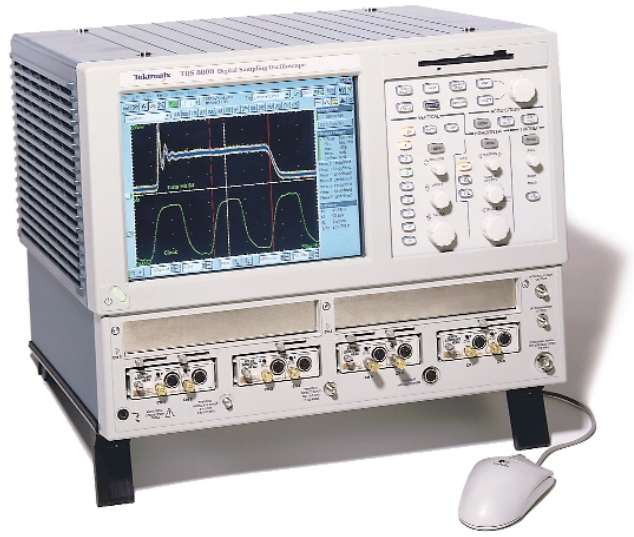
Digital Sampling Oscilloscope

TDS8000B



The TDS8000B 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 TDS8000B is a powerful measurement tool for semiconductor testing, TDR characterization of circuit boards, IC packages, cables and high-speed digital communications.

State-of-the-art Waveform Acquisition

The TDS8000 Series' state-of-the-art timebase provides equivalent time sweep speeds from 1.0 ps/div to 5 ms/div with record lengths from 20 to 4000 points and a sample interval down to 10 femtoseconds (0.01 ps). In addition, the 8000 Series Sampling Oscilloscopes' timebases can be locked to a 10 MHz reference providing greater long-term stability. This capability also allows multiple TDS8000Bs to be synchronized to other test equipment and/or the device-under-test.

The TDS8000B offers two magnification windows, whereby sections of the main trace are re-acquired at higher resolution for closer examination of details.

Features & Benefits

DC to 70+ GHz Bandwidth*[1]

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

*[1] Bandwidth is determined by plug-in modules and may exceed 70 GHz should higher speed modules become available in the future.

Applications

Semiconductor Testing

Impedance and Crosstalk Characterization (using TDR)

High-speed Digital Data Communications

Tektronix
Enabling Innovation

The TDS8000B 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 TDS8000B 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.

The electrical plug-ins include a variety of modules with typical bandwidths up to 70+ GHz and 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 43 Gb/s) and datacom (Fibre Channel, InfiniBand and Gigabit Ethernet) applications as well as general-purpose optical signal testing.

Unmatched TDR Capabilities

With the 80E04 TDR Sampling Module, the TDS8000B 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*[2]. The TDS8000B 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.

*[2]The observed rise time of a reflection from a short circuit.

8000 Series Sampling Oscilloscope Platform

The TDS8000B is built on Tektronix' 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 TDS8000B 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.

Gated triggering, a feature that allows the exclusion of selected time periods from being measured, is offered as an option.

Because 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.

Additionally, TekVISA™, a standard software feature, allows the instrument to be placed under the control of software applications (e.g., LabView, LabWindows, Visual Basic, Microsoft Excel, C, etc.) running on the instrument, or on external PC workstations network connected to the instrument, without the need for a GPIB hardware interface. Plug and play drivers for LabView and other programs are also supplied.

TDS/CSA8000 Series Sampling Oscilloscope Optical Modules

80C01 Multi-rate Telecom Sampling Module – The 80C01 module supports waveform conformance testing of long-wavelength (1100 to 1650 nm) signals at 622, 2488 Mb/s and 9.953 Gb/s as well as general-purpose testing with up to 20 GHz optical bandwidth. With its clock recovery option, the 80C01 provides complete testing solutions for 622 and 2488 Mb/s telecom applications.

80C02 High-performance Telecom Sampling Module – The 80C02 module is optimized for testing of long-wavelength (1100 to 1650 nm) signals at 9.953 Gb/s (SONET OC-192/SDH STM-64). With its high optical bandwidth of 30 GHz (typical), it is also well-suited for general-purpose high-performance optical component testing. The 80C02 can be optionally configured with clock recovery that supports 9.953 Gb/s telecom standards.

