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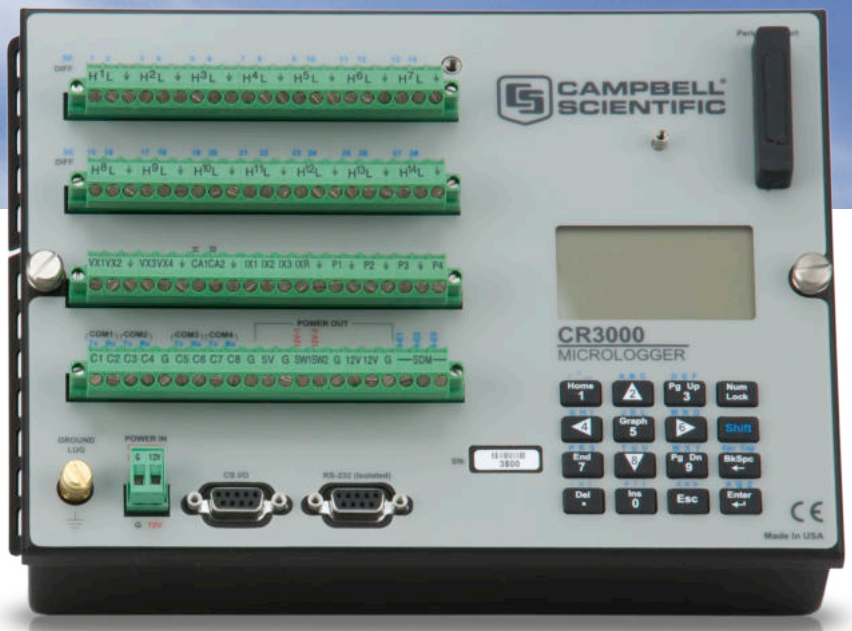
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CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

CR3000
Micrologger

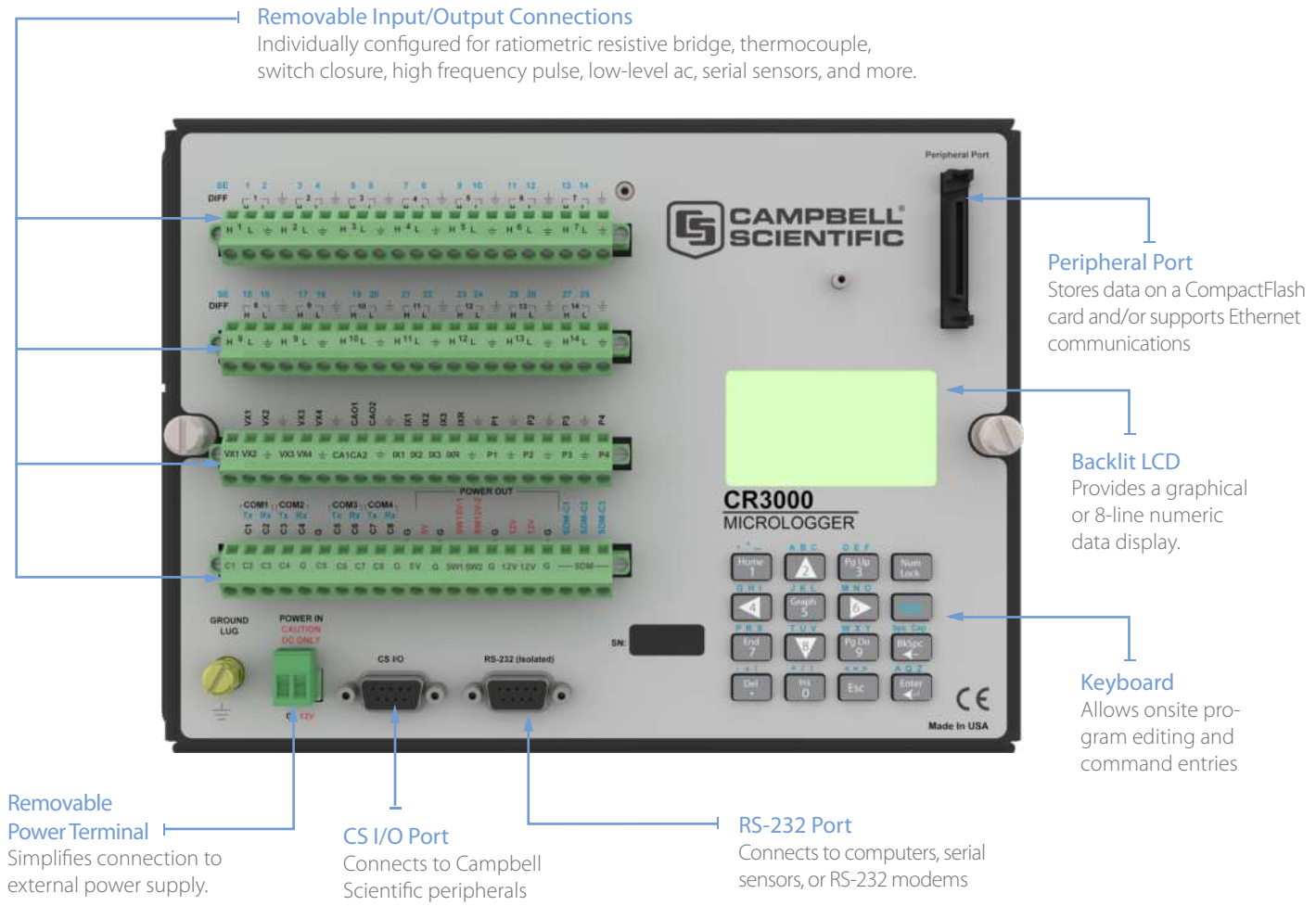
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campbellsci.com/cr3000

