations for resistive bridge measurements by switching voltage on and off. Bridge measurements are the ratio of the bridge output to the excitation voltage, eliminating any errors in the excitation voltage. The CR3000 and CR6 also have switched current excitation outputs that are for resistance measurements.

Communications/Data Storage Ports

The CS I/O 9-pin port is used to connect most of our data storage and retrieval peripherals. Connection to a laptop or PC requires an interface, typically the SC32B Optically Isolated Interface.

The USB and/or RS-232 port allows the datalogger to be connected to the PC. On the CR300-series, CR3000, and CR9000X, the RS-232 port is electrically isolated. Isolation is not provided by the RS-232 port on the CR800-series dataloggers.

Other communication ports available on some dataloggers include the 10/100 Ethernet port, microSD card slot, and 20-pin parallel peripheral port. The peripheral port allows connection of devices that store data on a CompactFlash card and/or communicate via Ethernet.

Datalogger Descriptions

CR300-Series Datalogger

The input channel configuration of the CR300-series datalogger is optimal for measuring two or three sensors. The CR300-series datalogger has an integrated dc/dc charge regulator for an external battery.



- › **Design Features:** This is our smallest and lowest-cost datalogger. It has a built-in USB port and can measure 0-to-20 mA or 4-to-20 mA sensors, natively.
- › **Ideal Applications:** Rural water, aquaculture, water quality, water level/stage, SCADA, weather stations, and OEM application specific where the small form factor and channel count customized to reduce cost
- › **Models Available:** Unlike the CR300, the CR310 (picture not shown) includes a built-in Ethernet port and removable terminal strips.
- › **Options Available:** both models can include on-board Wi-Fi, 900 MHz Spread Spectrum Radio, 922 MHz Spread Spectrum Radio, or 868 MHz SRD860 radio.

CR800-series Measurement and Control Datalogger

The CR800 series consists of measurement electronics encased in a plastic shell and an integrated wiring panel. The CR800 series uses an external power supply—typically the BPALK Alkaline Battery Pack or PS200 or PS150 Rechargeable Power Supply.



- › **Design Features:** These research-grade dataloggers have a custom ASIC chip that expands pulse count, control port, and serial communications capabilities. They are compatible with channel expansion peripherals and thermocouples, and support serial communications with serial sensors and devices via I/O port pairs.
- › **Ideal Applications:** Wind profiling, weather stations, air quality, ETo/agriculture, soil moisture, water level/stage, aquaculture, vehicle testing, Time Domain Reflectometry, SCADA, water quality.
- › **Models Available:** CR800 uses the portable CR1000KD keyboard display; CR850 has a keyboard display as part of its integrated package.

CR6 Measurement and Control Datalogger

Innovative U terminals featuring high accuracy analog measurements with unsurpassed sensor interface flexibility define the CR6. It also boasts fast processing, low power, and offers an integrated charger regulator.



- › **Design Features:** The CR6 includes 12 universal (U) terminals—an ingenious way for allowing virtually any sensor, analog digital or smart, to be connected to any U terminal. It is our only datalogger capable of doing direct static vibrating-wire measurements. The CR6 also provides faster communications, built-in USB and 10/100baseT ports, microSD card slot, compact size, and improved analog input accuracy and resolution. Measurement and control can be expanded as the CR6 is compatible with all Campbell Scientific SDMs and CDMs.
- › **Ideal Applications:** Structural health monitoring, solar and wind assessment and power performance, SCADA, vehicle testing, Mesonet systems, weather stations, air quality, ETo/agriculture, soil moisture, eddy covariance, aquaculture, avalanche forecasting, water quality.
- › **Options Available:** can include on-board Wi-Fi, 900 MHz spread spectrum radio, 920 MHz spread spectrum radio, 868 MHz SRD860 radio, or 1 W 9000 MHz spread spectrum radio.

CR1000X Measurement and Control Datalogger

The CR1000X is our flagship datalogger that provides measurement and control for a wide variety of applications. It uses an external power supply, usually the BPALK, PS200, or PS150, and a portable keyboard display, the CR1000KD.

- › **Design Features:** This world-class environmental datalogger has similar communication speed, analog input accuracy, and resolution as the CR6. The CR1000X includes built-in USB and 10/100baseT ports and a microSD card slot. It measures 0-to-20 mA or 4-to-20 mA sensors, natively. Measurement and control can be expanded as the CR1000X is compatible with all Campbell Scientific multiplexers, SDMs, and CDMs. An RS-232/CPI port allows CDM connection without using the SC-CPI interface.
- › **Ideal Applications:** Fire weather, mesonet systems, wind profiling, weather stations, air quality, ETo/agriculture, soil moisture, water level/stage, aquaculture, avalanche forecasting, Time Domain Reflectometry, vehicle testing, SCADA, water quality.



