



#### In This Issue.....

##### Tech Tip

- Loading Operating Systems into Your Campbell Logger

- Visual Weather

##### Instrumentation 101

- Differential vs Single Ended Measurements

##### CSA Case Study

- Monitoring Weather Conditions On Sydney Harbour Bridge

## Finalising Your End of Year Budget? CSA Stocks Up For End Of Financial Year!

Looking to finalise your end of year budget? Make sure you get your order in early to ensure you receive the goods by 30th June!

End of financial year is always a busy time for us, and while we try to ensure that we have plenty of stock it's a good idea to let us know if you are planning to purchase, so we can make sure the equipment is here for you. General delivery times for items not in stock are 6-8 weeks as CSI manufactures to order – and as a result, sometimes customers miss out on spending their final budget.

If you or anyone in your office are planning to order items that require delivery **BEFORE JUNE 30th** email [bree@campbellsci.com.au](mailto:bree@campbellsci.com.au) with the product details & an estimate of quantity. Our sales team will contact you if required to get any additional details. Note that these estimates are not binding at all – we just want to make sure that your stock is available and ready for delivery!

## GM Report - Vietnam & China Tour

One of the more pleasurable aspects of my job is visiting foreign countries in the line of duty. In the last few weeks I have had the opportunity to visit Vietnam and China, both of which were first time visits. My first impressions of Hanoi were that of a smoggy, busy city. And then there was the traffic! I have never seen so many motor scooters, push bikes and other two, four and six wheeled contraptions.



However, within little more than a day of wandering around the city, the beauty of its people shone through. Despite the hardships, there is a wonderful feeling of optimism, warmth and friendliness that is rarely present in our western world. And with regard to the traffic, I have never seen so much orderly chaos result in such an incredibly smooth flow of humanity. Despite the apparent lack of road rules and traffic lights, the constant tooting of car horns and the incredible number of vehicles of varying speed on the road, there is complete respect for others and absolutely no sign of road rage. I'm sure there's a lesson to be learnt there somewhere.

My main purpose of the visit to Vietnam was to meet and hopefully sign up a new distributor for hydro-meteorological applications in Vietnam. HYMETCO is a local company that had been highly recommended by D&A Sensors, a recent acquisition by Campbell Scientific, Inc. After spending a day talking with the principals of the company and meeting with some of their clients, we were impressed by HYMETCO's people, capability and attitude towards customers. An agreement was promptly reached and HYMETCO is now an authorized distributor for Campbell Scientific products for hydrological and meteorological applications within Vietnam. Geotech International remains the Campbell Scientific distributor for geotechnical applications within Vietnam.



The next stop was the beautiful, neat seaside city of Dalian in North Eastern China. Dalian has a population of around three million and is a well laid-out city with orderly traffic flow. It has an excellent public transport system and modern shopping facilities with every conceivable luxury. My purpose in visiting Dalian was to inspect the factory of one of our new sensor manufacturers and suggest changes to a new product line.

Although Hanoi and Dalian were of a similar size in terms of population, they were incredibly different in their organization and traffic flow. I saw very few motorcycles and pushbikes in China and yet in Vietnam, they would have accounted for 80% of the traffic volume. The highlight by far in both countries however, was the incredible variety of quality food available and the warmth and friendliness of the people. I was also surprised at the ready availability of luxury goods such as wide-screen TV's, cellphones, computers, etc

and at the number of high-end luxury vehicles on the streets. It seems that capitalism is alive and well in both countries.

# Want to Catch Up with Our Team?

## See us at Irrigation, Enviro or NMW this May!

Our team are geared up for a very busy couple of weeks with exhibits at Enviro 08, Irrigation 08 and National Manufacturing Week throughout May. If you are in the area why not pop in and say hello?

The trade shows are free to visit – all you need to do is register as an attendee!

Below are the dates, booth numbers and web addresses for registration. If you need any more information don't hesitate to contact [bree@campbellsci.com.au](mailto:bree@campbellsci.com.au) for more info.



