# PC400: Mid-level software support

## *New package is easy to use and offers many full-featured options*

We have recently released PC400 as our mid-level datalogger support software. PC400 follows the easy-to-use design of PC200W, but offers many of the telecommunications options and full-featured editors provided in LoggerNet.

An EZSetup Wizard in PC400 guides you through the necessary steps to add new dataloggers to your network or edit settings of existing dataloggers. PC400 software supports programming, communication, and data collection for all of our dataloggers, whether they use Edlog or CRBasic to create the program. The "Edlog dataloggers" include the CR500, CR510, CR10, CR10X, 21X, CR23X, and CR7 (with mixed-array, table-data, or PAKBUS® operating systems). The "CRBasic dataloggers" include the CR200, CR205, CR210, CR215, CR5000, CR9000 and CR9000X.

PC400 supports direct connect (RS-232 via local serial cable, short haul modems, or other transparent links), TCP/IP, telephone, TAPI, spread spectrum radios, VHF/UHF radios, and multidrop communication devices.

The Short Cut Program Generator as
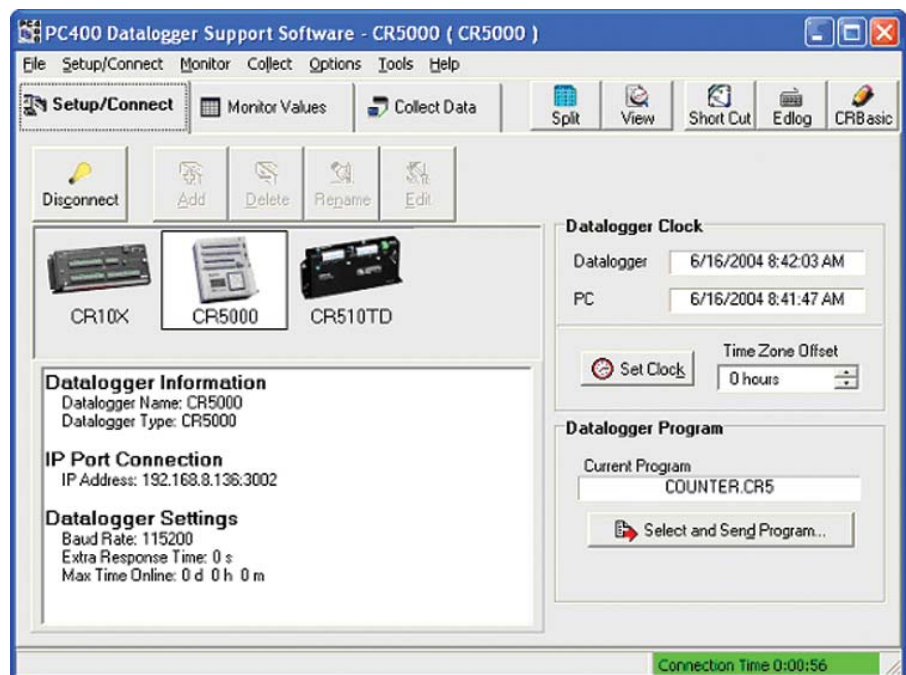


*Positioned between Short Cut/PC200W and LoggerNet, PC400 provides advanced programming and telecommunications without introducing large network complexity.*

well as the full-featured datalogger program editors, Edlog and CRBasic, are included with PC400. Other software tools bundled with PC400 include Split and View for working with data files, and LogTool for troubleshooting communications.

While LoggerNet is used to schedule data collection, PC400 relies on the user to initiate data collection. The new PAKBUS protocols are supported by assigning each datalogger its own sub-network. Users typically don't have to configure PAKBUS routing settings in the dataloggers. PC400 does not support mixed telecommunications links

# It's here:  New CR9000X CPU at least 25 times faster

The CR9000X, the next generation of the CR9000, is available. The CR9000X incorporates the new high speed CR9032 CPU Module, which processes at least 25 times faster than its predecessor, the CR9031 CPU Module.

In addition to the 180 MHz Hitachi processor, the CR9032 also features 128 MB internal SDRAM, a built-in PC card slot, an RS-232 port, and a 10/100 BaseT Ethernet port.

