

CAMPBELLUPDATE

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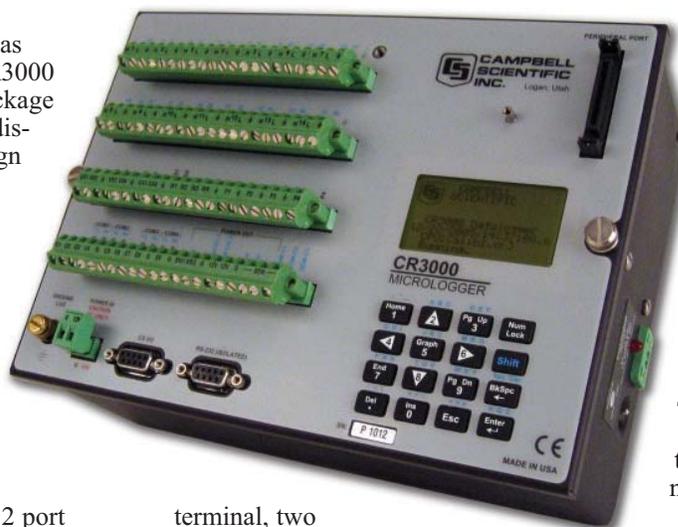
Introducing our new Micrologger®: CR3000 replaces the CR23X

Campbell Scientific's new Micrologger®, the CR3000, has replaced the CR23X. The CR3000 is a rugged, self-contained package with an integrated keyboard, display, and power supply. Design features include:

- Processing speed that is four times faster than the CR1000 and seven times faster than the CR23X
- 16-bit resolution on five analog ranges
- Dedicated SDM channels
- Two switched 12 V outputs
- Current excitation (Ix) for resistance measurements
- Four Mbyte storage capacity
- Electronically isolated RS-232 port
- SDI-12 support
- Removable, labeled terminal strips that are lockable
- PakBus® communication protocol
- Backlit, 128 x 64 pixel graphical or eight-line numeric LCD display
- Identical footprint to the CR23X

I/O Channels

For measurement and control, the CR3000 provides 14 differential/28 single-ended analog inputs, four switched voltage excitation channels, three current excitation channels, four pulse inputs, 21 analog grounds, five power grounds, one +5 V



terminal, two 12 V terminals, two switched 12 V terminals, eight digital I/O terminals, and three SDM terminals.

Pulse count inputs and all digital I/O ports have the ability to count pulses using 24-bit counters that handle the maximum input frequencies. Earlier dataloggers had 16-bit counters that needed special treatment for higher frequencies. Pulse count inputs count switch closures, "high frequency," and low-level AC signals. The digital I/O inputs count switch closures and "high

frequency" signals without additional signal conditioning. Digital I/O ports can also be used to count low-level AC signals with the addition of the LLAC4 module.

For communications, the CR3000 provides an electronically-isolated RS-232 port and a CS I/O port. Additionally, eight digital I/O terminals can be configured as pairs (transmit and receive) for up to four independent communications (COM) ports. These COM ports support serial communication from 300 to 115200 baud, and can be used to:

- Collect data from "smart" sensors
- Communicate between dataloggers
- Connect to another modem or network link
- "Pass through" communications from a modem on the CS I/O or RS-232 port to a digital camera or other device connected to a COM port.

A parallel peripheral port that supports the CFM100 CompactFlash® Module is built in. The CFM100 uses the peripheral port to expand the CR3000's memory using CompactFlash cards.

Battery Base Options

The alkaline base option includes 10 D-cell batteries with a 10 Ahr rating at 20°C. The rechargeable base option provides an internal 7 Ahr sealed rechargeable battery that can be trickle-charged via vehicle power, solar panels, or ac power. For charging the battery via ac power, a 110 Vac wall charger is offered for US cus-

See CR3000 on Page 6

Training budget tight?

Can't find the budget or time to travel to Logan, Utah for training? Try one of our new self-study courses. Campbell Scientific's CR1000 and CR10X training course can be done on your own with e-mail and telephone support from experienced instructors. You will need to provide a datalogger, power supply, and a

PC running LoggerNet. CR10X trainees will also need an SC32A or SC32B interface. If this is your first experience with Campbell Scientific dataloggers, you can expect to spend 20 hours getting through the materials and examples. Experienced users should be able to complete the training more quickly.

We will continue to offer training at our facility. Visit www.campbellsci.com/ training to see the current schedule and register on-line. If you are interested in customized courses at your location, we'd be happy to arrange them. Contact an Applications Engineer for details.