CR3000 Micrologger®

The CR3000 Micrologger® is a compact, rugged, powerful datalogger. Housed in a portable, self-contained package, the Micrologger consists of measurement and control electronics, communication ports, keyboard, display, power supply, and carrying handle. The CR3000's low power requirements allow extended field use from a dc voltage source.



Benefits and Features

- Program execution rate of up to 100 Hz
- 16-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
- Gas Discharge Tube (GDT) protected inputs
- Data values stored in tables with a time stamp and record number
- 4 MB data storage memory
- Battery-backed SRAM and clock that ensure data, programs, and accurate time are maintained while the CR3000 is disconnected from its main power source
- Serial communications with serial sensors and devices supported using I/O port pairs
- PakBus®, Modbus, DNP3, TCP/IP, FTP, and SMTP protocols supported

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.

Data Storage Capacity

The CR3000 Micrologger provides 2 MB of flash memory for the operating system (OS) and 4 MB of battery-backed SRAM for CPU usage, program storage, and data storage. Data is stored in a table format. The storage capacity of the CR3000 can be increased by using a CompactFlash® card.

Transient Protection

Gas Discharge Tube (GDT) protects the inputs from electrical transients. The CR3000 is CE compliant under the European Union's EMC Directive, meeting ESD, EMC, Fast Transient standards.

Input Output Terminals

Analog Inputs

Twenty-eight single-ended (14 differential) channels measure voltage levels with 16-bit resolution on five software selectable voltage ranges.

Pulse Counters

Four 24-bit pulse channels measure switch closures, high frequency pulses, or low-level ac.

Switched Excitation Outputs

Four switched voltage and three switched current outputs provide precision excitation for ratiometric sensor/bridge measurements.

Digital I/O Ports

Eight ports have multiple functions including digital control output, interrupt, pulse counting, switch closure, frequency/period measurements, edge timing, or SDI-12 communication. Three additional ports are dedicated for measuring 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 RS-232-to-logic level converter may be required in some cases.