A CR9000 system can be upgraded to a CR9000X system by replacing the CR9031 CPU Module with the CR9032 CPU Module. One licensed copy of PC9000 Support Software, version 5.0, is included with each CR9000X or CR9032 order.

A limited number of CR9031-compatible communication interfaces (PLA100, TL925, NL105) are available.

## Message from the President

# Committed to serving the causes of science

By Paul Campbell

I would like to share my thoughts on an issue at the soul of Campbell Scientific. From the beginnings of the company, there has been a strong desire to serve customers engaged in science. Our mission statement is: "We at Campbell Scientific, Inc., are committed to satisfying the instrumentation needs of our customers, especially those who are working in areas with significant potential for long-term benefit to the causes of science…" What are the causes of science, and how do we contribute to those causes?

The first cause of science is to expand the frontier of human knowledge. I recall Eric Campbell, co-founder and President of Campbell Scientific until his death in 1992, was highly motivated by the following quotation "…when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind…" —Lord Kelvin (*William Thomson, 1824-1907*).

Eric's vision of field data acquisition using the latest technologies in electronics established a foundation for sensor and datalogger design that has provided significant advancement in the tools available for scientists, especially in areas related to environmental physics. When I hear of successful research involving a Campbell Scientific instrument, I feel a great deal of personal satisfaction that the company has helped advance a cause of science. It has been said that within every person beats the heart of an explorer, and at times, people within Campbell Scientific are rewarded with being part of an exciting scientific expedition.

The second cause of science is to use our scientific knowledge to improve mankind's quality of life. This cause often involves engineering to solve specific technical problems. Many Campbell Scientific customers apply scientific principles in engineering disciplines. For example:

• A mechanical engineer may characterize attributes of a vehicle under test by making measurements of strain, vibration, pressure, flow, temperature, etc., with the object in mind of assuring safety, function, and comfort

• A civil engineer may measure slope stability, rock deformation, or resonant structural frequencies

• An environmental engineer may assess containment of pollutants through measurements of soil moisture, conductivity, rainfall

• The measurements from an automatic weather station may be used to conserve water with optimum irrigation of turf and landscapes in a municipality

With a sense of service to quality of life, support of these applications is no less motivating than the endeavor of discovery.

At Campbell Scientific, we are dedicated to understanding your work and strive to apply appropriate technology so that you have the tools you need. We take a personal measure of satisfaction when we hear of your success or pain if we hear of your frustration. We do our best to help you succeed, whether you are involved in expanding human knowledge, or applying that knowledge to improve the quality of life for mankind.

# Antenna, extended temperature options available for Spread Spectrum Radios

An extended temperature range option is now available for our RF400 and RF410 radios. Radios with this option are tested and certified to operate over the -55° to +85°C range. The standard temperature range is -25° to +50°C.

We offer several antennas for our RF400-series radios and CR200-series dataloggers. The antennas most commonly used with 900 MHz radios (RF400, RF410) and dataloggers (CR205, CR210) include:

• 14204 omnidirectional, 0 dBd, ½ wave whip with right angle knuckle joint
• 15970 dipole, 1 dBd with window/wall mount
• 14221 omnidirectional, 3 dBd (requires antenna cable)
• 14201 Yagi, 9 dBd (requires antenna cable)

Antennas compatible with our 2.4 GHz RF415 radio and CR215 datalogger include:

• 16005 omnidirectional, 0 dBd, ½ wave whip with articulating knuckle joint
• 16755 Yagi, 13 dBd (requires antenna cable)

Our higher-gain antennas (i.e., 14221, 14201, and 16755) can be used outdoors; we recommend using a surge suppressor to help protect the radio from electrical transients conducted through the antenna cable. The 16982 Surge Protector Kit can be used with our 2.4 GHz RF415 radio and CR215 datalogger. This kit includes a surge suppressor and a COAX RPSMA cable that connects the surge suppressor to the radio transceiver. Our 900 MHz radio transceivers use the 14462 Surge Protector Kit (see the August 2003 issue of *The Campbell Update*).

# CSI offers Customer-In-Control Technologies™

### *Setting a new standard in Automated Road Weather Information Systems*

Traditional automated Road Weather Information Systems (RWIS) have been reliant upon "one size fits all," ac-powered PC electronics that were expensive and inflexible. Additional engineering fees were often required to customize the system.

