CAMPBELL SCIENTIFIC
Australia, Pty Ltd

ONLINE

Next year we'll be taking our training courses back to Perth, as well as our regular Gold Coast, Melbourne, Townsville and Sydney events. The ever popular Gold Coast courses are almost full so if you were thinking of doing this one, get your registration in ASAP. Our feeback from the past year has highlighted the level of expertise, knowledge and teaching abilities of our trainers with 99% of those surveyed reporting the knowledge of our trainers was excellent and a further 84% reporting excellent overall value for money. If you want to get the most out of your data logger, you might consider signing up in 2010.

Location	Course	Dates	Venue	Price
Gold Coast	CRBasic - 3 Day	15-17 Feb	Vibe Hotel - Surfers Paradise	$850 ex GST
Gold Coast	Advanced - 2 Day	18-19 Feb	Vibe Hotel - Surfers Paradise	$600 ex GST
Melbourne	CRBasic - 3 Day	15-17 Mar	Medina Executive Northbank	$850 ex GST
Melbourne	Advanced - 2 Day	18-19 Mar	Medina Executive Northbank	$600 ex GST
Perth	CRBasic - 3 Day	17-19 May	Medina Executive Barrack,	$850 ex GST
Perth	Advanced - 2 Day	20-21 May	Medina Executive Barrack,	$600 ex GST
Townsville	CRBasic - 3 Day	21-23 June	Rydges Southbank	$700 ex GST
Townsville	Advanced - 2 Day	24-25 June	Rydges Southbank	$600 ex GST
Sydney	CRBasic - 3 Day	25-27 Oct	Vibe Hotel - Sydney	$850 ex GST
Sydney	Advanced - 2 Day	28-29 Oct	Vibe Hotel - Sydney	$600 ex GST

CSA Christmas Closure

Christmas is fast approaching and we'll be shutting up shop for a short period from COB December 24, re-opening Monday January 4. We'd like to wish you all a peaceful and joyful Christmas and New Year break. We look forward to providing great service you once again in the coming year.

CR200X Data Logger Released

December saw the release of the long-awaited CR200X data logger. The CR200X data logger replaces the CR200 logger which has served the needs of many users with applications involving small numbers of sensor inputs for many years. The CR200X has been redesigned to use a newer processor with more memory which allows the number of public variables in the logger to be doubled, the size of the compiled program to be double and number of data tables that can be declared to be doubled.

The new design also allows a full 3 year warranty to be offered on the CR200X loggers, which is the same as the other CS loggers such as the larger CR800 series, CR1000 and CR3000.

The CR211 logger with spread spectrum radio board has also been superseded by the CR211X, but the new units remain completely compatible with the previous model as do all logger programs and applications.

The best part about the new CR200X series of loggers is that the price has remained the same as the CR200 logger series.

The CR200X is available now and as soon as the CR200 stock is gone, the CR200X will be delivered for all orders.

CSA MYSTERY DAY OUT

The team at CSA were rewarded for a great years work with a mystery day out on the exquisite Magnetic Island. Split into 4 groups and each given a mini moke, a long list of clues and the promise of great rewards, the hunt was on for The Pirate's Treasure. From Horseshoe Bay to Arcadia, CSA were seen everywhere.

Rendezvousing for lunch at 'the local', the winners were decided and in true CSA equanimity, everyone received a share of the bounty, a great lunch and a leisurely ferry ride back to the mainland.

Water Level Measurements

Submersible Pressure Transducers - CS450 and CS455

The Campbell Scientific Submersible Pressure/Temperature sensors, CS450 and CS455, are designed to provide a reliable, accurate pressure (level) and temperature measurement that is fully temperature compensated. The piezoresistive sensor is housed inside a 316L Stainless Steel (CS450) or Titanium (CS455) body and uses a vented cable.

With a 24-bit analog-digital converter built in, the sensor offers mains power frequency rejection and a 0.1% Full Scale accuracy over a 0 – 60 degrees range with measurements controlled by SDI-12 or RS-232 terminal commands. This operation allows the sensor to have a very low current consumption from an input voltage range of 6 – 18V DC.

