CAMPBELL SCIENTIFIC UPDATE

Featured Application:
Vehicle Testing *p. 2*

Featured Application: Vehicle Testing

Campbell Scientific dataloggers are well known for making meteorological and hydrological measurements. Much of our early product development benefited agricultural researchers and others who needed remote, stand-alone monitoring of environmental parameters. However, it wasn't many years after the company's inception that our dataloggers found a place in an industrial application.

This occurred early in 1983 when Eric Campbell and Art Heers traveled to Kapuskasing, Ontario, the location of a General Motors cold-weather test track. A GM engineer was interested in seeing how the new CR7 datalogger could solve his vehicle testing needs. It didn't take long to show GM engineers that the CR7 could withstand the extreme cold (subzero temperatures), produce plotted results within minutes of the tests, and, as a small box in the seat of the car, provide more measurement functionality than a trailer full of their other measurement gear.

Since that trip, our systems have been used by major automotive companies in the US and around the world, as well as many of their suppliers. Vehicles outside of the automobile industry have also benefited from our dataloggers. These include military vehicles, agricultural equipment, construction equipment, and motorcycles. Even the performance racing industry has used our dataloggers.

Vehicle-testing applications typically involve measuring a variety of speeds, pressures, temperatures, forces, or noise in an effort to verify designs, fine tune performance, and support research. Sensor types often used in this industry include thermocouples, pressure transducers, pulse pick-ups, flow transducers, potentiometers, strain gages, load cells, digital switches, accelerometers, LVDTs, and tilt sensors.

Since the release of the CR7 in 1983, we've designed other dataloggers with additional capabilities to support the automotive industry. These dataloggers feature higher channel counts, faster measurement speeds, and larger data storage media than those used for environmental monitoring.

A few capabilities in particular have made our dataloggers a good fit for vehicle-testing applications:

- *Reliability:* Our dataloggers can withstand extreme temperatures, shock, and vibration.
- *Size and portability:* Even our largest unit, the CR9000X, can easily fit on a single seat of a car.
- *Versatility:* Our systems provide a wide range of configuration options and programming flexibility. Not only can test engineers configure systems using a wide variety of sensors and measurement peripherals, but they can create custom programs to get the exact data they want.
- *CANbus support:* Vehicle computer data can be synchronized with the test measurements.
- *Technical support:* Our application engineers help customers get the most out of their test systems.

The automotive industry is currently going through some slow times. Fortunately for some, many of those CR7 systems that were sold back in the 80s are still producing quality measurements, even after 20 years. Look for Campbell Scientific to continue to provide innovative measurement instruments to meet the needs of vehicle-testing and performance-monitoring applications.

To see a list of vehicle testing possibilites, please visit our website at campbellsci.com/vehicle-testing.

Case Study:
AgriMet Network

Competition for limited water resources in the western United States is increasing, as are the costs for moving irrigation water. In most western states, irrigated agriculture is the largest single consumer of water. To help improve irrigation efficiency, the Bureau of Reclamation and Bonneville Power Administration partnered to create a network of automated agricultural weather stations in the Pacific Northwest known as AgriMet (Agricultural Meteorology). Having begun with an initial installation of three stations in 1983, AgriMet now gathers meteorological data from 72 stations throughout Idaho, Montana, Oregon, and Washington, with additional stations located in northern California, western Wyoming, and Nevada.

Each AgriMet station is solar powered, using a photovoltaic panel to recharge a lead-acid battery. The stations collect data required for modeling evapotranspiration (ET). Measured parameters include air temperature, precipitation, solar radiation, wind speed and direction, and relative humidity. Some sites have special sensors to measure soil temperature and moisture, crop canopy temperature and humidity, diffuse solar radiation, pan evaporation, and leaf wetness. Each AgriMet station is configured with sensors, a Campbell Scientific CR10X datalogger for data collection and processing, and a TX312 HDR GOES for data transmission.

The CR10X measures each of the sensors once every second. The data is transmitted from the station via the Geostationary Operational Environmental Satellite (GOES) to the receiver site at the regional office in Boise, ID.

ET information generated is used in a variety of products and services to assist irrigators and water managers in efficient irrigation water management. There are four major products provided by the AgriMet program:

- A table of daily ET values for the last five days for a reference crop (alfalfa) and specific crops grown in the area
- A table of summary weather parameters for the last 5 days or 10 days for each station
- A summary of ET for each day of the growing season for each crop grown in the vicinity of each station
- Historical weather and crop water-use data for all stations for the entire period of record

All of this information is available on the Internet and is integrated into various on-farm technical assistance programs by local agricultural consultants, the Cooperative Extension Service, and the USDA Natural Resources Conservation Service. Use of AgriMet information in irrigation scheduling results in water and energy savings, reduced soil erosion, and protection of surface and ground water supplies. Various agricultural consultants have

Case Study: Lake Weather and Water in China

In 2006 a cooperative Japanese-Chinese science organization, the Japan International Cooperation Agency (JICA), began a project to measure the atmospheric boundary-level flux near Erhai Lake in Yunnan province in China. To correct for the influence of the large lake on the flux measurements, a combination hydrological-meteorological station was installed out on the lake in January 2008. The station was required to be solar powered, communicate via GPRS modems, and not detract from the natural setting.

