Need a tough, reliable logger without the bells & whistles?

Campbell Scientific CR800 Series

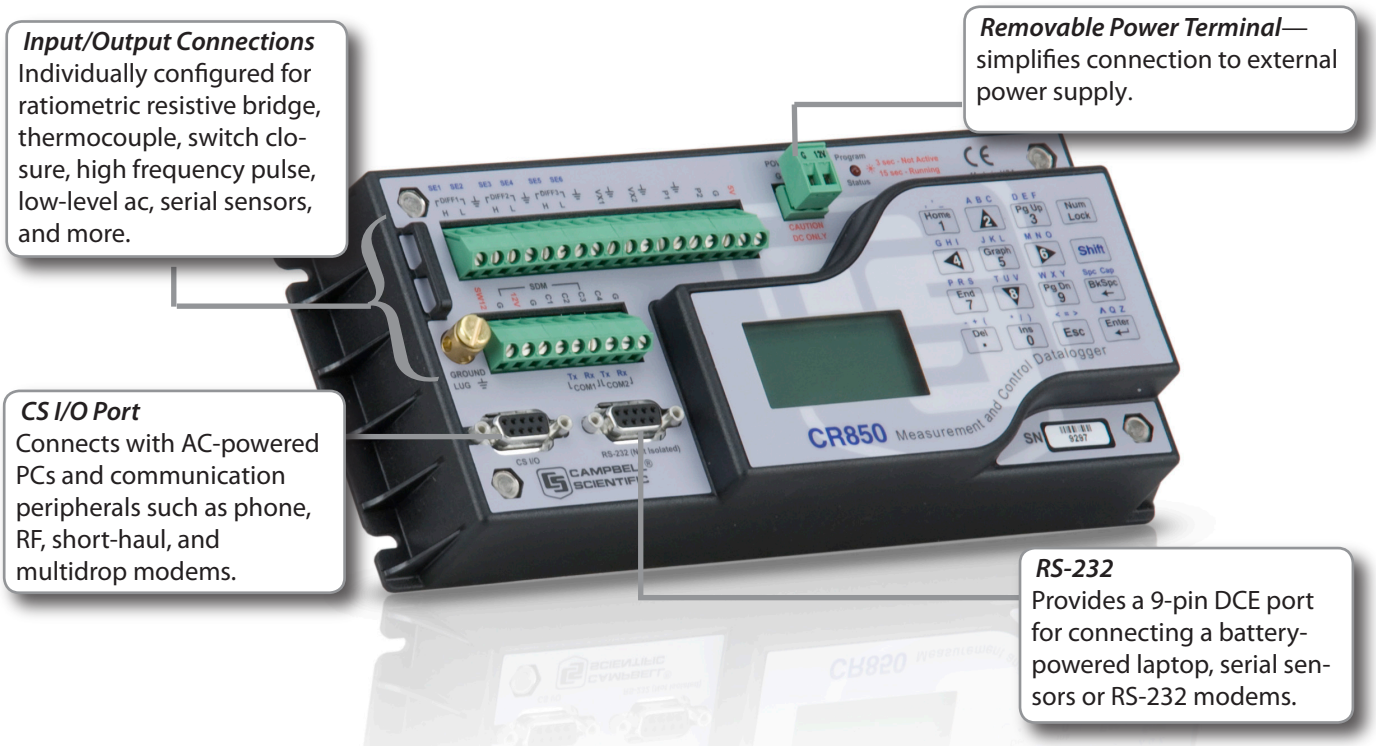
www.campbellsci.com.au/cr800datalogger

www.campbellsci.com.au
16 Somer Street Hyde Park QLD 4812
tel +61 7 4772 0444 fax +61 7 4772 0555

CAMPBELL SCIENTIFIC Australia, Pty Ltd

CR800 Series Measurement & Control System

The CR800 and CR850 dataloggers provide precision measurement capabilities in a rugged, battery-operated package. Both models consist of measurement electronics encased in a plastic shell and an integrated wiring panel. The standard operating range is -25° to +50°C. An extended range of -55° to +85°C for the CR800 or -30°to +80°C for the CR850 is also available.



