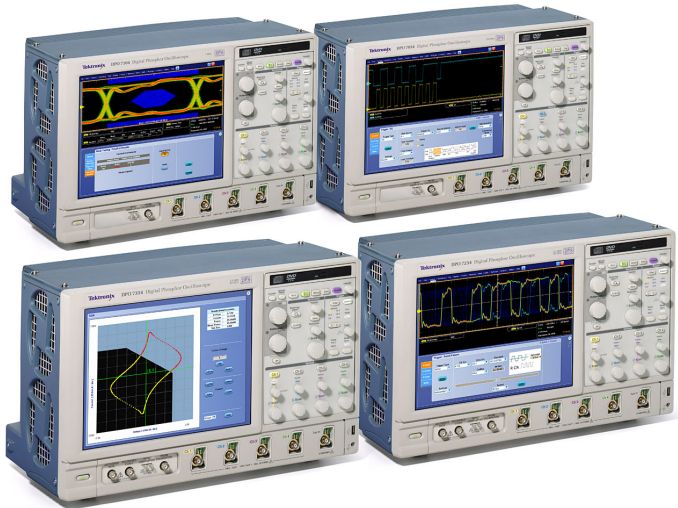# Digital Phosphor Oscilloscopes

DPO7000 Series Data Sheet

Features & Benefits

- 3.5 GHz Bandwidth Model for Serial and Digital Applications
- 2.5 GHz, 1 GHz, and 500 MHz Bandwidth Models for all Applications
- Up to 40 GS/s Real-time Sample Rate on One Channel and up to 10 GS/s on All Four Channels
- Up to 400 Megasamples Record Length with MultiView Zoom™ Feature for Quick Navigation
- >250,000 wfms/s Maximum Waveform Capture Rate
- User-selectable Bandwidth Limit Filters for Better Low-frequency Measurement Accuracy
- MyScope® Custom Windows and Right Mouse Click Menus for Exceptional Efficiency
- Event Search and Mark to Facilitate the Comprehension of Event Relationships

- Pinpoint® Triggering Provides the Most Flexible and Highest Performance Triggering, with over 1400 Combinations to Address Virtually Any Triggering Situation.
- Small Footprint and Light Weight
- 12.1" Largest XGA Touch-screen Display in the Industry
- Communications Mask Testing
- Clock Recovery from Serial Data Streams
- 64-bit NRZ Serial Pattern Trigger for Isolation of Pattern-dependent Effects up to 1.25 Gb/s
- NRZ Serial Test Pattern Triggering
- Low-speed Serial Protocol Triggering (I2C,SPI, RS-232, CAN)
- Technology-specific Software Solutions Provide Built-in Domain Expertise for Ethernet, USB 2.0 Compliance Testing, Jitter, Timing, Eye Diagram, Power, DDR Memory bus analysis, CAN, and LIN Network Design
- OpenChoice® Software with Microsoft Windows XP OS Enables Built-in Networking and Extended Analysis

Applications

- Signal Integrity, Jitter, and Timing Analysis
- Verification, Debug, and Characterization of Sophisticated Designs
- Debugging and Compliance Testing of Serial Data Streams for Telecom and Datacom Industry Standards
- Low-speed Serial Bus Design (I2C, SPI, CAN, LIN, RS-232)
- Investigation of Transient Phenomena
- Power Measurements and Analysis
- Spectral Analysis

Tektronix®

User-selectable bandwidth limiting choices

Zoom in on four areas of interest simultaneously to compare them

Unmatched Performance for Greater Insight Into Your Design to Get Your Work Done Faster

The DPO7000 Series are the new generation of real-time digital phosphor oscilloscopes and are the industry's best solution to the challenging signal integrity issues faced by designers verifying, characterizing, debugging, and testing sophisticated electronic designs.
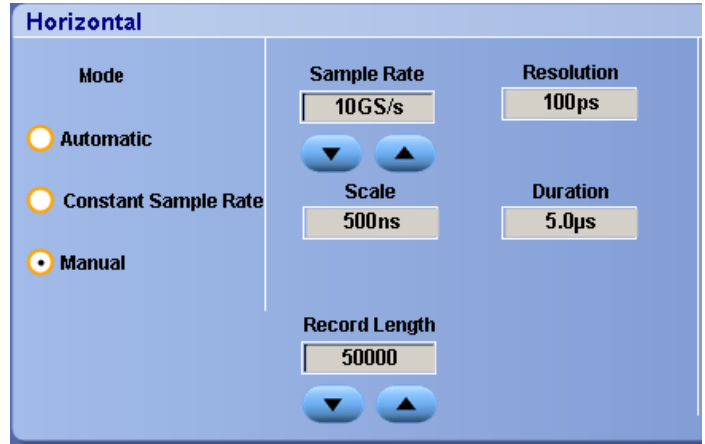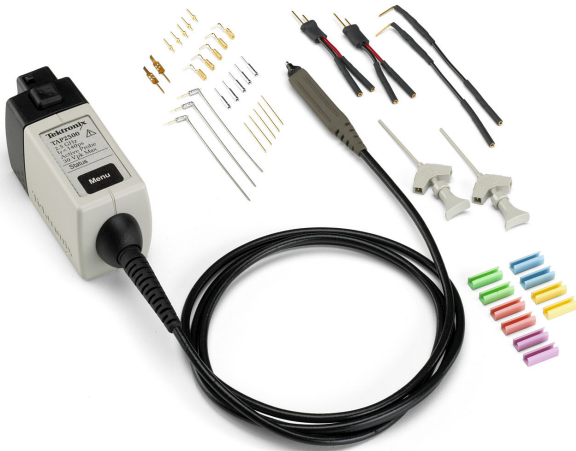
The family features exceptional performance in signal acquisition and analysis, operational simplicity, and unmatched debugging tools to

accelerate your day-to-day tasks. The largest screen in the industry and the intuitive user interface provide easy access to the maximum amount of information.

Unmatched Acquisition Performance

Signal Fidelity of Tektronix Oscilloscopes Ensures Confidence in Your Measurement Results

- High sample rate on all models, on all channels, to capture more signal details (transients, imperfections, fast edges)
  - 40 GS/s on one channel on the 2.5 GHz and 3.5 GHz models
  - Option 2SR to double the maximum real-time sample rate for the 500 MHz and 1 GHz models

- High bandwidth up to 3.5 GHz, matched across 2, 3, or 4 channels and enabled by Tektronix proprietary DSP enhancement. The user-selectable DSP filter on each channel provides magnitude and phase correction plus extension to 3.5 GHz for more accurate signal fidelity for complex measurements. The DSP filter on each channel can also be switched off to take advantage of true 2.5-GHz analog bandwidth for applications needing the highest available raw data capture.

- The DPO7000 Series oscilloscopes include as a standard feature a series of user-selectable bandwidth limit filters. These filters preserve the instrument's bandwidth roll-off characteristics, flatness, and phase linearity within the new frequency range, thereby reducing the effects of out-of-band noise on measurements. Now, designers can purchase one instrument for their highest bandwidth needs and easily optimize it to handle lower-frequency measurements as well.

- Very low jitter noise floor and vertical accuracy for very accurate measurements

- Longest acquisition of the industry to provide more resolution and longer time sequence
  - Standard 10 million data points per channel on the DPO7000 Series
  - Optional up to 400 million total data points on 2.5 GHz and 3.5 GHz models
  - Optional up to 200 million total data points on the 500 MHz and 1 GHz models
  - Easily manage this deep record length, provide detailed comparison and analysis of multiple waveform segments with the MultiView Zoom™ feature. Automatically scroll through deep records visually, or create a math expression to instantly highlight differences

- Highest performance probing solutions for differential and single-ended voltage signals as well as current measurement, because accurate design verification depends on high-bandwidth access to critical signals and high-fidelity signal capture

Tektronix Active probes achieve high-speed signal acquisition and measurement fidelity

Unmatched Versatility

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

You have the choice of three horizontal time base modes of operations. If you are simply doing signal exploration and want to interact with a lively signal, you will use the *Automatic* or interactive default mode that provides you with the liveliest display update rate. If you want a precise measurement and the highest real-time sample rate that will give you the most measurement accuracy, then the *Constant Sample Rate* mode is for you. It will maintain the highest sample rate and provide the best real-time resolution. The last mode is called the *Manual* mode because it ensures direct and independent control of the sample rate and record length.

