CAMPBELL SCIENTIFIC®

WHEN MEASUREMENTS MATTER

UPDATE

Fourth Quarter 2014

p. 2 New CR6 Datalogger

p. 2 New Iridium Satellite Solution

p. 3 Which Datalogger for Me: CR6 or CR1000

p. 3 Update on Our Family of Vibrating-Wire Products

p. 4 CPI and CDM

p. 4 PS150 and CH150 Power Supplies

p. 5 Case Study: Lightning Warning at Utah Schools

p. 6 Case Study: Solar-Energy Assessment in Chile

p. 7 Changes to Visibility and Present-Weather Sensors

p. 8 AM16/32B Improvements

p. 8 Tips and Tricks: Who's Driving

New CR6 Datalogger

New Product

We are excited to announce our newest datalogger, the CR6 Measurement and Control Datalogger. The CR6 is a major step forward in terms of flexibility, measurement quality, performance, and integration. While we've packed it with new capabilities, we've retained the rugged design and reliability that you've come to expect from Campbell Scientific loggers. We expect the CR6 to become a popular datalogger for a wide variety of applications. We have added new features that add to the capabilities you're accustomed to. If you rely on dataloggers to do your job, odds are there are some new features that you'll be excited about. Read on to find out what they are.

Flexibility

We can say with confidence that the CR6 is our most flexible datalogger ever. It all starts with the 12 universal channels that allow connection to nearly any sensor type (e.g., single or differential voltage input, SDI-12, pulse). This flexibility removes many constraints involved with matching sensors to terminals or not having enough of a specific type of terminal. It gives the CR6 the ability to match more applications, eliminates the use of many external peripherals, allows project needs to evolve without having to swap out the datalogger or add peripherals, and ultimately leads to long-term datalogger reuse and maximization of your datalogging investment.

We've also made the terminals field-friendly. You can easily remove them when wiring sensors or swapping out the datalogger or sensors. Terminals are lockable, angled, and fit larger-gage wires or even multiple wires.

With onboard power conditioning and expanded charging options, you have a lot more flexibility in the way you power the CR6: 12 V battery, 10 to 32 Vdc power supply, UPS with solar panel, UPS with ac-to-dc converter, and even some functionality with power over USB. Batteries and solar panels can be connected directly to the CR6 without having to go through a power-conditioning peripheral.

The CR6 uses the same powerful CRBasic programming language used by our other current dataloggers. This gives you all the power of a full programming language to make and store measurements exactly the way you want to. Programs or code snippets that you've used with our other loggers will carry over to the CR6.

If all of the flexibility mentioned above isn't enough, we've also added a CPI port that will allow the CR6 to tap into a whole new line of measurement peripherals through our new CPI bus (see article on page 4). This line of peripherals, called Campbell distributed modules (CDMs), will offer distributed measurements, higher speed, dynamic vibrating-wire measurements, distributed datalogging, specialized sensors, measurement synchronization, and other capabilities. It adds extensibility to an already very flexible datalogger.

Measurement Quality

Measurement quality has always been important to Campbell Scientific, and the CR6 takes a step forward in this area. A 24-bit A/D sigma-delta converter gives you analog resolution as small as 80 nV. The CR6 has three analog ranges with multiple filtering options and digital signal processing (DSP) oversampling technique for low-noise measurements. We also guarantee performance over the full temperature range (-55° to +85°C)—ensuring measurement quality in all types of environments.

Continued on page 7

Global Data Collection: New Iridium Satellite Solution

New Product

The Iridium9522B contains the equipment needed for on-demand, two-way communications using the Iridium satellite network. This network provides global data coverage that supports communication with Campbell-based stations located anywhere on earth, as long as they have clear view of the sky. The Iridium satellite network is particularly ideal for stations at very high-angle latitudes (greater than 70° North or South), high-altitude applications, and mobile applications, such as buoys or ships.

The Iridium9522B includes the 9522B modem with mounting hardware, a COM9522B modem interface, the cabling needed for configuration and connection to a datalogger, and an antenna with a mount. The 18017-L coaxial antenna cable is purchased separately to allow users to order the appropriate cable length for their application.

Which Datalogger for Me: CR6 or CR1000?