EXHIBIT	WHERE	WHEN	BOOTH	MORE INFO
Enviro08	Melbourne	5-7 May	W33	<a href="http://www.enviroconvention.com.au">www.enviroconvention.com.au</a>
Irrigation 08	Melbourne	20-22 May	710	<a href="http://www.irrigationaustralia.com.au">www.irrigationaustralia.com.au</a>
National Manufacturing Week	Sydney	27 - 30 May	4302	<a href="http://www.nationalmanufacturingweek.com.au">www.nationalmanufacturingweek.com.au</a>

## New & Second Hand Stock Discounted

We're cleaning out the cobwebs in our stock room for the end of financial year! We have several new and second hand items that need to be sold prior to June 30th – so we've discounted these items for quick sale.

Please contact [bree@campbellsci.com.au](mailto:bree@campbellsci.com.au) for more information on the below items.

### NEW STOCK

1 x 05106-L RM Young wind monitor (Brand New but out of calibration) - \$1200 + GST **NORMALLY \$1675.00 + GST**

1 x 014A-L Met One wind speed sensor (Brand New but out of calibration) - \$430 + GST **NORMALLY \$605 + GST**

1 x CR10X Wiring Panels can still be purchased - Brand new for \$455 + GST

### SECONDHAND STOCK

1 x CR510 Data Logger- \$1200 + GST

9 x CR10XM Measurement and Control Module (Cannister only) - \$1100 + GST

\*These loggers will be calibrated before delivery.

1 x AM25T Multiplexer- \$1200 + GST

1 x DB1 Liquid Level Sensor- \$940 + GST

1 x CS105 Barometer- \$700 + GST



## CRBasic Training

### We've discounted our Townsville course to only \$650 + GST!

Want to escape the cold dreary winter weather? Head up to Townsville for training!

As it's our home base (yep, we're lucky enough to live here) we've discounted our 3 day CRBasic programming course by almost 20%, so why not come and join us? Oh and the added bonus of a few days of breezy sunshine rather than subzero conditions!

The course will teach you all you need to know about Campbell loggers and software. For our more advanced users we also now have our 1 Day Advanced CRBasic course - suited for those who require complex programming skills.

Below is our training schedule for 2008, for all pricing and info please contact [bree@campbellsci.com.au](mailto:bree@campbellsci.com.au)

WHAT	WHERE	WHEN	SEATS
CRBASIC PROGRAMMING 3 DAY	TOWNSVILLE	14-16th JULY	16
CRBASIC ADVANCED 1 DAY	TOWNSVILLE	17th JULY	7
CRBASIC PROGRAMMING 3 DAY	SYDNEY	8-10th SEPT	16
CRBASIC ADVANCED 1 DAY	SYDNEY	11th SEPT	7



# Loading Operating Systems into Your Campbell Data Logger

From time to time, new revisions of data logger firmware are released, to add or upgrade logger features or to fix problems that may have been uncovered in a previous application. Logger operating systems are available for download for free from the CS websites. Loading an operating system into the logger is a simple process, but one that should be done carefully.

There are three ways that the operating system can be loaded.

1. Through Device Configuration Utility software and a direct, serial connection.
2. Through the Connect Screen in Loggernet software, via any of the supported communications options
3. Using a compact flash card and CFM100, controlled by the Powerup.ini file

In terms of speed of transfer and the contents of the logger memory, the results of loading an operating system vary, depending on which of the methods (above) is used to load the file.

## Speed

Fastest – Loading OS from Compact Flash

Slowest – Loading OS via Connect Screen

## Memory

When loading an operating system through Device configuration Utility, the contents of the logger's CPU memory are cleared and all settings (including the Pakbus address) return to their default setting. When loading an operating system through the Connect Screen or from the Compact Flash card, the contents of the CPU memory are retained as are the settings.]

## Running Program

In all cases, loading an operating system will stop the currently running program. In the case of loading the OS through Device Configuration Utility, this is because the CPU memory (where the program is stored) is cleared. The fact that there is no running program, can potentially cause connection issues to the site, especially if things like the switched 12V supply is used to power some integral equipment (such as the modem) or if custom baud rate settings are needed for successful interfacing with the communications device. For a discussion on ways to minimise the risk of these events occurring catch next issue's article on Safety Net for Logger Settings.