Campbell Scientific offers fully NTCIP-compliant, RWIS systems that use Customer-in-Control Technologies™ (CCT) Remote Processing Units (RPUs). With a CCT RPU, customers can choose the best sensors, telecommunication method, and software for their needs, including equipment from other CCT vendors. The choice of sensors allows the station to be configured for the unique microclimate where it will be deployed. The customer owns the RWIS data and may modify or redistribute the data at their discretion without additional expense.

Each RWIS network has several roadside Environmental Sensor Stations (ESS) and one or more computer sites. A typical ESS consists of a tower, RPU (datalogger), power supply, environmental enclosure, remote communication hardware, two intelligent road sensors, and meteorological sensors. The road sensors monitor road surface and subsurface temperatures, residual salt content, road surface freezing temperature, water film level, and road surface condition (dry, moist, wet, ice, or snow). Meteorological parameters commonly measured include wind speed and direction, air temperature, relative humidity, barometric pressure, solar radiation, and precipitation.

Software support for our RWIS is provided by BlackTop™ PC Software and LoggerNet Datalogger

*Roadside Environmental Sensor Stations (like the one shown above) monitor real-time road conditions and telemeter data to a central DOT office.*

# Based in the UK, CSL a leader throughout Europe

Campbell Scientific Ltd (CSL) was founded in 1985 by Gaylon Campbell, the late Eric Campbell (both Directors of Campbell Scientific, Inc., of Utah, USA) and Dick Saffell, the present Managing Director. At that time, most of the sales had been in the USA or through Claude Labine's new venture in Canada.

*At the heart of the UK's high-technology industrial and research sector, the offices of CSL are located in Shepshed, England.*

Although CSI had exported to Europe, they could see the advantages of establishing a European base in the UK.

Initially, CSL assembled a datalogger designed at the US parent company, and gradually began to integrate the datalog-

ger into systems and weather stations using European sensors. During this time the company leased premises from the University of Nottingham. The company has maintained close working relationships with East Midlands Universities since then.

With the introduction of the CR10 in 1987, sales increased rapidly, and the company grew. In 1990, CSL moved to a building in the centre of Shepshed and in 1996 moved again to Campbell Park—a purpose-built office and assembly plant on the outskirts of the town. CSL has over 1400 m$^2$ of space available for office accommodation, manufacturing and storage with sufficient land to treble in size. The next stage of development is due to start soon, with an extension to the building planned for 2005.

Shepshed is in the centre of the UK, close to East Midlands International Airport and several major roads, allowing easy access for the transport of equipment into Europe. The company employs around 40 people at the UK office. The region is at the heart of the UK's high-technology industrial and research sector, and skilled labor is provided by the local universities and colleges of Loughborough, Leicester and Nottingham.

Although CSL is based in the UK, as

much as 70 percent of its business can be exported to Europe. Europeans tend to appreciate local sales outlets and support. CSL has subsidiary offices in France and Spain, and is looking to establish another European office. The new web site will also cater to a large number of the languages across Europe.

CSL's single largest market in the UK is related to civil engineering, primarily the monitoring of bridges, dams, tunnels or buildings. This has changed the nature of its business away from weather stations, although CSL is still a key supplier for research grade and Met Office-approved systems.

New partnerships have been developed and the range of products has been increased to be able to provide different types of systems. These systems include water monitoring and telemetry, as well as systems for the burgeoning wind energy industry in Europe.

Looking further forward, CSL has embarked on a number of research collaborations with Universities in the region and expects to develop several new products that will benefit researchers and the Campbell community over the coming years.

# CS110 Electric Field Meter provides critical warning

## *Design allows for a direct electrical connection to shutter*

Large electric fields associated with the hazardous separation of charge occur during thunderstorms. Therefore, knowledge of the atmospheric
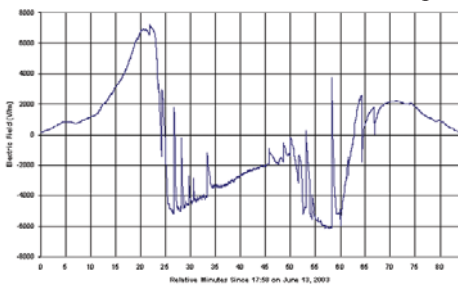
electric field at ground level is useful for thunderstorm research and lightning warning. The graph above depicts the chronology of a local thunderstorm from the onset of hazardous electrification, to lightning discharges, to returning to fair weather conditions. There is not a universally accepted lightning warning criteria that is based on electric field measurements.