Features

- 4 Mbytes* of battery-backed SRAM
- Program execution rate of up to 100 Hz
- CS I/O and RS-232 serial ports
- 13-bit analog to digital conversions
- 16-bit microcontroller with 32-bit internal CPU architecture
- Temperature compensated real-time clock
- Background system calibration for accurate measurements over time and temperature changes
- Single DAC used for excitation and measurements to give ratiometric measurements
- Gas Discharge Tube (GDT) protected inputs
- Data values stored in tables with a time stamp and record number
- Battery-backed SRAM and clock that ensure data, programs, and accurate time are maintained while a CR800-series datalogger is disconnected from the main power source
- One program-status LED
- Serial communications with serial sensors and devices supported via I/O port pairs
- PakBus, Modbus, and DNP3 protocols supported

Model Descriptions

The models differ in their keyboard display. The CR800 uses an external keyboard display, the CR1000KD, which connects to the CR800 via its CS I/O port. The CR850 includes an on-board keyboard display as part of its integrated package.

Operating System/Logic Control

The on-board operating system includes measurement, processing, and output instructions for programming the datalogger. The programming language, CRBasic, uses a BASIC-like syntax. Measurement instructions specific to bridge configurations, voltage outputs, thermocouples, and pulse/frequency signals are included. Processing instructions support algebraic, statistical, and transcendental functions for on-site processing. Output instructions process data over time and control external devices.

Storage Capacity*

The CR800 series has 2 Mbytes of FLASH memory for the Operating System, and 4 Mbytes of batterybacked SRAM for CPU usage, program storage, and data storage. Data is stored in a table format.

**Campbell Scientific is increasing the data storage memory from 2 Mbytes to 4 Mbytes. Dataloggers with a serial number greater than or equal to 3605 will have a 4 Mbyte memory. The 4 Mbyte dataloggers will also have a sticker on the canister stating "4M Memory".*

Input Output Terminals

Analog Inputs

Three differential (6 single-ended) channels measure voltage levels. Resolution on the most sensitive range is 0.67 µV..

Pulse Counters

Two pulse channels can count pulses from high level (5 V square wave), switch closure, or low level AC signals.

Switched Voltage Excitations

Two outputs provide precision excitation voltages for resistive bridge measurements.

Digital I/O Ports

Four ports are provided for frequency measurements, digital control, and triggering. Three of these ports can also be used to measure SDM devices. The I/O ports can be paired as transmit and receive. Each pair has 0 to 5 V UART hardware that allows serial communications with serial sensors and devices. An RS232-tologic level converter may be required in some cases.

CS I/O Port

AC-powered PCs and many communication peripherals connect with the datalogger via this port. Connection to an AC-powered PC requires either an SC32B or SC-USB interface. These interfaces isolate the PC's electrical system from the datalogger, thereby protecting against ground loops, normal static discharge, and noise.

RS-232 Port

This non-isolated port is for connecting a battery powered laptop, serial sensor, or RS-232 modem. Because of ground loop potential on some measurements (e.g., low level single-ended measurements), AC-powered PCs should use the CS I/O port instead of the RS-232 port (see above).

Switched 12 Volt

This terminal provides unregulated 12 V that can be switched on and off under program control.

Communication Protocols

The CR800 series supports the PakBus, Modbus, and DNP3 communication protocols. 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.

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

The DNP3 protocol supports only long data formats. The dataloggers are level 2 slave compliant, with some of the operations found in a level 3 implementation.

Transient Protection

Gas Discharge Tube (GDT) protects the inputs from electrical transients. The CR800 series is CE compliant under the European Union's EMC Directive, meeting ESD, EMC, Fast Transient standards.

