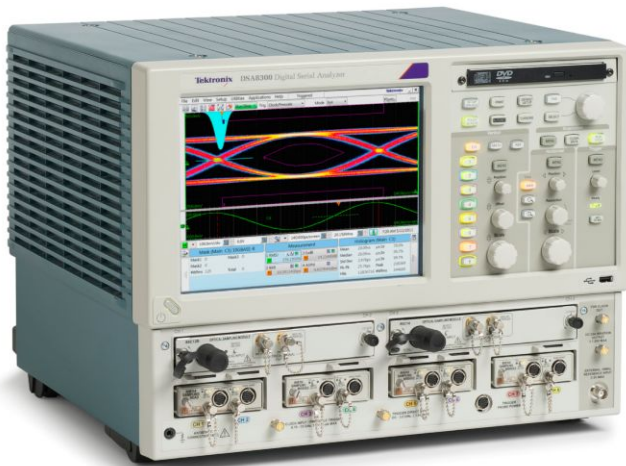**Tektronix®**

DSA8300 Datasheet

Digital Serial Analyzer Sampling Oscilloscope

The DSA8300 is a state-of-the-art Equivalent Time Sampling Oscilloscope that provides the highest fidelity measurement and analysis capabilities for Communications Signal Analysis, Serial Data Network Analysis, and Serial Data Link Analysis applications.

Key performance specifications

- Very low time base jitter:
    - 425 fs typical on up to 8 simultaneously acquired channels
    - <100 fs on up to 6 channels with 82A04B phase reference module
- Industry's highest vertical resolution – 16 bit A/D
- Electrical resolution: <20 µV LSB (for 1 v full range)
- Optical resolution from <20 nW for the 80C07B (1 mW full range) to <0.6 µW for the 80C10C (30 mW full range)
- Optical bandwidths to >80 GHz
- Electrical bandwidths to >70 GHz
- Over 120 automated measurements for NRZ, RZ, and pulse signal types
- Automated mask testing with over 80 industry-standard masks

Key features

- With today's sampling module portfolio, the DSA8300 supports up to 8 simultaneously acquired signals
- A wide variety of optical, electrical, and accessory modules to support your specific testing requirements
- **Optical modules**
    - Fully integrated optical modules that support all standard optical data rates from 155 Mb/s to 100 Gb/s
    - Certified optical reference receivers support specified requirements for standards-mandated compliance testing
    - Optical bandwidths to >80 GHz
    - High optical sensitivity, low noise, and wide dynamic range of the optical sampling modules allows accurate testing and characterization of short-reach to long-haul optical communications standards
    - Fully calibrated clock recovery solutions – no need to manually calibrate for data pick-off losses
    - Calibrated extinction ratio measurements ensure repeatability of extinction ratio measurements to <0.5 dB among systems with modules with this factory calibration option
- **Electrical modules**
    - Very low-noise electrical samplers (280 µV at 20 GHz, 450 µV at 60 GHz, typical)
    - Selectable bandwidths [1] allow the user to trade-off sampler bandwidth and noise for optimal data acquisition performance
    - Remote samplers [2] or compact sampling extender module cables support minimal signal degradation by allowing the sampler to be located in close proximity to the device under test
    - World's highest-performance integrated TDR (10 ps typical step rise time) supports exceptional impedance discontinuity characterization and high dynamic range for s-parameter measurements to 50 GHz

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1   With 80E07B, 80E08B, 80E09B, 80E10B, 80E11, and 80E11X1 modules.

2   80E07B, 80E08B, 80E09B and 80E10B only.

- **Analysis**
  - Complete suite of over 120 automated measurements for NRZ, RZ, and pulse signal types
  - Automated Mask Testing with over 80 Industry-standard Masks. New Masks can be Imported into the DSA8300 to support New Emerging Standards. Users can Define their own Masks for Automated Mask Testing
  - Vertical and Horizontal Histograms for Waveform Statistical Analysis
  - Vertical, Horizontal, and Waveform Cursors (with measurements)
  - Jitter, Noise, BER, and Serial Data Link Analysis is provided through the 80SJNB Basic and Advanced Software Application Options
  - Advanced TDR Analysis, S-parameter measurements, simulation model extraction, and serial link simulation capabilities are provided through the IConnect® Software Application options
- **High test throughput**
  - High sample acquisition rate up to 300 kS/s per channel
  - Efficient programmatic interface (IEEE-488, Ethernet, or local processor access) enables high test throughput
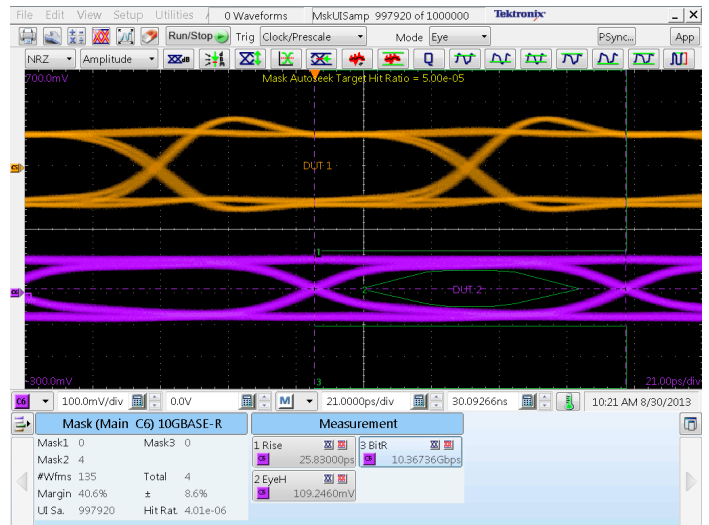
Applications

- Design/Verification of telecom and datacom components and systems
- Manufacturing/testing for ITU/ANSI/IEEE/SONET/SDH compliance
- High-performance true-differential TDR measurements
- Impedance characterization and network analysis for serial data applications including S-parameters
- Advanced jitter, noise, and BER analysis
- Channel and eye diagram simulation and measurement-based SPICE modeling

Superior performance with extraordinary versatility

The DSA8300 Digital Serial Analyzer is the most versatile tool for developing and testing communications, computers, and consumer electronics which use multi-gigabit data transmission. It is used for optical and electrical transmitter characterization, as well as compliance verification for devices, modules, and systems used in these products.

In addition, the DSA8300 is well-suited for electrical signal path characterization, whether for packages, PCBs, or electrical cables. With exceptional bandwidth, signal fidelity, and the most extensible modular architecture, the DSA8300 provides the highest-performance TDR and interconnect analysis, most accurate analysis of signal impairments, and BER calculations for current and emerging serial data technology.

Optical eye diagram testing
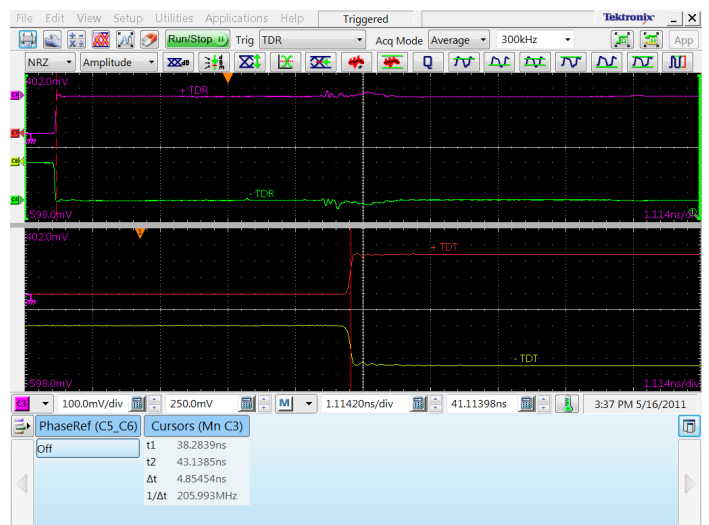
Passive interconnect test

Finally, with its exceptional signal fidelity and resolution, the DSA8300 is the gold standard for electrical and optical applications which require ultra-high bandwidths, very fine vertical resolution, low jitter, and/or exceptional time interval accuracy.

The DSA8300 provides unmatched measurement system fidelity with the lowest native instrument jitter floor (425 fs RMS, typical for serial data signals at rates >1.25 Gb/s) that ensures the most accurate acquisition of up to 8 high-bandwidth signals simultaneously. You get additional analysis benefits from acquisition jitter as low as 100 fs RMS when using the 82A04B Phase Reference module.

The multiprocessor architecture, with dedicated per-slot digital signal processors (DSPs), provides fast waveform acquisition rates, reducing the test times necessary for reliable characterization and compliance verification.

The DSA8300's versatile modular architecture supports a large and growing family of plug-ins enabling you to configure your measurement system with a wide variety of electrical, optical, and accessory modules that best suit your application now and in the future. With 6 module slots, the DSA8300 can simultaneously accommodate a Clock Recovery module, a precision Phase Reference module, and multiple acquisition modules (electrical or optical), so you can match system performance to your evolving needs. The ability to swap sampling modules without powering down the DSA8300 (available for scopes with firmware versions 6.1 and later) provides additional flexibility in configuring your DSA8300 to changing test needs.

Featuring industry-leading signal fidelity, the family of electrical modules includes bandwidth performance from 20 GHz to >70 GHz, while the optical modules support optical testing from 125 Mb/s to 100 Gb/s and beyond with optical bandwidth exceeding 80 GHz. The DSA8300 supports all of the legacy 8000 Series electrical and optical sampling modules and accessories. [3]

In addition, specialized modules supporting features such as single-ended and differential electrical clock recovery, electrostatic protection for electrical samplers, and connectivity to the popular TekConnect® probing system brings you the performance of state-of-the-art Tektronix probes for high-impedance and differential probing. Low-impedance probes for 50 Ω probing and for TDR probing are also available.

