

Data Storage Modules

Models SM192 & SM716

The SM192 and SM716 Storage Modules are rugged data storage devices that are used to transport data from the datalogger site to the office. While connected to the datalogger, a storage module can receive all data being stored in the datalogger (Models CR10, 21X, and CR7). Alternatively, data can be copied from the datalogger to a storage module during a site visit (includes BDR320).

Features

- SM192 stores 96,000 data points; SM716 stores 358,000 data points
- -35° to +65°C operating range (-55° to +85°C available as special order)
- Rugged, sealed, stainless steel packaging
- Battery-backed RAM data storage
- Stores up to eight datalogger programs; can automatically download CR10, 21X, or CR7 programs on datalogger power-up
- Can be carried in backpack or large pocket

Data Transfer - Datalogger to Storage Module

While in the field, the storage module is powered by the datalogger's power supply. During transport or interruption of system power, an internal battery maintains the storage module's data and programs.

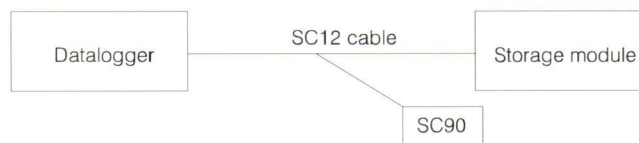
Data can be transferred from the datalogger to the storage module either automatically or under user control.

For automatic data transfer, the datalogger is programmed to send all or part of its data to a connected storage module. If the storage module is not connected, the data will be "queued up" until the storage module is reattached.



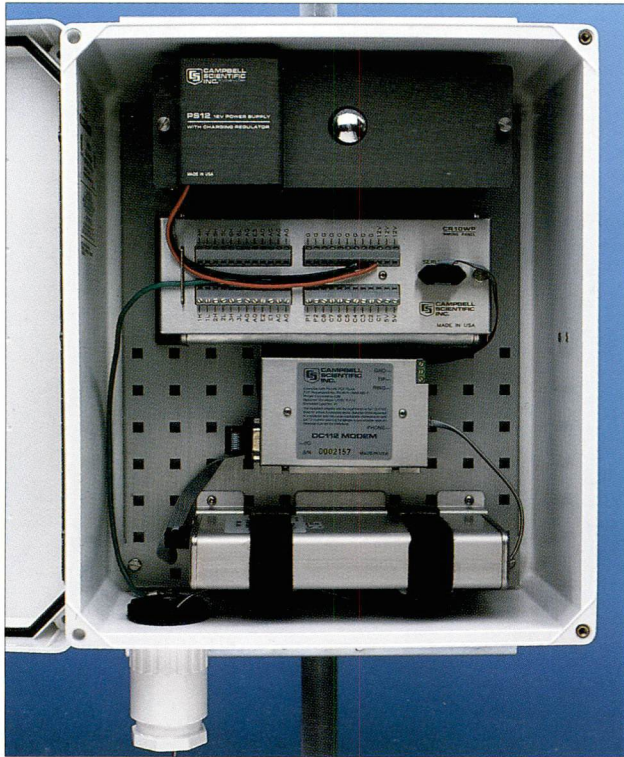
An SM716 stores data from a 21X Micrologger.

For user-controlled data transfer, the user commands the datalogger to download all or part of its data to an attached storage module. A laptop computer (requires SC32A Interface) or the datalogger's keyboard display can be used to issue commands.



The storage module connects directly to a datalogger via an SC12 cable (supplied). The SC90 Line Monitor, which lights up during data transfer, gives visual confirmation of the transfer.





A typical system includes power supply (top), datalogger, telephone modem, and a storage module for data/program backup. A specialized mounting bracket (p/n 6234) attaches the storage module to the enclosure's backplate.

Memory Configuration

The user can select fill-and-stop memory or ring memory (default). Fill-and-stop memory stores data until all available storage is filled. Ring memory continually accepts data from the datalogger; when the storage module is full, its oldest data are overwritten.