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

Easily create your own personalized "toolbox" of oscilloscope features in a matter of minutes using a simple, visual, drag-and-drop process. Once created, these custom control windows are easily accessed through a dedicated MyScope button and menu selection on the oscilloscope button/menu bar, just like any other control window. You can make an

3 modes of operation of the horizontal time base
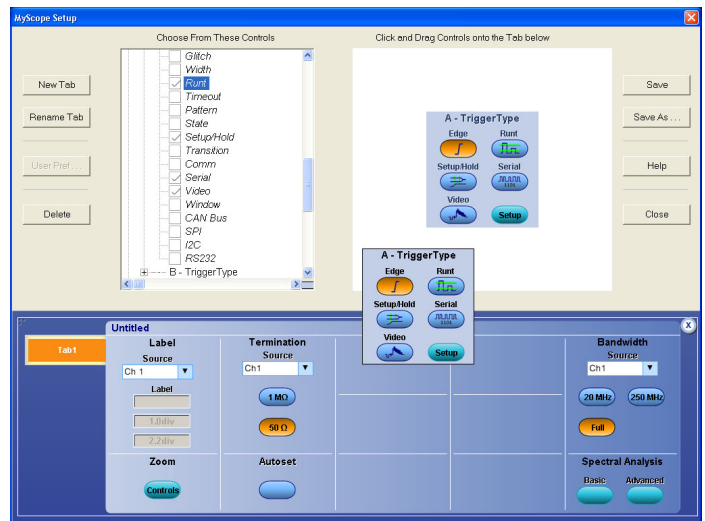
Drag and drop menu items of interest to create the MyScope control window

unlimited number of custom control windows, enabling each person who uses the oscilloscope in a shared environment, to have their own unique control window. MyScope control windows will benefit all oscilloscope users, eliminating the ramp-up time that many face when returning to the lab after not using an oscilloscope for a while, and enables the power user to be far more efficient. Everything you need is found in one control window rather than having to constantly navigate through menu after menu to repeat similar tasks.
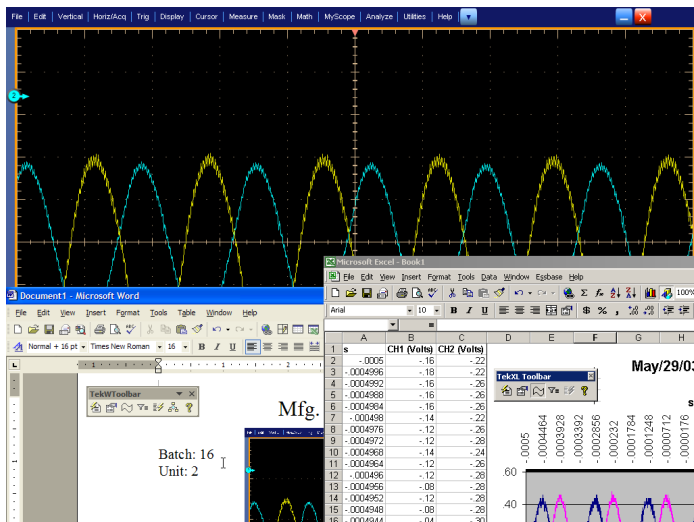
Capture data into Microsoft Excel using the unique Excel toolbar, and create custom reports using the Word toolbar

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

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

The analysis and networking features of OpenChoice software add flexibility to Tektronix' Windows XP oscilloscopes: Using the fast embedded bus, waveform data can be moved directly from acquisition to analysis applications on the Windows desktop at much faster speeds than conventional GPIB transfers. Tektronix' implementation of industry standard protocols, such as TekVISA™ interface and ActiveX controls, are included for using and enhancing Windows applications for data analysis and documentation. IVI-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). Integration of the oscilloscope with external PCs and non-Windows hosts is also supported by the DPO7000 Series software solutions. In addition, the OpenChoice architecture provides a comprehensive software infrastructure for faster, more versatile operations. Data transfer programs, such as the Excel or Word toolbar, are used to simplify analysis and documentation on the Windows desktop or on an external PC.
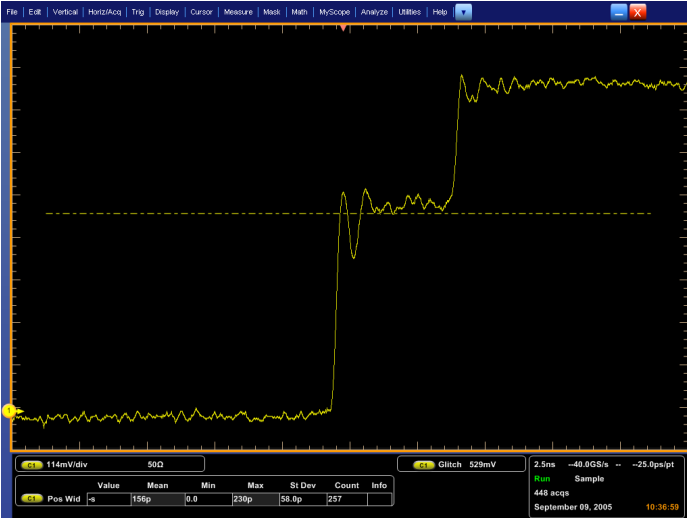
Accelerate the Debug of Complex Electrical Designs

FastAcq Acquisition Mode Expedites Debugging by Clearly Showing Imperfections

More than just color-grading, FastAcq enabled by Tektronix proprietary DPX® acquisition technology, captures signals up to more than 250,000 waveforms per second on all 4 channels simultaneously, dramatically increasing the probability of discovering infrequent fault events. And with a simple turn of the intensity knob you can clearly see "a world others don't see," because frequency of occurrence is color coded. Some oscilloscope vendors claim high waveform capture rates for short bursts of time, but only the DPO7000 Series, enabled by DPX technology, can deliver these fast waveform capture rates on a sustained basis — saving minutes, hours, or even days by quickly revealing the nature of faults so sophisticated trigger modes can be applied to isolate them.

Isolate glitches down to 200 ps wide

Isolate, setup, and hold violations down to 360 ps

Easily trigger on a specific I2C address

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

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

With Enhanced Triggering, you can choose to compensate for the difference in time there is between the trigger path and the display path and eliminate virtually any trigger jitter at the trigger point. In this mode, the trigger point can be used as a measurement reference.