Continuous Analog Outputs

Two continuous analog outputs provide voltage levels to displays or proportional controllers.

Peripheral Port

Campbell Scientific offers Ethernet and CompactFlash devices that directly connect to this peripheral port.

RS-232 Port

The RS-232 port is for connecting a computer, serial sensor, or RS-232 modem. The computer attaches to the CR3000 via an RS-232 cable—no interface required. This port isolates the computer electrical system from the datalogger, thereby protecting against ground loops, normal static discharge, and noise.

CS I/O Port

Many communication peripherals connect with the CR3000 via this port. A computer may connect with this port via an SC32B, SC-USB, or SC115 interface.

Power Connections

The continuous 5 V and 12 V terminals are for connecting sensors and non-Campbell Scientific peripherals. Two switched 12 V terminals are program controlled.

Enclosures

A CR3000 housed in a weather-resistant enclosure (ENC12/14 or larger) can collect data under extremely harsh conditions.

Communication Protocols

The CR3000 supports the PakBus, Modbus, DNP3, TCP/IP, FTP, and SMTP 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.

The TCP/IP, FTP, and SMTP protocols provide TCP/IP functionality when the CR3000 is used in conjunction with an IP network device such as the NL121, NL116, or NL241.

Operating Temperature Ranges

Standard operating range is -25° to +50°C; an extended range of -40° to +85°C is available. The rechargeable base option has a different temperature range (see Battery Base Options).

Battery Base Options

Rechargeable Base

This base includes an internal 7 Ah sealed rechargeable battery that can be charged using a vehicle (requires the DCDC18R), solar panel, or ac wall charger. Operating temperature range is -40° to +60°C.



The DCDC18R increases the vehicle's supply voltage to charging levels required by the CR3000.

Low-Profile Base (no battery)

The low-profile base requires a separate dc source. This base option may be preferable when the system's power consumption needs a larger capacity battery or when it's advantageous for the Micrologger to be thinner and lighter.

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 Devices

Campbell Scientific offers CompactFlash modules that store the CR3000's data on an industrial-grade CompactFlash (CF) card. The CR3000 can also store data on an SC115 2 GB Flash Memory Drive.



The NL116 Ethernet/ CompactFlash module is shown attached to the CR3000's peripheral port.

iOS Devices and Android Devices

An iOS device or Android device can communicate with the Micrologger or connect to the LoggerNet network using Apps available, at no charge, from the Apple Store or Google Play.

Direct Links

A computer can be connected directly to the datalogger's RS-232 port (no interface required). This port provides electrical isolation. Alternatively, the computer can be connected to the CR3000's CS I/O port via an SC32B, SC-USB, or SC115 interface.

Keyboard Display

The CR3000's integrated keyboard display is used to program the datalogger, manually initiate data transfer, and display data. It displays 8-lines by 21-characters (64 x 128 pixels) and has a 16-character keyboard. 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.

Mountable Display

The CD100 or CD295 can be mounted in an enclosure lid, which allows customers to view the CR3000's data on-site without opening the enclosure.

Internet and IP Networks

Campbell Scientific offers a variety of interfaces that enable the CR3000 Micrologger to communicate with a computer using TCP/IP.

Telephone Networks

The CR3000 can communicate with a computer using landlines or cellular transceivers. A voice synthesized modem enables anyone to call the CR3000 using phone and receive a verbal report of real-time site conditions.

Multidrop Interface

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

Short Haul Modems

The SRM-5A RAD Short Haul Modem supports communications between the CR3000 and a computer using a four-wire unconditioned line (two twisted pairs).

Satellite Transmitters

The CR3000 can transmit data using the Argos, Iridium, Inmarsat BGAN, GOES, or Meteosat satellite systems. Satellite telemetry offers an alternative for remote locations where phone lines or RF systems are impractical.

Radios

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



In Virginia, our RF500M Narrowband Radio Modem provides time- and event-driven ALERT data transmission.

