Digital Phosphor Oscilloscopes/Digital Serial Analyzers

DPO/DSA70000B Series Data Sheet

- DPX and Fast Acquisition - Quickly find intermittent events with the industry's highest waveform capture rate

- Long Record Lengths – Capture long-term trends or infrequent events then analyze the entire acquired record with built-in measurements

- P7500 TriMode™ Probing System - Perfectly matched signal connectivity from 4 GHz to 20 GHz

- Application Support – Enables standard-specific certification, measurement automation, and ease of use

- Serial Data Link Analysis (SDLA) - For high-speed serial data streams, emulate and equalize the channel as well as de-embedding the fixture.

Applications

- Signal Integrity, Jitter, and Timing Analysis

- Verification, Debug, Characterization, or Certification of Sophisticated Designs

- Debugging and Compliance Testing of Serial Data Streams for Industry Standards

- Memory Bus Analysis

- Switching Power Supply Verification

- Investigation of Transient Phenomena

- Spectral Analysis of Transient or Wide-bandwidth RF Signals

Features & Benefits

- On All Four Channels Simultaneously
  - 20, 16, 12.5, 8, 6, and 4 GHz Bandwidth Models
  - Up to 50 GS/s Real-Time Sample Rate
  - Up to 250 Megasamples Record Length with MultiView Zoom™ Feature for Quick Navigation
  - Fastest Waveform Capture Rate with >300,000 wfms/s Maximum per Channel

- Highest Bandwidth – Up to 20 GHz enables measurement on the latest high-speed serial standards

- Superior Signal Integrity and Excellent Signal-to-Noise Ratio – Observe the truest representation of your waveform

- Pinpoint® Triggering – Minimize time spent trying to acquire problem signals for efficient troubleshooting and shortened debug time

- 5 Gbps Real-time Serial Trigger – Assures triggering on the first instance of a specified NRZ or 8b/10b pattern to allow isolation of pattern dependent effects

- Search & Mark – Provides waveform pattern matching and software triggers for signals of interest

Unmatched Performance for Greater Insight Gets Your Work Done Faster

The DPO70000B and the DSA70000B Series real-time digital phosphor oscilloscopes are the industry's best solution to the challenging signal integrity issues faced by designers verifying, characterizing, debugging, and testing sophisticated electronic designs. The specialized DSA70000B Series provides a complete and dedicated solution to address the challenges of high-speed serial designs.

The family features exceptional performance in signal acquisition and analysis, operational simplicity, and unmatched debugging tools to accelerate your day-to-day tasks. A large display and the intuitive user interface provide easy access to the maximum amount of information.

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Tektronix®

Unmatched Acquisition Performance

Superior Signal Integrity and Excellent Signal-to-Noise Ratio of the DPO70000B and DSA70000B Series Ensures Confidence in Your Measurement Results

- High bandwidth up to 20 GHz matched across 2, 3, or 4 channels and enabled by Tektronix proprietary bandwidth enhancement. The user-selectable filter for each channel provides magnitude and phase correction for more accurate representation of extremely fast signals. In addition, only Tektronix allows the user to disable the bandwidth enhancement for applications needing the highest measurement throughput.

- Bandwidth enhancement eliminates imperfections in frequency response all the way to the probe tip

- Simultaneous high sample rate on all channels captures more signal details (transients, imperfections, fast edges)
  - 50 GS/s on all channels for the 12.5, 16, and 20 GHz models
  - 25 GS/s on all channels for the 4, 6, and 8 GHz models

- With high signal-to-noise ratio and low internal noise floor, the DPO70000B and DSA70000B series enable you to perform precise characterization measurements. When debugging a DUT, a low noise floor and maximum signal fidelity of the measurement instrument allows finding the smallest anomalies that might affect the DUT's performance. For RF signal verification, a lower noise floor translates into a higher dynamic range, opening the DPO/DSA70000B for a wider range of applications.

- Lowest jitter noise floor and highest vertical accuracy provide additional margin in your measurements.

- Long record length provides high resolution and extended-duration waveform capture
  - Standard 10 M samples per channel on the DPO70000B Series and 20 M on the DSA70000B Series
  - Optional up to 100 M samples on all four channels for the 4, 6, and 8 GHz models
  - Optional up to 250 M samples on all four channels for the 12.5, 16, and 20 GHz models
  - MultiView Zoom helps you manage long records, compare and analyze multiple waveform segments

- Widest Range of Probing Solutions – Whether you need to measure 8 Gbps serial data or switching currents from your new power supply design, Tektronix offers a vast array of probing solutions, including active single ended, differential, high voltage, current, optical, and a wide range of probe and oscilloscope accessories.


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20.0 GHz (DSP)
19.0 GHz (DSP)
18.0 GHz (DSP)
17.0 GHz (DSP)
16.0 GHz (DSP)
16.0 GHz (HW)
15.0 GHz (DSP)
14.0 GHz (DSP)
13.0 GHz (DSP)
12.0 GHz (DSP)
11.0 GHz (DSP)
10.0 GHz (DSP)
9.0 GHz (DSP)
8.0 GHz (DSP)
7.0 GHz (DSP)
6.0 GHz (DSP)
5.0 GHz (DSP)
4.0 GHz (DSP)
3.0 GHz (DSP)
2.0 GHz (DSP)
1.0 GHz (DSP)
500 MHz (DSP)
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User-selectable bandwidth limiting choices
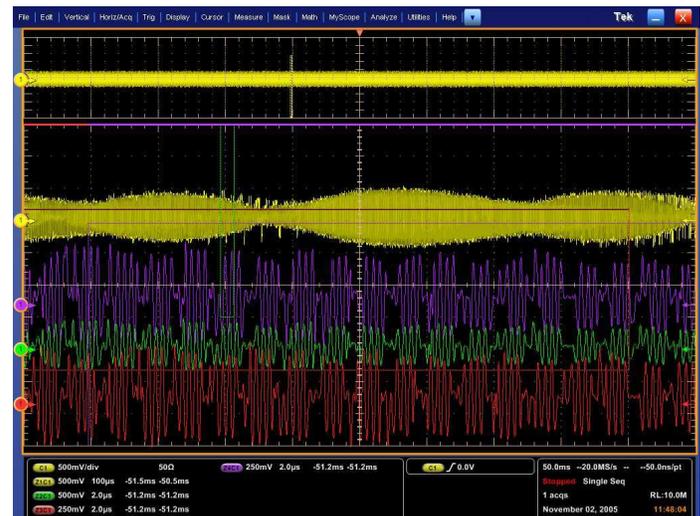
Zoom in on four areas of interest simultaneously to quickly compare them

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Low-cost solder tip features quick connection so moving probe to various solder points is fast and easy


P7500 TriMode probes simplify complex measurement setups

■ P7500 TriMode probing system – Perfectly matched to the DPO/DSA70000B, the P7500 TriMode probes allow you to switch among differential, single ended, and common-mode measurements without moving the probe from its connection points. The P7500 series offers probes for performance from 4 GHz to 20 GHz.

Accelerate the Debug of Complex Electrical Designs

FastAcq Acquisition Mode Expedites Debugging by Clearly Showing Imperfections

More than just color-grading, FastAcq's proprietary DPX® acquisition technology captures signals at more than 300,000 waveforms per second on all four channels simultaneously, dramatically increasing the probability of discovering infrequent fault events. And with a simple turn of the intensity
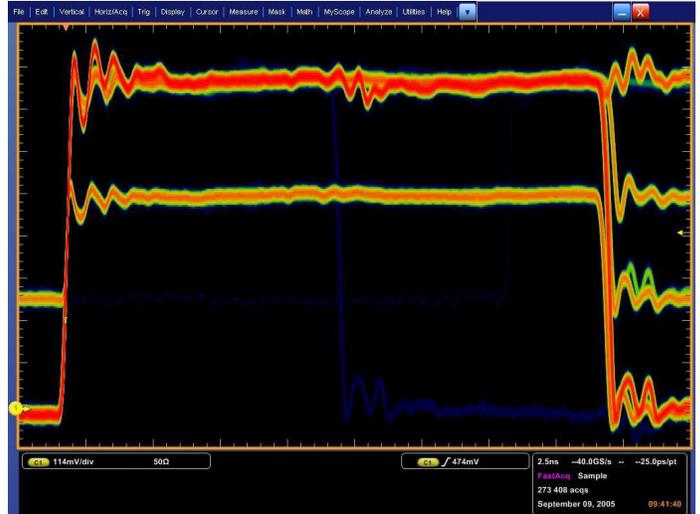

Maximize the probability of capturing elusive glitches and other infrequent events with FastAcq acquisition mode.

knob you can clearly "see a world others don't see", displaying the complete picture of your circuit's operation. Some oscilloscope vendors claim high waveform capture rates for short bursts of time, but only DPO70000B and DSA70000B oscilloscopes, enabled by DPX technology, can deliver these fast waveform capture rates on a sustained basis — saving minutes, hours, or even days by quickly revealing the nature of faults so sophisticated trigger modes can be applied to isolate them.

The Ability to Trigger an Oscilloscope on Events of Interest is Paramount in Complex Signal Debug and Verification

Whether you're trying to find a problem signal or need to isolate a section of a complex signal for further analysis, like a DDR read or write burst. Tektronix' Pinpoint® triggering provides the solution. The Pinpoint trigger system uses Silicon Germanium (SiGe) technology to provide very high trigger sensitivity with very low trigger jitter and ability to capture very narrow glitches. Pinpoint triggering allows selection of virtually all trigger types on both A and B trigger events. Other trigger systems offer multiple trigger types only on a single event (A event), with delayed trigger (B event) selection limited to edge type triggering and often do not provide a way to reset the trigger sequence if the B event doesn't occur. But Pinpoint triggering provides the full suite of advanced trigger types on both A and B triggers, logic qualification to control when to look for these events, and reset triggering to begin the trigger sequence again after a specified time, state, or transition so that even events in the most complex signals can be captured. Other oscilloscopes typically offer less than 20 trigger combinations; Pinpoint triggering offers over 1400 combinations, all at full performance.