However, the graph demonstrates that the local electric field provides critical warning information, especially for developing thunderstorms.

The traditional instrument for measuring the atmospheric electric field at ground level is the rotating-vane field mill, so named because a rotating vane "chops up" or modulates the electric field seen by sensing electrodes. Field mills employ a continuously rotating vane that is electrically connected to earth ground through a rotating electrical contact.

In contrast, the CS110 uses a stepper motor to open and close a reciprocating shutter to alternately shield and expose a sensing electrode from external electric fields. The reciprocating approach allows for a direct electrical connection to the shutter instead of a problematic rotating contact. The fully closed shutter position on the CS110 also provides a zero-field reference for each measurement



*The CS110 includes an embedded datalogger to control the reciprocating shutter and measure the output voltage from a charge amplifier.*

cycle, allowing for DC error correction. Additionally, de-energizing the stepper-motor coils between shutter movements results in reduced power consumption and measurement noise.

The CS110 includes an embedded datalogger to control the reciprocating shutter and measure the output voltage from a charge amplifier. A versatile programming language, CRBasic, provides flexibility in choosing measurement rates, onboard data processing, digital control, and

alarm thresholds. Along with electric field, the CS110 system can measure wind speed, wind direction, air temperature, relative humidity, solar radiation or barometric pressure, and rainfall with the addition of external sensors. LoggerNet Datalogger Support Software provides comprehensive monitoring, data collection, and networking capability for the CS110.

The CS110 will be available soon; contact Alan Hinckley for more information.

# PC9000 5.0: Faster communication

We are now shipping PC9000 version 5.0. This version offers more flexibility for real-time monitoring, historical data display, and faster communication speeds between the datalogger and the PC. Three new real-time windows are Trend Monitor, Spatial Plotter, and 3-D FFT. The historical data viewer now supports the CR9052 Filter Module. We have optimized the DLL for communicating with the new CR9032 CPU Module while allowing full reverse compatibility with the older CR9031 CPU Module and the CR5000 datalogger. We've revised the driver to support parallel port communications as well as added support for CANbus 11-bit identifiers in the program generators.

PC9000 runs on Windows® XP/2000/NT/98. One licensed copy of PC9000 ships free of charge with each CR9000X. CR5000 users can purchase either PC9000 or LoggerNet as their primary datalogger support software.
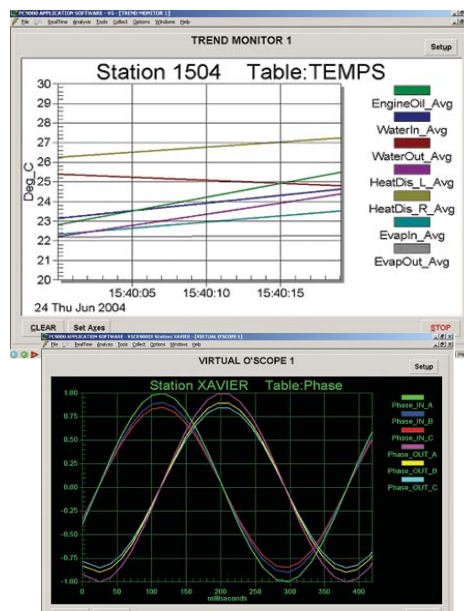


*Trend Monitor and Virtual Oscilloscope provide powerful tool sets for data display.*

# Removable terminal strips create new look for the CR23X

Our CR23X Microloggers® will soon have removable terminal strips, allowing the sensor wiring to remain intact while the datalogger is used elsewhere. The CR23X can then be transported to another site, stored in a safe location until further testing is required (e.g., hotel rooms at night), sent to the factory for recalibration, or "time-shared" between several sensor installations.

The green terminal strips are easily removed; no tools are required. Additional terminal blocks can be ordered by specifying #14216 (four per CR23X); previous loggers cannot be retrofitted.