The CS450/CS455 sensors are available in a number of range options:

0-20kPa
0-50kPa
0-100kPa
0-200kPa
0-500kPa
0-1000kPa

Contact CSA or visit the website for more details:

www.campbellsci.com.au/cs450
www.campbellsci.com.au/cs455

Radar Water Level Measurements

CS475, CS476 and CS477

The CS475/CS476 and CS477 are radar-based distance sensors that can be used to measure the distance from the sensor face to the target, which can be solids or liquids. These sensors emit short microwave pulses and compute the distance to the target from the time taken for the pulses to be reflected.

The CS475/CS476/CS477 operates from a 12V supply and is interfaced to the data logger by SDI-12 which allows the current consumption of the sensor to be minimized. This is particularly useful for sites where power consumption is critical. Proper installation of the sensor is vital to achieving successful measurement and all the sensors have a leveling bubble to make sure the sensor is level. The three models have physically different sizes and measurement footprints. They differ in their measurement range and rated accuracy although they all offer 1mm resolution. Measurement ranges and accuracies are shown in the table below.

Model	Range (mm)	Accuracy
CS475	50 – 20000	+-5mm
CS476	50 - 30000	+-3mm
CS477	400 – 70000	+-15mm

Contact CSA or visit the website for more details:

http://www.campbellsci.com/cs475-radar-water-level
http://www.campbellsci.com/cs476-radar-water-level
http://www.campbellsci.com/cs477-radar-water-level

CS475   CS477   CS476   3

Bunbury Engineering Surveys Remote Monitoring Caustic Lake with Remote Control Boat and Campbell Scientific Technology

Traditional boating survey methods for contaminated lakes required two people to enter the hazardous water in a small vessel placing them at immediate contact risk of contamination through all stages of the surveying process from launching the vessel, splashing from the hull when conducting the survey and physically retrieving the wet vessel. In the event of capsizing the risk of a fatality would be very high.

Bunbury Engineering Surveys (BES) employee Chris Gibbs explains -
"Remote controlled survey boat was designed and constructed by BES to eliminate the safety concerns with the traditional surveying method. It is a small remote control boat with onboard survey technology which allows for the safe completion of boating surveys on contaminated and uncontaminated water. This innovation allows us to obtain a complete under water surface profile or contour plan of a containment area, and locate it on a plan with reference to existing survey control. This data then enables volume calculation of product pumped into the containment lake since the last survey."

"In October 2009, BES was approached by a client with the request to obtain water temperature readings at 150mm below the surface of a 100Ha contaminated lake, whilst completing the normal underwater profile survey. Enlisting the services of David Boadle from Campbell Scientific we were able to fit a CR 800 Data Logger with temperature sensor to the remote controlled boat along with the RF 411 radio to transmit the temperature data in real time back to the shore."

"This technology has now been added as a permanent feature to our remote controlled survey boat and allows us to easily log surface water temperature as well as water temperature at any pre-given depth and locate the temperature differentials in unison with location data on the laptop."

"David and the team at Campbell Scientific were instrumental in enabling us to meet our client's requirements. Their prompt service had this technology delivered to WA within three days of order. David's after sales service to assist us to install this technology and get it operational in a very short period of time, was over and above what would normally be expected."

"Bunbury Engineering Surveys and its client were very happy with the results that were achieved."

Bunbury Engineering Surveys provides safe, accurate, efficient and cost effective surveying service to the mining and construction industry throughout Australia. They are also involved in the development, sale and installation of their remote controlled survey boat technology to the mining industry around the world. [Visit their website here](#)

4

DPI Victoria - Lateral Thinking & Good Old Fashioned Ingenuity Solves CS616 Probe Dilemma

Case Study: Dept of Primary Industries Hamilton Victoria


Aim

To measure soil moisture usage for a range of pasture systems. This is to develop pasture systems that are more efficient in their conversion of water to animal feed.