The raw acquisition performance of the DSA8300 and its sampling modules and accessories is further augmented by the comprehensive measurement and analysis capabilities of the DSA8300 and its associated software applications. For example, the IConnect® software applications provide complete TDR, S-parameter, and signal integrity analysis for passive electrical interconnects (packages, printed circuit boards, backplanes, cable, etc.) while the 80SJNB applications provide complete jitter, noise, and bit error rate analysis as well as channel and equalization analysis and emulation for both optical and electrical serial data links.

Jitter, noise, BER, and serial data link analysis
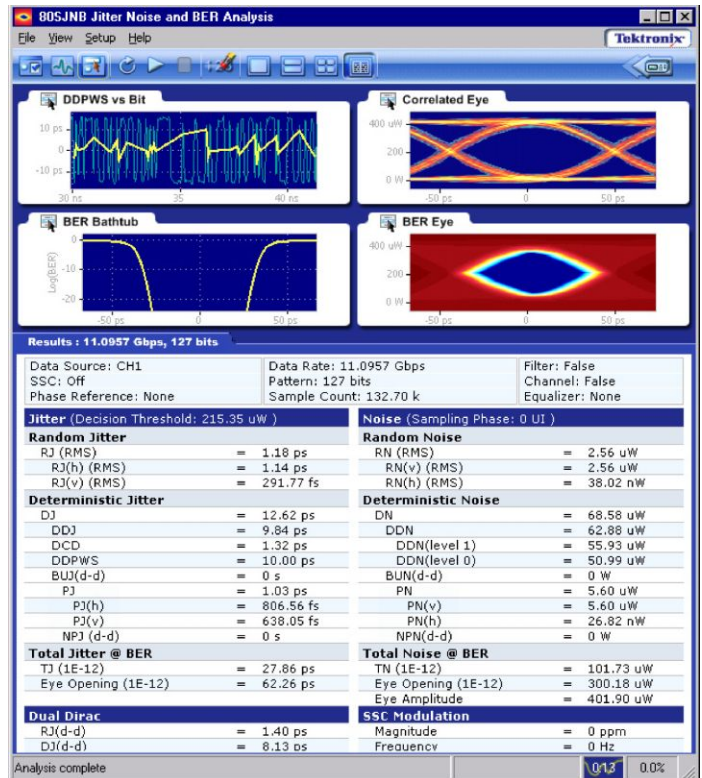
Jitter, noise and BER analysis

High-speed serial data link measurements and analysis are supported with three software solutions: 80SJARB, 80SJNB essentials, and 80SJNB Advanced. [4]

- 80SJARB (Option JARB) is a basic jitter measurement tool capable of measuring jitter on any waveform – random or repetitive. The simplicity of acquisition limits the amount of analysis possible so only the simplest decomposition can be used; repeatability is pattern dependent

- 80SJNB Essentials (Option JNB) offers complete analysis of jitter, noise, and BER, with decomposition of components for clear understanding of a signal's problems and margins. The acquisition methodology requires a repetitive pattern. Both accuracy and repeatability are improved relative to 80SJARB since the tool has access to the complete signal pattern

- 80SJNB Advanced (Option JNB01) adds features to 80SJNB Essentials for serial data link analysis – de-embedding of fixture, channel emulation, FFE/DFE equalization, and preemphasis/de-emphasis

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[3] The DSA8300 does not support the 80A06 Pattern Synchronization module, as this capability is superseded by the integrated Advance Trigger option (Option ADVTRIG) for the DSA8300.

[4] These software applications can be purchased to install on currently owned DSA8300 oscilloscopes with the DSA83UP upgrade kits.

Jitter analysis of arbitrary data (80SJARB)

The 80SJARB jitter measurement application software for the DSA8300 Series addresses IEEE 802.3ba applications requiring the J2 and J9 jitter measurements. It also enables basic jitter measurements for NRZ data signals including PRBS31, random traffic, and scrambled data. This provides an entry-level jitter analysis capability with simple Dual Dirac model jitter analysis and no pattern synchronization requirement.

80SJARB can acquire continuously in Free Run mode, delivering acquisitions and updates beyond the IEEE minimum requirement of 10,000 data points.

Plots include jitter and eye opening bathtub curves for both measured and extrapolated data, as well as a histogram of the acquired data.

80SJARB jitter analysis measurements

Measurement	Description
J2	Total jitter for BER = $2.5e^{-3}$
J9	Total jitter for BER = $2.5e^{-10}$
Tj	Total jitter for BER = $2.5e^{-12}$
DJ_{dd}	Deterministic jitter (Dual Dirac model)
RJ_{dd}	Random jitter (Dual Dirac model)

80SJNB jitter and noise analysis measurements

80SJNB jitter analysis

| Measurement	Description
TJ at BER	Total jitter at specified BER
J2	Total jitter for BER = $2.5e^{-3}$
J9	Total jitter for BER = $2.5e^{-10}$
RJ	Random jitter
RJ(h)	Horizontal component of random jitter
RJ(v)	Vertical component of random jitter
RJ(d-d)	Random jitter according to the Dual Dirac model
DJ	Deterministic jitter
DDJ	Data-dependent jitter
DDPWS	Data-dependent pulse width shrinkage
DCD	Duty cycle distortion
DJ(d-d)	Deterministic jitter computed in the Dual Dirac model
PJ	Periodic jitter
PJ(h)	Horizontal component of periodic jitter
PJ(v)	Vertical component of periodic jitter
EO at BER	Horizontal eye opening at specified BER
BUJ	Bounded uncorrelated jitter
NPJ	Non-periodic jitter (uncorrelated and bounded)
SSCMagnitude	Magnitude of SSC modulation in ppm
SSCFrequency	Frequency of SSC modulation in ppm

80SJNB noise analysis

Measurement	Description
RN	Random noise
RN(v)	Vertical component of random noise
RN(h)	Horizontal component of random noise
DN	Deterministic noise
DDN1	Data-dependent noise on logical level 1
DDN0	Data-dependent noise on logical level 0
PN	Periodic noise
PN(v)	Vertical component of periodic noise
PN(h)	Horizontal component of periodic noise
EO at BER	Vertical eye opening at specified BER
BUN	Bounded uncorrelated noise
NPN	Non-periodic noise

80SJNB Advanced (Opt. JNB01) supports:

- FFE (Feed Forward Equalization) to 100 Taps

- DFE (Decision Feedback Equalization) to 40 Taps

- Filter for support of linear filters from fixture de-embed to transmitter equalization. Channel emulation supported for channels with >30 dB of loss at 1st harmonic frequency

TDR (Time Domain Reflectometry) applications
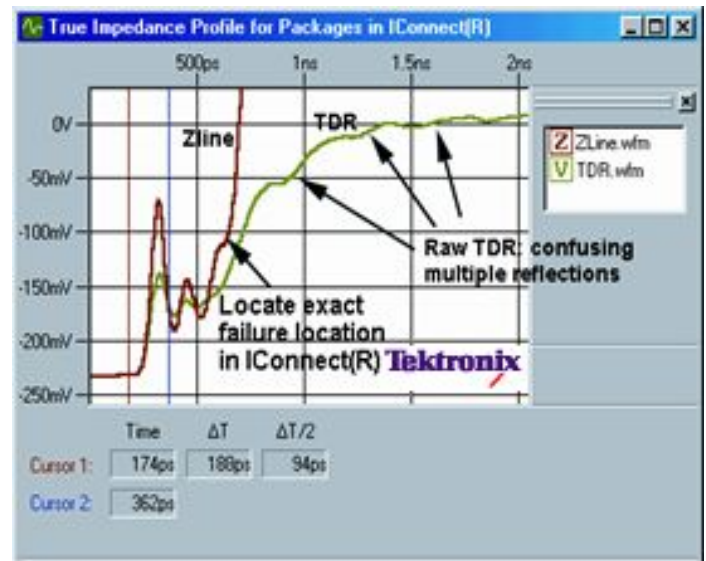
Quickly identify the exact location of faults with the 80E10B sub-millimeter resolution and IConnect ®True Impedance Profile

The DSA8300 is the industry's highest-performance fully integrated Time Domain Reflectometry (TDR) measurement system. Offering true-differential TDR measurements up to 50 GHz bandwidth with 15 ps reflected rise time and 12 ps incident rise time [5], the DSA8300 enables you to keep pace with today's most demanding Serial Data Network Analysis (SDNA) requirements.

The 80E10B and 80E08B TDR modules feature a fully integrated independent dual-channel 2-meter remote sampler system to minimize fixturing and assure optimal system fidelity. Independent sampler deskew ensures fast and easy fixture and probe de-embedding. The user can characterize differential crosstalk by using TDR steps from a differential module to drive one line pair while monitoring a second line pair with a second differential module.

The DSA8300 is the industry's most versatile TDR measurement system, accommodating up to 4 dual-channel true-differential TDR modules for fast, accurate multilane impedance and S-parameter characterization.