Channel Expansion

4-Channel Low Level AC Module

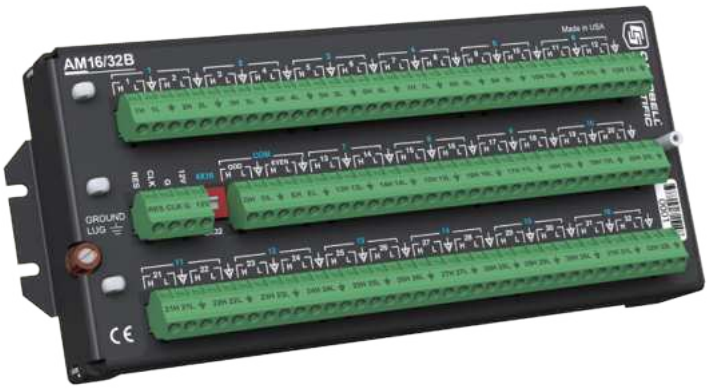
The LLAC4 is a small peripheral device that allows customers to increase the number of available low-level ac inputs by using control ports. This module is often used to measure up to four anemometers, and is especially useful for wind profiling applications.

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 CR3000 is 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 CR3000 is compatible with the AM16/32B (shown above) and AM25T multiplexers.

Software

Starter Software

Our easy-to-use starter software is intended for first time users or applications that don't require sophisticated communications or datalogger program editing. At www.campbellsci.com/downloads, the starter software can be downloaded at no charge.

SCWin Short Cut generates straight-forward datalogger programs. PC200W allows customers to transfer a program to, or retrieve data from a CR3000 via a direct communications link.

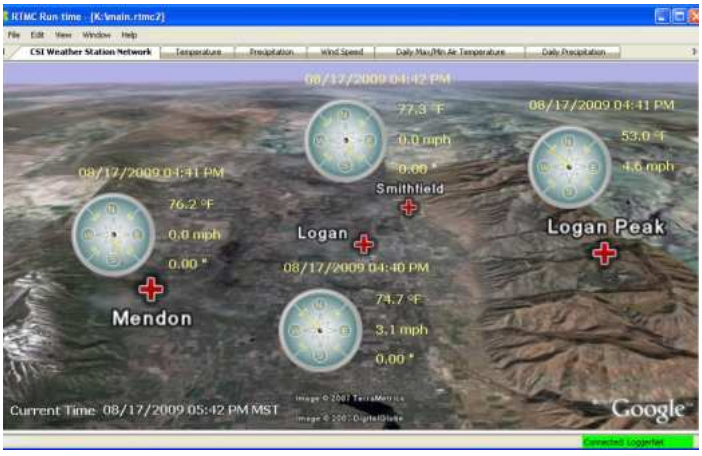
Datalogger Support Software

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.

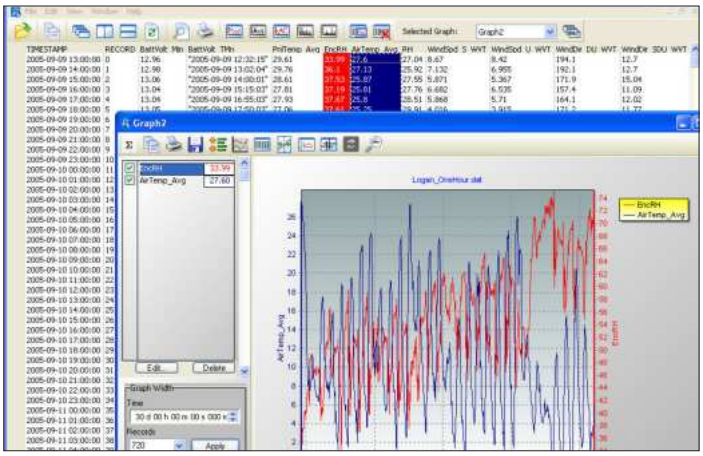
PC400, our mid-level software, supports a variety of telemetry options, manual data collection, and data display. For programming, it includes both Short Cut and the CRBasic program editor. PC400 does not support combined communication options (e.g., phone-to-RF), PakBus® routing, and scheduled data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

RTDAQ is an ideal solution for industrial and real-time 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 software. 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. LoggerNet supports combined communication options and scheduled data collection.