CR3000 Micrologger

The CR3000 consists of a compact, integrated package with a built-in power supply, a 128 x 64 pixel backlit graphical or eight-line numeric display, and a 16-character keyboard.

- › **Design Features:** The CR3000 provides more channels, programmable switched current outputs, and a 40-pin parallel peripheral port. The peripheral port interfaces with the NL116 Ethernet Interface and CompactFlash® Module, the NL121 Ethernet Interface, or the CFM100 CompactFlash Module.
- › **Ideal Applications:** Eddy covariance, wind profiling, HVAC, weather stations, vehicle testing, air quality, process control, Mesonet systems, agriculture, soil moisture, Time Domain Reflectometry, water quality.
- › **Base Options:** Sealed rechargeable battery, alkaline batteries, or low-profile (no-battery) base.



CR9000X Measurement and Control Datalogger

The CR9000X is a large modular datalogger that consists of a base system and slots for user-specified I/O modules.

- › **Design Features:** The CR9000X supports a measurement rate of up to 100,000 Hz, provides 180 MHz clock speed, has an onboard PC-card slot for expanding its storage capacity, and includes an onboard 10baseT/100baseT port. Also, the CR9000X can provide anti-aliasing and real-time FFT capabilities by using a CR9052IEPE or CR9052DC module.
- › **Ideal Applications:** Vehicle testing, structural or seismic monitoring, or other applications that require rapid sampling or a large number of high resolution channels.
- › **Base Options:** Standard CR9000X includes the base system and slots for up to nine I/O modules; the user chooses either the lab or environmental enclosure. The CR9000XC includes the base system, slots for up to five I/O modules, and an environmental enclosure.



Datalogger Comparison Table

FEATURE	CR300-Series	CR800/CR850	CR6 (see note 1)
Max. Scan Rate (Hz)	10	100	1000
Analog Inputs	6 SE or 3 diff (see note 2)	6 SE or 3 diff	up to 12 SE or 6 diff
Pulse Counters	2	2	up to 16
Switched Excitation Channels	2 voltage	2 voltage	up to 12 voltage or 12 current
Digital Ports (see notes 3, 4)	2 I/Os 1 TX/RX pair RS-232	4 I/Os or 2 TX/RX pair RS-232	up to 16 I/Os, 2 RS-232, 2 RS-485, 8 TX/RX pair RS-232, or 8 SDI-12
Continuous Analog Outputs	0	0	0
Communications/ Data Storage Ports	1 RS-232, 1 USB, 1 10/100baseT (CR310 only)	1 CS I/O, 1 RS-232	1 USB, 1 CS I/O, 1 CPI/RS-232, 1 MicroSD, 1 10/100baseT
CPI Port	0	0	1
Input Voltage Range (Vdc)	-0.1 to +2.5	±5	±5
Analog Voltage Accuracy	±(0.04% of reading + offset), 0° to +40°C	±(0.06% of reading + offset), 0° to +40°C	±(0.04% of reading +offset), 0° to +40°C
Analog Resolution	to 0.23 µV	to 0.33 µV	to 0.05 µV
A/D Bits	24	13	24
Temperature Range (°C)	-40 to +70	-25 to +50 (standard) -55 to +85 (extended, CR800) -30 to +80 (extended, CR850)	-40 to +70 (standard) -55 to +85 (extended)
Memory (B)	10 M flash for data storage 5 M flash for CPU drive / programs 2 M flash for operating system	2 M Flash (operating system) 4 M (CPU usage, program storage, and data storage)	6 M flash (operating system), 6 M (CPU usage, program, storage, and data storage)
Power Requirements (Vdc)	16 to 32 CHS, 9.6 to 16 BAT	9.6 to 16	16 to 32 CHS, 9.6 to 16 BAT
Typical Current Drain (mA)	1.5 (sleep, no radio) 5 (active, 1 Hz scan with analog measurement, no radio)	~0.7 (sleep mode) 1 to 16 (w/o RS-232 comm) 17 to 28 (w/RS-232 comm)	~0.8 (sleep mode) 3 (1 Hz sample rate), 67 (20 Hz sample rate)
Dimensions (inches)	5.5 x 3.0 x 2.0	9.5 x 4.1 x 2	8 x 4 x 2.4
Weight (lb)	0.5 (CR300) 0.6 (CR310, CR300-WIFI/RF407/412/422) 0.7 (CR310-WIFI/RF407/412/422)	1.5	0.9 (CR6) 1.0 (CR6-WIFI/RF407/412/422/451)
SDI-12 Supported	yes	yes	yes
PakBus Supported	yes	yes	yes
Modbus Supported	yes	yes	yes
DNP3 Supported	yes	yes	yes
Compliance Information	Available at: www.campbellsci.com/cr300 www.campbellsci.com/cr310	Available at: www.campbellsci.com/cr800 www.campbellsci.com/cr850	Available at: www.campbellsci.com/cr6

