CR350

Measurement and Control Datalogger

Compact Data Logger with RS-485

Ideal for small applications

Overview

The CR350 is a multi-purpose, extremely low-power, compact measurement and control data logger. This entry-level data logger, with its rich instruction set, can measure most hydrological, meteorological, environmental, and industrial sensors. The CR350 concentrates and makes data available over varied networks, with delivery using your preferred protocol. The CR350 also performs automated on-site or remote decision-making for control and M2M communications. This data logger is ideal for small applications requiring long-term, remote monitoring and control.

The following outlines the primary differences between the CR310 and CR350 dataloggers:

- The CR310 and CR350 offer removable connectors.
- The CR310 includes a 10/100 Ethernet connection.
- The CR350 has two independent RS-232/RS-485 ports and USB-C.

The CR350 includes Wi-Fi, cellular, or the following radio options for different regions:

- CR350-RF407: US and Canada
- CR350-RF412: Australia and New Zealand
- CR350-RF422: UK and EU
- CR350-RF427: Brazil

Note: Campbell Scientific does not recommend the CR350 for use as a PakBus router in networks with more than 50 devices. Large arrays or string variables may also reach memory limits. For such applications, a CR1000Xe Measurement and Control Datalogger is recommended.

Benefits and Features

- Two dedicated SDI-12 terminals to expand SDI-12 sensor use
- Extremely low current requirements
- Two dedicated RS-232/RS-485 terminals to support smart sensors or modems
- Easy setup with PC software and USB-C connectivity
- Ability to measure analog and digital sensors with confidence
- Trusted Campbell Scientific quality, including integral surge and ESD protection
- Integrated radio option to network wirelessly to another node or internet gateway
- CR350-WIFI ideal for short-range, wireless IP communications
- Removable terminal block for easy wiring
- Ability to communicate anywhere using built-in cellular or satellite peripherals
- Integrated 12 V battery solar charge regulator to charge batteries
- Flexibility to connect with PakBus, Modbus, DNP3, GOES, and other standard communications protocols
- Multiple general-purpose I/O and programmability to analyze and control measurement acquisition
- Event-driven communications and physical outputs for notifications

Detailed Description

The CR350 is a low-powered data logger designed to measure sensors, analyze data, and store data and programs. A battery-backed clock assures accurate timekeeping. The on-board, BASIC-like programming language—common to all Campbell Scientific data loggers—supports data processing and analysis routines.

Terminal Descriptions

- Two switched 12 V terminals (SW12V) for powering sensors or communications devices, 2100 mA
- Two sensor excitation or continuous 0.15 to 5 V terminals (VX1, VX2) for sensor excitation or output control
- Four multipurpose analog input terminals (SE1–SE4)
  - Analog functions (SE1–SE4)
    - Analog inputs: 4 single-ended or 2 differential inputs with -100 to +2500 mV and ±34 mV ranges 24 bit ADC
    - 4 to 20 mA or 0 to 20 mA inputs (SE1, SE2 only)
  - Digital I/O functions (SE1–SE4) consist of 3.3 V logic levels for:
    - High frequency counter (35 kHz)
    - Pulse width modulation
    - Interrupts and timer input
    - Period average (200 kHz, amplitude dependent)
- Two pulse counting terminals (P_SW, P_LL)
  - P_SW
    - Switch closure (150 Hz)
    - High frequency counter (35 kHz)
  - P_LL
    - Low level ac (20 kHz)
    - High frequency counter (20 kHz)
- Two control terminals (C1, C2): 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
    - High frequency counter (3 kHz)
    - Switch closure (150 Hz)
    - General status/control voltage source 5 V; 10 mA @ 3.5 V
    - Interrupts
    - Serial asynchronous communications Tx/Rx pair

Specifications

Operating Temperature Range	▪ -40° to +70°C ▪ *Non-condensing environment*
Maximum Scan Rate	10 Hz
Case Material	High-impact-resistant polycarbonate, recycle code 7
Analog Inputs	4 single-ended or 2 differential (individually configured)
Pulse Counters	8 (P_SW, P_LL, C1, C2, and SE1 to SE4)
Voltage Excitation Terminals	2 (VX1, VX2)

Communications Ports	▪ USB Type C 2.0 ▪ RS-232 ▪ RS-485
Switched 12 Volt	2 terminals
Digital I/O	7 terminals (C1, C2, P_SW, and SE1 to SE4) configurable for digital input and output. Includes status high/low, pulse width modulation, external interrupt, and communications functions. Exception: C2 and P_SW don't do pulse-width modulation.
Analog Input Limits	-100 to +2500 mV