Trigger on the Most Relevant Bit Sequence of the Industry Standard Serial Bus

I²C (Inter-Integrated Circuit) triggering is a standard feature and includes Start condition, Missing Acknowledge, Restart, Data Read, Address, and/or Data Frame, in a 10-bit or 7-bit format with a specific selection to choose whether or not to include the R/W bit.
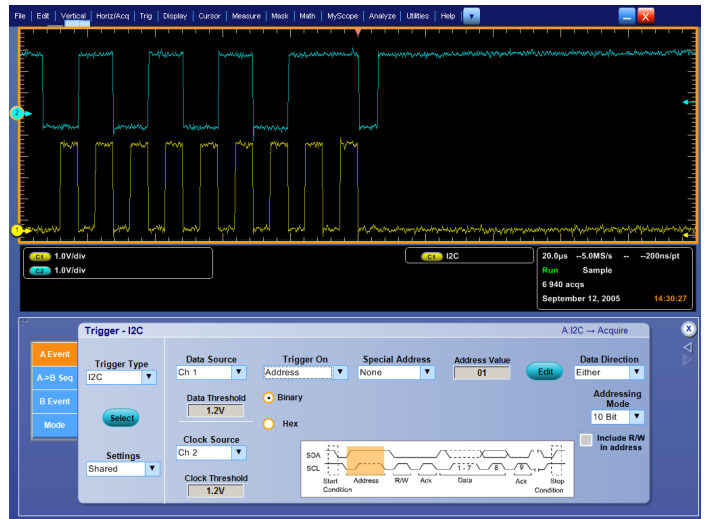
SPI (Serial Peripheral Interface) triggering is a standard feature and includes triggering on a data pattern within a user-definable frame. RS-232 triggering is a standard feature.

CAN (Controller Area Network) triggering is an optional feature (Opt. LSA) and includes synchronization to the Start or End of a CAN frame on any CAN high or CAN low signal, triggering on Type of Frame (Data, Remote, Overload), Identifier, Data, Missing Acknowledge, and Bit Stuffing error.

Analog HDTV/EDTV Triggering for emerging standards like 1080i, 1080p, 720p and 480p as well as standard video triggering on any line within a field, all lines, all fields, odd or even fields for NTSC, SECAM and PAL video signals. In addition, IRE and mV graticules can be selected for easier measurements and visual inspection. This is a standard feature.
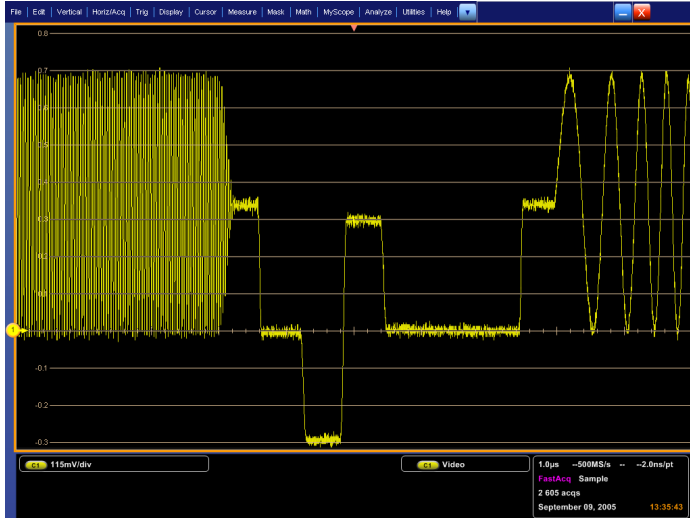
Triggering on an analog HDTV trilevel sync signal and examining horizontal blanking interval

Serial pattern triggering to debug pattern dependent issues.
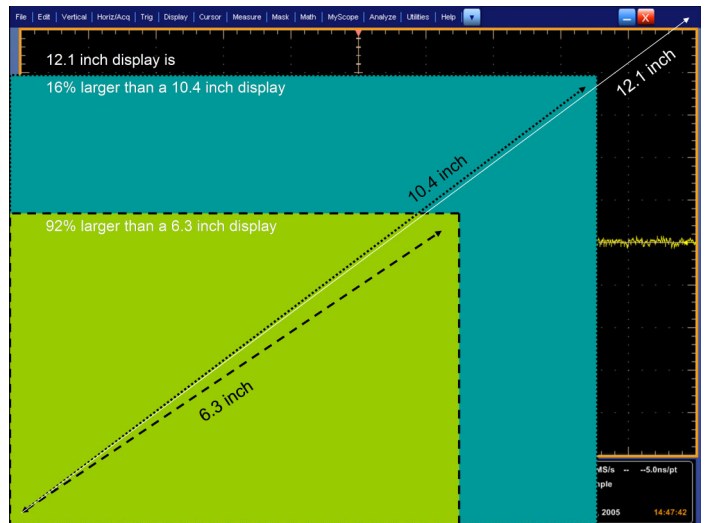
How does 12.1" display compare to the display size of other oscilloscopes?

Serial Pattern Triggering: To debug serial architectures, use the serial pattern triggering option for NRZ serial data stream with built-in clock recovery (available on models DPO7254 and DPO7354 only). The instrument can recover the clock signal, identify the transitions, and decode characters and other protocol data. With the combination of the Serial Trigger and Protocol Decode software, you can see the captured bit sequences decoded into their words for convenient analysis (for 8b/10b and other encoded serial data streams), or you can set the desired encoded words for the serial pattern trigger to capture. This serial trigger option covers NRZ serial standards up to 1.25 Gb/s.

Pattern Lock Triggering adds a new dimension to NRZ serial pattern triggering by enabling the oscilloscope to take synchronized acquisitions of a long serial test pattern with outstanding time base accuracy. Pattern lock triggering can be used to remove random jitter from long serial data patterns. Effects of specific bit transitions can be investigated, and averaging can be used with mask testing. This feature is included as part of Option PTM on the DPO7254 and 7354 models.

Large 12.1" XGA Display Screen

The DPO7000 Series has the largest display in the industry with a 12.1" XGA touch screen that gives up to 15% more waveform display than other oscilloscope series in its class.

10 vertical divisions give you 25% more vertical measurement resolution.

Unmatched Usability

The TekVPI™ probe interface provides versatility and ease of use enabled by intelligent bidirectional oscilloscope-to-probe communication.

The DPO7000 Series are fast-responding instruments and contain a comprehensive suite of features, such as a touch screen, shallow menu structures, intuitive graphical icons, knob-per-channel vertical controls, support for right mouse clicks, mouse wheel improvements, saving of waveforms and measurements available in Preview mode, Export/Save-Recall menu improvements.

Interoperability with Logic Analyzers for Digital Design and Debug

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

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

Such as a simple math expression, waveform mask testing, a pass/fail compliance test, event searching, event marking, or a custom application that you develop yourself, the DPO7000 Series Oscilloscopes offer the industry's most comprehensive set of analysis and compliance tools.

A Wide Range of Built-in Advanced Waveform Analysis Tools

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

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

FFT – To analyze your signal in the spectral domain, use the basic spectral (provides you with the best parameter), or use advanced spectral with the manual time base horizontal mode (to directly control the frequency span, center frequency, and resolution bandwidth).
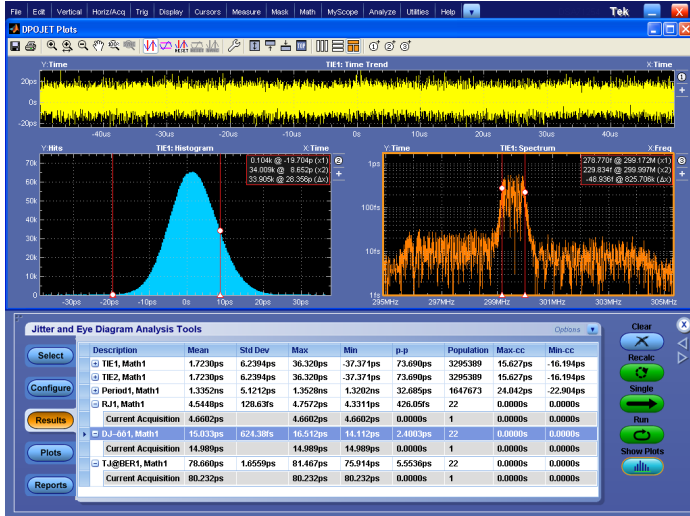

An integrated toolset for digital design and troubleshooting.