80C03 Multi-rate, High-sensitivity Datacom Sampling Module – The 80C03 module supports waveform conformance testing of both short and long-wavelength (700 to 1650 nm) signals at 1.063, 1.250, 2.488 and 2.5 Gb/s, as well as general-purpose testing with up to 2.5 GHz optical bandwidth. Its amplified optical to electrical converter design enables users to examine very low-level optical signals. The 80C03 can be optionally configured with clock recovery that supports Fibre Channel 1063 (1.063 Gb/s), Gigabit Ethernet (1.250 Gb/s), OC-48/STM-16 (2.488 Gb/s), 2 GbE (2.500 Gb/s) and InfiniBand (2.500 Gb/s) standards.

80C04 High-performance Telecom Sampling Module with Forward Error Correction – The 80C04 module is optimized for testing of long-wavelength (1100 to 1650 nm) signals at either 9.953 Gb/s or 10.664 Gb/s. With its high optical bandwidth of 30 GHz (typical), it is also well-suited for general-purpose high-performance optical component testing. The 80C04 can be optionally configured with clock recovery that supports the 9.953 Gb/s telecom standard or a dual-rate option supporting both the 9.953 Gb/s and 10.664 Gb/s standards.

80C05 40 GHz Optical Sampling Module – The 80C05 module is optimized for testing long-wavelength (1520 to 1580 nm) telecom signals at 40 Gb/s and with reference receiver filtering provided for 9.953 Gb/s. The 80C05, with its selectable bandwidth, lets the user choose optimal noise vs. bandwidth performance to accurately characterize the signal. With its high optical bandwidth (40 GHz), it is also well-suited for general-purpose high-performance optical component testing.

80C06 55 GHz Optical Sampling Module – The 80C06 module is optimized for testing long-wavelength (1520 to 1580 nm) high-power, high-bandwidth optical signals that are typical of transmission test for 40 Gb/s NRZ and RZ systems. With its high optical bandwidth, 55 GHz (typical), it is also well-suited for general-purpose high-performance optical component testing.

80C07 Multi-rate, Telecom Optical Sampling Module – The 80C07 module is a broad wavelength (700 to 1650 nm) multi-rate optical sampling module optimized for testing telecom signals from 155.52 to 2488.32 Mb/s. With its amplified O/E converter design, this module provides excellent signal-to-noise performance, allowing users to examine low-power optical signals. The 80C07 can be optionally configured with clock recovery that supports 155, 622 and 2488 Mb/s rates.

80C08B 10 GbE and 10 G Fibre Channel Datacom Optical Sampling Module – The 80C08B module is a broad wavelength (700 nm to 1650 nm) optical sampling module providing a complete conformance test solution for 10 GbE applications at 10.3125 Gb/s (10 G Base-R), 9.95328 Gb/s (10 G Base-W), or 10.51875 Gb/s (10 G Fibre Channel). With its amplified optical-to-electrical (O/E) converter design, this module provides excellent signal-to-noise performance and high optical sensitivity, allowing users to examine low-power level optical signals. The 80C08B can be optionally configured with clock recovery options that support 9.953 Gb/s and 10.3125 Gb/s or 10.3125 Gb/s and 10.51875 Gb/s rates.

80C09 High-performance Telecom Optical Sampling Module with G.709 Forward Error Correction – The 80C09 module is optimized for testing of long-wavelength (1100 to 1650 nm) signals at either 9.953 Gb/s or 10.709 Gb/s. With its high optical bandwidth of 30 GHz (typical), it is well-suited for general-purpose high-performance optical component testing. The 80C09 can be optionally configured with clock recovery that supports 9.953 and 10.709 Gb/s rates.

80C10 65 GHz 40 Gb/s Optical Sampling Module with 43 Gb/s ITU-T G.709 Forward Error Correction – The 80C10 module provides integrated and selectable reference receiver filtering enabling conformance testing at either 1310 nm or 1550 nm for 39.813 Gb/s (OC-768/STM-256) and 43.018 Gb/s (43 Gb/s ITU-T G.709 FEC) rates. In addition to the filter rates the user may also choose selectable bandwidths of 30 GHz or 65 GHz for optimal noise vs. bandwidth performance for accurate signal characterization.

