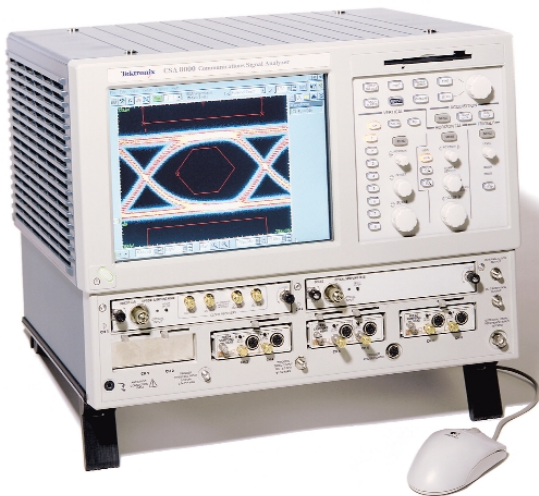


# Digital Sampling Oscilloscope

## ► TDS8000



The TDS8000 digital sampling oscilloscope offers the widest range of on-board measurement and waveform-processing capabilities of any ultra-high bandwidth oscilloscope. With excellent measurement repeatability, exceptional vertical resolution and fast waveform acquisition and display update rates, the TDS8000 is a powerful measurement tool for semiconductor testing, TDR characterization of circuit boards, IC packages and cables and high-speed digital communications.

### State-of-the-art Waveform Acquisition

The 8000 Series state-of-the-art timebase provides equivalent time sweep speeds from 0.5 ps/div to 5 ms/div with record lengths from 20 to 4000 points and a sample interval of 10 femtoseconds (0.01 ps). In addition, 8000 Series sampling oscilloscopes' timebases can be locked to a 10 MHz reference providing greater long-term stability. This capability also allows multiple TDS8000s to be synchronized to other test equipment and/or the device-under-test.

The TDS8000 offers two magnification windows, whereby sections of the main trace are re-acquired at higher resolution for closer examination of details.

The TDS8000 boasts the highest sample rate among sampling oscilloscopes. Its multi-processor architecture, with dedicated per channel Digital Signal Processors (DSP), guarantees the highest waveform acquisition rates regardless of the number of channels acquired or waveform processing done.

### Modularity and Flexibility

The TDS8000 supports a large and growing family of electrical and optical plug-in modules. This modular architecture lets you configure the instrument with the right features for your application both now and in the future.

## ► Features & Benefits

- DC to 50 GHz Bandwidth
- Exceptional Trigger Jitter and Horizontal Timebase Stability
- Modular Architecture
- Up to Eight Channels Acquisition
- High Resolution and Measurement Repeatability
- Comprehensive, Accurate, Automatic Measurement System
- Intuitive User Interface
  - Large Display (10.4 in.)
  - Microsoft Windows-based Graphical User Interface

## ► Applications

- Semiconductor Testing
- Impedance and Crosstalk Characterization (using TDR)
- High-Speed Digital Data Communications

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The electrical plug-ins include a variety of modules with bandwidths up to 50 GHz and with specialized features such as TDR for Impedance and Crosstalk Characterizations. High bandwidth probes are also available for constructing a total acquisition solution.

The available optical modules provide complete optical test solutions for both telecom (155 Mb/s to 40 Gb/s) and datacom (Fibre Channel and Gigabit Ethernet) applications as well as general-purpose optical signal testing.

### Unmatched TDR Capabilities

With the 80E04 TDR sampling module, the TDS8000 offers unmatched TDR performance on up to eight channels simultaneously. Each channel has an independent polarity selectable step-generator offering unmatched 35 ps reflected rise time\*<sup>1</sup>. The TDS8000 provides the only true differential TDR system available today. Automatic, transparent correction for variations in step amplitude and baseline offset guarantee accuracy and repeatability of impedance measurements.

### 8000 Series Sampling Oscilloscope Platform

The TDS8000 is built on Tektronix' new sampling oscilloscope platform that combines familiar MS Windows-based PC technologies with world-class waveform acquisition technology.

This platform provides a wide array of standard instrumentation and communications interfaces (such as GPIB, Parallel Printer Port, RS-232-C and USB Serial Ports and an Ethernet LAN connection). In addition, the platform includes several mass storage devices (floppy disk, removable hard drive and CD-ROM).

The TDS8000 is equipped with a large, full-color display that helps you discriminate waveform details. Color-grading of waveform data adds a third dimension – sample density – to your signal acquisitions and analysis.

Finally, since the system supports an open MS Windows environment, new levels of data analysis can be done directly on the instrument using commercially available software packages.

\*<sup>1</sup>The observed rise time of a reflection from a short circuit.

## ► Characteristics

### Signal Acquisition

**Acquisition Modes** – Sample (normal), envelope and average.

**Number of Sampling Modules Accommodated** – Up to four dual-channel electrical and two single-channel optical sampling modules.

