

## CR21 MICROLOGGER



For remote measurement, data reduction, and recording.

### Features

- User programmability
- Portability
- Real-Time data processing (averaging, totalizing, max, min)
- Battery operation
- Telephone dial-up
- Computer compatible

### Applications

- Portable weather stations
- Air and water quality monitoring
- Solar and wind energy assessment
- Pest management
- Irrigation scheduling
- Transportation systems monitoring
- Hydrological evaluations
- Building energy assessment
- Intelligent HVAC control

## CR21 MICROLOGGER

### Description

In the world of environmental datalogging, the luxury of mass data storage systems is often prohibited. Therefore, the CR21 MICROLOGGER concept makes every data point count through on-site processing. By simple keyboard selection analogous to a pocket calculator, the CR21 will process one-minute (ten-second models are optionally available) sensor readings into single data points (average, max., min., standard deviation, etc.) over time intervals up to one day in length. The significant difference between conventional sampling dataloggers and the CR21 is intelligence.

This miniature, battery-operated, microprocessor based computing datalogger inputs data from a variety of sensors, processes the information, and stores the processed data in memory to be read later using a dial-up telephone line, cassette recorder, storage module, portable printer, GOES satellite transmitter, or the digital display. The CR21 contains a microcomputer, signal conditioning for nine separate sensors, and internal memory capability for storing up to 608 processed data points.

Seven of the nine available input channels will accept analog voltages in two program controlled ranges: -0.2 to +2.5 volts, or -2 to +25 millivolts. A 2 volt DC excitation for DC resistance measurements can be switched on under program control during the sensor scan cycle.

In addition to handling volts and millivolts, input channels 5, 6, and 7 can read resistance probes excited by the 680 Hz, 4 volt AC excitation supply. Inputs 8 and 9 are pulse counting channels. Channel 8 has a capacity of 4095 counts per minute and channel 9 has a capacity of 15 counts per minute. These counters are reset automatically each time they are read.

To program the CR21 MICROLOGGER for reading each of the nine inputs, the user keys in a processing program number, multiplier, and offset for each channel. Input conditioning programs in read-only-memory include DC volts, DC millivolts, thermistor linearization, relative humidity sensor linearization, DC resistance and AC resistance.

Once each minute (or ten seconds) the MICROLOGGER samples the inputs, converting the raw electronic signals to engineering units. These values are stored in nine memory locations for later use by the real-time display or in data processing.

The sensor readings (in engineering units) are further processed by user selected output processing programs. Typical output programs include Sample, Average, Totalize or Integrate, Max., Min., Frequency Distribution (Histogram), and Event Recording. More than one output program can be used with each input channel. For example, the CR21 can compute the average, maximum and minimum temperature on channel 2 using three output programs for the single channel.

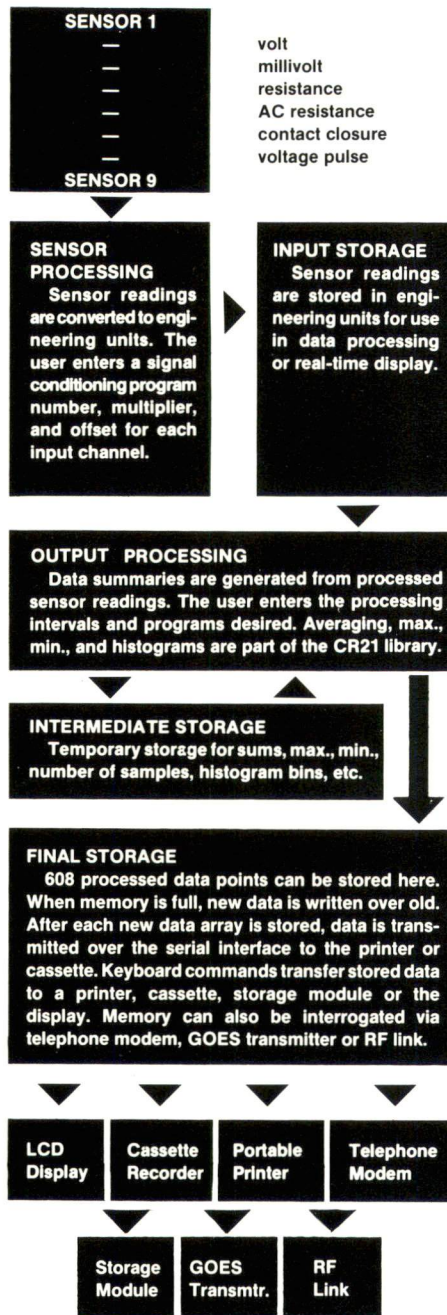
The time interval during which the output programs process data is user selectable. Up to three output intervals, from ten seconds to one day, can be keyed into the CR21. For example, the CR21 can be programmed to output both hourly and daily maximum/minimum values from channel 2.

At the selected output intervals, data is placed in final RAM storage and output to a cassette, printer, storage module, etc.