TDS/CSA8000 Series Sampling Oscilloscope Electrical Modules

80E01 Sampling Module – The 80E01 is a single-channel, 50 GHz bandwidth sampling module. The 80E01 has a measured bandwidth of 50 GHz or more and a calculated rise time of 7.0 ps or less. Displayed noise is typically 1.8 mV_{RMS}. The front-panel connector is female 2.4 mm and an adapter is provided (2.4 mm male to 2.92 mm female) to maintain compatibility with SMA connector systems.

80E02 Low-noise Sampling Module – The 80E02 is a dual-channel, 12.5 GHz sampling module specifically designed for low-noise measurements in digital communications and device characterization applications. It provides an acquisition rise time of 28 ps and typically 400 μV_{RMS} of displayed noise. The 80E02 is the deal instrument for low-noise applications. Common applications for the 80E02 are capturing and displaying switching characteristics of high-speed communications circuits, making accurate statistical measurements of signal noise and signal timing jitter or obtaining stable timing measurements of fast digital ICs.

80E03 Sampling Module – The 80E03 is a dual-channel, 20 GHz sampling module. This sampling module provides an acquisition rise time of 17.5 ps.

80E04 TDR Sampling Module – The 80E04 is a dual-channel, 20 GHz sampling module with TDR capability. This sampling module provides an acquisition rise time of 17.5 ps, with a typical 20 GHz equivalent bandwidth. The TDR feature provides high resolution with true differential capability and fast 35 ps reflected rise time of the TDR slope.

80E06 70+ GHz Sampling Module – The 80E06 is a single channel, 70+ GHz (typical bandwidth) sampling module with 5.0 ps calculated rise time. Typical RMS noise is 2.0 mV. This sampling module provides a 1.85 mm (Type V) front-panel connector and a precision adapter to 2.92 mm with a 50 Ω termination. 1 meter or 2 meter length Extender Cables can be ordered for remote operation of the sampling module from the sampling oscilloscope mainframe.

▶ 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 – Eight channels maximum (eight electrical or two optical and six electrical).

Vertical Systems

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

Vertical Resolution – 14 bits over the sampling modules' 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.

Maximum Trigger Rate – 200 kHz.

Typical Acquisition Rate – 150 Ksamples/sec. per channel.

Time Interval Accuracy –
Horizontal scale <21 ps/div: 1 ps + 1% of interval.
Horizontal scale ≥21 ps/div:
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, 250, 500, 1000, 2000 or 4000 samples.

Magnification Views – In addition to the main timebase, the TDS8000B supports two magnification views. These magnifications are independently acquired using separate timebase settings.

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 to 3 GHz (guaranteed).
- 600 mV, 3 to 10 GHz (guaranteed).
- 1000 mV, 10 to 12.5 GHz (typical).

Jitter –
Short-term jitter optimized mode:
- ≤0.8 ps_{RMS} + 5 ppm of position (typical).
- ≤1.2 ps_{RMS} + 10 ppm of position (max.).

Locked to 10 MHz reference:
- 1.6 ps_{RMS} + 0.01 ppm of position (typical).
- ≤2.5 ps_{RMS} + 0.04 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.

External Trigger Gate (optional) – TTL logic 1 enables acquisition, a TTL logic 0 disables acquisition, maximum non-destruct input level ± 5 V.

Display Features

Touch Screen 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 TDS8000B supports up to eight simultaneous measurements, updated three times per second with optional display of per measurement statistics (min, max, mean and standard deviation).

Measurement Set –
Automated measurements include RZ, NRZ, and Pulse Signal types and the following:
Amplitude Measurements
High, Low, Amplitude, Max, Mid, Min, +Width, Eye Height, Eye Opening Factor, Pulse Symmetry, Peak-to-Peak, Pk-Pk, +Overshoot, –Overshoot, Mean, +Duty Cycle, Cycle Mean, RMS, Cycle RMS, AC RMS, Gain, Extinction Ratio (Ratio, %, dB), Suppression Ratio (Ratio, %, dB), Peak to Peak Noise, RMS Noise, Q-Factor, SNR, Average Optical Power, (dBm, watts), Phase.
Timing Measurements
Rise, Fall, Period, Bit Rate, Bit Time, Frequency, Crossing (%, Level, Time), +Cross, –Cross, Jitter (peak-to-peak, RMS), Eye Width, +Width, –Width, Burst Width, +Duty Cycle, –Duty Cycle, Duty Cycle Distortion, Delay, Phase.
Area Measurements
Area, Cycle Area.

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 (TDS8000B with 80E04 Electrical Module)

TDR Channels – 2 per 80E04.

