COMPONENT

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

CR6 Series

Measurement and Control Datalogger

One Datalogger, Countless Applications

Featuring advanced vibrating-wire technology

Overview

The CR6-series measurement and control datalogger is a powerful core component for your data-acquisition system. We combined the best features of all our dataloggers and added faster communications, low power requirements, built in USB, compact size, and improved analog input accuracy and resolution. The CR6 series also introduces our new universal (U) terminal—an ingenious way for allowing virtually any sensor (analog, digital, or smart) to be connected to any U terminal. This is also our first multipurpose datalogger capable of doing static vibrating-wire measurements.

Benefits and Features

- Powerfully versatile, multi-tool of data acquisition
- U terminals configurable to what you want them to be: analog or digital, input, or output
- Static vibrating wire measurements using our patented spectral analysis
- Surge and over-voltage protection on all terminals
- Flexible power input from solar panel, dc power supply, 12 V battery, USB
- Onboard communication via Ethernet 10/100
- Wiring made easy through removable terminal block
- MicroSD card drive for extended memory requirements
- Serial sensors support with RS-232 and RS-485 native
- CPI for hosting Campbell high speed sensors and distributed modules (CDM)
- Programmable with CRBasic or SCWin program generator, completely PakBus compatible
- Shared operating system (OS) with the popular CRBasic CR1000 and CR3000 dataloggers

Specifications

- **CPU:** 32 bit with hardware FPU, running at 100 MHz
- **Internal Memory:** 4 MB SRAM for data storage, 6 MB flash for OS, 1 MB serial flash (CPU) for program files
- **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 (limited power source during configuration), 2.0 full speed, 12 Mbps
- **10/100 Ethernet RJ45** for LAN connection
- **CS I/O port** for connection to Campbell Scientific modems and displays
- **CPI port** for terminal expansion using Campbell Distributed modules (CDM)
- **Battery terminal pair** for regulated 12 V power input or rechargeable 12 V VRLA for UPS mode
- **Charge terminal pair** for 16 to 32 V from dc power converter or 12 or 24 V solar panel
- **Two switched 12 V terminals** for powering sensors or communication devices, 1100 mA @ 20°C
- **Continuous 12 V terminal**

Specifications Continued

- **Twelve Universal (U) Terminals:** U terminals are software configurable for analog or digital functions
  - Analog functions consist of:
    - Analog inputs: 12 single-ended or 6 differential with ±5000 mV, ±1000 mV, ±200 mV ranges 24 bit ADC
    - Analog outputs: ±2.5 V or ±2 mA ranges for bridge measurements 12 bit DAC
    - Static frequency-analyzed vibrating wire: terminal pair both excites to 12 V p-p and 100 Hz to 6.5 kHz and reads vibrating-wire transducers
    - Thermistor: completion resistor internal 5 kΩ
    - Period average: up to 200 kHz, amplitude dependent
    - Low level ac: 1 Hz to 20 kHz, amplitude dependent
  - Digital I/O functions consist of 5 V or 3.3 V logic levels for:
    - General status/control
    - Voltage source: 5 V, 3.3 V, 20 mA @ 3.5 V
    - Timer I/O
    - Switched closure (150 Hz) or high frequency counter (1 MHz)
    - Pulse width modulation
    - Interrupts
    - SDI-12 and SDM
    - Serial asynchronous communication Tx/Rx pairs
- **Four control (C) Terminals:** C terminals are software configurable for digital functions
  - Digital I/O functions consist of 5 or 3.3 V logic levels for:
    - General status/control
    - Voltage source 5 V, 3.3 V: 11 mA @ 3.5 V
    - Timer I/O
    - Switched closure (150 Hz) or high frequency counter (1 MHz)
    - Pulse width modulation
    - Interrupts
    - SDI-12 and SDM
    - RS-232/RS-485: half or full duplex, Tx/Rx pairs
- **Maximum Multiplexed Analog Measurement Rate:** 354 Hz (2.8 ms)
- **Best Analog Accuracy:** ±(0.03% of reading + 3 µV), 0° to 40°C
- **Best Effective Resolution:** 50 nV (±200 mV range, differential measurement, input reversal, 5 Hz f_{N1})
- **Weight:** 0.42 kg (0.92 lb)
- **Dimensions:** 20.3 x 10.2 x 6.1 cm (8.0 x 4.0 x 2.4 in)

Programmable Terminals

Twelve U terminals and four C terminals are programmable for the following functions.