Project Description

Australia is the driest inhabited continent in the world. It is becoming increasingly important to use the water it does have in a more efficient manner. Malcolm McCaskill of DPI Hamilton designed a system to measure soil profile moisture and to correlate this data with growth measurements on 4 different adjacent pasture types. Due to labour requirements in measuring both growth and soil moisture, it was decided to install an automatic soil moisture logging system. A CR1000 was connected to 52 CS616 without the use of a multiplexer. This was achieved by having up to 4 sensors connected to each single ended input and controlling them from different control ports. The system was located at a point where 4 pasture systems intersect and the soil moisture data was recorded hourly and daily. The CS616 probes were temperature compensated using 107 thermistors.

The probes were placed in the soil profile at depths of 5cm, 15cm, 30cm, 50cm, 75cm, 100cm and 150cm. A backhoe was used to dig a trench so the probes could be inserted horizontally into undisturbed soil. The top probes in the profile could be easily inserted without assistance however, due to soil compaction, the lower probes in the profile needed assistance to insert without damage.
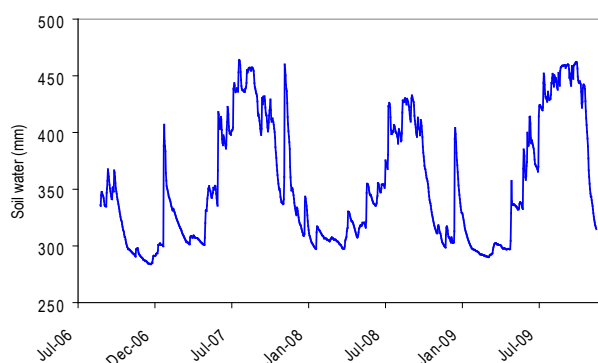
The installers used a stainless steel welding rod with a flattened end on a hammer drill to drill pilot holes so the probes could be easily inserted and still have the snug fit required to get good contact with the soil. The data from this system was used in conjunction with neutron moisture meter (NMM) data. The NMM can measure soil moisture down to 5 metres but can't measure in the top 10cm of the soil profile due to neutron escape. The NMM also take 2 days to make a measurement so the 2 systems complement each other well.

This test site was close to Malcolm's office so no telemetry was necessary. Malcolm was particularly happy with the fact that Campbell Scientific software was able to run on his 10 year old field laptop still running Windows 98™.

