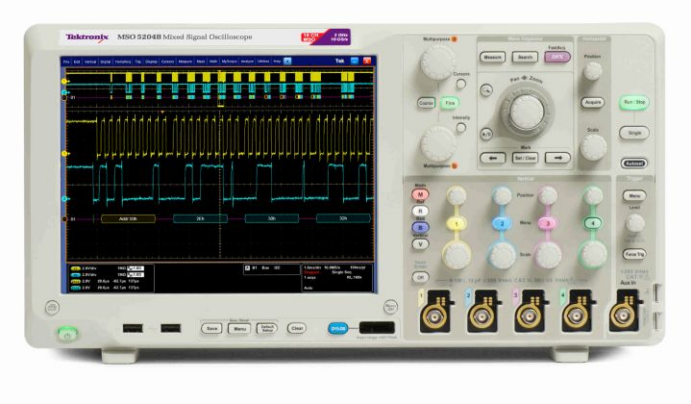
Mixed Signal Oscilloscopes

MSO5000B, DPO5000B Series Datasheet



Designing with today's faster data rates and tighter timing margins requires an oscilloscope with outstanding signal acquisition performance and analysis capabilities. Tektronix MSO/DPO5000B Series oscilloscopes provide exceptional signal fidelity, with 2 GHz bandwidth and 10 GS/s sample rate, along with advanced analysis and math capabilities, on your bench and in your lab. Run Windows®-based analysis software right on the oscilloscope. Point and click Visual Triggers enable you to capture complex signals with ease. MSO models include 16 digital timing channels, and all models can be equipped to decode common serial protocols, providing a comprehensive view of your systems.

Key performance specifications

- 2 GHz, 1 GHz, 500 MHz, and 350 MHz bandwidth models
- Up to 10 GS/s real-time sample rate on one or two channels and up to 5 GS/s on all four channels
- Up to 250 megapoint record length with MultiView zoom™
- >250,000 wfms/s maximum waveform capture rate with FastAcq™ acquisition
- FastFrame™ segmented memory acquisition mode with up to 290,000 segments and >310,000 waveforms per second capture rate
- Standard 10 MΩ passive voltage probes with less than 4 pF capacitive loading and 500 MHz or 1 GHz analog bandwidth
- >11 bits vertical resolution using HiRes sampling
- User-selectable bandwidth limit and DSP filters for lower noise and better measurement accuracy

Key analysis features

- Wave inspector® controls provide easy navigation and automated search of waveform data
- Suite of advanced triggers, with standard Visual Trigger and Search
- 53 automated measurements, selectable filtering, waveform math and FFT analysis
- Waveform histogram, eye diagram, TIE (jitter/timing) measurement and analysis
- User-definable math using MATLAB, Visual Studio and Excel
- Optional analysis for memory, advanced jitter, serial data, power and Wideband RF

Key protocol features

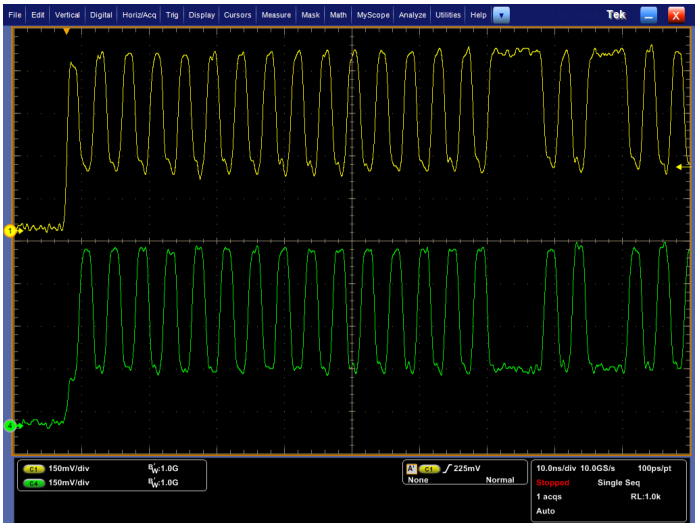
- Trigger and decode options for mid-speed (100 Mb/s to 1 Gb/s) buses
- Trigger and decode options for low-speed (<10 Mb/s) buses
- Compliance test options for USB2.0, Ethernet, USB power, MOST, BroadR-Reach
- Mask testing on communication, computing and video standards

Mixed signal design and analysis (MSO Series)

- 16 digital channels (user upgradeable)
- MagniVu™ high-speed acquisition provides 60.6 ps timing resolution on all digital channels
- Automated triggering, decode, and search on parallel buses
- Per-channel threshold settings

See the performance difference

With up to 2 GHz analog bandwidth and sampling rates up to 10 GS/s, the MSO/DPO5000B series ensures you have the performance you need to capture waveforms with the best possible signal fidelity and resolution for seeing small waveform details.



Performance - With up to 2 GHz bandwidth and 10 GS/s sample rate capture USB2.0 480 Mb/s differential signals with true fidelity and 100 ps resolution.

Accurate high-speed probing

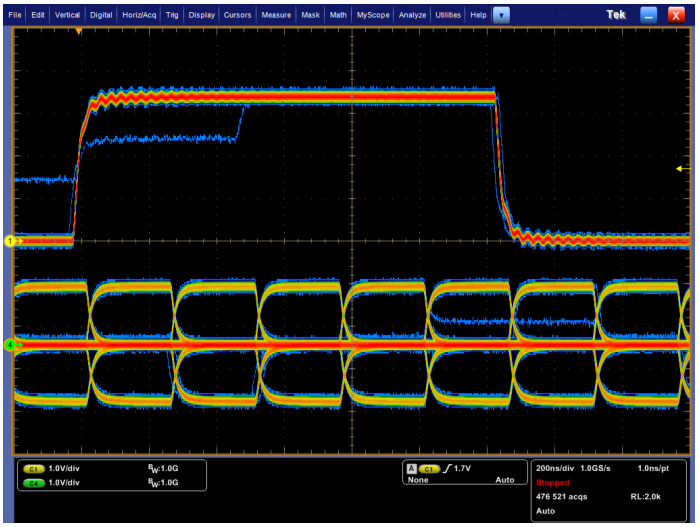
The TPP Series probes, included standard with every MSO/DPO5000B Series oscilloscope, provide up to 1 GHz of analog bandwidth, and less than 4 pF of capacitive loading. The extremely low capacitive loading minimizes adverse effects on your circuits and is more forgiving of longer ground leads. And with the probe's wide bandwidth, you can see the high frequency components in your signal, which is critical for high-speed applications. The TPP Series passive voltage probes offer all the benefits of general-purpose probes like high dynamic range, flexible connection options, and robust mechanical design, while providing the performance of active probes.



Probing - Up to 1 GHz bandwidth and less than 4 pF capacitive loading provides active probe performance and superior performance over passive probes included with other mid-range oscilloscopes.

Fast discovery

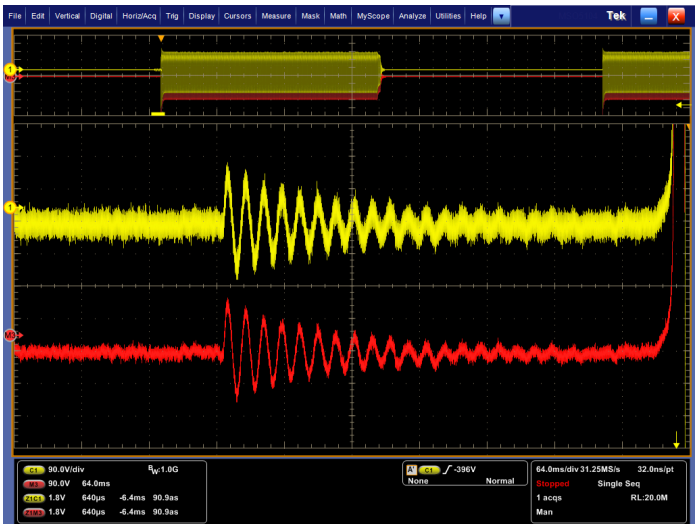
To debug a design problem, first you must know it exists. Every design engineer spends time looking for problems in their design, a time-consuming and difficult task without the right debug tools. The MSO/DPO5000B Series offers the industry's most complete performance to capture and isolate events, providing fast insight into the real operation of your device. Tektronix proprietary FastAcq™ technology delivers a fast waveform capture - greater than 250,000 waveforms per second - that enables you to see glitches and other infrequent transients within seconds, revealing the true nature of device faults. A digital phosphor display with color intensity grading shows the history of a signal's activity by using color to identify areas of the signal that occur more frequently, providing a visual display of just how often anomalies occur across all channels.



Discover – fast waveform capture rate - over 250,000 wfm/s - maximizes the probability of capturing elusive glitches and other infrequent events.

High vertical resolution

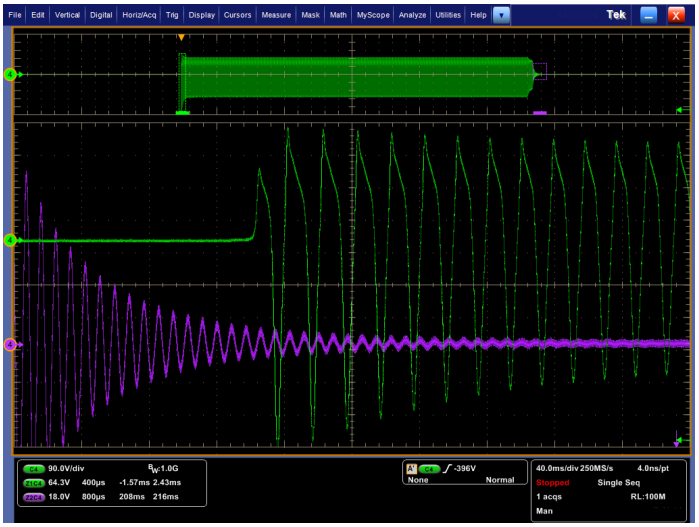
If the measurement requirement is to capture high-amplitude signals while seeing smaller signal details the MSO/DPO5000B provides the acquisition flexibility needed to capture the signals of interest while removing the effects of unwanted noise. With HiRes acquisition vertical resolution can be increased to over 11 bits while reducing signal noise. Signal fidelity can be further increased by using channel input filters or applying a wide choice of DSP filters.



