The
A newsletter for the customers of
Campbell Scientific, Inc.

CAMPBELLUPDATE

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CR800-Series Dataloggers Replace CR510s in Many Applications

Campbell Scientific's CR800-series dataloggers will eventually replace the CR510 dataloggers. The new dataloggers include many of the capabilities of our CR1000 dataloggers, but with fewer input channels and at a lower cost. The CR800 series offers four control ports, a CS I/O port, an RS-232 port, and either six single-ended or three differential analog inputs; each channel is individually configured. Like the CR1000, the CR800 series uses the PakBus® communications protocol and stores data for each output interval in a separate table. The dataloggers also support the Modbus protocol, SDI-12 protocol, multiplexers, and SDM devices. Any 12-Vdc source can power the loggers, but a PS100 or BPALK is typically used.

Compatible software includes LoggerNet, PC400, PC200W, and Short Cut. The CR800-series dataloggers are programmed in CRBasic or by using our Short Cut program generator. For continuity, most existing CR510 or CR10X datalogger programs may be converted to CR800 programs by using the Transformer program included with LoggerNet and PC400.

The CR800-series dataloggers are compatible with most of our telecommunication devices such as cellular telephones, UHF/VHF RF modems, and satellite transceivers. However, they do not have the peripheral port used with the CFM100 and NL115.

In June, Campbell Scientific released the CR800, which uses the detachable, CR1000KD keyboard display. Another member of the CR800-series, the CR850, is scheduled to be released in autumn 2006. The CR850 has a built-in keyboard display that provides functionality similar to the CR1000KD. Both the CR1000KD and the CR850's on-board keyboard display can be used to show datalogger status, plot or display sensor readings and stored values, enter numeric data, or change the state of a port or flag. An advanced and powerful feature of these keyboard displays is the ability to have user-defined menus to prompt field personnel through tasks such as sensor setup and calibration. The custom menu is defined as part of the program using the CRBasic Editor.

Although the CR800-series dataloggers will replace our CR510-series in many applications, existing CR510 customers who do not need the new capabilities offered in the CR800 and who prefer to program their datalogger using Edlog instead of CRBasic can still purchase a CR510. As with all of our other dataloggers, we will continue to support the CR510, and we will service it as long as replacement parts are available.

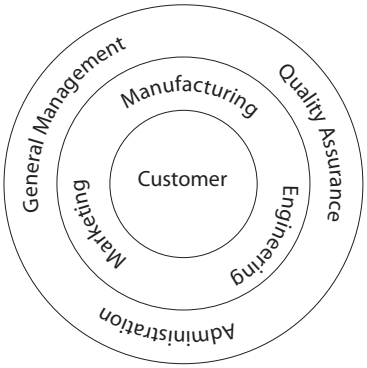
See Comparison Chart on Page 3

Message from the President

Quality Objectives

by Paul Campbell

I have recently been involved with a review of Campbell Scientific's quality policy and objectives for the purpose of maintaining an up-to-date quality system in the company. Quality requires a passion for excellence as a foundation. Built on that foundation are the processes, tools, and knowledge that allow us to improve over time as we learn from our own and others' observations about our mistakes, vulnerabilities, and strengths.



Our quality policy is focused on delivering value to customers. The company's organization is represented as a primary concentric ring of activity that directly focuses on and serves our customers, and a secondary ring of functions internal to the organization that support those in the primary ring.

The company's quality policy is as follows:

We at Campbell Scientific are committed to value oriented quality from the perspective of the customer.
- Quality of WORKMANSHIP and service are encouraged without adding unduly to cost.
- Quality is primarily dependent upon individual COMMITMENT and acceptance of responsibility by each employee for the quality of products and services offered, both internal and external to the company.
- Individual responsibility and continuous IMPROVEMENT will be encouraged through flexibility and feedback.
- The quality standards and means prescribed to achieve uniformity and RELIABILITY in the products and services offered to customers will be established through the operation of the Quality System.

One of the challenges we face in delivering high quality products to you, our customer, is managing the balance between flexibility and structure in our corporate work environment. Too much flexibility and too little structure leaves a vacuum of standards and uniformity. Too much structure and too little flexibility removes responsibility and empowerment from the individual level where it is most important for a sense of ownership. We strive for a mixture of flexibility and structure so that individuals have a sense of ownership and responsibility but are not left without guidance as to standards and corporate knowledge.

