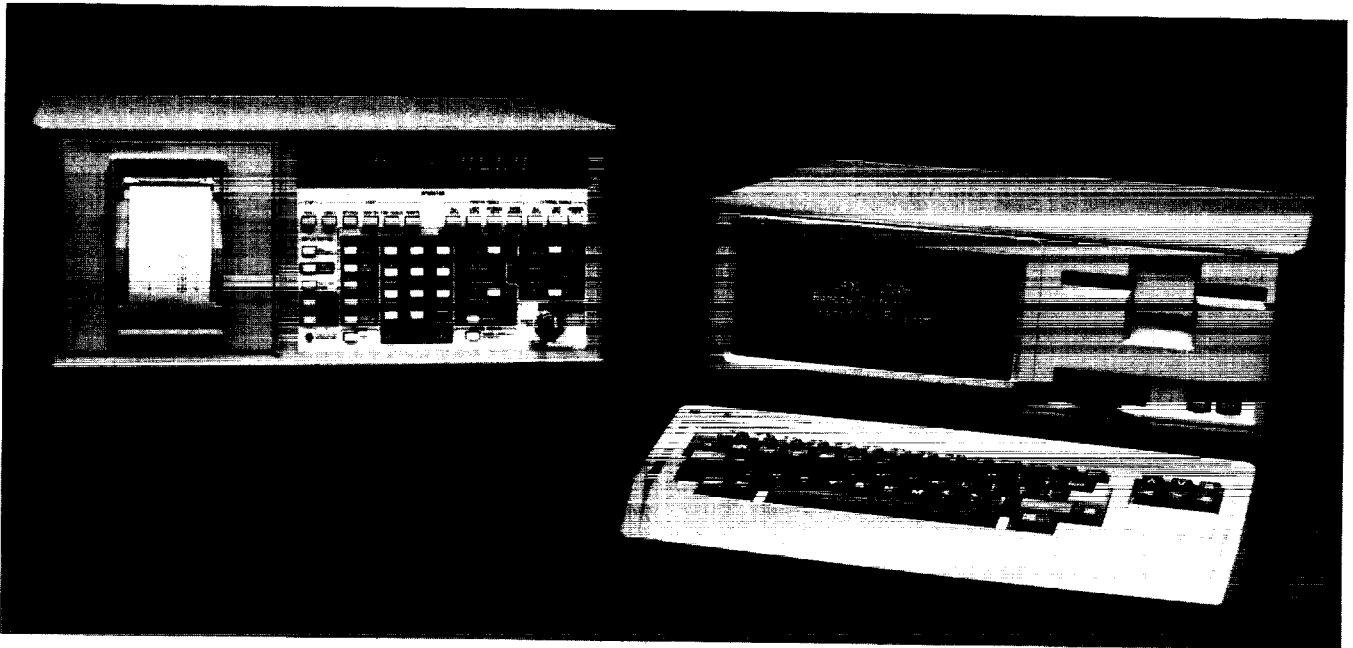


DATA LOGGERS

Introduction



1720A

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What a Fluke Data Logger Is To You

It is a *complete system*. Once it is delivered, it is only necessary to connect your sensors, select operating parameters from the front panel, and it is ready to go to work in the intended application. There is no need to add other hardware or spend time writing computer programs.

It is a *modular system*. It can be configured or reconfigured to suit the particular application. Its modular design allows you to select the exact number of channels, accuracy, and functions needed. And because there are so many standard modules, custom engineering is unnecessary.

It is a *high performance system*. It measures voltage to $1 \mu\text{V}$ and temperature to 0.1 degree. It will scan nearly 15 points per second with high noise rejection. It will scan as often as once every second or as seldom as once every 24 hours. It can be instructed to continuously monitor a single channel. It will either log all the data, or only data that exceeds preselected limits.

It is a *key programmable system*. That is, it is programmed with pushbutton-type keys from the front panel. There is no special language to learn; it is not necessary to know anything about software. Simple front panel pushbutton selections cause the internal microprocessor circuits to store and faithfully execute that exact measurement routine.

It can be a *remote programmable system*. With Option -15 or Option -17, the 2240C is capable of being programmed or controlled from a remote RS-232-C-compatible terminal or IEEE-488-compatible controller like the Fluke 1720A. When interfaced to an instrument controller or programmable calculator the 2200B or 2240C serve as the "front end" to a computer-based process control or data acquisition system.

Since late 1975 when the Fluke 2240A Data Logger was introduced, it has become a standard by which the industry compares all other programmable data loggers. The new 2240C, which replaces the 2240B, incorporates refinements that field experience has shown to be worthwhile. No performance features were sacrificed.

A Microprocessor and Common Bus Make It Possible

The key to the low-cost flexibility of Fluke data loggers is microprocessor control and common-bus architecture. All control, interface, and data handling functions are under the direction of the microprocessor. Many special features are achieved with standard internal software, so that much of the hardware is common to all system configurations. Its bus structure makes it very simple to configure a data logger to suit specific requirements. Or, if application requirements change, it can be reconfigured to perform in a new application. In many instances, a change in requirements can be handled with a simple program change. If power is lost, your program is not. The program is saved for up to five years!

Features and Benefits

Flexibility: Measures all physical parameters that can be represented by a proportional voltage or current. Signal sources can be from thermocouples, RTD's, thermistors, current transmitters, dc and ac voltage. Digital inputs may also be accommodated.

Expandability: Field-expandable system permits the addition of new inputs without disturbing previous signals. Sixty input channels are contained within the mainframe; additional channels are located in Scanner Extender Chassis.

Accuracy: Measure voltages from 40 mV full scale to 40V full scale (4 ranges) with accuracy that is the standard of the industry.

Low thermal emf switches: Permit measurements to $1 \mu\text{V}$ with a 40,000 count A/D converter.

Complete thermocouple capability: Isothermal input connector, automatic reference junction, and precise digital linearization. Measure with NBS linearizations for thermocouple types J, K, T, E, R, S, and B, DIN linearizations for types J, K, T, and S, as well as other linearizations. Resolution is 0.1° and accuracy is excellent.

DATA LOGGERS

Overview



Complete RTD capability: Linearizations for 100 Ω platinum 385, 390, 3902, and 392 plus 120 Ω nickel and 10 Ω copper RTD's are available.

Scale and condition transducer inputs: For direct readout in measurement units. RTD's, thermistors, current transmitters, pressure transducers, flowmeters, etc.

mx+b scaling factors: Assignable to any or all input channels.

Versatile Input connectors: Mix voltage inputs with thermocouple inputs, even thermocouple types, on the same connector.

15 channels per second: Scan rate on full scale inputs with 40,000 count resolution.

Scan remote sensors: With remote Scanner Chassis up to 1500 feet from data logger.

Operator control of measurements: Using the simple push-button keyboard, the operator selects the measurement process — Scan mode, Output, Range, Function, and Alarms.

Easiest front panel programming: Because of the color coding, prompting with LED's, switch grouping by function, and minimum use of multiple-function keys, straightforward programming is measurement-oriented and easily understood.

Control over input changes: If signal range or function changes, front panel programming allows the operator to accommodate most without equipment changes.

Choice of scan modes: For measurement flexibility. Single scan, at pre-set time intervals, continuous scanning of selected first-to-last channels, or monitoring of single channel.