Message from the President

Window to the World – PC Software

By Paul Campbell

A machine's capability is only as useful as the operator's understanding of the machine and its benefits. As the body of available technology expands for solving your measurement and data acquisition problems, one of our challenges is to make the benefits of new technology available to you without expanding complexity.

Indeed, something can be said for new technology that simplifies a machine. In the design of dataloggers and associated machines at CSI, we strive to balance flexibility and simplicity. The right balance will give you an extraordinary value with data acquisition tools that require some investment of your time, but in return offer you expanding capabilities as your understanding increases.

While much of the internal operation of a datalogger is hidden from external view, an operator must at a minimum specify the measurements to be made, at what frequency, and the means of reporting a useful result. While there are a number of functions supported through a simple keyboard and display, most of the user interface of Campbell Scientific equipment is handled through PC software. We offer three basic levels of PC software:

- entry level that is downloadable from our web site (Short Cut and PC200W)
- mid-level for the individual user requiring programming and manual telemetry capability (PC400)
- top-level for supporting wide area networks with automated data retrieval



through a variety of telemetry means (LoggerNet).

The release of LoggerNet 3.2 (see article on page 4) is a landmark event. LoggerNet 3.2 supports a broad variety of dataloggers and communication peripherals for wide area networking with a client/server architecture that allows remote (Internet based) network administration as well as local or remote data export from the LoggerNet server. LoggerNet 3.2 also supports a new generation of dataloggers that includes the CR1000, CR3000 (cover article), and several others that are programmed with an improved Short Cut program generator and with a full-featured CRBasic editor. Adherence to the BASIC syntax provides an easier entry into programming dataloggers. Improvements in the editor, CR1000, and related operating systems extends usefulness of the datalogger into applications requiring more on-site processing or handling strings in the data structure. LoggerNet 3.2 will also translate more readily into languages other than English.

For several years Campbell Scientific's software development has been focused on improvements to the user interface, upgrades relating to Windows operating system as it moved to a 32-bit platform, and support for the new generation of dataloggers (CR1000, CR3000). While there is always an ongoing maintenance effort driven by market changes to computers and their operating systems, I foresee an opportunity to extend the range and functionality of software products in the future. Internal discussions have included the following topics:

- Improve datalogger network planning and set-up
- Wizard-based report generator to format

printable reports

- Support for mainstream relational data bases
- Improve web publication support
- Integration with Geographic Information Systems (GIS)
- More sophisticated data analysis and graphics
- Enhanced troubleshooting and diagnostic tools
- LoggerNet server on LINUX (existing clients on Windows)
- Application specific adaptations.

As you read through the list, consider your use of Campbell Scientific software. Feel free to give us feedback on where you would like to see improvements or related products. Please direct this feedback to software@campbellsci.com.

We remain committed to an offering of software products that are easy to install and use on popular PC operating systems. If you haven't tried our latest offerings, I invite you to visit www.campbellsci.com and review our software products.

Argos Satellite Transmitter

Scheduled for release in February, 2006, the ST-20 Argos PTT is compatible with our CR1000 and CR3000 dataloggers. Because Argos satellites are polar-orbiting, Argos field sites are well suited to deployment in high latitudes. The number of bits for each data point is user selectable. The ST-20 has low power drain, -40° to +70° C operating temperature range, and seven data buffers.

A newsletter for the customers
of Campbell Scientific, Inc.

The CAMPBELLUPDATE

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 **CAMPBELL SCIENTIFIC, INC.**
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Campbell Scientific VP Receives Distinction as Fellow of Agronomy Society

Press Release Courtesy ASA

Bertrand D. Tanner has received the honor of Fellow of the American Society of Agronomy for 2005. The prestigious award was presented at the 2005 ASA Annual Meetings held in conjunction with the Crop Science Society of America (CSSA) and Soil Science Society of America (SSSA) on Nov. 6 to 10 in Salt Lake City, Utah.

Bertrand D. Tanner is a vice-president and micro-meteorologist at Campbell Scientific Inc., Logan, Utah and has been a corporate director since 1980. In 1993, he helped form Campbell Scientific Australia and has served since as board chairman. He received his B.S. degree at the University of Wisconsin-Madison and his M.S. degree at Utah State University.

