CAMPBELL SCIENTIFIC®

WHEN MEASUREMENTS MATTER

UPDATE

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Message From Rob

Dear Campbell Scientific Australia Readers,

It is hard to believe my first year as MD at CSA is over and 2012 is well underway. It seems like yesterday that Steve Bailey retired.

It had always been Steve's goal to develop suitable facilities from which CSA could focus on developing the business and meeting customer and market needs. This year CSA will fulfil that goal and reach a major milestone when the company relocates to new purpose built premises in February.

The new premises have been designed to maximise CSA efficiency and to also allow future growth. With almost 500m2 to be allocated to Production, Repair, Stock Warehousing and Control, we will have much improved supply chain and order fulfilment capability.

Our AE team will benefit from access to dedicated product application test facilities and equipment. This will help them respond to unusual questions regarding the use of our products. The CSA team are looking forward to the move and expect it to be "business as usual" in servicing our customers during the move.

In my previous column I had mentioned the array of new products in the pipeline. I can announce that the new products are now available. Please browse the CSA website for details, or contact an AE for information.

New products include :

- A family of discrete and composite portable Campbell Scientific water samplers.
- The IRGASON infrared CO2 / H2O open path gas analyser with integrated 3D sonic measurement.
- Dynamic Vibrating Wire Modules (2 & 8 channels) which achieve measurement rates not previously possible using standard vibrating wire gauges.
- A Network Link Interface (NL200) which offers Serial to Ethernet services including CS I/O bridging.
- New Temperature / RH Probe HC2S3.

You may also notice our updated newsletter format in keeping with our companywide global rebranding project. The new and improved CSA website should go live within months and we hope this will benefit both existing and potential customers when researching CSA products and capability.

Finally, thanks to all customers for your support through 2011, and I wish you all a successful 2012.

NL200 Network Link Interface

New Product

The NL200, a new, powerful, network link interface, is a wired Ethernet network connection for dataloggers and peripherals. It is the successor to the NL100, with many significant improvements, including:

- Lower current drain
- Ethernet-to-CS I/O bridging
- PakBus® routing capabilities
- DHCP support
- Wider operating-temperature range
- Faster Ethernet rates
- Smaller size
- Lower cost

With an extremely low active-current drain of 50 mA, the NL200 is one of the lowest power serial servers on the market today.

The NL200's Ethernet-to-CS I/O bridging provides direct access to the internal TCP/IP stack in our CR800, CR850, CR1000, and CR3000 dataloggers. This capability enables an NL200 used with a CR800 or CR850 to have the same functionality as an NL120 used with a CR1000 or CR3000.

Like the NL100, the NL200 allows our dataloggers, as well as other serial devices, to communicate over a local-area network or a dedicated Internet connection. Additionally, the NL200 supports sophisticated networking capabilities, especially when used in PakBus networks with PakBus devices. For example, with the NL200, multiple PakBus clients can be connected to a single datalogger at the same time. PakBus routing can also be used to maintain an Ethernet connection with up to four PakBus servers.

By providing both simple Ethernet communications and complex networking capabilities, the NL200 is a powerful device that can serve a wide range of applications to meet your networking needs.

Learn More Here
campbellsci.com.au/nl200

Vacuum Pump Water Sampler Line Acquired

Company News

We are pleased to announce that Campbell Scientific has acquired the Sirco line of water samplers from Southwell Corporation in Canada. Sirco samplers have a 30-year history of successful operation in stormwater, wastewater, and other water-quality applications. As stand-alone water samplers, these products already meet a variety of sampling needs. As we integrate them with our existing data acquisition, telemetry, and sensor products, we will provide even more solutions for monitoring and control applications.

Our search for a high-quality water sampler began a couple of years ago and it didn't take long to find Sirco samplers. After distributing them for a while, we decided to make them a permanent addition to our product line as Campbell Scientific water samplers. The acquisition was finalized earlier this year, and we have successfully transferred the entire manufacturing operation to our headquarters in Logan, Utah. We have been manufacturing samplers since late summer.