**Number of Simultaneously Acquired Inputs** – 8 channels maximum (8 electrical or 2 optical and 6 electrical).

### Vertical Systems

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

**Vertical Resolution** – 14-Bit over the sampling module's dynamic range.

### Horizontal System

**Main and Magnification View Timebases** – 1 ps/div to 5 ms/div in 1-2-5 sequence or 1 ps increments.

### Time Interval Accuracy

Horizontal sensitivity <21 ps: 1 ps +1% of interval.  
Horizontal sensitivity ≥21 ps:  
8 ps +0.1% of interval (short-term optimized mode).  
8 ps +0.01% of interval (locked to 10 MHz mode).  
Horizontal deskew range : -500 ps to +100 ns on any individual channel in 1 ps increments.

**Record Length** – 20, 50, 100, 500, 1000, 2000 or 4000 samples.

**Magnification Views** – In addition to the main timebase, the TDS8000 supports two magnification views. These magnifications are independently acquired using separate timebase settings.

**Maximum Trigger Rate** – 200 kHz.

### Trigger System

#### Trigger Sources –

External direct trigger.

External pre-scaled trigger.

Internal clock trigger: internally connected to direct trigger.

Clock recovery triggers (from optical sampling modules): internally connected to pre-scaled trigger.

**Trigger Sensitivity –**

External direct trigger input:  
50 mV, DC – 4 GHz (typical).  
100 mV, DC – 3 GHz (guaranteed).

Pre-scaled trigger input:  
800 mV, 2-3 GHz (guaranteed).  
600 mV, 3-10 GHz (guaranteed).  
1000 mV, 10-12.5 GHz (typical).

**Jitter –**

Short-term jitter optimized mode:  
1.0 ps +5 ppm of position (typical).  
<1.5 ps +10 ppm of position (max.).

Locked to 10 MHz reference:  
1.6 ps +0.05 ppm of position (typical).  
≤2.5 ps +0.10 ppm of position (max.).

**Internal Clock –** Adjustable from 25 to 200 kHz (drives TDR, internal clock output and calibrator).

**Trigger Level Range –** ± 1.0 V.

**Trigger Input Range –** ± 1.5 V.

**Trigger Holdoff –** Adjustable 5 μs to 100 ms in 2 ns increments.

**Display Features**

**Touchscreen Display –** 10.4 in. diagonal, color.

**Colors –** 16,777,216 (24 bits).

**Video Resolution –** 640 horizontal by 480 vertical displayed pixels.

**Math/Measurement System Measurements**

The TDS8000 supports up to eight simultaneous measurements, updated 3 times per second with optional display of per measurement statistics (min, max, mean and standard deviation).

**Measurement Set –**

Amplitude measurements: High, Low, Amplitude, Max, Mid, Min, Peak-to-Peak, + Overshoot, – Overshoot, Mean, Cycle Mean, RMS, Cycle RMS, AC RMS, Gain.  
Timing measurements: Rise, fall, period, frequency, + cross, – cross, + width, – width, + duty cycle, – duty cycle, burst width, delay, phase.

Area measurements: Area, Cycle Area.

Eye pattern/optical measurements: Extinction Ratio (Ratio, %, dB), Eye Width, Eye Height, Crossing %, Duty Cycle Distortion, Jitter (pk-pk, RMS), Noise (pk-pk, RMS), O-Factor, SNR, Average Optical Power.

**Cursors –** Dot, vertical bar and horizontal bar cursors.

**Waveform Processing**

Up to eight math waveforms can be defined and displayed using the following math functions: Add, Subtract, Multiply, Divide, Average, Differentiate, Exponentiate, Integrate, Natural Log, Log, Magnitude, Min, Max, Square Root and Filter.  
In addition, measurement values can be utilized as scalars in math waveform definitions.

**TDR System (TDS8000 with 80E04 Electrical Module)**

**TDR Channels –** 2 per 80E04.

**TDR Amplitude –** 250 mV.

**TDR System Rise Time –** < 35 ps.

**Time Coincidence Between TDR Steps –** < 1 ps.

**Source Resistance –** 50 +0.5 Ω.

**Typical Aberrations (at +250 mV amplitude) –**

10 ns to 20 ps before step: +3% or less.

< 400 ps after step: +10%, –5%.

400 ps to 5 ns after step: +3%.

Elsewhere: +1%.

**Power Requirements**

**Line-voltage Ranges –** 90 to 132 V<sub>RMS</sub>,  
180 to 250 V<sub>RMS</sub>.

**Line Frequency –** 48 to 440 Hz.

**Environmental****Temperature –**

Operating: +10°C to +40°C.

Nonoperating: –22°C to +60°C.

**Relative Humidity –**

Operating: Floppy disk and CD-ROM not installed: 20% to 80% at or below 40°C (upper limit de-rates to 45% relative humidity at 40°C).