If you have soil moisture monitoring requirements, contact one of the Application Engineers at Campbell Scientific Australia to discuss your needs. We have many options including Time Domain Reflectometry, volumetric water content (VWC) based on dielectric permittivity (CS616) or we can measure VWC using cosmic ray neutron scattering, the latter particularly useful in high conductivity (saline) soils.
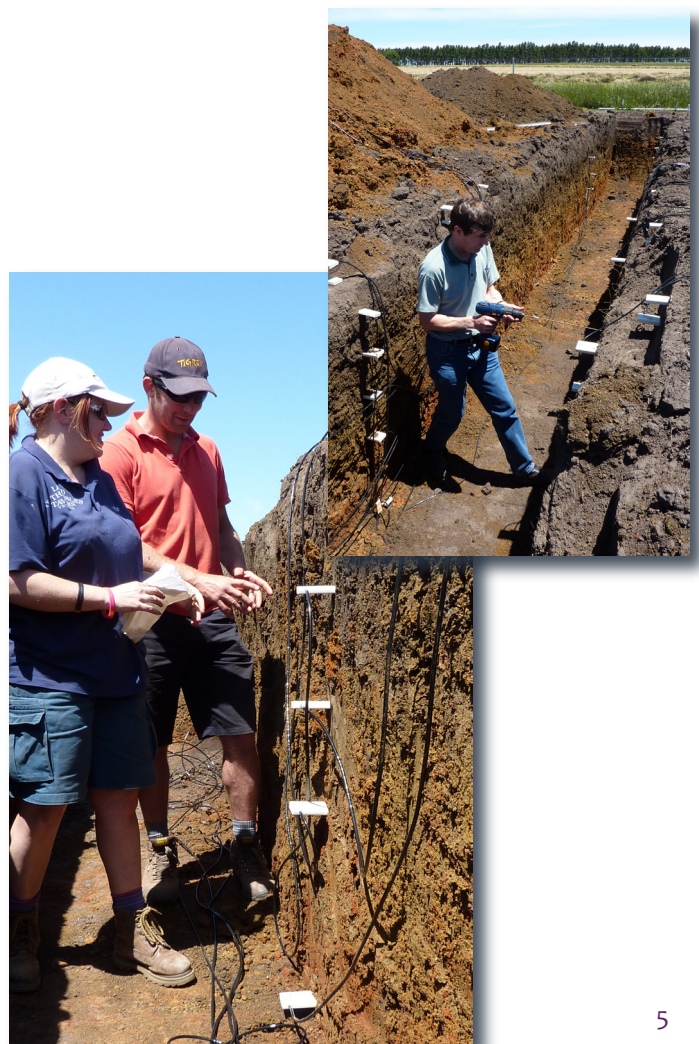
Soil moisture testing and your soil's ability to store water and make it available to the plants you grow is highly dependant on the type of soil you have. There are 3 major non-organic components of soil that affect its texture: sand, silt and clay. Each of these components has a progressively smaller grain size and this affects its physical properties. Sand has a grain size from 0.05mm up to 2mm, silt has a grain size 0.002mm up to 0.05mm and clay has a particle size less than 0.002mm.

The soil texture triangle attempts to classify soil according to its constituent particles. A simplified soil triangle is shown in Figure 1.

A simple field test to determine your soil type is called the Bolus Test and is widely used as a guide when full laboratory particulate analysis is not available.

Take a small amount of soil in hand. Wet soil to field capacity (just damp). Roll the soil into a ball. Push soil between thumb and forefinger to form a ribbon.
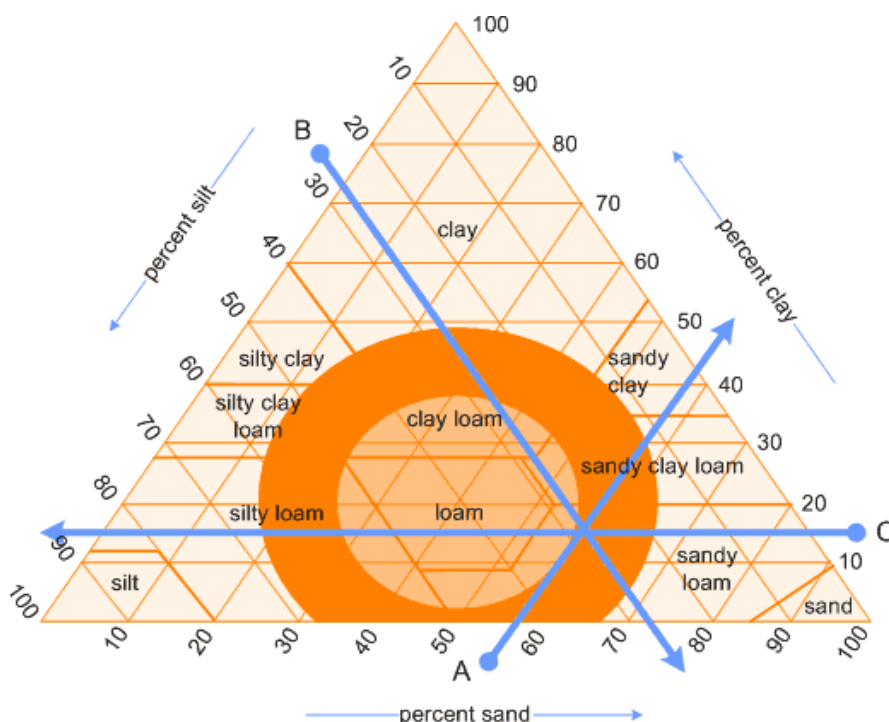
Figure 1: Soil triangle classifying soil according to its constituents. Sourced from http://www.landscape-and-garden.com/garden-soil/soil-triangle.aspx