With Enhanced Triggering, trigger jitter is reduced to <100 fs. With this stability at the trigger point, the trigger point can be used as a measurement reference.
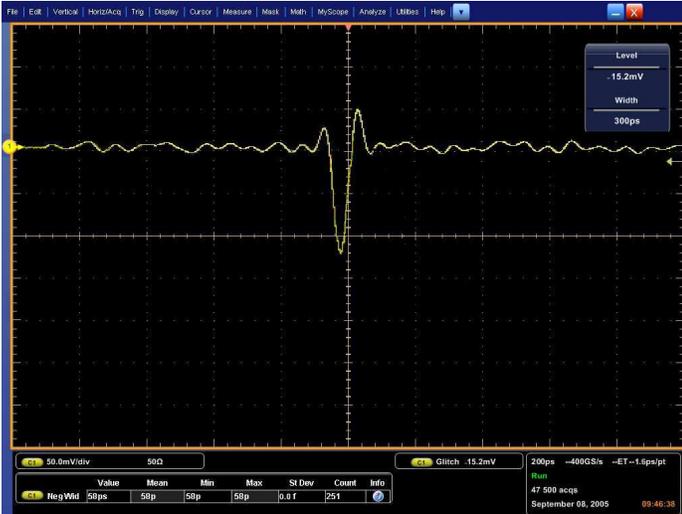
Pinpoint triggering can isolate glitches down to 100-ps wide
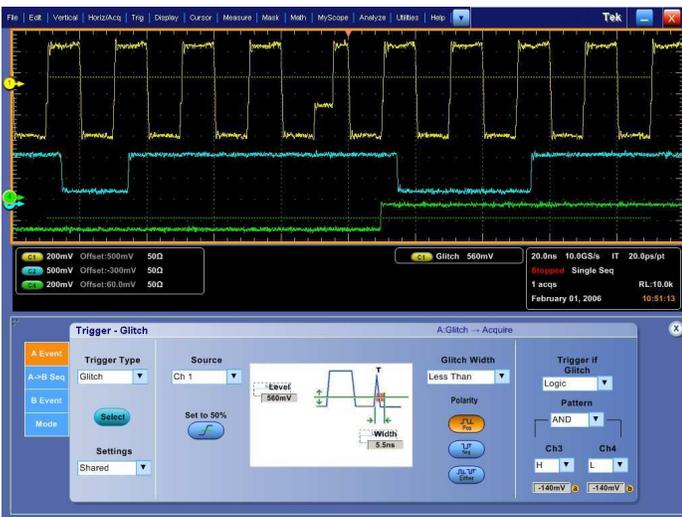
Isolate only the valid glitches

Protocol and Serial Pattern Triggering

To debug serial architectures, use the serial pattern triggering for NRZ serial data stream with built-in clock recovery and correlate events across physical and link layers. This feature comes standard on the DSA70000B series and is available on DPO70000B models as Opt. PTH. The instrument can recover the clock signal, identify transitions, and allow you to set the desired encoded words for the serial pattern trigger to capture. Opt. PTH and the DSA70000B Series cover serial standards up to 3.125 Gbps. For higher bit rate standards like USB 3.0, option PTU on the DPO70000B series and option STU on the DSA70000B series extend 8b10b triggering and decode to 5 Gbps.

Pattern Lock Triggering adds an extra dimension to NRZ serial pattern triggering by enabling the oscilloscope to take synchronized acquisitions
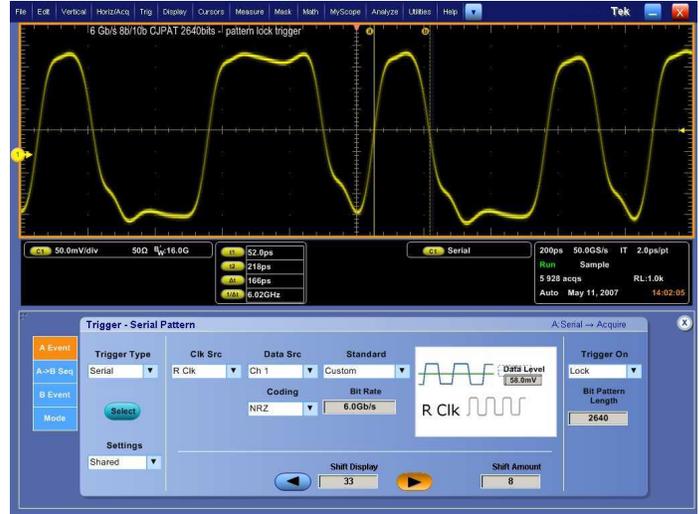
NRZ Pattern Lock Triggering of a 640-bit long SATA serial pattern at 6 Gbps

of a long serial test pattern with outstanding time base accuracy. Pattern lock triggering can be used to remove random jitter from long serial data patterns. Effects of specific bit transitions can be investigated, and averaging can be used with mask testing. This feature supports up to 6.25 Gbps NRZ serial data stream and is standard on the DSA70000B instruments, or included as part of Option PTH on the DPO70000B models.

Large 10-Division XGA Display Screen

The DPO/DSA70000B Series have a large 12.1" (307.3 mm) XGA display with a touch screen with 10 vertical divisions give you 25% more vertical measurement resolution than other oscilloscopes.

Unmatched Usability

TekLink™ allows you to acquire more than four channels by synchronizing multiple oscilloscopes and debug multiple-lane high-speed applications such as PCI Express X16 or DDR memory.

The DPO/DSA70000B Series instruments excel in usability with a suite of productivity features, such as a touch screen, flat menu structures, intuitive graphical icons, knob-per-channel vertical controls, right clicks, mouse wheel operation, and familiar Windows-based controls.

Interoperability with Logic Analyzers for Digital Design and Debug

Tektronix' Integrated View (iView™) data display enables digital designers to solve signal integrity challenges and effectively debug and verify their systems more quickly and easily. This integration allows designers to view time-correlated digital and analog data in the same display window, and isolate the analog characteristics of the digital signals that are causing system failures. No user calibration is required. And, once set up, the iView feature is completely automated.

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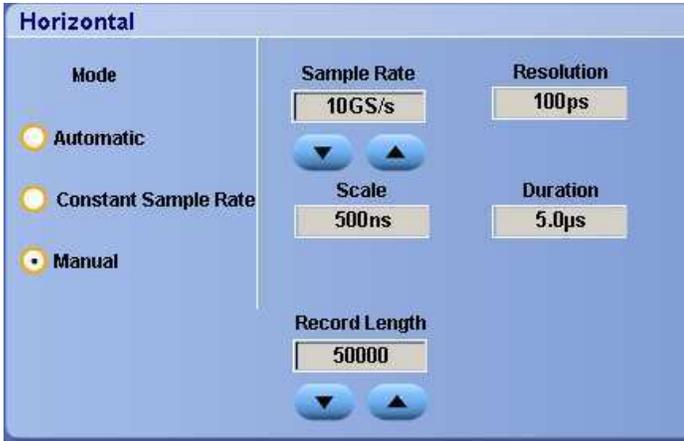
3 modes of operation of the horizontal time base

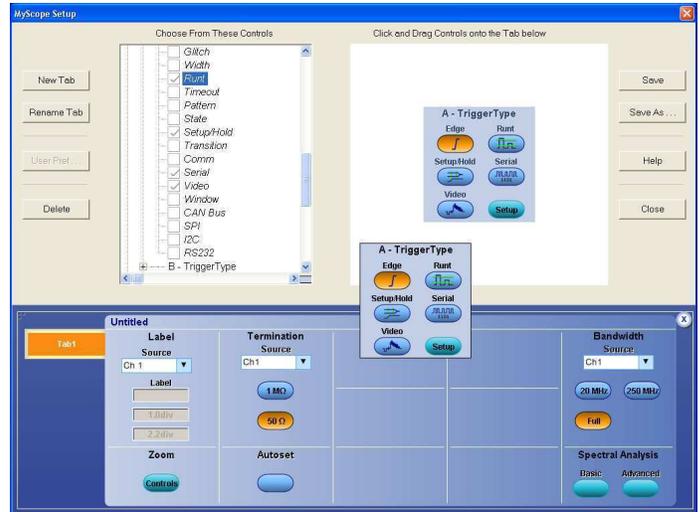Drag and drop menu items of interest to create the MyScope control window

Unmatched Versatility

Get the Most of Your Oscilloscope by Fully Controlling its Waveform Acquisition and Display Parameters.

Choose the operation you need to do your job the fastest: Automatic, Constant Sample Rate, or Manual. When you are doing signal exploration and want a lively signal, the default *Automatic* mode provides you with the liveliest display update rate. If you want the highest real-time sample rate that will give you the most measurement accuracy, then the *Constant Sample Rate* mode is for you. It will maintain the highest sample rate and provide the best real-time resolution. Finally the *Manual* mode ensures direct and independent control of the sample rate and record length for applications requiring specific settings.

With the MyScope® Feature, Create Your Own Control Windows With Only the Controls, Features, and Capabilities that You Care About

Easily create your own personalized "toolbox" of oscilloscope features in a matter of minutes using a simple, visual, drag-and-drop process. Once created, these custom control windows are easily accessed through a dedicated MyScope button and menu selection on the oscilloscope button/menu bar, just like any other control window. You can make an unlimited number of custom control windows, enabling each person who uses the oscilloscope in a shared environment to have their own unique control window. MyScope control windows will benefit all oscilloscope users, eliminating the ramp-up time that many face when returning to the lab after not using an oscilloscope for a while, and enables the power user to be

far more efficient. Everything you need is found in one control window rather than navigating through multiple menus to repeat similar tasks.

With OpenChoice® Software, Customize Your Test and Measurement System with Familiar Analysis Tools

The analysis and networking features of OpenChoice software add more flexibility to Tektronix' Windows XP oscilloscopes: Using the fast embedded bus, waveform data can be moved directly from acquisition to analysis applications on the Windows desktop at much faster speeds than conventional GPIB transfers. Tektronix' implementation of industry standard protocols, such as TekVISA™ interface and ActiveX controls, are included for using and enhancing Windows applications for data analysis and documentation. IVI instrument drivers are included to enable easy communication with the oscilloscope using GPIB, RS-232, and LAN connections from programs running on the instrument or an external PC. Or, use the Software Developer's Kit (SDK) to help create custom software to automate multistep processes in waveform collection and analysis with Visual BASIC, C, C++, MATLAB, LabVIEW, LabWindows/CVI, and other common Application Development Environments (ADE). Integration of the oscilloscope with external PCs and non-Windows hosts is also supported. In addition, the OpenChoice architecture provides a comprehensive software infrastructure for faster, more versatile operations. Data transfer utilities, such as the Excel or Word toolbar plug-ins can be used to simplify analysis and documentation on the Windows desktop or on an external PC.

More Insight into Your Complex Electrical Design for Characterization and Certification Testing

The DPO/DSA70000B series offers the industry's most comprehensive set of analysis and certification tools, such as a simple math expression, waveform mask testing, a pass/fail tests, event searching, and event marking. Custom applications that you develop yourself using application development environments such as MATLAB® can further extend this tool set.