# Visual Weather, the answer for ET107 Weather Stations

The introduction of our CR1000 data logger has brought significant improvements to the world of measurement and storage solutions. There are many new features in the CR1000 that expand on the capabilities of the old CR10X model, including packet based communications, improved programming language and more memory. The CR1000 has been incorporated into the new ET107 series weather station, which replaces our ET106 station (CR10X-based), which was a trusted and reliable source of weather information for many years. Many leading irrigation corporations combine their own custom software to retrieve information from the stations with sophisticated irrigation systems to improve efficiency in water usage and quality of management.

The new packet based communication of the CR1000 is known as Pakbus, and is specific to Campbell Scientific data loggers. The Pakbus protocol opens up a host of new communications and network options in a similar way to TCP/IP. To make use of these new features, new interfacing software with Pakbus support must be used. It is for this reason that previous versions of weather station software are not compatible with the ET107. If a graphical software package is needed to interface with the ET107, then Visual Weather from Campbell Scientific is the product you'll need.

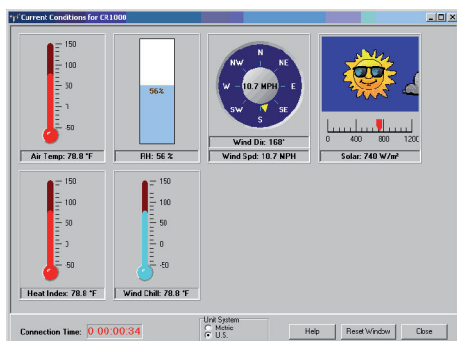
Visual Weather has complete support for older versions of weather stations, such as the ET106 and MetData 1. Additionally, Visual Weather includes support for custom built weather stations. This custom weather station option includes support for stations built around the CR1000 (including the ET107). For operators of the ET107, Visual Weather is an excellent option for a communications interface with the station as it can provide a graphical representation of the data and the ability to provide custom reports based on weather conditions. These reports can include calculations and models such as crop water needs and ET<sub>o</sub>. Collection of data from the ET107 (or any other weather station) can be configured to operate on automated schedules and over telemetry links including direct connect, phone modems, Ethernet links, radio and combinations of these. Visual Weather can be used to manage and collect data from a number of weather stations on a single PC.

The new version (Version 2.1) of Visual Weather now includes some of the features found in Loggernet software.

These new features include -

- The ability to backup and restore the network of loggers
- Improved options for importing data
- Better collation of data and additional output options
- Reports can now be produced in X/Y graph format in addition to traditional report styles
- Extensive web based output features including HTML and XML-based data files to make data available on the web or for importing into a data base.

For more information on how Visual Weather, please contact our sales team on [info@campbellsci.com.au](mailto:info@campbellsci.com.au)



# Differential vs. Single Ended Measurements

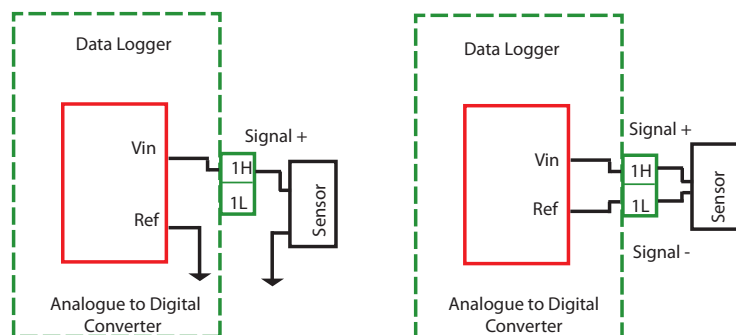
In this issue we will concentrate on analogue voltage measurements and the two basic groups – single-ended and differential. We'll compare these two groups and the points to consider when deciding how to measure a particular signal.