The P80318 True-differential TDR probe and P8018 Single-ended Passive Handheld TDR probe provide high-performance probing solutions for circuit board impedance and electrical signal characterization. The P80318, an 18 GHz 100 Ω input-impedance differential TDR hand probe, enables high-fidelity impedance measurements of differential transmission lines. The adjustable probe pitch enables a wide variety of differential line spacing and impedances. The P8018 is a 20 GHz Single-ended Passive Handheld TDR probe. Both the P80318 and P8018 can be used as stand-alone probes but are especially designed to work with the 80A02 EOS/ESD module to provide EOS/ESD protection.

Multi-gigabit signal path characterization and analysis – Serial Data Network Analysis (SDNA)
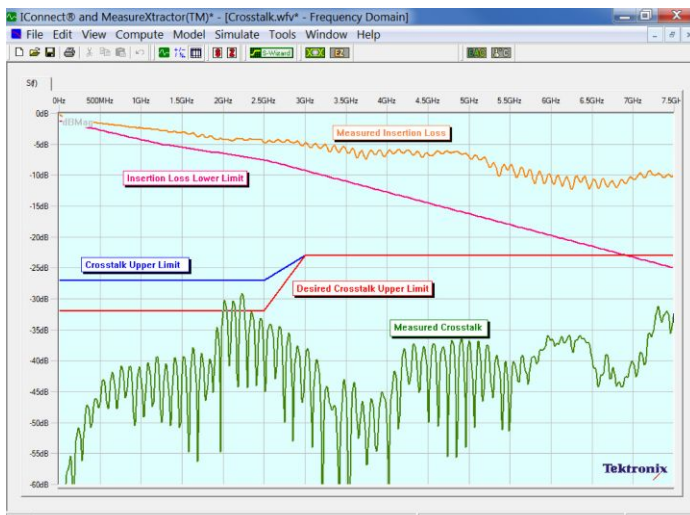
Serial data network analysis

As clock speeds and rise times of digital circuits increase, interconnect signal integrity dramatically affects digital system performance. Accurate and efficient Serial Data Network Analysis (SDNA) of the signal path and interconnects in time and frequency domains is critical to predict signal losses, jitter, crosstalk, terminations and ringing, digital bit errors, and eye diagram degradation, ensuring reliable system operation.

Tektronix offers several true-differential TDR modules, which in combination with IConnect® software allow S-parameter measurements with up to –70 dB of dynamic range. This performance assures accurate, repeatable measurements in serial data analysis, digital design, signal integrity, and electrical compliance testing applications.

TDR module performance with IConnect®

TDR Module	S-parameter measurement bandwidth performance
80E10B	50 GHz
80E08B	30 GHz
80E04	20 GHz

With the long record length acquisitions, IConnect® provides great flexibility for obtaining the desired frequency range and frequency step when performing S-parameter measurements. Up to 1,000,000 points can be acquired.

When you use IConnect® Signal Integrity TDR and S-parameter software with the DSA8300 you have an efficient, easy-to-use, and cost-effective solution for measurement-based performance evaluation of multi-gigabit interconnect links and devices, including signal integrity analysis, impedance, S-parameter, and eye-diagram tests, and fault isolation.

IConnect® can help you complete interconnect analysis tasks in minutes instead of days, resulting in faster system design time and lower design costs. IConnect® also enables impedance, S-parameters, and eye-diagram compliance testing as required by many serial data standards, as well as full channel analysis, Touchstone (SnP) file output, and SPICE modeling for multi-gigabit interconnects.

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5   Rise times are 10-90%. Typical reflected rise times for the 80E10B are <10 ps.

Failure analysis – quickly identify fault location

The 80E10B, with its 12 ps typical TDR rise time, provides superior resolution enabling the fastest and most efficient fault isolation in package, circuit board, and on-chip failure analysis applications.

IConnect® Signal Integrity TDR and S-parameter software

Operating on the DSA8300 TDR platform, IConnect® S-parameters is the most cost-effective and highest throughput approach for S-parameter measurements in digital design, signal integrity analysis, and interconnect compliance testing, providing as much as 50% cost savings compared to similar bandwidth VNAs, and dramatically speeding up measurements.

You can also take advantage of the IConnect® S-parameters command-line interface, which automates the S-parameter measurements to the overall suite of manufacturing tests you perform using your TDR instrument, significantly reducing test time while increasing measurement repeatability. The simplicity of S-parameter calibration using a reference (open, short, or through), and an optional 50 Ω load makes measurements, fixture de-embedding, and moving the reference plane a snap. Touchstone file format output enables easy S-parameter file sharing for further data analysis and simulations.

Tektronix offers several true-differential TDR modules, which in combination with IConnect® offers S-parameter measurements up to 50 GHz with up to –70 dB of dynamic range. This performance exceeds requirements for serial data analysis, digital design, and signal integrity applications, resolving down to 1% (–40 dB) accuracy of crosstalk, while electrical compliance testing masks typically call for measurements in the –10 to –30 dB range.

IConnect® software lets you:

- Quickly and easily generate SPICE and IBIS models for your PCBs, flex boards, connectors, cables, packages, sockets, and I/O buffer inputs directly from TDR/T or VNA S-parameter measurements
- Display eye diagram degradation, jitter, loss, crosstalk, reflections, and ringing in your digital system

- Substantially simplify the signal integrity analysis of the interconnect link, equalization and emphasis component design, and analysis of the interconnect link with transmitter and receiver
- IConnect® Linear Simulator lets the designer link several interconnect channels together to evaluate the total time, frequency domain performance, and eye diagram of the overall channel

For more information regarding the IConnect® software applications, see the *IConnect® Signal Integrity, TDR, and S-Parameter SW – 80SICMX • 80SICON • 80SSPAR* datasheet.

Measurement and analysis tools for optical testing applications

The DSA8300 includes a wide variety of measurement and analysis tools which specifically address optical testing applications. In addition to the standard amplitude and timing parametric measurements (such as rise/fall times, amplitude, RMS jitter, RMS noise, frequency, period, etc.), the measurement suite for the DSA8300 includes measurements specifically tailored to measuring optical signals (average optical power, extinction ratio, eye height, eye width, optical modulation amplitude (OMA), etc.). For a complete list of measurements, see the Measurement section of this datasheet.

The DSA8300 also includes standard compliance testing masks for all of the common optical standards from 155 Mb/s to 100 Gb/s. The DSA8300 mask testing system includes the ability to automatically fit standard and user masks to data acquired into a waveform database. The mask test system can also automatically determine the mask margin based either on the total # of mask violations or the "hit ratio" of mask violation to the number of samples acquired in the mask test unit interval. Users can also create their own masks for automated mask testing. Histograms and cursor measurements are also available to analyze optical signals acquired by the DSA8300.

Finally, the 80SJNB applications support complete jitter, noise, and BER analysis for optical signals. The advanced version of this software (Option JNB01) supports evaluating the emphasis and equalization on impaired signals.

Sampling modules

High speed optical test solutions

The DSA8300 with its highly configurable mainframe and a wide variety of optical modules provide complete optical test solutions with superior system fidelity from 125 Mb/s to 100 Gb/s and beyond. The modules cover a range of wavelengths for both single- and multi-mode fibers. Each module can be optionally configured with several selectable Optical Reference Receiver (ORR) filters and/or a full bandwidth path. Each module also supports fully calibrated clock recovery solutions (whether integrated into the module or through a data pick-off routed to an external clock recovery module or stand-alone clock recovery instrument).

See the *Optical sampling modules* table for a brief description of each available optical sampling module. See the *Optical sampling module selection guide* table for key specifications for each module. For more complete information on these modules, see the *Optical Sampling Modules – 80C07B • 80C08D • 80C10C • 80C11B • 80C12B• 80C14 • 80C15* datasheet.