Beijing Techno Solutions was chosen to design, integrate, and install the system. Their engineers designed the site structure to be an attractive part of the scenery, and the beautiful, carved panels hide most of the technical gear.

The system started with a Campbell Scientific CR1000 datalogger at its core, installed in a weatherproof enclosure mounted on a mast. Beijing Techno Solutions then chose a WXT510 from Vaisala to measure wind speed and direction, atmospheric pressure, and precipitation with a single instrument. To measure dissolved oxygen, pH, algae, and conductivity in the water, Beijing Techno Solutions chose an MS5 sonde from Hydrolab with several sensors bundled together in one product.

The engineers also designed a special floating mount to suspend three PT100 water temperature probes positioned 30 cm, 100 cm, and 200 cm below the lake surface. (See photo below.) The data from all of these sensors is collected by the CR1000 and transmitted to researchers on land.

With no access to land lines for power or communication, the system was set up with a solar panel for power and a GPRS modem for wireless communication. The data has been flowing for over a year, and Beijing Techno Solutions is providing support and training for ongoing operations.

New Radar Water-Level Sensors

Our new CS475, CS476, and CS477 water-level sensors are ideal for areas where submersed sensors can be damaged by corrosion, contamination, or flood-related debris. Manufactured by Ohmart/VEGA Corporation, the sensors feature:

- Low maintenance—no moving parts means significantly reduced maintenance cost and time.
- Rugged NEMA 4X enclosure suitable for outdoor installations
- Wide operating-temperature range

Radar sensors emit short microwave pulses and then measure the elapsed time between the emission and return of the pulses. The elapsed time measurement is used to calculate the distance between the sensor and the water surface. The distance value can then be used to determine depth. The sensors communicate with dataloggers via the SDI-12 protocol and output distance, stage, and diagnostic code.

The new sensors differ in their measurement range and accuracy. The CS475 measures up to 65 ft with an accuracy of ±0.2 in.; the CS476 up to 98 ft with an accuracy of ±0.1 in.; and the CS477 up to 230 ft with an accuracy of ±0.6 in.

RF430-Series Spread Spectrum Radios Offer USB

To make it easier to connect to newer computers, we are releasing three new spread-spectrum radios with USB ports. The new RF430 (900-MHz), RF431 (922-MHz), and RF432 (2.4-GHz) radios are functionally the same as our RF401 series. The difference between the two is that the RF430 series has both USB and RS-232 ports, while the RF401 series has RS-232 and CS I/O ports.

The new radios are designed primarily for use on the computer side (via the USB port), and they can also be adapted to connect to the datalogger via the RS-232 port. Because a CS I/O port is not provided on the new radios, they cannot be attached to some of our older dataloggers. However, networks can contain a mixture of RF430-series and RF401-series radios.
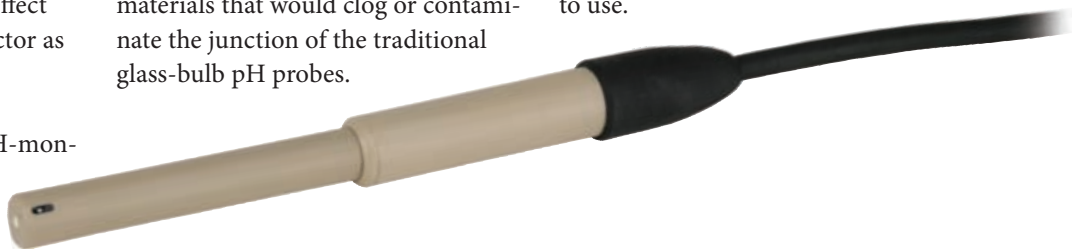
New pH Sensor Uses Innovative Technology

The CS525 is a rugged pH probe suitable for just about any liquid pH-monitoring application, from laboratory to harsh field applications. The CS525 incorporates SENTRON's high-tech, ion-sensitive field-effect transistor (ISFET) semiconductor as its pH-sensitive element.

ISFET is the most powerful pH-monitoring technology available today. This technology provides better measurements in extreme pH conditions. It allows the CS525 to monitor pH in liquids containing high solids, aggressive chemicals, or biological materials that would clog or contaminate the junction of the traditional glass-bulb pH probes.

The new probe's electronics are safely embedded in a durable PEEK body. Elimination of the glass bulb removes the possibility of broken glass, making the CS525 more durable and safer to use.

