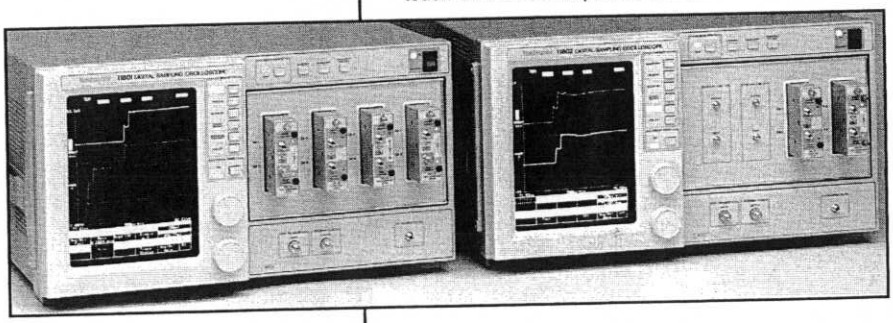
DIGITAL SAMPLING OSCILLOSCOPES

11801/11802

- *DC to 20-GHz Bandwidth*
- *10-femtosecond Equivalent-Time Sampling Interval*
- *Modular Architecture*
- *200 kHz Sampling Rate*
- *"Real-Time" Feel for Waveform Control*
- *TDR and Differential TDR*
- *Optical-to-Electrical (O/E) Capability*
- *Automatic Measurements with Statistics*
- *Comprehensive Waveform Processing*
- *Fully Programmable*
- *Easy to Use*
- *Hardcopy*
- *Internal Trigger Pickoff (11802)*
- *Eight Channels, Expandable to 136 (with an 11801 and SM-11 Multi-Channel Units)*

GPIB* IEEE-488



**The 11800 Series complies with IEEE Standard 488.1-1987, RS-232-C and Tektronix Standard Codes and Formats.*

Up to seven windows can be created on a single main trace, each with independent positions. The instrument can even be programmed to automatically locate a window on a specified transition within the main waveform. Like the other oscilloscopes in the 11000 Series, windows in the 11800 are actually re-acquired with a higher resolution than the main waveform – not just digitally expanded from the main trace, as in some lower performance instruments.

TIME DOMAIN REFLECTOMETRY (TDR)

With the SD-24 Dual-Channel TDR/Sampling Head, the CSA 803/11800 offers full 20-GHz acquisition and unmatched TDR performance on up to 136 channels. Each channel has an independent polarity-selectable (positive-going or negative-going) TDR step generator. The TDR outputs can also be precisely matched at a reference plane providing the only true integrated differential TDR system available today. Differential TDR offers an accurate picture of the performance of balanced or unbalanced differential systems, such as twisted pair cables, differential microstrips, or differential inputs in active devices.

The step generator of the SD-24 also represents state-of-the-art technology, offering unmatched 35-ps reflected risetime (the rise time of a reflection from a short circuit, including the acquisition rise time of 17.5 ps) with the flattest step in the industry. 11800 TDR is also simple to use with one-touch preset functions for both single-ended and differential TDR. There is direct readout of impedance in rho and ohms as well as readout of one-way or two-way distance in meters, feet, or inches.

The 11800 allows quick real-time viewing of the TDR response to a user-selected rise time with the filter function. Simply enter the filter rise time, and the 11800 displays a live trace that shows the response at that rise time. Waveform math can also be used to subtract a reference trace acquired with a 50-Ω terminator for removal of unwanted aberrations due to cabling and fixturing.

HARNESSING THE POWER

Virtually all operation of the 11800 is through the touch-sensitive front-panel. A simple two-level menu structure with pop-up menus and two control knobs provide simple interaction with all functions. In addition, common functions, such as volts/division and time/division are always selectable through on-screen icons – so these functions are never buried in menus. The two multi-function knobs allow controlling two related parameters, such as volts/division and offset, for less button pushing.

Autoset provides a convenient, fast method for displaying a signal on the 11800. Just select a channel and press autoset. Usually autoset is complete in less than 2 seconds.