The future is bright for these samplers. They are already capable of being programmed on their keypad for time-based, pulse-induced, 4 to 20 mA-input, and flow-based samples. We plan to extend their usefulness even more by integrating them with rain gauges, turbidity probes, pressure transducers, and telemetry devices—on top of the power, logic, and communications protocols (e.g., Modbus, DNP3, TCP/IP) provided by our dataloggers.

One of the biggest advantages of these samplers is that they use external vacuum pumps to draw water through intake tubing, instead of the traditional peristaltic pumps that induce flow by squeezing flexible tubing. Advantages of the vacuum-pump method include faster sampling rates, better vertical lifts, longer sampling distances, more-precise volume control between samples, and less maintenance. Because the vacuum method disturbs water samples less, they better represent the original water solution, especially if the solution has high concentrations of suspended solids. To prevent cross contamination, the samplers use air pressure (up to 28 psi) to purge the tubing of excess water.

The new product line includes many different options for both portable and stationary samplers. The PVS4150, PVS4120, and PVS4100 are portable, battery-operated water samplers. Designed for easy transport, the PVS4150 includes wheels, a telescoping handle, and a rugged case. The PVS4120 is the lightest sampler, weighing only 27 lb. The PVS4100 has a bigger pump that supports the fastest sampling rates, highest vertical lifts, and longest sampling distances. It also can use wider tubing (5/8-in. ID), which is better for handling large solids. All the portable models include space for ice to keep samples cool.

The CVS4200 and BVS4300 are stationary, ac-powered water samplers for waste-water applications. They use the same big pump as the PVS4100 and support all of its capabilities. The CVS4200 is an indoor sampler that has a corrosion-resistant steel enclosure. The BVS4300 is an outdoor sampler designed to handle extreme environments. It has a corrosion-resistant steel enclosure with a locking door and bolted-down instrument panel. All of the stationary samplers have a refrigerator option to keep the samples at the EPA-recommended temperature of 4° C. They can also be equipped with insulation, circulating fans, and heaters as needed.

Both composite and discrete options are available in both portable and stationary models. Composite samplers take samples, then deliver them into the same container each time. Discrete samplers collect samples and deliver them to different containers, from 500 ml to 1000 ml.

We are excited about the possibilities these samplers bring to water-quality applications. Don't hesitate to provide us with your input as we carry this great product line into the future.

Learn More Here
campbellsci.com.au/water-sampler

HC2S3 Temperature and RH Probe Replaces HMP45C

New Product

For many years, Campbell Scientific has offered the HMP45C as our higher-accuracy temperature and relative-humidity probe. With the retirement of the HMP45C (due to part obsolescence), our goal was to find an appropriate replacement that would minimize the difficulties that can surface when replacing one sensor with another—a replacement in fit, form, and function.

Our search led us to the HC2S3. The HC2S3 offers comparable accuracy to the HMP45C at a reduced price. The HC2S3 also has similar wiring and programming, and is housed in the same 41003-5 10-plate radiation shield (requires included hex plug) as the HMP45C.

The HC2S3 uses a capacitive sensor to measure relative humidity and a 100 ohm PRT to measure temperature. It includes a polyethylene filter that protects the capacitive sensor from fine dust and particles and minimizes water absorption and retention. Alternatively, a Teflon filter is available for marine environments.

The HC2S3 is offered in standard or high accuracy versions. The standard accuracy is calibrated at 23 degrees C at 10%, 35% and 80% humidity. The high accuracy is adjusted at 23 degrees C and 10, 20, 30, 40, 50, 60, 70, 80, 90% relative humidity and then calibrated at 20, 50 and 80% relative humidity giving superior accuracy suitable for such applications as Bowen Ratio.

Added to this, the HC2 S3 not only measures relative humidity and temperature but calculates dew/frost point

Although the HMP45C is no longer available, we will still recalibrate existing probes through our standard RMA procedure.

Learn More Here
campbellsci.com.au/hc2s3

New Enclosure Display: CD100

New Product

Now you can enter and view data without opening the enclosure. The new CD100 is an integrated keypad with display that mounts in an enclosure lid and provides the same operation and functionality as the CR1000KD. It allows you to check the datalogger's status, to view or plot sensor readings and stored values, and to enter numeric data or change ports. Security can be set in the datalogger to prevent unauthorized personnel from accessing the data.