Capture - HiRes acquisition - increased vertical resolution to >11 bits while removing noise on a 650 V Pk-Pk signal while seeing the smaller details of less than 1 V Pk-Pk with or without apply low-pass filtering.

Long record length

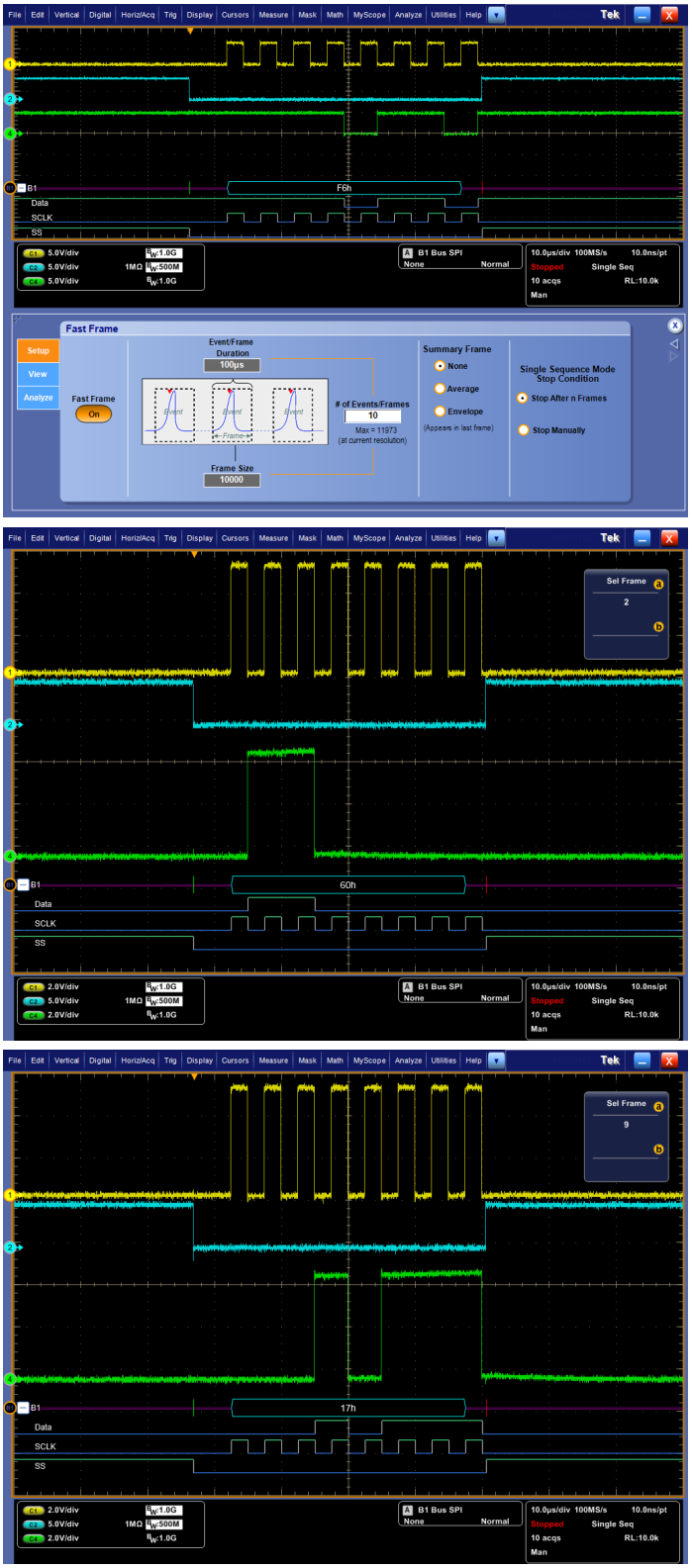
With up to a 250 M point record length, you can capture many events of interest, even thousands of serial packets, in a single acquisition for further analysis while maintaining high resolution to zoom in on fine signal details. For complex analysis like Time Interval Error (TIE) measurements the longer record length ensures you have enough data captured for handling clock recovery and creating jitter profiles. Unlike other oscilloscopes in its class, the MSO/DPO5000B provides flexible setup of both record length and sampling rate to ensure optimum resolution.



Capture - 100 Meg point acquisition with HiRes acquisition - increase vertical resolution to >11 bits with dual zoom of waveform details.

Segmented memory

For more efficient data capture, partitioning of memory can extend the total time captured. FastFrame™ Segmented Memory mode enables you to select up to 290,000 memory segments with a trigger capture rate of over 310,000 triggers per second. Beyond memory flexibility, segments are time stamped and can be viewed individually or as an overlay and analyzed using advanced features like protocol decoding.



FastFrame™ - User selectable memory segments allow for efficient memory management with time stamped capture of SPI bus data along with analysis of serial bus decoding on multiple data packets. Frames 1, 2, and 9 are shown here.

Mixed signal design and analysis (MSO Series)

The MSO5000B Series mixed-signal oscilloscopes provide 16 digital channels. These channels are tightly integrated into the oscilloscope's user interface, simplifying operation and making it possible to solve mixed-signal issues easily. MSO functionality can also be added later as a user upgrade.

Color-coded digital waveform display

The MSO5000B Series has redefined the way you view digital waveforms. One common problem with other mixed-signal oscilloscopes is determining if data is a one or a zero when zoomed in far enough that the digital trace stays flat all the way across the display. To avoid this problem, the MSO5000B Series has color-coded digital traces, displaying ones in green and zeros in blue.

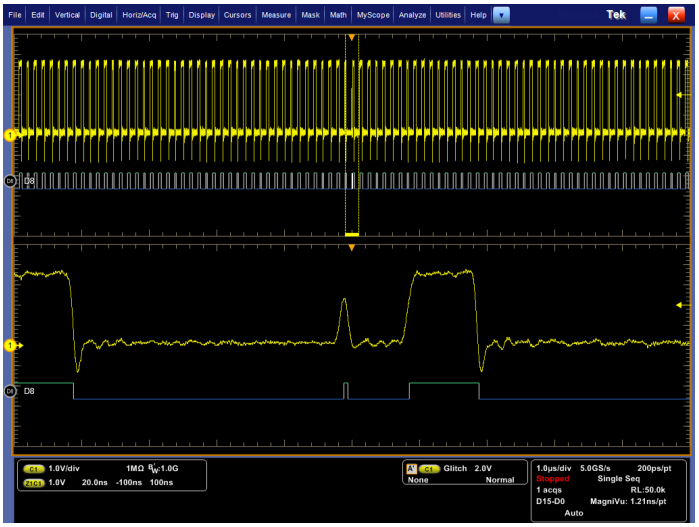


With the color-coded digital waveform display, low values are shown in blue and high values are shown in green, enabling instant understanding of the bus value whether transitions are visible or not.

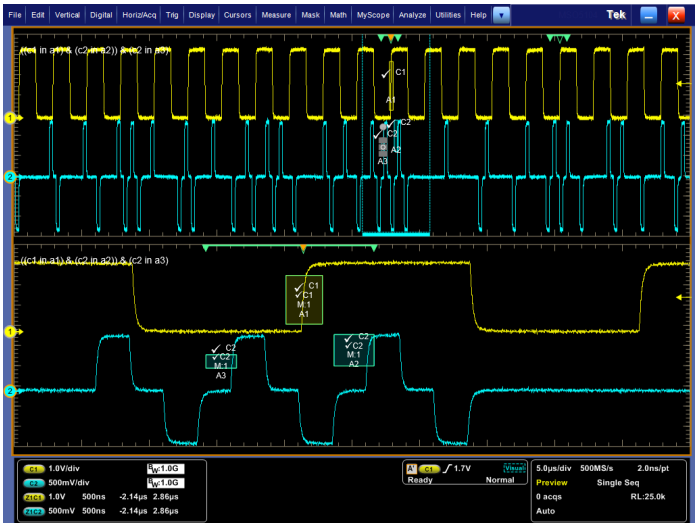
The multiple transition detection hardware of the MSO5000B Series will show you when the system detects more than one transition. This indicates that more information is available by zooming in or acquiring at faster sampling rates. In most cases zooming in will reveal a glitch that was not viewable with the previous settings.

MagniVu™ high-speed acquisition

The main digital acquisition mode on the MSO5000B Series will capture up to 40 M points at 500 MS/s (2 ns resolution). In addition to the main record, the MSO5000B provides an ultra high-resolution record called MagniVu which acquires 10,000 points at up to 16.5 GS/s (60.6 ps resolution). Both the main and MagniVu waveforms are acquired on every trigger and either can be displayed at any time, running or stopped. MagniVu provides significantly finer timing resolution than comparable mixed-signal oscilloscopes on the market, instilling confidence when making critical timing measurements on digital waveforms.



The MagniVu high-resolution record provides 60.6 ps timing resolution, enabling you to make critical timing measurements on your digital waveforms.



Visual Trigger- Capture signals on two channels with Visual triggering with multiple defined areas and markers showing repeat occurrences.

Versatile trigger and search

Discovering a device fault is only the first step. Next, you must capture the event of interest to identify root cause The MSO/DPO5000B Series provides a complete set of triggers - including runt, glitch, width, timeout, transition, pattern, state, setup/hold violation, serial packet, and parallel data - to help quickly find your event.

