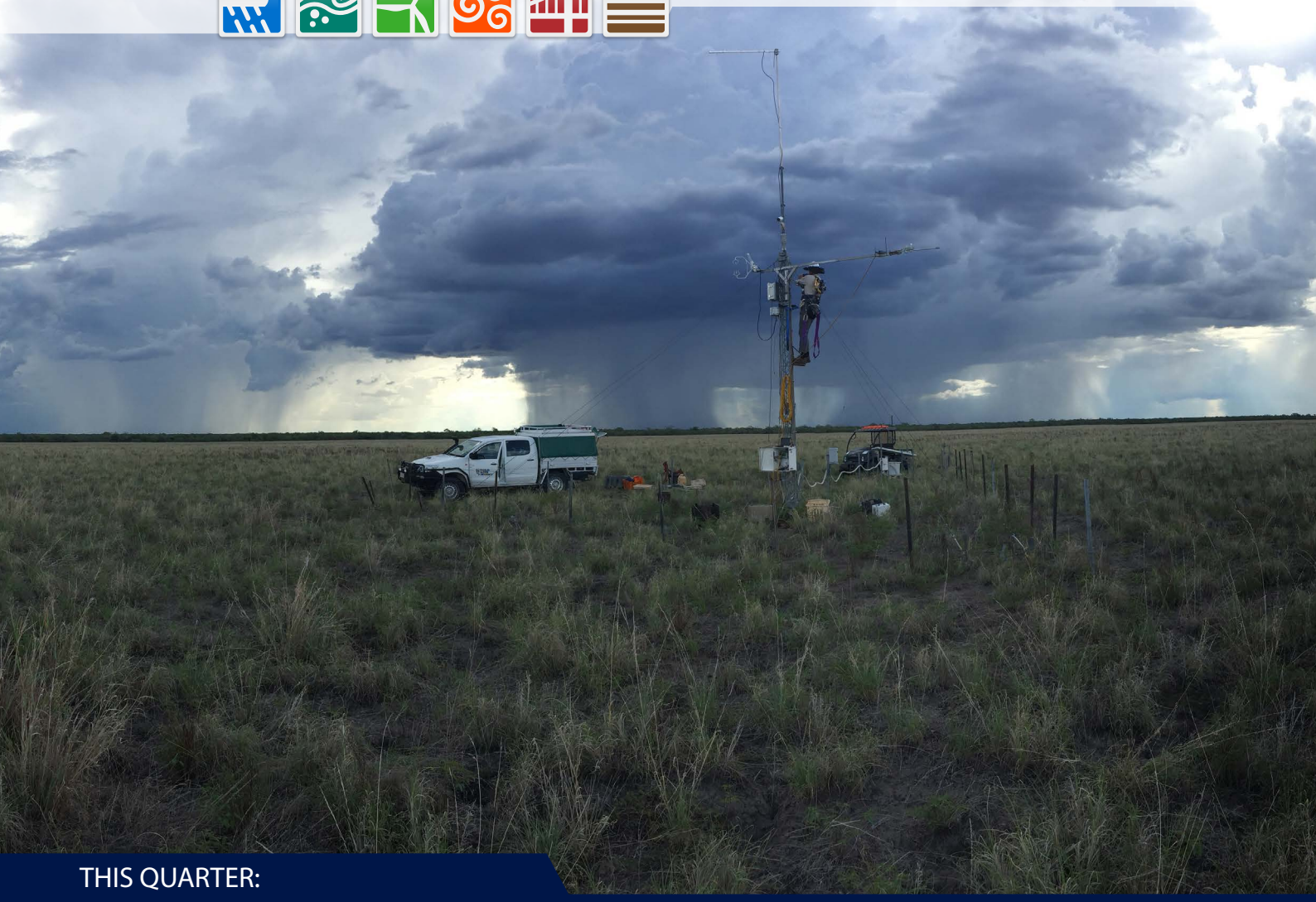
CAMPBELL SCIENTIFIC®

WHEN MEASUREMENTS MATTER

JUNE 2018 NEWSLETTER



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MESSAGE FROM THE GENERAL MANAGER

Campbell Scientific Australia (CSA) at the start of May celebrated 25 years of operation in Australia. A terrific achievement that all the CSA staff and the CSA Board are extremely proud of. There is more detail on this milestone in the accompanying pages.

For now I simply wanted to thank you our customer for trusting us to be your data acquisition partner – many of our customers have been with CSA for many years which we greatly appreciate and respect. Though much has changed in our 25 year history there are some things that haven't, in particular our strong desire to continually strive to meet your needs through great service and quality and reliable product solutions. Again we thank you for your trust in us.

Also this month, I spent a week at our parent company in Logan, Utah, attending the annual Campbell Scientific management conference. For me as a relatively newcomer the energy and desire to keep improving was very pleasing to see. The Campbell Scientific operations are extremely impressive with now over 300 staff, including 80 plus application engineers, making up the operations in Logan. The attention to detail and the focus on quality manufacturing is immediately evident along with the significant investment in infrastructure. All of which is geared to ensuring the highest quality products delivering and measurement for your application, whatever field that may be in.

Some exciting Campbell Scientific products, both here at CSA and at our parent company are being developed for release over the next 12 months. One of those products is featured in this newsletter, the CS240DM best-in-class smart sensor that measures back of module temperature on solar photovoltaic (PV) panels. With the growing solar industry in Australia, we look to offer alternative energy solutions. The CS240DM provides PV stakeholders with highly accurate back-of-module temperature - even at long cable lenghts - for use in power-performance modeling and simulation of solar energy applications.