A Wide Range of Built-In Advanced Waveform Analysis Tools

Waveform cursors make it easy to measure trace-to-trace timing characteristics, while cursors that link between YT and XY display modes make it easy to investigate phase relationships and Safe Operating Area violations. Select from 53 automatic measurements using a graphical palette that logically organizes measurements into Amplitude, Time, Combination, Histogram, and Communications categories. Gather further insight into your measurement results with statistical data such as mean, min, max, standard deviation, and population.

Define and apply math expressions to waveform data for on-screen results in terms that you can use. Access common waveform math functions with the touch of a button. Or, for advanced applications, create algebraic expressions consisting of live waveforms, reference waveforms, math functions, measurement values, scalars, and user-adjustable variables with an easy-to-use calculator-style editor.

FFT – To analyze your signal in the frequency domain, use the built-in spectral analysis function. Using the oscilloscope front-panel controls, you can directly control the frequency span, center frequency, reference level, and resolution bandwidth. Vector signal analysis and Ultra-Wideband (UWB) verification and characterization are provided as part of the SignalVu and UWB options.

Filtering – Enhance your ability to isolate or remove a component of your signal (noise or specific harmonics of the signal) by creating your own filters or by using the filters provided as standard with the instrument. These customizable FIR filters can be used to implement today's preferred signal-filtering techniques, including removing signal pre-emphasis or minimizing the effects of fixtures and cables connected to the device under test.
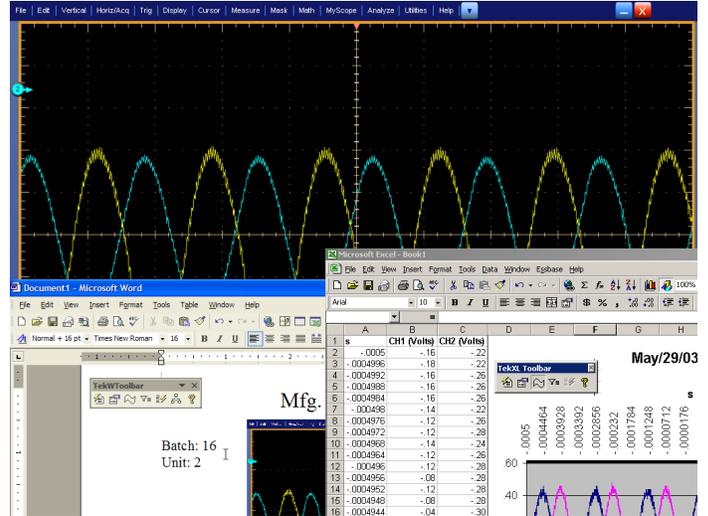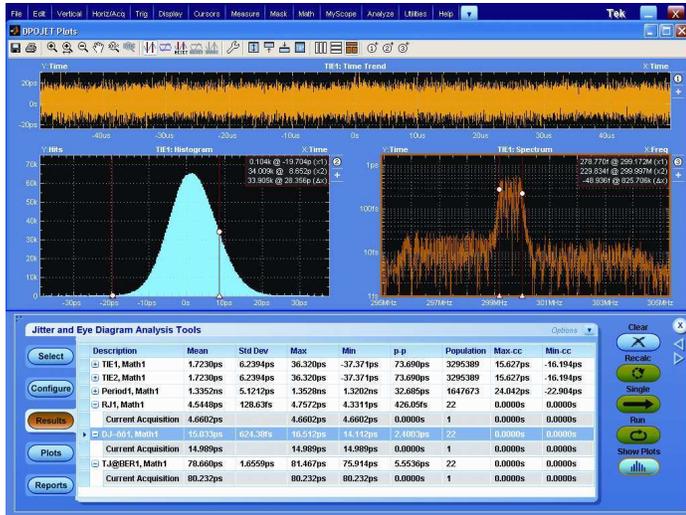

Capture data into Microsoft Excel using the unique Excel toolbar, and create custom reports using the Word toolbar
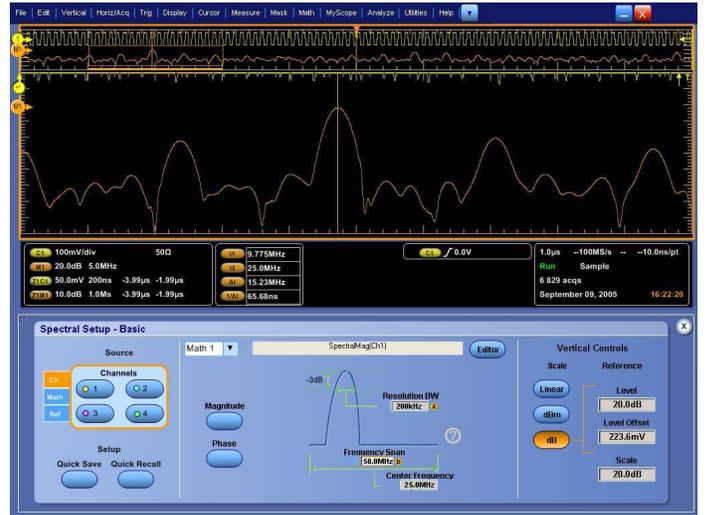

Basic spectral UI control window

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Application Specific Solutions –

