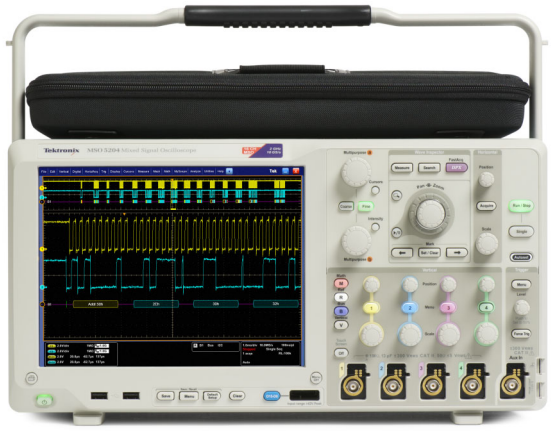
Mixed Signal Oscilloscopes

MSO5000, DPO5000 Series Datasheet



Features & Benefits

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™
- FastFrame™ Segmented Memory Acquisition Mode with >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
- 16 Digital Channels (MSO Series)
- User-selectable Bandwidth Limit Filters for Better Low-frequency Measurement Accuracy
- Suite of Advanced Triggers, with Optional Visual Trigger

Ease-of-Use Features

- Wave Inspector® Controls provide Easy Navigation and Automated Search of Waveform Data
- MyScope® Custom Control Windows and Right Mouse Click Menus for Exceptional Efficiency
- 53 Automated Measurements, Waveform Histograms, and FFT Analysis for Simplified Waveform Analysis
- TekVPI® Probe Interface supports Active, Differential, and Current Probes for Automatic Scaling and Units
- 10.4 in. (264 mm) Bright XGA Display with Touch Screen
- Small Footprint and Lightweight – Only 8.12 in. (206 mm) Deep and Less than 15 lb. (6.7 kg)

Connectivity

- Two USB 2.0 Host Ports on the Front Panel and Four on the Rear Panel for Quick and Easy Data Storage, Printing, and Connecting USB Peripherals
- USB Device Port on the Rear Panel for Easy Connection to a PC or GPIB Control with an Adapter
- Integrated 10/100/1000BASE-T Ethernet Port for Network Connection and Video Out Port to Export the Oscilloscope Display to a Monitor or Projector
- Microsoft® Windows 7 64-bit Operating System for Easy Connectivity and Integration into Your Environment
- LXI Class C Compliant

Mixed Signal Design and Analysis (MSO Series)

- Automated Triggering, Decode, and Search on Parallel Buses
- Per-channel Threshold Settings
- MagniVu™ High-speed Acquisition provides 60.6 ps Fine Timing Resolution on Digital Channels

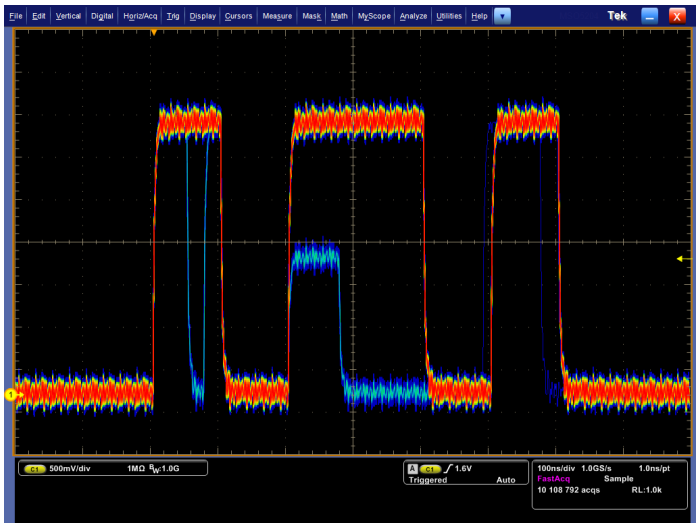
Optional Serial Triggering and Analysis

- Automated Serial Triggering, Decode, and Search Options for I^2C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and USB 2.0
- Automated Serial Analysis Options for MIPI® D-PHY DSI-1 and CSI-2, 8b/10b, and PCI Express

Optional Technology Specific Analysis

- Software Solutions provide Built-in Domain Expertise for Ethernet, MOST, and USB 2.0 Compliance Testing, Jitter, Timing, Eye Diagrams, Power, DDR Memory Bus Analysis, and Wideband RF
- Limit and Mask Testing provide Quick Insight into Signal Characteristics

Tektronix®



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

Feature-rich Tools for Debugging Mixed Signal Designs

With the MSO/DPO5000 Mixed Signal Oscilloscope Series, you can analyze up to 20 analog and digital signals with a single instrument to quickly find and diagnose problems in complex designs. Bandwidths up to 2 GHz and sample rates up to 10 GS/s ensure you have the performance you need to see fast-changing signal details. To capture long windows of signal activity while maintaining fine timing resolution, the MSO/DPO5000 Series offers a deep record length of up to 12.5M points standard on all channels and an optional record length of up to 250M points on two channels.

With Wave Inspector® controls for rapid waveform navigation, and more than 10 optional software and analysis packages for common technologies and in-depth analysis tasks, the MSO/DPO5000 Series from Tektronix provides the feature-rich tools you need to simplify and speed debug of your complex design.

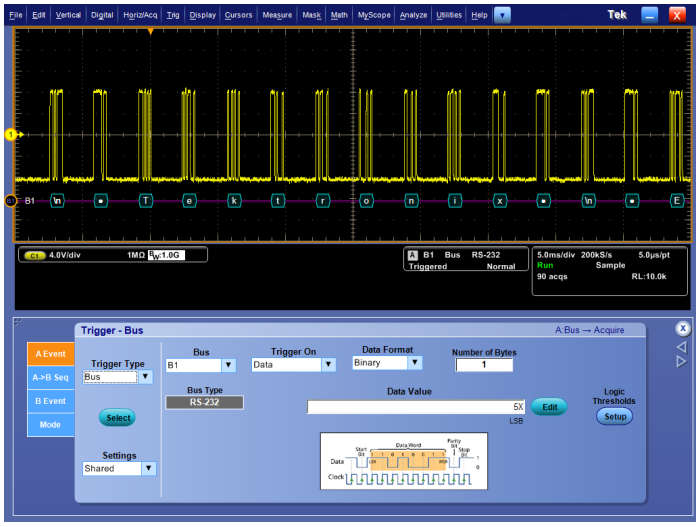
Comprehensive Features Speed Every Stage of Debug

The MSO/DPO5000 Series offers a robust set of features to speed every stage of debugging your design – from quickly discovering an anomaly and capturing it, to searching your waveform record for the event and analyzing its characteristics and your device's behavior.

Discover

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 frustrating task without the right debug tools.

The MSO/DPO5000 Series offers the industry's most complete visualization of signals, 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.



Capture – Triggering on a specific transmit data packet going across an RS-232 bus. A complete set of triggers, including triggers for specific serial packet content, ensures you quickly capture your event of interest.