We are happy to release a rugged, surface mountable platinum resistive thermometer (PRT) that promises Campbell Scientific precision analogue-to-digital, smart sensor module that makes back-of-module temperature measurements that are among the most accurate measurements available today. Talk to us today about our Solar Energy solutions for site assessment, performance monitoring and advanced solar monitoring.

Finally thank you to everyone who contributed to our recent photo competition, for our first year at running this the quality of entrants was absolutely terrific – congratulations to Matthew Northwood from Charles Darwin University for his winning shot. As always if there is anything you would like to suggest for our newsletter please do not hesitate to drop our marketing coordinator Nikki Hains an email marketing@campbellsci.com.au

Adam Parsons
GENERAL MANAGER

25 Years of Campbell Scientific Australia

This month we celebrated a momentous achievement. Campbell Scientific Australia turned 25!

Evolving from a one man shop in 1993 to an expanding team of 21 today, we have delivered reliable data acquisition solutions across all parts of Australia and South East Asia. From Perth to Darwin to the remote parts of Antarctica. We are proud to share our success and expertise from Townsville, Australia.

OUR VISION
Campbell Scientific Australia strives to be the leading provider of environmental data acquisition solutions in Australia and South East Asia.

OUR PROMISE
We guarantee expert Australian based engineering support, local technical repairs backed by quality and reliable Campbell Scientific products for all our customers.

OUR MISSION
In everything we do we act with integrity an take pride in our expertise to deliver quality and reliable environmental data acquisition solutions for our customers.

OUR VALUES
Integrity • Pride • Expertise • Respect • Teamwork

Providing expertise since 1993

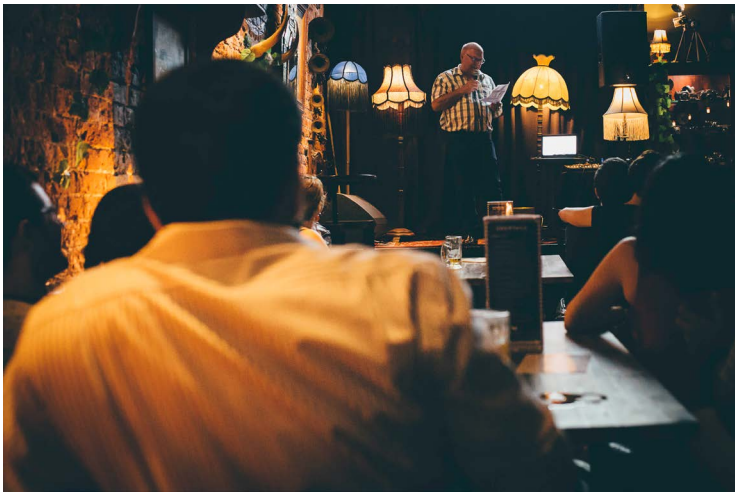
Campbell Scientific Australia has been a leading supplier of data loggers, data acquisition systems, measurement and control products used worldwide in a variety of applications related to weather, water, energy, infrastructure, soil, gas flux and turbulence for over 25 years. We specialise in rugged, lower-power systems for long-term, stand-alone monitoring and control.

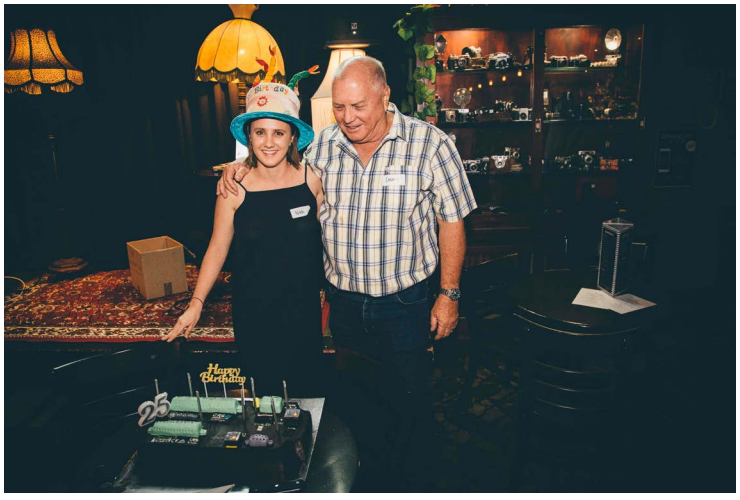
From left - Founder and Director Steve Bailey, Sandra Farrington, Alex Thomas, Chris Kellett and Ron Russo (1998)

25 Years of Campbell Scientific Australia

To celebrate 25 years of business we hosted a celebratory night with current staff and founding directors. The night featured a trip down memory lane, a data logger cake and a great video from some of the key people in CSA's success (previous page). See some great photos that show the celebration with our staff.