Specifications

Analog Voltage Accuracy	▪ Accuracy specifications do not include sensor or measurement noise. ▪ ±(0.04% of measurement + offset) at 0° to 40°C ▪ ±(0.1% of measurement + offset) at -40° to +70°C
ADC	24-bit
Charge Terminal Characteristics (CHG+ and CHG-)	▪ Input from power converter or solar panel ▪ ES1 PS2 energy sources only (Energy Source Class 1 [ES1] and Power Source Class 2 [PS2], as defined in Clauses 5 and 7 of IEC/AS/NZS 62368-1:2022) ▪ 16 to 32 Vdc ▪ Hold current limit 1.1 A @ 20°C
Battery Terminal Characteristics (BAT+ and BAT-)	▪ Input from external battery, 7 Ah lead-acid typical ▪ Voltage input 12 Vdc only ▪ Hold current limit 3.7 A @ 20°C
Internal Lithium Battery	▪ 3 V coin cell CR2032X for battery-backed clock ▪ 6-year life with no external power source
Real-Time Clock Accuracy	±3 min. per year
Internet Protocols	Ethernet, PPP, RNDIS, ICMP/Ping, Auto-IP (APIPA), IPv4, IPv6, UDP, TCP, TLS (v1.2), DNS, DHCP, SLAAC, NTP, Telnet, HTTP(S), FTP(S), SMTP/TLS, POP3/TLS, MQTT(S)
Communications Protocols	PakBus, PakBus Encryption, Modbus RTU/ASCII/TCP, DNP3, SDI-12, and others
CPU Drive/Programs	50 MB serial flash
Data Storage	50 MB serial flash
Idle Current Drain, Average	0.5 mA (@ 12 Vdc)
Active Current Drain, Average	▪ < 1.5 mA (@ 12 Vdc for 1 Hz scan with 1 analog measurement) ▪ 8 mA (@ 12 Vdc with processor always on)
Dimensions	16.3 x 8.4 x 5.6 cm (6.4 x 3.3 x 2.2 in.) Additional clearance required for cables and leads
Weight	288 to 306 g (0.64 to 0.68 lb) depending on communications option selected

CR350-RF407 Option

Radio Type	Frequency Hopping Spread Spectrum (FHSS)
Output Power	5 to 250 mW (user-selectable)
Frequency	902 to 928 MHz (US, Canada)
RF Data Rate	200 kbps
Receive Sensitivity	-101 dBm
Antenna Connector	RPSMA (external antenna required; see www.campbellsci.com/order/rf407 for Campbell Scientific antennas)
Idle Current Drain, Average	12 mA (@ 12 Vdc)
Active Current Drain, Average	< 80 mA (@ 12 Vdc)

CR350-RF412 Option

Radio Type	Frequency Hopping Spread Spectrum (FHSS)
Output Power	5 to 250 mW (user-selectable)
Frequency	915 to 928 MHz (Australia, New Zealand)

Specifications

CR350-RF412 Option (continued)

RF Data Rate	200 kbps
Receive Sensitivity	-101 dBm
Antenna Connector	RPSMA (external antenna required; see www.campbellsci.com/order/rf412 for Campbell Scientific antennas)
Idle Current Drain, Average	12 mA (@ 12 Vdc)
Active Current Drain, Average	< 80 mA (@ 12 Vdc)

CR350-RF422 Option

Radio Type	868 MHz SRD 860 with Listen Before Talk (LBT) and Automatic Frequency Agility (AFA)
Output Power	2 to 25 mW (user-selectable)
Frequency	863 to 870 MHz (European Union)
RF Data Rate	10 kbps
Receive Sensitivity	-106 dBm
Antenna Connector	RPSMA (External antenna required; see www.campbellsci.com/order/rf422 for Campbell Scientific antennas)
Idle Current Drain, Average	9.5 mA
Active Current Drain, Average	20 mA

CR350-RF427 Option

Radio Type	Frequency Hopping Spread Spectrum (FHSS)
Output Power	5 to 250 mW (user-selectable)
Frequency	▪ 902 to 907.5 MHz ▪ 915 to 928 MHz (Brazil)
RF Data Rate	200 kbps
Receive Sensitivity	-101 dBm
Antenna Connector	RPSMA (External antenna required)
Idle Current Drain, Average	12 mA (@ 12 Vdc)
Active Current Drain, Average	< 80 mA (@ 12 Vdc)

CR350-RF452 Option

Radio Type	Frequency Hopping Spread Spectrum (FHSS)
Output Power	10 mW to 1,000 mW (user-selectable)
Frequency	902 to 928 MHz
RF Data Rate	115.2 or 153.6 kbps
Receive Sensitivity	▪ -108 dBm (@ 115.2 kbps for 10^{-4} BER) ▪ -103 dBm (@ 153.6 kbps for 10^{-4} BER)
Antenna Connector	RPSMA (External antenna required)
Idle Current Drain, Average	< 29 mA (maximum @ 12 Vdc)
Active Current Drain, Average	< 84 mA (maximum @ 12 Vdc)

Specifications

CR350-WIFI Option

Operational Modes	Client or Access Point
Operating Frequency	2.4 GHz, 20 MHz bandwidth
Antenna Connector	Reverse Polarity SMA (RPSMA)
Antenna	pn 16005 unity gain (0 dBd), 1/2 wave whip, omnidirectional with articulating knuckle joint for vertical or horizontal orientation
Transmit Power	7 to 18 dBm (5 to 63 mW)