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



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

Applications

Measurement precision, flexibility, and long-term reliability of the CR3000 make it ideal for scientific, commercial, and industrial applications.

Open Path Eddy Covariance Systems



For eddy covariance applications, the CR3000 can measure the EC150 Open-Path CO_2 Analyzer, CSAT3A Sonic Anemometer, and KH20 Krypton Hygrometer then compute fluxes on-line.

The open path eddy covariance systems measure sonic sensible heat flux, momentum flux, and the flux of other scalars between the atmosphere and earth's surface.

The system consists of a CR3000 datalogger, fast response three-dimensional sonic anemometer, and fast response scalar sensors. An independent measurement of temperature and humidity from a slow response sensor is also used to calculate background meteorological variables. Horizontal wind speed and direction are computed by the datalogger from the three-dimensional measurements of wind made by the sonic anemometer.

Meteorology

The CR3000 is used in long-term climatological monitoring, meteorological research, and routine weather measurement applications.

Sensors the CR3000 can measure include:

- cup, propeller, and sonic anemometers
- tipping bucket rain gages
- wind vanes
- pyranometers
- ultrasonic ranging sensor
- thermistors, RTDs, and thermocouples
- barometers
- RH probes
- Cooled mirror hygrometers

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 CR3000 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 CR3000 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.

Agriculture and Agricultural Research

The versatility of the CR3000 allows measurement of agricultural processes and equipment in applications such as:

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

Air Quality

The CR3000 can monitor and control gas analyzers, 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).



The CR3000 can be used in networks of dataloggers that continuously monitor air quality.

Road Weather/RWIS

Our fully NTCIP-compliant Environmental Sensor Stations (ESS) are robust, reliable weather stations used for road weather/RWIS applications. A typical ESS includes a tower, CR3000, two road sensors, remote communication hardware, and sensors that measure wind speed and direction, air temperature, humidity, barometric pressure, solar radiation, and precipitation.

Soil Water

The CR3000 is compatible with soil water blocks, matric water potential sensors, Time-Domain Reflectometery (TDR) systems, self-contained water content reflectometers, and tensiometers. These soil water instruments are used extensively to monitor water content and matric potential in applications requiring knowledge of soil water inventory or movement.

Vehicle Testing

This versatile, rugged datalogger is ideally suited for testing cold and hot temperature, high altitude, off-highway, and cross-country performance. The CR3000 is compatible with our SDM-CAN interface and GPS16X-HVS receiver.



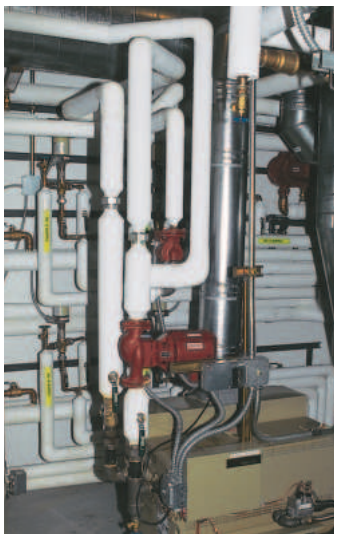
Vehicle monitoring includes not only passenger cars, but airplanes, locomotives, helicopters, tractors, buses, heavy trucks, drilling rigs, race cars, and motorcycles.