Capture

Discovering a device fault is only the first step. Next, you must capture the event of interest to identify root cause.

Accurately capturing any signal of interest begins with proper probing. The MSO/DPO5000 Series includes four high-impedance low-capacitance probes for accurate signal capture. These industry-first high-impedance passive voltage probes have less than 4 pF of capacitive loading to minimize the effect of the probe on your circuit's operation, offering the performance of an active probe with the flexibility of a passive probe.

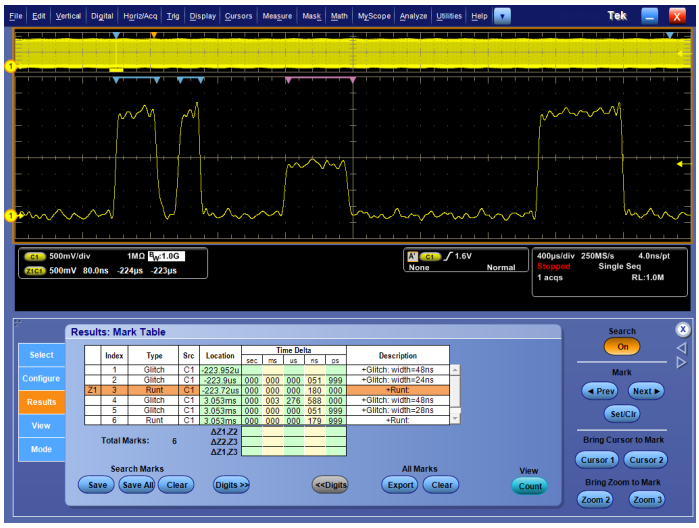
The MSO/DPO5000 Series provides a complete set of triggers – including runt, glitch, width, timeout, transition, pattern, state, setup/hold violation, serial packet, and parallel data – to help quickly find your event. Enhanced Triggering reduces trigger jitter at the trigger point. In this mode, the trigger point can be used as a measurement reference.

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. The optional Visual Trigger 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).

With up to a 250M 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. Investigate multiple segments of your waveform capture simultaneously with MultiView Zoom™ to quickly compare events in real time. FastFrame™ Segmented Memory mode enables you to make efficient use of large records by capturing many trigger events in a single record eliminating large time gaps between events of interest. View and measure the segments individually or as an overlay.

From triggering on specific packet content to automatic decode in multiple data formats, the MSO/DPO5000 Series provides integrated support for a broad range of serial buses – I^2C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and USB 2.0. The ability to decode up to 16 serial and/or parallel buses simultaneously means you gain insight into system-level problems quickly.

To further help troubleshoot system-level interactions in complex embedded systems, the MSO5000 Series offers 16 digital channels in addition to its analog channels. Since the digital channels are fully integrated into the oscilloscope, you can trigger across all input channels, automatically time correlating all analog, digital, and serial signals. The MagniVu™ high-speed acquisition enables you to acquire fine signal detail (up to 60.6 ps resolution) around the trigger point for precision measurements. MagniVu is essential for making accurate timing measurements for setup and hold, clock delay, signal skew, and glitch characterization.



Search – Results of an advanced search for a runt pulse or a narrow glitch within a long waveform record. Each instance of the runt or glitch is automatically marked for easy reference. Wave Inspector controls provide unprecedented efficiency in viewing and navigating waveform data.

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/DPO5000 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/DPO5000 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.



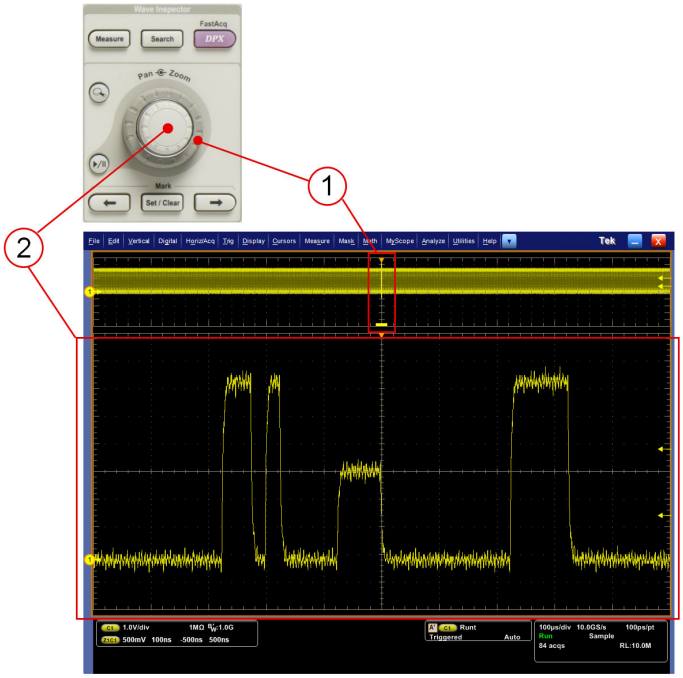
Analyze – Waveform histogram of a falling edge showing the distribution of edge position (jitter) over time. Included are numeric measurements made on the waveform histogram data. A comprehensive set of integrated analysis tools speeds verification of your design's performance.

Analyze

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/DPO5000 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, custom MATLAB and .NET math plug-in analysis functions, waveform histograms, and FFT analysis.

Every MSO/DPO5000 Series oscilloscope includes the DPOJET Essentials jitter and eye pattern analysis software package, extending the oscilloscope's measurement capabilities to make 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.

Specialized application support for serial bus debug and compliance test, jitter and eye pattern analysis, power supply design, limit and mask testing, DDR memory bus analysis, and wideband RF is also available.



Wave Inspector controls provide unprecedented efficiency in viewing, navigating, and analyzing waveform data. Zip through your long record by turning the outer pan control (1). Get from the beginning to end in seconds. See something of interest and want to see more details? Just turn the inner zoom control (2).

Wave Inspector® Navigation and Advanced Search and Mark

A 12.5M point standard record length represents thousands of screens of information. The MSO/DPO5000 Series enables you to find your event in seconds with Wave Inspector, the industry's best tool for navigation and search.