## Enable standard specific certification, measurement automation, and extended signal analysis

DPOJET Jitter And Eye Diagram Analysis (Opt. DJA) – Simplify identifying signal integrity concerns, jitter, and their related sources with DPOJET software. DPOJET provides the highest sensitivity and accuracy available for real-time oscilloscopes.
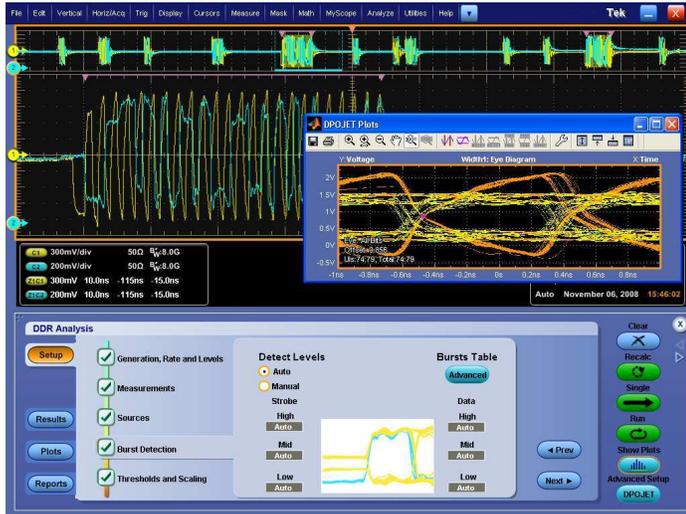
DDR Memory Bus Analysis (Opt. DDRA) – Automatically identify DDR1, LP-DDR1, DDR2, DDR3, and GDDR3 Reads and Writes and clearly see and analyze how analog anomalies are affecting your DDR/Memory. DDRA with DPOJET, combined with the DPO/DSA70000B DPX® technology, is the fastest way to solve complex memory signaling issues.
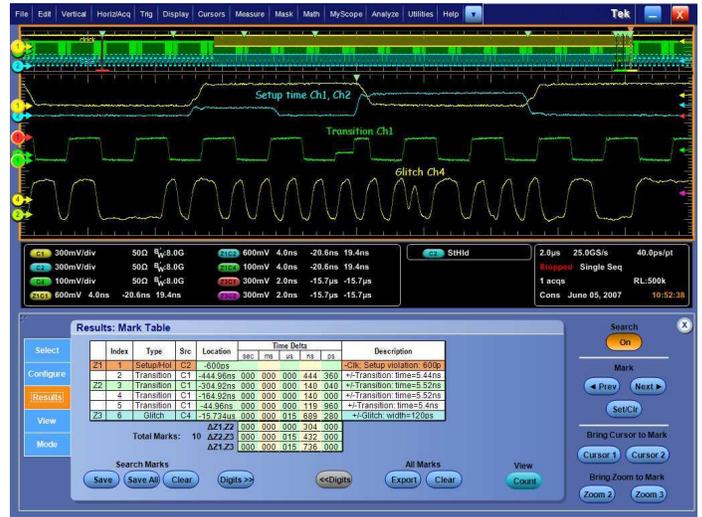
Advanced Event Search and Mark (Opt. ASM) – Ease the tedious task of examining data by highlighting important events, skipping the unimportant ones, and enhancing the comprehension of event relationships. Navigate between the events of interest effortlessly.
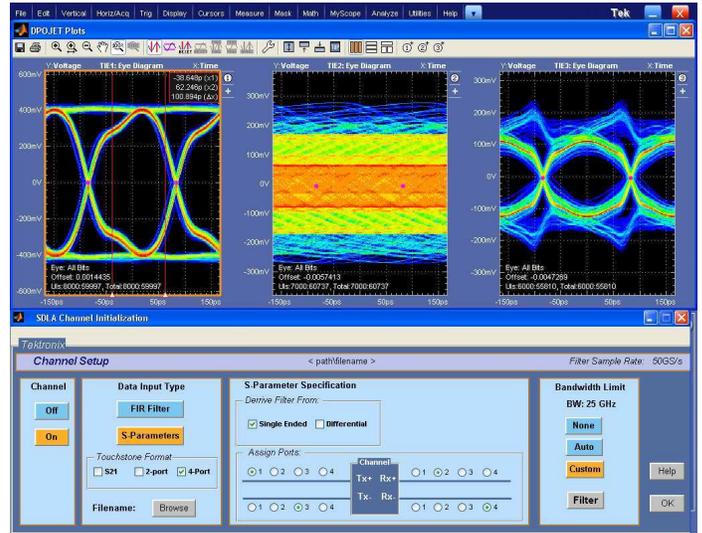
SDLA - Serial Data Link Analysis (options SLE and SLA) – Gain insight into serial data links with the capability to emulate the serial data channel from its S-parameters, de-embed the fixture or other network, and add or remove transmitter equalization (de-emphasis/pre-emphasis). Option SLA adds processing of waveforms with FFE and DFE equalizations and automatic equalizer training. DPOJET provides advanced measurement and jitter analysis of the resulting waveforms.
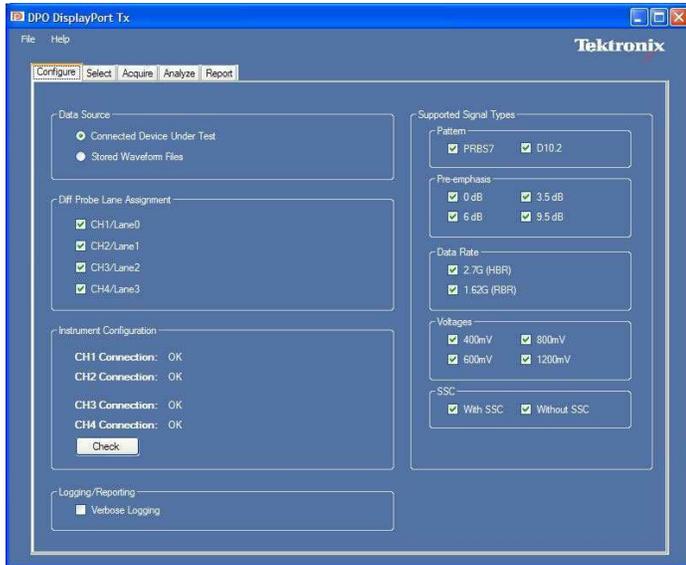
DisplayPort Compliance Test Solution (Opt. DSPT) – Support DisplayPort Compliance Test Standard (CTS) source test with four-line simultaneous testing using the Tektronix P7300SMA Series probes and DisplayPort software. Detailed test reports with waveform plots, pass/fail results, and margin analysis are included.
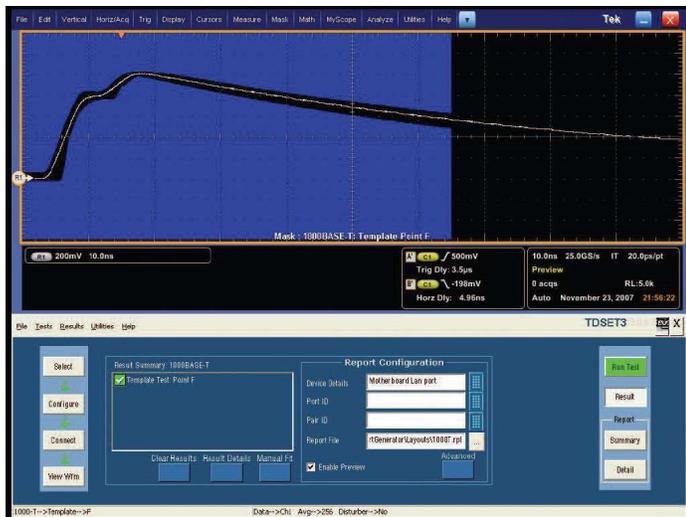
Ethernet Compliance Test Solution (Opt. ET3) – Receive full PHY layer support for Ethernet variants 10BASE-T, 100BASE-TX, and 1000BASE-T with Tektronix' comprehensive, integrated Ethernet tool set. Analog verification, automated compliance software, and device characterization solutions are all included.
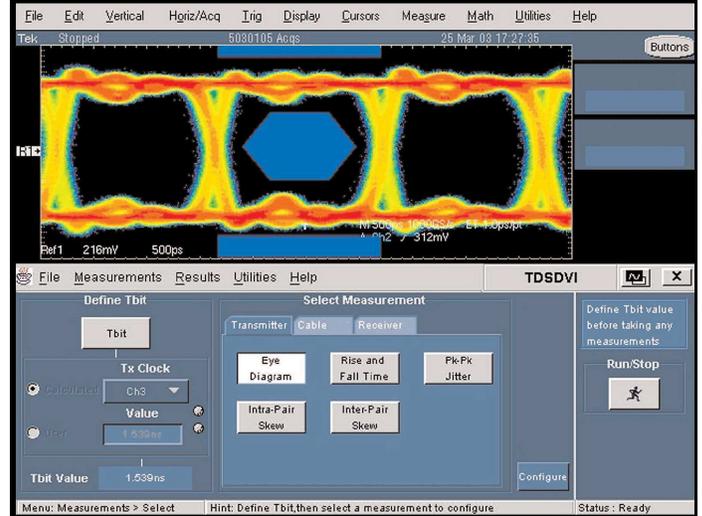
DVI Compliance Test Solution (Opt. DVI) – Obtain quick and dependable results with the DVI compliance test software. Automated testing based on objective pass/fail detection without human intervention will dramatically enhance your productivity.
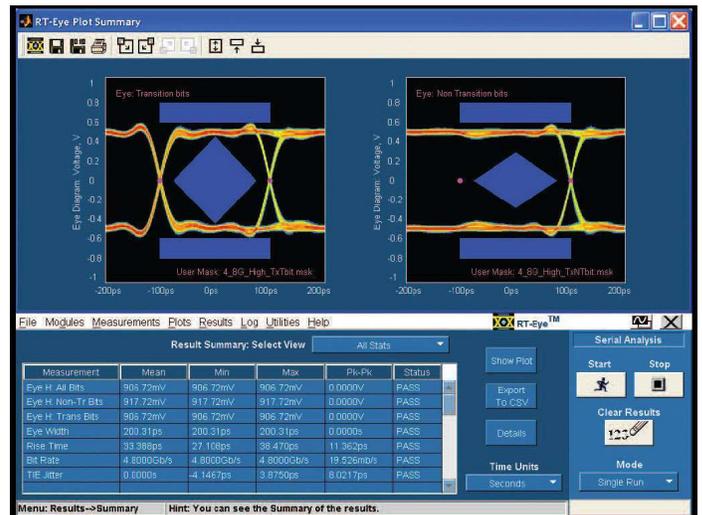
FB-DIMM Compliance Test Solution (Opt. FBD) – Test the Receiver, Transmitter, and Reference clock test points for compliance as per FB-DIMM standards.

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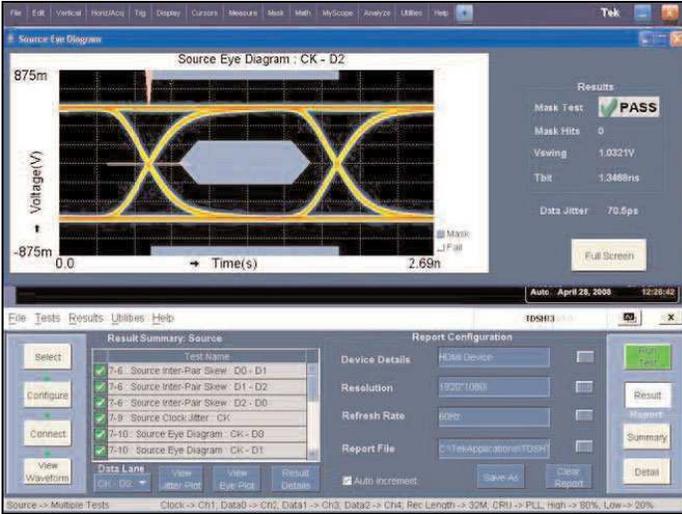
HDMI Compliance Test Solution (Opt. HT3) – Fast, efficient solution for HDMI compliance measurement challenges, no matter if you are working on a Source, Cable, or Sink solution. This application provides all the HDMI compliance test solutions you need to ensure quality and interoperability.