Calculating Storage Module Capacity

An SM192 Storage Module stores 96,000 low-resolution data points (four digits up to ± 6999); an SM716 stores 358,000. High-resolution data points (five digits up to ± 99999) require twice as much space.

To estimate when the storage module will be filled, first calculate the number of data points (dp) stored per day. Each Array ID (identifier for each output data string) and time-stamp constitute a data point, i.e., Array ID, date, and hour/minute are three data points. Assuming the datalogger stores 13 low-resolution data points each hour and an additional eight data points each day, then:
 $(13 \text{ dp/hour} \times 24 \text{ hours/day}) + (8 \text{ dp/day} \times 1/\text{day})$
 $= 320 \text{ dp/day.}$

Next, divide the available number of storage module locations by the number of data points accumulated per day. In the case of the SM192 Storage Module, $96,000 \text{ locations} / 320 \text{ dp/day} = 300 \text{ days}$.

Therefore, the data must be retrieved within 300 days to avoid losing data. In practice, the user is advised to retrieve data more frequently.

Use of Multiple Storage Modules

In data-intensive applications, two storage modules can be connected to a 21X or CR7 and up to eight to a CR10.

With a 21X or CR7, one storage module can be configured as fill-and-stop and one as ring memory. Data are transmitted to both storage modules simultaneously. Once full, the fill-and-stop storage module will refuse additional data while the ring memory module continues to store.

The CR10 can address up to eight storage modules; individual storage modules are configured as either fill-and-stop or ring memory. This feature allows the CR10 to direct specific data to a specific storage module.

Program Transfer

A storage module can store up to eight datalogger programs. Each stored program reduces available data storage.

The user generally directs program transfer with a keyboard. However, a program stored in the storage module's eighth program area will automatically download into the datalogger upon power-up (requires OS series datalogger PROMs). The datalogger checks the program for errors and then begins operation. This feature allows simple program transfers to be accomplished by untrained field personnel.

Data Retrieval Methods

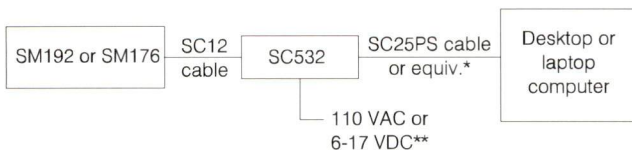
- 1) One storage module remains with the datalogger, stores data, then is replaced by a "fresh" storage module during a site visit. The "filled" module is returned to the office and downloaded to a computer.
- 2) A storage module is periodically taken to the site to "milk" data from the datalogger. Data from several dataloggers can be downloaded to a single storage module.

- 3) In applications with telecommunications, data are typically transferred directly from data-logger to computer. In these applications, a storage module provides on-site, independent backup of data and datalogger programs.
- 4) With the CR10, the storage module can be interrogated and its data downloaded to a remote computer via telecommunications. (Requires PC208's TELCOM version 6e or later and one of the following communication links: telephone, radio, cellular, multidrop, or shorthaul.)
- 5) Both the CR10 and the storage module can be interrogated on-site by a battery-operated IBM compatible laptop computer through an SC32A Optically Isolated Interface.

Data Transfer - Storage Module to Computer

For IBM® Compatible Computers - Recommended Method

The SC532 interface converts the CMOS logic levels of the storage module to the RS-232 levels of the computer. PC208 Datalogger Support Software is recommended for storage module communications, data transfer, data manipulation, report generation, and datalogger program editing.