Optical sampling modules

Module	Description
80C07B Multirate Datacom and Telecom	The 80C07B module is a broad-wavelength (700 to 1650 nm) multirate optical sampling module optimized for testing datacom/ telecom signals from 125 Mb/s to 2.5 Gb/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 80C07B can be optionally configured with fully calibrated internal clock recovery that supports 125, 155, 622, 1063, 1250, 2125, 2488, 2500, and 2666 Mb/s rates.
80C08D Multirate, Broad Wavelength, High Sensitivity 10 Gb/s	The 80C08D module is a broad-wavelength (700 to 1650 nm) multirate optical sampling module providing datacom rate testing for 10GbE, 40GbE-R4, 100GbE-SR10 applications at 9.953, 10.3125, 11.0957 Gb/s and 10G Fibre Channel applications at 10.51875 and 11.317 Gb/s. The 80C08D also provides telecom rate testing at 9.953, 10.664, and 10.709 Gb/s. With its amplified 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 80C08D can be optionally configured with an integrated clock recovery option that supports acquiring signals at any standard- or user-specified rate from 9.8 to 12.6 Gb/s.
80C10C Multirate Datacom and Telecom 40 Gb/s and 100 Gb/s	The 80C10C module provides integrated and selectable reference receiver filtering, enabling conformance testing at either 1310 nm or 1550 nm of all standard 25, 40 and 100 (4 x 25) Gb/s standard rates. There are three configurations for the 80C10C: **Option F1**: Provides standard compliant optical reference receivers for the following rates (standards): ■ 25.781 Gb/s (100GBase-LR4 and 100GBase-ER4) ■ 27.952 Gb/s (OTU4) ■ 39.813 Gb/s (OC-768/STM-256, VSR2000 G.693, 40G NRZ G.959.1) ■ 41.25 Gb/s (40GBase-FR) ■ 43.018 Gb/s (G.709 FEC, OTU3 4×10G LAN PHY) **Option F2**: Provides standard compliant optical reference receivers for the following rates (standards): ■ 25.781 Gb/s (100GBase-LR4 and 100GBase-ER4) ■ 27.952 Gb/s (OTU4) **Option F3**: Provides standard compliant optical reference receivers for the following rates (standards): ■ 39.813 Gb/s (OC-768/STM-256, VSR2000 G.693, 40G NRZ G.959.1) ■ 41.25 Gb/s (40GBase-FR) ■ 43.018 Gb/s (G.709 FEC, OTU3 4×10G LAN PHY) In addition to the filter rates, the user may also select bandwidths for the 80C10C for optimal noise vs. bandwidth performance for accurate signal characterization. When equipped with Option CRTP an electrical signal pickoff is provided for clock recovery. Clock recovery, to 28.6 Gb/s, for the 80C10C is provided using the CR286A clock recovery instrument (sold separately). When equipped with Option HSPR, a separate high-sensitivity photo receiver is provided with independent electrical outputs that can be used with external equipment (such as a Tektronix BERTScope) for high accuracy optical measurements. The 80C10C is also optionally available in a bundled ordering configuration which includes a single-channel 70+ GHz electrical sampling module.
80C11B Multirate 10 Gb/s Datacom and Telecom	The 80C11B module is a long-wavelength (1100 to 1650 nm) multirate optical sampling module optimized for testing 10 Gb/s datacom and telecom standard rates at 9.953, 10.3125, 10.51875, 10.664, 10.709, 11.0957, 11.317, and 14.025 Gb/s. With its high optical bandwidth of up to 30 GHz (typical) it is well-suited for general-purpose high-performance 10 Gb/s optical component testing. The 80C11B can be optionally configured with clock recovery that can support any standard or user-defined rate in the continuous range from 9.8 to 12.6 Gb/s.
80C12B Multirate Datacom and Telecom	The 80C12B module is a broad wavelength (700 to 1650 nm) multirate optical sampling module providing telecom and datacom testing for standards from 155 Mb/s to 11.4 Gb/s. This highly flexible module can be configured to support a wide variety of 10 Gb/s applications, lower data rate applications (155 Mb/s to 7.4 Gb/s), or a combination of 10G and lower data rate standards. The low data rate applications include: Telecom applications from 155 to 2666 Mb/s, 1G, 2G, and 4G Fibre Channel, multilane standards such as 10GBASE-X4 and 4-Lane 10 Gb/s Fibre Channel, and Infiniband SDR and DDR rates. The supported 10 Gb/s application includes both datacom and telecom standards. The supported 10 Gb/s datacom applications include 10GbE, 40GbE-R4, 100GbE-SR10 applications at 9.953, 10.3125, 11.0957 Gb/s, and 10G Fibre Channel applications at 10.51875 Gb/s and 11.317 Gb/s. The 80C12B also provides telecom rate testing at 9.953, 10.664, and 10.709 Gb/s. With its amplified O/E converter design, this module provides excellent signal-to-noise performance and high optical sensitivity, allowing users to examine low-power optical signals. Clock recovery for the 80C12B is provided using the 80A05 module or CR125A clock recovery instrument (sold separately).

Module	Description
80C14 Multirate Datacom and Telecom	The 80C14 module is a broad-wavelength (700 to 1650 nm) multirate optical sampling module providing 8G, 10G, and 16G telecom and datacom testing. The supported 10 Gb/s datacom applications include: 10GbE, 40GbE-R4, 100GbE-SR10 applications at 9.953, 10.3125, and 11.0957 Gb/s. Fibre Channel applications include: 8.500, 10.51875, 11.317, and 14.025 Gb/s. The 80C14 also provides telecom rate testing at 9.953, 10.664, 10.709, and 12.5 Gb/s. With its amplified 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. Clock recovery for the 80C14 is provided by the CR175A or CR286A (sold separately).
80C15	The 80C15 module provides integrated and selectable reference receiver filtering, enabling conformance testing for single- and multi-mode optical signals at 850 nm, 1310 nm or 1550 nm of all standard 25-32 Gb/s standard rates. This module provides bandwidth filters for the following rates (standards): - 25.781 Gb/s (100GBase-ER4, 100GBase-LR4, 100GBase-SR4, Infiniband EDR) - 27.952 Gb/s (OTU4) - 28.050 Gb/s (32G Fibre Channel) In addition to the filter rates, the user may also select bandwidths for the 80C15 for optimal noise vs. bandwidth performance for accurate signal characterization.

Optical sampling module selection guide

Character-istic	80C07B [6]	80C08D	80C12B [7] Opt. F0-F12	80C12B [7] Opt. 10G/ 10GP	80C14	80C11B	80C15	80C10C [8] Opt F1	80C10C [8] Opt F2	80C10C [8] Opt F3
Wavelength Range (nm)	700-1650	700-1650	700-1650	700-1650	700-1650	1100-1650	700-1650	1290-1330 1520-1620	1290-1330 1520-1620	1290-1330 1520-1620
Unfiltered Optical Bandwidth (GHz)	2.5	12.5	12 [9]	12 [9]	12	30	32	70	55	80
Fiber Input (µm)	9, 50, 62.5	9, 50, 62.5	9, 50, 62.5	9, 50, 62.5	9, 50, 62.5	9	9, 50, 62.5	9	9	9
Mask Test Sensitivity (dBm)	−22	−16 [10]	−19	−15	−15	−9	−9	−8 [11]	−8 [11]	−8 [11]
Optical reference receivers supported										
155 mb/s	■		■							
622 mb/s	■		■							
1.063 Gb/s	■		■							
1.250 Gb/s	■		■							
2.125 Gb/s	■		■							
2.488 Gb/s	■		■							
2.500 Gb/s	■		■							
2.66 Gb/s			■							
3.125 Gb/s			■							
3.188 Gb/s			■							

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[6] There are specific reference receiver groupings supported for the 80C07B. See the 80Cxx Optical Module datasheet for detailed information.

[7] There are specific reference receiver groupings supported for the 80C12B. See the 80Cxx Optical Module datasheet for detailed information.

[8] The clock recovery trigger pick-off (Option CRTP) for the 80C10C can support trigger pick-off for data rates to >43 Gb/s.

[9] The full 12 GHz bandwidth for the 80C12B is only available with Option F0, 10G, or 10GP.

[10] Mask test sensitivity of the 80C08D reduced by ~1 dBm with internal clock recovery options.

[11] Mask test sensitivity of the 80C10C reduced by ~0.6 dBm with internal clock recovery trigger pick-off (Option CRTP).

Character-istic	80C07B [6]	80C08D	80C12B [7] Opt. F0-F12	80C12B [7] Opt. 10G/ 10GP	80C14	80C11B	80C15	80C10C [8] Opt F1	80C10C [8] Opt F2	80C10C [8] Opt F3
4.250 Gb/s			■							
5.000 Gb/s			■							
6.144 Gb/s			■							
7.373 Gb/s			■							
8.500 Gb/s			■	■	■	■				
9.953 Gb/s		■		■	■	■				
10.31 Gb/s		■		■	■	■				
10.51 Gb/s		■		■	■	■				
10.66 Gb/s		■		■	■	■				
10.71 Gb/s		■		■	■	■				
11.1 Gb/s		■		■	■	■				
11.3 Gb/s		■		■	■	■				
14.025 Gb/s					■	■				
14.063 Gb/s					■	■				
25.78 Gb/s							■	■	■	
27.74 Gb/s							■	■	■	
28.05 Gb/s							■			
39.81 Gb/s								■		■
41.25 Gb/s								■		■
43.02 Gb/s								■		■

Clock recovery for optical testing

In many optical applications, there is no data clock directly available to provide a reference signal for acquiring the signals from the device under test. In these situations, it is necessary to recover the clock from the data signal. The Tektronix 8000 Series of sampling oscilloscope products provides a complete complement of clock recovery solutions to meet this need. Each of these solutions is fully calibrated so that users do not need to do any manual calibration of the system to take into account any losses due to data pick-off being routed to the input of the clock recovery unit.

Shown below is a clock recovery solutions selection guide with the key specifications for each solution to help you select the solution(s) most appropriate for your application. For more detailed information on these solutions, see the 80Cxx Optical Sampling Modules datasheet (for clock recovery options integrated into the 80C07B, 80C08D, or 80C11B) or the appropriate clock recovery datasheets for stand-alone clock recovery modules or instruments.

Note: The stand-alone clock recovery modules/instruments have electrical inputs and can be used to recover clocks from electrical signals as well as from the electrical data pick-off outputs from the 80CXX Series optical sampling modules.

Note: Clock recovery is integrated into the optical module and controlled from the Trigger Setup menu of the 8000 Series oscilloscope.

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6   There are specific reference receiver groupings supported for the 80C07B. See the 80Cxx Optical Module datasheet for detailed information.

7   There are specific reference receiver groupings supported for the 80C12B. See the 80Cxx Optical Module datasheet for detailed information.

8   The clock recovery trigger pick-off (Option CRTP) for the 80C10C can support trigger pick-off for data rates to >43 Gb/s.