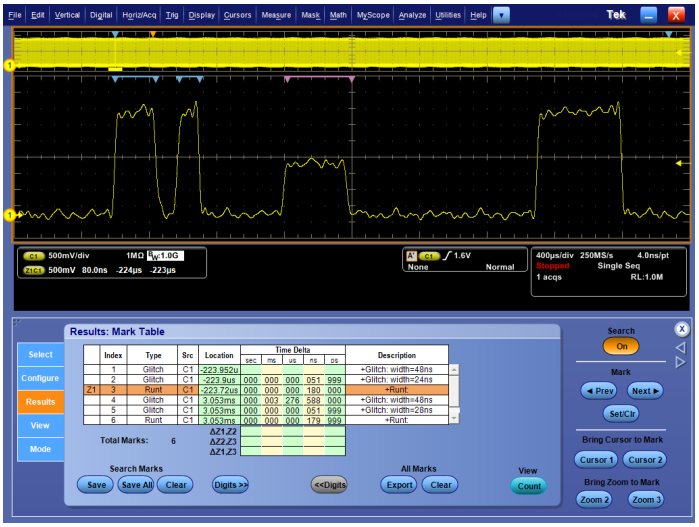
Visual trigger

Finding the right characteristic of a complex signal can require hours of collecting and sorting through thousands of acquisitions for the event of interest. Defining a trigger that isolates the desired event and shows data only when the event occurs speeds up this process. Visual Trigger and Search makes the identification of the desired waveform events quick and easy by scanning through all waveform acquisitions and comparing them to on-screen areas (geometric shapes). Areas can be created using a variety of shapes including triangles, rectangles, hexagons, trapezoids, and user-specified shapes to fit the area to the particular trigger behavior desired. Set up to eight areas and condition based on Boolean logic conditions.

Navigation and search

Finding your event of interest in a long waveform record can be time consuming without the right search tools. With today's record lengths pushing beyond a million data points, locating your event can mean scrolling through thousands of screens of signal activity.

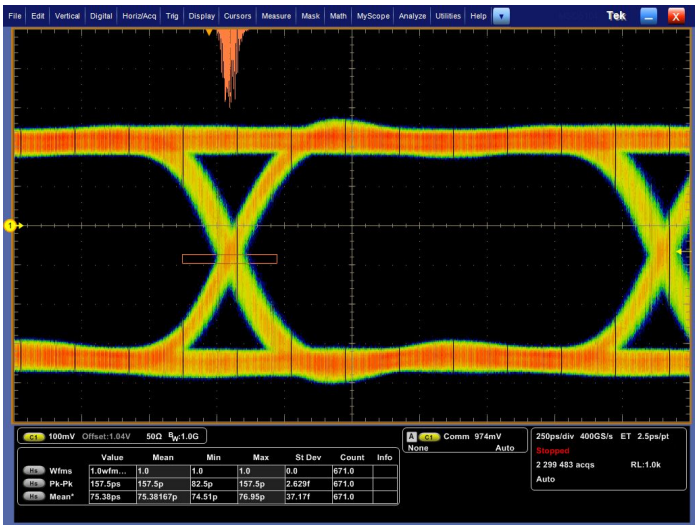
The MSO/DPO5000B Series offers the industry's most comprehensive search and waveform navigation with its innovative Wave Inspector® controls. These controls speed panning and zooming through your record. With a unique force-feedback system, you can move from one end of your record to the other in just seconds. User marks allow you to mark any location that you may want to reference later for further investigation. Or, automatically search your record for criteria you define. Wave Inspector will instantly search your entire record, including analog, digital, and bus data. Along the way it will automatically mark every occurrence of your defined event so you can quickly move between events. The standard Advanced Search and Mark capability of the MSO/DPO5000B Series can even search for up to eight different events simultaneously and stop a live acquisition when it finds an event of interest, saving even more time.



Search - Results of an advanced search for a runt pulse or a narrow glitch within a long waveform record.

Comprehensive analysis

Verifying that your prototype's performance matches simulations and meets the project's design goals requires analyzing its behavior. Tasks can range from simple checks of rise times and pulse widths to sophisticated power loss analysis, characterization of system clocks, and investigation of noise sources. The MSO/DPO5000B Series offers a comprehensive set of integrated analysis tools including waveform- and screen-based cursors, 53 automated measurements, advanced waveform math including arbitrary equation editing, waveform histograms, and FFT analysis.

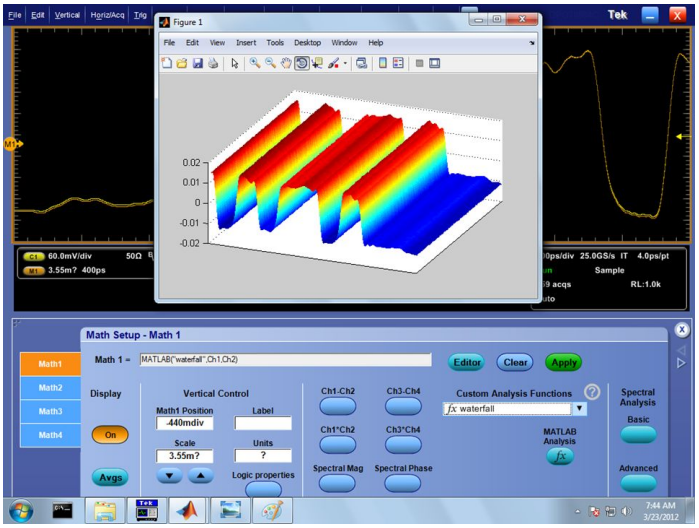


Analyze - Waveform histogram of the rising and falling edge of a 622 Mb/s signal showing the distribution of edge position (jitter) over time. Included are numeric measurements made on the waveform histogram data.

The standard limit test package enables long-term signal monitoring, characterizing signals during design, and production line testing. Limit test compares a tested signal to a known good or "golden" version of the same signal with user-defined vertical and horizontal tolerances. You can tailor a limit test to your specific requirements by defining test duration in a number of waveforms, setting a violation threshold that must be met before considering a test a failure, counting hits with statistical information, and setting actions upon violations, test failure, and test complete.

Custom analysis

When signal analysis needs extend beyond the standard or optional analysis features, the Windows 7 based MSO/DPO5000B series has the flexibility to support custom analysis. Apply your custom algorithms using custom MATLAB and .NET math plug-ins for analysis functions that are integrated in the oscilloscope user interface for more seamless operation.



Custom analysis - Waterfall display generated from oscilloscope data using MATLAB.

Jitter analysis

Every MSO/DPO5000B Series oscilloscope includes the DPOJET Essentials jitter and eye pattern analysis software package, extending the oscilloscope's measurement capabilities to take measurements over contiguous clock and data cycles in a single-shot real-time acquisition. This enables measurement of key jitter and timing analysis parameters such as Time Interval Error and Phase Noise to help characterize possible system timing issues. Analysis tools such as plots for time trends and histograms quickly show how timing parameters change over time, and spectrum analysis quickly shows the precise frequency and amplitude of jitter and modulation sources.

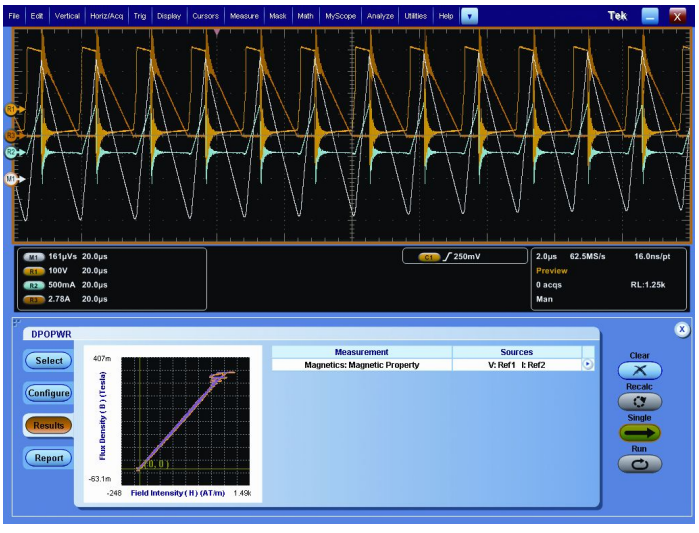


Jitter analysis - TIE jitter/timing analysis of 622 Mb/s signal

Extend jitter/timing analysis with the optional DPOJET Advanced software package (Option DJA). DPOJET Advanced adds advanced tools such as Rj/Dj separation, eye diagram masks, and Pass/Fail limits for conformance testing. DPOJET Advanced is also a measurement framework that works with standards-specific compliance test packages for applications such as DDR memory and USB.

Power analysis (optional)

The optional power analysis software package (Option PWR) enables quick and accurate analysis of power quality, switching loss, harmonics, magnetic measurements, safe operating area (SOA), modulation, ripple, and slew rate (di/dt, dv/dt). Automated, repeatable power measurements are available with a touch of a button; no external PC or complex software setup is required. The package includes a report generation tool to create customizable, detailed reports to document your measurement results.



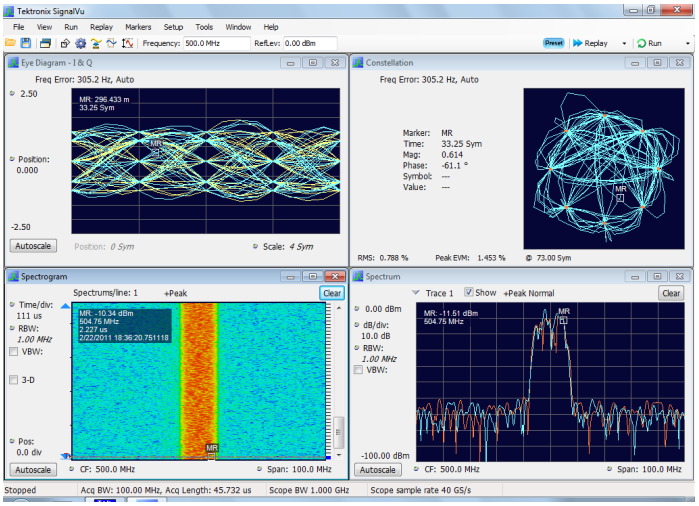
Power- B-H plot.