Basic spectral UI control window

Filtering – Enhance your ability to isolate or remove some important component of your signal (noise or specific harmonics of the signal) by creating your own filters, or using the filters provided as standard with the instrument.
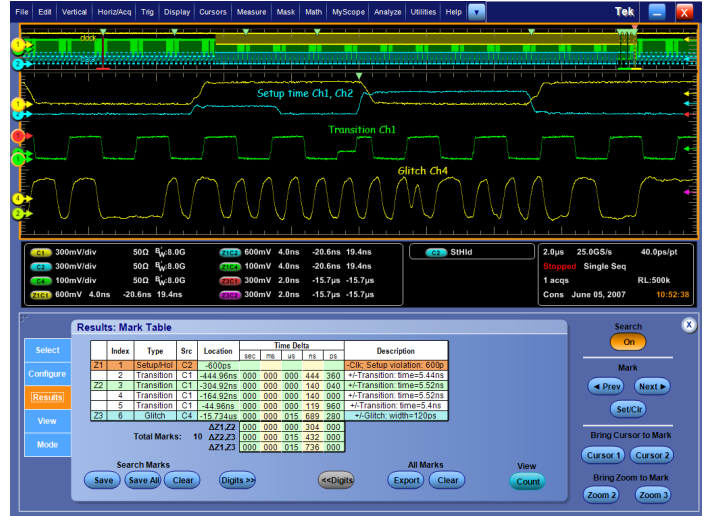
Jitter, Timing, and Eye-Diagram Analysis

Accelerating the research of specific events in an acquired waveform.

Jitter, Timing, and Eye Diagram Analysis

Jitter, Timing, and Eye Diagram Analysis (Opt. DJA) – Tight timing margins associated with today's serial buses demand stable, low-jitter designs. DPOJET extends the oscilloscope capability by making jitter, timing, and eye-diagram measurements over contiguous clock and data cycles in a single-shot real-time acquisition. With multiple measurements and a variety of analysis tools including spectral and trend plots, DPOJET quickly shows system timing under variable conditions. It also provides Rj/Dj on signals without a repeating pattern and without requiring a fixed pattern or length. You can get insight into the signal characteristics like SSC profile using the analysis features and perform pass-fail testing using eye-diagram masks and limit files for testing against statistical limits using the compliance features.

This tool is available for the DPO7000 Series as Opt. DJA and Opt. DJE.

Advanced Event Search and Mark (Opt. ASM) – Event Search and Mark will relieve the user from the tedious task of examining data by highlighting important events, skipping the unimportant ones, and enhancing the comprehension of event relationships. You can navigate between the events of interest effortlessly. A basic event (edge-only) search and mark is provided as a standard feature; and support for more advanced event types like transition, setup, and hold or logic pattern, is provided with the ASM option.

Limit Testing (Opt. LT) – This feature consists of comparing an acquired waveform to boundaries. These boundaries are typically defined by the user to specify a tolerance band around a reference waveform. If any part of the acquired waveform falls outside of the limit, the software returns a failure message and the location of the failure is shown on the waveform.

Communications Mask Testing (Opt. MTM) – This feature provides a complete portfolio of masks for verifying compliance to serial communications standards. It supports 156 Standards Masks –

- ITU-T (64 Kb/s to 155 Mb/s)
- ANSI T1.102 (1.544 Mb/s to 155 Mb/s)
- Ethernet IEEE 902.3, ANSI X3.263 (125 Mb/s to 1.25 Gb/s)
- Sonet/SDH (51.84 Mb/s to 622 Mb/s)
- Fiber Channel (133 Mb/s to 2.125 Gb/s)
- USB (12 Mb/s to 480 Mb/s)
- IEEE 1394 (491.5 Mb/s to 1.966 Gb/s)
- RapidI/O (up to 2 Gb/s)
- OIF Standards (1.244 Gb/s)
- Video (143.18 Mb/s to 1.485 Gb/s)

CAN and LIN Timing and Protocol Decode Software (Opt. LSA) – When you need to ensure seamless and reliable operation of a CAN or LIN network, this option enables CAN bus triggering and provides the solution to measure oscillator tolerance, propagation delay, and simultaneously decode CAN and LIN messages, with the protocol leveraging the trigger capabilities. This option is offered on DPO7354, DPO7254, DPO7104 and DPO7054 as Opt. LSA.
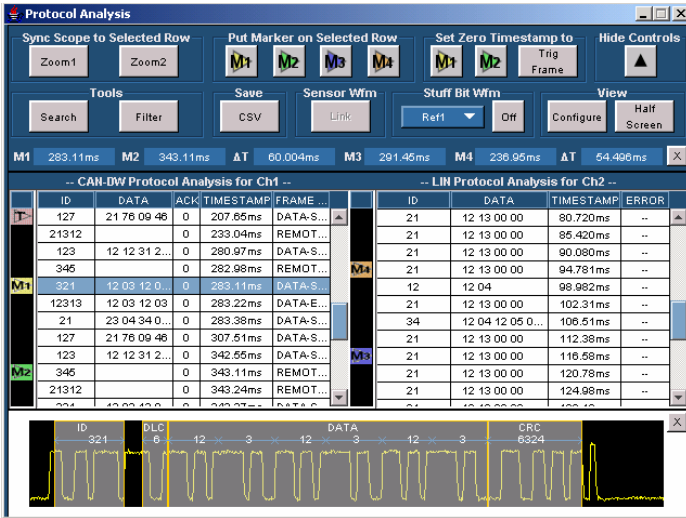
CAN and LIN Timing and Protocol Decode
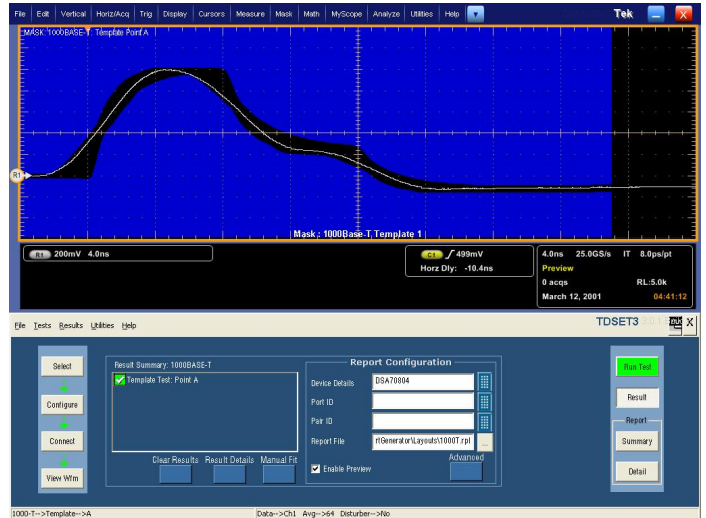
Ethernet compliance testing

Power Measurement and Analysis

USB compliance testing
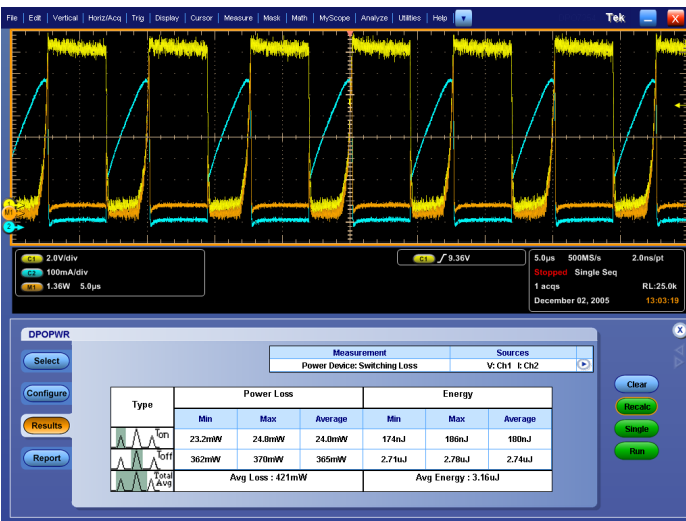
Optional Power Measurement and Analysis (Opt. PWR) – Analyze power dissipation in power supply switching devices and magnetic components, and generate detailed reports in customizable formats. The Hi-Res acquisition mode delivers greater than 8 bits of vertical resolution on single-shot or repetitive signals at bandwidth up to 125 MHz. The powerful and flexible measurements, math, and math-on-math capabilities make it an ideal solution for performing power measurements, such as voltage, current, instantaneous power, and energy, for power-device designers. The new TekVPI™ interface provides smart communication between the oscilloscope and the probe. TekVPI probe interface also provides more power to the probe interface, allowing customers to directly connect current probes to the front of the oscilloscope.

