



COM220 Phone Modem

Now available for sale in Australia



In this Issue...

- **Tech Tip** p2
Protecting Critical Logger Settings
- **Instrumentation 101** p3
Unusual Sensors
- **Software** p4
Third Party Software
- **CSA Case Study** p5
Fire Behaviour Modelling

Our COM220 modem has been tested and is now approved for sale within Australia!

The modem (which replaces our COM210A) enables communications between a computer and a Campbell Scientific data logger over a public switched telephone network.

A Hayes-compatible modem is required at the computer base station. The COM220 connects to the data logger at the field site. The COM220's wide operating temperature range and low power requirements make it ideal for use at remote sites.

Improvements over its predecessor, the COM210A, includes:

- Supports communication rates up to 115.2 kbps between modem and logger (in practice, data transmission through phone lines is generally constrained to 33.6 kbps)
- Offers both Modem Enable (ME) and Synchronous Device Communications (SDC) modes
- Allows customers to set the number of rings before answering call

For more information on the COM220A please contact our sales team on info@campbellsci.com.au

Last Training Course for 2008

Sydney, NSW 8-10th September

Need training before the year is out? CSA are running the last of our 3 day CRBasic training courses for 2008 in Sydney in September. We currently have 12 seats left available for the course, so book early to avoid missing out!

Our 3 day CRBasic course will be held 8th – 10th Sept which will cover basic to intermediate programming, Loggernet and much more. Our advanced course is unfortunately sold out, our next round of courses will be announced late September. For all course outline details and pricing please contact Bree on bree@campbellsci.com.au



DOWNLOAD THE LATEST O/S & SOFTWARE UPDATES

Have you got the latest operating system installed on your logger? Or upgraded your software lately?

Check out the downloads section of our website for all the latest o/s & software upgrades, as well as tutorials, demo's, trial versions and more!

Go to - <http://www.campbellsci.com.au/downloads>

Protecting Critical Logger Settings

How to ensure that your critical logger settings are protected when uploading programs or upgrading firmware

The introduction of the CR1000 logger has added the ability to support multiple communication devices and “smart” sensors on a single data logger. This allows a lot of flexibility and power in a logging application, however it also adds a level of complexity that must be managed to ensure the system operates correctly. This added complexity can take the form of a setting such as a ports’ baud rate, TTL vs RS232 logic levels and even things as simple as the default state of a variable, switched 12V or a control port.

Once a site has been configured, there is generally no need to alter these settings. However, changes to a site such as an operating system upgrade, the addition or removal of a sensor or a configuration change may require the system to be updated, which can cause problems if not considered carefully.

One of the most common problems would be sending a new program to a logger across a modem which is powered from the switched 12V supply. The logger program must be operating for the Switched 12V terminal (and therefore the modem) to be active. If the new program does not activate the Switched 12V supply, then communications to the site is lost and a site visit must be made to rectify the problem.

How to avoid this situation

The easiest and simplest way to deal with these situations is by using a file called default.cr1, (default.cr8 for a CR800, or default.cr3 for a CR3000). If there is no program running in the logger, (for any reason) and default.cr1 exists in the CPU drive of the logger, then it will be compiled and the logger will run it. This can be an extremely useful tool to make sure that any important settings are loaded in the logger after some unexpected event. The default.cr1 program can contain any CRBasic instructions, but it is generally most useful to load baud rates on certain ports and set up various hardware output requirements (e.g. power to a modem via Switched 12V or a relay).

Loading an Operating System (Firmware Upgrade)

Many users will be familiar and comfortable with the fairly simple process of loading firmware in their loggers. Firmware changes are made regularly to add new features, fix previous issues or increase the capabilities of the logger. The latest firmware versions are available for download, free from the Campbell Scientific website. In most cases, loading the firmware to the logger is done through Device Configuration Utility software, following the instructions in the Send OS tab.