For some time we have been working on improvements in our software, both PC based and embedded operating systems in dataloggers. The challenge is great because of the increasing complexity of software as memory expands, processors expand and increase in speed, and systems and sub-systems must interact. Oftentimes there is legacy code that must be maintained while new functions are added or new software development tools are adopted. This level of complexity requires both a disciplined development process and a high level of individual commitment by those involved. We engage regularly in small groups to sort out trade-offs among quality, cost, and time-to-market. We have improved our software development process with implementation of the following:
- Team reviews
- Design test by a peer
- Independent verification by someone not involved in the design
- Timely feedback to designers with a written record of reported bugs
- Test suite for standard products to make sure that old things still work after new things are added

Along with these improvements, we continue to emphasize responsiveness to customer feedback to solve problems and enhance our products. Please know that it is a high priority to me that Campbell Scientific maintain the same high standard of product quality relating to software and embedded operating systems as we do to hardware.

A newsletter for the customers of Campbell Scientific, Inc.

The CAMPBELL UPDATE

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WHEN MEASUREMENTS MATTER

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CR510 Datalogger vs CR800-Series Dataloggers

Feature	CR510	CR800/CR850
Execution Interval Max	64 Hz	100 Hz (all three channels)
Analog Input		
Single-ended Channels (Differential)	4 (2)	6 (3)
Max Input Voltage	±2500 mV	±5000 mV
A/D Bits	13-bit	13-bit
Resolution	to 0.33 µV	to 0.33 µV
Switched-Voltage Excitation Channels		
Count	2	2
Pulse Counters		
Pulse Port Channel Count	2	2
Counters	8-bit each	24-bit each
High Frequency Mode (Max)	400 kHz	250 kHz
Digital Control Ports		
High Frequency Max	40 kHz	400 kHz
SDI-12 Channel Count	2	2
Digital Ports	2 I/O	4 I/O or 2 RS-232 COM (the I/O ports can be paired as transmit and receive for measuring smart serial sensors)
Switched 12 V		
Channel Count	0	1
Communications		
RS-232 Port Count	0	1
Baud Rate Max	9600 bps	115.2 kbps
CS I/O Port Count	1	1
System		
Quiescent Current	1.3 mA	~0.6 mA
Memory	128 kbytes Flash for operating system; 128 kbytes standard data storage; 2 Mbytes optional data storage	2 Mbytes Flash for operating system; 2 Mbytes for CPU usage, program, and data storage
Compatibility		
Thermocouples	no	yes
SDM Devices	no	yes
Multiplexers	no	yes
Storage Modules (SM4M, SM16M)	yes	no

ENC14/16 Enclosure

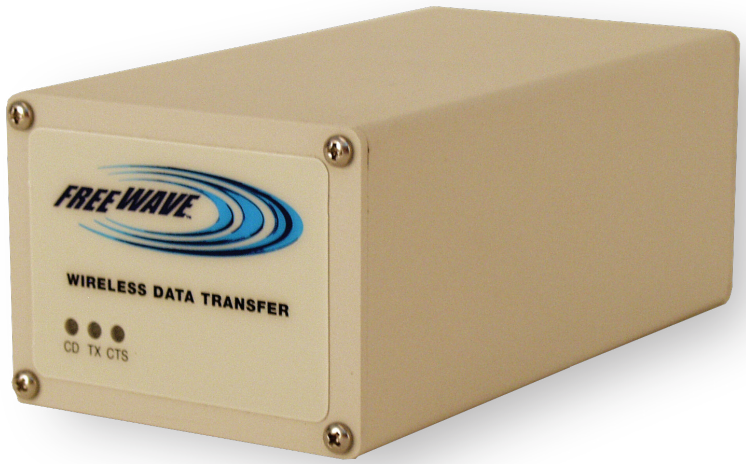
For those applications where the ENC12/14 enclosure is too small and the ENC16/18 is too big, the new ENC14/16 enclosure is just right.

The inside dimensions are approximately 14”wide x 16” long x 7.5” deep. The ENC14/16 is the preferred enclosure for housing a CR5000 datalogger. For applications that require a larger power supply, the enclosure will accommodate a BP12 or BP24 battery, charging regulator, datalogger, and one or more peripherals.

