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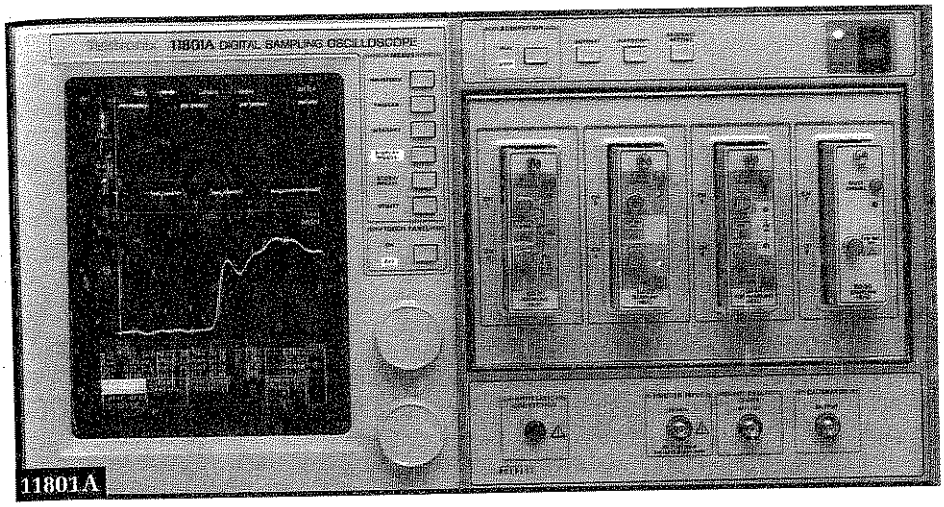
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Find the *Tektronix SD-24* at our website: ***Click HERE***

Digital Sampling Oscilloscope



High resolution capable of viewing very fast digital signals.

11801A

- 8.8 ps Rise Time
- 10 femtosecond Equivalent-Time Sampling Interval
- 200 kHz Sampling Rate
- "Real-Time" Feel for Waveform Control
- Optical-to-Electrical (O/E) Capability
- Modular Architecture
- Fully Programmable
- Easy to Use
- 8 Channels, Expandable to 136
- TDR/TDT Capability
- Automatic Measurements
- Waveform Processing
- High Frequency Sampling Heads (40 & 50 GHz) for Multi-GHz Sampling Requirements
- 2.5 GHz to 50 GHz BW
- 3 GHz High Impedance Probe Sampler

11801A Digital Sampling Oscilloscope

The 11801A digital sampling oscilloscope offers the highest bandwidth and time resolution of the 11000 Series. In addition to the easy-to-use, touch-screen user interface and powerful automatic measurement system common to all 11000 Series instruments, the 11801A adds single-ended and differential TDR and TDT, timing resolution to 0.01 ps, and up to 50 GHz bandwidth (depending on the sampling head used). This unmatched performance and feature set makes them ideal for semiconductor device testing; TDR characterization of circuit boards, IC packages, and cables; and high-speed digital, data-communication measurements.

- The 11801A accepts up to four, dual-channel SD Series sampling heads and is expandable to 136 channels of acquisition and TDR using SM-11 Multi-Channel Units.

RESOLUTION AND REPEATABILITY

The state-of-the-art digital time base in the 11801A provides unmatched timing resolution, with sample intervals to 10 femtoseconds (0.01 ps) and measurement repeatability to 1 ps. In addition, the vertical system provides 8 bits of vertical resolution at all deflection factors (78 µV LSB at 2 mV/div). Powerful onboard waveform processing allows expansion with averaging to sensitivities in the 100 µV/div range and beyond.

FASTEST ACQUISITION

The 11801A, with its multiprocessor-based architecture and high-speed analog, error-sample feedback-loop technology, has the highest sample rate of any sampling oscilloscope. The 200 kHz sampling rate gives the 11801A a "real-time" feel for waveform controls and allows high-speed data capture for histograms and automated measurements.

To order, contact your local sales office (listed on the inside back cover) or call the National Marketing Center at 1-800-426-2200, Ext. 99.