What may not be widely known are the other methods that can be used to load firmware to the logger and the operational differences in doing so. When loading the firmware through Device Configuration Utility, the CPU drive contents are cleared and all the logger’s settings (including the Pakbus address) are returned

to default values.

Logger firmware can also be loaded via Loggernet’s Connect screen. This allows the logger to be upgraded across a telemetry link. Changing firmware in this way takes longer than the Device Configuration Utility process, but may remove the need for a site visit for the upgrade. With this in mind, it is important to consider the specifics of the site and the likely results before making such a transfer.



Loading an operating system through the Connect screen will retain the contents of the CPU drive and the logger settings (such as Pakbus address), but the Run Options will be cleared, which will leave the logger without a running program. This can create problems, particularly if the program was activating switched 12V to power the modem. Sending an appropriately written “default.CR1” program to the logger’s CPU drive prior to loading the OS is a worthwhile effort to ensure

that critical settings are re-loaded after the process is complete.

A third and least-commonly-used method to load firmware to the CR1000 is to use the CFM100 module with a compact flash card and Powerup.ini file. This can be useful when working in difficult conditions on site, when there is a large number of loggers to upgrade or when the use of a PC on site is not possible. The Powerup.ini file is loaded on the CF card with the appropriate file(s) and the card is placed in the CFM100. When the logger power is applied, the Powerup.ini file is executed and the program or operating system is loaded.

Valid commands are listed in Table 1 below:

| Command | Description |
|---------|---|
| 1 | Run Now and on Powerup, Do not delete associated data |
| 2 | Run on Powerup |
| 5 | Format |
| 6 | Run Now, Do not delete associated data |
| 9 | Make the specified file the OS |
| 13 | Run now and on Powerup, delete associated data |
| 14 | Run Now, delete associated data |

The format of the Powerup.ini file is - Command,File,Device. Command is the action the logger will take, File is the name of the file associated with the command and Device is the device (CPU, USR, CRD) to which the file will be copied. The default device is the CPU.

Examples of Powerup.ini files can be found in the CR1000 manual – Section 12. Or contact our support team for more info on support@campbellsci.com.au

Unusual Sensors

Looking for a sensor that's a little out of the ordinary? Read on.....

Campbell Scientific data loggers have always been designed with general purpose measurements in mind. Using a flexible programming language along with multi-purpose measurement inputs, Campbell loggers can measure any sensor with an electrical output. The data loggers are most commonly used for meteorological, hydrographic or geotechnical applications, however due to the flexibility we are getting more and more requests for logger measurements outside of these fields. Below are a few of the more unusual sensors in the Campbell range which may not be used as widely, but provide very useful information in their own niche applications..

IRS21 Intelligent Road Surface Sensor

Lufft's IRS21 Intelligent Road Surface Sensor is a passive sensor embedded in the monitored road surface, flush with the surface, to provide measurements of actual road conditions. The IRS21 is a primary component of our Road Weather Information Stations (RWIS).

The IRS21 measures the following parameters:

- Road surface temperature (up to three sensors)
- Water film level (up to 4 mm)
- Freezing temperature for NaCl (others on request)
- Road condition (dry/damp/wet/ice or snow/residual salt/freezing)



The sensor uses radar techniques to measure water film thickness, temperature sensors to determine the road condition and onboard calculations to calculate freezing temperatures. All the information is relayed back to the data logger via a serial connection, so the data is already in engineering units, no calibration is required. The sensor is a great tool for road hazard warning if coupled with a cell phone modem which can send SMS or Email alerts.

CS110 Electric Field Meter



The CS110 Electric Field Meter measures the vertical component of the atmospheric electric field at the earth's surface. These atmospheric electric field measurements are useful for assessing the local lightning hazard and for thunderstorm research. The sensor can be deployed as a standalone unit when combined with a CR1000 canister which fits inside the sensor casing. The CS110 can then be integrated into an automated weather station to provide a full range of meteorological measurements, data storage, communication, and control. Connectors are provided on the CS110 for attaching wind speed and direction, temperature and relative humidity, solar radiation, and rainfall sensors. The CS110 is a variation on the traditional rotating field mill design for electric field meters, using a reciprocating shutter which snaps open and closed rather than a rotating vane, improving reliability and reducing power consumption. As with the Road Surface Sensor above, combined with a cell phone modem the sensor can be used at mine sites or other open work areas to send SMS's to key personnel when there is danger of lightning strikes in the area.