Optional Ethernet Compliance Testing (Opt. ET3) – Provides compliance testing for 10/100/1000Base-T signals.

Optional USB Compliance Testing (Opt. USB) – Provides compliance testing for USB 2.0 signals.

Optional DDR Memory System Analysis (Opt. DDRA) – Accelerate the validation of a memory system based on DDR1, LP-DDR1, DDR2, DDR3, or DDR variants technology, like GDDR3. This new DDR search algorithm automatically detects the rates and the voltage levels of the data and strobe signals and marks every occurrence of read or write bursts. You can then generate an eye diagram of the data or perform JEDEC standard measurements qualified on read or write bursts with DPOJET.
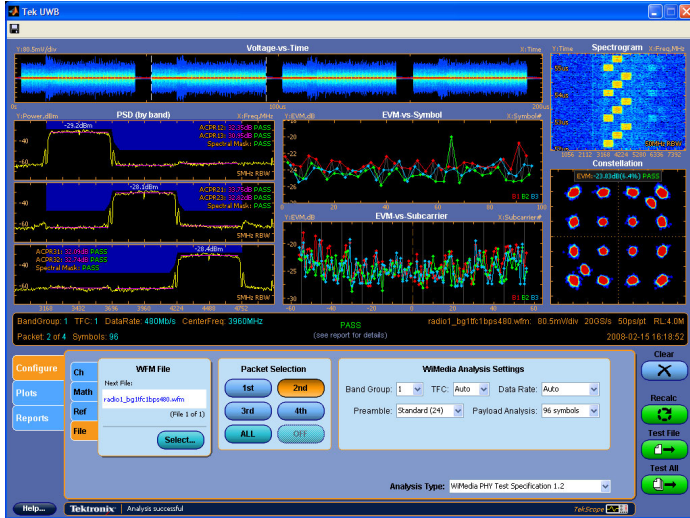
UWB WiMedia analysis and measurements
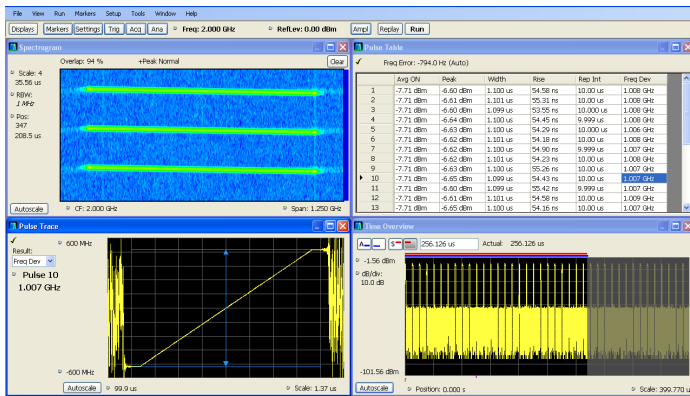
SignalVu™ enables detailed analysis in multiple domains

Optional Ultra-Wideband Spectral Analysis and Ultra-Wideband Spectral Analysis Essentials – UWBE: Ultra-Wideband microwave, optical, and electrical signals require more real-time bandwidth than is possible with spectrum analyzer based solutions. Spectral Analysis and Digital Down Conversion of RF data is fast and easy and the down-converted frequency span of interest may be exported for further analysis in tools such as RSAVu and MATLAB.

UWB in addition adds: With automatic packet, TFC and data rate detection, support for all band groups, Time Frequency Codes and data rates, WiMedia PHY 1.2 analysis provides a complete solution. Rapid visualization, debug, and report generation of the Spectrograms, Power Spectral Density, QPSK/DCM Constellations, EVM-vs-Symbol, EVM-vs-Subcarrier, Common-Phase-Error-vs-Symbol, and Voltage-vs-Time plots and complete measurements are captured and documented for each test condition.

SignalVu™ Vector Signal Analysis (Opt. SVE, SVP, SVM) – Easily validate wideband designs and characterize wideband spectral events. By combining the signal analysis engine of the RSA6100A Real-Time Spectrum Analyzer with that of the industry's widest bandwidth digital oscilloscopes, you can evaluate complex signals up to 20 GHz without the need of an external down converter. 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.

Characteristics

Vertical System

	DPO7054	DPO7104	DPO7254	DPO7354
Input Channels			4	
Bandwidth (DSP Bandwidth Enhance)	n/a	n/a	n/a	3.5 GHz*1
Rise Time (DSP Bandwidth Enhance)	n/a	n/a	n/a	115 ps
Hardware Analog Bandwidth (-3 dB)	500 MHz	1 GHz	2.5 GHz	2.5 GHz
Rise Time 10% to 90% (typical)	460 ps	300 ps	160 ps	145 ps
Rise Time 20% to 80% (typical)	310 ps	200 ps	100 ps	95 ps
DC Gain Accuracy		±1% with offset/position set to 0		
Bandwidth Limits		Depending on instrument model: 3.0 GHz, 2.5 GHz, 2 GHz, 1 GHz, 500 MHz, 250 MHz or 20 MHz		
Input Coupling		AC, DC, GND		
Input Impedance (software selectable)		1 MΩ ±1% with 13 pF ±2 pF or 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 bit (>11 bit with averaging)		
Max Input Voltage, 1 MΩ		±150 V CAT I, derate at 20 dB/decade to 9 V_{RMS} above 200 kHz		
Max Input Voltage, 50 Ω		5 V_{RMS}, with peaks less than ±24 V		
Position Range		±5 divisions		
Offset Range		1 mV/div to 50 mV/div: ±1 V 50.5 mV/div to 99.5 mV/div: ±1.5 V – 10 Divisions 100 mV/div to 500 mV/div: ±10 V 505 mV/div to 995 mV/div: ±15 V – 10 Divisions 1 V/div to 5 V/div: ±100 V 5.05 V/div to 10 V/div: ±150 V – 10 Divisions		
Offset Accuracy		1 mV/div to 9.95 mV/div: ±0.2% (offset value-position) ±0.1 div ±1.5 mV 10 mV/div to 99.5 mV/div: ±0.35% (offset value-position) ±0.1 div ±1.5 mV 100 mV/div to 1 V/div: ±0.35% (offset value-position) ±0.1 div ±15 mV 1.01 V/div to 10 V/div: ±0.25% (offset value-position) ±0.1 div ±150 mV		
Delay between any two channels (typical)		≤100 ps (50 Ω, DC coupling and equal V/div at or above 10 mV/div)		
Channel-to-channel Isolation (Any Two Channels at Equal Vertical Scale Settings) (typical)		≥100:1 at ≤100 MHz; ≥30:1 between 100 MHz and 2.5 GHz > 20:1 between 2.5 and 3.5 GHz		

*1 3 GHz for sine wave of more than 4 div amplitude (typically).