Power Measurement and Analysis Software (Opt. PWR) – Improve the efficiency of switching power supplies with increased power densities. Measure and analyze power dissipation in power supply switching devices and magnetic components, and generate detailed test reports in customizable formats.
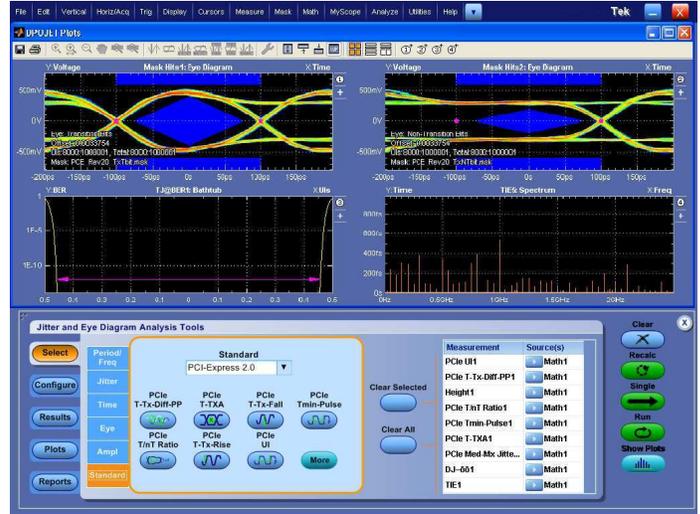
PCI Express Analysis Test Solution (Opt. PCE) – Analyze the performance of your PCI-Express Rev 1.0, 2.0, or 3.0 (draft spec) design with comprehensive test support. Option PCE enables tests that conform to PCI-SIG standards using either DPOJET or RT-Eye.
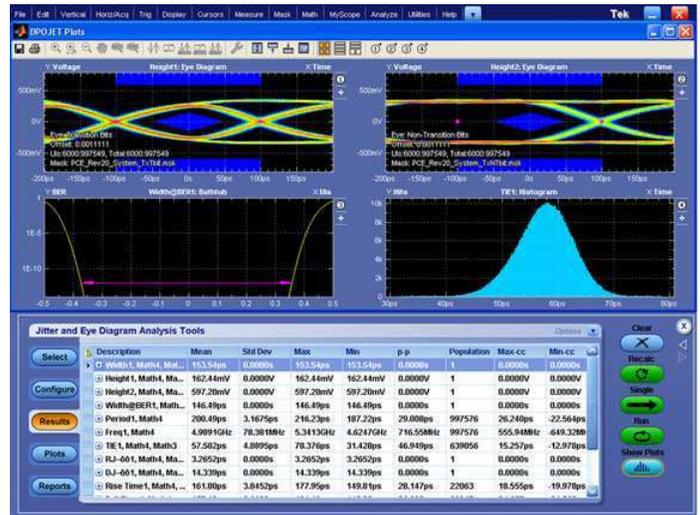
TekExpress™ SATA Automated Compliance Test Software – Reduce your compliance test time by approximately 70% with the simple, efficient testing and automation of all required testing suites provided by TekExpress software. Also included is auto-recognition of all required test equipment, precise DUT/Host control one-button testing, and complete support for SATA Gen1 and SATA Gen2 defined test suites.
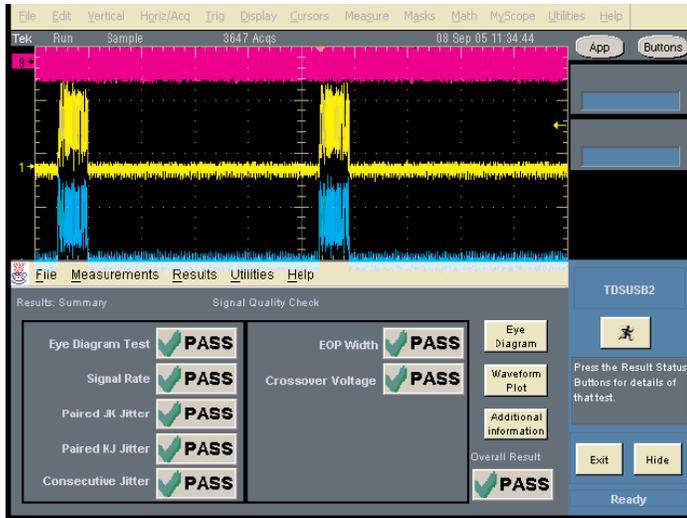
USB 2.0 Compliance Test Solution (Opt. USB) – Ensure your design has sufficient margins by characterizing your device with variable test limits. The USB compliance test solution provides "one touch" compliance testing by automatically setting up the oscilloscope for all compliance test configurations including probe deskew.
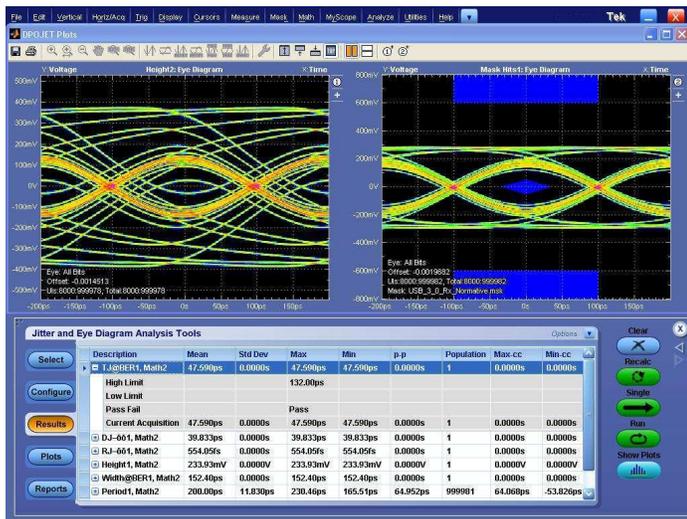
USB 3.0 Transmitter Testing – Verify, debug, and certify to the specifications of the USB 3.0 PHY layer using native capabilities in and additional applications for the DPO/DSA70000B series. Math function FIR filters and SDLA software, allow emulation of the Cable and Reference channels defined in the USB 3.0 spec. With DPOJET, jitter measurements needed to complete the Normative compliance test can be done.
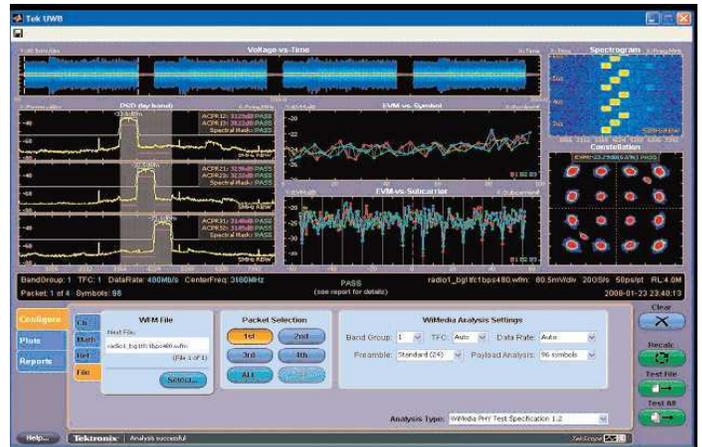
Ultra-Wideband Spectral Analysis Software (Opt. UWB) – Analyze hundreds of packet, TFC, and data-rate combinations without adjusting the UI. In addition, the automatic WiMedia modulation analysis configuration will analyze how complex wideband signals change frequency and amplitude with time using real-time spectrograms spanning 20 GHz.
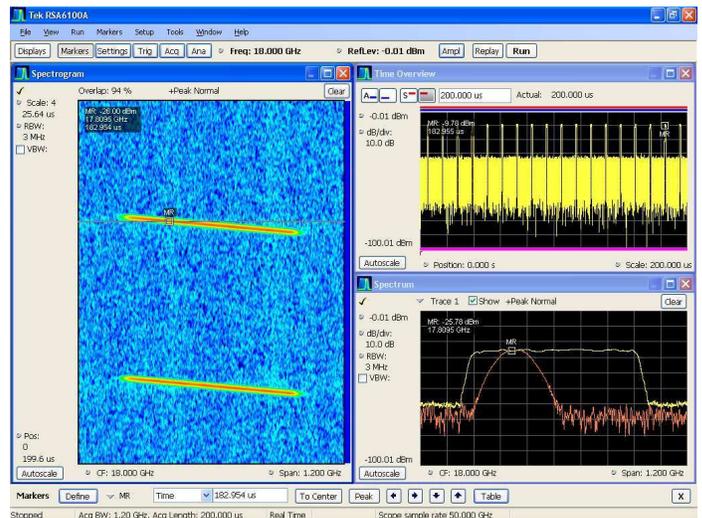
SignalVu™ Vector Signal Analysis – Easily verify wide-bandwidth designs such as wideband radar, high data rate satellite links, or frequency-hopping radios and characterize wideband spectral events. SignalVu combines the functionality of a vector signal analyzer, a spectrum analyzer, and the powerful triggering capabilities of the DPO/DSA70000B – all in a single package.

DSA70000B – A dedicated solution configured for today's high-speed serial design challenges

The DSA70000B Digital Serial Analyzer is specially configured to address high-speed serial data designs by encapsulating many of the serial domain features needed for high-speed serial verification and characterization. These standard features on the DSA70000B Series are options on the DPO70000B series.

Serial Pattern Triggering – Real-time serial pattern triggering and protocol decode with built-in clock recovery recovers the clock signal, identifies the transitions, and decodes characters and other protocol data. You can see the 8b/10b bit sequences decoded into their words for convenient analysis, or you can set the desired encoded words for the serial pattern trigger to capture. With Pattern Lock Triggering, the DSA70000B can synchronize to long serial test patterns up to 6.25 Gbps and remove random jitter. The DSA70000B Series covers serial standards up to 3.125 Gbps with an option to support up to 5 Gbps (Opt. STU)

Jitter, Timing, and Eye-diagram Analysis – The DSA70000B Series features the highest-accuracy jitter and timing measurements as well as comprehensive analysis algorithms. Tight timing margins demand stable, low-jitter designs. You can make jitter measurements over contiguous clock cycles on every valid pulse in a single-shot acquisition. Multiple measurements and trend plots quickly show system timing under variable conditions, including Random and Deterministic Jitter separation.

Communications Mask Testing – Provides a complete portfolio of masks for verifying compliance to serial communications standards. 156 masks for the following standards are supported – PCI Express, ITU-T/ANSI T1.102, Ethernet IEEE 802.3, ANSI X3.263, Sonet/SDH, Fiber Channel, InfiniBand, USB, Serial ATA, Serial Attached SCSI, IEEE 1394b, RapidIO, OIF Standards.

20 MSample Record Length – 20 Msamples on all four channels provides a longer time sequence at high resolution. Optional record lengths up to 100 Msamples for the 4, 6, and 8 GHz models, 250 Msamples for the 12.5, 16, and 20 GHz models extend the acquisition time sequence.

Advanced Event Search and Mark – Finding important events such as fast or slow transitions, setup and hold violations, or logic patterns within a long-duration capture is made easy with the pattern matching and software triggering functionality of Event Search and Mark.

Accurate, Simple, and Customizable Physical Layer Certification Testing – For designers with industry-standard certification needs, standard-specific compliance and analysis modules that configure the pass/fail waveform mask and measurement limit testing are available as options to the DSA70000B. Modules are available for PCI Express (Opt. PCE), Serial ATA and SAS (Opt. SST), FB-DIMM, (Opt. FBD), InfiniBand (Opt. IBA), HDMI (Opt. HT3), Ethernet (Opt. ET3), DisplayPort (Opt. DSPT), DVI (Opt. DVI), and USB (Opt. USB).
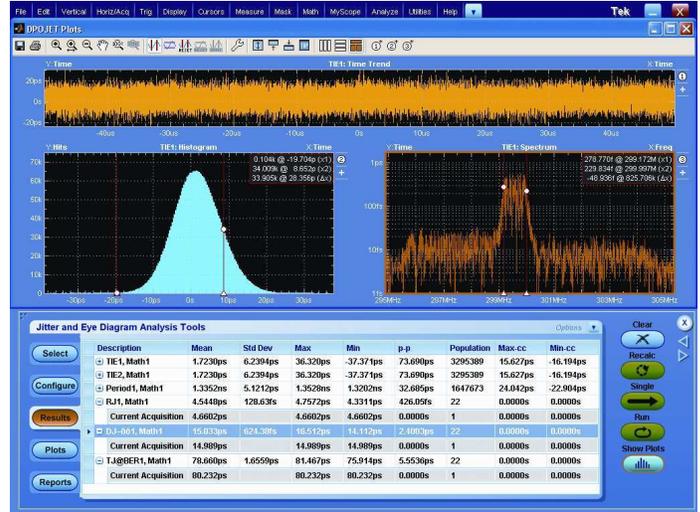
Jitter, Timing, and Eye-diagram Analysis
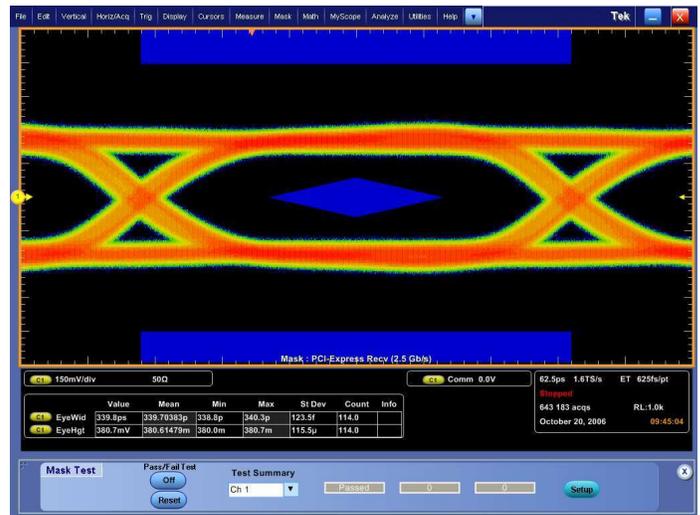
Communications Mask Testing

With standard features that extend the functionality of the Tektronix DPO70000B series to address high-speed serial signal analysis and certification, the DSA70000B series offers a specialized instrument that efficiently addresses your design challenges.