Enclosure/Stack Bracket

A CR800 or CR850 housed in a weather-resistant enclosure can collect data under extremely harsh conditions. The enclosure protects the datalogger from dust, water, sunlight, or pollutants.

The 17565 Stack Bracket allows a small peripheral to be placed under the mounting bracket, thus conserving space. With the bracket, a CR800 or CR850 can can be attached in a "horizontal" orientation in an ENC10/12 enclosure (i.e., the long axis of the CR1000 spanning the short axis of the enclosure).

Power Supplies

Any 12-Vdc source can power the CR800-series dataloggers; a PS100 or BPALK is typically used. The PS100 provides a 7-Ahr sealed rechargeable battery that should be connected to a charging source (either a wall charger or solar panel). The BPALK consists of eight non-rechargeable D-cell alkaline batteries with a 7.5-Ahr rating at 20°C.

Also available are the BP12 and BP24 battery packs, which provide nominal ratings of 12 and 24 Ahrs, respectively. These batteries should be connected to a regulated charging source (e.g., a CH100 connected to a unregulated solar panel or wall charger).

The CR800 series can operate for up to one year using the PS100 power supply, depending on scan rate, number of sensors, data retrieval method, and external temperature.

Communication Options

To determine the best option for an application, consider the accessibility of the site, availability of services (e.g., cellular phone or satellite coverage), quantity of data to collect, and desired time between data-collection sessions. Some communication options can be combined—increasing the flexibility, convenience, and reliability of the communications.

External Data Storage Device

The CR800 and CR850 can use the SC115 2-GB Flash Memory Drive to augment onsite data storage or to transport data between the datalogger and PC.

The SC115 is a light-weight, portable instrument that fits in a pocket allowing easy transport between the datalogger and PC.

CD295 DataView II Display

This two-line, 32-character LCD displays one real-time value, a description, and units. It is typically mounted in an enclosure lid, which allows customers to view the datalogger's data on-site without opening the enclosure.

Campbell Scientific will install a DataView II Display in the enclosure lid. Alternatively, the customer can install the display.

Keyboard Display

Keyboard displays are used to program the datalogger, manually initiate data transfer, and display data. Both the CR850's integrated keyboard display and the CR1000KD can show 8 lines x 21 characters (64 x 128 pixels). Their keyboard includes 16 characters. Custom menus are supported allowing customers to set up choices within the datalogger program that can be initiated by a simple "toggle" or "pick list".

Portable Handheld Devices

A user-supplied PDA can be used to collect and display the datalogger's data, transfer datalogger programs, graph data for up to two elements, and transfer the datalogger's data to a PC. User-supplied PDAs require either PConnect or PConnectCE soft ware.

Direct Links

AC-powered PCs connect with the datalogger's CS I/O port via an SC32B or SC-USB interface. Th ese interfaces provide optical isolation. A battery-powered laptop can be attached to the datalogger's RS-232 port via an RS-232 cable; no interface required.

Ethernet

The NL100 interface enables a CR800-series datalogger to communicate over a local network or a dedicated Internet connection via TCP/IP.

Multidrop Interface

The MD485 intelligent RS-485 interface permits a PC to address and communicate with one or more dataloggers over the CABLE3CBL cable. Distances up to 4000 feet are supported.

Radios

Radio frequency (RF) communications are supported via narrow-band UHF, narrow-band VHF, spread spectrum, or meteor burst radios. Line-of-sight is required for all of our RF options.

Telephone Networks

The CR800 series can communicate with a PC using landlines, cellular CDMA, or cellular GPRS transceivers. A voice synthesized modem enables anyone to call the datalogger via phone and receive a verbal report of real-time site conditions.

Short Haul Modems

The SRM-5A RAD Short Haul Modem supports communications between the datalogger and a PC via a four-wire unconditioned line (two twisted pairs).