Analog Input Function	C1	C2	C3	C4	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	Max
Single Ended					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
Differential					H	L	H	L	H	L	H	L	H	L	H	L	6
Period Average					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
Vibrating Wire						✓		✓		✓		✓		✓		✓	6
Thermistor						✓		✓		✓		✓		✓		✓	6
Analog Output Function	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**Max**
Switched-Voltage Excitation					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
Switched-Current Excitation					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
Digital I/O Function	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**Max**
RS-232	Tx	Rx	Tx	Rx													2
RS-485 (Half Duplex)	Tx-	Tx+	Rx-	Rx+													2
RS-485 (Full Duplex)	Tx	Rx	Tx	Rx													1
RS-232 TTL	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	8
SDI-12	✓		✓		✓		✓		✓		✓		✓		✓		8
SDM	DATA	CLK	ENABLE		DATA	CLK	ENABLE		DATA	CLK	ENABLE		DATA	CLK	ENABLE		1
General I/O Pair	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
5 V or 3.3 V Source	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Pulse-Width Modulation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Timer I/O	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Interrupt	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Pulse Counting Function	**C1**	**C2**	**C3**	**C4**	**U1**	**U2**	**U3**	**U4**	**U5**	**U6**	**U7**	**U8**	**U9**	**U10**	**U11**	**U12**	**Max**
Switch Closure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
High Frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	16
Low Level AC						✓		✓		✓		✓		✓		✓	6

Terminal Pair Use Examples

1. If U1 is programmed for analog input or output, its associated pair, U2, may only be used as an analog input or output.
2. If U6 is programmed as a low level ac pulse connection, its associated pair, U5, may only be used for digital I/O or pulse counting.

GEO MONITORING
Tecnología del Futuro

PRODUCT

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WHEN MEASUREMENTS MATTER

TDR200
Time-Domain Reflectometer

Core of the TDR System

Overview

The TDR200 Time-Domain Reflectometer is the core of the Campbell Scientific time-domain reflectometry (TDR) system. TDR systems accurately determine soil volumetric water content, soil bulk electrical conductivity, rock mass deformation, or a user-specific time-domain measurement. One Campbell Scientific datalogger can control multiple TDR200 reflectometers.

Benefits and Features

- Low power (half the power of the TDR100)
- Robust
- High sensitivity
- High resolution
- Low noise
- Advanced waveform filtering
- Advanced waveform analysis algorithm
- Backward compatible with TDR100 systems (CRBasic dataloggers only)
- 60 Hz frequency rejection

Detailed Description

The TDR200 generates a short rise time electromagnetic pulse that is applied to a coaxial system that includes a TDR probe for soil water measurements. Then the reflectometer samples and digitizes the resulting reflection waveform for analysis or storage.

The elapsed travel time and pulse reflection amplitude contain information used by the on-board processor to quickly and accurately determine soil volumetric water content, soil bulk electrical conductivity, rock mass deformation, or a user-specific time-domain measurement.

The datalogger collects a 250-point waveform and analyzes it in approximately two seconds. Each waveform can have up to 10,112 data points for monitoring long cable lengths used in rock mass deformation or slope stability. Advanced noise filtering and averaging make accurate measurements possible in noisy environments.

A Complete System

A complete TDR200-based system includes the TDR200, SDM8X50 multiplexers, datalogger, power supply, enclosures, and probes. PC-TDR version 3 software supports TDR200 and

For comprehensive details, visit: www.campbellsci.com/tdr200

sensor setup, troubleshooting, and program generation. This software is available, at no charge, from our website.

The SDM8X50 Multiplexer brochure, TDR Probes component category brochure, and Time-Domain Reflectometry System brochure provide additional information about the TDR system components.