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Characteristics

Vertical System

DPO/DSA Models	70404B	70604B	70804B	71254B	71604B	72004B
Bandwidth (user selectable DSP enhance)	4 GHz	6 GHz	8 GHz	12.5 GHz	16 GHz	20 GHz
Hardware Analog Bandwidth (-3 dB)	4 GHz	6 GHz	8 GHz	12.5 GHz	16 GHz (typical)	16 GHz (typical)
Input Channels	4	4	4	4	4	4
Rise Time 10% to 90% (typical)	98 ps	65 ps	49 ps	32 ps	24.5 ps	19 ps
Rise Time 20% to 80% (typical)	68 ps	45 ps	34 ps	22 ps	17 ps	14 ps
Vertical Noise (% of full scale) (typical)[16]	0.28%	0.32%	0.35%	0.38%	0.43%	0.77%
Bandwidth Limits	Depending on instrument model: 19 GHz, 18 GHz, 17 GHz, 16 GHz, 15 GHz, 14 GHz, 13 GHz, 12 GHz, 11 GHz, 10 GHz, 9 GHz, 8 GHz, 7 GHz, 6 GHz, 5 GHz, 4 GHz, 3 GHz, 2 GHz, 1 GHz, or 500 MHz					
Channel-to-channel Isolation (Any Two Channels at Equal Vertical Scale Settings)	≥120:1 (for input frequency 0 to 10 GHz) ≥80:1 (for input frequency >10 GHz to 12 GHz. ≥50:1 (for input frequency >12 GHz to 15 GHz) ≥25:1 (for input frequency >15 GHz)					
DC Gain Accuracy	±2% (of reading)					
Delay between any two channels (typical)	≤100 ps for any two channels with equal V/div and coupling settings ≤50 ps with BW enhance enabled (BW+)					
Effective Number of Bits (typical)	5.4 bits[14]					
Input Coupling	DC (50 Ω), GND					
Input Impedance	50 Ω ±2%, 1 MΩ with TCA-1MEG adapter					
Input Sensitivity 18 GHz and below 20 GHz and 19 GHz	10 mV/div to 500 mV/div (100 mV to 5 V full scale) 20 to 500 mV/div (200 mV to 5 V full scale)					
Max Input Voltage, 50 Ω	<5.0 V_{RMS} for ≥100 mV/div; also determined by TekConnect accessory 1.0 V_{RMS} for <100 mV/div					
Offset Accuracy	10 mV/div – 99.5 mV/div. ±(0.35% (offset value-position) + 1.5 mV + 1% of full scale) 100 mV/div – 500 mV/div. ±(0.35% (offset value-position) + 7.5 mV + 1% of full scale)					
Offset Range	10 mV/div: ±450 mV 20 mV/div: ±400 mV 50 mV/div: ±250 mV 100 mV/div: ±2.0 V 200 mV/div: ±1.5 V 500 mV/div: ±0.0 V					
Passband Flatness (20, 50, 100, 250 mV/div) (typical)	±0.5 dB to 50% of nominal bandwidth at 25 °C					
Position Range	±5 div					
Vertical Resolution	8 bit (11 bit with averaging)					

[14] 50 mV/div, bandwidth filter on, max bandwidth up to 13 GHz, max sample rate

[16] 50 mV/div, bandwidth filter on

Time Base System

DPO/DSA Models	70404B	70604B	70804B	71254B	71604B	72004B
Time Base Range	20 ps/div to 1000 s/div			10 ps/div to 1000 s/div		
Time Resolution (in ET/IT mode)	200 fs			100 fs		
Channel-to-channel Deskew	Range ±75 ns					
Delta Time Measurement Accuracy RMS Over <100 ns duration; single shot; with signal rise time = 1.2X scope rise time	1.61 ps	1.29 ps	1.14 ps	940 fs	900 fs	1.02 ps
Jitter Noise Floor (typical) (With BW+ bandwidth enhance enabled)	450 fs	450 fs	450 fs	300 fs	300 fs	400 fs
Time Base Accuracy	±1.5 ppm initial accuracy, aging <1 ppm per year					
Time Base Delay Time Range	-5.0 ks to 1.0 ks					
Trigger Jitter (RMS)	1 ps$_{RMS}$ (typical) with enhanced triggering OFF <100 fs$_{RMS}$ with enhanced triggering ON					

Acquisition System

DPO/DSA Models	70404B / 70604B / 70804B	71254B / 71604B / 72004B
Sample Rates		
Real-time mode 1, 2, 3, or 4 channel (max)	25 GS/s	50 GS/s
ET/IT Mode (max)	5 TS/s	10 TS/s
Maximum Record Length per Channel		
With Standard Configuration	10 M on all four channels (DPO70000B Series only) 20 M on all four channels (DSA70000B Series only)	
With Record Length Opt. 2XL	20 M on all four channels (DPO70000B Series only)	
With Record Length Opt. 5XL	50 M on all four channels	
With Record Length Opt. 10XL	100 M on all four channels	
With Record Length Opt. 20XL	N/A	250 M on all four channels

Maximum Duration at Highest Real-Time Resolution

DPO/DSA Models	70404B / 70604B / 70804B	71254B / 71604B / 72004B
Resolution	40 ps (25 GS/s)	20 ps (50 GS/s)
Max Duration with Standard Memory	0.4 ms DPO70000B Series; 0.8 ms for DSA70000B Series	0.2 ms DPO70000B Series; 0.4 ms for DSA70000B Series
Max Duration with Opt. 2XL	0.8 ms (DPO70000B Series only)	0.4 ms (DPO70000B Series only)
Max Duration with Opt. 5XL	2.0 ms	1.0 ms
Max Duration with Opt. 10XL	4.0 ms	2.0 ms
Max Duration with Opt. 20XL	N/A	5.0 ms

Acquisition Modes

Mode	Description
Averaging	From 2 to 10,000 waveforms included in average
Envelope	From 1 to $2×10^9$ waveforms included in min-max envelope
FastAcq Acquisition Mode	FastAcq optimizes the instrument for analysis of dynamic signals and capture of infrequent events
Maximum FastAcq Waveform Capture Rate	>300,000 wfms/s on all 4 channels simultaneously
FastFrame™ Acquisition	Acquisition memory divided into segments; maximum trigger rate >310,000 waveforms per second. Time of arrival recorded with each event. Frame finder tool helps to visually identify transients.
Hi-Res	Real-time boxcar averaging reduces random noise and increases resolution
Peak Detect	Captures narrow glitches at all real-time sampling rates: 1 ns at ≤125 MS/s; 1/sample rate at ≥250 MS/s
Roll Mode	Up to 10 MS/s with a maximum record length of 40 MS
Sample	Acquire sampled values
Waveform Database	Accumulate waveform database providing three-dimensional array of amplitude, time, and counts

Pinpoint® Trigger System

	DPO Models 70404B / 70604B / 70804B / 71254B / 71604B / 72004B	DSA Models 70404B / 70604B / 70804B / 71254B / 71604B / 72004B
Sensitivity		
Internal DC Coupled	4% of full scale from DC to 50 MHz 10% of full scale at 4 GHz 20% of full scale at 8 GHz 50% of full scale at 11 GHz	
External (Auxiliary Input) 50 Ω	250 mV from DC to 50 MHz, increasing to 350 mV at 1.0 GHz.	
Trigger Characteristics		
A Event and Delayed B Event Trigger Types	Edge, Glitch, Runt, Width, Transition Time, Time-out, Pattern, State, Setup/Hold, Window—all except Edge, Pattern, and State can be Logic State qualified by up to two channels	
Main Trigger Modes	Auto, Normal, and Single	
Trigger Sequences	Main, Delayed by Time, Delayed by Events, Reset by Time, Reset by State, Reset by Transition. All sequences can include separate horizontal delay after the trigger event to position the acquisition window in time.	
Clock Recovery System	**Requires Opt. PTH or Opt. MTH**	**Standard**
Clock Recovery Phase Locked Loop Bandwidth	Fixed at FBaud/1600	
Clock Recovery Frequency Range	1.5 MBaud to 3.125 GBaud	
	Requires Opt. PTU	**Requires Opt. STU**
8b10b Max Baud Rate	5 GBaud	
Communications-related Triggers	**Requires Opt. MTH**	**Standard**
	Support for AMI, HDB3, BnZS, CMI, MLT3 and NRZ encoded communications signals. Select among isolated positive or negative one, zero pulse form or eye patterns as applicable to the standard.	
Serial Pattern Trigger	**Requires Opt. PTH**	**Standard**
	Up to 64 bit serial word recognizer, bits specified in binary (high, low, don't care) or hex format. Trigger on NRZ-encoded data up to 1.25 GBaud.	
	Trigger on 8b/10b-encoded data from 1.25 to 3.125 GBaud (40 bits)	
	Requires Opt. PTU	**Requires Opt. STU**
	Trigger on 8b/10b-encoded data up to 5 GBaud (40 bits)	
AUX Trigger	TekConnect interface: ±5 V	
Clock Recovery Jitter (RMS)	<0.25% bit period + 2 ps_{RMS} for PRBS data patterns <0.25% bit period + 1.5 ps_{RMS} for repeating "0011" data pattern	
Enhanced Triggering	User-selectable; enhanced triggering corrects the difference in timing between the trigger path and the acquired data path (supports all Pinpoint trigger types on both A- and B-Events except pattern trigger); Not available in FastAcq.	
Line	Fixed at 0 V	
Minimum Signal Amplitude needed for Clock Recovery	1 div_{p-p} up to 1.25 Gbaud 1.5 div_{p-p} above 1.25 Gbaud	
Tracking/Acquisition Range	±2% of requested baud	
Trigger Coupling	DC, AC (attenuates <100 Hz), HF Rej (attenuates >20 kHz), LF Rej (attenuates <200 kHz), Noise Reject (reduces sensitivity)	
Trigger Holdoff Range	250 ns min to 12 s max	
Trigger Level Range Internal	±120% of full scale from center of screen	

Trigger Modes

Mode	Description
Comm	Standard feature on the DSA70000B, provided as part of Opt. MTH on the DPO70000B Series. Support for AMI, HDB3, BnZS, CMI, MLT3 and NRZ encoded signals.
Edge	Positive or negative slope on any channel or front panel auxiliary input. Coupling includes DC, AC, noise reject, HF reject, and LF reject.
Glitch	Trigger on or reject glitches of positive, negative, or either polarity. Minimum glitch width is down to 150 ps (typical) with rearm time of 300 ps
Pattern	Trigger when pattern goes false or stays true for specified period of time. Pattern (AND, OR, NAND, NOR) specified for four input channels defined as high, low, or don't care.
Runt	Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Event can be time- or logic-qualified.
Serial Pattern	Trigger on NRZ-encoded data up to 3.125 Gbaud (5 Gbaud with Opt. PTU or Opt. STU); above 1.25 Gbaud requires 8b/10b encoded data. Extended with pattern lock triggering to capture repeated acquisitions of long serial test patterns up to 6.25 Gbps.
Setup/Hold	Trigger on violations of both setup time and hold time between clock and data present on any two input channels.
State	Any logical pattern of channels (1, 2, 3) clocked by edge on channel 4. Trigger on rising or falling clock edge.
Time-out	Trigger on an event which remains high, low, or either, for a specified time period. Selectable from 300 ps.
Transition	Trigger on pulse edge rates that are faster or slower than specified. Slope may be positive, negative, or either.
Trigger Delay by Events	1 to 2 G events
Trigger Delay by Time	3.2 ns to 3 Ms
Width	Trigger on width of positive or negative pulse either within or out of selectable time limits (down to 150 ps).
Window	Trigger on an event that enters or exits a window defined by two user-adjustable thresholds. Event can be time- or logic-qualified.