25 Years of Campbell Scientific Australia

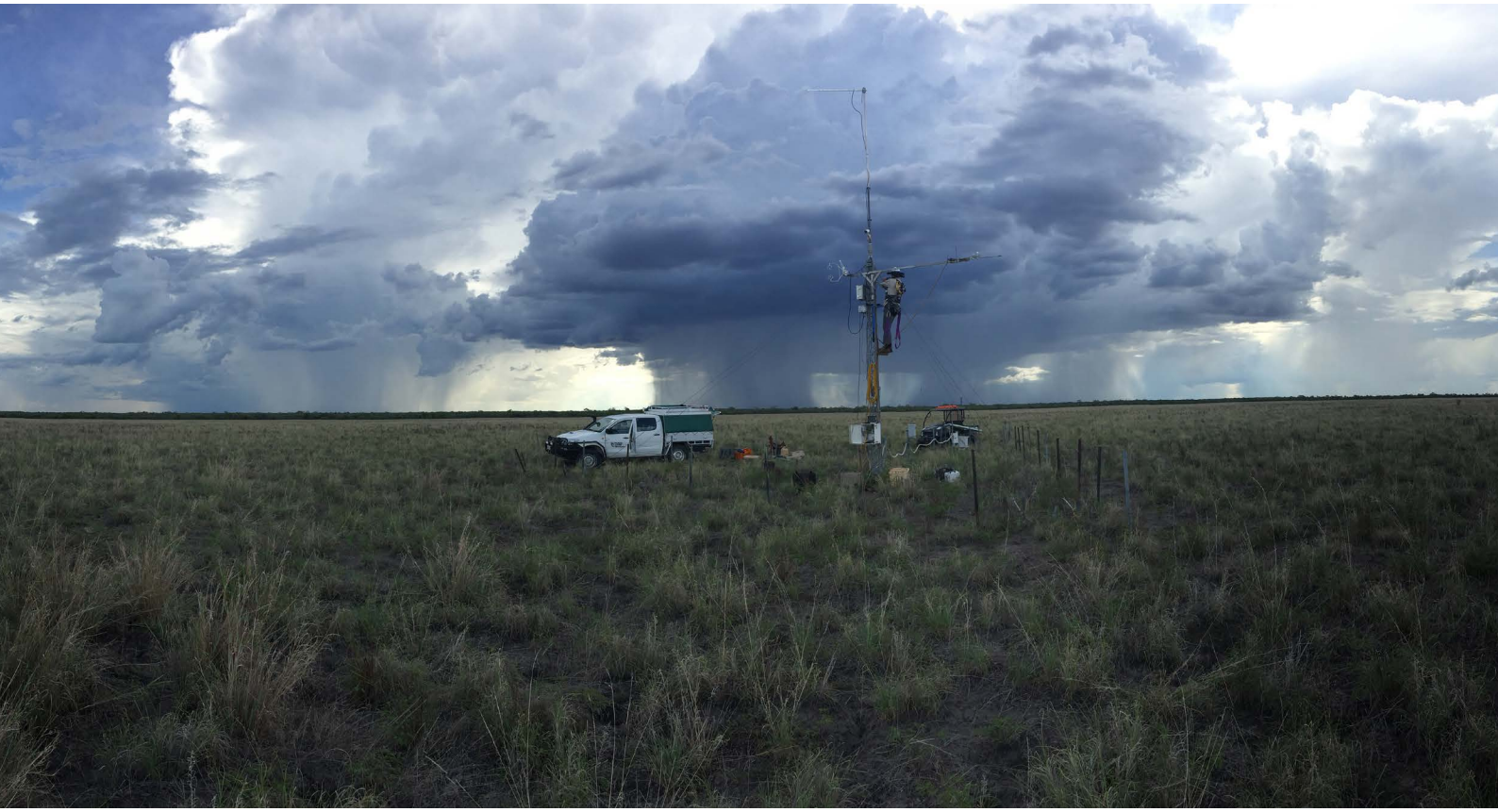




2018 Australian Photo Contest Results

The Campbell Scientific team would like to thank everyone who entered our first ever photo contest! We recieved a variety of captivating entries showing the wide sort of applications our gear is being utilised for. In our 25 years of business in Australia, we are proud to have worked closely with each and every customer to produce solutions that are rugged, reliable and providing invaluable data to inform change.

Winner: Matthew Northwood - Wet Season Feildwork
STURT PLAINS FLUX TOWER, NT AUSTRALIA



Matthew Northwood wins the 2018 Australian Photo Contest for this photo featuring the Sturt Plains flux tower that has seen fires and floods, lightning strikes, insect invasion and is still standing strong in the Northern Territory, Australia.

We are happy to announce the winning photo by Matthew Northwood from Charles Darwin University. On Newcastle Water Station, the Sturt Plains flux tower, pictured above, is one of the one of the five flux towers within the Northern Australia Tropical Transec (NATT). Charles Darwin University's Lindsay Hutley managed the project collaborating with the University of Western Australia's Jason Beringer.

Dominated by Mitchell grass the site is fast approaching a major milestone. In September of this year, the flux tower will make a decade of data collection.

It's not all been smooth sailing; there's been fires and floods, lightning strikes, subsidence and insect invasion. There has also been times when driving 800km (one way) to swap out an instrument seemed too daunting to contemplate. The major components on the site including Campbell Scientific sensors, loggers and ancillary equipment have been there through it all. Quality gear is a testament that it operates in conditions that humans can find difficult.

Late in the afternoon Charles Darwin University's Lindsay, seen in the photo, replacing an instrument at five metres high. With temperatures continuing to hover around a balmy 35°C and relative humidity of 37%, we were fortunate for the rain to miss us completely.

Sturt Plains is perhaps the perfect site for eddy covariance measurements due to its uniformity and its sets a magnificent back drop of a cloud burst, backlit by the setting sun in the west.