DDR memory bus analysis (optional)

The optional DDR memory analysis software package (Option DDRA) automatically identifies DDR1, DDR2, LP-DDR, and LP-DDR2 Reads and Writes and makes JEDEC conformance measurements with Pass/Fail results on all edges in every Read and Write burst, perfect for debugging and troubleshooting DDR memory buses. Also provided are common measurements of clock, address, and control signals. Used with DPOJET (Option DJA), Option DDRA is the fastest way to debug complex memory signaling issues.

Vector signal analysis (optional)

The optional SignalVu™ vector signal analysis package (Option SVE) easily validates wideband designs and characterizes wideband spectral events. By combining the signal analysis engine of Tektronix real-time spectrum analyzers with the wide bandwidth acquisition of Tektronix digital oscilloscopes, you can now evaluate complex baseband signals directly on your oscilloscope. You get the functionality of a vector signal analyzer, a spectrum analyzer, and the powerful trigger capabilities of a digital oscilloscope - all in a single package. Whether your design validation needs include wideband radar, high data-rate satellite links, or frequency hopping communications, SignalVu™ vector signal analysis software can speed your time-to-insight by showing you time-variant behavior of these wideband signals.



SignalVu™ enables detailed analysis in multiple domains.

Protocol triggering and analysis (optional)

On a serial bus, a single signal often includes address, control, data, and clock information. This can make isolating events of interest difficult. The MSO/DPO5000B Series offers a robust set of tools for debugging serial buses with automatic trigger and decode on I^2C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, Ethernet, and USB 2.0, and decode for HSIC, 8b/10b, PCI Express, and MIPI D-PHY DSI-1 and CSI-2 serial buses.



Triggering on a USB full-speed serial bus. A bus waveform provides decoded packet content including Start, Sync, PID, Address, End Point, CRC, Data values, and Stop.

Serial triggering

Trigger on packet content such as start of packet, specific addresses, specific data content, unique identifiers, etc. on popular serial interfaces such as I^2C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, Ethernet, and USB 2.0.

Bus display

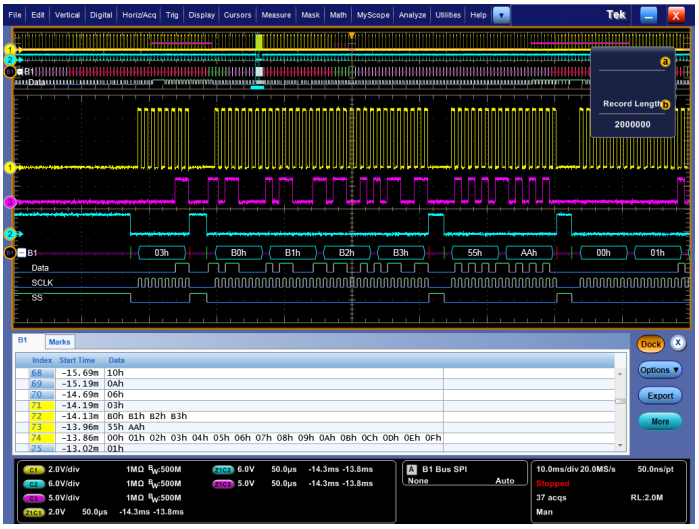
Provides a higher-level, combined view of the individual signals (clock, data, chip enable, etc.) that make up your bus, making it easy to identify where packets begin and end and identifying subpacket components such as address, data, identifier, CRC, etc.

Bus decoding

Tired of having to visually inspect the waveform to count clocks, determine if each bit is a 1 or a 0, combine bits into bytes, and determine the hex value? Let the oscilloscope do it for you! Once you've set up a bus, the MSO/DPO5000B Series will decode each packet on the bus, and display the value in hex, binary, decimal (USB only) or ASCII (USB and RS-232/422/485/UART only) in the bus waveform.

Event table display

In addition to seeing decoded packet data on the bus waveform itself, you can view all captured packets in a tabular view much like you would see in a software listing. Packets are time stamped and listed consecutively with columns for each component (Address, Data, etc.).

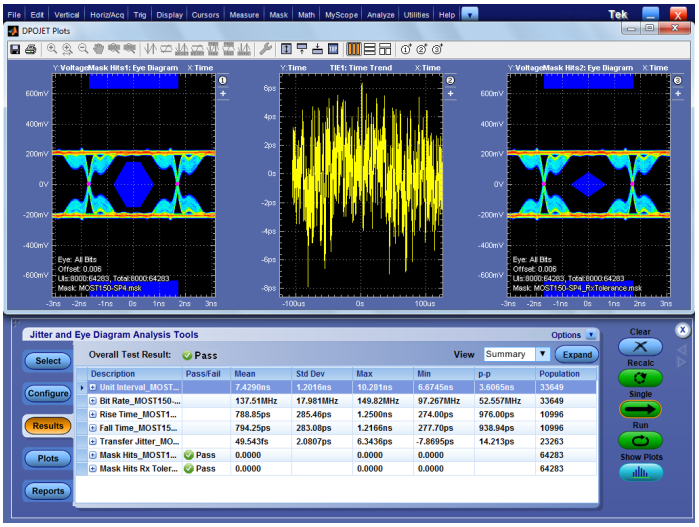


Event table showing decoded SPI serial packet data with bus timing waveform for a long acquisition.

Compliance testing

Serial bus compliance test (optional)

Software packages for automated compliance test are available for Ethernet 10BASE-T, 10BASE-Te, 100BASE-TX, and 1000BASE-T (Option ET3), MOST50 and MOST150 electrical (Option MOST), BroadR-Reach (Option BRR), and USB 2.0 (Option USB) physical-layer devices. These software packages enable you to conduct testing using the standard's specified compliance tests.



Mask testing

The optional mask test (Option MTM) software package is useful for long-term signal monitoring, characterizing signals during design, and production line testing. The mask test software includes a robust set of masks for telecommunications and computer standards for easily checking compliance to a standard. Additionally, custom masks can be created and used for characterizing signals. With mask testing you can tailor a test to your specific requirements by defining test duration in a number of waveforms, setting a violation threshold that must be met before considering a test a failure, counting hits with statistical information, and setting actions upon violations, test failure, and test complete.

Designed to make your work easier

Large, high-resolution touchscreen display

The MSO/DPO5000B Series features a 10.4 in. (264 mm) XGA color display with an integrated touch screen for seeing intricate signal details.



High resolution display quality with touch screen, mouse and stylus operation.

Dedicated front panel controls

Per-channel vertical controls provide simple and intuitive operation. No longer do you need to share one set of vertical controls across all four channels.

Floating licenses

Floating licenses offer an alternative method to manage your Tektronix asset. Floating licenses allow license-key enabled options to be easily moved among all your MSO/DPO5000, DPO7000, and DPO/DSA/MSO70000 Series of Tektronix oscilloscopes. Floating licenses are available for many license-key enabled options. To order a floating version of an option license add “DPOFL-“ prefix to the option name. (e.g. DPOFL-ET3)

Check www.tektronix.com for additional information about floating license options.

Easy data storage

Two USB 2.0 host ports on the front panel enable easy transfer of screenshots, instrument settings, and waveform data to a USB flash drive.

The rear panel contains four additional USB 2.0 host ports and a USB device port for controlling the oscilloscope remotely from a PC or for connecting USB peripherals. An integrated 10/100/1000BASE-T Ethernet port enables easy connection to networks and a Video Out port to drive an external monitor or projector. A standard ≥ 480 GB removable solid state disk drive makes customizing settings for different users easy and enables use in secure environments.

Connectivity and remote operation

There are many ways to connect to your MSO/DPO5000B Series oscilloscope to conduct extended analysis. The first makes use of the Windows Remote Desktop capability – connect directly to your oscilloscope and operate the user interface remotely through the built-in Remote Desktop. A second way to connect is through Tektronix OpenChoice® software which makes use of the fast embedded bus, transferring waveform data directly from acquisition to analysis applications on the Windows desktop at much faster speeds than conventional GPIB transfers.

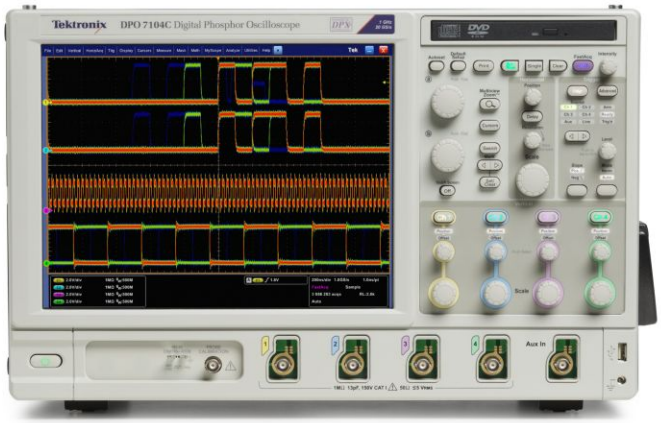
Industry-standard protocols, such as TekVISA™ interface and ActiveX controls are included for using and enhancing Windows applications for data analysis and documentation. IVI-COM instrument drivers are included to enable easy communication with the oscilloscope using GPIB, serial data, and LAN connections 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). Microsoft® Excel and Word toolbars are included to simplify data capture and transfer directly to these programs running on the Windows desktop.

Tektronix Mid-range Oscilloscopes

Need more performance or have other application needs? Consider the MDO/MSO/DPO4000 series or the DPO7000 series.

For more performance, the DPO7000C series offers:

- 500 MHz to 3.5 GHz bandwidth
- Up to 40 GS/s sampling rate
- Up to 500 M point record length
- 1 % accuracy
- More analysis and compliance support for higher data rates
- Microsoft Windows 7



For mixed-domain analysis or greater portability, the MDO/MSO/DPO4000B series offers:

- 100 MHz to 1 GHz bandwidth
- Up to 5 GS/s sampling
- Up to 20 M point record length
- Serial data trigger and decode
- Built-in 3 GHz or 6 GHz spectrum analyzer (MDO models)
- 2 or 4 analog channels and 16 digital channels (MSO and MDO models)



Specifications

All specifications apply to all models unless noted otherwise.

