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TR8818A MODULAR DIGITIZER

MM8103A/04/05/06 MEMORIES

- Excellent Accuracy
- > 120 MHz Bandwidth
- High-Speed Signal Averaging
- Up to 96 Channels per GPIB Port
- Waveform Records to 2 MS
- Remote Programmability
- External Clocking
-

HIGH SPEED DIGITIZER WITH EXPANDABLE MEMORY

LeCroy Model TR8818A Waveform Digitizer provides the system core for high-speed, long record, waveform recording. The proven, ultra-accurate system delivers unmatched data fidelity. The TR8818A digitizes up to 100 MS/sec.

The modular system design equates to configuration flexibility and low expansion costs. A minimum system contains one channel. To simultaneously measure multiple waveforms, add more TR8818A digitizer modules to your system. To look at longer waveforms, add more memory modules to existing channels. Whether it's next month or five years from now, add another module, not another system.

FUNCTIONAL DESCRIPTION

SYSTEM ARCHITECTURE

A complete waveform digitizing system includes one or more waveform digitizing modules, one or more waveform memory modules per digitizer module, an interface module, an instrument mainframe, a GPIB or RS-232C cable, and a host computer. A minimum configuration, single channel TR8818A system uses one MM8104 (MM8103A) Memory Module for 32 ksamples of waveform storage memory.

Multiple digitizer modules can reside within a single mainframe. TR8818A modules can be mixed with any other IEEE-583 Standard (CAMAC) instrument mod ules.

A 6103 pre-amplifier module mates with the TR8818A Waveform Digitizer for optimal system performance. The 6103 attenuates or amplifies 50 mV to 50 V full scale inputs to match the digitizer's full scale input. Without the 6103, the TR8818A full scale inputs are 510 mV.

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MULTICHANNEL DATA ACQUISITION

The modular design simplifies multiple channel applications. Note the large number of channels available:

TR8818A/MM8103A

Per Benchtop: 2

Per Chassis: 6

Per GPIB System: 96

The digitizer contains its own internal timebase. The external clock input (front panel) allows a TTL or ECL level signal (jumper selectable) to determine the sampling frequency. This external clock is used to synchronize multiple channels to a user-supplied master clock. The frequency of the external clock can range from DC to 100 MHz.

LONG RECORDING TIME

Long waveform memory lets the TR8818A record long waveforms even at fast sample rates. No need to reduce the timebase (sampling rate) to capture entire waveforms.

The TR8818A requires at least one memory module (MM8103A, MM8105, MM8106). Each MM8103A offers 32K samples of memory, each MM8105 offers 128K samples, and each MM8106 512K samples. Additional same type memory modules can be added as needs arise to expand the total usable waveform memory up to 2M samples maximum.

SEGMENTING MEMORY FOR MULTIPLE SIGNAL BURSTS

In segmented memory operation, the TR8818A accepts very fast trigger repetition rates. When a digitizing system reads out data, its trigger is disabled and it cannot capture waveforms. Segmenting waveform memory into subsections allows the digitizing system to record multiple waveforms without stopping to read out the data. So, segmented memory helps to ensure capture of closely spaced signals. It also prevents recording uninteresting dead time between signals and thereby saves memory.

The TR8818A can fill waveform memory in segments by starting and stopping an external clock in conjunc tion with signal presence. A LeCroy 2323A Gate Generator module can gate an external clock for this purpose. A trigger signal starts the clock gate. A programmed delay stops the clock. After data has been clocked into every active memory location, then all the waveforms can be read out as a data block.

FULLY PROGRAMMABLE, EASY SETUP

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The TR8818A digitizer, and 6103 amplifier module are all fully programmable for automated testing, remote operation, and quick setups. Remote commands set the digitizers' sample clock rate, pre-trigger memory fraction, waveform record size, and input offset. Remote commands can also arm and trigger the digitizers. A Look-At-Me flag gets set when data is ready for readout. Look-At-Me (LAM) gets translated to a GPIB Service Request (SRQ) by the LeCroy 8901A.

SPECIFICATIONS

ANALOG INPUT

Channels: One.

Connector: BNC type coaxial.

Impedance: 50 ohm ±3% DC; < 7% reflection from 3 nsec edge.

Bandwidth: DC to > 120 MHz guaranteed.

DC Offset Voltage: Programmable over ±1/2 full scale in 256 steps; ±0.1% full scale/°C.

Coupling: DC.

Overshoot: < 5% typical for step input with or without 6103 amplifier.

Overload Recovery: ±1% F.S. in 25 nsec from a 1.5X overdrive pulse of < 1 µsec duration.

Overload Protection: ±2.5 VDC INPUT, ±7.5 VDC HIGH LEVEL INPUT; ±500 Vpk for 30 nsec; ±100 Vpk for 100 µsec with 50 ohm source.

ANALOG-TO-DIGITAL CONVERSION

Input Amplitude Range: 510 mV p-p (2 mV/LSB) ±1% F.S. ±0.1%/°C.

Single Shot Resolution: 8 bit (offset binary code).

DC Accuracy: Errors < ±1.5 LSB + 0.5 LSB quantiza tion error from best linear fit over entire range.