Specifications

Pulse Generator Output	250 mV into 50 Ω
Output Impedance	50 Ω ±1%
Time Response of Combined Pulse Generator & Sampling Circuit	≤ 85 ps
Pulse Generator Aberrations	±16% (within first 1 ns) ±1% (after 1 ns)
Pulse Length	25.5 µs
Waveform Averaging	1 to 128
Operating Temperature Range	-40° to +85°C
Power Supply	Unregulated 12 Vdc (9.6 to 16 Vdc) 150 mA maximum, USB powered (5 Vdc)
Dimensions	21.6 x 5.1 x 10.7 cm (8.5 x 2.0 x 4.2 in.)
Weight	0.79 kg (1.75 lb)

Waveform Sampling

-NOTE-	*20 to 10112 waveform values over chosen length* *Distance is V_p=1. Time is one-way travel.*

Electrostatic Discharge Protection

Air	±8 kV @ 2 Ω
Contact	±4 kV @ 2 Ω
Surge	±2 kV @ 2 Ω

Current Drain

During Measurement	120 mA
Sleep Mode	1 mA

For comprehensive details, visit: www.campbellsci.com/tdr200

COMPONENTS

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WHEN MEASUREMENTS MATTER

SDM8X50

8-Channel, 50 Ohm, Coaxial Multiplexer for TDR Systems

Hermetically Sealed Long-Lasting Relays

SDM8X50 (strain relief bracket not shown)

Overview

The SDM8X50 is a 50 ohm, coaxial, 8:1 multiplexer used in a Campbell Scientific time-domain reflectometer system. It consists of a surge-protected multiplexer circuit board enclosed in a metal housing and a separate strain-relief bracket for the coaxial cables. Both the multiplexer housing and strain relief bracket have holes drilled at a 1-inch spacing that allow the SDM8X50 to be mounted to a wall or an enclosure backplate.

When purchased with the –E option, the SDM8X50 includes a 10-inch-by-12-inch-by-4.5-inch environmental enclosure and an enclosure supply kit. Other compatible Campbell Scientific enclosures that may be purchased separately include the ENCTDR100, ENC12/14, ENC 14/16, and ENC16/18.

Benefits and Features

- Long lasting, 20 times more operations than SDMX50 relays
- Non-latching relays provide better surge protection
- Hermetically sealed relays that are more stable and do not become coated with a non-conducting film
- Quiet operation

Ordering Information

Coaxial Multiplexer

SDM8X50	8-Channel, Solid-State, 50 Ohm Coaxial Multiplexer

Enclosure Options (choose one)

-N	No Enclosure
-E	10-inch-by-12-inch Enclosure

Cables

For the following cables, enter length, in feet, after the -L.

COAXTDR-L	TDR Multiplexer RG8 Cable for connecting different levels of the SDM8X50s or connecting the Level 1 SDM8X50 to the TDR100.
CABLE5CBL-L	5-Conductor 22 AWG Cable for connecting the datalogger to the SDM8X50. Must choose a cable termination option.

CABLE5CBL Cable Termination Options (choose one)

-PT	Cable terminates in pigtails for direct connection to the datalogger's terminals.
-PW	Cable terminates in a connector for attachment to a prewired enclosure.

More info: **+44(0) 1509 828 888**
www.campbellsci.eu/sdm8x50

Specifications

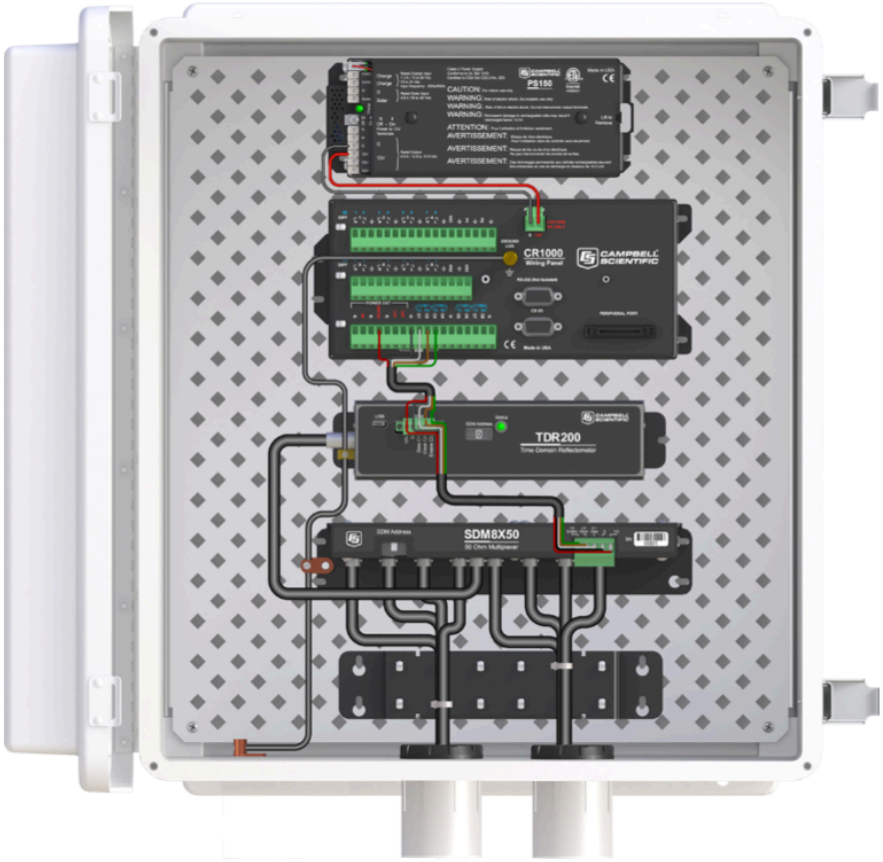
- Input Power: 12 Vdc
- Relay Contact Life Expectancy: 100 x 10^6 operations at 5 V and 10 mA
- Weight: 590 g (1.3 lb)
- Multiplexer Housing Dimensions with Mounts: 24.9 x 12.2 x 4.6 cm (9.8 x 4.8 x 1.8 in)
- Strain Relief Bracket Dimensions: 20.3 x 4.3 x 1.3 cm (8.0 x 1.7 x 0.5 in)