Time Base System

	DPO7054	DPO7104	DPO7254 / DPO7354
Time Base Range	100 ps/div to 1000 s/div	50 ps/div to 1000 s/div	25 ps/div to 1000 s/div
with Opt. 2SR	50 ps/div to 1000 s/div	25 ps/div to 1000 s/div	–
Time Resolution (in ET/IT mode)	1 ps	500 fs	250 fs
with Opt. 2SR	500 fs	250 fs	–
Time Base Delay Time Range		5 ns to 250 s	
Channel-to-channel Deskew		Range ±75 ns	
Delta Time Measurement Accuracy		((0.06/sample rate)+(2.5 ppm×Reading)) RMS	
Trigger Jitter (RMS)		1.5 ps_{RMS} (typical) with enhanced triggering OFF < 100 fs_{RMS} with enhanced triggering ON	
Jitter Noise Floor		<1 ps_{RMS} (<2 ps peak) for record duration <10 µs (typical) <2.5 ps_{RMS} for record duration <30 ms <65 parts/trillion for record durations <10 s	
Time Base Accuracy		±2.5 ppm + Aging <1 ppm per year	

Acquisition System

	DPO7054	DPO7104	DPO7254 / DPO7354
Real-time Sample Rates			
1 channel (max)	10 GS/s	20 GS/s	40 GS/s
with Opt. 2SR	20 GS/s	40 GS/s	−
2 channels (max)	5 GS/s	10 GS/s	20 GS/s
with Opt. 2SR	10 GS/s	20 GS/s	−
3-4 channels (max)	2.5 GS/s	5 GS/s	10 GS/s
with Opt. 2SR	5 GS/s	10 GS/s	−
Equivalent Time Sample Rate (max)	4 TS/s (for repetitive signals)		
Maximum Record Length per Channel			
with Standard Configuration	40 M (1-CH.), 20 M (2-CH.), 10 M (4-CH.)		
with Record Length Opt. 2RL	80 M (1-CH.), 40 M (2-CH.), 20 M (4-CH.)		
with Record Length Opt. 5RL	200 M (1-CH.), 100 M (2-CH.), 50 M (4-CH.)		
with Record Length Opt. 10RL	−	−	400 M (1-CH.) 200 M (2-CH.) 100 M (4-CH.)

Maximum Duration at Highest Real-Time Resolution (1-CH)

	DPO7054	DPO7104	DPO7254 / DPO7354
Resolution	100 ps (10 GS/s)	50 ps (20 GS/s)	25 ps (40 GS/s)
with Opt. 2SR	50 ps (20 GS/s)	25 ps (40 GS/s)	−
Max Duration with Standard Record Length and Sample Rate	4 ms	2 ms	1 ms
with Opt. 2SR	2 ms	1 ms	−
Max Duration with Opt. 2RL	8 ms	4 ms	2 ms
with Opt. 2SR	4 ms	2 ms	−
Max Duration with Opt. 5RL	20 ms	10 ms	5 ms
with Opt. 2SR	10 ms	5 ms	−
Max Duration with Opt. 10RL	−	−	10 ms

Acquisition Modes

	DPO7054 / DPO7104 / DPO7254 / DPO7354
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
Sample	Acquire sampled values
Peak Detect	Captures narrow glitches at all real-time sampling rates: 1/sample rate at ≤10 GS/s
Averaging	From 2 to 10,000 waveforms included in average
Envelope	From 1 to 2×10^9 waveforms included in min-max envelope
Hi-Res	Real-time boxcar averaging reduces random noise and increases resolution
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.
Roll Mode	Up to 10 MS/s with a maximum record length of 40 M

Pinpoint® Trigger System

	DPO7054 / DPO7104 / DPO7254 / DPO7354
Sensitivity	
Internal DC Coupled	0.7 div DC to 50 MHz increasing to 1.2 div at rated analog bandwidth (typical); 2.5 div at 3.5 GHz with DSP Bandwidth enhance
External (Auxiliary Input) 1 MΩ	250 mV from DC to 50 MHz increasing to 350 mV at 250 MHz (typical)
Trigger Characteristics	
A Event and Delayed B Event Trigger Types	Edge, Glitch, Runt, Width, Transition Time, Time-out, Pattern, State, Setup/Hold, Window—all except Edge, Pattern, and State can be Logic State qualified by up to two channels
Low-speed Serial Protocol Trigger Type (A Event only)	I^{2}C, SPI and RS-232 (standard). CANbus available as Opt. LSA. Trigger on address, data, and special handshaking states and other conditions.
Main Trigger Modes	Auto, Normal, and Single
Enhanced Triggering	User-selectable; it corrects the difference in timing between the trigger path and the acquired data path (it supports all Pinpoint trigger types on both A- and B-Events except pattern trigger and not available in FastAcq).
Trigger Sequences	Main, Delayed by Time, Delayed by Events, Reset by Time, Reset by State, Reset by Transition. All sequences can include separate horizontal delay after the trigger event to position the acquisition window in time.
Communications-related Triggers	Requires Opt. MTM Support for AMI, HDB3, BnZS, CMI, MLT3 and NRZ encoded communications signals. Select among isolated positive or negative one, zero pulse form, or eye patterns as applicable to the standard.
Serial Pattern Trigger	On DPO7254 or DPO7354 only, and requires Opt. PTM Up to 64 bit serial word recognizer, bits specified in binary (high, low, don't care) or hex format. Trigger on NRZ-encoded data up to 1.25 Gb/s.
Video Type Trigger Formats and Field Rates	Triggers from negative sync composite video, field 1 or field 2 for interlaced systems, any field, specific line, or any line for interlaced or noninterlaced systems. Supported systems include NTSC, PAL, SECAM, and HDTV 1080/24sF, 1080p/25, 1080i/50, 1080i/60, 1080p/24, 720p/60, 480p/60
Clock Recovery System	On DPO7254 or DPO7354 only and requires Opt. PTM or MTM
Clock Recovery Phase Locked Loop Bandwidth	Fixed at FBaud/500
Frequency Range	1.5 MBaud to 1.25 GBaud
Clock Recovery Jitter (RMS)	20 ps$_{RMS}$ + 1.25% Unit Interval RMS for PRBS data patterns. 20 ps$_{RMS}$ + 1.25% Unit Interval RMS for repeating "0011" data pattern.
Tracking/Acquisition Range	±5% of requested baud (typical)
Minimum Signal Amplitude needed for Clock Recovery	1 div$_{p-p}$ up to 1.25 GBaud (typical)
Trigger Level Range Internal	±12 divisions from center of screen
AUX Trigger	TekVPI interface; ±5 V (50 Ω); 150 V CAT I, derate at 20 dB/decade to 9 V$_{RMS}$ above 200 KHz (1 MΩ)
Line	Fixed at 0 V
Trigger Coupling	DC, AC (attenuates <60 Hz), HF Rej (attenuates >30 kHz), LF Rej (attenuates <80 kHz), Noise Reject (reduces sensitivity)
Trigger Holdoff Range	250 ns min to 12 s max

Trigger Modes

Mode	Description
Edge	Positive or negative slope on any channel or front panel auxiliary input. Coupling includes DC, AC, noise reject, HF reject, and LF reject.
Glitch	Trigger on or reject glitches of positive, negative, or either polarity. Minimum glitch width is down to 170 ps (typical) with rearm time of 250 ps (for DPO7254 or DPO7354).
Width	Trigger on width of positive or negative pulse either within or out of selectable time limits (down to 225 ps).
Runt	Trigger on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Event can be time- or logic-qualified.
Time-out	Trigger on an event which remains high, low, or either, for a specified time period. Selectable from 300 ps.
Transition	Trigger on pulse edge rates that are faster or slower than specified. Slope may be positive, negative, or either.
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 pattern goes false or stays true for specified period of time. Pattern (AND, OR, NAND, NOR) specified for four input channels defined as high, low, or don't care.
State	Any logical pattern of channels (1, 2, 3) clocked by edge on channel 4. Trigger on rising or falling clock edge.
Window	Trigger on an event that enters or exits a window defined by two user-adjustable thresholds. Event can be time- or logic-qualified.
Trigger Delay by Time	5 ns to 250 s.
Trigger Delay by Events	1 to 10,000,000 events
Comm	Provided as part of Opt. MTM. Support for AMI, HDB3, BnZS, CMI, MLT3 and NRZ encoded signals
I^{2}C, SPI and RS-232	Protocol trigger on DP07054, DPO7154, DPO7254, or DPO7354
CAN	Protocol trigger on DP07054, DPO7154, DPO7254, or DPO7354 as part of Opt. LSA
Serial Pattern (option PTM)	Captures serial data stream with built-in clock recovery for NRZ standards up to 1.25 Gb/s. Extended with pattern lock triggering to capture repeated acquisitions of long serial test patterns.

