
CAMPBELL SCIENTIFIC
Australia, Pty Ltd
WHEN MEASUREMENTS MATTER

In This Issue.....



# Team CSA Raises Money for Charity

## *And gets some well needed excercise!*

Earlier this year, the team banded together to participate and raise money for the Queensland Cancer Fund's "Relay for Life". For those of you who may not know - Relay for Life is an 18 hour relay event that focuses on not only raising money for cancer research but also celebrating the survivors and remembering those who have lost the battle with cancer. It also gave the team a good dose of well needed excercise!

*Our very own Octopus's garden!*

It was an action packed event and it was great to see such a large turn out for the cause – even better to see so many people in costume. CSA raised over two thousand dollars for the day – and have set our sights even higher for next year!

Special mentions have to go to our sales whiz *Michelle* for organising the team & order/admin guru *Sarah* for her very impressive octopus costume – you ladies are champions!

If you're in QLD and interested in participating next year go to - http://www.cancerqld.org.au/events/rfl.asp

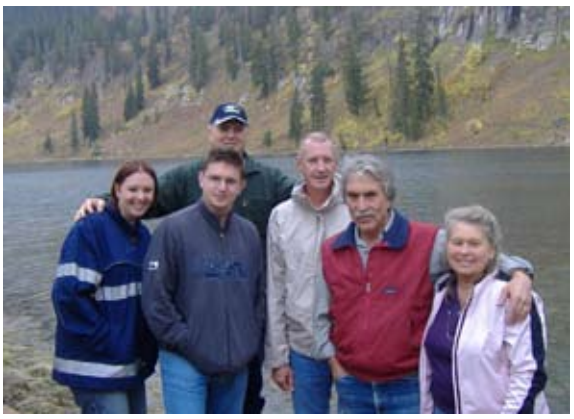
# *CSI Affiliates Conference 2007*

Every 18 months or so, various team members from the Campbell Scientific affiliates covering North and South America, Australia and South East Asia, Europe and Africa converge on Logan, Utah to discuss developments and opportunities within our various territories. The 2007 Campbell Scientific Marketing Conference, conducted in the last week of September, was attended by Steve Bailey, Gavin Shaw and Belinda Beer from CSA.

The environmental monitoring market is extremely vibrant at present and although we can't say too much just yet, this was reflected in a range of new hardware and software products due to be released over the next several months.

CSI produces all of their own data loggers in-house, and while there, it was announced that a new record had been set for September with over 1000 units of the CR1000 data logger shipped for the month. This relatively new logger has been an incredible success due mainly to its increased flexibility and measurement capability.

Other breaking news is that CSI has recently purchased the D&A Instrument Company who are renowned for their quality turbidity sensors and will now be manufacturing these products in their Logan, Utah factory.



Belinda, Gavin & Steve with Brain Day (CS Canada), Bert & Cookie Tanner (CSI)

# 2008 Training Schedule Announced

## And an optional 4th day now included!

Since the introduction of our CR1000/CRBasic training in late 2005, our courses have gone from strength to strength, with most being completely sold out. We're pleased to announce our upcoming training schedule for 2008, as well as the inclusion of a 1 day advanced course !

For all training enquiries please contact - bree@campbellsci.com.au

### *CRBasic Programming Course 3 Day (formerly CR1000/CRBasic Training)*

This three day course is suitable for beginners to intermediates and perfect for those working in the field or supporting Campbell data loggers.
The course covers many aspects including –

- Campbell Scientific Data Logger Hardware, Operations & Capabilities
- Introduction to PakBus & Loggernet
- Hands on programming using the CRBasic language
- Network features of PakBus & CRBasic data loggers

The course is only for users with CRBasic data loggers, including our CR200, CR800/850, CR1000, CR3000 & CR5000 data loggers.

### *CRBasic ADVANCED Programming Course, 1 Day*

Our advanced course will be held as either a 4th day option for those attending our standard training, or as a standalone 1 day for those who have attended a previous course.

Our advanced course covers –

- Program Execution Options (Including Pipeline/Sequential Mode)
- Programming for Serial Sensors/Devices (Including SMS messaging & Strings)
- Programming for Custom File Formats
- Internet Protocols (Including PPP, TCP I/P, Email)

It is important to note that this course is only suitable for those who have a high level of knowledge with CS loggers and will require complex programming knowledge in the field.