One to four limit set points: The measurements or average measurements on any channel or group of channels may be repeatedly compared to up to four high and/or low preset limits to signal or log out-of-limit conditions.

Alarms output: Gives the user open-collector TTL outputs and relay contacts that close when a limit is exceeded.

Display a reading on any channel: Without interrupting the scan in progress.

Complete listing of measurement program: Including range, function, alarm limits on the internal printer.

Program protection: The program is not lost if power fails or the data logger is turned off. Five-year, non-volatile memory.

LED display: For all information and to echo programming steps.

Time of year: Displayed and printed as heading of each scan.

No fan: Power dissipation less than 50 watts.

Complete user-control of output: User has a choice of an internal printer, display, and a variety of external display and logging devices using standard and special interfaces.

Interface capability: To controllers, computers, and calculators using RS-232-C, or IEEE-488.

User-control of external output format: Interface pcb's for all devices has character-deletion switches.

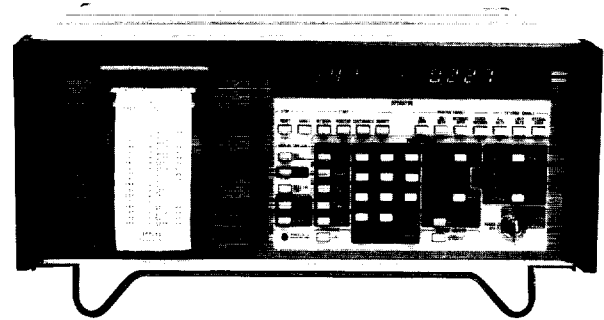
Record length control: By setting switches on mag-tape output interfaces.

Insert special control characters: For software compatibility. Choose engineering units from the complete ASCII set (up to four characters per channel).

Format control for CRT display: Pcb switches allow operator control of channels displayed per line, baud rate, parity, bits per character, and heading format.

An Overview of Models, Options, Etc.

There are two basic models of Fluke data loggers: the 2200B and 2240C. The 2200B is for less complex jobs and is the less expensive model, although it has a self-contained printer and is just as fast and accurate as the 2240C.

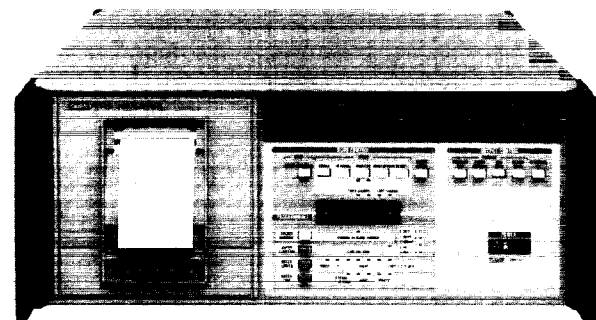


2240C

Simple data logging operations may be completely satisfied with nothing more than what may be contained in one data logger mainframe. In other words, wires from all your sensors and contacts may carry signals directly into a data logger where the signals may be scanned, conditioned, scaled, converted to equivalent digital data, and displayed and printed out automatically or on command.

If data acquisition is from more points than may be connected to the six 10-point scanner cards that will fit in one mainframe, a scanner chassis must be used. There are three kinds of scanner chassis: Model 2201A, for use near the data logger; Model 2202A, for installations where the scanner must be remote from the data logger (up to 1500 feet away); and Model 2203A, for resistive temperature devices (RTD's), which require an excitation current.

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2200B

If data needs to be displayed or logged elsewhere, or on equipment made by other manufacturers, nearly any kind of such equipment is compatible. Compatibility is achieved by selecting the circuit cards, connectors, and cable specifically designed to interface with that equipment. But you don't have to select every such component separately. Instead, they are grouped, and the groups numbered simply as options, according to the job they perform. The same is true of the other kinds of circuit cards and circuit card connectors that may be plugged into a Fluke data logger mainframe.



DATA LOGGERS

Configurations

Choosing the Configuration You Need

By selecting the Fluke data logger products and options needed to satisfy your particular requirements, you determine the configuration of your data logger system. All the compatible options are plug-to-plug compatible. That is, no special engineering is required to make the separate parts work as your own special system.

Although you may select all the necessary mainframes and options you will need by referring to the detailed descriptions of the products and options, we urge you to contact your Fluke Representative or Sales Engineer. He will be very glad to answer your questions and discuss your particular requirements.

You begin by considering what kind of input signals you have and how many scanner chassis may be required. This will determine what kind of connectors to use and how many scanner cards and connectors are required. There are five kinds of scanner cards: two for RTD signals, one for measuring low-level signals to 1 μ V, one for general purpose applications, and one for ac voltage signals.

As analog signals are converted to equivalent digital data in a Fluke data logger, the digital data can be scaled, linearized, and assigned engineering units before being displayed or logged. Several kinds of scaling and linearizing options are available.

If any input signal goes above a certain value or below a certain value, you may wish to note the condition as an alarm. If so, an Alarm Set Point Option is required.

Although both the 2200B and 2240C contain a printer, display, and front panel controls, both may be operated by and with peripheral equipment. Numerous standard digital interface options are available for your choosing. For your convenience, some include the peripheral equipment as well as the interface cards, cables, and connectors.

Data Loggers

Model 2200B

The 2200B provides control and basic programming for systems not requiring maximum flexibility or complex programming. A 2200B offers minimum system cost, and will log up to 60 channels in the mainframe or up to 100 channels with a scanner chassis. Range, function, and channel-skip can be programmed for 10 individual channels or ten blocks of 10 channels.

A 2200B system embodies the best in input measurement, throughput, resolution, accuracy, and speed available from Fluke.

With a 2200B system, you can have programming simplicity and a totally dedicated system without sacrificing resolution, accuracy or speed.

Model 2240C **NEW**

The 2240C provides full programming capability and utilization of all data logger options. The 2240C has a capacity of 60 channels in the mainframe and ability to monitor up to 1000 channels using scanner extender chassis. An on-board printer and front panel display are standard. In addition to the features and benefits mentioned thus far, the 2240C contains these capabilities also:

Remote programming: Lets a user control the data logger from a remote terminal with most of the capabilities of front panel programming. Also provides interfacing capability to controllers, calculators, and computers for additional processing of data.

Time average: Up to 99 successive measurements on each of up to 30 single channels may be averaged before comparing or logging data.

Group average: On each scan, average the measurements on any group of up to 99 channels for up to 30 groups.

Versatile alarms capability: User can choose between "alarms-once" or "all-alarm" data. Alarms-once causes an output only when a channel exceeds a limit and when it comes back within the limit. All-alarm causes an output as long as a channel is out of limits.

Security: Key switch locks out all front panel functions except single-channel display, to prevent tampering.

30 mx+b scaling factors: Programmable from the front panel. May be assigned to any or all of up to 1000 channels.