Search and Mark Events

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

Waveform Measurements

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

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 e.g. (Integral (CH.1–Mean(CH.1))×1.414×VAR1)
Math Functions	Average, Invert, Integrate, Differentiate, Square Root, Exponential, Log_{10}, Log_e, Abs, Ceiling, Floor, Min, Max, Sin, Cos, Tan, ASin, ACos, ATan, Sinh, Cosh, Tanh
Relational	Boolean result of comparison >, <, >=, <=, ==, !=
Frequency Domain Functions	Spectral Magnitude and Phase, Real and Imaginary Spectra
Vertical Units	Magnitude: Linear, dB, dBm
	Phase: Degrees, radians, group delay
	IRE and mV units
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.
Mask Function	A function that generates a Waveform Database pixmap from a sample waveform. Sample count can be defined.

Display Characteristics

Characteristic	Description
Display Type	Liquid crystal active-matrix color display
Display Size	Diagonal: 307.3 mm (12.1 in.)
Display Resolution	XGA 1240 horizontal × 768 vertical pixels
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 XP
CPU	Intel Pentium 4, 3.4-GHz processor
PC System Memory	2 GB
Hard Disk Drive	Rear-panel, removable hard disk drive, 80 GB capacity
CD-R/W Drive	Front-panel CD-R/W drive with CD creation software application
DVD Drive	Read only
Mouse	Optical wheel mouse, USB interface
Keyboard	Order 119-7083-00 for small keyboard (fits in pouch); USB interface and hub

Input/Output Ports

Port	Description
Front Panel	
Probe Compensator Output	Front panel pins. Amplitude 1 V ±20% into a ≥50 Ω load; 500 mV from base to top into a 50 Ω load, frequency 1 kHz ±5%.
Recovered Clock (for DPO7254 or DPO7354 only)	BNC connector, ≤1.25 Gb/s, Output swing ≥130 mV$_{p-p}$ into 50 Ω. Requires option to enable.
Recovered Data (for DPO7254 or DPO7354 only)	BNC connector, ≤1.25 Gb/s, Output swing 200 mV into 50 Ω. Requires option to enable.
USB 2.0 Port	One USB 2.0 connector
Aux Trigger Input	See Trigger specification
Side Panel	
Parallel Port	IEEE 1284, DB-25 connector
Audio Ports	Miniature phone jacks
Keyboard Port	PS-2 compatible
Mouse Port	PS-2 compatible
USB Ports	Four USB 2.0 connectors
LAN Port	RJ-45 connector, supports 10Base-T, 100Base-T, and Gigabit Ethernet
Serial Port	DB-9 COM1 port
VGA Video Port	DB-15 female connector; connect a second monitor to use dual-monitor display mode. Supports basic requirements of PC99 specifications.
Oscilloscope VGA Video Port	DB-15 female connector, 31.6 kHz sync, EIA RS-343A compliant, connect to show the oscilloscope display, including live waveforms on an external monitor or projector
Rear Panel	
Power	100 to 240 V$_{RMS}$ ±10%, 47 to 63 Hz, <550 W
	115 V$_{RMS}$ ±10%, 360 to 440 Hz,
	CAT I, <500 VA.
Analog Signal Output	BNC connector provides a buffered version of the signal that is attached to the Ch 3 input
Amplitude	50 mV/div ±20% into a 1 MΩ load, 25 mV/div ±20% into a 50 Ω load
Bandwidth	100 MHz into a 50 Ω load
Software-Switchable BNC Connector	
External Time Base Reference In	BNC connector, time base system can phase-lock to external 10 MHz reference
Time Base Reference Out	BNC connector, provides TTL-compatible output of internal 10 MHz reference oscillator
Aux Trigger Output	BNC connector provides a TTL-compatible, polarity switchable pulse when the oscilloscope triggers
GPIB Port	IEEE 488.2 standard

Physical Characteristics

Benchtop Configuration

Dimensions	mm	in.
Height	292	11.48
Width	451	17.75
Depth	265	10.44

Weight	kg	lbs.
Net	15	32
Shipping	28.9	63.75

Rackmount Configuration

Dimensions	mm	in.
Height	331	12.25
Width	479	18.85
Depth (from rackmounting ear to back of instrument)	231.75	9.12

Weight	kg	lbs.
Net	17.4	37.5
Rackmount Kit	2.5	5.5

Mechanical

Cooling — Required Clearance

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

Environmental

Characteristic	Description
Temperature	
Operating	0 °C to +50 °C, excluding CD-R/W drive; +10 °C to +45 °C, including CD-R/W drive.
Nonoperating	–40 °C to +71 °C.
Humidity	
Operating	5% to 95% relative humidity (RH) with a maximum wet bulb temperature of +29 °C at or below +50 °C, noncondensing. Upper limit derated to 45% RH above +30 °C up to +50 °C.
Nonoperating	5% to 95% relative humidity (RH) with a maximum wet bulb temperature of +29 °C at or below +60 °C, noncondensing. Upper limit derated to 45% RH above +30 °C up to +50 °C.
Altitude	
Operating	10,000 ft. (3,048 m).
Nonoperating	40,000 ft. (12,190 m).
Random Vibration	
Operating	0.000125 G^2/Hz from 5 to 350 Hz, -3 dB/octave from 350 to 500 Hz, 0.0000876 G^2/Hz at 500 Hz. Overall level of 0.27 G_{RMS}.
Nonoperating	0.0175 G^2/Hz from 5 to 100 Hz, -3 dB/octave from 100 to 200 Hz, 0.00875 G^2/Hz from 200 to 350 Hz, -3 dB/octave from 350 to 500 Hz, 0.006132 G^2/Hz at 500 Hz. Overall level of 2.28 G_{RMS}.
Regulatory	
Electromagnetic Compatibility	93/68/EEC; EN61326:1997 +A1 1998+A2:2000.
Certifications	UL 3111-1, CSA1010.1, ISO11469, EN61010-1, IEC 61010-1.

Ordering Information

DPO7000 Series

Product	Description
DPO7054	500 MHz Digital Phosphor Oscilloscope
DPO7104	1 GHz Digital Phosphor Oscilloscope
DPO7254	2.5 GHz Digital Phosphor Oscilloscope
DPO7354	3.5 GHz Digital Phosphor Oscilloscope for Serial and Digital applications

All Models Include: Accessory pouch, front cover, mouse, quick-start user manual (071-173x-xx), DPO7000 Series product software media, DPO7000 Series operating system restoration media, Optional applications software media, performance verification procedure PDF file, GPIB programmer's reference (on product software media), calibration certificate documenting NIST traceability, Z 540-1 compliance and ISO9001, power cord, one-year warranty.
Note: User to specify quick-start user manual language, and power plug when ordering.
DPO7054 also includes: (4) P6139A 500 MHz, 10x passive probes.(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.)