Sands:	Little or no coherence and cannot be rolled into a ball. Sand grains adhere to fingers
Sandy Loams:	Some coherence, can be rolled into a stable ball and will form a ribbon 15 – 25 mm long
Loams:	Will form a ribbon 25mm long. Smooth spongy feel with no sand grains
Clay Loams:	Ribbon 25-50mm long
Light clay:	Ribbon 50-75mm long. Some resistance to ribboning
Heavy Clay:	Ribbon greater than 75mm. Strong resistance to ribboning

Once you have determined the soil type, the graph in our Hydrosense manual appendix will allow you to determine your wilting capacity and field capacity from your Hydrosense measurements. You can then make some informed management decisions related to your crop.

What's New in Loggernet 4?

A New Major Version of Our Datalogger Support Software
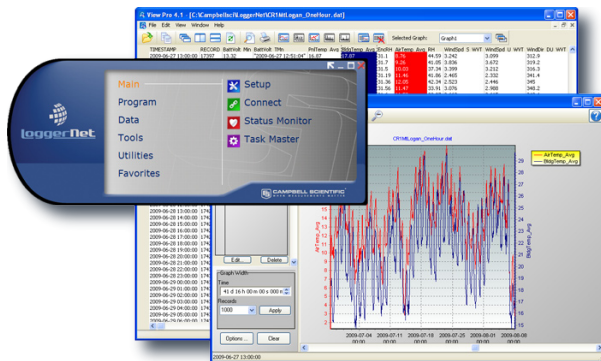
We're excited to announce the release of LoggerNet 4, a major upgrade to our main datalogger support software package. In addition to a redesigned user interface, we've added many functional changes to improve and expand the tools available for working with our dataloggers. Many of these improvements were recommended by you, our customers.

LoggerNet 4 retains the solid client/server architecture used by previous versions, with the server communicating with the datalogger network and simultaneously serving data to multiple client applications. These client applications provide a variety of useful tools, including:

* Network setup, configuration, monitoring, and backup
* Datalogger programming and data collection
* Real-time and historical data display

In addition to updating many of the existing LoggerNet clients, we've also added two new clients to the new version: Network Planner and View Pro.

The Network Planner is a tool that facilitates designing and configuring PakBus networks. The Network Planner allows you to add devices to a network, define communication links between devices, and set up activities such as scheduled data collection, callback, send/get variables, and one-way data transmissions. Once the network is designed, settings can be loaded directly into each PakBus device, or saved and loaded later using DevConfig.

View Pro is our new file viewer (replacing View) and features support for several new graph types (histogram, rainflow, and 2D/3D FFT), an unlimited number of traces on a graph, and the ability to open and graph data from multiple data files. A statistics feature on the graph displays the maximum, minimum, average, and standard deviation.

Significant updates to existing LoggerNet clients include the following:

* The Toolbar has been redesigned to offer quick access to all LoggerNet clients, and now includes a Favorites view that allows easy access to those clients most important to you.
* With the Setup client, you can now schedule an automated datalogger network backup, schedule retrieval of images or other files from a datalogger, create custom notes for a station, and cut and paste single devices or a branch of the network to another location in the network map.
* The Task Master has a new After File Closed event trigger, which has built-in support for sending files via FTP and SFTP.
* A Table Monitor has been added within the Connect window so that a table can be easily selected, displaying all values from that table. The numerical and graphical displays are fully configurable and allow saving a configuration that can be reloaded for the original station or a different station.
* The Status Monitor now allows for the configuration of custom views (previously available only in LoggerNet Admin).
* The CRBasic Editor features new support for user-defined functions and the ability to encrypt files prior to sending them to the datalogger.
* DevConfig can be launched from within LoggerNet without conflicting with the LoggerNet server or other dataloggers in the network.