ATE APPLICATIONS

All 11800 functions are completely programmable through the IEEE Standard 488 (GPIB) and RS-232-C interfaces. In addition, up to 10 complete instrument settings may be stored in nonvolatile memory on board for quick recall over the external interfaces or though the front-panel. Documentation is simple using the flexible hardcopy features of the CSA 803/11800. Full screen printouts, including waveforms, measurement results, and time/date stamp can be printed on a variety of devices including dot matrix or laser printers and pen plotters.

SOFTWARE SUPPORT

All the 11000-Series software products are compatible with the 11800, including the advanced i-Pattern™ statistical analysis software, Template Waveform Processing Program, Utility software, and EZ Test II. See page 67 for more information on software for the 11000 Series.

QUICKSTART TRAINING PACKAGE

QuickStart contains application examples, and is a complete and portable training package. It can serve several users for thorough self-study or as a quick, easy reference.

The package comes complete with the QuickStart board, video, workbook, board reference, and power plug; and is included in the purchase price of the instrument.

The 11800-Series features and characteristics are common to the CSA 803 unless otherwise noted.

11801 DIGITAL SAMPLING OSCILLOSCOPE

The 11801 has up to eight acquisition channels in the mainframe and expansion capability for up to 136 channels using four SM-11 Multi-Channel Units. This large number of channels allows parallel acquisition for very fast pulse parametric testing of high-speed integrated circuits or for supplementing a functional test system while performing AC parametric testing.

Up to half of the channels can be acquired and measured simultaneously – in a single acquisition cycle. This measurement power is made possible by the multiprocessor architecture used in the 11800 Series.

The highly parallel acquisition and measurement architecture not only eliminates the need for relay multiplexers, which degrade signal quality and system reliability, but it also makes acquisition and measurement of many channels practical in a production ATE environment. Signal acquisition and TDR measurements can be done with a simple command, with no disconnecting and reconnecting of cables or probes required before acquiring data.

In today's high-speed circuits, testing controlled impedances of circuit board runs, removing cable delays from the device under test, and other transmission-line integrity measurements are critical. In addition, multichannel TDR allows crosstalk testing on ribbon cables and circuit boards, as well as high throughput single-ended TDR for traditional cable and connector applications. The 11801 with the SD-24 TDR/Sampling head, moves TDR from the position of an occasional tool to an integral part of your measurement strategy.

11802 DIGITAL SAMPLING OSCILLOSCOPE

For those applications where four channels are sufficient, the 11802 offers a built-in, dual compensated, delay line with trigger pickoff. The delay line allows you to pick off a trigger from the input signal and provides up to 5 ns of pretrigger viewing. This is especially useful in applications involving low repetition rate signals, where it may be impractical to trigger on one event and look at the next repetition of that event.

CHARACTERISTICS (CSA 803/11800)

The 11800-Series characteristics are common to the CSA 803 unless otherwise noted.

VERTICAL SYSTEM

Rise Time/Bandwidth – Determined by the sampling head used.*1

Vertical Resolution – 8 bits full screen (80 μV LSB at 2 mV/div deflection factor).

Amplifier Gain Accuracy – ±1% of all settings.

Deflection Factors – 2 to 255 mV/div in 1 mV/div increments.

Offset Range – ±2V.

**1 See Sampling Head Characteristics on page 52. The 11800-Series mainframes have no acquisition bandwidth limits; except when delay lines are used in the 11802. Using delay lines in the 11802 limit bandwidth to 5 GHz and attenuate the signal by 50%.*

HORIZONTAL SYSTEM

Main and Window Time Base – 1 ps/div to 5 ms/div, settable to 1-2-5 sequence or in 1 ps increments.

Time Base Accuracy **2*

Time interval	Accuracy
≥ 20 ns	0.01% x time interval + 20 ps
1 ns	20 ps
100 ps	10 ps
10 ps	2.5 ps

**2 Interpolate linearly between cardinal points.*

Record Length – 512, 1024, 2048, 4096, and 5120 samples.