Since joining the company in 1978, Bert has been involved with environmental instrumentation and measurement practices, and with supporting applications in a variety of research disciplines. Early emphasis included the development of automated weather stations, widely deployed today in networks serving both agricultural research and producers. He has authored two invited chapters on automated weather stations. A primary focus has been the development and field operation of sensors for measuring the surface-atmosphere exchange of heat, water vapor, CO₂ and other trace gases. Bert holds a patent on a fast response water vapor sensor and led his company's participation in establishing China's carbon flux network, a Chinese Academy of Science program. He has participated in several international measurement workshops as an invited



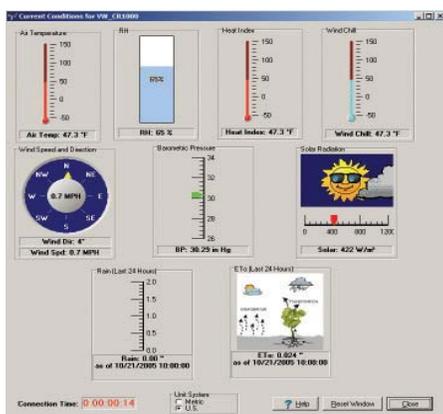
Bert Tanner with his certificate of recognition from ASA after being named Fellow in 2005.

lecturer and served on the editorial committee for the ASA monograph *Micrometeorological Measurements in Agricultural Systems*.

The Society has been selecting outstanding members to the position of Fellow since 1924. Colleagues within the Society nominate worthy members, and they are carefully ranked before final selection is made by the ASA Executive Committee. The Society has chosen 25 individuals, based on their professional achievements and meritorious service, to receive this honor in 2005.

VisualWeather 2.0: Added ease and flexibility

VisualWeather 2.0 was released in September. VisualWeather supports program generation, real-time data monitoring, automated data collection, and report generation, but heretofore was limited



VisualWeather screen graphically displays meteorological data retrieved from a weather station.

to Campbell Scientific's MetData1 and ET106 preconfigured weather stations. The new version of VisualWeather can interface with almost any of our custom weather stations. An EZSetup Wizard guides you through the necessary steps of configuring a weather station. To communicate with your station, VisualWeather supports direct connect, telephone, TCP/IP, spread spectrum radios, VHF/UHF radios, and multidrop communications devices.

Other features added to the latest version include:

- support for barometers
- heat index reports and two custom reports with selectable start and end dates
- your choice of Penman-Monteith, standardized short crop, or standardized tall crop methods for calculating evapotranspiration

- the ability to link different crop coefficients to different crop stages for estimating crop water needs
- an improved real-time display

Custom Weather Stations

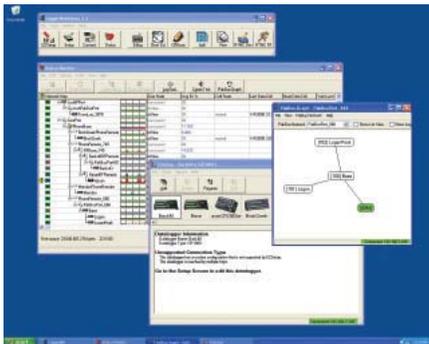
We've included our Short Cut program generator with VisualWeather. You can use Short Cut to generate the program and wiring diagram for your custom station. You can then use VisualWeather to send the program to the weather station and map the data fields used for report generation and real-time displays.

Preconfigured Weather Stations

For a preconfigured weather station, VisualWeather generates a program based on information you provide about the sensors and sends the program to your weather station.

LoggerNet 3.2

New Client-server Products and CR3000 Support



LoggerNet 3.2 introduces support for the new CR3000 Micrologger® and two new LoggerNet products, LoggerNet Remote and LoggerNet Admin. Also included is an updated version of Real Time Monitoring and Control Software (RTMC 2.0, see page 7).

From its inception, LoggerNet used client-server architecture. Starting the Toolbar launches a server process that runs in the background to manage communications with various devices to all

of our dataloggers. Client programs can then request data from the server's "data cache" without having to contact the dataloggers, making it possible to distribute data to remote PCs without those PCs needing to contact the datalogger directly. The server typically writes data files to one its local drives, but remote clients on remote PCs can also contact the server to create remote data files.

Version 3.2 makes remote administration functions available for all Campbell Scientific datalogger users through LoggerNet Remote and LoggerNet Admin. LoggerNet Remote is used to administer the network from afar. It is installed on a remote PC with advanced version of clients, but does not include the LoggerNet server. LoggerNet Admin provides the LoggerNet server, clients, and the advanced clients.