The CR3000 can measure:

- Suspension—strut pressure, spring force, travel, mounting point stress, deflection, ride.
- Fuel system—line and tank pressure, flow, temperature, injection timing
- Comfort control—ambient and supply air temperature, solar radiation, fan speed, ac on and off, refrigerant pressures, time-to-comfort, blower current
- Brakes—line pressure, pedal pressure and travel, ABS, line and pad temperature.
- Engine—pressure, temperature, crank position, RPM, time-to-start, oil pump cavitation.
- General vehicle—chassis monitoring, road noise, vehicle position and speed, steering, air bag, hot/cold soaks, wind tunnels, traction, CANbus, wiper speed and current, vehicle electrical loads.

Other Applications

- Structural or fatigue analysis
- Wireless sensor/datalogger networks
- Water quality
- Water level/flow
- Mesonet systems
- Avalanche forecasting, snow science, polar, high altitude
- HVAC Systems
- Aerospace/aviation



The CR3000 can monitor and control pumps, fans, and starter motors in an HVAC system.

CR3000 Specifications

Electrical specifications are valid over a -25° to +50°C, non-condensing environment, unless otherwise specified. Recalibration recommended every three years. Critical specifications and system configuration should be confirmed with Campbell Scientific before purchase.

PROGRAM EXECUTION RATE

10 ms to one day @ 10 ms increments

ANALOG INPUTS *(SE1–SE28 or DIF1–DIF14)*

14 differential (DIFF) or 28 single-ended (SE) individually configured input channels. Channel expansion provided by optional analog multiplexers.

RANGES, RESOLUTION: Basic resolution (Basic Res) is the resolution of a single A/D conversion. A DIFF measurement with input reversal has better (finer) resolution by twice than Basic Res.

Range (mV)[1]	DF Res (µV) [2]	Basic Res (µV)
±5000	83.33	167
±1000	16.67	33.4
±200	3.33	6.67
±50	0.83	1.67
±20	0.33	0.67

[1]Range overhead of ~9% on all ranges guarantees full-scale voltage will not cause over range.

[2]Resolution of DF measurements with input reversal.

ANALOG INPUT ACCURACY[3]:

±(0.04% of reading + offset), 0° to 40°C
±(0.07% of reading + offset), -25° to 50°C
±(0.09% of reading + offset), -40° to 85°C (-XT only)

[3]Accuracy does not include sensor and measurement noise. Offsets are defined as:

Offset for DIFF w/input reversal = 1.5·Basic Res + 1.0 µV
Offset for DIFF w/o input reversal = 3·Basic Res + 2.0 µV
Offset for SE = 3·Basic Res + 5.0 µV

ANALOG MEASUREMENT SPEED:

Integration Type/ Code	Integration Time	Settling Time	Total Time[4] SE w/ No Rev	Total Time[4] DF w/ Input Rev
250	250 µs	200 µs	~0.7 ms	~1.4 ms
60 Hz[5]	16.67 ms	3 ms	~20 ms	~40 ms
50 Hz[5]	20.00 ms	3 ms	~23 ms	~46 ms

[4]Includes 250 µs for conversion to engineering units.

[5]AC line noise filter.

INPUT NOISE VOLTAGE: For DIFF measurements with input reversal on ±20 mV input range; digital resolution dominates for higher ranges.

250 µs Integration: 0.4 µV RMS
50/60 Hz Integration: 0.19 µV RMS

INPUT LIMITS: ±5 Vdc

DC COMMON MODE REJECTION: >100 dB

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

INPUT VOLTAGE RANGE W/O MEASUREMENT CORRUPTION: ±8.6 Vdc max.

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

INPUT CURRENT: ±1 nA typical, ±6 nA max. @ 50°C; ±120 nA @ 85°C

INPUT RESISTANCE: 20 GΩ typical

ACCURACY OF BUILT-IN REFERENCE JUNCTION THERMISTOR (for thermocouple measurements):

±0.3°C, -25° to 50°C;
±0.8°C, -40° to 85°C (-XT only)

ANALOG OUTPUTS *(Vx1-Vx4, Ix1-Ix3, CAO1, CAO2)*

4 switched voltage and 3 switched current outputs sequentially active during measurement. Two continuous outputs.