# CDMA digital cellular modem trio has you covered

Campbell Scientific offers three CDMA digital cellular modems manufactured by AirLink®.

The Redwing100 and Redwing105 communicate with the computer via the CDMA network and the Public Switched Telephone Network (PSTN), but differ in the CDMA network used. The Redwing100 is compatible with the Verizon Wireless network, the Redwing105 the ALLTEL network.

Our third offering, the Raven100, com-municates with the computer via the Verizon CDMA network and the Internet. Using the Internet allows faster communication rates and eliminates dialing delays and long distance fees. The Raven100 requires a static IP account with Verizon Wireless; it will not work with other cellular networks or on a dynamic IP account.

All of our CDMA modems use the same antenna and power supply options. Antenna options include: 14453 0 dBd ½ Wave Dipole Whip Cellular Antenna and 14454 8 dBd Yagi Cellular Antenna with 10' cable. Sites near the edge of the CDMA coverage may require the Yagi antenna.

The system is typically powered with a BP12 battery, CH100 charger/regulator, and MSX10 solar panel. Prior to purchase, contact Verizon Wireless (Redwing100, Raven100) or ALLTEL (Redwing105) to ensure that they provide CDMA coverage at your site(s).

# VSP3 Vosponder: Get a verbal response of real-time conditions

The VSP3 Vosponder allows customers to call their monitoring station using a hand-held UHF or VHF radio and receive a verbal report of real-time conditions. Manufactured by Dacom, the VSP3 converts raw digital data from an SDI-12 compatible data acquisition system into a voice message. The voice messages, comprised of text and data values, can be transmitted via RF radio. Transmission of voice messages can be initiated based on an interval, an alarm condition, or a DTMF sequence. Each Vosponder can be assigned a unique DTMF ID Code that allows users to set up broadcasts from multiple sites. Unique messages can be assigned to different alarm conditions.

The Vosponder is set up using the "Image Builder" software program. It allows the user to create a configuration file that includes the voice message string and the data values that are inserted into the messages. HyperTerminal is used to upload the file to the Vosponder.

The Vosponder can be integrated with the RF310, RF311, and RF313 radios. A user-supplied, hand-held radio with matching radio frequency is required.

*Temperature is 82.15 degrees Fahrenheit.*

*The VSP3 Vosponder allows hand-held UHF or VHF radios to call monitoring stations and receive a verbal report of data.*

*If you didn't receive notification of the workshop, you can still register online.*

# Campbell Scientific teams up with Decagon to offer agronomy workshop

A measurement workshop for agronomy professionals will be presented jointly by Campbell Scientific, Inc., and Decagon Devices, Inc., on Saturday, October 30, 2004.

The one-day workshop is offered in conjunction with the 2004 ASA-CSSA-SSSA International Annual Meetings, which will be held at the Washington State Convention and Trade Center. The workshop will focus on the most commonly used instruments for soil water measurements. Principles of operation, guidance for calibration and optimization of measurement instruments, and hands-on measurements and data handling will be covered.

Completion of the course will result in (1) the ability to select the appropriate measurement method for a given soil water measurement application and (2) the information required to install, calibrate, read and maintain soil water sensors. The fee is $60, which includes the workshop and catered lunch. For more details see http://www.campbellsci.com/soils_course.cfm

# HMP45C-L sensor redesigned to ease installation

A redesigned HMP45C-L sensor started shipping in May 2004. We have removed a circuit in the cable of the HMP45C-L to ease installation and reduce the risk of damage to the sensor. The newer versions of the HMP45C-L have a yellow label on the cable instead of a white label and six wires instead of seven. The HMP45C-L is typically powered via a 12 V terminal on a datalogger. To conserve power, a switched 12 V terminal or a SW12V can be used.

# SW12V adds switched 12 V channel to Campbell dataloggers

The SW12V is a Switched 12 V Power Assembly that adds a switched 12 V channel to our older dataloggers, or expands the switching capability in our newer dataloggers. A datalogger control port is used to "switch" 12 V power to the sensor or peripheral instead of sourcing a constant 12 V, conserving battery power.