Current Drain

- Quiescent: < 1 mA
- During Switching: ~ 90 mA (all multiplexers of the same level switch simultaneously for less than 1 s)

Enclosure (-E option)

- Weight: 4.1 kg (9.0 lb)
- Outside Dimensions with Mounts: 40.4 x 29.2 x 17.5 cm (15.9 x 11.5 x 6.9 in)
- Inside Dimensions: 25.4 x 30.4 x 11.4 cm (10 x 12 x 4.5 in)



SDM8X50 in an ENCTDR100 enclosure with the TDR200, CR1000, and PS150.

RF451 front tilt view

Descripción detallada

The RF451 is a frequency-hopping spread-spectrum radio, capable of operating between 902 to 928 MHz and transmitting with up to 1 Watt (30 dBm). The specific frequencies used may be selected when operating outside the US and Canada to meet local regulations. Additionally, the RF power output may be adjusted to as low as 10 mW via software.

Typical communication distances are greater than 4 miles with up to 60 miles achievable under ideal conditions. Extended communication distances are possible using repeaters.

The operating frequency band of this radio modem may be shared with other non-licensed services such as cordless telephones and with licensed services including emergency broadcast and air-traffic control.

The RF451 consists of a radio module manufactured by FreeWave Technologies and a Campbell Scientific interface board. It reduces susceptibility to RF interference from other spread-spectrum devices by providing user-selectable frequency hopping patterns. Spread-spectrum radios spread the normally narrowband information signal over a relatively wide band of frequencies. This process allows communications to be more immune to noise and other interference.

RF451 radios, like all FCC Part 15 devices, are not allowed to cause harmful interference to licensed radio communications and must accept any interference that they receive. Most Campbell Scientific users operate in open or remote locations where interference is unlikely. If there is a problem, interference can be reduced using methods such as moving the device, reorienting or using a different type of antenna, or adding RF shielding.

Powering the Radio

At least two radios are required to create a link. The radio may be powered through the dc barrel connector or via a CS I/O connection. When ac power is available, the 15966 wall charger is commonly used. At remote sites, the RF451 typically is powered through the CS I/O or the 14291 field cable.

Antennas

Campbell Scientific offers a variety of antennas for this radio. The 14204 is a 0 dBd, 1/2 wave omnidirectional whip antenna that connects directly to the radio (no cable required) and can transmit short distances (up to 1 mile). The 15970 dipole antenna includes adhesive for window or wall mounting and a cable for connecting to the radio.

Our higher gain 14221 omnidirectional and 14205 Yagi antennas require a cable to connect them to the radio. The 31314 surge protector is available for radios susceptible to lightning or electrostatic buildup or when the cable length needs to be longer than 3 m (10 ft), as measured between the transceiver and the antenna.

Robusto, versátil

Montaje fácil y seguro de equipos Campbell

Imágenes
Productos similares
Descripción técnica
Especificaciones
Compatibilidad
Documentos
FAQs
Casos aplicación

Resumen

El armario ENC16/18 es el modelo más grande que disponemos. En su interior podemos albergar un datalogger, fuente de alimentación y uno o más periféricos. Es habitual utilizarlo en aplicaciones que requieran una de nuestras baterías de tamaño grande y/o si es necesario fijar diversos periféricos de medida o control.