Product Review

Campbell Scientific's CR1000 datalogger has become a valued central component in tens of thousands of applications, worldwide. It has been proven in the harshest environments, trusted to operate reliably in remote, standalone installations. We have now developed the CR6 datalogger to have that same type of wide-ranging usefulness and ruggedness, with new features to expand on the history and reputation our products have built for decades.

Many of you have used the CR1000 for years, and have become accustomed to its capabilities. As you plan future new projects, or expansion or maintenance of existing installations, we can help you determine if the CR1000 is still the best choice, or if the CR6 will better fill your needs.

What problems are best solved by the new CR6 Measurement and Control Datalogger?

- My secure socket connections are a little on the slow side.
- I wish my datalogger-hosted web page were a little more responsive.
- I wish there were more ports for serial sensors.
- I want a datalogger that will speak directly to my RS-232, RS-422, or RS-485 sensors without an external interface.
- When doing analog measurements, I need better resolution.
- I need a built-in charge regulator to connect directly to my solar panel and battery.
- I want the datalogger to be powered from my 24 Vdc power system without extra hardware.
- I would really like to reduce system cost by doing static vibrating-wire measurements directly with my datalogger.
- I place great value on having removable wiring terminals in the field.
- I wish there were a second SW12 terminal.
- I wish I could measure more than two anemometers with low-level ac outputs.
- I'd like to have the best interface for my new CSAT3B 3-D sonic anemometer or IRGASON.
- I will use multiple CDM devices on my datalogger.

If none of the above applies, the CR1000 is probably still the right datalogger for you.

Update on Our Family of Vibrating-Wire Products

New Product

Vibrating-wire technology is used in many sensors, including strain gages, pressure transducers, piezometers, tiltmeters, crack meters, and load cells. These sensors benefit a wide variety of structural, hydrological, and geotechnical applications because of their stability, accuracy, and durability. While vibrating-wire sensors have their benefits, they suffer from one major problem—external noise.

To provide better vibrating-wire measurements, Campbell Scientific developed the vibrating-wire spectral-analysis technology (VSPECT™). This innovative, patented technology delivers the most accurate measurement for vibrating-wire sensors. VSPECT observes the incoming sensor signal, performs a Fourier transform and a spectral analysis (transforming the time series into individual sinusoidal components in the frequency spectrum), and determines the sensor frequency by identifying the largest signal in the acceptable range and disregarding noise.

Our first products to include VSPECT were the AVW200-series vibrating-wire interfaces, introduced in 2008. These were followed by the CDM-VW300 series of dynamic vibrating-wire analyzers, released in 2013, and the CR6 Measurement and Control Datalogger, released in September of this year (see article on page 2). In a few months, the CRVW3 Vibrating-Wire Datalogger, our newest VSPECT product, will be released.

The CRVW3 is a small datalogger mounted in an IP66-rated enclosure with either a rechargeable or alkaline battery. Designed exclusively for vibrating-wire measurements, the CRVW3 has three channels for directly connecting vibrating-wire sensors (no interface required). Optional internal radios will support wireless routing communication.

The CRVW3 is designed to be either an independent datalogger, or a reliable component in a larger data-acquisition system. It arrives field ready and is configured to monitor vibrating-wire sensors; no coding by users is needed.

Vibrating-wire sensors are an important long-term monitoring tool in structural, transportation, and geotechnical applications, and our VSPECT products make better measurements for these applications. The CRVW3 promises to be a valuable new addition to our VSPECT family.

CPI and CDM

Tech Note

The CAN* peripheral interface (CPI) is a new proprietary measurement bus that provides communication between Campbell Scientific dataloggers and various peripheral modules and sensors. The CPI bus is an improvement upon the SDM (synchronous device for measurement) bus that has served our dataloggers for many years. The CPI bus allows multiple CPI-enabled devices to be connected and controlled through a single port on the datalogger, and synchronizes the measurements of these modules to the scan of the datalogger. The devices and the datalogger operate in concert with one another as a single measurement unit, expanding the functionality of the datalogger.

CPI improvements over SDM include higher data throughput and more robust signaling, allowing much longer cable lengths and immunity to noise. The SDM bus will continue to be supported by the dataloggers, but the CPI bus will be included more and more frequently as a communication option along with SDM as new products are developed.