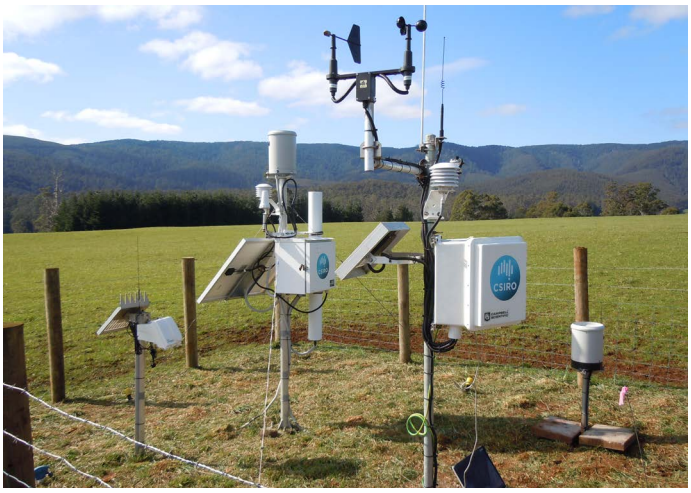
For more information about the sites:

- Land Ecosystem Atmosphere Program (LEAP) - Sturt Plains OzFlux Flux Tower Site (UWA)
- TERN Oz Flux Monitoring Sites - Sturt Plains

Runner Up: Dean Sandwell - Soil Climate Station
Soil-Climate Station, Ross Sea Region, Antartica

The Natural Resources Conservation Service of the United States Department of Agriculture (USDA) and The University of Waikato has established soil-climate stations in the Ross Sea Region to examine and research the thermal state of the active layer and the permafrost, which are key indicators of climate change within the cryosphere.

For more detailed site summary refer to:
[Manaaki Whenua Landcare Research - Monitoring Soil Climate in the Ross Sea Region]



Honourable Mentions:
From left: Dale Worledge - CSIRO Land and Water Automatic Weather Station and Logging Capacitance Probe; Dr Tony Wells - Soil Monitoring Sites in the upper Hunter Calley; and Simon Leeds - Specialised Data Services Rainfall Monitoring Site

Receive an extra 1 year warranty on all data loggers during the Campbell Scientific EOFY offer!

Use the code NL-EOFY18.

^T&C's - Australia and South East Asia only. Only used in conjunction with the above code. Ends June 30, 2018. Mention the code NL-EOFY18 in either email, online form or direct to CSA over the phone. For orders finalised before June 30, 2018.

TRAINING COURSES

Campbell Scientific offers several different multi-day training for our data loggers and software.

Designed for those without much data logger experience, or for those wanting to increase their knowledge.

Field Operators Training Course - 1 Day

This course covers an introduction to using Loggernet software, best practice for installation of a weather station and significant discussion about troubleshooting and maintenance procedures when conducting site visits.

Programming & Software Training - 2 Days

This courses provides an introduction to using our software to administer, program and collect data from the new generation of data loggers. You will also learn the basics of customising a data logger program to suit your sensor and data storage requirements.

Communications Course - 2 Days

Aimed at intermediate to advanced users wanting to learn how to program for and connect their data loggers to communication networks. The course covers cell phone modems, ethernet networks, spread spectrum radios and how to connect them to the data logger.

Upcoming Courses for 2018

- Melbourne: September 17 - 21
- Townsville: November 12 - 16

NEW PRODUCTS:
CS240DM Digital Temp Sensor for PV Panels

We are excited to announce the CS240DM Class A PRT back-of-module temperature sensor with digital Modbus output.

In 2010 Campbell Scientific released the 110PV back-of-module temperature sensor. This sensor quickly became one of the most trusted sensors in the solar industry for measuring the temperature of photovoltaic panels. The CS240 back-of-module temperature sensor was added in 2017, which included the same rugged construction as the 110PV sensor, but with a Class A platinum-resistive thermometer (PRT) sensing element.

Now with the release of the new CS240DM Class A PRT back-of-module temperature sensor with digital Modbus ouput is the latest sensor for the solar industry. The CS240DM incorporates the same best-in-class measurement technology as the CS240. The sensor promotes optimal heat transfer to the Class A PRT sensing element, can be pulled through conduit, an will survive for decades in the harsh conditions of a solar farm.

In addition, the CS240DM features a precision analogue-to-digital smart sensor measurement module, incorporating an optimised PRT measurement design. The measurement module is designed to minimise self-heating and lead-wire resistance errors. Measurement electronics are protected with 1,200 V isolation as well as an overmolding with an IP65 rating to protect against the elements.

The CS240DM digital Modbus output enables a broad range of compatibility with on-site SCADA hardware, even at long cable lengths.

Discover the specifications

Learn more about our Solar Solutions

COMING SOON:
CS110FV In-Field Verifier

You probably know that your CS110 Electric Field Metres can run many years with minimal maintenance and without calibration. But for applications requiring a high degree of long-term accuracy, a factory calibration is recommended about every three years.

For certain customers, our new **CS110FV In-Field Verifier** may be more convenient or less expensive than sending your CS110s to the factory for calibration. This may be the case for customers with a large number of CS110, or those who are outside the US, or those who are required by safety protocols to keep systems up and running.

The CS110FV Verifier is used to verify a CS110 factory calibration. The Verifier includes everything needed to test CS110s in the field with an accuracy of ±3%. It takes less than 10 minutes for the set up and verification process.

Housed in a rugged Pelican™ case, the Verifier includes a test cover that fits over the CS110 stator, a 12 Vdc alkaline battery pack, a GPS sensor to record the location of the CS110 and a CD100 keyboard display. A custom menu simplifies entering variables, initiating verification, monitoring the verfication progess, and viewing the results.