SOFTWARE SUPPORTED

Short Cut	3.2 or higher	yes	yes
PC200W	4.4 or higher	yes	yes
PC400	4.4 or higher	1.2 or higher	4.3 or higher
LoggerNet	4.4 or higher	3.0 or higher	4.3 or higher
RTDAQ	no	yes	yes

Notes:

- The CR6 has 12 universal (U) and four control (C) terminals that can be programmed for a variety of functions. The number of analog inputs, switched excitations, and digital ports assume all of the ports are configured the same.
- On the CR300-series, two analog inputs can measure 4 to 20 mA or 0 to 20 mA, natively, and four analog inputs can provide pulse/digital I/O functions.
- Certain digital ports can be used to count switch closures.
- I/O ports can be paired as transmit and receive for measuring smart serial sensors.
- We recommend you confirm system configuration and critical specifications with Campbell Scientific before purchase.

Datalogger Comparison Table Continued

FEATURE	CR1000X	CR3000	CR9000X (see note 1)
Max. Scan Rate (Hz)	1000	100	100,000
Analog Inputs	16 SE or 8 diff (see note 2)	28 SE or 14 diff	28 SE or 14 diff per CR9050, CR9051E, or CR9055(E)
Pulse Counters	2	4	12 per CR9071
Switched Excitation Channels	4 voltage	4 voltage, 3 current	10 voltage per CR9060
Digital Ports (see note 3,4)	8 I/Os, 4 TX/RX pair RS-232, or 4 SDI-12	3 SDM, 8 I/Os or 4 TX/RX pair RS-232	8 outputs per CR9060 or 16 I/Os per CR9071; 1 SDM
Continuous Analog Outputs	0	2	6 per CR9060
Communications/ Data Storage Ports	1 USB, 1 CS I/O, 1 CPI/RS-232, 1 MicroSD, 1 10/100baseT	1 CS I/O, 1 RS-232 1 parallel peripheral	1 CS I/O, 1 RS-232, 1 10/100baseT
CPI Port	1	0	0
Input Voltage Range (Vdc)	±5	±5	±5 w/CR9050 or CR9051E, ±50 w/CR9055(E), ±60 w/CR9058E
Analog Voltage Accuracy	±(0.04% of reading +offset), 0° to +40°C	±(0.04% of reading +offset), 0° to +40°C	±(0.07% of reading+4 A/D counts), -25° to +50°C
Analog Resolution	to 0.05 µV	to 0.33 µV	to 1.6 µV
A/D Bits	24	16	16
Temperature Range (°C)	-40 to +70 (standard) -55 to +85 (extended)	-25 to +50 (standard) -40 to +85 (extended)	-25 to +50 (standard) -40 to +70 (extended)
Memory (bytes)	128 MB Flash + 4 MB SRAM (battery backed)	2 M Flash (operating system), 4 M (CPU usage, program, storage, and data storage)	128 k (program), 128 M (data storage)
Power Requirements (Vdc)	10 to 16	10 to 16	9.6 to 16
Typical Current Drain (mA)	<1 (idle) 1 (1 Hz sample rate), 55 (20 Hz sample rate)	2 (sleep mode), 3 (1 Hz sample rate), 10 (20 Hz sample rate)	750 to 1000 (processing), 750 to 4000 (analog meas.)
Dimensions (inches)	9.4 x 4.0 x 2.4	9.5 x 7.0 x 3.8	15.75 x 9.75 x 8 (lab enclosure), 18 x 13.5 x 9 (field enclosure), 10 x 11 x 9 (CR9000XC)
Weight (lb)	1.9	10.7 (rechargeable battery), 8.3 (alkaline battery), 3.6 (w/o battery)	~30 (lab enclosure), ~40 (field enclosure), ~27 (CR9000XC)
SDI-12 Supported	yes	yes	no
PakBus Supported	yes	yes	no
Modbus Supported	yes	yes	no
DNP3 Supported	yes	yes	no
Compliance Information	Available at: www.campbellsci.com/cr1000x	Available at: www.campbellsci.com/cr3000	CE compliant

SOFTWARE SUPPORTED

Short Cut	yes	yes	no
PC200W	yes	yes	no
PC400	4.5 or higher	1.3 or higher	1.0 or higher
LoggerNet	4.5 or higher	3.2 or higher	2.0 or higher
RTDAQ	yes	yes	yes

Notes:

- For the CR9000X, the current drain, weights, and specific number of input/output channels depend on the I/O modules chosen
- On the CR1000X, two analog inputs can measure 4 to 20 mA or 0 to 20 mA, natively, and four analog inputs can provide pulse/digital I/O functions..
- Certain digital ports can be used to count switch closures.
- For the CR1000X and CR3000, the I/O ports can be paired as transmit and receive for measuring smart serial sensors.
- We recommend you confirm system configuration and critical specifications with Campbell Scientific before purchase.