The design of the CD100's 16-character keypad permits operation with a gloved hand. Its vacuum fluorescent display is responsive through a wide operating-temperature range, and can show 8 lines by 21 characters (64 by 128 pixels). The CD100 is both water- and dust-protected, providing an IP66 rating when installed in the enclosure lid.

Learn More Here
campbellsci.com.au/cd100

New CS526 Probe Coming Soon

New Product

The CS526 pH probe uses new pH-sensing technology that has significant advantages over traditional glass-bulb pH probes.

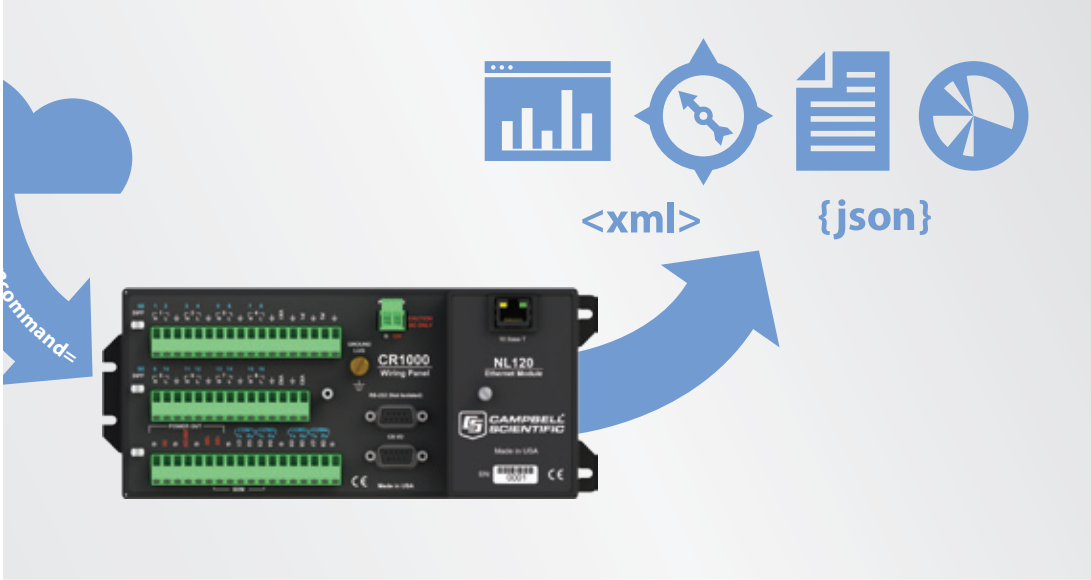
One advantage is that the CS526 provides better measurements in extreme pH conditions. For example, it can monitor pH in liquids containing high solids, aggressive chemicals, or biological materials that would clog or contaminate the junction of glass-bulb probes.

Eliminating the glass bulb in the probe's design results in other advantages. These include longer field use between maintenance, easier cleaning, dry storage, and a more rugged probe (no glass to break).

These advantages are a result of incorporating Sentron's high-tech, ion-sensitive field-effect transistor (ISFET) semiconductor as the probe's pH-sensing element.

Designed with serial RS-232 output, the CS526 improves upon its analog predecessor, the CS525, by preventing ground looping and galvanic interference.

Datalogger Web Service API



New Product

An application programming interface (or API) is a set of instructions and protocols for accessing functionality in software. Since the release of their operating systems in mid-2010*, our CR1000, CR3000, and CR800 dataloggers have supported the use of a web-based API. This API enables experienced computer programmers to create custom web applications for datalogger management, control, and data display.

Secure

The datalogger web API employs basic access authentication to provide a measure of secure access to a datalogger on the web. There are four levels of access: all access denied, all access allowed, read-only, and control. Different commands in the web API require different levels of access. User access is assigned using a file named .csipasswd that resides on the datalogger's CPU. Depending upon the settings in the .csipasswd file, a user can be challenged with a user name and password request when accessing the datalogger or initiating control.