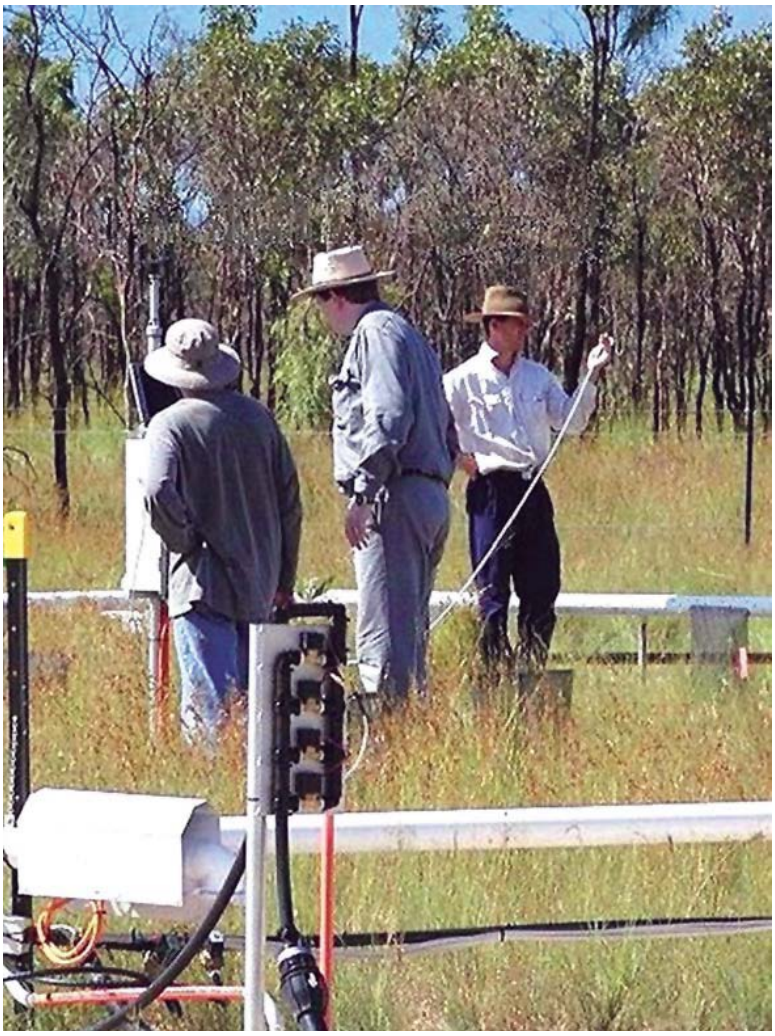
To test a CS110 in the field, the Verifier determines a CS110 MPARALLELPLATE calibration factor with an accuracy of 3%. This is done by applying measured dc voltages to a metal charge plate mounted close to the CS110 sense electrode and regressing the CS110 measured electric field against the Verifier applied electric field. If the test calibration factor differs from the original factory calibration factor (±1%) by more than 4%, the CS110 should be cleaned and retested. If, after cleaning, the difference is still greater than 4%, switch to the new test calibration factor (±3%) or return the CS110 for a factory calibration (±1%).

Each CS110FV has a unique factory calibration factor due to small mechanical variations in the Verifier test cover.

Learn More

Campbell Scientific's OzFace installation of worldwide significance: Studying CO_2 on tropical savannas

Involved in many incredible applications over our 25 years, to celebrate we are going back to an application based here locally in Townsville over 16 years ago.



Ivan Bogoev of Campbell Scientific, Inc., and Alex Thomas and Dave Price of Campbell Scientific Australia test the CO_2 sampling system at OzFace.

APPLICATION
Carbon dioxide supply and control system.

LOCATION
QNI Nickel Refinery, Townsville, Australia

CONTRIBUTORS
Department of Natural Resources and Mines

PARTICIPATING ORGANISATIONS
CSIRO
Campbell Scientific Australia
James Cook University
Queensland Nickel Pty Ltd

PRODUCTS USED
CR10X SDM-CD16AC MD9
COAXMD9-L PC208W

MEASURED PARAMETERS
Wind speed and direction, carbon dioxide pressure, carbon dioxide concentration

CONTROLLED DEVICES
Solenoid valves

RELATED WEBSITE
The Commonwealth Scientific and Industrial Research Organisation
Carbon Dioxide Information Analysis Centre

An experimental facility (OzFace) established in Townsville, Australia to examine the impacts of elevated carbon dioxide and climate change on tropical savannas. While there are several other Free-Air Carbon dioxide Enrichment (FACE) systems throughout the world, the OzFace system is the first in Australia and the first in the world conducted in the tropical savannas.

The OzFace system, designed and constructed by Campbell Scientific Australia, is a collaborative venture between Queensland Nickel Pty Ltd, James Cook University of North Queensland, and CSIRO. The primary aim is to study the effects of controlled, elevated levels of CO2 on an ecosystem under natural conditions.

While this sounds simple, it requires an advanced system to give accurate measurement and control of CO_2 under varying wind speed and direction. In June of 2000, Campbell Scientific Australia was awarded the contract to design, construct, and commission the OzFace system.

With an on-site supply of CO_2 and three hectares of land provided by Queensland Nickel, construction commenced in October 2000. Dr. Andrew Ash and Mike Whiting of CSIRO Sustainable Ecosystems and Dr. Joe Holtum of JCUNQ provided invaluable design assistance to CSA during the design phase of OzFace. CSI, in particular

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Ivan Bogoev, played a pivotal role in designing the CO_2 delivery system and in the design and manufacture of a spatial sampling system to measure variability of CO_2 across experimental plots.