Sensor and Peripheral Compatibility Table

DEVICE	CR300-Series	CR800/CR850	CR6	CR1000X	CR3000	CR9000X
SENSORS						
Anemometers (cup or propeller)	✓	✓	✓	✓	✓	✓
Anemometers (2-D sonic)	✓	✓	✓	✓	✓	
Anemometers (3-D sonic)	✓	✓	✓	✓	✓	✓
Barometers	✓	✓	✓	✓	✓	✓
Ceilometers	✓	✓	✓	✓	✓	
GPS	✓	✓	✓	✓	✓	see note 2
Present Weather	✓	✓	✓	✓	✓	✓
Pyranometers	✓	✓	✓	✓	✓	✓
Reflectometers	✓	✓	✓	✓	✓	
Relative humidity	✓	✓	✓	✓	✓	✓
Shaft encoders	✓	✓	✓	✓	✓	✓
Strain gages	✓	✓	✓	✓	✓	✓
Tipping buckets	✓	✓	✓	✓	✓	✓
Thermistors	✓	✓	✓	✓	✓	✓
Thermocouples	✓	✓	✓	✓	✓	✓
Vibrating wire		✓	✓	✓	✓	
Visibility	✓	✓	✓	✓	✓	✓
Wind Vanes	✓	✓	✓	✓	✓	✓
COMMUNICATIONS PERIPHERALS						
MicroSD			✓	✓		
CompactFlash®					✓	✓
Direct Connect	✓	✓	✓	✓	✓	✓
Ethernet	✓	✓	✓	✓	✓	✓
Multidrop Modems	✓	✓	✓	✓	✓	
PCMCIA Cards (type I, II, or III)						✓
Phone Modems (cellular)	✓	✓	✓	✓	✓	see note 3
Phone Modems (land-line)		✓	✓	✓	✓	see note 3
Radios (narrowband UHF/VHF)	✓	✓	✓	✓	✓	
Radios (spread spectrum/SRD860)	✓	✓	✓	✓	✓	see note 3
Satellite Transmitters (GOES)	✓	✓	✓	✓	✓	
Satellite Transmitters (Argos)	✓	✓	✓	✓	✓	
Satellite Transmitters (Iridium)	✓	✓	✓	✓	✓	
Short-Haul Modems		✓	✓	✓	✓	see note 3
MEASUREMENT AND CONTROL PERIPHERALS (see note 4)						
Multiplexers	see note 5	✓	✓	✓	✓	✓
SDM Devices		✓	✓	✓	✓	✓
CDM Devices (see note 6)		✓	✓	✓	✓	

Notes:

- To determine compatibility with devices not offered by Campbell Scientific or devices not listed on this chart, refer to the device's product brochure or manual, or contact Campbell Scientific.
- Contact Campbell Scientific about configuration requirements for using the CR9000X with our GPS sensor.
- Although compatible, phone modems, spread spectrum radios, and short haul modems do not support the CR9000X's maximum communication rate.
- Measurement and control devices typically used with the CR9000X are the AM25T and SDM-CAN. Although compatible, the AM16/32B, SDM-CD16AC, and SDM-CVO4 do not support the CR9000X's maximum communication rate and are not practical for most CR9000X applications.
- The CR300-series dataloggers are compatible with the AM25T only and the datalogger must have OS version 6 or later.
- Our CR6 and CR1000X dataloggers support CDMs natively through their CPI port. The CR800, CR850, and CR3000 must use an SC-CPI interface.



CDM-A108 and CDM-A116

Analog Measurement Modules



24-Bit Resolution

Greatly Increases Sensor Capacity

Overview

The CDM-A108 and CDM-A116 are 24-bit analog input modules that significantly increase the number of analog channels in a datalogger system. The CDM-A108 has eight differential channels and the CDM-A116 has 16 differential channels.

The CDM-A108 and CDM-A116 feature a 24-bit, analog-to-digital converter and a low-noise, analog front-end to provide superior analog measurements. They also can make simultaneous measurements, support period average measurements, and include both current and voltage excitation channels.