Search and Mark Events

Event	Description
Basic	Mark any events and document waveforms. Search positive, negative slopes or both on any channels. Event table summarizes all found events. All events are time stamped in reference to trigger position. Users can choose to stop acquisitions when an event is found.
Advanced	Search glitches or runts, as well as transition rate, pulse width, setup and hold, time-out, window violations, or find any logic or state pattern on any number of channels. Search DDR read or write bursts with Opt. DDRA.

Waveform Measurements

Measurement	Description
Automatic Measurements	53, of which 8 can be displayed on screen at any one time; measurement statistics, user-definable reference levels, measurement within gates isolating the specific occurrence within an acquisition to take measurements on.
Amplitude Related	Amplitude, High, Low, Maximum, Minimum, Peak-to-Peak, Mean, Cycle Mean, RMS, Cycle RMS, Positive Overshoot, Negative Overshoot
Combination	Area, Cycle Area, Phase, Burst Width
Eye-pattern Related	Extinction Ratio (absolute, %, dB), Eye Height, Eye Width, Eye Top, Eye Base, Crossing %, Jitter (p-p, RMS, 6sigma), Noise (p-p, RMS), Signal/Noise Ratio, Cycle Distortion, Q-Factor
Histogram Related	Waveform Count, Hits in Box, Peak Hits, Median, Maximum, Minimum, Peak-to-Peak, Mean (μ), Standard Deviation (sigma), μ+1sigma, μ+2sigma, μ+3sigma
Time Related	Rise Time, Fall Time, Positive Width, Negative Width, Positive Duty Cycle, Negative Duty Cycle, Period, Frequency, Delay

Waveform Processing/Math

Processing Type	Description
Algebraic Expressions	Define extensive algebraic expressions including Waveforms, Scalars, User-adjustable Variables and Results of Parametric Measurements e.g. (Integral (CH.1–Mean(CH.1))×1.414×VAR1)
Arithmetic	Add, Subtract, Multiply, Divide Waveforms and Scalars
Filtering Functions	User-definable filters. Users specify a file containing the coefficients of the filter. Several example filter files are provided.
Frequency Domain Functions	Spectral Magnitude and Phase, Real and Imaginary Spectra
Mask Function	A function that generates a Waveform Database pixmap from a sample waveform. Sample count can be defined.
Math Functions	Average, Invert, Integrate, Differentiate, Square Root, Exponential, Log_{10}, Log_e, Abs, Ceiling, Floor, Min, Max, Sin, Cos, Tan, ASin, ACos, ATan, Sinh, Cosh, Tanh
Relational	Boolean result of comparison >, <, ≥, ≤, ==, !=
Vertical Units	Magnitude: Linear, dB, dBm
	Phase: Degrees, radians, group delay
	IRE and mV units
Waveform Definition	As an arbitrary math expression
Window Functions	Rectangular, Hamming, Hanning, Kaiser-Bessel, Blackman-Harris, Gaussian, Flattop2, Tek Exponential

Display Characteristics

Characteristic	Description
Color Palettes	Normal, Green, Gray, Temperature, Spectral, and User-defined
Display Format	YT, XY
Display Resolution	XGA 1024 horizontal × 768 vertical pixels
Display Size	Diagonal: 307.3 mm (12.1 in.)
Display Type	Liquid crystal active-matrix color display
Horizontal Divisions	10
Vertical Divisions	10
Waveform Styles	Vectors, Dots, Variable Persistence, Infinite Persistence

Computer System and Peripherals

Item	Description
Operating System	Windows XP
CPU	Intel Pentium 4, 3.4-GHz processor
PC System Memory	2 GB
Hard Disk Drive	Rear-panel, removable hard disk drive, 160 GB capacity
CD-R/W Drive	Front-panel CD-R/W drive with CD creation software application
DVD Drive	Read only
Mouse	Optical wheel mouse, USB interface
Keyboard	USB interface

Input/Output Ports

Front Panel

Port	Description
AUX Trigger Input	See trigger specifications
AUX Trigger Output	BNC connector, provides a TTL-compatible, polarity-switchable pulse when the oscilloscope triggers.
DC Probe Calibration Output	BNC connector, ±10 V DC for DC probe calibration. (Signal available only during probe calibration.)
Fast Edge Output	SMA connector provides fast edge signal. 1 kHz ±20%; 810 mV (base to top) ±20% into ≥10 kΩ load; 440 mV ±20% into a 50 Ω load..
Recovered Clock	SMA connector, ≤1.25 Gbps, Output swing ≥130 mV$_{p-p}$ into 50 Ω at 1.25 Gbps. Requires Opt. PTH or Opt. MTH to enable on DPO70000B, standard on DSA70000B.
Recovered Data	SMA connector, ≤1.25 Gbps, Output swing of 1010 repeating pattern 200 mV into 50 Ω at 1.25 Gbps. Requires Opt. PTH or Opt. MTH to enable on DPO70000B, standard on DSA70000B.
USB 2.0 Port	One in front. Allows connection of USB keyboard, mouse, or storage device.

Rear Panel

Port	Description
Audio Ports	Miniature phone jacks for stereo microphone input and stereo line output.
AUX Trigger Output	BNC connector, 0 to 3 V; default output is A-Event Trigger low true
External Time Base Reference In	BNC connector; allows time base system to phase lock to external 10/100 MHz reference. Optimized (by using a software switch) for either a highly stable clock or tracking mode.
GPIB Port	IEEE 488.2 standard
Keyboard Port	PS/2 compatible
LAN Port	RJ-45 connector, supports 10Base-T, 100Base-T, and 1000Base-T
Mouse Port	PS/2 compatible
Parallel Port	IEEE 1284, DB-25 connector
Power	100 to 240 V$_{RMS}$, ±10%, 50/60 Hz; 115 V$_{RMS}$ ±10%, <870 Watts, 400 Hz; CAT II, <1100 VA typical
Scope XGA Video Port	15 pin D-sub connector on the rear panel, video is IBM XGA compatible. Connects 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 this port.
Serial Port	DB-9 COM1 port
TekLink™	Synchronizes multiple Tektronix scopes together to allow simultaneous acquisition of more than four channels.
Time Base Reference Out	BNC connector; provides TTL-compatible output of internal 10 MHz reference oscillator
USB 2.0 Ports	Four in back. Allow connection of USB keyboard, mouse, or storage device.
Windows Video Port	15 pin D-sub connector on the rear panel; connects a second monitor to use dual-monitor display mode allowing analysis results and plots to be viewed along with the oscilloscope display. Video is DDC2B compliant.

Physical Characteristics

Dimensions	mm	in.
Benchtop Configuration		
Height	298	11.74
Width	451	17.75
Depth	489.97	19.29
Weight	**kg**	**lbs.**
Net	20	44
Shipping	34	75
Rackmount Configuration		
	mm	in.
Height	311	12.25
Width	480.1	18.9
Depth (from rack mounting ear to back of instrument)	546.1	21.5
Weight	**kg**	**lbs.**
Net	20	44
Kit	2.7	6

Mechanical

Cooling — Required Clearance

	mm	in.
Top	0	0
Bottom	0	0
Left side	76	3
Right side	76	3
Front	0	0
Rear	0	0

Environmental

Temperature

Operating	5 °C to +45 °C
Nonoperating	–20 °C to +60 °C

Humidity

Operating	8% to 80% relative humidity (RH) at up to 32 °C. 5% to 45% RH above +32 °C up to +45 °C
Nonoperating	5% to 95% relative humidity (RH). Upper limit derated to 45% RH above +30 °C up to +60 °C

Altitude

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

Regulatory

Electromagnetic Compatibility	93/68/EEC; EN61326:1997 +A1 1998+A2:2000
Certifications	UL 3111-1, CSA1010.1, ISO11469,EN61010-1, IEC 61010-1

Ordering Information

Model	Description
DPO70404B	4 GHz Digital Phosphor Oscilloscope
DPO70604B	6 GHz Digital Phosphor Oscilloscope
DPO70804B	8 GHz Digital Phosphor Oscilloscope
DPO71254B	12.5 GHz Digital Phosphor Oscilloscope
DPO71604B	16 GHz Digital Phosphor Oscilloscope
DPO72004B	20 GHz Digital Phosphor Oscilloscope
DSA70404B	4 GHz Digital Serial Analyzer
DSA70604B	6 GHz Digital Serial Analyzer
DSA70804B	8 GHz Digital Serial Analyzer
DSA71254B	12.5 GHz Digital Serial Analyzer
DSA71604B	16 GHz Digital Serial Analyzer
DSA72004B	20 GHz Digital Serial Analyzer

All Models Include: Accessory pouch, front cover, mouse, keyboard, quick start user manual (071-173x-xx), DPO70000B Series product software CD/DVD-ROM, Optional applications software CD/DVD-ROM, performance verification procedure PDF file, GPIB programmer's reference (on product software CD/DVD-ROM), calibration certificate documenting NIST traceability, Z 540-1 compliance and ISO9001, power cord, one year warranty.

Note: Please specify quick-start user manual language and power plug when ordering.