Leer más

Ventajas y características

- Para uso en intemperie, y para proteger los instrumentos
- Placa de montaje diseñada de forma que sea fácil fijar componentes Campbell Scientific
- Armario color blanco, estabilizado UV que refleja la radiación solar—reduciendo los gradientes de temperatura dentro del armario sin necesidad de un protector para la radiación

Descripción detallada

The ENC16/18's backplate is prepunched with half-inch-on-center holes suitable for attaching a data logger, power supply, and a communications or measurement and control peripheral.

This enclosure is shipped with the 7363 enclosure supply kit that consists of desiccant, a humidity indicator card, cable ties, wire tie tabs, putty, grommets, screws, and PVC coupling. Additionally, Campbell Scientific offers a CS210 Enclosure Humidity Sensor for monitoring relative humidity inside of the enclosure. (See Ordering Info on the web page.)

Especificaciones

Color	White (Reflects solar radiation, reducing temperature gradients inside the enclosure without using a separate radiation shield.)
Construction	Fiberglass-reinforced polyester enclosure with door gasket, external grounding lug, stainless-steel hinge, and lockable hasps
Enclosure Classification	NEMA 4X (before being modified for cable entry)
Number of Cable-Entry Seals	2 large, 2 medium, 2 small
Dimensions	› 45.7 x 40.6 x 22.9 cm (18 x 16 x 9 in.) internal › 43.82 x 38.74 x 25.22 cm (17.25 x 15.25 x 9.93 in.) internal under the lid space › 49.53 x 44.4 x 26.98 cm (19.5 x 17.48 x 10.62 in.) external
Weight	7.7 kg (17 lb)

COMPONENT

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

Solar Panels

SP5, SP10, SP30, SP60 and SP100 Series

Reliable charging sources for remote locations

Photovoltaic power sources

Overview

Solar panels are photovoltaic power sources capable of recharging batteries. The minimum battery size and solar panel output required depends on 1) the average current drain of the system, 2) the maximum time the battery must supply power to the system without being charged, and 3) the location of the site. If you need assistance in selecting a solar panel, refer to our Power Supplies brochure, application note, or contact a Campbell Scientific Applications Engineer.

Solar panel characteristics assume 1 kW m^{-2} illumination and 25 °C solar panel temperature. Individual panels may vary up to 10%. The output panel voltage increases as the panel temperature decreases. All solar panels are shipped with hardware for mounting to a tripod or tower.

SP5-Series 5-Watt Solar Panels

The SP5-series solar panels are intended only for CR200(X)-series applications that have minimal power requirements.

- **SP5's** cable has a 4.5 m length and can be fitted with a connector that mates with the ENC200 enclosure's power connector.

SP10-Series 10-Watt Solar Panels

The SP10-series solar panels source sufficient current for many system configurations at most tropical to temperate latitudes. These solar panels include a 4.5 m cable. The models differ as follows:

- **SP10** uses the regulator in the PS150, PS200, CR6, or CR3000 to recharge their batteries. A CH150 or CH200 regulator is required to recharge the BP12, BP17 or BP24 batteries. The SP10's cable has stripped leads that connect to the power supply or datalogger battery base.
- **SP10R** is supplied with a regulator. It can recharge a user-supplied deep-cycle battery. The SP10R's cable has stripped leads that connect to the battery. Please note that the SP10R draws a continuous 5 mA current drain.

SP30-Series 30-Watt Solar Panels

The SP30-series solar panels are often used for system configurations that have higher than average power requirements, or in higher elevation and latitude locations. The models differ as follows:

SP30 uses the regulator in the PS150, PS200, CR3000, CR6 to recharge their batteries. The SP30 has a 5 m cable with stripped leads that connect to the power supply or datalogger battery base.

- **SP30R** is supplied with a regulator. It can recharge a user-supplied deep-cycle battery. This solar panel has a 5 m cable with stripped leads that connect to the battery. Please note that, the SP30R draws a continuous 5 mA current drain.

SP60 60-Watt Solar Panels

The SP60 solar panel is used for our CS110 Electric Field Meter or other systems that require 60 W solar panels. It needs to be connected to a CH150, CH200 Smart Charge Controller or 008116 Morningstar SunSaver regulator (see below).