The OzFace system has six identical experimental rings. These octagonal shaped rings have a 15 meter diameter with each octagonal segment consisting of a PVC pipe, sealed at one end with an air blower attached to the other. Based on wind speed, an independent set of four solenoid valves controls the CO_2 delivery rate. Two solenoid valves on each PVC segment control CO_2 supply based on wind direction. The blower forces the CO_2 and ambient air to mix inside each segment before exiting through numerous 10 mm diameter holes along its length.

The vegetation inside each ring is subjected to varied CO_2 levels: two rings at 370 ppm (ambient CO_2), two rings at 460 ppm, and two rings at 550 ppm. To achieve the target CO_2 concentrations, the amount of CO_2 released through each segment is controlled according to the wind direction and velocity. CO_2 usage for the site is approximately 1.5 tonnes per day. Within each experimental ring, multiple treatments simulate varying grazing and fertiliser effects. Soil moisture, plant biomass, plant carbon, and soil carbon are all independently measured to study the effects of increased CO_2 levels.

Logistically, construction of the OzFace project presented many challenges. Over 600 meters of trenching contained several kilometres of AC cables, instrumentation cables, and over a kilometre of CO_2-supply pipe. Six control boxes, 48 AC-powered air blowers, and 80 solenoids were networked together. To further complicate the process, construction was conducted in the middle of a typical monsoonal wet season.

Commissioned in March 2001, OzFace has a projected operational lifespan of five years. After six months of trouble-free operation and performance, the OzFace installation stands a proud testament to the quality of Campbell Scientific equipment and the capability of its staff.

OzFace Instrumentation

Six CR10X dataloggers measure and control the six experimental rings. The dataloggers are networked via an MD9 coaxial network to a central control computer housed in an air-conditioned office on site.

A GSM cellphone connected to the computer running pcAnywhere™ allows off-site control of the entire system and remote data collection. The CR10X dataloggers measure wind speed and direction at each ring to ascertain the amount of CO_2 delivered. An SDM-CD16AC control port module at each ring switches a combination of 20 solenoids according to the wind measurements. Each datalogger program waits an appropriate interval for the released CO_2 to reach the sampling location, and measures the CO_2 concentration via a Li-Cor GasHound CO_2 analyser before recommencing the measurement and control cycle. A sophisticated Proportional-Integral-Derivative (PID) measurement and control program within each datalogger provides automatic control of the entire system. PC208W software allows automatic data collection and storage on the central computer.

Testing the CO_2 delivery system with a smoke generator during the OzFace installation.

NEW WEBSITE SERVICES

We are always working on ways to improve our services for our customers, most recently we launched a Customer Centre for the Australian site. The Customer Centre allows you to manage your subscriptions to Software and OS changes and download calibration certificates for your Campbell Scientific products.

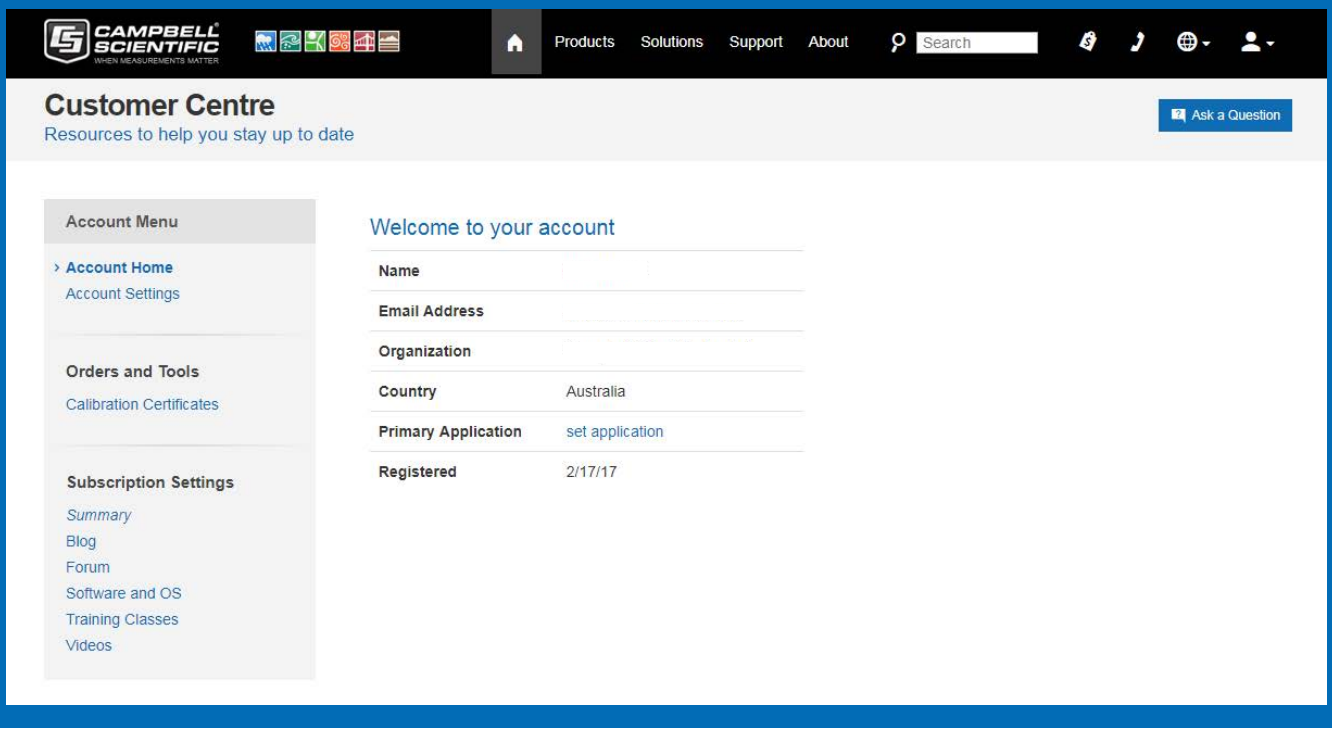
You can get access to your Customer Centre by logging in or registering an account.