Nonoperating: 5% to 90% at or below 60°C (upper limit de-rates to 20% relative humidity at +60°C).

**Altitude –** Operating: 3048 m (10,000 ft.);  
nonoperating: 12190 m (40,000 ft.).

**Safety –** UL 3111-1, CSA-22.2 No. 1010.1,  
EN 61010-1.

**Physical Characteristics**

Dimensions	Cabinet	Cabinet
	mm	in.
Width	457	18.0
Height	343	13.5
Depth	419	16.5
Weights	kg	lbs.
Net	20.8	46
Shipping	36.7	81

**▶ Ordering Information****TDS8000**

Digital Sampling Oscilloscope.

**Includes:** User manual, quick reference card, Microsoft® Windows 98 compatible keyboard, Windows 98 compatible mouse, WaveStar™ driver, Touchscreen stylus, online help, programmer online guide, power cord.

**TDS8000 Options**

**Opt. C3 –** Three years of Calibration Service.

**Opt. D1 –** Calibration data report.

**Opt. D3 –** Three years of calibration data reports.

**Opt. R3 –** Extended repair warranty to three years.

**Opt. 1K –** Cart.

**Opt. 1R –** Rackmount kit (includes: hardware, tooling and instructions for converting bench model to rack-mount configuration).

**International Power Cord Options**

**Opt. A1 –** Universal Euro 220 V, 50 Hz.

**Opt. A2 –** UK 240 V, 50 Hz.

**Opt. A3 –** Australian 240 V, 50 Hz.

**Opt. A5 –** Switzerland 220 V, 50 Hz.

**Opt. A99 –** No Power Cord.

**Opt. AC –** China 240 V, 50 Hz.

# Digital Sampling Oscilloscope

▶ TDS8000

## 8000 Series Sampling Oscilloscope Optical Modules

**80C01 Multi-rate Telecom Sampling Module with Optional Clock Recovery** – Supports waveform compliance testing of long wavelength (1,100 to 1,650 nm) signals at 622, 2,488 and 9,953 Mb/s as well as general purpose testing with up to 20 GHz optical bandwidth.

**80C02 High-performance Telecom Sampling Module with Optional Clock Recovery** – Supports waveform compliance testing of long wavelength (1,100-1,650 nm) signals at 9.953 Gb/s as well as general purpose testing with up to 28 GHz optical bandwidth.

**80C03 Multi-rate, High-sensitivity Datacom Module with Optional Clock Recovery** – Supports waveform compliance testing of short and long wavelength (700-1,650 nm) signals at 1,063, 1,250, 2,488 and 2,500 Mb/s as well as general purpose testing with up to 2.3 GHz optical bandwidth.

**80C04 High-performance Telecom Sampling Module with Optional Forward Error Correction Clock Recovery** – Supports waveform compliance testing of long wavelength (1100 – 1650 nm) signals at either 9.953 Gb/s or 10.664 Gb/s as well as general purpose testing with up to 28 GHz optical bandwidth.

**80C05 40 GHz Multi-rate Telecom Sampling Module** – Supports waveform compliance testing of long wavelength (1530 to 1580 nm) low-powered telecom signals at 9.953 Gb/s and 40 Gb/s with selectable bandwidth settings of 20, 30 and 40 GHz.

**80C06 50 GHz Telecom Sampling Module** – Supports waveform compliance testing with the highest optical bandwidth for communications signal analysis available today of long wavelength (1530-1580 nm) high-powered telecom signals at 40 Gb/s rates and 50 GHz bandwidth.

## 8000 Series Sampling Oscilloscope Electrical Modules

**80E01** – 50 GHz Single-channel Electrical Sampling Module.

**80E02** – 12.5 GHz Dual-channel, Low-noise Electrical Sampling Module.

**80E03** – 20 GHz Dual-channel Electrical Sampling Module.

**80E04** – 20 GHz Dual-channel Electrical Sampling Module with TDR.

## Other Accessories

**Calibration Step Generator** – 067-1338-07.

**Calibration Step Generator Power Cords** –

Std, US: 067-1338-00.

A1, Europe: 067-1338-01.

A2, UK: 067-1338-02.

A3, Australia: 067-1338-03.

A4, North America: 067-1338-04.

A5, Switzerland: 067-1338-05.

A6, Japan: 067-1338-06.

**SIU800 Static Isolation Unit** – SIU800.

**Sampling Module Extender Cable (1 meter)** – 012-1568-00.

**Sampling Module Extender Cable (2 meter)** – 012-1569-00.

**2X Attenuator (SMA Male-to-female)** – 015-1001-01.

**5X Attenuator (Male-to-female)** – 015-1002-00.

**Power Divider** – 015-1014-00.

**Rackmount Kit** – 016-1791-00.

**P6209** – 4 GHz Active FET Probe.

**P6150** – 9 GHz Passive Probe.

**K4000 Mobile Workstation.**

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