### *UPCOMING COURSES*

Mar 10th - 12th, Gold Coast - CRBasic Programming Course

Mar 13th, Gold Coast - CRBasic Advanced Course

Apr 28th - 30th, Melbourne - CRBasic Programming Course

May 1st, Melbourne - CRBasic Advanced Course

Jul 14th - 16th, Townsville - CRBasic Programming Course

Jul 17th, Townsville - CRBasic Advanced Course

Sep 22nd - 24th, Sydney - CRBasic Programming Course

Sep 25th, Sydney - CRBasic Advanced Course

## CR1000 & CR800 Series Memory Increase

CSI have recently announced that they will be increasing the CR1000 & CR800 series standard memory to 4MB from the previous 2MB.

This change is now in effect and customers will start to receive the new standard 4MB models after all existing stock is sold.

The upgrade was made to allow for increased storage of programs & data and will not affect the pricing, which will remain at the current listed price.

# Managing and Securing Your Data

## How much does your data mean to you?

Whether it's personal finances, business operations or sending an email to our dear old mum, in today's society we are extremely reliant on computers.

As with most things that we take for granted, our reliance on computers isn't necessarily apparent until it becomes unavailable, or stops working properly. However, managing the backup of our critical information is not something most of us ever consider when purchasing or configuring a new PC.

The cost of losing data is often immeasurable and is usually far more than the time required to re-configure the system. Thankfully, the reliability of computers and the capability of the associated backup systems have improved significantly, but there are still times when a computer-related issue leaves us with the risk of losing information.

Loggernet software includes a facility to backup and restore the Network Map in the Setup screen. This backup process creates a file which includes all the details of the stations that have been configured. This gives you a quick and easy way to restore the data logger network in the event of a hard drive failure or to create the network on a new PC without having to enter all the details for each site again. Backing up the network can be done by clicking on Backup Network in the Tools menu on the Setup screen. The process is quick and it is recommended that the back up be done every time a change is made to the Network map.

Restoring a network from a backup file is also a quick process and can be done by clicking on Restore Network in the Tools menu on the Setup screen. Backing up the data itself and the Loggernet working folder (C:\Campbellsci\Loggernet\) is also recommended and should be part of a larger IT-based backup policy.

Data loggers are generally programmed such that when the memory fills up, they begin overwriting the oldest data. Loggernet will generally be configured to collect the new data each time a collection is done. As long as the data is collected before the logger overwrites any uncollected information, no data will be lost. If a computer failure occurs and the collection of data from the loggers is delayed, there is potential for the logger to overwrite uncollected information. The likelihood of this will depend on the amount of data being stored and the rate at which it is being recorded.

Consideration of the capacity of the logger memory (in terms of days to fill) is a critical design parameter and should not be overlooked. The standard memory of the CR1000 and CR3000 data loggers can be expanded using Compact Flash Cards (up to 2GB) and the CFM100 Compact Flash Module.

### *Why is Compact Flash the only supported media? What about USB Memory Sticks and other types of cards?*

The reason for this is based on our discussion above – the cost of losing data. Most data logging applications are conducted in the field and under less than ideal conditions. These locations are almost always outside, in remote locations and in an environment with some exposure to weather conditions.

Significant testing was done when evaluating data storage devices for use with the data loggers. These tests included temperature extremes, electrostatic discharge events and impact tests. These tests were conducted on multiple types of storage media and on multiple brands and models of each media. Compact Flash proved to be the best performer in these tests and the Industrial Grade cards from Silicon Systems were the best of the CF cards. These are the only cards that passed the ESD testing process and as such they are the only cards that Campbell Scientific recommends. The cost of one of these cards is higher than some of the others on the market, but the question is what price can be put on the data that is stored on them? The cost of losing one set of data would far outweigh the extra cost for the most reliable field data storage device available.

Be sure to follow the instructions in the manual for entering and removing the Compact Flash cards in the CFM100. The process involves pressing a button and waiting for the green light before removing a card. This avoids the possibility of removing a card while it is being used by the logger. Removing a card during a read or write process comes with a high likelihood of corrupting the data on the card.

So, when designing a data logging system, be sure to consider data storage at both the data logger and the PC end. Determining the capacity of the data logger memory (number of days) can be done by looking at the Status table of the CR800/CR1000/CR3000 data logger. Each data table will have an indication of the number of records that the table can hold before overwriting and an estimate of the number of days required for that table to fill. This estimate (number of days) will be correct for time-based tables (tables stored on a regular interval) but will be underestimated for event-based tables. When calculating these values for event-based tables, the logger assumes that the event that causes a record to be written to the table will occur on every scan – this is obviously the worst case scenario in terms of filling the logger memory and is probably fairly unlikely.

For event-based tables, it is wise to use the number of records (number of events) as the way to determine the capacity of the logger memory for this table.