TDR Amplitude – 250 mV (polarity of either step may be inverted).

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) –
±3% or less over zone 10 ns to 20 ps before step transition.
+10%, –5% or less, for first 400 ps following step transition.
±3% or less over zone 400 ps to 5 ns following step transition.
±1% or less over zone 5 ns to 100 ns following step transition.
±0.5% after 100±ns following step transition.

Power Requirements

Line Voltage and Frequency –
100 to 240 VAC ±10% 50/60 Hz.
115 VAC ±10% 400 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 for Optical Sampling Modules

	Dimensions (mm/in.)			Weight (kg/lbs.)
	Width	Height	Depth	Net
80C01	165/6.5	25/1.0	305/12.0	<2.61/<5.75
80C02	165/6.5	25/1.0	305/12.0	<2.61/<5.75
80C03	165/6.5	25/1.0	305/12.0	<2.61/<5.75
80C04	165/6.5	25/1.0	305/12.0	<2.61/<5.75
80C05	165/6.5	25/1.0	305/12.0	>2.61/>5.75
80C06	165/6.5	25/1.0	305/12.0	>2.61/>5.75
80C07	165/6.5	25/1.0	305/12.0	<1.36/<3.0
80C08	165/6.5	25/1.0	305/12.0	<1.36/<3.0
80C09	165/6.5	25/1.0	305/12.0	1.22/2.7
80C10	165/6.5	25/1.0	305/12.0	>2.61/>5.75

▶ Optical Sampling Module Characteristics

	Application Type	Standards Supported with Reference Receiver Filtering Rates	Number of Input Channels	Effective Wavelength Range	Calibrated Wavelengths
80C01	Tributary Telecom	OC-12/STM-4 (622 Mb/s), OC-48/STM-16 (2.488 Gb/s), OC-192/STM-64 (9.953 Gb/s)	1	1100 nm to 1650 nm	1310 nm and 1550 nm (±20 nm)
80C02	10 Gb/s Telecom	OC-192/STM-64 (9.953 Gb/s)	1	1100 nm to 1650 nm	1310 nm and 1550 nm (±20 nm)
80C03	Datacom	Fibre Channel (1.063 Gb/s), GbE (1.250 Gb/s), OC-48/STM-16 (2.488 Gb/s), 2 GbE (2.500 Gb/s), InfiniBand (2.500 Gb/s)	1	700 nm to 1650 nm	780 nm, 850 nm, 1310 nm, 1550 nm (±20 nm)
80C04	10 Gb/s Telecom	OC-192/STM-64 (9.953 Gb/s), ITU-T G.975 FEC (10.664 Gb/s)	1	1100 nm to 1650 nm	1310 nm and 1550 nm (±20 nm)
80C05	40 Gb/s Telecom	OC-192/STM-64 (9.953 Gb/s)	1	1520 nm to 1580 nm	1550 nm (±20 nm)
80C06	40 Gb/s Telecom	—	1	1520 nm to 1580 nm	1550 nm (±20 nm)
80C07	Tributary Telecom	OC-3/STM-1 (155.52 Mb/s), OC-12/STM-4 (622 Mb/s), OC-48/STM-16 (2.488 Gb/s)	1	700 nm to 1650 nm	780 nm, 850 nm, 1310 nm, 1550 nm (±20 nm)
80C08B	Datacom	OC-192/STM-64 (9.953 Gb/s), 10GBASE-W (9.95328 Gb/s), 10GBASE-R (10.3125 Gb/s), 10 G Fibre Channel (10.51875 Gb/s)	1	700 nm to 1650 nm	780 nm, 850 nm, 1310 nm, 1550 nm (±20 nm)
80C09	10 Gb/s Telecom	OC-192/STM-64 (9.953 Gb/s), ITU-T G.709 FEC (10.709 Gb/s)	1	1100 nm to 1650 nm	1310 nm and 1550 nm (±20 nm)
80C10	40 Gb/s Telecom	OC-768/STM-256 (39.813 Gb/s), ITU-T G.709 FEC (43.018 Gb/s)	1	1310 nm and 1550 nm	1310 nm and 1550 nm (±20 nm)

▶ Optical Sampling Module Characteristics (continued)