Integrated clock recovery options

Characteristic	80C07B	80C08D Opt. CR1	80C08D Opt. CR2	80C08D Opt. CR4	80C11B Opt. CR1	80C11B Opt. CR2	80C11B Opt. CR3	80C11B Opt. CR4
Continuously Variable Rate Range (Gb/s)	Fixed Rates	Fixed Rates	Fixed Rates	9.8 - 12.6	Fixed Rates	Fixed Rates	Fixed Rates	9.8 - 12.6
Clock Recovery Sensitivity (dBm) [12]	−22	−15	−15	−15	−9	−9	−9	−9
Standard rates supported								
125, 155 Mb/s	■							
622 Mb/s	■							
1063 Mb/s	■							
1250 Mb/s	■							
2125 Mb/s	■							
2488, 2500 Mb/s	■							
9.95 Gb/s		■		■	■	■	■	■
10.31 Gb/s		■	■	■				■
10.52 Gb/s			■	■				
10.66 Gb/s				■		■		■
10.71 Gb/s				■			■	■
11.10 Gb/s				■				■
11.30 Gb/s				■				■
14.025 Gb/s								
14.063 Gb/s								
25.78 Gb/s								
27.74 Gb/s								

Stand-alone (electrical) clock recovery modules/instruments

Characteristic	80A05 Std. [13]	80A05 Opt. 10G [13]	CR125A [14]	CR175A [14]	CR286A [14]
Continuously Variable Rate Range (Gb/s)	50 - 3.188 4.25	50 - 3.188 3.267 - 4.25 4.900 - 6.375 9.8 - 12.6	0.1 - 12.5	0.1 - 17.5	0.1 - 28.6
Clock Recovery Sensitivity (mV$_{p-p}$) [15]	≤15	≤15	15	15	15
Adjustable Clock Recovery Loop Bandwidth and Peaking [16]			■	■	■
Standard rates supported					

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[12] Electrical clock recovery sensitivity is for differential input and varies with the input clock rate. See clock recovery datasheets for more information.

[13] The clock recovery module plugs into one of the 8000 Series large module slots and is controlled from the Trigger Setup menu.

[14] Stand-alone clock recovery instrument; controllable from the BERTScope clock recovery instrument control application, accessible from the App menu of the 8000 Series oscilloscope.

[15] Electrical clock recovery sensitivity is for differential input and varies with the input clock rate. See clock recovery datasheets for more information.

[16] For more information on clock recovery loop bandwidth and peaking, see clock recovery datasheets.

Characteristic	80A05 Std. [13]	80A05 Opt. 10G [13]	CR125A [14]	CR175A [14]	CR286A [14]
125, 155 Mb/s	■	■	■	■	■
622 Mb/s	■	■	■	■	■
1063 Mb/s	■	■	■	■	■
1250 Mb/s	■	■	■	■	■
2125 Mb/s	■	■	■	■	■
2488, 2500 Mb/s	■	■	■	■	■
2.66 Gb/s	■	■	■	■	■
3.125, 3.188 Gb/s	■	■	■	■	■
4.25 Gb/s	■	■	■	■	■
5.00 Gb/s		■	■	■	■
6.14 Gb/s		■	■	■	■
7.37 Gb/s		■	■	■	■
8.5 Gb/s		■	■	■	■
9.95 Gb/s		■	■	■	■
10.31 Gb/s		■	■	■	■
10.52 Gb/s		■	■	■	■
10.66 Gb/s		■	■	■	■
10.71 Gb/s		■	■	■	■
11.10 Gb/s		■	■	■	■
11.30 Gb/s		■	■	■	■
12.50 Gb/s			■	■	■
14.025 Gb/s			■	■	■
14.063 Gb/s			■	■	■
25.78 Gb/s					■
27.74 Gb/s					■

High-performance electrical test solutions

The DSA8300 is also well-suited for a variety of high-performance electrical applications. With the modular system, users can configure their DSA8300 with a variety of electrical modules that are best suited to their requirements. the following table provides key specifications for the current electrical sampling modules available for use with the DSA8300, to help you select the electrical module(s) most appropriate for your application. Detailed specifications are available in the 80E00 Electrical Sampling Modules datasheet.

Electrical sampling module selection guide

Characteristic	80E01	80E03	80E07B	80E09B	80E11, 80E11X1	80E04 (TDR Module)	80E08B (TDR Module)	80E10B (TDR Module)
Channels	1	2	2	2	2 (80E11) 1 (80E11X1)	2	2	2
Bandwidth	50 GHz	20 GHz	20/30 GHz (user selectable)	30/40/60 GHz (user selectable)	40/60/70 GHz (user selectable)	20 GHz	20/30 GHz (user selectable)	30/40/50 GHz (user selectable)
Step response at full bandwidth (10-90%)	7 ps	17.5 ps	11.7 ps	5.8 ps	5.0 ps	17.5 ps	11.7 ps	7 ps

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[13] The clock recovery module plugs into one of the 8000 Series large module slots and is controlled from the Trigger Setup menu.

[14] Stand-alone clock recovery instrument; controllable from the BERTScope clock recovery instrument control application, accessible from the App menu of the 8000 Series oscilloscope.

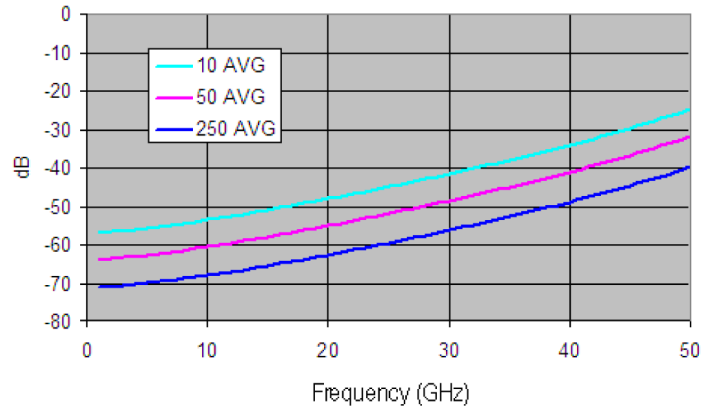| Characteristic	80E01	80E03	80E07B	80E09B	80E11, 80E11X1	80E04 (TDR Module)	80E08B (TDR Module)	80E10B (TDR Module)
RMS Noise	1.8 mV	600 µV	280 µV at 20 GHz 300 µV at 30 GHz	300 µV at 30 GHz 330 µV at 40 GHz 450 µV at 60 GHz	330 µV at 40 GHz 450 µV at 60 GHz 950 µV at 70 GHz	600 µV	280 µV at 20 GHz 300 µV at 30 GHz	300 µV at 30 GHz 370 µV at 40 GHz 600 µV at 50 GHz
Incident TDR Step Rise Time (10-90%)	-	-	-	-	-	23 ps	18 ps	12 ps
Reflected TDR Step Rise Time (10-90%)	-	-	-	-	-	28 ps	20 ps	15 ps
Remote Sampling Capability	w/ optional 80X01 or 80X02 extender cable	w/ optional 80X01 or 80X02 extender cable	Fully integrated 2 m remote cable	Fully integrated 2 m remote cable	w/ optional 80X01 or 80X02 extender cable	w/ optional 80X01 or 80X02 extender cable	Fully integrated 2 m remote cable	Fully integrated 2 m remote cable

S-parameter performance characteristics (80E10B)

- All measurements were performed after proper warm up as specified in the DSA8300 manual

- Standard S-parameter dynamic range measurement practices were used to determine the dynamic range of the module

- Uncertainty results were derived from a wide range of devices, with 250 averages

- Better dynamic range can be achieved by selecting lower bandwidth settings on the 80E10B module due to a lower RMS noise floor

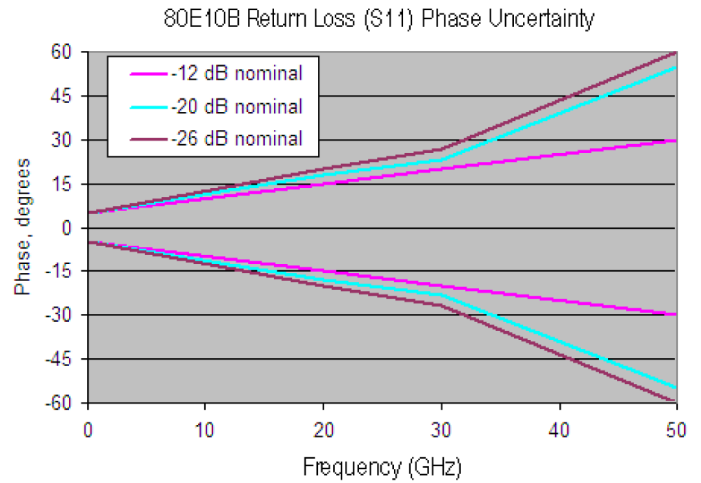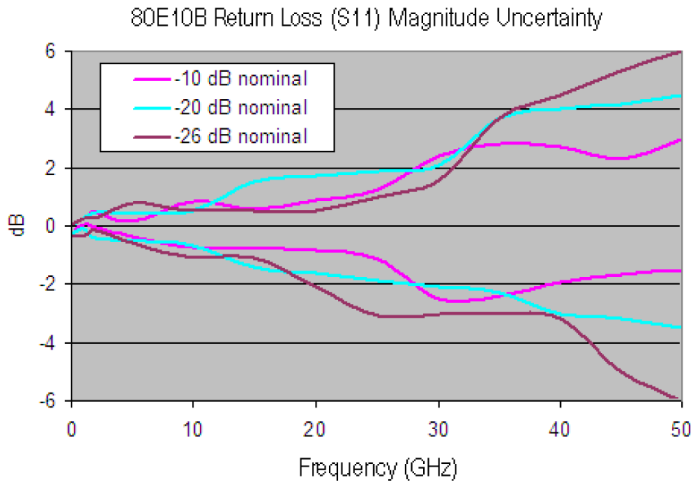- Results apply to single-ended or differential measurements
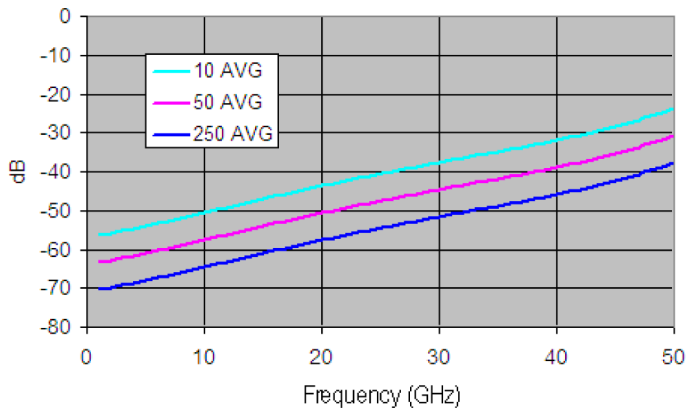
80E10B dynamic range

80E10B uncertainty

Test solutions for 100 Gb/s (4 x 25 Gb/s) electrical standards

With the continued increase in high-bandwidth applications, the need to test electrical components, modules and systems at high data rates is proliferating. An example of such data rates is the CEI 3.0 VSR-28 interface. This interface transfers data over multiple electrical channel at rates up to 28.6 Gb/s. Such signals place significant performance challenges on the test and measurement equipment used to acquire and analyze the devices under test.