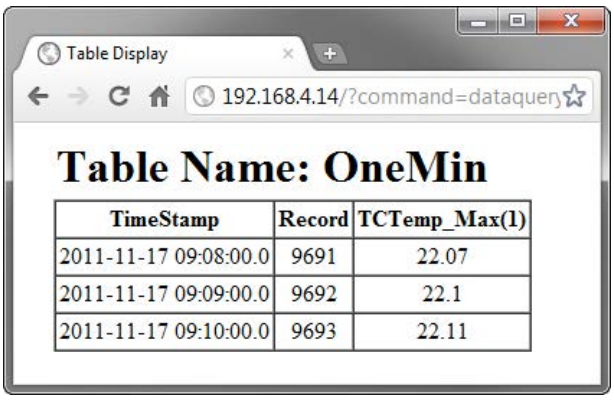
Full Command Set

The available commands in the web API allow the programmer to create a full-featured, web-based application. The ***Browse Symbols*** & ***DataQuery*** commands allow a web client to query a datalogger for its table information and request data. ***SetValueEx*** is used to set a value in the datalogger, thus enabling control. There are also commands to check and set the datalogger's clock and query and manage files on the datalogger's file system. Results of the commands are returned in HTML, JSON, or XML.

The Web API for the Rest of Us

So, what if you're not a programmer? You may still find the web API useful for quickly viewing a data table in a browser or setting a variable in a datalogger using a browser. A command is typed into the browser's URL field, and the result is returned in the browser window. For example, to display a table with the three most recent values from a variable named ***TCTemp_Max*** in a table called ***OneMin***, the command line would be (without line breaks):

http://192.168.4.14/?command=dataquery&uri=dl:onemin.TCTemp_Max&format=html&mode=most-recent&p1=3



The command above would return this display to the browser window.

Where Can I Learn More?

Documentation on the web API can be found in the CRBasic help files. To use the web API, the datalogger must be connected to the Internet (e.g., using an NL115, NL120, NL200, or cellular IP).

The web API opens up exciting possibilities for our dataloggers:

- Rich, custom web displays can be created by programmers.
- Datalogger data can be integrated "mashup" style with other data on the web.
- The datalogger can be used as a direct HTTP data source for other applications.

Campbell Scientific is busy leveraging the capabilities provided by the web API into its other applications. Look for new features in RTMC Pro and our PC-based web server to be announced soon!

** CR1000 OS 20, CR3000 OS 13, and CR800 OS11*

The Effect Of Lipids On Methane Emission

Case Study

Centre of Advanced Animal Science (CAAS), University of Queensland, Gatton Campus

Methane chambers were constructed in climate control rooms within CAAS. There are two chambers within each of the two climate control rooms. Within each chamber are two steers housed in individual pens. Methane emissions for each chamber are calculated using methane concentrations and airflow measurement within the supply and exhaust airducts. Each duct is fitted with Debimo air flow measuring blades (Kimo®) and pressure transmitters CP200 (Kimo®). The datalogger acquires the airflow measurements from each of the six ducts every 15 minutes.

Data Logger - CR1000

Sensors & Peripherals - Debimo air flow measuring blades (Kimo®) are fitted in each of the six ducts (two supply and 4 exhaust). Pressure transmitters CP200 (Kimo®) at each duct read in L/sec. In terms of programming the supply ducts are 10V out = 2000L while the exhaust ducts are 10V = 1000L. Methane concentration within each duct is measured using an infra red technique (Columbus Instruments, Ohio, USA). All equipment is in the plant room above the climate control rooms.

What parameters are being measured?

The parameters of interest are methane concentration and airflow within each duct.