Satellite Transmitters

Our NESDIS-certifi ed GOES satellite transmitter provides one-way communications from a Data Collection Platform (DCP) to a receiving station. We also off er an Argos transmitter that is ideal for high-altitude and polar applications and a METEOSAT transmitter for European applications.

Our GOES transmitters are used for stream stage (shown), water quality, and rainfall applications.

Channel Expansion

4-Channel Low Level AC Module

The LLAC4 is a small peripheral device that allows customers to increase the number of available low level AC inputs by using control ports. This module is often used to measure up to four anemometers, and is especially useful for wind profiling applications.

Multiplexers

Multiplexers increase the number of sensors that can be measured by a datalogger by sequentially connecting each sensor to the datalogger. Several multiplexers can be controlled by a single datalogger. The CR800 and CR850 are compatible with the AM16/32B and AM25T multiplexers.

Synchronous Devices for Measurement (SDMs)

SDMs are addressable peripherals that expand the datalogger's measurement and control capabilities. For example, SDMs are available to add control ports, analog outputs, pulse count channels, interval timers, or even a CANbus interface to the system. Multiple SDMs, in any combination, can be connected to one datalogger.

The SDM-SIO1 Serial Input/ Output Module is fully compliant with the RS-232 standards. It allows a CR800 or CR850 to communicate with up to 17 serial devices.

Software

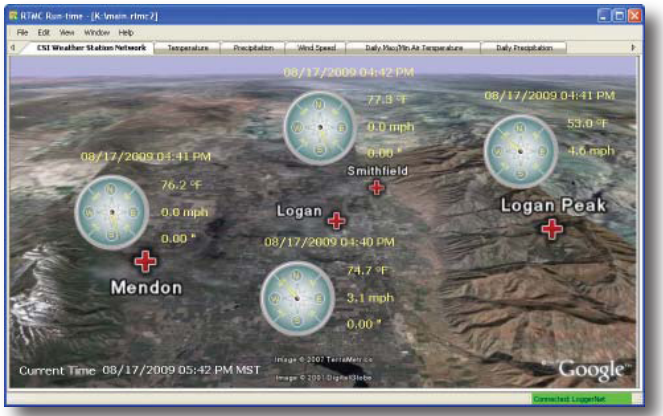
Starter Soft ware

Our easy-to-use starter soft ware is intended for first time users or applications that don't require sophisticated communications or datalogger program editing. SCWin Short Cut generates straight-forward datalogger programs in four easy steps. PC200W allows customers to transfer a program to, or retrieve data from a CR800 or CR850 via a direct communications link.

At www.campbellsci.com.au/downloads you can download starter software at no charge. Our Resource CD also provides this software as well as PDF versions of our brochures and manuals.

Datalogger Support Software

Our datalogger support software packages provide more capabilities than our starter software. These software packages contains program editing, communications, and display tools that can support an entire datalogger network.

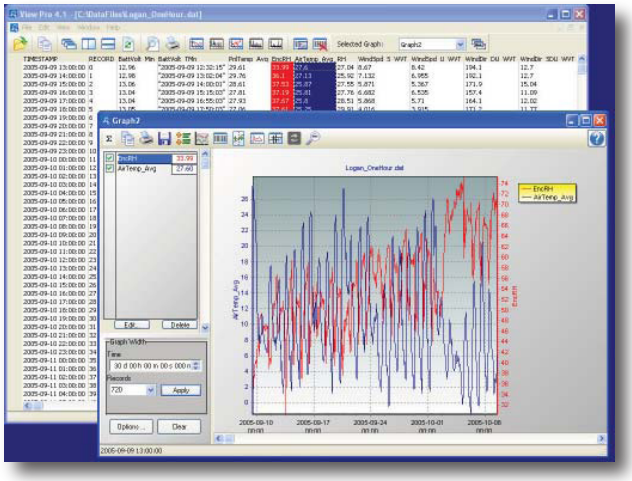


RTMC, a program for displaying the datalogger's data, is bundled with LoggerNet and RTDAQ. Customers may also purchase the RTMCRT and RTMC Web Server clients, which use forms created in the developer mode of RTMC.