## So, what do the terms “differential” and “single-ended” mean?

Differential simply means “*of, or pertaining to a difference*”, which reminds us that a voltage is a *difference* between two conductors. You can't measure a voltage with only one wire - there must always be a reference connection. In essence, this means that *all* voltages are differential

## If all voltages are differential, what does “single-ended”? mean?

It all has to do with the choice of our reference.



Imagine that we want to measure a number of voltages around a car. We could run two wires to each measurement point in the car, one for the signal and one for the ground. But, if all of these measurements are referenced to the chassis, we can simplify everything by connecting one wire to the chassis and then connect only one wire to each measurement point. This would save a great deal of wire and effort. This simplification involves an assumption that all of the measurements share a common reference and so we need only change one “end” of each signal, hence the term “single-ended”. In the case of a datalogger, the assumed reference is the datalogger analogue ground.

## Why would we choose one method over the other?

Below is an explanation of some of the differences between these techniques. For many applications either method will work perfectly, however there are some situations in which the quality of your measurements will be greatly improved by the correct choice of “ended-ness”

## Wiring

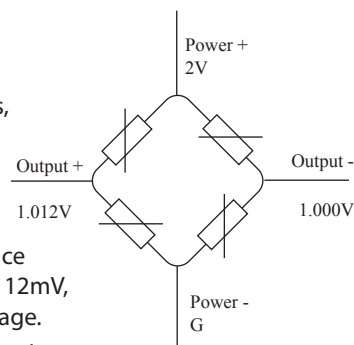
One obvious difference between both of these techniques is the number of terminals. Single-ended configurations only require one terminal on the datalogger wiring panel and so a given logger can measure twice as many single-ended signals as differential ones.

To maximise flexibility each datalogger channel can be configured as either differential or single-ended, so there are two different numbering schemes. Each differential channel has a “high” terminal and a “low” terminal. These are labelled with the channel number along with “H” or “L” (e.g. 1H, 1L, 2H, 2L), whereas single-ended channels only require one wire each so the terminals are just labelled with the channel number. Normally the single-ended and differential channels are labelled in different colours to avoid confusion.

## Common Mode Voltages

Some sensors produce an output for which the reference is significantly different to the datalogger. For example, a full-bridge pressure sensor might have a “-” output of 1000mV (with respect to the datalogger ground) while the “+” output may be at 1012mV. In this

case the signal could be thought of as a small voltage signal on top of a large offset. Because this offset voltage is common to both terminals, it is often referred to as the “common mode” voltage. If these signals are measured differentially, the analogue to digital converter in the datalogger sees only the difference between the high and low inputs i.e. 12mV, not the 1000mV common mode voltage.



While it would be possible to measure this sensor single-endedly, it would require 2 single-ended channels in the 2500mV range. Since the number of terminals used is the same and the resolution is worse, this technique is rarely used.

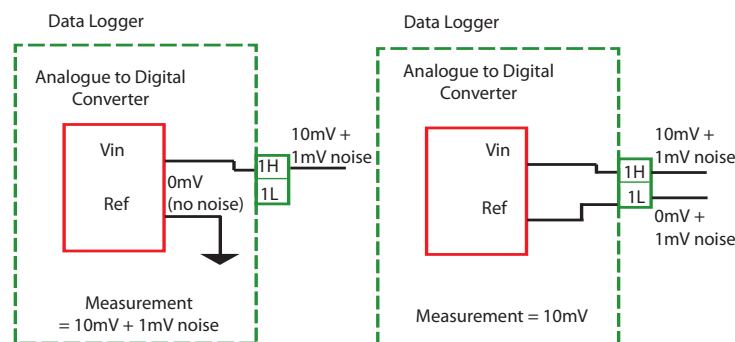
It is worth noting that while in the theory the differential measurement is independent of the common mode voltage of the inputs, there are practical limits to the common mode range of the differential inputs of any logger. Consult your manual.

## Resolution

Some dataloggers allow you to perform polarity reversals when making differential measurements. In this case, the datalogger automatically takes a differential measurement, reverses high and low terminals (internally) and measures again. The two measurements are then averaged to yield the final value. These reversals allow the logger to remove slight imbalances in the high and low sides of the analogue hardware, but it also has the added benefit of effectively increasing the measurement resolution by 1 bit. This is not possible with single-ended measurements..