GPIB IEEE-488 The 11801A Series complies with IEEE Standard 488.1-1987, and with Tektronix Standard Codes and Formats.

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11801A

Digital Sampling Oscilloscope

MODULARITY MAKES ROOM FOR GROWTH

In the Tektronix tradition, the 11801A can be tailored through modular plug-in sampling heads for a variety of applications. Modularity also offers a path for growth and expansion as new sampling heads become available. For example, for applications requiring superior noise performance, the SD-22 Sampling Head offers two channels of acquisition at 12.5 GHz with 450 μV (typical) of noise. High bandwidth acquisition and TDR are available in the SD-24 sampling head, which offers two channels with 20 GHz bandwidth and two polarity-selectable TDR step generators. The SD-14 Probe Sampler is the latest addition to the sampling head family. It is a two channel probe sampler with 3 GHz bandwidth, 100 kΩ input impedance, and a 0.45 pF capacitance. The SD 32 is a 50 GHz single channel sampling head for 2.4 mm coax connector input sampling requirements. The SD Series of sampling heads currently includes 10 heads.

AUTOMATED MEASUREMENTS MAKE IT EASY

The 11801A offers a comprehensive, accurate, and automatic measurement system. Up to six measurements can be displayed on screen at any time, all updated continuously. Any number of measurements may be made over the GPIB or RS-232-C interfaces.

For the first time in the industry, you now can make automatic jitter and noise measurements using the statistical measurement mode. Statistical measurements allow automatic pulse parameter measurements on random signals such as eye-diagrams and allow you to make stable and accurate measurements even in the presence of jitter and noise.

All measurement parameters are user-controllable and measurement levels may be set in relative (i.e., percentage) or absolute terms. Measurements are also fully annotated so there is no question about which part of the waveform is used for making the measurements.

Measurements include: amplitude measurements, such as mean, rms, p-p, and overshoot; timing measurements, such as width, propagation delay, and phase; and energy measurements, that provide direct area or energy results! Measurement statistics are also available to evaluate the stability of any measurement result.

For large channel count applications where throughput is a prime consideration, dedicated time measurement hardware can be used to make precise timing measurements on many channels in parallel – over 50 measurements per second. This hardware is duplicated for each sampling head in the mainframe and SM-11, providing maximum throughput even in large channel-count applications.

ON-BOARD WAVEFORM PROCESSING

The extensive on-board waveform processing capability of the 11801A not only provides smooth "real-time" update rate and control response, it also allows complex waveform calculations to be performed and displayed in the same continuously updated fashion.

Calculated waveforms can be as simple as addition of two channels, or more complex, from basic operators (+, –, x, ÷), to specialized math functions such as square root, differentiate, log, envelope, and filter. Calculations can include acquired waveforms, stored waveforms, and constants.

All measurement functions, except hardware measurements, are allowed on calculated traces. In addition, the instrument can be set to stop acquisition after certain conditions, such as when a specified number of averages have been completed.

WINDOWING SHOWS THE DETAILS

The 11801A offers another first for sampling oscilloscopes – windows. Similar to the delayed sweep on conventional oscilloscopes, windows allow viewing a long interval on one trace while examining the details of a section of the waveform on a second trace.

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 11801A 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.

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Digital Sampling Oscilloscope

TIME DOMAIN REFLECTOMETRY (TDR)

With the SD-24 Dual-Channel TDR/Sampling Head, the 11801A 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 rise time (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. 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 11801A allows 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 11801A 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 operations of the 11801A are through the touch-sensitive front-panel. A simple three-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 always available. 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 11801A. Just select a channel and press autoset. Usually autoset is complete in less than two seconds.

ATE APPLICATIONS

The 11801A 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 through the front panel. Documentation is simple using the flexible hardcopy features of the 11801A. Full screen printouts, including time/date stamp can be printed on a variety of devices including dot matrix, laser printers, pen plotters and ink jet.

SOFTWARE SUPPORT

All the 11000 Series software products are compatible with the 11801A. See page 278 for more information on software for the 11000 Series.