There are three enclosure mounting bracket options. One option attaches the enclosure to a tripod mast or vertical pipe. Another option attaches the enclosure between the legs of a CM110-series tripod, and the third option attaches the enclosure to two legs of our towers.

FreeWave FGR-115RC

It is rare for Campbell Scientific to find an off-the-shelf telemetry product that complements our dataloggers so well—but we've found it in FreeWave's FGR-115RC. This 900-MHz, 1-W, spread-spectrum radio is known for its high speed, long range, relatively low power consumption, and reliable performance.



The FGR-115RC has a continuous throughput of 115.2 kbps. Radio links of up to 60 miles line-of-sight between datalogger and repeaters have been documented. These transmission distances are not possible with our lower-powered RF401-series transceivers. When used in a PakBus® network and configured for multipoint slave operation, the radio can drop down below 12-mA quiescent current at 12 Vdc. Power to the radios is supplied by a 110-Vac power adapter or a 12-Vdc power cable that connects to the datalogger's power supply.

The FGR-115RC is an FCC Part 15 device that supports communications in the US. For customers outside the US, check with your local distributor to determine the applicability of the FGR-115RC in your area.

An Improved Infrared Radiometer

Apogee Instruments (Logan, UT) has developed a new infrared radiometer, the IRR-P. Typical applications of this infrared radiometer include:

- Road surface temperature
- Plant canopy temperature for irrigation scheduling and crop water stress
- Soil, snow, and water surface temperatures
- Sky temperature (net longwave radiation)

The IRR-P provides four main advantages over the original model:

1. The output follows the fundamental physics of the Stefan-Boltzman Law, which states that energy transfer by radiation is proportional to T4. The S-B equation is now used to correct for the effect of sensor body temperature. Sensor accuracy[1] is significantly improved when the temperature difference between the sensor body and target exceeds ±20°C.

2. The microvolt outputs of the original two thermocouples have been replaced with millivolt outputs of a thermopile and thermistor. This reduces the wire cost, increases accuracy, and is compatible with datalogger models that can not measure thermocouples (i.e., CR510). The internal reference temperature is now measured with a precision thermistor, which is accurately read with a single-ended measurement.

3. A germanium window, which corresponds to the 8 to 14 µm atmospheric window, has replaced the silicon window (6.5 to 14 µm). This germanium window facilitates correction of target emissivity, reduces the effect of atmospheric humidity, and allows the IRR-P to be used at greater distances from the target.

4. The IRR-P's field of view is 22° (half-angle), which is narrower than the original sensor's field of view. A narrower field of view allows the sensor to be mounted further away from the target.

Dimensions and mounts are identical to the original model. The IRR-P is mounted to a crossarm, tripod or tower mast, or a user supplied pole via the CM220 Right Angle Mounting Bracket or CM230 Adjustable Inclination Mount. The IRR-P should be mounted perpendicular to the target surface. Therefore, the CM230 mount is recommended when the target surface is on an incline.

See www.apogeeinstruments.com for more details.

[1]Accuracy
-15° to 60°C
± 0.2°C absolute accuracy
± 0.1°C uniformity and repeatability

-55° to 80°C
± 0.5°C absolute accuracy
± 0.3°C uniformity and repeatability

Campbell Scientific's weather stations help research at a banana cooperative in Costa Rica

Stations Monitor Costa Rican Banana Farms

Campbell Scientific recently supplied agrometeorological stations for an important research project in Costa Rica.

The project involves a network of seven automatic agrometeorological stations installed at banana plantations on the Atlantic Coast of Costa Rica. The network makes use of a Mikrotic WiFi system for data transmission, which not only allows connections to the stations, but also provides mail services, Internet, and VoIP at the field offices.

The system was ordered by REICO, a company that manages networks of data in Costa Rica for the National Banana Corporation (CORBANA), the leading banana industry organization in Costa Rica. CORBANA is a public entity, not state-owned, and its stocks are equally owned by the central government of Costa Rica, three state banks, and all banana producers.

The Costa Rican banana industry has achieved outstanding successes in this area of research, working with extreme scientific rigor in areas such as fertility and nutrition, phytopathalogy, nematology, cultivation of textiles, soils and drainages, microbiology of soils, and agronomy.