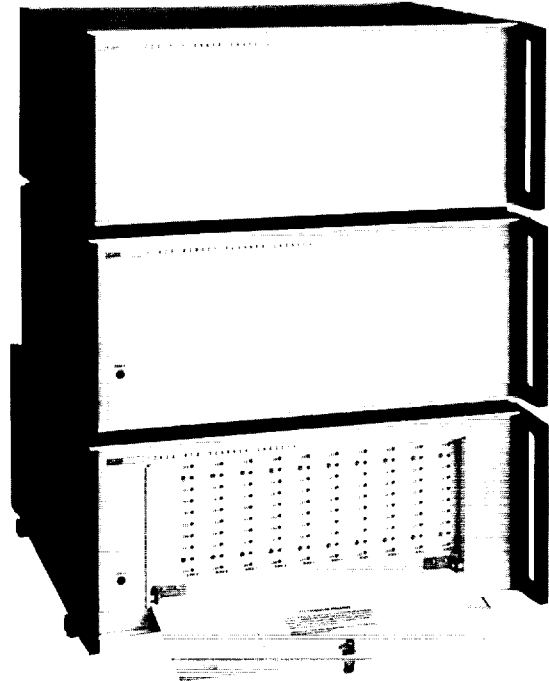
Scanner Extender Chassis (for 2200B, 2240C)

Model 2201A

A chassis for scanner circuit cards when there is a need for more than six such cards. (Six will fit in a data logger mainframe.) There are twelve slots for scanners in the Model 2201A, which means it can handle 120 input channels. By using more than one Model 2201A, up to 1000 channels may be scanned with a 2240C. Model 2200B will scan up to 100 channels. The 2201A Scanner Chassis may be installed up to 50 feet away from a data logger. A 6-foot cable is standard.

Model 2202A

Similar to the 2201A, the 2202A has its own power supply, can be located up to 1500 feet from a data logger, and can interface directly to a mainframe, or to other scanner chassis. The 2202A has ten slots for scanner circuit cards, meaning up to 100 channels. Cables are custom-made for each customer using Options 2200A-7001 and 2200A-7002.



2201A, 2202A, 2203A

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Model 2203A

Similar to the 2202A except that it accepts the larger RTD scanner card (-04), up to 10 per scanner chassis. Each card is equipped to supply a constant excitation current to each RTD. The 2203A contains its own power supply and can be located up to 1500 feet away from a data logger. A 6-foot cable is standard. It can either interface directly to a mainframe or scanner chassis. With 2200A-7003 adapters, up to ten regular scanner cards may be used with the 2203A. Behind a drop panel on the front of the 2203A chassis are ports for accessing ten R_0 calibration pots on each installed RTD scanner, one for each RTD channel.

Input Connectors (for 2200B, 2240C)

Application-oriented input connectors are used to connect up to 10 channels of analog data to each input scanner card. Each connector is housed in a plastic enclosure for ease in handling and relieving strain on the input wires. Several variations of these connectors are available as options.

RTD Connector Option (-03)

The RTD Input Connector is a card-edge connector which plugs onto an RTD Scanner (Option -04 or Option -33). Four screw terminals per channel are provided for connecting either three- or four-wire RTD's. Terminals are HI, LO, S+ and S.

Solder Pin Connector Option (-07)

The Solder Pin Connector is a 30-pin card-edge connector. Each of 10 possible three-wire inputs is soldered directly to the connector pins. This connector is recommended for general purpose ac or dc voltage measurements.

Isothermal Connector Option (-08)

The Isothermal Connector is a card-edge connector assembly designed for use in making thermocouple temperature measurements and/or voltage measurements. Input connections are in the form of convenient screw-type terminals. An anodized aluminum block thermally couples the input terminals to form an isothermal junction. The temperature of the isothermal block is detected by a transistor whose base-emitter voltage has been temperature calibrated. Temperature information from the transistor is then used by the microprocessor for reference junction temperature compensation. The maximum temperature gradient between any two terminals is $\pm 0.05^\circ\text{C}$. The reference junction stability is within $\pm 0.005^\circ\text{C}$ per degree, from 0°C to 50°C . Since measurement and scaling functions can be programmed for each individual channel, any combination of dc voltage and/or thermocouple type can be assigned as inputs to the Isothermal Connector.

Current Transmitter Connector Options (-28, -29, -30)

The Current Transmitter Connectors are card-edge connector assemblies designed for use in making dc current measurements with the 2240C. Each connector is designed to cover a specific current transmitter range. Three ranges are available: 1 to 5 mA (-28), 4 to 20 mA (-29), and 10 to 50 mA (-30). Input connections are in the form of screw-type terminals. Up to 10 current inputs can be assigned to each connector. However, each input must be within the connector's current range.

Input currents are converted to dc voltages by individual shunt resistors across each pair of input connections. These voltages can be read as current, or they can be scaled to read 0 to 100% of range, e.g., 0% for 4 mA and 100% for 20 mA. Scaling and engineering units notation can be added for direct readout in properly scaled units.

Scanners (for 2200B, 2240C)

Printed circuit boards that plug into the input section of a data logger or scanner chassis provide multiplexing of analog input signals. Each card scans up to 10 channels, and occupies one of six possible slots in the data logger mainframe or 10 or 12 slots in a scanner chassis, depending on the model. Analog input connections to the scanner are completed using one of the input connectors. Commands from the control section energize the appropriate scanner relays to complete the connection between a single channel of analog data and the a-d converter.

RTD Scanner Option (-04)

The RTD Scanner Card is a 10-channel, two-wire relay scanner which operates in a Model 2203A RTD Scanner Chassis with an RTD Connector Option -03 attached at the input. Up to 10 RTD scanners can be installed in a single Model 2203A, and each scanner will accept up to 10 RTD inputs. In addition to the scanning relays, each RTD scanner includes a common guard relay for all 10 channels. A current source is supplied to provide necessary excitation for the RTD, and an R_0 calibration adjustment is provided for each RTD input. The RTD current source is derived from the 2203A RTD Scanner Chassis. RTD's are accepted in 3-wire and 4-wire configurations.

Interchangeable RTD Scanner Option (-33)

The interchangeable 8-channel RTD Scanner is a two-wire relay scanner which operates in the 2200B and 2240C, but will also fit into the 2203A RTD Scanner Chassis with the addition of one 2200A-7003 Standard Scanner Adapter per scanner. A common guard wire for all 8 channels is provided, and a switched current source excites the RTD's only when their scanner is being used. Separate calibration adjustments for each RTD are accessible at the top of each scanner by removing the top and guard covers of the chassis. RTD's are accepted in three- and four-wire configurations.

General Purpose Scanner Option (-05)

The General Purpose Scanner Card is a 10-channel, two-wire relay scanner designed for general purpose multiplexing applications. High and low inputs are provided for each of the ten channels. A common guard input is provided for all ten channels and its relay is energized when any one of the ten channel relays is energized. Voltage offsets due to scanner relay characteristics (thermal emf, contact resistance, etc.) are less than $10 \mu\text{V}$.

Low Level Scanner Option (-06)

The Low Level Scanner Card is a 10-channel, three-wire relay scanner designed for high-accuracy multiplexing applications. High, low, and guard are provided for each channel. Special reed relays and thermal isolation techniques result in voltage offsets of less than $1 \mu\text{V}$.

AC Voltage Scanner Option (-33/AL)

An 8-channel scanner card with two switch-selectable voltage ranges: 4V and 120V rms. The option provides an average reading for ac voltage and fits directly into all 2000-Series Data Loggers.