PC400, our mid-level soft ware, supports a variety of telemetry options, manual data collection, and data display. For programming, it includes both Short Cut and the CRBasic program editor. PC400 does not support combined communication options (e.g., phone-to-RF), PakBus® routing, and scheduled data collection.

RTDAQ is an ideal solution for industrial and realtime users desiring to use reliable data collection software over a single telecommunications medium, and who do not rely on scheduled data collection. RTDAQ's strength lies in its ability to handle the display of high speed data.

LoggerNet is Campbell Scientific's full-featured datalogger support soft ware. It is referred to as "full featured" because it provides a way to accomplish almost all the tasks you'll need to complete when using a datalogger. It supports combined communication options (e.g., phone-to-RF), PakBus® routing, or scheduled data collection.



Both LoggerNet and RTDAQ use View Pro to display historical data in a tabular or graphical format.

Applications

The measurement precision, flexibility, long-term reliability, and economical price of the CR800 and CR850 make them ideal for scientific, commercial, and industrial applications.

Meteorology

The CR800 series is used in long-term climatological monitoring, meteorological research, and routine weather measurement applications.

Sensors the CR800 series can measure include:

- cup, propeller, and sonic anemometers
- tipping bucket rain gauges
- wind vanes
- pyranometers
- ultrasonic ranging sensor
- thermistors, RTDs and thermocouples
- barometric pressure sensors
- RH sensors

Meteorological conditions affecting marine larvae distribution are monitored at Exuma Cay, Bahamas.

Data is output in a choice of units (e.g., wind speed in miles per hour, meters per second, or knots). Standard outputs include wind vector averaging, sigma, theta, and histograms.

Agriculture and Agricultural Research

The versatility of the CR800 and CR850 allows measurement of agricultural processes and equipment in applications such as:

- plant water research
- canopy energy balance
- machinery performance
- plant pathology
- crop management decisions
- food processing/storage
- frost prediction
- irrigation scheduling
- integrated pest management

Wind Profiling

Our data acquisition systems can monitor conditions at wind assessment sites, at producing wind farms, and along transmission lines. The reliability of these systems ensures data collection, even under adverse conditions. Wide operating temperature ranges and weatherproof enclosures allow our systems to operate reliably in harsh environments.

The CR800 or CR850 makes and records measurements, controls electrical devices, and can function as PLCs or RTUs. Because the datalogger has its own power supply (batteries, solar panels), it can continue to measure and store data and perform control during power outages. Typical sensors for wind assessment applications include, but are not limited to:

- cup, propeller, and sonic anemometers (up to 10 anemometers can be measured by using two LLAC4 peripherals)
- wind vanes
- thermistors, RTDs, and thermocouples
- barometers
- pyranometers

For turbine performance applications, the CR800 series monitors electrical current, voltage, wattage, stress, and torque.

Photo courtesy RADTech Ltd. UK

A Campbell Scientific datalogging system monitors this offshore wind farm located between Rhyl and Prestatyn in North Wales at about 7 to 8 km out to sea.

Air Quality

The CR800 series can monitor and control gas analysers, particle samplers, and visibility sensors. The datalogger can also automatically control calibration sequences and compute conditional averages that exclude invalid data (e.g., data recorded during power failures or calibration intervals).

Water Resources/Aquaculture

Our CR800 series is well-suited to remote, unattended monitoring of hydrologic conditions. Most hydrologic sensors, including SDI-12 probes, interface directly to the datalogger.

The CR800-series dataloggers are ideal for monitoring water quality and level at reservoirs, springs, canals, pipelines, and culinary sites.