	Clock Recovery	Clock Recovery Outputs	Unfiltered Optical Bandwidth*1	Absolute Maximum Nondestructive Optical Input	Internal Fiber Diameter
80C01	Optional 622.08 Mb/s, 2.48832 Gb/s (±1000 ppm)	±Clock, ±Data	20 GHz	5 mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest relative responsivity	9 µm/125 µm single-mode
80C02	Optional 9.95328 Gb/s (±1000 ppm)	Clock, Clock/16, Data	28 GHz	5mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest relative responsivity	9 µm/125 µm single-mode
80C03	Optional 1.0625 Gb/s, 1.2500 Gb/s, 2.48832 Gb/s, 2.5000 Gb/s (±1000 ppm)	±Clock, ±Data	2.3 GHz	5 mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest relative responsivity	62.5 µm/125 µm multi-mode
80C04	Optional 9.95328 Gb/s, 10.664 Gb/s (±1000 ppm)	Option CR1: Clock, Clock/16, Data Option CR2: Clock, Clock/16	28 GHz	5 mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest relative responsivity	9 µm/125 µm single-mode
80C05	Not Available	Not Available	40 GHz	10 mW average maximum operational power level (20 mW displayed peak-peak level); 10 mW average absolute maximum non-destruct power level (30 mW displayed peak-peak level)	9 µm/125 µm single-mode
80C06	Not Available	Not Available	*55 GHz*	15 mW average maximum operational power level (30 mW displayed peak-peak level); 20 mW average absolute maximum non-destruct power level (60 mW displayed peak-peak level)	9 µm/125 µm single-mode
80C07	Optional 155.52 Mb/s, 622.08 Mb/s, 2.48832 Gb/s (±1000 ppm)	±Clock, ±Data	2.3 GHz	5 mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest responsivity	62.5 µm/125 µm single-mode
80C08B	Optional 9.95328 Gb/s, 10.3125 Gb/s, 10.51875 Gb/s (±1000 ppm)	Clock, Clock/16	*10 GHz*	1 mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest responsivity	All single-mode and multi-mode fibers up to core diameter of 62.5 µm (non-angled)
80C09	Optional 9.95328 Gb/s, 10.709 Gb/s (±1000 ppm)	Clock, Clock/16	28 GHz	5 mW average absolute maximum non-destruct power level; 10 mW peak power at wavelength of highest relative responsivity	All single-mode and multi-mode fibers up to core diameter of 9 µm (non-angled)
80C10	Future Upgradeable	Future	*65 GHz*	20 mW average absolute maximum non-destruct power level; 60 mW peak power at wavelength of highest relative responsivity	9 µm/125 µm single-mode (non-angled)

*1 Values shown are warranted unless printed in an italic typeface which represents a non-warranted characteristic value that the instrument will typically perform to.

▶ Optical Sampling Module Characteristics (continued)