Online Customer Center Upgrades

We've added a couple of new features to our online Customer Center that may interest you. The Customer Center is a relatively new resource on our website that provides services to help you manage your dealings with Campbell Scientific. In the past, we've offered price list downloads, newsletter subscriptions, and returned-materials-authorization (RMA) instructions. Recent additions include email notifications for new software and operating systems (OS) and the ability to update your contact information.

Software and OS Notifications

We are constantly updating product operating systems and software programs. We offer many of these as downloads from our website at www. campbellsci.com/downloads. In the past, if you wanted to know when a new OS or software patch was available, you had to monitor the website or contact someone at Campbell Scientific. To keep you up to date on our latest offerings, we've created a feature that allows you to mark the downloads for which you want notifications and then later receive notifications by email when new versions are available from the website.

To use this new feature, log in to the Customer Center and select Software and OS Notifications.

Contact Information Updates

If you've changed your mailing address, phone number, email address, or other contact information, this feature allows you to update our database so we can stay in contact with you.

Log in to your Customer Center account to take advantage of these new services. If you haven't created a Customer Center account, you can do so by visiting the the registration page. Please let us know if you have ideas for additional services that would benefit you.

Tips and Tricks: Short Cut

Psst, want in on a secret? Campbell Scientific has a great tool to help you get your datalogger up and running in a matter of minutes. No, it isn't the awesome screwdriver that comes with just about everything. It's Short Cut, the program generator. Short Cut will write the datalogger program (including comments) and generate a wiring diagram. Your program will be written in four easy steps. Then all you have to do is use your handy screwdriver to wire the sensors as shown and download the program.

If you need to do something more complicated than Short Cut can handle, start your program in Short Cut to at least generate a wiring diagram. Then open the program file (*.CR*) in the CRBasic editor. For Edlog users, you will first need to select Document DLD File from Edlog's File menu.

One of the best things about Short Cut is that you can get the latest version FREE (campbellsci.com/downloads). What is the very best thing about Short Cut? It is so easy to use. Give it a try. All current and most retired dataloggers are supported, along with over 100 sensors and 13 generic measurements. But that's not all! Multiplexers, vibrating-wire interfaces, and more are included. If you haven't used Short Cut or haven't used it in a while, give it a try and let me know what you think.
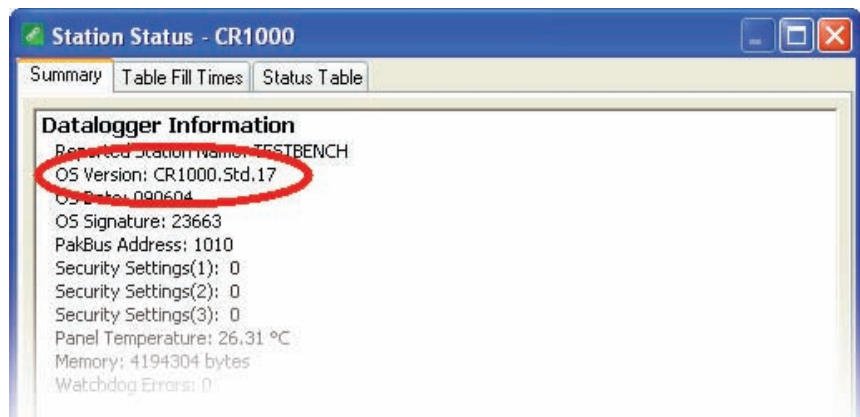
Thanks for reading! *Tip*

Updating to the Latest Datalogger Operating System

One of the questions you may be asked when calling Campbell Scientific support regarding your datalogger is if you are running the most recent operating system (OS). Periodically we release new operating systems that include new functions and instructions, as well as enhancements or bug fixes for existing functions and instructions.

So where do you find out which operating system is in your datalogger? The operating system version is in a field named OSVersion in the datalogger's Status table. The Status table can be viewed using a keyboard display or datalogger support software such as LoggerNet. In LoggerNet, there are a couple of ways to see this value: it can be added as a field to the software's Numeric Display or it can be viewed by choosing View Station Status from the Connect window's Datalogger menu. The version of the software is normally in the format of *datalogger_type.STD.xx.*

For instance, version 17 of the standard CR1000 OS is identified as *CR1000. STD.17.**

If you are asked to upgrade your operating system or need a newly added feature for your application, where do you go to get the latest version? Campbell Scientific offers datalogger operating systems (as well as operating systems for some of our other peripherals) on our website at campbellsci.com/

downloads. The most recently added downloads are on this page, but you can filter the download list by category, view by name, or perform a keyword search. Filter the list by the category Datalogger Operating Systems and Compilers to access the latest firmware downloads for our dataloggers.