SR50A Sonic Ranging Sensor

The SR50A, manufactured by Campbell Scientific Canada, is a rugged, acoustic sensor that provides a non-contact method for determining snow or water depth. The SR50A determines depth by emitting an ultrasonic pulse and then measuring the elapsed time between the emission and return of the pulse. Using a non contact method for the measurement of depth, along with a lack of moving parts, prolongs the life of the sensor and simplifies maintenance when it is required. The sensor will also overcome anchoring problems, which can be associated with pressure sensors and does not suffer with the same errors at low water levels as submersible pressure sensors.



255-100 Analog Output Evaporation Gauge

The 255-100 determines evaporation rate by measuring the changing water level in an evaporation pan. This evaporation gauge consists of a float, pulley, and counterweight attached to a precision 1000-ohm potentiometer mounted through a gear assembly in a weatherproof housing. A 255-200 or another standard National Weather Service Class A Evaporation Pan is used to ensure standardised measurements. Evaporation is a property which is usually calculated from other measurements, this sensor allows direct measurement of evaporation to 0.25% accuracy.

Third Party Software

Need a specialised data analysis package? Read on for more info on third party software...

Every application has different data management, analysis, and display requirements. While CSA offers a range of software packages that suit most applications, in some circumstances additional features are needed. Including the ability to store and manage collected data in a database, the ability to process particularly large amounts of data, and the ability to manage and display data from sources other than Campbell loggers.

Numerous data management packages can be used with Campbell Scientific software or as a stand-alone package. In some cases, the software has been designed specifically to manage data recorded by Campbell logging systems such as Vista Data Vision, MultiLogger and GeoMos. At the core of each of these packages is the facility to communicate and collect data from our data loggers. This data is stored in a database, and can be analysed and displayed in a variety of ways. Each of these packages is designed to provide a different solution and they operate in quite different ways. Below is a brief look at the features of each package and how they integrate with Campbell data loggers or networks.

Vista Data Vision by Vista Engineering

<http://www.vista.is/english.html>

Vista Data Vision has three main applications - "db.robot.c", "db.data.browser", and "db.web.browser". These applications work together to create a complete data management system.

The "db.robot.c" application allows the user to import data from a .dat file (collected by software such as Loggernet, or PC400) into a database. The application monitors the .dat files, and when any new data is added it is automatically copied over to the database. The user can easily label each variable with descriptive names and engineering units or use naming labels from the header information of table-based .dat files or from .FSL files for array based data loggers. Old .dat files can also be manually imported into the database and experienced users can use SQL (Structured Query Language) commands to access the data in the database.

The "db.data.browser" and "db.web.browser" applications provide ways to edit and view the data either locally, or hosted as a web-page. These applications allow reporting in both table and graphical formats and perform statistical calculations on the data in the database as part of the reporting process. These applications support multiple languages and the "db.web.browser" application includes built-in access control to configure user accounts and passwords and to set each user's access to the data from various sites.

MultiLogger by Canary Systems

<http://www.canarysystems.com/>

Canary Systems manufacture various software packages for use with Campbell Scientific loggers. Due to its ability to handle large amounts of data, the software is ideal for high speed monitoring applications and it is commonly used in the geotechnical industry.

The base package offered by Canary Systems is "MultiLogger", support-

ing communication and data collection from all Campbell loggers and offers many of the same features as Loggernet software. "MultiLogger" includes scheduled data collections, a menu-driven program generator (similar to ShortCut) and the capacity to communicate via any form of telemetry, numeric monitoring and troubleshooting facilities.