Stored data is output in the following format:

Output ID No.	Description
01:	Output interval number (1, 2 or 3)
02:	Julian Day
03:	Time
04:	First output data value
05:	Second output data value
	Etc.

## CR21 Operating System



## CR56 Printer



The CR56 Printer, shown above with the CR21, can be used to obtain on-line printed copy where environmental extremes or lack of AC power would limit the use of standard computer peripheral type printers.

## CR21 Specifications

- General:** User programmable processing datalogger with auto ranging and full floating point math capability.
- Input Signal Conditioning Programs:** Provide signal conditioning for volts, millivolts, DC resistance, AC resistance, thermistor linearization, and RH sensor linearization; multiplier and offset programmed for each channel.
- Data Processing Output Programs:** Standard programs include sampling, averaging, totalize or integrate, max., min., histograms, event, standard deviation and more.
- Internal Data Storage:** 608 locations for processed data points, 64 intermediate storage locations for processing, and 9 locations for sensor readings.
- Sensor Scan Interval:** Once every minute or once every ten seconds; user must specify his requirement at time of ordering.
- Maximum Output Time Interval:** Single data points can be processed over time intervals up to one day in length.
- Final Data Storage Intervals:** Up to three output intervals possible, each user programmable from ten seconds to one day in length.
- Input Channels:** Nine total, seven analog, two pulse counting. Of the seven analog, channels 5, 6 and 7 can read AC resistance. Battery voltage monitored by an internal channel.
- Digital Input Channels:** Two inputs, 5V CMOS levels — available for special applications.
- Digital Output Channels:** 4 CMOS outputs for use with custom software.
- Amplifier Accuracy:** 0° to +40°C Temperature range: ±0.2% of reading or two times the resolution, whichever is greater. -25° to +50°C Temperature range: ±0.5% of reading or five times the resolution, whichever is greater.
- Resolution:** ±5 μV on mv range and ±1 mv on volt range.
- On-Line Data Storage Media:** Internal memory (CMOS RAM), printer, cassette, storage module, or any RS232 terminal via CSI's SC232 Interface.
- Data Retrieval From RAM:** Cassette, display, telephone dial-up telemetry, CR56 Printer, or GOES transmitter.
- Cassette Tape Data Storage Capacity:** CSI's newly developed high speed—high density, error detection and correction format (Format 2) allows a maximum of 180,000 data points (2 bytes/data point) to be stored on a single side of a C-60 cassette tape. Note: Cassette recorder's recommended minimum operating temperature is 0° C.
- Display:** Six digit LCD.
- Power:** Eight alkaline D cells; typ. life 4-6 months depending on ambient temperature and user's individual acquisition needs. The Model CR21L MICROLOGGER is optionally available and has a sealed lead acid battery pack substituted for the alkaline D cells. The CR21L is recommended ONLY for data acquisition situations where AC power is available on a continuous basis.
- Environmental:** -25° to +50°C, 0 to 95% RH, noncondensing.
- Size and Weight:** 2.7" x 5.7" x 8.2", 5 lbs.

Portable Weather Station using the CR21 Micrologger with sensors and other accessories from Campbell Scientific.



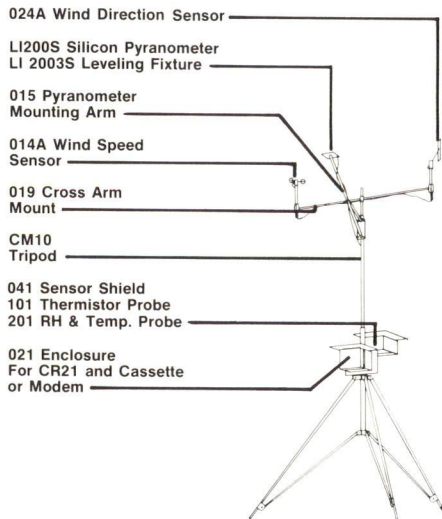
Connecting wind direction sensor.



Entering CR21 program parameters.

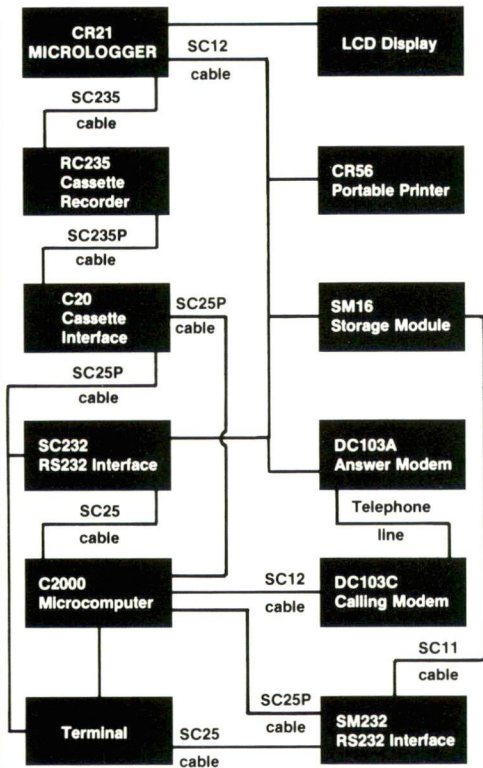


Complete station for monitoring wind speed, wind direction, solar radiation, air temperature, humidity, precipitation, and soil temperature.