Typical hydrologic measurements:

- Water level is monitored with incremental shaft encoders, double bubblers, ultrasonic ranging sensors, resistance tapes, strain gage pressure transducers, or vibrating wire pressure transducers. Vibrating wire transducers require an AVW200 series or another Vibrating Wire Interface.
- Well draw-down tests use a pressure transducer measured at logarithmic intervals or at a rate based on incremental changes in water level.
- Ionic conductivity measurements use one of the switched excitation ports from the datalogger.
- Samplers are controlled by the CR800 or CR850 as a function of time, water quality, or water level.
- Alarm and pump actuation are controlled through digital I/O ports that operate external relay drivers.

Vehicle Testing

This versatile, rugged datalogger is ideally suited for testing cold and hot temperature, high altitude, off - highway, and cross-country performance. The CR800 and CR850 are compatible with our SDM-CAN interface, GPS16X-HVS receiver.

Vehicle monitoring includes not only passenger cars, but airplanes, locomotives, helicopters, tractors, buses, heavy trucks, drilling rigs, race cars, and motorcycles.

Soil Moisture

The CR800 and CR850 are compatible with the following soil moisture measurement technologies:

- Soil moisture blocks are inexpensive sensors that estimate soil water potential.
- Matric water potential sensors also estimate soil water potential but are more durable than soil moisture blocks.
- Time-Domain Reflectometry Systems (TDR) use a reflectometer controlled by the datalogger to accurately measure soil water content. Multiplexers allow sequential measurement of a large number of probes by one reflectometer.
- Self-contained water content reflectometers are sensors that emit and measure a TDR pulse.
- Tensiometers measure the soil pore pressure of irrigated soils and calculate soil moisture.

Other Applications

- Wireless sensor/ datalogger networks
- Avalanche forecasting, snow science, polar, high altitude
- Fire weather
- Geotechnical
- Historic preservation

Data measured by this weather station near Aspen, Colorado is used in avalanche forecasting.

CR800-Series Specifications

PROGRAM EXECUTION RATE
10 ms to 30 min. @ 10 ms increments

ANALOG INPUTS
3 differential (DF) or 6 single-ended (SE) individually configured. Channel expansion provided by AM16/32 and AM25T multiplexers.

RANGES and RESOLUTION: Basic resolution (Basic Res) is the A/D resolution of a single conversion. **Resolution of DF measurements with input reversal is half the Basic Res.**

	Input Referred Noise Voltage	
Input Range (mV)[1]	DF Res (µV)[2]	Basic Res (µV)
±5000	667	1333
±2500	333	667
±250	33.3	66.7
±25	3.33	6.7
±7.5	1.0	2.0
±2.5	0.33	0.67

[1]Range overhead of ~9% exists on all ranges to guarantee that full-scale values will not cause over-range.

[2]Resolution of DF measurements with input reversal.

ACCURACY[3]:
±(0.06% of reading + offset), 0° to 40°C
±(0.12% of reading + offset), -25° to 50°C
±(0.18% of reading + offset), -55° to 85°C(-XT only)

[3]The sensor and measurement noise are not included and the offsets are the following:

Offset for DF w/input reversal = 1.5·Basic Res + 1.0 µV
Offset for DF w/o input reversal = 3·Basic Res + 2.0 µV
Offset for SE = 3·Basic Res + 3.0 µV

INPUT NOISE VOLTAGE: For DF measurements with input reversal on ±2.5 mV input range; digital resolution dominates for higher ranges.

250 µs Integration: 0.34 µV RMS
50/60 Hz Integration: 0.19 µV RMS

MINIMUM TIME BETWEEN VOLTAGE MEASUREMENTS: Includes the measurement time and conversion to engineering units. For voltage measurements, the CR1000 integrates the input signal for 0.25 ms or a full 16.66 ms or 20 ms line cycle for 50/60 Hz noise rejection. DF measurements with input reversal incorporate two integrations with reversed input polarities to reduce thermal offset and common mode errors and therefore take twice as long.