The file that is downloaded from the website is a self-extracting executable. When this file is saved to your computer

* The CR200 and dataloggers no longer in production (such as the CR10X or CR23X) follow a different naming convention. See manuals for specifics.

Modified RMA Process

Many of you have worked with our Repair and Calibration Department over the years to keep your products in top operating condition. Like many companies, Campbell Scientific has a standard returned-materials-authorization (RMA) process for these services. We recently revised this process and need to make you aware of the changes we've made.

As we have received returned products in the past, we've occasionally been surprised by various types of "critters" that came along for the ride. At times, we've also found products covered with unknown substances. In the interest of protecting the health and safety of our employees, we have implemented a new policy requiring that all products returned for service be (1) clean, and (2) uncontaminated with harmful substances, such as chemicals, biohazards, and insects. As part of this policy, we now require that a new form, Statement of Product Cleanliness and Decontamination, be submitted before shipping products to Campbell Scientific.

To facilitate this, as part of the RMA process you will be emailed a link to the form when you are assigned an RMA number. The link will allow you to complete and submit the form on our website. When you submit the form, a copy will be sent to you and to our Repair and Calibration Department.

If you would like to review the complete RMA process, please visit the Repair and Calibration page of our website. Please direct any questions you have about this process to our Repair and Calibration Department at (435) 750-9535. Thank you for supporting our efforts to protect the health and safety of our employees.

AgriMet Network

reported water and power savings ranging from 15 to 50 percent. Some irrigators have reported real savings of as much as $25 per acre in pumping costs after using AgriMet ET data to schedule their irrigations.

AgriMet not only provides information for irrigation water management, all of the current and historical weather information is available on the AgriMet website for a variety of user applications. Weather data is transmitted hourly from each station,

and is almost immediately available on the website. This near-real-time availability of weather data from the AgriMet network finds many uses. The National Weather Service uses the hourly data for short term forecasting and forecast verification. Weather and ET data are used by state DEQs for investigating pesticide application and ground-water contamination issues. Electric utilities use the information to model heating, air-conditioning, and peaking-power requirements.

The success of AgriMet in the Pacific Northwest expanded east of the continental divide in the 1990s. The Great Plains Cooperative Agricultural Weather Network maintains and monitors 22 AgriMet stations in central Montana.

More information can be found on the Bureau of Reclamation Pacific Northwest AgriMet website at www.usbr.gov/pn/agrimet and for the Great Plains AgriMet program at www.usbr.gov/gp/agrimet.

Updating to the Latest Datalogger Operating System

and double-clicked, the compressed files are extracted to a user-selectable directory. Extracted files include the operating system, files needed to add the new functions and instructions to the CRBasic Editor (PC-based compiler, definition files, and help files), and a small installation utility named CSIInstaller.exe. When you run CSIInstaller.exe, it saves the files and displays the name of the directory in which they were installed.

At this point you can use the Device Configuration (DevConfig) utility to load the new operating system into the datalogger. DevConfig provides com-

plete instructions for this procedure. Note that to use DevConfig you must be connected directly to the datalogger. All settings will be reset to their factory defaults when a new OS is sent using DevConfig—including the PakBus address! An alternate method for sending the OS, which can be accomplished remotely and retains settings where possible, is to send the operating system as if sending a datalogger program from LoggerNet's Connect window.

After following these steps, you are ready to take advantage of the new features in the datalogger operating system. The next time you open the CR-

Basic Editor, new instructions will show up in the Instruction pick list. When the program is sent to the datalogger, the datalogger will recognize and compile the new instructions.

You can find a list of new features and enhancements by visiting our Downloads page (noted above) and selecting the Revision History link in the Description field.

If you would like to receive an email notification every time we release a new operating system, take a look at the Online Customer Center Upgrades article on page 6.

Calendar

August

1-5	APS Annual American Phytopathology	Portland. OR
2-7	94th ESA Annual Meeting	Albuquerque NM
16-20	StormCon	Anaheim CA
23-27	National Rural ITS Conference	Seaside, OR

September

12-15	PCI National Bridge Conference	San Antonio, TX
21-23	Western Bridge Conference	Sacramento, CA
22-25	AEG	Lake Tahoe, CA
24-25	AWEA Wind Assessment Conference	
27-1	Dam Safety 2009	Hollywood FL

October

04-07	Geothermal Energy Expo	Reno, NV
18-21	GSA 2009	Portland, OR
26-29	Oceans 2009 MTS/IEEE	Biloxi, MS
27-29	Automotive Testing	Novi, MI
27-29	Solar Power International	Anaheim, CA
28-30	NALMS	Hartford, CT

November

1-5	ASA 2009 Annual Meeting	Pittsburgh, PA
1-5	CERF 2009	Portland, OR
9-12	45th AWRA Conference	Seattle, WA

December

2-4	Irrigation Show 2009	San Antonio, TX
14-18	AGU	San Francisco, CA

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