Digital Inputs (for 2200B, 2240C)

Option (-16) is a circuit card that accepts up to nine digits of BCD input data for display as supplementary heading data. It can be installed in one of the three available I/O slots. Up to three digital input cards can be installed in the data logger for a total of 27 extra heading-data digits. The data inputs are DTL/TTL compatible and can be updated anytime during the

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analog channel measurement sequence. Utilization of the special 2201A/AA Extender Chassis provides for up to 15 Digital Input pcb's.

A-to-D Converter (for 2200B, 2240C)

Each 2200B and 2240C has one analog-to-digital converter. It is a plug-in circuit that measures and digitizes multiplexed analog data (dc voltage levels) from the input scanner. It employs dual-slope conversion techniques and has a dynamic range of 40,000 counts. The Converter measures dc voltages on four ranges: 40 mV, 400 mV, 4V, and 40V. Resolution on the 40 mV range is 1 μ V. Measurement speeds of 3 or 15 readings per second are switch-selectable. The following specifications apply when used with the Low Level Scanner Option (-06).

Common Mode Noise Rejection: ≥ 140 dB at 50 and 60 Hz $\pm 0.1\%$, ≥ 120 dB at dc, with 1 k Ω unbalance, at slow speed. At high speed the same except 110 dB at 50 and 60 Hz

Common Mode Voltage: ± 350 V dc or peak ac, system max
Normal Mode Noise Rejection: ≥ 70 dB at 50 and 60 Hz $\pm 0.1\%$ at slow speed. At high speed ≥ 55 dB

90-Day System Accuracy*: $\pm(0.01\%$ reading $+0.005\%$ range $+1 \mu$ V) at slow speed. At fast speed $\pm(0.01\% + 0.008\%$ range $+2 \mu$ V)

1-Year System Accuracy*: $\pm(0.015\%$ reading $+0.01\%$ range $+2 \mu$ V) at slow speed. At fast speed $\pm(0.015\%$ reading $+0.015\%$ range $+4 \mu$ V)

Temperature Coefficient: $\pm(0.001\%$ reading $+0.001\%$ range) per $^{\circ}$ C from 20° C to 0° C or from 30° C to 50° C

Reference Voltages: 2V and 0.02V at jacks in rear

Reference Voltage Accuracy: $\pm 0.02\%$ for 90 days from 20° C to 30° C

*Includes all instrument errors such as A-D errors, scanner errors, and power supply variations.

Scaling and Conditioning (for 2240C)

mx+b Scaling Option (-40)

This option provides 30 user-programmable mx+b scaling functions. These scalings may be programmed for any or all 1000 possible channels. Additionally, a table of engineering unit notations is included which allows assignment of engineering units to scaled input data for readout on the printer or external device.

Temperature Scaling Options (-43, -44, -45)

These options provide a choice of thermocouple linearizations, RTD linearizations, and a 4 to 20 mA (0% to 100%) current transducer scaling operation.

Option -43 has NBS linearizations for J,K,T,S,R,B,E and C type thermocouples and 385 Pt and 390 Pt RTD's plus 4 to 20 mA scaling.

Option -44 has both NBS and European (DIN) linearizations for J,K,T, and S thermocouples and 385 Pt and 392 Pt RTD's plus 4 to 20 mA scaling.

Option -45 has NBS linearizations for J,K,T,S,N*,D, and G thermocouples and 385 Pt, 120 Ω Ni, and 10 Ω Cu RTD's plus 4 to 20 mA scaling.

Only one of the above options (-43, -44, or -45) may be installed at one time.

Data Averaging Option (-42)

This option is for the 2240C only. It offers single-channel *time averaging* and multi-channel *group averaging*. Time averaging applies to up to 30 single channels with a selectable "averaging window" of up to 99 successive readings. Group averaging applies to up to 30 groups of channels with up to 99 channels in

one group. Each group average is computed each time the group is scanned. Averaging functions can be performed at user-selectable time intervals.

Data averages may be printed by the front panel printer or external device. They may also be compared to preset limits in the Alarm Set Point Option (-41).

Scaling and Conditioning (for 2200B)

Temperature & Current Transmitter

A Temperature and Current Transmitter circuit card is for the 2200B only and is included with the 2200B. It provides the data logger with the capability of measuring and linearizing four thermocouples, RTD's, and current transmitters.

When using thermocouple or RTD inputs, the readout is directly in temperature, switch-selectable in $^{\circ}$ C or $^{\circ}$ F.

A total of four thermocouple types and/or linearizations may be chosen from: NBS linearizations for thermocouple types J, K,T,E,R,S, and B; DIN linearizations for types J,K,T, and S; JIS linearizations for type PR13; industry linearizations for types C*, G*, and D*.

When using current transmitter inputs, Current Transmitter Connector Options -28, -29, -30 are needed to provide a readout of 0 to 100%.

When using RTD inputs, linearizations for 100 Ω platinum 385, 392 platinum and 10 Ω copper are standard.

*Not an ISA symbol. Type D also known as W3.

Multiple-Scaling Option (-26)

The Multiple-Scaling Option provides up to four mx+b scaling functions of any signal. These must be specified by the customer at order time and are not programmable (changeable) from the front panel.

Engineering Units Notation Option (-27)

The Engineering Units Notation Option allows selected voltage ranges, decimal point positioning, and engineering units to be assigned as scales for up to four functions. For example, if a pressure transducer provides a 0 to 100 mV output for a 0 to 1000 psi input, a direct readout and printout of 1000 psi can be made by shifting the decimal point and addressing different print wheel combinations on the printer. This example assumes a linear scale. If linearization or an offset is required, Option -27 must be supplemented by one of the custom scaling options.

Limits and Alarms (for 2200B, 2240C)

Alarm Set Point Option (-41)

Option -41 is only for the 2240C. It detects alarm conditions — data readings which exceed high or low limits programmed by the user. Option -41 contains 60 programmable limit values and up to 4 may be assigned to individual channels. With Averaging Option -42 installed, limits may be applied to the *average* of a group of channels or to the *time average* of a single channel. For an individual channel you may set 4 alarms as all High, all Low, or any combination, such as HH, H, L, LL.

Alarms All Mode: When the LIMIT DATA pushbutton is pushed, the 2240C will print out only alarm (limit) data for the channel or channels where a limit has been exceeded. Scanning remains the same as it was and the alarm data will continue to be printed out for as long as any channel remains out of limits. With both the LIMIT DATA and the ALL DATA buttons pushed, the logger will print data, only when and if an alarm condition exists but for as long as the condition lasts.

Alarms Once Mode: With only the LIMIT DATA button pushed, no printing occurs until a limit on some channel has been exceeded. Then it prints the out-of-limit data once only (in

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red), and does so again once the channel returns to normal (in black). With both the LIMIT DATA and ALL DATA buttons pushed, the logger will print data on all channels once when a channel exceeds a limit and again when the channel returns to normal.

Alarms Set Point Option (-34)

Option -34 is similar to Option -41 but has only 40 set points and is for the 2200B only.

Alarms Set Point Output Option (-23)

Option -23 is a plug-in circuit card that occupies one of the three I/O slots in a 2200B or 2240C. It is used when it is necessary to provide an electrical output which can control a warning device when an input signal has crossed an alarm set point. An open collector output is provided for each of 30 alarm set points. Two Option -23's are required if you need between 30 and 60 set points (2240C only). The open collector outputs will sink 30 mA maximum. These outputs are available on the pins of the output connector. Two 50V, 1A relays are included with each Option -23 that may be controlled by any or all of the open collector transistors. Outputs from the relays also go to the output connector pins.