Advanced clients included with LoggerNet Admin are:

- Security Manager—creates user names

and passwords with different levels of access to the LoggerNet server and data logger network

- LoggerNet Server Monitor—monitors the state of remote servers
- Service Manager—installs and runs the LoggerNet server as a Windows service without the Toolbar open, for cases where the PC needs to run without someone logging onto it, such as after a power failure or in a secure room
- Data Export—provides a socket interface to a custom application used to automatically feed a database
- Hole Monitor—updates missing data in RF data advise networks

To update from earlier 3.x versions to LoggerNet 3.2, visit www.campbellsci.com/downloads. LoggerNet 3.2 users can upgrade to LoggerNet Admin at a lower price by purchasing a LoggerNet Remote license and installing it over their existing LoggerNet instance.

See Loggernet 3.2 on Page 5

LP02 Pyranometer

Hukseflux's LP02 Pyranometer has been added to our product line. This ISO second class pyranometer measures solar radiation with a high-quality blackened thermopile protected by a dome. The blackened thermopile provides a flat spectral response for the 305 to 2800 nm spectral range, which allows the LP02 to be used under plant canopies or lamps, when the sky is cloudy, and for reflected radiation measurements. The LP02 features a temperature dependence of $<0.1\%/^{\circ}\text{C}$ and a bubble level and three adjusting screws for leveling the sensor. Customers can mount two LP02s back-to-back to make a low-cost albedometer.

CMP3 Pyranometer replaces the CM3

The CMP3 Pyranometer, manufactured by Kipp & Zonen, has replaced the CM3 Pyranometer. The CMP3 is an ISO second class pyranometer that measures solar radiation with a high-quality blackened thermopile protected by a dome. The blackened thermopile provides a flat spectral response for the 310 to 2800 nm spectral range, which allows the CMP3 to be used under plant canopies or lamps, when the sky is cloudy, and for reflected radiation measurements. The CMP3 features a white, snap-on, sun shield that reduces the sensor's temperature. A bubble level and three adjusting screws are provided for leveling the sensor. To make a low-cost albedometer, customers can mount two CMP3s back-to-back.

Enclosure Door Switch

A door switch indicator (part number 18165) is now offered for our enclosures. This magnetic switch allows our dataloggers to detect enclosure door status (open or closed) and to include that status in the data stream to document maintenance visits, unauthorized visits, spikes in RH due to door opening, etc. Templates are provided to ensure proper installation.



Loggernet 3.2

Continued from Page 4

Owners of 2.x versions can migrate to LoggerNet Admin in a two-step process. First, upgrade your LoggerNet license at a discounted price to LoggerNet 3.2. Then, add a LoggerNet Remote license and install it over LoggerNet 3.2 to obtain the functionality available in LoggerNet Admin.

LoggerNet 1.x owners can install LoggerNet Admin 3.2 in parallel with their existing software to preserve the older networks until they become comfortable with the new screens and features.

During the install, LoggerNet 3.2 will offer to upgrade

LoggerNet 2.x or PC400. Choosing to upgrade will remove the older installs, though you may have to update file and path names for your data files.

We recommend that users back up their networks regularly. LoggerNet 3.2 offers a useful option from the Setup Screen for creating a single backup file. This backup utility can be run while the server is operating and can also be triggered automatically through LoggerNet's Task Master.

LoggerNet is not just for large networks. This new release brings "big network" power to every network.

Sentek probes



EnviroSMART probe

Sentek's EnviroSMART and EasyAG water content profile probes have been improved to make them easier to use in the field and provide better measurements. New features include:

- Rapid Measurement Technique (RMT) circuitry (reduces power consumption)
- Replaceable fuse
- Reverse polarity protection

EasyAGII Only

- Improved design to reduce fouling of electronics
- Improved top cap seal and brass cap fastening inserts
- Removable / replaceable interface
- Better access to the diagnostic connector
- New cutting edge and insertion tools

Call Campbell Scientific to find out how you can easily incorporate water content profile probes into your measurement sites.



EasyAGII Probe



The EnviroSMART is inserted into an access tube in a row of cotton.

2006 Pricelists

Our US and International price lists for 2006 are available, effective February 1, 2006. You can receive our price lists via email by contacting one of our applications engineers. While most of the datalogger and software prices remain the same, the prices of many of the sensors have increased. Price changes in hardware are primarily due to changes in manufacturing and cost of parts. Throughout the year, our price lists will be updated monthly to reflect new products.

New GSA Contract

We are pleased to announce our new GSA contract, MAS Contract Number GS-07F-9255S, active through December 2010. Our CR3000 Micrologger and high data rate GOES satellite transceiver, the TX312, can now be ordered from our GSA contract.