## Noise

Another area where these techniques differ is noise immunity. Consider the following scenario: a 10mV signal is being measured over a long cable that runs past a large pump which emits a large amount of electrical noise. Because of the close proximity of the cable to the pump, the cable will act like an antenna and will conduct a small amount of noise (let's say 1mV). The diagrams below show the two different configurations.



When we compare the measurements made at the datalogger, we can see that by measuring the signal differentially, the induced noise (which should be present equally on both wires) cancels out, whereas the reference in the single-ended case is connected to the system ground (which should be free from noise) and so noise appears in the final result. This does not obviate the need for shielded cables, but can help to reduce the effects of noise even further. Because the induced noise is normally quite small, this effect becomes more important as the desired signal gets smaller.



# Monitoring Weather Conditions on Sydney Harbour Bridge.

*\*Images provided by Phil Newman of BridgeClimb & Ron Russo*

On the 1st October 1998, BridgeClimb commenced operations hosting guided Climbs to the top of one of Australia's most famous engineering icons, the Sydney Harbour Bridge. To date, over two million tourists and locals have made the Climb with many claiming it as the most memorable thing to do in Sydney.



Naturally, safety is of paramount importance to BridgeClimb. As well as ensuring that there is no possibility of danger to Climbers or those below, there are other factors that also need to be taken into account. Weather conditions 134 metres above sea level on top of the famous "coat hanger" can vary considerably from those on the ground. Due to this, accurate weather information from the top of the Bridge needs to be made available to the BridgeClimb team in real-time at their operational headquarters.

In 2005, Campbell Scientific Australia was approached to provide a reliable, cost-effective solution for providing weather monitoring equipment, associated software, communication equipment and computer displays of the current weather conditions on top of the bridge.

Campbell Scientific's smallest data logger, a CR200 was selected for the role. An RM Young 05103 Wind Monitor measures wind speed & direction while a Vaisala HMP45C measures RH and air temperature. This equipment is installed at a point on top of the bridge known fondly as Blinky Bill, a small landing supporting an aircraft hazard warning light. The equipment runs from an AC power supply with battery backup. Data is transmitted to BridgeClimb's operational headquarters at the base of the bridge using a pair of Trio 450MHz radios and a Yagi directional antenna.

Updated information is provided by radio every minute while weather information is automatically updated

on BridgeClimb's webpage every half-hour. The data are collected using Campbell Scientific's Loggernet software. Data presentation is handled by RTMC, the graphical display module of Loggernet, and presented in multiple different formats - for the Climb Operations & Safety Team, on monitors in the foyer and delivered to the BridgeClimb web site. This data can be viewed at - <http://www.bridgeclimb.com/theClimb/weather.htm>

A number of Campbell Scientific employees have since made the memorable journey over the bridge. They include Alex Thomas (of CSA) and his family, Paul Campbell (President of Campbell Scientific Inc) and two of his children, and Brian Day (Manager of Campbell Scientific Canada). CSA is proud that our equipment was chosen for such a high profile application.

## Application at a Glance

### **Application**

Weather Monitoring

### **Project Area**

Sydney Harbour Bridge

### **Data Logger**

CR200

### **Sensors**

05103 Wind Monitor  
HMP45C Temp & RH

### **Communication**

450MHz Radio

### **Measured Parameters**

Wind Speed  
Wind Direction  
Temperature  
Relative Humidity

#### **Weather Monitoring**

A high quality weather monitoring system is installed at the summit of the Bridge to monitor Sydney weather, including temperature, humidity and wind speed and direction. This allows us to monitor conditions to the minute, ensuring the safety of all Climbers.

#### **Sydney Weather**

What's the weather like in Sydney right now? Check our updated feed direct from the summit of the Sydney Harbour Bridge.

Humidity 100.0 %

Air Temp  
21.3 °C



Wind Chill  
21.3 °C

Avg. Wind Speed  
14.1 km/h

Last Updated 09:30 AEST Tue, 05 Feb 2008