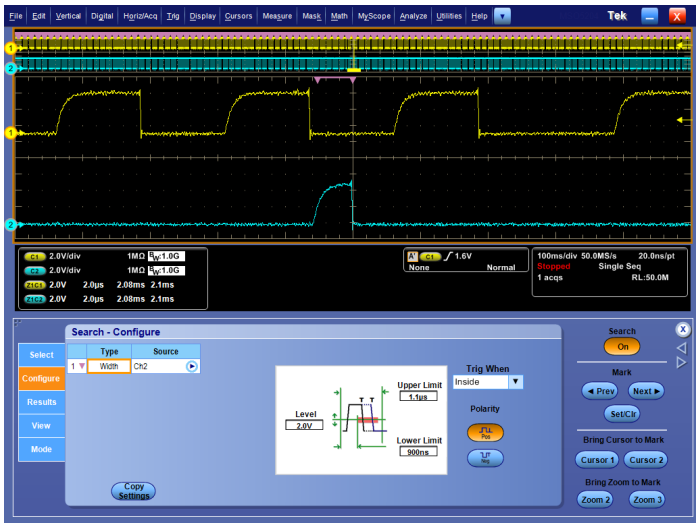
Wave Inspector offers the following innovative controls:

Zoom/Pan

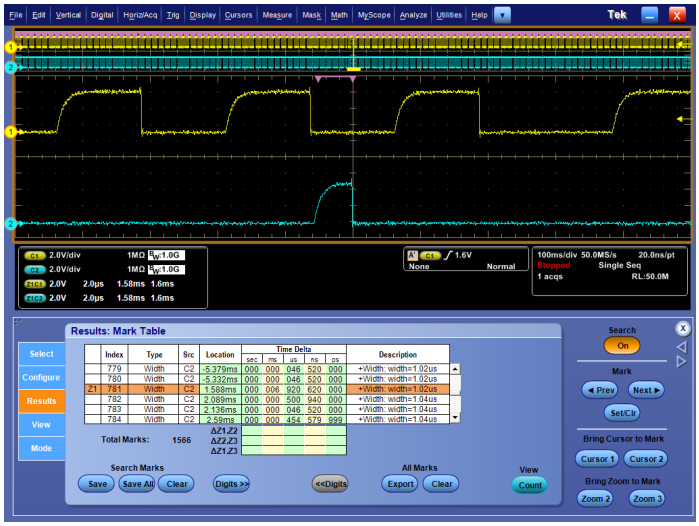
A dedicated, two-tier front-panel control provides intuitive control of both zooming and panning. The inner control adjusts the zoom factor (or zoom scale); turning it clockwise activates zoom and goes to progressively higher zoom factors, while turning it counterclockwise results in lower zoom factors and eventually turns zoom off. No longer do you need to navigate through multiple menus to adjust your zoom view. The outer control pans the zoom box across the waveform to quickly get to the portion you are interested in. The outer control also utilizes force feedback to determine how fast to pan on the waveform. The farther you turn the outer control, the faster the zoom box moves. Pan direction is changed by simply turning the control the other way.

Play/Pause

A dedicated **Play/Pause** front-panel button scrolls the waveform across the display automatically while you look for anomalies or an event of interest. Playback speed and direction are controlled using the intuitive pan control.



Search step 1: You define what you would like to find.



Search step 2: Wave Inspector automatically searches through the record and marks each event with a solid colored triangle. You can then use the **Previous** and **Next** buttons to jump from one event to the next.

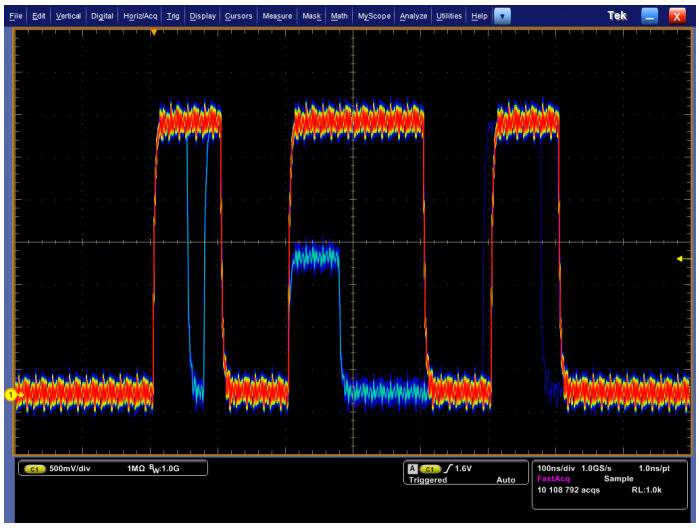
Once again, turning the control further makes the waveform scroll faster and changing direction is as simple as turning the control the other way.

User Marks

Press the **Set/Clear** front-panel button to place one or more marks on the waveform. Navigating between marks is as simple as pressing the **Previous** (←) and **Next** (→) buttons on the front panel.

Search Marks

The **Search** button allows you to automatically search through your long acquisition looking for user-defined events. All occurrences of the event are highlighted with search marks and are easily navigated to, using the front-panel **Previous** (←) and **Next** (→) buttons. Search types include edge, glitch, width, timeout, runt, pattern, state, setup and hold, transition, and window.



Digital phosphor technology enables greater than 250,000 wfm/s waveform capture rate and real-time color grading on the MSO/DPO5000 Series.

Digital Phosphor Technology

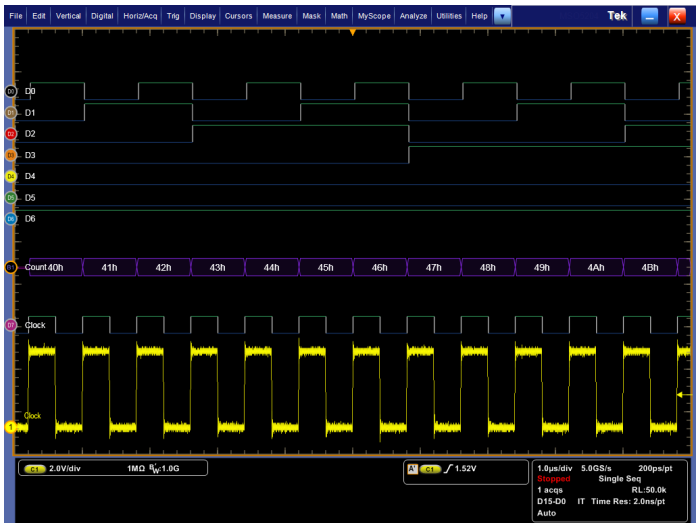
The MSO/DPO5000 Series' digital phosphor technology provides you with fast insight into the real operation of your device. Its fast waveform capture rate – greater than 250,000 wfm/s – gives you a high probability of quickly seeing the infrequent problems common in digital systems: runt pulses, glitches, timing issues, and more.

Waveforms are superimposed with one another and waveform points are color coded by frequency of occurrence. This quickly highlights the events that occur more often over time or, in the case of infrequent anomalies, occur less often.

With the MSO/DPO5000 Series, you can choose infinite persistence or variable persistence, determining how long the previous waveform acquisitions stay on-screen. This allows you to determine how often an anomaly is occurring.

Accurate High-speed Probing

The TPP Series probes, included standard with every MSO/DPO5000 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. In addition, a low-attenuation (2X) version of the TPP probes is available for measuring low voltages. Unlike other low-attenuation passive probes, the TPP0502 has high input resistance and high bandwidth (500 MHz) as well as low (12.7 pF) capacitive loading, providing superior fidelity and signal-to-noise performance.



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. You can set threshold values for each channel, enabling support for up to 16 different logic families.