Output Options (for 2200B, 2240C)

These digital output interfaces function as peripheral drivers and are controlled by the External Enable Commands of the OUTPUT CONTROL section of the data logger front panel. The interfaces are plug-in pcb's that go into the three available I/O slots in the data logger mainframe.

Except for Option -15 and Option -17, these interfaces are data transmission devices only and not designed for external control. However, they can accept a contact closure to ground to initiate a scan. If a scan is in progress, the start signal will be ignored and a signal returned.

On each pcb are switches for the user to tailor the output data for the specific device and/or application. For each option series the following are available:

- 12 Character deletion, baud rate, and readings per line
- 13 Character deletion and readings per line
- 14 Character deletion and record length

TTY/RS-232-C Interface Options (-12)

With these interfaces the data logger will function with a wide variety of RS-232-C-compatible devices including cartridge magtape, cassette recorders, teletype (ASR33, etc.), CRT and printing terminals, compatible computers, and programmable calculators (such as HP 9825, TEK 4051, Wang 2200, etc.).

Option -12M has a male connector compatible with Data Communication Equipment (DCE) or modem type interfaces as defined by EIA Standard RS-232-C.

Option -12L has a female connector and characteristics that make it compatible with Data Terminal Equipment (DTE) or terminal RS-232-C devices.

Option -12C is the same as the -12L except that it contains circuitry to provide a delay after CR/LF to specifically accommodate the TI Silent 700 Series of terminals.

Option -12B will open or close an external 20 mA current loop when operating with teletype equipment. No current source is provided with Option -12, however.

Punch and Cassette Interface Options (-13)

A series of options for paper tape punches and cassette recorders. See listing on last data logger page.

Mag Tape Interface Options (-14)

Option -14E interfaces to the Kennedy 1600/5 and 1610/5 7-track magnetic tape recorders. Recording density is 556 or 800

BPI. Data rates up to 300 characters per second are achievable and output code is either ASCII or BCDIC.

Option -14G interfaces to the Kennedy 1600/360 and 1610/360 9-track magnetic tape recorders. Recording density is 800 BPI. Data rates to 500 characters per second are achievable and output code is either ASCII or EBCDIC.

Option -14K interfaces with the Kennedy 9832-9, nine-track, buffered tape recorder. Recording density is 800 BPI. Data rates up to 20,000 characters per second are achievable and output code is either ASCII or EBCDIC.

IEEE-488 Interface Option (-37)

A bus-compatible option for the 2200B only. Switch-selectable operation either as an addressable talker, using an instrument controller, or for the talk-only mode. May be remotely triggered to scan. Field-installable with all 2200B's.

Remote Programming Options (for 2240C)

For the 2240C only, these options let you operate the data logger from remote equipment. Operation may be according to a program which depends on changing events, and the data logger may be only a part of a larger system.

IEEE-488 Interface Option (-15)

Option -15 makes it possible to operate a 2240C Data Logger in conjunction with other instruments compatible with IEEE Standard 488-1978, including Fluke DVM's, counters, calibrators, synthesizers, printers, and the 1720A Controller. The data logger may be used as an addressable listener, addressable talker, or in a talk-only mode. It will generate service requests and respond to serial polls. Programming uses the same command set as employed with Option -17. Easily accessible switches on the Option -15 pcb lets an operator select the IEEE-488 bus address, talk-only mode, enable service requests, and print one or four readings per line. Cables with standard IEEE-488 connectors are available in 1-meter, 2-meter, and 4-meter lengths but none is supplied as part of Option -15.

Remote Programming Option (-17)

Options -17A, -17B, and -17C are for remote control and programming of the 2240C. Outputs may be displayed and recorded with the same equipment.

Serial ASCII characters control all functions that are normally controlled on the front panel. These characters are generated at the keyboard of the remote terminal and are interpreted as a command string by the data logger.

For example, if you type the four characters F013, you will select the first channel scanned to be 13. L056 sets the last channel to be 56. I003000 will set the scan interval at 30 minutes (00 hours, 30 minutes, 00 seconds). S2 sets the data logger for INTERVAL SCAN. S4 sets it for CONTINUOUS SCAN. C011, 2, 01, 16 programs channel 11 on the 400 mV range and applies limit 1 and 16.

This Option also provides random access to any channel regardless of what programming or output control is in progress. For example, the command R0184 interrupts the scan in progress and samples channel 18 on the 4V range (function 4).

The number of readings per line to be displayed or printed is selectable by a switch on the output pcb (1 or 4). Up to 16 readings per line may be chosen and characters in the standard output format may be deleted or substituted for individually by installing a Non-standard Output Format Option (-18). Engineering units and special control characters can be chosen from the complete ASCII set when Option -27 is installed in the data logger.

DATA LOGGERS

Options

Option -17A has a male connector with pin wiring that is compatible with Data Communication Equipment (DCE) or modem type equipment. With it the data logger acts like a terminal, using EIA Standard RS-232-C.

Option -17B has a female connector with pin wiring compatible with DTE or Terminal type equipment that is compatible with EIA Standard RS-232-C.

With the flexibility afforded by -17A and -17B, the 2240C can be interfaced to a wide variety of peripherals including Phillips and cartridge magnetic tape recorders, teletype (ASR33, etc.), Silent 700 Systems, CRT and printing terminals, RS-232-C-compatible computers, and programmable calculators (HP 9825, TEK 4051, Wang 2200, etc.).

Option -17C is for TTY type equipment using a 20 mA current loop. This option has transmit and receive current sources available if required.

Non-Standard Output Format Option (-18)

This option includes a PROM added to the pcb used in any of the Option -17 series. The PROM provides a special output format to suit individual needs described by the user. Either the standard or special format is selectable with switches on the Option -17 pcb, however.

Dual Interval Scan Option (-32)

This option (Option -32) permits any selected group of inputs to be scanned less frequently than others and as infrequently as 99 hours and 59 minutes. The points to be scanned less frequently may include any of the ones scanned more often.

Temperature Measurement Accuracy

RTD's (with Option -33 and -03)

Temperature Range	90 Day ±5°C		1 Year ±10°C
	Slow	Fast	Slow
-200°C to +450°C	0.3°C	0.4°C	0.4°C
+450°C to +800°C	0.4°C	0.5°C	0.5°C
-328°F to +700°F	0.5°F	0.6°F	0.6°F
+700°F to +1472°F	0.7°F	0.8°F	0.7°F

Note: Specifications do not include sensor error. Fast is 15 readings per second; slow is 3 readings per second.