Communications & Networking - Data is retrieved on a laptop. Programming was performed by Daniel Roebuck, Campbell Scientific

Project Description - This project focuses on the measurement of methane in Bos indicus cattle fed tropical pastures and supplemented with various lipids. Methane is a digestive by-product from cattle and is a major greenhouse gas. Lipids can reduce methane emissions and are also a source of energy. Beef production systems in northern Australia use Bos indicus cattle grazed on subtropical pastures. These pastures generate high methane emissions and are seasonally of poor quality. The purpose of this project is to investigate the impact of lipids on the suppression of methane emissions and improvements in growth rate of cattle fed a diet of subtropical pasture. The lipids include algal meal, sunflower oil and whole cottonseed. No research has been published with regard to methane emissions in cattle fed subtropical pastures supplemented with lipids.

The 32 steers are supplemented for at least 50 days, food intake recorded daily and liveweight measured weekly. Steers enter the chambers for four days (one day equilibration and three day emission measurement).

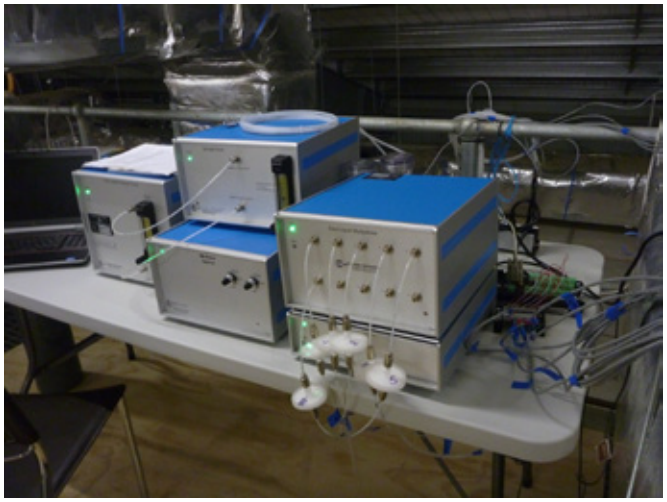
This is a joint project with University of Queenland and DEEDI. It is funded by MLA (meat and livestock association). This project is headed by Assoc. Professor Athol Klieve. Karen Harper manages and runs this steer trial.

Case study courtesy of Karen Harper University of Queensland.

Learn More Here
campbellsci.com.au/cr1000datalogger

Did you know you can submit a case study online?
Let others know what you've been working on..
You can find the submission form here.

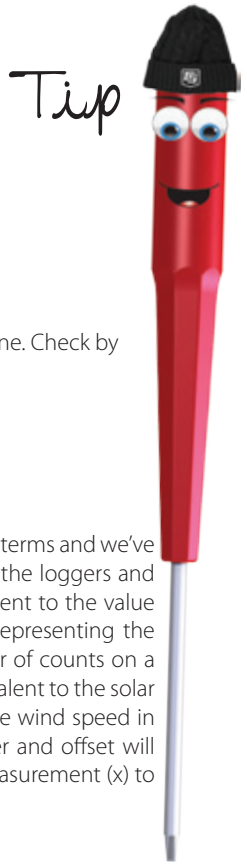
Above: Each Chamber houses 2 steers



Above: Methane analyser and CR1000

Above: Plant room ducts (above chambers)

Calculating Multipliers and Offsets



Tips and Tricks

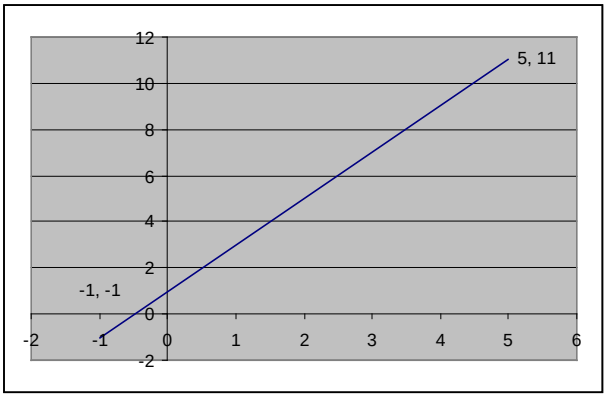
Background

Many of the instructions in Campbell Scientific datalogger operating systems have parameters where a multiplier and an offset can be entered. This allows the programmer to scale the units of the measurement from the electrical parameter that was measured by the logger, into more applicable engineering units for the sensor in question.