By means of this new network of Campbell agrometeorological stations, CORBANA will be able to relate environmental parameters—like rain, direction and velocity of wind, ambient temperature and relative humidity, solar radiation, ground temperature, and leaf wetness—to all of the problems of planting, irrigation, fertilization, disease, and banana production. Additionally, CORBANA has a specialized office for weather forecasts and can give statistical information that is used at each plantation to take pertinent precautionary measures.

The stations are located at strategic farms covering a great area of Costa Rica traditionally dedicated to the cultivation of this fruit. See www.corbana.co.cr for more details.

APPLICATION AT A GLANCE

Application type:
Agrometeorology on Banana Plantations

Project area:
Atlantic Coast, Costa Rica

Author:
Otton C. Brenes, Representaciones Corelsa, S.A.
Brad Maxfield, Campbell Scientific

Contracting agencies:
REICO, S.A.
CORBANA, S.A.

Datalogger(s):
CR10X-PB

Communication links:
Mikrotic WiFi

Measured/calculated parameters:
Rain, Wind, Temperature, Humidity, Solar Radiation, Ground Temperature, Leaf Wetness

Campbell Scientific automated weather stations aid monitoring of ecosystems

Biodiversity Measured in Tropical Forests

A long-term scientific study to monitor trends in the biodiversity and structure of ecosystems of tropical forests is making use of a network of Campbell Scientific field stations in Central America. Taking advantage of standardized protocols, each station will obtain data using the same methods, making the results consistent and comparable. The project is sponsored by the University of Missouri, St. Louis, in cooperation with the Organization for Tropical Studies (OTS) in Costa Rica. The principal researcher is Dr. David B. Clark, and the project coordinator for the OTS is Johanna Hurtado of Costa Rica National University.

Meteorological data is collected from a network of Campbell Scientific's automatic weather stations. The stations measure the following parameters: rain, wind, solar radiation, air temperature and relative humidity, and soil moisture and temperature.

The plot of land for this study is located in La Selva Biological Station (1,500 ha) that the OTS administers in Costa Rica, and in the Braulio Carrillo National Park (47,000 ha) on the slopes of Barva Volcano. Side by side, La Selva and the park spread out laterally on a gentle grade for close to 3,000 m of altitude of protected forest, which is a characteristic almost unique to Central America. The design includes establishing a grid of 1-km^2 plots of land throughout the sector. Each of these plots of land is called an AMI (area of integrated monitoring) and, at this time, there are four such areas. In order to select an AMI several factors are considered: present types of forest in that area, presence of permanent bodies of water and areas of seasonal flooding, potential sources of disturbance and of effects of edge no closer than 500 m, and accessibility within an hour hiking distance from the station or closer means of entry.

The measured variables were selected so that they would give information on a variety of levels, range of plant sizes, physiological adaptations, and strata inside the tropical forest. Moreover, they were selected to learn what we should be able to study in various types of forest on all continents. For this reason the researchers selected, as indicators of biodiversity at the local level, environmental and biological variables that include vegetation, vertebrates, and invertebrates.

Finally, the philosophy of the project is to merge science and conservation through the accomplishment of complete zoological and botanical inventories, adherence to rigorous field procedures, use of tools for data analysis, and investment in education and student training from technician to doctoral levels. At present 90 percent of the work is done by local human resources of Costa Rica. The technical team in La Selva is made up of people from the area with previous experience or that have been trained through the project.

See www.teaminitiative.org for more details.

APPLICATION AT A GLANCE

Application type:
Ecosystem Diversity Monitoring

Project area:
La Selva Biological Station
Braulio Carrillo National Park

Author:
Otton C. Brenes, Representaciones Corelsa, S.A.
Brad Maxfield, Campbell Scientific

Contracting agencies:
Organization for Tropical Studies (OTS)
University of Missouri, St. Louis

Datalogger(s):
CR23X, CR10X

Communication links:
Direct connect to computer

Measured/calculated parameters:
Rain, Wind, Solar Radiation, Air Temperature and Humidity, Soil Moisture and Temperature

LoggerNet 3.3 Released

In June, we released LoggerNet version 3.3, which provides communication and programming support for our new CR800-series dataloggers. In addition, this version includes the following enhancements:

- CSV is a custom file format available in the Setup window and CardConvert. This new format, available only for table-based dataloggers, saves data in a comma-separated format similar to mixed-array data. This option allows customers who have databases or other data analysis packages populated with mixed-array data to easily integrate table-based data.