Platinum

Ice Point Resistance: 100Ω ±0.8% (Standard)
Temperature Range: -200°C to +800°C (-328°F to +1472°F)
Linearization Conformity: 0.035°C, 0.063°F
Resolution: 0.1°C, 0.1°F

Copper

Ice Point Resistance: 9.024Ω, 10Ω at 25°C
Temperature Range: -75°C to +150°C (-167°F to +302°F)
Linearization Conformity: 0.002°C, 0.001°F
Resolution: 0.1°C, 0.1°F

Thermocouples (with Option -06 and -08)

Temperature Range And Thermocouple Type	Worst Case Resolution	NBS Conformity	System Accuracy (±)		
			90 Days 77°F ±9°F 25°C ±5°C		1 Year 77°F ±18°F 25°C ±10°C
			Slow	*Fast	**Slow
J Iron-Constantan					
°F -332 to -200	0.2°	0.15°	1.0°	1.2°	1.2°
-200 to 32	0.1°	0.15°	0.8°	0.9°	1.0°
32 to 1400	0.1°	0.1°	0.7°	0.8°	0.7°
1400 to 2200	0.1°	0.3°	0.8°	0.9°	1.0°
°C -202 to 0	0.1°	0.083°	0.6°	0.7°	0.7°
0 to 760	0.1°	0.055°	0.4°	0.5°	0.5°
760 to 1205	0.1°	0.166°	0.5°	0.6°	0.6°
K Chromel-Alumel					
°F -332 to -300	0.3°	0.175°	1.2°	1.4°	1.5°
-300 to -200	0.2°	0.175°	1.0°	1.2°	1.3°
-200 to 32	0.2°	0.175°	0.8°	1.0°	1.1°
32 to 500	0.1°	0.15°	0.7°	0.8°	0.8°
500 to 2500	0.1°	0.15°	0.8°	0.9°	1.0°
°C -202 to -172	0.2°	0.1°	0.7°	0.8°	0.9°
-172 to -130	0.1°	0.1°	0.6°	0.7°	0.8°
-130 to 0	0.1°	0.1°	0.5°	0.6°	0.6°
0 to 260	0.1°	0.083°	0.4°	0.5°	0.5°
260 to 1370	0.1°	0.083°	0.5°	0.6°	0.6°
T Copper-Constantan					
°F -332 to -300	0.2°	0.1°	1.0°	1.4°	1.5°
-300 to -200	0.1°	0.1°	0.9°	1.2°	1.3°
-200 to 32	0.1°	0.1°	0.8°	1.0°	1.1°
32 to 750	0.1°	0.1°	0.6°	0.7°	0.8°
°C -202 to -130	0.1°	0.055°	0.6°	0.8°	0.8°
-130 to 0	0.1°	0.055°	0.5°	0.6°	0.7°
0 to 400	0.1°	0.055°	0.4°	0.5°	0.5°
E Chromel-Constantan					
°F -332 to -240	0.2°	0.175°	0.9°	1.0°	1.1°
-240 to 32	0.1°	0.175°	0.8°	0.9°	1.0°
32 to 500	0.1°	0.11°	0.6°	0.7°	0.7°
500 to 1830	0.1°	0.11°	0.6°	0.7°	0.7°
°C -202 to 0	0.1°	0.1°	0.5°	0.6°	0.6°
0 to 260	0.1°	0.1°	0.4°	0.5°	0.5°
260 to 960	0.1°	0.07°	0.4°	0.5°	0.5°
R Pt. 13% Rhodium					
°F 32 to 90	0.4°	0.2°	2.8°	3.6°	3.6°
90 to 500	0.3°	0.2°	2.4°	3.2°	3.2°
500 to 3200	0.2°	0.2°	1.6°	2.2°	2.4°
°C 0 to 260	0.2°	0.1°	1.5°	2.2°	2.2°
260 to 350	0.2°	0.1°	1.0°	1.2°	1.4°
350 to 1760	0.1°	0.1°	1.0°	1.4°	1.4°
S Pt. 10% Rhodium					
°F 32 to 90	0.4°	0.2°	2.8°	3.6°	3.6°
90 to 500	0.3°	0.2°	2.4°	3.2°	3.2°
500 to 3200	0.2°	0.2°	1.6°	2.2°	2.4°
°C 0 to 260	0.2°	0.1°	1.5°	2.2°	2.2°
260 to 550	0.2°	0.1°	1.0°	1.2°	1.4°
550 to 1760	0.1°	0.1°	1.0°	1.4°	1.4°
B Pt. 6% Rhodium versus Pt. 30% Rhodium					
°F 896 to 1800	0.3°	0.14°	2.6°	3.6°	3.6°
1800 to 3308	0.2°	0.14°	2.0°	2.6°	2.6°
°C 480 to 1000	0.2°	0.08°	1.6°	2.4°	2.4°
1000 to 1820	0.1°	0.08°	1.2°	1.6°	1.6°
C* Tungsten 5% Rhenium versus Tungsten 26% Rhenium					
°F 32 to 3632	0.2°	0.18°	1.2°	1.6°	1.6°
3632 to 4208	0.2°	13.5°	15.0°	16.0°	16.0°
°C 0 to 2000	0.1°	0.1°	0.7°	1.0°	1.0°
2000 to 2320	0.1°	7.5°	9.0°	9.5°	9.5°
D* (W3)* Tungsten 3% Rhenium versus Tungsten 25% Rhenium					
°F 32 to 500	0.2°	0.22°	1.4°	1.8°	1.8°
500 to 3632	0.2°	0.22°	1.2°	1.6°	1.6°
3632 to 4208	0.2°	18.4°	20.0°	21.0°	21.0°
°C 0 to 260	0.1°	0.12°	0.8°	1.0°	1.0°
260 to 2000	0.1°	0.12°	0.7°	1.0°	1.0°
2000 to 2320	0.1°	10.2°	12.0°	12.5°	12.5°
G* Tungsten versus Tungsten 26% Rhenium					
°F 410 to 800	0.2°	0.2°	1.6°	2.2°	2.2°
800 to 3632	0.2°	0.2°	1.4°	1.8°	1.8°
3632 to 4208	0.2°	13.8°	15.0°	16.0°	16.0°
°C 210 to 420	0.2°	0.12°	1.0°	1.4°	1.4°
420 to 2000	0.1°	0.12°	0.8°	1.0°	1.2°
2000 to 2320	0.1°	7.1°	8.0°	8.5°	8.5°

*Not ANSI Symbol
 **Slow Speed, 3 readings/sec
 ***Fast Speed, 15 readings/sec

DATA LOGGERS

Display Panels

Data Logger Front Panel Displays

Digital data is displayed on the front panel of Fluke data loggers. Model 2200B can display as many as eight digits and Model 2240C can display as many as nine. Five of the digits are primarily to indicate the value of any of the analog signals that are connected to a scanner card. The other digits are primarily to identify the source of the signal that is being measured, scaled, digitized, and displayed at the moment. The identity of a signal source is shown by the input channel number that the signal leads are connected to. That number may be 0 through 99 for the Model 2200B, or 0 through 999 for Model 2240C. Whether the digital value of a signal stands for millivolts, volts, or temperature is indicated by a LED annunciator.

The Model 2240C has an additional annunciator LED labeled DATE and TIME. When that LED is lit, the first three digits are a code for the day and the next six are for the hour, minute, and second of a real-time clock.

The digits in the display have a special significance while the data logger is being programmed, and any programming errors are indicated by a flashing display. When measuring temperature with thermocouples, an open thermocouple is indicated by a series of five C's (CCCCC). Similarly, a series of five U's (UUUUU) indicates an overload condition in any measurement mode.