From here you will be able to search and download a calibration certificate for your product. You will also be able to set email notifications for Software and OS Updates. You are able to set up your preferences for

- All New Software & OS's
- All existing Software & OS's
- Personal Software and OS's related to your
- products

(Note: All calibration certificates issued after July 2015 are available through this system. Please email us or call +61 (0)7 4401 7700 to request older certificates).

If you would like to know more information, instructions on how to use the new service or give feedback please email us or call +61 (07) 4401 7700.



RETIRED PRODUCTS AND CHANGED SERVICES

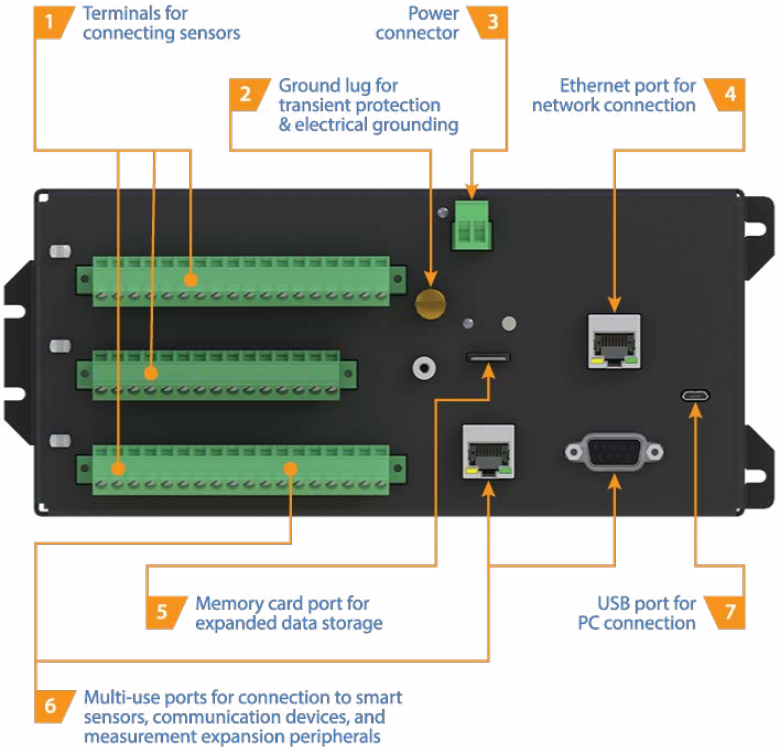
Campbell Scientific Australia has been cleaning up our product offerings, finding long-retired products that are difficult to repair, calibrate, or offer technical support. Campbell Scientific Inc. has outline a plan for support of older products manufactured by the company.

For more information on these poduct updates please click the link here: Product Changes

TECHNICAL TIP
Campbell Core Technology: The Datalogger

At Campbell Scientific, we want to help you get the most out of your datalogger that you can. You may have purchased your datalogger to be the core of your data acquisition system without knowing all the things your datalogger can do for you. For example, do you know what all the different terminals, ports, and connection options on your datalogger can be used for? In this blog article, we'll introduce you to the various parts of a datalogger wiring panel, so you can maximize the benefit you receive from your datalogger. In future blog articles, we'll take a more in-depth look at some of these parts.

The following illustration depicts the most common parts of a general-purpose datalogger's wiring panel:



#1 - Sensor Terminals

The wiring panel of a datalogger provides terminals for connecting sensors. These terminals enable the datalogger to measure, communicate with and power your sensors. Depending on the size and sophistication of the datalogger, the quantity and types of input connections it offers for sensors will vary.

Note: Different sensors produce different types of signal outputs. For your datalogger to interpret the sensor signal, the signal output from the sensor must be compatible with the datalogger input terminal to which it is connected.

Depending on the complexity of your data acquisition system, you may be using a datalogger with some or all of these common sensor terminal types:

- Analogue inputs
- Pulse counters
- Switched voltage excitation outputs
- Digital I/O ports
- Communication ports
- Continuous 5 V terminals
- Continuous 12 V terminals
- Switched 12 V terminals

These terminal types are discussed briefly in the following sections. (More details will follow in future blog articles)

Analogue inputs

Analogue inputs include both voltage and current inputs. Analogue inputs can be configured to make single-ended measurements (measuring the input's voltage with respect to ground) or differential measurements (measuring the voltage between two inputs).

Sensors that have analog inputs are various, including some models of the following:

- Air temperature and relative humidity sensors
- Mechanical wind direction sensors
- Solar radiation sensors
- Strain gages
- Water level, stage, and flow sensors

Pulse Counters

Pulse counters are used by the datalogger to record the number of times that something happens. For example, pulse counters are used to measure switch closures, low-level ac sine waves, or high-frequency pulses. Pulse counters sum the number of counts over each execution (scan), allowing variables such as velocity, flow, and rainfall intensity to be determined.