Model overview

		MSO5034B DPO5034B	MSO5054B DPO5054B	MSO5104B DPO5104B	MSO5204B DPO5204B
Input Channels		4			
Bandwidth		350 MHz	500 MHz	1 GHz	2 GHz
Rise Time (Calculated)		1 ns	700 ps	350 ps	175 ps
DC Gain Accuracy		±1.5%, derated at 0.10%/°C above 30 °C			
Bandwidth Limits		Depending on instrument model: 1 GHz, 500 MHz, 350 MHz, 250 MHz, and 20 MHz			
Effective Number of Bits (Typical)		6 bits (10 division$_{p-p}$ sine wave input at instrument bandwidth, 100 mV/div, 50 Ω Input Impedance, maximum sample rate, 1 k point record length)			
Random Noise (RMS, typical, sample mode, full BW)					
	1 MΩ	≤(130 µV + 8.0% of V/div setting)	≤(130 µV + 8.0% of V/div setting)	≤(150 µV + 8.0% of V/div setting)	≤(180 µV + 8.0% of V/div setting)
	50 Ω	≤(130 µV + 8.0% of V/div setting)	≤(130 µV + 8.0% of V/div setting)	≤(75 µV + 6.0% of V/div setting)	≤(150 µV + 6.0% of V/div setting)
Maximum Sample Rate (All channels)		5 GS/s	5 GS/s	5 GS/s	5 GS/s
Maximum Sample Rate (1 or 2 channels)		–	–	10 GS/s	10 GS/s
Maximum Equivalent Time Sampling Rate		400 GS/s			
Maximum Record Length with Standard Configuration		25 M		25 M (4 ch) 50 M (1 or 2 ch)	
Maximum Record Length with Option 5RL		50 M		50 M (4 ch) 125 M (1 or 2 ch)	
Maximum Record Length with Option 10RL		125 M		125 M (4 ch) 250 M (1 or 2 ch)	

Vertical system analog channels

Input coupling	AC, DC
Input resistance	1 MΩ ±1%, 50 Ω ±1%
Input sensitivity range	1 MΩ: 1 mV/div to 10 V/div 50 Ω: 1 mV/div to 1 V/div
Vertical resolution	8 bits (>11 bits with Hi Res)
Maximum input voltage, 1 MΩ	300 V_{RMS} CAT II, with peaks ≤ ±425 V For <100 mV/div derate at 20 dB/decade above 100 kHz to 30 V_{RMS} at 1 MHz, 10 dB/decade above 1 MHz For ≥100 mV/div derate at 20 dB/decade above 3 MHz to 30 V_{RMS} at 30 MHz, 10 dB/decade above 30 MHz
Maximum input voltage, 50 Ω	5 V_{RMS}, with peaks ≤ ±20 V
Position range	±5 divisions

Vertical system analog channels

Delay between any Two Channels (Typical)	≤100 ps (50 Ω, DC coupling and equal V/div at or above 10 mV/div)
Offset range	
1 mV/div - 50 mV/div	1 MΩ: ±1 V
	50 Ω: ±1 V
50.5 mV/div - 99.5 mV/div	1 MΩ: ±0.5 V
	50 Ω: ±0.5 V
100 mV/div - 500 mV/div	1 MΩ: ±10 V
	50 Ω: ±10 V
505 mV/div - 995 mV/div	1 MΩ: ±5 V
	50 Ω: ±5 V
1 V/div - 5 V/div	1 MΩ: ±100 V
	50 Ω: ±5 V
5.05 V/div - 10 V/div	1 MΩ: ±50 V
	50 Ω: NA
Offset Accuracy	±(0.005 × |offset – position| + DC Balance)
	Note: Both position and constant offset term must be converted to volts by multiplying by the appropriate volts/div term
Channel-to-channel isolation (Any two channels at equal vertical scale settings) (typical)	≥100:1 at ≤100 MHz and ≥30:1 at >100 MHz up to the rated BW

Vertical system digital channels

Input Channels	16 Digital (D15 - D0)
Thresholds	Per-channel Thresholds
Threshold Selections	TTL, ECL, User
User-defined Threshold Range	±40 V
Threshold Accuracy	±(100 mV + 3% of threshold setting)
Maximum Input Voltage	±42 V_{peak}
Input Dynamic Range	30 V_{p-p} ≤200 MHz
	10 V_{p-p} >200 MHz
Minimum Voltage Swing	400 mV
Input Impedance	100 kΩ
Probe Loading	3 pF
Vertical Resolution	1 bit

Horizontal system analog channels

Maximum Duration at Highest Real-Time Sample Rate	25 ms
Time Base Range	12.5 ps/div to 1000 s/div
Time resolution (in ET/IT mode)	2.5 ps/div
Time base delay time range	–10 divisions to 1000 s
Channel-to-channel deskew range	±75 ns
Time base accuracy	±5 ppm over any ≥1 ms interval

Horizontal system digital channels

Maximum Sample Rate (Main)	500 MS/s (2 ns resolution)
Maximum record length (main)	25 M Standard Up to 40 M with Record Length options
Maximum sample rate (MagniVu)	16.5 GS/s (60.6 ps resolution)
Maximum record length (MagniVu)	10k points centered around the trigger
Minimum detectable pulse width	1 ns
Channel-to-channel skew (typical)	200 ps
Maximum input toggle rate	500 MHz at minimum input swing; higher toggle rates can be achieved at higher amplitudes

Trigger system

Main trigger modes	Auto, Normal, and Single
Trigger coupling	DC, AC, HF Rej (attenuates >50 kHz), LF Rej (attenuates <50 kHz), Noise Reject (reduces sensitivity)
Trigger holdoff range	250 ns to 8 s
Enhanced triggering	User-selectable; corrects the difference in timing between the trigger path and the acquired data (not available in FastAcq)
Trigger jitter	≤100 fs_{RMS} using Enhanced Trigger ≤10 ps_{RMS} without Enhanced Trigger and in Fast Acq mode ≤100 ps_{RMS} for non-Edge-type trigger modes
Trigger sensitivity	
Internal DC coupled	For 1 MΩ: 1 mV/div to 4.98 mV/div: 0.75 div from DC to 50MHz, increasing to 1.3 div at instrument bandwidth ≥5 mV/div: 0.40 div from DC to 50 MHz, increasing to 1 div at instrument bandwidth For 50 Ω (MSO5204, DPO5204, MSO5104, DPO5104): 0.40 div from DC to 50 MHz, increasing to 1 div at instrument bandwidth For 50 Ω (MSO5054, DPO5054, MSO5034, DPO5034): 1 mV/div to 4.98 mV/div: 0.75 div from DC to 50MHz, increasing to 1.3 div at instrument bandwidth ≥5 mV/div: 0.40 div from DC to 50 MHz, increasing to 1 div at instrument bandwidth
External (auxiliary input) 1 MΩ	200 mV from DC to 50 MHz, increasing to 500 mV at 250 MHz

Trigger system

Trigger level range

Any channel	±8 divisions from center of screen
External (auxiliary input)	±8 V
Line	Fixed at about 50% of line voltage

Trigger modes

Edge	Positive or negative slope on any channel or front-panel auxiliary input. Coupling includes DC, AC, HF reject, LF reject, and noise reject
Glitch	Trigger on or reject glitches of positive, negative, or either polarity. Programmable glitch width is 4 ns minimum to 8 s maximum
Runt	Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again
Width	Trigger on width of positive or negative pulse either within or outside selectable limits (4 ns to 8 s)
Timeout	Trigger on an event which remains high, low, or either, for a specified time period (4 ns to 8 s)
Transition	Trigger on pulse edge rates that are faster or slower than specified. Slope may be positive, negative, or either
Setup/Hold	Trigger on violations of both setup time and hold time between clock and data present on any two input channels
Pattern	Trigger when any logical pattern of signals goes false or stays true for specified period of time (4 ns to 1 s). Pattern (AND, OR, NAND, NOR) specified for all analog and digital input channels defined as High, Low, or Don't Care
Parallel Bus	Trigger on specified data value on defined parallel bus
State	Any logical pattern of analog channels and digital channels (MSO models) clocked by edge on another channel. Trigger on rising or falling clock edge
Video	Any logical pattern of analog channels and digital channels (MSO models) clocked by edge on another channel. Trigger on rising or falling clock edge
Trigger Sequences	Main, Delayed by Time, Delayed by Events. All sequences can include separate horizontal delay after the trigger event to position the acquisition window in time
A/B Sequence Event Trigger Types	Edge
Trigger Delay by Time	4 ns to 8 s
Trigger Delay by Events	1 to 4,000,000 events
Visual Trigger	Trigger on up to 8 user-specified areas, including rectangle, triangle, trapezoid, hexagon, and user-specified shapes on any of the analog channels
I^2C (Optional)	Provided as part of Opt. SR-EMBD. Trigger on Start, Repeated Start, Stop, Missing ACK, Address (7 or 10 bit), Data, or Address and Data on I^2C buses up to 10 Mb/s
SPI (Optional)	Provided as part of Opt. SR-EMBD. Trigger on Slave Select, Idle Time, or Data (1-16 words) on SPI buses up to 10 Mb/s
CAN (Optional)	Provided as part of Opt. SR-AUTO. Trigger on Start of Frame, Type of Frame (Data, Remote, Error, or Overload), Identifier, Data, Identifier and Data, EOF, Missing Ack, Bit Stuff Error, and CRC Error on CAN buses up to 1 Mb/s
LIN (Optional)	Provided as part of Opt. SR-AUTO. Trigger on Sync, Identifier, Data, Identifier and Data, Wakeup Frame, Sleep Frame, and Error on LIN buses up to 1 Mb/s
FlexRay (Optional)	Provided as part of Opt. SR-AUTO. Trigger on Indicator Bits (Normal, Payload, Null, Sync, Startup), Cycle Count, Header Fields (Indicator Bits, Identifier, Payload Length, Header CRC, and Cycle Count), Identifier, Data, Identifier and Data, End Of Frame, and Error on FlexRay buses up to 10 Mb/s
MIL-STD-1553 (Optional)	Provided as part of Opt. SR-AERO. Trigger on Sync, Command Word, Status Word, Data Word, Idle Time, and Error on MIL-STD-1553 buses up to 1 Mb/s
Ethernet (Optional)	Provided as part of Opt. SR-ENET. Trigger on Start of Packet, MAC Address, MAC Q-tag, MAC Length/Type, MAC Data, IP Header, TCP Header, TCP/IPV4 Data, End of Packet, and FCS(CRC) Error on 10BASE-T and 100BASE-TX buses.
RS-232/422/485/UART (Optional)	Provided as part of Opt. SR-COMP. Trigger on Start Bit, End of Packet, Data, and Parity Error up to 10 Mb/s