For more information on data storage using Compact Flash modules or just calculating the capacity of the logger memory, check **www.campbellsci.com.au/data-storage** or contact one of our support team on **support@campbellsci.com.au**

## NEW SOFTWARE DOWNLOADS RELEASED!

*The following sotware upgrades and operating systems have recently been added to the downloads section of our website - www.campbellsci.com.au/downloads*

- *LoggerNet 3.4.1 (free upgrade for all v3.x users)*
- *Visual Weather 2.2*
- *CR200 Series O/S Upgrade*
- *DevConfig 1.9*

# Calibration - The key to maintaining accurate data

Anyone who uses a Campbell Scientific data logger for any application can appreciate the accuracy and reliability they provide. Our data loggers have a reputation for very high mean-time- between-failure (MTBF) rates and here in Australia some clients are still collecting data with loggers that are approaching twenty years of age.

There are a number of factors that have attributed to the success of our data loggers over the years. Such factors include engineering design and manufacturing techniques as well as high standards of calibration. The National Institute of Standards and Technology works hard to define standards that test equipment are calibrated against. Each data logger manufactured by Campbell Scientific is calibrated with NIST traceable test equipment. The second stage of the manufacturing process involves testing every individual data logger in a purpose built environmental chamber that exercises temperatures from -25°C to 65°C. Whilst being tested in the environmental chamber, the accuracy of the data logger's measurements will be closely monitored to ensure that specified accuracy is met. Extended temperature rated certification from -55°C to +85°C is also available for most loggers at special request.

WANT TO KNOW MORE?
Contact our team on
repairs@campbellsci.com.au

## Why Calibrate Your Data?

Like most instruments on the market, the calibration performed on the data loggers should be checked and adjusted over time to ensure the accuracy is maintained for all applications. We recommend that all loggers be recalibrated every two years to keep accuracy at the highest level possible. Our repair department is fully equipped with the necessary NATA traceable test equipment to service your data logger to the required standard. Once completed, the calibration label located on your logger is updated to reflect the next service date. If your logger is identified to be out of calibration or there is uncertainty as to when calibration was last performed, then contact our repairs department direct on repairs@campbellsci.com.au

## Is It Just Data Loggers That Require Calibration?

Maintenance or calibration does not stop at data loggers. All sensors used in monitoring systems will need servicing, calibration or replacement at some point. A few recommendations have been put forward for the maintenance and calibration of different sensors.

- For Wind Speed and Direction sensors, we recommend replacement of bearings at one to two year intervals dependant on the environment the sensor is in stalled in. If the sensor is equipped with a reed switch, then the switch should be replaced at the same frequency as the bearings. Potentiometers in wind direction sensors should be replaced every two to four years.
- The HMP45 temperature and relative humidity sensor should be recalibrated at one to two year intervals and the RH chip should be replaced once every five years at recalibration.
- The HMP50 sensor should have the RH chip replaced at two year intervals and the sensor should be replaced every four years.
- Rain Gauges such as the CS700 should have the tipper assembly recalibrated on a 12 month basis to ensure the rainfall measurement is within specification.
- Solar radiation sensors (LI200X and Apogee PYR) require specialist labs to recalibrate them. These labs are normally located at the manufacturer's premises and while there can be significant costs involved recalibration or replacement is recommended once every two to four years for best accuracy.
- Barometric sensors such as the CS105 should be compared against other barometric units periodically once or twice every 12 months. Recalibration is normally only required if there is any doubt over the measurements the sensor is returning.

The key to successful measurement and data storage is preventative maintenance on the equipment that you are using. The small cost associated with regular, planned maintenance such as cleaning, servicing and calibration is a small price to pay for peace of mind that comes with knowing that your equipment is working optimally.

# NEXT G Modems- What are the options?

According to a press report on 3/10/2007, Telstra claims its Next-G Network has already surpassed the coverage of its national CDMA network some four months ahead of its CDMA switch-off date which is set for 2/1/2007. This is reportedly two weeks ahead of the where it expected to be by October 15th. But despite Telstra's confidence that the switch-off can go ahead, Federal ICT Minister Helen Coonan issued a license condition last month requiring Telstra maintain its CDMA network until there is proof its HSDPA Next-G network can provide a better service.

This will be a relief to many of our existing clients using CDMA for telemetry in rural areas of Australia where the Next G network is not living up to expectations in terms of reliability and coverage.

Over the last several months at CSA we have been evaluating a number of Next G solutions for integration with Campbell Scientific data loggers in anticipation of the switch-over. Modems tested include the Maxon Modmax, the Wavecom SAM3G, and the CDCS CDM800 series.