Voice Synthesized Modem Supports PakBus Dataloggers

Campbell Scientific's COM310 modem now supports our CR3000, CR1000, and other dataloggers with PakBus® operating systems. The COM310 can answer incoming calls, recite pre-defined messages that include the latest measurements, initiate voice warning call-outs, and commence data calls. Customers use either CRBasic code or LoggerTalk™ software to generate messages.

CR3000

Continued from Page 1

tomers or other countries with 110 Vac outlets. A 100 to 240 Vac wall charger is also available. When using vehicle power, our DCDC18R Boost Regulator is used to increase the vehicle's supply voltage to charging levels required by the CR3000.

The low-profile (no battery) option requires a user-supplied dc source. It is used when the system's power consumption requires a larger capacity battery or when it's advantageous for the datalogger to have a smaller depth or weight.

Datalogger Programming

The CR3000 is programmed using CRBasic. CRBasic programs can be created using the Short Cut program generator or the CRBasic Editor. Short Cut generates CR3000 programs and wiring diagrams in four easy steps and supports almost all of Campbell Scientific sensors. The CRBasic Editor uses a flexible BASIC-like programming structure to create more complex CR3000 programs. Short Cut generated programs can be imported into the CRBasic Editor to add instructions or functionality not supported

by Short Cut. Short Cut and the CRBasic Editor are available in LoggerNet 3.2 Datalogger Support Software.

For CR23X customers, LoggerNet 3.2 includes the Transformer application to convert existing CR23X Edlog programs to CR3000 CRBasic programs.

CR23X Availability

Limited quantities of CR23X Microloggers are available for purchase. As with all of our retired products, we will continue to service the CR23X as long as parts are available.

CR3000 Micrologger vs CR23X Micrologger

Feature	CR23X	CR3000
Execution Interval Max	100 Hz	100 Hz
Speed (# fast measurements stored at 100Hz)	2	14
Analog Input		
Channel count (Differential)	12	14
Max input Voltage (+9% overhead)	±5000 mV	±5000 mV
Resolution	15-bit basic resolution	16-bit basic resolution
Integration over 50/60 Hz	partial cycle 5V range	full cycle all ranges
Internal noise (50/60 Hz Diff Integration)	0.15 µV	0.19 µV
Analog Output		
Voltage Excitation Channel count	4	4
Vx Resolution	333 µV	170 µV
CAO Channel count	2	2
CAO Resolution	333 µV	170 µV
Current Excitation Channel count	n/a	3
Ix Range	n/a	±2.5 mA
Pulse Counters		
Pulse Port Channel count	4	4
Counters	8-bit each	24 bit each
High Frequency Mode (Max)	400 kHz	250 kHz
Low Level AC Range (20 mV)	1 kHz	20 Hz
Low Level AC Range (5000 mV)	16 kHz	20 kHz
Digital Control Ports		
Control Port Channel count	8	8 + SDM-C1, C2, C3
High Frequency Max	2.5 kHz	400 kHz
SDI-12 Channel count	4	4 C1, C3, C5, C7
COM ports	2 C5, C6, C7, C8	4 C1-2, C3-4, C5-6, C7-8
COM port baud rate max	4800	115200
Switched 12V		
Channel Count	1	2
Communications		
RS-232 Port count	1	1
Isolation	Optical	Transformer
Baud Rate Max	38400	115200
CS I/O Port Count	1	1
Additional COM Ports	n/a	COM 1, 2, 3, 4
System		
Clock Accuracy	±12 min/yr	±3 min/yr
Quiescent Current	2 mA	2 mA
Display on Current	+7 mA	+1 mA
Backlight on Current	n/a	+42 mA
Data Storage	2M Flash	4M SRAM
Peripheral Expansion Port	n/a	Flash Card

Solar Panel and Regulator

Campbell Scientific has replaced the MSX-series solar panels with the SP-series solar panels. The SP10 and SP20 connect to the voltage regulator integrated into a PS100, CH100, or the rechargeable base of a CR5000, CR3000, CR23X, and CR7 datalogger. The SP10R and SP20R contain an on-board regulator allowing them to connect directly to a user-supplied external battery.

A Morningstar SunSaver regulator is available as an option for the SP65. This regulator is shipped with a 15 foot cable for connecting to a user-supplied battery and a mounting bracket for attaching to an enclosure backplate; the SunSaver regulator must be housed in an environmental enclosure. Two SP65 solar panels may be connected to a single regulator to provide 130 Watts of power.