AC Accuracy: A reconstructed digitized pure sine wave has a typical dynamic accuracy as follows:

Signal Frequency	Signal Amplitude	Effective Bits	Signal-to-Noise Ratio (SNR)*
DC5 MHz	80% F.S.	6.5	47 dB
520 MHz	80% F.S.	6	45 dB

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2025 MHz	50% F.S.	6	41 dB
25-50 MHz	50% F.S.	6	41 dB
** Signal-to-Noise Ratio includes all harmonics.*			

Aperture Uncertainty: ± 5 psec maximum.

Noise: < 1.7 LSB R.M.S.

TIMEBASE

Internal Sample Clock Rates: 100, 50, 25, 12.5, 6.25, 3.125, or 1.5625 MS/sec.

Accuracy: 0.01% crystal oscillator.

External Clock: Any frequency input up to 100 MHz; TTL or ECL levels 50 ohm input.

Clock Out: ECL level.

STOP TRIGGER

Slope: + only.

Level: TTL (+2.5 V) or ECL (-1.2 V).

Impedance: 50 ohm ±3%.

Duration: 8 nsec minimum.

Overload Protection: ±2.5 VDC; ±250 Vpk for 1 µsec with 50 ohm source.

Operation: A trigger switches the TR8818A from pre- to post-trigger recording; digitizing stops when post -trigger sampling complete.

WAVEFORM MEMORY

Memory Configurations

Standard Memory Configurations for the TR8818A			
Total Memory Length (samples)	MM8103A quantity	MM8105 quantity	MM8106 quantity
32K	-	-	-

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64K	2	-	-
96K	3	-	-
128K	4	1	-
160K	5	-	-
192K	6	-	-
224K	7	-	
256K	8	2	-
288K	9	-	-
320K	10	-	-
352K	11	-	-
384K	12	3	-
416K	13	-	-
448K	14	-	-
480K	15	-	-
512K	16	4	1
640K	-	5	-
768K	-	6	-
896K	-	7	-
1024K	-	8	2
1152K	-	9	-
1280K	-	10	-
1408K	-	11	-
1536K	-	12	3
1664K	-	13	-
1792K	-	14	-
1920K	-	15	-
2048K	-	16	4

Active Memory Size: Programmable in 8 kBytes increments, up to the total installed memory size (max. 2 kBytes).

Pre-trigger: Memory can be divided into pre- and post-trigger sample storage; programmable from 0% to 100%, in 1/8ths of total memory.

Battery Backup: Data in memory preserved when external power removed.

Cables Required: DC8134/N digitizer-to-memory address cable (N = # of memory modules). DC8150/N digitizer-to-memory data cable (N = # of memory modules).

GENERAL

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Status Indicators:

Power (red): All supplies operating properly.

N (green): Controller sent command to the digitizer module (slot N).

LAM (red): Waveform acquisition complete.

RDY (green): Armed and ready for trigger.

Module ID: 8-bit side-panel switch allows user to assign a unique ID number; readable via CAMAC/GPIB.

Internal Battery: Replaceable lithium type (lifetime > 2 years) in each digitizer and memory module automatically becomes power source for memory and control registers.

MECHANICAL

Packaging: RF shielded module in conformance with the IEEE-583/CAMAC.

Module	Size	Height	Width	Depth
TR8818A	2 slots	221 mm	34 mm	292 mm
MM810X	1 slot	221 mm	17 mm	292 mm

Power Requirements:

Module	+6 V	-6 V	+24 V	-24 V
TR8818A	0.44 A	7.8 A	0.22 A	0.14 A
MM8103A	2.5 A	1.3 A	-	-
MM8104	2.5 A	1.3 A	-	-
MM8105	2.7 A	1.3 A	-	-
MM8106	2.9 A	2.1 A	-	-

ENVIRONMENTAL

Operating Temperature: +15 to +25°C intake air with sufficient airflow to maintain exhaust air less than 15°C higher than intake; up to 30°C if exhaust < 40°C.

Storage Temperature: -10 to +50°C.

Operating Humidity: Up to 90% r.h. non-condensing at +25°C.

Operating Altitude: < 10,000 feet above sea level.

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CAMAC COMMANDS

CAMAC FUNCTION CODES

F(0): Control register; reads from R9-R16.

F(1): Input offset; reads from R9-R16. Offset = 255 - N mV for N = 0 to 255.

F(2): Read data; the first byte is the time vernier (see note 1). The next 15 bytes and the last 16 bytes may be inaccurate and therefore should be discarded. Read must be preceded by F(17) command (Enable Read Mode) to set the address counter.

F(3): Module ID word; reads an 8-bit binary value.

F(9): Trigger arm.

F(10): Clear LAM.

F(16): Control register; writes to W1-W16.

F(17): Enable read mode.

F(19): Input offset; writes to W1-W8. Data is 8-bit binary representation of the input offset where offset = 255 - N mV for N = 0 to 255.

F(24): Disable LAM.

F(25): Internal trigger.

F(26): Enable LAM.

F(27): Test LAM status.

Notes:

1. Trigger time vernier: The high speed nature of the digitizer requires that four samples be simulta neously transferred to memory. R1 and R2 of first byte specifies which of the four bytes (of the next two words) starts the data record as follows:

R1-R2 - First Sample

0 - R1-R8 of 1st word

1 - R9-R16 of 1st word

2 - R1-R8 of 2nd word

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3 - R9-R16 of 2nd word

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