From our testing, the **Maxon Modmax** appears to be a standout in terms of performance, ease of connectivity and value for money. Because of these benefits, it is the unit that we have standardized on as our recommended NextG solution. CSA's list price for this unit is $950 + GST and that includes the modem, external whip antenna, null modem cable and installation manual. Power consumption is a meager 10mA in standby mode and around 250mA when in use. A full report on how to use this modem with Campbell Scientific data loggers will be available in a future version of our Online newsletter.

The **Wavecom SAM3G** comes a close second to the ModMax. It has a recommended retail price of roughly the same price as the ModMax although it uses a little more power and requires non-standard power cables. Power consumption for this unit is also quite acceptable at 25mA in standby mode and around 250mA when in use.

The **CDCS CDM800** is considerably more expensive than the other two units, but it does come with a number of additional features including an inbuilt router and Ethernet port. However, power consumption with this unit is of the order of 300 – 500mA during transmission and 230mA quiescent – high enough to be a serious concern when not using AC power.

So while the hardware vendors seem to be ready to roll, there are concerns about the readiness of the 3G network. We have heard that many of the current problems are a result of trying to operate the CDMA and NextG networks in parallel but that things will be improving sooner rather than later. We remain optimistic that this is the case and that Telstra delivers a NextG solution as promised.

# Effectiveness of Water Sensitive Urban Design Facilities

## Source - Daniel Giglio & Nathaniel Parker, DNR Indooroopilly

As concern for environmental issues increases amongst the general population, most modern urban projects now include a Water Sensitive Urban Design (WSUD), which offers an alternative to the traditional conveyance approach to stormwater management. This is the case in the South East Queensland area where the parties involved in the latest fast urban development have made a real effort to include the program as a means of protecting environmental values in the region. It seeks to improve the ecological condition of urban streams, catchments and receiving waters through on-site reuse of the water in a sustainable manner as well as providing temporary storage. At this stage the effectiveness of WSUD treatment systems under real storm events is largely unknown due to insufficient data.

The Department of Natural Resources in Indoroopilly has been involved in assessing the effectiveness of WSUD facilities in place at Coomera Waters on Queensland's Gold Coast and predicting the quality of water exiting WSUD devices to the environment. The WSUD facilities include swales, a rain garden, a number of bio-retention basins and wetlands – all situated in an urban area. The key aim is to find reliable data justifying the efficiency of the WSUD stormwater system in place. Storm flow and rainfall measurements together with water samples taken at specific times throughout the flow period will allow researchers to compare water quality parameters such as nutrients, suspended sediment and heavy metal load at inlet and outlet points in these treatment systems.

To collect the data, DNR has been using water samplers, pressure transducers, flow velocity sensors, tipping bucket rain gauges and custom-designed, calibrated V-Notch weirs. These sensors provide measurements of total discharge and flow rate at the weirs or creeks, water temperature, rainfall, suspended sediments and the amount of nutrients and metals in the water samples collected during flow periods. The Campbell Scientific CR1000 and CR211 data loggers employed in this project use the Pakbus® communication protocol to communicate by three separate radio networks. The data routed from the CR211s to the CR1000s is then made available to a DNR central PC via GSM modem connection.

### APPLICATION AT A GLANCE

**APPLICATION TYPE -**
Urban Storm Protection

**PROJECT AREA -**
Gold Coast, Queensland

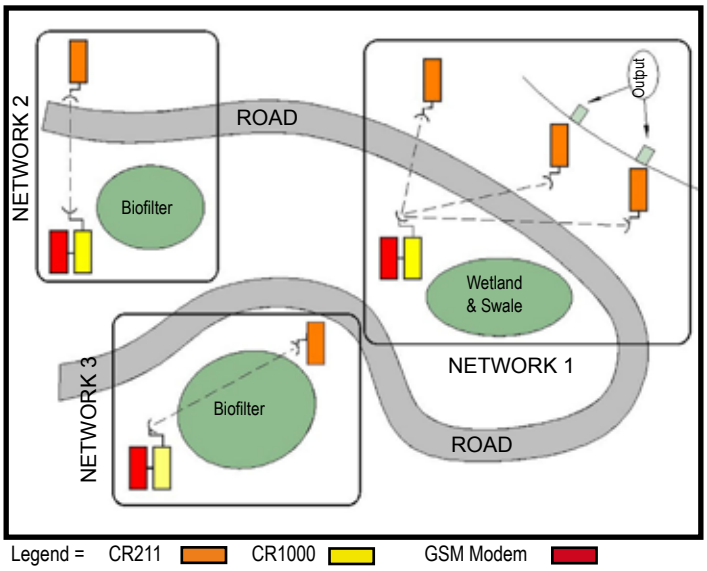
**DATA LOGGER -**
CR1000 & CR211's

**COMMUNICATION LINKS -**
Direct download and remote telemetry

**MEASURED PARAMETERS -**
Water height and velocity (total discharge and flow rate), water temp, rainfall, suspended sediments, water nutrients and metals.