Some of these challenges include:

- The need to acquire the signal with excellent signal fidelity - this requirement has several implications for the test instrumentation:
  - Low instrumentation noise
  - Low instrumentation jitter
  - The need to acquire the signal as close to the DUT as possible - thereby reducing signal degradation and potential inter-symbol interference
- The need to recover the clock from the data stream to acquire signals under test and to do detailed analysis of these signals.

The DSA8300 with its modular architecture, and its associated modules and accessories, provides all of the components necessary to fully test multi-lane high bit-rate signals. To simplify configuring a system to test such devices, Tektronix offers the following product bundle:

80B28G - a DSA8300 product bundle for 28 Gb/s applications

This bundle, when used with a DSA8300, provides all of the electrical sampling modules, accessories, and clock recovery capabilities needed to test applications at rates from 10 Gb/s to 28.6 Gb/s per lane. The bundle includes the following products:

- 1 ea. 80E09B: dual channel, 70 GHz Remote Electrical Sampling Module
- 1 ea. 82A04B: Phase Reference Module that supports sub-100 fs instrumentation jitter when used with the 80E09B
- 1 ea. CR286A: 28.6 GHz clock recovery instrument that supports clock recovery at rates from 150 Mb/s to 28.6 Gb/s
- 1 ea. 80X01: 1-meter sampling module extender cable used to extend the phase reference module to connect directly to the clock recovery module
- 1 ea. 80A08 : accessory kit with all of the necessary cables, adapters, DC blocks and other accessories to configure a complete test solution

To extend this solution to test additional lanes in a multi-lane application, simply install additional 80E09B dual channel remote sampling modules.

Specifications

Product specifications and descriptions in this document are subject to change without notice.

Vertical system

Rise Time / Bandwidth	Determined by the sampling modules used
Vertical Resolution	16 bits over the sampling modules' dynamic range
	Electrical Resolution: <20 µV LSB (for 1 V full range)
	Optical resolution depends on the dynamic range of the optical module – ranges from <20 nW for the 80C07B (1 mW full range) to <0.6 µW for the 80C10C (30 mW full range)

Horizontal system

Main and Magnification View Time Bases, Horizontal Scale	100 fs/div to 1 ms/div, in 1-2-5 sequence or 100 fs increments
Time Interval Accuracy	
Trigger Direct (Front Panel) Input	Horizontal scale >20 ps/div, right-most point of measurement interval <150 ns; Mean Accuracy: 0.1% of interval, STDEV: ≤1 ps
	Horizontal scale ≤20 ps/div, right-most point of measurement interval <150 ns; Mean Accuracy: 1 ps + 0.5% of interval
Clock Input/Prescale Trigger (Front Panel), Eye or Pattern Mode	Mean accuracy determined by clock input accuracy STDEV: <0.7 ps (max); <0.1 ps (typical)
Clock Input/Prescale Trigger (Front Panel), Other Mode	Horizontal scale >20 ps/div, right-most point of measurement interval <150 ns; Mean Accuracy: 0.1% of interval, STDEV: ≤3 ps
	Horizontal scale ≤20 ps/div, right-most point of measurement interval <150 ns; Mean Accuracy: 1 ps + 0.5% of interval
TDR Clock Trigger (Lock to External 10 MHz Clock)	Horizontal scale >20 ps/div, right-most point of measurement interval <150 ns; Mean Accuracy: 0.01% of interval, STDEV: ≤1 ps (0.1 ps typical)
Random Phase Corrected Mode (Clock Input to 82A04B)	Maximum timing deviation 0.1% of phase reference signal period, typical, relative to phase reference signal
	For more information on phase reference modes of operation, see the "Phase Reference Module for the DSA8300 Sampling Oscilloscope" datasheet.
Triggered Phase Corrected Mode (Clock Input to 82A04B)	Maximum timing deviation relative to phase reference signal:
	>40 ns after trigger event: 0.2% of phase reference signal period, typical
	≤40 ns after trigger event: 0.4% of phase reference signal period, typical
Horizontal Deskew Range Available	–500 ps to +100 ns on any individual channel in 100 fs increments
	Mainframe slot deskew only: the 80E07B, 80E08B, 80E09B, 80E10B, 80E11, and 80E11X1 remote sampling modules include additional channel deskew range.
DSA8300 Record Length	50, 100, 250, 500, 1000, 2000, 4000, 8000, or 16000 samples (magnification views have maximum record length of 4000 samples)
Longer Records Available	IConnect®: 1M samples
	80SJNB Jitter, Noise, and BER Analysis Software: 10M samples (100k unit intervals, 100 samples per unit interval)

Trigger system

Trigger Sources	Clock Input/Prescale Trigger (front panel)
	TDR clock (generated internally)
	Clock recovery triggers from Optical Sampling modules and Electrical Clock Recovery modules (internally connected)
	Phase Reference (when using the 82A04B Phase Reference module) time base supports acquisitions without a trigger signal in its Free Run mode
	Trigger Direct Input (front panel)

Clock Input / Prescale Trigger Input	
Clock Input Sensitivity	100 mV$_{p-p}$, 0.15 to 20 GHz (typical)
	200 mV$_{p-p}$, 0.15 to 15 GHz (guaranteed)
Minimum Slew Rate	≥2 V/ns
Clock Input Range	1.0 V$_{p-p}$ (max) – AC coupled
Pattern Lengths Supported (for Pattern Triggering with ADVTRIG Option)	2 to 2^{23} (8,388,608) inclusive
Clock Input Jitter in Clock-eye and Clock-pattern Trigger Modes (Typical)	0.15 - 0.40 GHz: 900 fs (RMS)
	0.40 - 1.25 GHz: 800 fs
	1.25 - 20 GHz: 425 fs
Clock Input Jitter in Clock-eye and Clock-pattern Trigger Modes (Max)	0.80 - 1.25 GHz: 900 fs (RMS)
	1.25 - 11.20 GHz: 500 fs
	11.20 - 15.0 GHz: 600 fs

TDR Trigger	
TDR Step Rate	Selectable from 25 to 200 kHz in 1 kHz steps
	Actual TDR step rate may vary up to 2% from requested rate
TDR Trigger Jitter	1.3 ps RMS (typical) 1.8 ps RMS (max)

Phase Reference Time Base	
Phase Reference Input Range	Standard 82A04B: 8 - 32 GHz (guaranteed), 2 - 32 GHz (typical)
	82A04B Option 60G: 8 - 60 GHz (guaranteed), 2 - 70 GHz (typical)
	For clock frequencies <8 GHz, it may be necessary to filter the clock input to eliminate harmonics from the clock signal (see accessories 020-2566-xx, 020-2567-xx, and 020-2568-xx)
Phase Reference Input Sensitivity	Best jitter performance is with the clock input to the 82A04B in the following range: 0.6 - 1.8 V. The phase reference time base remains operational to 100 mV (typical) with increased jitter
Jitter	f ≥8 GHz: 100 fs RMS, on a 10 GHz or faster sampling module
	2 GHz ≤ f ≤ 8 GHz: 140 fs RMS, typical on a 10 GHz or faster acquisition module
	For clock frequencies <8 GHz, it may be necessary to filter the clock input to eliminate harmonics from the clock signal (see accessories 020-2566-xx, 020-2567-xx, and 020-2568-xx)

Trigger Direct Input	
Trigger Sensitivity	50 mV, DC - 4 GHz (typical)
	100 mV, DC - 3 GHz (guaranteed)
Trigger Level Range	±1.0 V
Trigger Input Range	±1.5 V

Trigger system

Trigger Holdoff	Adjustable 5 µs to 50 ms in 0.5 ns increments
Trigger Direct Input Jitter	1.1 ps RMS + 5 ppm of horizontal position (typical)
	1.5 ps RMS + 10 ppm of horizontal position (max)

Acquisition system

Acquisition modes	Sample (Normal), Envelope, and Average
Number of sampling modules accommodated	Up to 4 dual-channel electrical; up to 2 optical sampling modules. Population of the CH1/CH2 large slot with any module other than one requiring power only displaces functionality of the CH1/CH2 small slot; population of the CH3/CH4 large slot with any module other than one requiring power only displaces functionality of the CH3/CH4 small slot.
Number of simultaneously acquired inputs	8 channels maximum
Maximum acquisition rate	300 kS/s per channel in TDR mode 200 kS/s per channel in all other nonphase reference modes 120 kS/s per channel in phase reference modes