Benefits and Features

- › 8 differential or 16 single-ended inputs on the CDM-A108
- › 16 differential or 32 single-ended inputs on the CDM-A116
- › Ability to make simultaneous measurements
- › 3.0 kHz maximum multiplexed sample rate using fast (100 μ s) input settling
- › 30 kHz maximum burst sample rate
- › 24-bit sigma-delta ADC with 16 user programmable notch frequencies from 30000 Hz to 2.5 Hz, including 50 and 60 Hz. Previous generations of dataloggers could notch out 50 or 60 Hz
- › ± 5000 mV, ± 1000 mV, and ± 200 mV input ranges

Specifications

Power Requirements

- › Voltage: 9.6 to 32 Vdc

Estimated Accuracy

- › $\pm(0.04\%$ of reading + offset), 0° to 40°C
- › $\pm(0.06\%$ of reading + offset), -40° to 70°C
- › $\pm(0.08\%$ of reading + offset), -55° to 85°C

Voltage/Current Excitation Outputs

- › Voltage Excitation: ± 5 V @ 50 mA
- › Current Excitation: ± 2.5 mA; ± 5 V compliance voltage
- › Number of Voltage/Current Excitation Outputs: 2 (CDM-A108), 4 (CDM-A116)

General Purpose Outputs for AM16/32B Control or Sensor Power

5W5V Outputs

- › Number of Outputs: 2 (CDM-A108), 4 (CDM-A116)
- › Output Resistance: 40 Ω

5W12V Outputs

- › Number of Outputs: 1 (CDM-A108), 2 (CDM-A116)
- › Typical Limit: 200 mA
- › Minimum Limit: 180 mA

12V Outputs

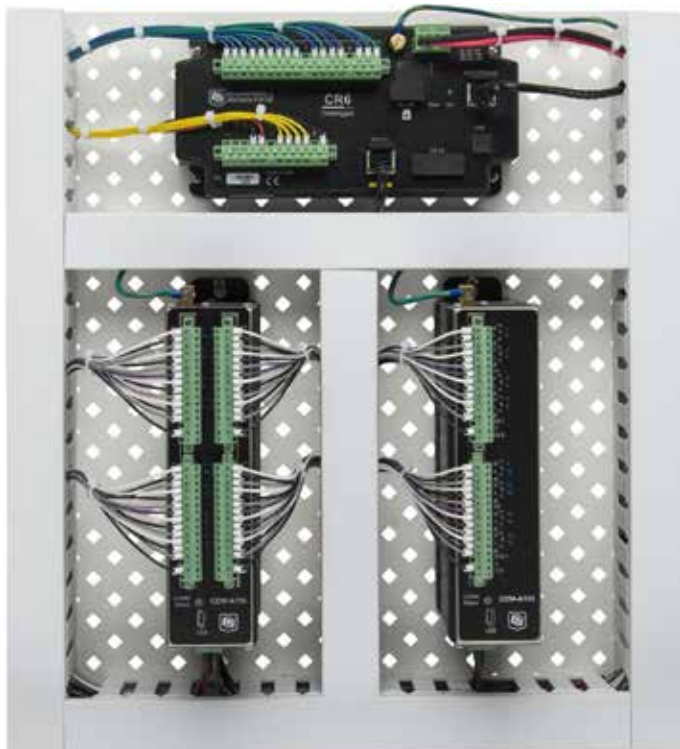
- › Number of Outputs: 1 (CDM-A108), 2 (CDM-A116)
- › Typical Limit: 200 mA
- › Minimum Limit: 180 mA

questions & quotes: 435.227.9120

www.campbellsci.com/cdms



Specifications Continued



The CR6 (shown above) and CR1000X measure CDM devices natively, and therefore do not require an SC-CPI.

Period Averaging

- Traditional period averaging on analog input channels

Communication

- CPI: For datalogger connection. Baud rate selectable from 50 kbps to 1 Mbps. Allowable cable length varies depending on baud rate, number of nodes, cable quality, and noise environment, but can be as long as 700 m under proper conditions.
- USB: USB 2.0 full speed connection available for attaching to a PC. Port is used to configure the module and download updates via our Device Configuration Utility.