- The Field Calibration wizard detects the presence of a calibration file in the CRX000 dataloggers. This wizard uses the information generated by the datalogger's FieldCal instruction to walk you through calibration of the measurements.

- An option creates unique file names when LoggerNet's command line backup utility is run as a task. The file names are based on the date and time when backup occurs.

- Library-file support is available in the CRBasic Editor. A library file is a snippet of CRBasic code that is easily imported into a new program.

- CardConvert can now store processed files in uniform-sized packets based on time, as well as provide a unique name for processed files based on the time stamp of the data.

Users who have any 3.x version of LoggerNet can download a patch from our web site to update their software to LoggerNet 3.3 free of charge. Other LoggerNet and PC208W users can upgrade their software for a reduced price.

Introducing Our Quick Deployment Weather Station: the RAWS-F

Campbell Scientific's RAWS-F (Remote Automated Weather Station for Fire Weather) is ideal for prescribed burns or other temporary installations. This lightweight, pre-configured station can be set up in as little as 10 minutes—without tools. An aluminum environmental enclosure houses a 12-V rechargeable battery and a CR1000M Module; in turn, the enclosure mounts to a 6-ft tripod. The battery is recharged with either a solar panel or AC power.

The outside of the enclosure has color-coded, keyed connectors for attaching wind speed and direction, air temperature and relative humidity, precipitation, solar radiation, and the optional fuel moisture/temperature sensors. Besides the connectors, a wiring panel is included that allows the attachment of additional sensors that measure barometric pressure, stream flow, snow depth, water depth.

The station is preprogrammed to comply with the National Fire Danger Rating System (NFDRS) weather station standards. Communication options include our GOES satellite transmitter and the VSP3 Voice Radio Interface. The VSP3 allows customers to call a RAWS-F station via a hand-held radio and receive verbal reports of real-time conditions. Our RAWS-F station is also compatible with other communication equipment such as telephones, digital cellular transceivers, and RF.

The station's components fit inside of two custom carrying cases (optional) for easy transport to your site.

Training Courses

Campbell Scientific offers comprehensive training courses on our dataloggers and software. Visit www.campbellsci.com/training to see the current schedule and register on-line. These courses emphasize datalogger programming and use hands-on exercises to reinforce concepts.

Each course is suitable for a family of dataloggers supported by common software. Take the CR9000X course if you have a CR9000, CR9000X, or are using a CR5000 with PC9000. Take the CR1000 course if you have a CR3000, CR1000, CR800, or CR200-series datalogger, or are using a CR5000 with LoggerNet. The CR10X course is suitable for users of dataloggers programmed with Edlog, such as the CR23X, CR10X, and CR510.

If you have questions about which course will best meet your needs, please contact an applications engineer. We can also arrange for a customized course at your location or a self-study course.

New 56K Phone Modem Provides New Features

Campbell Scientific's COM220 phone modem is smaller, but shares many electrical specifications with its predecessor, the COM210. Several of the COM220's settings are user-configurable via dip switches for specialized applications. This modem offers both the Modem Enable (ME) and Synchronous Device Communications (SDC) modes. It supports communication rates up to 115.2 kbps between the modem and datalogger. In practice, data transmission through phones lines is generally constrained to 33.6 kbps. Number of rings before answer and other settings are configurable using our Device Configuration Utility (DevConfig) v. 1.6 or later and the SC532A Interface. The COM220 should be available for purchase in September 2006.

CAMPBELL SCIENTIFIC CALENDAR

Date	Event	Location
September		
10-14	ASDSO-Dam Safety	Boston, MA
21	Rural Water Association of Utah	Park City, UT
19-20	WARWS Fall Training Expo	Casper, WY
October		
01-06	International Snow Science Workshop	Telluride, CO
09-10	Dam Surveillance & Monitoring Workshop	Sacramento, CA
21-25	WEFTEC	Dallas, TX
22-25	Geological Society of America	Philadelphia, PA
25-27	Automotive Testing Expo North America	Detroit, MI
25-29	Society of American Foresters	Pittsburg, PA
November		
05-07	Irrigation Association Annual Meeting	San Antonio, TX
12-16	American Society of Agronomy	Indianapolis, IN
December		
11-15	American Geophysical Union	San Francisco, CA
14-16	*Performance Racing Industry* Trade Show	Orlando, FL

Visit our web site for additional listings and training class schedules.