Channel	Range	Res.	Current Source/ Sink	Compliance Voltage
VX 1-4	±5 V	0.17 mV	±50 mA	N/A
IX 1-3	±2.5 mA	0.08 µA	N/A	±5 V
CAO	±5 V	0.17 mV	±15 mA	N/A

ANALOG OUTPUT ACCURACY (VX and CAO):
±(0.04% of setting + 0.5 mV), 0° to 40°C
±(0.07% of setting + 0.5 mV), -25° to 50°C
±(0.09% of setting + 0.5 mV), -40° to 85°C (-XT only)

ANALOG OUTPUT ACCURACY (IX):
±(0.1% of setting + 0.5 µA), 0° to 40°C
±(0.13% of setting + 0.5 µA), -25° to 50°C
±(0.15% of setting + 0.5 µA), -40° to 85°C (-XT only)

VX FREQUENCY SWEEP FUNCTION: Switched outputs provide a programmable swept frequency, 0 to 5000 mV square wave for exciting vibrating wire transducers.

PERIOD AVERAGE

Any of the 28 SE analog inputs can be used for period averaging. Accuracy is ±(0.01% of reading+resolution), where resolution is 68 ns divided by the specified number of cycles to be measured.

INPUT AMPLITUDE AND FREQUENCY:

Voltage Gain	Input Range (±mV)	Signal (peak to peak) Min. (mV) [6]	Signal (peak to peak) Max (V)[7]	Min Pulse Width (µV)	Max[8] Freq (kHz)
1	1000	500	10	2.5	200
5	25	10	2	10	50
20	7.5	5	2	62	8
50	2.5	2	2	100	5

[6]Signal centered around Threshold (see PeriodAvg() instruction).

[7]Signal centered around ground

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

RATIOMETRIC MEASUREMENTS

MEASUREMENT TYPES: Provides ratiometric resistance measurements using voltage or current excitation. Four switched voltage excitation outputs are available for measurement of 4- and 6-wire full bridges, and 2-, 3-, and 4-wire half bridges. Three switched current excitation outputs are available for direct resistance measurements. Optional excitation polarity reversal minimizes dc errors.

RATIOMETRIC MEASUREMENT ACCURACY[9, 10, 11]:
±(0.02% of voltage reading + offset[12]), 0° to 40°C
±(0.025% of voltage reading + offset[12]), -25° to 50°C
±(0.03% of voltage reading + offset[12]), -40° to 85°C

[9] Accuracy specification assumes excitation reversal for excitation voltages < 500 mV and excitation currents < 500 µA. Assumption does not include bridge resistor errors and sensor and measurement noise.

[10]For Resistance() instruction, the sensor resistance is determined from VS / IX, where excitation current IX is measured across a 1000 Ω, ±0.005% at 25°C, 2 ppm•°C^{-1} TCR internal resistor.

[11]Estimated accuracy, ΔX (where X is value returned from measurement with Multiplier =1, Offset = 0):
BrHalf() instruction: $\Delta X = \Delta V_i/V_x$
BrFull() instruction $\Delta X = 1000 \cdot \Delta V_i/V_x$, expressed as mV•V^{-1}.
ΔV^{-1} is calculated from the ratiometric measurement accuracy. See Resistance Measurements Section in the manual for more information.

[12]Offset definitions:
Offset for DIFF w/input reversal = 1.5•Basic Res + 1.0 µV
Offset for DIFF w/o input reversal = 3•Basic Res + 2.0 µV
Offset for SE = 3•Basic Res + 5.0 µV
Excitation reversal reduces offsets by a factor of two.

PULSE COUNTERS *(P1-P4)*

4 inputs individually selectable for switch closure, high frequency pulse, or low-level AC. Independent 24-bit counters for each input.

MAXIMUM COUNTS PER SCAN: 16.8 x 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 dc offsets up to ±0.5 Vdc.