Waveform measurements

System Measurement Rate	The DSA8300 supports up to 8 simultaneous measurements, updated 3 times per second with optional display of per-measurement statistics (min, max, mean, and standard deviation)
Measurement Set	Over 120 automated measurements include RZ, NRZ, and pulse signal types, and the following measurement types:
Amplitude Measurements	High, Low, Amplitude, Peak-to-Peak, Max, Mid, Min, Mean, +Overshoot, –Overshoot, P-P, Average Optical Power (dBm, watts), Noise, RMS Noise, SNR, Eye Height, Eye Opening Factor, Extinction Ratio (Ratio, %, dB), Suppression Ratio (Ratio, %, dB), OMA, Q-factor, RMS, AC RMS, Cycle RMS, Cycle Mean, Gain, Crossing %, Crossing Level
Timing Measurements	Rise, Fall, Period, Bit Rate, Bit Time, Frequency, Crossing Time, +Cross, –Cross, Jitter (P-P, RMS), Eye Width, +Width, –Width, Burst Width, +Duty Cycle, –Duty Cycle, Duty Cycle Distortion, Delay, Phase, Pulse Symmetry
Area Measurements	Area, Cycle Area
Cursors	Dot, vertical bar, and horizontal bar cursors
Waveform Processing	Up to 8 math waveforms can be defined and displayed using the following math functions: Add, Subtract, Multiply, Divide, Average, Differentiate, Exponential, Integrate, Natural Log, Log, Magnitude, Min, Max, Square Root, and Filter. In addition, measurement values can be utilized as scalars in math waveform definitions
Mask Testing	For many applications, standard masks are available as predefined, built-in masks. Many of the most commonly used standard masks are shown in the following supported standards list. Contact your local Tektronix representative to get a list of all available masks. Unless otherwise noted, file-based masks are used to distribute new, Tektronix factory-created, updated masks as a file loadable by the firmware. User-defined masks allow the user to create (through UI or PI) user masks

Waveform measurements

Supported standards

Type	Standard
Ethernet	100BASE-LX10 125.0 Mb/s 100BASE-BX10 125.0 Mb/s Gigabit Ethernet 1.250 Gb/s 1000BASE-KX 1.250 Gb/s 2 GBE 2.500 Gb/s 10GBASE-X4 3.125 Gb/s 10GBASE-W 9.95328 Gb/s 10GBASE-R 10.3125 Gb/s FEC11.10 11.095728 Gb/s 10GBASE-LRM 10.31250 Gb/s 40GBASE-FR 41.25 Gb/s 40GBASE-LR4 10.3125 Gb/s 40GBASE-SR4 10.3125 Gb/s 100GBASE-ER4 25.71825 Gb/s 100GBASE-LR4 25.71825 Gb/s 100GBASE-SR10 10.3125 Gb/s 100GBASE-SR4 25.7185 Gb/s
SONET/SDH	OC-1/STM-0 51.84 Mb/s OC-3/STM-1 155.52 Mb/s OC-12/STM-4 622.08 Mb/s OC-48/STM-16 2.48832 Gb/s FEC2.666 2.6660571 Gb/s OC-192/STM-64 9.95328 Gb/s FEC10.66 10.6642 Gb/s FEC10.71 10.709225 Gb/s OTU4 27.95 Gb/s OC-768/STM-256 39.81312 Gb/s FEC42.66 42.6569 Gb/s FEC43.02 43.018414 Gb/s
Fibre Channel Optical	FC133 132.81 Mb/s FC266 265.6 Mb/s FC531 531.2 Mb/s FC1063 1.0625 Gb/s FC2125 2.125 Gb/s FC4250 4.250 Gb/s 8GFC 8.500 Gb/s 10GFC 10.518750 Gb/s FC11317 11.3170 Gb/s 16GFC MM r6.1 14.025 Gb/s 16GFC SM r6.1 14.025 Gb/s 32GFC 28.05 Gb/s
Fibre Channel Electrical	FC133 132.81 Mb/s FC266 265.6 Mb/s FC531 531.2 Mb/s FC1063 1.0625 Gb/s FC2125E 2.125 Gb/s: Abs, Beta, Tx/Rx; Abs, Gamma, Tx/Rx FC4250E 4.250 Gb/s: Abs, Beta, Tx/Rx; Abs, Gamma, Tx/Rx FC8500E 8.500 Gb/s: Abs, Beta, Tx/Rx; Abs, Gamma, Tx/Rx
SATA	G1 1.500 Gb/s Tx, Rx G2 3.000 Gb/s Tx, Rx G3 6.000 Gb/s Tx, Rx

Datasheet

Display system

Touch Screen Display	264 mm / 10.4 in. diagonal, color, LCD
Colors	16,777,216 (24 bits)
Video Resolution	1024 horizontal by 768 vertical displayed pixels
Magnification Views	In addition to the main time base, the DSA8300 supports two magnification views. These magnifications are independently acquired using separate time-base settings which allow same or faster time/div than that of the main time base

Input output ports

Front Panel

USB 2.0 Port(s)	One USB 2.0 connector (instruments shipped after 12/2012 have 3 USB ports on the front panel)
Anti-static Connection	Banana-jack connector, 1 MΩ
Trigger Direct Input	See Trigger System specification
Clock Input / Prescale Trigger	See Trigger System specification
TDR Clock Output	See Trigger System specification
DC Calibration Output	±1.25 V maximum

Rear Panel

USB Ports	4 USB 2.0 connectors
LAN Port	RJ-45 connector, supports 10/100/1000BASE-T
Serial Ports	DB-9 COM1, COM2 ports
GPIB	IEEE488.2 connector
DVI-I Video Port	DVI connector, female
	Connect to show the oscilloscope display, including live waveforms on an external monitor or projector. The primary Windows desktop can also be displayed on an external monitor using these ports.
	Alternatively, the DVI-I port can be configured to show the secondary Windows desktop (also called extended desktop or dual-monitor display).
	DVI to VGA 15-pin D-sub connector adapter provided
PS2 Serial Ports	Mouse and keyboard inputs
Audio Ports	1/8 in. microphone input and line output

Data storage

Waveform Databases	4 independently accumulated waveform records of up to 4M waveform points each. Variable waveform database mode with true first-in/first-out of up to 2000 waveforms available on each of 4 waveform databases (2M samples maximum / waveform database)
Hard Disk Drive	Rear-panel, removable hard disk drive, 500 GB capacity
Optical Drive	Front-panel DVD Read Only / CD Read-Write drive with CD-creation software application
Nonvolitile storage	USB 2.0 flash memory

Power source

Line voltage and frequency	90 V to 250 V
	50 Hz to 400 Hz

Power Consumption	205 W, typical, mainframe only
	330 W, typical, fully loaded
	600 W, maximum

Physical characteristics

Dimensions

	mm	Inches
Width	475	18.0
Height	343	13.5
Depth	419	16.5

	kg	lb
Weight	21	46

EMC, environment and safety

Temperature

Operating	+10 to +40 °C
Nonoperating	−22 to +60 °C

Altitude

Operating	3,048 m (10,000 ft.)
Nonoperating	12,190 m (40,000 ft.)

Relative Humidity

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

Electromagnetic compatibility	2004/108/EC

Safety	UL3111-1, CSA1010.1, EN61010-1, IEC61010-1

Ordering information

Models

DSA8300	Digital Serial Analyzer Sampling Oscilloscope

Standard accessories

071-2897-XX	DSA8300 Digital Serial Analyzer Quick Start User Manual
119-7083-00	Keyboard
19-7054-00	Mouse
200-4519-00	Instrument front cover
016-1441-00	Accessory pouch
19-6107-00	Touch screen styluses (2)
006-3415-04	ESD wrist strap with 6 foot coiled cord
020-3082-XX	DSA8300 Product Documentation Kit (CD)
Not orderable	DSA8300 Online Help (part of application software)
Not orderable	DSA8300 Programmer Online Manual (part of application software)
020-3088-XX	DSA8300 TekScope Product Software Install Kit
Type dependent on selection during order placement	Power cord
013-0347-00	VGA female to DVI male adapter

Instrument options

Options

ADVTRG	Add advanced triggers with pattern sync
CEI-VSR	OIF CEI 3.0 Compliance Solution for DSA8300
ICMX	IConnect® and MeasureXtractor Signal Integrity and Failure Analysis Software
ICON	IConnect® Signal Integrity and Failure Analysis Software
JARB	Add 80SJARB (included with Option JNB or JNB01)
JNB	Add 80SJNB Essentials
JNB01	Add 80SJNB Advanced
SPAR	IConnect® S-parameters Software

Power plug options

Opt. A0	North America power plug (115 V, 60 Hz)
Opt. A1	Universal Euro power plug (220 V, 50 Hz)
Opt. A2	United Kingdom power plug (240 V, 50 Hz)
Opt. A3	Australia power plug (240 V, 50 Hz)
Opt. A4	North America power plug (240 V, 50 Hz)
Opt. A5	Switzerland power plug (220 V, 50 Hz)
Opt. A6	Japan power plug (100 V, 110/120 V, 60 Hz)
Opt. A10	China power plug (50 Hz)
Opt. A11	India power plug (50 Hz)
Opt. A12	Brazil power plug (60 Hz)
Opt. A99	No power cord

Language options

Opt. L0	English manual
Opt. L7	Simplified Chinese manual
Opt. L8	Traditional Chinese manual
Opt. L10	Russian manual

Language options include translated front-panel overlay for the selected language(s).