Trigger system

USB 2.0 Low Speed: (Optional)	Provided as part of Opt. SR-USB. Trigger on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error. Token Packet Trigger – Any token type, SOF, OUT, IN, SETUP; Address can be specified for Any, OUT, IN, and SETUP token types. Address can be further specified to trigger on ≤, <, =, >, ≥, != a particular value, or inside or outside a range. Frame number can be specified for SOF token using Binary, Hex, Unsigned Decimal, and Don't Care digits. Data Packet Trigger – Any data type, DATA0, DATA1; Data can be further specified to trigger on ≤, <, =, >, ≥, != a particular data value, or inside or outside a range. Handshake Packet Trigger – Any handshake type, ACK, NAK, STALL. Special Packet Trigger – Any special type, Reserved. Error Trigger – PID Check, CRC5 or CRC16, Bit Stuffing.
USB 2.0 Full Speed: (Optional)	Provided as part of Opt. SR-USB. Trigger on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error. Token Packet Trigger – Any token type, SOF, OUT, IN, SETUP; Address can be specified for Any, OUT, IN, and SETUP token types. Address can be further specified to trigger on ≤, <, =, >, ≥, != a particular value, or inside or outside a range. Frame number can be specified for SOF token using Binary, Hex, Unsigned Decimal, and Don't Care digits. Data Packet Trigger – Any data type, DATA0, DATA1; Data can be further specified to trigger on ≤, <, =, >, ≥, != a particular data value, or inside or outside a range. Handshake Packet Trigger – Any handshake type, ACK, NAK, STALL. Special Packet Trigger – Any special type, PRE, Reserved. Error Trigger – PID Check, CRC5 or CRC16, Bit Stuffing.
USB 2.0 High Speed: (Optional)	Provided as part of Opt. SR-USB. Trigger on Sync, Reset, Suspend, Resume, End of Packet, Token (Address) Packet, Data Packet, Handshake Packet, Special Packet, Error. Token Packet Trigger – Any token type, SOF, OUT, IN, SETUP; Address can be specified for Any, OUT, IN, and SETUP token types. Address can be further specified to trigger on ≤, <, =, >, ≥, != a particular value, or inside or outside a range. Frame number can be specified for SOF token using Binary, Hex, Unsigned Decimal, and Don't Care digits. Data Packet Trigger – Any data type, DATA0, DATA1, DATA2, DATAM; Data can be further specified to trigger on ≤, <, =, >, ≥, != a particular data value, or inside our outside a range. Handshake Packet Trigger – Any handshake type, ACK, NAK, STALL, NYET. Special Packet Trigger – Any special type, ERR, SPLIT, PING, Reserved. SPLIT packet components that can be specified include: Hub Address Start/Complete – Don't Care, Start (SSPLIT), Complete (CSPLIT) Port Address Start and End bits – Don't Care, Control/Bulk/Interrupt (Full-speed Device, Low-speed Device), Isochronous (Data is Middle, Data is End, Data is Start, Data is All) Endpoint Type – Don't Care, Control, Isochronous, Bulk, Interrupt Error Trigger – PID Check, CRC5, CRC16, Any. Note: USB 2.0 High-speed triggering, decoding, and search only available on 1 GHz and 2 GHz models.

Acquisition system

Acquisition modes

Sample	Acquire sampled values
Peak detect	Captures narrow glitches as narrow as 100 ps (2 GHz and 1 GHz models) or 200 ps (500 MHz and 350 MHz models) at all real-time sampling rates
Averaging	From 2 to 10,000 waveforms included in average
Envelope	Min-Max envelope reflecting Peak Detect data over multiple acquisitions
Hi-Res	Real-time boxcar averaging reduces random noise and increases resolution
Roll mode	Scrolls sequential waveform points across the display in a right-to-left rolling motion at sweep speeds slower than 50 ms/div. Up to 20 MS/s with a maximum record length of 10 M
FastAcq®	FastAcq optimizes the instrument for analysis of dynamic signals and capture of infrequent events
Maximum FastAcq waveform capture rate	>250,000 wfms/s on all 4 channels simultaneously
Waveform database	Accumulate waveform database providing three-dimensional array of amplitude, time, and counts
FastFrame®	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

Automated Search and Mark	Automatically mark events and document waveforms. Search positive/negative slopes or both, glitches, runts, pulse widths, transition rate, setup and hold, timeout, windows, or find any logic or state pattern, up to 8 different event types on any of the 4 analog channels. Search DDR Read or Write bursts with Opt. DDRA. Event table summarizes all found events. All events are time stamped in reference to trigger position. Stop acquisitions when an event is found

Waveform analysis

Waveform measurements

Cursors	Waveform and Screen
Automatic measurements	53, of which 8 can be displayed on-screen at any one time. Measurements include: Period, Frequency, Delay, Rise Time, Fall Time, Positive Duty Cycle, Negative Duty Cycle, Positive Width, Negative Width, Burst Width, Phase, Positive Overshoot, Negative Overshoot, Peak-to-Peak, Amplitude, High, Low, Maximum, Minimum, Mean, Cycle Mean, RMS, Cycle RMS, Area, Cycle Area
Eye-pattern measurements	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
Measurement statistics	Mean, Minimum, Maximum, Standard Deviation
Reference levels	User-definable reference levels for automatic measurements can be specified in either percent or units
Gating	Isolate the specific occurrence within an acquisition to take measurements on, using either screen or waveform cursors
Waveform histogram	A waveform histogram provides an array of data values representing the total number of hits inside a user-defined region of the display. A waveform histogram is both a visual graph of the hit distribution and a numeric array of values that can be measured. Sources – Channel 1, Channel 2, Channel 3, Channel 4, Ref 1, Ref 2, Ref 3, Ref 4,Math 1,Math 2,Math 3,Math 4 Types – Vertical, Horizontal
Waveform histogram measurements	Waveform Count, Hits in Box, Peak Hits, Median, Maximum, Minimum, Peak-to-Peak, Mean (μ), Standard Deviation (sigma), μ +1sigma, μ +2sigma, μ +3sigma

Waveform processing/math

Arithmetic	Add, Subtract, Multiply, Divide waveforms and scalars
Algebraic expressions	Define extensive algebraic expressions including waveforms, scalars, user-adjustable variables, and results of parametric measurements. Perform math on math using complex equations. e.g. (Integral (CH1 – Mean(CH1)) × 1.414 × VAR1)
Math functions	Average, Invert, Integrate, Differentiate, Square Root, Exponential, Log10, Log e, Abs, Ceiling, Floor, Min, Max, Sin, Cos, Tan, ASin, ACos, ATan, Sinh, Cosh, Tanh
Relational	Boolean result of comparison >, <, ≥, ≤, ==, !=
Frequency domain functions (FFT)	Spectral Magnitude and Phase, Real and Imaginary Spectra
FFT vertical units	Magnitude: Linear, dB, dBm Phase: Degrees, radians, group delay

Waveform analysis

FFT window functions	Rectangular, Hamming, Hanning, Kaiser-Bessel, Blackman-Harris, Gaussian, Flattop2, Tek Exponential
Waveform definition	As an arbitrary math expression
Filtering functions	User-definable filters. Users specify a filter containing the coefficients of the filter. Filter files provided
Custom math functions	Custom MATLAB and .NET plug-ins can be included in the math waveform definition
Mask function	A function that generates a waveform database pixmap from a sample waveform. Sample count can be defined

Software

IVI driver	Provides a standard instrument programming interface for common applications such as LabVIEW, LabWindows/CVI, Microsoft .NET and MATLAB. IVI-COM standard
LXI Class C web interface	Connect to the MSO/DPO5000B Series through a standard Web browser by simply entering the oscilloscope's IP address in the address bar of the browser. The web interface enables viewing of instrument status and configuration, as well as status and modification of network settings. All web interaction conforms to LXI Class C specification

Display system

Display type	10.4 in. (264 mm) liquid-crystal active-matrix color display with touch screen
Display resolution	1024 horizontal × 768 vertical pixels (XGA)
Waveform styles	Vectors, dots, variable persistence, infinite persistence
Color palettes	Normal, green, gray, temperature, spectral, and user defined
Display format	YT, XY

Computer system

Operating system	Windows 7 Ultimate 64-bit Instrument operation verified with version 1.1 of the National Institute of Standards and Technology (NIST) DSS Baseline Requirements, also known as the United States Government Configuration Baseline (USGCB)
CPU	Intel Core 2 Duo, ≥2 GHz processor
PC system memory	≥4 GB
Solid state disk drive	Removable solid state disk drive, ≥480 GB
Mouse	Optical wheel mouse, USB interface
Keyboard	Order 119-7083-xx for small keyboard; USB interface and hub