Physical

- Dimensions: 20.3 x 12.7 x 5.1 cm (8 x 5 x 2 in.)
- Mounting: Standard 1-in. grid; DIN rail mounting available
- Operating Temperature: -40° to +70°C (standard), -55° to +85°C (extended)

Typical Measurement Performance

Analog Voltage Measurement Range and Resolution					
f_{N1} (Hz)	Range ² (mv)	Typical Effective Resolution			
		Differential w/Input Reversal ³		Differential w/o Input Reversal ³	
		RMS μ V	bits	RMS μ V	bits
30000	± 5000	10.350	20.0	14.756	19.5
	± 1000	2.239	19.9	3.148	19.4
	± 200	0.799	19.0	1.121	18.5
60	± 5000	0.769	23.7	1.140	23.2
	± 1000	0.162	23.6	0.261	23.0
	± 200	0.056	22.9	0.113	21.8
50	± 5000	0.732	23.8	1.112	23.2
	± 1000	0.161	23.7	0.254	23.0
	± 200	0.053	22.9	0.111	21.9
2.5	± 5000	0.447	24.5	0.564	24.2
	± 1000	0.095	24.4	0.144	23.8
	± 200	0.020	24.3	0.077	22.4

¹ First notch frequency
² Range overhead of ~6% on all ranges guarantees that full-scale values will not cause over range.
³ Effective resolution (ER) in bits is computed from ratio of full-scale range to RMS noise.

Analog Voltage Measurement Speed ¹				
f_{N1} (Hz)	Multiplexed ² Measurement			
	With Input Reversal		Without Input Reversal ³	
	Time (ms)	Rate (Hz) ⁴	Time (ms)	Rate (Hz) ⁴
30000	1.46	698.49	0.75	1394.05
60	34.73	28.82	17.38	57.63
50	41.50	24.18	20.72	48.35
2.5	801.40	1.25	400.72	2.50

¹ Default settling time of 500 μ s.
² Refers to multiplexing circuitry internal to the CDM-A100 series.

EU Declaration of Conformity

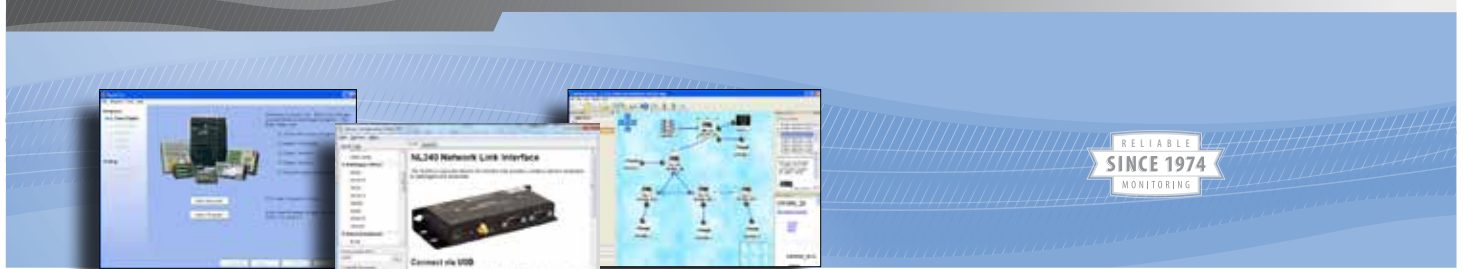
- www.campbellsci.com/cdm-a108
- www.campbellsci.com/cdm-a116

Warranty

- One year against defects in materials and workmanship.








Monitoring and Support Software



Our software solutions support device configuration, datalogger and station programming, communications between the station and a PC and database, and real-time and historical data monitor-

ing and retrieval. Software supports extend from a single station to large networks. We also have apps that allow an iOS or Android device to communicate with our products.

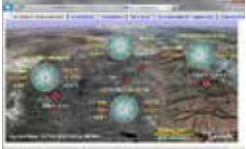






SOFTWARE

		Description
<p>LOGGERNET/LOGGERNET ADM Datalogger Support Software</p> 		<p>LoggerNet is Campbell Scientific's main datalogger support software packages; supporting programming, communication, and data retrieval between dataloggers and a PC.</p> <p>LoggerNet Admin provides additional clients, capabilities, and tools that are useful when managing a large datalogger network.</p>
<p>LNDB LoggerNet Database Software</p> 		<p>LNDB is an application that enables you to easily move data from a LoggerNet data cache into a database such as Microsoft SQL Server or MySQL. Then you can use industry-standard software to access and query your data for reports. LNDB also comes with QuickReports, an application that allows you to generate simple reports from an LNDB database with just a few mouse clicks.</p>
<p>LoggerNet Mobile Connect Mobile Apps for iOS and Android</p> 		<p>LoggerLink Mobile Apps are simple yet powerful tools that allow communication with any station in your LoggerNet network using an iOS or Android device. The apps give you access to the LoggerNet server anywhere your mobile device has a data connection.</p>
<p>LOGGERLINK Mobile Apps for iOS and Android</p> 		<p>LoggerLink Mobile Apps are simple yet powerful tools that allow an iOS or Android device to communicate with Campbell Scientific dataloggers using an IP device. The apps support field maintenance tasks such as viewing and collecting data, setting the clock, and downloading programs.</p>
<p>RTMCPRO Real-Time Monitor and Control Software, Professional Version</p> 		<p>RTMCPRO is used to create and run graphical screens that provide real-time monitor and control capabilities. You can easily design displays using its large library of components including alarms, switches, status bars, charts, and gages. Simply select a component, place it on the workspace, and specify the data value to be displayed. Each component has properties that can be set by the user giving maximum design control.</p>