There are lots of other improvements as well. Be sure to check the manual for the complete list.

LoggerNet 4 is the first LoggerNet version to include a 30-day trial and it is available for download from our website free of charge. This is a fully functional version of the software that runs for 30 days. We invite you to download the trial and explore the new features.*

Upgrade pricing for LoggerNet 4 is available to anyone who owns PC400 or a prior version of LoggerNet. We will also honor upgrade pricing for PC208W until December 31, 2009.

We hope that this new version of LoggerNet improves your datalogging experience. Please drop us a line if you have feedback for us.

*If you are already running an earlier copy of LoggerNet, we suggest you install the trial on a different computer so you don't interfere with your operational system. Files used in LoggerNet 4 may be not fully backward compatible with previous versions.

Take a look a the What's New in LoggerNet 4 Tutorial.

tech tips

Synchronizing the Logger Clock and Keeping it Synchronized

Why does the logger clock need to be synchronized?

Electronic devices are manufactured and calibrated in controlled environments. The temperature is controlled, the relative humidity is low and conditions are, in a word, ideal. When the device is installed and operated out in the real world, those perfect conditions often cease to exist and in many cases, they are replaced with conditions that are quite the opposite. As the temperature varies, electronic components drift and vary in their operation. The real time clock of the data logger and any other electronic device will also drift with this temperature change. Different devices have a different specification as to the accuracy or drift of the real time clock. The newer generation of loggers (CR800, CR1000, CR3000) have a much improved clock stability specification when compared with that of the older generation of loggers (CR510, CR10X, CR23X). If the logger clock drifts significantly, the data stored with that time stamp may not truly represent the time at which it was measured. So, this leads to two questions:

How much drift is significant and how can I synchronize the clock?

The answer to the second question depends largely on the answer to the first question. How accurate does the clock have to be? The answer to this question can vary quite a lot depending on the application.
For a stand-alone weather station, it may mean making sure that the clock matches the PC time once a month and as long as the logger and the PC clocks are within a minute of one another, that may be satisfactory.
For a high frequency system such as an eddy covariance monitoring station, which logs data at 10Hz or 20Hz, a difference in logger and PC clocks of one second may prove to be significant in the frequency response of the system.
For a system where multiple loggers are in a network and the measurements and data set from different loggers must be integrated and processed together and a high level of confidence in synchronized measurements is required, then sub-second synchronization is important.

How to synchronize the clocks?

1.   The simplest way to synchronize the clock(s) of the data logger(s) is to use the Set clock button on the Connect screen of Loggernet. This will set the logger clock to be the same as the PC time.

2.   To synchronize a network of loggers via a telemetry link, the best option is to use a single PC/server as the master time for all loggers. Loggernet software can be configured (through the Setup screen) to check the logger clock on some automated interval and synchronize it if it has drifted by more than some predefined amount. As long as this server maintains an accurate clock, then the loggers will all have an accurate clock (limited by the latency of passing the data across the telemetry link).

3.   For a network of loggers connected via radio, RS485 or some other media that doesn't involve Loggernet, one logger can pass clock data to another logger using Pakbus protocol and synchronize the clocks without the need for a PC or human interaction. This has limitations due to the latency of passing the data from one logger to another over whatever communications path is being utilized.

4.   The most accurate way to synchronize the logger clocks is by using GPS receivers. All GPS receivers output posi tion, heading, speed and time information and many also output pulse per second information, which can be used to set the logger clock to 10 microsecond resolution. The CR800, CR1000 and CR3000 data loggers (hardware revi sion 007 and later) all have a GPS() instruction that can be used to capture position and speed information (or any other information of interest that is being output from the GPS) as well as keeping the clock synchronized.

For information about how to use the GPS() instruction, look at the help in Loggernet and CRBasic or contact an Application Engineer at CSA.