CR21 accessories for environmental monitoring.

## Data Retrieval



## C2000 Network Data Acquisition Microcomputer

### Description

The C2000 is a Z80 based microcomputer with 64K of RAM, 4K of ROM, 600K of mass storage on each of two floppy disk drives, two serial RS232 ports, and a cassette interface for reading and writing CSI formatted cassette tapes. This system can be expanded with up to 8 additional STD bus cards when additional functions and peripheral interfacing options are required.

### Applications

- Reading and processing data from cassette tapes generated by CR5, CR7 or CR21 dataloggers.
- Automatic data transfer directly from dataloggers via telecommunications or hard wire tie.
- Generating reports based on collected data.
- General purpose programming and text editing.
- Transfer of processed data to and from other computers.

Structured with the well established STD microcomputer bus, the C2000 is easily adapted to a broad range of expansion options.

## C20 Cassette Interface

The C20 CASSETTE INTERFACE replaces the older A235 Cassette Reader and allows users of CSI dataloggers to write or read data tapes generated in either CSI's original format (Format 1) or the newly developed high speed—high density format (Format 2). With Format 2, the CR21 MICROLOGGER stores 180,000 data points on one side of a C-60 tape and is read by the C20 at a rate of one hundred data points a second. Using a sophisticated error detection and correction technique, the C20 reads tapes with a high degree of reliability, automatically correcting burst errors up to 16 data points in length. The C20 also has the capability to generate tapes from terminal or computer stored information.

Baud rate, format selection, parity, protocol determination and port configuration are easily controlled by the user through switches conveniently located on the C20's front panel. There are eight possible baud rate settings ranging from 110 to 19,200.



Equipped with two EIA RS-232-C ports, the C20 acknowledges commands and transmits data to both the computer/modem and terminal/printer or the computer only. In either mode, the C20 is transparent to all commands except those meant for it, thereby causing minimal interference in the communication between terminal and computer.

### C20 Specifications

- Tape Read Rate:** 1 block/5 secs. (1024 bytes/block) with Format 2.
- Tape Storage:** 180K Format 2 data points (360K bytes) or 8K Format 1 data points (16K bytes) per C-60 tape side.
- Max. Burst Error Correction Capability:** 16 consecutive data points (or 0.2" of tape).
- Baud Rates:** 110, 300, 600, 1200, 2400, 4800, 9600 or 19,200.
- Power Requirements:** 95-130VAC @ 47-63 Hz.
- Port Configuration:** Two (2) EIA RS-232-C.
- Size:** 9.0"D x 8.2"W x 5.5"H.
- Weight:** 6.0 lbs.

## C2000 Options and Peripherals

Model	Description
2105	Telecommunications option includes clock and two (2) channel serial I/O card, clock power controller, the Model DC103C 300 baud calling modem for direct-connect to the telephone switching network, an automatic dialer, and telecommunications software for automated interrogation of CSI dataloggers at user programmable time intervals.
8510A	Dot Matrix Printer (C. Itoh) with serial interface.
NEC 7710	Letter Quality Printer (Spinwriter).
TI 810	Dot Matrix Line Printer (Texas Instruments).
TVI-910	CRT Terminal (TeleVideo).
BASCOM	BASIC Compiler (MicroSoft).
BASIC-80	BASIC Interpreter (MicroSoft).
FORTRAN-80	FORTRAN Compiler (MicroSoft).
WORDMASTER	Text Editing Software (MicroPro).
WORDSTAR	Word Processing Software (MicroPro).

## C2000 Specifications

- Mainframe:** Card cage for up to 12 STD bus cards, power supplies, slots for two 8" floppy disk drives, and desktop chassis.
- Power Supplies:** 100 watt switching power supply providing  $\pm 5$ ,  $\pm 12$  and 24 VDC. Power requirements are 95-130 VAC @ 47-63 Hz.
- CPU:** Z80 microprocessor with clock frequency at 4 MHz.
- Memory:** 64 kilobytes of RAM, 4 kilobytes of ROM.
- Disk Drives:** Two 8" floppy disk drives (IBM format) with formatted capacity of 600 kilobytes each, using double density format. Double-sided disk drives are optionally available.
- Serial I/O:** 2 channels RS-232-C.
- Cassette I/O:** Campbell Scientific datalogger audio Format 1 and Format 2, relay equipped to turn tape drive on and off under computer control.
- Size:** 9" high, 17" wide, 20" front to back.
- Weight:** Approx. 40 lbs.
- Software:** CP/M (Digital Research, Inc.) Disk Operating System, cassette read/write utilities and ROM-based memory test utilities. Text editors and high level languages are optionally available.



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