More info: 435.227.9120
campbellsci.com/software



SOFTWARE

		Description
CSIWEBS CSI Web Server		<p>The CSI Web Server includes a CSI Web Server Administrator and a Web Publisher. The CSI Web Server Administrator allows you to configure the web server, check the status of the web server, set up user accounts and passwords, and easily browse to sites running on the web server. The Web Publisher allows you to publish your RTMC project to either a PC website using the CSI Web Server or to an HTTP enabled datalogger (publishing to a datalogger requires an RTMC Pro project).</p>
DevConfig Device Configuration Utility		<p>Device Configuration Utility (DevConfig) is used to download operating systems and set up Campbell Scientific hardware. It will also update PakBus Graph and the Network Planner if they have been installed prior by another Campbell Scientific software package.</p>
SCWIN Short Cut Program Generator for Windows (SCWin)		<p>SCWin is a free, menu-driven, PC-compatible software package that simplifies the creation of datalogger programs; it creates a datalogger program in five easy steps.</p>
LoggerNet-SDK LoggerNet Software Development Kit		<p>LoggerNet-SDK is a flexible and powerful programming tool that allows software developers to create customized applications based on Campbell Scientific's LoggerNet software package. LoggerNet-SDK includes a limited LoggerNet Server communications DLL that only allows direct RS-232 and IP port connections with a single datalogger.</p>
LoggerNet Server-SDK LoggerNet Server Software Development Kit		<p>LoggerNet Server-SDK is a flexible and powerful programming tool that allows software developers to create customized applications based on Campbell Scientific's LoggerNet software package. LoggerNet Server-SDK includes the entire LoggerNet Server communications DLL that supports datalogger networks and any of our telecommunications links.</p>
LoggerNet for Linux Linux-Based LoggerNet Server with LoggerNet Remote		<p>LoggerNet Linux provides a solution for those who want to run the LoggerNet server in a Linux environment. The package includes a Linux version of the LoggerNet server. A Windows version of LoggerNet Remote is required. The Windows-based client applications in LoggerNet Remote are run on a separate computer, and they are used to manage the LoggerNet Linux server.</p>
PC200W Datalogger Starter Software		<p>PC200W is a free software package designed for first-time users or users with simple data communication needs. It provides basic tools such as clock set, program download, monitor data, or retrieve data. PC200W supports direct connections between a PC and datalogger (no telecommunications or scheduled data-collection support).</p>
PC400 Mid-Level Datalogger Support Software		<p>PC400 supports a variety of telecommunication options, manual data collection, and data display. It includes an easy-to-use program generator (Short Cut) as well as full-featured program editors (CRBasic, Edlog). PC400 does not support combined communication options (e.g., phone-to-RF), PakBus® routing, or scheduled data collection; LoggerNet software is recommended for applications that require those capabilities.</p>



Telemetry Peripherals

Wireless, remote, hard-wired, or two-way communication

Rugged, Reliable, and Ready for any Application



Campbell Scientific offers a full line of telemetry peripherals that support remote communications between dataloggers and PCs. These peripherals have wide operating temperature ranges allowing their

use in extreme, remote environments. They facilitate the accessibility, analysis, sharing, and reporting of data.

MAJOR SPECIFICATIONS











		Transmission Distance or Area	Current Drain @ 12 Vdc	Service Requirements
NL121 Ethernet Interface Connects CR1000 or CR3000 to LAN or Internet		Worldwide	58 mA typical, 3 mA Ethernet off	Ethernet access
NL116 Ethernet Interface and CompactFlash Module Connects CR1000 or CR3000 to LAN or Internet and stores data on a CompactFlash card		Worldwide	58 mA typical, 3 mA Ethernet off	Ethernet access
NL201 Ethernet Interface Connects dataloggers to LAN or Internet via Ethernet		Worldwide	50 mA active 2 mA forced standby	Ethernet access
NL241 Wi-Fi Network Link Wireless Network Link		Worldwide	< 1.5 mA (standby) 7.5 to 8 mA (client, idle) 65 to 75 mA (client, communicating) 67 mA (access point, idle) 70 mA (access point, communicating)	Wi-Fi hotspot (access to standard 802.11b/g/n networks)
RV50 Sierra Wireless 4G LTE Cellular Gateway		Dependent on antenna used and LTE, CDMA/EV-DO, and GSM/GPRS/EDGE/WCDMA coverage	1 mA typical enable/ignition sense low 65 to 95 mA typical idle 250 to 300 mA typical active	Network coverage at the datalogger site and account at Verizon, AT&T, T-Mobile USA, Rogers, Bell, or Telus
COM220 Phone Modem Ideal for sites with telephone access		Worldwide	12 µA quiescent 30 mA active	If not available at the site, phone lines must be installed.
COM320 Voice Phone Modem Make your datalogger speech capable		Worldwide	100 µA quiescent 35 mA active	If not available at the site, phone lines must be installed.
MD485 RS-485 Multidrop Interface Connect many dataloggers with a single cable		1219 m (4000 ft) Can increase distance by using more MD485s or combining with spread spectrum radios, Ethernet, or phone	1.2 mA standby 2 to 7 mA communicating	CABLE2TP two-twisted pair cable must be installed between networked dataloggers and base.