Western Weather Group, LLC of Chico has recently signed as Campbell Scientific's sales representative for California, serving weather and agricultural applications. The Western Weather Group team is comprised of a group of highly skilled meteorologists and physical scientists. Many of WWG's team members have worked together for over 20 years in the field of meteorology, providing weather forecasting and Campbell Scientific weather monitoring systems for industrial applications and California farmers. Western Weather Group specializes in microscale site-specific weather forecasts, crop pest and disease forecasts, evapotranspiration forecasts and installation, maintenance and calibration services.



As part of the ongoing commitment to providing service and support across Europe, Campbell Scientific Ltd. opened a new satellite office in Germany in March of 2005. The new office is led by Jens Lamping, Ph.D. (Earth Science, Durham University) in Bremen, North Germany. Paul Campbell (left) and Jens Lamping are pictured above.

CD295 DataView II Display supports our CR200-series Dataloggers

Two DataView Displays, manufactured by Campbell Scientific Australia, are now available. The CD294 DataView Display supports our mixed-array dataloggers, and the CD295 DataView II Display supports our CR200-series dataloggers. Both DataView displays are two-line, 32-character LCDs that show one real-time value, a description, and units. They are typically mounted in an enclosure lid, which allows customers to view the datalogger's data on-site without opening the enclosure.

Customers can enter descriptions, choose units, and specify the data that will be displayed. Up to 18 input locations can be specified for the CD294, and up to 30 public variables can be specified for the CD295. Two buttons are provided for scrolling through the data.

RTMC 2.0 now shipping

RTMC 2.0 has more polished components, zoom capabilities on graphs, auto-tabling for dynamic displays, and a floating toolbox. RTMC forms can be displayed on the same or remote PCs. Forms can be fed into the RTMC Web Server for "on-the-fly" html displays. Version 2.0 can import forms created in earlier versions.

PConnect and PconnectCE- New Versions on the Way!

In early 2006, Campbell Scientific will release new versions of PConnect and PConnectCE. PConnect provides a Palm OS-based field solution for communication with our dataloggers; PConnectCE provides this same solution for PocketPC/Windows Mobile 2003 platforms.

PConnect 3.2 will add support for our CR3000 Micrologger® and implement Bluetooth communication capability. PConnectCE 2.1 will add support for the CR3000 (Bluetooth communication is currently supported in 2.0).

WXT510 Weather Transmitter

The WXT510 Weather Transmitter, manufactured by Vaisala, measures wind speed and direction, precipitation, barometric pressure, temperature, and relative humidity—all in a single device that has no moving parts. The WXT510's SDI-12 signal can be measured by any of our SDI-12 equipped dataloggers. The WXT510 is about the size of our larger Gill radiation shield, making it ideal for use with our CR200-series dataloggers in applications requiring quick, short-term deployment. However, the WXT510 is not intended for weather stations that require research-grade performance.

CAMPBELL SCIENTIFIC CALENDAR

Date	Event	Location
January		
29- Feb. 2	American Meteorological Society Annual Meeting	Atlanta, GA
February		
1-3	Fish Farming Trade Show	Greenville, MS
9-11	Golf Industry Show	Atlanta, GA
13-16	Aquaculture America 2006	Las Vegas, NV
13-17	Colorado Rural Water Conference	Colorado Springs, CO
14-16	World Ag Expo	Tulare, CA
20-24	Ocean Sciences Meeting	Honolulu, HI
22-24	Montana Rural Water Conference	Great Falls, MT
28- March 2	Rural Water Association of Utah	St. George, UT
March		
20-23	New Mexico Rural Water Association (NMRWA) Conference	Albuquerque, NM
April		
11-13	USGS Western Region Data Conference	Sacramento, CA
17-20	Western Snow Conference	Las Cruces, NM
May		
7-11	National Monitoring Conference	San Jose, CA
June		
4-7	WindPower 2006	Pittsburgh, PA
13-15	CHIDER Data Conference	Louisville, KY
14-16	Pacific NW Snowfighters	Spokane, WA
20-22	Air & Waste Management Association	New Orleans, LA
July		
9-12	ASABE International Meeting	Portland, OR
9-15	World Congress of Soil Science	Philadelphia, PA
20-23	Recirculating Aquaculture	Roanoke, VA
24-27	StormCon	Denver, CO
August		
6-9	Bridges and Structures of the 21st Century	Philadelphia, PA

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



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