CR350-CELL205 Option

-NOTE-	***The CR350-CELL205 option is not compatible with a Verizon cellular network.***
Certifications	IC (Industry Canada) 10224A-201611EC21A
Cell Technologies	▪ 3G (UMTS/HSPA+) ▪ 4G (LTE CAT-1)
3G Frequency Bands	850, 1700/2100 (AWS), and 1900
4G Frequency Bands	700, 850, 1700/2100 (AWS-1), 1900
Antenna Connector	SMA (External antenna required; see www.campbellsci.com/order/cr350 for Campbell Scientific antennas)
Power Consumption - Idle	14 mA (average)
Power Consumption - Active	75 mA (average)
SIM Interface	3FF (6 position/contacts) Supports SIMs that require 1.8 or 3 V
Radio Output Power	▪ 23 dBm on LTE ▪ 24 dBm on UMTS ▪ 27 dBm on EDGE ▪ 33 dBm on GSM
Radio Sensitivity Range	-99.5 to 110.5 dBm (10 M)

CR350-CELL210 Option

-NOTE-	***The CR350-CELL210 option is only compatible with a Verizon cellular network.***
Cell Technologies	4G (LTE CAT-1)
4G Frequency Bands	700, 850, 1700, 1900, 2100
Antenna Connector	SMA (External antenna required; see www.campbellsci.com/order/cr350 for Campbell Scientific antennas)
Power Consumption - Low Power Mode	5 mA
Power Consumption - Idle	28 mA (average)
Power Consumption - Active	90 mA (average)
SIM Interface	3FF (6 position/contacts) Supports SIMs that require 1.8 or 3 V
Radio Output Power	23 dBm on LTE
Radio Sensitivity Range	-99.5 to 110.5 dBm (10 M)

Specifications

CR350-CELL215 Option

-NOTE-	***The CR350-CELL215 option is intended for use in EMEA countries.***
Cell Technologies	▪ 2G (GSM/GPRS/EDGE) ▪ 3G (UMTS/HSPA+) ▪ 4G (LTE CAT-1)
2G Frequency Bands	900 and 1800 MHz
3G Frequency Bands	850, 900, and 2100 MHz
4G Frequency Bands	800, 850, 900, 1800, 2100, and 2600 MHz
Antenna Connector	SMA (External antenna required; see www.campbellsci.com/order/cr350 for Campbell Scientific antennas)
Power Consumption - Idle	14 mA (average)
Power Consumption - Active	75 mA (average)
SIM Interface	3FF (6 position/contacts) Supports SIMs that require 1.8 or 3 V
Radio Output Power	▪ 23 dBm on LTE ▪ 24 dBm on UMTS ▪ 27 dBm on EDGE ▪ 33 dBm on GSM
Radio Sensitivity Range	-99.5 to 110.5 dBm (10 M)

CR350-CELL220 Option

-NOTE-	***The CR350-CELL220 option is intended for use in Australia and New Zealand.***
Cell Technologies	▪ 3G (UMTS/HSPA+) ▪ 4G (LTE CAT-1)
3G Frequency Bands	▪ 850 and 2100 MHz (EC-21AUT) ▪ 850, 900, 1900, and 2100 MHz (EC-21AU)
4G Frequency Bands	▪ 700, 850, 1800, 2100, and 2600 MHz (EC-21AUT) ▪ 700, 900, 1700, 1800, 1900, 2100, and 2600 MHz (EC-21AU)
Antenna Connector	SMA (External antenna required; see www.campbellsci.com/order/cr350 for Campbell Scientific antennas)
Power Consumption - Idle	14 mA (average)
Power Consumption - Active	75 mA (average)
SIM Interface	3FF (6 position/contacts) Supports SIMs that require 1.8 or 3 V
Radio Output Power	▪ 23 dBm on LTE ▪ 24 dBm on UMTS
Radio Sensitivity Range	-99.5 to 110.5 dBm (10 M)

CR350-CELL225 Option

-NOTE-	***The CR350-CELL225 option is intended for use in Japan.***
Cell Technologies	4G (LTE CAT-1)
4G Frequency Bands	800 (lower), 800 (upper), 850+, 900, 1800, and 2100 MHz
Antenna Connector	SMA (External antenna required; see www.campbellsci.com/order/cr350 for Campbell Scientific antennas)
Power Consumption - Idle	14 mA (average)

Specifications

CR350-CELL225 Option (continued)

Power Consumption - Active	75 mA (average)
SIM Interface	3FF (6 position/contacts) Supports SIMs that require 1.8 or 3 V
Radio Output Power	23 dBm on LTE
Radio Sensitivity Range	-99.5 to 110.5 dBm (10 M)

CR350-CELL230 Option

Cell Technologies	LTE-Cat M, NB-IoT
Frequency Bands	▪ LTE M B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85 ▪ LTE NB-IoT B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85
Antenna Connector	SMA (External antenna required; see www.campbellsci.com/order/cr350 for Campbell Scientific antennas)
Power Consumption - Idle	23 mA average (26 mA if GPS is on)
Power Consumption - Active	50 mA average (53 mA if GPS is on)
SIM Interface	3FF (6 position/contacts) Supports SIMs that require 1.8 or 3 V