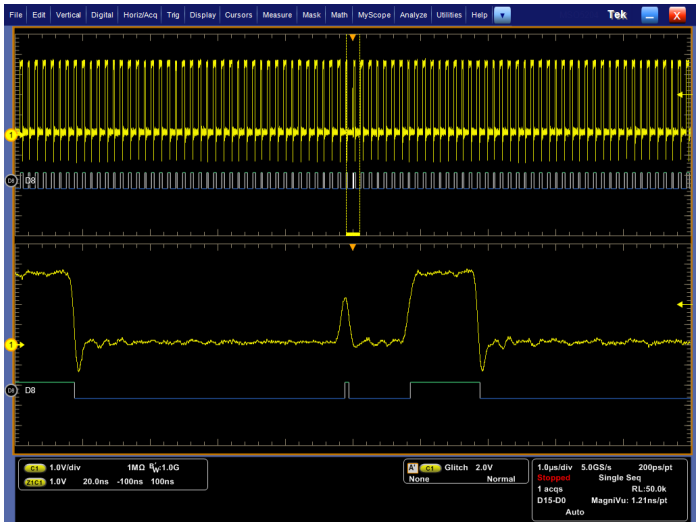
Mixed Signal Design and Analysis (MSO Series)

The MSO5000 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.

Color-coded Digital Waveform Display

The MSO5000 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 MSO5000 Series has color-coded digital traces, displaying ones in green and zeros in blue.

The multiple transition detection hardware of the MSO5000 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.



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

MagniVu™ High-speed Acquisition

The main digital acquisition mode on the MSO5000 Series will capture up to 40M points at 500 MS/s (2 ns resolution). In addition to the main record, the MSO5000 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.

P6616 MSO Probe

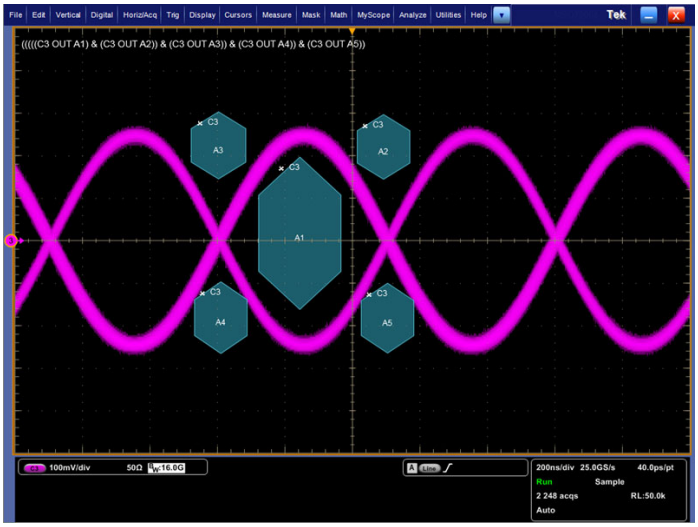
This unique probe design offers two eight-channel pods. Each channel ends with a probe tip featuring a recessed ground for simplified connection to the device under test. The coax on the first channel of each pod is colored blue making it easy to identify. The common ground uses an automotive-style connector making it easy to create custom grounds for connecting to your device. When connecting to square pins, the P6616 has an adapter that attaches to the probe head, extending the probe ground flush with the probe tip so you can attach to a header. The P6616 offers outstanding electrical characteristics, having only 3 pF of capacitive loading, a 100 kΩ input resistance, and capable of acquiring toggle rates as fast as 500 MHz and pulses as short as 1 ns in duration.

Visual Trigger (Optional)

The Visual Trigger option adds an additional dimension to the standard trigger system that provides an intuitive method of triggering based on shapes in the oscilloscope's graticule. It enables the user to define shapes

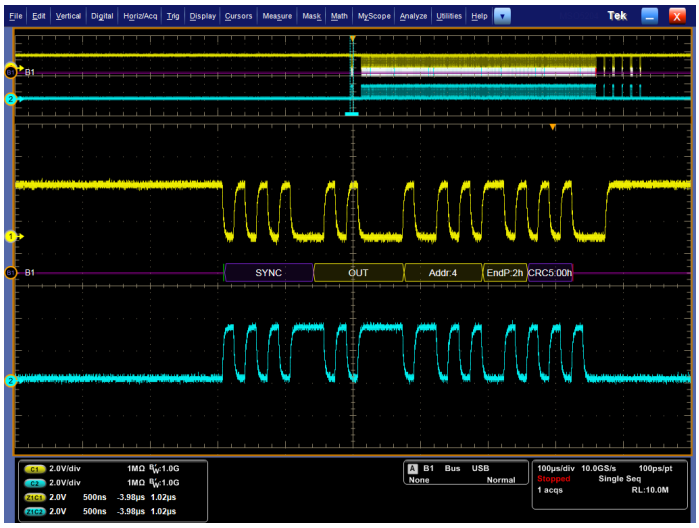


The P6616 MSO probe offers two eight-channel pods to simplify connecting to your device.



Eye Diagram triggering using optional Visual Trigger.

on the oscilloscope's display that qualify trigger events for the incoming signals. 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. Once shapes are created on the oscilloscope's display, they can be positioned and/or re-sized dynamically while the oscilloscope is in Run mode to create ideal trigger conditions. Visual Trigger can be combined with the standard triggers and act as a Boolean logic qualifier for the "A" and "B" events.



Triggering on a specific OUT Token packet 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 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/DPO5000 Series offers a robust set of tools for debugging serial buses with automatic trigger and decode on I²C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and USB 2.0, and decode for 8b/10b, PCI Express, and MIPI D-PHY DSI-1 and CSI-2 serial buses.

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 I²C, SPI, CAN, LIN, FlexRay, RS-232/422/485/UART, MIL-STD-1553, and USB 2.0.

Bus Display

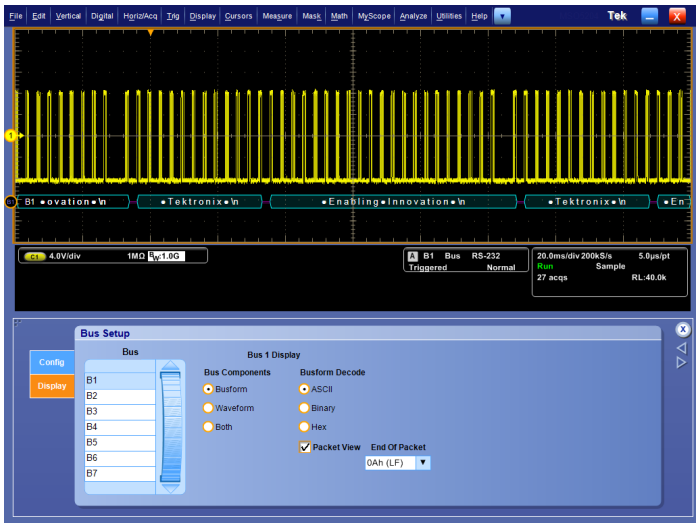
Provides a higher-level, combined view of the individual signals (clock, data, chip enable, etc.) that make up your bus, making it easy to identify where packets begin and end and identifying subpacket components such as address, data, identifier, CRC, etc.