Pulse counters are often used with any of the following sensors:

- Contact closures
- Flow meters
- Mechanical wind speed sensors
- Tipping bucket rain guages

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Switched voltage excitation outputs
Switched voltage excitation outputs provide programmable voltage excitation for resistive bridge measurements. Additionally, these terminals can be configured to supply a regulated 3.3 or 5 Vdc power source to power sensors or toggle control lines.

Digital I/O ports
By default, digital I/O (input and output) ports are configured as binary inputs to perform functions such as detecting status or reading measurement expansion peripherals. In addition, you can individually program each port as a control output to physically control an external device.

Communication ports
Communication ports are used to enable data transfer between your datalogger and various smart sensors. The communication protocols used may be RS-232, RS-485 or SDI-12.

Continuous 5 V terminals
Continuous 5 V terminals are regulated power sources for your sensors and other peripheral devices.

Continuous 12 V terminals
The 12 V terminal is generally used as an unregulated continuous power source for your sensors and other devices.

Switched 12 V terminals
A switched 12 V terminal is used to power your external devices, such as sensors, that only require power during measurements.

You can also use a switched 12 V terminal to switch power to your communication device during scheduled transmission intervals, thereby conserving power.

#2 - Ground Lug
The ground lug connects your datalogger to earth ground. Dataloggers are connected to earth ground to protect them from nearby lightning strikes by shunting transient voltages away from electronics. This also protects from electrostatic discharge and helps assure noise-free analog measurements.

#3 - Power Connector
A power connector provides screw terminals for connecting your datalogger to the wires of its power source. For example, the power connector can be used to connect a 12 V battery. On some dataloggers, you can also connect a 16 to 32 Vdc charging source (such as a power converter or solar panel) to your datalogger.

#4 - Ethernet Port
A datalogger may have an Ethernet port, which is typically used for IP communications with Campbell Scientific software such as LoggerNet and LoggerLink. In addition, it can be used to connect to an Ethernet-enabled camera or sensor.

#5 - Memory Card Port
A memory card port on your datalogger enables you to do the following: save your datalogger internal memory to a card (such as a CompactFlash card or microSD card), easily transport it, and upload your data using a memory card reader. You can upload your data to a computer at an offsite location. Then, your data can be processed for visualization, analysis, sharing, report generation, and permanent storage.

In addition to transferring measurement data, you can use memory cards to transfer your digital camera images, datalogger programs, and datalogger operating systems—without the need for a computer connection.

#6 - Multi-use Ports
Multi-use ports are used to connect your datalogger to smart sensors (that have internal measurement and processing components), communication devices (such as cellular or radio modems) and measurement expansion peripherals.

#7 - USB Port
A micro USB port is primarily used for datalogger programming and testing.

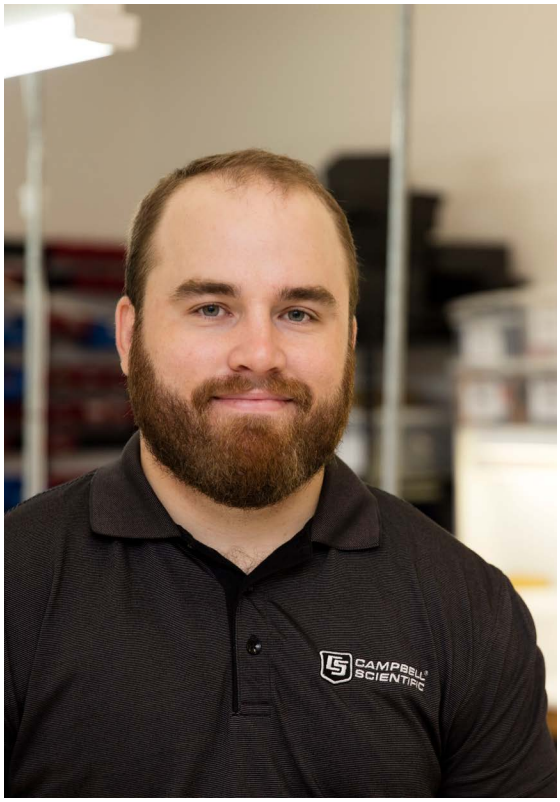
In the absence of an external power supply, the USB connection to a computer also supplies 5 V power to the datalogger, which is adequate for configuration and making some measurements. If Ethernet or wireless data transmission is not feasible, you may need to rely on an onsite transmission option, such as a USB cable connecting your datalogger to a desktop or laptop computer.

Conclusion
We hope this article has introduced you to the various parts of a general-purpose datalogger so that you can get the most out of your datalogger that you can. In future blog articles, we'll take a more in-depth look at some of the parts of the datalogger wiring panel. In the meantime, let us know if you have any general datalogger wiring panel questions.

MEET OUR STAFF: JORDAN

Jordan is a North Queensland local, growing up one hour south of Townsville in Ayr. Studying at James Cook University here in Townsville, Jordan graduated with a Bachelor of Electrical and Electronic Engineering. Working for Rio Tinto in Gladstone at an Alumina Refinery as an Electrical Engineer after university, Jordan worked on instrumentation maintenance and reliability in hazardous industrial environments. Starting at Campbell Scientific Australia in 2017, Jordan works mostly with new customers to introduce the Campbell Scientific products and solutions to match their application needs. He has also recently taken on the role as the new trainer for our training courses that are held throughout Australia for customers and partners.

In his spare time Jordan enjoys staying social playing regular touch football and trivia nights with friends.



Connect with Jordan on LinkedIn

WANT TO CONNECT WITH CAMPBELL SCIENTIFIC?

There are lots of ways to stay up to date with what we're doing.

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