	Optical Return Loss	Fiber Input Accepted	RMS Optical Noise (typical)	RMS Optical Noise (maximum)	Independent Channel Deskew
80C01	>30 dB	single-mode	8.0 µW at 622.08 Mb/s, 2.488 Gb/s, 9.953 Gb/s, 12.5 GHz mode; 15.0 µW at 20 GHz mode	12.0 µW at 622.08 Mb/s, 2.488 Gb/s, 12.5 GHz mode; 25 µW at 20 GHz mode	Standard
80C02	>30 dB	single-mode	6.0 µW at 9.953 Gb/s, 12.5 GHz mode; 15.0 µW at 20 GHz mode; 20.0 µW at 30 GHz mode	10.0 µW at 9.953 Gb/s, 12.5 GHz mode; 20 µW at 20 GHz mode; 30 µW at 30 GHz mode	Standard
80C03	>14 dB (62.5 µm multi-mode) >24 dB (9 µm single-mode)	single- or multi-mode	0.75 µW at 1.063 Gb/s, 1.250 Gb/s; 1.0 µW at 2.488 Gb/s, 2.500 Gb/s	1.0 µW at 1.0625 Gb/s, 1.250 Gb/s; 1.5 µW at 2.488 Gb/s, 2.500 Gb/s	Standard
80C04	>30 dB	single-mode	6.0 µW at 9.953 Gb/s, 10.664 Gb/s; 10.0 µW at 20 GHz mode; 20.0 µW at 30 GHz mode	10.0 µW at 9.953 Gb/s, 10.664 Gb/s; 15 µW at 20 GHz mode; 30 µW at 30 GHz mode	Standard
80C05	>30 dB	single-mode	10.0 µW at 9.953 Gb/s; 15 µW at 20 GHz mode; 25 µW at 30 GHz mode; 50 µW at 40 GHz mode	15 µW at 9.953 Gb/s; 25 µW at 20 GHz mode; 35 µW at 30 GHz mode; 70 µW at 40 GHz mode	Standard
80C06	>30 dB	single-mode	150 µW at 55 GHz mode	192 µW at 55 GHz mode	Standard
80C07	>14 dB (62.5 µm multi-mode) >24 dB (9 µm single-mode)	single- or multi-mode	0.50 µW at 155.52 Mb/s, 622.08 Mb/s; 0.70 µW at 2.48832 Gb/s	1.0 µW at 155.52 Mb/s, 622.08 Mb/s; 1.5 µW at 2.48832 Gb/s	Standard
80C08B	>14 dB (62.5 µm multi-mode) >24 dB (9 µm single-mode)	single- or multi-mode (non-angled)	2.5 µW at all bandwidth settings (1550 nm)	5.0 µW at all bandwidth settings (1550 nm)	Standard
80C09	>30 dB	single-mode (non-angled)	6.0 µW at 9.953 Gb/s, 10.709 Gb/s; 10.0 µW at 20 GHz mode; 20.0 µW at 30 GHz mode	10.0 µW at 9.953 Gb/s, 10.709 Gb/s; 15 µW at 20 GHz mode; 30 µW at 30 GHz mode	Standard
80C10	>30 dB	single-mode (non-angled)	60 µW at 39.813 Gb/s, 43.018 Gb/s (1550 nm); 110 µW at 39.813 Gb/s, 43.018 Gb/s (1310 nm); 45 µW at 30 GHz mode (1550 nm); 82 µW at 30 GHz mode (1310 nm); 100 µW at 65 GHz mode (1550 nm); 182 µW at 65 GHz mode (1310 nm)	75 µW at 39.813 Gb/s, 43.018 Gb/s (1550 nm); 136 µW at 39.813 Gb/s, 43.018 Gb/s (1310 nm); 60 µW at 30 GHz mode (1550 nm); 110 µW at 30 GHz mode (1310 nm); 150 µW at 65 GHz mode (1550 nm); 273 µW at 65 GHz mode (1310 nm)	Standard

▶ Optical Sampling Module Characteristics (continued)

	Offset Capability Front of Module	Power Meter	Power Meter Range	Power Meter Accuracy	Mask Test Optical Sensitivity*2
80C01	Standard	Standard	+4 dBm to –30 dBm	5% of reading + connector uncertainty	–8 dBm at 622 Mb/s, 2.488 Gb/s, 9.953 Gb/s; –5.0 dBm at 20 GHz mode
80C02	Standard	Standard	+4 dBm to –30 dBm	5% of reading + connector uncertainty	–9 dBm at 9.953 Gb/s; –7 dBm at 20 GHz; –4 dBm at 30 GHz
80C03	Standard	Standard	+4 dBm to –30 dBm	5% of reading + connector uncertainty	–22 dBm at 1.063 Gb/s, 1.250 Gb/s; –20 dBm at 2.488 Gb/s, 2.500 Gb/s
80C04	Standard	Standard	+4 dBm to –30 dBm	5% of reading + connector uncertainty	–9 dBm at 9.953 Gb/s, 10.664 Gb/s; –7 dBm at 20 GHz mode; –4 dBm at 30 GHz mode
80C05	Standard	Standard	+13 dBm to –21 dBm	5% of reading + connector uncertainty + polarization dependent loss	–7 dBm at 9.953 Gb/s; –5 dBm at 20 GHz mode; –3 dBm at 30 GHz mode; 0 dBm at 40 GHz mode
80C06	Standard	Standard	+13 dBm to –21 dBm	5% of reading + connector uncertainty + polarization uncertainty	+5 dBm at 55 GHz mode
80C07	Standard	Standard	+4 dBm to –30 dBm	5% of reading + connector uncertainty	–22 dBm at 155.52 Mb/s, 622.08 Mb/s; –20 dBm at 2488.32 Mb/s
80C08B	Standard	Standard	0 dBm to –30 dBm	5% of reading + connector uncertainty	–13 dBm at 9.95328 Gb/s, 10.3125 Gb/s, 10.51875 Gb/s (1550 nm)
80C09	Standard	Standard	+4 dBm to –30 dBm	5% of reading + connector uncertainty	–9 dBm at 9.95328 Gb/s, 10.709 Gb/s; –7 dBm at 20 GHz mode; –4 dBm at 30 GHz mode
80C10	Standard	Standard	+13 dBm to –21 dBm	8% of reading + connector uncertainty	0 dBm at 39.813 Gb/s, 43.018 Gb/s; 0 dBm at 30 GHz mode; +3 dBm at 65 GHz mode (1550 nm)