Bus Decoding

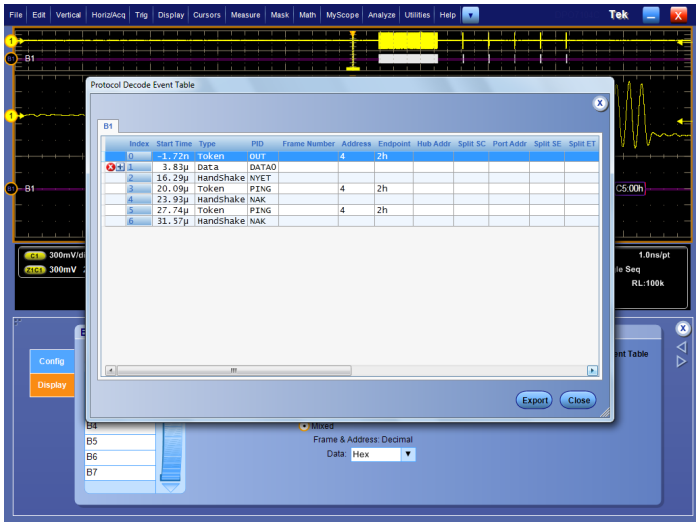
Tired of having to visually inspect the waveform to count clocks, determine if each bit is a 1 or a 0, combine bits into bytes, and determine the hex value? Let the oscilloscope do it for you! Once you've set up a bus, the MSO/DPO5000 Series will decode each packet on the bus, and display the value in 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.).



Packet View display of decoded RS-232 messages.



Event table showing decoded serial packet data in a long acquisition.

Bus Searching

Serial triggering is very useful for isolating the event of interest, but once you've captured it and need to analyze the surrounding data, what do you do? In the past, users had to manually scroll through the waveform counting and converting bits and looking for what caused the event. With the MSO/DPO5000 Series, you can have the oscilloscope automatically search through the acquired data for user-defined criteria including serial packet content. Each occurrence is highlighted by a search mark. Rapid navigation between marks is as simple as pressing the **Previous** (←) and **Next** (→) buttons on the front panel.



USB 2.0 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), and USB 2.0 (Option USB) physical-layer devices. These software packages enable you to conduct testing using the standard's specified compliance tests.

Power Analysis (Optional)

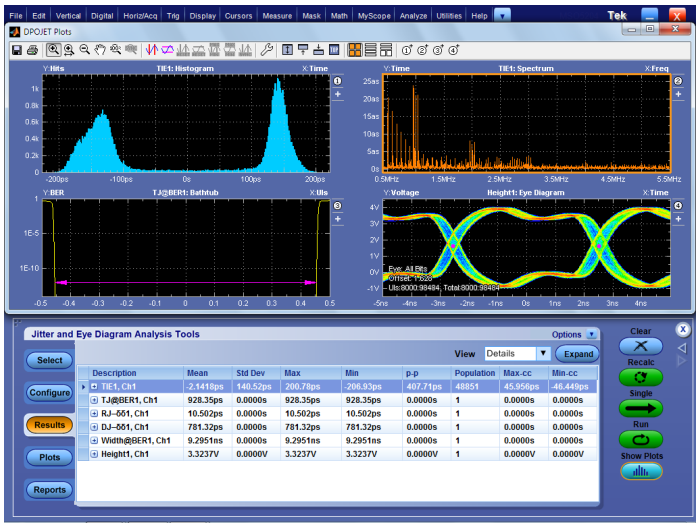
The optional power analysis software package (Option PWR) enables quick and accurate analysis of power quality, switching loss, harmonics, magnetic measurements, safe operating area (SOA), modulation, ripple, and slew rate (di/dt, dv/dt). Automated, repeatable power measurements are available with a 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.

Advanced Analysis, Jitter, Timing, and Eye Diagram Measurements (Optional)

The optional DPOJET Advanced software package (Option DJA) offers extended capabilities, providing a complete suite of analysis tools for insight into jitter and timing as well as other signal quality issues. DPOJET Advanced adds advanced tools such as Rj/Dj separation, eye diagram masks, and Pass/Fail limits for conformance testing. The innovative

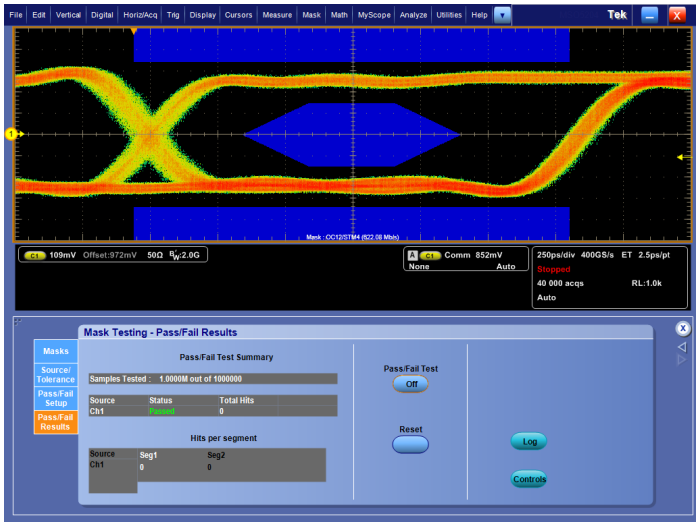


Switching Loss measurements. Automated power measurements enable quick and accurate analysis of common power parameters.

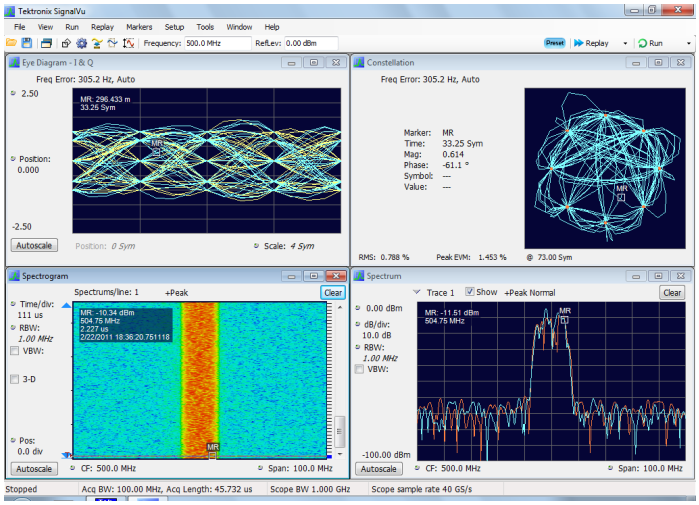


Advanced Analysis, Jitter, Eye Diagram, and Timing measurements.

one-touch wizard makes setup for jitter measurements easy. DPOJET Advanced is also a measurement framework that works in conjunction with standards-specific compliance test packages for applications such as DDR memory and USB.