(4) TekConnect® to 2.92 mm adapters (TCA-292MM) and (1) Tekconnect to BNC adapter (TCA-BNC)

Options

Instrument Options

Option	Description
Record Length Options for DPO70000B Series	
Opt. 2XL	20 MSamples/ch
Opt. 5XL	50 MSamples/ch
Opt. 10XL	100 MSamples/ch
Opt. 20XL*8	250 MSamples/ch
Record Length Options for DSA70000B Series	
Opt. 5XL	50 MSamples/ch
Opt. 10XL	100 MSamples/ch
Opt. 20XL*8	250 MSamples/ch
Software Options for DPO70000B Series	
Opt. ASM	Advanced Event Search and Mark
Opt. MTH	Mask testing for Serial Standards up to 4.25 Gbps. Includes hardware clock recovery.
Opt. PTH	Protocol Triggering and Decoding for 8b/10b-encoded Serial Signals up to 3.125 Gbps. Includes hardware clock recovery and pattern lock triggering.
Opt. PTU	Protocol Triggering and Decoding for 8b/10b-encoded Serial Signals up to 5 Gbps.
Software Options for DSA70000B Series	
Opt. STU	Protocol Triggering and Decoding for 8b/10b-encoded Serial Signals up to 5 Gbps.
Software Options for DPO70000B Series and DSA70000B Series	
Opt. DDRA*9	DDR Memory Bus Analysis
Opt. DJA	DPOJET Jitter and Eye Diagram Analysis
Opt. DSPT*11	DisplayPort Compliance Test Solution
Opt. DVI	DVI Compliance Test Solution
Opt. ET3*2	Ethernet Compliance Test Software
Opt. FBD*5	FB-DIMM Compliance Module for RT-Eye Serial Data Compliance and Analysis Software
Opt. HT3	HDMI Compliance Test Software
Opt. IBA*5	InfiniBand Compliance Module for RT-Eye Serial Data Compliance and Analysis Software
Opt. LT	Waveform Limit Testing
Opt. PCE*15	PCI Express™ Analysis Software
Opt. PWR*4	Power Measurement and Analysis Software
Opt. RTE	Serial Data Compliance and Analysis Software
Opt. SLA	Serial Data Link Analysis Advanced (with Equalization)
Opt. SLE	Serial Data Link Analysis Essentials (no Equalization)
Opt. SST*5	SATA and SAS Analysis Software Module for RT-Eye Serial Data Compliance and Analysis Software
Opt. SVE	SignalVu™ Essentials – Vector Signal Analysis Software
Opt. SVM*10	General Purpose Modulation Analysis. Requires option SVE
Opt. SVP*10	Advanced Signal Analysis (including pulse measurements). Requires option SVE
Opt. USB*3	USB 2.0 Compliance Test Software only
Opt UWB	Ultra-Wideband Spectral Analysis (includes WiMedia Alliance PHY interf. testing)

Option	Description
Opt UWBE	Ultra-Wideband Spectral Analysis Essentials

*2 Requires Ethernet Test Fixture.

*3 Requires TDSUSBF (USB Test Fixture).

*4 At least Opt. 2XL and a TCA-1MEG TekConnect 1 MΩ buffer amplifier are recommended for use.

*5 Requires Opt. RTE on DPO70000B Series.

*8 For models of bandwidth ≥ 12.5 GHz only.

*9 Requires DJA and ASM.

*10 Requires Opt. SVE, SVEH, or SVEU.

*11 For models of bandwidth ≥ 8 GHz only.

*15 Requires Opt. RTE or Opt. DJA on DPO70000B Series

User Manual Options

Option	Description
Opt. L0	English
Opt. L1	French
Opt. L3	German
Opt. L5	Japanese
Opt. L7	Simple Chinese
Opt. L8	Standard Chinese
Opt. L9	Korean
Opt. L10	Russian
Opt. L99	No manual

Power Plug Options

Option	Description
Opt. A0	North America
Opt. A1	Universal European Union
Opt. A2	UK
Opt. A3	Australia
Opt. A5	Switzerland
Opt. A6	Japan
Opt. A10	China
Opt. A11	India
Opt. A99	No power cord

Service Options

Option	Description
Opt. CA1	Provides a single calibration event or coverage for the designated calibration interval, whichever comes first
Opt. C3	Calibration Service 3 Years
Opt. C5	Calibration Service 5 Years
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. R3	Repair Service 3 Years
Opt. R5	Repair Service 5 Years

Recommended Accessories

Probes

Probe	Description
P7520	20 GHz TriMode™ probe
P7516	16 GHz TriMode™ probe
P7513A	13 GHz TriMode™ probe
P7313SMA	13 GHz TekConnect® differential SMA probe
P7508	8 GHz TriMode™ probe
P7380SMA	8 GHz TekConnect® differential SMA probe
P7506	6 GHz TriMode™ probe
P7504	4 GHz TriMode™ probe
P6251	DC to 1 GHz, 42V, Differential Probe (requires TCA-BNC adapter)
P6250	DC to 500 MHz, 42V, Differential Probe (requires TCA-BNC adapter)
TCPA300/TCPA400	Series current measurement systems
P5200/P5205/P5210	High-voltage differential probes

Adapters

Adapter	Description
TCA-1MEG	TekConnect high-impedance buffer amplifier. Includes P6139A passive probe
TCA-292MM	TekConnect to 2.92 mm connectors
TCA-BNC	TekConnect-to-BNC adapter
TCA-N	TekConnect-to-N adapter
TCA-SMA	TekConnect-to-SMA adapter
TCA75	8 GHz precision TekConnect 75 Ω to 50 Ω adapter with 75 Ω BNC input connector

Cables

Cable	Order
Centronics Cable	012-1214-00
GPIB Cable (1 m)	012-0991-01
GPIB Cable (2 m)	012-0991-00
RS-232 Cable	012-1298-00

Accessories

Accessory	Order
Ethernet Test Fixture	Order through Crescent Heart Software (http://www.c-h-s.com)
Instrumented DIMM for DDR3	Order Scope NEXVu card for UDIMM Raw Card E. (Contact http://www.nexustechnology.com)
Oscilloscope Cart	K4000
Probe Calibration and Deskew Fixture (4 GHz)	067-0484-xx
Probe Deskew Fixture (>4 GHz)	067-1586-xx
Power Deskew Fixture	067-1686-xx
Rackmount Kit	016-1985-00
Service Manual	071-1740-xx
TDSUSBF	Test fixture for use with Opt. USB
Transit Case	016-1977-00

www.valuetronics.com

Instrument Upgrades

To upgrade your DPO70000B Series Oscilloscope or your DSA70000B Series Serial Analyzer, order DPO7UP and option as noted.

Option	Description
To upgrade record length on DPO70000B Series from:	
XL02	Standard configuration to Opt. 2XL configuration
XL25	Opt. 2XL configuration to Opt. 5XL configuration
XL210	Opt. 2XL configuration to Opt. 10XL configuration
XL220*8	Opt. 2XL configuration to Opt. 20XL configuration (only available on instruments of bandwidth >= 12.5 GHz)
To upgrade record length from standard configuration to:	
XL05	Opt. 5XL configuration
XL010	Opt. 10XL configuration
XL020*8	Opt. 20XL configuration (only available on instruments of bandwidth >= 12.5 GHz)
To upgrade record length on DPO70000B Series or DSA70000B Series from:	
XL510	Opt. 5XL configuration to Opt. 10XL configuration
XL520*8	Opt. 5XL configuration to Opt. 20XL configuration (only available on instruments of bandwidth >= 12.5 GHz)
XL1020*8	Opt. 10XL configuration to Opt. 20XL configuration (only available on instruments of bandwidth >= 12.5 GHz)
To upgrade bandwidth on DPO70000B Series or DSA70000B Series from:	
BWU4T6	4 GHz to 6 GHz configuration
BWU4T8	4 GHz to 8 GHz configuration
BWU4T12	4 GHz to 12.5 GHz configuration
BWU4T16	4 GHz to 16 GHz configuration
BWU4T20	4 GHz to 20 GHz configuration
BWU6T8	6 GHz to 8 GHz configuration
BWU6T12	6 GHz to 12.5 GHz configuration
BWU6T16	6 GHz to 16 GHz configuration
BWU6T20	6 GHz to 20 GHz configuration
BWU8T12	8 GHz to 12.5 GHz configuration
BWU8T16	8 GHz to 16 GHz configuration
BWU8T20	8 GHz to 20 GHz configuration
BWU12T16	12.5 GHz to 16 GHz configuration
BWU12T20	12.5 GHz to 20 GHz configuration
BWU16T20	16 GHz to 20 GHz configuration
To upgrade:	
ASM	DPO70000B with Opt. ASM
MTH	DPO70000B with Opt. MTH
PTH	DPO70000B with Opt. PTH
DJAH	DPO70404B, 70604B, 70804B with Opt. DJA
DJAU	DPO71254B, 71604B, 72004B with Opt. DJA

To upgrade DPO70000B Series or DSA70000B Series with:	
CP2*6	TDSCPM2 ANSI/ITU Telecom pulse compliance testing software (requires Opt. MTH on DPO70000B Series)
DDRA*9	Opt. DDRA
DVI	Opt. DVI
EQ*13	From Opt SLE to Opt. SLA
ET3	Opt. ET3
FBD*5	Opt. FBD
HT3	Opt. HT3
IBA*5	Opt. IBA
J2	TDSDDM2 disk-drive analysis software
LT	Opt. LT
PCE*15	Opt. PCE
PWR	Opt. PWR
SLA	Opt. SLA
SLE	Opt. SLE
SST*5	Opt. SST
SVEH*11	Opt. SVE
SVEU*12	Opt. SVE
SVM*10	Opt. SVM
SVP*10	Opt. SVP
USB	Opt. USB
UWB	Opt. UWB
UWBE	Opt. UWBE
VNM*7	TDSVNM CAN and LIN Timing and Protocol Decode (no CAN triggering included)

*5 Requires Opt. RTE on DPO70000B Series.

*6 Requires Opt. MTH on DPO70000B Series

*7 Requires ATM1 CAN/LIN trigger module - Order through Crescent Heart Software

*8 For models of bandwidth ≥ 12.5 GHz only

*9 Requires DJA and ASM

*10 Requires Opt. SVE, SVEH, or SVEU

*11 DPO/DSA70404B, DPO/DSA70604B, DPO/DSA70804B only

*12 DPO/DSA71254B, DPO/DSA71604B, DPO/DSA72004B only

*13 Request Opt. SLE

*15 Requires Opt. RTE or Opt. DJA on DPO70000B Series

CE

ISO 9001   Product(s) are manufactured in ISO registered facilities.

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Data Sheet

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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