Input output ports

USB 2.0 High-speed host ports	Supports USB mass storage devices, printers, keyboard, and mouse. Two ports on front and four ports on rear of instrument. Can be disabled individually
USB 1.1 Full-speed device port	Rear-panel connector allows for communication/control of oscilloscope through USBTMC or GPIB (with a TEK-USB-488 adapter)
LAN port	RJ-45 connector, supports 10/100/1000BASE-T
Video out port	DB-15 female connector, connect to show the oscilloscope display on an external monitor or projector. Support for extended desktop and clone mode
Audio ports	Miniature phono jacks
Keyboard port	PS/2 compatible
Mouse port	PS/2 compatible
Auxiliary input	Front-panel BNC connector. Input impedance 1 MΩ. Max input 300 V_{RMS} with peaks ≤ ±425 V
Auxiliary out (software switchable)	Trigger Out: A TTL compatible pulse when the oscilloscope triggers Time Base Reference Out: A TTL compatible output of internal 10 MHz reference oscillator
External reference in	Time base system can phase lock to an external 10 MHz reference (10 MHz ±1%)
Probe compensator output	Front-panel pins Amplitude: 2.5 V Frequency: 1 kHz
LAN eXtensions for Instrumentation (LXI)	Class: LXI Class C Version: 1.3
Optional TekVPI® external power supply	Required when total oscilloscope probe power usage exceeds 15 W.
Output Voltage	12 V
Output Current	5 A
Power Consumption	50 W

Power source

Power source voltage	100 to 240 V ±10%
Power source frequency	45 Hz to 66 Hz (85 to 264 V) 360 Hz to 440 Hz (100 to 132 V)
Power consumption	275 W maximum

Physical characteristics

Dimensions

	mm	in.
Height	233	9.16
Width	439	17.29
Depth	206	8.12

Weight

	kg	lb.
Net	6.7	14.9
Shipping	12.5	27.5

Rackmount configuration 5U

Cooling clearance

	in.	mm
Top	0	0
Bottom	0	0
Left Side	2	51
Right Side	0	0
Front	0	0
Rear	2	51

EMC environmental and safety

Temperature

Operating 0 °C to +50 °C

Nonoperating –20 °C to +60 °C

Humidity

Operating 8% to 90% relative humidity with a maximum wet-bulb temperature of 29 °C at or below +50 °C (upper limit de-rates to 20.6% relative humidity at +50 °C). Noncondensing

Nonoperating 5% to 98% relative humidity with a maximum wet-bulb temperature of 40 °C at or below +60 °C (upper limit de-rates to 29.8% relative humidity at +60 °C). Noncondensing

Altitude

Operating 3,000 m (9,843 ft.)

Nonoperating 9,144 m (30,000 ft.)

Regulatory

Electromagnetic compatibility 2004/108/EC

Certifications UL61010-1; CSA61010-1, EN61010-1; IEC 61010-1

Ordering information

DPO5000B models

DPO5034B	350 MHz, 5 GS/s, 25 M record length, 4-channel digital phosphor oscilloscope
DPO5054B	500 MHz, 5 GS/s, 25 M record length, 4-channel digital phosphor oscilloscope
DPO5104B	1 GHz, 10/5 GS/s (2/4 ch), 50 M/25 M record length, 4-channel digital phosphor oscilloscope
DPO5204B	2 GHz, 10/5 GS/s (2/4 ch), 50 M/25 M record length, 4-channel digital phosphor oscilloscope

MSO5000B models

MSO5034B	350 MHz, 5 GS/s, 25 M record length, 4+16 channel mixed signal oscilloscope
MSO5054B	500 MHz, 5 GS/s, 25 M record length, 4+16 channel mixed signal oscilloscope
MSO5104B	1 GHz, 10/5 GS/s (2/4 ch), 50 M/25 M record length, 4+16 channel mixed signal oscilloscope
MSO5204B	2 GHz, 10/5 GS/s (2/4 ch), 50 M/25 M record length, 4+16 channel mixed signal oscilloscope

Standard accessories

TPP0500/B	One passive voltage probe per analog channel (500 MHz, 10X, 3.9 pF) for 500 MHz and 350 MHz models
TPP1000	One passive voltage probe per analog channel (1 GHz, 10X, 3.9 pF) for 2 GHz and 1 GHz models
200-5130-xx	Front cover
119-6107-xx	Touch-screen stylus
071-298x-xx	User Manual (please specify language when ordering)
—	Advanced Search and Mark, DPOJET Essentials, Visual Trigger and Search, Limit Test, and SR-CUST Custom serial analysis license all included standard
—	Accessory pouch
—	Mouse
—	Calibration Certificate documenting measurement traceability to National Metrology Institute(s), Z 540-1 Compliance and ISO9001
—	Power Cord (please specify power plug option when ordering)
—	One-year warranty
P6616	16-channel logic probe for MSO Models
020-2662-xx	Logic probe accessory kit for MSO Models

Options

Record length options

Option	MSO5034B DPO5034B MSO5054B DPO5054B	MSO5104B DPO5104B MSO5204B DPO5204B
Opt. 5RL	50 M/Ch	125 M max, 50 M/Ch
Opt. 10RL	125 M/Ch	250 M max, 125 M/Ch

Advanced analysis options

Option	Description
Opt. BRR	BroadR-Reach Compliance Testing (Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture)
Opt. DDRA	DDR Memory bus analysis (Requires Opt. DJA) (Available on 1 GHz and 2 GHz models only.)
Opt. DJA	Jitter and Eye Analysis Tools – Advanced (DPOJET)
Opt. ET3	Ethernet compliance test (Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture)
Opt. HSIC	USB HSIC protocol decode and electrical validation (Requires Opt. DJA) (Available on 2 GHz models only.)
Opt. MOST	MOST Essentials – Electrical compliance and debug test solution for MOST50 and MOST150 (Requires Opt. DJA)
Opt. MTM	Mask testing – ITU-T (64 Kb/s to 155 Mb/s) – ANSI T1.102 (1.544 Mb/s to 155 Mb/s) – Ethernet IEEE 802.3, ANSI X3.263 (125 Mb/s to 1.25 Gb/s) – SONET/SDH (51.84 Mb/s to 622 Mb/s) – Fibre Channel (133 Mb/s to 2.125 Gb/s) – Fibre Channel Electrical (133 Mb/s to 1.06 Gb/s) – USB (12 Mb/s to 480 Mb/s) – IEEE 1394b (491.5 Mb/s to 1.966 Gb/s) – Rapid I/O Serial (up to 1.25 Gb/s) – Rapid I/O LP-LVDS (500 Mb/s to 1 Gb/s) – OIF Standards (1.244 Gb/s) – CPRI, V4.0 (1.228 Gb/s) – Video (143.18 Mb/s to 360 Mb/s)
Opt. PWR	Power measurement and analysis
Opt. SR-AERO	Aerospace serial triggering and analysis (MIL-STD-1553). Enables triggering on packet-level information on MIL-STD-1553 buses and analytical tools such as bus views, packet decoding, search tools, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 Recommended probing – Differential
Opt. SR-AUTO	Automotive serial triggering and analysis (CAN/LIN/FlexRay). Enables triggering on packet-level information on CAN, LIN, and FlexRay buses and analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 (and any D0 - D15 on MSO models) Recommended probing – LIN: single-ended; CAN/FlexRay: differential
Opt. SR-COMP	Computer serial triggering and analysis (RS-232/422/485/UART) Enables triggering on packet-level information on RS-232/422/485/UART buses and analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 (and any D0 - D15 on MSO models) Recommended probing – RS-232/UART: single ended; RS-422/485: differential
Opt. SR-DPHY	MIPI® D-PHY serial analysis. Enables analysis of MIPI DSI-1 and CSI-2 buses with analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 Recommended probing – Differential

Option	Description
Opt. SR-EMBD	Embedded serial triggering and analysis (I^2C, SPI) Enables triggering on packet-level information on I^2C and 2-wire and 3-wire SPI buses and analytical tools such as digital views of the signal, bus views, packet decoding, search tools, and packet decode tables with time stamp information. Signal Inputs – I^2C: Any Ch1 - Ch4 (and any D0 - D15 on MSO models); SPI: Any Ch1 - Ch4 (and any D0 - D15 on MSO models) Recommended probing – I^2C, SPI: single ended
Opt. SR-ENET	Ethernet serial triggering and analysis (10BASE-T, 100BASE-TX) Enables triggering on packet-level information on Ethernet buses as well as analytical tools such as bus views, packet decoding, search tools, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4. Recommended probing – Differential
Opt. SR-USB	USB 2.0 serial triggering and analysis (LS, FS, HS) Enables triggering on packet-level content for low-speed, full-speed, and high-speed USB serial buses. Also enables analytical tools such as bus views, packet decoding, search tools, and packet decode tables with time stamp information for low-speed, full-speed, and high-speed USB serial buses. Signal Inputs – Low-speed and Full-speed: Any Ch1 - Ch4 (and any D0 - D15 on MSO models) for single ended, Any Ch1 - Ch4 for differential; High-speed: Any Ch1 - Ch4 Recommended probing – Low-speed and Full-speed: Single ended or differential; High-speed: Differential (USB high-speed supported only on MSO5204, DPO5204, MSO5104, and DPO5104 models.)
Opt. SVE	SignalVu® Essentials – Vector signal analysis software
Opt. USB	USB 2.0 Compliance testing (Requires TDSUSBF USB Test Fixture. 2 GHz bandwidth required for high-speed USB)
Opt. USBPWR	Automated compliance test solution for USB power adapters
Opt. VNM	CAN/LIN Protocol analysis software

Bundle options

These bundled items must be purchased at the same time as the instrument purchase.

Option	Description
Opt. PS2	Power Solution Bundle: DPOPWR, THDP0200, TCP0030A, 067-1686-xx (Deskew fixture)
Opt. PS3	Power Solution Bundle: DPOPWR, TMDP0200, TCP0020, 067-1686-xx (Deskew fixture)

Floating options

Floating licenses offer an alternative method to manage your Tektronix asset. Floating licenses allow license-key enabled options to be easily moved among all your MSO/DPO5000, DPO7000, and DPO/DSA/MSO70000 Series Tektronix oscilloscopes. Floating licenses are available for the following license-key enabled options.