More info: 435.227.9120

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MAJOR SPECIFICATIONS

		Transmission Distance or Area	Current Drain @ 12 Vdc	Service Requirements
SRM-5A Short Haul Modem		Up to 12.2 km (7.6 miles) depending on data rate and wire gage	2.2 mA quiescent; 10 to 15 mA active	Dedicated two-twisted pair cable connects one field station with base.
RF320 Series with RF500M Narrowband VHF/UHF Radios with Radio Modem Long-distance option for communication		Up to 40.2 km (25 miles) between stations (line-of-sight and interference affects transmission length). Repeaters can be used to increase line-of-sight.	<u>RF320-series radio:</u> 25 mA receive standby <900 mA (transmit 2 W RF power) <1200 mA (transmit 5 W RF power) <u>RF500M radio modem:</u> < 15 mA (active)	FCC-assigned frequency and license. Requires line-of-sight
RF401A and RF411A 900 MHz Spread Spectrum Radios		Up to 16 km (10 miles) with Yagi antennas at ideal conditions; up to one mile with inexpensive omnidirectional antennas (line-of-sight obstructions and interference affects transmission length)	<0.5 mA stand-by 15 mA receiving < 80 mA transmitting	Shares frequency with other devices. Must not cause harmful interference to licensed radios. Requires line-of-sight
RF407, RF412, and RF427 900 MHz Spread Spectrum Radios		Up to 16 km (10 miles) with Yagi antennas at ideal conditions; up to one mile with inexpensive omnidirectional antennas (line-of-sight obstructions and interference affects transmission length)	Transmit: < 80 mA (250 mW TX Power) Receive: 15 mA Stand-by: < 0.5 mA (depending on power saving mode)	Shares frequency with other devices. Must not cause harmful interference to licensed radios. Requires line-of-sight
RF422 868 MHz SRD860 Radio		Up to 5 km, depending on antenna (line-of-sight obstructions and interference affects transmission length)	Transmit: < 25 mA (25 mW TX Power) Receive: 15 mA Stand-by: < 0.5 mA (depending on power saving mode)	Shares frequency with other devices. Must not cause harmful interference to licensed radios. Requires line-of-sight
RF451 900 MHz Spread Spectrum Radio 1 W power supports longer distances		20 to 25 miles with Yagi antenna at ideal conditions; up to one mile with inexpensive omnidirectional antenna (line-of-sight obstructions and interference affect transmission length)	6 mA sleep mode 15 mA idle 40 mA receiving 650 mA transmitting	Shares frequency with other devices. Must not cause harmful interference to licensed radios. Requires line-of-sight
ST-21 Argos Satellite Transmitter		Worldwide	1.1 mA quiescent 375 mA transmitting	Must receive formal permission from Service Argos and pay a fee. Must use data for environmental purposes.
IRIDIUM9522B Satellite Modem and Interface Kit		Worldwide (including poles, oceans and airways)	Operating: 333 mA Standby: 125 mA	Needs a SIM card. Must pick a service provider and pay a fee.
HUGHES9502 Inmarsat BGAN Satellite IP Terminal		Worldwide between +70° and -70° latitude	Transmit: < 1.7 A peak Narrowbeam w/o transmit: 333 mA Idle (regional beam): < 84 mA Sleep (wake on Ethernet packet): < 0.8 mA Off, GPIO sleep pin control: < 0.3 mA	Needs a SIM card. Must pick a service provider and pay a fee.
TX321 GOES or Meteosat Transceiver		GOES: North America Meteosat: Europe	<5 mA, idle <100 mA, during GPS fix <2.6, transmit	<u>GOES</u> Must be U. S. government agency or sponsored by such an agency. Apply at: http://noaasis.noaa.gov/DCS . <u>Meteosat</u> Apply at: www.eumetsat.int



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A worldwide network of companies to help meet your needs



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