One motivation for developing the CPI was to provide a solution for the communication and synchronization needs of a new line of datalogger peripherals known as Campbell distributed modules (CDMs).

The first two of these modules were released last year: the CDM-VW300 and CDM-VW305 dynamic vibrating-wire analyzers. Other measurement modules are in development. All CDM devices share a common mechanical design that is optimized for building networks of multiple devices. CDM devices enable the customization of a datalogger system by adding unique functions and additional measurement channels as needed, and they provide the flexibility to spatially distribute the measurements.

Campbell smart sensors that have historically used SDM to communicate with the datalogger can also benefit from the CPI bus. We will incorporate CPI into new versions of some sensors to help with their communication as well as synchronization requirements.

An important design objective of the CPI bus is versatility and ease of use. Connections are made using standard Ethernet cables. CPI-enabled devices offer dual connections to the bus on each unit, making it simple to connect devices in series. Branching network configurations can be achieved using a passive RJ45 hub. Hardware setup is simple, and the CRBasic program disseminates configuration information to the devices at startup. A rich set of bus diagnostic information is available through the datalogger.

The SC-CPI interface module provides a CPI bus connection for our existing CR3000, CR1000, and CR800 dataloggers. The new CR6 is the first Campbell datalogger to directly support the CPI bus. With the future release of more CDMs and other devices that make use of the CPI bus, we will continue to expand the capability of our dataloggers and provide users with the flexibility and configurability they need.

** Controller area network*

PS150 and CH150 Power Supplies

New Product

Campbell Scientific offers two new ETL listed Class 2 power supplies, the PS150 and CH150, for recharging 12 Vdc, valve-regulated, lead-acid (VRLA) batteries. The PS150 contains a 12 Vdc, 7 Ah rechargeable battery, whereas the CH150 is for applications where the user provides the battery, such as our BP12 or BP24.

The PS150 and CH150 are microcontroller-based smart chargers that incorporate many of the attributes provided in the PS200 and CH200, but do not have the onboard measurement capabilities of the PS200 and CH200. These attributes include temperature compensation to optimize battery charging and increase the battery's life. Two input terminals enable simultaneous connection of two charging sources. For solar inputs, a maximum-power-point tracking algorithm maximizes available solar charging resources. Safety features such as battery-reversal, electrostatic discharge (ESD), and surge protection help safeguard the charging source, battery, charger, and load devices.

Learn More Here
campbellsci.eu/power-supplies

Case Study: Lightning Warning at Utah Schools

Case Study

Lightning strikes are a serious concern for school officials who are responsible for protecting the safety of everyone who uses their facilities. To protect athletes and spectators, school officials may instruct athletic trainers to use NOAA's observational method of estimating the distance from lightning activity. For example, if thunder sounds within 30 seconds of a lightning flash, trainers typically delay a game or practice for 30 minutes. This 30/30 rule or flash/bang method, however, doesn't always provide sufficient warning to evacuate the playing field and bleachers, preventing injury.

Officials at three high schools in Cache Valley, Utah, (Logan, Sky View, and Mountain Crest) wanted a better system that would warn them of the chance of lightning before lightning is seen or thunder is heard. Campbell Scientific worked with school officials and athletic trainers to determine which meteorological parameters to measure, and then we configured lightning warning systems specific to each school's needs.

At the heart of each school's system is a CS110 Electric Field Meter that indicates the potential for lightning strikes in an approximate five-to-seven-mile radius, providing enough time to seek shelter when necessary. In addition, each system measures air temperature and relative humidity. Mountain Crest's system also measures wind speed and direction, solar radiation, and rainfall.

To protect the equipment from vandalism, all of the lightning warning systems were installed on the roofs of the schools. At each high school, the RA100 strobe lights were positioned to be visible from the playing field and bleachers. A flashing blue light indicates that there is no threat of danger. The yellow light flashes to signal a state of caution. A flashing red light, accompanied by a siren blasting a three-second alarm every two minutes, warns that there is enough electric charge in the atmosphere to trigger a lightning strike.