The SP60 has a 5 m standard length; maximum length is 15 m.

NOTE: Power ratings quoted on this sales leaflet apply to European customers only.

SP100 100-Watt Solar Panels

The SP100 solar panel is used in Eddy Covariance, or other systems that require high-power solar panels. This solar panel needs to be connected to 008116 Morningstar SunSaver regulator (see below).

The SP100 has a 5 m standard length cable; maximum length is 15 m.

Regulators for the SP60 and SP100

CH150 Smart Charge Controller

The CH150 is a micro-controller-based smart charger with temperature compensation that optimizes battery charging and increases the battery's life. It is for use with a separate larger battery such as our BP12, BP24, or a user-supplied battery.

CH200 Smart Charge Controller

The CH200 limits charging current to a maximum of 40 Adc typical, has a quiescent current drain of only 0.3 mA and can precisely charge the following battery families: Yuasa NP Series (includes our PS200, BP12 and BP24), EnerSys Cyclone Series, Concorde Sun Xtender Series or a custom battery.

008116 Morningstar SunSaver

The Morningstar SunSaver limits charging current to approximately 10 A, has a quiescent current drain of approximately 8 mA, and can charge sealed (includes our BP17, BP24) or flooded batteries.

Mounting

The SP5 and SP10 solar panels are supplied with simple, single `V' bolt fitting for mounting on a pole in the size range of 25-54 mm diameter (see the image on the front page of this leaflet). The angle of the solar panel can be adjusted to be 0 to 90 degrees relative to the pole. If necessary the V-bolt fitting can be removed and the panel fixed to a vertical surface with screws. Optional band clamps are available to allow the brackets to be fitted to larger poles up to 120 mm in diameter.

The SP30 and larger standard panels are supplied with a Solar Panel Multi-Fit bracket (Part number 006607). This is a substantial bracket that fits many different sizes of panels by simply clamping under the rear lip of the frame at either side of the panel (it works with panels up to 500 mm internal width). See the diagrams below showing the multi-fit bracket. This allows easy exchange of the panel in the field, e.g. to upgrade to a larger size panel.

One bracket is supplied as standard with each panel which is suitable for mounting the SP30 panel on poles, tripods or towers in most applications. A single bracket may also be adequate with larger panels in sheltered sites where the lower edge of the panel rests on the ground or on the tripod legs. For exposed windy sites, especially with the larger panels, e.g. the SP60 or SP100, a second bracket should be ordered to allow the panel to be mounted on two vertical tubes rather than one. Those tubes could be the two sides of a larger tower or user supplied poles which are fixed into the ground.

Each bracket has two `V' bolt fittings for poles in the range of 25-54 mm diameter. Optional band clamps are available to allow the brackets to be fitted to larger poles up to 120 mm in diameter. Larger poles can be catered for to special order. The panel angle can be adjusted in one of six steps from 0-90 degrees relative to the pole.

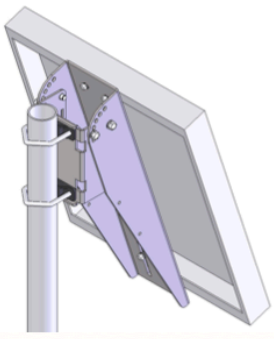


Diagram of a solar panel mounted to pole

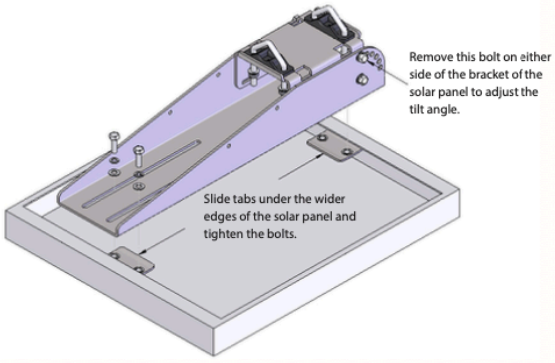


Diagram showing the method of fixing the bracket to the panel

Note: With some smaller panels the bracket will protrude at the bottom side of the panel.