# Datalogger programs a snap with Short Cut

Short Cut Software generates programs for Campbell Scientific's dataloggers and preconfigured weather stations. Short Cut is designed to help both beginning and advanced datalogger programmers create datalogger programs quickly and easily. Programs are created in four easy steps: 1) select the datalogger model, 2) select the sensors and devices to be connected to the datalogger, 3) select the data to be stored in the datalogger, and 4) save the datalogger program. Short Cut generates a wiring diagram for connecting your sensors and devices to the datalogger. In addition to our standard sensors, multiplexers, and dataloggers, Short Cut supports generic measurements such as differential voltage, bridge, and pulse. Short Cut also supports commonly used mathematical calculations (e.g., heat index, wind chill), custom user entered calculations, and control logic (e.g., alarm trigger, cellular phone control).

A new feature in Short Cut 2.0 is its ability to generate CRBasic programs, the language used by our CR200 and CR5000 dataloggers. If you are new to CRBasic programming, you can generate a CRBasic datalogger program with Short Cut, open it in the CRBasic Editor available in LoggerNet and PC400, and examine the CRBasic code that Short Cut generated. However, the changes you make to the datalogger program with the CRBasic Editor can not be imported back into Short Cut.

Short Cut is a program generator only. A communications package such as PC200W, PC400, or LoggerNet must be used to transfer the datalogger program to the datalogger. Short Cut is included with PC400, and is available at no charge from our Web site.

## New submersible pressure sensors

Pressure Systems' 116 and 126 (CS401 and CS406) have replaced the 169 and 173 Submersible Pressure Sensors (CS400 and CS405). The CS401 and CS406 can be read directly by the datalogger without the 7977 Resistor Assembly. The sensors feature strain gage technology and are designed for surface and groundwater level measurement. See http://campbellsci.com/waterlevel.html for more information on water level, stage, and flow sensors offered by Campbell Scientific.

# PC400

**Continued from Page 1**

(phone-to-RF), automatic data collection, or real-time graphical displays.

Making its debut with PC400 is DevConfig, a Device Configuration Utility for setting up Campbell Scientific hardware. DevConfig allows you to send new operating systems to devices with FLASH memory, configure various PAKBUS settings in dataloggers, and edit settings for communications peripherals such as the MD485, RF400, and SC105. DevConfig includes clear instructions for connecting each device to the PC and provides Help for each setting.

# RWIS

**Continued from Page 3**

Support Software. BlackTop Software is a web-based package that complies with the NTCIP standards. It collects data from each RPU, stores the data in an industry-standard relational database (MS SQL Server), reports atmospheric weather and road surface conditions, and displays alarm notifications when critical parameters have been reached. BlackTop's open architecture and clearly defined user interfaces allow easy integration into other sub-systems such as bulletin boards, web display, and second party forecasting services. Measurements can be displayed in engineering units of the customer's choice. LoggerNet allows customers to develop/edit custom RPU programs and retrieve/archive RPU diagnostic information by automatic schedule or on demand.

## CAMPBELL SCIENTIFIC CALENDAR

| Date | Event | Location |
|------|-------|----------|
| **August** | | |
| 1-6 | Ecological Society of America | Portland, OR |
| **September** | | |
| 19-24 | International Snow Science Workshop | Jackson Hole, WY |
| 26-29 | Association of State Dam Safety Officials | Phoenix, AZ |
| 27-30 | MINExpo | Las Vegas, NV |
| **October** | | |
| 3-6 | Water Environment Federation Technology | New Orleans, LA |
| 18-20 | Southwest Association of ALERT Systems | Mesa, AZ |
| 27-29 | Automotive Testing Expo | Detroit, MI |
| 30 | Soil Water Measurements Workshop | Seattle, WA |
| 31 | ASA, CSSA, SSSA | Seattle, WA |
| **November** | | |
| 1-4 | ASA, CSSA, SSSA | Seattle, WA |
| 7-10 | Geological Society of America | Denver, CO |
| 14-16 | Irrigation Association Annual Meeting | Tampa, FL |
| 14-18 | Entomological Society of America | Salt Lake City, UT |
| **December** | | |
| 13-17 | American Geophysical Union | San Francisco, CA |
| **January** | | |
| 9-13 | American Meteorological Society Meeting | San Diego, CA |
| 17-20 | Aquaculture America | New Orleans, LA |

*visit our web site for additional listings and training class schedules*

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