

FERMILAB TECHNICAL FAC REPAIR DATA



CAMAC Model 2232 32-Input Differential ADC

- * High sensitivity: 12 bits or 0.025% resolution
- * Two digitizing modes: Continuous Scan or Single Shot
- * Asynchronous readout: any channel can be read at any time
- * Independent measurements: operation same as 32 separate ADC's
- * Bipolar operation: covers 10 volt range between -5 and +5 volts
- * Differential inputs: eliminate 50-60 cycle and other common mode noise

The LeCroy Model 2232 is a 32-input, 12-bit ADC intended for use in general-purpose voltage-monitoring applications. The $> 10 M\Omega$ inputs of the 2232 respond to voltages over a 10-volt common mode range, (limits, ± 5 volts), converting them to proportional 12-bit digital data words. An on-board switch provides the option of a monopolar mode, 0 to +10 volts, differential, from minus to plus input. The differential inputs suppress the contribution from common mode noise and provide bipolar operation for usefulness in varied applications.

The voltage levels at the 32 inputs on the front-panel connectors are converted sequentially, requiring 550 μ sec per channel for conversion and storage in the RAM (Random Access Memory). The total cycle time is 18 msec, after which the cycle is continuously repeated. During readout the addressed 12-bit data word is placed on the Dataway without any interference of a store cycle, should one be present.

In the Continuous Scan Mode each channel of the 2232 continuously updates its memory every 18 msec. Thus, the need to respond to CAMAC commands C(clear) or I(initialize), or the generation of LAM are eliminated. As a result, programming for the 2232 is quite simple, since an extremely limited number of CAMAC functions and commands need be used. Readout onto the CAMAC Dataway proceeds via the standard CAMAC read functions F0 (Read Group 1 Registers, channels 0-15) and F1 (Read Group 2 Registers, channels 16-31). This method of readout provides the flexibility of reading individual channels or subgroups of the 32 channels more frequently than others, permitting low maintenance items to be monitored compatibly with ones that demand a higher level of attention.

In the Single Shot Mode the CAMAC function F(25)•N initializes the Analog Switch Address to Channel 1 and starts a single scan of all 32 channels. This may also be accomplished by applying a TTL logical zero pulse to a front-panel Lemo-type connector (Scan Trigger). This mode thus permits all 32 measurements to be more clearly related in time to some external event or reference.

The 2232 finds useful application in the monitoring of power supply voltages, magnet currents, temperature or pressure transducers, and in a variety of other situations where computer-compatible high resolution measuring of dc voltages is desired.

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SPECIFICATIONS

CAMAC Model 2232

32-INPUT DIFFERENTIAL ADC

Analog Inputs:	32 differential, voltage-sensing inputs; direct-coupled; > 10 M Ω impedance; front-panel connectors (mate with AMP #205210-1.*)
Full-Scale Range:	Common mode: 10 volt range between the limits of ± 5 volts. Monopolar Mode: 0 to + 10 volts referenced from minus to plus input (via on-board switch option).
Common Mode Rejection Ratio:	60 dB.
Noise Immunity:	1 kHz low pass filtering.
Integral Non-linearity:	$\pm 1/2$ count.
ADC Resolution:	12 bits ($\pm 0.025\%$ relative accuracy).
Temperature Coefficient:	Accuracy, 30 PPM/ $^{\circ}$ C., linearity 20 PPM/ $^{\circ}$ C.
Conversion Time:	Continuous Scan Mode: continuously converted data always available for readout. Updated every 18 msec (550 μ sec/channel). Single Shot Mode: 18 msec (550 μ sec/channel).
Readout Time:	Readout may proceed at the fastest rate permitted by the CAMAC standard at any time.
Data:	The proper CAMAC function and addressing scheme gates the 12 binary bits of the selected channel onto the R1 to R12 (2^0 to 2^{11}) Dataway bus lines. MSB indicates polarity of + input with respect to - input, remaining; 11 bits indicate absolute value. (In monopolar option all bits indicate absolute value.)
CAMAC Commands:	Q: A Q = 1 response is generated in recognition of F(0) and F(1) read functions for a valid "N" and "A", but there will be no response (Q = 0) under any other condition. X: An X = 1 (Command Accepted) response is generated when a valid F, N, and A command is applied.
CAMAC Function Codes:	F(0): Read first 16 registers (inputs 0-15); requires N and A; A(0) through A(15) are used for channel addresses. F(1): Read second 16 registers (inputs 16-31); requires N and A; A(0) through A(15) are used for channel addresses. F(25): Initiates Single Scan of all channels beginning with channel 0. Requires N.
Scan Trigger:	Logical "one" TTL pulse ($> + 2.0$ volts) of duration ≥ 100 nsec applied to front-panel Lemo-type connector initiates single scan of all 32 channels beginning with Channel 0.
Packaging:	In conformance with CAMAC standard for nuclear modules (ESONE Committee Report EUR 4100). RF-shielded CAMAC #1 module.
Power Requirements:	+6 V at 700 mA +24 V at 50 mA -24 V at 50 mA

*Input source impedance of < 0.5 M Ω is required for 1 bit AC accuracy over full range.

IRS Model 2232 Conversion to DMA

IC-AB is modified so that in the read mode IC-AF pin 8 is always high. This allows IC-AC pin 8 to give an output on subaddress A(15). This output, strobed by S2, is used to clock IC-W pin 13 which is a Master/Slave J-K F-F. The outputs of this F-F are used to select which half of the module memory is being read. In the DMA mode (switch selected) the above F-F changes state on A(15) + S2 with pin 9 high for selecting the 2nd half of the memory. The trailing edge of the signal from pin 9 is used to set another F-F formed by two gates (pins 1 & 4) from IC-Z. This F-F inhibits Q response via IC-Z pin 9 for the next address cycle and is then reset by S2 on pin 6. In the Random Access mode, the J-K F-F (IC-W pin 13) is set and cleared by F(1) and F(0) which override the clocking function of DMA and the F-F of IC-Z is reset by F(0) so that normal Random Access is accomplished.

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