	SP5	SP10	SP30	SP60	SP100
Typical maximum power (W)	4.5(±10%)	10(±10%)	35(+/-5%)	70(+/-5%)	110(+/-5%)
Voltage at peak power**	16.5	16.8	18.1	18.1	17.6
Current at peak power (A)	0.27	0.57	1.94	3.87	6.25
Short circuit current (A)	0.30	0.6	2.1	4.2	6.8
Open circuit voltage**	20.5	21.0	21.7	21.7	21.1
Dimensions (excluding bracket)	251x269 mm	420x269 mm	415x510 mm	535x734 mm	1037x527 mm
Weight (excluding bracket and cable)	0.9 kg	1.9 kg	2.3 kg	4.18 kg	7 kg
Temp. coeff. of voltage (mV/°C)	-80	-72	-63	-61	-61
Temp. coeff. of power (%/°C)	-0.5	-0.37	-0.38	-0.38	-0.38
Cable *** termination	Fixed 4.5 m lead	Fixed 4.5 m lead	0.9 m lead with MC4 connectors	0.9 m lead with MC4 connectors	0.9 m lead with MC4 connectors

*Power ratings are obtained under standard test conditions of 1000 Wm^{-2} and 25°C cell temperature.
**These are voltages at the panel surface. If an external regulator or long cables are used the apparent output voltage will be lower.
***Larger panels have two separate output leads fitted with MC4 connectors. A single dual-core extension cable is supplied with mating connectors to make the standard total cable length 5 m.

Common Specifications:

Maximum temperature range: -40 to +85 °C
Maximum system voltage: 50 V
Warranty on power output (90% of initial power): 10 years

Note: Due to variations in the supply of solar panels and also continued improvement in solar panel technology all specifications are subject to change.

Especificaciones

Radio Type	Frequency Hopping Spread Spectrum (FHSS)
Frequency	902 to 928 MHz
Country Used In	US, Canada, Australia
Power Output	10 to 1,000 mW (user-selectable)
Transmission Distance	› *-Note- Transmission distance assumes line-of-sight and appropriate antenna. Line-of-sight obstructions, RF interference, and antenna type will affect transmission distance.* › 20.92 to 96.56 km (13 to 60 mi) depending on antenna and line-of-sight
Modulation	2 level GFSK
RF Data Rate	115.2 or 153.6 kbps (selectable speeds)
Occupied Bandwidth	142 kHz (applicable to FCC ID KNYAMM0921TT)
Hopping Patterns	15 per band, 105 total (user-selectable)
Hopping Channels	50 to 111 (user-selectable) applicable to FCC ID KNYAMM0921TT
Frequency Zones	16
Receiver Sensitivity	› -108 dBm at 115.2 kbps (for 10^{-4} BER) › -103 dBm at 153.6 kbps (for 10^{-4} BER)

Power	
Input Voltage	7 to 28 Vdc
Powered Over	CS I/O or barrel plug
Connector	Barrel plug, center positive 12 V (used to connect the 14291 Field Power Cable or 15966 ac adapter)

USB	
-NOTE-	*Used for connection to computer for network communications or device configuration. Does not supply enough power for normal operation; RF451 must be powered through dc barrel plug or CS I/O.*
Type	USB standard B (device only)

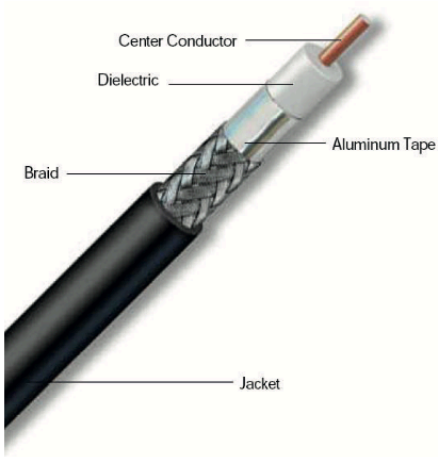
IF Selectivity	40 dB (at fc ± 230 kHz)
Receiver Selectivity	50 dB (at 896 MHz, 935 MHz)
Error Detection	32-bit CRC (retransmit on error)
Data Encryption	proprietary spread-spectrum technology
Link Throughput	115.2 kbps (maximum)
RF Connector	Reverse Polarity SMA (RPSMA) jack (external antenna required)
CS I/O	DB9 M, SDC 7/8/10/11 device
RS-232	DB9 F, DCE
Operating Temperature Range	-40° to +85°C
Relative Humidity	0 to 95% RH (non-condensing)
Compliance Information	› KNYAMM0921TT (FCC ID) › 2329B-AMM0921TT (Industry Canada ([IC])
Average Current Drain (@ 12 Vdc)	› 650 mA (transmit) › 40 mA (receive) › 15 mA (idle) › 6 mA (sleep)
Communication Ports	› RS-232 9 pin D female › CS I/O 9 pin D male › USB Type B jack
Service Requirements	Shares frequency with other devices. Must not cause harmful interference to licensed radios. Requires line-of-sight.
Dimensions	13.61 x 2.74 x 7.01 cm (5.36 x 1.08 x 2.76 in.)
Weight	0.18 kg (0.4 lb)