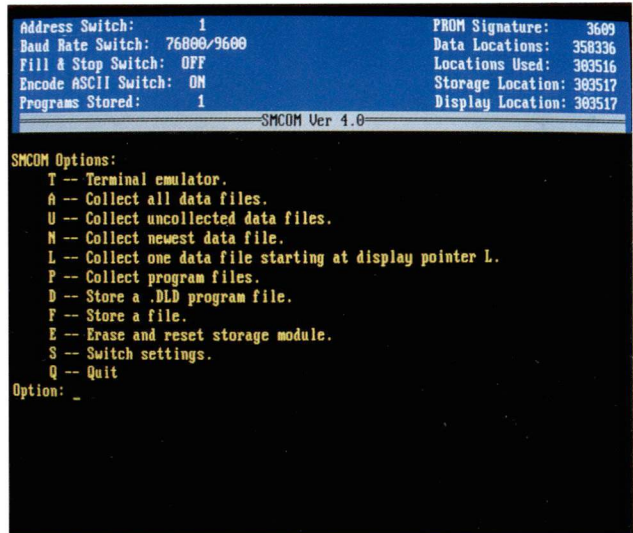


*Requires 9-pin to 25-pin adapter cable for 9-pin serial ports
 **Requires simple modification for DC operation

Storage module interrogation and configuration is supported by SMCOM, a program in PC208 Software. SMCOM prompts the user for a COM port, then advances to a menu screen. To accomplish most functions, the user simply enters the letter of the desired operation.

For IBM PC/XT/AT Compatible Computers - Alternate Method

A PC201 card may be used in an IBM compatible computer equipped with a full-size, industry-standard card slot. Due to its cost, this method is recommended only for users who presently own a PC201 card or require one for another purpose such as data download from cassette tape or unattended



SMCOM's main menu screen.

power-up of the computer. An SC209 cable and PC208 Datalogger Support Software are required.

For non-IBM Compatible Computers

The SM232A Storage Module interface and a commercially available terminal emulator program are used with non-IBM compatible computers. This method generally requires substantial knowledge of computer and storage module communication protocols. However, some MacIntosh® computers have successfully run PC208 software in conjunction with SoftPC® (a product of Insignia Solutions, Burlington, MA); an application note on this procedure is available from Campbell Scientific.

SM192/716 Specifications

Storage capacity

SM192: 192,896 bytes (~96,000 low resolution Final Storage locations)

SM716: 716,672 bytes (~358,000 low resolution Final Storage locations)

Power requirements

5 VDC supplied by the datalogger or SC532 on pin 1 of the 9-pin connector. Typical current drain:

active and processing 18 mA

standby state ("asleep" but

connected to datalogger) 250 μ A

Internal battery

3.5 VDC lithium thionyl chloride battery.

Expected battery life (@ 25°C) is 10 years for an SM192, 6 years for an SM716.

Memory configuration

User-selectable as either fill-and-stop or ring style.

File mark

A file mark is automatically placed in the data when the storage module is first connected to a datalogger (includes situations where power to the datalogger has been temporarily lost).

Baud rates

Supports all datalogger baud rates.

Data transfer is typically 9600 or 19,200 baud; 76,800 baud in burst mode.

Operating temperature range

-35°C to +65°C, standard

-55°C to + 85°C, on special order

Packaging

Sealed, stainless steel canister

Dimensions

7.8" x 3.5" x 1.5" (19.8 x 8.9 x 3.8 cm)

Weight

SM192: 1.5 lbs (0.7 kg)

SM716: 1.9 lbs (0.9 kg)

SM192/716 shipped with:

SC12 cable and instruction manual

SC532 Specifications

Supply voltage

+6 VDC to 17 VDC; factory-installed

110 VAC to 7.5 VDC adapter

Output voltage to SM192/716

5 VDC \pm 0.2 VDC

RS-232 output levels

High: +10 VDC \pm 1 VDC

Low: -10 VDC \pm 1 VDC

RS-232 input levels

\pm 30 V maximum

Low threshold \leq 0.8 V

High threshold $>$ 3.5 V

Input impedance $>$ 3000 Ohms

Port Configuration

25-pin D-subminiature female configured as RS-232 DCE. 9-pin D-subminiature female connects to the storage module through the SC12.

Operating temperature range

-25°C to +50°C

Dimensions

4.9" x 2.9" x 0.9" (12.5 x 7.4 x 2.3 cm)

Weight

0.9 lbs (0.4 kg)

SC532 shipped with:

SC12 cable and instruction manual



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