In addition to the strobe lights and siren, each warning system uses Campbell Scientific's LoggerNet and RTMC Pro software to post the data on the Internet. Using mobile devices and computers, school officials can immediately view the data from the following websites:

- Logan High School
  205.121.198.39/lightning/lightning.php
- Sky View High School
  csiwebserver.campbellsci.com/svlightning/index.html
- Mountain Crest High School
  csiwebserver.campbellsci.com/mclightning/index.html

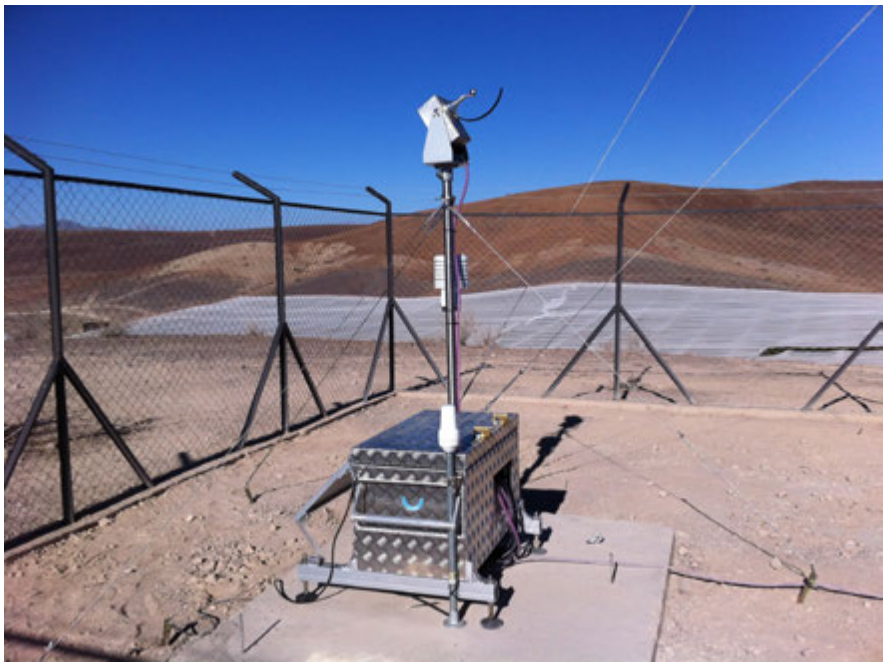
School officials can monitor either the strobes and siren or the web page, assess the danger in the immediate area, and stop or delay athletic events—before lightning strikes. School officials can declare an evacuation of the area and instruct people to seek shelter. After the electric-field data indicates that the danger of a lightning strike has passed, outdoor activities can be resumed.

In 2008, Logan High School became the first school in Utah to use an electric-field meter to detect approaching lightning storms. Sky View followed in Logan High's footsteps in 2010. The electric-field meter at Mountain Crest was installed in 2011.

Cache Valley school officials appreciate having data to help them assess lightning risk and make safety decisions. In August of 2010, school officials at Logan High reviewed the electric field meter data and decided to delay an evening football game. That same night, at a high school football game approximately 130 miles away, a girl was injured by a lightning strike before the area had been evacuated.

Case Study: Solar-Energy Assessment in Chile

Case Study



Solar-energy resource-assessment projects are critical to the successful siting of solar thermal power plants. Before a plant is developed, the environment of the plant's intended location must be studied in detail to ensure that the site will continue to deliver a consistent and reliable source of solar power. If it is determined that a site cannot harness a continuous and sufficient solar-energy supply, another site must be selected and researched.

Solar-energy resource-assessment projects were conducted in many different territories by Solar Millennium AG, a global project developer for solar thermal power plants. The developer's task entailed gathering radiation and climatological data to assess the suitability of particular locations. Their assessment task was complicated because the sites that Solar Millennium had to research and test were often in remote locations that were hard to access. Any equipment used to gather the data had to be rugged enough to withstand the harsh, remote environments. In addition, because it was impractical and hazardous to retrieve the data manually from these locations, the equipment needed to have low-maintenance requirements, and the data needed to be remotely retrievable through a reliable and secure connection.