Data Logger Front Panel Controls

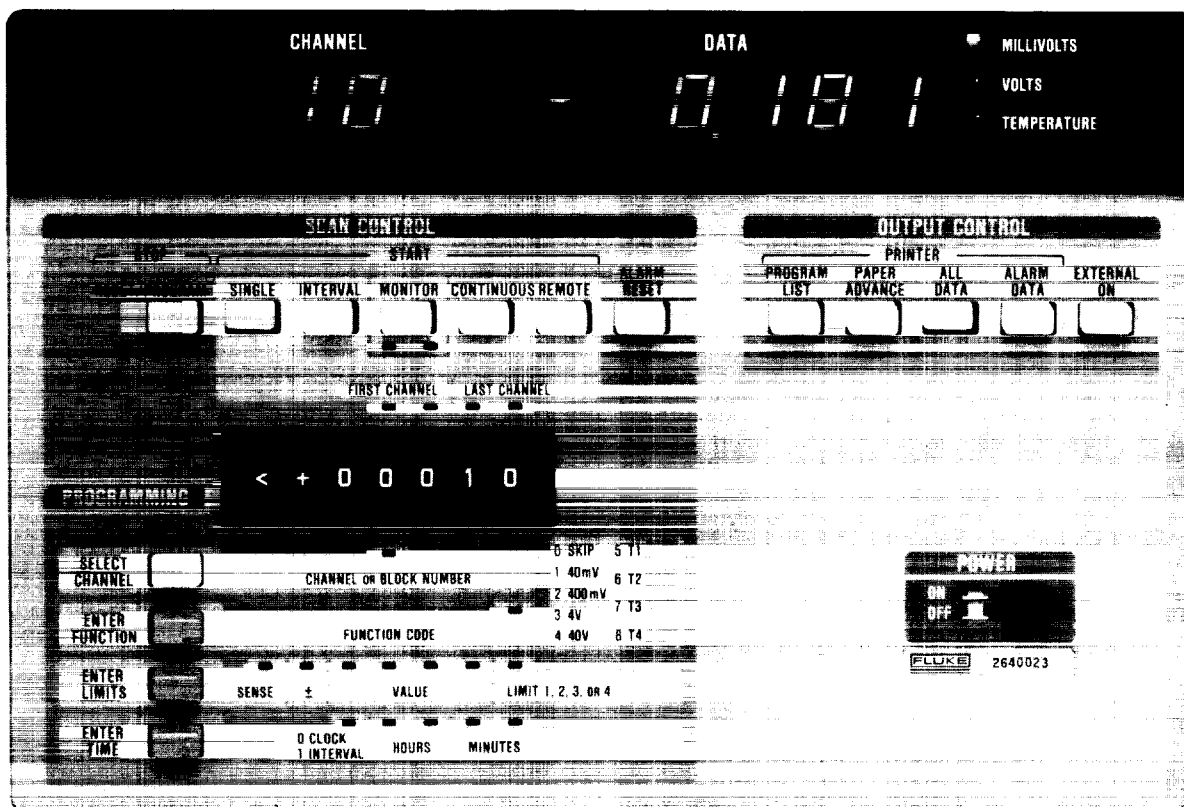
The 2200B is very simple to operate. It has a minimum of pushbuttons and front panel controls. Six pushbuttons select

the scanning mode, and five control the output mode. Each individual channel or block of ten channels can be programmed by entering two sets of thumbwheel data. Adding alarm limit values is as easy as entering one more setting per alarm level; four levels maximum. The scan interval and time of day are entered, then first and last channels are set with the thumbwheels to complete the process.

The front panel of the 2240C contains keyboard-like pushbuttons that are color coded and grouped to make it plain to both the programmer and the operator which pushbuttons are for which functions. It is surprising how much that simplifies set-up and operation. All data entered during programming is displayed on the front panel. An audible tone will be heard each time a valid entry is made and a flashing LED indicates each improper entry. A CLEAR ENTRY key clears erroneous entries. Several other kinds of errors are indicated by the display lights flashing, depending on what the error is. For example, unless certain options are installed certain operations cannot be performed, so the display lights will flash if you try to program an operation that cannot be executed.

The power switch is operated by a key, and after a program has been completed the switch may be moved to a position that prevents the program from being changed from the front panel. It may still be reviewed but not changed.

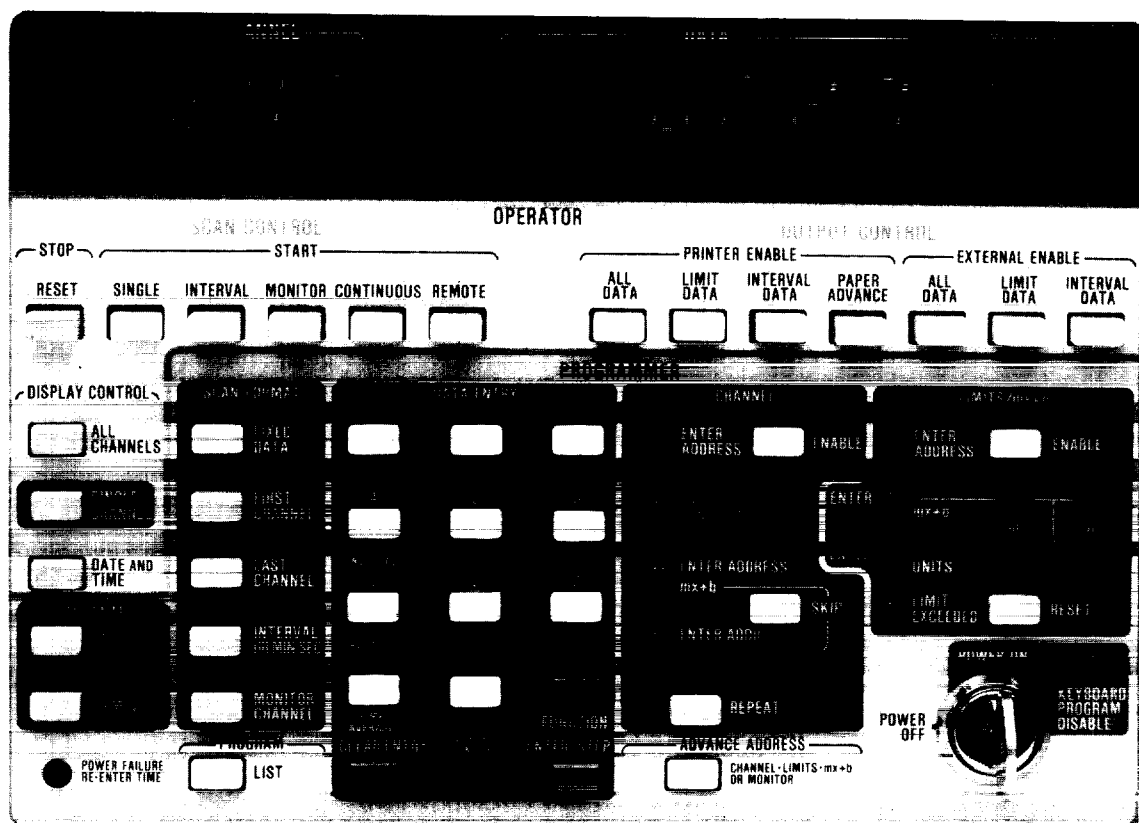
The SCAN CONTROL group of keys lets you either scan all inputs continuously, scan all selected inputs periodically at a preselected interval, scan one input repeatedly, scan all selected inputs once each time a key is pushed, let a scan be commanded by an external input, or stop all scanning and output operations.