The multiplier and offset are used when the relationship between the measured electrical output (say voltage) and the parameter being measured (say temperature) is linear. If the relationship between two parameters is linear, there is a straight line that can be drawn on a graph to describe this relationship.

The equation of this line will be Y = mX + b
where m is the multiplier (or slope of the line) and b is the offset (or the y-intercept of the line). All straight lines can be represented mathematically in this way.

Mathematical Example



Calculating the multiplier and offset from a straight line graph such as this one is straightforward.

Multiplier

To calculate the multiplier (slope) we use the equation

m = rise/run = (change in y)/(change in x) = (11- (-1))/(5- (-1))
m = 12/6 = 2 So our slope (multiplier) is 2. This means that for every 1 unit we move along the x-axis, the value of y changes by 2.

Offset

To calculate the offset (y-intercept) we do the following:

The y-intercept occurs when the line crosses the vertical axis (y-axis). This occurs when x = 0. Looking at the graph, we can guess that the y-intercept (the value of y when x = 0) is 1.

To calculate this value, we use the coordinates of one of a nearby point on the line, in this case (-1,-1) and the slope of the line (2).

The equation used to calculate this value is:
b = multiplier x (0 – (x-value of the nearby point)) + (y-value of the nearby point)
b = 2 x (0-(-1)) + (-1)
b = (2 x 1) – 1
b = 2-1 = 1
So our offset is 1.

This will work out the same from any point on the line. Check by using the point (5,11).
b = 2 x (0-5) + 11
b = -10 + 11 = 1 (the same result).

Relating this to the logger

Now, we have spoken in fairly generic mathematical terms and we've heard a lot about x and y. It's time to relate this to the loggers and measurements of real values. The x value is equivalent to the value that the logger measures. It might be a number representing the mV output of the sensor or it could be the number of counts on a pulse channel in the last interval. They value is equivalent to the solar radiation in kW/m2, the temperature in degrees, the wind speed in metres/second or the rainfall in mm. Our multiplier and offset will describe the straight line that relates our logger measurement (x) to the parameter in question (y).

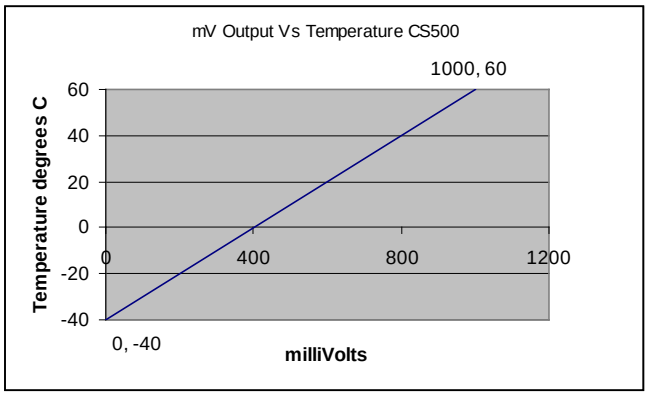
Example

Calculating Multiplier and Offset for CS500 Temperature and Relative Humidity Output

CS500 specifications:
Temperature Output: 0-1000mV for -40 to +60 degrees C.
Relative Humidity Output: 0-1000mV for 0-100% RH.

If we plot these on graphs, they look like this:

Temperature

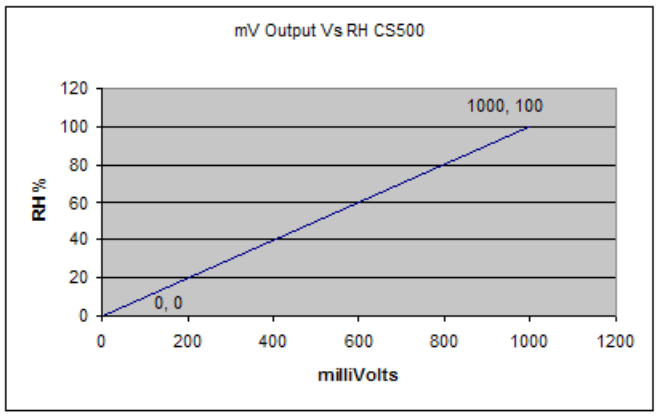


Now, we calculate the multiplier and offset.