Mask testing an OC-12 signal, capturing any violations of the mask.



SignalVu™ enables detailed analysis in multiple domains.

Limit and Mask Testing (Optional)

The optional limit test (Option LT) and mask test (Option MTM) software packages are useful for long-term signal monitoring, characterizing signals during design, and testing on a production line. The limit test software compares a tested signal to a known good or "golden" version of the same signal with user-defined vertical and horizontal tolerances. 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 both software packages 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 along with statistical information, and setting actions upon violations, test failure, and test complete. Whether specifying a limit template or a mask, conducting pass/fail tests in search of waveform anomalies such as glitches has never been easier.

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 in conjunction 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 packages (Options SVE, SVA, SVM, SVP, and SVT) easily validate wideband designs and characterize 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.

Designed to Make Your Work Easier

Large, High-resolution Display

The MSO/DPO5000 Series features a 10.4 in. (264 mm) XGA color display with an integrated touch screen for seeing intricate signal details.

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.

Connectivity

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 allows the oscilloscope display to be exported to an external monitor or projector. PS-2 ports for keyboard and mouse are included for security-conscious applications that require the USB ports to be disabled. A standard removable hard disk drive makes customizing settings for different users easy as well as enables use in secure environments.



The MSO/DPO5000 Series' compact form factor frees up valuable space on your bench.



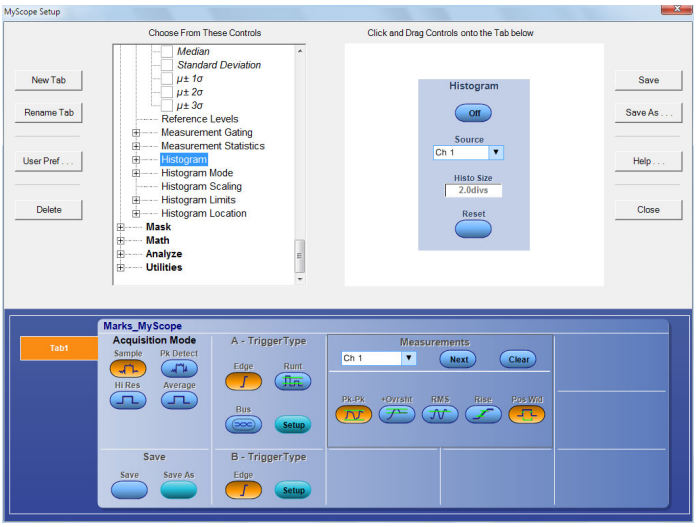
TekVPI probe interface simplifies connecting your probes to the oscilloscope.

Compact Form Factor

A compact, portable form factor allows the MSO/DPO5000 Series to be easily moved between labs and, with a depth of just 8.12 in. (206 mm), it saves you valuable space on your test bench. Additionally the 5U rack height makes the MSO/DPO5000 Series an ideal choice for ATE applications where rack space is limited.

TekVPI® Probe Interface

The TekVPI probe interface sets the standard for ease of use in probing. TekVPI probes feature status indicators and controls, as well as a probe menu button right on the probe itself. This button brings up a probe menu on the oscilloscope display with all relevant settings and controls for the probe. The TekVPI interface enables direct attachment of a current probe without requiring a separate power supply. TekVPI probes can be controlled remotely through USB, GPIB, or Ethernet, enabling more versatile solutions in ATE environments.



MyScope custom control windows are created with a simple drag-and-drop process enabling each user to have a unique interface.

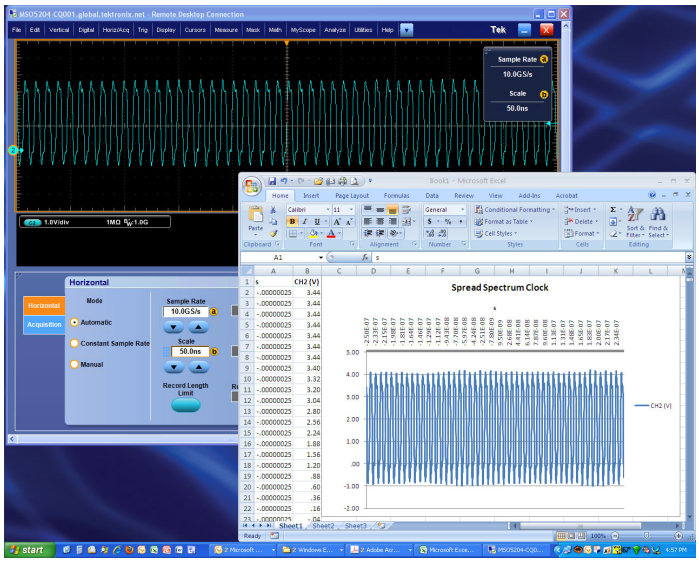
MyScope® Custom Control Window

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 menu selection on the oscilloscope. This is ideal in a shared resource environment where each person can have their own custom control interface suited to their particular use. MyScope control windows 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 enabling power users to be far more efficient.

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.



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

Remote Operation and Extended Analysis

There are many ways to connect to your MSO/DPO5000 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. A third way to connect to your oscilloscope is through NI LabVIEW SignalExpress Tektronix Edition, enabling you to instantly acquire, generate, analyze, compare, import, and save measurement data and signals using an intuitive drag-and-drop user interface that does not require any programming.

Characteristics

Vertical System Analog Channels

Characteristic	MSO5034 DPO5034	MSO5054 DPO5054	MSO5104 DPO5104	MSO5204 DPO5204
Input Channels	4			
Analog Bandwidth (–3 dB)	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, 1k point record length)			
Random Noise (RMS, 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)
Input Coupling	AC, DC			
Input Impedance	1 MΩ ±1%, 50 Ω ±1%			
Input Sensitivity	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)			
Max 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			
Max Input Voltage, 50 Ω	5 V_{RMS}, with peaks ≤ ±20 V			
Position Range	±5 divisions			
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

Characteristic	All MSO5000 Models
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

Characteristic	MSO5034 DPO5034	MSO5054 DPO5054	MSO5104 DPO5104	MSO5204 DPO5204
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	12.5M		12.5M (4 ch) 25M (1 or 2 ch)	
Maximum Record Length with Option 2RL	25M		25M (4 ch) 50M (1 or 2 ch)	
Maximum Record Length with Option 5RL	50M		50M (4 ch) 125M (1 or 2 ch)	
Maximum Record Length with Option 10RL	125M		125M (4 ch) 250M (1 or 2 ch)	
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

Characteristic	All MSO5000 Models
Maximum Sample Rate (Main)	500 MS/s (2 ns resolution)
Maximum Record Length (Main)	12.5M Standard Up to 40M 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

Characteristic	Description
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 50 MHz, 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 50 MHz, 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 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