CA400

AIR 802

Specifications Cable Construction:

Description	Material	mm	Inches
1.Inner Conductor	Solid BCCAl	2.74	0.108
2.Dielectric	Foam PE (Polyethylene)	7.24	0.285
3.Outer Conductor	Aluminum Tape	7.39	0.291
4.Overall Braid	34 AWG Tinned Copper, 90%	8.13	0.320
5.Jacket	Black PE (Polyethylene)	10.29	0.405



Mechanical Specifications:

Performance Characteristics	Unit	US	Metric
Minimum Bend Radius	in-mm	2	50
Tensile Strength	lb-kg	160	72.6
Cable Weight	lb/ft-kg/m	0.068	0.1
Operating Temperature Rating	F°-C°	-40° to -185°	-40° to 85°

Electrical Specifications:

Performance Characteristics	Unit	US	Metric
Cutoff Frequency	GHz	16.2	16.2
Peak Power	kW	16.0	16.0
Velocity of Propagation	%	85.0	85.0
Impedance	ohms (Ω)	50	50
Capacitance	pF/m - pF/ft	23.9	78.4
DC Resistance Inner Conductor	ohms/1000ft ohms/km	1.32	4.30
DC Resistance Outer Conductor	ohms/1000ft ohms/km	2.10	6.80
Shielding Effectiveness	dB	>90	>90
Jacket Spark	Volts RMS	4000	4000

Attenuation and Average Power

Frequency (MHz)	dB/100 Foot	dB/100 Meter	Av. Power (kW)
30	0.7	2.2	3.33
50	0.9	2.9	2.57
150	1.5	5.0	1.47
220	1.9	6.1	1.20
450	2.7	8.9	0.83
800	3.7	12.0	0.61
900	3.9	12.8	0.58
1500	5.1	16.8	0.44
1800	5.7	18.6	0.40
2000	6.0	19.6	0.37
2200	6.3	20.7	0.36
2400	6.6	21.7	0.34
2500	6.8	22.2	0.33
3500	8.1	26.7	0.27
5800	10.8	35.5	0.21

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CA400
Related Products

SKU	DESCRIPTION
CONNECTORS	
CN4BNCF	BNC HEMBRA
CN4BNCM	BNC MACHO
CN4BNCMRA	BNC MACHO ANGULAR
CN4NFB	N HEMBRA BULKHEAD
CN4NFC	N HEMBRA
CN4NMC	N MACHO
CN4NMCLP	N MACHO
CN4NMC-PIN	PIN CN4NMC
CN4NMRA	N MACHO ANGULAR
CN4RSJB	RP SMA H BULKHEAD
CN4RSJBO	RP SMA HEMBRA BULKHEAD
CN4RSJC	RP SMA HEMBRA
CN4RSPC	RP SMA MACHO
CN4RSPRA	RP SMA MACHO ANGULAR
CN4RTJB	RP TNC HEMBRA BULKHEAD
CN4RTJC	RP TNC HEMBRA
CN4RTPC	RP TNC MACHO
CN4SMAJ	SMA HEMBRA
CN4SMAJB	SMA HEMBRA BULKHEAD
CN4SMAP	SMA MACHO
CN4SMAP-PIN	PIN CN4SMAP
CN4SMAPRA	SMA MACHO DE ANGULAR
CN4TNJ	TNC HEMBRA
CN4TNP	TNC MACHO
CN4TNPRA	TNC MACHO ANGULAR
CN4UHFJ	PL259 HEMBRA
CN4UHFP	PL259 MACHO
HEAT-SHRINKABLE	
HSTB16MM	Termocontraible adhesivo 16mm negro
HSTW16MM	Termocontraible adhesivo 16mm blanco
TOOLS	
TL-CRIMP04	Crimpeadora CA400
TL-RNDCUT01	Cortador de cable

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