2200B Panel Section

DATA LOGGERS

Display Panels



2240C Panel Section

The OUTPUT CONTROL group lets you select the output mode for the front panel printer and any peripheral. You can record all data, record data only when an out-of-limit transition occurs, or record data periodically at preselected intervals. Identical and independent keys will control the output to the peripheral device.

The DISPLAY CONTROL group lets you either display the data from every channel as it is scanned, display a single random channel from each set of inputs scanned, or display the date and time of day.

The SCAN FORMAT keys let you identify the first and last channel to be scanned, the time interval between periodic scans, and a particular channel that may be monitored. Another key in the group lets you program fixed heading data to appear at the start of each scan. A PROGRAM LIST key will cause a print-out of the contents of the program memory to help you change or document a program.

The DATA ENTRY group contains ten digit keys, 0 through 9, plus a key for a minus sign, a key to clear an improper entry, and an ENTER/STEP key to enter proper data and advance to the next step. The digit keys are also used to select certain measurement functions and limits when programming, so they have two labels.

The other keys let you establish the measurement functions and limits assigned to each channel and to skip any channel in a sequence. An ADVANCE ADDRESS key makes it easy to move to the next higher channel or limit address when programming, and a REPEAT key makes it simple to duplicate the function and limits of the previous address.

Data Logger Front Panel Printer

A 16-column digital printer is built into the 2200B and 2240C for recording both measurement and program data. Data is printed on 2¼-inch fanfold paper at a speed of 2.5 lines per second.

For convenience and for the record, the printer can be used to list the stored measurement program. The listing provides information on the function, range, and limits for each channel.

General Specifications

Warmup Time: One hour to full accuracy. Accuracy reduced by 0.02% of range on initial turn-on

Shock and Vibration: Meets requirements of MIL-T-28800

Package: Corpac II

Temperature: 0°C to 50°C, operating; -40°C to 60°C, non-operating

Humidity: ≤80% non-condensing to 35°C, ≤70% non-condensing to 50°C

Power: 100, 115, or 230V ac ±10%, 50 or 60 Hz; less than 50 watts maximum. Internal switches allow the user to choose 115 or 230V ac

Size: 15.4 cm H x 37.5 cm W x 49.5 cm L (7 in H x 17 in W x 22.47 in L) except 2201A, 2202A, and 2203A are shorter by about 8.2 cm (3.72 in)

Weight: Approximately 18 kg (40 pounds) dependent on options

DATA LOGGERS

Accessories and Options

Accessory Descriptions

- 2200A-7001:** Remote Scanner Cable Connector and assembly. A required part of connecting cable assembly for Model 2202A Scanner Chassis.
- 2200A-7002:** Remote Scanner Chassis Cable. Length must be specified. A required part of connecting cable assembly for Model 2202A Scanner Chassis. Priced by the foot.
- 2200A-7003:** Standard Scanner Adapter. One required for each Option -05 or -06 Scanner circuit card installed in Model 2203A RTD Scanner Chassis.
- 2200A-7005:** Extender Cables. A set of two extender cables for servicing vertical plug-in pcb's.
- 2200A-7006:** General Purpose Interface Cable. Six foot, 50-wire cable with 50-pin connector installed on one end. For Option -16 and Option -23.
- 2010A-7013:** Fan-Fold printer paper. A package of twelve packets of paper for the data logger's front panel printer.
- 2010A-7014:** Printer Ribbon. A package of twelve spools of two-color (red and black) ribbons for the data logger's front panel printer.
- M07-205-600:** 7-inch Rack Adapter. For any Fluke data logger or extender chassis
- M00-260-610:** 18-inch rack slides and hardware.
- M00-280-610:** 24-inch rack slides and mounting hardware.
- A22-4:** EIA Rack Enclosure. An enclosure 71 inches high containing power strip and all panels. For data loggers, scanner chassis, etc.
- A22-6:** Roll Paper Adapter. Adapts Data Logger front panel printer to use standard adding machine roll paper.
- A22-15:** Environmental Enclosure. Air-tight, sealed enclosure, for operation of the data logger in extremely corrosive atmospheres.

Models

February 1982 prices

2200B Data Logger	
Complete logging system, w/-06, -08	\$3695
2240C Data Logger	5145
2201A Scanner Extender Chassis	1295
2202A Remote Scanner Chassis	1495
2203A RTD Scanner Chassis	1995

Options

2200A-03 RTD Connector	90
2200A-04 RTD Scanner	435
2200A-05 General Purpose Scanner	255
2200A-06 Low Level Scanner	295
2200A-07 Solder Pin Connector	50
2200A-08 Isothermal Block Connector	125
2200A-12B Interface for ASR33	1045
2200A-12C Interface for TI 733	1045
2200A-12L Interface to RS-232-C Terminals	1045
2200A-12M Interface to RS-232-C Modems	1045

2200A-13C Interface for Facit 4070	1095
2200A-14G Interface for Kennedy 1600/360,1610/360	1095
2200A-14J Interface and Kennedy 9832-9	7995
2200A-14K Interface for Kennedy 9832-9	1095
2200A-16 Digital Input	425
2240B-15 IEEE Interface	1195
2240B-17A Remote Control, RS-232-C, Modem	1095
2240B-17B Remote Control, RS-232-C, Terminal	1095
2240B-17C Remote Control, 20 mA Loop, TTY	1095
2240B-18 Non-Standard Output Format	150
2240A-23 Alarm Set Point Outputs	360
2240B-26 Multiple Scaling	400
2240A-27 Engineering Units Notation	150
2240A-28 Connector for 1 to 5 mA Transmitters	185
2240A-29 Connector for 4 to 20 mA Transmitters	185
2240A-30 Connector for 10 to 50 mA Transmitters	185
2240B-32 Dual Interval Scan	325
2240A-33 Interchangeable RTD Scanner	415
2240A-33/AL AC Voltage Scanner	on req
2200B-34 40 Alarm Limit Set Points	725
2200B-37 IEEE Interface	1250
2240C-40 mx+b Scaling	160
2240C-41 Alarm Set Point	315
2240C-42 Time and Group Average	160
2240C-43 Temperature Scaling Group One	260
2240C-44 Temperature Scaling Group Two	260
2240C-45 Temperature Scaling Group Three	260

Accessories

2200A-7001 Cable Connector & Assembly	150
2200A-7002 Remote Scanner Cable (per foot)	5/ft
2200A-7003 RTD-to-Standard Scanner Adapter	50
2200A-7005 Extender Cable	220
2200A-7006 Digital Input/Alarm Output Cable	160
2010A-7013 Fan-fold Printer Paper (12 packets)	30
2010A-7014 Printer Ribbon (12 spools)	30
M00-260-610 18" Rack Slides	105
M00-280-610 24" Rack Slides	110
M07-205-600 7" Rack Adapter	95
A22-4 EIA Rack Enclosure	on req
A22-6 Printer Roll Paper Adapter	on req
A22-15 Environmental Enclosure	on req
A22-148 Tandberg BDL-3000 Cartridge Recorder (RS-232-C)	on req
A22-150 Tandberg GPIB-3000 Cartridge Recorder (IEEE-488)	on req

Also see Section 17 for more accessory information.