Multiplier = rise/run = (60-(-40))/(1000-0) = 100/1000 = 0.1

Using the point (1000,100) and a multiplier of 0.1
Offset = multiplier x (0 – (x-value of the nearby point)) + (y-value of the nearby point)
Offset = 0.1 x (0-1000) + (60) = 0.1 x (-1000) + 60 = -100 + 60 = -40
We can see that this offset is correct as we have one of the points at (0,-40) which is the y intercept (at x=0).

Relative Humidity



Multiplier = rise/run = (100-0)/(1000-0) = 100/1000 = 0.1

We can see that the offset is 0 because we have coordinates of the point at x=0 (0,0).

To check, we use the point (1000,100) and the multiplier = 0.1
Offset = multiplier x (0 – (x-value of the nearby point)) + (y-value of the nearby point)

Offset = 0.1 x (0-1000) + (100) = 0.1 x (-1000) + 100 = -100 + 100 = 0

Exercises

Calculate the multipliers and offsets that would be used for the following:

- Greenspan Pressure Sensor 0-5metre range with 0-2500mV output.
- Wind Direction Vane. 10k ohm potentiometer excited with 2000mV. Measurement range 0-355 degrees (5 degrees open)
- Battery Voltage monitor. 0-1.5V output for 10-13V input.
- What multiplier and offset would be used if the raw mV output of the CS500 temperature element was to be stored?

SDI-12—Is It a Logger or Sensor?

Tips and Tricks

It's both! All of our customers know that Campbell Scientific dataloggers can be SDI-12 recorders, that is, they can record data from SDI-12 sensors. But did you know they can act like SDI-12 sensors, too?

This little trick makes it super easy to share data with another logger or SDI-12-enabled transmitter. Take all of your analog and digital measurements with a CR200X, CR800, CR1000, or CR3000 and share the results using SDI-12. You'll need two special instructions in your program, ***SDI12SensorSetup*** and ***SDI12SensorResponse***. We put them in a SlowSequence Do/Loop so the data are available as soon as the other SDI-12 device asks for it.

This program takes three measurements every five seconds: (1) the datalogger's battery voltage, (2) a tipping-bucket rain gage, and (3) an SDI-12 pressure transducer. When an external SDI-12 recorder queries this logger on SDI-12 address 0, it provides all three measurements.

```
PreserveVariables
Public SDI12(3)
Alias SDI12(1) = BattV
Alias SDI12(2) = Rain
Alias SDI12(3) = Level
BeginProg
  Scan (5,Sec,3,0)
    'measure battery
    Battery (BattV)
    'measure accumulated rain
    PulseCount (Rain,1,1 ,2,0,1.0,Rain)
    'measure current water level
     SDI12Recorder
(Level,1,0,"M!",1.0,0)
  NextScan
  SlowSequence
  Do
    'Return 3 vals on C7 with addr 0
in 1 sec
     SDI12SensorSetup (3,7,0,1)
    'give measurements to SDI-12
recorder
     SDI12SensorResponse (SDI12())
    'reset rainfall accumulator
    Rain = 0
  Loop
  EndSequence
EndProg
```

Tip

So, not only can your Campbell Scientific datalogger read and record SDI-12 sensors, it can behave like one, too. When you need to add measurement-and-control capability to an existing DCP, your Campbell datalogger can do the job—again.

Sensing your enthusiasm at 1200 baud,

Pre-Configured SDI-12 Addresses

Starting January 2012, Campbell Scientific Australia will ship CS650 water content sensors with preconfigured SDI-12 addresses. The addresses for these sensors will be set to the last digit of the sensor's serial number, which is clearly marked on the sensor cable. For example, a sensor with serial number 6124 will have SDI-12 address 4. This not only makes sensors in the field easier to communicate with, but means simpler configuration of systems with multiple CS650 probes.

Need Logger Training?

Gold Coast CRBasic Training Mar 12-14.
Still some spots available.
Register now to avoid disappointment.

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