Mode	Description
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 of 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	Trigger on all lines, specific line number, odd, even, or all fields on NTSC, PAL, SECAM, and HDTV 480p/60, 576p/50, 875i/60, 720p/30, 720p/50, 720p/60, 1080/24sF, 1080i/50, 1080p/25, 1080i/60, 1080p/24, 1080p/25, 1080p/50, 1080p/60, Bi-level, Tri-level
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 (Optional)	Provided as part of Opt. VET. 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
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

Mode	Description
USB 2.0 (Optional)	Provided as part of Opt. SR-USB. Low Speed: 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 of 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 of 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.
	Full Speed: 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 of 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 of 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.
	High Speed: 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 of 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 of 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 Modes

Mode	Description
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	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 10M
FastAcq Acquisition Mode	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	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

Search and Mark Events

Characteristic	Description
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 Measurements

Measurement	Description
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 of a user-defined region of the display. A waveform histogram is both a visual graph of the hit distribution as well as 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

Characteristic	Description
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
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

Software	Description
NI LabVIEW SignalExpress Tektronix Edition	A fully interactive measurement software environment optimized for the MSO/DPO5000 Series, enables you to instantly acquire, generate, analyze, compare, import, and save measurement data and signals using an intuitive drag-and-drop user interface that does not require any programming. Standard MSO/DPO5000 Series support for acquiring, controlling, viewing, and exporting your live signal data is permanently available through the software. The full version (SIGEXPTE) adds additional signal processing, advanced analysis, mixed signal, sweeping, limit testing, and user-defined step capabilities and is available for a 30-day trial period standard with each instrument.
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/DPO5000 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 Characteristics

Characteristic	Description
Display Type	Liquid-crystal active-matrix color display with touch screen
Display Size	Diagonal: 10.4 in. (264 mm)
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 and Peripherals

Characteristic	Description
Operating System	Windows 7 Ultimate 64-bit Instrument operation verified with 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
Hard Disk Drive	Removable hard disk drive, ≥500 GB capacity (2.5 in. SATA)
Mouse	Optical wheel mouse, USB interface
Keyboard	Order 119-7083-xx for small keyboard; USB interface and hub

Input/Output Ports

Port	Description
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)

Characteristic	Description
Class	LXI Class C
Version	V1.3

Power Source

Characteristic	Description
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

Optional TekVPI® External Power Supply*1

Characteristic	Description
Output Voltage	12 V
Output Current	5 A
Power Consumption	50 W

*1 Required when total oscilloscope probe power usage exceeds 15 W.

Physical Characteristics

Dimension	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	2 in. (51 mm) required on left side and rear of instrument	

Environmental

Characteristic	Description
Temperature	
Operating	5 °C to +50 °C (with Hard Disk Drive) 0 °C to +50 °C (with Solid State Drive)
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	9,843 ft. (3,000 m)
Nonoperating	30,000 ft. (9,144 m)
Regulatory	
Electromagnetic compatibility	2004/108/EC
Certifications	UL61010-1, Second Edition; CSA61010-1 Second Edition, EN61010-1:2001; IEC 61010-1:2001

Ordering Information

MSO/DPO5000 Family

Product	Description
DPO5000 Models	
DPO5034	350 MHz, 5 GS/s, 12.5M record length, 4-channel digital phosphor oscilloscope
DPO5054	500 MHz, 5 GS/s, 12.5M record length, 4-channel digital phosphor oscilloscope
DPO5104	1 GHz, 10/5 GS/s (2/4 ch), 12.5M record length, 4-channel digital phosphor oscilloscope
DPO5204	2 GHz, 10/5 GS/s (2/4 ch), 12.5M record length, 4-channel digital phosphor oscilloscope
MSO5000 Models	
MSO5034	350 MHz, 5 GS/s, 12.5M record length, 4+16 channel mixed signal oscilloscope
MSO5054	500 MHz, 5 GS/s, 12.5M record length, 4+16 channel mixed signal oscilloscope
MSO5104	1 GHz, 10/5 GS/s (2/4 ch), 12.5M record length, 4+16 channel mixed signal oscilloscope
MSO5204	2 GHz, 10/5 GS/s (2/4 ch), 12.5M record length, 4+16 channel mixed signal oscilloscope

All Models Include: One passive voltage probe per analog channel (TPP0500: 500 MHz, 10X, 3.9 pF for 500 MHz and 350 MHz models; TPP1000: 1 GHz, 10X, 3.9 pF for 2 GHz and 1 GHz models), front cover (200-5130-xx), touch-screen stylus (119-6107-xx), user manual (071-2790-xx), NI LabVIEW SignalExpress Tektronix Edition software, accessory pouch, mouse, Calibration Certificate documenting measurement traceability to National Metrology Institute(s), Z 540-1 Compliance and ISO9001, power cord, one-year warranty.
MSO Models also Include: P6616 16-channel logic probe and a logic probe accessory kit (020-2662-xx).

Note: Please specify power plug and manual language version when ordering.

Options

Record Length Options

Option	MSO5034 DPO5034 MSO5054 DPO5054	MSO5104 DPO5104 MSO5204 DPO5204
Opt. 2RL	25M/Ch	50M max, 25M/Ch
Opt. 5RL	50M/Ch	125M max, 50M/Ch
Opt. 10RL	125M/Ch	250M max, 125M/Ch

Solid State Hard Disk Drive Options

Option	Description
Opt. SSD	Solid State Hard Disk Drive, ≥300 GB

Software Options

Option	Description
Opt. DDRA*3	DDR Memory Bus Analysis
Opt. DJA	Jitter and Eye Analysis Tools – Advanced (DPOJET)
Opt. ET3*4	Ethernet Compliance Testing
Opt. LT	Waveform Limit Testing
Opt. MOST*2	MOST Essentials – Electrical Compliance and Debug Test Solution for MOST50 and MOST150
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 as well as analytical tools such as digital views of the signal, bus views, 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 as well as analytical tools such as digital views of the signal, bus views, 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 as well as 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-CUST	Custom Serial Analysis Kit for Developers
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, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 Recommended Probing – Differential
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 as well as 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-PCIE*7	PCI Express Serial Analysis. Enables analysis of PCI Express buses with analytical tools such as digital views of the signal, bus views, and packet decode tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 (and any D0 - D15 on MSO models) Recommended Probing – Differential

Option	Description
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 digital views of the signal, 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. SR-810B	8b/10b Serial Analysis. Enables analysis of 8b/10b buses with analytical tools such as digital views of the signal, bus views, and packet tables with time stamp information. Signal Inputs – Any Ch1 - Ch4 (and any D0 - D15 on MSO models) Recommended Probing – Differential
Opt. SVE	SignalVu Essentials – Vector Signal Analysis Software
Opt. SVA*5	SignalVu AM/FM/Direct Audio Measurements
Opt. SVM*5	SignalVu General-purpose Modulation Analysis
Opt. SVP*5	SignalVu Pulse – Advanced Signal Analysis
Opt. SVT*5	SignalVu Settling Time Measurements – Frequency and Phase
Opt. USB*6	USB 2.0 Compliance Testing
Opt. VET	Visual Trigger and Search
Opt. VNM	CAN/LIN Protocol Analysis Software
Bundle Options	
Opt. PS1	Power Solution Bundle: DPOPWR, P5205A, TCP0030, TPA-BNC, 067-1686-xx (Deskew Fixture)
Opt. PS2	Power Solution Bundle: DPOPWR, THDP0200, TCP0030, 067-1686-xx (Deskew Fixture)
Opt. PS3	Power Solution Bundle: DPOPWR, TMDP0200, TCP0020, 067-1686-xx (Deskew Fixture)

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

Floating Option 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 Tektronix oscilloscopes. Floating licenses are available for the following license-key enabled options.