*2 Smallest power level for mask test. Values represent theoretical typical sensitivity of NRZ eyes for competitive comparison purposes. Assumes acceptable instrument peak-peak noise is 40 percent of the amplitude of the signal allowing the instrument to consume 100 percent of the mask margin.

▶ Electrical Sampling Module Characteristics

	Application Type	Channels	Input Impedance	Channel Input Connector	Bandwidth*3
80E01	Microwave General Purpose	1	50 ±0.5 Ω	2.4 mm female Precision adapter to 2.92 mm included with 50 Ω SMA termination	50 GHz
80E02	Low-level Signals	2	50 ±0.5 Ω	3.5 mm female	12.5 GHz*4
80E03	Device Characterization	2	50 ±0.5 Ω	3.5 mm female	20 GHz*4
80E04	TDR Impedance Characterization with single-ended, common, differential TDR capability	2	50 ±0.5 Ω	3.5 mm female	20 GHz*4
80E06	High-speed Electrical Device Characterization	1	50 ±0.5 Ω	1.85 mm female Precision adapter to 2.92 mm included with 50 Ω SMA termination	*70+ GHz*

*3 Values shown are warranted unless printed in an italic typeface which represents a non-warranted characteristic value that the instrument will typically perform to.

*4 Calculated from 0.35 bandwidth rise time product.

	Rise Time (10% to 90%)	Dynamic Range	Offset Range	Maximum Input Voltage	Vertical Number of Digitized Bits
80E01	7 ps (typical)*4	1.0 V_{p-p}	±1.6 V	±2.0 V	14 bits full scale
80E02	≤28 ps	1.0 V_{p-p}	±1.6 V	±3.0 V	14 bits full scale
80E03	≤17.5 ps	1.0 V_{p-p}	±1.6 V	±3.0 V	14 bits full scale
80E04	≤17.5 ps	1.0 V_{p-p}	±1.6 V	±3.0 V	14 bits full scale
80E06	5.0 ps*5	1.0 V_{p-p}	±1.6 V	±2.0 V	14 bits full scale

*4 Calculated from 0.35 bandwidth rise time product.

*5 80E06 rise time is calculated from formula rise time = 0.35/(typical bandwidth).

▶ Electrical Sampling Module Characteristics (continued)

	Vertical Sensitivity Range	DC Vertical Voltage Accuracy, Single Point, Within ±2 °C of Compensated Temperature	Typical Step Response Aberrations*6	RMS Noise*6
80E01	10 mV to 1.0 V full scale	± [2 mV + 0.007 (Offset) + 0.02 (Vertical Value – Offset)]	*±3% or less over the zone 10 ns to 20 ps before step transition; +12%, –5% or less for the first 300 ps following step transition; +5.5%, –3% or less over the zone 300 ps to 3 ns following step transition; ±1% or less over the zone 3 ns to 100 ns following step transition; ±0.5% after 100 ns following step transition*	*1.8 mV* ≤2.3 mV (maximum)
80E02	10 mV to 1.0 V full scale	± [2 mV + 0.007 (Offset) + 0.02 (Vertical Value – Offset)]	*±3% or less over the zone 10 ns to 20 ps before step transition; +10%, –5% or less for the first 300 ps following step transition; ±3% or less over the zone 300 ps to 5 ns following step transition; ±1% or less over the zone 5 ns to 100 ns following step transition; ±0.5% after 100 ns following step transition*	*400 µV* ≤800 µV (maximum)
80E03	10 mV to 1.0 V full scale	± [2 mV + 0.007 (Offset) + 0.02 (Vertical Value – Offset)]	*±3% or less over the zone 10 ns to 20 ps before step transition; +10%, –5% or less for the first 300 ps following step transition; ±3% or less over the zone 300 ps to 5 ns following step transition; ±1% or less over the zone 5 ns to 100 ns following step transition; ±0.5% after 100 ns following step transition*	*600 µV* ≤1.2 mV (maximum)
80E04	10 mV to 1.0 V full scale	± [2 mV + 0.007 (Offset) + 0.02 (Vertical Value – Offset)]	*±3% or less over the zone 10 ns to 20 ps before step transition; +10%, –5% or less for the first 300 ps following step transition; ±3% or less over the zone 300 ps to 5 ns following step transition; ±1% or less over the zone 5 ns to 100 ns following step transition; 0.5% after 100 ns following step transition*	*600 µV* ≤1.2 mV (maximum)
80E06	10 mV to 1.0 V full scale	± [2 mV + 0.007 (Offset) + 0.02 (Vertical Value – Offset)]	*±5% or less for first 300 ps following step transition*	*2.0 mV* ≤2.8 mV (maximum)