Service options

Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
Opt. CA1	Single Calibration or Functional Verification
Opt. D1	Calibration Data Report
Opt. D3	Calibration Data Report 3 Years (with Opt. C3)
Opt. D5	Calibration Data Report 5 Years (with Opt. C5)
Opt. IF	Upgrade Installation Service
Opt. R3	Repair Service 3 Years (including warranty)
Opt. R5	Repair Service 5 Years (including warranty)

Probes and accessories are not covered by the oscilloscope warranty and Service Offerings. Refer to the datasheet of each probe and accessory model for its unique warranty and calibration terms.

DSA83UP - DSA8300 upgrade kit

ADVTRIG	Add advanced triggers with pattern sync
HDD8	Additional hard disk drive complete with assembled mounting bracket, operating system, and oscilloscope application
JARB	Add 80SJARB (included with Option JNB or JNB01)
JNB	Add 80SJNB Essentials
JNB01	Add 80SJNB Advanced
ADDJNB01	Upgrade 80SJNB Essentials to 80SJNB01 Advanced
CEI-VSR	OIF CEI 3.0 Compliance Solution for DSA8300

DSA8300 Rack Mount

016-1791-02	DSA8300 Rack Mount Kit

Optional Accessories

Optical modules

Optical modules plug directly into large slot of DSA8300 sampling oscilloscope mainframe. See the "Optical Sampling Modules – 80C07B • 80C08D • 80C10C • 80C11B • 80C12B • 80C14 • 80C15" datasheet for more details.

All optical modules have FC/PC connectors installed. Other connector adapters available as options are: ST/PC, D4/PC, Biconic, SMA 2.5, SC/PC, DIN/PC, HP/PC, SMA, DIAMOND 3.5.

80C07B	2.5 GHz single-mode and multi-mode, amplified (750 to 1650 nm) optical module for multirate datacom and telecom applications w/ optional integrated clock recovery
80C08D	9 GHz optical channel; single-mode and multi-mode, amplified (750 to 1650 nm) optical module optimized for 8.5 to 12.5 Gb/s applications with optional integrated clock recovery
80C10C	55/70/80 GHz; single-mode (1290 to 1330 nm and 1520 to 1620 nm) optical module with reference receiver filters for multirate datacom and telecom 40 Gb/s and 100 Gb/s (4 × 25 Gb/s) applications with optional calibrated trigger pick-off for use with external clock recovery instruments (such as the CR286A)
80C11B	30 GHz, single-mode (100 to 1650 nm) optical module with reference receiver filters for 8.5 to 14.1 Gb/s telecom and datacom standards. Optional, integrated clock recovery for 8.5 to 12.6 Gb/s applications
80C12B	12 GHz optical channel; single-mode and multi-mode, amplified (750 to 1650 nm) optical module with optical reference receivers to support 155 Mb/s to 12.5 Gb/s applications with calibrated trigger pick-off for use with external clock recovery instruments (such as the 80A05 or CR125A)
80C14	12 GHz optical channel; single-mode and multi-mode, amplified (750 to 1650 nm) optical module optimized for 8.5 to 12.5 Gb/s applications with calibrated trigger pick-off for use with external clock recovery instruments (such as the CR175A or CR286A)
80C15	32 GHz, single-mode and multi-mode optical module with bandwidth filters for multirate datacom and telecom 25 and 100 (4x25) Gb/s applications.

Electrical modules

Electrical modules plug directly into one of four small slots of the DSA8300 sampling oscilloscope mainframe. See the "Electrical Sampling Modules – 80E11 • 80E11X1 • 80E10B • 80E09B • 80E08B • 80E07B • 80E04 • 80E03 • 80E01" datasheet for more details.

80E11	70/60/40 [17] GHz electrical sampler, dual channel
80E11X1	70/60/40 [17] GHz electrical sampler, single channel
80E10B	Remote [18] Sampling Module – 50/40/30 [17] GHz electrical, dual-channel with true-differential TDR capabilities
80E09B	Remote [18] Sampling Module – 60/40/30 [17] GHz electrical, dual-channel
80E08B	Remote [18] Sampling Module – 30/20 [17] GHz electrical, dual-channel with true-differential TDR capabilities
80E07B	Remote [18] Sampling Module – 30/20 [17] GHz electrical, dual-channel
80E04	20 GHz electrical sampler, dual-channel with true-differential TDR capabilities. For remote sampling use the 80X01 or 80X02 Electrical Sampling Module Extender Cables
80E03	20 GHz electrical sampler, dual-channel. For remote sampling use the 80X01 or 80X02 Electrical Sampling Module Extender Cables
80E01	50 GHz, single-channel electrical sampler. For remote sampling use the 80X01 or 80X02 Electrical Sampling Module Extender Cables

Phase reference module

The 82A04B Phase Reference module, when installed in the DSA8300 and provided with a clock synchronous with the data to be acquired, provides a very low-jitter time base for acquiring signals from the device under test. It can accommodate clocks from 2 GHz [19] to >60 GHz.

82A04B	Phase Reference Module – Standard module supports clocks up to 32 GHz. With Option 60G it supports clocks to >60 GHz

Clock recovery module/instrument

80A05	Electrical Clock Recovery module. Applicable to electrical signals and for the 80C12B.
	The standard version of 80A05 supports signals in the following ranges:
	50 Mb/s - 2.700 Gb/s
	2.700 Gb/s - 3.188 Gb/s
	4.250 Gb/s (4 Gigabit Fibre Channel)
	Option 10G adds the ranges of:
	3.267 Gb/s - 4.250 Gb/s
	4.900 Gb/s - 6.375 Gb/s
	9.800 Gb/s - 12.60 Gb/s
CR125A	Electrical Clock Recovery instrument. CR125A recovers clocks from serial data streams for all of the most common electrical standards in the continuous 100 Mb/s to 12.5 Gb/s range. Applicable to electrical signals and for 80C12B
CR175A	Electrical Clock Recovery instrument. CR175A recovers clocks from serial data streams for all of the most common electrical standards in the continuous 100 Mb/s to 17.5 Gb/s range. Applicable to electrical signals and for 80C12B and 80C14
CR286A	Electrical Clock Recovery instrument. CR286A recovers clocks from serial data streams for all of the most common electrical standards in the continuous 100 Mb/s to 28.6 Gb/s range. Applicable to electrical signals and for 80C12B, 80C14, and 80C10B/80C10C (for rates up to 28.6 Gb/s)

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[17] User-selectable bandwidth.
[18] Each remote sampler/TDR generator is on a separate 2-meter remote cable for easy co-location with the device under test and best acquired signal fidelity.

[19] For clock frequencies <8 GHz, it may be necessary to filter the clock input to eliminate harmonics from the clock signal (see Other Accessories 020-2566-xx, 020-2567-xx, and 020-2568-xx).

Product bundle for 10-28 Gb/s applications

80B28G	Product bundle which includes one each of the following products: 80E09B Electrical Sampling Module; 82A04B Phase Reference Module; CR286A 28.6 GHz Clock Recovery instrument; 80X01: 1-meter sampling module extender cable; and 80A08 28 Gb/s Measurements Accessory Kit.

Recommended Accessories

80A02	EOS/ESD protection module for electrical static isolation of electrical sampling modules
80A03	TEKConnect probe interface module
80A08	Accessory kit for electrical measurements up to 28 Gb/s
80X01	1-meter electrical sampling module extender cable
80X02	2-meter electrical sampling module extender cable

Interconnect cables (3rd party)

Tektronix recommends using quality high-performance interconnect cables with these high-bandwidth products to minimize measurement degradation and variations. The W.L. Gore and Associates' cable assemblies in teh following table are compatible with the 2.92 mm, 2.4 mm, and 1.85 mm connector interface of the 80E00 modules.

Assemblies can be ordered by contacting Gore by phone at (800) 356-4622, or on the Web at www.gore.com/tektronix

Cable	Frequency	Connectors	Length
Bench top test cable assemblies			
TEK40PF18PP	40 GHz	2.92 mm male	18.0 in.
TEK50PF18PP	50 GHz	2.4 mm male	18.0 in.
TEK65PF18PP	65 GHz	1.85 mm male	18.0 in.
High-frequency interconnect cables for electrical sampling modules			
TEK40HF06PP	40 GHz	2.92 mm male	6.0 in.
TEK40HF06PS	40 GHz	2.92 mm male 2.92 mm female	6.0 in.
TEK50HF06PP	50 GHz	2.4 mm male	6.0 in.
TEK50HF06PS	50 GHz	2.4 mm male 2.4 mm female	6.0 in.
TEK65HF06PP	65 GHz	1.85 mm male	6.0 in.
TEK65HF06PS	65 GHz	1.85 mm male 1.85 mm female	6.0 in.

Calibration kits and accessories (3rd party)

For best S-parameter measurement results with the 80E10B, 80E08B, and 80E04 electrical TDR modules and IConnect® software, we recommend precision calibration kits, adapter kits, connector savers, airlines, torque wrenches, and connector gauges from Maury Microwave.

These components are compatible with the 2.92 mm, 2.4 mm, and 1.85 mm connectors of the 80E00 modules. Contact Maury Microwave (www.maurymw.com/tektronix.htm) to order calibration kits and other components.

CE

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

Datasheet

For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit www.tektronix.com.

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