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

Option	Description
DPOFL-DDRA*3	DDR Memory Bus Analysis
DPOFL-DJA	Jitter and Eye Analysis Tools – Advanced (DPOJET)
DPOFL-ET3*4	Ethernet Compliance Testing
DPOFL-LT	Waveform Limit Testing
DPOFL-MOST*2	MOST Essentials – Electrical Compliance and Debug Test Solution (MOST50, MOST150)
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-CUST	Custom Serial Analysis Kit for Developers
DPOFL-SR-DPHY	MIPI® D-PHY Serial Analysis
DPOFL-SR-EMBD	Embedded Serial Triggering and Analysis (I^2C, SPI)
DPOFL-SR-PCIE*7, 8	PCI Express Serial Analysis
DPOFL-SR-USB	USB 2.0 Serial Triggering and Analysis (LS, FS, HS)
DPOFL-SR-810B	8b/10b Serial Analysis
DPOFL-SVE	SignalVu Essentials – Vector Signal Analysis Software
DPOFL-SVA*5	SignalVu AM/FM/Direct Audio Measurements
DPOFL-SVM*5	SignalVu General-purpose Modulation Analysis
DPOFL-SVP*5	SignalVu Pulse – Advanced Signal Analysis
DPOFL-SVT*5	SignalVu Settling Time Measurements – Frequency and Phase
DPOFL-USB*6	USB 2.0 Compliance Testing
DPOFL-VET	Visual Trigger and Search
DPOFL-VNM	CAN/LIN Protocol Analysis Software

*2 Requires Opt. DJA.

*3 Requires Opt. DJA. Available on 1 GHz and 2 GHz models only.

*4 Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture.

*5 Requires Opt. SVE.

*6 Requires TDSUSBF (USB Test Fixture). 2 GHz bandwidth required for high-speed USB.

*7 Available on ≥1 GHz models only.

*8 Due to large volumes of data, use of standard high-capacity hard drive rather than smaller SSD is recommended.

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. A12	Brazil
Opt. A99	No power cord

User Manual Options

Option	Description
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. 99	No manual

Service Options*[9]

Option	Description
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)

*[9] Probes and accessories are not included in the oscilloscope warranty. Refer to the data sheet for each probe for its unique warranty and calibration terms.

Recommended Accessories

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.

Probe	Description
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
TCP0030	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

Accessories

Accessory	Description
077-0076-xx	Service Manual
077-0010-xx	Programmer Manual
077-0063-xx	Performance Verification and Specifications Manual
SIGEXPTE	NI LabVIEW SignalExpress Tektronix Edition Software (Full Version)
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)
119-6297-xx	Full-size keyboard with 4-port USB hub
119-7465-00	TekVPI External Power Supply – Required when probe power usage exceeds 15 W. Power cord not included
119-7766-xx	External DVD R/W Drive
065-0851-xx	Removable HD Spare with rotational media
K420	Oscilloscope Cart
FPGAVIEW-A-MSO	Support for Altera FPGAs
FPGAVIEW-X-MSO	Support for Xilinx FPGAs
NEX-HD2HEADER	Mictor connector to square pin adapter

Cables

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

Test Fixtures

Fixture	Description
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

Adapter	Description
P6701B*[10]	Optical/Electrical Converter (Multi Mode)
P6703B*[10]	Optical/Electrical Converter (Single Mode)

*[10] Requires TekVPI to TekProbe BNC adapter (TPA-BNC).

Instrument Upgrades

To upgrade your MSO/DPO5000 Series oscilloscope, order DPO-UP and option listed below. For example, DPO-UP DDRA.

Option	Description
To upgrade record length:	
RL02E	From Standard Configuration to Opt. 2RL Configuration
RL05E	From Standard Configuration to Opt. 5RL Configuration
RL010E	From Standard Configuration to Opt. 10RL Configuration
RL25E	From Opt. 2RL Configuration to Opt. 5RL Configuration
RL210E	From Opt. 2RL 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 to a higher-capacity Hard Disk Drive:	
HDD5	Add an additional higher-capacity removable Hard Disk Drive (customer installable)
To upgrade MSO/DPO5000 Series with:	
DDRA*3	Add Opt. DDRA
DJAE	Add Opt. DJA – Jitter and Eye Analysis Tools - Advanced (DPOJET)
ET3*4	Add Opt. ET3 – Ethernet Compliance Testing
LT	Add Opt. LT – Waveform Limit Testing
MOST*2	Add Opt. MOST – MOST Essentials - Electrical Compliance and Debug Test Solution (MOST50, MOST150)
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-CUST	Add Opt. SR-CUST – Customer Serial Analysis Kit for Developers
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-PCIE*7, 8	Add Opt. SR-PCIE – PCI Express Serial Analysis
SR-USB	Add Opt. SR-USB – USB 2.0 Serial Triggering and Analysis (LS, FS, HS)
DPOFL-SR-810B	8b/10b Serial Analysis
SVEE	Add Opt. SVE – SignalVu Essentials - Vector Signal Analysis Software
SVA*5	Add Opt. SVA – SignalVu AM/FM/Direct Audio Measurements
SVM*5	Add Opt. SVM – SignalVu General-purpose Modulation Analysis
SVP*5	Add Opt. SVP – SignalVu Pulse - Advanced Signal Analysis
SVT*5	Add Opt. SVT – SignalVu Settling Time Measurements - Frequency and Phase
USB*6	Add Opt. USB – USB 2.0 Compliance Testing
VETE	Add Opt. VET – Visual Trigger and Search
VNM	Add Opt. VNM – CAN/LIN Serial Protocol Decode
To upgrade DPO5000 Series to MSO:	
MSOE	Add 16 digital channels to a DPO5000

*2 Requires Opt. DJA.

*3 Requires Opt. DJA. Available on 1 GHz and 2 GHz models only.

*4 Requires TF-GBE-BTP or TF-GBE-ATP Ethernet Test Fixture.

*5 Requires Opt. SVE.

*6 Requires TDSUSBF (USB Test Fixture). 2 GHz bandwidth required for high-speed USB.

*7 Available on ≥1 GHz models only.

*8 Due to large volumes of data, use of standard high-capacity hard drive rather than smaller SSD is recommended.

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* European toll-free number. If not accessible, call: +41 52 675 3777

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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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