One location that Solar Millennium researched was in the Atacama Desert in Chile. For this solar-energy resource-assessment project, a variety of sensors were used: pyranometers, anemometers, wind direction vanes, temperature sensors with radiation shields, and tipping bucket rain gages.

To supply the necessary wireless communication solution, Solar Millennium contracted with Wireless Innovation. Wireless Innovation is a global provider of satellite solutions to the telemetry marketplace, has worked extensively in the renewables market, and has experience providing communication solutions that integrate with Campbell Scientific dataloggers and LoggerNet software.

For the Atacama Desert project, Wireless Innovation designed and employed a communication solution that operated via the Iridium Low Earth Orbit (LEO) satellite network and a MiChroSat 2403 satellite modem. The Iridium satellite network provides complete coverage of the earth, enabling communication services to and from remote areas where other forms of reliable communication are not available or feasible. The MiChroSat 2403 modem allows datalogging solutions to be deployed securely and reliably in remote and hostile locations where GPRS (general packet radio service) coverage is poor.

For their satellite data solution, Wireless Innovation integrated a number of Campbell Scientific CR1000 dataloggers into the Iridium network. The CR1000 dataloggers were rugged enough to withstand the harsh, remote environment of the Atacama Desert, offered low-maintenance requirements, and integrated seamlessly with the satellite solution. Data retrieval via email was aided by the use of Campbell's LoggerNet software. Consequently, Solar Millennium was supplied with the detailed radiation and climatological measurement data they needed for their site suitability assessments.

CAMPBELL SCIENTIFIC UPDATE

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New CR6 Datalogger

Continued from page 2

Integration

The CR6 takes the capabilities previously offered through several different external peripherals and provides them all natively—and in a more compact footprint: 20.3 by 10.2 by 6.1 cm (8.0 by 4.0 by 2.4 in.). The following functionality is native on the CR6:

- Ethernet 10/100
- Memory card data storage (microSD)
- USB
- Power conditioning
- Serial sensor measurements (RS-232 and RS-485)
- Vibrating-wire measurements using our patented noise-reduction process, VSPECT (see vibrating-wire article on page 3)
- Wi-Fi (option coming soon)

Eliminating the need for added peripherals to get the functionality listed above not only reduces overall system cost, but it eliminates the hassle of integrating and installing multiple peripherals. All of this capability comes in a package that is two-thirds the size of the CR1000. In short, you get a simpler, leaner, less-expensive system, but with all the same functionality—and likely much more.

Performance

A 32-bit processor running at 100 MHz with minion architecture gives the CR6 plenty of power to speed up every area of the datalogger. But this additional capability doesn't result in a power hungry datalogger. The CR6 features smart power management that provides access to this speed only when needed, allowing the logger to conserve power. Add to this a quiescent current drain of less than 1 mA and the CR6 easily fits remote applications with no access to ac power. Future CDM modules will provide faster scan rates for those applications that need faster measurements.

This performance boost affects everything, including an internal web server that provides an instant, responsive website for IP-enabled installations. The default web page can be customized and branded however you want, allowing access to data display, configuration options, diagnostics, and security.

Rugged Reliability

This year we're celebrating our 40th year as a company, and throughout our history our dataloggers have proven that they can be counted on in harsh environments of all types and in remote locations. Our loggers have shown reliability year after year, demonstrating great product longevity. We have the same high expectations for the CR6. It has been vibration and shock tested, and it features: a wide operating-temperature range; surge, ESD, and overvoltage protection (giving it a CE industrial outdoor rating); dust protection; nonvolatile memory; and battery-backed clock and memory. All that great flexibility, performance, and integrated functionality is for naught if your datalogger can't stand up to the elements and the years. You can count on the CR6 to do that.

We are excited about the CR6. Its flexibility and performance make it an investment that will pay off for years to come. Take a close look at it and see what it will do to help your datalogging applications.

Learn More Here
campbellsci.eu/cr6-series

Changes to Visibility and Present-Weather Sensors

New Product

Campbell Scientific has added the CS125 Visibility and Present Weather Sensor and the CS120A Visibility Sensor to our product line. The CS125 is ideal for applications that need both visibility and present weather data. The CS120A provides the same functionality as its predecessor, the CS120, but has a more powerful processor and is better suited for marine applications. The new processor allows the CS120A to be upgraded to a CS125 if it becomes desirable to monitor both visibility and present weather.

