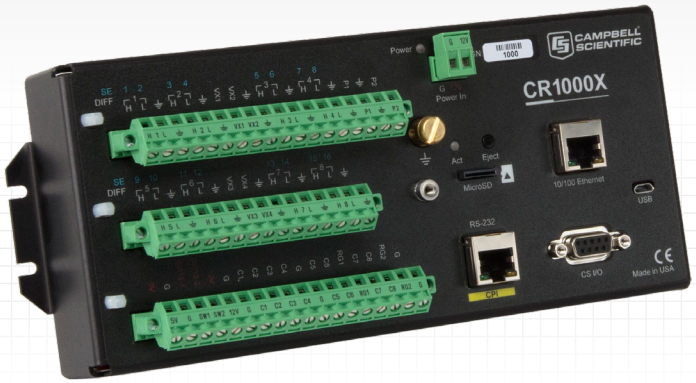
CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

CR1000X

Measurement and Control Datalogger



World-Class Environmental Datalogger

Accurate, Rugged, Reliable

Overview

The CR1000X is our flagship datalogger that provides measurement and control for a wide variety of applications. Its reliability and ruggedness make it an excellent choice for remote environmental applications, including weather stations, mesonet systems, wind profiling, air quality monitoring, hydrological systems, water quality monitoring, and hydrometeorological stations.

The CR1000X is a low powered device that measures sensors, drives direct communication and telecommunications, analyzes data, controls external devices, and stores data and programs in onboard, nonvolatile storage. The electronics are RF shielded by a unique sealed, stainless-steel canister. A battery-backed clock assures accurate timekeeping. The onboard, BASIC-like programming language, common to all contemporary Campbell Scientific dataloggers, supports data processing and analysis routines.

Benefits and Features

- Operates in extreme environments with a standard operating range of -40° to +70°C and extended operating range of -55° to +85°C
- Connects directly to a computer's USB port
- Captures quickly changing data values with fast analog measurement capabilities
- Differentiates even slight changes in data values with high resolution measurements
- Includes two non-isolated current input channels for directly connecting sensors with 0-to-20 mA or 4-to-20 mA current outputs
- Contains an onboard CPI port for hosting Campbell high speed sensors and distributed modules (CDM)
- Directly connects to Ethernet
- Includes microSD card drive for extended memory requirements
- Provides simple serial sensor integration and measurement with SDI-12, RS-232 and/or RS-485
- Supports full PakBus networking
- Includes embedded web page for direct connection via web browser

General Specifications

- **CPU:** 32 bit with hardware FPU, running at 100 MHz
- **Internal Memory:** 128 MB flash and 4 MB battery-backed SRAM
- **MicroSD Drive** for extended data storage up to 16 GB
- **Clock Accuracy:** ±3 min per year, optional GPS correction to 10 µs
- **USB micro B** for direct connection to PC, 2.0 full speed, 12 Mbps
- **10/100 Ethernet RJ45** for LAN connection
- **CS I/O Port** for connection to Campbell Scientific communications and displays
- **RS-232/CPI Port** for terminal expansion using Campbell Distributed modules (CDM)
- **Supported Protocols:** PakBus, Modbus, DNP3, NTCIP, NMEA 0183, and many more
- **Removable Power Terminal** for connecting BPALK, PS150, PS200, or other power supply
- **Two Switched 12 V Terminals** for powering sensors or communication devices, 1.3 A @ -40°C, 0.47 A @ 80°C
- **Power Drain @ 12 Vdc:** < 1 mA (idle), 1 mA (active, 1 Hz scan), 55 mA (active, 20 Hz scan), active + 25 mA (RS-232/RS-485), active + 48 mA (Ethernet link)