Options

Instrument Options

Option	Description
Record Length Options	
Opt. 2RL	80 MSamples max, 20 MSamples/ch
Opt. 5RL	200 MSamples max, 50 MSamples/ch
DPO7254/DPO7354	
only	
Opt. 10RL*5	400 MSamples max, 100 MSamples/ch
DPO7104/DPO7054	
only	
Opt. 2SR*2	Double maximum real-time sample rate
DPO7104	40 GS/s (1 channel), 20 GS/s (2 channels), 10 GS/s (3 or 4 channels)
DPO7054	20 GS/s (1 channel), 10 GS/s (2 channels), 5 GS/s (3 or 4 channels)
Software Options	
Opt. DDRA*9	DDR Memory Bus Analysis
Opt. DJA	DPOJET Jitter and Eye-diagram Analysis - Advanced
Opt. DJE	DPOJET Jitter and Eye-diagram Analysis - Essentials
Opt. LSA	Low-speed Serial Analysis includes CAN/LIN Trigger, Decode, and Analysis
Opt. MTM	Mask Testing for Serial Communication Standards (up to 1.5 Gb/s) Includes hardware clock recovery on DPO7254/DPO7354
Opt. LT	Limit Testing
Opt ASM	Advanced Event Search and Mark
Opt. ET3*3	TDSET3 Ethernet Compliance Test Software
Opt. USB*4	TDSUSBS USB 2.0 Compliance Test Software only
Opt. UWBE8	Ultra-Wideband Spectral Analysis Essentials. Does not include WiMedia compliance tests.
Opt. UWB*8	Ultra-Wideband Spectral Analysis Software. Includes WiMedia compliance tests.
Opt. PWR	DPOPWR Power Measurement and Analysis Software
Opt. SVE	SignalVu™ Essentials – Vector Signal Analysis Software
Opt. SVP*10	Advanced Signal Analysis (including pulse measurements). Requires option SVE
Opt. SVM*10	General-purpose Modulation Analysis. Requires option SVE
DPO7254/DPO7354 only	
Opt. PTM*5	8b/10b protocol triggering and NRZ serial pattern triggering. Includes hardware clock recovery up to 1.25 Gb/s and pattern lock triggering.
Opt. RTE*5	RT-Eye® Serial data compliance and analysis software
DPO7354 only	
Opt. DVI*8	Digital Visual Interface compliance test software
Bundle Options	
Opt. PS1	Power Bundle option includes TPA, BNC adapter, Probe Calibration, and deskew fixture 067-1686-xx, P5205, TCP0030, and Opt. PWR,

User Manual Options

Option	Description
Opt. L0	English manual
Opt. L1	French manual
Opt. L3	German manual
Opt. L5	Japanese manual
Opt. L7	Simple Chinese manual
Opt. L8	Standard Chinese manual
Opt. L9	Korean manual
Opt. L10	Russian manual

Power Plug Options

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

Service Options

(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.)

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. R3	Repair Service 3 Years
Opt. R5	Repair Service 5 Years

Recommended Accessories

Probes

Probe	Description
TCP0150	20 MHz TekVPI™ AC/DC 150 A current probe
TCP202*6	DC coupled current probe
TDP0500	500 MHz TekVPI high-voltage differential probe
TDP1000	1 GHz TekVPI high-voltage differential probe
TDP1500	1.5 GHz TekVPI high-voltage differential probe
TDP3500	3.5 GHz TekVPI high-voltage differential probe
TAP3500	3.5 GHz TekVPI active single-ended probe
TAP2500	2.5 GHz TekVPI active single-ended probe
TAP1500	1.5 GHz TekVPI active single-ended probe
TCP0030	>120 MHz TekVPI AC/DC 30 A current probe
TPA-BNC	TekProbe-BNC Level 2 to TekVPI adapter
P6139A	500 MHz, passive probe
P6158	3 GHz, 20x low C probe
P6247*6	1 GHz differential probe
P6243*6	1 GHz active probe
P6245*6	1.5 GHz active probe
P6248*6	1.5 GHz differential probe
P6250*8	500 MHz TekVPI high-voltage differential probe
P6251*8	1 GHz TekVPI high-voltage differential probe
P6330*6	3 GHz differential probe
P6246*6	400 MHz differential probe
P6101B	1x passive probe 15 MHz
TCPA300/TCPA400*6	Series current measurement systems
P5200/P5205/P5210*6	High-voltage differential probes
P5100/P6015A	High-voltage probes

Cables

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

Accessories

Accessory	Description
Mini Keyboard (USB interface)	Order 119-7083-00
Keyboard (USB interface)	Full-size keyboard with 4 port USB hub. Order 119-6297-00
Service Manual	Order 071-1740-xx
Instrumented DIMM for DDR3	Order scope NEXVu card for UDIMM Raw Card E (Contact www.nexustechnology.com)
Transit Case	Order 016-1970-00
Video Display Clamp Order	Order 013-0278-xx
Rackmount Kit	Order 016-1985-xx
Front Hard-drive Option for Rackmount Kit	Order 0161979-xx
Removable HD Spare	Order 065-0744-xx
Oscilloscope Cart	Order K420 (requires 407-5192-00 bracket set)
WaveStar™	Windows application for remote access

Test Fixtures

Fixture	Description
TDSUSBF	Test fixture for use with Opt. USB
Probe Calibration/Power Deskew Fixture	Order 067-1686-xx
Ethernet Test Fixture	Order through Crescent Heart Software (http://www.c-h-s.com)

Adapters

Adapter	Description
AMT75	1 GHz 75 Ω adapter
P6701B[6]	Optical/electrical converter (multi mode)
P6703B[6]	Optical/electrical converter (single mode)

Instrument Upgrades

To upgrade your DPO7000 Series Oscilloscope, order option as noted:

Option	Description
To upgrade record length:	
DPO7UP with Opt. RL02	From standard configuration to Opt. 2RL configuration
RL05	From standard configuration to Opt. 5RL configuration
RL010[5]	On DPO7254 or DPO7354 from standard configuration to Opt. 10RL configuration
RL25	From Opt. 2RL configuration to Opt. 5RL configuration
RL210[5]	On DPO7254 or DPO7354 from Opt. 2RL configuration to Opt. 10RL configuration
RL510[5]	On DPO7254 or DPO7354 from Opt. 5RL configuration to Opt. 10RL configuration
To upgrade DPO7000 Series with:	
DVI[8]	Opt. DVI
RTE[5]	Opt. RTE or TDSRT-Eye software
LSA	Opt. LSA

Option	Description
LT	Opt. LT
ASM	Opt. ASM
DDRA[9]	Opt. DDRA
DJAM	Opt. DJA
DJEM	Opt. DJE
ET3[3]	Opt. ET3
USB[4]	Opt. USB
UWBE[8]	Opt. UWBE
UWB[8]	Opt. UWB
MTM	Opt. MTM
PWR	Opt. PWR
SVEM	Opt. SVE
SVP[10]	Opt. SVP
SVM[10]	Opt. SVM
Other Upgrades:	
PTM[5]	To upgrade DPO7254 or DPO7354 with Opt. PTM
CP2[7]	TDSCPM2 ANSI/ITU Telecom pulse compliance testing software (requires Opt. MTM on DPO7000 Series)
J2	TDSDDM2 disk drive analysis software

[2] DPO7054 and DPO7104 only.

[3] Requires Ethernet Test Fixture.

[4] Requires TDSUSBF (USB Test Fixture). Greater than 2-GHz bandwidth required for high-speed USB.

[5] DPO7254 or DPO7354 only.

[6] Probe requires TPA-BNC adapter.

[7] Requires Opt. MTM

[8] DPO7354 only

[9] Requires DJA and ASM.

[10] Requires Opt. SVE or SVEM

CE

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

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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