*6 Values shown are warranted unless printed in an italic typeface which represents a non-warranted characteristic value that the instrument will typically perform to.

Physical Characteristics for Electrical Sampling Modules

	Dimensions (mm/in.)			Weight (kg/lbs.)
	Width	Height	Depth	Net
80E01	79/3.1	25/1.0	135/5.3	0.4/0.87
80E02	79/3.1	25/1.0	135/5.3	0.4/0.87
80E03	79/3.1	25/1.0	135/5.3	0.4/0.87
80E04	79/3.1	25/1.0	135/5.3	0.4/0.87
80E06	79/3.1	25/1.0	135/5.3	0.4/0.87

▶ TDR System (80E04 only)

	80E04
Channels	2
Input Impedance	50 ±0.5 Ω
Channel Input Connector	3.5 mm
Bandwidth	20 GHz
TDR Step Amplitude	250 mV (polarity of either step may be inverted)
TDR System Reflected Rise Time	≤35 ps each polarity
TDR System Incident Rise Time	28 ps (typical)
TDR Step Maximum Repetition Rate	200 kHz
TDR System Step Response Aberrations	*±3% or less over the zone 10 ns to 20 ps before step transition; +10%, –5% or less typical for the first 400 ps following step transition; ±3% or less over the zone 400 ps to 5 ns following step transition; ±1% or less after 5 ns following step transition*

▶ Ordering Information

TDS8000B

Digital Sampling Oscilloscope.

Includes: User manual, quick reference card, Microsoft Windows 98 compatible keyboard, Windows 98 compatible mouse, touch screen stylus, online help, programmer online guide, power cord.

With OpenChoice™ software, Tektronix provides enhanced test and measurement analysis with the capability of full integration of third-party software on the Open Windows oscilloscopes. By working with the industry leaders, National Instruments and The MathWorks, examples of software programs from these companies are featured on all Tektronix Open Windows oscilloscopes.

TDS8000B Options

Opt. C3 – Three years of Calibration Service.

Opt. D1 – Calibration data report.

Opt. D3 – Three years of Calibration data reports.

Opt. GT – Gated Trigger.

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 rackmount configuration).

International Power Cord Options

Opt. A0 – US plug, 115 V, 60 Hz.

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

Opt. A2 – UK 240 V, 50 Hz.

Opt. A3 – Australian 240 V, 50 Hz.

Opt. A4 – North American 240 V, 60 Hz.

Opt. A5 – Switzerland 220 V, 50 Hz.

Opt. A99 – No Power Cord.

Opt. AC – China 240 V, 50 Hz.

Other Accessories

Calibration Step Generator with 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 – Order SIU800.

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

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

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

5X Attenuator (Male-to-female) – Order 015-1002-01.

Adapter (2.4 mm male to 2.92 mm female) – Order 011-0157-01.

Power Divider – Order 015-1014-00.

Rackmount Kit – Order 016-1791-01.

80A01 – Pre-scaled Trigger Amplifier: The 80A01 Pre-scaled Trigger Amplifier provides enhanced triggering capability on low-level signals up to 12.5 GHz. This module plugs into any of the four available electrical sampling module slots on the TDS8000B and the CSA8000B mainframes. It is ideally suited for component designers and manufacturers who are verifying the performance of optical and electrical components that run at non-standard clock rates up to 12.5 GHz.

GTS1063 – GBIC test system for Fibre Channel.

GTS1250 – GBIC test system for Gigabit Ethernet.

P6209 – 4 GHz Active FET Probe.

P6150 – 9 GHz Passive Probe.

K4000 Mobile Workstation.

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