Packaged as part of the "MultiLogger" is the data processing application, "Roobrik", designed to process large ASCII data files and produce reports, charts and spreadsheets quickly and easily. There are two types of report that can be produced, a tabulated list of measurements, and an instrument report, which presents statistical parameters. "Roobrik" also has an extensive charting tool, and the capacity to export directly into Excel.

Extensions on "MultiLogger" include "MultiLoggerDB" which adds database technology, "Insite", which is a data access client package that allows data to be presented as a project and "MLWeb" which provides web data access to "MultiLoggerDB".

GeoMos by Leica

http://www.leica-geosystems.com/corporate/en/ndef/lgs_4802.htm

Leica GeoMos is an automatic monitoring system, specifically designed for use in deformation and geotechnical applications. The GeoMos software consists of two main applications, "GeoMos Monitor" and "GeoMos Analyzer".

"Monitor" is an online application responsible for managing sensor control, data collection, calculations, and event management. The package collects data directly from any Campbell datalogger through an interface similar to Loggernet.

Data collection is generally performed on a schedule and all data collected or calculated are stored in an open SQL database. The database has an automatic backup facility and can be accessed by multiple users either locally or remotely using "GeoMos Analyzer".

"Monitor" provides real time calculations of deformations and performs limit checks and with its event management and messaging capabilities, notifies the necessary people of important system events. Both "GeoMos Monitor" & "GeoMos Analyzer" can display data graphically and "Analyzer" allows the user to have data overlay a map or photo. As well as being able to display data numerically, "Analyzer" can combine data from multiple locations or sensors into a single graph. Through "Analyzer", users can import and export data for editing and post processing.

A third application "GeoMos Web" is a web based application, available for analysing and displaying data collected by "GeoMos Monitor". The user can host the web page or have Leica host it on their behalf.

All three companies offer software packages, which can all easily manage data from any Campbell Scientific data acquisition system. As is commonly the case these days, the data is stored and managed in a database. Each package has different display and analysis features and all three allow the data to be easily hosted on the web. It may be worth considering one of these software solutions in the future when considering the software needs of your network or monitoring site.



Fire Behaviour Modelling

How Campbell Scientific data loggers are used to develop the next generation

fire-behaviour models

After identifying a need to conduct better measurements of flame front properties in wildfires, the Bushfire Cooperative Research Centre from CSIRO developed a rapid-deployment, multi-sensor system to measure fundamental fire behaviour properties in experimental and wildland fires.

Incorporating Campbell Scientific instrumentation the system measures heat fluxes, fluid flow velocities and radiation characteristics in bushfire flames.

Campbell Scientific CR10X and CR3000 data loggers with an AM25T thermocouple multiplexer were chosen to measure the complex sensor arrangement consisting of custom-made narrow-angle radiometers, small diameter K Type thermocouples and Schmidt-Boelter type dual heat flux sensors. The Campbell Scientific loggers were chosen for their low power needs, ruggedness, accuracy under temperature extremes, high speed measurement and fast processing capability. Flame temperatures, flame radiation, convective and radiative heat fluxes and flow velocities within flames are measured during the experiments.

A major challenge overcome during the design phase was to develop a multi-sensor measurement package that would be light enough to allow rapid deployment on short notice and yet robust enough to survive the extreme environment that characterizes high intensity flames.

The equipment has now been operating in excess of three years, during which time the Campbell loggers have performed reliably under hostile environmental conditions. The type and number of sensors integrated in this package permits spatially and temporally resolved measurements of the heat that is driving the fire.

These flame-front measurements will set the base data from which physical-based modeling frameworks will be developed to build the next generation of fire behaviour models.



Application at a Glance

Application

Bushfire Monitoring

Project Area

South Australia

Data Logger

CR10X and CR3000

Sensors

Custom radiometers
K-type thermocouples
Schmidt-Boelter dual heat-flux sensors.

Communication

Direct connect

Measured Parameters

Flame Temperature
Flame Radiation
Convective and Radiative Heat Fluxes
Flow Velocity