Since its implementation, the system has been provided very promising results. Multiple samples and data have been collected and DNR is currently identifying the characteristics of the WSUD facility in place at Coomera Waters.As the overall impact of these development works will only be known after long term collection of data through many seasonal variations, study at this site will no doubt continue for some time to come.

Wetland Radio Network Map



# Serial I/O Communications...

## For CRBasic Dataloggers


***Serial communication is one of the most common forms of communication currently in use. However, many of our customers are unsure of exactly how it works, what is involved, and how it can be used with Campbell data loggers.***

Serial communication is the process of sending data one bit at a time, sequentially over a single communications channel. There are several different types of serial communication, and these can include RS232, RS485, Ethernet, SDI-12, and USB (universal serial bus). Devices involved in serial communication are generally linked together by a cable and each type of serial communication requires a different type of cable.

RS232 is the most common type of serial communication that we use with Campbell data loggers.

### *Background Information on RS232*

In an RS232 connection, 3 basic lines are required:

- Transmit (Tx)
- Receive (Rx)
- Ground

Each line is a separate piece of wire. The Tx and Rx lines are where most of the action occurs when two devices are communicating. All lines, excluding Tx, Rx and Ground, that may be involved in establishing communications are known as handshaking lines. Some devices require the use all of the handshaking lines and some use no handshaking lines. This is unique for each RS-232 device.

It is important that the Tx line on one device must be linked to the Rx line on the other device and vice versa. Otherwise, communications will not occur. Due to this, an industry standard was formed. The standard involved two different configurations of RS-232 devices, where the Tx and Rx lines were in fixed pin positions. These are DCE (Data Circuit-terminating Equipment) and DTE (Data Terminal Equipment). For example, a DTE device might be a PC, and a DCE device might be a data logger or modem.

The standard Pin configuration of a DTE RS232 device is Pin2 as the Rx line, Pin3 as the Tx line, and Pin5 is ground. Whereas, the standard Pin configuration of a DCE RS232 device is Pin3 as the Rx line, Pin2 as the Tx line, and Pin5 is ground.

This Pin configuration enables you to communicate between a DTE device and DCE device using a "Straight-Through Serial Cable". However, when communicating between "like" devices, such as DTE-to-DTE or DCE-to-DCE, a "Null Modem Cable" is required. A Null Modem Cable internally crosses the Tx and Rx lines over, thus allowing data to be transferred.

Rule of Thumb: An easy way to tell DTE and DCE devices apart is that DTE devices generally have a male connector and DCE devices generally have a female connector.

### *Communicating via serial on a CRBasic Data Logger*

The control ports on the CR800/CR850/CR1000 can be configured as Com Ports. Note: these are in pairs of Tx and Rx – no handshaking. The CR800/850 has two Com Ports and the CR1000 has four Com Ports. All the loggers also have both CS I/O and RS232 ports.

All of the Com Ports (including CS I/O and RS232), can be configured independently (i.e. each port can have different settings, such as baud rate, stop bits etc.). Furthermore, all of the ports can be communicating independently at the same time. This is due to the data logger having independent hardware for each communication port. Port configuration is done through Device Configuration Utility.

### *Why use serial communication?*

Our data loggers support an extensive list of serial instructions. The main use for serial instructions is to communicate to serial devices including sensors, telemetry devices and even other data loggers.

Sensors: An advantage of a serial output is that data is digitised, and can be moved longer distances, without loss of signal. Some sensors, such as a GPS, are limited to a serial output as they output strings of letters and numbers. Some sensors can measure multiple parameters. For example, the Windsonic 2D sonic anemometer measures wind speed and wind direction. Through serial communication the logger is able to collect data from both parameters simulatneously, only utilising a single channel.

Telemetry: Serial communications allows the sending and receiving of SMS messages via a cell phone modem. The serial ports can also be used in conjunction with a modem to establish PPP connections to the internet. This opens up a number of communication possibilities which make use of the TCP/IP stack of the data logger.

Serial communications of one form or another are used extensively in measurement and control applications. Whether used for sensors, telemetry or networking, Campbell Scientific data loggers and the powerful CRBasic programming language provide the maximum flexibility in serial communication for your application.