Check http://www.tek.com/products/oscilloscopes/floatinglicenses for additional information about floating license options.

Option	Description
DPOFL-BRR	BroadR-Reach Compliance Testing (Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture)
DPOFL-DDRA	DDR Memory bus analysis (Requires Opt. DJA) (Available on 1 GHz and 2 GHz models only)
DPOFL-DJA	Jitter and Eye Analysis Tools – Advanced (DPOJET)
DPOFL-ET3	Ethernet compliance testing (Requires TF-GBE-BTP or TF-GBE-ATP Ethernet test fixture.)
DPOFL-HSIC	USB HSIC protocol decode and electrical validation (Requires Opt. DJA) (Available on 2 GHz models only)
DPOFL-MOST	MOST Essentials – Electrical compliance and debug test solution (MOST50, MOST150) (Requires Opt. DJA)
DPOFL-MTM	Mask testing
DPOFL-PWR	Power measurement and analysis
DPOFL-SR-AERO	Aerospace serial triggering and analysis (MIL-STD-1553)
DPOFL-SR-AUTO	Automotive serial triggering and analysis (CAN/LIN/FlexRay)
DPOFL-SR-COMP	Computer serial triggering and analysis (RS-232/422/485/UART)
DPOFL-SR-DPHY	MIPI® D-PHY serial analysis

Option	Description
DPOFL-SR-EMBD	Embedded serial triggering and analysis (I^2C, SPI)
DPOFL-SR-ENET	Ethernet serial triggering and analysis (10BASE-T and 100BASE-TX)
DPOFL-SR-PCIE	PCI Express serial analysis (Available on ≥1 GHz models only) (Due to large volumes of data, use of standard high-capacity hard drive rather than smaller SSD is recommended)
DPOFL-SR-USB	USB 2.0 serial triggering and analysis (LS, FS, HS)
DPOFL-SR-810B	8b/10b serial analysis
DPOFL-SVA	SignalVu® AM/FM/PM/Direct Audio measurements (Requires Opt. SVE)
DPOFL-SVE	SignalVu® Essentials – Vector signal analysis software
DPOFL-SVM	SignalVu® General purpose modulation analysis (Requires Opt. SVE)
DPOFL-SVP	SignalVu® Pulse – Advanced signal analysis (Requires Opt. SVE)
DPOFL-SVT	SignalVu® Settling time measurements (Requires Opt. SVE)
DPOFL-USB	USB 2.0 Compliance testing (Requires TDSUSBF USB Test Fixture. 2 GHz bandwidth required for high-speed USB)
DPOFL-USBPWR	Automated compliance test solution for USB power adapters
DPOFL-VNM	CAN/LIN Protocol analysis 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. 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

User manual options

Opt. L0	English manual
Opt. L1	French manual
Opt. L3	German manual
Opt. L5	Japanese manual
Opt. L7	Simplified Chinese manual
Opt. L8	Traditional Chinese manual
Opt. L9	Korean manual
Opt. L10	Russian manual
Opt. L99	No manual

Service options

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. G3	Complete Care 3 Years (includes loaner, scheduled calibration, and more)
Opt. G5	Complete Care 5 Years (includes loaner, scheduled calibration, and more)
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.

Upgrade options

To upgrade your MSO/DPO5000B Series oscilloscope, order DPO-UP and an option listed below. For example, DPO-UP DDRA.

To upgrade record length:	
RL25E	From standard 25 M/channel configuration to Opt. 5RL configuration
RL210E	From standard 25 M/channel configuration to Opt. 10RL configuration
RL510E	From Opt. 5RL configuration to Opt. 10RL configuration
To add a solid state hard disk drive:	
SSDE	Add an additional removable solid state drive (customer installable)
To upgrade MSO/DPO5000B Series with:	
BRR	Add Opt. BRR - BroadR-Reach Compliance Testing (Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture)
DDRA	Add Opt. DDRA (Requires Opt. DJA.) (Available on 1 GHz and 2 GHz models only)
DJAE	Add Opt. DJA – Jitter and Eye Analysis Tools - Advanced (DPOJET)
ET3	Add Opt. ET3 – Ethernet Compliance Testing (Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture)
HSIC	Add Opt. HSIC - USB HSIC protocol decode and electrical validation (Available on 2 GHz models only) (Requires Opt. DJA)

MOST	Add Opt. MOST – MOST Essentials - Electrical Compliance and Debug Test Solution (MOST50, MOST150) (Requires Opt. DJA)
MTM	Add Opt. MTM – Mask Testing
PWR	Add Opt. PWR – Power Measurement and Analysis
SR-AERO	Add Opt. SR-AERO – Aerospace Serial Triggering and Analysis (MIL-STD-1553)
SR-AUTO	Add Opt. SR-AUTO – Automotive Serial Triggering and Analysis (CAN/LIN/FlexRay)
SR-COMP	Add Opt. SR-COMP – Computer Serial Triggering and Analysis (RS-232/422/485/UART)
SR-DPHY	Add Opt. SR-DPHY – MIPI D-PHY Serial Analysis (DSI-1, CSI-2)
SR-EMBD	Add Opt. SR-EMBD – Embedded Serial Triggering and Analysis (I^2C, SPI)
SR-ENET	Add Opt. SR-ENET – Ethernet Serial Triggering and Analysis (10BASE-T and 100BASE-TX)
SR-PCIE	Add PCI Express Serial Analysis (Available on ≥1 GHz models only.)
SR-USB	Add Opt. SR-USB – USB 2.0 Serial Triggering and Analysis (LS, FS, HS)
SR-810B	Add 8b/10b Serial Analysis
SVA	Add SignalVu AM/FM/Direct Audio Measurements (Requires Opt. SVE)
SVEE	Add Opt. SVE – SignalVu Essentials - Vector Signal Analysis Software
SVM	Add SignalVu General-purpose Modulation Analysis (Requires Opt. SVE)
SVP	Add SignalVu Pulse - Advanced Signal Analysis (Requires Opt. SVE)
SVT	Add SignalVu Settling Time Measurements - Frequency and Phase (Requires Opt. SVE)
USB	Add Opt. USB – USB 2.0 Compliance Testing (Requires TDSUSBF USB Test Fixture) (2 GHz bandwidth required for high-speed USB)
USBPWR	Add Opt. USBPWR - Automated compliance test solution for USB power adapters
VNM	Add Opt. VNM – CAN/LIN Serial Protocol Decode

To upgrade DPO5000B Series to MSO:

MSOE	Add 16 digital channels to a DPO5000B

Recommended accessories

Accessories

077-0076-xx	Service manual (PDF only)
077-0010-xx	Programmer manual (PDF only)
077-0063-xx	Performance verification and specifications manual (PDF only)
TPA-BNC	TekVPI-to-TekProbe BNC adapter
TEK-DPG	Deskew Pulse Generator
TEK-USB-488	GPIB-to-USB adapter
HCTEK54	Hard transit case
RMD5000	Rackmount kit
119-7083-xx	Mini keyboard (USB interface)
119-7275-xx	Mini multimedia keyboard
119-7465-00	TekVPI external power supply – Required when probe power usage exceeds 15 W. Power cord not included. Specify power cord when ordering.
119-7766-xx	External DVD R/W drive
065-0952-xx	Spare removable Solid State Drive
K420	Oscilloscope cart
NEX-HD2HEADER	Mictor connector to square pin adapter

Cables

012-0991-xx	GPIB Cable (1 m)
012-0991-xx	GPIB Cable (2 m)

Test fixtures	
067-1686-xx	Probe Calibration / Power Deskew test fixture
TDSUSBF	Test fixture for use with Opt. USB
TF-GBE-BTP	Basic test package for 10/100/1000BASE-T Ethernet tests
TF-GBE-ATP	Advanced test package for 10/100/1000BASE-T Ethernet (includes 1000BASE-T jitter test channel cable)
TF-GBE-EE	Additional test fixture for Energy Efficient Ethernet measurements. Order through Crescent Heart Software (http://www.c-h-s.com)
Adapters	
P6701B	Optical/Electrical converter (multi mode). Requires TekVPI® to TekProbe BNC adapter (TPA-BNC).
P6703B	Optical/Electrical converter (single mode). Requires TekVPI® to TekProbe BNC adapter (TPA-BNC).
Probes	Tektronix offers over 100 different probes to meet your application needs. For a comprehensive listing of available probes, please visit www.tektronix.com/probes.
TPP0500	500 MHz, 10X TekVPI® passive voltage probe with 3.9 pF input capacitance
TPP1000	1 GHz, 10X TekVPI passive voltage probe with 3.9 pF input capacitance
TPP0502	500 MHz, 2X TekVPI passive voltage probe
TAP2500	2.5 GHz TekVPI active single-ended voltage probe
TAP1500	1.5 GHz TekVPI active single-ended voltage probe
TDP3500	3.5 GHz TekVPI differential voltage probe with ±2 V differential input voltage
TDP1500	1.5 GHz TekVPI differential voltage probe with ±8.5 V differential input voltage
TDP1000	1 GHz TekVPI differential voltage probe with ±42 V differential input voltage
TDP0500	500 MHz TekVPI differential voltage probe with ±42 V differential input voltage
TCP0150	20 MHz TekVPI 150 Ampere AC/DC current probe
TCP0030A	120 MHz TekVPI 30 Ampere AC/DC current probe
TCP0020	50 MHz TekVPI 20 Ampere AC/DC current probe
TPP0850	2.5 kV, 800 MHz TekVPI high-voltage passive probe
TMDP0200	±750 V, 200 MHz high-voltage differential probe
THDP0200	±1.5 kV, 200 MHz high-voltage differential probe
THDP0100	±6 kV, 100 MHz high-voltage differential probe
P5100A	2.5 kV, 500 MHz, 100X high-voltage passive probe

CE

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

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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