Input Hysteresis: 12 mV RMS @ 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 CONTROL PORTS *(C1-C8, SDM)*

8 ports software selectable as binary inputs or control outputs. Provide on/off, pulse width modulation, edge timing, subroutine interrupts / wake up, switch-closure pulse counting, high-frequency pulse counting, asynchronous communications (UARTs), and SDI-12 communications.

LOW FREQUENCY MODE MAX: <1 kHz

HIGH FREQUENCY 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 Ω

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

INPUT HYSTERESIS: 1.4 V

INPUT RESISTANCE: 100 kΩ with < 6.2 Vdc; 220 Ω with inputs ≥6.2 Vdc

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

ADDITIONAL DIGITAL PORTS: SDM-C1, SDM-C2, SDM-C3 are dedicated for measuring SDM devices.

SWITCHED 12 V *(SW12V)*

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

EU DECLARATION OF CONFORMITY

VIEW EU DECLARATION OF CONFORMITY AT:
www.campbellsci.com/cr3000

COMMUNICATION

RS-232 PORTS:
DCE 9-pin (electrically isolated): for computer connection or connection of modems not manufactured by Campbell Scientific.
COM1 to COM4: 4 independent Tx/Rx pairs on control ports (non-isolated); 0 to 5 Vdc UART
Baud Rate: Selectable from 300 to 115.2k bps.
Default Format: 8 data bits; 1 stop bit; no parity
Optional Format: 7 data bits; 2 stop bits; odd, even parity

CS I/O PORT: Interface with telecommunication peripherals manufactured by Campbell Scientific.

SDI-12: Digital Control ports C1, C3, C5, and C7 are individually configurable and meet SDI Standard v 1.3 for datalogger mode. Up to 10 SDI-12 sensors are supported per port.

PERIPHERAL PORT: 40-pin interface for attaching CompactFlash or Ethernet peripherals

PROTOCOLS SUPPORTED: PakBus, AES-128 Encrypted PakBus, Modbus, DNP3, FTP, HTTP, XML, HTML, POP3, SMTP, Telnet, NTCIP, NTP, Web API, SDI-12, SDM.

SYSTEM

PROCESSOR: Renesas H8S 2674 (16-bit CPU with 32-bit internal core)

MEMORY: 2 MB of flash for operating system; 4 MB of battery-backed SRAM for CPU usage, program storage and final data storage

REAL-TIME CLOCK ACCURACY: ±3 min. per year. Correction via GPS optional

REAL-TIME CLOCK RESOLUTION: 10 ms

SYSTEM POWER REQUIREMENTS

VOLTAGE: 10 to 16 Vdc

RECHARGEABLE BASE INPUT: 17 to 24 Vdc or 18 V RMS ac

INTERNAL BATTERIES: 1200 mAh lithium battery for clock and SRAM backup. Typically provides 3 years of backup. Optional 7 Ah rechargeable battery plus base available as primary power supply.

EXTERNAL BATTERIES: Optional 12 Vdc nominal alkaline and rechargeable available. Power connection is reverse polarity protected.

TYPICAL CURRENT DRAIN @ 12 Vdc:
Sleep Mode: < 2 mA
1 Hz Sample Rate (one fast SE measurement): 3 mA
100 Hz Sample Rate (one fast SE measurement): 10 mA
100 Hz Sample Rate (one fast SE measurement w/RS-232 communications): 38 mA
Active integrated keyboard display adds 1 mA (42 mA with backlight on).

PHYSICAL SPECIFICATIONS

DIMENSIONS: 24.1 x 17.8 x 9.6 cm (9.5 x 7.0 x 3.8 in); additional clearance required for cables and leads.

WEIGHT:

Base Type	Mass (kg)	Weight (lb)
Low profile	1.6	3.6
Rechargeable	4.8	10.7

WARRANTY

3 years against defects in materials and workmanship.

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