250 µs Analog Integration: ~1 ms SE
1/60 Hz Analog Integration: ~20 ms SE
1/50 Hz Analog Integration: ~25 ms SE

INPUT LIMITS: ±5 V

DC COMMON MODE REJECTION: >100 dB

NORMAL MODE REJECTION: 70 dB @ 60 Hz when using 60 Hz rejection

SUSTAINED INPUT VOLTAGE W/O DAMAGE: ±16 Vdc max.

INPUT CURRENT: ±1 nA typical, ±6 nA max. @ 50°C; ±90 nA @ 85°C

INPUT RESISTANCE: 20 Gohms typical

ACCURACY OF BUILT-IN REFERENCE JUNCTION THERMISTOR (for thermocouple measurements):
±0.3°C, -25° to 50°C
±0.8°C, -55° to 85°C (-XT only)

ANALOG OUTPUTS
2 switched voltage, active only during measurement, one at a time.

RANGE AND RESOLUTION: Voltage outputs programmable between ±2.5 V with 0.67 mV resolution.

ACCURACY: ±(0.06% of setting + 0.8 mV), 0° to 40°C
±(0.12% of setting + 0.8 mV), -25° to 50°C
±(0.18% of setting + 0.8 mV), -55° to 85°C (-XT only)

CURRENT SOURCING/SINKING: ±25 mA

RESISTANCE MEASUREMENTS
MEASUREMENT TYPES: The CR800-series provides ratiometric measurements of 4- and 6-wire full bridges, and 2-, 3-, and 4-wire half bridges. Precise, dual polarity excitation using any of the 3 switched voltage excitations eliminates dc errors.

RATIO ACCURACY[3]: Assuming excitation voltage of at least 1000 mV, not including bridge resistor error.

±(0.04% of voltage reading + offset)/V_x

[3]The sensor and measurement noise are not included and the offsets are the following:

Offset for DF w/input reversal = 1.5·Basic Res + 1.0 µV
Offset for DF w/o input reversal = 3·Basic Res + 2.0 µV
Offset for SE = 3·Basic Res + 3.0 µV

Offset values are reduced by a factor of 2 when excitation reversal is used.

PERIOD AVERAGING MEASUREMENTS
The average period for a single cycle is determined by measuring the average duration of a specified number of cycles. The period resolution is 192 ns divided by the specified number of cycles to be measured; the period accuracy is ±(0.01% of reading + resolution). Any of the 6 SE analog inputs can be used for period averaging. Signal limiting are typically required for the SE analog channel.

INPUT FREQUENCY RANGE:

Input	Signal (peak to peak)[4]		Min.	Max[5]
Range	Min	Max	Pulse W.	Freq.
±2500 mV	500 mV	10 V	2.5 µs	200 kHz
±250 mV	10 mV	2 V	10 µs	50 kHz
±25 mV	5 mV	2 V	62 µs	8 kHz
±2.5 mV	2 mV	2 V	100 µs	5 kHz

[4]The signal is centered at the datalogger ground.

[5]The maximum frequency = 1/(Twice Minimum Pulse Width) for 50% of duty cycle signals.

PULSE COUNTERS
Two 24-bit inputs selectable for switch closure, high-frequency pulse, or low-level AC.

MAXIMUM COUNTS PER SCAN: 16.7×10^6

SWITCH CLOSURE MODE:
Minimum Switch Closed Time: 5 ms
Minimum Switch Open Time: 6 ms
Max. Bounce Time: 1 ms open w/o being counted

HIGH-FREQUENCY PULSE MODE:
Maximum Input Frequency: 250 kHz
Maximum Input Voltage: ±20 V
Voltage Thresholds: Count upon transition from below 0.9 V to above 2.2 V after input filter with 1.2 µs time constant.

LOW-LEVEL AC MODE: Internal AC coupling removes AC offsets up to ±0.5 V.