These new sensors measure visibility using infrared forward-scatter technology with a 42° scatter angle. The FAA determined, after extensive testing, that a 42° scatter angle provides the most accurate measurements in fog and snow. The 42° scatter angle allows the sensors to accurately measure atmospheric visibility for the range of 10 to 30,000 m.

To monitor present weather, the CS125 identifies precipitation particles from their scattering properties and fall speeds, and combines this with a temperature measurement to determine the weather type. Continuous high-speed sampling reduces errors during mixed weather events and events that return intermittent signals such as rain and hail, while still providing reliable readings during more stable events such as fog and mist. The CS125 also has high immunity to interference from the visible and infrared warning lights used to mark obstructions such as wind turbines.

The CS120A and CS125 have several design features that keep their optics clean. Downward facing optics minimize dirt and snow buildup. Low-powered heaters prevent the formation of dew, and a higher-powered heater prevents the formation of ice.

The CS120A and CS125 are high-performance sensors available at economical prices. They can be used as stand-alone products or as components of road, marine, and airport-based weather stations. These features make them ideal solutions for transport as well as many other applications.

Learn More Here
campbellsci.com/cs125

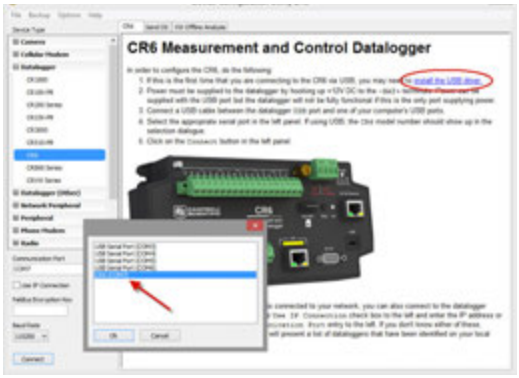
Tips and Tricks: Who's Driving?

Tips and Tricks

A new adventure often starts with, "Who's driving?" As you unpack your new CR6, you'll be excited to get going right away. Hold on, let's get someone in the driver's seat.

Make sure you've got the latest version of the Device Configuration Utility (DevConfig) installed. You'll need version 2.10 or later. You can get that from your ResourceDVD or from the Downloads page of our website: www.campbellsci.com/19_1_9999_83. You'll also get the latest and greatest version of DevConfig when you install LoggerNet 4.3 or its patch. Note: the Device Configuration Utility version 2.10 and LoggerNet 4.3 will be released by the time the CR6 starts shipping.

First, click the install the USB driver link on the CR6 page of the Device Configuration Utility and follow the installation wizard.



Then connect your computer to the CR6 using the supplied USB cable from the bottom compartment of the CR6 box. Now, the USB communications port will show up in the selection list as CR6 (COM number).

Since your CR6 is powered via the USB cable, you do not need a separate power supply to configure or program it. You can just connect to a PC and be on your way.

AM16/32B Improvements

Product Update

Our AM16/32B multiplexer now has removable terminal strips, allowing the wiring to remain intact while the multiplexer is used elsewhere. The green terminal strips are easily removed; no tools are required. Another change to the AM16/32B is that it no longer comes with its aluminum terminal cover since most users do not need it. However, the terminal cover (pn 19237) as well as replacement terminal strips may be purchased separately from Campbell Scientific. Visit www.campbellsci.eu/am16-32b

Upcoming Trade Shows

Visit our website for training class schedules and additional listings.

NOVEMBER

19-21	Irrigation Association	Phoenix, AZ

DECEMBER

02-04	AWEA	Orlando, FL
09-12	NGWA EXPO	Las Vegas, NV
11-14	IAHS/ICCE I'ntl Symposium	New Orleans, LA
15-19	AGU 2014	San Francisco, CA

JANUARY

04-08	AMS	Phoenix, AZ
11-15	TRB 2015	Washington, DC

FEBRUARY

03-05	Distributech 2015	San Diego, CA
04-05	Solar Power Generation 2015	San Diego, CA
25-26	Golf Show	San Antonio, TX

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