Data Acquisition Systems

Introduction

A complete data acquisition system consists of data logger components, data retrieval components, and software components.

Data Logger Components

Data Loggers: Campbell Scientific data loggers are known for their field reliability and offer compatibility with a wide range of sensors and data retrieval options.

A single data logger can read a large number of sensors provided they are concentrated into a small area. Additional loggers should be deployed if sensors are distributed over a wide area. This keeps signal cables short, reduces problems with noise, and minimizes the potential for damage from construction activities and electrical transients. Cost savings on cable can sometimes pay for the additional loggers.

Interface Modules: Certain types of sensors require additional interfaces. For example, vibrating wire sensors require a VW interface, which is connected between the data logger and a multiplexer.

Multiplexers: Multiplexers increase the number of sensors that can be monitored by a data logger. For example, the CR1000 can control up to seven multi-plexers, each capable of handling 16 to 32 sensors. In practice, the data logger usually controls one or two multiplexers, and additional loggers and multiplexers are employed if there are more sensors.

Power Supplies: A power supply provides regulated power to the logger and sensors. Power is drawn from a battery that is charged from AC mains power or a solar panel.

Weatherproof Enclosures: All field components must be housed in weatherproof enclosures.

Data Retrieval Options

Wired Links: Wired links for data retrieval include direct connection to the PC, telephone modems, short haul modems, and multidrop networks.

Wired links are usually less expensive and easier to set up. They are also better for real-time data retrieval.

Wireless Links: Wireless links for data retrieval include cell modems, and spread-spectrum radio modems.

Wireless links are useful when distances, site traffic, or other obstacles make wired links impractical. Also, to the degree that wireless links eliminate surface runs of cable, they also reduce problems caused by electrical transients.

Software Components

Logger Control Software: Logger-Net software is used to create monitoring programs and to retrieve data from logger to PC.

Custom Programming: Slope Indicator offers custom monitoring programs for Campbell data loggers. The programs, which are created with LoggerNet and can be modified by the user, significantly reduce the time and expense required to deploy the data acquisition system.

Web-Based Monitoring: Processing and distribute the data collected by data loggers can be a daunting task. Atlas Monitoring Software provides an efficient and cost-effective solution to this problem.

Atlas automatically processes readings, checks for alarms, displays graphs, and generates reports. Distribution is immediate because Atlas works on the internet. With only their web browsers, users can view and download data, whether they are at work, at home, at a client's office, or half-way around the world.

See the Atlas data sheet or visit www.slopeindicator.com for more information on Atlas.

DATA LOGGER COMPONENTS

CR800 Data Logger 56700800
CR1000 Data Logger 56701000
PS100 Power Supply 56703120
AC Adapter, 90 to 260 VAC 56703124
RS-232 Interface Cable 50306869
USB Interface Cable 56704018
ENC 16/18 Enclosure 56705020
AVW200 VW Interface 56701550
AM16/32 Multiplexer 56702110
System Integration Per Logger . . .96700000

A minimum logger system consists of the CR800 or CR1000, a power supply with an AC adapter or large capacity battery, an interface cable for communication with PC, a weatherproof enclosure for all outdoor components, and LoggerNet software for the PC. A VW interface is required for vibrating wire sensors.

An expanded system could include additional data loggers, power supplies, multiplexers, enclosures, and data retrieval options.

The ENC 16/18 enclosure can house a logger with power supply, VW interface, one AM16/32 multiplexer, and a communications module, such as a telephone modem. A second multiplexer can sometimes fit in the same box. Battery powered systems require a separate box for the battery.

The capacity of an AM16/32 multiplexer depends on the type of sensor connected. In general, the AM16/32 multiplexer can operate 32 two-wire sensors or 16 four-wire sensors of the same type. The table below shows multiplexer capacity for common sensors:

Sensor Type	AM16/32 Capacity
Vibrating wire sensors without RTD or thermistor readings	32
Vibrating wire sensors with RTD or thermistor readings	16
EL beam sensors and EL tiltmeters without RTD or thermistor readings	32
EL beam sensors and EL tiltmeters with signal conditioning board.	16
EL uniaxial in-place inclinometers EL uniaxial monopod tiltmeters	16
EL biaxial in-place inclinometers EL biaxial monopod tiltmeters	16

BASIC DATA RETRIEVAL OPTIONS

Com200 Telephone modem 56704410
The COMM200 telephone modem is designed specifically for Campbell Scientific data loggers. One modem is placed with each data logger and connected to a telephone line with a dedicated number. Communication is typically initiated by the computer which uses LoggerNet to dial the logger and retrieve the data. Real-time data transfers are possible while connected.

OTHER DATA RETRIEVAL OPTIONS

Voice Modems: Voice modems, a variation of the telephone modem, can deliver messages to preset phone numbers. Voice modems generally require extra set up time.

Short Haul Modems: Short-haul modems are placed with each logger and provide a reliable real-time link between the logger and a computer. The short-haul modem transmits data up to 8 km over a four-wire cable that is routed by the user.

MD9 Multidrop Interface: The MD9 is placed with each logger. A single coaxial cable links the MD9s into a network. The network can be connected to the controlling computer or to a telephone or radio modem.

Cell Phone Modems: Cell phone modems are placed with each data logger. Some cell services offer IP connections to the modem, so that the long-distance portion of the transmission is carried on the internet.

Spread-Spectrum Radio Modems: Spread-spectrum modems are placed with each data logger. Communication is typically initiated by the computer. Most countries do not require licenses for these modems.

SOFTWARE COMPONENTS

LoggerNet Software 56708020
Custom Programming 96701000

LoggerNet Software: This software is required for each data logging system. It is used to write and compile monitoring programs, to transfer the program to the data logger, and to retrieve data by direct wire, modem, or radio telemetry.

Custom Programming: Slope Indicator offers custom programs written in CR Basic. A typical program excites the sensors, obtains readings, and stores data at preset intervals, but it does not perform data reduction operations. Users can modify the program as needs evolve.

ATLAS WEB SERVICE

Atlas Activation Fee 58851000
Atlas Monitoring Service 58851050

Atlas is a web service with monthly plans based on the number of sensors to be monitored. The activation fee includes a partial setup of a project. Monitoring service is a monthly change and includes monitoring of 50 sensors. Additional sensors can be added for a nominal fee.