11801A DIGITAL SAMPLING OSCILLOSCOPE EXPANSION

The 11801A supports to eight acquisition channels in the mainframe and provides 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 11801A.

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.

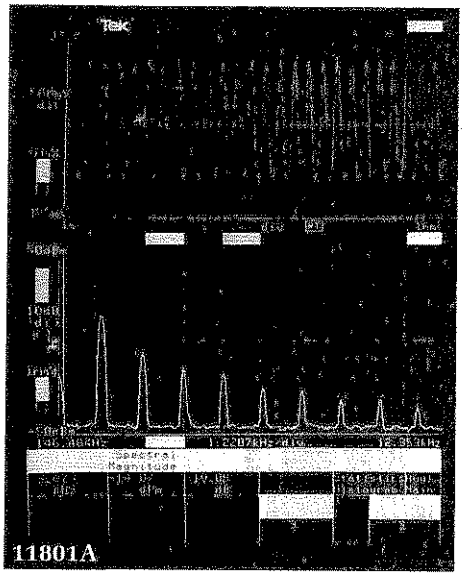
In today's high-speed circuits, testing controlled impedances of circuit board runs, removing cable delays from the device under test, and other transmission-line integrity measurements are critical. In addition, multichannel TDR allows crosstalk testing on ribbon cables and circuit boards, as well as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

Continued on next page.

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11801A

Digital Sampling Oscilloscope



Characteristics

VERTICAL SYSTEM (EXCEPT SD-14)

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 – ±2 V.

HORIZONTAL SYSTEM

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

TIME BASE ACCURACY*2

Time interval	Accuracy
≥ 10 ns	0.01% x time interval + 10 ps
1 ns	10 ps
100 ps	5 ps
10 ps	2 ps

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

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

Maximum Sample Rate – 200 kHz.

TRIGGER SYSTEM

Trigger Bandwidth – 2 GHz.

Trigger Sensitivity*3 – DC Coupled, 40 mVp-p DC – 200 MHz; 200 MHz – 2.0 GHz increasing linearly to 200 mV; AC Coupled: Attenuates signals below 30 kHz, 40 mVp-p from 30 kHz to 200 MHz, 250 mVp-p at 2 GHz.

Delay Jitter – 2.5 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).

Trigger Input Range – ±1.5 V.

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, amplitude, extinction ratio, overshoot, undershoot, noise*4, rise, fall, frequency, period, prop delay, cross, width, phase, duty cycle, jitter*4, 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 Vrms, 180 to 250 Vrms.

Line Frequency – 48 to 440 Hz.

Maximum Power Consumption – 214 W.

ENVIRONMENTAL AND SAFETY

Operating Temperature – 0°C to 50°C.

Non-Operating Temperature – –40°C to +75°C.

Altitude, Vibration, Shock, Bench Handling – Operating and Non-Operating: meets MIL-T-28800C, Type III, Class 5.

Safety – Listed UL 1244, CSA Bulletin 556B September 1973, Tektronix self-certification to comply with IEC 348 recommendation.

Electromagnetic Compatibility (except SD-14) – Meets the following requirements of MIL-STD-461C: CE-03 Pt 4 Curve 1, CS-01 Pt 7, CS-02 Pt 4 CS-06 Pt 5, RE-02, Pt 7, RS-01 Pt 4, RS-02 Pt 5, RS-03 Pt 7, (limited to 1 GHz). Meets FCC Part 15, subpart J, Class A.

For Germany: Meets VDE 0871/6.78 Class B.

Humidity – To 95% RH at up to 50°C.

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
Weight ≈	**kg**	**lb**	**kg**	**lb**
Net	22.3	49	23.2	51
Shipping	25.9	57	26.8	59

**1 See Sampling Head Characteristics on page 90. The 11801A mainframes have no acquisition bandwidth limits.*

**2 Interpolate linearly between cardinal points.*

**3 11801A has external trigger only; requires > 40 ns pretrigger or use of DL-11 Delay Lines to view trigger point.*

**4 Available only in statistical measurement mode.*

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