Windows – Any number of window records may be placed on any number of main records, up to maximum of 8 displayed traces. All window records have the same duration, but may be independently positioned on any main record. Window may be set to automatically track a moving edge on the main record.

Maximum Sample Rate – 200 kHz.

TRIGGER SYSTEM (11801 and 11802)

Trigger Bandwidth – 1 GHz.

Trigger Sensitivity **3* –

DC Coupled: 50 mV p-p, DC to 100 MHz, 150 mV p-p to 800 MHz; increasing to 250 mV at 1 GHz;

AC Coupled: Attenuates signals below 10 kHz, 50 mV p-p from 10 kHz to 100 MHz; 150 mV p-p at 1 GHz.

Delay Jitter – 5 ps +20 ppm of selected delay (RMS).

Internal Clock – 100 kHz (Drives TDR, Internal Clock Output, and Calibrator).

Trigger Level Range – ±1.0 V (±5.0 V with 10X trigger attenuator activated).

**3 11801 has external trigger only; requires 50-ns pretrigger or use DL-11 delay lines; 11802 provides internal pretrigger pickoff in both delay lines.*

MEASUREMENT SYSTEM

Waveform Processing Functions – Add, subtract, multiply, divide, absolute, average, differentiate, envelope, exponent, integrate, natural log, log, signum, square root, smoothing, and filter.

Measurement Set – Max, min, mid, p-p, mean, RMS, rise, fall, frequency, period, prop delay, cross, width, area +, area –, and energy. Measurements are constantly updated; mean and standard deviation available on all measurements.

Measurement Parameters – *(Proximal, mesial, distal,and start/stop levels):* May be set to relative or absolute values.

Cursors – Paired or split dots, vertical bars, and horizontal bars.

POWER REQUIREMENTS

Line-Voltage Ranges – 90 to 132 V RMS, 180 to 250 V RMS.

Line Frequency – 48 to 440 Hz.

Maximum Power Consumption – 214 W.

ENVIRONMENTAL AND SAFETY

See page 52.

ORDERING INFORMATION

11801 Digital Sampling Oscilloscope **$23,500**
Includes:
Introduction manual (070-7036-01); User Reference (070-7037-01); Programmer Reference (070-7038-01); Pocket Reference (070-7039-01); Service Reference (070-7041-01); Power Cord, U.S., 120 V (016-0066-00).

11802 Digital Sampling Oscilloscope **$22,000**
Includes:
Introduction manual (070-7042-01); User Reference (070-7043-01); Programmer Reference (070-7044-01); Pocket Reference (070-7045-01); Service Reference (070-7047-01). Power Cord, U.S., 120 V (016-0066-00).

INSTRUMENT OPTIONS

Opt. 1R – Rackmount. **+$250**
Opt. 1M – Multi-Channel Conversion (11801 only). **+$1,000**
Opt. 25 – PEP 301 Instrument / System Controller. **+$7,995**
For additional option information see page 67.

WARRANTY-PLUS **SERVICE PLAN OPTIONS**

See page 490.
Opt. Q0 – On-Site Product Installation and Setup **+$440**
Opt. Q1 – 1-Year On-Site Service **+$640**
Opt. Q2 – 2-Year On-Site Service **+$1,915**
Opt. Q3 – 3-Year On-Site Service **+$3,155**

ACCESSORIES

See pages 52 and 383.

PHYSICAL CHARACTERISTICS

	Cabinet		Rackmount	
Dimensions	**mm**	**in.**	**mm**	**in.**
Width	448	17.6	483	19.0
Height	238	9.4	222	8.8
Depth	599	23.6	550	21.6
Weights ≈	**kg**	**lb**	**kg**	**lb**
11801				
Net	22.3	49	23.2	51
Shipping	25.9	57	26.8	59
11802				
Net	24.1	53	25.0	55
Shipping	27.7	61	28.6	63