Input Hysteresis: 12 mV @ 1 Hz
Maximum ac Input Voltage: ±20 V
Minimum ac Input Voltage:

Sine wave (mV RMS)	Range (Hz)
20	1.0 to 20
200	0.5 to 200
2000	0.3 to 10,000
5000	0.3 to 20,000

DIGITAL I/O PORTS
4 ports software selectable, as binary inputs or control outputs. They also provide edge timing, subroutine interrupts/wake up, switch closure pulse counting, high frequency pulse counting, asynchronous communications (UART), SDI-12 communications, and SDM communications.

HIGH-FREQUENCY PULSE MAX: 400 kHz

SWITCH CLOSURE FREQUENCY MAX: 150 Hz

OUTPUT VOLTAGES (no load): high 5.0 V ±0.1 V; low <0.1

OUTPUT RESISTANCE: 330 ohms

INPUT STATE: high 3.8 to 16 V; low -8.0 to 1.2 V

INPUT HYSTERESIS: 1.4 V

INPUT RESISTANCE: 100 kohms

SERIAL DEVICE/RS-232 SUPPORT: 0 to 5 V UART

SWITCHED 12 V
One independent 12 V unregulated sources switched on and off under program control. Thermal fuse hold current = 900 mA @ 20°C, 650 mA @ 50°C, 360 mA @ 85°C.

SDI-12 INTERFACE SUPPORT
Control ports 1 and 3 may be configured for SDI-12 asynchronous communications. Up to ten SDI-12 sensors are supported per port. It meets SDI-12 Standard version 1.3 for datalogger mode.

CE COMPLIANCE
STANDARD(S) TO WHICH CONFORMITY IS DECLARED:
IEC61326:2002

CPU AND INTERFACE
PROCESSOR: Renesas H8S 2322 (16-bit CPU with 32-bit internal core)

PROTOCOLS SUPPORTED: PakBus, Modbus, DNP3, FTP, HTTP, XML, POP3, SMTP, Telnet, NTCIP, NTP, SDI-12, SDM

MEMORY: 2 Mbytes of Flash for operating system; 4 Mbytes of battery-backed SRAM for CPU usage, program storage and data storage.

SERIAL INTERFACES: CS I/O port is used to interface with Campbell Scientific peripherals; RS-232 DCE port is for battery-powered computer or non-CSI modem connection.

BAUD RATES: Selectable from 300 bps to 115.2 kbps. ASCII protocol is one start bit, one stop bit, eight data bits, and no parity.

CLOCK ACCURACY: ±3 min. per year

SYSTEM POWER REQUIREMENTS
VOLTAGE: 9.6 to 16 Vdc

TYPICAL CURRENT DRAIN:
1 Hz Scan (60 Hz rejection)
w/RS-232 communication: 19 mA
w/o RS-232 communication: 4.2 mA
1 Hz Scan (250 µs integration)
w/RS-232 communication: 16.7 mA
w/o RS-232 communication: 1 mA
100 Hz Scan (250 µs integration)
w/RS-232 communication: 27.6 mA
w/o RS-232 communication: 16.2 mA

CR1000KD OR CR850'S ON-BOARD

KEYBOARD DISPLAY CURRENT DRAIN:

Inactive: negligible
Active w/o backlight: 7 mA
Active w/backlight: 100 mA

EXTERNAL BATTERIES: 12 Vdc nominal; reverse polarity protected.

PHYSICAL SPECIFICATIONS
DIMENSIONS: 9.5" x 4.1" x 2" (24.1 x 10.4 x 5.1 cm); additional clearance required for serial cable and sensor leads.

WEIGHT: 1.5 lbs (0.7 kg)

WARRANTY
3-years against defects in materials and workmanship.

Electrical specifications are valid over a -25° to +50°C range unless otherwise specified; non-condensing environment required. To maintain electrical specifications, Campbell Scientific recommends recalibrating dataloggers every two years. We recommend that the system configuration and critical specifications are confirmed with Campbell Scientific before purchase.