General Specifications Continued

- **Compliance Information:** View the CR1000X EU Declaration of Conformity at: www.campbellsci.com/cr1000x
- **Four Sensor Excitation (VX1 - VX4)** for sensor excitation or regulated supply
- **100 Ohm Resistive Ground Terminal** for measuring 0 to 20 mA or 4 to 20 mA outputs
- **Analog Input Terminals (SE1 - SE16)**
  - 16 single-ended or 8 differential inputs with ±5000 mV ranges
  - 24 bit ADC
  - Ratiometric Bridge
  - Thermocouple
  - Period Averaging
- **Two Pulse Counting Terminals (P1, P2)**
  - Switch closure
  - High frequency counter
  - Low level AC
  - High frequency counter
- **Eight Control Terminals (C1 - C8):** C terminals are software configurable for digital functions
  - Digital I/O functions consist of 5 V output and 3.3 V input logic levels for:
    - SDI-12
    - Serial communication Tx/Rx pair
    - High frequency counter
    - Switch closure
    - General status/control
    - Voltage source 5 V: 10 mA @ 3.5 V
    - Interrupts
- **Best Analog Accuracy:** ±(0.04% of measurement + offset)
- **Best Effective Resolution:** 0.02 µV RMS
- **Operating Temperature Range:** -40° to +70°C standard, -55° to +85°C extended
- **Weight:** 0.86 kg (1.9 lb)
- **Dimensions:** 23.8 cm x 10.1 cm x 6.2 cm (9.4 in x 4.0 in x 2.4 in)

Terminals

Analog Input	SE1	SE2	SE3	SE4	SE5	SE6	SE7	SE8	SE9	SE10	SE11	SE12	SE13	SE14	SE15	SE16	RG1	RG2	Max
Single Ended	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Differential	H	L	H	L	H	L	H	L	H	L	H	L	H	L	H	L			8
Ratiometric Bridge	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Thermocouple	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16
Current Loop																	✓	✓	2
Period Average	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			16

Analog Output	VX1	VX2	VX3	VX4	Max
Switched-Voltage Excitation	✓	✓	✓	✓	4

Voltage Output[a]	C1	C2	C3	C4	C5	C6	C7	C8	VX1	VX2	VX3	VX4	5 V	12V	SW12V-1	SW12V-2	Max
5 V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				9
3.3 V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					8
12 V														✓	✓	✓	3

Communication[b]	C1	C2	C3	C4	C5	C6	C7	C8	RS-232/CPI	USB	Ethernet	CS I/O	Max
SDI-12	✓		✓		✓		✓						4
GPS	PPS	Rx	Tx	Rx	Tx	Rx	Tx	Rx					1
TTL (0 to 5 V)	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					4
LVTTL (0 to 3.3 V)	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx					4
RS-232					Tx	Rx	Tx	Rx	✓				3
RS-485 (Half Duplex)					A(-)	B(+)	A(-)	B(+)					2
RS-485 (Full Duplex)					Tx-	Tx+	Rx-	Rx+					1
I2C	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL					4
SPI	MOSI	SCLK	MISO		MOSI	SCLK	MISO						2
SDM[c]	DATA	CLK	ENABLE		DATA	CLK	ENABLE						1
CPI/CDM									✓				1
USB										✓			1
Ethernet											✓		1
CS I/O												✓	1

Digital I/O[b]	C1	C2	C3	C4	C5	C6	C7	C8	Max
General I/O Pair	✓	✓	✓	✓	✓	✓	✓	✓	8
Pulse-Width Modulation Output	✓	✓	✓	✓	✓	✓	✓	✓	8
Timer Input	✓	✓	✓	✓	✓	✓	✓	✓	8
Interrupt	✓	✓	✓	✓	✓	✓	✓	✓	8

Pulse Counting[b]	C1	C2	C3	C4	C5	C6	C7	C8	P1	P2	Max
Switch Closure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
High Frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	10
Low Level AC									✓	✓	2

[a]For the Voltage Outputs, the C terminals have limited drive capacity and the voltage levels are configured in pairs.

[b]Triggering conflicts can occur when companion control ports are used for different triggering instructions (TimerInput, PulseCount, SDI12Recorder, WaitDigTrig). For example, if C3 is used for the SDI12Recorder instruction, C4 cannot be used in the TimerInput, PulseCount, or WaitDigTrig instructions.

[c]SDM can be on either C1-C3 or C5-C7, but not both at the same time.